

VOLT *master* *America*[®]

OWNER'S MANUAL AB, AR AND EC TWO BEARING GENERATORS



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SAFETY FIRST

While safety is built into every generator, imprudent operation, negligent maintenance or carelessness can contribute to present serious hazards to life and limb. Gasoline and other fuels always present a hazard of possible explosion or fire.

- Keep fuel container out of reach of children.
- Do not fill fuel tank when engine is running or hot or in darkness.
- Do not smoke or use open flames near generator set fuel tank.
- When fueling electric start models do not touch battery cables or posts with a gasoline supply can.
- Keep a fire extinguisher nearby. Know its proper use. Consult your local fire department for correct extinguisher type.
- Store fuel only in approved containers and in a well ventilated area. Exhaust fumes are poisonous in inhaled.
- Be sure the generator is well ventilated on all four sides.
- Provide adequate ventilation for the prime mover if it is a gasoline or diesel engine. The output power voltage present in this equipment can cause a fatal electric shock. This equipment must be operated by a responsible adult.
- Do not allow anyone to operate the generator without proper instructions.
- Guard against electric shock.
- Avoid contact with live terminals or receptacles.
- Do not operate this unit in rain or snow.
- Use only 3 prong grounded receptacles and extension cords.
- This unit must be properly grounded.
- On construction sites a customer supplied GFCI (ground fault circuit interruptor) should be utilized to protect the 120 volt AC receptacles.
- When utilizing a lead acid battery starting battery on electric start models, extreme care must be taken when handling or servicing the battery.
- Lead acid batteries emit a colorless explosive hydrogen gas when being charged.

- Battery acid will cause severe burns and eye damage. Use extreme care when handling or servicing the battery. Hot engine parts and the output of the generator could cause serious injury to the operator. The operator must use caution and remain alert when using this unit.
- Do not smoke while servicing the battery. An open flame can cause an explosion.
- Do not disconnect battery cables on electric start models from the battery or engine while the unit is cranking or operating. Sparks may cause an explosion.
- Only operate in a well ventilated area.
- All pulleys, belts, etc should be provided with safety guards.
- Keep all safety guards and power shields in position and tightly secured.
- When working on or around this unit do not wear neckties or loose shirts, jackets or sleeves that may become caught in moving parts. Only a qualified technician should perform repairs on this equipment.
- Do not work on this equipment while fatigued, under the influence of alcohol or drugs.
- Use extreme caution when working on electrical components. High output voltages from this equipment can cause injury or death.
- When working on this equipment avoid hot mufflers, exhaust manifolds and engine parts which can cause severe burns. Installing and wiring a home standby generator is not a do it yourself project. Consult a qualified licensed electrician or contractor.
- This installation must comply with all national, state, providence and local codes. Do not connect a generator to a home or building except through an approved disconnect disconnect switch.
- When working around engines use noise suppression equipment and wear protective devices as necessary. Excessive noise is not only tiring, but continual exposure can lead to loss of hearing.
- Keep you neighbors in mind when noise level is high. Keep generator and surrounding areas clean.
- Remove oily rags and other material that create potential fire hazard. Consult the local fire department.
- Extinguishers rated ABC by the NFPA are appropriate for all applications. Consult the local fire department.
- Keep extinguisher properly maintained and be familiar with its proper care. The manufacturer recommends that all service including the installation or replacement of service parts be performed only by a qualified electrical service person. Use only factory approved repair parts.
- Do not operate this unit in an enclosed compartment such as found in recreational vehicles, marine compartments, under the hood of a vehicle or inside box trucks with only the rear door open. All warranties are voided if the unit is operated in any of the previously mentioned enclosures. Operate only outside in a well ventilated area.

VISUAL INSPECTION

Visually inspect the unit before the initial start. Check for loose or missing parts and damage that may have occurred in shipment. If freight damage has occurred, contact the freight company.

PRINCIPAL OF OPERATION

On models AB and AR the generator stator in addition to the main phase output winding has an auxiliary phase winding that is connected to a capacitor(s). 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 the opposite direction and inducing in the rotor field winding an electro magnetic field double the rated frequency. By connecting a diode in series with the rotor field winding the current is rectified and the necessary excitation obtained. The voltage regulation at load is ensured by the field build-up generated by the armature reactance and the rotating field windings.

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. All EC generators are 3 phase wound generators that are reconnected for single phase applications and can operate at 60 hertz, 1800 RPM or 50 hertz at 1500 RPM with reconnections.

SAFETY PRECAUTIONS

Before operating the generator set, read the Owner's Manual and become familiar with it and your equipment. Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

The following symbols found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel or the equipment.

 **DANGER** *This symbol warns of immediate hazards, which if not avoided, will result in severe personal injury or death.*

 **WARNING** *This symbol refers to a hazard or unsafe practice, which if not avoided, could result in severe personal injury or death.*

 **CAUTION** *This symbol refers to a hazard or unsafe practice, which if not avoided, might result in minor or moderate injury or product or property damage.*

OPERATION

 **CAUTION** The user provides their own engine to drive the generator either by pulleys or couplings. All models operate in both clockwise or counter clockwise directions.

SPECIFICATIONS

All AB units have an outside diameter of .875 inches (7/8") with a .1875 (3/16") keyway. The key is included with the generator. These models require a single pulley, preferably with a "B" size type belt. Model AR100 has an outside shaft diameter of 1.0 inch with a .25 (1/4") keyway. Model AR250 has an outside diameter of 35mm, and a 10mm keyway. The key is included. A double pulley is required. The EC series of 32 models have shaft diameters of 35, 42, 55, 65 and 85 mm. Consult the exact model or web site www.voltmaster.com for the specific model and shaft specifications. Key is included with each unit.

 **CAUTION** The AB and AR series must operate at a constant speed of 3600 RPM for 60 hertz and 3000 RPM for 50 hertz. The EC series must operate at 1800 RPM for 60 hertz and 1500 RPM for 50 hertz. To determine the shaft speed of the generator, use a tachometer. The model AB25 has a volt meter which when reading 120 volts is operating at 3600 RPM. All other AB and AR units have voltmeter when reading 240 volts are operating at 3600 RPM. All EC units come with a frequency meter. For 60 hertz operation when the meter reads 60 hertz the unit is operating at 1800 RPM. For 50 hertz when the meter reading is 50 hertz the unit is operating at 1500 RPM. The maximum allowable RPM variation is minus 10% and plus 10% RPM on any unit. Too low of RPM's will create high amperage demands and too high of RPM's will create too high of voltage.

ADJUSTING VOLTAGE

All AB and AR units are inherently regulated. By maintaining at least 3600 RPM on these units the proper voltage of 120/240 volts will be delivered by the generator. Lowering the shaft speed of the generator will decrease the voltage and increasing the shaft speed will increase the voltage.

 **DANGER** All EC units are 12 wire reconnectable generators with an automatic voltage regulator. The voltage and phase, 1 or 3, have been connected and tested at the factory. To change phase or voltages see the reconnection chart. To adjust voltage you must remove the top cover of the control box. The terminal strip from the generator will have live wires that can produce voltage and amperage that can be lethal. This is not a do it yourself project and should only be done by a technician or electrician. You must first establish 60 hertz with a frequency meter before adjusting the voltage. At 60 hertz the generator shaft is turning at 1800 RPM for 60 hertz. If 50 hertz is required, the shaft will turn at 1500 RPM. There are several different types of automatic voltage regulators. In small print are Phillips adjusting screws and the one marked VOLTS is the only one to be adjusted. DO NOT touch any other adjusting screws. With the generator operating at 60 hertz, 1800 RPM or for 50 hertz applications at 1500 RPM, and no load on the generator, turn the volts screw very slowly and monitor the voltage from one line (hot wire) to neutral. You will observe the voltage increase or decrease. When you have established the proper voltage, stop the unit and replace the top cover before operating the unit again.

MINIMUM HORSE POWER REQUIREMENTS

Model AB25 and AB25-HYDRO	5 HP
AB50	8 HP
AB60	11HP
AR100	18HP
AR250	50HP

EC units (approximately 2 HP for every 1000 watts)

It is important to know that all engines have a horse power curve. You MUST operate the engine at a speed (RPM) that will develop the above horse power, not just running the engine at any speed. If you attempt to draw the full power of the generator without enough horse power, you will not get the full power of the generator, you will get low voltage and higher amperage which will cause damage to the generator and the items you are operating. This is improper use of the generator and will void your warranty. Even though all AB and AR generators have circuit breakers, the circuit breakers are a thermal type which takes a little time to heat up on overload before tripping. EC generators do NOT come with circuit breakers and the customer MUST supply their own circuit breaker between the generator and load.

INSTALLATION

The most common installation method is with an engine via pulleys. Most engine crankshafts turn counter clock wise when viewing the engine shaft. The engine and generator must be mounted on a common base such as a steel plate. All engines vibrate and the generator must move with the engine or there will be excessive belt slippage. Customers must supply rubber mounts beneath the common base and the ground. Smaller diameter pulleys require more belt tension to deliver equal horsepower. To reduce the belt's load on the crankshaft and bearings, be sure to observe the pulley size requirements.

All of these generators can be directly coupled to an engine by means of a flexible coupling. You must use couplings with a spider (rubber) insert. Failure to use a spider insert will cause damage to the generator. Unless the engine and generator are almost perfectly aligned when using a coupling, the possibility of damage is great. It is normally recommended to use pulleys and a belt as this method is less likely to create problems.

Both pulleys, belts and couplings are available from industrial supply companies.

V BELT Keep the pulley close to the engine. The outer edge of the pulley should not extend more than 50mm (2.0") past the end of the crankshaft. Greater distances will stress the shaft and bearings. If a tensioner is used, it should also be installed on the slack side run of the belt. 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.

! DANGER A belt guard is REQUIRED for safe operation. This guard should cover both pulleys and the belt. Safety guards are NOT provided as the generator manufacturer does not know the size and

dimensions of the engine to be used. All rotating parts MUST be covered with a guard for safe operation or personal injury can occur. The generator and engine must be securely fastened to the base plate. If the generator is not securely fastened, the generator can lift up and cause personal injury or physical damage.

! CAUTION All of these generators require open air to properly cool. Do not operate these generators in an enclosed compartment such as in a recreational vehicle, in an enclosed compartment in a marine application, under the hood of a vehicle or closed building. Operation in enclosed compartments without adequate cool air may result in over heating of the generator and will void the warranty.

! DANGER All gasoline and diesel engines emit carbon monoxide which can kill. Only operate any engine with all four sides of the engine completely open away from walls, enclosures, compartments etc. Complete fresh air is required. DO NOT OPERATE an engine inside a home/building/recreational vehicle compartment, garage or near open windows of a home or building.

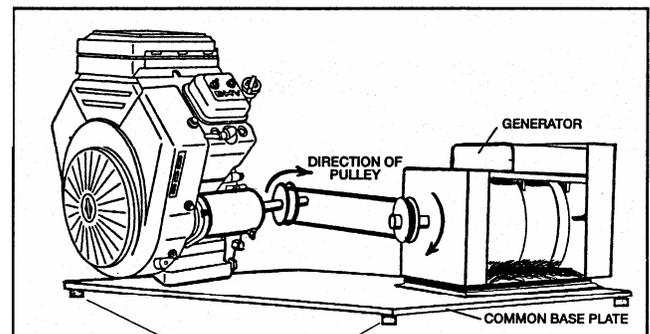
! DANGER All generators MUST be grounded according to your local electrical codes, the national electric code (or CSA in Canada). External grounding terminals are provided. All generators are internally grounded but an external ground is required by the customer.

GENERAL INFORMATION

These generators should not be run in a vertical position. These units do not come with a transmission for operation from a PTO off of a tractor. Tractor PTO's run in either 540 or 1000 RPM's. Consult the factory if a PTO is required as this is available.

Always disconnect all electric loads from the generator before starting or stopping the engine. Voltage surges (high or low) at start up or shut down may damage equipment.

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. See the chart of loads for approximate guide lines.



SHOWN WITH CUSTOMER SUPPLIED RUBBER MOUNTS BETWEEN PLATE AND GROUND LEVEL
CUSTOMER SUPPLIED BELT GUARD REMOVED

Figure 1

The most common installation method is with an engine via pulleys. Most engine crankshafts turn counter clockwise when viewing the engine shaft.

1. The engine and generator must be mounted on a common base such as a steel plate. All engines vibrate and the generator must move with the engine or there will be excessive belt slippage. (SEE DRAWING PAGE 2) Customer supplies rubber mounts beneath the common base and the ground is recommended.

! DANGER 2. A belt guard is required for safe operation. This guard should cover both pulleys and the belts. Safety guards are not provided as the generator manufacturer does not know the size and dimensions of the engine to be used. All rotating parts must be covered with a guard for safe operation.

! DANGER 3. The generator and engine must be securely fastened to the base plate. If the generator is not securely fastened, the generator can lift up and cause personal injury or physical injury or physical damage.

4. DETERMINING PULLEY DIAMETER AB&AR SERIES, FOR EC SERIES GENERATOR SPEED IS 1800 RPM

The generator shaft MUST turn at a constant speed of 3600 RPM. The formula for sizing a pulley is:

$$\frac{\text{ENGINE SPEED (RPM)}}{\text{GENERATOR SPEED 3600 RPM}} = \frac{\text{PULLEY DIAMETER (GENERATOR)}}{\text{PULLEY DIAMETER (ENGINE)}}$$

EXAMPLE: You want to operate an engine at 2400 RPM. You have a 7.0 diameter pulley on the engine. The generator must always operate at 3600 RPM.

$$\frac{\text{ENGINE SPEED 2400 (RPM)}}{\text{GENERATOR SPEED 3600 RPM}} = \frac{\text{PULLEY DIAMETER (GENERATOR) (X)}}{\text{PULLEY DIAMETER (ENGINE 7.0")}}$$

$$\frac{2400 \times 7.0}{3600 (X)} = \frac{216,800}{3,600} = 4.66$$

The diameter of the pulley for the generator for this example should be 4.66". If the exact size pulley is not available, you must slightly adjust the engine speed to compensate for the pulley diameter. IMPORTANT! The minimum engine horse power required to carry the full electrical load of the generator requires enough engine RPM's. Most one and two cylinder engines have rated horse power at 3600 RPM. Slower engine speed results in less horse power. If the engine operates at 3600 RPM's, the pulley diameter for the engine and generator will be the same. The example is for 60 Hertz.

5. V-Belt TRANSMISSIONS

Keep the pulley close to the engine. The outer edge of the pulley should not extend more than 50mm (2in) past the end of the crankshaft. Greater distances will stress the shaft and bearings.

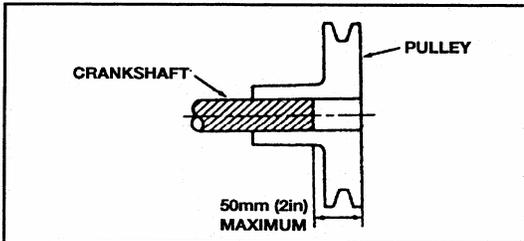


Figure 2

- Avoid using an idler pulley whenever possible. If an Idler must be used, install it on the slack run of the belt.
- If a belt tensioner is used, it should also be installed on the slack run of the belt. 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.

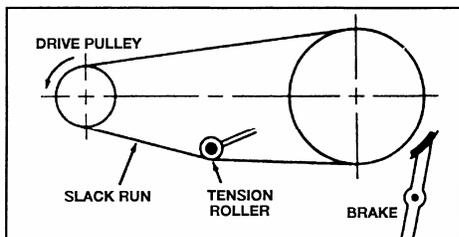


Figure 3

- Smaller diameter pulleys require more belt tension to deliver equal horsepower. To reduce the belt's load on the crankshaft and bearings, be sure to observe the pulley size requirements.

6. All of these generators can be directly coupled to an engine by means of a flexible coupling. You must use couplings with a spider (RUBBER) insert. Failure to use a spider insert will cause damage to the generator. Raise or lower generator until generator shaft and engine shaft are aligned.

! DANGER The generator and engine must be securely fastened to the common base plate. If the generator is not securely fastened, the generator can lift up and cause personal injury or physical damage. Customer supplied rubber mounts beneath the common base and the ground are recommended.

These types of couplings are made by companies such as LOVEJOY and BOSTON GEAR. The couplings are available from industrial supply companies. A safety guard must be installed protecting any person near the enginelgenerator from all rotating parts.

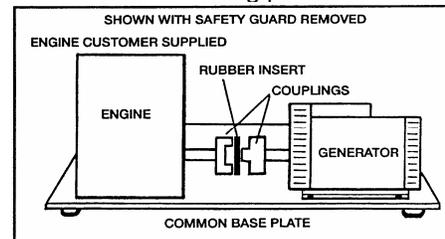


Figure 4

CAUTION 7. These generators require open air to properly cool. Do not operate these generators in an enclosed compartment, in a recreational vehicle, in an enclosed compartment in marine applications or under the hood of a vehicle. Operation in enclosed compartments without adequate cool fresh air may result in over heating of the generator and will void the warranty.

DANGER All gasoline and diesel engines emit carbon monoxide which can kill. Complete fresh air is required.

DANGER 8. All generators must be grounded according to your local electric codes and/or the national electric code (or CSA, in Canada). External grounding terminals are provided on all generators. All generators are internally grounded but an external ground is required by electric codes.

GENERAL INFORMATION

These generators should not be run in a vertical position. These units do not come with a transmission for operation from a PTO off of a tractor. Tractor PTO's run at either 540 RPM or 1000 RPM.

Always disconnect all electric loads from the generator before starting or stopping the engine. Voltage surges (High or Low) at start up or shut down may damage equipment.

When adding AC loads to a generator, always start with big loads first. Electric motors require 3 to 4 times rated amperage and wattage to start. * SEE CHART OF LOADS FOR APPROXIMATE GUIDELINES ONLY

HOW TO CHOOSE THE CORRECT SIZE 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. 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 motor. The rule of thumb is to multiply the wattage requirements by three. For example, if you want to run a drill with a rated wattage requirement of 300 watts you must multiply by three to get the 900 watt requirement to start the electric motor.

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. Never run the generator with a cover on the unit as the unit must operate in a free air environment. Do not operate the generator in rain, snow or wet conditions.

High altitude operation affects the horse power performance of all engines. Every 1000 feet above sea level reduces engine horse power by 3.5% and consequently reduces the generator wattage by 3.5%.

HOME STAND-BY INSTALLATIONS

General information

This generator does not have output capacity to power your entire home. Most home utility commercial electric service is in excess of 100 amperes at 240 volts which will exceed the output of this generator. Because of this, only key items can be powered (up to the ampere rating of the generator) during a utility power outage.

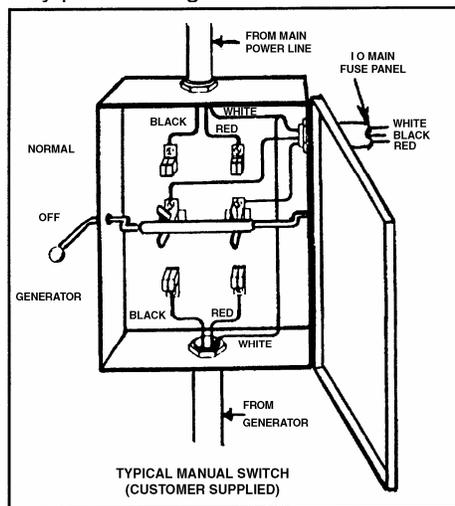


Figure 5

GENERATOR AND UTILITY POWER ISOLATION METHODS

WARNING If utilizing existing home electric circuits to power the emergency load, provide a positive means of insuring that the commercial power and portable generator powered are never fed to the load at the same time. Never connect the generator output to any live home electric circuit(s). If the generator will be connected to existing home electric circuits during a commercial power outage, a positive means of isolating the commercial and generator power must be provided. The usual 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.

A potential hazard exists during a power outage if the generator output is connected to the dead home electric circuits and no means is provided to isolate the home electric circuits from the commercial power source. A power company lineman working to return electric service to normal will open a switch between the main power supply and the spot where he is working to return electric service to normal will open a switch between the main power supply and the spot where he is working. He has every right to believe that the line is dead. If the home electric circuits are not isolated the generator output will back feed through the home electric circuits up to the power line and the line repairman may be electrocuted when he attempts repairs. If normal power and generator power are not isolated and the normal power is suddenly restored while the generator is still powering the home electric circuits, severe damage to the generator will occur and the possibility of a home electric fire and damage to home electric wiring circuits exists.

SUGGESTED HOME STANDBY INSTALLATION

A typical installation with an outdoor connection box, cord set and manual transfer switch is shown in the illustration below. The installation of the outdoor connection box and manual transfer switch must be performed by a licensed electrician or electrical contractor. The factory does not recommend operating or installing the generator indoors. Store the generator in a warm dry location. During a utility power failure carry it outdoors to a flat dry area such as a drive way or walkway. Use a connection box and cord set to connect your home electric circuits to the 240 volt receptacle on your generator. Turn off the lights and appliances that were on before the utility power failure. This prevents possible overloading of the generator due to immediate demand for a large amount of power. Start the generator and then throw the manual transfer switch to the generator position. Turn load emergency items back on. Be careful not to exceed the output capacity of the generator. When the utility power is restored, throw the manual transfer switch to 'the normal position. Your home electric circuits are now being powered by your utility. Disconnect the cord set from the connector box and generator. Shut down the generator. When the engine cools down service the engine and place the generator back in its warm, dry storage area.

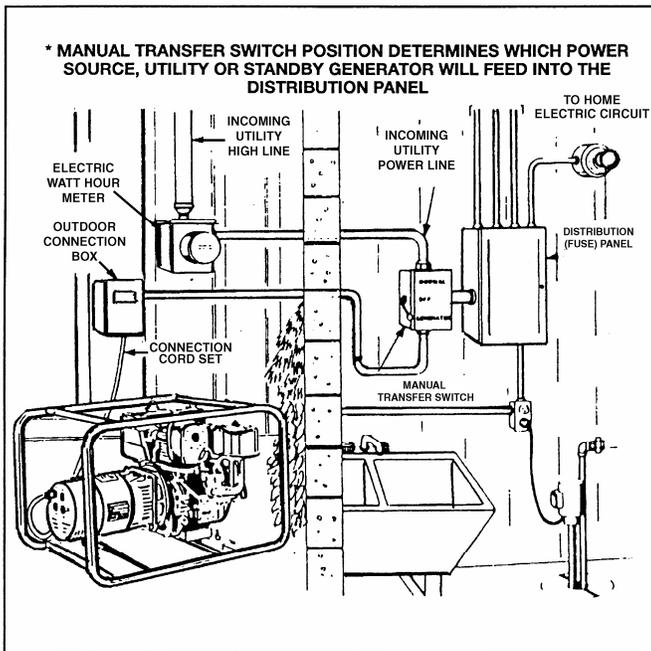


Figure 6

HOME REWIRING

Any home rewiring modification or the installation of a manual transfer switch and outdoor connection box must be done by a qualified and licensed electrician. NOTE: Any permanent wiring installations must comply with the National Electric Code, and all local and state codes. (CSA IN CANADA)



WARNING

Installing and wiring a home standby generator system using existing home electric circuits is not a do-it-yourself project. Consult a qualified licensed electrician or electrical contractor.

A) Emergency Circuit Isolation Method:

One method is to have the emergency circuits (important items to be powered in a power outage) grouped together and rewired into a separate junction box (this emergency circuit must not exceed the ampere rating of the generator) and connected to the generator by a cord set or directly wired into the generator. The manual transfer switch with an ampere rating equal to the ampere rating of the emergency circuit, would then be connected between the home load center panel and the emergency circuit junction box. With this method it will be difficult to accidentally overload the generator. During a power outage, start the generator (with no load) and then place the manual transfer switch in the generator position. The emergency circuits will now be powered by the generator. When the normal power is restored the manual transfer switch should be placed in the normal position after the generator is shut down. The emergency circuits will now be powered by the normal power source.

B) Total Circuit Isolation Method:

If the emergency circuits are not or can not be rewired 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 the overload of the generator. The manual transfer switch ampere rating must be equal to the ampere rating of the normal incoming utility service. During a power outage start the generator with no load. All items in the home should be turned off. Place the manual transfer switch in the "generator" position. Selected emergency items can then be turned on. Be sure these items don't overload the generator. The emergency items left on home circuits will now be powered by the generator. When the normal power is restored the manual transfer switch is placed in the "normal" position and the generator is shut down. The home electric circuits will now be powered by the utility power source.

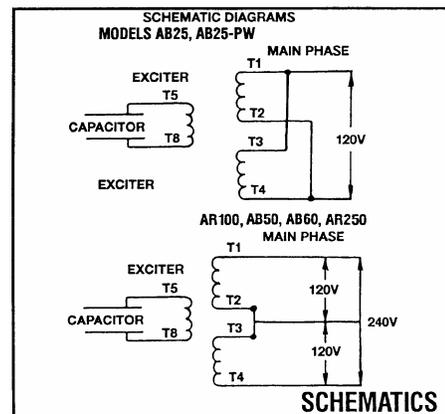


Figure 7

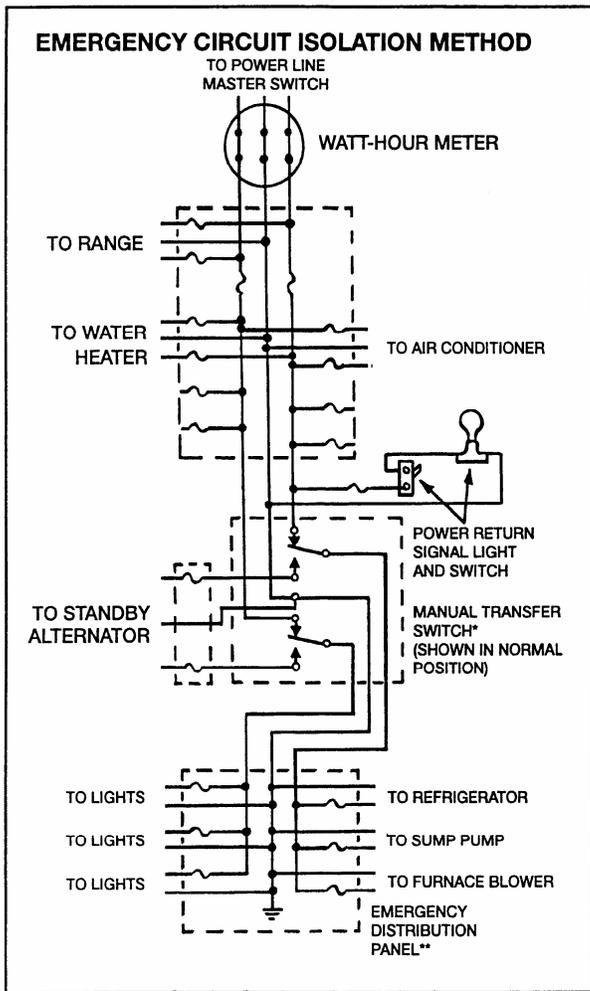
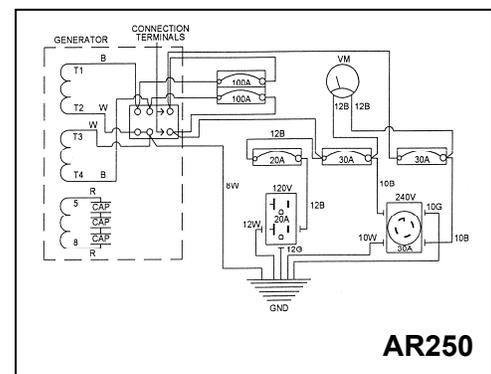
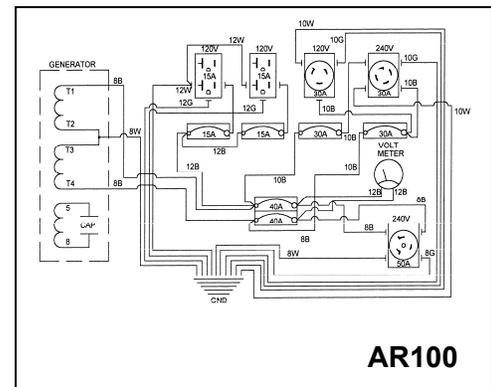
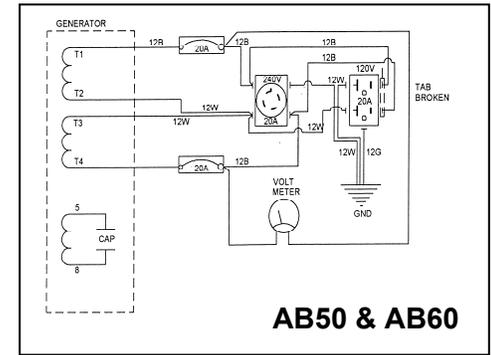
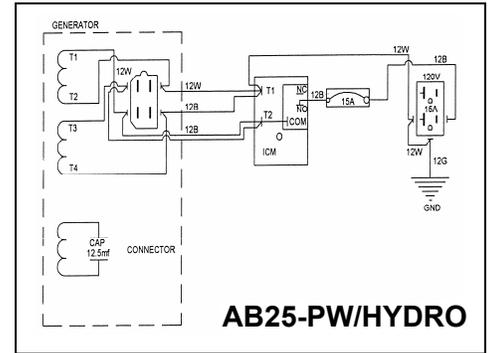
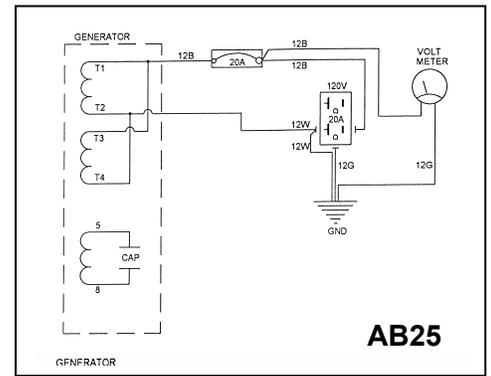


Figure 8

*AMPERE RATING MUST EQUAL OR EXCEED THE AMPERE RATING OF THE EMERGENCY DISTRIBUTING PANEL.

** AMPERE CAPACITY NOT TO EXCEED THE GENERATOR RATING. ONLY THESE ITEMS POWERED BY STANDBY GENERATOR. IF ELECTRICIAN SIZES THE LOAD PROPERLY, THE GENERATOR CAN'T BE OVERLOADED. ALL WIRING MUST CONFORM TO NATIONAL ELECTRIC CODES AND ALL STATE AND LOCAL CODES. CONSULT A QUALIFIED, LICENSED ELECTRICIAN. THE ILLUSTRATION ASSUMES 120/240 VOLT SINGLE PHASE ELECTRIC SERVICE IS BEING SUPPLIED BY THE UTILITY.



NOTE: WITH THIS SYSTEM, CAUTION MUST BE USED TO PREVENT OVERLOAD OF THE GENERATOR DURING UTILITY POWER FAILURE, ALL LOAD ITEMS IN THE DISTRIBUTION PANEL MUST BE TURNED OFF. ONLY CERTAIN ITEMS CAN BE TURNED BACK ON DURING GENERATOR OPERATION. THESE ITEMS SHOULD BE SPECIFIED BY YOUR ELECTRICIAN SO AS NOT TO OVERLOAD THE GENERATOR. ALL WIRING MUST CONFORM TO THE NATIONAL ELECTRIC CODE AND ALL STATE AND LOCAL CODES. CONSULT A QUALIFIED LICENSED ELECTRICIAN. THE ILLUSTRATION ASSUMES 120/240 VOLT PHASE ELECTRIC SERVICE IS BEING SUPPLIED BY THE UTILITY

Figure 9

EC SERIES GENERATORS

All EC series generators operate at 1800 RPM (60 hertz) or 1500 RPM (50 hertz). All of these units can operate in bi-directional rotation (clock wise or counter clock wise rotation). All EC generators are 12 wire re connectable into three phase units or can be re connected for single phase operation. (see re connection chart for various connections). All EC units can be operated as prime power with 24 hour continuous operation.

ADJUSTING VOLTAGE EC AND PTO'S

⚠ DANGER All EC units feature an automatic voltage regulator that will maintain +/- 1 ½% voltage regulation. The voltage regulator is preset at the factory for the required voltage. 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. On a three phase 240 volt series delta connection, there is no neutral. For neutral connection you must use the center tap(CT) adjacent to the line connection you choose. With the frequency meter operating at 60 hertz (50 hertz for 50 hertz operation and the jumper installed) you can increase or decrease the voltage by simply adjusting the Phillips screw marked VOLTS on the automatic voltage regulator. See page 15

⚠ DANGER The generator must be operating at the proper speed (RPM) before and while adjusting the voltage regulator. Turn the VOLTS adjusting screw very slowly stop and wait 2 or 3 seconds and read the voltage from one of the lines and neutral connection (note that on the three phase 240 volt series delta connection there is no neutral so you must go to the center tap as a neutral. Adjust the voltage up or down by turning the VOLTS clock wise or counter clock wise. Once the voltage is adjusted, do not adjust any of the other Phillips screws on the automatic voltage regulator. Refer to the re connection chart if you are changing voltages. Near the automatic voltage regulator are the main power terminals of the generator. If you make contact with the main terminals, serious injury and death will occur. These adjustments MUST be done by a licensed electrician or technician familiar with high voltage equipment. This is NOT a do it yourself activity.

From the automatic voltage regulator terminal 4 a green wire always goes to stator lead wire 3. From the automatic voltage regulator terminal 5 a black wire always goes to stator lead wire 4. This applies to single and three phase units both 50 and 60 hertz and any voltage combination. On 60 hertz versions, single and three phase and any voltage combination, there is a small brass jumper connected on the automatic voltage regulator between terminal 5 and terminal 6. For 50 hertz operation, this jumper is removed.

Adjacent to the automatic voltage regulator is the radio suppressor on some models. The lead wires from the radio suppressor are always red and must go to the stator leads wires 5, 7, 9 and 12 on any version in single or three phase., 50 or 60 hertz and any voltage combination. Some leads may be on the same terminals as other depending on the various phase and voltage combinations.

CIRCUIT BREAKER

⚠ DANGER All EC units are designed for hard wire connections by the customer. It is strongly recommended to have a circuit breaker between the generator and the load that the generator will operate. Circuit breakers are not provided with these units.

ENGINE REQUIREMENTS

As a general rule, 2 horse power for every 1000 watts of generator output is required. Be sure to check the power curve of the engine that will drive the generator to obtain the minimum RPM from the engine to give 2 horse power for every 1000 watts from the generator. If you do not have enough horse power from the engine, you will not obtain the full electrical output from the generator. Engines are not provided with these units.

OPERATING GENERATOR SHAFT SPEED

⚠ WARNING For 60 hertz operation the generator shaft speed of 1800 RPM must be continuously maintained. The operating speed range is 1700 RPM to 1900 RPM for 60 hertz and for 50 hertz at 1500 RPM the operating speed range is 1425 RPM to 1575 RPM. These are NOT variable speed generators.

GUARD FOR PULLEYS, BELTS AND COUPLINGS

⚠ WARNING 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 unit and the customer is responsible for installing the appropriate guards. Serious personal injury or death could result without proper guards in place while the generator is in operation.

ELECTRIC MOTOR CHART

Approximate current requirements

HORSE-POWER	RUNNING WATTS	STARTING WATTS			
		UNIVERSAL MOTOR (sm. appliance)	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	X
1	1000	1250	2300	3000	X
1 1/2	1600	1750	3200	4200	X
2	2000	2350	3900	5100	X
3	3000	X	5200	6800	X
5	4800	X	7500	9800	X

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

EXTENSION CORD CHART

CONTINUOUS LOAD (use either Amps or Watts below)			MINIMUM GAUGE (AWG)		
AMPS	WATTS		0-50 feet	50-100 feet	100-150 feet
	@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	3660	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	12000	6	4	2
60	7200	14400	4	2	

THE FORMULA FOR WATAGE IS VOLTS X AMPERAGE = WATTAGE
EXAMPLE 120 X 10 = 1200

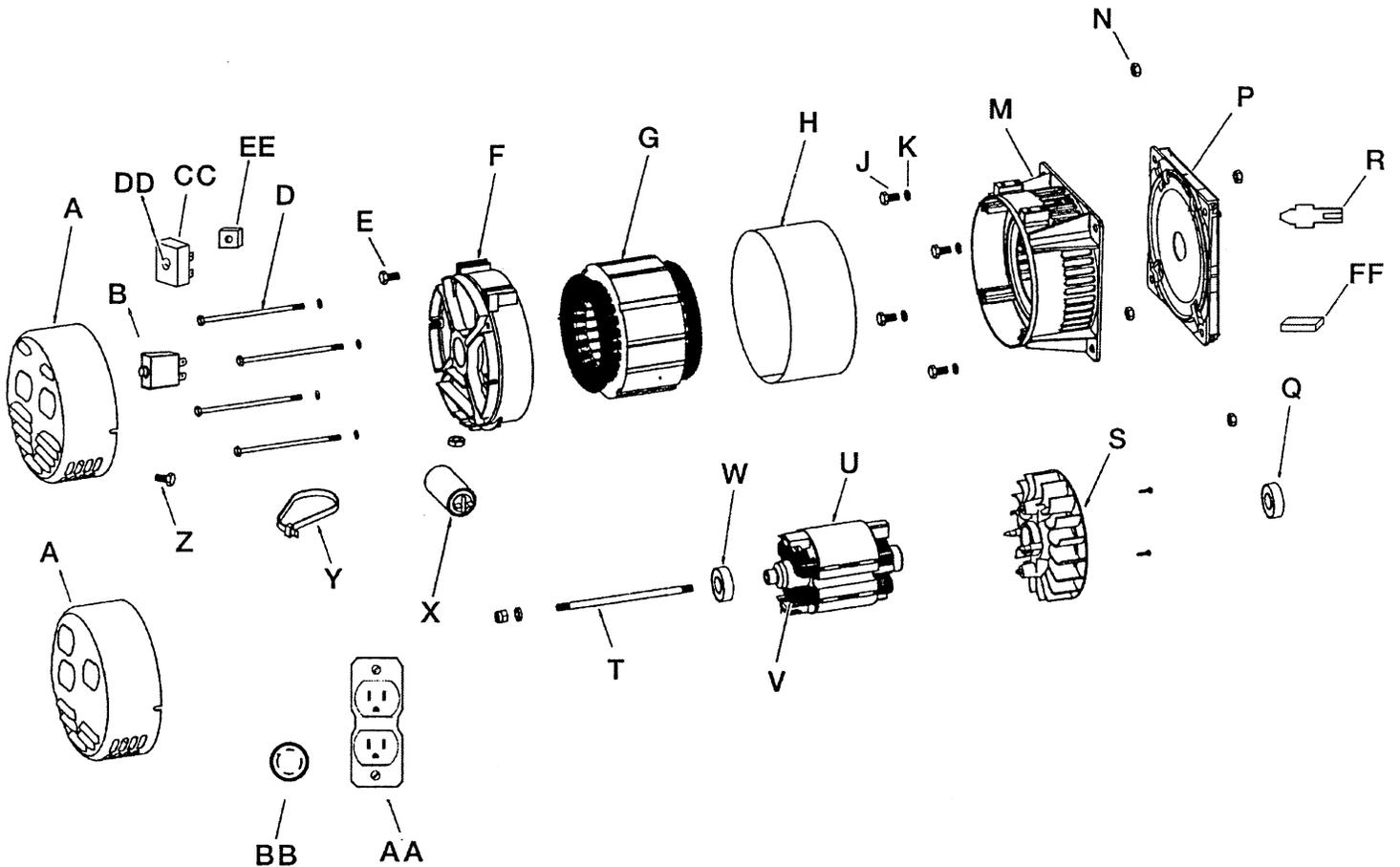
APPROXIMATE POWER

Requirements for Equipment

	WATTAGE REQUIREMENTS	
	Starting	Running
Battery charger, 10 amps	-	200
Compressor (see motor charts) -3/4 HP	1900	850
-1 HP	2500	1100
-2 HP	3600	1800
-3 HP	4800	2400
Drill -1/4"	400	300
-3/8"	650	475
-1/2"	900	750
-1"	1250	1000
Welder 100 amps DC	-	3600
Floodlight	--	1000
Grain cleaner, 1/4 HP	1000	650
Grain elevator, 3/4 HP	3000	1400
Grinders (by motor size)		
Heater radiant portable	--	1300
Heater portable liquid fuel -50,000 btu	675	225
-100,000 btu	1260	420
-150,000 btu	1875	625
Impact wrench -1/2"	750	600
-3/4"	900	750
-1"	1400	1200
Milk cooler	1800	1100
Mixer, 3 1/2 cubic feet	2300	1000
Motors-		
Belt sander	2600	1200
Disc sander	2600	1200
Orbital sander	2600	1200
Chain saw	3400	1200
6" circular saw	2200	950
7 1/4" circular saw	2600	1200
8 1/2" circular saw	3000	1500
10" circular saw	3900	2000
Jig saw	400	300
Cutoff saw	3500	2500
Screwdriver	800	550
Soldering iron or gun	-	150
Sump pump	1300	400
Water pump submersible -3000 gph	1750	500
-5000 gph	2500	650
-10000 gph	3750	1000
-15000 gph	5000	1500
Water pump non submersible -3000 gph	2250	600
-5000 gph	2850	750
-10000 gph	4100	1100
-15000 gph	5250	1600

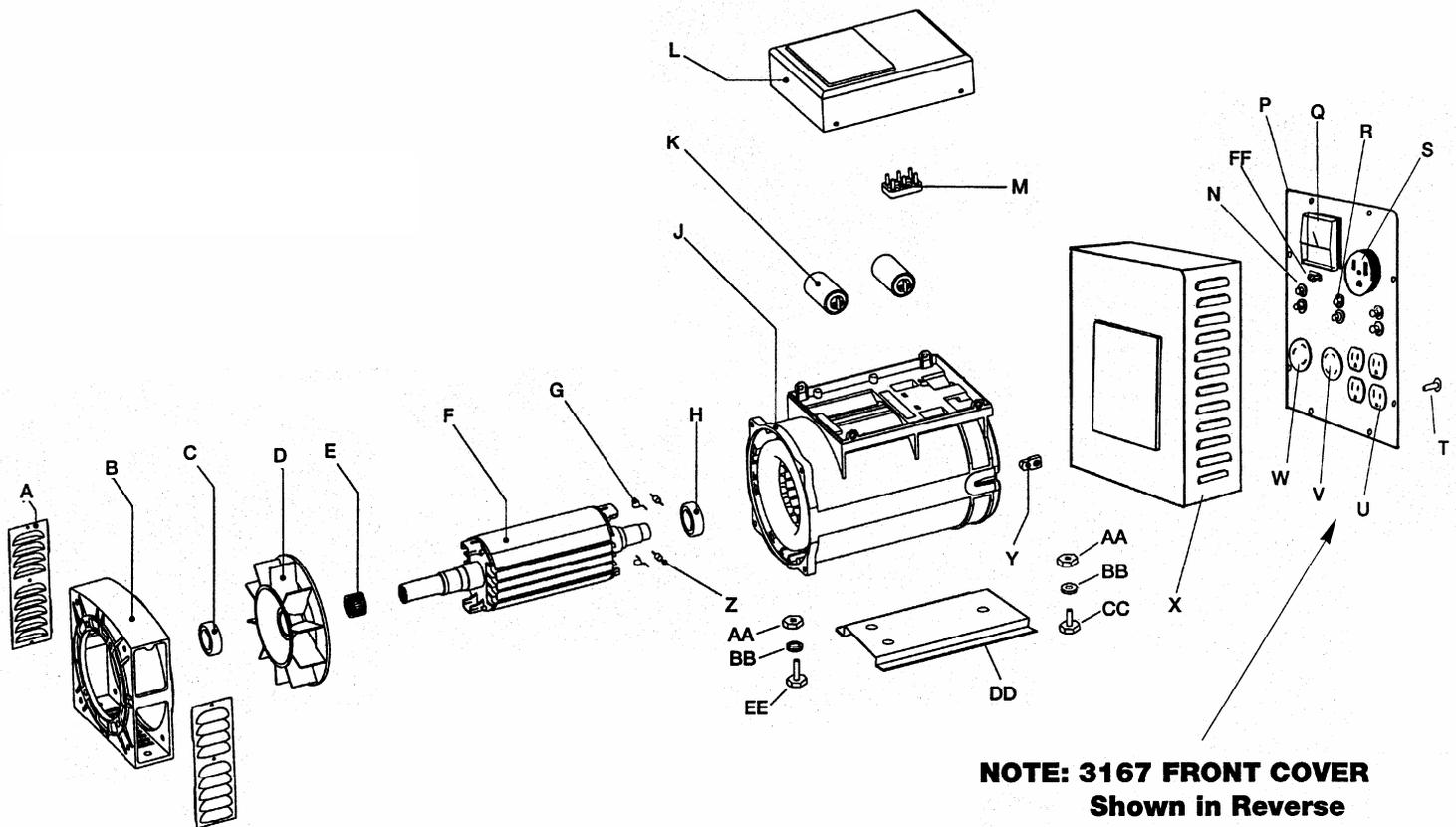
REF NO.	PART NO	DESCRIPTION	AB25	AB25PW HYDRO	AB 50	AB 60
A	2604	COVER	1	1	-	-
A	2621	COVER	-	-	1	1
B	1069	CIRCUIT BREAKER 20A	1	-	-	2
B	1070	CIRCUIT BREAKER 15A	-	1	-	-
C	1018	8/32 X 1/2 PHILLIPS SCREW	2	2	4	4
D	2605	STATOR BOLT	4	4	-	-
D	2622	STATOR BOLT	-	-	-	4
	2623	STATOR BOLT	-	-	-	-
E	2606	GROUND SCREW	1	1	1	1
F	2607	BEARING BRACKET	1	1	1	1
G	2608	STATOR	1	1	-	-
G	2624	STATOR	-	-	1	-
	2625	STATOR	-	-	-	1
H	2609	COVER (STATOR)	1	1	-	-
H	2626	COVER (STATOR)	-	-	1	-
H	2627	COVER (STATOR)	-	-	-	1
J		WASHER	4	4	4	4
K		NUT	4	4	4	4
M	2610	FAN BRACKET	1	1	1	1
N		SCREW	4	4	4	4
N		WASHER	4	4	4	4
P	2763	PTO BRACKET	1	1	-	-
P	2764	PTO BRACKET	-	-	1	1
Q	2615	BALL BEARING 52 mm	1	1	1	1

REF NO.	PART NO	DESCRIPTION	AB25	AB25PW HYDRO	AB 50	AB 60
R	2763	SHAFT EXTENSION	1	1	-	-
R	2764	SHAFT EXTENSION	-	-	1	-
S	2612	FAN	-	1	1	1
T	2613	ROTOR SCREW	1	1	-	-
T		ROTOR SCREW	-	-	1	-
T		ROTOR SCREW	-	-	-	1
U	2614	ROTOR	1	1	-	-
U	2628	ROTOR	-	-	1	-
U	2629	ROTOR	-	-	-	1
V	3190	DIODE WITH SUPPRESSOR	2	2	2	2
W	3287	BALL BEARING 40mm	1	1	1	1
X	2200	CAPACITOR 16 MF	1	-	-	-
X	2007	CAPACITOR 20 MF	-	-	-	1
X	1134	CAPACITOR 31.5 MF	-	-	-	1
Y	2617	TY RAP	1	1	1	1
Z	2619	5/16 SQUARE NUT	1	-	-	-
AA	1011	DUPLEX RECEPTACLE 125V,	1	1	1	1
BB	2454	T/L RECEPTACLE 250V, 20A	-	-	1	1
CC	3277	DELAY TIMER	-	1	-	-
DD		SCREW	-	1	-	-
EE		NUT	-	-	-	-
FF	3203	KEY	1	1	1	1
	2641	CAPACITOR 12.5MF	-	-	-	-

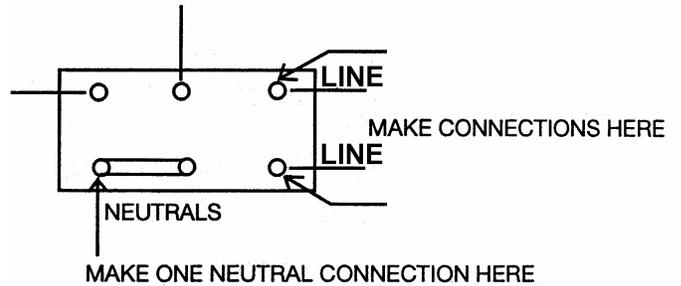


REF NO.	PART NO.	DESCRIPTION	QTY
A	3330	FAN GUARD	2
B	3328	FAN BRACKET	
C	3192	BEARING 72 MM 6306-2Z	1
D	3332	FAN	1
E	3349	FIXING RING	
F	3335	ROTOR COMPLETE	1
G	2603	VARISTER	2
H	2615	BEARING 52MM 6205-2Z	1
J	3345	STATOR COMPLETE	1
K	1134	CAPACITOR 31.5mf	2
L	3281	TOP BOX	1
M	3184	TERMINAL	1
N	1069	CIRCUIT BREAKER 20A	2
N	1112	CIRCUIT BREAKER 30A	2
P	3167	FRONT COVER	1
Q	2024	VOLTMETER	1
	2882	CIRCUIT BREAKER 40A	

REF NO.	PART NO.	DESCRIPTION	QTY
S	3506	RECEPTACLE 240V, 50A	1
T	1018	8/23 X 1/2 PHILLIPS	8
U	1011	DUPLEX RECEPT 120V	2
V	1117	TWISTLOCK RECEPT 120V,	1
W	1101	TWISTLOCK RECEPT 240V,	1
	3168	CONTROL BOX	1
Y	3282	RUBBER GROMMET	2
	3190	DIODE	2
AA	1041	NUT	3
BB	1022	LOCKWASHER	
CC	3279	3/8 X 3/4 HEX SCREW	1
DD	3168-B	BRACKET BASE PLATE	1
EE	2878	3/8 X 1 HEX SCREW	2
FF	1024	GROUND LUG	1

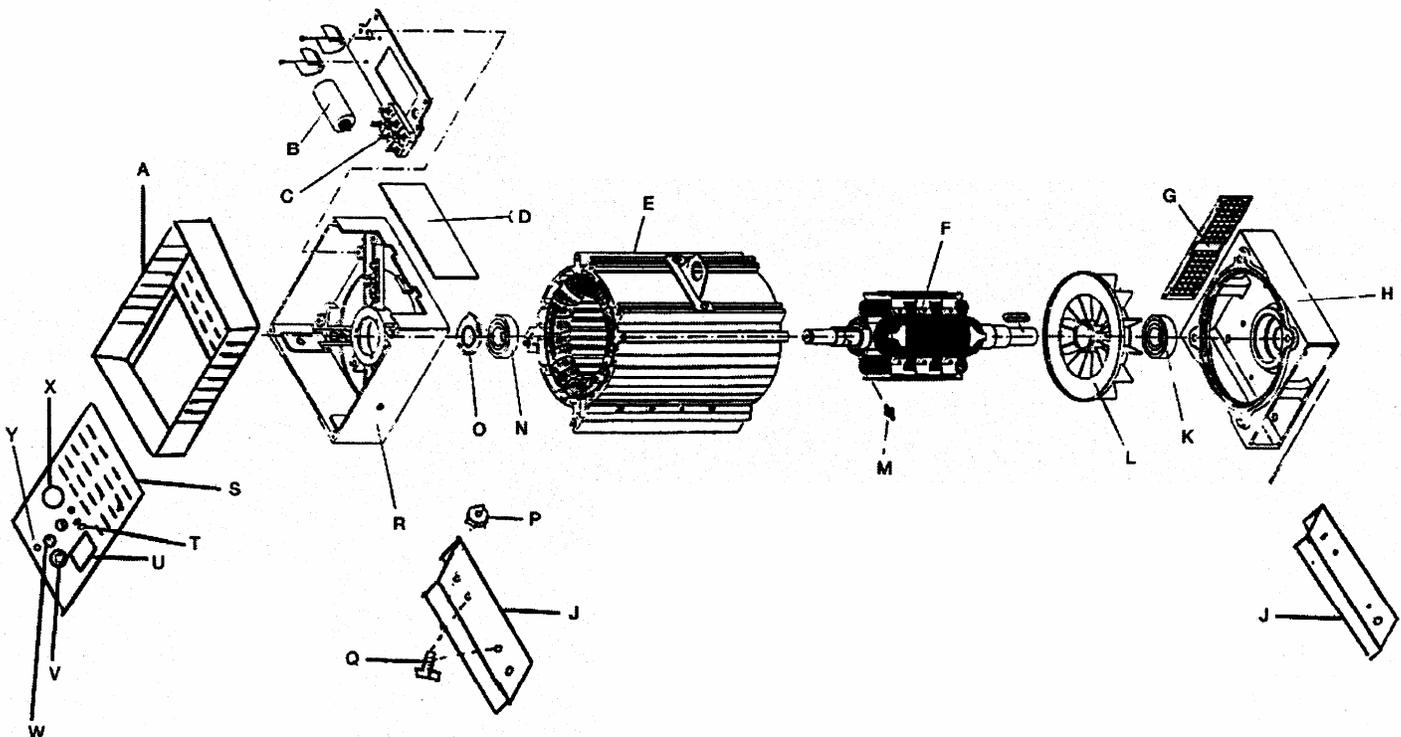


REF NO.	PART NO.	DESCRIPTION	QTY
A	3351	CONTROL BOX	1
B	1134	CAPACITOR 30MF	2
	3217	CAPACITOR 40MF	1
	3354	TERMINAL STRIP	1
D	3355	COVER	1
E	3356	STATOR	1
F	3357	ROTOR	
G	3358	FAN GUARD	2
H	3359	BRACKET (PTO SIDE)	1
	3360	CHANNEL	2
K	3361	BALL BEARING 90mm 6308 2RSIC3	1
L	3362	FAN	1
M	3363	DIODE	1
N	3364	BALL BEARING 80mm 6307 2RSIC3	
O	3365	SPRING WASHER	1
P	3366	3/8" NUT	4
O	3367	3/8"X 1-1/4" HEX SCREW	4
	3368	BRACKET	1
S	3350	FRONT COVER	1
T	1112	CIRCUIT BREAKER 30A	2
T	1069	CIRCUIT BREAKER 20A	
U	3369	CIRCUIT BREAKER 100A	1
V	1101	TWISTLOCK RECEPTACLE 240V, 30A	1
W	1011	DUPLEX RECEPTACLE 120V, 20A	
X	2024	VOLTMETER	
Y	1024	GROUND LUG	1



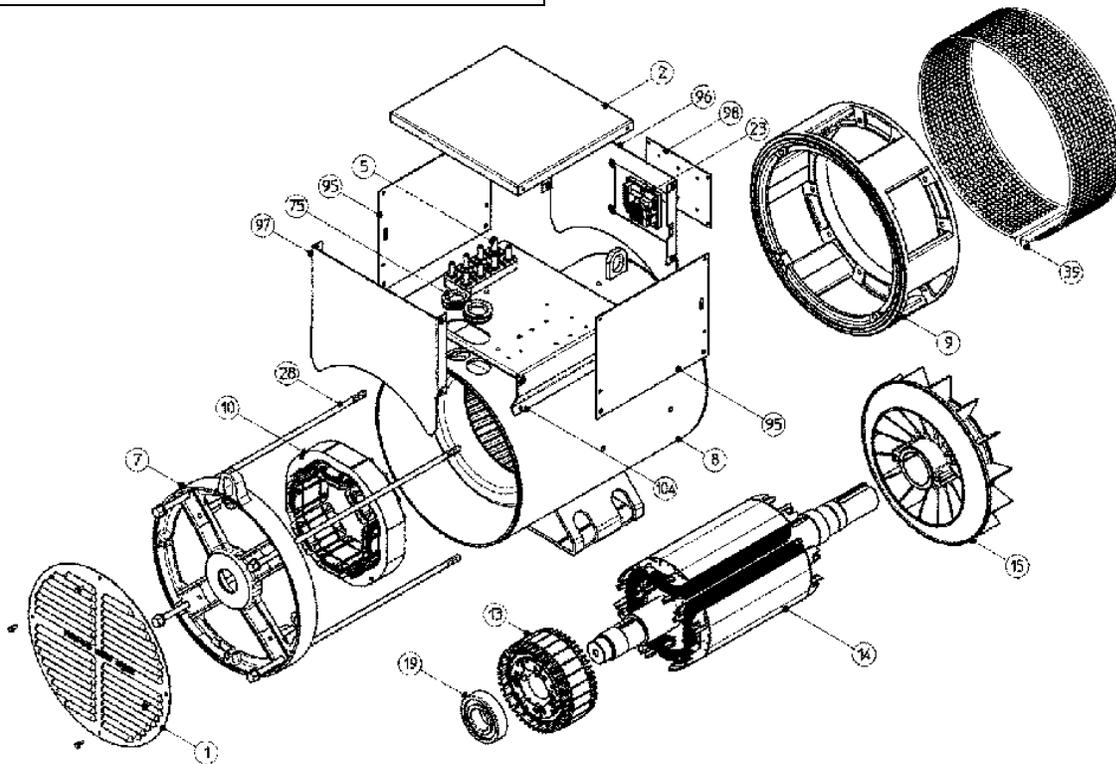
HARDWIRING AR250

To permanently wire this model, you must open the front cover "S" of the control box. You will observe a terminal strip "C" with 6 wires connected to this strip. You must use #2 wire AWG type THHN or MTW to carry the full electrical load of this generator. Connect to each wire labeled line. Also connect to the neutral lines which are connected together with a jumper. The two line wires, neutral wire and a ground wire, should exit the unit through the knock out on the side of the bracket "R" with the wires going through the isolated connector provided. **IMPORTANT-** when connecting the lines make certain that you use the connectors provided and that they are securely crimped, firmly attached, and not touching any other terminals or personal injury and damage to the unit will occur. Be certain that the unit is properly grounded and complies with the National Electric Code and your local codes. Close the front cover before operating unit. Consult a licensed electrician for safe and proper installation.

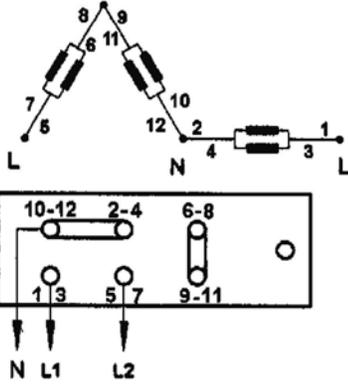


ITEM NO.	DESCRIPTION
1	REAL SEAL
2	CASING
3	GRID
5	USERS TERMINAL BOARD
7	REAR COVER
8	FRAME WITH STATOR
9	FRONT COVER
9A	FRONT COVER MD 35
10	EXCITING STATOR
11	ROTATING DIODE BRIDGE
12	HUB
13	EXCITING ARMATURE
14	ROTOR
15	FAN
16	EXTERIOR FLANGE BEARING COVER
17	DRIVE-END BEARING
18	INTERIOR FLANGE BEARING COVER
19	REAR BEARING
20	TERMINAL BOX
22	DIODE HOLDER WASHER
23	ELECTRONIC REGULATOR
24	AUXILIARY TERMINAL BOARD
28	COVER STAY BOLT

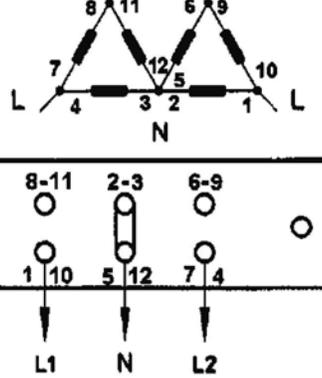
ITEM NO.	DESCRIPTION
39	PROTECTION SCREEN
40	FIXING RING
42	PARALLEL DEVICE
75	CABLE GROMMET
94	REAR CASE
95	TERMIN.BRD.SIDE PANEL
96	TERMIN.BRD.FRONT PANEL
97	TERMIN.BRD.REAR PANEL
98	REGULATOR CARRYING PANEL
104	COMPONENT-CARRYNG PANEL
123	RING SPACER
138A	FRONT GRESING PIPE
138B	REAR GREASING PIPE
139A	REAR TERMINAL STRIP
139B	FRONT TERMINAL STRIP
140	COPPER TERMINAL
141	COPPER BRIDGE
142	STIRRUPS SUPPORT
143	EXCITER STAY BOLT



**SINGLE PHASE 120/240 VOLTS
PARALLEL ZIG ZAG**

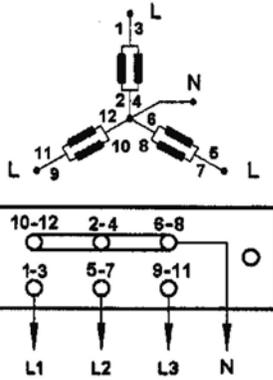


**SINGLE PHASE 120/240 VOLTS
DOUBLE DELTA**

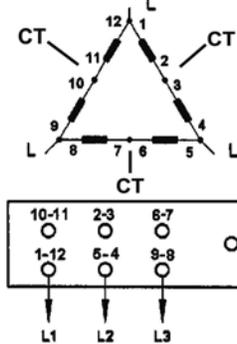


L1 = LINE
L2 = LINE
L3 = LINE
N = NEUTRAL
CT = CENTER TAP

**THREE PHASE 120/208 VOLTS
PARALLEL STAR**

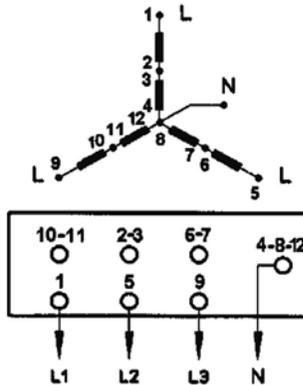


**THREE PHASE 240 VOLTS
SERIES DELTA (NO NEUTRAL)
CT CENTER TAP**



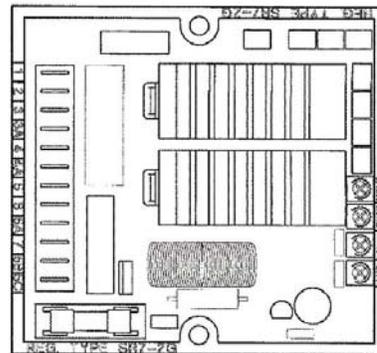
**DO NOT USE
OTHER
CONNECTION
TERMINALS**

**THREE PHASE 277/460/480 VOLTS
SERIES STAR**



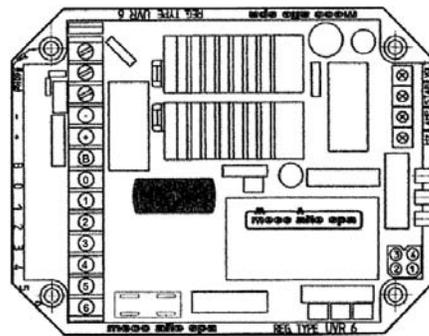
S.R.7/2-G

**VOLTAGE
REGULATORS**



U.V.R.6/1-F

←VOLTS



**FOR 50 HERTZ CONNECTIONS,
CONSULT THE FACTORY.**

ORDERING PARTS

For parts or service, contact either the factory or the dealer or distributor from whom you purchased this equipment for the name of the nearest authorized service station. To avoid errors or delay in filling your parts order, please furnish all information requested and always refer to the nameplate on the unit by giving the model and serial number. Do not order by reference number or group number if possible, always use the part number. State definite shipping instructions. Any claims for loss or damage to your unit in transit must be promptly filed against the transportation company making the delivery at the time of delivery. Shipments are complete unless the packing list indicates items are back ordered.

FOR SERVICE OR PARTS CONTACT THE FACTORY AT:

Wanco/Voltmaster 5870 Tennyson Street, Arvada, Colorado 80003 Phone 800-730-3927 or 303-427-5700, fax 303-427-5700, web site www.voltmaster.com

ONE YEAR LIMITED WARRANTY AB, AR and EC SERIES

This warranty extends to the original purchaser only. The generator sold is warranted to the original purchaser for a period of one (1) year from the original purchase date. The manufacturer warrants the generator sold to be free from defects in material and workmanship if properly installed, service and operated within the nameplate rating under normal conditions according to the manufacturer's written instructions.

DISCLAIMERS

This warranty does not apply to any items which must be repaired or replaced due to normal wear, which have been subject to misuse, negligence, accident or which have been repaired, altered by others outside of the manufacturer's factory unless authorized in writing by the manufacturer. Under no circumstances will the manufacturer be liable for any consequential damage or expense or any kind, including loss of profits not the fitness of the product for any specific application or particular purpose. Any implied warranties are limited in duration to the above one (1) year period. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

PERFORMANCE

The manufacturer's obligation under this warranty is limited to correcting without further charge at its factory or authorized service station any part or parts which shall be returned transportation charges prepaid, and which upon examination shall disclose to the manufacturer's satisfaction to have been originally defective. Other than transportation charges, no charge will be made for such repair, adjustment and or replacement. This remedy is expressly in lieu of all other remedies, and is the purchaser's sole and exclusive remedy hereunder.