Standby Generators - *Doing it Right*

1. Proper Sizing
2. Proper Installation
3. Other Considerations

Electrical Contractors

- Mercer County Electric (Ft. Recovery, 419-375-2514)
- Seitz Electric (Celina, 419-925-5206)
- Roessner Energy (Coldwater, 419-678-4858)
- Schleuter Home Services (Celina, 419-586-2322)
- Kogge Electric (St. Marys, 419-394-6162)
- Nagel Electric (Wapak, 419-738-2884 or 738-2595)
- Sparta Electric (Lima, 419-331-6941 or 1-800-682-8736)
- Sarka Electric (Columbus Grove, 419-532-3492)
- Overholt Electric (Middlepoint, 419-968-2015)
- Bender Electrical Contracting (St. Henry, 419-678-0002)

Wholesale/Retail Supply Stores

- Mesco Electrical Supply (New Bremen, 419-629-2711 or 1-800-821-1755)
- Dickman Supply (Celina, 419-584-1170)
- All-Phase Electric Supply (Lima, 419-221-1000)
- Lowe's, Home Depot, Menards

On-Line

- www.harborfreight.com
- www.generac.com

Midwest Electric, Inc.
A Touchstone Energy® Cooperative
1-800-962-3830
www.midwestrec.com

Proper Sizing

- An under-sized generator can damage your connected equipment or your generator.
- An over-sized generator is a waste of money. You're paying for more capacity than you need.
- Many people do not consider the extra starting wattage requirement from motor loads.

How to Size It

1. Identify the critical appliances that you'll want running during a power outage.
2. Calculate your "rated" wattage requirements. Rated, or running wattage, is the amount of electricity necessary to run your appliances continuously.
3. Calculate your "surge" wattage requirements. Surge, or starting wattage, is the additional amount of electricity needed for 2-3 seconds to start electric motors commonly found in household appliances (such as furnace fan or refrigerator).
4. Since appliances rarely start-up at the same time, you will only need to factor in the appliance with the highest additional surge watts.
5. Decide whether the generator will be sized for using appliances simultaneously or for manually rotating appliances.

What Watt?

- Check the serial plate or owner's manual for a listing of the appliance's wattage requirement
- If it does not list watts, then multiply Volts x Amps = Watts. For example, a television running at 120 volts and 2 amps would = 240 watts.
- If it does not list the additional surge watt requirement: This can range from 2 to 7 times the running wattage, but typically is 2 to 3 times the running wattage. So you may need to estimate it accordingly if the serial plate or owner's manual does not list the surge watt requirement.

Other Safety & Maintenance Issues

- "Exercise" -- Run the generator for one hour once a month
- Generator should be grounded, using #6 solid copper wire and an 8-foot ground rod.
- Never run a generator inside a basement, or a garage or any enclosed area. It creates deadly carbon monoxide fumes.
- Never shut off a generator under load. Shut off the load first.
- Check with your insurance company to see if you'll qualify for a reduced premium for having a standby generator.

Wattage Worksheet Example

- Refrigerator: 800 running watts, 1600 additional surge watts
- 1/2 hp furnace fan: 800 running watts, 1300 additional surge watts
- Deep freezer: 500 running watts, 500 additional surge watts
- Television: 500 running watts
- 6 Lights, 75 watts each: 450 watts

Tool or Appliance	Rated (running) watts	Additional Surge (starting) watts
1. Refrigerator	800	1600
2. Furnace Fan	800	1300
3. Freezer	500	500
4. Television	500	-
5. 6 Lights, 75 w each	450	-
6.		
7.		
8.		
9.		
10.		

Total Rated Watts	**3050**
+ Highest Additional Surge Watts	**1600**
Total Watts	**4650**

- With this example, you need a generator that produces at least 3050 total rated watts and 4650 total surge watts.
- With this example, we are assuming that only one motor load (surge watts) will cycle or start at the same time.

- Wattage requirements will vary. For example, different refrigerators may have different wattage requirements. The following pages are average and typical wattage guidelines, but are estimates only. Check your appliance for exact watage requirements.

Take-Home Sizing Sheet

1. Identify the critical appliances that you'll want running during a power outage.
2. Calculate your "rated" wattage requirements. Rated, or running wattage, is the amount of electricity necessary to run your appliances continuously. Ideally, look at the appliance's serial plate or owner's manual to determine its wattage; or, use the following wattage sheets.
3. Calculate your "surge" wattage requirements. Surge, or starting wattage, is the additional amount of electricity needed for 2-3 seconds to start electric motors commonly found in household appliances (such as furnace fan or refrigerator).
4. Since appliances rarely start-up at the same time, you will only need to factor in the appliance with the highest additional surge watts.
5. Decide whether the generator will be sized for using appliances simultaneously or for manually rotating appliances.

Tool or Appliance	Rated (running) watts	Additional Surge (starting) watts
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

Total Rated Watts _____
+ Highest Additional Surge Watts _____
Total Watts _____

WATTAGE REFERENCE GUIDE

FREQUENTLY ASKED QUESTIONS

What if I can't determine the rated or the surge watt requirement for a tool or appliance?

If the rated/running watts are not on the tool or appliance, you may estimate using the following equation: WATTS=VOLTS x AMPS. Only motor-driven items will have an additional surge requirement. The additional surge watts required may be estimated at 1 – 2x the rated/running watts.

Why is only one additional surge watt item used to calculate your total surge watt requirement?

Unlike rated watts, surge watts are only needed during the first few seconds of operation. In most cases, only one item will start or cycle at the same time, therefore this is the most accurate estimate. The guide below lists rated and surge watt totals separately to help you determine which tool or appliance represents your total wattage requirement.

TOOL OR APPLIANCE	RATED (RUNNING) WATTS	ADDITIONAL SURGE (STARTING) WATTS
HOME		
Light Bulb - 75 Watt	75	–
Deep Freezer	500	500
Sump Pump	800	1200
Refrigerator/Freezer	800	1600
Water Well Pump 1/3 HP	1000	2000
HEATING/ COOLING		
Space Heater	1800	–
Table Fan - 14"	200	400
Ceiling Fan	800	1200
Furnace Fan Blower 1/2 HP	800	1300
Window AC - 10000 BTU	1200	1800
Window AC - 12000 BTU	3250	3950
* Central AC - 10000 BTU	1500	4500
Heat Pump	4700	4500
KITCHEN		
Microwave Oven - 1000 Watt	1000	–
Coffee Maker	1500	–
Electric Stove - Single Element	1500	–
Dishwasher - Hot Dry	1500	1500
FAMILY ROOM		
DVD/CD Player	100	–
VCR	100	–
Stereo Receiver	450	–
Color Television - 27"	500	–
LAUNDRY ROOM		
Iron	1200	–
Washing Machine	1150	2250
Clothes Dryer	5400	1350

TOOL OR APPLIANCE	RATED (RUNNING) WATTS	ADDITIONAL SURGE (STARTING) WATTS
OFFICE EQUIPMENT		
Personal Computer with 17" Monitor	800	–
Fax Machine	65	–
Laser Printer	950	–
Inkjet Printer	80	–
Copy Machine	1600	–
OTHER		
Security System	180	–
AM/FM Clock Radio	100	–
Garage Door Opener - 1/2 HP	480	520
Hair Dryer - 1250 Watt	1250	–
Electric Water Heater - 40 Gallon	4000	–
DO-IT-YOURSELF JOBSITE		
Quartz Halogen Work Light	1000	–
Airless Sprayer - 1/3 HP	600	1200
Reciprocating Saw	960	–
Electric Drill - 1/2 HP	1000	1000
Circular Saw - 7 1/4"	1500	1500
Miter Saw - 10"	1800	1800
Planer/Jointer - 6"	1800	1800
Table/Radial Arm Saw 10"	2000	2000
Air Compressor - 1 1/2 HP	2500	2500

The above are estimates only. Check your tool or appliance for exact wattage requirements. The wattages listed in our reference guide are based on estimated wattage requirements. For exact wattages, check the data plate or owner's manual on the item you wish to power.

** Please consult an electrician for your particular central AC requirements.*

How much *LOAD* should your generator take?

Overloading a generator in excess of its rated wattage capacity can result in damage to the generator and to connected electrical devices.

Observe the following, to prevent overloading the unit:

Add up the total wattage of all electrical devices to be connected at one time. This total should NOT be greater than the generator's wattage capacity. The rated wattage of tools, appliances and motors usually can be found on a data plate or decal affixed to the device.

If the wattage information is not available, multiply volts times ampere rating to determine watts (volts x amps = watts). Some electric motors, such as induction types, require about three times more watts of power for starting than for running. This surge of power lasts for only a few seconds when starting such motors.

Be sure you allow for this high starting wattage when selecting electrical devices to connect to your generator, and when buying your generator. First figure the watts needed to start the largest motor. Add to that figure the running watts of all other connected loads. The list below can help you to determine the wattage of various household items.

Device	Running Watts
Battery Charger (20 Amp)	500
Belt Sander (3-inch)	1,000
Electric Chain Saw	1,200
Circular Saw (6 1/2-inch)	800 to 1,000
*Clothes Dryer (Electric)	5,750
*Clothes Dryer (Gas)	700
*Clothes Washer	1,150
Coffee Maker	1,750
*Compressor (1 HP)	2,000
*Compressor (3/4 HP)	1,800
*Compressor (1/2 HP)	1,400
*Freezer	700
*Dehumidifier	650
Disc Sander (9-inch)	1,200
Edge Trimmer	500
Electric Nail Gun	1,200
Electric Range (per element)	1,500
Electric Skillet	1,250
*Furnace Fan (3/5 HP)	875
Hand Drill	250 to 1,100
Hedge Trimmer	450
Impact Wrench	500
Iron	1,200
*Jet Pump	800
Lawn Mower	1,200
Light Bulb	60 to 100
*Milk Cooler	1,100
Oil Burner on Furnace	300
Oil-Fired Space Heater (140,000 Btu)	400
Oil-Fired Space Heater (85,000 Btu)	225
Oil-Fired Space Heater (30,000 Btu)	150
*Paint Sprayer, Airless (1/3 HP)	600
Paint Sprayer, Airless (handheld)	150
Radio	50 to 200
*Refrigerator	700
Slow Cooker	200
*Submersible Pump (1 1/2 HP)	2,800
*Submersible Pump (1 HP)	2,000
*Submersible Pump (1/2 HP)	1,500
*Sump Pump	800 to 1,050
*Table Saw (10-inch)	1750 to 2,000
Weed Trimmer	500

*** Allow three times the listed watts for starting.**

TYPICAL ELECTRIC TOOL AND APPLIANCE WATTAGES

Note: This chart is provided to suggest typical values. Actual wattages may be significantly higher or lower depending on age, size, make, and condition of appliance.

Equipment	Running Watts	Maximum VA
Light bulb (100W)	100	100
Radio	150	150
Fan	200	600
Television	400	400
Refrigerator (conventional)	400	1200
Furnace fan—1.3 HP with blower	600	1800
Vacuum cleaner	600	1800
Sump pump—1.3 HP	700	2100
Refrigerator/freezer combination	800	2400
6" Circular saw	800	2400
Floodlight	1000	1000
1/2" Drill	1000	3000
Toaster coffeemaker	1200	1200
14" Chain saw	1200	3600
Water well pump—1.2 HP	1400	4200
Hot plate range (per burner)	1500	1500
10" Circular saw	2000	6000
Water Heater (storage-type)	5000	5000
Electric oven	10,000	10,000

Table 1--Wattage and Horsepower Requirements of Typical Farm and Residential Equipment

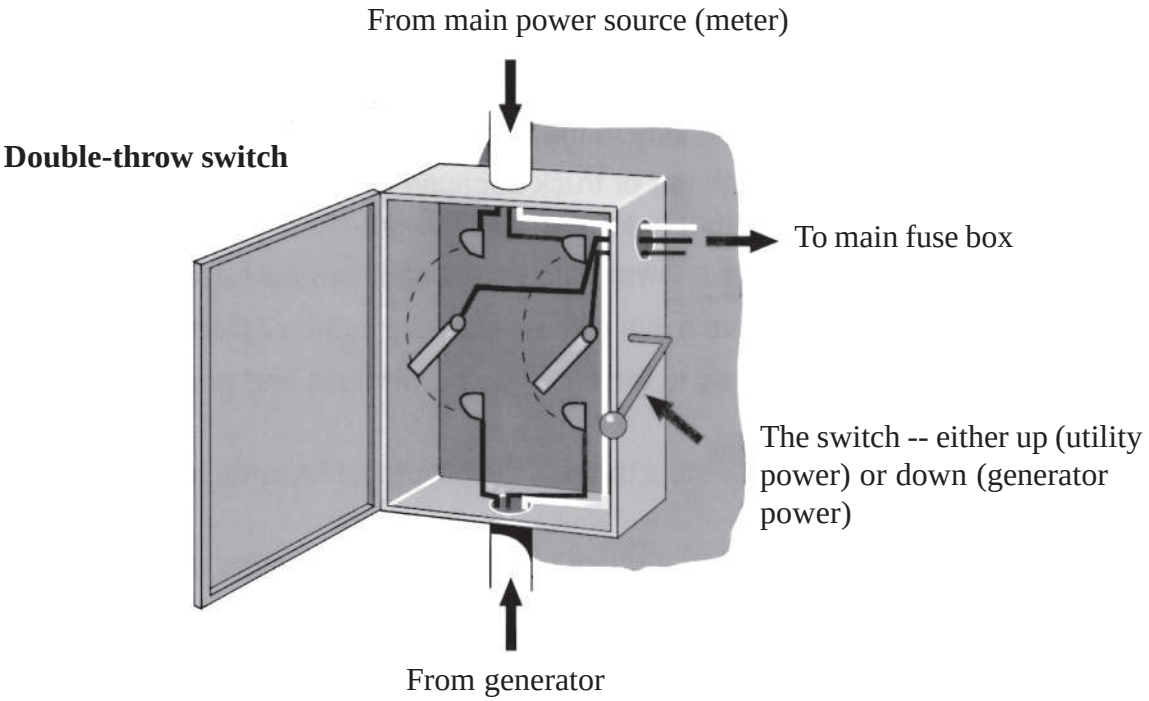
Kind of Equipment	*Typical Size*	
Farm Equipment:	***Horsepower***	***Running Watts***
Milking vacuum pump	*5 - 15*	*4,390 - 12,030*
Bulk milk cooler	*1 - 12*	*1,005 - 9,946*
Milk pump	*1 - 2*	*1,005 - 1,935*
Water pump	*1/3 - 2*	*360 - 1,935*
Water heater	**	*1,500-4,500*
Milking parlor heater	**	*2,000-10,000*
Space heater	**	*1,000-5,000*
Ventilation fans	*1/4 - 1*	*295 - 1,005*
Silo unloader	*2 - 7 1/2*	*1,935 - 6,430*
Electric fence	**	*7-10*
Feed grinding	*1-10*	*1,005 - 8,475*
Feed mixing	*1 - 5*	*1,005 - 4,390*
Feed conveyor	*½ - 5*	*525 - 4,390*
Gutter cleaner	*3 - 5*	*2,635 - 4,388*
Infrared lamp	**	*175 - 250*
Yard light	**	*100-500*
Shop tools	*1/6 - 1*	*205 - 1,005*
Residential Equipment:	***Horsepower***	***Running Watts***
Refrigerator (15 cu ft)	*1/4 - 1/2*	*295 - 525*
Freezer	*1/4 - 1/2*	*295 - 525*
Coffeemaker	**	*1,000-1,500*
Furnace fan	*1/4 - 1/2*	*295 - 525*
Electric range w/oven	**	*5,000 - 12,200*
Microwave oven	**	*1,450 - 1,600*
Electric heater	**	*600 & up*
Radio	**	*50 -200*
Window air conditioner	*½ - 2*	*525 - 1,490*
Central air conditioner	*2 - 5*	*1,490 - 4,390*
Electric fan	*1/6 - 1/4*	*205 - 295*
Electric water heater	**	*1,500 - 5,000*
Water pump	*½ - 2*	*525 - 1,490*
Television	**	*80-600*

** indicates a non-motorized electric load

Assumed motor efficiency values: 1/6, 61%; 1/4, 63%; 1/3, 69%; 1/2, 71%; 3/4, 72%; 1, 74%; 1½, 75%; 2, 77%; 3, 79%; 5, 85%; 7½, 87%; 10, 88%; 12, 90%; 15, 93%.

Proper Installation

- A transfer switch is <u>not</u> necessary, for small portable generators that serve a single appliance like a freezer or other appliance that plugs **<u>directly into</u>** the generator.
- A transfer switch IS necessary, if you are connecting directly into the home's wiring (ie, at the service panel). (See National Electrical Code)
- The double-pole, double-throw switch:
    - Double-pole means that there are two pairs of wire lugs available for connection of hot conductors. The third wire (neutral) is continuous and is not switched. Ground wire is also continuous.
    - Double-throw means you can place or "throw" the switch into two different positions (utility power or generator power).
    - This prevents electricity from flowing simultaneously to both the customer's home **<u>and</u>** the utility's system.
    - That's called "backfeeding," and it can kill lineworkers or the unsuspecting public.
    - Switch also prevents feedback of power when utility service is restored, which otherwise would destroy the generator.
    - Located between the utility meter and the loads to be served (see diagram).
    - Should be located within 25 feet or less of the generator, or at central meter pole.
    - Size of the switch is determined by the loads to be served (in amps).



GenerLink

Generator Transfer Switch

- Safely separates your generator from the utility powerlines
- No subpanel necessary
- No re-wiring necessary
- Just plug in your generator. Connect the cord to your generator, and to your GenerLink unit. Then simply start your generator and turn on your home circuits that you want to run.
- Direct pricing program: You purchase directly from the manufacturer, saving approximately $100. We install at no charge.

See next page for product and pricing options. Call Global Power Products to order, at 770-736-8232. After you receive the GenerLink, call Midwest Electric to schedule installation, at 1-800-962-3830.

Distributor Pricing

GLOBAL POWER PRODUCTS

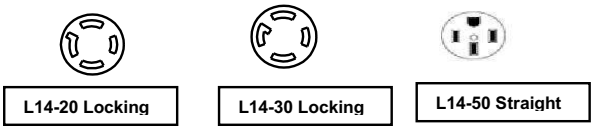
GenerLink™

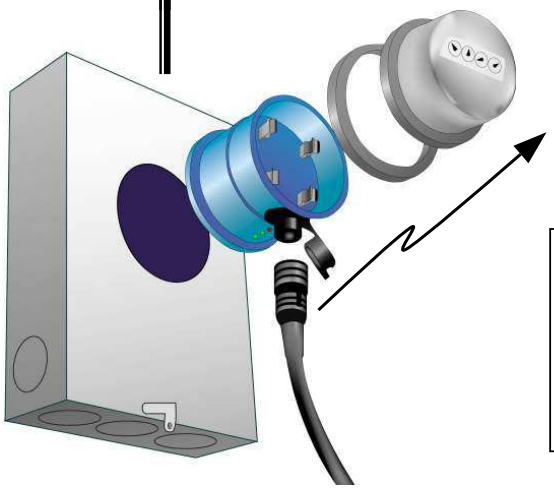
Product Part #:	**MA23-N**	**Generlink, Non-Surge 30Amp**
	MA23-S	**Generlink, Surge 30 Amp**
	MA24-N	**GenerLink, Non-Surge 40 Amp**
	MA24-S	**GenerLink, Surge 40 Amp**

With Cable:	***MA23-N***	***MA23-S***	***MA24-N***	***MA24-S***
	$ 550*	$ 625*	$650*	$725*

**Pricing based on Standard cable L14-30, 20' length OR L14-20, 20' Length. MA 24 Includes an *AWG 20' cord*
(See illustrations and ordering information below)

Generlok™ cable length and connection options are shown below. Please call out the version you need when placing your order:





GenerLok Cord

GLC [ ] [ ] – [ ]

Connector End:
1 - Locking L14-20 Amp
2 - Locking L14-30 Amp
3- Straight L14-50 Amp

Cord Length/Pricing:
20 - 20' long (Standard stock item, **included in set price above**)
40 - 40' long (Custom, Additional $50.00 to set prices above)
60 - 60' long (Custom, Additional $100.00 to set prices above)
80 - 80' long (Custom, Additional $150.00 to set prices above)
00 - 100' long (Custom, Additional $200.00 to set prices above)*
* 100' is longest recommended cord length available. 10 AWG only

Example: **GLC20-3** GenerLok Cord 20' long with Locking 30 Amp Connector

Stand Alone Cord Pricing:**

20 -	20' long, 20 or 30 Amp Connector	$135
40 -	40' long, 20 or 30 Amp Connector	$165
60 -	60' long, 20 or 30 Amp Connector	$195
80 -	80' long, 20 or 30 Amp Connector	$225
00 -	100' long, 20 or 30 Amp Connector	$275

**Cords may be purchased separately from the standard GenerLink Set.10)AWG only

Pricing effective: 4/2007

Global Power Products
225 Arnold Road, Lawrenceville, GA 30044 770-736-8232 Fax: 770-736-8231 www.globalpowerproducts.com

Standby Power Safety and Connections

(From the ***Rural Electricity Resource Council*** ~ www.rerc.org)

Never operate a portable generator inside a home, garage, or other closed building.

Just like your car's engine, your generator produces carbon monoxide when it's running. This is an odorless, invisible and deadly gas that will overtake you in a matter of minutes. To keep fumes away from people and pets, operate the generator outdoors and away from air intakes to the home, and install carbon monoxide alarms with battery backup inside the home, especially in sleeping areas.

Never plug a portable electric generator into a regular household outlet or breaker box.

Connecting your generator directly to your home's circuitry can send electricity back through power lines, creating a lethal hazard for crews working on lines that are thought to be de-energized. You could also cause expensive damage to utility equipment and your generator. Individual appliances should be directly connected to the receptacle outlet of the portable generator. Use heavy duty, outdoor rated cords with a larger wire size that is adequate for the appliance load.

Permanently-installed generators for homes or businesses should only be installed by a certified electrician and have a properly wired transfer switch.

Once the decision is made to purchase a permanently-installed generator, most of the hazards tied to portable units disappear. Rather than extension cords, the generator will provide power to critical loads through a transfer switch. The issue of carbon monoxide is also gone, because the certified installer will locate the generator at a safe distance from the home. The key is to select a qualified installer. An experienced installer will conduct a complete inventory of the loads to be powered, to determine proper sizing of the generator, transfer switch and conductors.

Don't overload the generator.

Do not operate more appliances and equipment than the output rating of the generator.

Use the proper power cords.

Plug individual appliances into the generator using heavy-duty, outdoor-rated cords with a wire gauge adequate for the appliance load. Overloaded cords can cause fires or equipment damage. Don't use extension cords with exposed wires or worn shielding. Make sure the cords from the generator don't present a tripping hazard. Don't run cords under rugs where heat might build up or cord damage may go unnoticed.

Read and adhere to the manufacturer's instructions for safe operation.

Don't cut corners when it comes to safety. Carefully read and observe all instructions in your portable electric generator's owner manual.

To prevent electrical shock, make sure your generator is properly grounded.

Consult your manufacturer's manual for correct grounding procedures.

Do not store fuel indoors or try to refuel a generator while it's running.

Gasoline (and other flammable liquids) should be stored outside of living areas in properly labeled, non-glass safety containers. They should not be stored in a garage if a fuel-burning appliance is in the garage. The vapor from gasoline can travel invisibly along the ground and be ignited by pilot lights or electric arcs caused by turning on the lights. Avoid spilling fuel on hot components. Put out all flames or cigarettes when handling gasoline. Always have a fully charged, approved fire extinguisher located near the generator. Never attempt to refuel a portable generator while it's running.

Turn off all equipment powered by the generator before shutting down your generator.

Always start and stop the generator under "no load."

Avoid getting burned.

Many generator parts are hot enough to burn you during operation.

Keep children away from portable electric generators at all times.