PowerTechPlus

Switch Mode

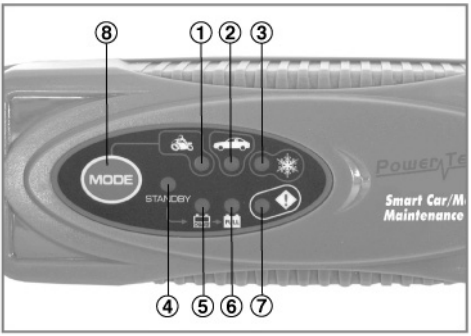
BATTERY CHARGER

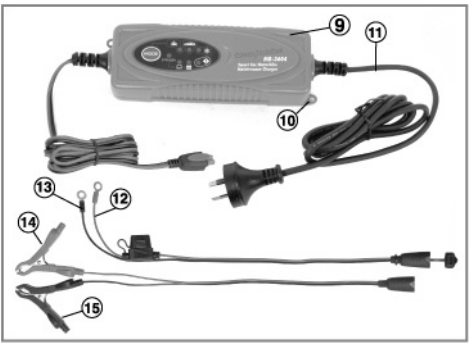
For Lead acid rechargeable batteries 1.2-120Ah

MB-3604

User's Manual And Guide To Professional Battery Charger

Index





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 MB-3604 5-Step fully automatic switch mode battery charger and maintainer, designed for charging a variety of Lead-Acid rechargeable batteries, widely used in motorbikes, cars 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) batteries. Their capacity range from 12V/1.2 Ah to 12V/120 Ah. MB-3604 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 drained battery. 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. 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)
- Double insulated

Contents

1) MB-3604
2) Interchangeable quick contact battery leads with clamps
3) Interchangeable quick contact battery leads with eyelet terminals (Ø 6.3mm)
4) Plug-in fuse 10A
5) User Manual

Safety Information

- **MB-3604** 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 (11). 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.
- 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.

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/3.8A** This mode is normally used for WET, MF and most GEL batteries
	**Mode 14.7V/3.8A** This mode is recommended for several AGM batteries. This mode is also suitable for charging batteries in sub-zero temperatures.

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 ⑮ ("-" pole connection) has not contact with the fuel line or the battery.
      - Connect the red wire ⑭ ("+") to the positive ("+") pole of the battery and the black wire ⑮ ("-") to the vehicle chassis.
   e) Charging of positive earthed battery:
      - Make sure the red wire ⑭ ("+" pole connection) has no contact with the fuel line or the battery.
      - Connect the black wire ⑮ ("-") to the negative ("-") pole of the battery and the red wire ⑭ ("+") 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 ⑭ ("+") to the positive ("+") pole of the battery and the black wire ⑮ ("-") to the negative ("-") pole.

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 ⑫ ("+") to the positive ("+") pole of the battery and the black wire ⑬ ("-") to the negative ("-") pole.

Equipment Description

a) Indication:

Indication	State	Description
4	STANDBY	LED displays "STANDBY" In case of open circuit or short circuit or reverse connection, LED lights up
1		LED displays "Mode1" (14.4V/0.8A)
2		LED displays "Mode2" (14.4V/3.8A)
3		LED displays "Mode3" (14.7V/3.8A)
7		LED displays "Incorrect polarity/Fault
5	CHARGE	LED displays "Charging in progress"
6	FULL	LED displays "Fully charged"
8	MODE	"Mode" selection button

b) Component Description

9	Charger
10	Mounting holes
11	Mains cable with power plug
12	Permanent connection cable for motorcycle: "+" Pole connection cable (red) with ring terminal
13	Permanent connection cable for motorcycle: "-" Pole connection cable (black) with ring terminal
14	"+" Pole quick clamp (red), with built-in terminal screw
15	"-" Pole quick clamp (black), with built-in terminal screw

Select Charging Mode

To charge various batteries at different ambient temperature you can select correct voltage charging mode by pushing the MODE (8) selection button until the light for correct voltage is lit.

Reset/Deleting Settings

After connection to the power supply, the charger automatically resets itself to basic settings and remains in mode STANDBY (4) unless further action is executed by the user.

Switching over between Modes 1,2 and 3

By repeatedly pressing the selection button MODE (8) displays the charging modes in the following order-
STANDBY STANDBY (4), MODE 1 , MODE 2 , MODE 3 and repeats this cycle.

If you press MODE (8), 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 (8) to select Mode 1 . After executing this operation the corresponding LED display (1) will light up. If no further process is activated, the electronic system will automatically start the charging process with the LED displaying CHARGE (5) and charging starts with a current of 0.8A ±10%. If this procedure runs smoothly, the LED display CHARGE (5) will remain on during the entire charging process, until battery is fully charged upto 14.4V±0.25V. At this stage LED display CHARGE (5) will turn off and LED display FULL (6) will turn on. The Trickle current is now available to battery for maintenance.

MODE 2 (14.4/3.8A)

This mode is mainly applied for charging large batteries with a capacity over 14Ah in normal conditions.
Press the selection button MODE (8) to select Mode 2. After executing this operation the corresponding LED display (2) will light up.

If no further process is activated, the electronic system will automatically start the charging process with the LED displaying ② and charging starts with a current of 3.8A ±10%. If this procedure runs smoothly, the LED display ⑤ will remain on during the entire charging process, until battery is fully charged upto 14.4V±0.25V. At this stage LED display ⑤ will turn off and LED display FULL ⑥ will turn on. The Trickle current is now available to battery for maintenance.

MODE 3 (14.7/3.8A)

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 ⑧ to select Mode 3. After executing this operation the corresponding LED display ③ will light up immediately. 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, the LED display ⑤ remains on, the electronic system becomes active and remains in this condition until battery is fully charged upto 14.7V±0.25V. At this stage LED display ⑤ will turn off and LED display FULL ⑥ will turn on. The Trickle current 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. If voltage is below 7.5V the MB-3604 will not start due to its internal safety circuit. It initiates pulse charging mode if the voltage is in the range of 7.5V±0.5 to 10.5V±0.5V. Once voltage of battery rises to 10.5V±0.5V, charger changes over to previously selected normal charging mode. Now the battery can be charged faster and safely. Most drained batteries can be charged and used again using this procedure.

Abnormality Protection

In case of short-circuit, open circuit, reversed polarity connection or battery voltage below 7.5V±0.5, 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. System will remain in STANDBY STANDBY ④ mode unless it receives any charging action by the user. Additionally, the LED displays ⑦ to indicate reverse polarity/fault.

Overheating Protection

MB-3604 is protected by NTC control. During the charging process, if the charger becomes too hot or due to extreme ambient emperature, 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.

Technical Data

MODEL	MB-3604
Input Voltage AC	220-240VAC, 50/60Hz
Output Voltage	Nominal: 12V
Starting Current	<25 A
Input Current	0.6A RMS max
Efficiency	75%
Charging Voltage	14.4V±0.25V or 14.7V±0.25V
Charging Current	3.8A±10% or 0.8A±10%
Back Current Drain*	1 mA
Ripple**	Max 150mV
Ambient Temperature	-20°C to 50°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)
Battery Capacity	1.2-120Ah
Dimensions (LxWxH)	172x62x42mm
Housing Protection	IP65 (Dust and Splash proof)
Weight	0.596kg
Noise Level	<50 dB (Tested from a distance of 50cm)

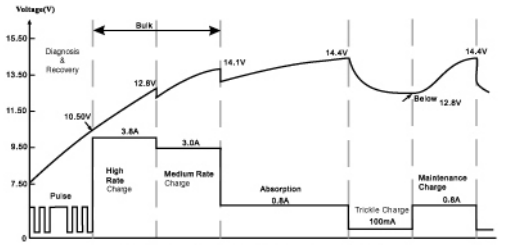
Bulk Charging Time

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

* = 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. MB-3604 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 upto 400%, MB-3604'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

MB-3604 performs 5-step fully automatic charging cycle. Mode 1 for (14.4V/0.8A), Mode 2 for (14.4V/3.8A) and Mode 3 for (14.7V/3.8A).



MB-3604 Charging Curve (60AH Battery)

1) Diagnosis & Recovery: As soon charging instruction is given to the charger, the unique diagnostic function automatically checks status of battery (detects voltage). If a deeply discharged battery's voltage is over 7.5V±0.5, charger begins pulse charging with small current to recover it, which terminates when voltage reaches to 10.5V±0.5V. If battery voltage is over 10.5V±0.5V, charger skips pulse charging and switches over to pre-selected charging mode.

2) Bulk : 80% of energy is returned in this phase of charging. Here charger performs in two-stages-

- **a) High Rate Charging:** Charger delivers constant current of 3.8A until the voltage reaches to 12.8V
- **b) Medium Rate Charging:** Charger delivers constant current of 3.0A until the voltage reaches to 14.1V at which point the charger switches to Absorption phase. Since current is not delivered at highest constant level, MB-3604 will minimize the heating up of the battery, and hence will eliminate the build up of gases. This ensures more efficient and safer performance.

3) Absorption: Use of a constant current of 3.8A for extended periods of time risks gassing the battery. Therefore a constant low charging current is given at 0.8A to raise voltage from 14.1V to 14.4V. 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. 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. Very low current of 100mA is given to the battery. When voltage drops below 12.8V, monitoring circuit senses that battery needs more current to maintain its charge than available in trickle charge phase. The Charger switches 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 charging pulse at constant 0.8A until voltage reaches to 14.4V. The maintenance charging is discontinued. Cycle of trickle charging and maintenance charging is repeated indefinitely to keep battery in good condition when it is not in use and enables charger to be left connected indefinitely.

Maintenance

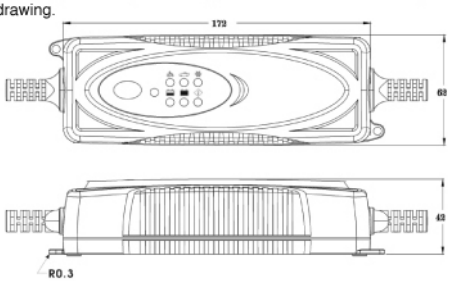
MB-3604 does not need any specific maintenance. Only install, maintain or service this charger when it is disconnected from the mains. It may be cleaned with a dry cloth or soft tissue. Under any circumstances, do not use any solvents or other cleaning agents.

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

MB-3604 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 fix using two screws. Please refer to product drawing.



Equipment

MB-3604 is supplied with two detachable and interchangeable colour coded lead sets- one with clamps for bench charging and other with eyelet terminals (Ø6.3mm) with in-line battery protection plug-in fuse (10A) for permanent attachment to the battery posts to allow quick connection/disconnection through snap-connector.

Declaration of Compliance

Tested and approved by Jiangsu TÜV Product Service Ltd. Guangzhou Branch 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 Complied and tested to Australia/New Zealand electrical safety standards. Approval number Q070702.

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 MB-3604 charger.

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