

## USING THE MINI-MAXIMIZER

Please read the previous page first, before proceeding.

**WARNING:** THE RACE-TRIM MINI-MAXIMIZERS CAN OPERATE AT POTENTIALLY LETHAL DC VOLTAGE LEVELS. INSTALLATION MUST BE PERFORMED BY SUITABLY QUALIFIED PERSONNEL AND ALL APPLICABLE ELECTRICAL SAFETY CODES MUST BE FOLLOWED.

The Mini-Maximizer modules are supplied for use as sub-assembly components to form part of a larger electrical power system. As such, they are not supplied in any enclosure and should only be handled in the unenergised state with the plug-in power socket removed.

\*\*\*\* Many parts of the componentry on the units, when energised, are at high DC voltage levels during operation. \*\*\*\*

All Mini-Maximizers manufactured by AERL P/L have been thoroughly 100% tested and are guaranteed to meet all of the applicable specifications at the time of shipping. The Mini-Maximizers are supplied by the manufacturer or their agent for charging solar racing car batteries as electrical sub-assemblies only, under the express condition that no lawful responsibility is implied or accepted by the above parties, save those non-excludeable conditions stated or implied by any state or federal legislation, for any damage to any persons, structure, equipment or property associated with the correct or otherwise use of the Mini-Maximizer modules. Use of this product for any purpose other than PV maximum power extraction and battery charging in solar racing cars voids the warranty. AERL guarantees this product against defects of materials and workmanship for a period of 12 months from the date of installation, providing it is used strictly in accordance with the specified voltage & current limits. Damage from external voltage surges (lightning etc), output short-circuits, water / moisture or physical damage sustained while in use is not covered by this warranty. Any defective product should be returned carriage paid to AERL or their agent.

## CONNECTING THE MINI-MAXIMIZER

**COOLING.** The MINI-MAXIMIZERS use their own circuit board as a heatsink and although very efficient, should always be mounted in the vehicle so that their air is always gently changing.

The Race-Trim Mini-Maximizers are fitted with a quick-release plug-in terminal block for rapid and safe change-over. The units can thus be removed in safety without disconnecting individual wires. To remove the terminal block, hook three fingers behind the raised section containing the terminal screws and pull this section firmly, horizontally away from the fixed male pins section. The disconnection requires considerable force as the socket firmly locks in place. The terminal block accepts up to 4.5 sq.mm cables.

\*\*\*\* ALWAYS DOUBLE-CHECK THE POLARITY \*\*\*\*

**MOUNTING.** To avoid damage to the large electrolytic capacitors, the units should be mounted with the circuit board parallel to the plane of the ground. Otherwise excessive vehicle vibration may cause fatigue failures.

**ON/OFF CONTROL.** The remaining 3 terminals, marked 'REMOTE CONTROL': 'LINK for ON' & 'LINK for OFF' are for a remote on/off switch to be connected - if required. This is an electronic ON/OFF control that shuts down the Mini-Maximizer. (It is a 3V logic control with respect to the (-) PV INPUT and involves only 0.1mA of current). \*\*The first piano DIP switch on the Battery Selector is also an ON/OFF switch.\*\*

**OUTPUT FUSE.** The negative output is fused with a high voltage, low loss 25A fuse, printed on the top side of the PCB. When the 'FUSE' blows, the white-ringed section blows away. The fuse will blow if, (1) The battery is connected backwards or (2) The inputs are shorted, while the battery is connected.

**REPLACING A BLOWN FUSE.** A spare printed circuit board fuse is supplied. If the built-in fuse is blown, unplug the terminal

connector socket, rectify the cause of the fault and then remove the top extra set of nuts and spring washers from the fuse mounting bolts. Place the spare fuse, metal side downwards on the bolts, place the spring washers on the bolts and then the second set of nuts. Tighten firmly to achieve a good electrical connection.

**\* NEVER SHORT THE INPUTS OR OUTPUTS \***

**USING A BLOCKING DIODE or AN OUTPUT CIRCUIT-BREAKER.** A blocking diode is usually used in PV battery charging systems to prevent the battery discharging back into the PV panels at night. This is ideal for unattended PV systems, but wastes valuable power in the diode. In solar racing cars, where every watt counts, it is recommended to connect the outputs from the Mini-Maximizer(s) via an isolating circuit-breaker, instead of using a blocking diode. This circuit breaker can be simply opened at night to stop reverse power flow from the battery. This will also power down the Maximizer(s) and prevent them from drawing their supply current from the battery bank at night and also prevents the panels from remaining electrically "ALIVE" at night. The Maximizers do not have to be switched off before opening or closing this output isolator at night or the next morning as they have an automatic idle-down mode when their output is open-circuited. A single, double pole, miniature circuit-breaker, with one pole in each positive and negative line is recommended. Place this circuit-breaker after the common output bus connection, if multiple Maximizers are being used. If a blocking diode is used as well, place an appropriately heatsunk and rated diode after the Maximizer(s) output. This will serve both functions of night-time reverse power blocking and stopping the Maximizer power supply drawing from the battery.

**WARNING:** In wet Lead-acid systems, keep circuit-breakers away from the battery, as a tripping breaker represents a possible hydrogen gas ignition source.

**MULTIPLE L.E.D. INDICATORS.** When voltages are present at the input and output terminals, red "INPUT ALIVE" & "OUTPUT ALIVE" LED's light up to indicate this. When the battery voltage reaches a level corresponding to fully discharged, (eg. 1.8-1.9V/cell for lead-acid batteries), a red "LOW" LED lights and remains lit until the battery is fully equalised and recharged, at which point the red "FULL" LED lights up. This shows if the battery has been below the "LOW" level on the last discharge cycle.

## PANEL DESIGN & MAXIMIZER SELECTION

**MINI-MAXIMIZER DESIGN RULE:** The "hot cell", (that is the 50-60 degrees celcius PV cell temperature), Maximum Power PV Panel Voltage should be selected to be equal to OR above the fully charged & equalised (110%) battery bank voltage level. This will always ensure maximum PV power delivery.

**IMPORTANT NOTE:** PV Cell open-circuit and operating voltages increase by 0.4% / Deg.C. for decreases in temperature and decrease by 0.4% / Deg.C. for increases in cell temperature.

When referring to a battery, the following will be used to describe its voltages - REST Volts / FLOAT Volts / EQUALISE Volts.  
e.g. For a lead-acid cell this typically gives 2.06V / 2.34V / 2.55V  
e.g. For a Silver/Zinc cell this typically gives 1.5V / 1.81V / 2.00V

## A TYPICAL RACING CAR DESIGN EXAMPLE

**THE BATTERY:** 60 x lead-acid Cells (124V / 140V / 153V)  
Using the above DESIGN RULE; the "hot cell" PV maximum power voltage should thus be 153V or above. To obtain the approximate "hot cell" PV open-circuit voltage, multiply this figure by 1.3 times. This gives a voltage of 199V<sub>o/c</sub> "hot". To obtain the 25 degree C. ("cold cell") PV open circuit voltage, multiply the "hot cell" V<sub>o/c</sub> value by 1.15. This gives 229V<sub>o/c</sub> "cold". This would then require the use of an "HV" Mini-Maximizer, with the float selection dip-switch on setting # 7, with the 20 Turn "Final Float" trim-pot adjusted to give a final float voltage of 140V. (The equalise level will then be around 153V, 9% above the 140V).

(NOTE: The Mini-Maximizer samples the PV panels every 30 seconds to update the Maximum Power Point Voltage). FEB1996