

# AUTO CHARGE 40/20

## AUTOMATIC BATTERY CHARGER

Unit supplied with one of these displays



**MODEL # : 091-216-40/20**

**INPUT: 120 Volt, 50/60 Hz, 8.5 Amps**

**CHARGER OUTPUT: 40 Amps**  
**BATTERY SAVER OUTPUT: 20 Amps**

File: IM\_091-216-4020\_reva.indd  
Rev: A  
Revised By: MFG  
Date: 10-16-2013

**3 YEAR WARRANTY**



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# IMPORTANT SAFETY INSTRUCTIONS

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## I. PERSONAL PRECAUTIONS:

1. Someone should be within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
3. Wear complete eye and clothing protection. Avoid touching your eyes while working near a battery.
4. If battery acid contacts skin or clothing, wash immediately with soap and water. If battery acid enters the eye, immediately flood eye with cold running water for at least 10 minutes and get medical attention immediately.
5. **NEVER** smoke or allow a spark or flame in the vicinity of the battery or engine.
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 and cause a fire or an explosion.
7. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery, when shorted, can produce a current sufficient to weld a ring or the like metal causing a severe burn.
8. Use the battery charger for charging gel-cell, AGM and flooded lead-acid batteries only. Do not use the charger for charging dry-cell batteries that are commonly used with home applications. These batteries may burst and cause injury to persons and damage to property.
9. **WARNING – RISK OF EXPLOSIVE GASES:** Working in the vicinity of a lead-acid battery is dangerous. Batteries generate explosive gases during normal battery operation.

## II. CHARGER PRECAUTIONS:

1. **NEVER** charge a frozen battery.
2. Make sure the cord is located so that it will not be stepped on, tripped over, or otherwise subjected to damage or stress.
3. Do not operate the charger with a damaged cord or plug; replace them immediately.
4. Do not operate the charger if it has received a sharp blow, been dropped, or otherwise damaged.
5. Do not disassemble the charger. Incorrect reassembly may result in a risk of electric shock and fire.
6. To reduce the risk of electric shock, disconnect the charger from the AC source before attempting any maintenance or cleaning.
7. **LOCATION OF CHARGER:** The charger should be mounted on a wall, vehicle floor, ventilated compartment or other suitable surface as close to the batteries to be charged as possible. Do not block the charger's fan or air intakes. Do not mount the charger directly over the batteries as fumes may cause excessive corrosion. The area should be well ventilated and free from excessive moisture, exhaust manifolds, and battery fumes. For maximum performance, the charger should not be located in an area of extreme high temperature. The charger is not waterproof. Do not mount the charger where there is a possibility of water entering the unit. Evidence of water entry into the charger will void the warranty.
8. **CAUTION:** Do not attempt to increase battery bank capacity by splitting the output of one of the banks with a diode-type battery isolator. The diode isolator lowers the charger voltage and results in under-charging the batteries connected to it. If additional capacity is required it is preferable to add another isolated or parallel battery.

## III. GROUND AND AC POWER CORD CONNECTION:

1. The charger should be grounded via the AC power connection to reduce the risk of electrical shock.
2. The charger must be plugged into or wired to an outlet that is an over-current protected 3 prong outlet. Alternatively, it may be routed through a separate dedicated fuse or circuit breaker on an AC distribution panel with proper earth/safety ground. All wiring shall comply with UL recommendations, NEC or NFPA standards and local ordinances. Never alter the AC cord or plug if provided. Any modification of the cord must only be done by a qualified electrician. Improper cord/outlet connection may result in a risk of electrical shock.
3. Observe color coding of the AC wiring as follows:

Black.....	AC Hot or LINE (fused)
White.....	AC Neutral
Green.....	AC Ground (safety/earth)
4. **CAUTION:** (230 VAC applications only): If AC input is provide from a source consisting of two HOT or LINE leads (phase-to-phase 230 VAC input voltage); an external fuse or circuit breaker must be used to protect both hot leads.

# INTRODUCTION

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The Auto Charge 40/20 is an intergrated charger with Battery Saver Low Ripple. The 40/20 is a completely automatic, modified 3-step, single channel battery charger designed for vehicles with a single battery system. The combined battery charger and battery saver provides a complete package. Additionally, the battery saver output provides uninterrupted power to accessory loads. This complete package simplifes installation and improves system reliaility due to parasitic loads. The charger is also ruggedized to withstand the shock and vibration encountered by vehicle mounted equipment.

## FEATURES

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### I. AUTO CHARGE 40/20 BATTERY CHARGER

- 1-hour “boost” voltage for rapid recovery
- Automatic current-limit
- Battery Type Selector Switch
- Intergrated Battery Saver Low Ripple
- Battery Saver Low Ripple output ATC fuse protected
- Remote Battery charge/condition indicator display
- LED status indicators
- Dual Cooling Fans
- Reverse polarity protected
- AC input circuit breaker protection

### II. CHARGE CONTROLS & ELECTRONIC REMOTE SENSING

The Auto Charge 40/20 contains a precision voltage controller to maintain the battery’s charge. The output terminal is voltage regulated and internal circuitry provides for boost voltage during loaded situations. Output voltage regulation and boost voltage compensate for cable voltage drop. Using high-frequency switching technology the output terminal voltage is compared to a reference voltage, any error detected is then used to control the charger output at the desired level. There is no “trickle charge” stage and therefore no danger of overcharging and water boil-off.

### III. AUTOMATIC CURRENT LIMITING

When batteries are severely discharged, some battery chargers can be overloaded due to the high charging current required. The Auto Charge 40/20 is automatically current-limited. The current-limit feature limits the output current to 40 amperes when charging a deeply discharged battery, or if the starter cranks the engine while charging. The current-limit circuit thus eliminates the need for an ignition interlock circuit.

### IV. BATTERY TYPE SELECTOR SWITCH (LEAD ACID/AGM OR GEL-CELL)

Used to select between Lead-Acid/AGM or Gel-Cell batteries.

## V. BATTERY SAVER LOW RIPPLE (BSLR)

The BSLR is a DC power supply with a load transfer function. Accessories connected to the BSLR output are powered by the vehicle's battery when AC shore power is not available. When shore power is applied the accessory loads are automatically transferred from the vehicle battery to the BSLR. The uninterrupted transfer to the BSLR then provides low ripple DC to accessory loads. Utilizing the BSLR further protects the vehicle battery from discharging and ensures battery charger power is available to maintain vehicle batteries. The BSLR is unique in that there is no interruption of power to accessory loads during power transfers. This feature makes the BSLR ideal for Mobile Data Terminal (MDT) or other vehicle accessories.

## VI. BATTERY SAVER LOW RIPPLE (BSLR) OUTPUT ATC FUSE PROTECTED

The BSLR output ATC fuse is common to the BSLR and the vehicle battery. Do not exceed the BSLR output rating. Always manage loads to rated specifications.

## VII. REMOTE BATTERY CHARGE CONDITION INDICATOR

This indicator shows the charge condition of the battery in 10-level increments from "LOW CHARGE" to "FULLY CHARGED". This device indicates a defective battery when a bar graph does not rise to the "FULLY CHARGED" level after an extended period of charging. **Note:** If a battery is being charged with an external load of 4 to 10 amperes across its terminals, the bar graph may move down 1 or 2 levels. This does not indicate a defective battery.

## VIII. LED STATUS INDICATORS

1. **BATTERY CONNECTED** : Indicates that a battery of proper polarity is connected to the charger output terminals.
2. **BATTERY CHARGER ON**: Indicates that AC input voltage is present. Note: Battery must be above 9VDC and of proper polarity
3. **BATTERY SAVER ON**: Indicates power to BSLR output is ON

## IX. COOLING FAN

The 40/20 is fan cooled and automatically adjusts depending on output current or internal component temperature. Two fans circulate air from the rear panel and exhaust through the top cover. The rear panel fan blows air in and the top cover fan blows air out. When the load current increases or the internal component temperature increases, the fan speed increases to allow increased air circulation.

## X. REVERSE POLARITY PROTECTED

Incorrect vehicle battery polarity will disable charger startup.

## XI. AC INPUT CIRCUIT BREAKER PROTECTION

The AC input is fuse protected with a resettable circuit breaker, which protects from excessive input current.

# OPERATION

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## I. BATTERY CHARGER OUTPUT

1. A discharged battery is recharged to roughly 90% or until the current tapers down to less than 4 amps. From current-limit (40 amps) to 4 amps, the LPC output terminal is voltage regulated at the boost voltage level.
2. Once the current decreases to less than 4 amps, or the 1-hour boost voltage timer times-out, the output terminal is set to float voltage level.

**NOTE: See specifications for battery selector switch boost and float voltage settings.**

## II. BOOST VOLTAGE WITH 1 HOUR TIMER

1. Whenever the vehicle is powered from shore power the charger charges the battery at boost voltage level for approximately 1-hour. At the completion of 1-hour, which starts when AC power is cycled, the output voltage switches to “float” voltage level.

## III. BATTERY SAVER LOW RIPPLE OUTPUT

1. The Battery Saver Low Ripple eliminates power glitches or interruptions during power transfers. When power is transferred from the vehicle battery to shore power or shore power to vehicle battery, power to accessory loads remains uninterrupted.

# WIRING

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## I. BATTERY CHARGER WIRING INSTRUCTIONS

1. Refer to Installation Wiring Diagram I & II.
2. Refer to Wiring Specifications to determine the recommended wire size and maximum lengths. Using a smaller gauge may cause overheating of the terminal. Additional information is available upon request if longer, larger wiring is required.
3. Both the battery charger's and battery saver's negative terminals must be connected to battery negative or chassis ground.
4. Double check all wiring before applying AC power to input terminal.
5. Apply AC power (shore power) and observe that the charger and BSLR are operating. When the battery is connected and AC power is applied, all front panel LED indicators will illuminate.
6. Verify that the battery voltage appears at the charger output terminals. A minimum of 9 volts is required before the charger will start.

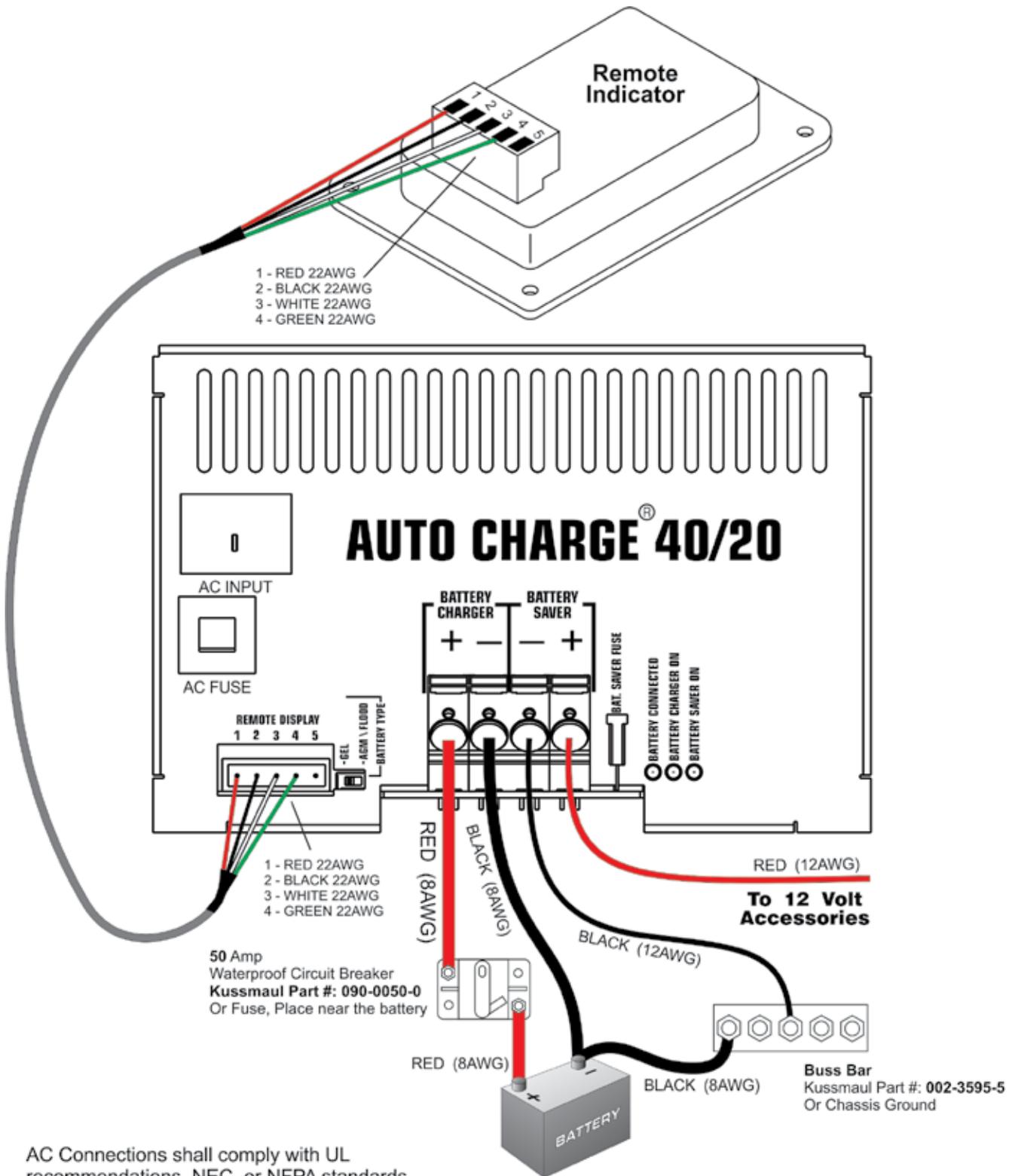
## II. WIRING SPECIFICATIONS

Length of Wire to Battery (feet)	0 - 5	< 5 - 10	< 10 - 20*
Wire # Gauge (AWG)			
BATTERY CHARGER + / -	8 / 8	8 / 8	6 / 6
BATTERY SAVER + / -	12 / 12	12 / 12	10 / 10
* Consult factory if length of wire to battery is longer than 20 feet			

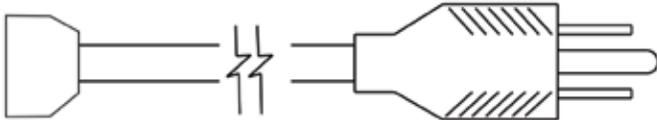
# INSTALLATION WIRING DIAGRAM

## I. FOR BAR GRAPH DISPLAY, 091-200-IND OR DELUXE STATUS CENTER, 091-194-IND

Wiring Diagram shown is for a 10 foot installation



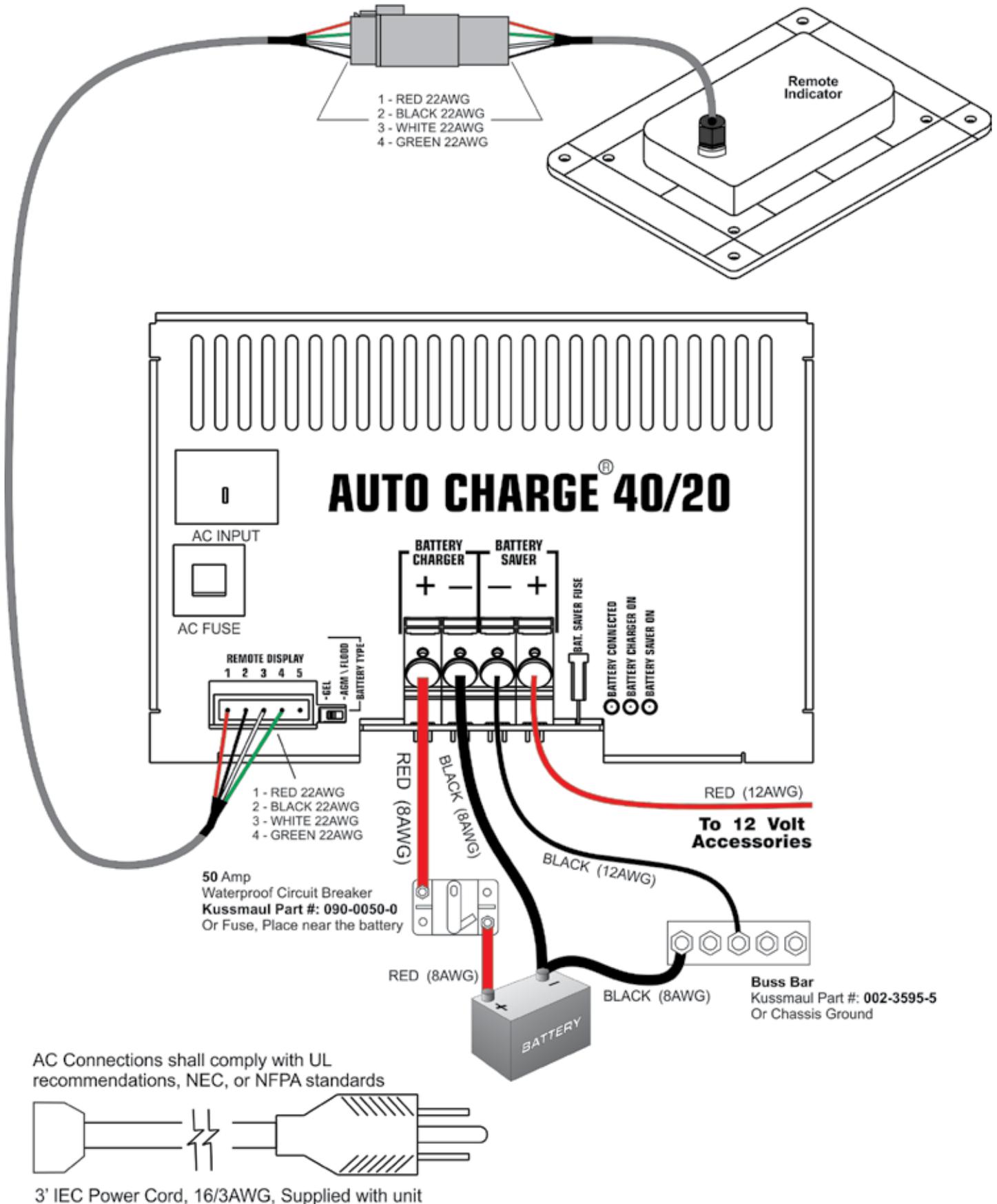
AC Connections shall comply with UL recommendations, NEC, or NFPA standards



3' IEC Power Cord, 16/3AWG, Supplied with unit

## II. FOR WATERTIGHT DELUXE STATUS CENTER, 091-194-IND-WT-XX

Wiring Diagram shown is for a 10 foot installation



## SPECIFICATIONS

**Input Power:** 120 VAC, 50/60 Hz, 8.5 Amps

**Input Fuse:** 10 Amp, resettable, circuit breaker

**Battery Saver Low Ripple Output Fuse:** 20 Amp, ATC fuse, 091-FUS0257020

**Battery Charger Output Power:** 12 volts DC, 40 amperes max

**Battery Saver Low Ripple Output Power:** 14.0 volts DC, 20 amperes max

**Remote Sensing:** Output terminal voltage boost compensated

**LED Status Indicators:** Bat Connected, Bat Charger On, Bat Saver On

**Battery Type Selector Switch:** Lead-Acid/AGM: Boost = 14.0VDC; Float = 13.2VDC

Gel-Cell: Boost = 13.8VDC; Float = 13.4VDC

**Boost Voltage Timer:** 1-Hour (starts when AC power is applied)

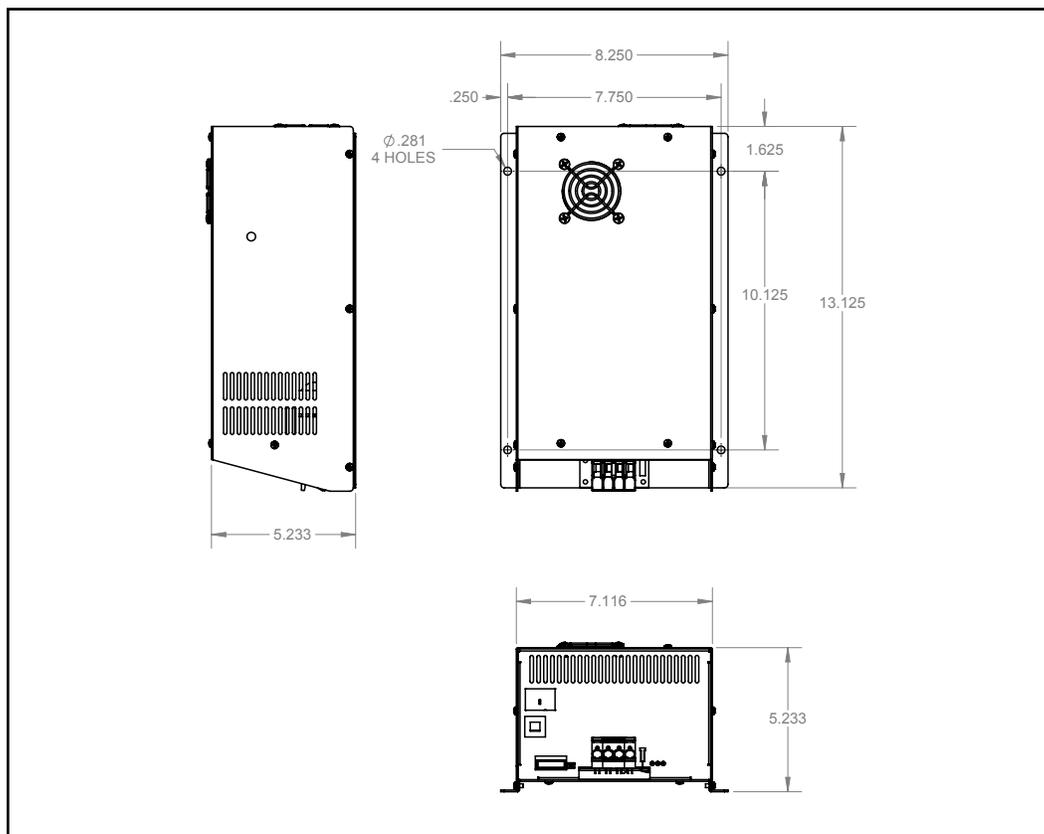
**Charger Indicators:** Remote Bar Graph Display, Deluxe Status Center or Waterproof Status Center

**Output Waterproof Circuit Breaker (Optional):** 50 Amperes, P/N: 090-0050-0

**Output Buss Bar (Optional):** 5 Studs, P/N: 002-3595-5

**Weight:** 13 pounds

## OUTLINE DRAWING



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# OPTIONAL ACCESSORIES

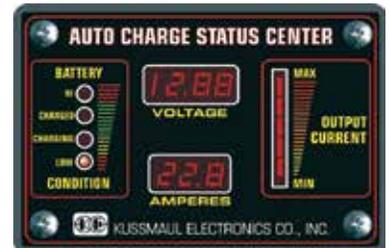
## I. BAR GRAPH DISPLAY, MODEL #: 091-200-IND

- 10-Segment LED display indicate the “state of charge” and the general condition of the batteries



## II. DELUXE STATUS CENTER, MODEL #: 091-194-IND

- Indicator has a digital voltage and ampere display
- 5 segment bar graph display indicates output current
- 4 LED's to show the condition of the batteries



## III. WATERTIGHT DELUXE STATUS CENTER, MODEL #: 091-194-IND-WT-XX

- Indicator has digital voltage and ampere display
- 5 segment bar graph display indicates output current
- 4 LED's to show the condition of the batteries
- Indicator is housed in a watertight bezel
- Bezel is available in 6 different colors, Red, White, Blue, Yellow, Gray, and Black
- Specify color choice when ordering



## IV. WATERPROOF CIRCUIT BREAKER, MODEL #: 090-0050-0

- Combines switching and circuit breaker function
- Compact size and surface mount configuration
- Protects high amperage circuits
- Latch arms resets breaker after overload
- Cannot be held in ON position if short remains on circuit
- Waterproof - Ideal for truck applications



# INSTALLATION RECORD

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DATE INSTALLED \_\_\_\_\_

INSTALLED BY \_\_\_\_\_

VEHICLE IDENTIFICATION \_\_\_\_\_

VEHICLE OWNER \_\_\_\_\_

# WARRANTY POLICY

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All products of Kussmaul Electronics Company Inc. are warranted to be free of defects of material or workmanship. Liability is limited to repairing or replacing at our factory, without charge, any material or defects which become apparent in normal use within 3 years from the date the equipment was shipped. Equipment is to be returned, shipping charges prepaid and will be returned, after repair, shipping charges paid.

Kussmaul Electronics Company, Inc. shall have no liability for damages of any kind to associated equipment arising from the installation and/or use of the Kussmaul Electronics Company, Inc. products. The purchaser, by the acceptance of the equipment, assumes all liability for any damages which may result from its installation, use or misuse, by the purchaser, his or its employees or others.



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