

Inverters

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Inverters are a device which can convert 12 or 24 volt DC to 120 volt AC. This allows us to have the luxury of using household appliances and entertainment systems greatly enhancing our boating pleasure. Connected to a boats DC battery bank it allows us to have silent AC power.

As simple as this sounds introducing an inverter to the boats system can become very complex dependent on our expectations. An inverter can be one of our best friends or our worst nightmare. The cheapest part of an inverter installation is the purchase of the unit. To make it function effectively can be expensive.

Before choosing an inverter it is important to understand how an inverter works and the impact it will have on your boats present DC system. If you find that you have limited battery storage capabilities presently then you will have to consider the installation of additional batteries to operate the inverter. Remember there is no free power. Whatever we take out of the batteries we have to replace by some charging method. The power draws of an inverter may surprise you. We are used to AC appliance hooked to a power grid at home with no limitations and take their loads for granted.

When using AC appliance then we have to understand what effect it is having on the batteries. To do this we look at the load that the device draws measured in watts and divide by the voltage of the battery. For ex: the power draw of a 100 watt light bulb. 100 watts divided by 12 volts equals a draw of 8.33 amps off the battery. This is a load we take for granted at home but draws more than the normal refrigeration unit on a boat. When using an inverter we have to be power conscious and not take things for granted.

There are many types of inverters on the market ranging from 75 watts to 4000 watt. Some are simple and some very complex. Inverters are available in different sine wave options, built in chargers and external displays. We'll look at some of these to gain an understanding.

Wattage

Inverters have a wattage rating that determines the maximum load that the unit can operate. Therefore we have to determine the load we need to run in watts before choosing an inverter. For example a household computer draws around 300 watts.

Sine Wave

Sine wave is important. Inverter is manufactured in square, modified and true sine wave. Utility power at your home is true sine wave. True sine wave is the best. Most cheap inverters are modified sine wave. Although laptop computers and some devices do work off modified sine wave other devices do not like it. Modified sine wave can

cause lines to run through your TV screen. Motors do not work as efficiently and your refrigerator compressor may have a shortened life. True sine wave units have come down in price and are the best way to go. If you are into high tech. entertainment systems and computers then True sine wave is the only way to go.

Portable Inverters

These are small inverters usually 75 to 175 watt size that can be plugged into a 12 volt outlet and are used to power laptop computers and light load devices.

Permanent Inverters

These units may range in size from 300 watt to 3000 watt. They usually have AC outlets mounted on the front of them and can have devices plugged directly into them or can be hardwired.

Combination Inverter/Charger

These units are the top of the line units and have many features that make them completely automatic in operation when professionally installed. These units range in the 1500 watt to 4000 watt size. These units have built in battery chargers that range from 100 to 130 amps for fast charging of a proper sized battery bank when on shorepower or generator. Most of these units have remote panels that allow you to turn on and off the inverter or charger and also to monitor the battery bank so you know when to charge the batteries or how much load you are using.

The first consideration when choosing an inverter is to determine the loads that you plan to supply for a 24 hour period, how long you use the appliance and the effect it will have on your 12 volt batteries. Following is a sample load calculation

Item	Wattage	Current draw In Amp	Hrs of use	Amp/hrs
19" TV	100	8.3	3	24.9
VCR	50	4.2	2	8.4
Stereo	50	4.2	3	12.6
Blender	300	25.0	0.2 (12 min)	0.5
Coffee Maker	1000	83.4	0.2 (12 min)	1.7
Microwave	1200	100.0	0.3 (18 min)	3.0
Hairdryer	1250	104.0	0.1 (6 min)	10.4

The amp/hrs is calculated by dividing the Wattage by the voltage (12volt) to give you the amp draw off the batteries. Multiply this by the hours of use to give the daily draw in amp hrs.

In the above example we would use 61.5 amp/hrs from our batteries.

The inverter would have to be large enough to provide power to whatever appliance you would be running at the same time. The minimum inverter above would be 1500 watt to operate the largest single load.

The battery bank should be 3 to 4 times the daily amp/hrs consumed. For the above example you would need 61.5 amp/hr times 4 = 246 amp/hrs. This would require a minimum of two 31series, 1 8D or two 6 volt golf cart batteries for the inverter load only. These batteries have to be rated as deep cycle. Don't forget you need a method to get these batteries charged after they have been discharged. This is a complete story on its own. "The Balanced Energy System".

INSTALLATIONS

BASIC

There are many small 75 up to 400 watt inverters on the market which can be installed by the novice and used for individual loads. You will need to consider the following:

- Inverters are not ignition proofed and should not be located in an engine room
- Make sure that the source of power you use has heavy enough wiring to handle the load the unit will draw. Follow the manufactures recommendations
- Ensure that proper fusing is used at the power source.
- Turn the unit off when not in use as it consumes power all the time it is on

ADVANCED

The large combination Inverter/Charger 1500 to 4000 watt are best left to be done by a professional since these units require AC input breakers, modifications to the AC panel, large battery cables requiring special pressing equipment. Each installation differs dependent on the owner's requirements.

In Conclusion in order to have a trouble free inverter installation which you can enjoy and reap the benefits from that you desire it requires the following:

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- **Proper load calculation**
- **Proper system design**
- **Proper installation**
- **Proper monitoring of system**
- **Proper maintenance of system and batteries**

OK get an inverter and happy boating.