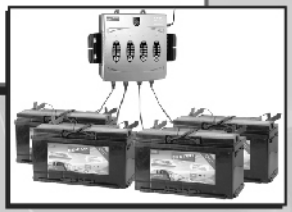
BENTON
CAR ACCESSORIES

5STEP

SWITCH MODE BATTERY CHARGER

Quadruple
For Lead acid rechargeable batteries 1.2-120Ah



BX-6

User's Manual And
Guide To
Professional Battery Charger

Index

For Your Safety 3
Product Feature 3
Product Safety Feature 3
Contents 3
Safety Information ..... 3 - 4
Locate Charger 4
Battery Type & Settings 4
Operation ..... 5 - 8
Charging Batteries 5
DC Output Cable Wiring Diagrams 5
Equipment Description 6
Indication 6
Component Description 6
Select Charging Mode 6
Reset/Deleting Settings 6
Switching Over Between Modes 1,2 and 3 7
MODE 1 (14.4V/0.8A) 7
MODE 2 (14.4V/4.0A) 7
MODE 3 (14.7V/4.0A) 7
Rescuing Drained Battery 8
Abnormality Protection 8
Overheating Protection 8
Bulk Charging Time 8
Technical Data 8
Charging Phases 9
Diagnosis & Recovery 9
Bulk 9
Absorption 9
Trickle Charge 9
Maintenance Charge 9
Trouble Shooting 10
Maintenance 10
Mounting & Product Dimensions 10
Application 11
Equipment 11
Declaration of Compliance 11
Environmental friendly disposal 11

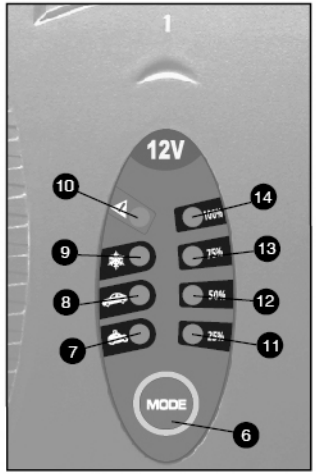


Fig.1: Control Panel

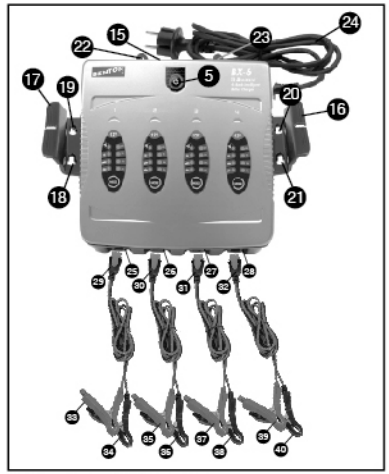


Fig. 2: Equipment Description

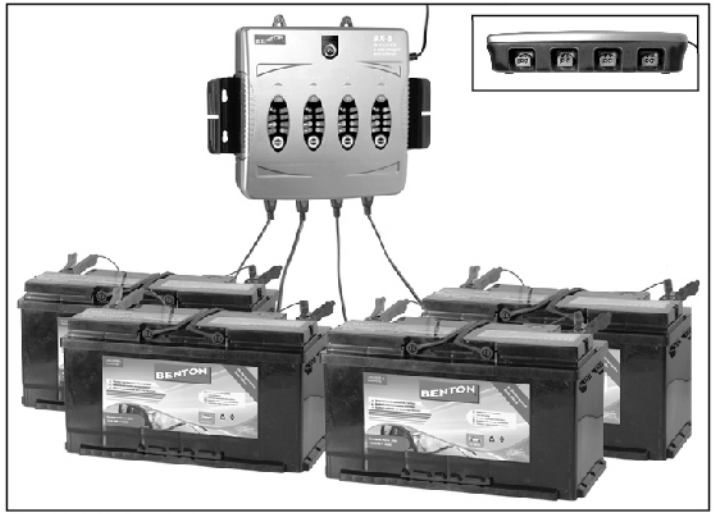


Fig.3: Application Illustration

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-6** 5-Step fully automatic switch mode multi-station battery charger and maintainer designed for charging simultaneously and independently up to 4 12 Volt lead-acid rechargeable batteries, widely used in motorbikes, cars, several other vehicles, communication equipments, information technology equipments, medical equipments, scientific equipments etc. 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) batteries. Their capacity range from 12V/1.2 Ah to 12V/120 Ah. The **BENTON® BX-6** battery charger also charges batteries in cold conditions. 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 deep drained battery as low as 3.0V. It provides trickle charge and maintenance charging which increases battery life and gives superb performance. 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. This feature does not activate when the charger is in Supply mode. 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 (IP64) , approved for outdoor use.

Contents

1) **BENTON®** Charger **BX-6**
2) 4-Sets Quick contact battery leads with clamps
3) 1-Pair Mounting brackets
4) User Manual

Safety Information

- **BENTON® BX-6** charger is designed for charging 12V 1.2-120Ah 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 24. 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 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.
- 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.
- The battery terminal not connected to the chassis has to be connected first. The other connection is to be made to the chassis, far from the battery and fuel line. The battery charger is then to be connected to the power supply.
- After charging, disconnect the battery charger from supply mains. Remove the chassis connection and the battery connection, respectively. This will reduce back drain current.
- 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.

Locate Charger

- 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 may corrode and damage the charger.
- Never allow battery acid to drip on the charger
- 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.

	**Mode 14.4V/0.8A** This mode is normally suitable for batteries <14 Ah batteries.
	**Mode 14.4V/4.0A** This mode is normally used for WET, MF and most GEL batteries.
	**Mode 14.7V/4.0A** This mode is recommended for several AGM batteries. This mode is also suitable for charging batteries in sub-zero temperatures.

OPERATION

Charging Batteries

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 ㉞ ("-" pole connection) has not contact with the fuel line or the battery.
   - Connect the red wire ㉝ ("+") to the positive ("+") pole of the battery and the black wire ㉞ ("-") to the vehicle chassis.

   e) Charging of positive earthed battery:
   - Make sure the red wire ㉝ ("+" pole connection) has no contact with the fuel line or the battery.
   - Connect the black wire ㉞ ("-") to the negative ("-") pole of the battery and the red wire ㉝ ("+") 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 ㉝ ("+") to the positive ("+") pole of the battery and the black wire ㉞ ("-") to the negative ("-") pole.

(In case of multi-Bank charging, instead of ㉝, connect ㉟, ㊲, ㊴, and instead of ㉞, connect ㊱, ㊳, ㊵)

DC Output Cable Wiring Diagrams

BENTON® BX-6 Charger is designed to charge 12V, 24V, 36V and 48VDC battery systems. Each DC jacketed bank cable must be properly connected to independent 12VDC battery and observe the polarity of all connections. Series connection wire must be removed during charging. Please refer to our typical wiring diagram.

Wiring Diagrams of BENTON® BX-6 Quadruple Ouput Charger for 4 Batteries

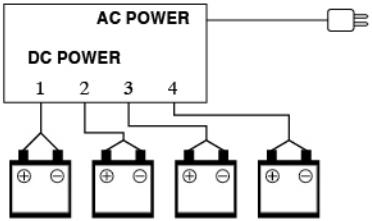


Fig 4: Four 12VDC Battery configuration

Equipment Description

a) Indication:

Indication	Symbol	Description
⑤		Red LED ON for " POWER " In case of open circuit or short circuit or reverse connection, LED lights up
⑥		Blue light ON for " Mode " selection
⑦		Red LED displays " Mode1 " (14.4V/0.8A)
⑧		Red LED displays " Mode 2 " (14.4V/4.0A)
⑨		Red LED displays " Mode 3 " (14.7V/4.0A)
⑩		Red LED displays " Incorrect polarity "
⑪		Red LED flashes " Charging in progress " (Below 25%)
⑪,⑫		Red LED ⑪ ON, Red LED ⑫ flashes " Charging in progress " (Between 25% to 50%)
⑪,⑫,⑬		Red LEDs ⑪, ⑫ ON, Red LED ⑬ flashes " Charging in progress " (Between 50% to 75%)
⑪,⑫,⑬,⑭		Red LEDs ⑪, ⑫, ⑬ ON, Green LED ⑭ flashes " Charging in progress" (Between 75% to 100%)
⑪,⑫,⑬,⑭		Red LEDs ⑪, ⑫, ⑬ ON, Green LED ⑭ ON "Charging completed"(100%)

b) Component Description

Indication	Description
⑮	Charger
⑯ ⑰	Detachable mounting brackets
⑱,⑲,⑳,㉑,㉒,㉓	Mounting holes
㉔	Mains cable with power plug
㉕,㉖,㉗,㉘	Built-in female connectors
㉙,㉚,㉛,㉜	Detachable lockable male connectors
㉝,㉟,㊲,㊴	"+" Pole quick clamp (red)
㉞,㊱,㊳,㊵	"-" Pole quick clamp (black)

Select Charging Mode

Power ON/OFF

Plug the AC lead to a nearby 220~240VAC outlet. By pressing On/Off Power button ⑤ power will turn on and it will be indicated by illumination of red ring ⑧. Power shall turn off if power button ⑤ is pressed again. Red LED shall turn off. To charge various batteries at different ambient temperature you can select correct voltage charging mode by pushing the ⑥ selection button of charging station(s) 1 to 4 until the light for correct voltage is lit. Charging stations 1 to 4 can be used independently or simultaneously. Selection button(s) ⑥ shall illuminate in blue colour.

Reset / Deleting Settings

After connection to the power supply and turning ON the switch ⑤, the charger automatically resets itself to basic settings and remains in power mode unless further action is executed by the user.

Switching over between Modes 1, 2 and 3

By repeatedly pressing the selection button (MODE) (6) displays the charging modes in the following order- MODE 1, MODE 2, MODE 3 and repeats this cycle.

If you press (MODE) (6), charging mode automatically switches to the next operation mode and begins functioning in that specific mode. However after a full charge, if battery is not disconnected from the charger, it remains in float charge mode, even if user switches it over to another mode. This protects battery from being damaged.

MODE 1 (14.4/0.8A)

This mode is suitable for charging small batteries with a capacity below 14Ah.

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 (MODE) (6) to select Mode 1. After executing this operation (MODE) (6) will be illuminated in blue and the corresponding red LED display (7) will light up. If no further process is activated, the electronic system will automatically start the charging process with a current of 0.8A. If this procedure runs smoothly, charging shall continue in several stages (11)→(12)→(13)→(14) until battery is full charged up to 14.4V. If voltage of battery is less than 25% of the capacitance, red LED (11) will flash. If voltage of battery is between 25% to 50% of the capacitance, red LED (11) will on and red LED (12) will flash. If voltage of battery is between 50% to 75% of the capacitance, red LEDs (11) and (12) will be on and red LED (13) will flash. If voltage of battery is between 75% to 100% of the capacitance, red LEDs (11), (12) and (13) will be on and green LED (14) will flash. Upon full charge (100% of capacitance of battery) red LEDs (11), (12) (13) and green LED (14) will light up simultaneously. Combination of Trickle current 200mA and maintenance charge current of 0.8A is repeatedly applied to keep battery fully charged.

MODE 2 (14.4/4.0A)

This mode is mainly applied for charging large batteries with a capacity over 14Ah in normal conditions.

Press the selection button (MODE) (6) to select Mode 2. After executing this operation (MODE) (6) will be illuminated in blue and the corresponding red LED display (8) will light up. If no further process is activated, the electronic system will automatically start the charging process with a current of 4.0A. If this procedure runs smoothly, charging shall continue in several stages (11)→(12)→(13)→(14) until battery is full charged up to 14.4V. If voltage of battery is less than 25% of the capacitance, red LED (11) will flash. If voltage of battery is between 25% to 50% of the capacitance, red LED (11) will on and red LED (12) will flash. If voltage of battery is between 50% to 75% of the capacitance, red LEDs (11) and (12) will be on and red LED (13) will flash. If voltage of battery is between 75% to 100% of the capacitance, red LEDs (11), (12) and (13) will be on and green LED (14) will flash. Upon full charge (100% of capacitance of battery) red LEDs (11), (12), (13) and green LED (14) will light up simultaneously. Combination of Trickle current 200mA and maintenance charge current of 0.8A is repeatedly applied to keep battery fully charged.

MODE 3 (14.7/4.0A)

This mode is mainly applied for charging large batteries with a capacity over 14Ah in cold conditions or charging several AGM batteries with capacity of more than 14Ah.

Press the selection button (MODE) (6) to select Mode 3. After executing this operation (MODE) (6) will be illuminated in blue and the corresponding red LED display (9) will light up. If no further action is taken, the electronic system will automatically start the charging process with a set delay. In this mode, the charging current is identical to that of Mode 2. If this procedure runs smoothly, charging shall continue in several stages (11)→(12)→(13)→(14) until battery is full charged up to 14.7V. If voltage of battery is less than 25% of the capacitance, red LED (11) will flash. If voltage of battery is between 25% to 50% of the capacitance, red LED (11) will on and red LED (12) will flash. If voltage of battery is between 50% to 75% of the capacitance, red LEDs (11) and (12) will be on and red LED (13) will flash. If voltage of battery is between 75% to 100% of the capacitance, red LEDs (11), (12) and (13) will be on and green LED (14) will flash. Upon full charge (100% of capacitance of battery) red LEDs (11), (12), (13) and green LED (14) will light up simultaneously. Combination of Trickle current 200mA and maintenance charge current of 0.8A is repeatedly applied to keep battery fully charged.

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 can recover deeply discharged & drained batteries with pulse charging if the voltage is in the range of 3.0-10.5V.

Abnormality Protection

In case of short-circuit, open circuit, reversed polarity connection or battery voltage below 3.0V, 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. Additionally, the LED displays (10) to indicate reverse polarity/fault.

Overheating Protection

BENTON® BX-6 charger is protected by NTC control. During the charging process, if the charger becomes too hot or due to extreme ambient temperature, 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

Battery size (Ah)	Mode	For About 80% Charge (hours)
2		2
8		8
20		4.5
60		14
100		23
120		28

Technical Data

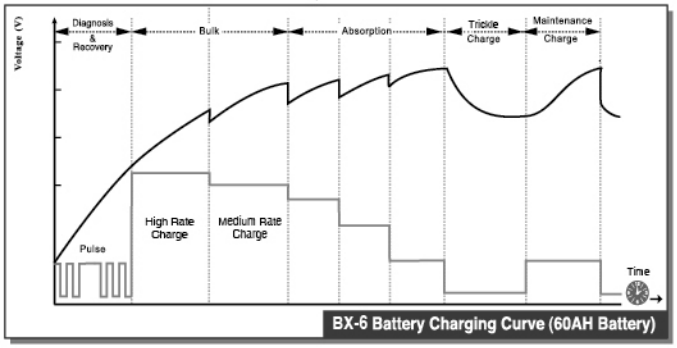
MODEL	BX-6
Input Voltage AC	220-240VAC, 50/60Hz
Output Voltage	Nominal: 12V
Starting Current	<25 A (No AC input)
Input Current	2.4A RMS max
Efficiency	75%
Charging Voltage	14.4V or 14.7V
Charging Current	16 Amp (4.0A or 0.8A per Bank)
Back Current Drain*	5 mA
Ripple**	Max 150mV
Ambient Temperature	-20°C to 40°C, Reduced output power at higher temperature
Type of Charger	Five step, fully automatic, switch mode with maintenance charging
Type of Batteries	12V Lead-acid rechargeable batteries (WET, MF,AGM and GEL).
Bank Configuration	Quadruple
Number of Batteries can be charged simultaneously	4
Battery Capacity	1.2-120Ah
Dimensions (LxWxH)	260x246x63mm
Housing Protection	IP64 (Dust and Splash proof) outdoor use
Weight	2.3kg
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-6** 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, which has a current ripple of up to 400%, **BENTON® BX-6** charger's current ripple is below 2% (0.15/12V 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-6 charger performs 5-step fully automatic charging cycle. Mode 1 for (14.4V/0.8A), Mode 2 for (14.4V/4.0A) and Mode 3 for (14.7V/4.0A).



1) Diagnosis & Recovery: Initializes the recovery process for drained batteries by pulse charging with small current in order to restoring the battery capacity.

2) Bulk : 80% of energy is returned in this phase of charging. Here charger performs in two states: High Rate Charging and Medium Rate Charging.

3) Absorption: In this phase complete charging up to almost 100% is achieved. Charger switches to trickle charge phase after sensing that the battery is truly fully charged.

4) Trickle Charge : Battery is fully charged and ready to use. If the battery needs more current, the charger will switch to Maintenance Charge phase.

5) Maintenance Charge : As charger continuously monitors the terminal voltage in order to determine if a maintenance charging should be initiated. If the battery is loaded and/or terminal voltage falls below 12.8V, the charger starts a maintenance cycle until voltage reaches to 14.4V. The maintenance charging is discontinued.

Trouble Shooting

Problem	Indication	Possible Cause	Solution
Charger does not work	Indicator lights are not on	a) Charger is not plugged in b) Poor electrical connection c) AC outlet is dead	a) plug in b) Check AC connections and make sure mains is switched on c) Check receptacle
Charger has no DC output	10 Or 5	a) Battery is connected with reverse polarity poles b) Output is short circuited c) Poor contact from charger to battery d) MODE button is not pressed	a) Check DC connection between charger and battery and make sure they are not short circuited b) Check if clamps or ring connectors are connected to the correct polarity c) Check if connectors are not greasy or corroded and making a clean connection and there are no loose or damaged connection d) Press the MODE button
No charging current	5	a) Battery may be defective/ excessive current draw b) Battery may be severely sulfated	a) Check battery condition b) If battery can not be de-sulfated, it must be replaced
Excessive charging time	All LED indicators work normally	a) Wrong battery type selected b) Battery capacity too large	a) Check battery type selection b) Battery can not be charged and must be replaced

Maintenance

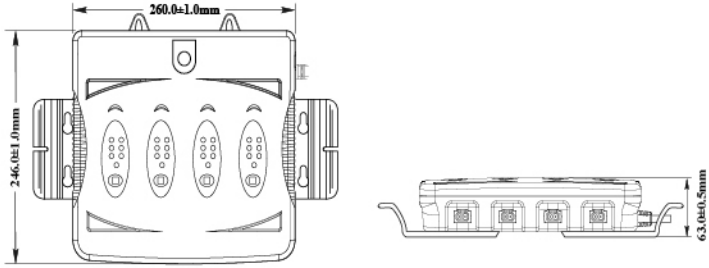
BENTON® BX-6 charger does not need any specific maintenance. Only install, maintain or service this charger when it is disconnected from the mains. It may be cleaned with a dry cloth or soft tissue. Under any circumstances, do not use any solvents or other cleaning agents.

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

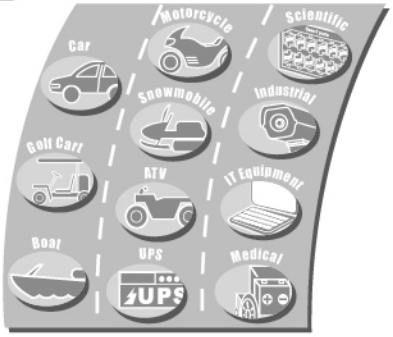
BENTON® BX-6 is fully interactive charger which adjusts itself to changing current and voltage requirement to charge and maintain the battery.

Mounting & Product dimensions

The charger is easy to mount using screws. The charger is supplied with a pair of bracket containing 4 holes. Additional 2 built-in hangers are also provided.

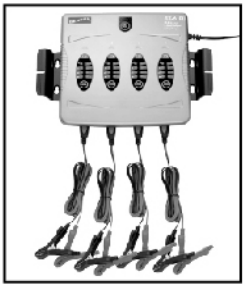


Application



Equipment

BENTON® BX-6 Charger is supplied with four detachable and lockable snap connected, colour coded lead sets with clamps for bench charging.



Declaration of Compliance

Tested and approved by and conforms to EN55014-1, EN55014-2, EN55022, EN55024, EN55011, EN61000-6-1, EN61000-3-2, EN61000-3-3, EN60335-1, EN60335-2-29, EN 62233.

Environmental friendly disposal

You can help protect the environment! Please remember to respect your local regulations. Please hand over the non-working electrical equipments to an appropriate waste disposal centre. The packing material is recyclable and make it available for the recyclable material collection center.

Note- We reserve right to carry out technical modifications for improvement of BX-6 charger.

EN 69754