72 VOLT BATTERY DISCHARGE UNIT
MODEL 25680

PLEASE SAVE THESE IMPORTANT SAFETY AND OPERATING INSTRUCTIONS

For correct operation of the equipment, it is important to read and be familiar with this entire manual before installing and operating the discharger. DO NOT DISCARD THIS MANUAL AFTER READING.

LOOK FOR THIS SYMBOL TO POINT OUT SAFETY PRECAUTIONS. IT MEANS: *BECOME ALERT—YOUR SAFETY IS INVOLVED.* IF YOU DO NOT FOLLOW THESE SAFETY INSTRUCTIONS, INJURY OR PROPERTY DAMAGE CAN OCCUR.

A discharge unit is used to measure the remaining or proportional useful energy for which a battery set is capable. Since slightly different methods are used when determining a battery's useful energy, this discharge unit has the capability of being programmed to use a variety of discharge times and shut-off voltages. Other features which have been designed in are:

- Operates from battery voltage only (no AC supply)
- Used on 72 volt battery systems only
- Electronically controlled (uses microcontroller)
- Programmable voltage or time shut-off
- LED digital display for easy reading
- Built-in thermal protection
- 8 foot DC cord with cord wrap built into handle
- Durable eighteen gauge (18 Ga.) steel case with powder coat paint
- Large 500 amp alligator clamps for battery connections
- Three minute test cycle feature for measuring cell voltages

IMPORTANT SAFETY INSTRUCTIONS

1. This manual contains important safety and operating instructions for discharge unit Model 25680.
2. Before using discharge unit, read all instructions and cautionary markings on electric vehicle, battery, battery charger, and all accessories using battery.
3. Position the discharger on a foundation of stone, brick, concrete or grounded metal.
4. TO REDUCE THE RISK OF FIRE, DO NOT USE THE DISCHARGER NEAR FLAMMABLE MATERIALS OR VAPORS.
5. Do not expose discharge unit to rain or snow.
6. Use of an attachment not recommended or sold by the discharge unit manufacturer may result in a risk of fire, an electric shock, or injury to persons.
7. Make sure DC cord is located so that it will not be stepped on, tripped over, or otherwise subjected to damage or stress.
8. Do not operate discharge unit with damaged cord or clamp; replace it immediately.
9. To permit free air flow for cooling, allow eighteen inches (18") minimum between the discharger and any wall or other equipment.

10. Do not touch the back or sides of the case during or just after operation of the discharge unit. A large amount of energy is being dissipated by the unit and the case will become hot.
11. NEVER disconnect the discharge unit from the batteries while the unit is operating. This will subject the unit to heat stress and may immediately damage or shorten the life of the unit.
12. Do not operate discharge unit if it has received a sharp blow, been dropped, or otherwise damaged in any way; take it to a qualified service center.
13. Do not disassemble discharge unit; take it to a qualified service center when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
14. To reduce risk of electric shock, disconnect discharge unit from batteries before attempting any maintenance or cleaning.

RECEIVING AND INSTALLING THE UNIT

When the discharge unit is received, check for possible in-transit damage. If any damage is found, it should be reported as a claim to the carrier.

Proper operation of the discharge unit is important in order to achieve good performance and to prevent damage to the discharger and batteries. The discharge unit should be located in a clean, cool, dry, and well ventilated area. To permit free air flow for cooling, allow eighteen inches (18") minimum between the discharger and any wall or other equipment. Position the discharger on a foundation of stone, brick, concrete or grounded metal.

⚠DANGER: TO REDUCE THE RISK OF FIRE, DO NOT USE THE DISCHARGER NEAR FLAMMABLE MATERIALS OR VAPORS.

THEORY OF OPERATION

The importance of using a discharge unit on battery sets is two-fold:

1. To determine battery capacity.
2. To find defective cells or batteries in a battery set.

These are accomplished by conducting a discharge under controlled conditions as specified by the American Golf Car Manufacturers Association (AGCMA). The AGCMA has outlined battery capacity measurements as follows:

> Battery energy is measured in minutes obtained upon discharging a fully charged 72 volt battery set with a 75 amp resistive load at a temperature of 80°F until a shut-off voltage of 63 volts (1.75 volts per cell) is reached.

To test a set of batteries to the above specification, the battery is to be first completely charged. This means charging the battery until the specific gravity of the battery cells does not change in three consecutive readings taken one hour apart.

A discharge unit is then connected to the battery and a discharge started. Applying the 75 amp average load will lower the voltage immediately to slightly below nominal voltage. As the discharge progresses, the voltage will decrease gradually at first, then fall faster until the pre-selected shut-off voltage is reached and the discharge shuts off.

Testing battery capacity

Battery capacity is expressed as the percentage of time at which shut-off voltage was reached.

Example:

> A 36 cell battery set rated at 107 minutes at 75 amp discharge rate is to be tested to a shut-off voltage of 63 volts. Upon discharging a set of fully charged batteries, the discharge unit shut off in one hour and 32 minutes (92 minutes). Battery capacity is therefore expressed as: (92 / 107) * 100% = 86.0%.

Use both the battery manufacturer specifications for battery capacity and battery performance when determining the appropriate time for battery replacement.

Testing for defective cells

During a discharge, all cells in a set should decrease in voltage nearly evenly. Right before the discharger shuts off at 31.5 volts (assuming all cells being good), the total battery voltage is composed of 36 cells supplying 1.75 volts each or 6 twelve volt batteries supplying 10.5 volts each. Should one or more cells decrease faster or fail to hold their respective load, the total discharge time will be less to the extent it probably will not be acceptable. If, for example, one battery is yielding only 8 volts, the balance of the batteries must make up for this deficiency. Further, the 8 volts for this one battery could be caused by one or more cells being deficient in this battery.

After the discharge unit shuts off at 63 volts, restart the discharger to quickly monitor the individual cell or battery voltages while the batteries are underload. If cell or battery voltages vary considerably or any cell voltage is below 1.75 volts or battery voltage is below 10.5 volts, replace the low cells or batteries. Caution should be observed, as the cells or batteries with higher voltages should not be taken below 1.75 volts per cell (10.5 volts per battery). Some experience will be needed to judge these conditions.

OPERATING INSTRUCTIONS

The discharge unit is designed for long, trouble-free service. It features a five-digit display and two push buttons which are used to interact with the user.

The discharge unit is a DC-only unit. Connect the two alligator clamps to the batteries to power up the discharge unit. Make sure the clamps are properly connected to the battery posts. The RED clamp connects to the positive post (+), and the BLACK clamp connects to the negative post (-).

⚠WARNING: NEVER DISCONNECT THE DISCHARGE UNIT FROM THE BATTERIES WHILE THE UNIT IS OPERATING. THE LARGE AMOUNT OF ENERGY BEING DISSIPATED BY THE RESISTIVE ELEMENT COULD CAUSE DAMAGE TO THE DISCHARGE UNIT IF THE FAN IS NOT RUNNING.

Pressing the START/STOP button will begin a discharge cycle. The discharge unit has been designed to have several methods for terminating a discharge cycle:

- Pressing the START/STOP button (can be used like a pause button)
- Maximum time shut-off (programmable from 5 - 240 minutes)
- Shut-off voltage
- Over temperature shut-off

When a discharge cycle has been terminated, check to see which type of shut-off has occurred. If the value in Func2 is the value programmed for the maximum timer, then the terminating method was by maximum time shut-off. If the value in Func3 is the value programmed for the shut-off voltage, then the terminating method was by shut-off voltage. If neither of the above methods were true, then the discharge unit shut-off by over temperature or by someone pressing the START/STOP button. When this occurs, make sure nothing is blocking the ventilation area around the discharge unit (keep unit at least eighteen inches (18") from walls or other equipment). Also check and make sure the fan is operating properly by restarting, then stopping the unit.

FAN OPERATION

After discharge shuts off there is a certain amount of time the fan runs to cool off the coils. When that timer expires, the beeper will beep for .25 seconds every second for 1 minute. After 1 minute the beeper will change to 1 second on for every three minutes. If user presses the display button, the beeper will shut off.

OPERATING THE PUSH BUTTONS

The two buttons control all of the operations of the discharge unit. The left button is labeled START/ STOP and the right button is labeled DISPLAY. Both buttons are used in a variety of ways to make the operation simple.

START/STOP button

When the discharger unit is connected to a set of batteries, it powers up in the off condition, with "OFF" being displayed for about five (5) seconds. Pressing the START/STOP button will start the discharge unit as indicated by the message "ON". If the button is pressed again, the unit will shut off, as indicated by the message "OFF". If this button is pressed again, the unit will restart and continue from where it was stopped. As long as the battery remains connected to the discharge unit, this button can be used to start and stop a discharge without losing the total discharge time.

After the unit has stopped, either by maximum timer or by reaching the shut-off voltage, a test discharge cycle may be started by pressing the START/STOP button. A test cycle will run for three minutes, which should allow you enough time to measure the individual cell voltages to check for bad cells. If more time is needed, press the START/STOP button again to start another test cycle.

DISPLAY button

The DISPLAY button is used to display several different values. Press the button to show the function, then release it to show its present value. The following functions can be displayed:

Func1 - Present battery voltage

Func2 - Discharge time in minutes and seconds (minutes are displayed on the left and seconds to the right of the decimal point)

Func3 - Lowest battery voltage reached during discharge

Func4 - Battery voltage sensed (72)

PROGRAMMING INSTRUCTIONS

The discharge unit also has several values which are programmable. This allows more flexibility to vary the discharge depending on the batteries and the desired discharge method. The following values can be programmed:

- Maximum discharge time
- Shut-off voltage

The maximum discharge time can be changed at any time, but the shut-off voltage can only be adjusted after a discharge cycle has started.

Changing the maximum timer

The default discharge time is 240 minutes. This value is the maximum time the discharge unit allows to discharge a set of batteries.

To increase the maximum timer if it has been decreased from the default value, press and release the DISPLAY button until Func1 is displayed. Continue to hold in the DISPLAY button while you press and release the START/STOP button. Every time you press and release the START/STOP button, the maximum timer will increase by five minutes. When you are finished increasing the maximum timer to the desired value, release the DISPLAY button.

To decrease the maximum timer from 240 minutes, press and release the DISPLAY button until Func2 is displayed. Continue to hold in the DISPLAY button while you press and release the START/STOP button. Every time you press and release the START/STOP button, the maximum timer will decrease by five minutes. When you are finished decreasing the maximum timer to the desired value, release the DISPLAY button.

Changing the shut-off voltage

When the unit is powered up, the shut-off voltage defaults to its lowest programmable value of 63 volts (1.75 volts per cell).

To increase the shut-off voltage from the default setting, press and release the DISPLAY button until Func3 is displayed. Continue to hold in the DISPLAY button while you press and release the START/STOP button. Every time you press and release the START/STOP button, the shut-off voltage will increase by 0.1 volts. When you are finished increasing the shut-off voltage to the desired value, release the DISPLAY button.

To decrease the shut-off voltage if it has been increased from the default setting, press and release the DISPLAY button until Func4 is displayed. Continue to hold in the DISPLAY button while you press and release the START/STOP button. Every time you press and release the START/STOP button, the shut-off voltage will decrease by 0.1 volts. When you are finished decreasing the shut-off voltage to the desired value, release the DISPLAY button.