Solar Charger Systems and Subsystems report
Introductory paragraph

The Solar Panels use light (Photons) from the sun as input, they then convert it into an electrical charge and outputs it into the battery. The charge controller takes the output from the solar panel as input and monitors the input to see if it is too large. If it is it will stop any output into the battery, but if the input is within acceptable limits then the charge controller will out but the electricity into the battery and charge it.

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What subsystems make up or are a part of a technological system(s)

The solar charger is made up of *three main* systems. There is the Solar Module, the charge controller and finally the battery. Each system is made up of multiple subsystems. The Solar Module job is to actually generate electricity through photovoltaics and p-type to n-type junctions.
The charge controller's job is to limit the amount of electricity that is either being taken from/given to the battery. The batteries function is to then collect the electricity and either offload it into a DC load or into an inverter and then an AC load. The charge controller interacts and gives feedback to the solar module or battery. The charge controller checks the power level of the battery and then if it is too high sends feedback to the battery to shut down input to the battery and stop further overfilling, the battery will remained locked until feedback comes to the solar charger telling it that the battery requires more power and the solar charger will re-enable electrical input from the solar module.

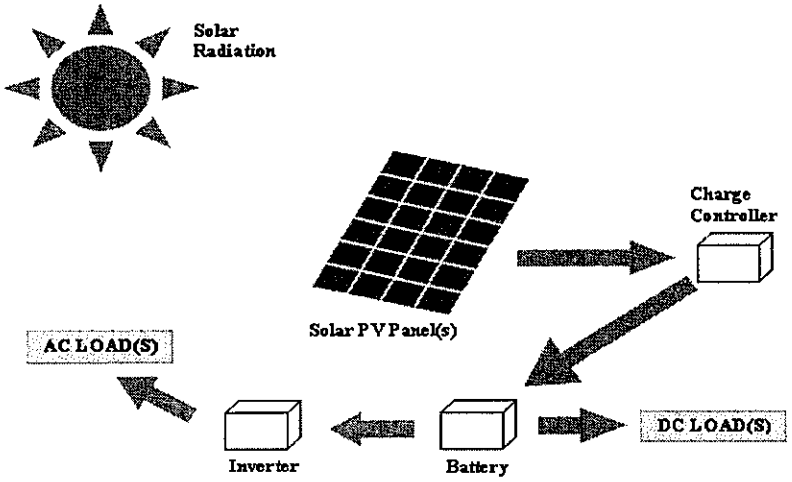
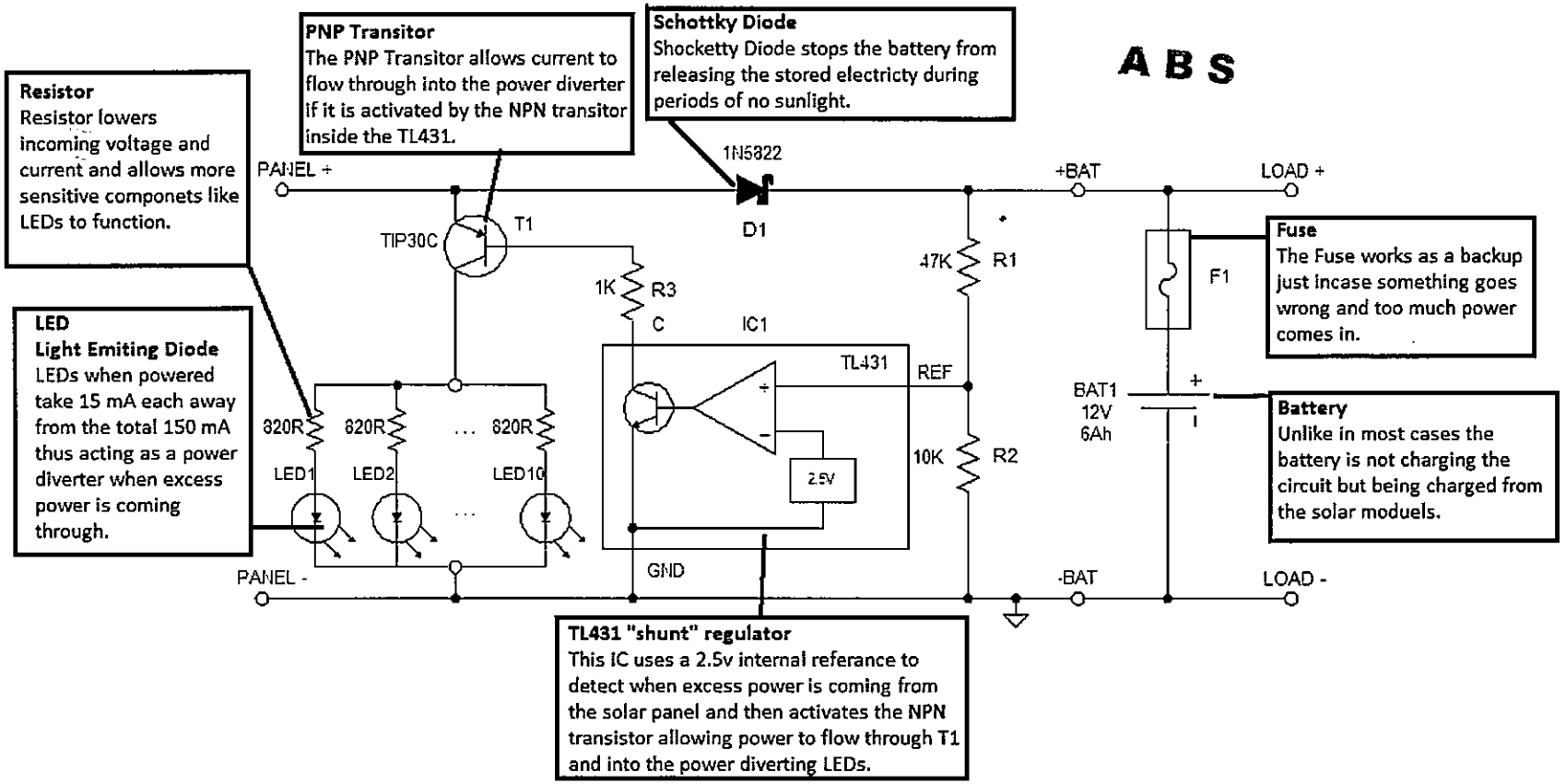


Diagram shows process of electricity through a solar charger and interaction between systems.

Each system contains many subsystems that work together in order for the system to work as a whole and interact properly to allow the system to function. The systems converts a received input through a process into an output for another system or subsystem.

The circuit diagram below shows description of the subsystems and their components



The roles of the subsystems in the technological system
How the subsystems work together

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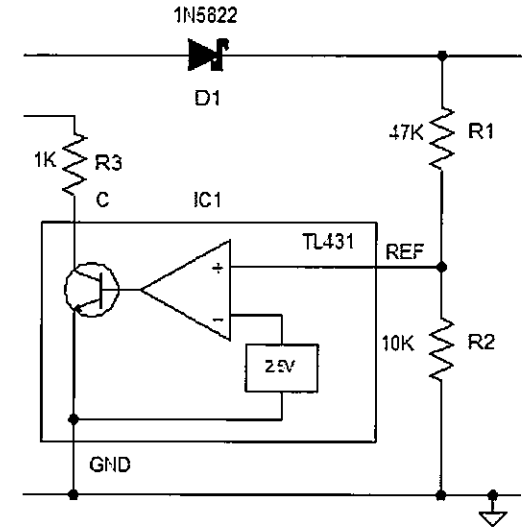
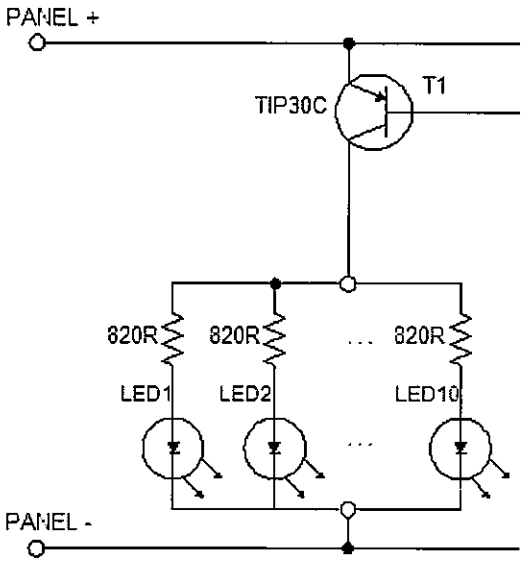
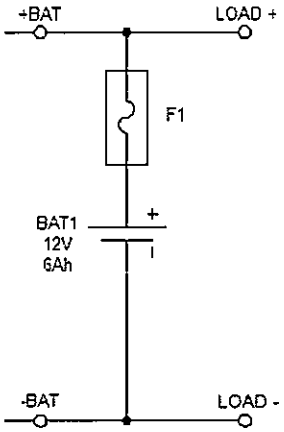


This part of the charge controller is dedicated to detecting when input from the solar modules is too large. The integrated circuit (IC1) works as a comparator between the internal 2.5v reference and the reduced voltage that has just come through the the voltage divider adjacent the IC. If this input is too high it will activate the NPN transistor located inside the IC. The NPN transistor will then allow current to flow through it and thus interacting with the PNP Transistor located in another subsystem. Overall this subsystem works to measure excess input from the solar module and then interacts with another subsystem in order to reduce incoming input from the solar modules.



The circuit inside the charge controller works as a current redirector. When the PNP transistor has been turned on from the previous subsystem it will then allow input coming from the solar modules a shortcut through the circuit. Through this circuit is a parallel set of 10 LEDs and resistors. The resistors reduce voltage allowing the LEDs to function without breaking and the LEDs work as energy diverters, converting excess energy into light. Each set takes away 15mA from the overall 150mA. As there are 10 LEDs that means that this circuit when activated will take all amperage (10 x 15 = 150mA) from the circuit and stop input from the solar modules from overfilling the battery.



Circuit 3 is simply the battery. The battery is connected through the fuse into solar modules. So input from the solar modules will come through and into the battery (Assuming that circuit 2 is not active) and charge it. A fuse is present incase something goes wrong in other subsystems and excess power starts overfilling the battery. This subsystem is also connected to other systems allowing it to output into other systems and further the function.

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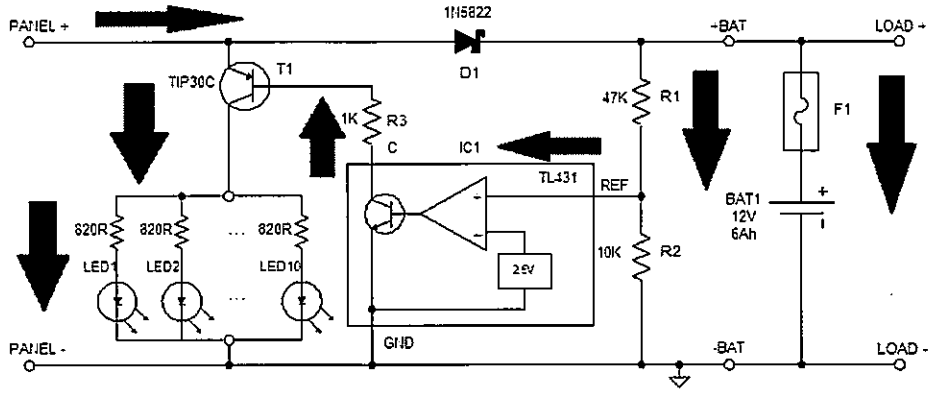
How control and feedback allow subsystems to function in technological system(s)



Inside of the system there is not a massive amount of back and forth input and output but there is a simple path. As input goes along from the solar modules it continues into the integrated circuit, this circuit then will either do nothing if the incoming power isn't in excess or it will send feedback through opening electrical pathways and attempt to get rid of the excess power by sending it down through a new pathway that will absorb all of its power through LEDs until the battery is low enough that it needs more power.

Diagram indicating the direction of inputs and outputs through the system.

The advantages and disadvantages of this subsystems compared with other types of subsystems.

The subsystems of this charge controller have advantage of being very easy to make. The components required are not difficult to find and integrated circuits such as the TL413 can be found inside old computers. With all of the components being easy to acquire this makes this model of charge controller attractive to companies that wish to mass produce cheap solar chargers or for individuals who wish to build solar chargers at home for personal use and do not have resources and time to gather copious amounts of high end equipment.

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Though because it is at more simple system that leaves it with disadvantages. One being that it is designed for small solar module use and could probably not function as well if larger solar modules were to be used. Another is that its method of current redirection into LEDs is not very efficient as it could be done through properly configured resistors at a much larger efficiency. A large disadvantage is because of the large chain of resistors and LEDs. Because of the large amount of components in chain it greatly increases the chance that a component will fail and that this could break the system.

This system is good for individuals who need a simple solar charge controller or does not have time or resources to create an efficient high end one. Though the system would not function well in other situations leaving it limited to a singular purpose/job where as others with resources/time can create a much more efficient high end solar charger system that could be used in multiple ways and configuration of systems.