

SmartBank Automotive owners/installation manual

1 - DESCRIPTION

SB-Automotive (SB-Auto) is an auto-battery combine controller that monitors two battery banks and by making accurate measurements decides when to parallel them to allow simultaneous charging and when to separate them to prevent cross-discharging.

Unlike conventional split charge systems using diodes or relays SB-Auto is not affected by where the charge is coming from, nor does it have to be separately controlled by alternator signals, manual switches etc. There is nothing for you to forget. Neither does it suffer from the voltage drop problems of split charge diodes.

SB-Auto automatically controls charging of 2 battery banks no matter which battery bank is being charged. Whether it is the vehicle alternator or AC powered charger SB-Auto will take care of it automatically. You make sure your charge source is connected to one battery bank. SB-Auto will take care of the other one, totally automatically. No more flat engine batteries because you forgot to switch the battery selector over. No more uncharged auxiliary bank.

Not only is SB-Auto more effective than a standard split charge relay or diode set up but it's actually simpler and quicker to install. In most instances 3 wires is all you need!

Should a fault occur in your charge source producing an over voltage situation SB-Auto will disconnect the other battery bank to prevent damage to it.

The remote switch permits manual paralleling of the relay to assist in engine starting should the main engine battery be too deeply discharged to crank the engine sufficiently. The remote switch also incorporates an LED which lights to show correct operation of the unit.

SB-Auto has been designed and built using ultra low power semi-conductors and ultra low power design techniques which results in a standby current that is so low, no ON/OFF switch is required. Therefore you can never forget to switch SB-Auto on because you never need to switch it off. Standby power consumption is less than 400uA (0.0004A)

SB-Auto also uses switch mode technology to control the relay coil and thus keep the power consumption to an absolute minimum whilst in the connected mode (typically using less than half the power of an equivalent standard split charge relay). Not only does this conserve power, but it also increases the operational life of the relay.

A simple 5 wire connection is required between the SB-Auto and the relay and GND.

How SB-Auto works.

SB-Auto continually monitors both battery banks. Should either battery status indicate that a charge source is available it will connect the batteries together via the relay ensuring that both battery banks are charged. This will not happen immediately. There will be a short delay while SB-Auto verifies that the charge source is valid. Once the charge source is removed (or a very heavy load is connected that risks flattening all the batteries in the event that the charge source cannot keep up with the current requirements) it will disconnect the banks ensuring that your house bank loads do not discharge the engine battery. All settings are user adjustable.

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2 - INSTALLATION

WARNING Incorrect wiring of this unit may cause serious damage to the electronic circuit and/or relay that will not be covered by the warranty.

It is recommended that the relay be sited as close to the batteries as possible. Not only does this make the cable installation easier but it also reduces the losses that would otherwise occur with running high battery charge currents through long battery cables.

WARNING The usual precautions regarding relays in proximity to possibly explosive battery gasses should be taken. If in doubt consult a qualified auto electrician.

As all control and indication is by way of the remote switch, the siting of the main control unit can be made purely on a “safety and ease of installation basis”.

WARNING This unit contains sensitive electronic circuitry and the usual precautions should be taken regarding water, dirt and oil ingress etc.

Refer to the diagram for installation guidance

WARNING. Incorrect wiring to any of the terminals may cause serious, irreparable damage to the unit that will not be covered by the warranty.

It is recommended that 1.5mm² cabling be used for the connections to the main terminal block. If any of the connections need to be over 3 metres for any reason then it is recommended that this cable be increased to 2mm². This is purely to increase the accuracy of the voltage measurements.

The cabling from the batteries to the main relay terminals cannot be specified in this manual as it depends upon the installation and cable lengths etc. As a rough guide you should use cable that will have a maximum voltage drop of 0.1 volts at the maximum charge rate in your installation. Obviously this depends upon the cable length. If in doubt consult a qualified auto electrician.

In any event a cable capable of handling the maximum charge capability of the installation **MUST** be used. Your cable supplier will be able to advise you on this point.

The remote switch simply plugs into the RJ11 socket on the PCB.

Failure to adhere to these instructions could result in overheating of the battery cables.

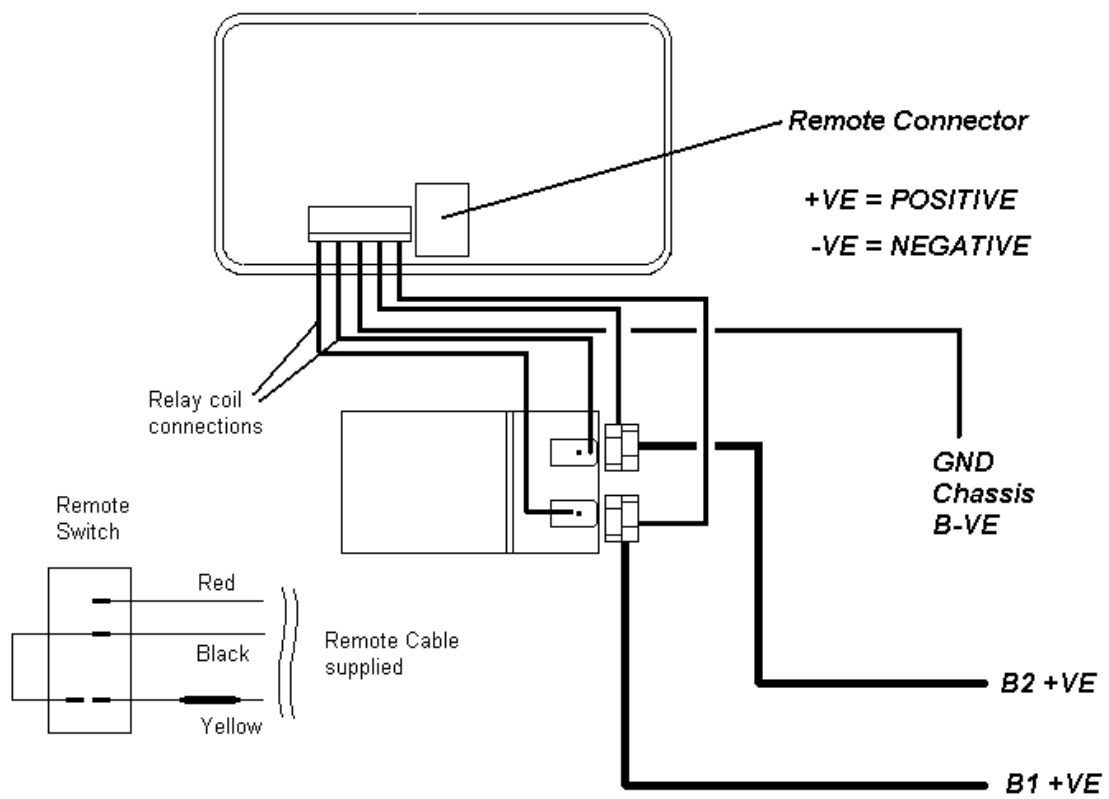
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3 - SB-Auto Installation Diagram

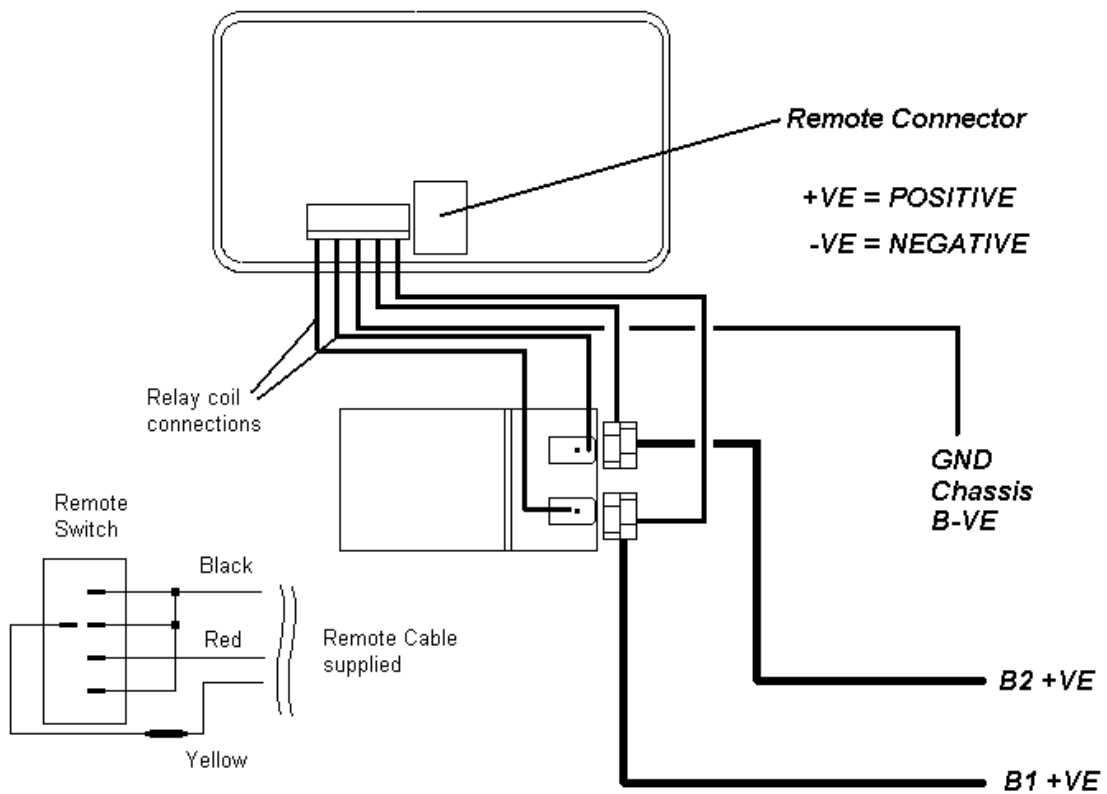
2 different diagrams are shown here to cover both types of remote switches that are available. They are identical apart from the connection at the end of the remote cable on the switch.

Mounting holes are drilled in the back of the main case. These holes have a corresponding clearance on the PCB. Screws with a head diameter up to 8mm may be used with safety. Use of screws larger than this may cause short circuits on the back of the PCB. These holes are countersunk and the correct size countersunk screws should be used.

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Please note that your relay may look different to the one in the diagram.
It will be obvious which contacts are the coil contacts and which are the switched contacts. If you are unsure please contact us or the relay supplier if you supplied your own relay



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4 - SET UP PROCEDURE

SmartBank Automotive is shipped already calibrated according to the installation specified when the unit was ordered. You may however need the set up procedure to make adjustments in the event that the installation, battery or charger types are changed or adjusted.

There are three methods of setting the unit up. Choose whichever of the following suits you, your equipment and expertise best:-

Decide on your voltage set points. If you are unsure of these refer to section 5 for standard set up guidelines. Professional installers may have their own preferred settings depending upon the installation.

STANDARD SET UP

1. Turn VR1 and VR3 fully clockwise. Turn VR2 fully anti-clockwise.
2. Run the batteries down a bit. Switch on a charge source (engine alternator, AC powered charger, wind generator, whatever you normally use) and monitor the battery voltage until you see your desired CONNECT voltage. As soon as you see this voltage adjust VR1 very slowly anti-clockwise until you hear the relay click in - stop turning as soon as you hear it click. If the voltage rises quickly past your desired CONNECT voltage, you will have to discharge the batteries further and repeat the procedure
3. Switch off the charge source and again monitor the battery voltage as it falls. As soon as you see your desired DISCONNECT voltage turn VR2 very slowly clockwise until you hear the relay click out.
4. Leaving both VR1 and VR2 where they are, run the batteries down a touch and start charging again. Monitor the battery voltage as it rises and you should hear the unit connect at your desired CONNECT voltage. Switch off the charge source and watch the voltage fall. You should see the unit disconnect at your desired DISCONNECT voltage. If this does not occur at the correct voltages leave VR1 and VR2 where they are and repeat the above procedure from stage 2 again. It will be closer this time !
5. Set VR3 according to the table in section ##

Set up is complete

ADVANCED SETUP (for professional installers - the quickest method)

NOTE You will need a digital voltmeter with an input impedance of at least 10M ohms (fluke 7 and 8 series etc). Use of a lower input impedance meter will result in a wildly inaccurate set up.

It is not necessary to rely on any particular voltage of the batteries to carry out this set up procedure.

1. Measuring the voltage between the GND terminal and TP1, adjust VR1 until this voltage reads exactly half (one quarter for 24 volt systems) of the required connect voltage.
2. Measuring between the GND terminal and TP2 adjust VR2 until this voltage reads exactly half (one quarter for 24 volt systems) of the required disconnect voltage minus 0.3. (ie for a disconnect voltage of 12.8 TP2 should measure $12.8/2 - 0.3 = 6.1$ volts.
3. Set the hi voltage disconnect as per the table in section 8

Set up is now complete.

VERY ADVANCED SETUP PROCEDURE.

For engineers with considerable workshop equipment and experience there is a much simpler, quicker and more accurate set up procedure that we use prior to shipment. Details are available on request but you will need access to a highly accurate adjustable DC power supply and an oscilloscope. Details of this procedure are only available to professional installers.

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5 - BATTERY TYPES

These are typical figures required for various battery types assuming that the correct battery charger is being used for the batteries. Clearly if the wrong battery charger is being used (ie charging at an incorrect voltage for the selected battery type) then these voltages will possibly need to be adjusted. If in doubt consult a qualified auto electrician or contact your dealer.

Wet cell batteries.

Connect voltage	13.2v (26.4 on 24 volt systems)
Disconnect voltage	12.8v (25.6 on 24 volt systems)
Hi volt disconnect	14.8v (29.6 on 24 volt systems)

Gel cell batteries

Connect voltage	13.4v (26.8 on 24 volt systems)
Disconnect voltage	12.8v (25.6 on 24 volt systems)
Hi volt disconnect	14.6v (29.2 on 24 volt systems)

AGM batteries

Connect voltage	13.4v (28.8 on 24 volt systems)
Disconnect voltage	12.8v (25.6 on 24 volt systems)
Hi volt disconnect	15.0v (30.0 on 24 volt systems)

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6 - SPECIFICATIONS

Connect voltage range	13.0 to 13.8 volts (26.0 to 27.6 volts on 24 volt systems)
Disconnect voltage	12.7 to 13.2 volts (25.4 to 26.4 volts on 24 volt systems)
Hi voltage disconnect range	14.0 to 16.4 volts (28.0 to 32.8 volts on 24 volt systems)

Standby current draw < 0.0004 amp (< 0.005 watts)

Connected current draw	80 amp	< 170 mA	(< 2.3 watts)
	125 amp	< 240 mA	(< 3.2 watts)
	200 amp	< 250 mA	(< 3.4 watts)

Specifications are subject to change without prior notification.

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7 - TROUBLE SHOOTING

Symptom	Possible problem
Green LED lights up solid but the relay does not energise	Faulty connections between C1 or C2 terminals on the connector block and the relay coil. Faulty relay. The charge source is charging at a higher voltage than the hi voltage setting. Check the charge source voltage is correct or readjust VR3 A 12 volt unit is installed in a 24 volt system. The DISCONNECT voltage is set higher than the CONNECT voltage. Run through the set up procedure.
Charge source is switched on, the unit connects then disconnects almost immediately	The charge source is connected to the smaller battery bank and the larger bank is deeply discharged. This can cause the overall voltage to fall below the disconnect voltage when the banks are connected together. Either move the charge source to the larger battery bank or lower the disconnect voltage. DISCONNECT and CONNECT voltages are set too close together. Refer to setting up procedure. High voltage disconnect set too low. Refer to setting up procedure.
The unit simply will not connect.	Disconnect voltage is set higher than the connect Voltage. Refer to setting up procedure. Charge source is set lower than CONNECT voltage. Either increase the charge voltage or decrease the CONNECT voltage. No charge source available or faulty charger. 24 volt unit installed in a 12 volt system

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8 - OVERVOLTAGE ADJUSTMENT

Many users do not require the overvoltage cut out. If that is the case for your installation then it is recommended that the adjustment (VR3) be turned fully clockwise. This will effectively set the overvoltage higher than 16.4 volts and prevent false triggering.

Adjustment of the overvoltage set point can be achieved by either of the following methods.

By interpolating between the following given values:-

VR3 position	Overvoltage cut out
9 o'clock	13.6 volts
10 o'clock	14 volts
11 o'clock	14.5
12 o'clock	15 volts
1 o'clock	15.5
2 o'clock	16 volts
3 o'clock	16.4 volts

Or by increasing the charge voltage on the charger until the relay can be heard/seen to disconnect. LED will remain lit.

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