



ADVERC - FUNCTIONAL BACK GROUND.

Twenty-seven years of study and development have gone into optimising alternator battery charging which, presently, permits only 60% - 70% state-of-charge using conventional voltage regulation.

The result is the well-proven **ADVERC Battery Management System.**

The underlying principle is that batteries should be charged fully, quickly, safely and without damage to batteries and alternator. This is achieved, firstly, by **cycling** the **battery** voltages to an established programme, at a nominal **14.0-14.4v** (12v systems) or **27.5-28.5v** (24v systems).

The **cycling** programme is normally: **5 minutes @ 14.0 volts**, followed by **15 minutes @ 14.4 volts**. After four **20** minute cycles, there is a 'rest period' of up to **40** minutes i.e. at the lower voltage, depending on the battery state-of-charge and electrical duty-cycle.

These voltage values lie either side of the battery gassing voltage, ensuring rapid charging **without the battery actually gassing**. Voltage settings will accommodate most battery types including gel. Ni-cads etc., require a special setting. The charging voltages will automatically adjust for ambient temperature variations around the batteries, an important consideration e.g. a voltage increase with cold ambient temperature and vice versa.

The net result is more efficient alternator performance, compensation for voltage losses in the system (including that across blocking-diodes), accompanied by considerably reduced engine running time e.g. **50%**.

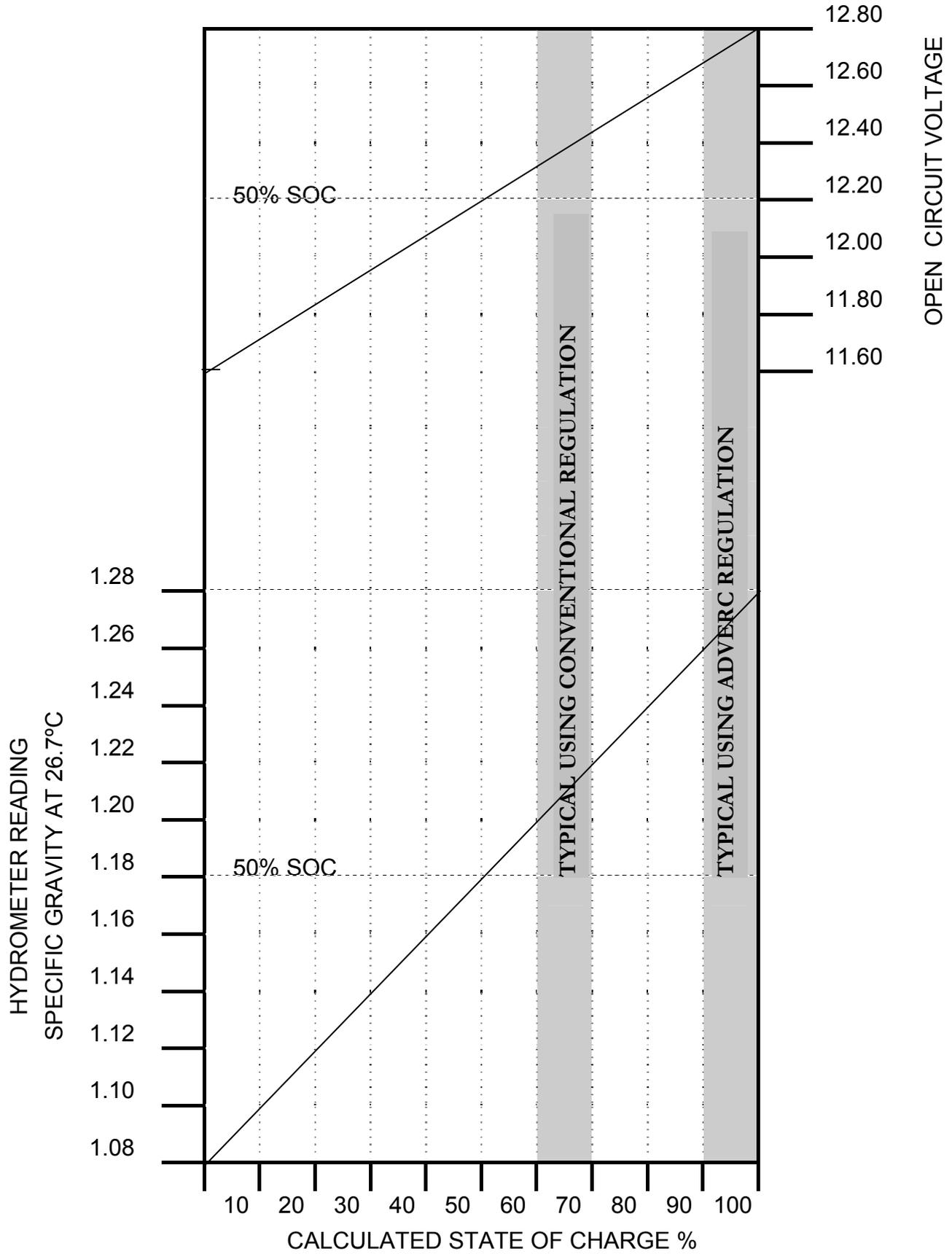
NOTE: ADVERC is a controller not a booster. There is no forced feeding of the batteries. ADVERC simply creates the correct voltage climate at the batteries, which then takes what they want in terms of charging current. Heavily discharged batteries can expect and obtain a high alternator output, whilst well-charged batteries will take much less.

Battery and alternator life are considerable improved but the main benefit comes from having **more available battery capacity** at one's disposal, **two to three times, without having to install extra batteries and bigger alternators.**

Twin alternators on single or twin engines can be accommodated by a **single** ADVERC system, making ADVERC ideal for catamarans, twin-engined motor-cruisers and single engines with twin alternators. Improvements in **nett** charging of up to **145%** have been achieved.

Over the years, ADVERC has provided a variety of solutions in the marine and automotive sectors, from Round the World Yachts to Supermarket Trucks, Ambulances, Bomb Disposal and Security Vehicles etc.

TYPICAL BATTERY STATE-OF-CHARGE
CORRELATION BETWEEN S.G. AND OPEN CIRCUIT VOLTAGE





INSTALLATION INSTRUCTIONS



1 PRE INSTALLATION

A typical ADVERC BM system consists of a remote regulator, a standard alternator regulator, modified for tandem operation, and a harness, which also contains a temperature sensing thermistor.

There are 9 leads in the harness, of which 7 are for external connection, with colour coding as follows:

Connections to Alternator

- ADVERC GREEN - Field brush (or modified regulator).
- ADVERC BROWN - Low current output (Ind, D+, 61, L terminal etc.)
- ADVERC BLACK - (Twin leads) B- terminal or case if earth return.
- ADVERC BLUE - B+ terminal (see **Section 4 SPLIT-CHARGING**: Blocking-diode).

Connections to System or Batteries

- ADVERC RED - Usually service battery +ve terminal (see **Section 4 SPLIT-CHARGING**).
- ADVERC YELLOW - Ignition live when 'ON' (see **Section 2 – INSTALLATION**).
- ADVERC WHITE - (Twin leads) internal connections to temperature sensor.

IMPORTANT

- ! The batteries must be disconnected before commencing installation.**
- ! When locating the ADVERC regulator 'black box', remember that the unit is water protected, but not waterproof. It will withstand high ambient temperatures, so the engine bay is a suitable location for marine craft. Mount the unit vertically with the plug at the bottom i.e. pointing downwards.**

2 INSTALLATION

- ▼ Disconnect the batteries (negative first followed by positive).
- ▼ Make the alternator connections as shown in **Section 1 – PRE INSTALLATION**.
- ▼ The ADVERC RED lead (battery sense) is normally connected to a battery +ve terminal, usually the domestic or auxiliary service battery (see **Section 4 SPLIT-CHARGING**).
- ▼ The ADVERC YELLOW lead incorporates a charge control-lamp to provide an over-voltage alarm indication, and should be connected to a **switched** +ve supply, preferably from the ignition switch to the free spade terminal on the lamp. This can be the same terminal which supplies the standard ignition warning light, or any point which is live when the ignition switch is 'ON'.

Should you consider the alarm function to be unnecessary, simply leave the ADVERC YELLOW lead disconnected. The ADVERC system will work perfectly well without this function, though fitting the green lamp is recommended.

Important: The ADVERC YELLOW lead must not be connected without the charge control lamp or damage will eventually result.

- ▼ The ADVERC BLUE and RED connections may vary when used in conjunction with a split-charging system (see **Section 4 SPLIT-CHARGING**).
- ▼ The ADVERC harness can be lengthened or shortened as required – too much spare cable is undesirable and should not be coiled in the event of there being an excess. However, care must be exercised when cutting the ADVERC RED lead. **The temperature sensor, attached to two WHITE leads, is located near the battery end of the RED sense lead and identified by a bulge in the harness.**

Note: The WHITE leads can be connected to the thermistor either way round, but there must be a good connection. An OPEN-CIRCUIT situation causes the alternator to go into FULL OUTPUT. A typical resistance value, measured across pins 8 and 9 at the main plug, is **4-10Kohm**, depending on ambient temperature.
- ▼ If you have an insulated return alternator, **both ADVERC BLACK lead(s) must be connected to the negative output post** on the alternator (B-). If an insulated return alternator is used with an earth return system, there must be a substantial connection between B- and the alternator casing or engine block, to convert the alternator to earth-return.

Note: Negative cable ratings should always be equal or greater than those on the positive side.
- ▼ **Section 7 – COMMON ALTERNATOR TYPES** provides a series of illustrations covering typical connections for a variety of alternators. Separate instructions and data sheets are available for other makes.

3 FUNCTIONS & INSTALLATION CHECKS

▼ WHAT TO EXPECT FROM YOUR ADVERC SYSTEM

The ADVERC Battery Management System compensates for voltage losses between alternator and batteries, including those attributable to blocking-diodes, and ambient temperature changes - low temperatures require higher charging voltages and vice versa. In addition, the ADVERC cycles battery voltages either side of the battery gassing voltage to provide fast, efficient and safe battery charging. These voltages are as follows:

12v system: 14.0 -14.4v nominal at 25°C.
24v system: 27.5 -28.5v nominal at 25°C.

These voltages will vary, depending upon the ambient temperature at the sensor. For a 12 volt system the nominal variation is 0.02v per °C deviation from 25°C (0.04v for 24v systems).

Note: Ensure that the alternator functions with standard regulation before finally connecting the ADVERC plug.

▼ WHAT TO EXPECT ON 'START-UP'

With the ignition switch 'ON', the ignition warning light and green ADVERC charge-control lamp should illuminate, **except for certain twin alternator situations or where the ADVERC brown lead is connected to the ignition switch.**

On starting the engine, both lights should extinguish and remain extinguished unless a problem arises.

The ADVERC begins to control when the battery voltage reaches a nominal 14.0 volts (27.5v for a 24v system).

After 5 minutes there should be a distinct voltage 'jump' to 14.4v (28.5v for 24v system) for 15 minutes, before returning to the low voltage mode. These voltages are, of course, dependent on the ambient temperature around the battery sensor.

This 'cycle' will be repeated four times, whereupon the system will remain in the lower charging mode for 40 minutes. (It is not necessary to proceed beyond the first voltage 'jump', for check purposes). If the system cycles once, then the basic installation is correct.

NOTE: Heavily discharged batteries can pull down the alternator output voltage to as low as 13.0v. The ADVERC system will not 'cycle' until sufficient charge has been accepted by the batteries and the alternator is on top of the situation, and providing a nominal 14.0v at the battery.

▼ **USEFUL OBSERVATIONS & 'RUNNING' CHECK**

A fact, not always fully appreciated, is that small voltage changes can produce significant differences in battery charging current, so an inexpensive digital multimeter and clip-on ammeter are useful tools to have available. In the event of queries concerning installation, we are more interested in **voltages** for diagnostic purposes – see below.

If batteries and alternators are inaccessible, it is possible to obtain meaningful voltages by using a multimeter and the following method:

Pull back the outer sleeving on the harness going into the ADVERC black box and insert the multimeter probes into the back of the plug. With the engine running, measure the voltages across the following:

GREEN/BLACK: this reading can indicate regulator polarity.

RED/BLACK: gives an indication of battery voltage **expected:** 14.0-14.4v (27.5-28.5v), not necessarily the actual value achieved.

BLUE/BLACK: indicates alternator voltage, depending on the location of the ADVERC BLUE lead.

BROWN/BLACK: shows the voltage at the alternator low current output terminal (D+, 61, IND, L): 15.0v (29.0v) approximately.

RED/BLUE: this provides a direct read-out of the voltage between blue and red and is therefore a guide to voltage losses in the system. **These should not be more than 0.5v.**

In addition, measure the battery voltages, directly across the battery posts.

For regular checks, an ADVERC test lead is available, at a nominal cost. This is a useful tool for regular voltage checks on the system in general & saves having to access the back of the 9 pin plug.

▼ **TANDEM FUNCTION CHECK**

The tandem feature is incorporated to provide a fall-back situation in the unlikely event of ADVERC failure. This can be simulated simply by disconnecting the main plug to the ADVERC 'black box'. The charging system should revert to standard regulation.

▼ **GENERAL**

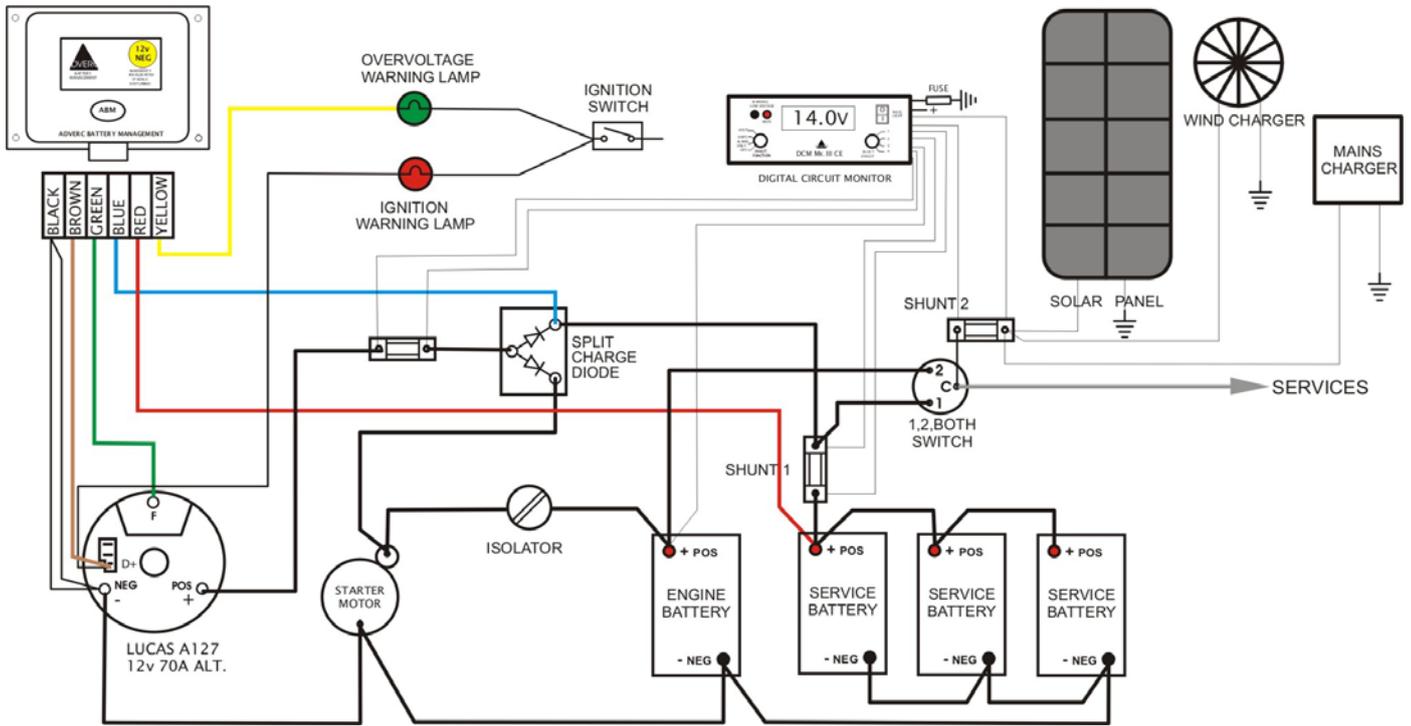
Batteries: If possible, check the specific-gravity in **all** cells in **all** batteries and open circuit voltage prior to using the ADVERC. A battery is suspect if any cell varies by more than 30 points e.g. 1.260-1.230.

Alternator: It is essential that the connections on the main output of B+ terminal and the ADVERC BLUE lead (if connected to the alternator) are tight. A poor connection can produce unacceptable voltage 'spikes' and may cause eventual damage.

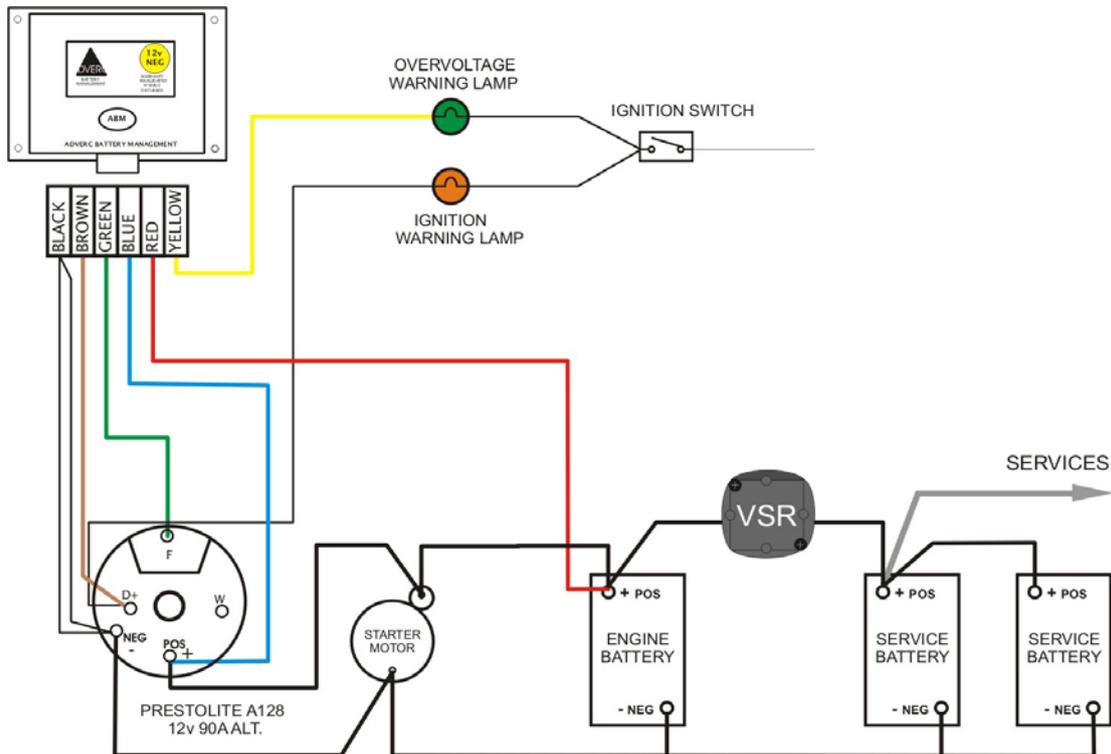
Do not connect the two ADVERC BLACK leads anywhere other than prescribed in Section 1 (or splice them together) – see Section 8.

If a blocking-diode **and** rotary switch are used – see **IDEAL BOAT ELECTRICS** – the blocking-diode route should be adopted, since **alternator charging** takes place via the former i.e. **do not connect the ADVERC RED lead to the common on the switch, in this case.**

▼ **COMBINED APPROACH – IDEAL BOAT ELECTRICS**



▼ **RELAY**



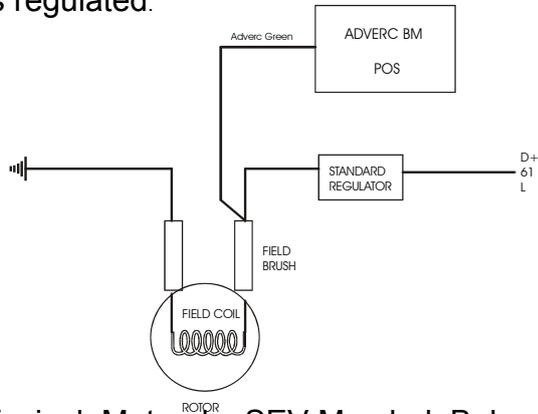
When split-charging using a relay, connect ADVERC BLUE to the alternator B+ terminal and ADVERC RED to the **engine** battery +ve post, as a precautionary measure.

5 REGULATOR POLARITY: POSITIVE / NEGATIVE

Regulator polarity refers to the control of the excitation voltage in the alternator field windings and may be either positive or negative.

▼ POSITIVE POLARITY REGULATION

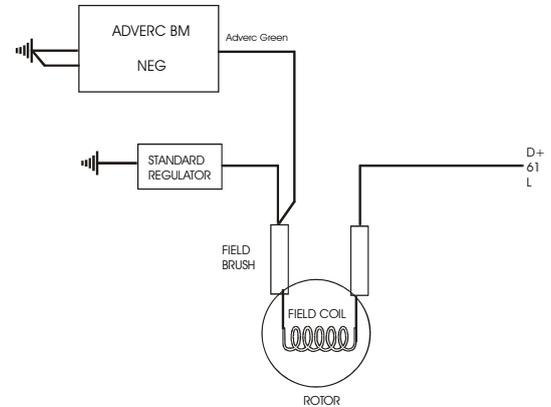
One brush is connected directly to earth / ground. The other end of the field windings is regulated.



Typical: Motorola, SEV Marchal, Balmar

▼ NEGATIVE POLARITY REGULATION

One brush is connected directly to a positive supply from the D+ or B+. The other end of the field coil is regulated.



Typical: Lucas, Bosch, Hitachi, Prestolite

▼ POLARITY TEST

Use a multimeter on the Ohms x 1 range and connect across any brush and B- or the alternator case.

Positive regulation will give a low reading up to 8 ohm.

Negative regulation will give a high reading in the K ohms range.

If in doubt, contact us for guidance.

6 ALARM FUNCTION

▼ ALARM FUNCTION

This is not usually triggered by a false symptom and should be investigated.

▼ 'FLASHING' CHARGE-CONTROL LAMP

A 'flashing' charge control-lamp (approximately 1 per second) indicates an over-voltage condition at the battery, (e.g. 15.5-16.0v or 31.0-32.0v, for 24v systems).

Should high battery voltages develop at any stage, these should not be ignored. In an emergency situation, if the source cannot be discovered, pull the plug at the ADVERC 'black box' and the tandem standard regulator will normally take over. If the battery voltage remains high, then the standard/original regulator is likely to be faulty and creating the problem. Unfortunately, the ADVERC system cannot control 'downwards'.

NOTE: The 'flashing' lamp symptom can also be activated by total or partial disconnection of the ADVERC RED battery sense lead. There must be a good connection.

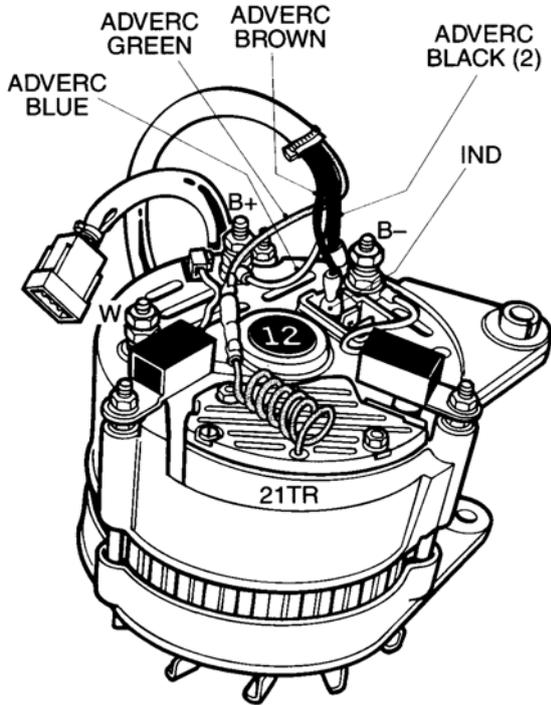
7 GENERAL GUIDANCE

▼ Do not turn the ignition-switch to 'OFF' with a diesel engine still running. **This could cause the alternator to go into full output, without an over-voltage indication by the green control-lamp.**

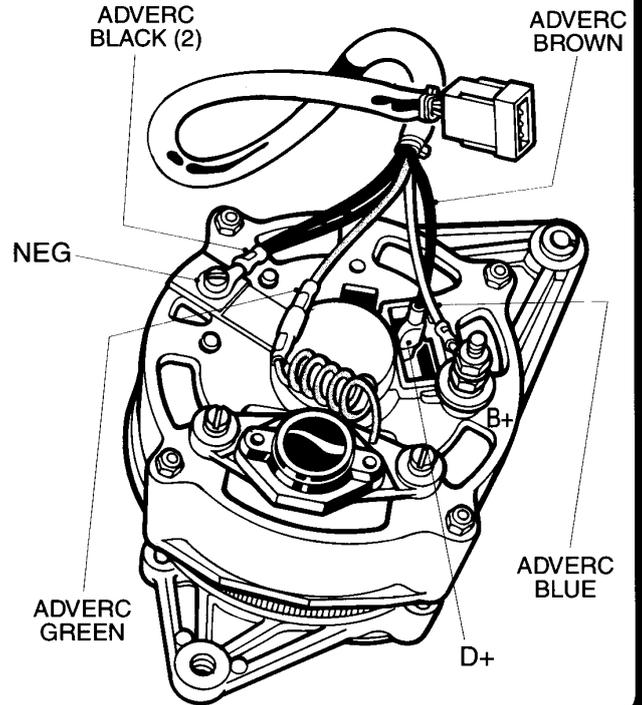
▼ Twin alternator installations: **The green control lamp will not illuminate, prior to engine-start.** . The over-voltage indicator is still functional, however, and can be tested by temporarily removing the ADVERC RED lead, with the engine running (slow blink, once per second).

8 COMMON ALTERNATOR TYPES

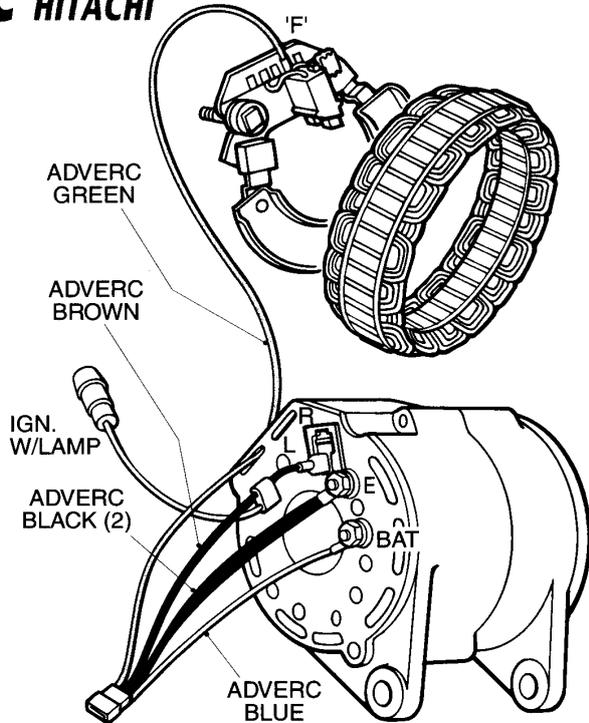
a LUCAS A127



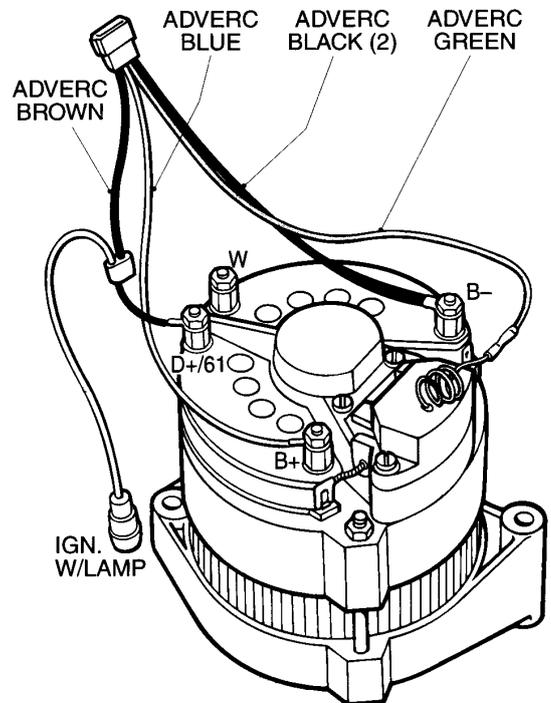
b BOSCH



c HITACHI



d PARIS RHONE



TESTING AN ADVERC, ALTERNATOR & CHARGING SYSTEM
- USING AN ADVERC TEST LEAD.



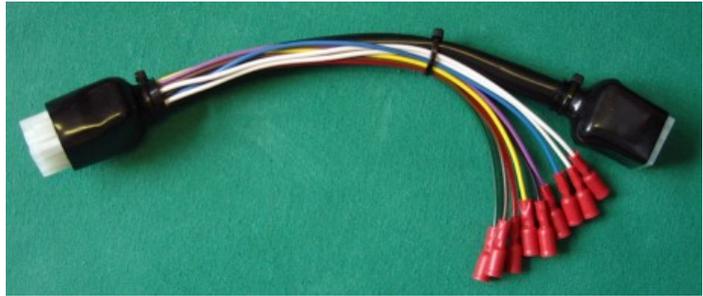
PURPOSE:

An ADVERC test-lead enables a number of voltage readings to be taken at various terminations to check the functionality of an Adverc charging system. This simple approach also obviates the previous inconvenience and impracticality of having to insert multimeter probes into the back of plugs and sockets, to obtain these readings.

RECOMMENDED PROCEDURE:

1. Insert the test-lead between the Adverc unit plug and 9-pin socket on the harness.
2. Before starting the engine, measure and record the **actual battery voltage – the one to which the Adverc red battery sense lead is connected.**
3. Using a multimeter, measure the voltage across the following leads:

- Red/Black**
- Brown/Black**
- Blue/Black**
- Green/Black**
- Yellow/Black**
- Red/Blue**



The **Red/Black** reading should be the same as in 2.

4. Start the engine and maintain the rpm just above idle i.e. so that the alternator is 'producing'. Switch-off all electrical loads.
5. Allow the Adverc to 'cycle' i.e. after 5 minutes, both the battery voltage and **Red/Black** voltage should jump by approximately **0.4** volts.
6. Repeat 3.
7. **Disconnect** the Adverc, whilst the engine is running – it is safe to do so.
8. Repeat 3.
9. Switch-off the engine.

With the Adverc plug still disconnected, using a multimeter on a **Kohms** setting, measure the resistance between the **two white** leads. The reading should be between **4 and 10 Kohms**.

10. Typical readings for a 12 volt system are as follows:

SCENARIO			TYPICAL VOLTAGES + 0.2 VOLTS					
ENGINE	B/DIODE USED	ADVERC	RED/BLACK	BROWN/BLACK	BLUE/BLACK	GREEN/BLACK	YELLOW/BLACK	RED/BLUE
OFF	YES	CONNECTED	12.6	0	12.6	0	0	0
OFF	NO	CONNECTED	12.6	0	12.6	0	0	0
ON	YES	CONNECTED	14.4	15.3	14.4	3 - 13	14.4	0
ON	NO	CONNECTED	14.4	14.4	14.4	3 - 13	14.4	0
ON	YES	DISCONNECTED	13.4	14.1	13.4	3 - 13	13.4	0
ON	NO	DISCONNECTED	13.9	14.1	14.1	3 - 13	13.9	0.2

Note:

- (a) **Red/Black** voltages vary with ambient temperature.
- (b) **Green/Black** readings can vary, depending on the polarity of the Adverc, the state of charge of the battery and if any electrical loads are applied.
- (c) **Red/Blue** values should be no more than **0.3** volts. The ideal value is **zero**, indicating no voltage losses in the system. Voltage losses in the positive line will be compensated for by the Adverc system. However, the Adverc will not compensate for any losses in the negative return, resulting in lower **Red/Black** voltages e.g. **14.2**, instead of **14.4**, reducing charging performance.
- (d) Voltage losses in the negative return can be checked by measuring the voltage between alternator negative and the battery negative terminal. This ideally, should be **zero** and not greater than **0.1** volts, for optimum charging performance.