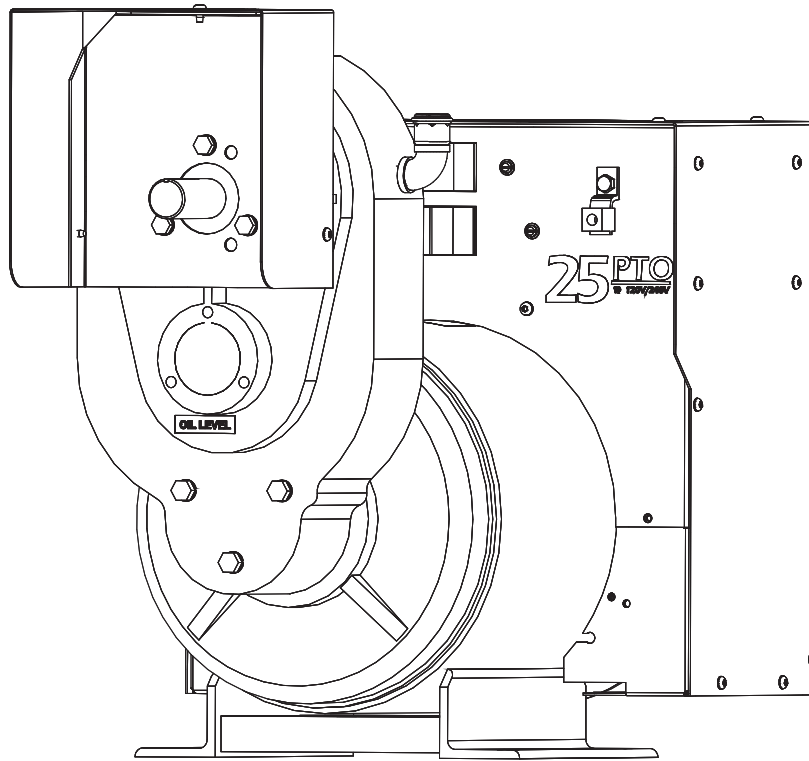


WINCO[®]

25PTOS-3 GENERATOR



INSTALLATION AND OPERATORS MANUAL

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36 MONTH LIMITED WARRANTY

COPY YOUR MODEL AND SERIAL NUMBER HERE

No other WINCO generator has the same serial number as yours.

If you should ever need to contact us on this unit, it will help us to respond to your needs faster.

MODEL _____

SERIAL NUMBER _____

PURCHASE DATE _____

DEALER NAME _____

DEALER PHONE # _____

60706-199

SAVE THESE INSTRUCTIONS

- 2** This manual contains important instructions that should be followed during installation and maintenance of the generator. Read and understand all instructions in the manual before starting and operating the generator.

3 USING THIS MANUAL

- 3** Congratulations on your choice of a WINCO generator. You have selected a high-quality, precision-engineered generator designed and tested to give you years of satisfactory service.

- 4** To get the best performance from your new generator, it is important that you carefully read and follow the operating instructions in this manual.

- 4** Should you experience a problem please follow the "Troubleshooting Tables" near the end of this manual. The warranty listed in the manual describes what you can expect from WINCO should you need service assistance in the future.

5

7 INTRODUCTION

7

- 8** The WINCO rotating armature power take-off generators are designed primarily for farm use as a standby electrical power supply, utilizing the power take-off of a tractor or truck as the prime mover. This PTO drive generator will provide, 120/240V single phase, 60Hz electrical service when properly driven.

8

NOTE:

The prime mover which drives the generator must be capable of delivering approximately 2 HP per 1000 watts output from the generator. Observe input RPM specifications.

The generator may be foundation mounted for use as standby power source, or trailer mounted, and used as portable electrical power sources for areas where commercial power is not readily available, such as out buildings.

11

- 12** This generator includes a color coded voltmeter to warn against high or low voltage, three output power receptacles, an overload protection circuit, and an electronic excitation circuit. To reduce maintenance problems, the coupling between the generator input shaft and rotor consists of precision helical gearing rather than a chain link drive. The input shaft is a 1 1/8 in. diameter smooth shaft with a keyway and center drilled for a roll pin. Both must be used at all times.

The factory thoroughly tests each generator before shipment. All are continuous duty rated.

IMPORTANT: THE MANUFACTURER STRONGLY RECOMMENDS RUNNING THE GENERATOR UNDER LOAD AT LEAST ONCE A MONTH IN ORDER TO EVAPORATE ANY ACCUMULATED MOISTURE CONDENSATION.

SPECIFICATIONS

25PTOS

Watts	25,000
Amps	104
Input Speed	540 RPM
Generator Speed	3600 RPM
Input Shaft	1 1/8" - keyed
Required Tractor PTO HP	50
Gear Lube	
Volume	2 Pints
Type	85/90W-140

SAFETY

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual contains important information that should be understood and followed before the installation, operation and maintenance of the generator. Failure to follow the safety instructions in this manual could result in serious injury or death. Keep this manual available for future reference.

ANSI SAFETY DEFINITIONS

DANGER:

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.

WARNING:

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION:

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may be used to alert against unsafe practices.

NOTE: CAUTION is also used on the unit labels and in this manual to indicate a situation that could result in serious damage or destruction of the equipment and possible personal injury.

1. ELECTRIC SHOCK -

The output voltage present in this equipment can cause a fatal electric shock. This equipment must be operated by a responsible person.

- Do not allow anyone to operate the generator without proper instruction.
- Guard against electric shock.
- Avoid contact with live terminals or receptacles.
- Use extreme care if operating this unit in rain or snow.
- Use only three-prong grounded plugs and extension cords.

- Be sure the unit is properly grounded to an external ground rod driven into the earth.

2. FIRE HAZARD -

- Keep a fire extinguisher nearby and know its proper use. Fire extinguishers rated ABC by NFPA are appropriate.

3. NOISE HAZARD -

Excessive noise is not only tiring, but continual exposure can lead to loss of hearing.

- Use hearing protection when working around this equipment for long periods of time.
- Keep your neighbors in mind when permanently installing this equipment.

4. CLEANLINESS -

Keep the generator and surrounding area clean.

- Remove all grease, ice, snow or materials that create slippery conditions around the unit.
- Remove any rags or other materials that could create a potential fire hazard.
- Carefully clean up any gas or oil spills before starting the unit.

5. SERVICING EQUIPMENT -

All service, including the installation or replacement of service parts, **should be performed only by a qualified technician.**

- Use only factory approved repair parts.
- Do not work on this equipment fatigued.
- Use extreme caution when working on electrical components. High output voltages from this equipment can cause serious injury or death.
- Installing a generator is not a "do-it-yourself" project. Consult a qualified, licensed electrician or contractor. The installation must comply with all national, state, and local codes.

6. INSTALLATION -

Installing a PTO generator is not a "do-it-yourself" project. Consult a qualified, licensed electrician or contractor. The installation must comply with all national, state, and local codes.

- Never operate the PTO drive generator without having it properly mounted to a concrete base or approved trailer.
- Never connect the PTO generator to an existing electrical system without installing an isolation transfer switch.
- Always insure the drive shaft is straight and level before operating the generator.

8. OPERATION - PTO drive shafts (tumbling bars) have many inherent dangers, extreme caution must be exercised when using them.

- A. NEVER allow children around the drive shaft when it is in operation.
- B. Keep all safety guards and shields in place and securely tightened.
- C. Never operate a drive shaft that has been damaged or had the safety shield removed.
- D. Never step over a drive shaft while it is running.
- E. Never wear a necktie, loose articles of clothing, or anything else that can be caught in moving parts.
- F. Never try to stop drive shaft with your hand or your foot.

TESTING POLICY

Before any generator is shipped from the factory, it is fully checked for performance. The generator is loaded to its full capacity, and the voltage, current, and frequency are carefully checked.

Rated output of generator is based on engineering tests of typical units, and is subject to, and limited by, the temperature, altitude, fuel, and other conditions specified by the manufacturer of applicable engines.

PREPARING THE UNIT

UNPACKING

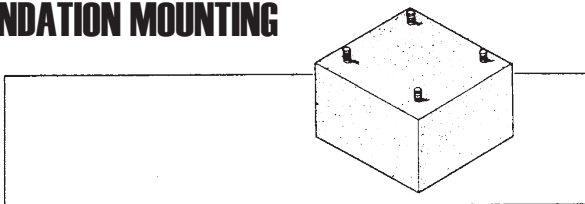
CAUTION: EQUIPMENT DAMAGE

When you unpack your new generator, be sure to remove all of the information sheets and manual from the carton.

1. As you receive your unit, it is critical to check it for any damage. If any damage is noted, it is always easiest to refuse the shipment and let WINCO take care of the freight claim. If you sign for the unit, the transfer of the ownership requires that you file the freight claim
2. Before proceeding with the preparations of your new generator for operation, take a couple of minutes to ensure the unit you have received is the correct model and review the specification pages in this manual to ensure that this unit meets your job requirements.

INSTALLATION

FOUNDATION MOUNTING



Mount the generator on a foundation if it is to be used as a permanent or standby power source. When planning a foundation consider the following points:

- A. The foundation location should enable aligning the drive shaft (tumbling bar) in a straight or nearly straight line between the power take-off and the generator input shaft. Misalignment must be less than

5 degrees during generator operation, even though the mechanical design of the tumbling bar would allow greater misalignment.

- B. The foundation must be solid enough to absorb generator starting and reflected load torque during operation.

- C. The foundation surface should be flat.

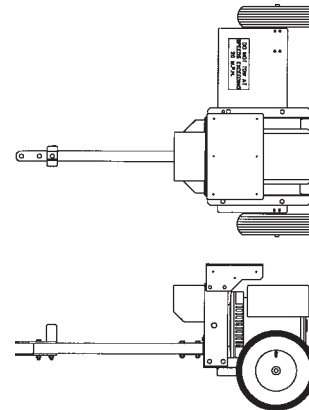
- D. Space is required around the generator for mounting switching devices, making connections, and for servicing.

- E. For dimensions needed for install for your specific generator, please refer to it's outline drawing. The hardware needed is dependent on your distinct application.

- F. The generator mounting bracket must rest evenly and firmly on the foundation. Install shims if necessary to even out the foundation under the mounting pads then bolt the generator firmly in place.

TRAILER MOUNTING

Optional Trailer Part Number TDM76



Mount the generator on a trailer if you plan to use it as a portable power source. When selecting or building a trailer to mount the generator, consider the following points:

- A. The trailer construction must be strong enough to support the generator.

- B. The design of the trailer must enable the trailer to remain stable during operation, and to resist tipping caused by generator starting and reflected load torque.

- C. The trailer height and mounting position of the generator on the trailer should enable aligning the drive shaft (tumbling bar) in a straight or nearly straight line between the power take-off and generator input shafts. Misalignment must be less than 5 degrees during generator operation, even though the mechanical design of the tumbling bar would allow greater misalignment.

- D. The generator mounting area of the trailer bed should be flat.

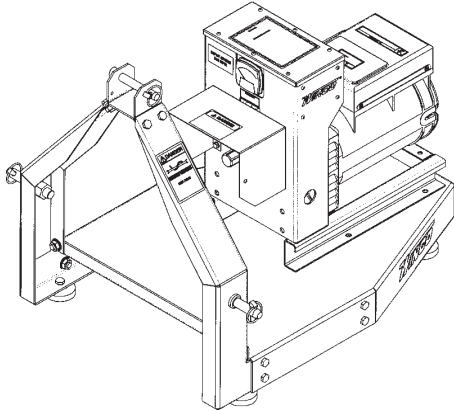
All four generator mounting pads must rest firmly on the trailer bed. Install shims if necessary to even out the bed under the mounting pads, then bolt the generator firmly in place.

WARNING: PERSONAL INJURY & EQUIPMENT DAMAGE

Trailer may tip over and cause injuries if wheels are not spaced far enough apart.

THREE-POINT HITCH KIT

Optional 3-Point Hitch Part Number TPH241



WARNING: PERSONAL INJURY & EQUIPMENT DAMAGE

When using the 3-point hitch assembly all three points must be attached to the tractor. Failure to do so will cause the generator to tip when lifting it damaging both the t-bar and the generator.

- A. The three point hitch must be attached to the tractor at all times during operation.
- B. When operating the generator the three point hitch and generator must be sitting on flat level ground. All four deck pads must be in constant contact with the ground at all times. This will reduce the vibration in both the generator and the tumbling bar.
- C. For safety the generator must be bolted to the three point hitch deck using all four mounting bolts.

ELECTRICAL CONNECTIONS

CAUTION:

Only qualified electricians should install electrical wiring. Wiring must conform to all applicable national, state, and local codes. (Reference: National Fire Protection Association Manual No. 70, National Electrical Code.)

DANGER: PERSONAL INJURY:

If the generator is to be used as a standby power source,, a manual transfer switch must be installed to separate the generator and the commercial power lines. The switch must isolate the generator from the commercial power lines and the load when the generator is on standby, and must isolate the commercial power lines from the load and the generator when the generator is supplying power. See the following diagrams.

A properly rated and installed double throw manual power isolation transfer switch must be used with a standby generator. The transfer switch isolates the load from the power line and allows you to safely operate your loads without endangering the power line repair crew. See previous diagrams

The load, connected to the normal terminals of the transfer switch, is energized by the normal power line when the switch is in the normal position. The generator, connected to the emergency terminals of the switch, furnishes power when the switch is in the emergency mode position.

There are two ways to install a manual transfer switch. The first shown on the left side of page 6 is to install the switch between the watt-hour meter and the normal distribution panel. As with any system you must install an entrance rated breaker before the manual transfer switch. The manual transfer switch must in all cases be equal to or greater than the rating of the entrance rated breaker.

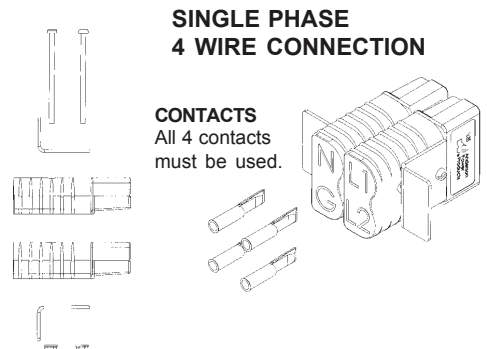
The second way to install the system is to purchase and install an emergency distribution panel and move the circuits you wish to back up to the new distribution panel. In this case the manual transfer switch only has to be sized to the amperage of the circuit breaker in the main distribution panel that is feeding it. See the right hand drawing of the previous diagrams

Before deciding which system to install, first determine which loads you can safely run on your PTO generator and the cost of buying a large manual transfer switch versus the cost of a smaller switch and the additional distribution panel.

The only assembly work required after unpacking the generator is to assemble the load disconnect plug, which is contained in a bag in the subpack carton packed in the generator crate.

The bag contains an instruction sheet, 2 plug bodies, four contacts, two handle and the hardware to assembly the disconnect plug. You will need to purchase the appropriate length of fine stranded copper wire for your application in order to complete the assembly of the disconnect plug. **DO NOT USE SO CABLE - USE SINGLE LEAD WELDING CABLE**

A #4 Neoprene/THHN wire size is recommended.



If you require different inserts or contacts for local code, WINCO has a variety of different inserts and contacts available. Contact the factory at 507-357-6831 for pricing.

WARNING: EQUIPMENT DAMAGE

Never use acid core solder. When soldering insure no excess solder runs down on the contact surface - Solder on the contact surface will not allow the contacts to mate properly causing them to burn up.

Each wire should be stripped back 7/8 of an inch and inserted into one of the contacts in the plug kit. You will then either need to solder them together using a good grade of resin core solder or they can be crimped with an appropriate compression crimper or both.

Approved Crimping tools are:

1. Anderson Power Products
2. ETC Model HHS hydraulic crimper
3. ITT Blackburn NO. 1640
4. T&B (Thomas & Betts) #TBM5

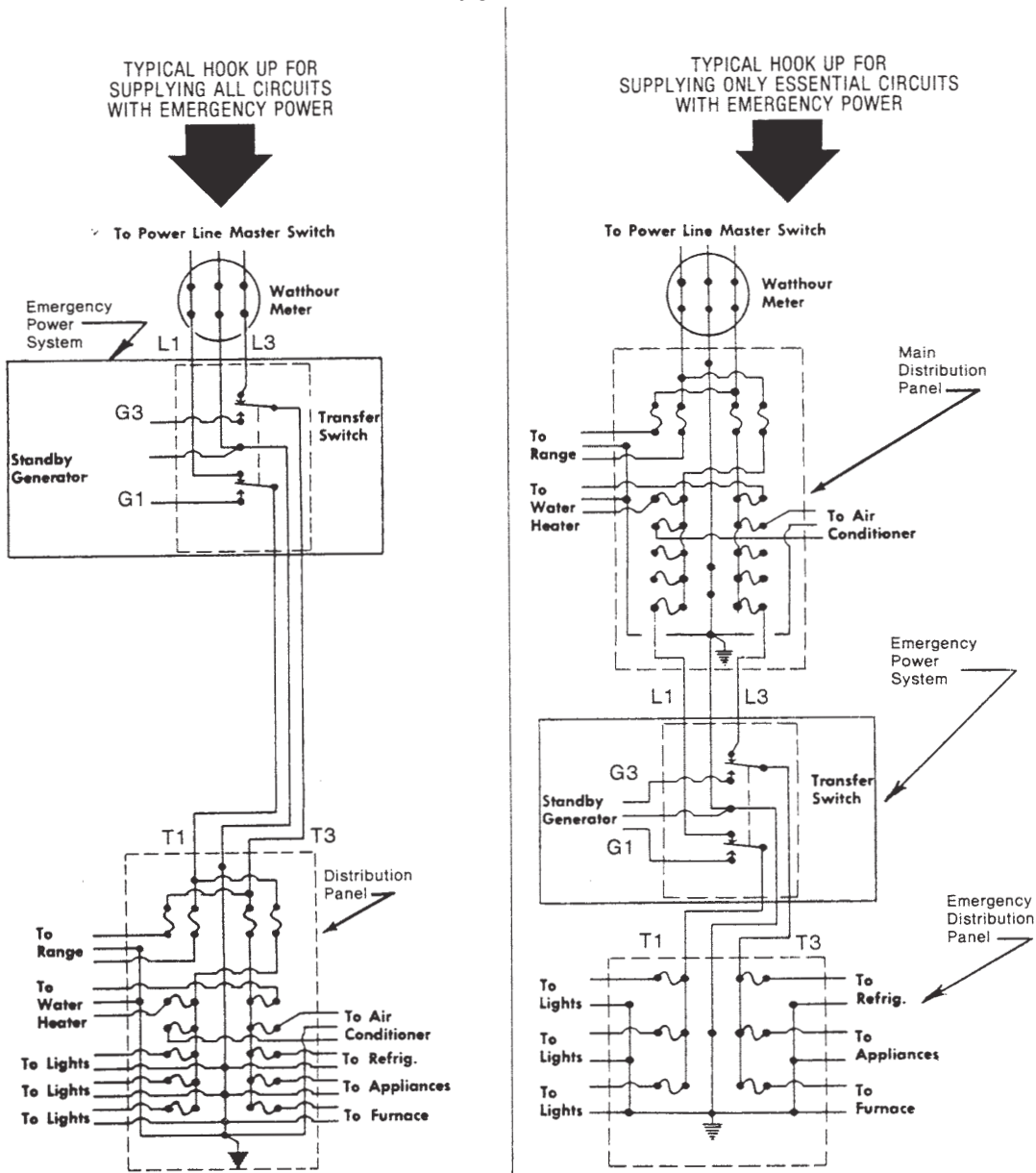
To complete the assembly of the disconnect plug refer to the instruction sheet in the plug kit.

WARNING: ELECTRICAL SHOCK

DURING THE NEXT STEP, THE LOAD DISCONNECT PLUG SHOULD NOT BE PLUGGED INTO ITS RECEPTACLE. ALSO, MAKE SURE THAT THE EQUIPMENT TO WHICH THE PLUG LEADS (CABLES) ARE BEING CONNECTED IS NOT ENERGIZED (LIVE).

Strip the insulation off the free end of each of the plug leads (cables), and connect them to the load transfer switch (or directly to the load).

IMPORTANT: When making standby service hook up, make sure load to be transferred to standby generator will not exceed generator rating.



Typical Connection Methods for Generator Power Service

OPERATION

Output power available and load determination

Before using the generator, read and understand the following information.

Generator output current (amperage) is internally limited by three circuit breakers. If too much demand is placed on a generator output (if you try to drive too many motors with it, for example), one of the circuit breakers will trip, cutting off the output in order to protect the generator.

A 20 Amp push-to-reset circuit breaker protects the 120V duplex receptacle output circuit. 20 Amps is the total limit for both outputs of the duplex receptacle.

A 50 Amp push-to-reset circuit breaker protects the 240V receptacle output circuit.

A large two pole (three pole for three phase) switch type main circuit breaker protects the generator windings and output circuits, including the load disconnect receptacle outputs. The load disconnect receptacle on the 25PTOC is the largest gray receptacle on the generator output panel.

To aid in determining how much load can be applied to the generator, and how it should be distributed among the generator output receptacles, the following formulas may be useful. Get load voltages, current, and wattage from the nameplates on the equipment in the load.

Load current (in Amps) x Load voltage = Load wattage
 Amps x Volts = Watts
 Watt/1000 = kW

Load wattage / Load voltage = Load current (in Amps)

Example: 250W, 120V floodlight load: $250W / 120V = 2$ Amps (parrots.)

NOTE:

Electric motors require more current to start than to run. Commonly, the current rating given on a motor nameplate is the full load (running) current required by the motor, not its starting current, which is a lot higher. Motor starting current requirements vary greatly, by motor size and type. Repulsion-induction type motors are the easiest to start, typically using 1 1/2 to 2 1/2 times as much current to start as to run; capacitor type motors usually require 2 to 4 times as much current to start as to run; split-phase type motors are the hardest to start, normally using 5 to 7 times as much current to start as to run.

PRE-START CHECKS

WARNING: PERSONAL INJURY

When working on or around these generators, do not wear loose fitting clothing or any articles that may get caught in moving parts.

1. Visually inspect the generator. Check for:

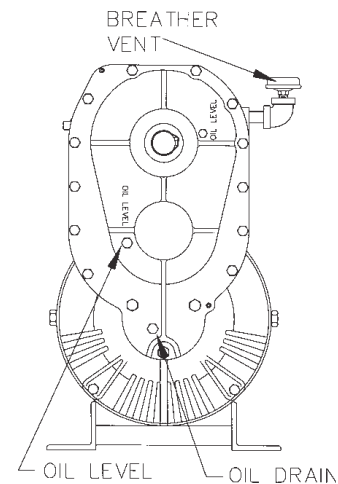
- A. Correct mounting
- B. Physical damage
- C. Debris in cooling vents and screens (could cause generator to overheat)

IMPORTANT: The manufacturer recommends that, if the generator has been stored for any length of time, before using it, the operator removes the control box cover and cooling fan screen. Then inspect the generator for rodent nests or other objects that could cause the generator binding and/or overheating. See “cleaning portion of the Maintenance section.

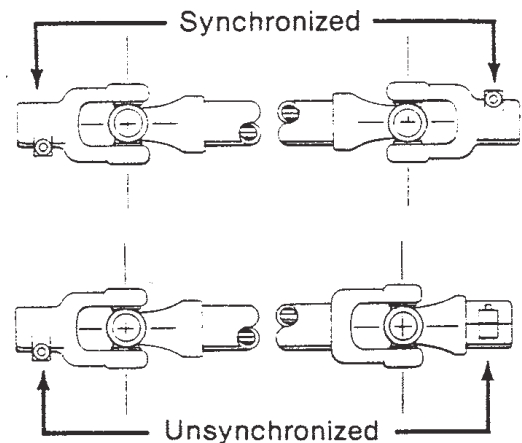
2. Check gearcase oil level. Case should be filled with oil to plug marked “OIL LEVEL”. Fill or remove oil as required.

NOTE: Either too little or too much oil can harm the equipment.

See “lubrication” portion of Maintenance for oil specifications.



3. Make sure the drive shaft (tumbling bar) is assembled with its universal joint knuckles “synchronized”. If the knuckles are not synchronized, the bar will chatter when rotating, which will cause the generator output voltage to flicker.



DANGER: PERSONAL INJURY

Power take-off must be **DISENGAGED** at this time.

4. Couple the tractor to the generator with the drive shaft (tumbling bar). Couple the tumbling bar to the generator input shaft first, then to the power take-off shaft. Check alignment, tractor, power take-off shaft (tumbling bar), and the generator input shaft should form a straight (or nearly straight) line, with less than 15 degrees misalignment between the shafts. Misalignment will cause generator output voltage to flicker.

CAUTION:

Make sure that all tumbling bar lock pins are engaged and that all safety shields are in place before operating the PTO generator.

5. Make sure no binding exists in generator or gearbox. If binding is found, locate the cause and correct it before proceeding.
6. Make sure that the electrical loads to be driven by the generator will not draw more current than the ratings of the generator receptacle or cord set which will supply the current.
7. Check all electrical connections in the system to be energized by the generator. Make sure the connections are correct and are tight.
8. Make sure all loads are turned off. Do not start generator under load.

GENERATOR PROCEDURES

START-UP

1. With the power take-off drive disengaged, start the engine which will drive the generator. Run the engine long enough to warm it up before proceeding, so that it will run smoothly and achieve full power under generator load.
2. With the engine idling, engage the power take-off drive.
3. Watch the voltmeter on the generator and slowly increase engine speed until the output reaches approximately 260 Volts, in green portion of voltmeter scale.
4. With engine and generator running smoothly, switch on the electrical load while watching the voltmeter.

NOTE: EQUIPMENT DAMAGE

If the load includes motors, turn them on one at a time, highest starting current motor first, next highest second, etc.

Readjust engine throttle to keep generator output under load at 240V (in green portion of voltmeter scale). If engine is equipped with speed governor, it may automatically readjust the throttle as the load changes and keep the generator output at the proper level.

SHUTDOWN

1. Switch off electrical load.
2. Reduce Speed of engine driving generator to idle.
3. Disengage power take-off drive and allow generator to coast to a stop.

WARNING: PERSONAL INJURY

Never try to manually stop the generator. Always let it coast until it stops.

4. Shut off the engine.
5. Disconnect drive shaft. Power take-off end first, then the generator end.

MAINTENANCE

GENERAL INFORMATION

The main components of the generator are: armature, field coils, cooling fan, brushes, brush holder assembly, end brackets, and rectifier. Before performing any maintenance on the generator, isolate and/or disable the drive system so the unit can not be accidentally started while being repaired.

The trouble shooting chart lists various symptoms of poor generator operation with possible causes and the appropriate corrective action. You will need a volt-ohm meter or test light to check some of the causes. For some of the other causes you will need to check generator speed. To check generator speed, you can use a frequency meter, a tachometer, or a 120V-60Hz electric clock and a correctly operating wrist watch (run the electric clock and a correctly power and compare the clock's second hand movement with that of the wrist watch. They should run at the same speed. If the clock runs faster, generator speed is too high, and vice versa).

CAUTION: EQUIPMENT DAMAGE

Most electrical equipment in North America operates satisfactory at frequencies between 58.5 and 62 Hz (cycles per second). Operating the generator at frequencies outside that range may cause damage to the generator and/or to electrical equipment driven by the generator.

PERIODICAL MAINTENANCE

Service/maintenance items include periodic external physical inspection for missing hardware or damage to mounting or drive system and checking the oil level in the gearcase. It is recommended that the generator be operated at least monthly under normal loads to familiarize operators with the procedures and controls as well as to dry out any accumulated condensation or other moisture in the generator electrical windings. The maintenance and service attention invested will ensure getting the peak performance that was designed to the unit.

Routine preventative maintenance minimizes costly repairs and generator down-time. Before each use, inspect the generator: gearcase oil level should be correct, cooling vents and screens should be clear, and generator mounting hardware should be tight. Clean and inspect the generator after storing it for long periods, and after using it in extremely dusty conditions or in severe weather, such as rain or blowing snow.

LUBRICATION

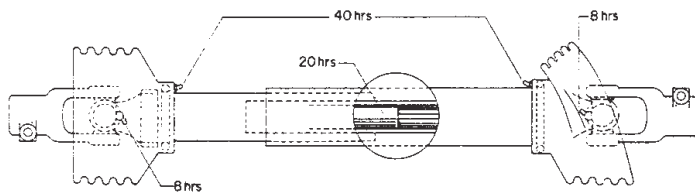
The generator bearings are factory lubricated and sealed, and require no further lubrication.

The generator input shaft should be cleaned and lubricated with a thin film of grease before installing the drive shaft and each time it is removed.

The drive shaft (tumbling bar) requires greasing. Keep the universal joints in the coupling shaft free from grease and dirt build-up.

NOTE:

Do not over lubricate the universal joints.



Check the generator gearcase oil level before each use of the generator. Maintain the oil level at the oil level plug height. The generator is shipped with lubricant in the gearcase. Specifications for the gearcase lubricant are:

API Serie: GL-5
Grade: SAE 85W-90-140
Amount: 2 Pints

The following kind of oil are recommended for use in the generator gearcase: Mobile SAE 85W-90-140 API Service GL-5, Sunonco/ DX XL80W90-140, Kendal Three Star 85W-140, Amoco 85W140 or equivalent.

CAUTION: EQUIPMENT DAMAGE

Do not overfill generator gearcase. Overfilling causes overheating and oil seal failure.

Change oil at least once every six months. Change it more often if you use the generator in bad weather. Use the following procedure to change generator gearcase oil:

1. Remove gearcase breather. Soak breather in cleaning solvent, then allow to dry.
2. Remove oil level, check plug.
3. Remove the oil drain plug, drain the oil into a clean oil resistant container, 1 quart or larger. Check the oil for metal. Fine metal dust in the oil does not indicate trouble, but metal chips do. Dismantle the gearcase and look for damaged gears if you find metal chips in the oil.
4. Replace the oil drain plug. Refill the gearcase through the breather port with new oil of the recommended type. Fill the case up to oil level check plug height (it will take about 2 pint).

5. Replace the oil level check plug.

6. Replace the breather.

CLEANING & INSPECTION

Use a vacuum cleaner or dry low pressure compressed air (regulated at 25-35 PSI) to clean the generator periodically.

WARNING:

Do NOT clean the generator while it is running.

Proceed as follows:

1. Remove control box cover. Vacuum or blow dust or debris from the control box. Inspect all wiring for correct routing, fraying insulation, and secure connections.
2. Remove end cover. Vacuum or blow dust and debris from the inside of the generator. Inspect wiring for loose connections, fraying insulation and correct wire routing.
3. Replace end cover and control box cover.

GENERATOR STORAGE

Before storing the generator, apply a heavy coat of grease to the splined input shaft. Store the generator in a sheltered area, where it is protected against snow, rain, and excessive dust.

GENERATOR TESTING

BRUSHES

Under ordinary circumstances, brushes will operate for extremely long periods without requiring replacement. They should be inspected after the first 500 hours of operation, and after every 200 hours of operation thereafter. Remove brushes one at a time and check for length; be sure that each moves freely in the brush holder. Brushes should be replaced when worn down to 3/8". Replace brushes in complete sets, never singly. When replacing brushes, be careful to reconnect the lead wires properly.

Poor contact (or "skipping") between brush and slip ring is caused by oil and grit, flint, or other hard substance on the brush, or by the brush not being properly shaped to fit the slip rings. Remedy these defects by fitting the brushes to the slip ring curvature. Place #00 sandpaper under the brushes with the abrasive side to the brushes, and work it back and forth until the brushes are the same shape as the slip rings.

SLIP RINGS

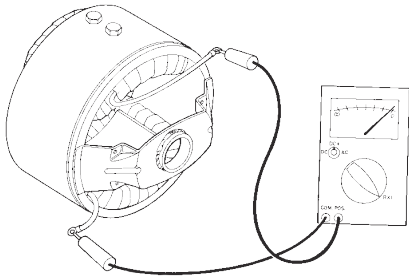
The four continuous copper rings located on the end of the armature are the generator output slip rings. For proper generator output, the surface of the slip rings must have a smooth, shiny, highly polished finish. Normal brush seating will transfer a shiny black finish that will seat the copper surface. This finish should not be removed unless it becomes dull or begins to build up. Under sustained use, it is advisable

to check and if necessary, polish the ring surfaces with a crocus cloth to maintain the smooth finish.

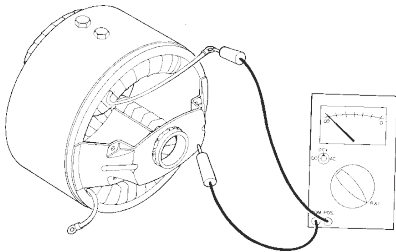
ELECTRICAL TESTING

Testing generator fields for opens and grounds.

1. Disconnect field leads from rectifier.
2. Set multimeter to read resistance, and connect the meter leads to the field leads. If the field is open, meter will read infinite resistance (very high ohms). Repair or replace field if it is open. Typically resistance for these fields vary from 20.2 to 22.4 ohms.

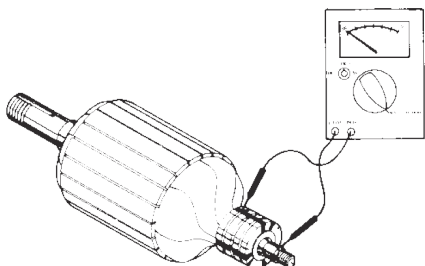


3. Leaving one meter lead connected to the field, connect the other meter lead to the field shell. If the meter indicates continuity, any reading other than infinite resistance, the field is grounded and should be repaired or replaced. To determine which of the field is grounded, cut the connector between the two coils and retest to determine which coil has the low resistance path.

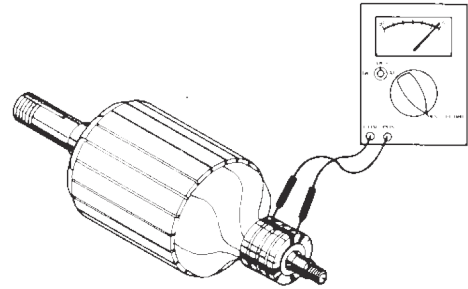


TESTING ARMATURE FOR OPENS AND GROUNDS

1. Remove all brushes
2. Ground faults test - set multimeter to read high resistance (meg-ohms). Holding one meter lead against a clean spot on the armature shaft, touch the other lead to each of the slip rings (one at a time) while observing the meter. If meter indicates continuity (any reading lower than one meg-ohm), the armature is grounded. Dirt between the slip rings and on the insulator surface can cause grounding. If grounding was indicated, carefully clean all dirt off the slip rings and their insulators and recheck it. Replace the armature if it is grounded and unrepairable.



3. Open test. Set meter to read low resistance ($R \times$ ohms). Holding one meter lead on the surface of slip ring No. 1, touch other meter lead to the surface of slip ring No. 2, while observing the meter. The meter should indicate continuity (low resistance - less than one ohm is typical). If the meter indicates open circuit (infinite resistance), part of the armature winding is open. This may be caused by a repairable defect in the connection at the slip ring, however, generally an open armature will have to be replaced. Continue reading the continuity between slip rings No. 2 to No. 3 and No. 2 to No. 4. All the slip rings should have continuity to slip ring No. 2, the neutral ring.



TESTING RECTIFIERS

Testing field excitation is supplied through a full wave bridge rectifier. This type of rectifier has four terminals, two AC, a DC positive, and a DC negative. A rectifier may be tested in the following manner:

1. Tag and disconnect all leads from rectifier.
2. Connect the red ohmmeter lead to the positive DC (+) terminal.
3. Connect the black lead to each of the AC terminals in turn. Either a high or low resistance reading will be obtained.
4. Reverse the meter leads, black lead to the DC positive (+) and the red lead to the AC terminals, each in turn. An opposite reading should be observed.
5. Connect the red ohmmeter lead to the negative DC (-) terminal.
6. Connect the black lead to each of the terminals in turn. Either a high or low resistance reading will be obtained.
7. Reverse the meter leads, black lead to the DC negative (-) and red to the AC terminals, each in turn. An opposite reading should be observed.
8. Check each terminal to the case. An open circuit (very high resistance) reading should be observed. A battery powered test light may be used. Follow the same procedures described above. A good diode element will allow current to pass to the light in the test lamp in only one direction.
9. If the rectifier fails any of the above tests, it should be considered defective and be replaced.

CONDENSER TESTING

Condensers are built into the generator circuit to minimize radio interference during operation. If a condenser shorts out, it will also short out the generator output. To determine whether a condenser is shorted, stop the generator and disconnect the condenser lead wire from the brush holder. Using a multimeter on the R x 100 scale, check the resistance of the condenser. Normal response is a sharp swing of the meter towards low resistance and then a steady rise towards high resistance (open circuit). If the capacitor is shorted, it will show as a constant low resistance.

Other wise, restart the generator without the capacitor connected to recheck the generator output. If the generator then provides power, the condenser was at fault and should be replaced. If the generator does not provide power, the problem was not caused by that condenser, reconnect the lead wire.

If these tests have not located the trouble, remove the armature and have it tested for opens, shorts, and grounds on a growler.

TROUBLE SHOOTING TABLE

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Low Output Voltage	<ol style="list-style-type: none"> 1. Engine speed too slow. 2. Generator overloaded. 3. Inadequate engine horse power.. 4. Incorrect field excitation. (no load/output low) 	<ol style="list-style-type: none"> 1. Check engine speed. Increase RPM if necessary. 2. Reduce load if it is higher than the rated capacity of the generator. See generator nameplate. 3. Generator requires 2.0 HP/1000 Watt output. Obtain larger engine if necessary. 4. Check for worn brushes and weak or broken brush springs; replace as required. Check input AC voltage to rectifier. Check rectifier output DC voltage to positive DC brush. If no DC voltage is present at the brush, replace the rectifier. Check for dirty slip rings. Clean them if they are dirty.
High Output Voltage	Engine speed too fast.	Check engine speed for correct input RPM.
Excessive Vibration	<ol style="list-style-type: none"> 1. Power take-off misalignment excessive. 2. Loose mounting nuts and bolts or hold-down studs. 3. Universal joints in coupling shaft worn or dry. 4. Defective bearings 	<ol style="list-style-type: none"> 1. Correct misalignment. It should be less than 15°. 2. Tighten mounting nuts and bolts; repair hold-down stud mountings. 3. Repair or replace defective parts. 4. Check for possible causes. Replace defective bearings.
No Output Voltage	<ol style="list-style-type: none"> 1. Circuit breaker open. 2. Defective voltmeter. 3. Short circuit in the load.. 4. Defective receptacles. 5. Loose (or broken) wires or connections in control box. 6. Defective rectifier. 7. Dirty slip rings. 8. Brushes binding in holders. 9. Shorted or open armature. 10. Shorted or open field coils. 	<ol style="list-style-type: none"> 1. Reset circuit breakers, replace if defective. 2. Check output with another meter, replace meter if defective. 3. Disconnect the load. Check voltage at receptacle cord set. Check motors, appliances, and load leads for short circuit, repair short.. 4. Remove panel cover and check for voltage to the receptacles. Replace defective receptacles.. 5. Remove panel cover and check all wiring and connections. Tighten and/or replace where necessary. 6. Test rectifier. Replace if defective. 7. Clean and polish. Use 00 sandpaper or crocus cloth, never use emery paper. 8. Check brushes for swelling; replace armature if open or shorted. 9. Measure armature resistance. Replace armature if open or shorted. 10. Measure between leads for open or short. Replace field coils if defective.
Generator Overheating	<ol style="list-style-type: none"> 1. Poor ventilation. 2. Generator overloaded. 3. Shorted turns in field or armature windings. 	<ol style="list-style-type: none"> 1. Clean ventilation and cooling fan screens. 2. Reduce load, then check voltage and current. 3. Replace defective components.
Oil Leak	<ol style="list-style-type: none"> 1. Loose plug in gearcase. 2. Defective seal, gasket, or plug in gearcase. 	<ol style="list-style-type: none"> 1. Tighten plug. 2. Replaces seal(s), gasket or plugs. Maintain correct oil level.



36 MONTH LIMITED WARRANTY

WINCO, Inc., warrants for thirty-six months from date of shipment, that it will repair or replace at its option, for the original user, the whole or any part of the product found upon examination, by WINCO at its factory at 225 South Cordova Avenue, Le Center, Minnesota, or by any factory-authorized service station, to be defective in material or workmanship under normal standby use (average less than 50 hours per month) and service.

For warranty service, return the product within 36 months from the date of purchase, transportation charges prepaid, to your nearest factory-authorized service station or the WINCO factory. THERE IS NO OTHER EXPRESS WARRANTY.

There is no other express warranty. To the extent permitted by law, any and all warranties, including those of merchantability and fitness for a particular purpose, are limited to 36 months from date of shipment, and liability for incidental or consequential damages or expenses is excluded. Some states do not allow limitations on the duration of an implied warranty, and some states do not allow the exclusion or limitation of incidental or consequential damages, so that above limitation or exclusion may not apply to you. This warranty gives you specific legal rights; you may have other rights which vary from state to state. Note: Some states do not allow limitation on the duration of implied warranty and some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations may not apply in every instance. This warranty gives you specific legal rights which may vary from state to state.

EXCLUSIONS:

WINCO does not warrant drive lines, trailer tires, receptacles, or certain other component parts of the product installed by others, since such items are warranted by their manufacturers.

WINCO does not warrant modifications or alterations which were not made or authorized by the WINCO factory and which affect the stability or reliability of the product.

WINCO does not warrant products which have been exposed to misuse and/or negligence or have been involved in an accident.

WINCO does not warrant products which have been installed in such a manner as not to protect them from the adverse environmental conditions (water, mud, insects, etc.) or have not been kept clean.

WINCO reserves the right to change or improve its products without incurring any obligations to make such changes or improvements on products purchased previously.

This warranty is limited to bench labor and parts only, no allowance will be made for travel time, or removal and reinstallation of the PTO unit.