VIBS 2018
PYS Presentation

Inverter Selection & Installation Tips

By Jeff Cote

Pacific Yacht Systems Inc.

design • installation • service • support

p | 604-284-5171 w | www.pysystems.ca a | 1641 Powell Street, Vancouver, BC V5L 1H5

A Little about PYS

- 11 years in business
- Genesis: wanted a reliable and safe electrical system
- What makes us different
  - Expertise through specialization & repetition
    - 2017: Over 750 boats
  - Teamwork breeds synergy
- Team members
  - Detailed oriented
  - Passion for doing it right the 1st time
  - Our installations are safe and follow:
    ABYC and NMEA standards

What's an Inverter?

- Run AC appliances without shore power or a generator
  - TV
  - Microwave
  - Computer
  - AC outlets
- Inverts DC battery power to AC power
- Inverter is opposite of battery charger (aka converter)

Inverter Requirements

- Large enough battery bank to sustain large amp draw from Inverter
  - Microwave draws 50-60 amp
  - Coffee machine 90-100 amps
- Minimum Battery bank size
  - 200 AHr (2 Golf Cart in series, 2 Group 31s in parallel, 1 8D)
- Battery Bank Voltage 12VDC or 24VDC

Inverter - Purchasing Tips
Wattage Size?

- What's inverter intended purpose?
  - Microwave, computer charging, TV, blender, etc…
  - Look at wattage specification of AC appliances
- Advice: Get a slightly larger inverter then you need
- EXAMPLES
  - Inverter: 300W – 600W
    - TV, computer charging, portable powertool battery charging
  - Inverter: 1000W
    - Small microwave, blender, etc…
  - Inverter: 2000W
    - Coffee/espresso machine, hairdryer, etc…

Inverter - Purchasing Tips
True Sine vs Modified

- What loads will you be running off Inverter
  - Resistive Loads: Toaster, hairdryer, etc..
  - Inductive Loads: Microwave, fridge, etc…
- PYS Recommendation: true sine wave inverter
  - Provides flexibility
  - More efficient at conversion

Inverter - Purchasing Tips With or Without Charger

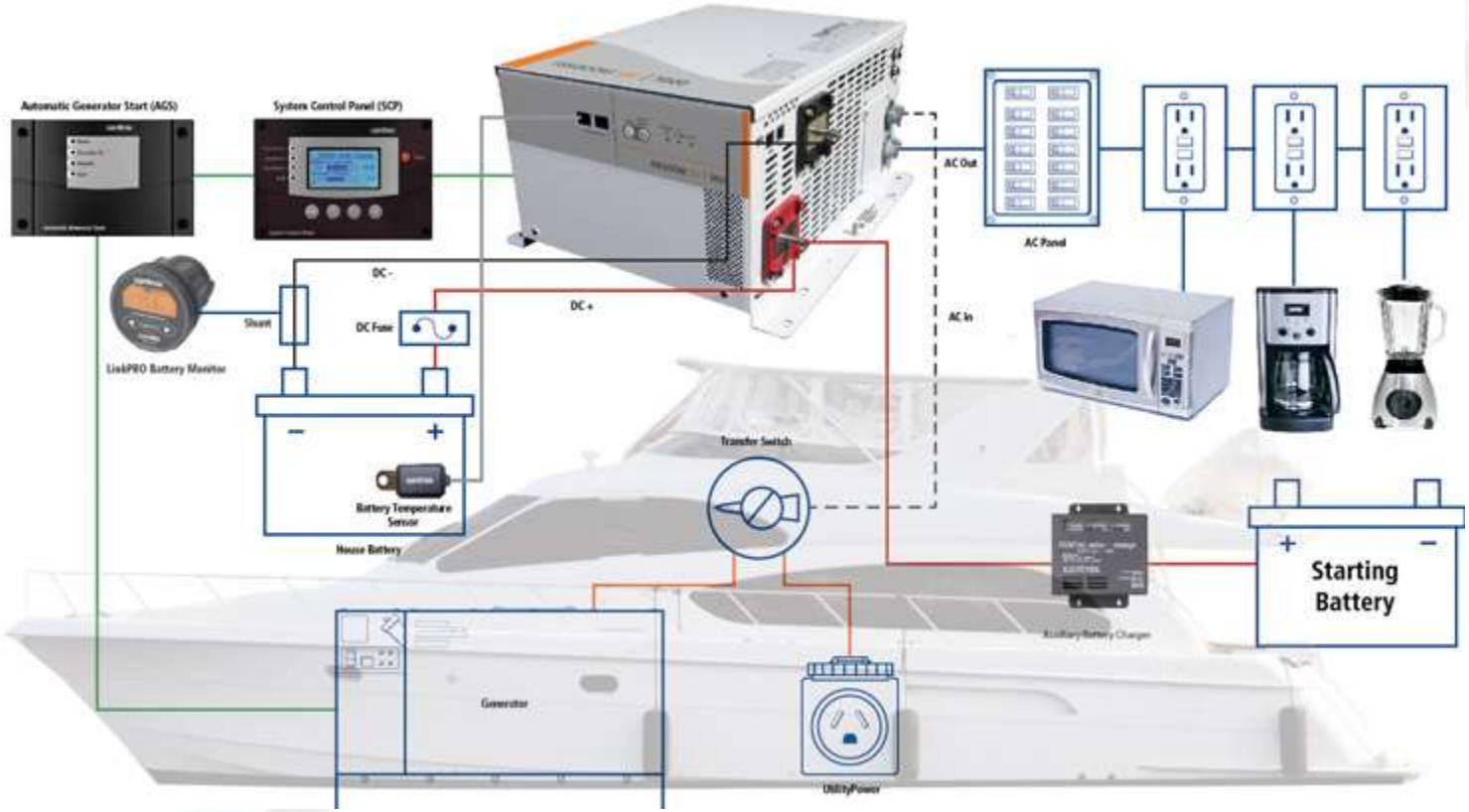
- Many inverters come with a built-in charger
  - 1000W Inverter & 50A Charger
  - 2000W Inverter & 80 - 100A Charger
  - 3000W Inverter & 125 – 150A Charger
- Convenient way to get large battery charger to recharge large battery banks
  - Recall: minimum charge rate is 10% of battery capacity
- Cost effective way to get large charge rate
  - Standalone 100 amp 12 VDC smart charger is about $2K

Inverter/Charger Example

Inverter - Purchasing Tips Interesting Features

- Marine certified
- Low idle power draw (i.e. stand-by mode)
- High efficiency
  - DC to AC conversion
- Power assist mode
- Remote control
  - Disable inverter, power draw, battery voltage
- Built-in charger
  - Custom charge profile e.g. AGM
- Automatic generator start module

Inverter Wiring Schematic



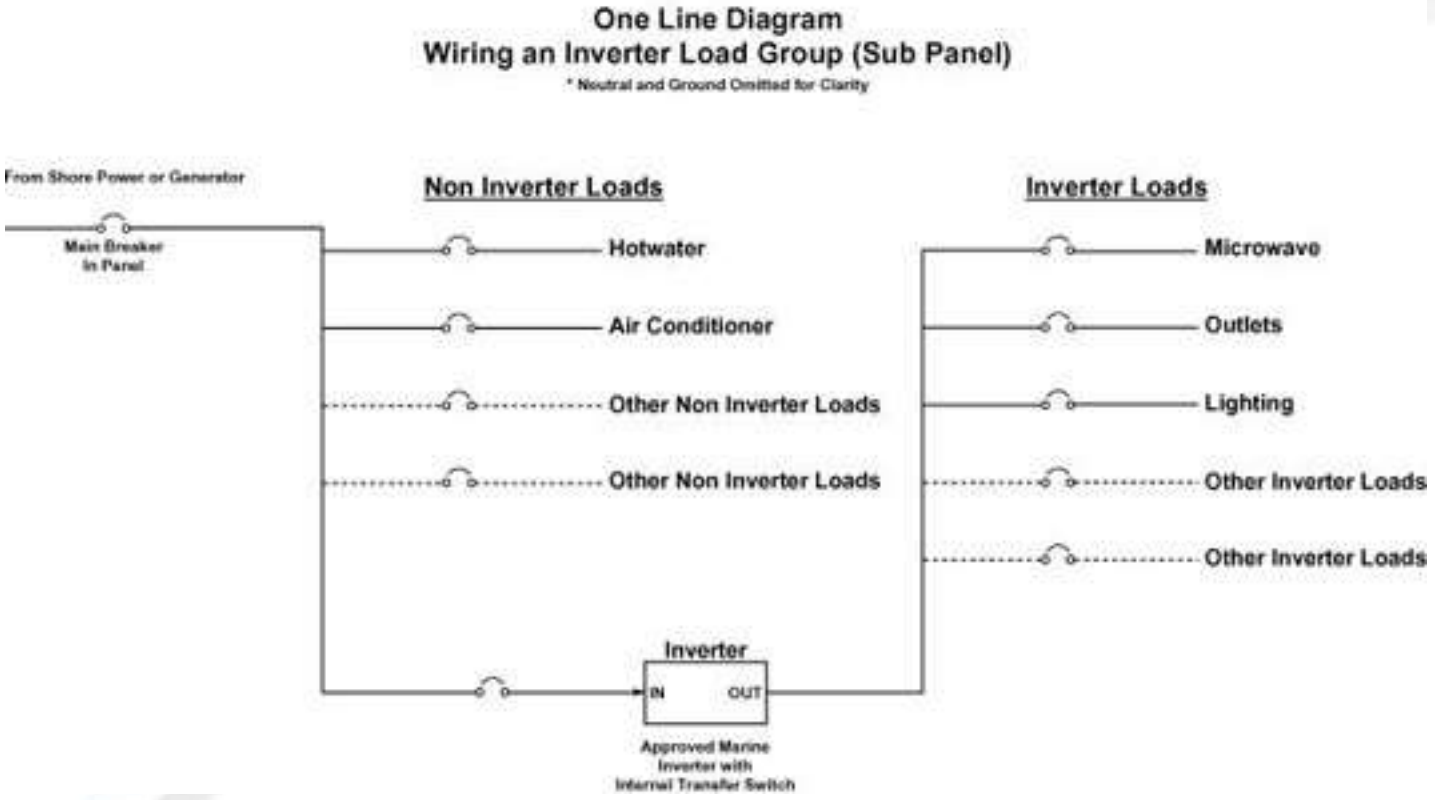
Inverter – Installation Tips
AC Loads to Select

- What AC loads on AC panel will run off inverter
  - AC outlets
  - Microwave
  - Ice Maker
  - Etc…
- Examples of AC loads NOT to connect to inverter (typical install)
  - Hot water heater
  - Air conditioning
  - Battery charger for boat batteries

Inverter/Charger AC One Line

BLUE SEA SYSTEMS

Illustration #1



Inverter - Installation Tips
AC Wiring

- Dedicated inverter/charger AC circuit breaker at AC panel is required
- Marine grade AC wiring
- Inverter-only neutral bus is required
  - i.e. all inverter loads need their own AC neutral bus
- NEVER connect inverter/charger between AC shorepower receptacle and AC panel without circuit protection

Marine AC Wiring

Inverter - Installation Tips
Inverter Location

- Inverters are NOT ignition protected and cannot be installed in gasoline engine room
- Mount in dry location
  - AWAY from potential engine water spray
  - AWAY from rainwater
- Location with good ventilation
- NOT above flooded lead acid batteries
  - Corrosive gassing of batteries while charging

Inverter Mounting Example

Inverter - Installation Tips Fusing

- Choose correct type of fuse (preferred Class T)
- Correct amp rating
- Location of fuse near the battery
- Class T fuse is NOT ignition protected
  - DO NOT install in gasoline engine room
- Fuse to protect inverter and wire inverter
- Carry a spare inverter fuse
  - Hard to find when cruising

Inverter Fuse Re-invented???

Inverter - Installation Tips
Master Disconnect

- On/off master DC disconnect
  - Turn power OFF to inverter for servicing AC or troubles with inverter
- Installed in convenient location for easy access
- Installed after the inverter fuse
- Inverter/charger switch
  - Bypass house switch
  - Direct at battery via fuse

Inverter - Installation Tips
DC Wiring

- Wire size is a function of amperage and voltage drop
  - Consider the whole length of DC positive and negative cable
- Use ABYC color wiring red for positive and yellow for negative
- High amperage connection requires perfect crimp of lug unto inverter battery cable
- Chassis ground cable
  - Needs to be only 1 size smaller then large DC cable size
  - Terminated to DC common bus

Marine Grade Cabling

Inverter/Charger Operation Guidelines

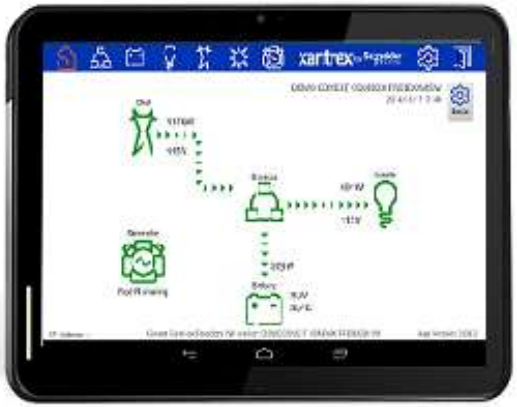
- When connected to shorepower and leaving vessel unattended (for long periods)
  - Turn inverter function off (using inverter button)
    - Especially when large AC loads like a heater are connected to inverter outlets
  - NEVER turn inverter/charger circuit breaker OFF
    - Charger will NOT work without AC input
- Charger function
  - Some models will allow the adjustment of charger output for smaller battery banks and limited AC power use

Old Inverter/Charger Considerations

- An inverter/charger is a cornerstone of many boat AC and DC electrical systems:
  - Charger is essential to recharge batteries while connected to shorepower or running AC generator
  - Many critical AC loads run off inverter: refrigeration, all AC outlets, microwave
  - Pass-through feature is convenient until inverter/charger fails
    - Lost of ALL AC loads even with shorepower or generator
- Inverter/charger rarely fail at the dock charging
  - They fail while doing heavy use

Inverter/Charger Remote Monitoring

- Newer models allow ability to remote login
  - Loss of AC shorepower
  - Capacity of batteries
  - Inverter status



Making it Work vs. Doing it Right

The PYS Difference

- We are boaters too!
- Expertise through Repetition
- Many electrical “fixes” are indicators of the bigger picture.
- We can help you prioritize safety.

Connect with PYS

- Starting Point: PYS Electrical Audit for your boat
  - 90 minutes: Batteries, DC distribution, charger, alternator, inverter
  - Written report: observations & recommendations
  - Cost: $189
- PYS Design Services for DIYers
  - Electrical system designed by PYS (collaborative and to code)
  - Installed by yourself or other outfit
- Pacific Yachting magazine - Monthly Tech Talk Column
- www.pysystems.ca 100s of articles
- Monthly email newsletter

Questions?

Pacific Yacht Systems

marine electronics & electrical

Full-service shop delivering marine electrical and navigation solutions tailored to your vessal and your boating needs.

boating made simple *by design*

design • installation • service • support

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