

Voltmaster Two-Bearing Belt-Drive Generators

AB-, AR- and EC-Series

Owner's Manual

March 2011

Voltmaster 
BY WANCO®

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1 Introduction

1.1 Read before using



WARNING

Improper use of equipment could cause serious injury or death.

Prior to using this equipment, carefully read, understand, and observe all instructions.

This is an industrial-type electric generator. This equipment is potentially hazardous and could cause physical injury or even death if improperly used. Before attempting to operate this generator:

- Check to ensure no damage has occurred in transit
- Read this manual thoroughly
- Follow all instructions carefully
- Before using an engine to power the generator, read the engine manufacturer's instructions

By following these instructions, you will enjoy safe and trouble-free operation of your generator.

Installing and wiring a home standby generator is not a do-it-yourself project. Consult a qualified licensed electrician or contractor.

1.2 Principle of operation

1.2.1 AB- and AR-Series

On AB- and AR-Series generators, the generator stator and the main phase output winding have an auxiliary phase winding that is connected to a capacitor.

The resultant current flow creates an alternating armature reaction that can be considered the combination of two rotating fields. One field is in the direction of the generator rotation at the same speed; the other is in the opposite direction, and induces in the rotor field winding an electromagnetic field that is double the rated frequency.

By connecting a diode in series with the rotor field winding, the current is rectified and the necessary excitation is obtained.

The voltage regulation at load is ensured by the field build-up generated by the armature reactance and the rotating field windings.

1.2.2 EC-Series

All EC-Series generators are 12-wire brushless generators with an exciter generator that induces a voltage in the main generator. An automatic voltage regulator is connected to the main generator and controls the output voltage of the generator.

EC-Series generators are 3-phase wound generators that are reconnected for single-phase applications. They can operate at 60 hertz and 1800 RPM or 50 hertz and 1500 RPM with reconNECTIONS.

All EC-Series generators can operate in bidirectional rotation (clockwise or counterclockwise). They can function as prime power with 24-hour continuous operation.

1.3 Specifications

1.3.1 AB-Series

All AB-Series models

Shaft O.D.	0.875 (7/8) inch
Keyway	0.1875 (3/16) inch
Key	Included
Pulley	Single pulley, B-size belt

1.3.2 AR-Series

	AR100	AR250M
Shaft O.D.	1.0 inch	35mm
Keyway	0.25 (1/4) inch	10mm
Key	Included	Included
Pulley	Double pulley	Double pulley

1.3.3 EC-Series

Single-phase

	EC7-1	EC11-1	EC12.5-1	EC24-1	EC30-1	EC40-1	EC50-1	EC67-1	EC83-1	EC100-1	EC120-1	EC145-1	EC180-1	EC200-1	EC270-1
Shaft O.D.	35mm	42mm	42mm	42mm	55mm	55mm	55mm	65mm	65mm	65mm	65mm	85mm	85mm	85mm	85mm
Keyway	10mm	10mm	12mm	12mm	16mm	16mm	16mm	18mm	18mm	18mm	18mm	22mm	22mm	22mm	22mm
Key	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included

Three-phase

	EC8-3	EC13-3	EC15-3	EC29-3	EC40-3	EC50-3	EC65-3	EC80-3	EC100-3	EC120-3	EC145-3	EC176-3	EC215-3	EC240-3	EC325-3
Shaft O.D.	35mm	42mm	42mm	42mm	55mm	55mm	55mm	65mm	65mm	65mm	65mm	85mm	85mm	85mm	85mm
Keyway	10mm	10mm	12mm	12mm	16mm	16mm	16mm	18mm	18mm	18mm	18mm	22mm	22mm	22mm	22mm
Key	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included	Included

1.4 Where to obtain service

Before calling for service, please have the generator model and serial number ready. This information is displayed on the serial number tag, which is adhered to the generator.

Contact our service department using the following information:

Wanco Inc.

5870 Tennyson Street
Arvada, Colorado 80003

800-730-3927
fax 303-427-5725

www.voltmaster.com
sales@voltmaster.com

2 Safety

2.1 Operating safety



 **DANGER**

Explosion hazard.

- NEVER operate generator in an explosive atmosphere or near combustible materials.
- Keep generator, engine, fuel, and other combustibles away from sparks, open flame, and burning objects.
- Before using an engine to power the generator, read engine manufacturer's instructions.

 **WARNING**



Shock hazard.

- Use extreme caution when working on or with electrical components.
 - Avoid contact with live terminals and receptacles.
 - The generator must be properly grounded according to all applicable electrical codes.
 - Do not operate generator in rain, snow, or wet conditions.
 - Use only 3-prong grounded receptacles and extension cords.
 - On construction sites, use a GFCI (ground fault circuit interrupter) to protect 120-volt receptacles.
 - Installation as a standby generator must comply with all applicable electrical codes, and requires a suitable power-transfer device to isolate generator from power utility.
-
- Before using this equipment, carefully read, understand, and observe all instructions in this manual.
 - If using an engine to power the generator, read the engine manufacturer's instructions.
 - Before using this equipment for the first time, inspect it for loose or missing parts and damage that may have occurred in shipment.
 - This equipment should not be operated by persons under 18 years of age.
 - ALWAYS wear appropriate protective clothing, shoes, and other protective devices, as required by the job.
 - When working on or around this equipment, do not wear neckties, loose-fitting shirts or jackets, or sleeves that may become caught in moving parts.
 - ALWAYS wear appropriate respiratory, hearing, and eye protection.
 - NEVER operate this equipment when not feeling well due to fatigue, illness, or medication.

- NEVER operate this equipment under the influence of drugs or alcohol.
- Before operating, know the location of the nearest fire extinguisher, first aid kit, and emergency telephone.
- Keep a fire extinguisher nearby and know its proper use. Extinguishers rated ABC by the NFPA are appropriate for all applications. For more information, consult your local fire department.
- Ensure the generator is well ventilated on all four sides.
- Do not operate this equipment in an enclosed area, such as a recreational vehicle, marine vehicle, under the hood of a car or truck, or inside a truck or van with only the rear door open. All warranties are voided if the unit is operated in such an area.
- Keep generator and surrounding areas clean. Remove oily rags and other material that could create a fire hazard.
- NEVER use generator with any safety guards removed. Keep all safety guards and power shields in position and secured.
- NEVER use the generator with a cover over the unit. The generator must operate in an open-air environment.
- NEVER service generator or its components while generator is running. Do not perform service or maintenance while generator is hot.
- Only a qualified technician should perform repairs on this equipment, including the installation or replacement of parts and accessories.
- Use ONLY accessories or attachments that are recommended by the manufacturer. Unauthorized equipment modifications will void all warranties.

2.2 Storage and maintenance safety

- When not in use, store equipment in a clean, dry location, out of the reach of children.
- ALWAYS keep the generator in proper running condition.
- Before servicing, ensure the power unit cannot be inadvertently started during service.
- ALWAYS fix damage to the generator immediately. Repair or replace broken or worn parts. Only use parts from original manufacturer.
- Replace operation and safety decals when they become difficult to read.

3 Operation

3.1 Before starting

3.1.1 Safety

Before operating the Voltmaster Generator:

- Read and be familiar with this instruction manual.
- Read and follow all safety instructions (see Section 2, page 5).
- If using an engine to power the generator, read the engine manufacturer's instructions.

3.1.2 Power requirements

You must supply the power source—usually an engine—for use with your generator. The factory does not supply engines.

CAUTION

Insufficient horsepower will damage generator and other connected equipment.

Use a power source that is properly sized for the generator.

All engines have a horsepower curve. Always operate the engine at a speed that develops the required horsepower, as listed in Table 3.1.

If you do not have enough horsepower from the engine, you will not obtain the full electrical output from the generator. If you attempt to draw full power from the generator without enough horsepower, the result will be low voltage and higher amperage, which will damage the generator and the equipment you are powering with the generator.

The generator will not operate properly if powered by a tractor (as a PTO generator). The RPMs from a tractor engine are too low. If a PTO generator is required, contact the factory.

Table 3.1 Minimum horsepower requirements

Generator model	Minimum horsepower
AB25, AB25-Hydro, AB30-Hydro	5 HP
AB50	8 HP
AB60	11 HP
AR100	18 HP
AR250M	50 HP
EC-Series	Approximately 2 HP per 1000 watts

Operating the generator with insufficient horsepower is considered improper use of the generator and will void the warranty.

Although AB- and AR-Series generators have circuit breakers, they are thermal-type breakers, which take some time to heat up on overload before tripping. With insufficient horsepower, they may not trip soon enough to protect connected equipment.

EC-Series generators do not have circuit breakers. To protect equipment, you **MUST** supply your own circuit breaker between the generator and load.

3.1.3 Operating speed

CAUTION

Low RPMs will create high amperage demands. High RPMs will create high voltage.

- Always operate at the required speed.
 - Use a tachometer when needed.
 - Maximum allowable RPM variation is $\pm 10\%$.
- Operate AB- and AR-Series generators at a constant speed of 3600 RPM for 60 Hz models or 3000 RPM for 50 Hz models.
 - All AB25 and AB30 generators are running at the correct speed when their voltmeters read 120V.
 - All other AB- and AR-Series generators are operating at the correct speed when their voltmeters read 240V.

- All AB- and AR-Series generators are inherently regulated. By maintaining the appropriate speed as described above, the proper voltage of 120 or 240 volts will be delivered by the generator. Lowering the generator shaft speed decreases the voltage; increasing the shaft speed increases the voltage.
- Operate EC-Series generators at a constant speed of 1800 RPM for 60 Hz models or 1500 RPM for 50 Hz models.
 - ❑ For 60 Hz models, EC-Series generators are operating at 1800 RPM when the frequency meter reads 60 Hz.
 - ❑ For 50 Hz models, EC-Series generators are operating at 1500 RPM when the frequency meter reads 50 Hz.

3.1.4 EC-Series reconfiguration

To change phase or voltages on 60-Hertz EC-Series generators, see Figure 3.1. For 50-Hertz generators, consult the factory.



DANGER



Shock hazard.

Live wires carry a voltage and amperage that are lethal.

NEVER touch the generator's main power terminals.

This is not a do-it-yourself project and should only be done by a certified electrician or electrical contractor.

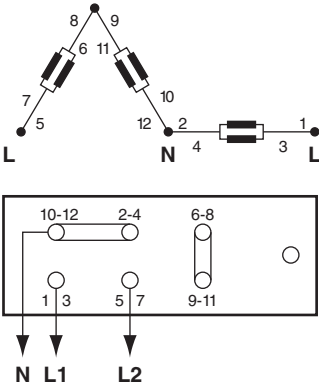
The generator must be operating at the proper speed (see Section 3.1.3) before and while adjusting the voltage regulator.

All EC-Series generators feature an automatic voltage regulator that maintains $\pm 1.5\%$ voltage regulation. If a change in voltage is required, the frequency meter **MUST** be connected to one line (hot) wire and to the neutral connection for the meter to function.

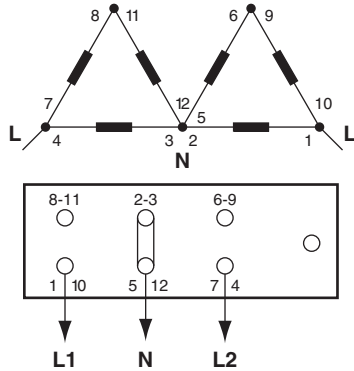
To adjust voltage, refer to Figure 3.1 and follow the instructions on page 14.

Figure 3.1 EC-Series connections, 60 Hz

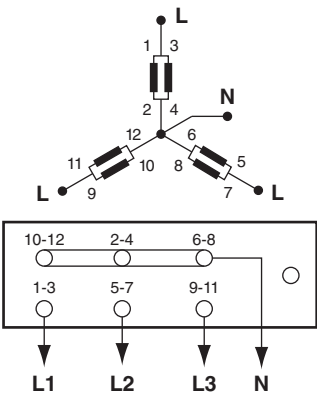
**Single phase, 120/240 volts
Parallel zigzag**



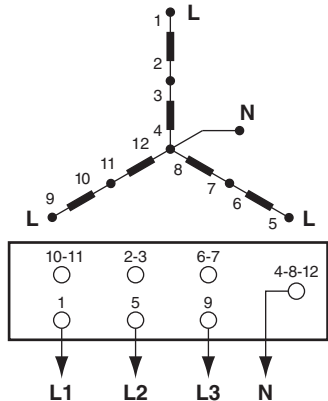
**Single phase, 120/240 volts
Double delta**



**Three phase, 120/208 volts
Parallel star**



**Three phase, 277/460/480 volts
Series star**

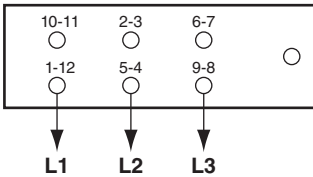
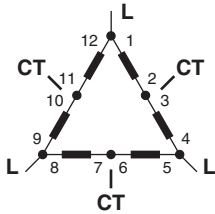


L1 = Line
L2 = Line
L3 = Line
N = Neutral

Do not use other connection terminals

Connections for 60Hz generators only. Consult factory for 50Hz connections.

**Three phase, 240 volts
Series delta (no neutral)
CT center tap**



- L1 = Line**
- L2 = Line**
- L3 = Line**
- CT = Center tap**

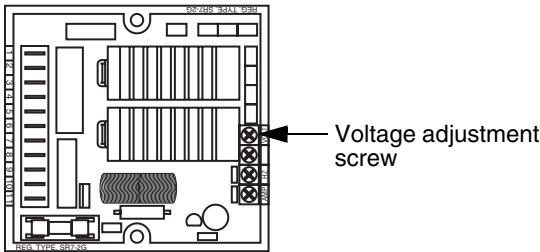
Do not use other connection terminals.

For neutral connection, you must use the center tap adjacent to the line connection you choose.

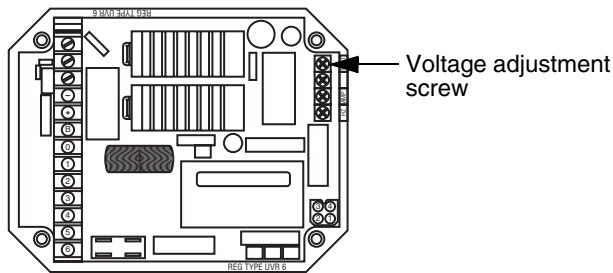
Connections for 60Hz generators only. Consult factory for 50Hz connections.

Voltage regulators

S.R.7/2-G



U.V.R.6/1-F



This is not a do-it-yourself project and should only be done by a certified electrician or electrical contractor.

1. Remove the top cover of the control box.
2. Before adjusting the voltage, establish the proper speed using a frequency meter:
 - For 60-hertz models, the generator shaft is turning at 1800 RPM when the frequency meter reads 60 Hz.
 - For 50-hertz models, the generator shaft is turning at 1500 RPM when the frequency meter reads 50 Hz.
3. The generator has several automatic voltage regulators. Locate the Phillips adjusting screw marked "VOLTS" in small print. DO NOT touch any other adjusting screws.
4. With no load on the generator, and the generator operating at either 60 hertz and 1800 RPM, or 50 hertz and 1500 RPM, turn the "VOLTS" adjusting screw very slowly, wait a few seconds, then monitor the voltage from one line (hot wire) to neutral (or center tap on 240V delta connections). The voltage will increase or decrease depending on the direction you turn the screw.
5. When you have established the proper voltage, stop the generator and reinstall the top cover of the control box.

3.1.5 Installation options

Belt and pulleys

The most common installation connects the generator and engine using a belt and pulleys, available from industrial supply sources.

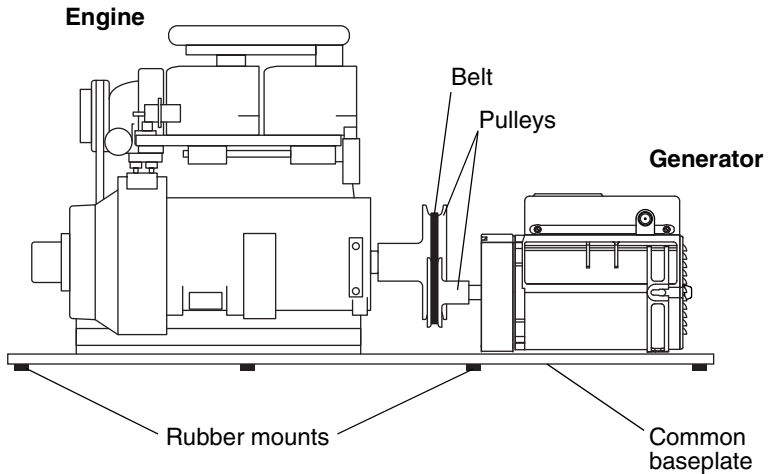
- All engines vibrate and shake while running. The generator must move with the engine or the belt that connects them will slip. The engine and generator must therefore be mounted on a common base, such as a steel plate. Installing rubber mounts on the bottom of the baseplate prevents it from shifting during operation. See Figure 3.2.

CAUTION

Improper installation can result in equipment damage and severe injury.

To prevent the engine and generator from lifting off the baseplate, ensure they are both securely fastened.

Figure 3.2 Sample installation



- When mounting the engine and generator, remember that most engine crankshafts turn counterclockwise (when viewing the engine shaft straight on).
- Smaller pulleys require more belt tension to deliver sufficient horsepower. To reduce the belt's load on the crankshaft and bearings, determine the correct pulley size based on the equation in Figure 3.3.
- Altitude affects the horsepower performance of all engines. For every 1000 feet above sea level, engine horsepower is reduced by 3.5%, consequently reducing the generator wattage by 3.5%.
- If the exact pulley size is not available, you must slightly adjust the engine speed to compensate for the pulley diameter. It is important to note that slower engine speed will result in less horsepower. The result may be a lack of power sufficient to carry the full electrical load of the generator.
- Most one- and two-cylinder engines have horsepower rated at 3600 RPM. If the engine and generator both operate at 3600 RPM, the pulley diameter for the engine and generator will be the same.

Figure 3.3 Equation for calculating pulley size

The equation for determining pulley diameter is:

$$\frac{\text{Engine Speed}}{\text{Generator Speed}} = \frac{\text{Generator Pulley Diameter}}{\text{Engine Pulley Diameter}}$$

The equation can be solved for any variable using simple algebra.

EXAMPLE: You want to operate an engine at 2400 RPM. You have an AR-Series generator, which must always operate at 3600 RPM. You have a pulley on the engine that is 7.0 inches in diameter. What diameter pulley should you use on the generator?

$$\frac{2400}{3600} = \frac{\text{Generator Pulley Diameter}}{7}$$

$$\frac{2400 \times 7}{3600} = \text{Generator Pulley Diameter}$$

$$\frac{16800}{3600} = 4.67 = \text{Generator Pulley Diameter}$$

- Keep the pulley close to the engine. The outer edge of the pulley should not extend more than 2 inches (50mm) past the end of the crankshaft (see Figure 3.4). Greater distances will stress the shaft and bearings.
- If a belt tensioner is used, it should be installed on the slack side run of the belt (see Figure 3.5). If the tensioner is used as a drive clutch, you may need to install a brake at the driven pulley to prevent driven pulley rotation while belt tension is released.
- Avoid using an idler pulley whenever possible. If an idler must be used, install it on the slack side of the belt (see Figure 3.5).

Figure 3.4 Maximum pulley distance from end of crankshaft

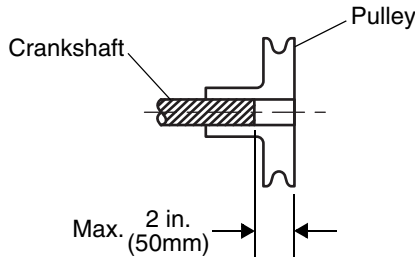
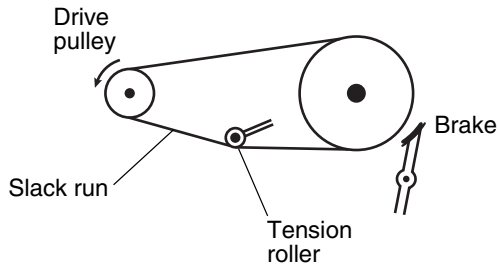


Figure 3.5 Slack run side, tensioner and brake



Flexible coupling

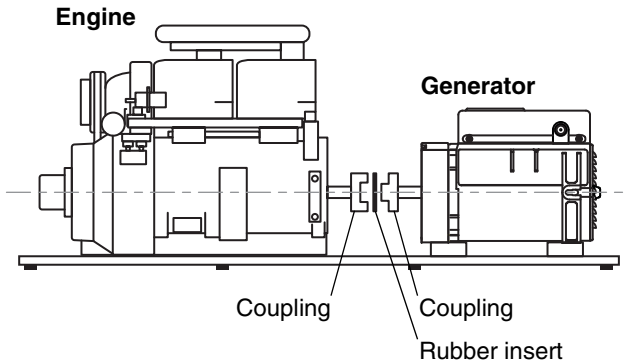
The generator can be directly coupled to an engine by means of a flexible coupling with a spider (rubber) insert, available from industrial supply sources. See Figure 3.6.

CAUTION

Improper installation can result in equipment damage and severe injury.

- When connecting the engine and generator with a coupler, always use a spider insert.
- Align the engine and generator precisely.

Figure 3.6 Flexible coupling



3.1.6 Standby installations

The generator does not have output capacity to power an entire home or commercial enterprise. Most utility electric service for a home is in excess of 100 amperes at 240 volts, which far exceeds the output of the generator.

If a standby installation is desired, only vital items can be powered (up to the ampere rating of the generator) during a power outage.

IMPORTANT!

Standby applications such as these require installation by a qualified electrician or electrical contractor. **DO NOT** attempt to install the generator in a standby application yourself.

Safety concerns

WARNING

Shock hazard.

Failure to isolate generator from power utility can result in death or serious injury.



When using the generator for backup power:

- Never connect the generator output to any live home or commercial electric circuits.
- Use a suitable power-transfer device to isolate the generator from the power utility.

If the generator will be connected to existing electric circuits during a commercial power outage, the installation must provide a positive means of isolating the commercial and generator power. The most common means for isolation protection is to incorporate a suitably rated double-throw, double-pole manual transfer switch. (California law requires isolation of the resident electrical system before connecting a generator to the electrical system.) Consult the national electrical code and your local code prior to installation.

A potential hazard exists during a power outage if the generator output is connected to the dead home or commercial electric circuits and no means is provided to isolate the electric circuits from the commercial power source. A power utility lineman working to return electric service to normal has every reason to believe that the line is dead. If your electric circuits are not isolated, the generator output will back feed to the power line and the lineman may be electrocuted when he attempts repairs.

Furthermore, if the utility and generator are not isolated, and utility power is restored while the generator is still powering the electric circuits, severe damage to the generator will occur and the possibility exists for an electric fire.

Emergency circuit isolation

To address the possibility of overloading the generator, the building may be wired so emergency circuits are grouped together, rewired to a separate junction box, and connected to the generator through a manual transfer switch.

The emergency circuit should be configured so it does not exceed the ampere rating of the generator. The transfer switch must have an ampere rating equal to that of the emergency circuit.

Total circuit isolation

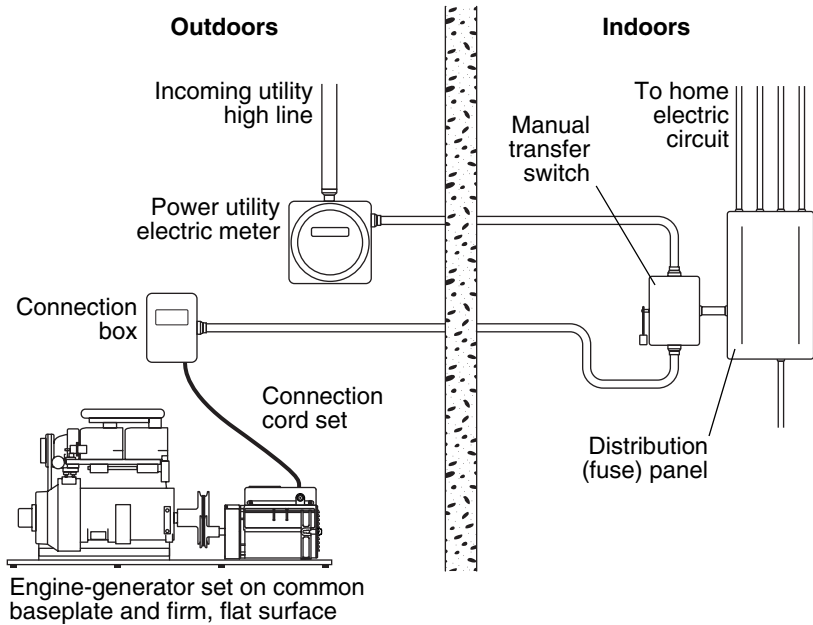
If the emergency circuits are not or cannot be wired together in a separate junction box, you will have to select the circuits and appliances to be powered by the generator. Caution must then be used to prevent overloading the generator.

The transfer switch ampere rating must be equal to the ampere rating of the normal incoming utility service.

Recommended practices

1. Installation of the outdoor connection box and manual transfer switch must be performed by a licensed electrician or electrical contractor. A typical installation with an outdoor connection box, cord set, and manual transfer switch is illustrated in Figure 3.7.
2. To prevent possible overloading of the generator due to immediate demand for a large amount of power, turn off all lights and appliances that were on before the utility power failure.
3. Use a connection box and cord set to connect your electric circuits to the 240-volt receptacle on your generator.
4. Start the generator, then move the manual transfer switch to the generator position. Turn on vital items, such as lights, being careful not to exceed the output capacity of the generator.
5. When the utility power is restored, move the manual transfer switch to the off position, shut down the generator, then move the switch to the normal position. Your electric circuits are now being powered by your utility.
6. Disconnect the cord set from the connection box and generator. When the engine cools down, service the engine and place the engine and generator back into storage.

Figure 3.7 Typical standby installation



3.1.7 Safety guards

WARNING

Exposure to moving parts can lead to severe injury and death.

A safety guard is required for safe operation. The guard should cover the connection between the generator and engine.

All rotating equipment **MUST** be equipped with guards to prevent contact with rotating shafts, pulleys, belts, and couplings. These guards are not supplied with the generator. The user is responsible for ensuring the appropriate guards are in place.

3.1.8 Circuit breakers

AB- and AR-Series generators have thermal-type circuit breakers.

EC-Series generators do not have circuit breakers. To protect equipment, you **MUST** supply your own circuit breaker between the generator and load.

3.2 Operating the generator

CAUTION

Load on generator at startup or shutdown can damage equipment.

Remove all electric loads from the generator before starting or stopping the engine.

1. Before operating the generator, follow all instructions in Section 3.1.
2. Start the engine, referring to engine manufacturer's instructions if necessary.
3. When adding AC loads to a generator, always start with the big loads first. Electric motors require 3 to 5 times rated amperage and wattage to start. For reference, see Appendix A, page 23.

3.3 General maintenance

The generator should be run at least once a month for a few minutes to keep all components in proper operating condition.

All ball bearings are sealed and require no servicing. There is no maintenance required on any other components of the generator.

Store the generator in a warm, dry location.

Appendix A

Power requirements

The information provided in this appendix is for reference only. Values presented here are not necessarily representative of all such equipment.

A.1 Sizing the generator

In most applications, the generator will provide power to devices that use a total wattage rating up to the rated wattage output of the generator. For example, to power ten 100 watt light bulbs, the generator rated wattage output would need to be 1000 watts ($10 \times 100 = 1000$).

In order to operate an appliance that has an electric motor, such as a compressor, pump, freezer, saw, or drill, you must calculate the wattage required to start the appliance motor. The rule of thumb is to multiply the wattage requirement by three. For example, to run a drill with a rated wattage requirement of 300 watts, the wattage requirement to start the electric motor would be 900 watts ($300 \times 3 = 900$).

- To calculate wattage, use the formula in Figure A.1.
- For the approximate starting wattage for appliances with motors, see Table A.1.
- When using extension cords, refer to Table A.2.
- For approximate equipment power requirements, see Table A.3.

Figure A.1 Formula for calculating wattage

$$\text{Volts} \times \text{Amps} = \text{Watts}$$

Table A.1 Approximate current requirements for electric motors

Horsepower	Running watts	Starting watts			
		Universal motor*	Induction motor	Capacitor motor	Split-phase motor
1/6	275	400	600	850	1200
1/4	400	500	850	1050	1700
1/3	450	600	950	1350	1950
1/2	600	750	1300	1800	2600
3/4	850	1000	1900	2600	—
1	1000	1250	2300	3000	—
1 1/2	1600	1750	3200	4200	—
2	2000	2350	3900	5100	—
3	3000	—	5200	6800	—
5	4800	—	7500	9800	—

*Small appliance

NOTE: For pumps, air compressors, air conditioners, and inverters, add at least 25% to starting wattage.

Table A.2 Minimum extension cord gauge

Amps	Continuous load		Minimum gauge		
	Watts		0–50 foot length	50–100 foot length	100–150 foot length
	@ 120 volts	@ 240 volts			
2	240	480	22	20	18
3	360	720	22	18	16
4	480	960	20	16	16
5	600	1200	18	16	14
6	720	1440	18	16	14
8	960	1920	16	14	12
10	1200	2400	16	12	12
12	1440	2880	16	12	10
14	1680	3360	14	12	10
16	1920	3840	14	10	10
18	2160	4320	14	10	8
20	2400	4800	12	10	8
22	2640	5280	12	10	8
25	3000	6000	12	10	6
30	3600	7200	10	8	6
35	4200	8400	10	8	4
40	4800	9600	8	6	2
50	6000	12,000	6	4	2
60	7200	14,400	4	2	—

Table A.3 Approximate equipment power requirements*

Household and RV equipment		Running watts	Starting watts
Central air conditioner	10,000 BTU	1500	2200
Clothes dryer, electric		5200	5750
Clothes dryer, gas		700	1800
Clothes washing machine		1150	2300
Coffee maker		1750	—
Computer, desktop		600–800	—
Computer, laptop		200–250	—
Computer monitor		200–250	—
Computer printer		400–600	—
Dishwasher, cool dry		700	1400
Dishwasher, hot dry		1450	1400
Frying pan, electric		1300	—
Furnace fan, gas or oil	1/8 HP	300	500
	1/6 HP	500	750
	1/4 HP	600	1000
	1/3 HP	700	1400
	1/2 HP	875	2350
Hair dryer		300–1200	—
Iron		1200	—
Lights	bulb wattage	bulb wattage	—
Microwave oven	650 watts	1000	1000
	1000 watts	1500	1500
Radio		50–200	—
Refrigerator or freezer		700	2200
RV air conditioner	7,000 BTU	600	1700
	10,000 BTU	700	2000
	13,500 BTU	1250	2750
	15,000 BTU	1500	3500
Stove, electric	6-inch element	1500	—
	8-inch element	2100	—
Sump pump	1/3 HP	800	1300
	1/2 HP	1050	2150
Television		300	—
Toaster, 2-slice		1050	—
Toaster, 4-slice		1650	—
Well pump	1/2 HP	1000	2100
Vacuum cleaner		800–1100	—

Table A.3 Approximate equipment power requirements* (continued)

Contractor equipment		Running watts	Starting watts
Air compressor (see Table A.1)	1/2 HP	975	1600
	1 HP	1600	4500
	1 1/2 HP	2200	6000
	2 HP	2800	7700
Bench grinder	8 inch	1400	2500
Circular saw	6 inch	950	2200
	7 1/4 inch	1200	2600
	8 1/2 inch	1500	3000
	10 inch	2000	3900
Drill	1/4 inch	300	400
	3/8 inch	475	650
	1/2 inch	750	900
	1 inch	1000	1250
Impact wrench	1/2 inch	600	750
	3/4 inch	750	900
	1 inch	1200	1400
Jig saw		300	400
Miter saw	10 amp	1100	2000
	15 amp	1650	3000
Mixer	3 1/2 cubic ft.	1000	2300
Pressure washer	5/8 HP	900	2700
	1 HP	1200	3600
Reciprocating saw, heavy-duty		750	1400
Sander, belt, disc or orbital		1200	2600
Table saw	10 inch	1800	4500
Water pump, non-submersible	3000 gph	600	2250
	5000 gph	750	2850
	10,000 gph	1100	4100
	15,000 gph	1600	5250
Water pump, submersible	3000 gph	500	1750
	5000 gph	650	2500
	10,000 gph	1000	3750
	15,000 gph	1500	5000
Welder, electric	70 amp AC	2800	—
	200 amp AC	9000	—
	230 amp AC @100 amps	7800	—
	250 amp AC/DC @75 amps	9800	—

Table A.3 Approximate equipment power requirements* (continued)

Farm equipment		Running watts	Starting watts
Battery charger	4 amp	90	—
	15 amp	380	—
	60 amp with 240-amp boost	1500/5750	—
	100 amp with 300-amp boost	2400/7800	—
Electric fence	25 mile	250	—
Grain cleaner	1/4 HP	650	1000
Grain conveyor, portable	1/2 HP	1000	2400
Heater, portable liquid-fuel type	50,000 BTU	400	675
	100,000 BTU	500	1260
	150,000 BTU	625	1875
Heater, portable radiant type		1300	—
Milk cooler		1100	1800
Milker (vacuum pump)	2 HP	1000	2300
Stock tank de-icer		1000	—

*The power requirements listed here are estimates. To determine actual wattage for the items you wish to power, refer to owner's manuals or the data plate on the equipment.



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