



Advanced Training Systems

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M-145 OPERATIONS GUIDE



Set Up:

Unpack the M-145 Robotic Platform, Save the packing material in case the unit must be sent in for repair. In the carton are several smaller boxes. Inside of one box is the post; inside of a second box are the transmitter and other accessories.



Note the location of the power switch on the side. The antenna is mounted on the top deck.

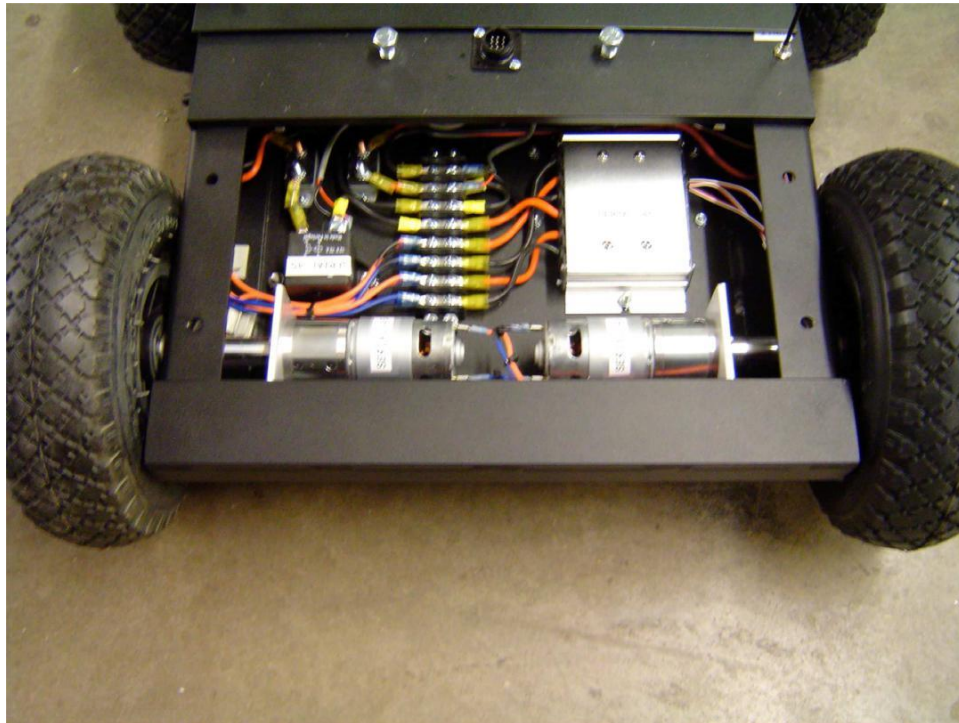
To mount the post ensure the power switch is in the off position, mate the circular on the top of the platform with the pigtail inside post. Mate the connector and lock the collar on the circular connector. After the connector is mated, bolt the post in place with the provided hardware, the switches are placed to the rear (battery end with blank plate). The base platform will not operate without the post mounted. It is possible to create a jumper to test the base unit. Contact the factory for this option.



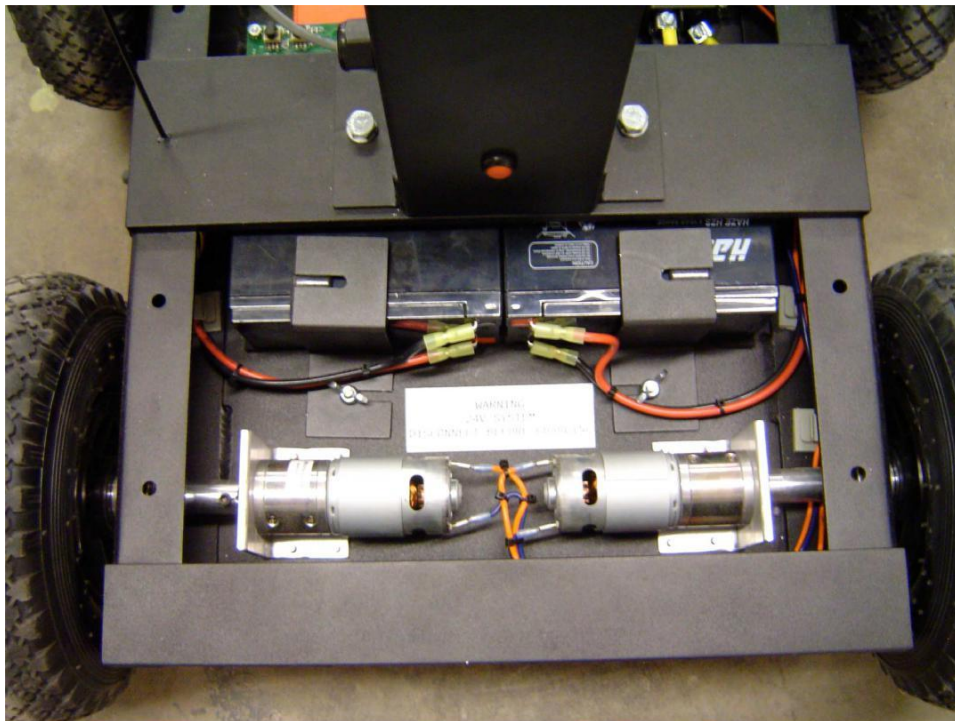
To remove a cover simply pull on each of the 4 plastic rivets until they click; about $\frac{1}{4}$ " is all they move. The center Pin of the Rivet will stay in the fastener. When all 4 rivets are loose, grab 2 rivets on opposite sides of the cover and pull up.

To reinstall set the cover into place, align the 4 rivets and push each of the 4 center lock pins until the snap action is felt. No tools are required.

The cover with the M-145 sticker is the front of the unit. The motor controller and radio receiver are located under this cover. Two circuit breakers as well as a terminal block and power disconnect relay are under this cover also.



The bare cover (no logo) is the rear of the unit (may have loop handles) and is where the 2 batteries are located. The unit uses two 12V 7.5Ah Sealed Lead Acid Batteries for its power source wired in series to create 24V. This is a 24V system using two 12V batteries. Both Batteries are required to operate the system. These batteries use the T2 style of terminal, if replacing the batteries ensure that T2 terminals are used. To connect the batteries attach both sets of Red and Black cables to the proper terminals on the batteries, ensuring the connections are secure. If it has loop handles, the cover is fastened using high strength Vlecro©, so just pull straight up, hard, and it should pop off.



Caution: When charging you MUST remove both sets of battery cables from both batteries before connecting the charger; Failure to do so will cause damage to the charger, wiring and robotic platform.

To charge the batteries, remove both sets of red and black cables from both batteries. Connect the alligator clips on the charger to matching color on one battery at a time. Charge the batteries one at a time to avoid damage to the system or batteries by using heavy-duty jumpers it is possible to charge both batteries from one charger but we do not suggest this method of charging.

You can purchase a second charger to charge the second battery at the same time.

To change the batteries, loosen the wing nut, and slide the battery clamp aside. Slide the battery out while tilting up. Insert New Battery, install clamp and tighten wing nut. At this point connect both sets of leads and reinstall cover.

Do not allow the batteries to become deeply discharged. Running the batteries too low can cause decreased battery life or even battery failure. If the batteries drop to 9V or below they should be charged immediately.

It is good practice to turn the transmitter on before the M-145 Robotic Platform.

To operate the unit, turn the Transmitter ON and then flip the Power Switch UP. The unit is now ready to drive.

Each radio unit has a unique ID code that links the transmitter to the receiver. The system operates on 2.4GHz spread Spectrum Frequency Hopping scheme. The radios are off the shelf consumer units and must be replaced as a pair. If multiple units are ordered at the same time they will be labeled with a "Unit" number on the Base near the antenna and on the transmitter. Transmitters are interchangeable between units.

The M-145 moves forward and Backwards by using the trigger on the hand held transmitter. The steering wheel on the transmitter controls left and Right turning. The M-145 operates in a skid steer type of operation. If no forward or reverse command is given the unit will still spin and turn.

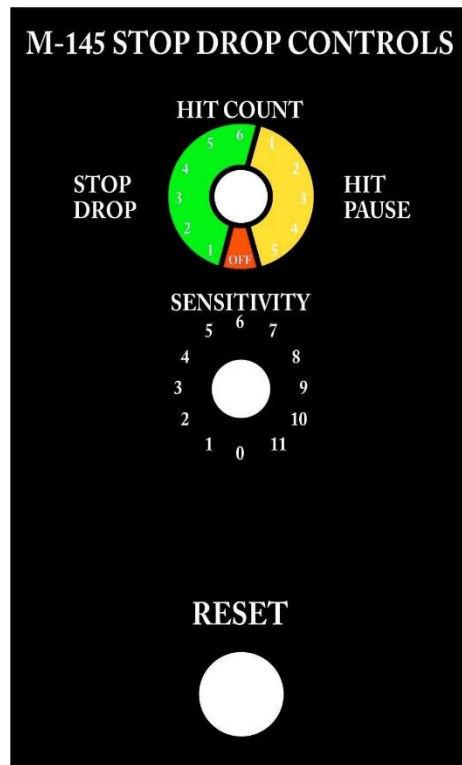
Upon power up the hit detection system is disabled. To enable simply press the Red Reset Button located on the back of the post.

The unit is shipped from the factory with the hit detection board disabled. There are two modes of operation. The first mode is Hit-Stop the second is Hit-Pause. In hit stop mode the unit detects and counts, when the correct count is reached the unit will stop, drop the mannequin and wait for the dummy to be replaced and reset button pressed. In hit pause mode the

impacts are counted and the when the count is reached the platform will pause for 5 seconds and resume motion as commanded after time expires.



There are two Knobs on the post to control the hit settings. The top knob sets the count and mode. The bottom knob sets the sensitivity. Any time a change is to be made the power should be turned off. Upon power up, the reset button must be pressed to energize the post.



The top knob controls 3 modes. When set to 0 the post is disabled. Pressing the reset button with the knob set to 0 will cause the latch to disengage. Positions 1-6 control Hit-Stop/Drop mode with the number controlling the number impacts to activate the latch. Positions 7-11 on the switch control the Hit-pause mode with 1-5 hits to activate.

The bottom knob controls sensitivity. 0 is the most sensitive. The larger the number the bigger the impact required to trip the sensor. The normal range for operation is 4 through 8 depending on the caliber used. A knob setting of 4 works well with 5.56mm rounds. A setting of 6 will work well with 40 S&W.

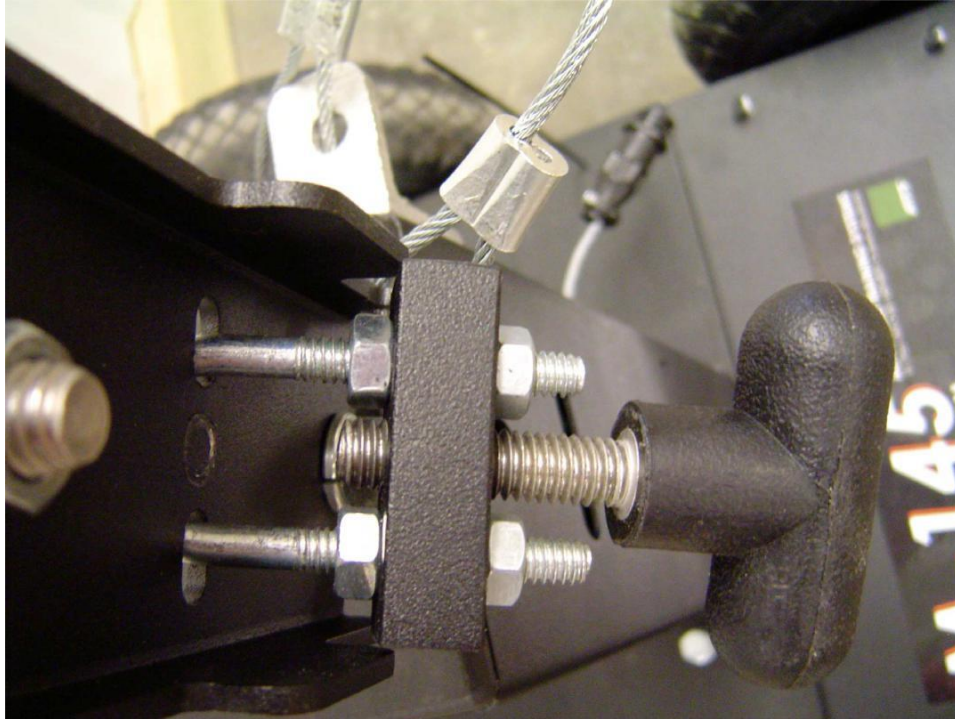
Setting the sensitivity is a balance of not detecting bumps and vibrations from the M-145 platform in motion but detecting bullet impacts to the torso. To experiment with the sensitivity set the Hit-Pause to 1, press the reset button and drive the unit around. If the platform stops and pauses it is detecting false triggers, increase the setting on the bottom knob. Once no false hits are detected test with live fire to ensure the unit operates correctly. The power should be turned off and the reset button must be pressed any time a change is made to the knob settings.

In Stop/Drop mode the bracket is released from the latch when the correct number of impacts has been detected.



The bracket is tethered to the post. Removing the tether can cause the bracket to fall straight down crushing the covers. Do not remove the tether.

To replace the bracket after it has fallen, loosen the hand knob 1 to 2 turns. This will give enough slack in the U-Bolt to allow the latch to engage.



After loosening the hand knob, grab the knob and bar attaching the U-Bolt in the palm of your hand pressing the U-Bolt as far through the bracket as possible. Guide the 2 Pins into the matching holes in the post and the U-Bolt into the slot. You will feel the Latch engage. If the latch does not engage, loosen the hand Knob further and retry.



Once the bracket is latched in place, tighten the bracket to the pole by turning the hand knob. If the bracket is too loose the mannequin will flop all over. There is no need to over-tighten the knob, it is only required to snug the bracket and take up most of the slop.

Once the bracket is in place the 2" PVC pole can be placed over the bracket with the mannequin on top of the Pole.



The mannequin is shipped from the factory ready to be assembled and pre-wired. If replacing the sensor it is important to place the duct tape over the sensor as shown below. When assembling the mannequin ensure the legs are mounted as shown above and the wires are routed as shown.

The pole has a large screw in the top of the post, remove this screw before inserting the pole into the body. There are two washers on this bolt. It is recommended that the star washer be placed between the top of the pole body, inside the pocket. The large flat washer goes directly under the bolt head.



The bottom end of the pole is keyed to keep the mannequin aligned. The back of the pole has an indication line, this line marks key slot for the pole. This indicator marks the back of the pole. The bracket has 4 tabs, one of which is $\frac{1}{2}$ " taller than the rest, this is the key and is the rear of the unit. When installing the post into the mannequin, align the mark before tightening the screw.



The M-145 is a Cost Effective Light Duty Robotic Platform designed to be quick and agile. The unit has a limited carrying capacity of 35#. A mannequin weights approximately 9 pounds. Overloading the M-145 will make it harder for the unit to turn and accelerate, decreasing performance. The more weight placed on the M-145 the shorter battery life will become.

Overloading the M-145 will cause premature motor wear. Motors are field replaceable.

Maintenance

If the wires are damaged during use connectors have been provided. There are 3 wires inside the cable; Red, Black, and a bare wire. All 3 wires are required for the unit to operate correctly. When making repairs make sure all wires are connected. To use the repair connectors, simply slip the loose ends into the connector and crimp shut with a pair of pliers. No stripping is required. These same styles of connectors are used to connect the hit sensor.



To replace a wheel simply remove the one bolt in the end of the axle shaft, remove the keyed wheel retainer, slip the tire and wheel off the axle. Next replace with a new wheel assembly and reinstall the Key. Install the washer and Bolt and tighten. If when reinstalling the wheel the keyed retainer does not mate up with the webs in the wheel, flip the key backwards and use it as a wrench to rotate the wheel on the shaft to the correct orientation.



CAUTION: Be sure to read, follow and understand the following instructions.

Failure to follow this instruction manual may result in serious bodily harm to yourself or others.

Do Not Ride This Device. The M-145 Platform is not designed to carry passengers.

This device is a radio controlled, wireless device operating in the 2.4 GHz unlicensed frequency band. It is possible that interference from an outside source could cause unwanted movements of the unit. Ensure all users and bystanders are alert and clear of the unit.

This unit is not 100% waterproof. Driving this unit through puddles, lakes, streams, rivers, snow, ice, sleet or rain could damage the unit.

The M-145 platform moves fast and is heavy. Slamming the bumpers into people or stationary objects can cause substantial damage to the unit, the object, or bodily harm to the person. Avoid this at all times.

This unit is not a tow truck or plow. Using this unit to pull or push heavy objects is not recommended. It could cause severe damage to the unit.

Continuing to apply power to the unit when stuck (when at least one wheel on each side is not turning) will likely damage the electronics. This stall condition will cause the motors and motor controller to overheat and could cause permanent damage.

Turn the power OFF when not in use.

Do not drive the unit off jumps and ramps. Do not drop the unit. Do not jump onto the M-145. Any of these actions could cause the chassis to bend or may cause damage to the motors and motor shafts.

BATTERY DOC®

The Ideal Portable Battery Charger

5 YEAR LIMITED WARRANTY

WirthCo Engineering, Inc. will replace or repair, at its option, this product or any product component found to have defective materials or workmanship within two years of the original retail purchase. This nontransferable warranty is valid for the original purchaser from the date of the initial retail purchase on the original sales receipt, which is required as proof of purchase to obtain warranty performance. WirthCo Engineering, Inc. dealers, service centers or retail stores offering WirthCo Engineering, Inc. products have no authority to alter, modify or otherwise change the terms or conditions of this warranty.

WHAT IS NOT COVERED

- Shipping costs to WirthCo Engineering, Inc.
- Normal wear and tear, chips, scratches discoloration, etc.
- Damage caused by abuse, misuse, neglect, alterations, unauthorized repairs or failure to follow recommended care instructions
- Products used for commercial purposes
- CONSEQUENTIAL DAMAGES, INCIDENTAL DAMAGES, OR EXPENSES, INCLUDING DAMAGES TO PROPERTY, SOME STATES/PROVINCES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

IMPLIED WARRANTIES

Any implied warranties, statutory or otherwise, including implied warranties for merchantability and fitness for a specific purpose, shall be limited to the terms and duration of the warranties expressly provided by this limited warranty. Some states/provinces do not allow limitations on the duration of a implied warranty, so the limitations above may not apply to you.

HOW TO OBTAIN WARRANTY PERFORMANCE

Take the product to an authorized WirthCo Engineering, Inc. Service Center. If one is not conveniently located, attach a tag to the product stating your name, address, telephone number and description of the problem. Include a copy of the original sales receipt. Carefully package the product and send prepaid by U.P. S. or Parcel Post, insured to WirthCo Engineering, Inc. 7491 Cahill Road, Minneapolis, MN 55439.

If you are located outside the United States or Canada, return this product to the place you purchased it, or to any other retailer seller of similar WirthCo Engineering, Inc. products and request warranty assistance. To obtain further assistance: WirthCo Engineering, Inc. 7491 Cahill Road, Minneapolis, MN 55439.

Tel: 952-941-9073

Fax: 952-941-0659

Note: To the extent any provision of this warranty is prohibited by federal, state, provincial or local law and cannot be preprinted, it shall not be applicable. This warranty gives you specific legal rights and you may also have other rights which vary from state/province to state/province.



BATTERY DOC®

The Ideal Portable Wallmount Battery Charger

Available in 1Amp and 2Amp versions, this range of Wallmount Battery Chargers employs state of the art electronics perfect for lead acid/gel 12-Volt batteries. The **BATTERY DOC®** is a highly efficient, reliable battery charger that will safely charge and maintain your battery at peak condition 24hours a day 365 days a year.

FEATURES

- Small Lightweight construction.
- UL 1236 approved for everyday use
- Short Circuit protected with Automatic Recovery.
- Three Color LED Charge Indicator
- Electronically monitored Over Current Limiting
- Two Stage Charging Constant Voltage (*Maintenance*) Constant Current (*Charging*)
- Battery Clips and terminals for easy connection
- Universal AC Input 100 - 240VAC, 50/60Hz

Additional accessories available. Contact WirthCo Engineering, Inc. for

more information

Email sales@wirthco.com

Tel: 952-941-9073

Fax: 952-941-0659



SAVE THESE INSTRUCTIONS-
This manual contains important safety and operating instructions for battery charger model numbers #20030 & #20033

1. Use of an attachment not recommended or sold by the battery charger manufacturer may result in a risk of fire, electric shock, or injury to persons.
 2. To reduce risk of damage to electric plug and cord, pull by plug rather than cord when disconnecting charger.
 3. An extension cord should not be used unless absolutely necessary. Use of improper extension cord could result in a risk of fire and electric shock. If extension cord must be used, make sure:
 - a. That pins on plug of extension cord are the same number, size, and shape as those of plug on charger.
 - b. That extension cord is properly wired and in good electrical condition; and
 - c. That wire size is large enough for ac ampere rating of charger.
 4. Do not operate charger with damaged cord or plug - replace the cord or plug immediately.
 5. Do not operate charger if it has received a sharp blow, been dropped, or otherwise damaged in any way; take it to a qualified serviceman.
 6. Do not disassemble charger; take it to a qualified serviceman when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
 7. To reduce risk of electric shock, unplug charger from outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
 8. **WARNING - RISK OF EXPLOSIVE GASES**
 9. **WORKING IN VICINITY OF A LEAD-ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT EACH TIME BEFORE USING YOUR CHARGER, YOU READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.**
 10. To reduce risk of battery explosion, follow these instructions and those published by battery manufacturer and manufacturer of any equipment you intend to use in vicinity of battery. Review cautionary marking on these products and on engine.
- 9. PERSONAL PRECAUTIONS**
- a. Someone should be within range of your voice or close enough to come to your aid when you work near a lead-acid battery.
 - b. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
 - c. Wear complete eye protection and clothing protection. Avoid touching eyes.
 - d. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid gets near eyes, immediately flood eyes with running cold water for at least 10 minutes and get medical attention immediately.
 - e. NEVER smoke or allow a spark or flame in vicinity of battery or engine.
 - f. Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit battery or other electrical part that may cause explosion.
 - g. 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.
 - h. Use 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 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.
 - i. NEVER charge a frozen battery.
- 10. PREPARING TO CHARGE**
- a. If necessary to remove battery from vehicle to charge, always remove grounded terminal from battery first. Make sure all accessories in the vehicle are off, so as not to cause an arc.
 - b. Be sure area around battery is well ventilated while battery is being charged. Gas can be forcefully blown away by using a piece of cardboard or other nonmetallic material as a fan.
 - c. Clean battery terminals. Be careful to keep corrosion from coming in contact with eyes.
 - d. Add distilled water in each cell until battery acid reaches level specified by battery manufacturer. This helps purge recharging from cells. Do not overfill. For a battery without cell caps, carefully follow manufacturer's recharging instructions.
 - e. Study all battery manufacturer's specific precautions such as removing or not removing cell caps while charging and recommended rates of charge.
- 11. CHARGER LOCATION**
- a. Locate charger as far away from battery as dc cables permit.
 - b. Never place charger directly above battery being charged; gases from battery will corrode and damage charger.
 - c. Never allow battery acid to drip on charger when reading gravity or filling battery.
 - d. Do not operate charger in a closed-in area or restrict ventilation in any way.
 - e. Do not set a battery on top of charger.

12. DC CONNECTION PRECAUTIONS
 - a. Connect and disconnect dc output clips only after setting any charger switches to off position and removing ac or electric outlet. Never allow clips to touch each other.
 - b. Attach clips to battery and chassis as indicated in 13(e), 13(f), 14(f), & 14(g).

13. FOLLOW THESE STEPS WHEN BATTERY IS INSTALLED IN VEHICLE. A SPARK NEAR BATTERY MAY CAUSE BATTERY EXPLOSION. TO REDUCE RISK OF A SPARK NEAR BATTERY:
 - a. Position ac and dc cords to reduce risk of damage by hood, door, or moving engine part.
 - b. Stay clear of fan blades, belts, pulleys, and other parts that can cause injury to persons.
 - c. Check polarity of battery posts: POSITIVE (POS, P, +) battery post usually has larger diameter than NEGATIVE (NEG, N, -) post.
 - d. Determine which post of battery is grounded (connected) to the chassis. If negative post is grounded to chassis (e in most vehicles), see (e). If positive post is grounded to chassis, see (f).
 - e. If negative post of battery is grounded to chassis, connect POSITIVE (RED) clip to vehicle chassis or engine block away from battery. Do not clip to carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or engine block.
 - f. For positive-grounded vehicle, connect NEGATIVE (BLACK) clip from battery charger to NEGATIVE (NEG, N, -) ungrounded post of battery. Connect POSITIVE (RED) clip to vehicle chassis or engine block away from battery. Do not connect clip to carburetor, fuel lines, or sheet-metal body parts. Connect to a heavy gage metal part of the frame or engine block.
 - g. When disconnecting charger, turn switches to off, disconnect AC cord, remove clip from vehicle chassis, and then remove clip from battery terminal.
 - h. See operating instructions for length of charge information.

14. FOLLOW THESE STEPS WHEN BATTERY IS OUTSIDE VEHICLE. A SPARK NEAR THE BATTERY MAY CAUSE BATTERY EXPLOSION. TO REDUCE RISK OF A SPARK NEAR BATTERY:
 - a. Check polarity of battery posts: POSITIVE (POS, P, +) battery post usually has a larger diameter than NEGATIVE (NEG, N, -) post; connect
 - b. Attach at least a 24-inch-long 6-gauge (AWG) insulated battery cable to NEGATIVE (NEG, N, -) battery post.
 - c. Connect POSITIVE (RED) charger clip to POSITIVE (POS, P, +) post of battery.
 - d. Position yourself and free end of cable as far away from battery as possible - then connect NEGATIVE (BLACK) charger clip to free end of cable.
 - e. Do not face battery when making final connection.
 - f. When disconnecting charger, always do so in reverse sequence of connecting procedure and break first connection while as far away from battery as practical.
 - g. marine (boat) battery must be removed and charged on shore. To charge it on board requires equipment specially designed for marine use.

OPERATING INSTRUCTIONS Part No. 20030 & 20033

LED STATUS	OUTPUT VOLTAGE	CONDITION	*NOTES
OFF	No Output	Charger not plugged in	
OFF	No Output	Output Shorted	
Red (blinking)	No Output	Battery Voltage below 3Vvolts	2
Red	Vbatt 3-7Vvolts typ.	Charging	1 & 2
Yellow	Vbatt 7-13Vvolts typ.	Charging full Amps (1 or 2A)	
Green	Vbatt 13.0 -13.5Vvolts	Charging < 70% full Amps	
Green (Blinking)	Vbatt 13.5Vvolts	Battery fully charged (OR not connected)	
Green (Blinking)	Vbatt > 13.5Vvolts	Check for incorrect battery	3

- *NOTES:
1. Vbatt is the battery voltage
 2. Battery overly discharged; may not fully charge.
 3. LED may blink momentarily if the above connection procedure is not followed.