Preparing for the **NEXT** Electric Power Failure

A Panel Discussion

By Members of

The New Providence Amateur Radio Club

December 12, 2011

Contact us on www.nparc.org

Stages of Readiness…

Crisis: When you know that something bad is likely to happen.

Emergency: When something bad is happening.

Disaster: When you don't do anything during the previous two stages.

Abe Lincoln said:

You can fool some of the people all of the time,

and all of the people some of the time,

but you can not fool all of the people all of the time.

NPARC says:

We can help some of the people all of the time,

and all of the people some of the time,

but we can't help all of the people all of the time.

BUT - You can do a lot to help yourself.

Each Panel Member…

…Is an experienced member of the New Providence Amateur Radio Club, and is familiar with electrical systems.

…will present a short outline of his presentation on the subject listed, and will use about three slides to illustrate his subject.

…after all the introductory presentations, is prepared with additional slides and materials to answer questions from the audience.

As Moderator …

… I will try to keep the total introduction time to about 15 minutes, and then open the floor to questions.

Panel Members:

Jim Brown WB2EDO

Automatic, natural gas powered systems

Frank McAneny K2EZR

Planning for portable, gasoline powered AC generators

John Zellhofer KC2MTN

Safety considerations including extension cords and transfer switches

Moderated by: Barry G. Cohen K2JV

EMERGENCY POWER SYSTEMS

By Jim Brown WB2EDO

Two Basic types of systems:

1. Portable Systems
2. Permanent, Embedded, Non-Transportable Type

The system described here is Permanent, comprised of:

1. A Generator Unit, and
2. an Automatic Transfer Switch.

The Generator Unit is composed of an internal combustion engine, normally fueled by natural gas, and an Alternating Current Generator.

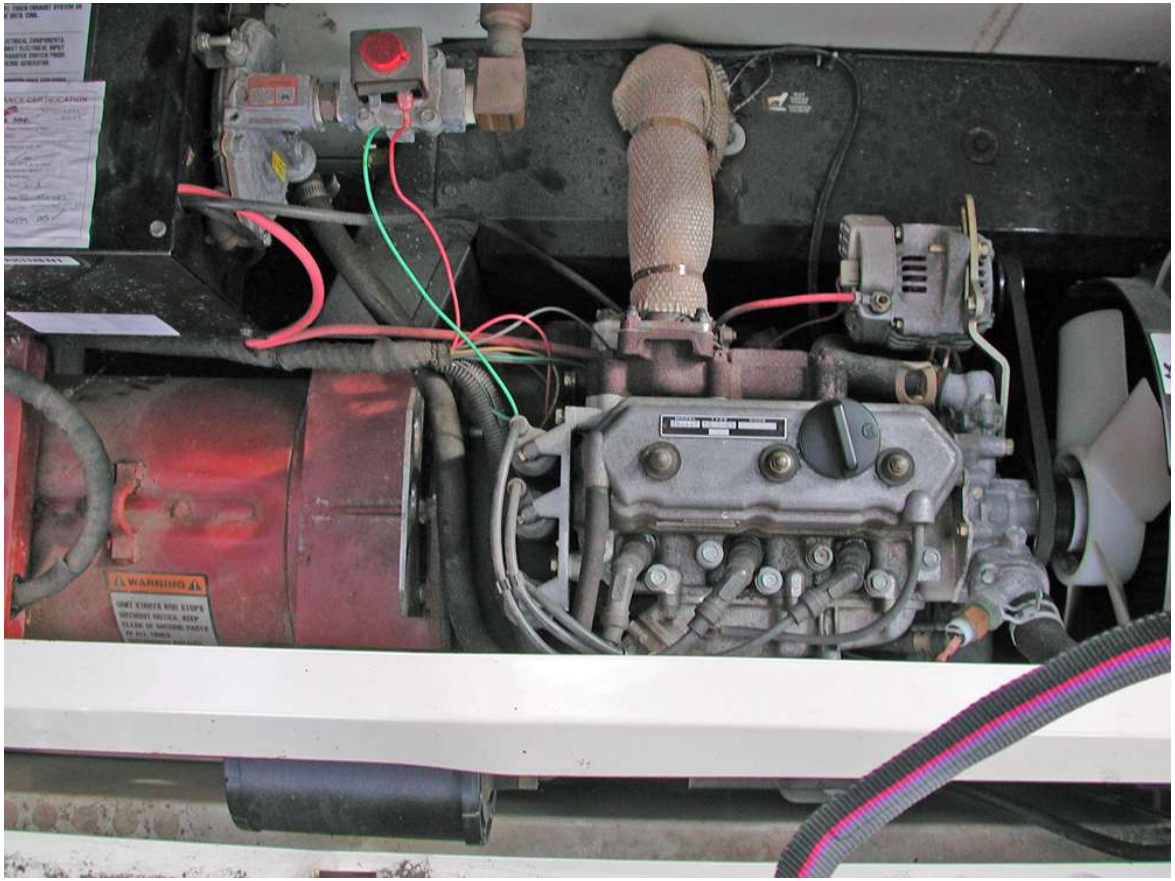
The Transfer Switch

1. Isolates the Generator from the Commercial Power Line,
2. Monitors the system condition
3. Manages the "self-testing" program.

System Capacity described here is 15 KW, and is capable of running a good sized house as to light, heat, refrigerators, freezers, and TVs, but NOT a central air conditioner.

Cost of such a system is about $10,000 to $12,000.

Outside View



Inside View

Planning

By Frank McAneny K2EZR

What Appliances MUST be run?

Sump Pump

Furnace

Refrigerator/Freezer

Any of these which are not “plug in” will require a professionally installed Transfer Switch.

Identify any appliances which require 230 volt service.

Most portable generators will not be able to support them.

Where will the generator be located?

How will it be protected from weather? (Do NOT place it in the garage, just outside the garage with the door open, or anywhere fumes can enter building).

How will you route power into the building?

Obtain extension cords which will be needed. (Best to use #16 or #14 gauge cords. Do not use #18 except for lighting.

Special Considerations

If you must run Medical Equipment, an Elevator, Electric Range, Well or Sewage Pump, etc. Seriously consider a permanently installed generator with automatic controller.

My Experience

December 2011 Snow Storm
and power outage

Using the Honda EU2000i

Successfully ran:

½ HP Sump pump	633 W
Forced Air Furnace	690 W
Refrigerator #1	748 W
Refrigerator #2	886 W
Misc. lights	100 W
Total	3057 W

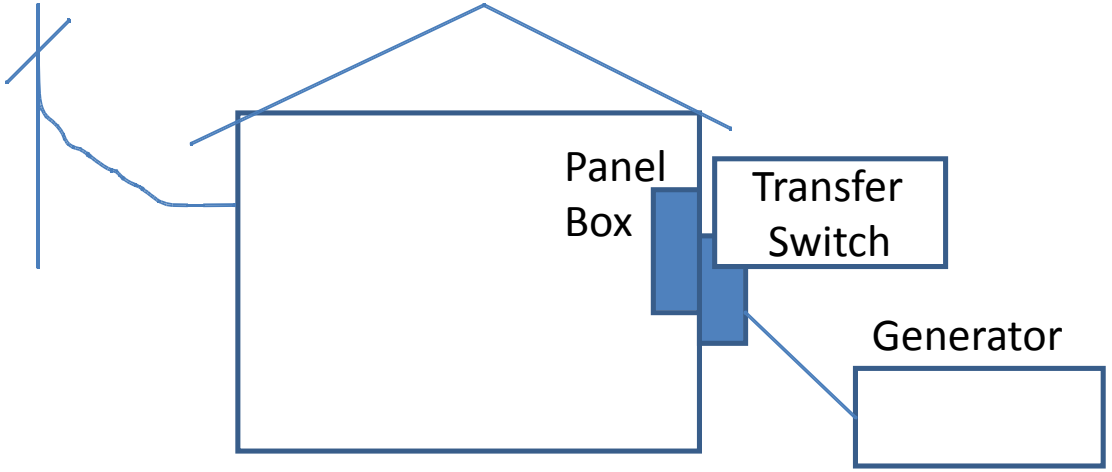
Note: These are full load (starting) values which do not (hopefully) occur simultaneously. Therefore the 2 KW inverter handled them without any problems.

Entrance Panel with Transfer Switch

Power Backup Safety Goals:

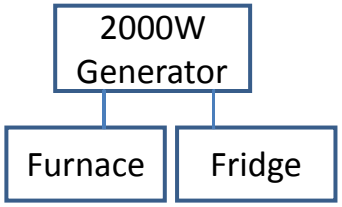
By John Zellhofer KC2MTN

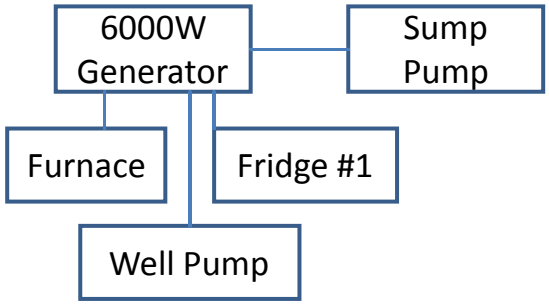
1. Isolate backup power from the power company to protect others on power grid and your own generator.
2. Meet electrical codes, including proper wire size.
3. Place generator in a safe location (e.g. outside of garage door, in an open detached shed, backyard) to avoid electrical shock and carbon monoxide poisoning. (keep a CO sensor on in home).

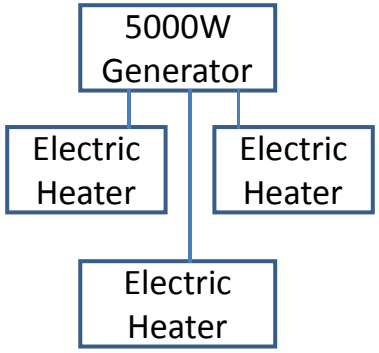


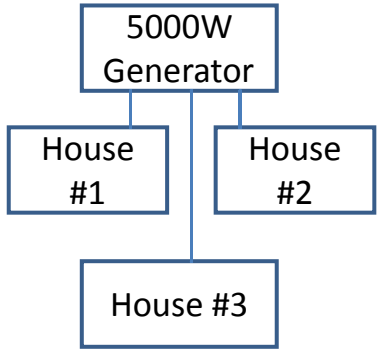
Using Generators With Extension Cords

Rule #1: Operate each device on it's own power cord to generator.
Rule #2: If plug gets warm, replace it or the receptacle it's plugged into.
(unless you have exceeded rating - then reconfigure wiring)
Rule #3: 50' ext. cord – 14 AWG, 100' = 12 AWG, 3 wire with ground.
Rule #4: Keep cord ends dry.









Transfer Switch Safety

Rule#1: Installation to be inspected, preferably installed by a licensed electrician.

Rule#2: Transfer Switch rating is matched to generator.

Rule#3: Follow switching and generator starting instructions carefully.

- Single Manual Transfer Switch ($87.) – most commonly used on a furnace, whereby an extension cord is plugged directly in. Mounted either on furnace or next to panel box, depending on location of generator.
- 6-10 Circuit Manual Transfer Switch (≥ $250.) – located next to circuit breaker panel, inside or outside wall. Any transfer switches or receptacles mounted outdoors must be rated for outdoor use.
- 100A Automatic Transfer Switch (≥$700) – located next to circuit breaker panel. These perform the switching automatically, start the generator and cycle the generator once a week. Must have a generator with remote starting connections. Most commonly used with non-portable generators. A completely installed backup system such as this starts at approx. $7000.

Summary:

- Read “FEMA Important Tips to Ensure Safety When Using Generators”
- See the homedepot.com website for sample selections on transfer switches.

Getting Ready Before a Crisis

Get familiar with possible actions (grandma's house??)

Learn something about generator systems, transfer switches, but most important….

Check out your existing electrical power distribution box.

Determine which circuit breakers control what appliances.

Make sure your distribution includes "Mains Disconnect" circuit breakers.

Make an accurate list and post it in the box.

Make a list of Absolutely Indispensable appliances for a long outage.

Call and get a reliable local electrician to come to your house and advise you.

Being Ready in a Crisis

Have important Emergency Equipment ready “at hand.”

- Flashlights
- Spare Batteries
- Extension Cords
- Battery Operated Radio
- Food and Water
- Got Kids?? Sleeping Bags
- Got a Fireplace?? Wood close at hand
- Got a Gas Range?? Matches

••• What is important to you??

Q & A Period

Portable Electric Generator Safety Tips
(from dom.com)

- Don’t connect your generator directly to your home’s wiring.
- Never plug a portable electric generator into a regular household outlet.
- Don’t overload the generator.
- Never use a generator indoors or in an attached garage.
- Use the proper power cords.
- Read and adhere to the manufacturer’s instructions for safe operation.
- Use proper grounding. (3 wire extension cords)
- Do not store fuel indoors or try to refuel a generator while it’s running.
- Shut the generator down properly. Pull off the extension cords first.
- Avoid getting burned. (hot exhaust system)
- Keep children away.
- Keep windows and doors closed on generator side of house, to prevent exhaust gases from entering into house. (my own tip.)

Simple Shelter

Cable Markings

The letters used to describe portable cords hold signif cance.

S = Service Cord
J = Junior Service - 300 Volt
T = Thermoplastic
O = Oil Resistant

Power Estimation Guide

		Approximate Starting Wattage	Approximate Running Wattage
Refrigerator or Freezer (Energy Star)		1200	132-192
Microwave Oven	650 watts	1000	1000
	800 watts	1300	1300
	1000 watts	1500	1500
Incandescent Lights		as indicated on bulb (i.e. 60W)	
Furnace Fan, gas or fuel oil	1/8 Horsepower	500	300
	1/6 Horsepower	750	500
	1/4 Horsepower	1000	600
	1/3 Horsepower	1400	700
	1/2 Horsepower	2350	875
TV Set	Tube type	300	300
	Flat Screen (20Ó)	120	120
	Flat Screen (46")	190	190
Coffee Maker (4 cup)		600	600
Dishwasher (Cool Dry)		540	216
Electric Fry Pan		1500	1500
Electric Range (8-inch element)		2100	2100
Automatic Washer		2000	1200
Clothes Dryer (Electric)		6750	5400
Radio		50 to 200	50 to 200
Sump Pump	1/3 Horsepower	1300	800
	1/2 Horsepower	2150	1050
Window Air Conditioner (10,000 BTU)		2200	1500
Computer	Laptop	200-250	200-250
	Desktop	600-800	600-800
Printer		400-600	400-600
Hot Water Heater		4500	4500
Garage Door Opener		1420	720

Honda & Yamaha Specifications

- EU2000i Specifications
- Engine Honda GX100
- Displacement 98.5cc
- AC Output 120V 2000W max. (16.7A) 1600W rated (13.3A)
- Receptacles 20A 125V Duplex
- DC Output 12V, 96W (8A)
- Starting System Recoil
- Fuel Tank Capacity 1.1 gal
- Run Time per Tankful 4hrs. @ rated load, 9.6 hrs. @ 1/4 load
- Dimensions (L x W x H) 20.1" x 11.4" x 16.7"
- Noise Level 59 dB @ rated load 53dB @ 1/4 load
- Dry Weight 46.3 lbs.
- Residential Warranty 3 Years
- List Price $1150

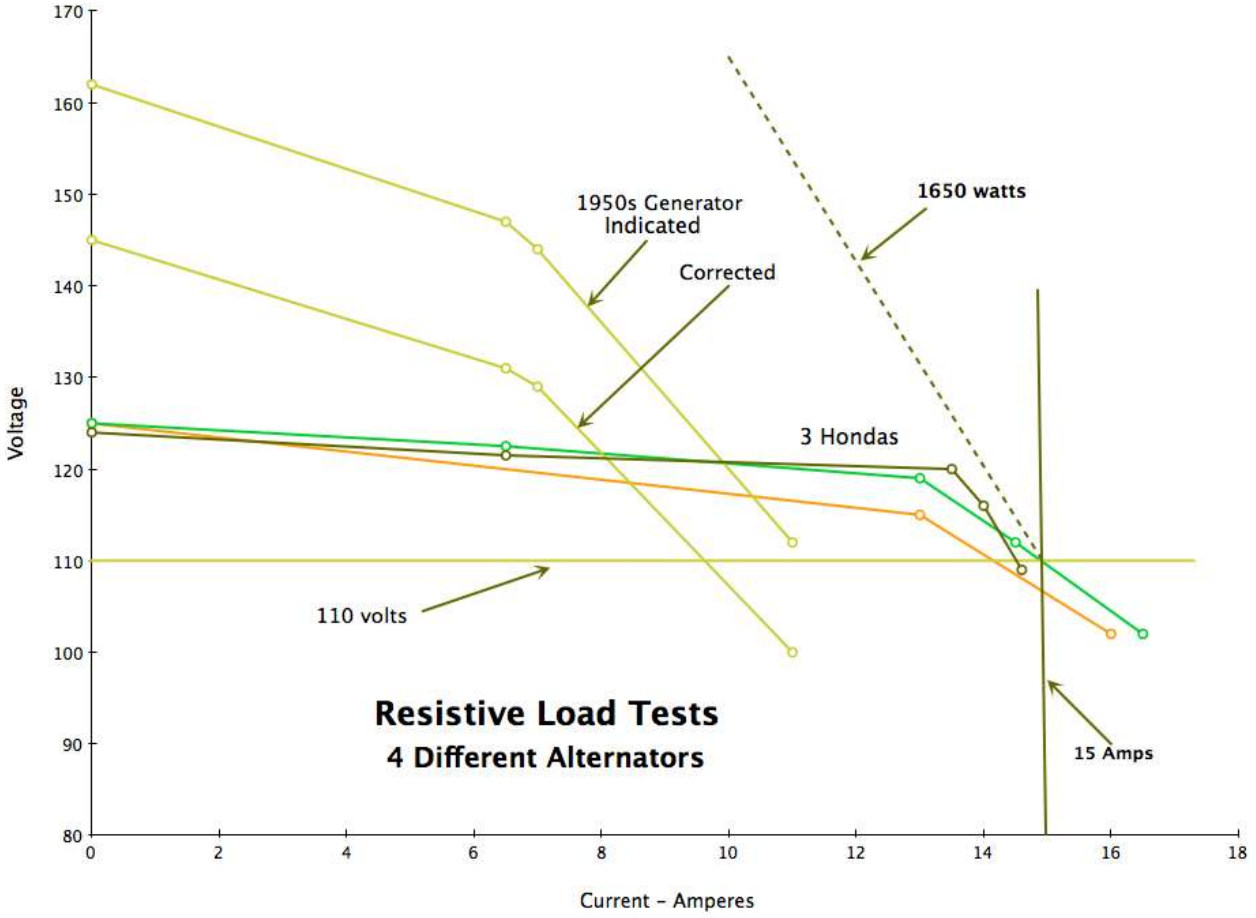
EF2000iS

Engine OHV, Air-Cooled, Four-Stroke, Single Cylinder
Displacement / HP 79cc
Maximum AC Output 2000 Watts
Rated AC Output 1600 Watts
Rated AC Current / Max AC Current 13.3 / 16.7
DC Output 12V, 96W (8A)
Starting System Recoil
Fuel Tank Capacity 1.1 Gallons
Continuous Operation at 1/4 Rated Load 10.5 Hrs.

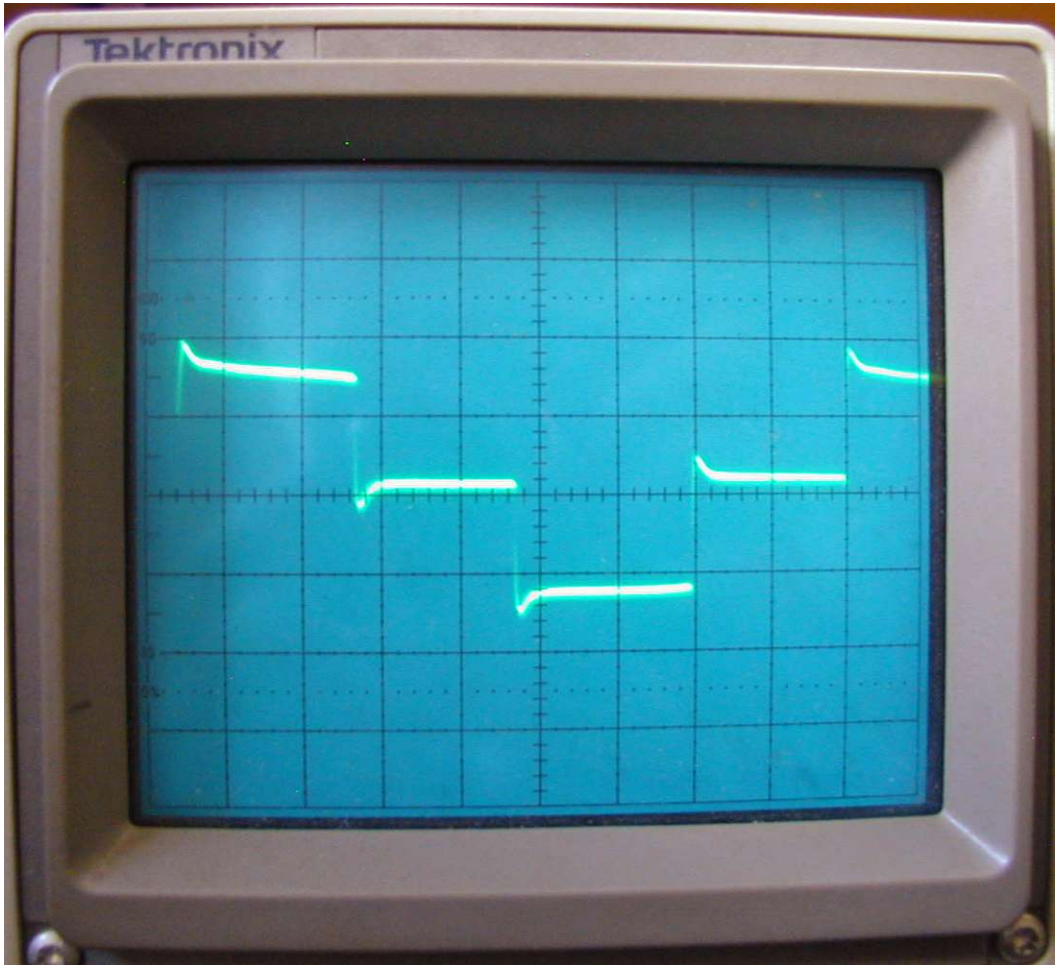
Dimensions (length/width/height)
19.3" x 11.0" x 17.9"
Noise Level 1/4 Load/ Full Load 51.5 dBA / 61dBA

Dry Weight 44.1 lbs
Warranty 3 Year Limited Warranty
List Price $990

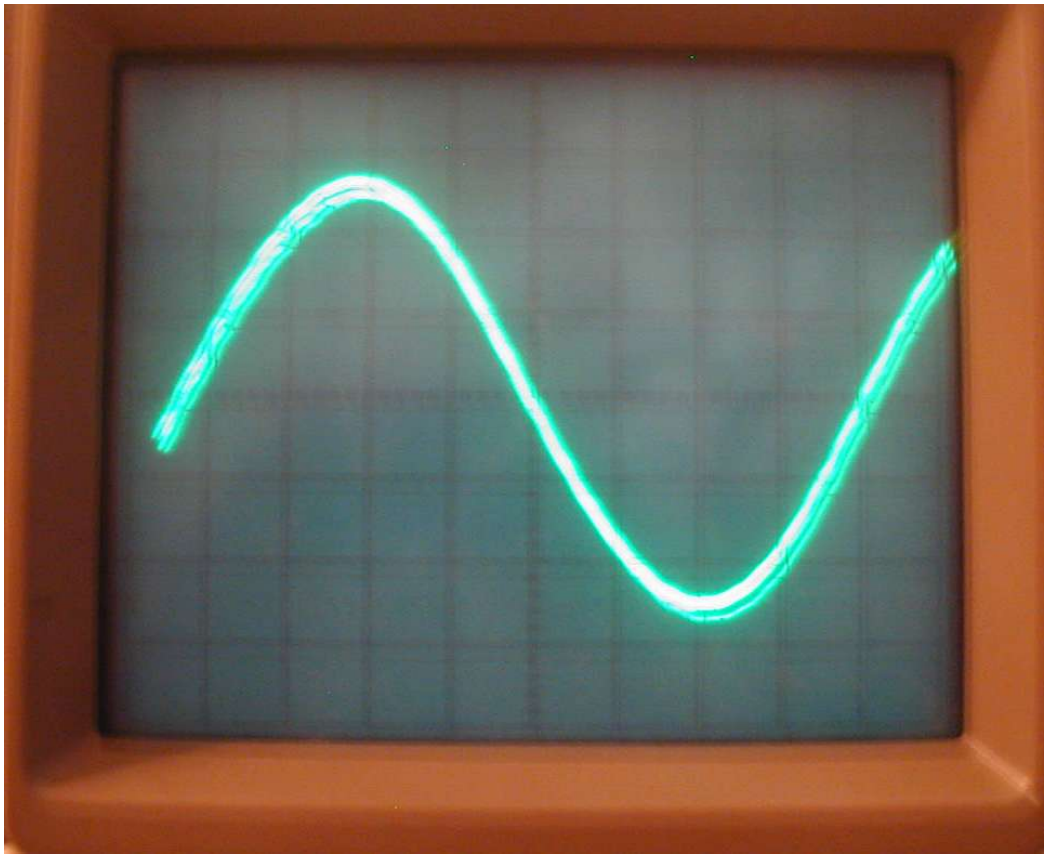
Load Tests


170
160
150
140
130
120
110
100
90
80
Voltage
0
2
4
6
8
10
12
14
16
18
Current – Amperes
1950s Generator
Indicated
Corrected
1650 watts
3 Hondas
110 volts
15 Amps
Resistive Load Tests
4 Different Alternators

300 Watt Inverter Waveform



Honda Waveform



Rotating Field Alternator

1930's Technology