

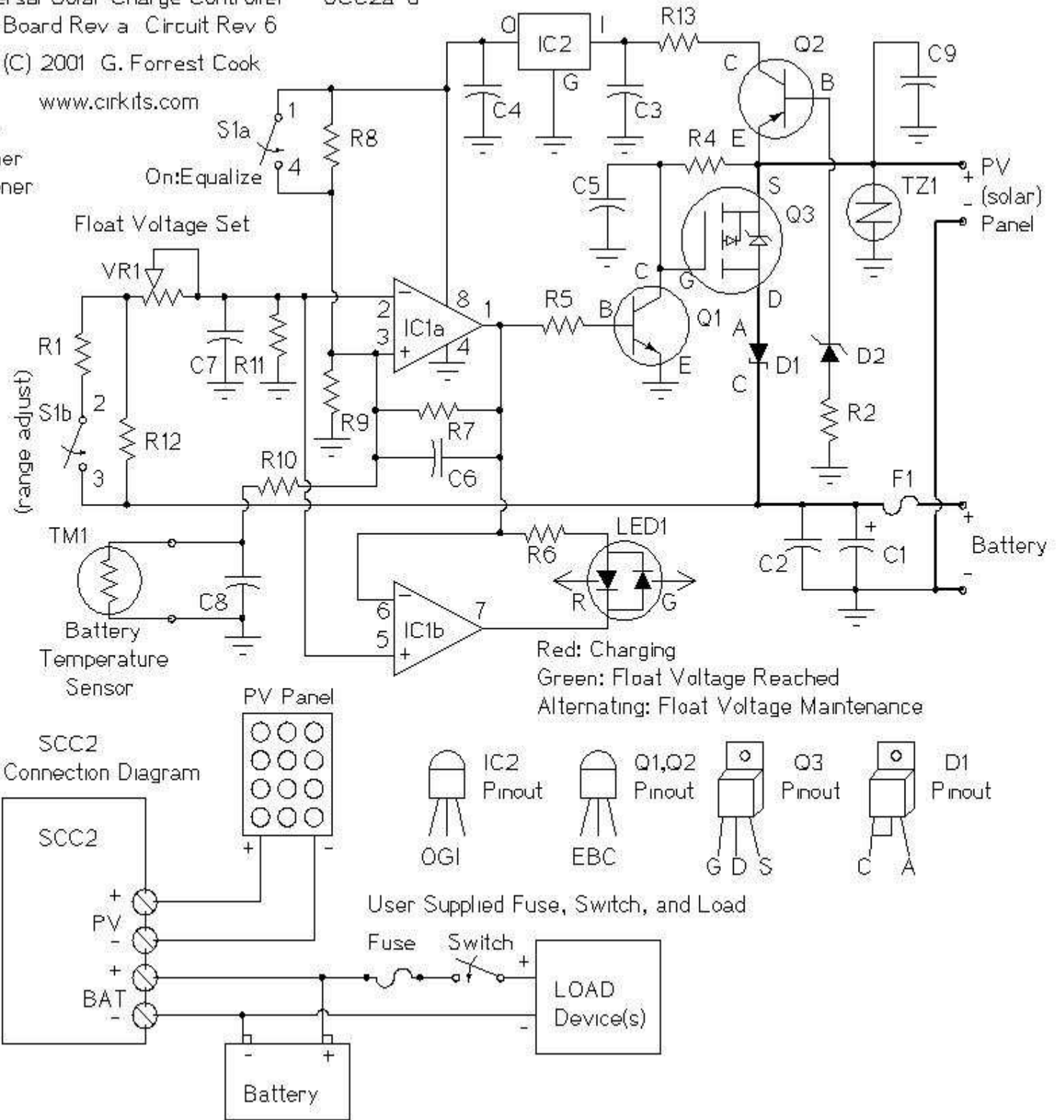
SCC2 10 Amp Solar Charge Controller

This design has been replaced by the newer 20 Amp SCC3 design.
Buy the [SCC3 kit](#) (circuit board and parts) and see the [SCC3 schematic](#).

PARTS LIST

- IC1 TLC2272CP
- IC2 78L05
- (6V,12V) D1 19TQ015
- (24V) D1 18TQ045
- (6V) D2 1N5231 5V 500mw zener
- (12V) D2 1N5242 12V 500mw zener
- (24V) D2 1N5252 24V 500mw zener
- Q1 2N3904
- Q2 2N3906
- Q3 IRF9Z34N
- LED1 Red/Green bicolor
- C1 47uF,50V
- C2-C4,C7-C9 0.1uF
- C5,C6 0.01uF
- (6V,12V) TZ1 27V Transzorb
- (24V) TZ1 47V Transzorb
- (6V) TM1 2.2K@25c NTC therm
- (12V) TM1 3.3K@25c NTC therm
- (24V) TM1 4.7K@25c NTC therm
- all resistors 1/4w
- R1 (omit)
- (6V) R2 1K
- (12V) R2 2.2K
- (24V) R2 3.9K
- R4 10K
- R3 (omit)
- R5,R8 100K
- R6 750
- R11 75K
- R10 180K
- R9 200K
- (6V) R12 100K
- (12V) R12 300K
- (24V) R12 470K
- R7 4.7M
- R13 100
- (6V,12V) VR1 100K 10t
- (24V) VR1 500K 10t
- F1 10 Amp Fuse
- S1 2 position DIP switch

Universal Solar Charge Controller SCC2a-6
Board Rev a Circuit Rev 6
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SCC2 10 Amp Solar Charge Controller

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Introduction

The SCC2 is a solar charge controller, its function is to regulate the power flowing from a photovoltaic panel into a rechargeable battery. It features easy setup with one potentiometer for the float voltage adjustment, an equalize function for periodic overcharging, and automatic temperature compensation for better charging over a range of temperatures.

The goal of the circuit design was to make a charge controller with analog simplicity, high efficiency, and reliability. A medium power solar system can be built with a 12V solar panel up to 10 amps, the SCC2, and a rechargeable battery. The SCC2 works with lead acid, NiCD and NiMH batteries with ratings from less than one to several hundred amp-hours. With the appropriate parts selection, the SCC2 can be operated at 6V, 12V, 24V or other voltages.

Specifications

- Maximum solar panel current: 10 Amps
- Night time battery drain current: approximately 1ma
- Nominal battery voltage: 6V, 12V or 24V.

See the full SCC2 [specifications](#) for more information.

Theory

The SCC2 acts as a medium power DC current switch between the + terminals of the PV and battery. Diode D1 prevents reverse night time current flow from the battery back to the PV panel.

When the PV voltage is high enough to charge the battery, zener diode D2 conducts and turns on transistor Q2. Q2 switches the power for the rest of the circuit on. The circuit is switched off at night. IC2 provides a 5 volt regulated voltage to power the comparator circuits, it also provides a reference voltage for comparator IC1a.

When the battery voltage is below the desired full voltage and needs charging, comparator IC1a turns on and activates Q1 and Q3, this allows the solar charging current to flow into the battery. Note that Q3 is a P-channel mosfet, this allows the circuit to be wired with a common ground for the solar panel and battery. The solar current loop is drawn in heavy lines on the schematic.

When the battery reaches the full charge point, IC1a operates as a comparator based schmidt trigger oscillator, it switches the solar current off and on. The switching causes the battery voltage to oscillate a few tens of millivolts above and below the desired set point. A rail-to-rail op-amp is required for proper operation, 741 style op-amps will not work in this circuit.

The red/green charging/full LED is driven between the output of IC1a and IC1b. IC1b has an inverted version of the IC1a signal. Pin 5 of IC1b only needs an approximate center point to work as an on-off comparator, it is connected to the varying IC1a pin 2 so that it does not require another reference divider circuit.

The resistors and thermistor on the input side of IC1a form a resistive bridge circuit that is used to compare the battery voltage to a reference voltage coming from IC2/R8/R9. The potentiometer adjusts the voltage point around which the circuit will oscillate on full charge. Resistor R7 adds positive feedback to IC1a for a schmidt trigger characteristic. The thermistor provides thermal compensation, as the temperature goes down, the full voltage goes up.

The equalize switch, S1a, forces the circuit on for intentional overcharging. Switch S1b and R1 can be used to select a different float voltage range, you can experiment with this by using different values of R1, typically R1 should be greater than 1M.

alignment

[]Start with a charged battery, connect the solar panel directly to the battery until the battery voltage is at or above the desired full setting, this also that the panel is capable of charging the battery.
[]While measuring the battery voltage, adjust VR1 clockwise to align the float voltage set point. If the LED turns red before it reaches the desired float voltage, the battery will need to charge for a while.
[]When the battery is fully charged, it should be at the float voltage and the led should show alternating colors.
[]The float voltage should be set when the board and battery are at room temperature. Typical 12V set points are 13.8V for a gell cell and 14.5V for a wet cell. For 6V, divide those by two, for 24V, multiply by 2. Follow your battery manufacturer's recommendations for the best settings.
[]Readjust the float voltage after the battery has reached a full charge.
[]The float voltage should be set when the circuit is at room temperature.

Use

Connect the solar panel to the SCC2 solar panel input connectors, connect the battery to the SCC2 output connectors. Put the solar panel in the sun, and watch the battery charge up. Systems where the battery is frequently discharged way down should occasionally be run in equalize mode for a few hours or a full day. It is best to monitor the battery voltage during this operation, disable equalization if the battery voltage goes above 16V (12V version).

Solar Charge Controller Kits For Sale

The SCC2 kit has sold out, it has been replaced by the higher current [SCC3](#) kit.

