The Central Ohio Radio Club, Inc.

Home of the Central Ohio Severe Weather Net

More than 50 Years of Service to the

An ARRL Special Service Club

Portable Generators

Power Where You Need It

TechNet

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Tonight's Topics

- Overview
- How Power is Generated
- Sizing a Generator
- Cost
- Safety
- Summary

Overview

WHAT IS A PORTABLE GENERATOR?

- **PORTABLE GENERATOR DEFINED**
  - PORTABLE - EASILY MOVED BY 1-2 PEOPLE
  - INTENDED TO BE USED AS A TEMPORARY SOURCE OF POWER
    - BY COMPARISON, *STANDBY* GENERATORS ARE *PERMANENTLY INSTALLED* UNITS, HIGHER POWER THAN MOST PORTABLES, REQUIRE TRANSFER SWITCH AND INSTALLATION BY QUALIFIED INSTALLERS. THEY CAN BE USED TO SUPPLY POWER TO AN ENTIRE HOME.

BASIC COMPONENTS OF PORTABLE GENERATORS

- INTERNAL CUMBUSTION ENGINE – SINGLE OR MULTI CYLINDER, AIR COOLED
- FUEL TANK
- GENERATOR UNIT
- POWER OUTLETS
- ILLUMINATED INDICATORS, MECHANICAL/ELECTRONIC ENGINE CONTROL, MONITORING, AND CIRCUIT PROTECTION HARDWARE
- MANY WITH WHEELS AND HANDLES

FUEL TYPES

- GASOLINE – MOST COMMON
- LP – NOT AS POPULAR
- DUAL FUEL – GAS & LP

FEATURES

- ELECTRIC START
  - MORE COMMON ON LARGER UNITS
  - BATTERY MAINTENANCE
  - GENSET HEAVIER OVERALL
  - STARTER MOTOR CAN FAIL
- PULL START
  - TYPICAL OF MANY UNITS
- CIRCUIT BREAKER PROTECTED – AC
- 1 OR MORE GFCI OUTLETS
- 12V DC OUTPUT – COMMONLY 10A
  - MAY BE PROTECTED VIA CIRCUIT BREAKER OR FUSE
- USB CHARGE OUTLET(S)
- AUTOMATIC CO SHUTDOWN DETECTION
  - CR can no longer recommend any portable generator that doesn't pass their new CO safety technology test
- LOW OIL PRESSURE SHUTDOWN

POWER AND VOLTAGE RATINGS

- AC OUTPUT (SINGLE PHASE)
  - 120
  - 240
- DC OUTPUT
  - 12V DC ON *SOME* MODELS
- FROM UNDER 1KW to 15KW POWER – WATTS OR KILOWAT

- **Above right**
- **15KW PORTABLE**
- **$2700 to $4300 SHOP IT!**
- **360 LBS**
- **L 48” X W 31” X H 38”**
- **16 GALLON FUEL TANK (10 HOURS AT 7500 WATTS)**
- **120 / 240 & 12VDC**

SURGE VERSUS CONTINUOUS POWER

- SURGE VS. CONTINUOUS POWER
  - MAX SURGE – POWER RATING FOR MOMENTARY LOADS SUCH AS START-UP OF A REFRIGERATOR, POWER TOOLS, ETC.
  - CONTINUOUS POWER – THE POWER A GENERATOR CAN DILVER TO THE LOAD ON A CONTINUOUS BASIS
  - CAUTION – VERIFY THE POWER RATINGS
    - EXAMPLE - SOMETIMES GENERATOR SURGE RATING IS USED IN THE PRODUCT POWER DESCRIPTION
      - “2000W” PRODUCT IS ACTUALLY RATED 1600W CONTINUOUS

HOW POWER IS GENERATED

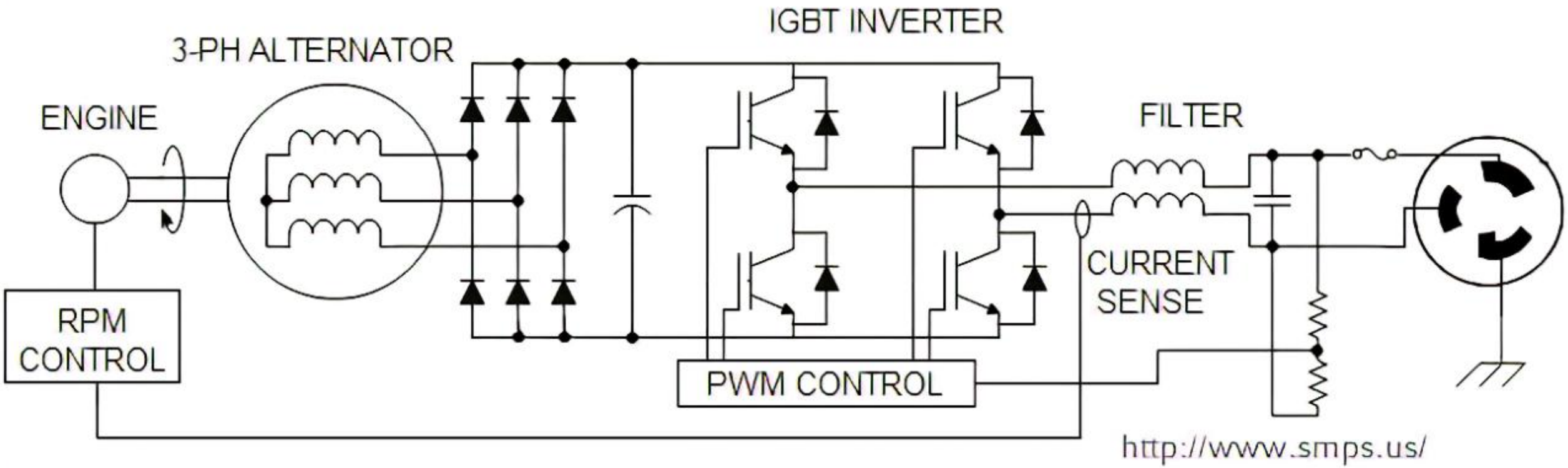
CONVENTIONAL ROTATING ARMATURE AND FIELD

- **PROS**
  - LOW COST
  - GOOD FOR POWER TOOLS, APPLIANCES, LIGHTING
  - RELIABLE
- **CONS**
  - NOISY – RUN AT FULL THROTTLE
  - HEAVY
  - 4 STROKE ENGINE - VOLTAGE REGULATION BASED ON SPEED
  - OUTPUT IS NOT AS CLEAN AS INVERTER TYPE
    - TYPICAL THD IS 9% BUT CAN BE AS HIGH AS 15% - LOWER THD IS BETTER
    - GET THE THD SPEC OFF THE WEBSITE FOR THE UNIT YOU'RE CONSIDERING TO PURCHASE

INVERTER TYPE GENERATORS

- NEWER DESIGN DEVELOPED AND INTRODUCED BY HONDA ABOUT 2010
- THEORY OF OPERATION
  - ENGINE TURNS A HIGH FREQUENCY 3 PHASE MECHANICAL GENERATOR
  - 3 PHASE POWER IS RECTIFIED TO DC
  - THE DC IS THEN FED TO AN INVERTER WHERE IT BECOMES AN AC POWER SOURCE
  - INVERTER OUTPUT IS FED TO USER OUTLETS

BASIC INVERTER GENERATOR SCHEMATIC



INVERTER TYPE GENERATORS

- PROS
  - CLEANER POWER FOR SENSITIVE ELECTRONIC LOADS
    - LCD TV, COMPUTERS
  - PURE SINE WAVE OUTPUT TYPICALLY STATED AT %5 OR LESS
    - **SHOOTING FOR 3% THD**
  - QUIET ENGINE – HIGHER RPM BASED ON LOAD DEMAND
  - WELL REGULATED
  - MORE FUEL EFFICIENT
  - LIGHT WEIGHT
    - 50-60 POUNDS FOR 2KW
    - 100 LBS FOR 3KW
  - GENSET PARALLEING AVAILABLE FOR SOME BRANDS/SIZES

INVERTER TYPE GENERATORS

- CONS
  - HIGHER COST
  - MORE COMPLEX DESIGN

SIZING A PORTABLE GENERATOR

1700 WATT
47 LBS

12,000 WATT
380 LBS

BASICS

- OBTAIN THE CONTINUOUS POWER REQUIREMENTS FOR THE EQUIPMENT THAT YOU PLAN TO
- DETERMINE THE SURGE POWER DEMAND FOR APPLIANCES WITH MOTOR LOADS
  - FRIDGE
  - FREEZER
  - POWER TOOLS
- CONTACT THE GENERATOR MANUFACTURER
- USE AN ON-LINE CALCULATOR AND **READ THE FINE PRINT** ON ITS USE
- IF THERE IS NO SURGE POWER DEMAND, USE CONTINUOUS POWER REQUIREMENTS
  - CONSIDER BUYING A MORE POWER THAN YOU THINK YOU WILL NEED

TOOL/APPLIANCE VS RATED POWER / SURGE POWER DEMAND

Tool/Appliance	Rated (running) Watts	Surge Watts
electric water heater (40 gal)	4000	0
hot plate	2500	0
saw- radial arm	2000	2000
electric stove (each element)	1500-2800	0
saw- circular	1500	1500
air compressor (1 HP)	1500	3000
window air conditioner	1200	1800
saw-miter	1200	1200
microwave	1000	0
well water pump	1000	1000
reciprocating saw	960	1040
sump pump	800	1200
refrigerator freezer	800	1200
furnace blower	800	1300
computer	800	0
electric drill	600	900
television	500	0
deep freezer	500	500
garage door opener	480	0
stereo	400	0
box fan	300	600
clock radio	300	0
security system	180	0
DVD player/ VCR	100	0
common light bulb	75	0

COST

CONVENTIONAL VERSUS INVERTER

- CONVENTIONAL
  - 3.6KW - $400 WESTINGHOUSE (LOWES)
  - 5.25KW - $525 PULSAR (WALMART)
  - 8KW - $1200 DEWALT (HOME DEPOT)
- INVERTER
  - 5.5KW - $1100 OSAK (WALMART)
  - 5KW -$530 NEXPOW (WALMART)
  - 5.5KW - $4500 HONDA (NORTHERN TOOL & EQUIPMENT)
- WIDE PRICE RANGES ACROSS THE MARKET

SAFETY

FROM OSHA…

- CAUSES OF INJURIES AND FATALITIES
  - Shocks and electrocution to workers from improper connection to structures, such as residences, offices, shops and trailers
  - CAUSES OF INJURIES AND FATALITIES TO USERS (OSHA) - Shocks and electrocution to users from improper use

GROUNDING

- NATIONAL ELECTRIC CODE
  - ARTICLE 250 APPLIES
- OSHA
  - 29 CFR 1926.404(f)(3)(i)
  - DEALS WITH REQUIREMENTS RELATING TO GROUNDING BASED ON GENERATOR CONSTRUCTION AND METHOD OF USE AND INSTALLATION

SAFETY CONSIDERATIONS

- CORDS MUST BE IN GOOD CONDITION AND SIZED FOR THE LOAD(S)
- NEVER FUEL A RUNNING GENERATOR
- READ THE USER MANUAL THOROUGHLY AND UNDERSTAND THE CONTENTS
- UNDERSTAND AND FOLLOW ALL GROUNDING REQUIREMENTS FOR YOUR GENERATOR
- **CARBON MONOXIDE WARNING** - DO NOT PLACE A PORTABLE GENERATOR CLOSER THAN 20’ TO A STRUCTURE OR AS INSTRUCTED BY THE SPECIFIC DOCUMENTATION FOR YOUR GENERATOR
  - EVEN WHEN 20’ OR MORE, DO NOT OPEN WINDOWS ADJACENT TO GENERATOR LOCATION

TO SUMMARIZE…

TAKEAWAYS

- WHAT IS THE GENERATOR APPLICATION?
- WHAT QUALITY (THD) POWER IS NEEDED?
- WHAT IS THE TOTAL POWER REQUIREMENT PLUS THE SURGE POWER?
- BUY A BIT MORE POWER THAN YOU THINK YOU WILL NEED
- DOES THE UNIT MEET SURGE POWER RATINGS?
- WHAT IS YOUR BUDGET?
- IS ENGINE NOISE A CONCERN?
- DO YOU NEED HIGH PORTABILITY?
- THERE ARE MANY PRODUCTS TO FIT MANY BUDGETS
- NUMEROUS FEATURES ARE AVAILABLE ACROSS BRANDS AND SIZES

USEFUL LINKS 1 of 3

- OSHA FACT SHEET ON PORTABLE GENERATOR GROUNDING https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.osha.gov/sites/default/files/publications/grounding_port_generator.pdf&ved=2ahUKEwjHuZOK87yQAxUx4MkDHbVPEXcQFnoECB8QAQ&usg=AOvVaw01lkyK9044 8y9SeRrZiwKf

- CARB COMPLIANCE: https://woodstockpower.com/blog/what-is-carb-and-what-does-carb-compliant-generator-mean/

- INFO ON *INVERTER* GENERATORS: https://www.bestgenerator.org/inverter-generators-vs-conventional-generators-whats-the-difference/

- COMPARISON, REVIEW AND SELECTION GUIDE: https://generators.smps.us/inverter-generator.html

INFORMATION LINKS

ALL LINKS TESTED AS OF OCTOBER 24, 2025

USEFUL LINKS 2 of 3

- CONSUMER REPORTS PROS & CONS OF INVERTER GENERATORS
- https://www.consumerreports.org/inverter-generators/pros-and-cons-of-inverter-generators/

- CONSUMER REPORTS - NEW CARBON DIOXIDE SAFETY FEATURE ON PORTABLE GENERATORS
- https://www.consumerreports.org/portable-generators/new-safety-feature-on-portable-generators-could-save-lives-consumer-reports-tests-show/

- LAZAR'S ELECTRIC GENERATOR GUIDE
- http://www.generatorguide.net/

USEFUL LINKS 3 of 3

- GENERATORS AND TOTAL HARMONIC DISTORTION: https://support.generac.com/s/article/What-Is-Total-Harmonic-Distortion-THD
- PORTABLE GENERATOR SIZING GUIDE: https://www.consumerreports.org/home-garden/generators/how-to-choose-the-right-size-generator-a4942266454/

Portable Generators

Thanks for checking in to the CORC TechNet

73 until next time!