P.O. Box 1112 • Willoughby, OH 44096-1112

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OPERATOR'S MANUAL
EM-100™ Lithium Ion Battery Pack

TO REDUCE THE RISK OF INJURY, YOU MUST READ THIS OPERATOR'S MANUAL AND COMPLY WITH ALL INSTRUCTIONS AND PROCEDURES DESCRIBED HEREIN.

FAILURE TO DO SO MAY RESULT IN FIRE, PERSONAL INJURY, AND/OR OTHER DAMAGE.

NEW PACKS MUST BE CHARGED BEFORE FIRST USE. THEY ARE SHIPPED AT 40% STATE OF CHARGE AND ARE DISABLED AND WILL NOT OPERATE UNTIL CHARGED.

PATENTS AND PATENTS PENDING

7,838,142 • 7,990,102 • 8,025,118 • 8,026,698
8,084,154 • D601,088 • D632,649 • 20100197222
20100248616 and others

GENERAL SAFETY RULES

⚠ *WARNING*

READ AND UNDERSTAND ALL INSTRUCTIONS

Failure to follow all instructions may result in electrical shock, fire, equipment damage, and/or serious personal injury.

SAVE THESE INSTRUCTIONS

This manual contains important safety and operating information for the Modtech Corp. EM-100 24V *Lithium-Ion* battery pack. Before using the battery pack, read this operator's manual. Also, read and observe all information on the labels attached to the battery pack.

1. ***CAUTION!*** ***TO REDUCE THE RISK OF INJURY AND/OR EQUIPMENT DAMAGE, CHARGE EM-100 LITHIUM ION BATTERY PACKS USING ONLY MODTECH CORP. BATTERY CHARGERS DESIGNATED TO CHARGE THIS SPECIFIC BATTERY PACK MODEL***. The use of other types of chargers may result in personal injury or equipment damage. Under no circumstances attempt to connect the battery pack to any power supplies or other equipment that is not specifically and expressly designated for use with this model battery pack.

2. ***USE THE MODTECH CORP. EM-100 LITHIUM ION BATTERY PACK ONLY WITH MODTECH CORP. EQUIPMENT SPECIFICALLY AND EXPRESSLY DESIGNATED FOR USE WITH THIS MODEL BATTERY PACK***. Use with other tools or equipment may result in fire, electric shock, personal injury, and/or damage to equipment.

3. ***AVOID DANGEROUS CONDITIONS AND ENVIRONMENTS***. Do not charge the battery pack in damp or wet conditions. Avoid using the pack in direct exposure to rain or snow. Do not use the battery pack or charger in the presence of explosive gases or flammable materials because sparks will be generated whenever the battery pack is plugged or unplugged from chargers or other equipment.

4. AVOID USING OR STORING THE BATTERY PACK IN EITHER EXTREME COLD OR EXTREME HOT TEMPERATURES. The battery pack will disable itself under conditions of extreme heat (above 60 °C) and may not function to full performance under conditions of extreme cold (below –20 °C). Storage at elevated temperatures (above 25 °C) will shorten the life of your battery pack.

5. ***DO NOT BURN OR INCINERATE BATTERY PACKS***. Battery packs may explode causing personal injury, fire, and/or damage. Fumes resulting from burning of battery packs may be toxic.

6. ***DO NOT DROP, CRUSH, IMPACT, OR MECHANICALLY ABUSE BATTERY PACKS***. Cease use of packs that have suffered a sharp impact, been dropped, run over, or damaged in any other way. Such impacts may cause internal damage that is not externally visible and that, over time, may cause short circuits, battery cell leakage, or other events that may lead to fire, personal injury, and or equipment damage.

7. ***DO NOT DISASSEMBLE BATTERY PACKS***. There are no user serviceable parts within battery packs. Disassembly may result in short circuiting or other damage that may cause fire, personal injury, and/or other damage.

8. ***AVOID CONTACT WITH BATTERY CHEMICALS***. If a battery pack leaks battery chemicals, avoid any contact with skin, eyes, or mouth. In the event of contact with skin, wash immediately with soap and water and rinse with vinegar. For eye contact, begin flushing with clean water, immediately call for medical help, and continue flushing for 20 minutes or until medical help arrives.

9. ***AVOID SHORT CIRCUITS***. A short circuit will result if conductive materials such as wires, metal tools, coins, keys, salt water, or other conductive objects contact the positive and negative terminals at the same time. A short circuit may cause sparks, excessive heat, fire, personal injury, or other equipment damage.

10. ***REPLACE FUSE ONLY WITH 10A 32V MINI BLADE FUSE***. No exceptions.

11. ***STORE BATTERY PACKS IN A COOL, DRY PLACE***. Avoid leaving the battery pack in direct sunlight, vehicle cabs, compartments, or unventilated storage buildings during hot summer conditions. Under extreme temperature conditions damage may occur. Elevated temperatures in general shorten the life of your battery pack.

WARNING

READ AND SAVE THESE INSTRUCTIONS FOR FUTURE USE.

Failure to follow all instructions may result in electrical shock, fire, equipment damage, and/or serious personal injury.

FUNCTIONAL DESCRIPTION

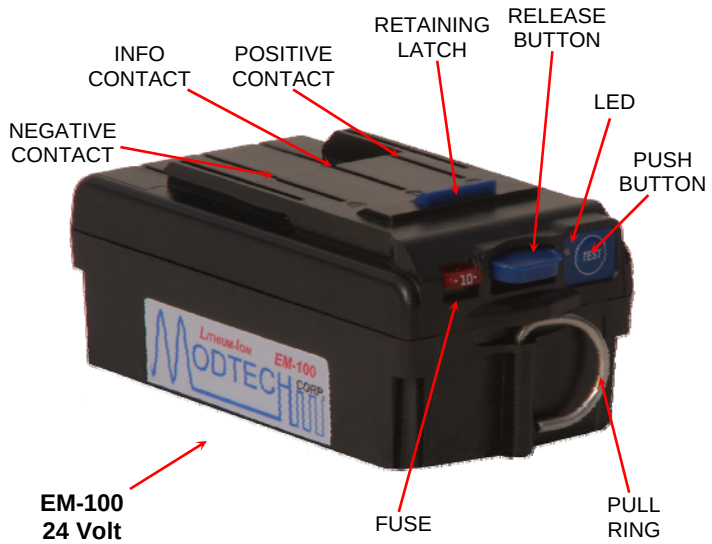

TABLE 1 - TEST PUSH BUTTON OPERATION

(VERY SHORT FLASH)	PACK IS DISABLED
▬	10 – 20% CHARGE
▬ ▬	20 – 30%
▬ ▬ ▬	30 – 40%
▬ ▬ ▬ ▬	40 – 50 %
▬ ▬ ▬ ▬ ▬	50 – 60%
▬ ▬ ▬ ▬ ▬ ▬	60 – 70%
▬ ▬ ▬ ▬ ▬ ▬ ▬	70 – 80%
▬ ▬ ▬ ▬ ▬ ▬ ▬ ▬	90 – 100% CHARGE

Press the push button firmly to actuate. The LED will flash indicating whether the pack is enabled and how much charge it contains. A very short, single flash of the LED indicates that the pack is disabled and will not provide any further power until re-charged. If the pack is enabled, one flash will be given for each 10% increment of charge. The flashes occur in groups of three for ease of counting. If there is no flash, the pack may be damaged and should be removed from service and sent for repair.

BATTERY PACK OPERATION

The EM-100 is an intelligent, *lithium ion* power pack. It protects itself automatically in several ways:

1. ***High voltage condition:*** The EM-100 will inhibit any charging (disallow any power input) and only allow discharging (power output) in the case of high voltage.

2. ***Low voltage condition:*** The EM-100 will inhibit any discharging (power output) and only allow charging (power input) in the case of low voltage.

3. ***High temperature condition:*** The EM-100 will inhibit either charging or discharging until the temperature is below satisfactory limits.

4. ***Low temperature condition:*** The EM-100 will inhibit any charging and only allow discharging until the temperature is above a satisfactory limit. In the case of *extreme cold*, discharging and charging both will be disabled.

5. ***High charge current:*** The EM-100 will inhibit charging momentarily in the case of high charge (input) current. Charging will be re-enabled after a short time, but will be disabled again quickly if charge current remains too high. In the case of extremely high charge current, the EM-100 will become disabled and must be connected to the charger to re-enable. This should never occur when the EM-100 is properly charged using the Modtech Corp. supplied, appropriate, designated chargers.

6. ***High discharge current:*** The EM-100 will inhibit output current momentarily in the case of high discharge current. Output will be re-enabled after a short time, but will be disabled again quickly if discharge current remains too high. In the case of extremely high output current, the EM-100 will become disabled and must be connected to the charger to re-enable.

7. ***External fuse:*** The EM-100 is programmed to disable current flow, either charging (input to EM-100) or discharging (output from EM-100) at levels below the rating of the supplied fuse. In the event that the fuse becomes open (blown), the EM-100 may be damaged or operating improperly. In this case, the battery pack should be removed from service immediately and sent for inspection and repair if needed. In no event should the external fuse be replaced with any fuse other than one identical to the factory supplied type, 10A, 32V, mini-blade type fast blow fuse.

8. ***Internal TCO fuse:*** The EM-100 includes a Temperature Cutoff Fuse (TCO) device internally. This device will open in the case of either excessively high current or temperature. If this internal fuse opens, the battery pack will output no power and an error will be indicated when recharging is attempted. ***The pack must be removed from service*** in this case. ***The TCO cannot be replaced or repaired by the user***.

MAINTENANCE AND STORAGE

Moisture and heat are deleterious to battery pack operation and life. Refrain from exposing the pack to rain, snow, or moisture of any kind. When storing the pack, a cool, dry location is mandatory for good preservation of capacity and life. It is also advantageous to store packs for extended periods at 40% to 50% charge level if possible. This will optimize shelf life and service life.

Battery packs placed in prolonged storage should be checked once or twice a year. When a pack is seen to decline to 10% charge level, it may be placed on the charger for approximately 1 hour to return it to 50% charge level. If the pack is allowed to discharge fully, it will become disabled but not otherwise damaged. In this case, a very short flash of the LED will occur when the test push button is pressed (see Table 1). A disabled pack should be charged at the user's earliest convenience, preferably for at about one hour if it is to be returned to storage.

If the pack is to be transported for recycling or other purposes, or at time of disposal or recycling, ***remove the external fuse***. This will electrically disconnect the pack contacts from the batteries inside and provide a safer state for avoiding short circuit conditions. The fuse may be simply re-installed when the pack is to be returned to service.

DISPOSING OF BATTERY PACKS

Lithium ion battery packs are more environmentally friendly than many other types of batteries (e.g. lead acid or nickel cadmium types). Always dispose of battery packs according to federal, state, and local regulations. Contact a recycling agency in your area for recycling instructions and locations.

Always treat battery packs with care, do not incinerate or burn, and avoid crushing or compacting. Remove the external fuse when the pack is to be discarded or recycled. Do not allow the pack to become submerged in water.

RBRC BATTERY RECYCLING

The RBRC™ Battery Recycling Seals indicate that the battery pack may be recycled. When a spent pack is to be retired, return it to Modtech Corp. or a participating distributor for recycling. For more information, visit the RBRC web site at www.rbrc.org.

SPECIFICATIONS

Battery Cell Type	*Lithium Ion*
Nominal Pack Voltage	24 VDC
Minimum Operating Voltage	16.5 VDC
Nominal Pack Capacity	4.4 Ah
Minimum Discharge Temperature	-20 °C
Minimum Charging Temperature	0 °C
Maximum Charging Temperature	45 °C
Maximum Discharge Temperature	60 °C
External Fuse	10 A, 32 V MINI-BLADE, FAST ACTING
Maximum Charge Current	2.5 A
Maximum Continuous Discharge	4.4 A
Shutdown Discharge Current	9 A
Dimensions	5-3/4" x 3" x 2-5/8" (146 x 76 x 67 mm)
Weight	28 oz. (794 g)

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