

VOLTAGE SENSITIVE RELAY

DUAL BATTERY CHARGING MADE EASY



Installation instructions

BEFORE INSTALLING

IMPORTANT

Do not use any type of corrosion inhibiting spray such as CRC, INOX etc. on any part of this unit. These units are hermetically sealed so do not require any other form of sealing. The studs have been tinned to inhibit corrosion, use petroleum grease if required (on metal parts only).

ENSURING CORRECT BATTERY SIZING:

The charging system must be correctly sized to the batteries. If the charging system is too small for the batteries the VSR will not work properly.

How the VSR works

Once the starting battery's voltage rises to above 13.7 VDC, the VSR switches to charge both batteries in parallel, when the voltage drops below 12.8 V DC the VSR disengages. A buzzer-like sound can be heard as the relay quickly switches in and out. Disengagement can occur at idle (low amps out due to slow speed of alternator) or if the house battery is at a low charge. An increase of the engine's RPM will increase the alternator output and hold up the voltage.

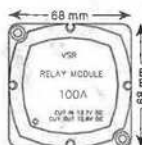
Alternator vs battery capacity

Alternator Size	Second battery size
10 Amp	60 AH GRP 22
16 Amp	85 AH GRP 24
25-35 Amp	85-100 AH GRP 27
50-60 Amp	100-130 AH GRP 31
80-90 Amp	130-220 AH GRP 80

INSTALLATION

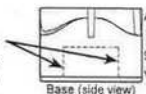
Connect the VSR to the back of the battery isolating switches, ensuring that the battery cable is correctly sized. This will ensure good current flow to the battery, reducing unwanted voltage drops to the VSR. The LED on the front of the VSR should be visible, as it will instantly show when it is in operation.

Note: When using a VSR in conjunction with a high performance voltage regulator (eg Next Step Regulator) the regulator sense wire must go to the same point as the sense for the VSR is the start battery.



Remove base to expose studs and negative lead. Cut out cable access slots:

1) With a hacksaw blade, cut vertical lines into the side walls of the VSR case, as shown by dashed lines (approximate positions). Stop cutting at the point where the plastic steps up to a thicker wall. Take care not to damage the circuit board with the blade.

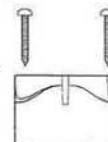


2) Once the two slots have been cut, with a pair of pliers bend the middle section (between the two slots) inwards until it snaps away from the main body (Along horizontal dashed lines)

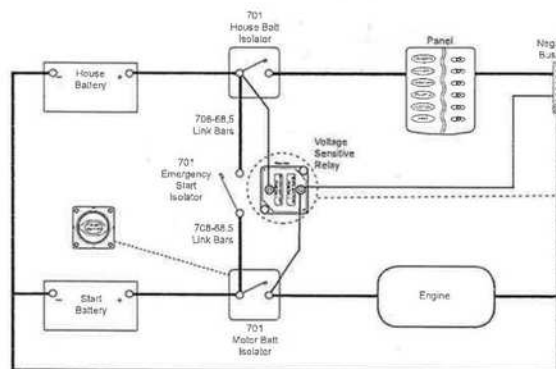
Use countersunk screws for fastening base down.



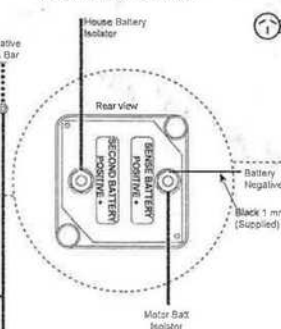
Use Panhead screws for fastening the VSR onto the base.



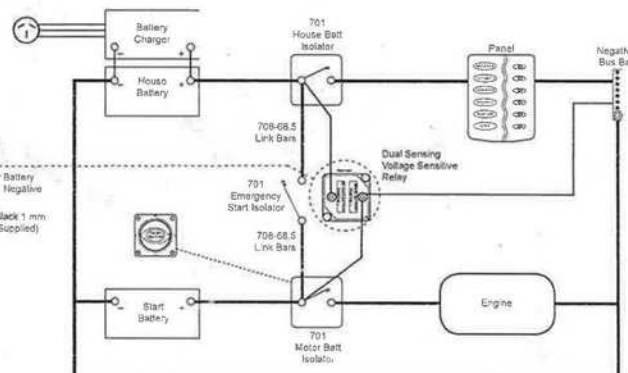
Wiring for Voltage Sensitive Relay



VSR Rear view (same with both installations)



Wiring for Dual Sensing Voltage Sensitive Relay



VOLTAGE SENSITIVE RELAY

DUAL BATTERY CHARGING MADE EASY

- Dual battery charging made easy
- Protects electronics on house battery circuit from engine start up spikes
- Fully automatic



www.bepmarine.com

Important information

BEP's unique VSR

Modern charging systems must be able to safely charge two or more different types of batteries from one engine.

Now, thanks to BEP's unique VSR (Voltage Sensitive Relay) boat owners can enjoy the benefits of fully charged engine starting batteries and deep cycle house batteries with one easy-to-install charging system.

710-100A (SINGLE SENSE) VSR OPERATION

The Voltage Sensitive Relay (VSR) allows two batteries to be charged at the same time. When the engine is started and the start battery reaches 13.7 volts, the VSR engages, allowing two battery banks (start and house) to be charged simultaneously. When the voltage drops below 12.8 volts (eg the engine is stopped), the VSR disengages, separating the batteries.

This system eliminates the possibility of draining the wrong battery and protects sensitive electronic equipment powered from the house battery from harmful engine start up spikes.

710-100A-DS (DUAL SENSE) VSR OPERATION

Same as the 710-100A with the added feature of dual sensing. This allows the unit to sense the voltage of both batteries that it is connected between. If either battery is receiving a charge the VSR will activate paralleling the two battery banks.

The 710-100A-DS is designed for situations where a battery charger or second charging source is used into the house battery.

IMPORTANT

It is the installer's sole responsibility to install and use this product in a manner that will not cause accidents, personal injury or property damage. Please follow the installation instructions supplied. If installation is not correct, the unit may not perform at its designed potential. If in doubt, consult your local BEP Marine dealer. BEP Marine Limited disclaims all liability for any use of this product that may cause accidents, damage or be a violation of any laws.

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VOLTAGE DROP CHART

Total Cable Length (m)	Total Cable Length (ft)	Amps	Voltage Drop (%)	mm ²	AWG
1	3	50	2.3%	4 mm	11
1	3	100	3%	6 mm	10
2	6	50	3%	6 mm	10
2	6	100	3.5%	10 mm	7
3	9	50	2.7%	10 mm	7
3	9	100	3.4%	16 mm	5
4	12	50	3.6%	10 mm	7
4	12	100	2.6%	25 mm	3
5	15	50	2.8%	16 mm	5
5	15	100	3.3%	25 mm	3
6	18	50	3.4%	16 mm	5
6	18	100	3.9%	25 mm	3
7	21	50	3.9%	16 mm	5
7	21	100	4.6%	25 mm	3
8	24	50	2.6%	25 mm	3
8	24	100			

SPECIFICATIONS

Continuous 100 Amps

Intermittent 140 Amps

Ignition Protected UL1107

System size	12 V DC	24 V DC
Engages	13.7 V DC	27.4 V DC
Disengages	12.8 V DC	25.6 V DC

24 V DC system is 710-100A-24V



Frequently asked questions

Q: To which side of the battery switch should the VSR be wired?

A: It is vital to follow the wiring installation diagram which shows correct connection to the master switch. BEP only recommends the supplied option. Other options can lead to accelerated battery discharge as the sense circuit draws 0.01 Amps continuously. The output wire of the VSR should always be connected to the battery side of the House battery switch to ensure true isolation of house circuits if the VSR is engaged.

Q: Why does the LED stay on after engine is turned off?

A: System voltage has not dropped below 12.8 V DC due to battery charging. VSR will disengage once residual battery voltage drops below 12.8 V DC.

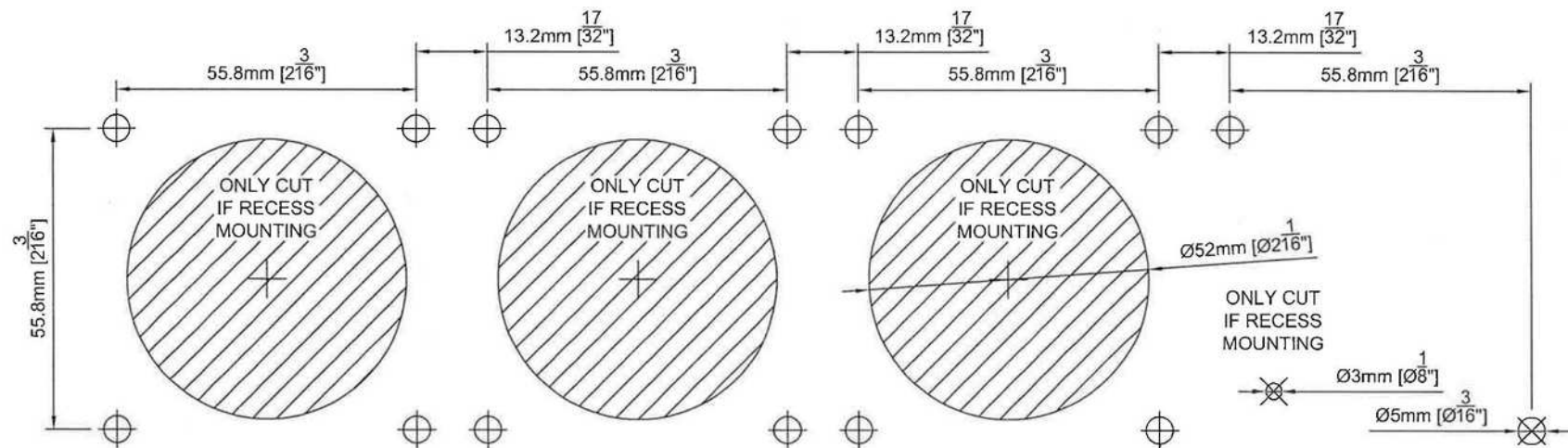
Q: How do I ensure that the correct size of battery is matched to my VSR?

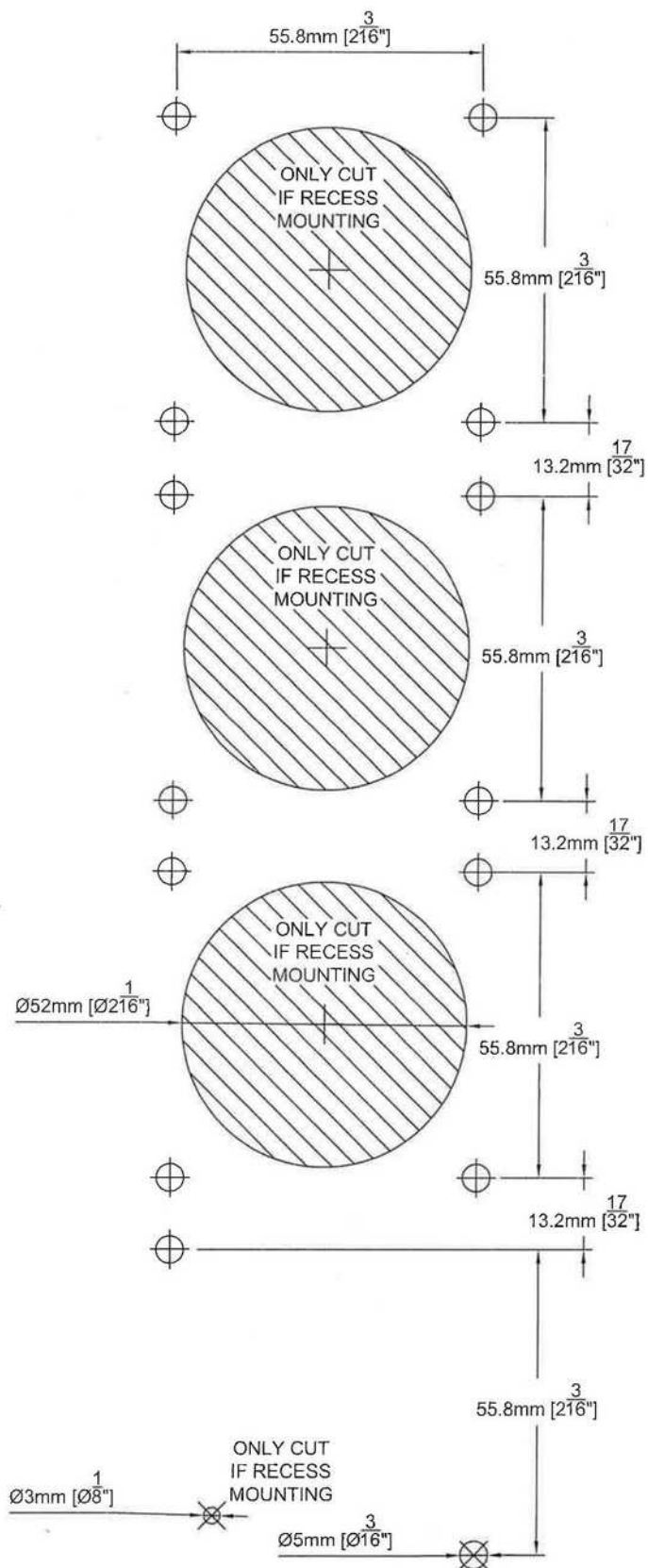
A: See the battery sizing chart on next page.

Q: Why does my VSR 'chatter'?

A: Because the charging system is too small for the batteries and this is not allowing the VSR to work properly. Instead, once the starting battery has reached the right voltage and the house battery is connected the systems voltage is 'caving down' below 12.7 volts and the relay is automatically disconnecting. The voltage then rises, the relay re-engages; then the voltage drops the relay disengages and the 'chattering' sound is heard as the relay quickly switches in and out. Refer to battery sizing chart on next page.

More information can be found on our Website www.bepmarine.com.





716 Battery Distribution Cluster

DUAL BATTERY CHARGING MADE EASY! The 716 battery distribution cluster is the optimum battery management system for your single engined boat.

The 716 combines 3 of BEP's 701 battery switches and a 710-100A Voltage sensitive relay (VSR).

The **701 Battery Master Switch** offers a number of unique features. The highlights being the contour lock system, allowing it to be locked together with other switches. The 701 also features a control knob which cannot be removed whilst in the On or Off position, however can be removed by switching to an anti-clockwise 45° position.

The 701 also features a removable rear cover insulating the rear terminals against any short circuits and ensures the switch meets ABYC requirements.

701 specifications

Continuous rating:	275 Amps DC
Intermittent rating:	455 Amps DC
Cranking rating:	1250 Amps DC
Voltage rating:	48 Volts DC
Operation:	On / Off
Mounting:	recessed or surface
Termination stud size:	2 x 3/8" (10mm)

BEP Marine Battery Switch Test Procedure (UL 1107)

Continuous (1 hour)

Intermittent (5 minutes)

Cranking (10 seconds)

The test is to determine the maximum current the switch can handle for the stated time, without the terminals exceeding 212°F (100°C) above the ambient temperature.

The continuous and intermittent ratings are tested 110% of specified ratings.

THE 716 SYSTEM INCLUDES dedicated battery switches for each bank and a 710-100A voltage sensitive relay (VSR). The VSR allows for two batteries to be charged at the same time. When the engine is started, and the start battery reaches 13.7 Volts, the relay closes, Combining the battery banks (start and house) and allowing them to be charged simultaneously.

When the engine is stopped and the voltage drops to 12.8 Volts, the relay will open separating the batteries.

This system eliminates the possibility of draining the wrong battery and protects sensitive electrical equipment powered from the house battery from harmful engine start up spikes.

The 716 cluster is designed for single outboard or inboard systems on power or sailboats with an alternator size up to 100A.

How to use

1. When boarding the boat switch both the START and HOUSE battery switches to ON.
Only use the EMERGENCY PARALLEL battery switch if both batteries need to be combined for emergency starting.
2. Start the engine, when the start battery reaches 13.7 Volts the small red light on the VSR case will illuminate, indicating the VSR is engaged.
3. When the engine is stopped and the start battery voltage drops to 12.8 Volts the light will switch off, indicating the VSR is disengaged.

Special note:

After a long run the residual voltage of the battery may hold above 12.8 Volts for a period of time, this will hold the relay engaged. This is not a fault.

As soon as any load is applied the voltage will settle below 12.8 Volt, disengaging the VSR.

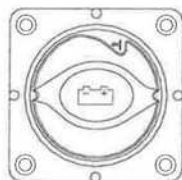
4. On leaving the boat switch both the START and HOUSE battery switches to off.

Trouble shooting

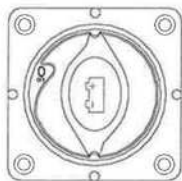
Fault	Possible solution
Engine wont start	-Ensure start battery switch is switched on
House battery is flat	-Ensure engine charging system is working. -Ensure the light on VSR case is on when engine is running and start battery voltage is above 13.7 Volts. If light is not on and voltage is over 13.7V on the start battery then there is possibly a fault with the VSR
House loads not working	-Ensure house battery switch is switched on
Start battery is flat	-Switch the Emergency parallel switch to on. Turn off once engine is started. <u>Note:</u> When starting the engine with the emergency parallel, the house loads will not be protected from engine spikes.
VSR chatters	-Increase RPM's of engine to increase alternator output. -Ensure alternator is not too small for the battery bank. Check with the table below

Alternator Vs Battery capacity

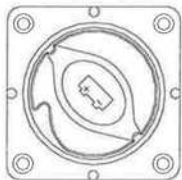
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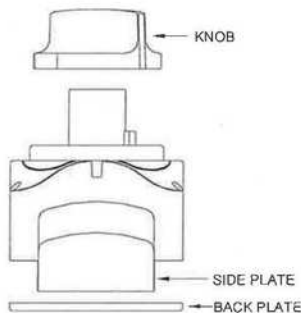
SWITCH IN ON POSITION



SWITCH IN OFF POSITION



SWITCH IN REMOVAL POSITION



716 Battery Distribution Cluster

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3. When an engine is stopped and the start battery voltage drops to 12.8 Volts the light will switch off, indicating the VSR is disengaged.

Special note:

After a long run the residual voltage of the battery may hold above 12.8 Volts for a period of time, this will hold the relay engaged. This is not a fault.

As soon as any load is applied the voltage will settle below 12.8 Volt, disengaging the VSR.

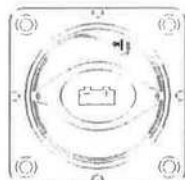
4. On leaving the boat switch both the START and HOUSE battery switches to off.

Trouble shooting

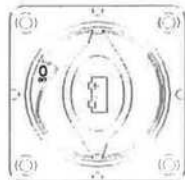
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Engine wont start	-Ensure start battery switch is switched on
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House loads not working	-Ensure house battery switch is switched on
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VSR chatters	-Increase RPM's of engine to increase alternator output. -Ensure alternator is not too small for the battery bank. Check with the table below

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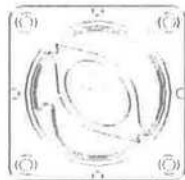
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25-35 Amp	85-105 Amp hours
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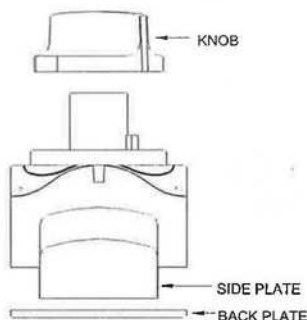
SWITCH IN ON POSITION



SWITCH IN OFF POSITION

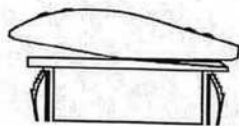


71 & 80 Series 76 & 80

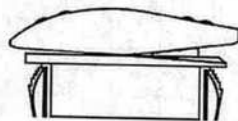


Carlingswitch brytere

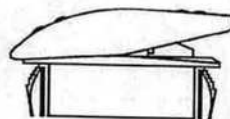
Posisjon 1



Posisjon 2

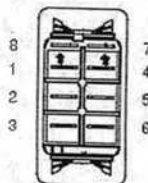


Posisjon 3



10113-01

Type: AV - PÅ

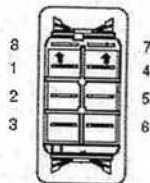


- 2: Spenning inn
- 3: Spenning ut
- 7: Minus til lysdiode
- 8: Pluss til lysdiode

Vanlig AV/PÅ-bryter som f.eks. kan brukes til belysning og pumper.

10113-02

Type: AV - PÅ - PÅ

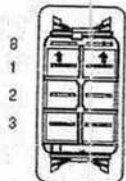


- 1: Spenning ut (trinn 0)
- 2: Lask til 4
- 3: Spenning ut (trinn 1)
- 4: Lask til 2
- 5: Spenning inn
- 6: Spenning ut (trinn 2)
- 7: Minus til lysdiode
- 8: Pluss til lysdiode

To-trinns bryter som f.eks. kan brukes til viskermotor med 2 hastigheter.

10113-03

Type: AV - - (PÅ)

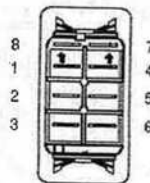


- 2: Spenning inn
- 3: Spenning ut
- 7: Minus til lysdiode
- 8: Pluss til lysdiode

Fjærbelastet AV/PÅ-bryter som kan brukes til septikpumpe, horn eller lignende.

10113-04

Type: (PÅ) - AV - (PÅ)

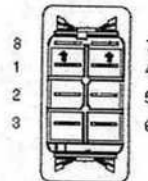


- 1: Spenning ut
- 2: Spenning inn
- 3: Spenning ut
- 7: Minus til lysdiode
- 8: Pluss til lysdiode

PÅ/AV/PÅ-bryter for trimplan, lukeløftere eller lignende.

10113-05

Type: (PÅ) - AV - PÅ



- 1: Spenning ut
- 2: Spenning inn
- 3: Spenning ut
- 7: Minus til lysdiode
- 8: Pluss til lysdiode

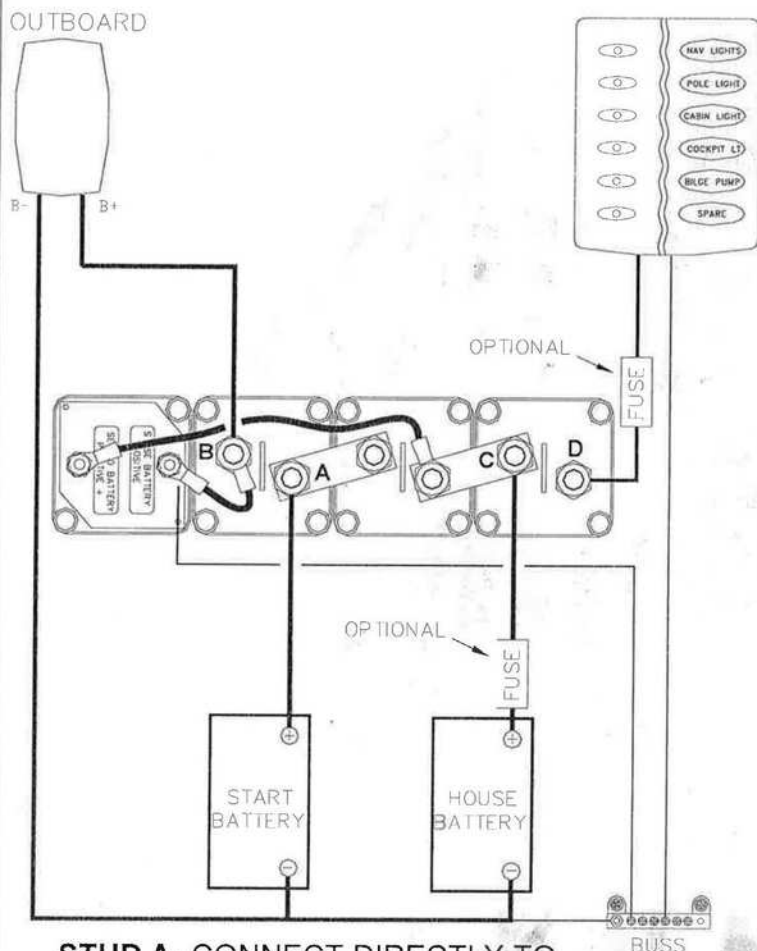
PÅ/AVPÅ-bryter spesielt beregnet for lensepumpe og lenseautomatikk.

Man velger da om automatikken skal være innkoblet eller om man skal kjøre pumpen manuelt.



Utarbeidet av as Maritim

716H INSTALLATION DIAGRAM



OPTIONAL ACCESSORY CONNECTIONS:

BATTERY CHARGER:

CONNECT THE BATTERY CHARGER POSITIVE OUTPUT TO TERMINAL A. THE HOUSE BATTERY SWITCH CAN BE OFF BUT THE ENGINE BATTERY SWITCH MUST BE ON WHEN LEAVING THE BOAT. THIS ALLOWS THE VSR TO ENGAGE AND CHARGE BOTH BATTERIES.

SOLAR PANEL:

CONNECT THE SOLAR PANEL POSITIVE OUTPUT TO TERMINAL A. THE HOUSE BATTERY SWITCH CAN BE OFF BUT THE ENGINE BATTERY SWITCH MUST BE ON WHEN LEAVING THE BOAT. THIS ALLOWS THE VSR TO ENGAGE AND CHARGE BOTH BATTERIES.

BOW THRUSTER:

CHECK MANUFACTURER'S SPECIFICATIONS TO ENSURE BOW THRUSTER IS WITHIN BATTERY SWITCH SPECIFICATIONS. CONNECT THE BOW THRUSTER TO THE START BATTERY SWITCH (TERMINAL B) TO PREVENT BOW THRUSTER LOADS RUNNING THROUGHT THE VSR.

STUD A- CONNECT DIRECTLY TO THE POSITIVE TERMINAL OF THE START BATTERY.

STUD B- CONNECT DIRECTLY TO THE POSITIVE OF THE OUTBOARD MAIN.

STUD C- CONNECT TO THE POSITIVE TERMINAL OF THE HOUSE BATTERY VIA A FUSE.

STUD D- CONNECT TO THE POSITIVE TERMINAL OF THE HOUSE LOAD THROUGH A FUSE.

NOTE: THIS DIAGRAM IS NOT INTENDED TO BE A FULL SYSTEMS WIRING DIAGRAM. IT'S SOLE PURPOSE IS TO SHOW 716H CONNECTIONS

DATE	1/06/04	DWG No.	INST-716H OVERVIEW	TITLE
DRAWN	S. PLAYER			
REV	DATE	DESCRIPTION	DRAWN	APPROVE

INSTALLATION DIAGRAM FOR 716H

BEP MARINE LTD.

13 Tarnhole Grove
Albany

Auckland 1310 N.Z.

PH 09 415 7261 FAX 09 415 9327

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Special note:

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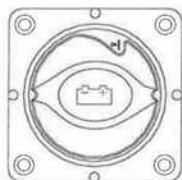
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Trouble shooting

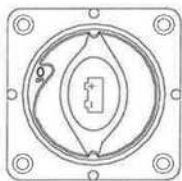
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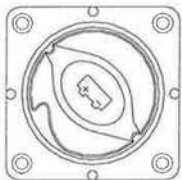
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SWITCH IN ON POSITION



SWITCH IN OFF POSITION



SWITCH IN REMOVAL POSITION

