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in One Electronic Project Lab Manual The in One Electronic Project Lab comes with a large manual that is as big as the box. It has some lovely illustrations and circuit diagrams and their explanations are in clear English.

This project provides v AC but the current it limited to 60mA if a 15 watt transformer is used. Although the output can produce a nasty shock and the voltage will kill you, the circuit provides isolation from the mains and if a short-circuit occurs, it will not blow a fuse, but the transformers will get very hot as start to buzz. You can use any two identical transformers and the wattage of either transformer will determine the maximum output wattage. This arrangement is not perfectly safe, but is the best you can get when working on projects such as switch-mode power supplies, capacitor-fed down-lights etc. Connect a 4R7 yellow-purple-gold-gold resistor across the terminals of a clock mechanism and fit a fully charged rechargeable cell. Now fit another cell and see how long it lasts. You cannot work out the exact capacity of a cell but you can compare one cell with another. Lots of cells are FAKE. Just like the UltraFire cell below. You cannot get 6amp-hr capacity into 30gms!! But what is the capacity of the cell? Our cell had less than 0. Use this tester to find out: The resistors and diodes are simply easy-to-get components that make up a load to discharge the cell at about mA. This is a load of about 2. The voltage of the cell drops from 4v to 2v and the current drops too. You can measure the voltage across the resistors and work out the current-flow. The buzzer starts to buzz when the voltage drops to 2v. You will need to adjust the value of the biasing resistors to reproduce this value if you are using a different transistor as the detection voltage can change by as much as mV with different makes of BC Our cell lasted less than 2 hours and was obviously FAKE. If you charge a cell from a variable power supply and do not monitor the terminal voltage of the cell, it will rise to over 5. The circuit does not have a current-limiting resistor because the base resistor is very high and the current through the transistor is only 2mA. Many solar panels produce 16v - 18v when lightly loaded, while other 12v solar panels will not charge a 12v battery. Some panels say "nominal voltage," some do not give any value other than 6v or 12v, and some specify the wrong voltage. You need to know accurate details to charge a battery from a solar panel. There are 3 things you have to know before buying a panel or connecting a panel to a battery. The voltage of the panel when delivering the rated current. The Unloaded Voltage is the voltage produced by the panel when it is lightly loaded. This voltage is very important because a 12v battery will produce a "floating voltage" of about 15v when it is fully charged and it will gradually rise to this voltage during the charging period. This means the panel must be able to deliver more than 15v so it will charge a 12v battery. Sometimes there is a diode and a charging circuit between the panel and battery and these devices will drop a small voltage, so the panel must produce a voltage high enough to allow for them. The Unloaded Voltage can sometimes be determined by counting the number of cells on the panel as each cell will produce 0. If you cannot see the individual cells, use a multimeter to read the voltage under good illumination and watch the voltage rise. You can place a ohm resistor across the panel to take readings. Take readings of your own. The Rated Voltage and current is produced when the panel receives bright sunlight. This may occur for only a very small portion of the day. You can clearly see the 11 cells of this panel and it produces 6. This panel claims to be 18v, but it clearly only produces This is not suitable for charging a 12v battery. When you add a protection diode, the output voltage will be A flat battery being charged will reach This is a genuine 18v panel: The panel needs to produce 17v to 18v so it will have a small "overhead" voltage when the battery reaches The Rated Current is the maximum current the panel will produce when receiving full sunlight. The current of a panel can be worked out by knowing the wattage and dividing by the unloaded voltage. The voltage of the panel does not matter and the voltage of the battery does not matter. The output voltage of the panel will simply adapt to the voltage of the battery. Even though there is a voltage mismatch, there is NO "lost" or wasted energy. An 18v panel "drives into" a 12v battery with the maximum current it can produce when the intensity of the sun is a maximum. To prevent overcharging the battery, the wattage of the panel is important. To prevent overcharging a battery, the charging current should not be more than one-tenth its amp-hr capacity. For instance, a 2,mAhr set of cells should not be charged at a rate higher than mA for 14 hours. This is called its hour rate. This will deliver the

energy to fully charge the cells. This diode drops 0. If the diode is Schottky, the voltage-drop is 0. Here is the simplest and cheapest regulator to charge a 12v battery. Full details of how the circuit works and setting up the circuit is HERE. The diagram only shows a 24 cell panel - it should be 28 cells. The only other thing you have to consider is the wattage of the panel. For instance, a 12v 1. An 6watt panel 16v to 18v will deliver 18watt-hours in bright sunlight in 3 hours. The battery will be fully charged in 3 hours. The pot is adjusted so the relay drops-out at Connect a 22R 0. The resistor will get very hot if mA or more is flowing. To get some idea of 0. This is mW of heat and is your reference. This circuit can be used when charging a battery from your car, from a solar panel, a battery charger or a pulsed solar-charging circuit. If the current is higher than mA, the resistor will hot and start to smell. Turn the LOW voltage cutout trim pot to mid way and connect the Turn the HIGH voltage trim pot to the high end and the relay will turn off. Now turn the 1. It will measure resistance values normally used to test resistors - you can also test other components and Voltage and Current. We use the resistance settings. It will be the top scale. The scale starts at zero on the right and the high values are on the left. This is opposite to all the other scales. When the needle swings to "1" on the "x" setting, the value is ohms. Use this to work out all the other values on the scale. Resistance values get very close-together and very inaccurate at the high end of the scale. Keep trying a transistor in all different combinations until you get one of the circuits below. When you push on the two leads, the LED will get brighter. The leads of some transistors will need to be bent so the pins are in the same positions as shown in the diagrams. This helps you see how the transistor is being turned on. The circuit is set to test NPN types. The transformer in the photo is a 10mH choke with turns of 0. The two original pins with the red and black leads go to the primary winding and the fine wires are called the Sec. Connect the transformer either way in the circuit and if it does not work, reverse either the primary or secondary but not both. Almost any transformer will work and any speaker will be suitable. If you use the speaker transformer described in the Home Made Speaker Transformer article, use one-side of the primary. This is basically a high gain amplifier with feedback that causes the LED to flash at a rate determined by the 10u and k resistor. Remove one of the transistors and insert the unknown transistor. To turn the unit off, remove one of the transistors. And it also tests LEDs. See the full project: Transistor Tester This circuit is basically a Joule Thief design with the coil actually a transformer increasing the 1. The two "coils" are wound on a 10mm dia pen with 0.

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