



OWNER'S MANUAL

Model MSC-2405
For 24-Volt Batteries



Voltage: 24
Amperage: 5

OWNER'S MANUAL

**READ ENTIRE MANUAL BEFORE
USING THIS PRODUCT**

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IMPORTANT: READ AND SAVE THIS SAFETY AND INSTRUCTION MANUAL.

1. IMPORTANT SAFETY INSTRUCTIONS

WARNING: This battery charger is to be used for charging 24 volt batteries only. Use of this charger on other batteries could lead to severe property damage or personal injury.

- 1.1 **SAVE THESE INSTRUCTIONS** – The MSC-2405 offers a wide range of features to accommodate the needs for home or light commercial use. This manual will show you how to use your charger safely and effectively. Please read, understand and follow these instructions and precautions carefully, as this manual contains important safety and operating instructions.
- 1.2 **WARNING:** Pursuant to California Proposition 65, this product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.
- 1.3 Do not expose charger to rain or snow.
- 1.4 Use only recommended attachments. Use of an attachment not recommended or sold by Schumacher® Electric Corporation may result in a risk of fire, electric shock or injury to persons.
- 1.5 To reduce the risk of damage to electric plug or cord, pull by the plug rather than the cord when disconnecting the charger.
- 1.6 An extension cord should not be used unless absolutely necessary. Use of an improper extension cord could result in a risk of fire and electric shock. If an extension cord must be used, make sure:
 - That the pins on the plug of the extension cord are the same number, size and shape as those of the plug on the charger.
 - That the extension cord is properly wired and in good electrical condition.
 - That the wire size is large enough for the AC ampere rating of the charger as specified in the table in section 8.
- 1.7 Do not operate the charger with a damaged cord or plug; take it to a qualified service person. (Call customer service at: 1-800-621-5485.)
- 1.8 Do not operate the charger if it has received a sharp blow, been dropped or otherwise damaged in any way; take it to a qualified service person. (Call customer service at: 1-800-621-5485.)
- 1.9 Do not disassemble the charger; take it to a qualified service person when service or repair is required. Incorrect reassembly may result in a risk of fire or electric shock. (Call customer service at: 1-800-621-5485.)
- 1.10 To reduce the risk of electric shock, unplug the charger from the outlet before attempting any maintenance or cleaning. Simply turning off the controls will not reduce this risk.

WARNING – RISK OF EXPLOSIVE GASES.

WORKING IN THE VICINITY OF A LEAD-ACID BATTERY IS DANGER-

OUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT YOU FOLLOW THE INSTRUCTIONS EACH TIME YOU USE THE CHARGER.

TO REDUCE THE RISK OF BATTERY EXPLOSION, FOLLOW THESE INSTRUCTIONS AND THOSE PUBLISHED BY THE BATTERY MANUFACTURER AND THE MANUFACTURER OF ANY EQUIPMENT YOU INTEND TO USE IN THE VICINITY OF THE BATTERY. REVIEW THE CAUTIONARY MARKINGS ON THESE PRODUCTS AND ON THE ENGINE.

2. PERSONAL PRECAUTIONS

- 2.1** Consider having someone close enough by to come to your aid when you work near a lead-acid battery.
- 2.2** Have plenty of fresh water and soap nearby in case battery acid contacts your skin, clothing or eyes.
- 2.3** Wear complete eye and body protection, including safety goggles and protective clothing. Avoid touching your eyes while working near the battery.
- 2.4** If battery acid contacts your skin or clothing, wash immediately with soap and water. If acid enters your eye, immediately flood the eye with cold running water for at least 10 minutes and get medical attention right away.
- 2.5** NEVER smoke or allow a spark or flame in the vicinity of a battery or engine.
- 2.6** Be extra cautious to reduce the risk of dropping a metal tool onto the battery. It might spark or short-circuit the battery or other electrical part that may cause an explosion.
- 2.7** Remove personal 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 weld a ring or the like to metal, causing a severe burn.
- 2.8** Use this charger for charging a LEAD-ACID battery only. It is not intended to supply power to a low voltage electrical system other than in a starter-motor application. Do not use this battery charger for charging dry-cell batteries that are commonly used with home appliances. These batteries may burst and cause injury to persons and damage to property.
- 2.9** NEVER charge a frozen battery.
- 2.10** NEVER overcharge a battery.

3. PREPARING TO CHARGE

- 3.1** If it is necessary to remove the battery from the vehicle to charge it, always remove the grounded terminal first. Make sure all of the accessories in the vehicle are off, to prevent arcing.
- 3.2** Be sure the area around the battery is well ventilated while the battery is being charged.
- 3.3** Clean the battery terminals before charging the battery. During cleaning, keep airborne corrosion from coming into contact with your eyes, nose and mouth. Use baking soda and water to neutralize battery acid and help eliminate airborne corrosion. Do not touch your eyes, nose or mouth.
- 3.4** Add distilled water to each cell until the battery acid reaches the level specified by the battery manufacturer. Do not overfill. For a battery without removable cell caps, such as valve regulated lead-acid-batteries, carefully follow the manufacturer's recharging instructions.
- 3.5** Read, understand and follow all instructions for the charger, battery, vehicle and any equipment used near the battery and charger. Study all of the battery manufacturer's specific precautions while charging and recommended rates of charge.
- 3.6** Determine the voltage of the battery by referring to the vehicle owner's manual and make sure that the output voltage selector switch is set to the correct voltage. If the charger has an adjustable charge rate, charge the battery in the lowest rate first.
- 3.7** Make sure that the charger cable clips make tight connections.

4. CHARGER LOCATION

- 4.1** Locate the charger as far away from the battery as the DC cables permit.
- 4.2** Never place the charger directly above the battery being charged; gases from the battery will corrode and damage the charger.
- 4.3** Do not set the battery on top of the charger.
- 4.4** Never allow battery acid to drip onto the charger when reading the electrolyte specific gravity or filling the battery.
- 4.5** Do not operate the charger in a closed-in area or restrict the ventilation in any way.

5. DC CONNECTION PRECAUTIONS

- 5.1** Connect and disconnect the DC output clips only after turning the charger off and removing the AC plug from the electrical outlet. Never allow the clips to touch each other.
- 5.2** Attach the clips to the battery and chassis, as indicated in steps 6.5, 6.6 and 7.2 through 7.4.

6. FOLLOW THESE STEPS WHEN BATTERY IS INSTALLED IN VEHICLE.

A SPARK NEAR THE BATTERY MAY CAUSE A BATTERY EXPLOSION. TO REDUCE THE RISK OF A SPARK NEAR THE BATTERY:

- 6.1** Position the AC and DC cables to reduce the risk of damage by the hood, door and moving or hot engine parts.
- 6.2** Stay clear of fan blades, belts, pulleys and other parts that can cause injury.
- 6.3** Check the polarity of the battery posts. The POSITIVE (POS, P, +) battery post usually has a larger diameter than the NEGATIVE (NEG, N, -) post.
- 6.4** Determine which post of the battery is grounded (connected) to the chassis. If the negative post is grounded to the chassis (as in most vehicles), see step 6.5. If the positive post is grounded to the chassis, see step 6.6.
- 6.5** For a negative-grounded vehicle, connect the POSITIVE (RED) clip from the battery charger to the POSITIVE (POS, P, +) ungrounded post of the battery. Connect the NEGATIVE (BLACK) clip to the vehicle chassis or engine block away from the battery. Do not connect the clip to the carburetor, fuel lines or sheet-metal body parts. Connect to a heavy gauge metal part of the frame or engine block.
- 6.6** For a positive-grounded vehicle, connect the NEGATIVE (BLACK) clip from the battery charger to the NEGATIVE (NEG, N, -) ungrounded post of the battery. Connect the POSITIVE (RED) clip to the vehicle chassis or engine block away from the battery. Do not connect the clip to the carburetor, fuel lines or sheet-metal body parts. Connect to a heavy gauge metal part of the frame or engine block.
- 6.7** When disconnecting the charger, turn all switches to off, disconnect the AC cord, remove the clip from the vehicle chassis and then remove the clip from the battery terminal.
- 6.8** See BATTERY PERCENT AND CHARGE TIME for length of charge information.

7. FOLLOW THESE STEPS WHEN BATTERY IS OUTSIDE VEHICLE

A SPARK NEAR THE BATTERY MAY CAUSE A BATTERY EXPLOSION. TO REDUCE THE RISK OF A SPARK NEAR THE BATTERY:

- 7.1** Check the polarity of the battery posts. The POSITIVE (POS, P, +) battery post usually has a larger diameter than the NEGATIVE (NEG, N, -) post.
- 7.2** Attach at least a 24-inch long 6-gauge (AWG) insulated battery cable to the NEGATIVE (NEG, N, -) battery post.
- 7.3** Connect the POSITIVE (RED) charger clip to the POSITIVE (POS, P, +) post of the battery.
- 7.4** Position yourself and the free end of the cable you previously attached to the NEGATIVE (NEG, N, -) battery post as far away from the battery as possible – then connect the NEGATIVE (BLACK) charger clip to the free end of the cable.
- 7.5** Do not face the battery when making the final connection.
- 7.6** When disconnecting the charger, always do so in the reverse order of the connecting procedure and break the first connection while as far away from the battery as practical.
- 7.7** A marine (boat) battery must be removed and charged on shore. To charge it onboard requires equipment specially designed for marine use.

8. BATTERY CHARGING - AC CONNECTIONS

8.1 This battery charger is for use on nominal 100 - 240 volt circuits.

DANGER – Never alter AC cord or plug provided – if it does not fit the outlet, have proper outlet installed by a qualified electrician. Improper connection can result in a risk of an electric shock.

Recommended minimum AWG size for extension cords for battery chargers:

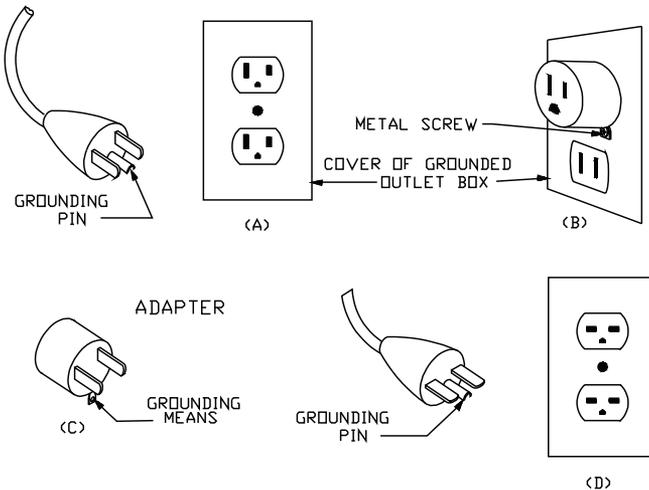
8.2

AC input rating, amperes ^a		AWG size of cord Length of cord, feet (m)			
At least	But less than	25 (7.6)	50 (15.2)	100 (30.5)	150 (45.6)
0	2	18	18	18	16
2	3	18	18	16	14
3	4	18	18	16	14
4	5	18	18	14	12
5	6	18	16	14	12
6	8	18	16	12	10
8	10	18	14	12	10
10	12	16	14	10	8
12	14	16	12	10	8
14	16	16	12	10	8
16	18	14	12	8	8
18	20	14	12	8	6

^aif the input rating of a charger is given in watts rather than in amperes, the corresponding ampere rating is to be determined by dividing the wattage rating by the voltage rating – for example:
1250 watts/125 volts = 10 amperes

8.3

Grounding Methods

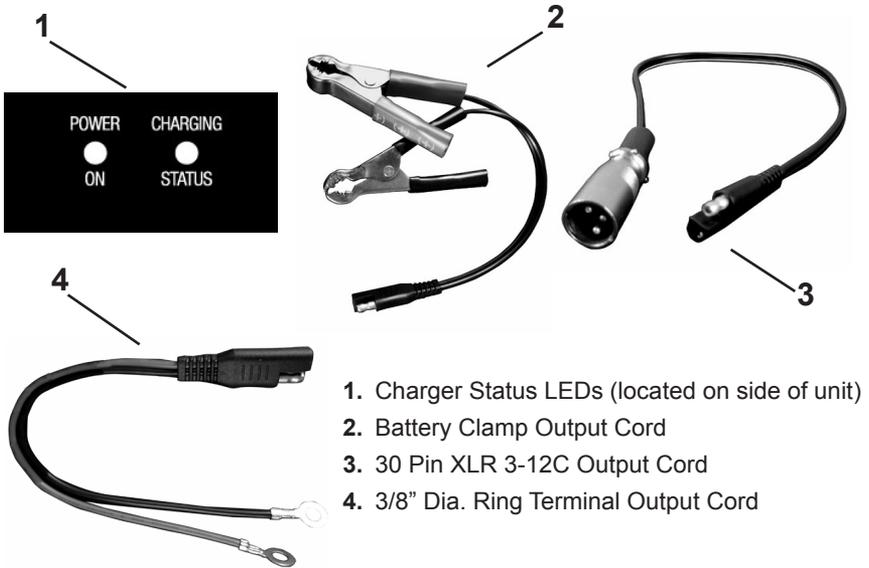


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9. ASSEMBLY INSTRUCTIONS

No assembly required.

10. PRODUCT FEATURES

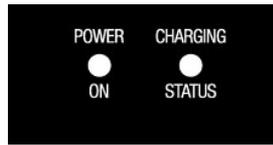


11. MOUNTING CHARGER TO A FLAT SURFACE

Do not mount charger in a location with restricted air flow. The area where the charger is to be fastened must be dry, well ventilated and away from any combustible material and fumes.

- 11.1 Turn off and disconnect charger.
- 11.2 Place the back of the charger with mounting bracket against a secure, flat surface.
- 11.3 Securely mount charger to a flat surface with a minimum of one and a half inches of clearance on each side.

12. CONTROL PANEL



- 12.1 POWER ON (red) LED** – The red POWER ON LED lights up when the charger is plugged in and receiving AC power.
- 12.2 CHARGING STATUS (yellow and green) LED** – The CHARGING STATUS LED glows yellow when the charger is charging and green when the battery is charged and in maintain mode.

LED Color/Flash Pattern	Explanation
Red On	AC Power Present
Yellow On	Charging
Green On	Charge Complete

13. OPERATING INSTRUCTIONS

WARNING: Failure to follow instructions may cause damage or an explosion. Read the entire instruction manual before use.

- 13.1** Make sure that the charger is unplugged from the AC outlet.
- 13.2** Connect one of the three optional output cables to the charger output connector.
- 13.3** Connect the other end of the output cable to the battery.
- 13.4** Plug the charger into the AC outlet. The POWER ON (red) LED will glow to show that AC power is present. Then the green and yellow LED will blink once as a self-test to make sure that the LED is operating properly.
- 13.5** After three seconds, the CHARGING (yellow) LED will glow to show that charging has begun. If none of the LEDs glow, or if the CHARGING (yellow) LED does not glow, refer to the troubleshooting section. Charge time may vary from less than one hour to 12 hours.
- 13.6** When charging is complete, the CHARGED (green) LED will glow and the charger will automatically go into maintain mode. The charger is now ready to be unplugged from the AC outlet.

NOTE: If the battery has not reached at least 18-volts after five minutes of charging or at least 24-volts after four hours of charging, the charger will abort the charging process and turn the yellow LED off.

14. CALCULATING CHARGE TIME

To determine the time needed to fully charge your battery, you must first determine the battery's charge level with a hydrometer or electronic Percent-of-Charge Tester. The following table will help you convert hydrometer readings to percent of charge values.

Specific Gravity	Percent of Charge	Percent of Charge Needed
1.265	100%	0%
1.225	75%	25%
1.155	25%	75%
1.120	0%	100%

When the percent of charge and the Amp Hour (AH) rating of your battery is known, you can calculate the approximate time needed to bring your battery to a full charge.

To convert Reserve Capacity to Amp Hours, divide Reserve Capacity by 2, and add 16:

Example:

$$\text{Amp Hour Rating} = \frac{\text{Reserve Capacity}}{2} + 16$$

NOTE: The Reserve Capacity can be obtained from the battery specification sheet or the owner's manual.

To calculate the time needed for a charge:

1. Find the percent of charge needed (a battery at 50 percent charge that will be charged to 100 percent needs another 50 percent (.5)).
2. Multiply the Amp Hour Rating by the charge needed (.5) and divide by the charger setting (5 amps).
3. Multiply the results by 1.25 and you will have the total time needed, in hours, to bring the battery to a full charge.
4. Add an additional hour for a deep-cycle battery.

Example:

$$\frac{\text{Amp Hour Rating} \times \% \text{ of charge needed}}{\text{Charger Setting}} \times 1.25 = \text{hours of charge}$$

$$\frac{100 \text{ (AH Rating)} \times .50 \text{ (charge needed)}}{5 \text{ (Charger Setting)}} \times 1.25 = 12.5 \text{ hours}$$

$$\frac{100 \times .50}{5} \times 1.25 = 12.5$$

A 100-Ampere Hour Battery must charge for 12 ½ hours when using the above example.

15. MAINTENANCE INSTRUCTIONS

- 15.1 Before performing maintenance, unplug and disconnect battery charger (see sections 6.7 and 7.6).
- 15.2 After use, unplug charger and use a dry cloth to wipe all battery corrosion and other dirt or oil from terminals, cords, and the charger case.
- 15.3 Have any cracked or frayed cables replaced by an authorized service person.
- 15.4 Servicing does not require opening unit, as there are no user-serviceable parts.

16. STORAGE INSTRUCTIONS

- 16.1 Store charger unplugged, in an upright condition. Cord will still conduct electricity until it is unplugged from outlet.
- 16.2 Store inside, in a dry, cool place (unless you're using an on-board Marine Charger).
- 16.3 Do not store clips on handle, clipped together, on or around metal, or clipped to cables.

17. TROUBLESHOOTING

LED GUIDE/PROBLEM	POSSIBLE CAUSE	SOLUTION
The charger is plugged in but the POWER ON (red) LED is not lit.	No power at the AC receptacle.	Check for open fuse or circuit breaker supplying AC outlet.
	Poor electrical connection.	Check power cord and extension cord for loose fitting plug.
	The battery charger is not functioning properly.	Call customer service (1-800-621-5485).
The battery is connected and the POWER ON (red) LED is on, but the CHARGING (yellow) LED is not lit and charger is not charging.	Battery connectors are not making a good connection.	Check for poor connection at battery. Make sure connecting points are clean.
	The battery is bad.	Have the battery checked by a qualified service person.
	The battery charger is not functioning properly.	Call customer service (1-800-621-5485).

18. BEFORE RETURNING FOR REPAIR

Please do not return for repair before speaking to a customer service representative (1-800-621-5485).

- 18.1** When a charging problem arises, make certain that the battery is capable of accepting a normal charge. Use a good battery to double check all connections, AC outlet for a full 120-volts, charger clamps for correct polarity, and the quality of the connections from the cables to the output connector and from the output connector to the battery system. The output connectors must be clean.
- 18.2** When a battery is very cold, partially charged or sulfated, it will not draw the full rated amperes from the charger. It is dangerous and damaging to a battery to force higher amperage into it than it can effectively use in recharging.
- 18.3** When an unknown operating problem arises, please read the complete manual and call the customer service number for information. Doing so will usually eliminate the need for return.

19. TECHNICAL SPECIFICATIONS

This charger is intended for use with lead-acid and gel-cell batteries only.

Electrical	
Nominal Operating Voltage (VAC)	100 – 240
Input Voltage Range (VAC)	85 – 264
Input Current (A rsm max)	2.9 @ 85V 60Hz
Output Power (W)	120 nom. 130 max.
Output Current (A max)	5.0
Output Voltage (VDC nom./range)	24 / 2 – 29.5

Mechanical	
Case	Black Anodized Aluminum
Dimensions (inches)	7 L x 5½ W x 2 H
Weight	1.80 lbs

Connections	
AC Power Input	IEC 320/C14 Male on Cable
DC Power Output Adapters	Option #1 – Battery Clamp Output Cord Option #2 – 3-Pin XLR 3-12C Output Cord Option #3 – 3/8" Dia. Ring Terminal Output Cord

20. REPLACEMENT PARTS

20.1 Battery Clamp Output Cord

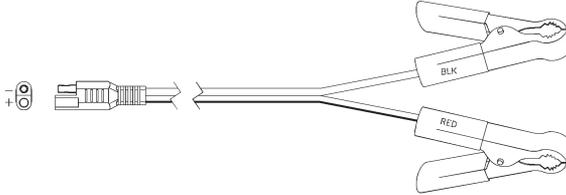
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20.2

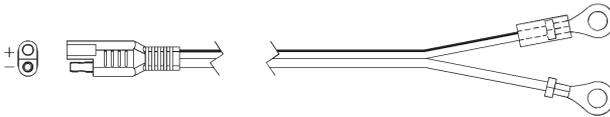
3-Pin XLR 3-12C Output Cord

38-99-002111



20.3 3/8" Dia. Ring Terminal Output Cord

38-99-002112



21. LIMITED WARRANTY

SCHUMACHER ELECTRIC CORPORATION, 801 BUSINESS CENTER DRIVE, MOUNT PROSPECT, IL 60056-2179, MAKES THIS LIMITED WARRANTY TO THE ORIGINAL RETAIL PURCHASER OF THIS PRODUCT. THIS LIMITED WARRANTY IS NOT TRANSFERABLE OR ASSIGNABLE.

Schumacher Electric Corporation (the "Manufacturer") warrants this battery charger for one year from the date of purchase at retail against defective material or workmanship that may occur under normal use and care. If your unit is not free from defective material or workmanship, Manufacturer's obligation under this warranty is solely to repair or replace your product, with a new or reconditioned unit, at the option of the Manufacturer. It is the obligation of the purchaser to forward the unit, along with mailing charges prepaid to the Manufacturer or its authorized representatives in order for repair or replacement to occur.

Manufacturer does not provide any warranty for any accessories used with this product that are not manufactured by Schumacher Electric Corporation and approved for use with this product. This Limited Warranty is void if the product is misused, subjected to careless handling, repaired, or modified by anyone other than Manufacturer or if this unit is resold through an unauthorized retailer.

Manufacturer makes no other warranties, including, but not limited to, express, implied or statutory warranties, including without limitation, any implied warranty of merchantability or implied warranty of fitness for a particular purpose. Further, Manufacturer shall not be liable for any incidental, special or consequential damage claims incurred by purchasers, users or others associated with this product, including, but not limited to, lost profits, revenues, anticipated sales, business opportunities, goodwill, business interruption and any other injury or damage. Any and all such warranties, other than the limited warranty included herein, are hereby expressly disclaimed and excluded. Some states do not allow the exclusion or limitation of incidental or consequential damages or length of implied warranty, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights and it is possible you may have other rights which vary from this warranty.

THIS LIMITED WARRANTY IS THE ONLY EXPRESS LIMITED WARRANTY AND THE MANUFACTURER NEITHER ASSUMES OR AUTHORIZES ANYONE TO ASSUME OR MAKE ANY OTHER OBLIGATION TOWARDS THE PRODUCT OTHER THAN THIS WARRANTY.

WARRANTY VALIDATION: To activate this limited warranty, within 30 days of product purchase you must either complete and return the enclosed "Warranty Card" along with the product receipt to the Manufacturer or go online to www.batterychargers.com and fill out the online warranty card.

