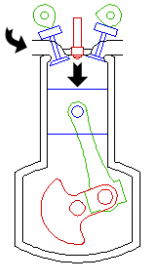
4 Stroke Diesel Engine

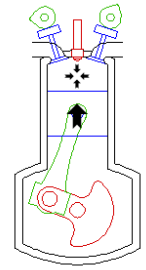
Intake

The intake valve opens, and fresh air (containing no fuel), is drawn into the cylinder.



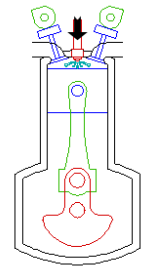
Compression

As the piston rises, the air is compressed, causing its temperature to rise. At the end of the compression stroke, the air is hot enough to ignite fuel.



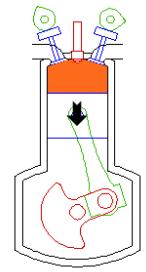
Injection

Near the top of the compression stroke, the fuel injector drives fuel into the cylinder. The fuel immediately ignites upon contact with the hot compressed air.



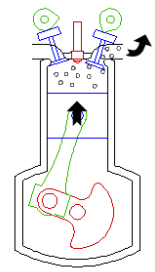
Power

As the fuel burns, the gas in the cylinder heats and expands, driving the piston.



Exhaust

The exhaust valve opens, and the exhaust is driven out



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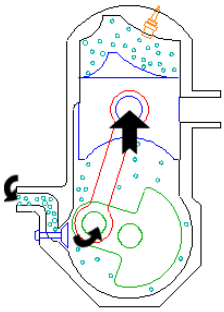
2 Stroke Engine

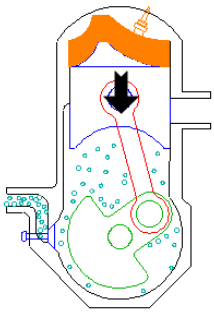
Intake

The fuel/air mixture is first drawn into the crankcase by the vacuum that is created during the upward stroke of the piston. The illustrated engine features a poppet intake valve; however, many engines use a rotary value incorporated into the crankshaft.



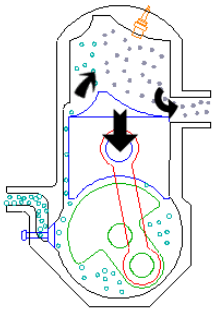
Crankcase compression

During the downward stroke, the poppet valve is forced closed by the increased crankcase pressure. The fuel mixture is then compressed in the crankcase during the remainder of the stroke.



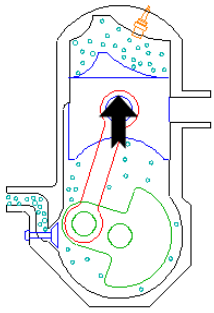
Transfer/Exhaust

Toward the end of the stroke, the piston exposes the intake port, allowing the compressed fuel/air mixture in the crankcase to escape around the piston into the main cylinder. This expels the exhaust gasses out the exhaust port, usually located on the opposite side of the cylinder. Unfortunately, some of the fresh fuel mixture is usually expelled as well.



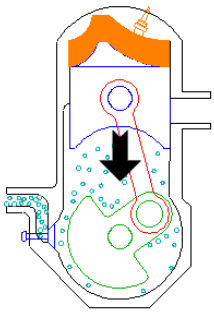
Compression

The piston then rises, driven by flywheel momentum, and compresses the fuel mixture. (At the same time, another intake stroke is happening beneath the piston).



Power

At the top of the stroke, the spark plug ignites the fuel mixture. The burning fuel expands, driving the piston downward, to complete the cycle. (At the same time, another crankcase compression stroke is happening beneath the piston.)



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Diesel vs. Gasoline

Since the two stroke engine fires on every revolution of the crankshaft, a two stroke engine is usually more powerful than a four stroke engine of equivalent size. This, coupled with their lighter, simpler construction, makes the two stroke engine popular in chainsaws, line trimmers, outboard motors, snowmobiles, jet-skis, light motorcycles, and model airplanes. These advantages make the two-cycle outboard a good motor for the *Inland Seas'* tender.

Unfortunately, most two stroke engines are inefficient and are terrible polluters due to the amount of unspent fuel that escapes through the exhaust port.

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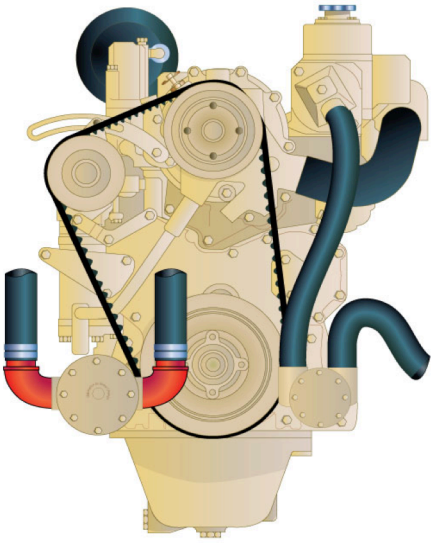
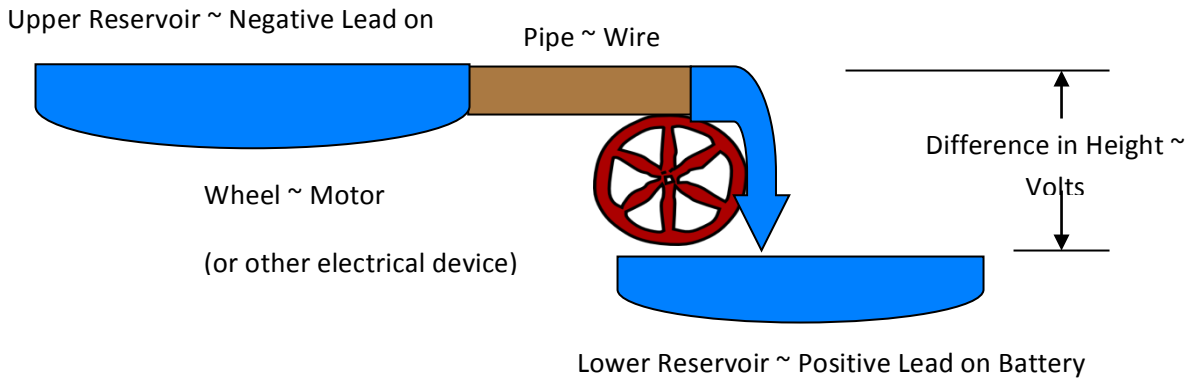


The Diesel engine is one of the most energy efficient engines available. In addition, diesel fuel is less volatile than gasoline and therefore, safer. *Inland Seas'* main engine is a diesel for these reasons.

To see an animated version of the previous as well as other curious engines, go to http://www.animatedengines.com

DC (Direct Current) Electricity

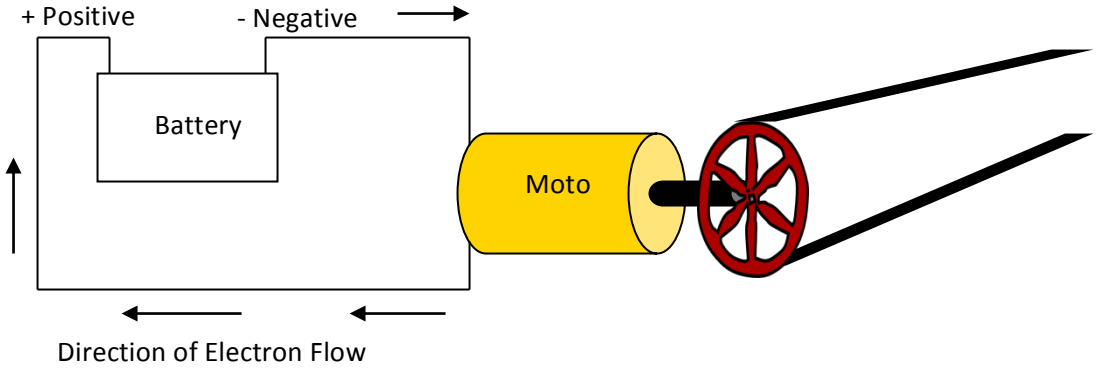
DC Electricity is analogous to flowing



Amount of Water Flowing through Pipe ~ Current

Amount that water is being kept from free flowing ~ Resistance

Force of turning the wheel ~ Power

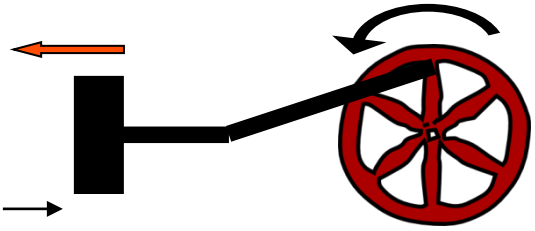


DC power is usually supplied by a battery which eventually will become depleted. It's analogous to the lower reservoir of water filling to the level of the upper reservoir. A good example is the electrical power in your car being supplied by your car battery. If you leave your lights on the battery will soon loose potential to where it can no longer power the electrical systems. If the engine is running, however, the battery is constantly being charged by an engine driven alternator.

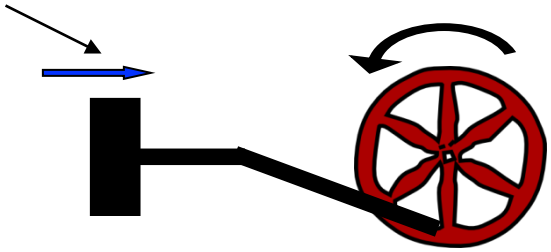
! Something I should clarify: Conventionally, the flow of electricity is represented as going from positive to negative, but according to physics, the actual electrons flow from the negative ground (which is an endless source of electrons) to positive. You can think of a charged battery as having a depletion of electrons in the positive post toward which electrons will have a tendency to flow.

AC (Alternating Current) Electricity

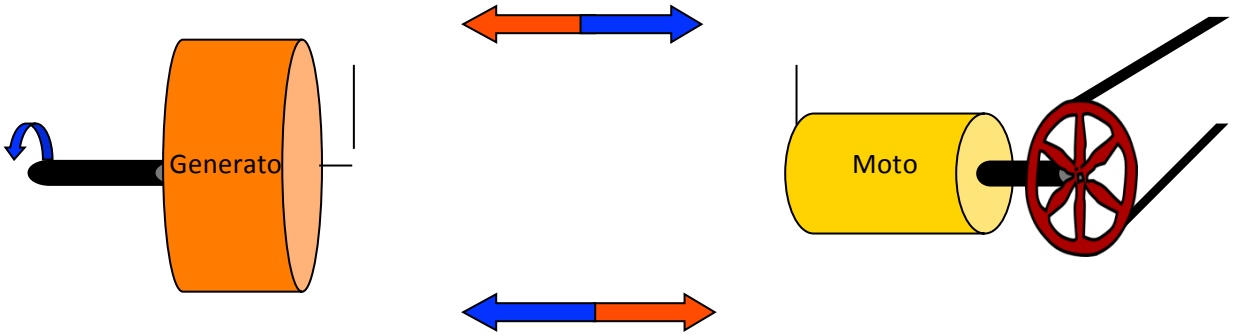
AC Electricity is analogous to a piston on an engine



Direction of piston movement ~ Flow of electricity



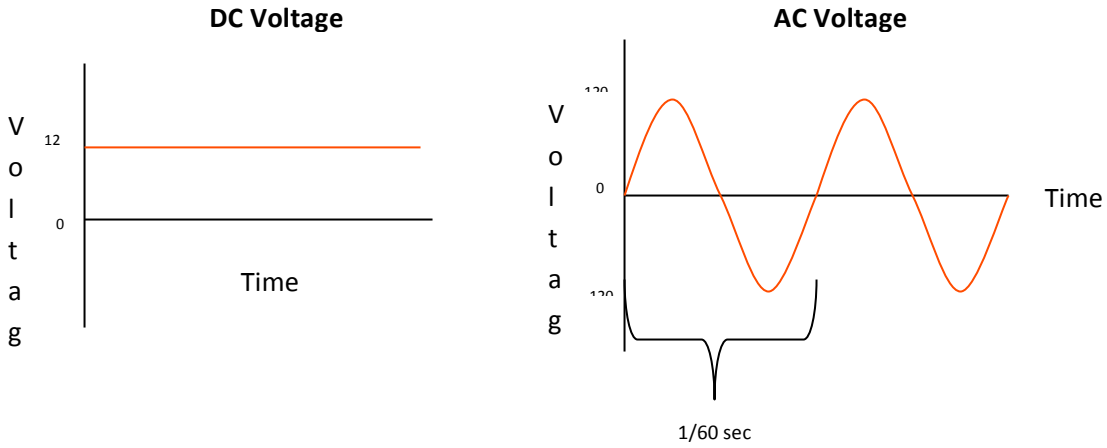
Instead of flowing continuously in the direction from negative to positive as in DC current, the flow of electrons in AC Current is rapidly shifted back and forth along the wire. You can sort of imagine it as if the electrons were pushing and pulling along the wire in order to do work.



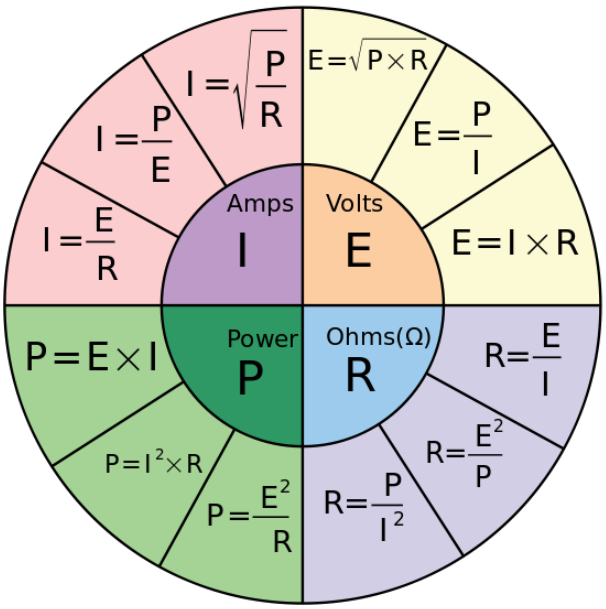
The flow of electrons change in the direction of the red then blue arrows respectively over time. In the United States, the frequency of this change is 60 cycles in one second. We call this frequency ***Hertz***.

AC power is generally supplied by an electrical generator rather than a battery. An exception to this is where a device known as an **inverter** is employed for the supply of AC power by using DC current. While out sailing board *Inland Seas*, we are unable to use AC power from the shore. Since we do not have an on board generator, we use an inverter to convert 12 volt DC power from our battery bank to 120 volt AC power in order to use common household appliances such as a coffee maker.

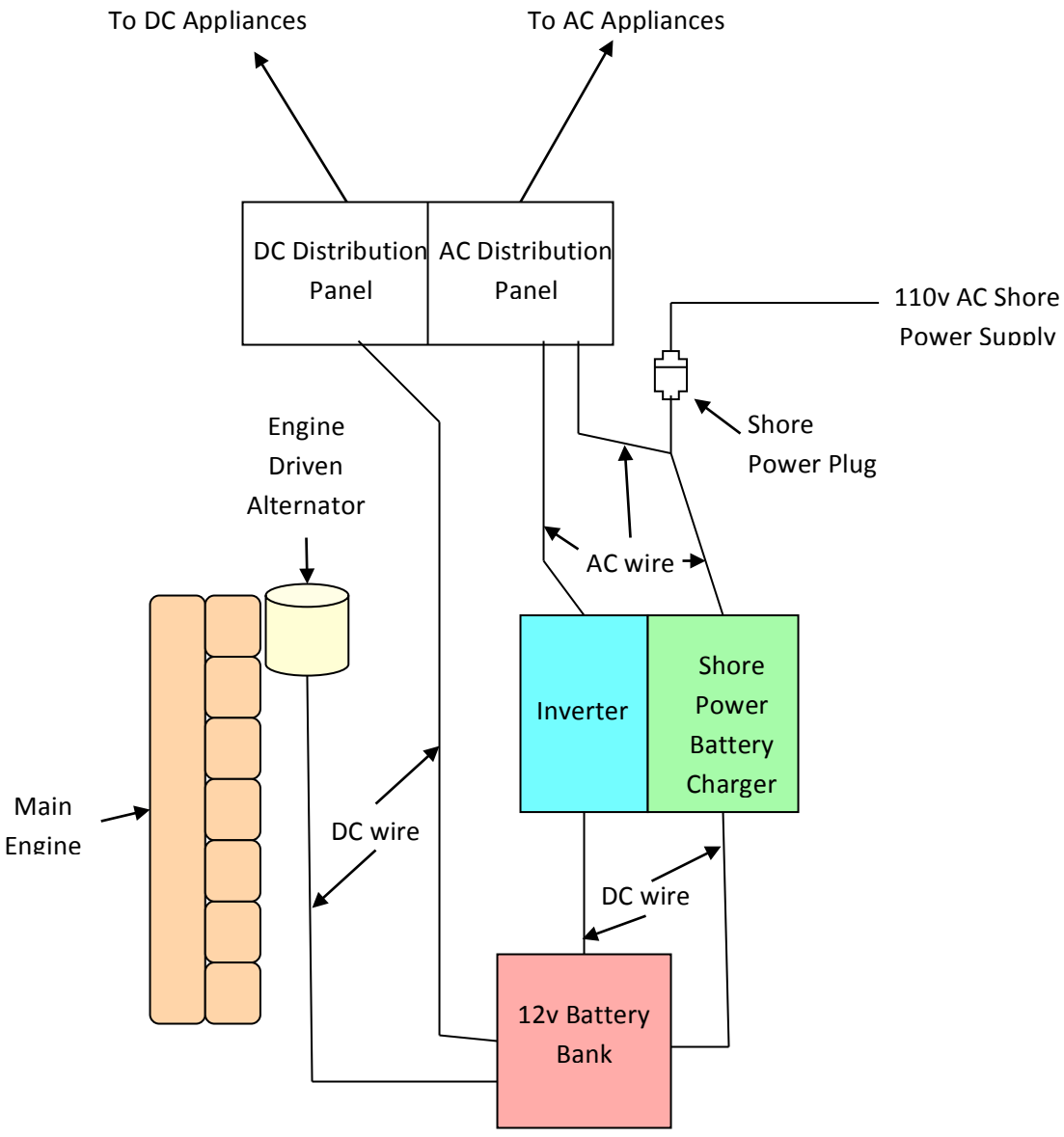
Below are two graphic representations of AC and DC current respectively. While the DC current remains at 12Volts over time, AC current alternates through 120 and –120 volts 60 times per second. This frequency is what's known as Hertz (Hz). In the United States, Our AC power runs at 120 volts at 60 Hz or 60 cycles per second whereas in Europe, AC power runs at 230 volts at 50 Hz. If you travel over seas you will need a power converter for any plug in electrical appliances.



Ohm's Law



Ohm's Law is the relationship between Volts, Amps, Ohms, and Watts. If any two of the values I, P, E, or R are known, the others can be calculated using Ohm's Law


To DC Appliances
To AC Appliances
DC Distribution Panel
AC Distribution Panel
110v AC Shore Power Supply
Shore Power Plug
Engine Driven Alternator
AC wire
Inverter
Shore Power Battery Charger
Main Engine
DC wire
DC wire
12v Battery Bank