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1. GENERAL INFORMATION

1.1. Scope

The Power Charger is designed to charge or recover (“Charger” mode) most accumulator batteries of 1-12V voltage and 6-100Ah capacity that are used in cars and in everyday life (wet cell, gel cell, AGM, MF types). The charger can be used as a stabilized power supply with constant 12.8V voltage and current limit of 25A (“Booster” mode). The device is protected against short circuit and overheat. The device has a special mode that allow to estimate capacity of a battery (BAT.TEST mode – training).

1.2 System set

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1.3. Features

Charger mode

Depending on the current state of a battery, the device automatically set one of the following operation mode: pre-charging, charging, and charge maintaining.

Pre-charging mode is activated if a battery is deeply discharged when the terminal voltage is below the specified value (default setting is 10.2V).

Charging mode is activated to normally charge a battery to the specified voltage or current values.

Charge maintaining mode is activated after the end of charging to maintain the specified voltage (default setting is 13.2V).

Booster mode

Maximum current - 25A, fixed constant voltage – 12.8V. In case of overcurrent (over 25A), the protection mode is activated.

BAT.TEST mode (training)

This mode allows to estimate residual capacity of a battery. There are three stages in this mode: pre-charging, discharging and main (finish) charging. The parameters are selected depending on a battery type and its capacity.

1.4. Special mobile app

The charger has a Bluetooth 4.2 interface that allow pairing it with an Android smartphone. You can manage and configure all parameters of the charger using our mobile application. There is an advanced settings menu for professional configuration. All configurations are stored in the history.

2. SAFETY INSTRUCTIONS

Read this manual and battery manufacturer's specific precautions before using the charger.



WARNING!

WHILE CHARGING, A BATTERY CAN EMIT EXPLOSIVE GASES THAT ARE DESTRUCTIVE FOR HEALTH. THAT IS WHY CHARGING MUST BE PERFORMED ONLY IN A PROPER VENTILATED AREA. KEEP SPARKS, FLAMES AND OTHER SOURCE OF HEAT AWAY FROM THE BATTERY. THE BATTERY AND CHARGER MUST BE INSTALLED ON A STABLE NON-FLAMMABLE SURFACE. BATTERIES CONTAIN CORROSIVE ACID. IF BATTERY ACID CONTACTS SKIN OR EYES, IMMEDIATELY FLOOD IT WITH RUNNING COLD WATER AND GET MEDICAL ATTENTION IMMEDIATELY. IT IS PROHIBITED TO OPEN THE CHARGER CASE AND USE THE DEVICE WITH DAMAGED CORDS. IT IS PROHIBITED TO BLOCK THE VENTILATIONS HOLES ON THE DEVICE. DO NOT ALLOW FLUIDS OR OTHER OBJECTS TO CONTACT WITH THE CHARGER AND WIRES. TO PREVENT CONDENSATION INSIDE THE UNIT, STORE IT IN VENTILATED AREA. IN CASE OF STORAGE OR SHIPPING UNDER BAD CONDITIONS, KEEP THE DEVICE IN A DRY AND WARM ROOM FOR TWO HOURS BEFORE TURNING IT ON. THE DEVICE MAY HEAT UP WHILE CHARGING. ALWAYS CHECK THE CONNECTIONS OF THE CORDS TO BATTERY TERMINALS (THE DEVICE MAY FAIL BECAUSE OF UNRELIABLE CONNECTIONS). MONITOR THE DEVICE PERIODICALLY DURING BATTERY CHARGING.



CHECK IF THE LATEST FIRMWARE VERSION IS INSTALLED BEFORE USING THE CHARGER. SEE THE SECTION 7 FOR DETAILS.

3. SPECIFICATION

Supply voltage	220V ~ 50Hz
Maximum input power	400 W

Parameters of the “Charger” mode

Charging current	0,1-25 A
Setting step	0,1 A
Maximum charging voltage	10-15V
Setting step	0,1 V

Parameters of the “Booster” mode

Voltage (fixed)	12,8 V
Maximum current	25 A

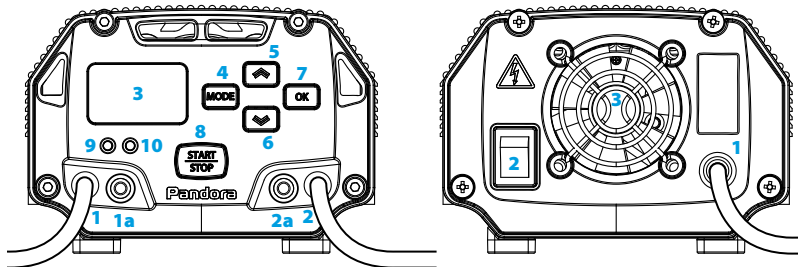
Parameters of the “BAT.TEST” mode

Maximum discharging current	5A
Operating temperatures	-20+40° C
Dimensions	295x127x90 mm
Net weight	no more than 3,1 kg

4. OPERATING INSTRUCTIONS

The Charger is a switched-mode power supply controlled by a microcontroller.

Management, display of operating modes and parameters of the device is available on the front panel or in the mobile app.



4.1. Controls on the charger case

FRONT PANEL

1. Negative terminal for connecting wires to the battery
- 1a. Negative power socket
2. Positive terminal for connecting wires to the battery
- 2a. Positive power supply socket
3. LCD indicator
4. MODE – button for selecting device operation modes
5. ⬆ - up button (increase)
6. ⬇ - down button (decrease)
7. OK - Select
8. Start/Stop button
9. Red indicator
10. Green indicator

BACK PANEL

1. AC Power cord (220V)
2. Power switch (Position: 0 – off; 1 – on)
3. Cooling fan

4.2. Getting started

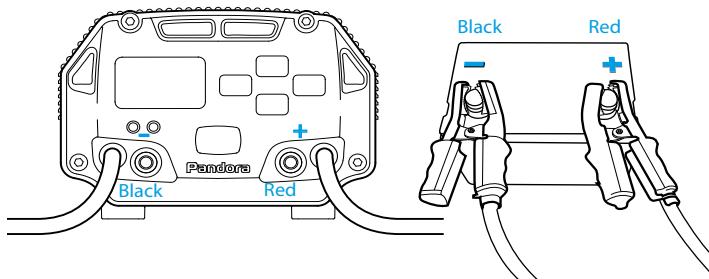
Connect wires to battery terminals.



WARNING! CHECK POLARITY BEFORE CONNECTIONS!

THE WIRE WITH THE RED CLAMP IS CONNECTED TO A POSITIVE (+) BATTERY TERMINAL.

THE WIRE WITH THE BLACK CLAMP IS CONNECTED TO A NEGATIVE (-) BATTERY TERMINAL.



4.3. Turn on/off the device

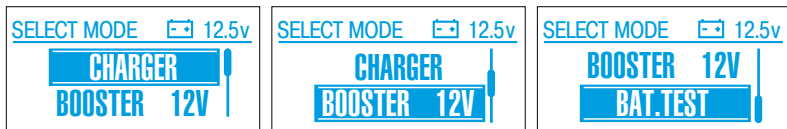
In order to turn on the device, turn the power switch on the back panel from position “0” to position “1”. A long melody and enabled display on the front panel will confirm that the device is turned on.

In order to turn off the device, turn the power switch on the back panel from position “1” to position “0”. The display on the front panel will be switched off.

5. CONTROL FORM THE FRONT PANEL OF THE DEVICE

The mode selection menu will be displayed after turning on the device:

CHARGER – for charging a battery, “BOOSTER” – power supply or TEST.BAT – estimate battery capacity. Select a mode using the buttons “5” (up) and “6” (down) and confirm it using the button “7” (OK).



5.1. CHARGER mode

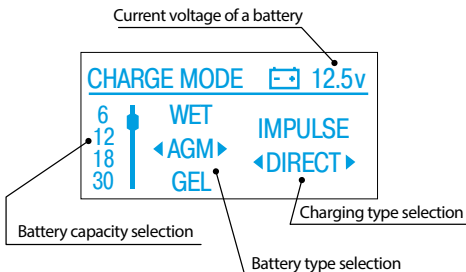
A menu of three columns will appear after selecting the “CHARGER” mode.

Battery capacity selection – select capacity of a battery being charged (or select the closest option):

Capacity, Ah: 6, 12, 18, 30, 40, 60, 75, 100. Confirm selection using the button “7” (OK).

Battery type selection – select a type of a battery being charged: WET – Wet type, AGM or GEL – gel cell type.

Confirm selection using button “7” (OK).



Charging type selection – select a type of charging: pulse (asymmetric pulse charging) or direct (normal charging). Confirm selection using button “7” (OK).

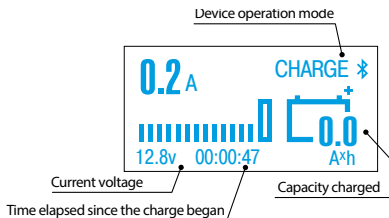
Direct charging is used to charge or recharge batteries

Asymmetric pulse charging – this mode is used for a deeply discharged batteries that become sulphated.

Current voltage – it displays current voltage of battery terminals. If it displays 0.0V, it means a battery is not connected to the device.

5.1.1. Start charging

Set parameters in the columns 1-3, and press the button 8 to start charging.



5.1.2. Stop charging

The green indicator stops flashing when charging is finished.

The charger will go to the Charge maintaining mode and will maintain the specified voltage on battery terminals (default setting is 13.2V), current will be lower than the charging current (default value is 0.4A).

5.2. Booster mode

This mode is used to power consumers with constant 12.8V voltage and max current of 25A. The green indicator is constantly on when this mode is working, it turns off when the mode is turned off.

If current consumption exceeds 25A, automatic overcurrent protection is triggered, the green and red indicators starts flashing and intermittent beep sounds.

5.3. BAT.TEST MODE

This mode allows to estimate residual capacity of a battery.



WARNING! THIS EVALUATION METHOD ALLOWS YOU TO GET CONDITIONAL VALUES THAT DIFFER FROM NOMINAL CAPACITY OF A BATTERY WRITTEN IN ITS SPECIFICATION! THIS ESTIMATED VALUES WILL ALLOW YOU TO COMPARE CAPACITY DURING BATTERY OPERATION OR RECOVERY PERIODS.

Enter parameters of a battery before activating the mode:

- Battery capacity selection;
- Battery type selection;
- Charging type selection.

The full "BAT.TEST" cycle includes the following steps:

- 1.Pre-charging
- 2.Pause before discharging
- 3.Discharging
- 4.Pause before charging
- 5.Main (finish) charging
- 6.Charge maintaining

Description of the steps

Step №1 – Pre-charging. First, pre-charging (same as the usual charging in the "CHARGER" mode) is performed in accordance with a selected type of charging. Pre-charging stops when the following battery voltage values are reached: 14,2 V – for a WET battery; 13,6V – for a GEL battery; 13,8V – for a AGM battery. Pre-charging is performed up to a voltage at which electrolyte boiling may occur, but the battery can not be considered fully charged.

Step №2 - Pause before discharging.

Step №3 - Discharging. A battery is discharged by current calculated as $0.1 * \text{Battery Capacity}$, but no more than 5A. For example, the nominal battery capacity is 44Ah, then the discharge current is $0,1*44 = 4,4A$. If the nominal battery capacity is 77Ah, then the discharge current is 5A.

Step №4 - Pause before charging.

Step №5 - Charging. This step is the same as the "CHARGER" algorithm described in the 5.1 section. Charging is performed in accordance with a selected type of charging and it stops when a specified value is reached (voltage or current, which are specified in the advanced settings menu).

Step №6 - Charge maintaining. The cycle ends after the step 5 and the device goes into the charge maintaining mode described in the section 5.1.

If you want to repeat the steps 1-6, start the BAT.TEST mode again.

You can find a detailed report on the estimated capacity and other parameters with a chart of the whole process under the “History” tab in the Pandora Charger app.

6. CONTROL FROM A MOBILE DEVICE

The special mobile app Pandora Charger for Android devices allows you to control charging modes more easily and configure advanced parameters.



WARNING! MINIMUM REQUIREMENTS TO A MOBILE DEVICE: ANDROID v4.4, BLUETOOTH 4.0 LOW ENERGY.

6.1. Installing the app

You can download the app from the Google Play (Android).

It is required to make pairing procedure after the installation is finished.

6.2. Pairing a mobile device with a charger

1. Turn on the charger.
2. Press and hold buttons 5 (up) and 6 (down) for 3 seconds (until 3 sound signals) simultaneously. The «» sign will appear in the top right corner on the display
3. Turn on Bluetooth on your phone.
4. Run the Pandora Charger app.
5. Select the charger device and enter the pairing PIN - **0-0-0-0-0-0** if required.

The charger can work only with one device paired with it. If you want to use another mobile device, repeat the pairing procedure.

6.3. Work with the mobile app

Select a Charger operation mode:

Charger - for charging and maintaining a battery;

Service – use the charger as a power source or to estimate capacity of a battery.

CHARGER mode

Settings

Select the Charger mode and a type of a battery being charged:

- Wet;
- Gel;
- AGM.

Select capacity of a battery being charged (or select the closest option) (Capacity, Ah):

- 6, 12, 18, 30, 40, 60, 75, 100.

Select a type of charging:

- Pulse (asymmetric pulse charging);
- Direct (normal charging).

Start charging

Check if the clamps are connected to a battery correctly. Press the start button after setting the parameters to start charging. Current parameters of charging will be displayed on the screen. (the green indicator 10 on the front panel will be flashing during charging).

The charger will go to the Charge maintaining mode and will maintain the specified voltage on battery terminals.

You can find a detailed report on the previous operation stages under the “History” tab.

AN EXAMPLE OF CONFIGURING THE CHARGER USING A MOBILE APP. CHARGING A BATTERY OF 62AH CAPACITY.

1. CONNECT CORDS OF THE CARGER TO BATTERY TERMINALS.
2. RUN THE PANDORA CHARGER APP AND CONNECT IT WITH THE CHARGER.
3. SELECT THE CHARGER MODE
4. SELECT BATTERY TYPE: (LEAD-ACID BATTERY – WET)
5. SELECT CAPACITY (OUR BATERRY IS 62 AH – SELECE 60 AH)
6. SELECT CHARGING TYPE – NORMAL CHARGING
7. ENSURE THAT CLAMPS ARE CONNECTED TO THE TERMINALS AND PRESS THE “START/STOP” BUTTON. THE LIGHT INDICATOR ON THE FRONT PANEL IS FLASHING.

SERVICE MODE

The Service mode includes the Booster and Training commands.

BOOSTER command

The Booster mode described in the 5.2 section is activated when you select this command. This mode doesn't require special settings.

TRAINING command

The BAT.TEST mode described in the 5.3 section is activated when you select this command

Settings

Select battery type, battery capacity and charging type similar to the Charger mode.

Starting training mode

Check if the charger wire clips are properly connected to battery terminals and press the Start button.

Current parameters and steps of training (BAT.TEST mode) will be displayed on the screen.

The device will go into the charge maintaining mode after all steps of the BAT.TEST mode are finished.

You can find a detailed report on the estimated capacity and other parameters with a chart of the whole process under the "History" tab.

6.4. Advanced settings

The advanced settings menu is available only in the mobile app. Parameters are set automatically depending on battery type, battery capacity and charging type



WARNING! THE FOLLOWING SETTINGS ARE INTENDED ONLY FOR QUALIFIED PROFESSIONALS. INCORRECT PARAMETERS CAN CAUSE DAMAGE TO A BATTERY AND INJURY!

Maximum battery voltage during charging (10-15V) – set maximum value of battery voltage during charging.

Maximum charging current (0.2-25A) – set maximum value of charging current.

Pre-charging mode – this mode is used for deeply discharged batteries, charging current and voltage are limited when charging starts in this mode.

- Disabled
- DC charging
- Asymmetric pulse current (default value)

Finish charging

- By voltage – charging will be stopped when the defined voltage is reached
- By current (default value) – charging will be stopped when the defined current value is reached

Finish charging current (0-10A) – charging will be stopped when this value is reached.

Charging duration for pulsed charging (0-400 min).

Voltage level when current starts decreasing (10-20V) – Charging current will start decreasing when battery voltage has reached this value.

Maximum pre-charging current (0.2-10A).

Impulse duration in pulsed pre-charging mode (1-20 sec).

Pause between impulses duration in pulsed pre-charging mode (0-100%).

Deep discharge voltage (1-20V) – if battery voltage is below this value, the charger will consider the battery as deeply discharged.

Impulse duration in asymmetric pulse current charging mode (1- 20 sec.).

Pause between impulses duration in asymmetric pulse current charging mode (0-100%).

Voltage of keeping a charge mode (10-20V) – the charger will maintain this voltage after charging.

Maximum current in keeping a charge mode (0-10A) - set maximum current for keeping a charge mode.

Work timeout (off. – 48 h) – after this time the charge will turn off (in order the device to not remain on). Default value is 12 h. in for the Normal charging mode and 14 h. for Asymmetric pulse current charging mode.

7. UPDATING FIRMWARE

Use the Pandora Charger mobile app to update firmware of the device.

If a mobile phone has been already paired with the charger device:

- Turn on the charger;
- Run the mobile app;
- Enter the settings menu in the app and select "Update firmware" function;
- Select type of update (Bluetooth or Processor) and update option (Internet or File manager);
- Start updating.

If a mobile phone has not been paired with the charger device:

- Run the mobile app;
- Press and hold the buttons 4 and 7 and turn on the device while holding the buttons.
- Release the buttons when the FIRMWARE UPDATE text appeared on the display;
- Select the device in the search window of the app;
- Select type of update (Bluetooth or Processor) and update option (Internet or File manager);
- Start updating.

8. WARRANTY OBLIGATIONS

The manufacturer guarantees correct operation of the charger device if exploitation, storage and transportation conditions described in this manual were met.

The device should only be used according to the manual.

Parts malfunctioning during warranty period on the fault of the manufacturer is repaired or replaced by the manufacturer or service center.

A user loses the right for warranty services in the following cases:

- When the warranty period expires;
- If exploitation, installation, storage or transportation conditions were not met;
- If there is mechanical damage of the external parts of the system after it is sold. This includes: fire damage, aggressive liquids and water seeping damage, damage caused by improper use;
- If damage was caused with incorrect settings and parameter adjustment;
- If manufacturer sealing is broken;
- If there is no properly filled warranty card.

Warranty period is 3 years since the moment of purchase, but no more than 3,5 (three and a half) years since the moment of production.

Maintenances and repairs of the system with expired warranty period are carried out at the expense of a user on a separate contract between a user and a seller.



WARNING! We recommend you to ask a seller to fill the warranty card. This document may be required for contacting the customer support.

Acceptance certificate

Pandora Charger is in conformity with Electromagnetic Compatibility Directive EMC 2004/108/EC and R&TTE Directive 1999/5/EC and recognized as fit for use.

Serial number _____

Date of production _____

Responsible person's signature (stamp) _____

Stamp

Packager _____

Signature (personal stamp) _____

Warranty card

Model **Pandora Charger**

Serial number

Date of purchase « ____ » _____ 20 ____ y.

Seller's stamp

Sellers's signature