Generator Set Application Guide

for Prime and Stand-by Power Generator Sets

MODEL SELECTION

Northern Lights generator sets provide continuous or standby power for homes, schools, government facilities, farms, campsites and businesses. This guide will help you select the appropriate model for your application. Remember, if you have any questions regarding a particular application, call your local Northern Lights, Inc. representative or factory authorized dealer.

1. Use this Northern Lights Generator application questionnaire for a worksheet. Include all motors, lights, applications, and electrically powered devices to be powered by the generator. If the generator is to be used for standby operation, list only essential lights and appliances needed during a power failure.
2. Continuous operation puts many hours on an engine. Diesel engines are more durable and should be considered for long term operation. Also, diesel fuel is safer than gasoline or propane and more energy efficient. Compare fuel costs over a one month time span.

ESTIMATING ELECTRICAL LOAD

It is important that the correct size Northern Lights generator set be selected. The size generator required is determined by the total wattage of all the equipment and appliances which will be operated at the same time.

Wattage required for any given piece of equipment or appliance is usually printed on the name plate. If only the amps required are listed on the name plate, then use the following formula to figure out the watts needed:

A. Single phase - Amps x Voltage = Watts
B. Three phase - Amps x Voltage x 1.73 + Watts

If there is no data plate, or if the information is not supplied on the data plate, see the following charts for typical wattage requirements of some common motors and appliances. Starting a motor requires several times more power than is needed to run it. If the motor starting load is large, a voltage dip may cause the lights to dim or relays to chatter. Selecting a generator which is inadequate for the peak load may make it difficult to start the motors in air conditioners or freezers, among other high-draw appliances.

Selecting a generator that is too large causes the engine to operate in an overcool condition. This can result in carbon build up in the injector and valves, raw fuel pumping into the exhaust, and other problems.

A good rule of thumb is that the continuous load should be at least 50% of the generator capacity.

BALANCING LOADS

It is recommended that all loads which will be in use at any given time be divided up equally among the generator's output legs. For example, do not put heating loads on one leg, and air conditioning loads on the other leg. If the loads are not balanced properly, it may cause a loss in voltage on the loaded leg and excessive voltage on the unloaded leg as well as low output. Normally, the engine will not be affected by an unbalanced load.

MOTOR LOADS

Electric motors and appliances containing electric motors usually require up to ten times the running wattage during starting. A good rule of thumb when working with motor loads is to take running wattage of the largest motor and multiply that by ten. Then add the running wattage of all the smaller motors, as well as the wattage of all the other loads. This will add up to your total load.

Then determine how much of your total load would be in operation at any one time. If a motor can be wired up at several voltage - for example, 120 volt or 240 volt - it is usually more effective to wire it at the higher voltage. The following charts give some typical power requirements.

MOTOR WATTAGES

Starting wattages of motors vary by its class, which is designated as a NMEA code letter. Try to choose equipment with lower motor starting wattage requirements. These motors are more expensive but allow you to use a smaller generator.

Motor Starting Wattage

NMEA Code Letter	Starting Wattage per H.P.
A	3100
B	3500
C	4000
D	4500
E	5000
F	5600
G	6300
H	7100
J	8000
K	9000
L	10,000
M	11,200

Motor Running Wattage

Size H.P.	Approximate Running Watts
1/6	275
1/4	400
1/3	450
1/2	600
3/4	850

Typical Example

NMEA Code	Starting Watts/H.P.		H.P.		Starting Watts*	Running Watts
A	3100	x	1/2	=	1550	600

Determine starting wattage of largest electric motor by taking NMEA Code Letter on nameplate multiplied by horsepower.
For example: NMEA "A" Coded frame, 1/2 H.P. motor requires 1550 watts for starting (3100 x 1/2 - 1550).
Add running wattages of all other motors to this figure for total motor wattages.

** Starting watts required are determined by NMEA Code Rating on motor nameplate.*

TYPICAL LOAD CALCULATIONS

The following is an example of one method for load calculation to determine the minimum size of panel boards and their main conductors as well as the size of the power source(s) supplying these devices.

A. Lighting Fixtures and Receptacles

Length times width of living space (excluding spaces only for machinery and open deck areas) times 2 watts per square foot.

Formula: _____ x _____ x 2 = _____ lighting watts.
LENGTH WIDTH

B. Small Appliances

Number of circuits times 1,500 watts for each 20 ampere appliance receptacle.

Formula: _____ x 1500 = _____ appliance watts.
NUMBER OF WATTS

Sub-Total: _____ + _____ = _____ total wattage required.
A. LIGHTING FIXTURE WATTS B. SMALL APPLIANCE WATTS

C. Load Factor

First 2,000 total watts at 100%: _____

Remaining total watts times 35%: _____

Total watts divided by system voltage: _____

D. Amperes

If the power system is to operate on 240 volts, split and balance loads into Leg A and Leg B. If power is to operate on 120 volts, use Leg A only.

	Leg A	Leg B
Total Amperes (from "C")		

E. Add name plate amperes for motor and heater loads

	Leg A	Leg B
Exhaust and supply fans		
Air conditioners [1, 2]		
Electric, gas, oil heater[1]		
Other loads (winch, etc.)		
Largest motor		
Sub-total[3]		

NOTES: *1 - Omit the smaller of these two, but include any motor common to both functions.*
2- If system consists of three or more independent units, adjust the total by multiplying by 75% diversity factor.
3- Or, ten times the running amperage of the largest motor, whichever is largest.

F. Add name plate amperes at indicated use factor percentage for:

	Leg A	Leg B
Disposal / 10%		
Water Heater / 100%		
Wall mount oven / 75%		
Cooking units / 75%		
Refrigerator / 100%		
Freezer / 100%		
Ice maker / 50%		
Dishwasher / 25%		
Washing machine / 25%		
Dryer / 25%		
Trash compactor / 10%		
Air compressor / 10%		
Battery chargers / 100%		
Vacuum system / 10%		
Other fixed appliances		
Sub-total		

NOTE: If four or more appliances are installed, adjust the total by multiplying by a 60% diversity factor.

Adjusted Sub-total		

G. Add amps for free-standing range, distinguished from separate oven and cooking units in "F". Derive from following table by dividing watts by 120 volts or 240 volts, depending on which unit is installed.

Sub-total		

H.

	Leg A	Leg B
Lighting and small appliances		
Motors		
Fixed appliances		
Free standing range		
Total		

NOTE: If the total for Legs A and B are unequal, use the larger value to determine the real power required.

TYPICAL RUNNING LOADS

(See data plate for exact wattage)

Kitchen	Watts
Dishwasher	1000 -2500
Garbage disposal	300-400
Microwave oven	650-1600
Range (per element)	500-1500
Water heater	3500-5000

Laundry	Watts
Dryer	4000-5000
Iron	500-1300
Washer	250-1200

Food Storage	Watts
Freezer*	350-850
Refrigerator*	350-850

Comfort and Health	Watts
Air conditioner (12,000 BTU)*	3200
Electric blanket	70-225
Furnace (1/4 HP)*	800
Furnace (1/2 HP)*	1200
Oil burner on furnace	300
Fan	50-100
Heat lamp	250
Heater	1000-2000
Oil-fired space heater (30,000 BTU)	150
Sun lamp	400

Personal Grooming	Watts
Curling iron	600
Hair dryer	750-1000

Portables	Watts
Coffee maker	1000
Frying pan	1000-1400
Fryer	1300
Kettle	1500
Mixer	150-300
Toaster oven	1000-1500
Toaster	800-1200
Waffle iron	600-1300

Electronics	Watts
Desktop PC	80-200
Laptop	20-75
Printer	100
Stereo	100-300
Radio	50
TV	300-400
Satellite Dish	100

Other	Watts
Clock	4-10
Sewing machine	1000
Vacuum cleaner	400-1000
Milk cooler*	1100
Jet pump*	800

Lawn/Garden Tools	Watts
Chain saw	1200
Lawn mower	1200
Edge Trimmer	500
Weed Trimmer	500
Hedge Trimmer	450

Construction/Tools	Watts
Radial arm saw	2600
Concrete vibrator	2500
Compressor (1 HP)*	2000
Electric nail gun	1200
Disc sander (9”)	1200
Belt sander (3”)	1000
Submersible pump (1-1/2 HP)*	4000
Circular saw (6-1/2”)	1000
Battery charger (20 amp)	500
Hand drill (3/8”)	500
Hand drill (1/4”)	250
Airless paint sprayer (1/3 HP)*	600
Impact wrench	500
Oil-fired space heater (140,000 BTU)	400
Oil-fired space heater (85,000 BTU)	225

** Include calculations for motor starting requirements on these items.*

Corporate Headquarters
4420 14th Ave. NW
Seattle, WA 98107-4616
Tel: 206-789-3880
Fax: 206-782-5455
Toll Free: 800-762-0165
info@northern-lights.com

Alaska Branch Office
1200 W. Int’l Airport Rd.
Anchorage, AK 99518-0208
Tel: 907-562-2222
Fax: 907-563-1921
Toll Free: 800-478-3006
alaska@northern-lights.com

Eastern US Branch Office
Northern Lights Industrial Park
8 Connector Road
Andover, MA 01810
Tel: 978-475-7400
Fax: 978-475-7745
Toll Free: 800-480-4223
northeast@northern-lights.com

Southeastern US Branch Office
1419 W. Newport Center Drive
Deerfield Beach, FL 33441
Tel: 954-421-1717
Fax: 954-421-1712
Toll Free: 800-843-6140
southeast@northern-lights.com

www.northern-lights.com