

**BENTON**  
CAR ACCESSORIES

**5STEP**

# **SWITCH MODE BATTERY CHARGER**

**For Lead acid rechargeable batteries  
1.2-12Ah (6V) & 7.2-60Ah (12V)**



## **BX-3**

**User's Manual And  
Guide To  
Professional Battery Charger**

# Index

For Your Safety.....	2
Product Feature.....	2
Product Safety Feature.....	2
Contents.....	2
Safety Information.....	2
Locate Charger.....	3
Battery Type & Settings.....	3
Operation.....	4-7
Charging.....	4
Equipment Description.....	4
Indication.....	4-5
Component Description.....	5
Select Charging Mode.....	5
Reset/Deleting Settings.....	5
Switching Over between different Modes.....	5
MODE 1 <b>1V</b> (6.8V/1.0A) and (7.2V/0.6A).....	6
MODE 2 <b>12V</b> (13.6V/1.0A) and (14.4V/0.6A).....	6
Rescuing Drained Battery.....	6
Abnormality Protection.....	6
Overheating Protection.....	6
Bulk Charging Time.....	7
Technical Data.....	7
Charging Phases.....	8
Diagnosis & Recovery.....	9
Bulk.....	9
Absorption.....	9
Battery Capacitance verification stage.....	9
Maintenance Charge.....	9
Error Mode.....	9
Power Mode.....	9
Trouble Shooting.....	10
Maintenance.....	10
Mounting & Product Dimensions.....	11
Application.....	11
Equipment.....	11
Declaration of Compliance.....	11

## For Your Safety

This manual contains important safety and operating instructions. Read this manual carefully before using the charger for the first time and keep the manual in a safe place for future reference.

## Product Feature

Congratulations on your purchase of the BENTON® BX-3 5-Step fully automatic switch mode battery charger and maintainer, designed for charging a variety of Lead-acid rechargeable batteries, widely used in motorbikes and several other vehicles. The batteries may be of various types i.e. WET/Flooded (Liquid Electrolyte), GEL (Gelatin type Electrolyte, absorbed into the plates), AGM (Absorbed Glass Mat), MF, VRLA (Valve Regulated Lead Acid) batteries. Their capacity range from 6V/1.2Ah to 6V/12Ah and 12V/7.2Ah to 12V/60Ah. Using state-of-the-art technology, the charger enables the recharging of the batteries to almost 100% of their original capacity. It recovers slightly sulphated batteries. It diagnoses and rescues drained battery. It provides trickle charge and maintenance charging which increases battery life and gives superb performance. It is also ideal for maintaining batteries of non-regularly used vehicles of all types. It has memory function. The charger returns to last selected mode automatically when power is switched on. For repetitive charging process, this is a very useful feature. However charging mode could be selected by pressing the "MODE" button. It also features low back current drain and low ripple.

## Product Safety Feature

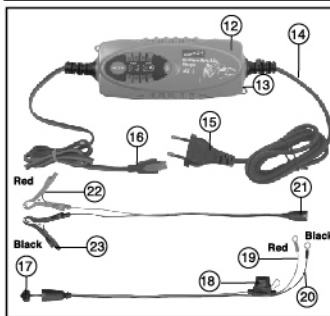
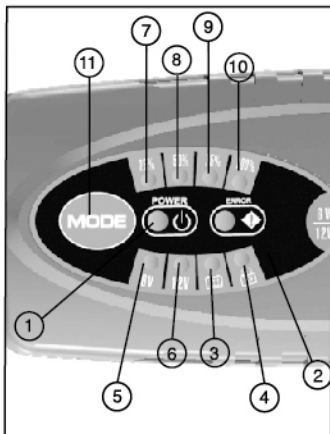
- Electronically safe against user errors. The charger will not damage vehicle electronics. It is totally safe for months-long connections and maintenance of irregularly or seasonally used batteries even while the charger is still connected to the vehicle. It provides optimal condition without damage. No risk of over-charging!
- Full protection against wrong connection and against short circuit ensures safe charging operation.
- Provided with Spark protection mechanism. The charger will not begin operation upon connection to the battery unless charging mode has been selected. This embedded feature eliminates the possibility of a spark that often appears during connections.
- Fully controlled by internal MCU (Micro-Computer-Unit), which makes it faster, powerful, reliable and smarter. It detects the state of charge of the battery plugged into it and initiates charging.
- Dust and splash proof (IP65) approval. Approved for indoor use.
- Double insulated

## Contents

- 1) BENTON® BX-3 Charger
- 2) Interchangeable quick contact battery leads with clamps
- 3) Interchangeable quick contact battery leads with eyelet terminals (Ø 6.3mm)
- 4) Plug-in fuse 2.0A
- 5) User Manual

## Safety Information

- BENTON® BX-3 charger is designed for charging 6V 1.2-12Ah and 12V 7.2-60Ah Lead-acid rechargeable batteries. Do not use it to supply power to low voltage electrical system other than designated applications. Do not use it for any other purposes. It may cause an explosion.
- **WARNING! DO NOT ATTEMPT TO CHARGE A NON-RECHARGEABLE BATTERY (PRIMARY CELLS).**
- Before charging make sure the input power is as per rated specifications, otherwise the charging performance may be seriously affected.
- Do not use battery charger for charging dry-cell batteries. They may burst and cause injury to persons and damage to property.
- Never charge a frozen battery.
- Never charge a damaged battery.
- Do not use the charger with a damaged cable (14). It must be replaced by the manufacturer, its service agent or similarly qualified technician in order to ensure safety.
- Do not operate charger if it appears to be damaged or malfunctioning. Take it to qualified person for inspection and repair.
- Do not disassemble charger, incorrect reassembly may result in electric shock or fire. Locate charger as far away from battery as DC cable permit.
- Never place charger above battery being charged, gases from battery will corrode and damage charger.
- While charging always use safety glasses, gloves, protective clothing and keep your face away from the battery.
- Remove metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to melt such metallic objects, causing a severe burn.





- **Explosion hazard!** A battery being charged could emit explosive gasses. Avoid smoking or open sparks or flames in the vicinity of the battery. Explosive and flammable substances such as fuel or solvents should not be kept in the vicinity of the charger or the battery.
- Disconnect the supply before making or breaking connections to the battery.
- While connecting the charger to the battery, maintain right polarity connection and avoid short-circuiting.
- Connect the appropriate DC clip to the battery post which is first not connected to the automobile chassis. (The battery terminal not connected to the chassis has to be connected first.)
- Connect the other DC connector to the chassis, away from the battery and fuel line.
- The connector to be fixed to the positive pole shall be coloured red and that to be connected to the negative pole shall be coloured black.
- Then connect the battery charger to the supply mains.
- Do not cover the charger while charging.
- Do not touch the battery clips together when charger is connected with mains.
- After charging, disconnect the battery charger from supply mains. Remove the chassis connection and the battery connection, respectively. This will reduce back drain current.
- Charging must be ceased immediately if battery is found to be too hot or leaks out liquid during charging.
- In case of malfunction or damage, immediately disconnect the charger from the mains.
- Do not use vehicle when charging permanently installed batteries.
- During charging the battery must be placed in a well ventilated area.
- **Danger of chemical burns!** Battery acid is highly corrosive. If your skin or eyes come into contact with acid, immediately rinse the affected part of the body with excessive water and seek medical advice.
- This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.
- Children should be supervised to ensure that they do not play with the appliance.
- Ensure that charger switches to maintenance charge mode, before it is left unattended and connected for long time. If this stage does not arrive within 120 hours (max), the charger must be disconnected manually.

#### Charger Location

- Locate the charger as far away from battery as the DC cord permits.
- While charging do not place charger directly above or below the battery. Gases or fluids from the battery will corrode and damage the charger.
- Never allow battery acid to drip on the charger when reading electrolyte specific gravity or filling battery.
- Charging should be carried out in a well-ventilated, weather protected facility.

#### Battery Type & Settings



The following recommendations should only be referred to as guidelines. For precise details, you must refer to battery manufacturer for instructions.

Symbol	Mode	Settings	Details
	1	7.2V/1.0A	This mode is normally suitable for 6V (1.2Ah to 12Ah) WET/Flooded, GEL, AGM, MF, VRLA type Lead-Acid Rechargeable batteries
	2	14.4V/1.0A	This mode is normally suitable for 12V (7.2Ah to 60Ah) WET/Flooded, GEL, AGM, MF, VRLA type Lead-Acid Rechargeable batteries

#### OPERATION












##### Charging

- 1) Charging of a permanently installed battery in a vehicle
  - a) Before connecting or disconnecting the battery leads, the power cord should be removed from the mains.
  - b) Check polarity of battery post. A positive (+) battery post usually has a larger diameter than a negative (-) post.
  - c) Identify the pole of battery which is connected to the chassis (earth). Normally the negative terminal is connected to the chassis.

- d) Charging of negative earthed battery:
  - Make sure the black wire ③ (- pole connection) has not contact with the fuel line or the battery.
  - Connect the red wire ② (+) to the positive (+) pole of the battery and the black wire ③ (-) to the vehicle chassis.
- e) Charging of positive earthed battery:
  - Make sure the red wire ③ (+ pole connection) has no contact with the fuel line or the battery.
  - Connect the black wire ② (-) to the negative (-) pole of the battery and the red wire ③ (+) to the vehicle chassis.
- 2) Charging of a battery not connected to a vehicle
  - a) Before connecting or disconnecting the battery leads, the power cord should be removed from the mains.
  - b) Connect the red wire ② (+) to the positive (+) pole of the battery and the black wire ③ (-) to the negative (-) pole.  
In case of reverse polarity connection red LED  ② indicate error mode. Error indication light  ② would be also shown if charge mode is initiated without connecting the battery to the battery leads.
- 3) Charging with eyelet terminals (Permanent connection to the vehicle battery)
  - a) Before connecting or disconnecting the battery leads, the power cord should be removed from the mains.
  - b) Connect the red wire ③ (+) to the positive (+) pole of the battery and the black wire ② (-) to the negative (-) pole.

#### Equipment Description


##### a) Indication:

INDICATION	SYMBOL	Description
①		Yellow LED for "POWER"
②		Red LED displays "Incorrect polarity/Fault"
③		Red LED displays "Recovering"
④		Red LED displays "Reverse connection"
⑤		Red LED on for "Mode 1" Charging 6V battery
⑥		Red LED on for "Mode 2" Charging 12V battery
⑦		Red LED on (below 25% charging) "Bulk"
⑧		Red LED on (below 50% charging) "Bulk"
⑨		Red LED on (below 75% charging) "Absorption"
⑩		Green LED displays "Fully charged" "Maintenance"
⑪		"Mode" selection button


## b) Component Description

Indication	Description
12	Charger
13	Mounting Holes
14	Mains Cable
15	Power plug
16	Male connector
17	Female connector with protection cap
18	Fuse Holder with 2A plug-in fuse
19	"+" Pole connection cable (red) with ring terminal
20	"-" Pole connection cable (black) with ring terminal
21	Female connector
22	"+" Pole connection cable (red) with quick clamp (red)
23	"-" Pole connection cable (black) with quick clamp (black)


### Select Charging Mode

BENTON® BX-3 battery charger has unique memory function. The charger returns to last selected mode automatically when power is switched on. For repetitive charging process, this is a handy feature. However a specific charging mode could also be selected manually by pressing the  selection button until the light for correct voltage is lit. Within 0.5 second, the charger activates the selected mode.

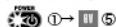
### Reset / Deleting Settings

In beginning of charging process after connection to the power supply, the charger automatically resets itself to "Power" basic settings and remains in  position unless further action is executed by the user. Yellow LED is illuminated.

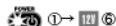
### Switching over between different Modes

By pressing the selection button  displays the charging modes in the following order-

a) for 6V battery:















b) for 12V battery:














After a full charge, if battery is not disconnected from the charger, it remains in trickle charge mode. The default mode is OFF output.

### MODE 1 (6.8V/1.0A) and (7.2V/0.6A)

This mode is suitable for charging 6V batteries with capacity range from 1.2-12Ah in normal conditions. Connect the output terminals of the charger to the battery with right polarity. Connect the power cord to the power outlet to begin charging. Press the selection button  to select Mode 1 . After executing this operation the corresponding LED display  will light up. If no further process is activated, the electronic system will automatically start the charging. Charging shall continue in several stages:  →  →  →  →  until battery is fully charged upto 7.2V. During battery capacitance verification stage (charger on 30 minutes → off 30 minutes) when battery voltage  $\geq 6.8-0.15V/0.2A$  at this stage all intermediate charging status LEDs display , ,  will turn on one by one, finally LED display  will turn on. The Trickle current (0.1A) is now available to battery for maintenance.

### MODE 2 (13.6V/1.0A) and (14.4V/0.6A)

This mode is suitable for charging 12V batteries with capacity range from 7.2-60Ah in normal conditions. Connect the output terminals of the charger to the battery with right polarity. Connect the power cord to the power outlet to begin charging. Press the selection button  to select Mode 2 . After executing this operation the corresponding LED display  will light up. If no further process is activated, the electronic system will automatically start the charging. Charging shall continue in several stages:  →  →  →  until battery is fully charged upto 14.4V. During battery capacitance verification stage (charger on 30 minutes → off 30 minutes) when battery voltage  $\geq 13.6-0.3V/0.2A$  at this stage all intermediate charging status LEDs display , ,  will turn on one by one, finally LED display  will turn on. The Trickle current (0.1A) is now available to battery for maintenance.

### Rescuing Drained Battery

When charger is connected to a battery, before the start of charging process, the charger automatically detects the voltage of the battery. It initiates recovery charging mode by applying a high voltage charging if the battery voltage is in the range of 1.0V-5.25V (for 6V battery) or 8.0V-10.5V (for 12V battery)

**Note:** A battery left deep discharged for an extended period may result in permanent damage to one or more cells, which may heat up considerably during charging. Stop charging immediately if the battery casing temperature becomes very hot.

### Abnormality Protection

In case of short-circuit, open circuit, reversed polarity connection or battery voltage below 1.0V (for 6V battery) or below 8V (for 12V battery), the charger will turn-off the electronic system and will immediately reset the system back to basic position to avoid damage to battery and charger.

### Overheating Protection

BENTON® BX-3 charger is protected by NTC control. During the charging process, if the charger becomes too hot, the power output is automatically reduced to protect itself from damage. The charger continues to work trickle charge. Charger increases power automatically when the ambient temperature drops.

### Bulk Charging Time

Time required for the BENTON® BX-3 to complete a charge on a normally discharged battery is roughly equal to the battery's Ah rating. Deep-discharged battery might take longer time to charge.

Battery Size (Ah)	For about 80% Charge (hours) Max	
	6V	12V
1.2	3	
2	4.5	
7.2	15	15
10	20	20
12	25	25
20		40
30		60
40		80
50		100
60		120

Note: Above table for reference only. Actual data may differ due to battery condition.

### Technical Data

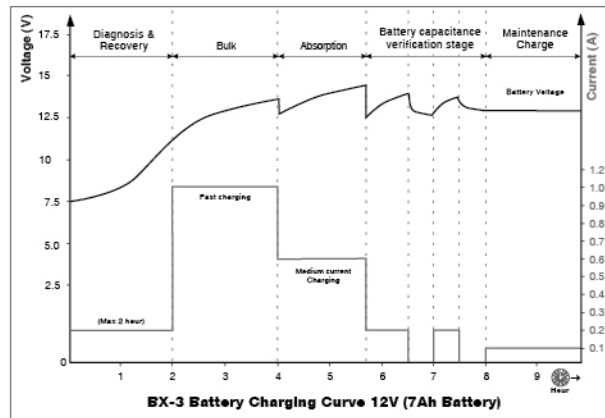
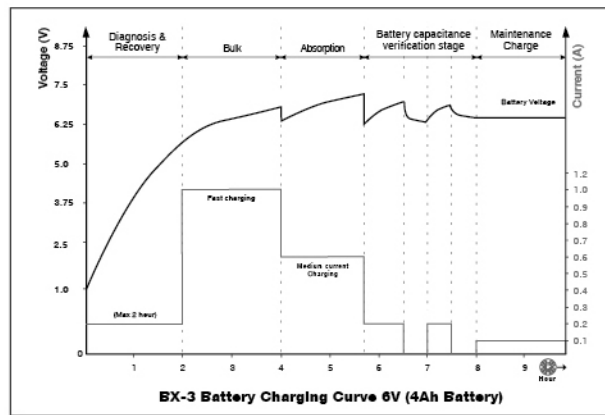
MODEL	BX-3
Input Voltage AC	220-240VAC, 50/60Hz
Output Voltage	6V & 12V (Manual-Select)
Input Current	0.4A RMS max
Efficiency	>75%
<b>Charging Voltage</b>	
Normal Temperature Mode	7.2V (for 6V Battery), 14.4V (for 12V Battery)
Maintenance Charging Mode	6.8V (for 6V Battery), 13.6V (for 12V Battery)
Recovery Mode	8V (for 6V Battery), 16V (for 12V Battery)
Charging Current	1.0A or 0.6A or 0.2A or 0.2A ON 30 min and OFF 30 min, 0.1A
Back Current Drain*	<5mA
Ripple**	Max 150mV, 0.3A
Ambient Temperature	-20°C to +50°C/-4°F to +122°F Reduced output power at higher temperature
Type of Charger	Five step, switch mode with Recovering, fully automatic, battery capacitance verification stage with maintenance charging
Type of Batteries	6V & 12V Lead-acid rechargeable batteries (WET, MF, AGM and GEL)
Battery Capacity	1.2-12Ah (for 6V battery) and 7.2-60Ah (for 12V battery)
Dimensions (LxWxH)	140x60x34.5mm
Housing Protection	IP65 (Dust and Splash proof) Indoor use
Weight	0.38kg
Noise Level	<50 dB (Tested from a distance of 50cm)

\* = Back current drain is the amount of current drawn by the charger from battery, when the charger is connected to the battery, without power cord connected. BENTON® BX-3 has extremely low back current drain which corresponds to 0.7 Ah per month (1mA/hr)  
 \*\* = Ripple refers to interference of current and voltage. A high current ripple heats up battery and reduces life of battery. Against a linear charger, BENTON® BX-3 charger's ripple voltage is below 2.5% (0.15/6V or 0.3/12V battery voltage), which is much lower than the max 5% for a sealed acid battery. Equipments connected to the battery could be damaged by high voltage ripple.

### Charging Phases

BENTON® BX-3 charger performs 5-step fully automatic charging cycle.  
 Mode 1 [1] for (7.2V/1.0A), Mode 2 [2] for (14.4V/1.0A)

MODE	SETTINGS	SYMBOL
1	7.2V/1.0A	[1]
2	14.4V/1.0A	[2]



**1) Diagnosis & Recovery:** Initializes the recovery process for drained batteries by high voltage charging in order to restoring the battery capacity.

**2) Bulk :** 80% of energy is returned in this phase of charging.

**3) Absorption:** In this phase complete charging up to almost 100% is achieved. Charger would initiate verification stage.

**4) Battery Capacitance verification stage:** The battery will signal to the charger and will only take enough current to sustain small loads such as alarms etc or current leaks in the vehicle wiring circuit. The charger will be charging with 30 minutes on and 30 minutes off and use a constant voltage and constant current to confirm the battery voltage. When the battery voltage reaches to 7.2V (for 6V battery) or 14.4V (for 12V battery), battery is fully charged and ready to use. The charger switches to maintenance phase.

**Standby feature :** When battery remains connected with vehicle's wiring system, during the trickle mode, circuits continuously monitor the current drawn by the battery.

**5) Maintenance Charge :** Charger begins maintenance charging pulse at constant 100mA to support any connected accessories or losses due to deteriorating vehicle wiring until voltage reaches 6.8V (for 6V battery ) or 13.6V (for 12V battery).

BENTON® BX-3 is fully interactive charger which adjusts itself to changing current requirement to charge and maintain the battery.

#### Error Mode ②

The charger goes to Error mode  ② in following situations-

- After charging, battery's voltage is not sustained or despite recovery attempts the battery was irrecoverable. This may be due to a defect in the battery itself such as a short-circuited cell or total sulfation.
- If battery is still connected to the vehicle's wiring system, there may be loss of current through deteriorating wiring or a degraded switch or contact or in-circuit current-consuming accessories.
- If wrong charging mode is selected such as 6V charging mode for a 12V battery or 12V charging mode for a 6V battery.



#### Power Mode ①

The charger goes to Power mode  ① in following situations-

- Charger's terminals are short circuited or open circuited when charging is initiated
- Charging is initiated without any battery connected to the battery leads
- Attempt to charge a battery whose voltage is below 1V (for 6V battery) or 7.5V (for 12V battery)
- The charger is in recovery mode for over 2 hours
- The charger is in bulk and absorption mode for over 41 hours

#### Trouble Shooting

##### a) Error Mode ②

Remove the battery from the vehicle, reconnect the BX-3 and allow it to run a fresh test once again. If one of the capacity indication LED illuminates, the cause is to be traced on the vehicle; if  ② illuminates, it is the battery which is suspected and should be taken to a professional workshop for testing. It is important to note that even  ② illuminates, the battery would continue to receive maintenance charge support at 6.8V (for 6V battery) or 13.6V (for 12V battery) until battery is disconnected, so as to protect it from deterioration as far as possible.

##### b) Maintaining a battery for extended periods:

At least once every two weeks, check that the connection between the charger and battery are secure. In case of batteries with filler caps on each cell, disconnect the battery from the charger, check the level of the electrolyte and if necessary, top up the cells with distilled water and then reconnect it.

##### c) Deep-discharged battery:

If the battery is deeply discharged or sulfated, it is essential to disconnect the battery from the vehicle before connecting the charger for recovery. The recovery mode would not be engaged if circuit senses that battery is still connected to vehicle's wiring system.

##### d) Charger light does not turn on:

- Remove the charger from the AC outlet and recheck the charger clamps are connected to the correct terminals and are making a clean connection
- Check to make sure AC outlet is supplying power
- A bad connection of the battery to ground

##### e) Charger light is on but battery does not charge properly:

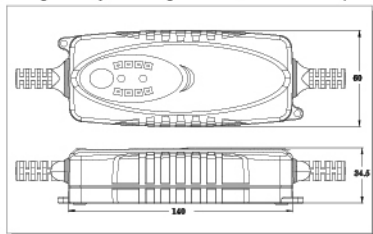
- The battery may be defective or of oversize
- The battery has a excessive current draw, battery must be replaced

#### Maintenance

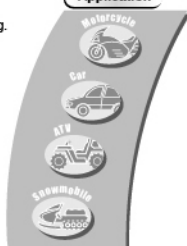
BENTON® BX-3 charger does not need any specific maintenance. Only install, maintain or service this charger when it is disconnected from the mains. It may be cleaned with a dry cloth or soft tissue. Under any circumstances, do not use any solvents or other cleaning agents.

## Mounting & Product dimensions

The charger is easy to fix using two screws. Please refer to product drawing.



## Application



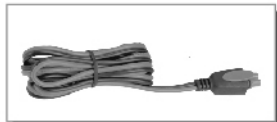
## Equipment

BENTON® BX-3 charger is supplied with two detachable and interchangeable colour coded lead sets- one with clamps for bench charging and other with eyelet terminals with in-line battery protection fuse 2.0A for permanent attachment to the battery posts to allow quick connection/disconnection through snap-connector.

## Connectors



Interchangeable Quick Contact Battery Leads with Clamps




Snap Connector



Interchangeable Quick Contact Battery Leads with Eyelet Terminals

## Declaration of Compliance

Tested and approved by  and conforms to EN 60335-1, EN 60335-2-29, EN 55014-1, EN 55014-2, EN 61000-3-2, EN 61000-3-3, EN 62233

Environment friendly disposal



You can help protect the environment!

Please remember to respect the local regulations: hand in the non-working electrical equipments to an appropriate waste disposal centre. The packaging material is recyclable. Dispose of the packaging in an environmentally friendly manner and make it available for the recyclable material collection-service.

**Note:** We reserve right to carry out technical modifications for improvement of BX-3 charger without notice.