

WINCO® *Modular Generator & Lighting Systems*

OWNERS MANUAL
*INSTALLATION, OPERATION,
and MAINTENANCE INSTRUCTIONS*

YLT6010DE	LLT6012DE
MLS4Y	MLS4L
MD6Y	MD6L



Read and understand all instructions in the manual before starting and operating the generator set.

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USING THIS MANUAL

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

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

Should you experience a problem please follow the "Things To Check" near the end of this manual. The warranty listed in this manual describes what you can expect from WINCO should you need service assistance in the future.

PROPER USE AND INSTALLATION

You must be sure your new engine generator set is:

- * Properly serviced before starting
- * Operated in a well ventilated area
- * Exhaust gases are dispersed safely
- * Wired by a qualified electrician
- * Operated only for its designed purposes
- * Used only by operators who understand its operation
- * Properly maintained

COPY YOUR MODEL AND SERIAL NUMBER BELOW FOR FUTURE REFERENCE.

No other WINCO generator has the same serial number as yours. It is important that you record the number and other vital information here, 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_____

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GUIDE TO PRODUCT SAFETY

This Mobile Lighting System has been designed and manufactured to allow safe reliable performance. Improper or careless use can result in potentially deadly hazards; from electrocution or serious electrical shock, exhaust gas asphyxiation, or fire. Please read all safety instructions carefully before installation or use. Keep these instructions handy for future reference. Take special note and follow all warnings on the unit and in the manuals.

CAUTION: Damage to Equipment.

CAUTION notes indicate any condition or practice, which if not strictly observed or remedied, could result in damage or destruction of the equipment.

WARNING: Personal Danger.

WARNING notes indicate any condition or practice, which if not strictly observed, could result in personal injury or possible loss of life.

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.

- A. Do not allow anyone to operate the generator without proper instruction.
- B. Guard against electrical shock.
- C. Avoid contact with live terminals or receptacles.
- D. Use extreme care if operating this unit in rain or snow.
- E. Use only three-prong grounded receptacles and extension cords.
- F. Be sure the unit is properly grounded to an external ground rod driven into the earth.

2. FIRE HAZARD - Engine fuels always present a hazard of possible explosion and/or fire.

- A. Do not refuel when the engine is running or hot. Allow the engine to cool, at least two minutes, before refueling.
- B. Keep fuel containers out of reach of children.
- C. Do not smoke or use open flame near the generator set or fuel tank.
- D. Keep a fire extinguisher nearby and know its proper use. Fire extinguishers rated ABC by NFPA are appropriate.
- E. Store fuel only in an approved container, and only in a well ventilated area.

3. DEADLY EXHAUST GAS - Exhaust fumes from

any internal combustion engine contains carbon monoxide, an odorless and deadly gas, that must be mixed with fresh air.

- A. Operate only in well ventilated areas.
- B. Never operate indoors.
- C. Never operate the unit in such a way as to allow exhaust gases to seep back into closed rooms (i.e. through windows, walls or floors).

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

- A. Use hearing protection equipment when working around this equipment for long periods of time.
- B. Always operate with the doors closed to reduce the operational noise level.

5. CLEANLINESS - Keep the generator and surrounding area clean.

- A. Remove all grease, ice, snow or materials that create slippery conditions around the unit.
- B. Remove any rags or other material that could create potential fire hazards.
- C. Carefully wipe up any gas or oil spills before starting the unit.
- D. Never allow leaves or other flammable material to build up around the engine exhaust area.

6. SERVICING EQUIPMENT - All service, including the installation or replacement of service parts, should be performed only by a qualified technician.

- A. Use only factory approved repair parts.
- B. Do not work on this equipment when fatigued.
- C. Never remove the protective guards, cover or receptacle panels while the engine is running.
- D. Never wear neckties or other loose clothing that can be caught in moving parts while you are servicing or operating this equipment.
- E. Use extreme caution when working on electrical components. High output voltages from this equipment can cause serious injury or death.
- F. When servicing this unit always avoid hot mufflers, exhaust manifolds, and engine parts. They all can cause severe burns instantly.
- G. Installing and wiring a standby 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.

7. LIFTING THE EQUIPMENT - When lifting, always make sure that the area under the equipment is kept clear.

- A. Be certain that rigging is designed to lift unit

safely.

B. Never attempt to lift the equipment unless you are certain the lifting device has sufficient capacity.

C. Never allow the equipment to swing while suspended.

D. Be certain the supporting structure is adequate to handle the load.

8. TOWING THE EQUIPMENT - When towing this equipment, always use a vehicle large enough for safe operation.

A. Never tow without the safety chains secured.

B. Always use the proper size hitch ball on the vehicle.

C. Never attempt to tow with a vehicle that does not have side mirrors installed.

D. Always retract the tower and lock it into the horizontal retracted position before moving the unit.

E. Always put all jacks into ("foot up") horizontal position before moving the tower.

9. TOWER ERECTION - This equipment will become top heavy very quickly as the tower is raised. Always follow the proper sequence raising or lowering the tower.

A. Always extend the leveling jacks and level the unit before lifting the tower from its horizontal position.

B. Always lift the tower to the full vertical position (or tilt position) and lock in place before removing the pin to extend the tower.

C. Never attempt to lower the tower to the horizontal position without the tower FULLY RETRACTED and locked.

D. Always check for proper overhead clearance before attempting to erect the tower. Never raise in the vicinity of overhead power lines.

E. Never allow anyone to walk under the tower during the raising or lowering operation.

MODULAR GENERATOR/ LIGHT- ING SYSTEM DESCRIPTION

WINCO's uniquely designed MLS4 Modular Lighting System offers you three units in one. 1. MSL4 is an Ultra Quiet light tower and trailer equipped with a 30 ft tower, four 1000 watt metal Halide lamps and your choice of two different Ultra Quiet power units. The power units are self contained and can be easily removed or installed on the light tower trailer

2. a. YLT6010DE power unit is powered by a Yanmar 10 h.p. diesel operating at 3600 rpm. It comes complete with a receptacle panel, running time meter

and an internal 20 gallon fuel tank.

This power unit can be used on the MSL4 light tower mounted on a separate trailer, or operated as a stationary power unit.

b. LLT6012DE power unit is powered by a Lister 12 h.p. diesel operating at 1800 rpm. It comes complete with a receptacle panel, running time meter and an internal 35 gallon fuel tank.

This power unit can be used on the MSL4 light tower mounted on a separate trailer, or operated as a stationary power unit.

3. MD6 is an over-the-road trailer with one of the two power units listed above mounted on it. The trailer is equipped with a standard DOT trailer light package, jack stand and safety chains.

SPECIFICATIONS

MLS4Y & MLS4L

TOWER

Height	30 Feet
Rotation	360 degrees

LIGHTS

Type	Metal Halide
Number/Wattage	4/1000

TRAILER

Axle Capacity	2200lbs
Tires	215/75-15
Hitch Type	1-7/8 to 2 1/8" Ball

YLT6010DE

ENGINE/GENERATOR

Make/Model	Yanmar - L100AE
Fuel/Cooling	Diesel/Air
Displacement	406 c.c.
HP @ 3600	10
Starting System	12 volt DC
Fuel Tank	20 gallons

Generator	WINCO 6000
Continuous Watts	5500
Type	Rotating Field

LLT6012DE

ENGINE/GENERATOR

Make/Model	Lister - LPA3
Fuel/Cooling	Diesel/Air
Displacement	1088 c.c.
HP @ 1800	12
Starting System	12 volt DC

Fuel tank	35 gallons
Generator	WINCO6000
Continuous Watts	5500
Type	Rotating Field

40 to 80 degrees F.	SAE20W/40
	SAE10W/40
5 to 40 degrees F.	SAE15W/40
Below 5 Defrees F.	SAE 10W/30
	SAE5W20
For Additional information see the Lister engine manual.	

PREPARATION

NOTE: This booklet covers the entire unit, EXCEPT THE ENGINE. See the engine manufacturer's operator manual for specific maintenance and care information regarding the engine. The engine information provided in this manual is for your convenience only and in no way supersedes the engine manufacture's instruction. If a conflict should arise regarding engine instruction, the engine manual should be considered the authority, unless specifically instructed in this manual to ignore an engine manual instruction.

Read **ALL** instructions in the manuals provided before attempting to operate the generator set.

UNPACKING

When unpacking the unit, be sure to inspect it carefully for freight loss or damage. Check the nameplate to be sure it is what you ordered (proper KW, voltage, fuel, etc.). If you have questions, contact your local authorized dealer. If you see evidence of loss or damage at the time of delivery, have the driver sign and describe the loss or damage in the "memo of loss or damage" section on the freight bill. Then contact the carrier to get instructions on filing a claim.

When loss or damage is discovered after the equipment is delivered, but not seen at the time of delivery, it is referred to as "concealed damage." Separate any damaged material and contact the carrier for proper procedures to file a "concealed damage" claim.

OIL REQUIREMENTS

Engine oil should be MIL-L-2104B or have properties of API classification CC/CD grades. Change the type of engine oil according to the ambient temperature.

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-10 to 100 degrees F.	SAE20W-40
-20 to 80 degrees F.	SAE10W-30
below -20 or above 100 degrees F. ..Consult Yanmar	

LLT6012DE

Above 86 degrees F.	SAE15W/40
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OIL QUANTITY US Qts.

YLT6010DE	1.74 Qt/1.65 L
LLT6012DE	4.43 QT/4.20 L

FUEL REQUIREMENTS

ASTM No. 2 diesel fuel is recommended for these engines. The use of No. 2 diesel fuel will result in optimum engine performance. When normal operating temperatures are below 32 degrees F. (0 degrees C.), it is acceptable to use a seasonal blend of No. 2 fuel. The use of lighter fuel will reduce fuel economy. (SEE THE ENGINE OPERATOR'S MANUAL FOR ADDITIONAL FUEL INFORMATION.)

Filling the Fuel Tank

These units are equipped with a single internal fuel tank. The YLT6010DE has a 20 gallon tank and the LLT6012DE has a 35 Gallon tank. Use caution when filling the tank to prevent it from overflowing.

BATTERY CONNECTION INSTRUCTIONS

CAUTION: EQUIPMENT DAMAGE

Insure the Selector Switch is in the OFF position before connecting or disconnecting either of the battery cables. Failure to turn the Selector switch OFF can cause equipment damage when the battery cables are connected or disconnected.

These units will require installation of a coustomer purchased 12 volt battery for starting. The **YLT6010DE** requires a group **U1 235CCA** battery and the **LLT6012DE** requires a group **24F 600 CCA** battery. When connecting the battery, ALWAYS CONNECT THE POSITIVE CABLE FIRST and THE NEGATIVE CABLE LAST! Disconnecting the battery is done in reverse, disconnecting the negative cable first and then the positive cable.

WARNING ! - POTENTIAL BATTERY EXPLOSION !

This unit uses a negative ground. Connecting the negative cable first makes the battery positive terminal

HOT. Connecting the positive cable last may result in an accidental short circuit of the positive battery terminal to any of the surrounding metal surfaces (i.e. dropping a tool, wrench swing etc.). Use extreme caution whenever making or breaking the battery connections and follow the correct sequence carefully.

INSTALLATION OF LIGHTS

The four flood lamps for the Mobile Lighting System have been shipped on a separate pallet to prevent damage during shipment. Carefully unpack and inspect the lamps prior to installing them on the tower crossbar.

The individual lamps have been prewired and hardware provided for their installation. Two lamps are installed on the top of the crossbar and two are attached to the bottom of the crossbar. The lights should be tipped straight down and the swivel joints locked before towing.

CAUTION: LIGHT BULB DAMAGE

Never handle the metal halide bulbs with your bare hands! Doing so will leave traces of normal body oil deposits on the bulbs which will shorten the bulb life. In addition, a hot bulb will cause severe burns instantly. See the Maintenance section of this manual for the proper procedures.

OPERATIONS

DESCRIPTION AND IDENTIFICATION

CONTROL PANEL LAYOUT

A. GENERATOR CONTROL PANEL

1. **Hour Meter** - This D.C. powered meter records the time that the engine has run. It is used to schedule engine maintenance such as air, fuel and oil filter changes.

2. **Start Switch** - This unit is equipped for manual start only. A three position Selector Switch controls the engine.

a. "OFF" - This switch position stops the engine. With the Selector Switch in this position, the unit can be safely serviced.

b. "RUN" - This switch position activates the fuel gauge, running time meter, electric fuel pump and the holding coil in the fuel solenoid.

c. "START" - This switch position engages the engine starter and the pull-in coil on the fuel solenoid.

3. **Alarm Light** - This light will be lit if the unit has shutdown on low oil pressure.

4. **Fuel Pump Primer Switch - (YLT6010DE only)** This switch can be used to prime the fuel system prior to engaging the engine starter.

5. **Preheat Switch - (LLT6012DE only)** At temperatures below 14 degrees F. this switch is used to activate the engine preheat system.

6. **AC Receptacles and Circuit Breakers** - All of the receptacles on the panel are protected by circuit breakers.

1. 120 Volt 15 Amp GFCI (Ground Fault Circuit Interrupter) duplex receptacle, Nema Spec. 5-15. This duplex receptacle is protected by the 15 amp circuit breaker mounted on the center side of the control panel.

2. 120 Volt 15 Amp Duplex receptacle (NEMA 5-15R). This receptacle is installed downstream of the GFCI receptacle. Therefore it has both ground fault protection as well as circuit breaker protection.

3. 120 Volt 50 Amp receptacle (NEMA 5-50R). This receptacle is protected by 45 amp single pole breaker.

4. 120/240 Volt 30 Amp Twistlock (NEMA L14-30R). This twistlock receptacle is also protected by the 30 Amp two pole 240 volt breaker mounted on the bottom front of the control panel.

7. **GROUNDING THE UNIT** - To comply with current safety standards, this generator set must be properly grounded. Ground the Mobile Lighting System by driving an 8 ft. copper ground rod into the earth. Connect a #8 AWG copper ground cable from the grounding lug on the control panel to the ground rod.

B. LAMP CONTROL AND BALLAST ASSEMBLY

The ballast assembly is connected to the generator AC control panel via (4) four wire cord and plug assembly that plugs into the L14-30R receptacle in the control panel. Each of the lamps and ballasts are protected by an individual 15 amp circuit breaker located on the end of the ballast assembly. The individual lamp switches are located just above the circuit breakers on this

panel. Two lights are connected to each 120 volt leg (G1 and G3) of the generator.

TOWER PROCEDURES

*****WARNING*****

NEVER ATTEMPT TO RAISE THE TOWER WITH THE ENGINE GENERATOR SET REMOVED FROM THE TRAILER BED. RAISING THE TOWER WITHOUT THE ENGINE GENERATOR ON THE BED OF THE TRAILER WILL CAUSE THE UNIT TO BECOME TOP HEAVY AND TIP OVER VERY EASILY. IN ORDER TO MAINTAIN STABILITY, THE TRAILER BED MUST HAVE A MINIMUM OF 600 POUNDS ON IT ANY TIME THE TOWER IS RAISED.

A. RAISING THE TOWER

WARNING: PERSONAL DANGER

Always check your overhead clearance before raising the tower and never raise in the vicinity of overhead power lines.

1. Extend both of the outriggers by removing the locking pins to release the arms. Pull out the arm until the outrigger holes line up in the extended position and insert the locking pins.

2. Rotate all four of the jacks into the “foot-down” vertical position and lock. Level the trailer using the outriggers, bumper, and tongue jacks. All four jacks must be in contact with the ground.

CAUTION: EQUIPMENT DAMAGE

Never attempt to raise the tower without all the outriggers fully extended and the trailer properly leveled. Failure to properly support the trailer may cause it to tip over in a high wind with the tower raised.

3. Loosen the light at the trunnion pivots. Aim (forward) 5 degrees to 30 degrees as desired, re-tighten.

4. Remove the mast travel locking pin.

5. Crank the winch to raise the tower to the full vertical position, insert the vertical tower locking pin through the vertical support and the tower. Insert the safety pin in the vertical tower locking pin.

6. Reverse winch slightly to slacken cable.

7. Pull the telescoping locking pin and hold while operating the tower extension winch (#2) to extend the

tower for at least six inches of tower extension.

8. Release the pin and continue to extend the tower to the desired height or until it is fully extended to the tower stop.

9. Loosen the “T-handle” nut and rotate the tower to aim the light and retighten the “T-handle” nut. NOTE: DO NOT LOOSEN UNLESS THE TOWER IS IN THE TRUE VERTICAL POSITION.

B. LOWERING THE TOWER

1. Loosen the “T-handle” nut, rotate the tower until the winch cable is realigned on the tongue end of the trailer. Retighten.

2. Crank the tower extension winch (#2) to lower the tower until the telescoping lock pin engages with an audible click.

WARNING: PERSONAL DANGER

Do not attempt to tilt the tower up or down unless the tower is in the fully retracted position and the telescoping lock pin is fully engaged. Attempting to lift or lower an extended tower may exceed cable strength leading to possible cable or winch failure.

3. Remove the safety pin from the vertical tower locking pin and pull the vertical tower locking pin. Crank the tower tilt winch to lower the tower into the travel position.

4. Install the mast travel locking pin.

5. Raise all the outrigger jacks to their fully retracted position. Rotate all the jacks to the “foot-up” vertical position. Pull the locking pins and slide the outriggers into the fully retracted position, making sure the locking pins are re-installed.

6. Rotate the trunnions to aim the lights down and tighten securely for travel.

7. Before moving the trailer, fully retract the tongue jack after hooking up to the towing vehicle. DO NOT MOVE WITHOUT THE SAFETY CHAINS HOOKED UP.

OPERATING THE UNIT

A. START UP CHECKLIST

Before initial start-up and each subsequent start,

complete the following checklist:

1. Check oil level, refill with proper grade oil.
2. Check for loose bolts or hardware.
3. Check tire pressure. (35 psi)
4. Trailer level to within 15 degrees.
5. Battery securely fastened, connections clean and tight, and proper fluid level.
6. Fuel tank filled with the proper grade of diesel fuel.
7. Check the air cleaner. Service only when indicated. Do not over service.

B. STARTING INSTRUCTIONS

CAUTION: EQUIPMENT DAMAGE

DO NOT USE STARTING FLUIDS! Immediate engine damage may result!

Note: This unit is equipped with engine safety shutdown monitoring of low oil pressure. This shutdown is not bypassed during start up. The engine will build sufficient oil pressure during cranking to open the safety switch.

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1. Depress the fuel pump primer switch for 10 seconds. This will charge the fuel system before cranking.
2. Turn the Selector Switch to the "START" position. The starter will engage and the engine will start. The Selector Switch is spring loaded so it can't be accidentally left in the "START" position. Releasing the switch in the "START" position will automatically return it to the "RUN" position.
3. Allow the engine to stabilize in speed and warm up, then turn on the lights or other external loads plugged into the receptacles.
4. When stopping the unit, first turn off the lights and disconnect the external loads. Allow the engine to cool down at no load for 5 minutes. Then turn the selector switch to the OFF position.

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1. If the temperature is below 14 degrees F. Put the control switch in the run position. Depress the preheat switch for 15 to 20 seconds. Continuing to depress the preheat switch move, the selector switch to the start position.

Release both switches when the unit starts.

2. If the temperature is above 14 degrees F. turn the Selector Switch to the "START" position. The starter will engage and the engine will start. The Selector Switch is spring loaded so it can't be accidentally left in the "START" position. Releasing the switch in the "START" position will automatically return it to the "RUN" position.

3. Allow the engine to stabilize in speed and warm up, then turn on the lights or other external loads plugged into the receptacles.

4. When stopping the unit, first turn off the lights and disconnect the external loads. Allow the engine to cool down at no load for 5 minutes. Then turn the selector switch to the OFF position.

C. UNIT STORAGE

Certain precautions must be taken if a Mobile Light System is to be stored for a long period of time. The unit must be stored in a dry location to prevent the generator winding from drawing moisture. The unit should also be thoroughly cleaned prior to storage.

For engine storage procedures, consult your local Yanmar or Lister engine dealer. They have certain procedures that must be followed in order to prevent engine damage, i.e. cylinder rust and injector, injector pump deterioration.

MAINTENANCE

The ultimate aim of any preventive maintenance program is to maintain the equipment in optimum condition, either in service or ready for service, for the maximum amount of time during the useful life of the equipment. The detection of faults before they develop into major sources of difficulty will decrease the incidence of repair. To this end, a regular schedule of cleaning and inspection will go far toward assuring trouble-free operation. Personnel responsible for maintenance should set up a schedule for inspection, and cleaning at intervals calculated to keep the equipment in good condition. In making up a schedule, keep the following in mind:

- A. New equipment must be carefully monitored until extended operation has demonstrated that it is performing satisfactorily.

B. Old equipment requires more frequent inspection, and possibly servicing, than similar equipment that has seen less service.

C. Time spent in cleaning, inspecting and correcting minor defects before they become major troubles means time saved in overhaul and repair.

PREVENTIVE MAINTENANCE

A. Daily Maintenance Checklist

- **Oil level is maintained between the "L" low mark and the "H" high mark on the dipstick.
- **Fuel tank full of proper grade of diesel fuel.
- **Water and sediment drained from water separator.
- **Air cleaner checked regularly. Change the filter element only as required.
- **Inspect for any fluid leaks.
- **Look for any loose or damaged parts.
- **Trailer hitch and safety chains checked for fitness.
- **Tires checked for proper pressure.
- **Battery checked for proper fluid level.
- **Generator control panel checked for loose or damaged parts.
- **Unit checked for general appearance and cleanliness.
- **Tower cable checked for broken strands or frays.
- **Insure floodlights are securely fastened.

B. Engine Routine Maintenance

A good preventive maintenance program begins with a good day-to-day maintenance check and continues with a rigid routine maintenance program at the proper service intervals. The chart below is to be used as a guide for your maintenance program. Shorter maintenance intervals are required if the engine is operated in a dusty environment or if frequent stops are made. If the engine is operated in consistent ambient temperatures below 0 or above 100 degrees F., maintenance should be performed at shorter intervals. Consult your Yanmar authorized repair location for recommended intervals.

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INTERVAL	ITEM
Every 100 hours	Change engine oil and oil filter
	Check air cleaner element
	Check fuel filter
	Check injector nozzles
	Check fuel lines
	Check battery electrolyte

Every 500 hours Replace air cleaner element.

See Yanmar operator's manual for complete maintenance schedule for the Engine.

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INTERVAL	ITEM
Every 125 hours	Change oil and filter if you're operating regularly above 95 degrees F or high duty factors.
	Clean air cleaner.
	Check for fuel and oil leaks.
	Check serviceability of battery.

Every 250 hours	Change oil and filter if you're operating regularly below 95 degrees F.
	Clean fuel injectors if the exhaust is dirty.
	Replace the fuel filter element.

See Lister operator's manual for complete maintenance schedule for the Engine.

C. Generator Routine Maintenance

Very little routine maintenance is required on the generator itself as it contains no consumable parts. The generator and control panel should be kept free of oil and dirt. The generator air intake and exhaust must be kept clear of all debris.

1. The generator frequency should be checked periodically to insure that the engine is maintaining the correct operating speed. The voltage should be checked with an external voltmeter.
2. Inspecting generator insulation - Routine nondestructive testing of the stator windings may be required where the unit is subjected to excessive humidity, and/or dirty environment. This is especially important when the Generator Set is used for prime power.

CAUTION: EQUIPMENT DAMAGE

When making an insulation test on the main field, disconnect all diodes. This is done to protect diode elements from high voltage breakdown during megger test.

Measure insulation resistance with a megger. If reading of less than 200 megohm is obtained at 75 degrees F.

(297k) ambient temperature and moisture is suspected, dry the insulation as described later in this section.

Note: Measurement of insulation resistance is an important part of an adequate program for the maintenance of electric equipment. The measured values of insulation resistance serve as a useful guide in determining whether or not insulation is defective. Drying, revarnishing, or overhauling may be necessary to prevent failure.

- a) Check windings, connections, load cables, and other components for excessive dirt and grime. Clean if applicable.
- b) Make sure all mounting bolts have been installed and are tight. Refer to applicable portions of the text for torque specifications.
- c) Make certain no foreign objects are lodged in the generator. Remove all tools and shop clothes from the vicinity of the Generator Set.
- d) Be sure that all covers and guards are reinstalled.

3. Cleaning - Cleanliness is of primary importance in preventive maintenance. Do not allow dust, moisture, oil, or other substances to remain in or on the equipment. The importance of keeping all insulation clean cannot be over emphasized. Dust, dirt and other foreign materials tend to block ventilating ducts and retard dissipation of heat, which in turn, leads to local overheating. If the particles are allowed to build up, the windings may eventually be short circuited or grounded. Abrasive particles may puncture insulation. Iron dust is especially harmful because the particles are continually agitated by magnetic pulsations. For these reasons, equipment must be kept clean, both externally and internally, and particularly, all air ducts must be kept clean and unobstructed.

There are four (4) acceptable methods of cleaning insulation associated with electrical equipment:

- a) Clean with a vacuum cleaner with suitable plastic attachments.
- b) Wipe clean with a cloth.
- c) Blow off with direct stream of filtered, oilless low pressure compressed air.
- d) Clean with solvent and soft bristle brush.

Of the methods listed above, the vacuum cleaner

method is the most practical for removing loose, dry particles because it does not redeposit them on other parts of the equipment as is done when compressed air is used. Also, a vacuum cleaner is capable of removing dust from coils and from grooves between wires that is otherwise inaccessible to a wipe cloth.

Substances such as grease and oil can best be removed by wiping whenever possible with a cloth or a brush, and flushing inaccessible windings and other areas with a minimum volume of trichloroethane* solvent. Flush windings with trichloroethane beginning at the top or 12 o'clock position and proceeding to the bottom or 6 o'clock position, on either side. After cleaning and drying (which is rapid with trichloroethane), take megger readings to determine whether resistance has increased to above the acceptable 200 megohm level. If resistance is still low, clean the affected areas again.

***WARNING: PERSONAL DANGER**

The explosive and fire hazards of trichloroethane are negligible and it has the least toxic effect of all the chlorinated hydrocarbons; however, avoid prolonged skin contact with the solvent and perform cleaning operations in a well ventilated area. If the solvent is splashed on the skin, wash off with soap and water. If splashed into the eyes, flush with water and get medical help. Avoid prolonged breathing of fumes.

4. Drying insulation - It is sometimes necessary to dry insulation in order to recondition electrical equipment that has been submerged or splashed with water. It may also be necessary to dry equipment that has absorbed moisture from the air after standing idle for an extended period of time.

Heat and circulation of dry air, or the application of a vacuum, is required in order to effectively remove moisture from insulation. Heat may be provided by either of 2 methods or a combination of both.

- a) By external application of heat.
- b) By circulation of electrical current at low voltage through the conductors.

The best method to use on a specific case depends upon local conditions and the facilities/equipment available. Do not use the second method until after insulation has been partially dried by the first method. Regardless of heating method used, keep a close check on temperature of the insulation. This can be done by means of temperature detectors, either permanently or temporarily installed, or by thermometers so placed that they can be easily read at the

hottest areas on the equipment. Heat applications should be continuous. Interruption of the heating operation to the extent that the equipment cools and approaches ambient temperature, may allow moisture to condense in the insulation and retard the drying process. Drying cannot be hurried. Many hours, or even days, may be required to achieve satisfactory results.

5. Revarnishing insulation - In some cases, after long periods of operation, or if repeated cleaning and drying has been necessary, the results of insulation resistance tests may indicate that revarnishing of insulation is necessary. However, the application of varnish will not permanently increase the insulation resistance or dielectric strength of the insulating material and should not be done in lieu of repairing defective insulation.

TROUBLESHOOTING

A. General - Check for loose wires, connections, and hardware whenever the engine or generator control panels are opened. If the troubleshooting chart indicates a particular component discrepancy, proceed to that portion of the test procedure.

To properly check out electronic components and generator wiring, they must be isolated from associated circuitry. Always mark leads disconnected to insure correct reconnection after testing.

Test equipment required to accomplish the static and operational tests:

1. Volt-ohmmeter - 20,000 ohms per volt (or higher).
2. Frequency meter - 58 to 62 hertz (cycles per second).
3. Clamp-on ammeter 0-600 ampere range.

B. Problem isolation - Malfunctions are generally classified and described by symptoms, with the symptoms pointing to causes.

Start failure, poor speed regulation, high voltage, low voltage, etc., are only SYMPTOMS. To find and correct CAUSES of these malfunctions, it is necessary to isolate the problem to one of the basic system components.

1. Engine - including fuel and cranking systems.

2. Generator - including excitation capacitors, winding, and rectifiers.
3. Control panel - switches and wiring
4. Light tower - lamps, ballasts, or wiring
5. Other external influences - such as load, fuel, battery, accessory equipment (remote control panels, exhaust system, etc).

C. Eliminate external causes of malfunction

1. Installation - restrictions in exhaust, ventilation, fuel, low battery etc.
2. Load - two basic checks regarding apparent overload.
 - a. Verify load is within nameplate capacity using a clamp-on ammeter.
 - b. If within nameplate capacity on all legs, determine if speed drops below specifications.
 1. If speed drops, engine/fuel etc., problem.
 - a. Fuel filters plugged.
 - b. Tank empty.
 - c. Water in system.
 - d. Lines broken or disconnected.
 - e. Air filter plugged
 2. If speed is OK, there is a generator/electrical problem.

Efficient troubleshooting will rapidly narrow the number of possible causes of malfunction with the minimum of checks. To do this, a general understanding of the total system operation is necessary. Each system component has unique input and output characteristics that provide clear messages that properly interpreted will point directly to the cause of malfunction. Verify defect and repair or replace as required.

For resolution of specific failure symptoms, isolate to system or component and refer to section of this manual covering the suspected system.

WINDING RESISTANCES

	YLT6010DE LLT6012DE Main	
Rotor	2.0	.67
Stator		
G1-N	.13	.25
G3-N	.26	.35
Q-Windings		
(Capcitor Leads)	.35	.85

DIAGNOSTIC TABLE

GENERATOR

SYMPTOM

POSSIBLE CAUSE

CORRECTION

LOW VOLTAGE (UNDER 220 VOLTS LOADED)

Engine Speed too Slow the governor to 61.5 Hertz at no-load. Troubleshoot engine and deter- proper speed.	Check the no-load engine speed with a frequency meter and adjust mine why it will not hold the
---	---

Generator Overloaded on each leg should be as evenly balanced as possible and should not any leg.	Measure load being run and compare with nameplate rating. The load exceed the rated current on
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LOW VOLTAGE (UNDER 230 VOLTS NO LOAD)

Engine Speed too Slow governor to 61.5 Hertz at no-load.	Check the no-load engine speed with a frequency meter and adjust the
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Generator Overloaded on each leg should be as evenly balanced as possible and should not any leg.	Measure load being run and compare with nameplate rating. The load exceed the rated current on
---	---

Defective Main Rotor if defective.	Measure rotor resistance (Rotating Fields). Check for grounds. Replace
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Defective Capacitor	Test and replace if defective.
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LOW VOLTAGE (3 TO 40 VOLTS)

Loose or Shorted Wires in Control Cabinet	Check all wiring and repair as needed.
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Defective Diode (Rotating Excitation)	Follow test procedure and replace if defective.
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Defective Excitor Winding Repair or replace as required. Check for grounds.	Measure the resistance of the two leads connected to the capacitor,
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Defective Capacitor (Excitor)	Test for opens and shorts. Replace if defective.
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Defective Main Rotor if defective.	Measure rotor resistance (Rotating Field). Check for grounds. Replace
---------------------------------------	---

LOW VOLTAGE (0 VOLTS)

Loss of Residual Magnetism procedure.	Flash the exciter stator with a small 9 volt battery. Consult factory for procedure.	
Defective Main Stator	Measure stator resistance (G1 TO N & G3 TO N).	Check for ground shorts. Replace if defective.
Short in AC Wiring.	Turn off all circuit breakers for the lights and disconnect all external loads. Check all the AC wiring in the control cabinet for shorts. Repair or replace as required.	

FLUCTUATING VOLTAGE

Erratic Engine Speed	Refer to the Engine manufacturer's maintenance manual.
Loose Terminal or Load	Check all AC wiring connections.

HIGH VOLTAGE

Engine Speed too High	Check engine speed, reset to 61.5 HZ no-load.
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GENERATOR OVERHEATING

Air Vents Obstructed	Clear obstruction.
High Intake Air Temperature	Improve ventilation. Allow at least two feet clearance around generator.

ENGINE OVERHEATING

Engine Exhaust Leaking into Housing	Repair exhaust system.
Generator Overloaded Unbalanced	Measure load being run and compare with nameplate rating. The load on each leg should be as evenly balanced as possible and should not exceed the rated current on any leg.
Shorted Turns in Either the Rotor or Stator	Measure rotor and stator resistance for shorted turns. Replace if defective.

GENERATOR NOISY AND/OR VIBRATES

Loose Sheet Metal	Check nuts, bolts and doors for tightness.
Rotor Rubbing	Repair or replace defective part.
Bearing Defective	Replace bearing.
Rotor Unbalanced	Rotors are factory spin balanced on special computer controlled machines before assembly. Small washers or bars are used as balancing weights. Check inside the generator for loose or missing parts. If any balance weights have broken loose, do not run the unit. Consult your Winco dealer or the factory.

Engine Unbalanced	Consult local engine dealer.
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ENGINE

DIESEL ENGINE WILL NOT CRANK.

Corroded Battery Cable Connections	Remove cables from battery and clean.
Battery Dead	Check battery with a hydrometer. Recharge or replace as required. <i>CAUTION: SEE BATTERY CONNECTION ON PAGE 4</i>
Defective Starter or Solenoid	Test start solenoid and starter. Refer to engine manufacturer's manual.
Selector Switch Defective	Check selector switch for proper continuity. Replace.

CRANKS BUT WILL NOT START.

Out of Fuel	Fill fuel tank.
Air in the Fuel Lines	Bleed air out of fuel system. See engine manual.
Misadjusted or Defective Fuel Solenoid	Troubleshoot and Replace. See engine manual for details.
Water/Fuel Separator Full of Water	Drain water from separator.
Fuel Filter Plugged	Replace filter(s).

STARTS BUT WILL NOT RUN.

Defective Holding Coil in Fuel Solenoid	Troubleshoot and replace.
Low Battery for proper charge operation.	Test and recharge or replace. Be sure to check battery charging circuit <i>CAUTION: SEE BATTERY CONNECTION ON PAGE 4</i>

ENGINE SPEED DROPS TOO LOW UNDER LOAD

Air Cleaner Plugged	Replace.
Generator Overloaded	Remove external load and troubleshoot generator.
Water/Fuel Separator Full of Water	Drain water from separator.
Fuel Filter Plugged	Replace filter(s).
Injector Pump Defective	Repair or replace.

LIGHT TOWER

Lamp Switches/ Circuit Breaker

No Generator Output	Troubleshoot generator.
Circuit Breaker Trips	Troubleshoot and replace if defective.
Defective Transformer or Capacitor (Ballast)	Troubleshoot and replace if defective.
Short Circuit in Tower Wiring	Trace and repair as required.
Defective Breaker	Troubleshoot and replace if defective.
Short Circuit in Lamp Fixture	Troubleshoot and repair or replace as required.
Defective Transformer or Capacitor (Ballast)	Troubleshoot and repair or replace as required.

LAMPS START TO LIGHT AND THEN GO OUT.

Incorrect Generator Output	Troubleshoot generator.
Incorrect Engine Speed	Check engine speed reset to 61.5 HZ no-load.
Defective Transformer or Capacitor (Ballast)	Troubleshoot and repair or replace as required.
Defect in Ballast Wiring	Trace and repair as required.
Defect in Tower Wiring	Trace and repair as required.

WINCO, INC.

12 Month Limited Warranty

WINCO, Incorporated warrants to the original purchaser for 12 months that goods manufactured or supplied by it will be free from defects in workmanship and material, provided such goods are installed, operated and maintained in accordance with WINCO's written instructions.

WINCO's sole liability, and Purchaser's sole remedy for a failure under this warranty, shall be limited to the repair of the product. At WINCO's option, material found to be defective in material or workmanship under normal use and service will be repaired or replaced. For warranty service, return the product within 12 months from the date of purchase, transportation charges prepaid, to your nearest WINCO Authorized Service Center or to WINCO, Inc. at Le Center, Minnesota.

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 12 months from date of purchase. In no event is WINCO liable for incidental or consequential damages.

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.

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

EXCLUSIONS:

WINCO does not warrant engines, batteries, or other component parts that are warranted by their respective manufacturers.

WINCO does not warrant modifications or alterations which were not made by the WINCO, Inc.

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

This warranty does not include travel time, mileage, or labor for removal or reinstallation of WINCO product from its application.

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