

Application notes for installation of solar panels.

Introduction

These notes are for the installation of solar panels on board motor homes equipped with power supply unit models AL-310-X and AL-310-X2 being produced in the 1999-2000 season.

General part

The power supply unit of the electrical system developed by ArSilicii (models. AL-310-X and AL-310-X2) manages the various sources of energy available on board the mobile home.

The energy flows are shown briefly in Figure 1.

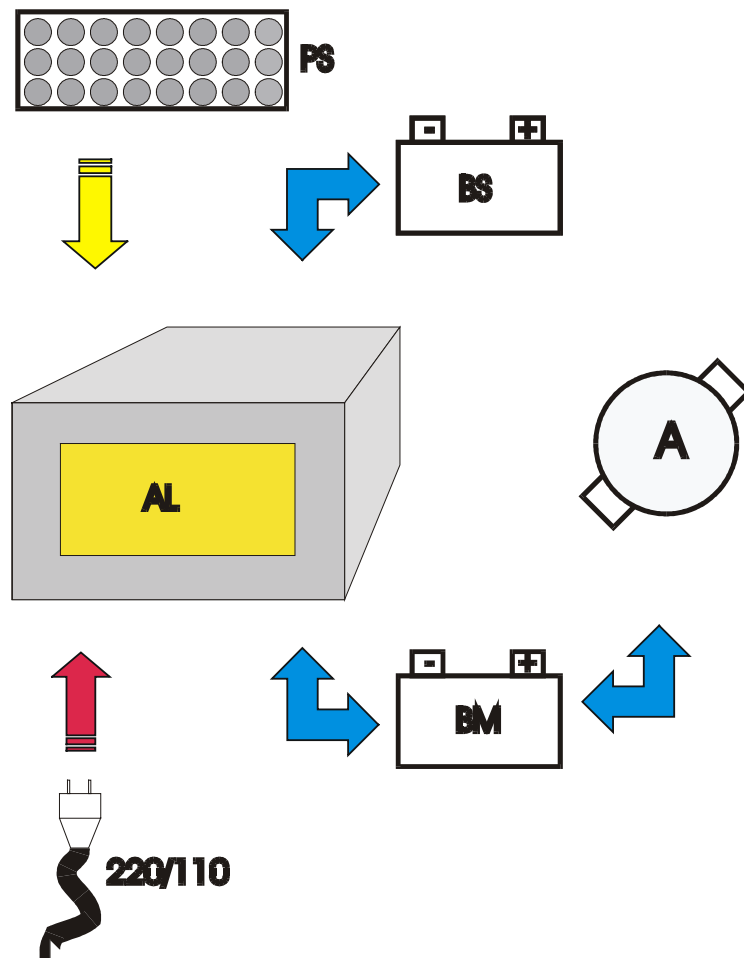


Figure 1 "Overview"

Figure 1 shows the following elements:

Symbol	Device
AL	Power supply
BS	Service battery
BM	Engine batteries

A	Alternator
220/110	External power supply unit

The power supply unit is therefore able to charge the batteries by running the charge cycle selected by the user as a function of the available source.

In the particular case of the solar panel, further units need not be installed between the solar panel and the power supply unit because, as said earlier, the charge regulator functions are already performed by the power supply unit.

The basic version of the power supply unit supports solar panels up to a **maximum of 100 W (current at maximum power of 6 A)**.

With this type of panel, the power supply unit also supplies an estimation of the power that can be provided by the panels and a general switch to cut out the panels directly from the control panel.

Moreover, thanks to the data normally supplied to the voltage user on the batteries and the current supplied from/to the service battery, an accurate valuation can be obtained of the energy status of the vehicle and an index of the panel functions.

Case 1 : Installation of a single panel

If a single panel is installed, it must be connected as shown in Figure 2:

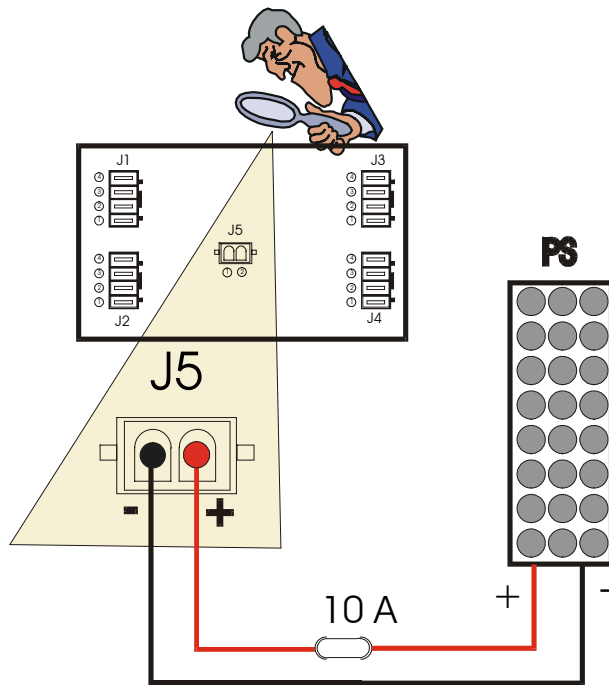


Figure 2 "Installation of a single panel"

It should be noted that a fuse with adequate amperage is inserted in the positive pole cable **near the power supply unit**.

How should the fuse breaking capacity be selected?

Clearly the fuse must be chosen according to the normal running current and the section of the connection cables used.

Example:

For a generic 100 W panel, the maximum current (Short Circuit Current) indicated by the manufacturer is approximately:

$$\text{Short Circuit Current} = 7 \text{ A}$$

Using cables with a section of 4mm^2 and considering that an extremely rough estimation of the maximum current density is about $5 \text{ Ampere}/\text{mm}^2$, for safety's sake a maximum current in the conductors must be 20 A.

Consequently, the Breaking Capacity (BC) of the fuse must meet the following conditions:

$$\begin{aligned} 1^{\text{st}} &\rightarrow \text{BC} \geq 7 \text{ A} \\ 2^{\text{nd}} &\rightarrow \text{BC} \leq 20 \text{ A} \end{aligned}$$

In this case a 10 or 15 Ampere fuse can be used.

Case 2 : Installation of two panels

Once again, taking into account that the maximum power supplied by the sum of solar panels mounted must be under 100 W, you can nonetheless add more than one panel, for example two 50 W panels.

The connection is similar to the previous one with the only difference being that two diodes are needed, one for each panel, to prevent a panel from discharging part of its power onto the other panel in cases of non-homogeneous insulation or non-identical yield of the panels.

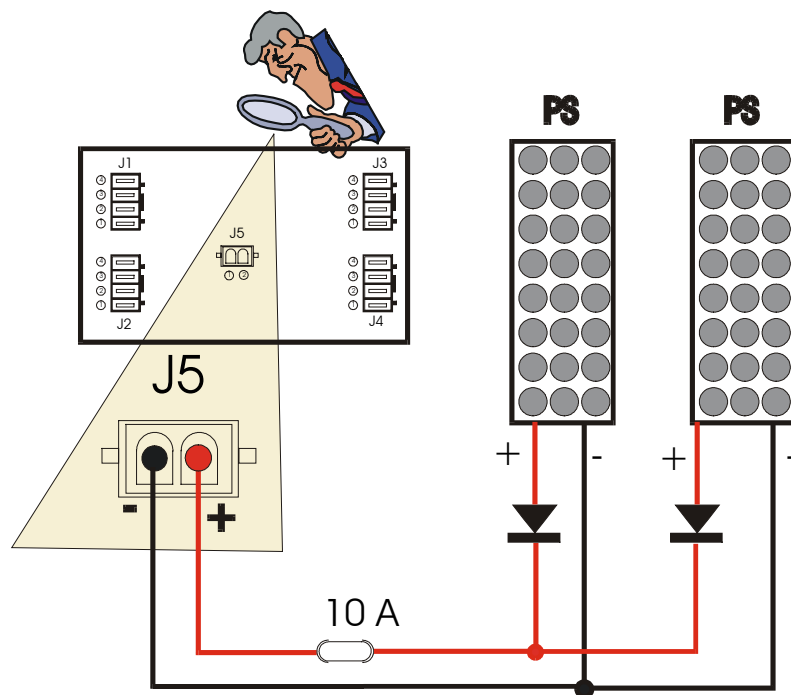


Figure 3 "Installation of double panel"

The diodes you use must be of a type that supports a maximum voltage of 20 V and a current of 3 A.

A suitable model might be the diode **1N5401** shown in Figure 4 or an equivalent model.



Figure 4 "Diode 1N5401"