

SOLAR CINEMA

TECHNICAL DETAILS SOLAR EQUIPMENT

As explained in our video every Solar Cinema is custom made and it all depends on your specific wishes, budget and equipment. This guide is only a reference. Do always get in touch with a certified electrical engineer that can help you design and develop your solar system.

A few key thoughts before designing your Solar Cinema: Calculation is key!

In all parts of designing the solar cinema, take in account:

- > The maximum payload capacity of the vehicle you want to convert. (weight of the solar system + equipment + people).
- > Size of the roof of the vehicle and size of the solar panels.
- > Total power consumption of your audiovisual equipment when in use.
- > Total of screening hours you plan to do per week. (take in account weather circumstances! Less sun is less power. In wintertime battery capacity goes down.)
- > Actual battery capacity: calculate with a maximum of 75% of the specified capacity.

Solar System

3 x 170wp solar panels on the roof > total = 510wp
BMV-700 Battery Monitor Victron

Charger controller

Converter/ Inverter Victron Multiplus Phoenix 12volt / 1600 watt
--> a max. of 1600 watt can be used at the same time.

Battery Pack

4 x 170ah x 12v AGM Deep Cycle batteries in parallel connection

NOTE: do choose a battery type that is suitable for being used in autonomous mobile systems. Do not use so called 'wet' batteries. They are not suitable for transport.

Example calculation of the battery capacity:

$170 \times 4 \times 12 \text{ V} = 8160 \text{ watts}$ > of which 75% is usable > $0,75 \times 8160 = 6120$

6120 watts : 1018 watts (1 hour power consumption + blower)= 6 > this means you have about 6 hours of energy in the batteries.

The above technical details come from the Dutch Solar Cinema which was the blueprint of many other. But you can adapt your system due to the circumstances or budget you have.

Other variations of the system are for example:

- > **Solar Cinema Adria** (Croatia). They have a bigger capacity, weight and costs. Which ables them to do bigger shows and more screenings in a row.
- > **Solar Cinema Western Sahara**. They have a smaller and lighter system and use a Landrover in stead of a van.

Solar Cinema Adria:

6 x 12V 200ah AGM Batteries
3 x 280 wp solar panels
MPPT battery controller (victron)
BMV - Battery Monitor
Convertor/ Inverter > 12V / 3000 Phoenix Multiplus Victron
Extra battery protect and fuses
Extra electric charger from the car engine: Cyrix

Solar Cinema Western Sahara:

2 x 280 WP LG solar panels on roof
4 x 220 ah 12V AGM Victron batteries (connected in parralell)
1 x Victron phoenix compact multiplus 1200/ 50/12 (converter/inverter)
1 x Victron Solar Charger mppt 100 | 30
1 x Victron BMV 600 battery monitor
1 x main safety switch

Some important general issues to take into account:

To keep your system running smoothly, do regular check ups, keep your solar panel clean, do 'live' tests: keep your equipment running for a few hours and keep a log of your battery capacity during this time.

After this check give your batterypack a boost every 2-3 months by plugging the convertor into the main electricity. Make sure to fully charge the batteries for a few hours. Always follow up the maintenance instructions of your local technical engineer.

Weather

In normal weather conditions your batteries will charge up the usage of one screening in about 8 hours. But be aware charging is slow when the sun is low or the weather is cloudy.

If you are operating in a hot environment. Only put your vehicle in the sun in the morning and late afternoon > due to the heat during the day it can get too hot in the vehicle, which might damage your equipment. It is advisable to move your vehicle inside or in the shade during the afternoon sun.

All equipment has a 'heat' warning > above 40 degrees celsius technical failures might appear > charging capacity of solar panels and batteries goes down in high temperatures.

If you plan to do many screenings per week, do check if your battery capacity can increase. But when increasing your battery capacity do keep in mind the total Weight of your system.

Weight is another very important part in the development of your solar system. You can never exceed the max. load capacity of your vehicle. Do calculate all the weight of the equipment all together including the weight of the personnel carried in your vehicle.

System only to used for audiovisual equipment – max. 1600 Watt at once > if more capacity is connected the red alarmlight on the Multiplus will flash.

Maximum screening in a row: 2 days after eachother. Leave enough 'solar charging days' between screenings.

More specific details on:

Manual Solar Charger: Phoenix Compact Multiplus 1200/ 50/12

<https://www.victronenergy.com/upload/documents/Manual-ML-PhoenixMultiCompact.pdf>

Switch on the Multiplus only (ON = green light) only when using electricity

In all other circumstances put Multiplus on OFF or Charge Only

The Multiplus can be used as a charger with additional electricity than the solar panels: for example energy from the grid or from a generator

--> Switch to 'Charge only' and plug the black electricity cable into the wall or generator > When charging the orange light (Charge Only) should go on.

When the battery power is too low or too much equipment is plugged in the converter will go on ALARM > Red flashing light.

If the battery is too low > no solar charging can take place > you have to attach the Multiplus to 'Charge from the grid or generator to give the batteries a boost.

Manual Battery Monitor BMV 600

The battery Monitor tells what the current battery capacity is. Be aware this monitor is not always precise due to external influences. The battery level should preferably not go below 11V (alarm will go on at 10.5V > readable on setting V).

We suggest to make a 'live' test > using the audiovisual equipment for 1 hour and write down all settings of the BMV > you can see how much 'power' 1 hour of screening will consume checking both SOC and V levels. And continue this for a few hours. Do this test at the start of using the Solar Cinema and repeat every 1 month or 2 months to detect differences in battery capacity levels. Always avoid going below 50% on the SOC. We suggest to find a local engineer to check the BMV 600 settings