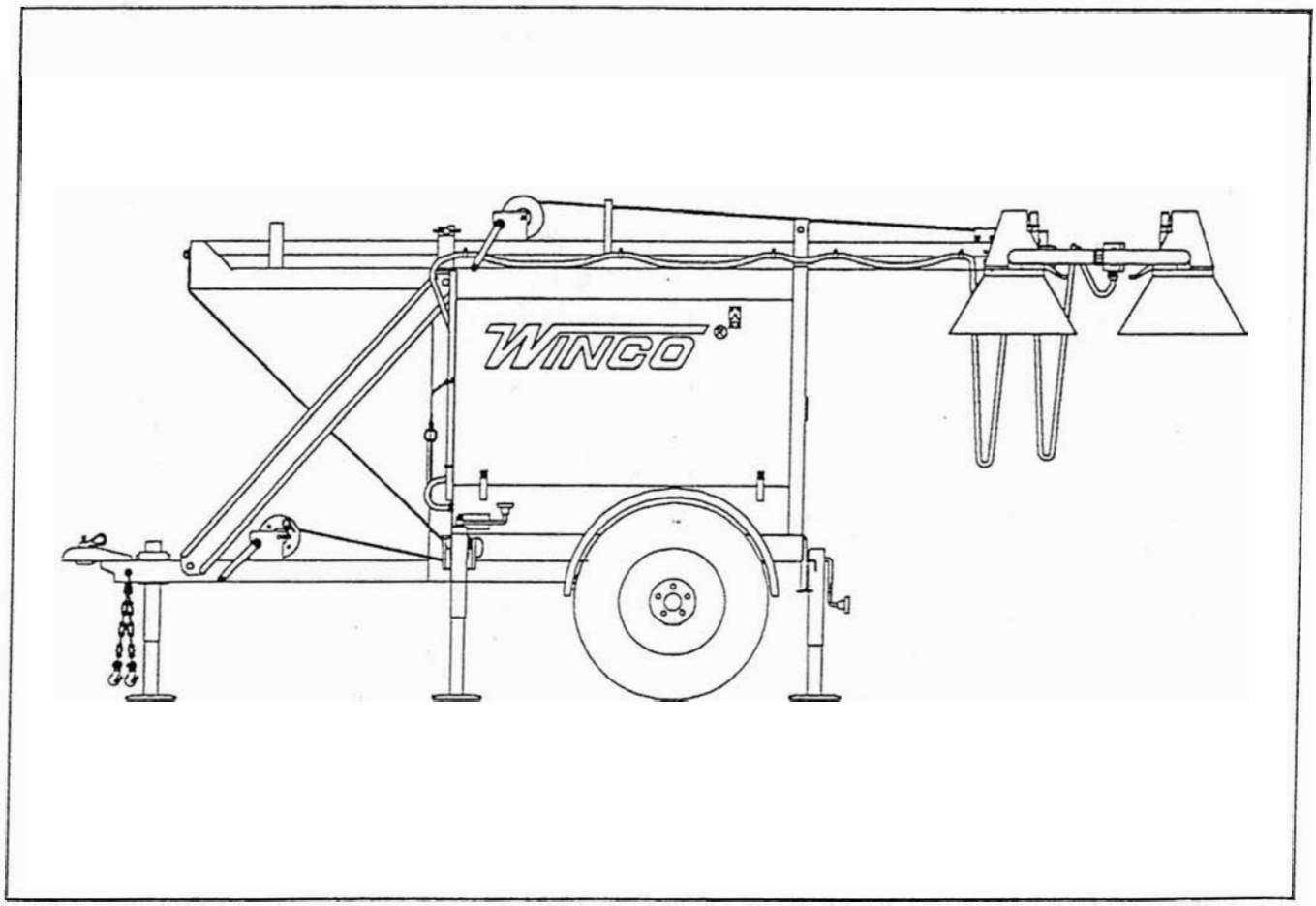
WINCO®

Mobile Lighting Systems

OWNERS MANUAL - LSC4II-MH/A

INSTALLATION, OPERATION, and MAINTENANCE INSTRUCTIONS



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

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_____

TABLE OF CONTENTS

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: Possible 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 anddeadly 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.

SPECIFICATIONS

MODEL LSC4II-MH

GENERATOR SPECIFICATIONS

Power Rating (Kilowatts)	4.8 KW
Generator Resistances	
Main Stator	0.50 ohms
Main Rotor	1.3 ohms
Excitor Winding (Stator)	0.50 ohms

ENGINE SPECIFICATIONS

See Kubota Operator's Manual for complete engine specifications.

Model	D850-BG
Type	4 cycle, liquid cooled
Starting System	12V electric
Governor	Mechanical

TRAILER/HOUSING

Capacity	3500 lbs
Fuel Capacity	18 gals
Axles	Single
Hitch Height	Fixed
Tires	P235/75B15 4 Ply
Tread	
Tire Pressure	35 psi

TOWER

Height	30 Feet
Rotation	360 degrees

LIGHTS

Type	Medal Halide
Number/Wattage	4/1000

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 supercedes the engine manufactures 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/MIL-L-2140C or have properties of API classification CC/CD grades. Change the type of engine oil according to the ambient temperature.

above 77degrees F. SAE30
32 to 77degrees F. SAE20
below 32degrees F. .....SAE10 or SAE10W-30

OIL QUANTITY US Qts.
LSC4II-MH 5

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 OPERATORS MANUAL FOR ADDITIONAL FUEL INFORMATION.)

Filling the Fuel Tank

This unit is equipped with a single 18 gallon fuel tank. Use caution when filling the tank to prevent it from overflowing.

COOLANT REQUIREMENTS

Premium antifreeze with corrosion inhibitor should be used during all seasons to protect the engine cooling system from corrosion as well as freezing damage.

The cooling system of the engine has been filled at the factory with a 50% water and 50% ethylene-glycol antifreeze mixture. This mixture provides protection to -34degrees F.

CAUTION: ENGINE DAMAGE
Always maintain a 50/50 ratio water and antifreeze when adding coolant or refilling the cooling system.

COOLANT QUANTITY - US Gal.
LSC4II-MH
0.74 gal (2.8 litre)

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.

The standard Mobile Lighting System is equipped with a single 12 volt (group 24F) battery for starting. The battery has been disconnected from the battery cables prior to shipment of this unit. When re-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 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

FRONT PANEL LAYOUT

A. FRONT PANEL

1.Hour Meter (1) - 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.DC control Circuit Breaker (2) - The 15 amp DC Circuit Breaker protects the Control Switches (4), (5) and wiring harness against faults in wiring or control equipment. The DC Circuit Breaker also prevents a discharge of the battery due to a circuit fault.

3.Glow Indicator (3) - The glow indicator is connected to the glow plug circuit and has a wire loop inside, visible through the hole in the face of the indicator. The wire loop is an indication of the glow plug tip condition. Excessive glow plug temperatures will shorten the life of the glow plug.

4.Master Switch (4) - This is a mechanically held SLR (safety latching relay). It controls the battery (+) power for the Selector Switch. This SLR will shut down the unit if a fault should occur in either the cooling system or the engine lubricating system. Two monitoring sensor/switches have been installed on the engine. One to monitor coolant temperature (HCT) and the other to monitor oil pressure (LOP). In the event either device senses a system failure, the monitoring switch will ground the coil of the Master Switch, releasing the mechanical latch. This will disconnect the battery (+) power to the Selector Switch shutting the unit down. Depressing the switch while starting the unit bypasses the low oil shut down until the engine has time to build minimum oil pressure. In addition, it 'arms' the SLR by engaging an internal mechanical latch.

5.Selector Switch (5) - This unit is equipped for manual start only. A four position Selector Switch controls the engine.

a."PREHEAT" - This position turns on the glow plug solenoid which provides power to the glow plug indicator and the glow plugs on the engine.

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

c."RUN" - This switch position activates the fuel gauge,running time meter, electric fuel pump and the holding coil in the fuel solenoid when the Master Switch is depressed.

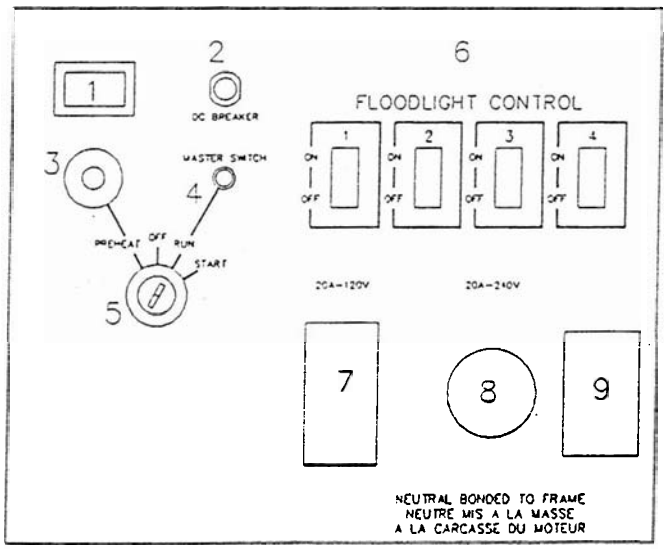
d."START" - This switch position engages the engine starter when the Master Switch is depressed. Both switches must be held in position until the engine starts. It also engages the pull-in coil on the fuel solenoid.

WARNING: EQUIPMENT DAMAGE

Under no circumstances should the switch be depressed more than 10 seconds after the unit has been started! If the relay will not remain latched after 10 seconds, determine the cause before restarting the unit. It is possible the engine is not building sufficient oil pressure, and continued starting may cause major engine damage.

6.AC Controls

a.Light Switches/Breakers (6) - Each of the four lamps are individually controlled from the front panel. Each of the lamp switches is protected by the 20 Amp two pole circuit breaker (9).



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

1.120 Volt 20 Amp GFCI (Ground Fault Circuit Interrupter) duplex receptacle (7), Nema Spec. 5-20. This duplex receptacle is protected by the 20 amp two pole circuit breaker (9) mounted on the right side of the control panel.

2.240 Volt 20 Amp Twistlock (8), Nema Spec. L6-20. This twistlock receptacle is also protected by the two pole 20 amp breaker (9) mounted on the right side 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.

TOWER PROCEDURES

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 andinsert the locking pins.

2.Rotate all four of the jacks into the "foot-down" vertical position and lock. Level the trailer using the outriggers, the 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 on the trunion 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 desired tower angle insuring that the vertical tower locking pin completely engages the vertical tower locking arm. Insert the safety pin in the vertical tower locking pin.

6.Stop cranking and 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 stop.

9.Loosen the "T-handle" Nut and rotate the tower to aim the light and re-tighten 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 re-aligned on the tongue end of the trailer. Re-tighten.

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 down until the telescoping lock pin is fully engaged. Tilting the tower without the pin properly engaged may result in will allow the tower to drop very rapidly. The impact of the tower hitting the transport carrier will causedamage to the tower. The tower extending out may also cause severe personal injury or damage to adjacent property.

3.Remove the safety pin from the vertical tower lock and pull the vertical-tower lock pin. Crank the tower tilt winch (1#) 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 trunions 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.STARTUP CHECKLIST - Before initial startup and each subsequent start, complete the following checklist:

1.Check oil level, refill with proper grade oil.
2.Check coolant level, refill with 50/50 mix of demineralized water and a permanent ethylene-glycol antifreeze.
3.Check for loose bolts or hardware.
4.Check tire pressure. (35 psi)
5.Trailer level to within 15 degrees.
6.Battery securely fastened, connections clean and tight, and proper fluid level.
7.Fuel tank filled with the proper grade of diesel fuel.
8.Check the fan belt for tightness and excessive wear.
9.Check hoses and clamps for leakage.

10.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 and high coolant temperature. The shutdowns must be bypassed during the starting mode. To Over-ride the shutdown lockout during starting, the Master Switch (4) must be depressed. Depress and hold down the Master Switch during preheating, starting and for an additional 10 seconds after theengine starts to allow it to build oil pressure.

1.Depress the Master Switch (4) and turn the Selector Switch (5) to the "PREHEAT" position. Hold in the glow position until the wire inside the glow plug indicator (3) glows with a dull red color.

2.Depress the Master Switch (4) and 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.Continue to hold the Master Switch (4) in for 10 seconds after the engine has started.

4. Allow the engine to stabilize in speed and warm up, then turn on the lights (6) or other external loads plugged into the receptacles.

5.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 (5) 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 Kubota engine dealer. They have certain procedures that must be followed in order to prevent engine damage, i.e. cylinder rust and injector and 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.

**Radiator filled with the proper coolant mixture.
**Air cleaner checked regularly. Change the filter element as required.
**Inspect for any fluid leaks.
**Look for any loose or damage parts.
**Belts checked for tightness, cracks or frays.
**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 flood lights are securely fastened.

B.Engine Routine Maintenance - A good preventivemaintenance 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 Kubota authorized repair location for recommended intervals.

INTERVAL	ITEM
Every 100 hours	
	Change engine oil and oil filter
	Check air cleaner element
	Check fuel filter
	Check injector nozzles
	Check fuel pipes
	Check fan belts
	Check battery electrolyte
Every 150 hours	
Check radiator hoses	
Every 500 hours	
Clean radiator core	
Every one year	
	Change radiator cleaner and coolant
	Replace air cleaner element
Every two years	
	Replace radiator hoses and clamps
	Replace fuel pipes and clamps

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.

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 to be certain the voltmeter on the control panel is maintaining accuracy.

1.Inspecting generator insulation - Routine non-destructive 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 exciter armature or main field, disconnect all diodes (including the rotating rectifiers).This is done to protect diode elements and rectifiers 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 re-installed.

2.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, oil-less 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 whencompressed 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.

3.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.

4.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.

DIAGNOSTIC TABLE

GENERATOR

SYMPTOM	POSSIBLE CAUSE	CORRECTION
Low Voltage (under 220 volts loaded)		
	Engine Speed too slow	Check the no-load engine speed with a frequency meter and adjust the governor to 61.5 Hertz at no-load. Troubleshoot engine and determine why it will not hold the proper speed.
	Generator Overloaded	Measure load being run and compare with name plate rating. The load on each leg should be as evenly balanced as possible and should not exceed the rated current on any leg.
	Defective Rectifier	Follow test procedure and(Rotating one phase) replace if defective.
	Defective Main Rotor	Measure rotor resistance (Rotating Fields) (2.9 ohms). Check for grounds. Replace if defective.
	Defective Excitor Rotor	Measure rotor resistance (one phase open) line to line (.3 ohms). Check for grounds and growl for internal shorts. Replace if defective.
Low Voltage (under 230 volts no-load)		
	Engine Speed too Slow	Check the no-load engine speed with a frequency meter and adjust the governor to 61.5 Hertz at no-load. Generator Overloaded Measure load being run and compare with name plate rating. The load on each leg should be as evenly balanced as possible and should not exceed the rated current on any leg. Defective Main Rotor Measure rotor resistance (Rotating Fields) (2.9 ohms). Check for grounds. Replace if defective.

Low Voltage (20 to 40 Volts)		
	Loose or shorted wires in control cabinet	Check all wiring and repair as needed.
	Defective Rectifier (Rotating Excitation)	Follow test procedure and replace if defective.
	Defective Capacitor (Excitor Stator) Winding	Follow test procedure for Main Stator winding. Repair or replace as required.
	Defective Capacitor (Excitor)	Test for opens and shorts. Replace if defective.
	Defective Main Rotor	Measure rotor resistance (Rotating Field) (2.9 ohms). Check for grounds. Replace if defective.
Low Voltage (3 to 5 volts)		
	Defective Rectifier (Rotating Excitation)	Follow test procedure - replace if defective.
	Defective Capacitor (Excitor)	Follow test procedure. Test foropens and shorts. Replace if defective.
Low Voltage (0 volts)		
	Loss of Residual Magnetism	Flash the exciter stator with a small 9 volt battery. Consult factory for procedure.
	Defective Main Stator	Measure stator resistance (.3 ohms). Check for ground shorts. Replace if defective.
	Short Circuit on the AC Ckts.	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 Loose terminal or load	Refer to the Engine manufacturer's maintenance manual. Check all AC wiring connections.
High Voltage		
	Engine Speed too High	Check engine speed reset to 1845 RPM (61.5 HZ) no-load.
Generator Overheating		
	Air Vents Obstructed	Clear Obstruction.

	High Intake Air Temperature	Improve ventilation. Allow at least two feet clearance around generator.
Engine Overheating		
	Engine Radiator Blocked	Clear the blockage from the or plugged. radiator and clean the core inside and outside.
	Engine exhaust leaking into trailer	Repair exhaust system.
	Generator Overloaded or Unbalanced	Measure load being run and compare with name plate 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.
ENGINE		
Glow Plug Indicator Inoperative		
	DC Circuit Breaker Tripped	Reset.
	DC Circuit Breaker Defective	Check DC breaker for continuity. Replace.
	Defective Control Switch	Troubleshoot and replace. Control Switch Defective Check start switch for proper continuity. Replace.
	Defective Glow Plug Solenoid	Troubleshoot and replace.
	Defective Glow Plug Indicator	Troubleshoot and replace.

	Corroded Battery Cable	Remove cables from battery and Connections clean.
	Battery Dead	Check battery with a hydrometer. Recharge or replace as required.
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.
	Defective Starter or Solenoid	Test start solenoid and starter Refer to engine manufacturers manual.
	DC Circuit Breaker Tripped	Reset.
	DC Circuit Breaker Defective	Check DC breaker for continuity. Replace.
	Defective Master Switch	Troubleshoot and replace.
	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	Test and Recharge or replace. Be sure to check battery charging circuit for proper charge operation.
Master Switch keeps Tripping		
	Either low Oil Pressure or High	Determine which sensor is shutting the system down.

Water Temperature sensor	Troubleshoot that system.
Low Oil Pressure Engine Low on Oil	Fill to required level.
Oil Pump Failure	Troubleshoot and repair.
Defective Pressure Sensor	Check actual oil pressure. Replace sensor if defective.
Oil is thinning out when the engine gets hot.	Check oil for contamination and change the oil.
High Water Temperature	Engine Low on Water. Fill to required level.
Engine Thermostat Defective	Check for water circulation. Repair as required.
Coolant Mixture Incorrect	Check for required 50/50 mix.
Plugged Radiator	Clean or repair as required.
Broke/Loose Fan Belt	Repair.
Defective Sensor	Troubleshoot and replace.
Defective Water Pump	Repair or replace.

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 1845 RPM (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.

COMPONENT TESTING

CONTROL PANEL

A. FRONT PANEL SWITCHES - Access to the all front panel controls is gained by removing the four screws holding the front panel in place and pulling the front panel forward.

1. Selector Switch

a.Disconnect the negative battery cable.
b.Set your VOM to Ohms Rx1 scale.
c.Move the control switch to "preheat".
d.Check for continuity between wire #5 and #91. You should have continuity.
e.Move the mode switch to "RUN".
f.Now check for continuity between wire #5 and #21.
g.Move the switch to "start".
h.Now check for continuity between wire #5 and #9.
i.With the switch in the "stop" position you should have no continuity between any combination of #5, #91, #21 or #9.
j.If you get incorrect readings in any of these tests the switch should be considered defective and replaced.

2. Master Switch

a.Disconnect the negative battery cable.
b.Set your VOM to Ohms Rx1 scale.
c.Check for continuity between the "B" and "C" terminal when the Master Switch button is depressed.
d.Leave the Master Switch button depressed (armed). Turn the DC breaker back on. The Master Switch button should pop back out as soon as the DC breaker is closed.
e.Replace if defective.

B. METERS

1. RUNNING TIME METER - This meter accumulates the total number of hours the engine has operated.

a.Turn the control switch to the "run" position.

b.Set your VOM for 15 to 30 volts DC.

c.Test between lead #21 on the back of the meter and lead #1 for 12 VDC. If you do not have the proper voltage trace the #21 lead back to the Selector Switch and retest the switch.

d.If the proper voltage is present and the running time meter is not operating it is defective and should be replaced.

C. CIRCUIT BREAKERS

1.AC Circuit Breaker - Both of the receptacles on the front panel are protected by the two pole 20 amp circuit breaker. All circuit breakers can be tested the same way.

CAUTION: EQUIPMENT DANGER

Do Not assume that because a breaker keeps tripping it is defective. Most breaker trips are caused by an overload. If continual breaker interruptions are being experienced, use a clamp-on ammeter to determine the actual load before replacing the circuit breaker.

a.Move the Selector Switch to the "OFF" position.

b.Disconnect the negative battery cable.

c.Set your VOM to Ohms Rx1 scale.

d.Test the resistance from the upper to the lower connection on each circuit breaker. The breakers must be in the closed position.

e.Your should read a very low resistance between the two terminals on each circuit breaker (less than .5 ohms).

f.Any circuit breaker that has a high resistance or is open and can't be reset must be replaced.

B. GENERATOR

1. Generator static tests - Most of the generator tests can be accomplished from the Ballast/Control box at the circuit breaker and generator excitation capacitors. Testing the main rotating field and rectifiers requires removal of the generator bearing support end bracket. The rotating rectifiers and rotor leads are mounted on the fan blades and can be tested with any electronic VOM that has an in-circuit diode test mode. Meters without the in-circuit test capability will require the disconnection of the field leads from the rectifier to check the field winding and the diodes in the rectifier assemblies.

a.Rectifier Assembly - Disconnect leads from the rectifier to be tested. Mark the leads for identification. Placeone ohmmeter lead on the positive terminal and the other lead on each AC terminal in turn. These readings should be the same whether high or low. Reverse the ohmmeter leads and repeat the test. These readings should be opposite. Repeat these tests between the negative terminal and each AC terminal in turn. If resistance readings are incorrect, replace the rectifier.

b.Main Rotating Field - The rotating field is checked for shorts and opens. With the leads connected to the rectifier, the resistance should be 1.3 ohms one way and very low the other. If you disconnect field leads from the exciter rectifier, the resistance between the field leads should be about 2.9 ohms. Resistance between either of the field leads and ground should be infinite. Replace the rotating field coil assembly if resistance readings are incorrect. Watch your polarity when reconnecting the rectifiers.

c.Main Stator - To test the stator for opens and shorts, the windings must be isolated.

Caution: Mark all leads for correct reconnection and disconnect all 5 leads from the connections. The two independent coil groups - one winding labeled with three leads marked with numbers G1, N1, & G3 and the other winding with two unmarked leads going to the excitation capacitor. There should be no internal circuit between the two groups.

Using a volt/ohmmeter, test the coil groups for continuity, and shorts to ground. If the stator tests defective, it should be returned for repair or replacement. Normal resistances are very low:

G1 to N1 .25 Ohms G3 to N .25 Ohms G1 to G3 .50 Ohms

2.Flashing the Exciter Field - Consult factory. If voltage did not build up while set was running, check other troubleshooting symptoms listed in this Section. Often turning on a large electrical load (such as the lamps) will cause the unit to self-excite.

C. Ballasts, Lights and Tower Wiring

1.Ballasts - It is not necessary to remove the ballasts from the unit to determine if they are working. The generator wiring and tower wiring are connected in the ballast/Control box. Remove the cover for access to the electrical connection terminals.

a.Remove the Ballast/Control box cover.

b.Locate the ballast input and output leads on the right hand side of the control box (at the capacitor terminals

c.Start the unit up.

WARNING: PERSONAL DANGER

HIGH VOLTAGE! Use extreme caution when testing. This panel contains voltage capable of killing you.

d.With your VOM set for 600 Volts AC check the voltage between the following wires. In all cases the voltage should be approximately 400 volts open circuit.

Color Code-# To Color Code-#

Black-41 White-45 Red-42 White/Black-46 Orange-43 White-45 Blue-44 White/Black-46

e.If any one of the ballasts does not have the proper output it will be necessary to pull the ballast drawer out, and check that individual transformer and capacitor.

f.Turn the unit off before removing the ballast or capacitor assemblies.

WARNING: PERSONAL DANGER

Use extreme caution when working inside the ballast drawer. This drawer contains high voltage components and should be powered only as a last resort. Most troubleshooting and diagnosis can be accomplished using static (non-powered) tests.

g.The following resistance should be obtained on the transformer.

From Wire # to	Wire #	Resistance
480	Comm	1.50ohms
120	Comm	0.27ohms
120	480	1.26ohms
120	Ground	Infinite
480	Ground	Infinite
Comm	Ground	Infinite

h.The capacitors when checked for resistance should show a resistance reading when the meter is first attached and then should taper to infinity.

i.Check the capacitors to be sure that none of them are swelled or bulging on the sides. Swollen capacitors should be replaced.

2.Tower Wiring - This wiring can be checked by checking the open circuit voltage at the top of the tower. You should read about 400 volts between the following wire combinations. Be sure to unplug the lamps before turning on the switches on the front panel.

WARNING: PERSONAL DANGER

HIGH VOLTAGE! Use extreme caution when testing. This panel contains voltage capable of killing you.

Color Code-#	**To**	**Color Code-#**
Black-41		White-45
Red-42		White/Black-46
Orange-43		White-45
Blue-44		White/Black-46

While you have the connector box open, be sure to check the receptacle and the plugs for any broken parts or loose wires.

3.Lamps/Bulbs - Use the following sequence to replace defective bulbs.

WARNING: PERSONAL DANGER

Always wear clean cotton gloves when removing or replacing a metal halide bulb. Use extreme caution, allow the bulb to cool for at least 30 minutes before opening the fixture to attempt a lamp change. These lamps operate at temperatures over 500 degrees f., and will burn your hand instantly.

CAUTION: EQUIPMENT DAMAGE

In addition to protecting your hand from hot bulbs the clean cotton gloves will protect the bulb surface from body oil or dirt which will shorten the bulb life. The change process is simpler if the reflector is pivoted to aim to the rear, allowing the reflector assembly to pivot down out of the way.

a. Unsnap the reflector and lens cover assembly. Lower gently and pivot on the hinge. Hold reflector assembly out of the way if necessary. Be sure to clean lens before reinstalling.

b. Using clean cotton gloves remove the defective bulb by unscrewing it. Be careful, it may still be warm.

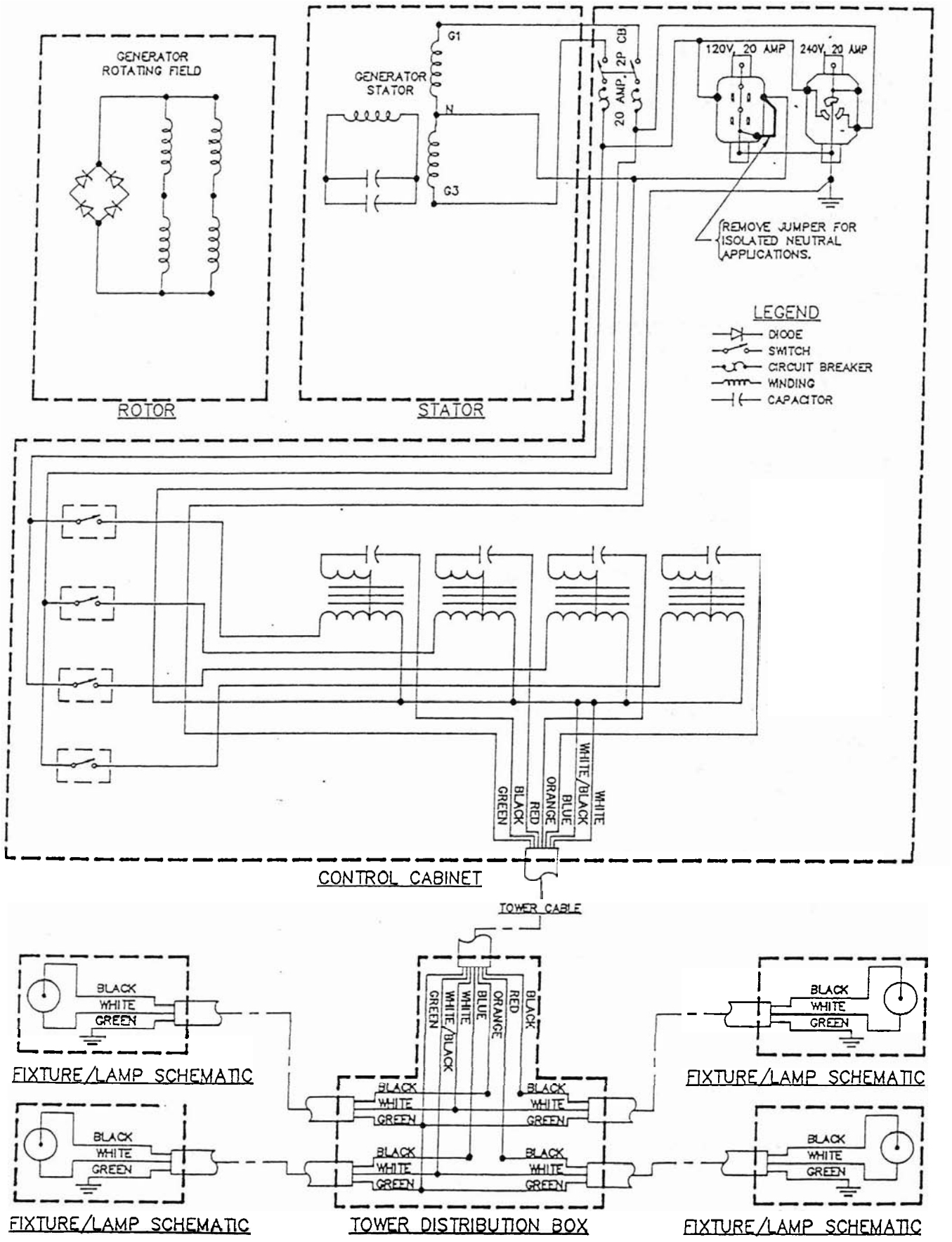
c. Install the new metal halide bulb. Handle only with clean white gloves to make sure that no oil, grease or other foreign material is left on the bulb surface. Clean the bulb with alcohol and a lint free cloth if necessary and allow to completely dry before lighting.

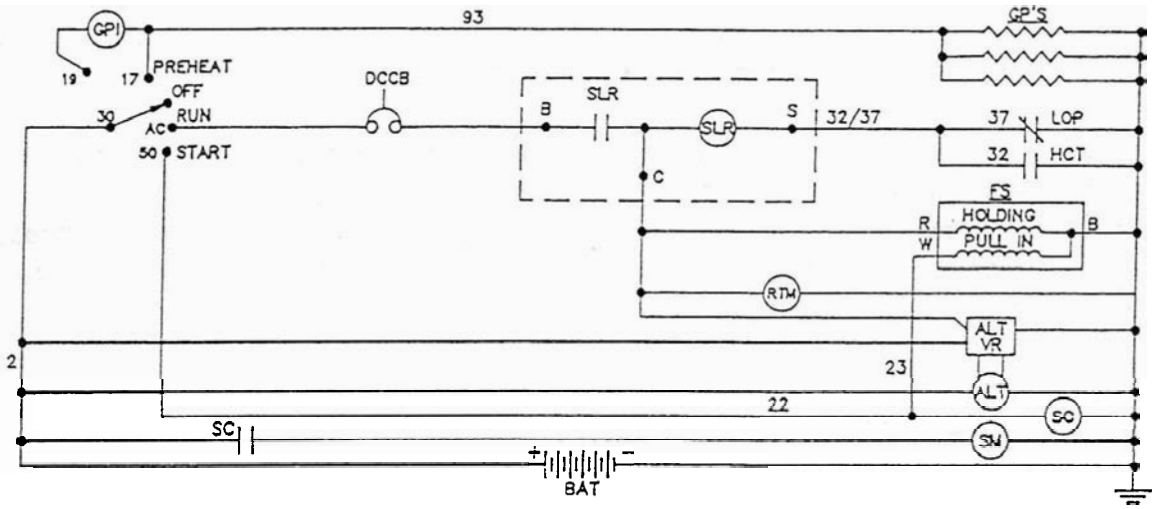
d. Hold the end of the bulb while replacing the support bracket. Gently snap the bracket into place.

e. Close the lens cover and re-snap all latches. Be very sure that the lens cover has sealed properly to prevent water or foreign material from entering the fixture.

ENGINE

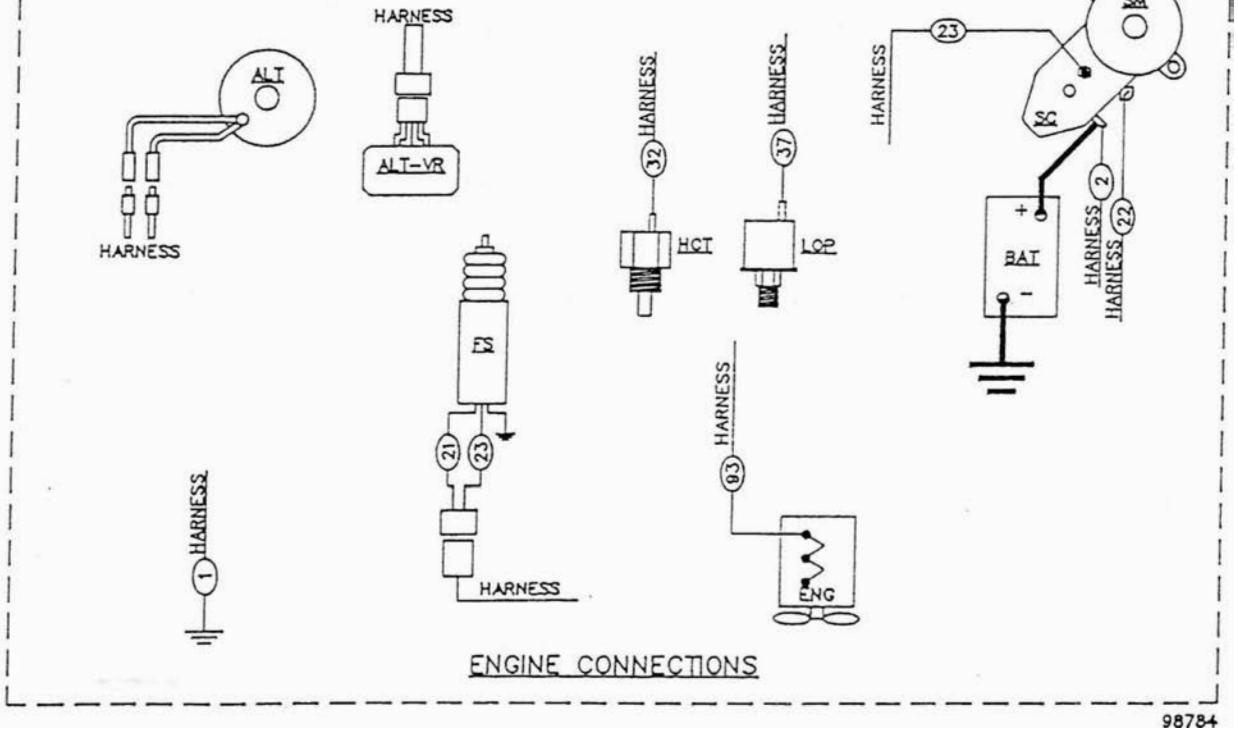
A basic engine Operation and Maintenance Manual has been provided with each Mobile Light Tower set. Additional copies of basic and overhaul manuals can be ordered from Kubota. Order forms are in the back of the engine Operation and Maintenance Manual.


GENERATOR ROTATING FIELD
ROTOR
GENERATOR STATOR
G1
N
G3
STATOR
20 AMP, 2P CB
120V, 20 AMP
240V, 20 AMP
REMOVE JUMPER FOR ISOLATED NEUTRAL APPLICATIONS.
LEGEND
DIODE
SWITCH
CIRCUIT BREAKER
WINDING
CAPACITOR
GREEN
BLACK
RED
ORANGE
BLUE
WHITE/BLACK
WHITE
CONTROL CABINET
TOWER CABLE
BLACK
WHITE
GREEN
FIXTURE/LAMP SCHEMATIC
TOWER DISTRIBUTION BOX



LEGEND

ALT	ALTERNATOR	HCT	HIGH COOLANT TEMP. SWITCH
ALT-VR	ALTERNATOR VOLTAGE REGULATOR	LOP	LOW OIL PRESSURE SWITCH
BAT	BATTERY	RTM	RUNNING TIME METER
DCCB	DC CIRCUIT BREAKER	SC	START CONTACTOR
FS	FUEL SOLENOID	SLR	SAFETY LATCHING RELAY
GND	GROUND	SM	STARTING MOTOR
GP'S	GLOW PLUGS		
GPI	GLOW PLUG INDICATOR		



ENGINE CONNECTIONS

98784

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 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 no 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.

WINCO®
INCORPORATED
225 South Cordova Avenue
Le Center, Minnesota 56057
1-800-433-8123 / 612-357-6821

60706-101 - 10322