SOLAR COOL'S SOLAR PV MODULES POWERED INVERTER TECHNOLOGY FOR AIR CONDITIONERS

1.0 PRINCIPLE OF OPERATION

Based on PV generation principle, the solar inverter module in the air conditioner changes solar energy into electric energy, that is then supplied to the air conditioner to replace part of commercial power. This new inverter technology incorporates a proprietary power sharing circuitry that optimizes usage of the available solar power and only then draws the remaining required operational power from the commercial power source thereby reducing the air conditioner's power consumption from the commercial source. This results in energy cost savings in your monthly electricity bills, and an advantage over the conventional air conditioners. Flow chart Figure 1 outlining the principle of operation is provided below.

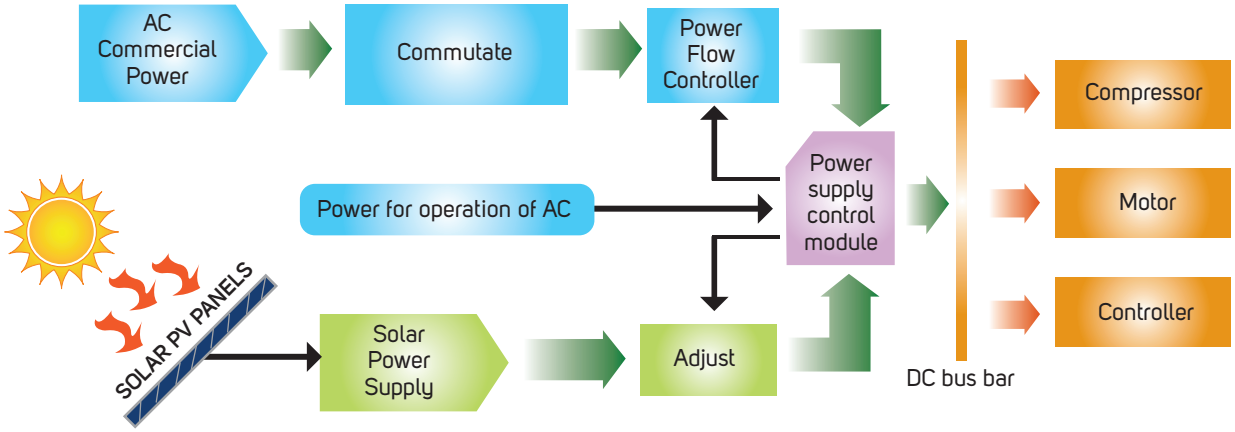

Figure 1: Outline Of Operation Principle Of Solar Powered Inverter Air Conditioner

Compared with general inverter type air conditioners, SOLAR COOL's solar powered inverter air conditioner has a proprietary Power Supply Control Module (PSCM) which automatically adjusts the power supply of solar energy and commercial power to achieve the needed input power. The solar energy will be the primary power source and the commercial power as a secondary source. When the power requirement for operation of air conditioner is less than or equal to the actual output power produced by solar panels, the proprietary PSCM in the air conditioner will automatically cut off input of commercial power and completely rely on solar power. When the power required for operation of the air conditioner is higher than the actual output power produced by solar panels, PSCM in the air conditioner will supplement the shortfall by drawing the remaining power from the commercial power source. Figure 2 below shows the operation principle of SOLAR COOL's proprietary Power Supply Control Module.

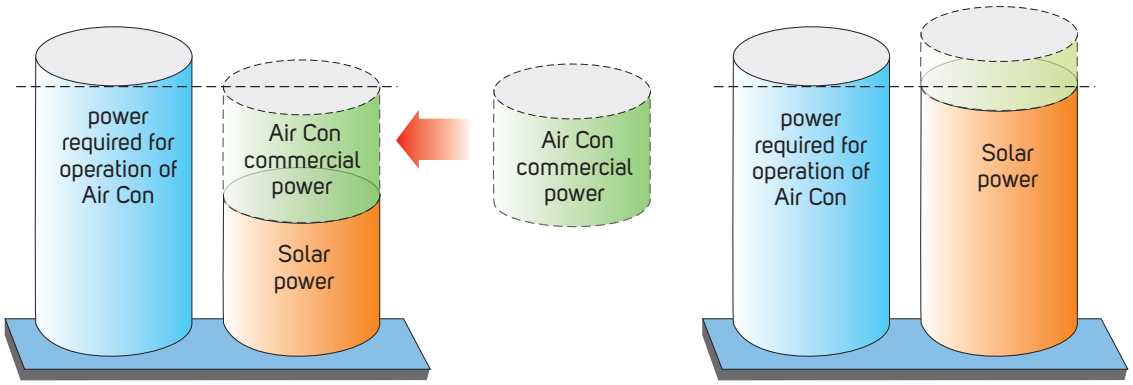

Figure 2: Function Schematic Plan Of How The Power Supply Control Module Automatically Adjust The 2 Power Inputs To Operate The Air Conditioner Unit

2.0 PRODUCT FEATURES

2.1 The proprietary circuitry in the Power Supply Control Module enables an excellent integration that is close to perfection between the PV generation technology and the inverter air conditioner technology.

PV generation technology is an energy conversion technology that transforms luminous energy into electric energy. Widely applied in fields such as lighting and micro-electronics, it can supply cheap and green electric energy for electric appliances. PV generation technology however has its limitations because the energy conversion efficiency is very low and the output is direct current. Hence power generated is insufficient to meet demands of large electric equipment like air conditioners. The limitation for application of the PV generation technology necessitated the coupling of the solar generated power supply with the commercial power supply. The inverter in the PSCM will convert (commutate) the alternating current (AC) input into direct current (DC) and inversely convert (invert) the solar power direct current into alternating current. The PSCM enables the direct current produced by PV generation technology to be merged into the output current during this process. This integration technology of coupling the two different power supply sources eliminates the need for an independent inversion unit to convert the DC solar power into AC power.

The key feature in this very advance control technology is the proprietary Inverter Engine that allows the compressor to operate at very low frequencies. When triggered to operate at very low frequencies, the actual operating power can be reduced to as low as between 100 to 200 watts. Under these conditions, the air conditioner unit can be completely powered by solar energy thereby enabling a 100% energy savings.
Figure 3 below shows comparisons between Solar Cool's and Regular air conditioners' methods of utilization of solar power.

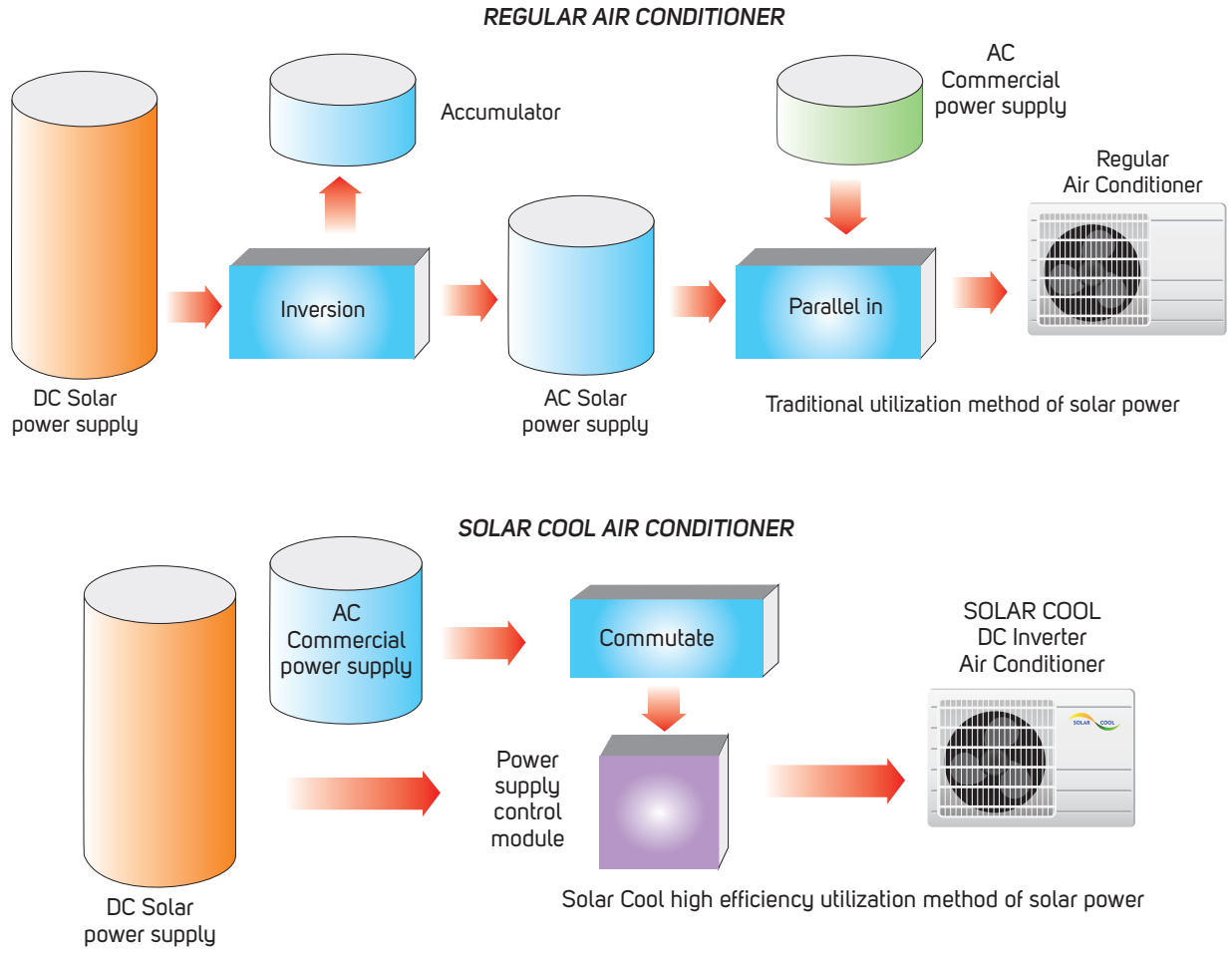

Figure 3 : Comparisons between Conventional and Solar Cool's utilization of solar power

Considerable efforts were expanded to make the Power Supply Control Module compatible with solar PV panels that were designed with different capacity limitations. This provision allows the end user to connect multiple solar panels with different generating capacities to operate the air conditioner. The larger the generating capacity (within the specified design limits) the greater the energy savings that can be achieved. The end user also has the option and flexibility to utilize available solar panels with different limits and or specifications to meet his needs. This product design is compatible for use with solar panels with output ranging from 22VDC to a maximum of 165VDC and current capacity of at least 9 amperes but not exceeding 11 amperes. Installation has been made easy by allowing the power cables from the solar panels to be directly connected to the corresponding terminals in the outdoor unit. Installation of the unit is the same as any regular split air conditioner as shown in Figure 4. This product has obtained both the ETL Safety Certificate and the E-Star Energy Certificate.

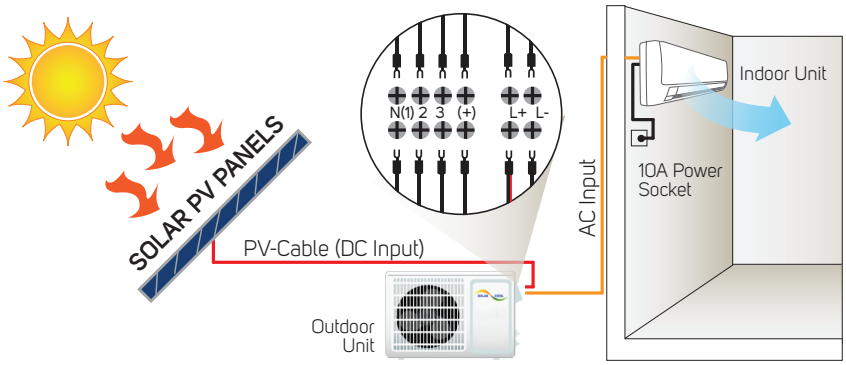

Figure 4 : Typical installation of split air conditioners

3.0 SPECIFICATION AND INSTALLATION INSTRUCTION FOR SOLAR PANEL

Solar panels required to power this product must be connected in series as shown in Figure 5. When the solar panels are connected in series, the total open circuit voltage of the solar panels is equal to the sum of all solar panels while the total short-circuit current is equal to the short-circuit current of each solar panel.

Utotal = U1+U2+.....+Un
Itotal = I1=I2=.....In

Take a 200W solar panel as an example. Under rated illumination conditions*, the open-circuit voltage of a piece of solar panel is 33VDC and short-circuit current is 9A. When the 5 solar panels are connected in series, the total open-circuit voltage will be 33 x 5 = 165VDC.

DEFINITIONS:

Open-circuit voltage: The voltage between the positive and negative electrodes, when the solar panel is not connected to any load.

Short-circuit current: The current flow generated when the solar panel's positive and negative electrodes are directly connected without any load.

Operating voltage: The voltage between the positive and negative electrodes when the solar panel is connected to a load.

Operating current: the current flow generated when the solar panel is connected to a load and the amount of current generated is determined by the intensity of illumination. The bigger the intensity of the illumination, the higher the current flow rate will be, but the value is smaller than the short-circuit current flow rate.

3.1 Solar panel specification required for this product is as follows:

The short-circuit voltage range of the solar panel must be within 22V-165VDC and the short-circuit current should NOT be higher than 11A. Take a 200W solar panel as an example: the open-circuit voltage of one piece of solar panel is 33VDC while short-circuit current is 8.3A. Therefore, up to 5 pieces of 200W solar panels can be combined to supply power for this product, but they must be connected in series.

3.2 When open-circuit voltage of the solar panel is lower than 22VDC, the circuit of the power supply control module will not work. When that voltage is higher than 165VDC, the power supply control module may be damaged.

Note: * the data in the above table is measured under rated illumination conditions: Solar radiation intensity reaches 1000W/m2; solar subassembly temperature of 25degC; AM=1.5 (Air Mass Coefficient of 1.5)

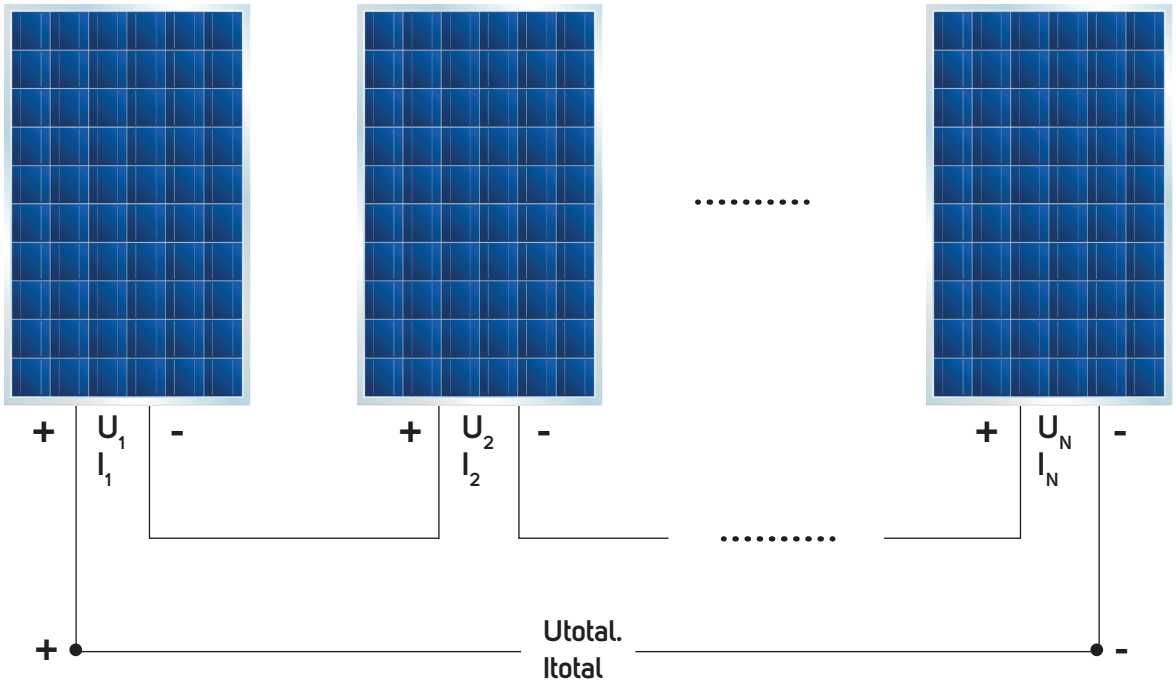

Figure 5 : Solar Panels connected in series to increase output voltage