

USING ELECTRICITY ABOARD NARROWBOAT TRANQUILITY

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Overview

In this presentation we will look at the dangers of electricity and how to avoid them, the how's why's and wherefores of operating the systems and maintaining them, some do's and don'ts about the engine and a little on generating electricity.



Be Safe

A decorative graphic consisting of several overlapping, wavy blue lines that flow from the top left towards the bottom right, creating a sense of movement and depth. The lines vary in opacity and thickness, giving it a layered, ethereal appearance.

The dangers of electricity aboard any vessel are much the same as they are in the home and all the precautions taken at home also apply to Tranquility.

Asked which is most dangerous, 230 volt AC mains or 12 volt DC, the reply is they are both equally as dangerous but for different reasons.

With 230 volts AC the dangers are mainly from electric shock possibly resulting in death, yes, it's that serious, but there are precautions that can be taken, for example by using a residual current circuit breaker (RCCB) in the line. It will not stop you getting a shock if you touch a live conductor or faulty appliance casing, but it will cut the supply quickly enough to help prevent a fatality.

It is unlikely that 12 volts DC would give you a shock therefore is deemed to be safe. This is not the case as it is dangerous for very different reasons. The greatest risk from 12 volt DC is short circuit which, if not protected, can quickly result in a serious fire. Many people believe that a fuse is there to protect the appliance, actually it is primarily there to protect the wiring leading to the appliance. If you were to short just one of Tranquility's batteries by placing a spanner across the terminals (NEVER DO THIS TO ANY BATTERY) there would be more than enough amps being discharged to weld steel, in fact the spanner would instantly weld itself to the terminals and become red hot within seconds. With this severe rate of discharge the battery may explode splashing acid all around. So you can see how it is vitally important that all 12 volt DC circuitry is protected with a fuse of the correct rating.

The Control Panel (fig. 1)

Circuit Switches

Two Way Switch

Residual Current Circuit Breaker (RCCB)

Remote Inverter Switch

Central Heating Controller

Battery Monitor

Engine and Domestic Battery Isolators



The Inverter

This device converts 12 volts DC to 230 Volts AC and supplies the ring main via the two way switch. Use this method of producing energy whenever shore line is not available as it is less costly regarding diesel and is much less noisy. However, it is recommended to run the engine if for example, it is planned to watch the TV for say four hours in the evening, in which case run the engine for the first two, (see notes below) keeping the batteries charged, then switch it off and use the inverter on its own for the remaining two. This will leave enough energy in the domestic batteries for use in the morning. It is also recommended to switch off the inverter and turn the fridge down to No. 1 over night to conserve energy. The fridge uses 12 volts DC direct from the domestic batteries.

The washing machine/tumble dryer can be used from the inverter, however the engine must be running to maintain a charge in the domestic batteries. It is recommended that nothing else is to be in use when using the washer/dryer and that the engine revs are set to just above tick-over. This also applies to the Vacuum cleaner and Microwave oven.

To use the inverter turn the two way switch to “INVERTER” and switch it on at the remote switch (Fig. 1), ensure the lever on the RCCB is in the up position and observe the orange neon is illuminated. The ring main is now live and ready to use.

NOTES:-

- The engine doesn't need to be running to use the inverter, but if it is then it's maintaining a charge in the domestic batteries.
- Always run the engine if high consumption appliances are used e.g. Washing machine, Vacuum cleaner, Microwave oven etc.
- Do not run the engine after 8:00pm after which a statutory noise nuisance order comes into effect.
- Always switch off the inverter when connected to Shore Line.

The Inverter Control



The switch should be left in the ON position at all times.



Control is via the remote switch also featured in Fig.1.

Shore Line

This will negate the necessity to use the inverter and must be used when Tranquility is moored in the marina. Firstly ensure the two way switch is turned to “SHORE” and the engine is switched off before connecting to the supply bollard. Plug in the correct end of the shore line into the blue receptor on the rear of Tranquility, then connect the other end to the bollard. It must be done this way around, otherwise you could be walking around on the jetty with a live cable in your hand. Check the RCCB lever is up and the orange neon is illuminated, the ring main is now live and ready for use. All the appliances aboard Tranquility can be used from the shore line.

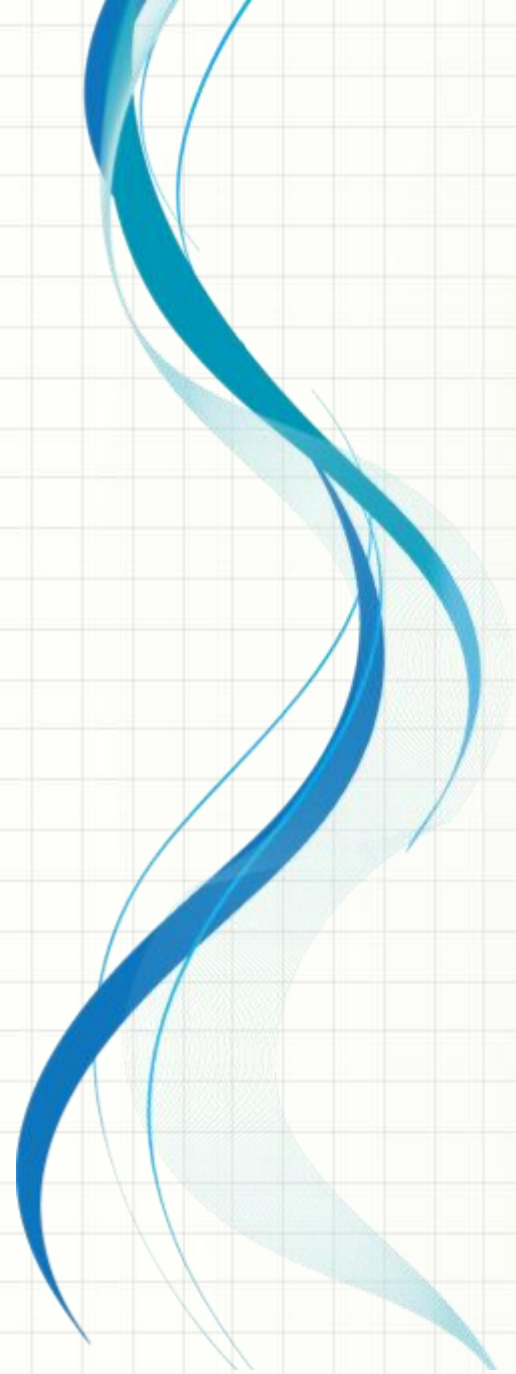
If you have connected the shore line correctly and have no power, check the RCCB on the bollard. Open each flap until you find a lever in the down position and place it in the up position. If there is still no power, contact the marina office.

Once connected, the mains battery chargers will commence charging the domestic pack and the starter motor battery. No adjustment is necessary to either charger, they are fully automatic and can safely be left connected for months at a time.

If you were to inadvertently switch on the engine while connected to the shore line, in theory the batteries would be being charged from both the mains chargers and the engine’s alternators. This isn’t the best situation and a relay has been installed to switch off the mains supply to the battery chargers when the ignition switch is turned on.

Note:-

The TV is both 12 volts DC and 240 volts AC. When connected to the shore line it is advisable to use the 240v AC adapter and only use the 12v DC adapter when away from shore mains supply. In other words it is best not to run the TV from the inverter.



About Generating Electricity

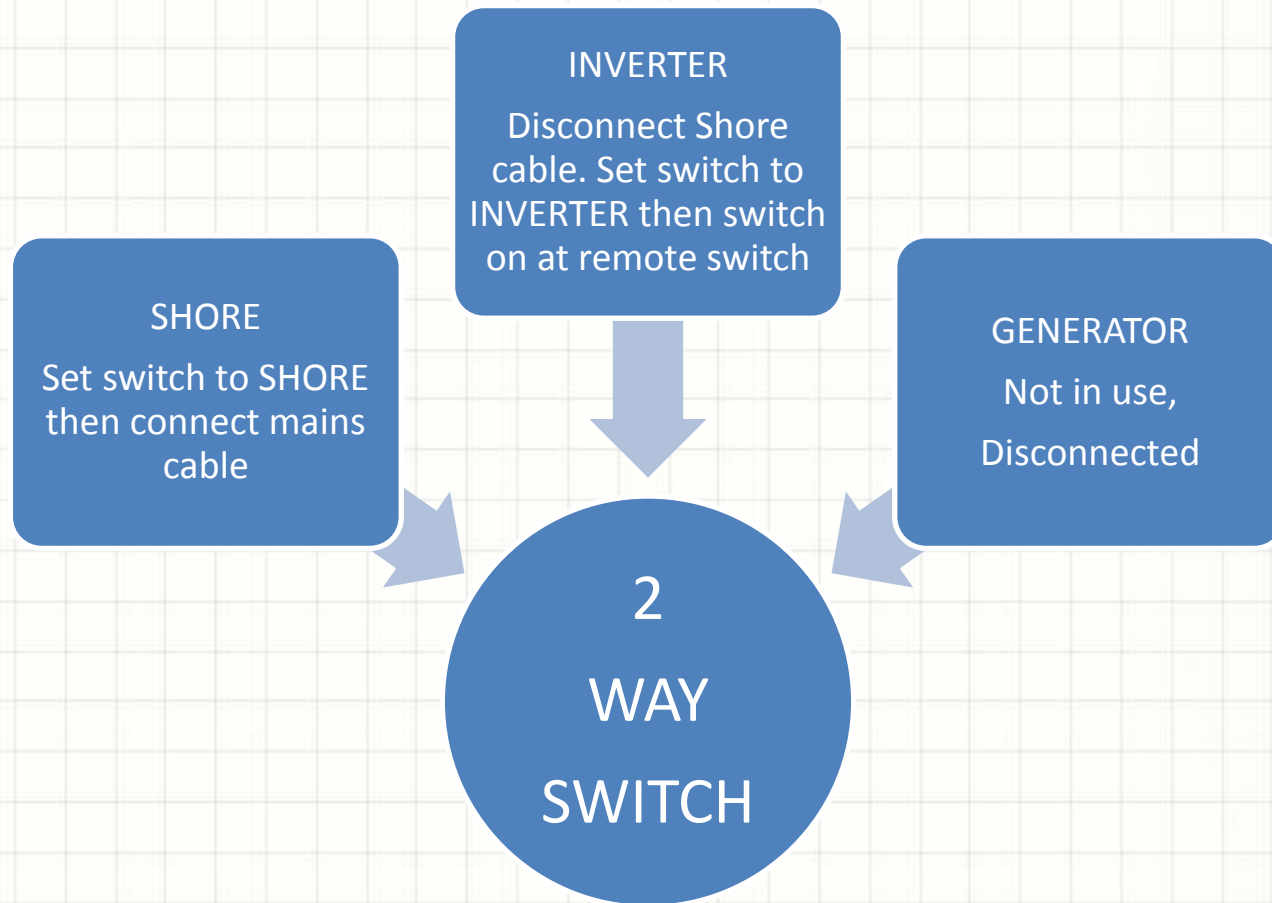
Electricity is made by passing a conductor through a magnetic field. Very small amounts of energy are produced depending on the strength of the magnetic field, the speed of the conductor as it passes through the magnetic field, the size of the conductor and the number of connected conductors.

A generator produces Alternating Current (AC). As the conductor moves into the magnetic field, the current travels firstly in one direction and as it passes out of the magnetic field, it travels in the opposite direction. This is caused by the conductor passing through opposing poles of the magnet. In household mains supply this occurs at a rate of 50 times every second and this is known as Hertz or abbreviated to Hz. When this rate is multiplied by 60 (seconds in a minute) the result is 3,000 revolutions per minute of the generator.

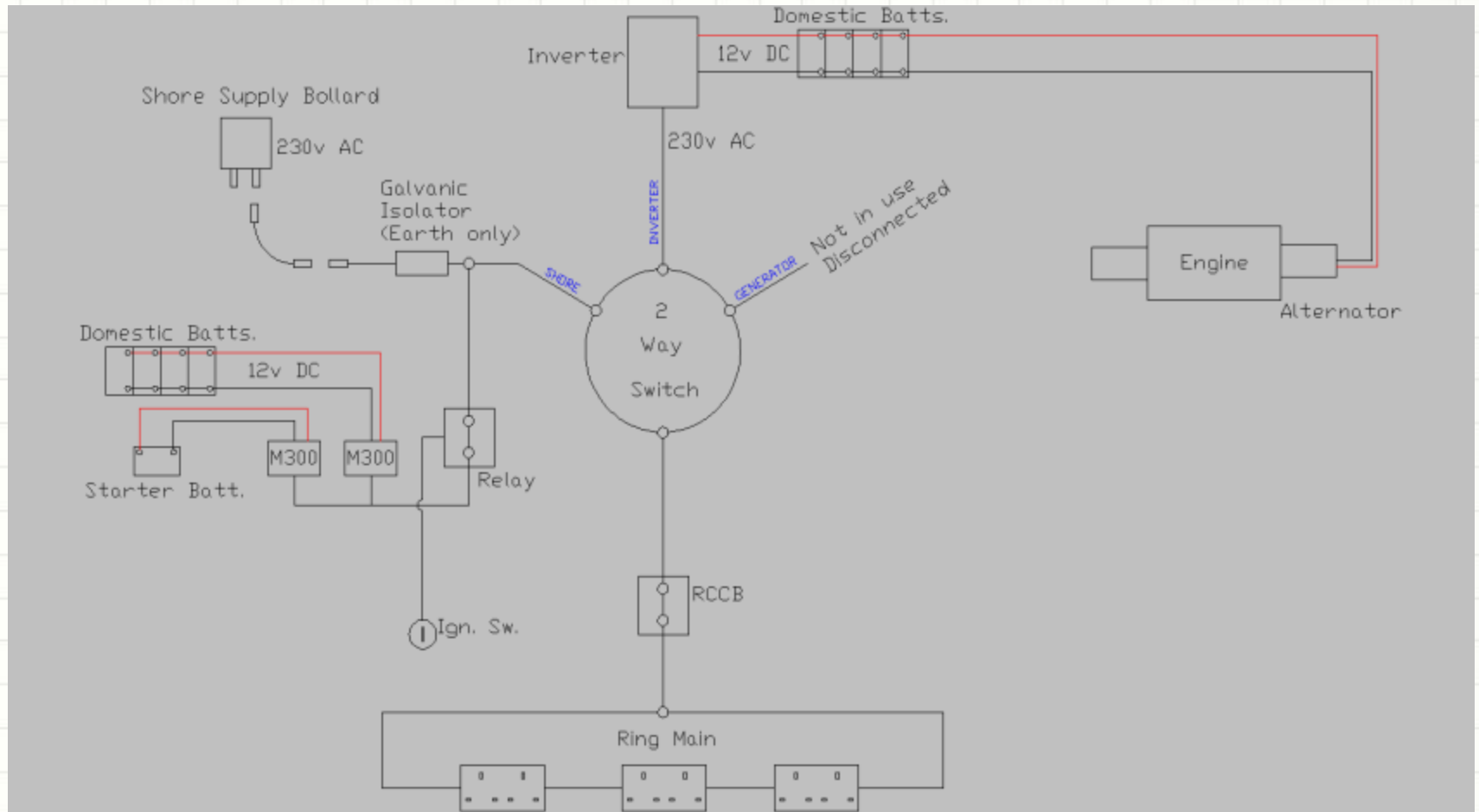
If the conductors were coiled up, increasing the length of the conductor within the generator, more of the conductor can pass through the magnetic field in one pass generating more energy. Further, if three coils were fitted in the generator, then three phase (3ph) electricity would be generated. These phases can be used separately to drive e.g. a single phase motor in a vacuum cleaner or all together to drive e.g. a three phase motor in an industrial compressor.

Single phase is used mainly in domestic applications and three phase is used for heavy industrial applications such as compressors, furnaces, lathes, milling machines etc.

In a Nutshell...



Basic Wiring Diagram



Q & A

Questions can be directed to the author on

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