

SOLAR CHARGED BATTERY OPERATED YARD EQUIPMENT MANUAL



A product of the Mow With Less Program
Sponsored by:
 Project Grow of Ann Arbor
 The Ann Arbor Energy Commission
with a grant from the Michigan State Energy Office

DISCLAIMER

The information included in this manual is a schematic guide for skillful individuals with abilities in electrical repair. Any work with electricity and mowing equipment is potentially dangerous with possibilities of shock, fire, or dismemberment. Do not attempt the procedures in this manual without a good knowledge of electricity and safe wiring practices. Project Grow, The Ann Arbor Energy Commission, the State Energy Office and the writers of this manual take no responsibility for accident happening as a result of using information contained herein.

Introduction

Mowing the average lawn in the United States creates as much air pollution as driving the family car on a 200 mile trip. It also submits the operator and his/her neighbors to a large amount of noise pollution.

Small yards(up to 1/2 an acre) can be mowed with commercially available electric powered push mowers that are quieter and use only locally non-polluting electricity. The operation can be made totally non-polluting by supplying the electricity with solar electric(photovoltaic(PV)) panels.

The following information is result of converting one lawn mower and two string trimmers over to using PV power and should not be construed as being an all inclusive informational source. Products vary and will have to be adapted differently. It is important to realize that alteration of equipment usually voids any manufacturer's warrantee. It is also important to realize that although this equipment is powered with low voltage potentials for shock, fire, or equipment damage by shorting can occur. Batteries can explode if their contacts are shorted. Also mowers and string trimmers can inflict physical injure. Always disconnect power from devices where possible, wear eye protection and keep body parts away from blades and string.

Product Selection



A) YARD EQUIPMENT

The products converted as part of this grant were a 19" Black and Decker CM-1000 rechargeable, push lawn mower and a Yard Stick string trimmer by American Gardner. Both have 24 volt storage batteries with 24 Volt chargers. Having the same charging voltage is important if you are converting more than one device. If it does not say on the product literature or box, look on the back of the plug in power supply. This usually shows both the voltage (24V)(AC or DC) and the amperage (1 amp or 500 milliamps) of its output. This information is necessary for selecting the charge controller and PV array.

PV PANELS

PLUG FOR CHARGING



B) PV PANELS

The maximum current and voltage requirements determine the panel size and selection. This is also governed by availability. The product literature for the yard equipment will give you the amount of time that it will take for the unit to be charged using the provided power sourced and utility power. Oversizing the panel output will not increase the charging rate but will allow them to charge in lower light levels and for a larger part of the solar day. In our case (2) 12V Watt BP/Solarex panels were connected in series to produce 24V for charging purposes. These panels are available on-line or over the phone from the solar suppliers listed in the appendix.

C) CHARGE CONTROLLER

The charge controller is chosen by the voltage output desired for charging and by the maximum amperage output required. Get one with a LED light that shows maximum and float charging so you can see what is happening. If you don't, you will need a volt meter to check on things. The Controller is a Sunselector M-4 by Bobier Electronics. These controllers are available from the solar suppliers listed in the appendix

D) CONNECTORS

The trailer/auto industry is an excellent source for connectors that are polarized, rugged, waterproof and designed to carry low voltage current. Auto supply stores will have these.

CONVERSION

A) Mower

The mower that was altered was a Black and Decker CM-1000 19" rechargeable push mower. The charging power supply produced 1 amp max. at 24VAC (really over 25v for charging a 24V battery). Upon removing the cover of the mower(see picture) it was discovered that the charge plug connected to a circuit board that also controlled the power to the mower. In order to use 24VDC from the pv panels, it was necessary to splice in a new polarized plug directly to the wires to the battery. (see picture). Be careful of polarity. The controller is mounted on board the mower to allow the mower to be charged in remote locations and to make sure that the charger was always connected to the batteries before current was applied to the charger. The charger manufacturer warns that damage to the controller can occur if this is not done. By mounting in on the mower this danger is eliminated.

If you want to use one controller for both a mower and a string trimmer you will have to mount it off the unit, with a switch to disconnect the panels from the controller before removing the device being charged.



CHARGE CONTROLLER

PLUG FOR PV PANEL

PLUG TO PV PANELS

ON/OFF SWITCH

CHARGE CONTROLLER

PLUG TO STRING TRIMMER



B) STRING TRIMMERS

The string trimmers chosen were other models are available from Black and Decker. These were chosen in part because they also required 24v charging and so could easily use the same PV array. The charging power supply produced 500 milliamps at 24VDC. This meant that the device itself needed no alteration. The cord leading from the 120v to 24vdc power supply to the string trimmer was cut and a 2 wire polarized trailer cable connector was inserted. This way the plug that fit in the handle of the string trimmer could be used for both utility or solar power. A similar mating plug was attached to the wires coming out of the controller. Wires from the panels were fitted with a different polarized plug that connected to either the trimmer charge controller or the mower.

APPENDIX

SELECTED WEB-SITES FOR RELATED PRODUCTS

www.blackanddecker.com
<http://www.powerexperts.com>
www.homepower.com/
<http://www.alt-energy.com/>
<http://www.solarconverters.com/>
<http://www.mrsolar.com>
<http://www.rt66.com/aaasolar/>
<http://www.ovonic.com/>
<http://www.goldengenes.com/>
http://www.upvg.org/upvg/pv_othr.htm
<http://www.eren.doe.gov/pv/>
www.newenglandsolar.com/
www.realgoods.com