TOWER LIGHT OPERATION & SERVICE MANUAL

Table of Contents

1 General Introduction

1.1 INTRODUCTION

It is our goal in this manual to provide you with basic information and instructions for proper installation and use of your lighting tower. It is essential that you carefully read all the safety rules and warnings before, during and after you put your lighting tower into operation, as only in this way can we ensure you will have optimal normal service under ideal conditions for reliability and safety. STAUNCH MACHINERY tower light are built by our technical and production team using the highest quality materials.

The tower light consists of five major components groups are trailer, generator, tower, lamps and electrical system. These above groups are covered in this manual.

This manual contains information and procedures to safely operate and maintain the light tower. For your own safety and protection from physical injury, carefully read, understand, and observe the safety instructions described in this Operating manual. DO NOT MODIFY or use this equipment for any application other than which it was designed for.

1.2 Quality Policy

We are committed to satisfy our customers and continually improve our quality by supplying products and services without defects and delays. We emphasize on ‘Doing the thing rightly’ rather ‘Doing the right thing’. As part of our quality policy, we strictly comply with the following objectives:

• Quality checks are done on ISO standards during the stages of inspection, manufacturing, testing and service.

• Immediate action over customer complaints.

• Adoption of latest techniques for the enhancement of quality and performance.

2 GENERAL SAFETY PRECAUTIONS

2.1 Safety and Warning

Before operation and maintenance for the generator sets, please read carefully about this manual and make sure a good understanding of this operation manual and other documents which attached with the engine.

Correct installation of the generator set is the precondition of normal operation. Qualified spare parts shall be used for maintenance to ensure good running condition and long life expectancy of the generator sets.

The generator set shall be operated only by the staffs who have received training on the operation and the repair shall be made by the authorized staffs. Operator and maintenance staff shall be clear about safety and preventive actions and operation maintenance procedure.

The generator sets can only be started under safety conditions. Please do not start the generator sets when any abnormal condition has been found so that to avoid accidents.

Maintain and repair the generator sets, please shut down the generator set and cut off the connection of negative polar of the battery or dismantle battery connecting cable, and place warning label at the relative place so that to avoid accident.

The exhaust air discharged from engine is harmful for people's health. All of the generator sets installed indoors shall discharge the exhaust gas to outside doors.

During the period of generator set running, the exhaust pipe and silencer will generate high temperature. Therefore when the generator set is installed, these parts need to be covered with insulation materials and be kept far away from inflammable materials.

Please ensure good ventilation and organized environment for the generator set's installation room.

Please do not place inflammable materials and explosives (liquid) near the engine. Smoking, spark over, and other fire lighting behaviors are not allowed in the area which is close to the battery and fuel because the mixture of volatilization from fuel and hydrogen generated by battery charging process will cause explosion when it meets sparkle or naked flame.

The generator set installation room shall be facilitated with BC and ABC fire extinguisher, and operators shall be familiar with the knowledge on how to use it.

When fan protection cover or other protection cover has been detached, please do not try to start the generator set, and when the generator set has to be started, please don't put your hand in the area where the protection cover is missing or make repair around these areas.

Please keep your palm, arm, long hair, jewelry and loose clothes far away from belt pulley, belt and other power transmission parts. When working in the generator set installation room, please ware working clothes, gloves and hat.

After the generator set being started, please don't try to open the cover of the radiator before the anti-freeze fully cooled down, so that to avoid steam (hot water) burst forth to hurt people. Please don't swallow or let your skin contact with the harmful materials such as fuel, anti-freeze, lubricant and electrolyte. When you skin is spattered with these kinds of liquids, please use plenty of water to rinse.

Long time stay in high noise level environment will cause harm to your hearing. If you have to work around the generator set frequently, you'd better ware the device to protect your ear.

When the generator set need to make cable connections to output power, the operation shall conform to the condition, specification, standard related to power distribution. Qualified cable shall be used to make power distribution.

When the installation of generator set involves with welding, please do not connect to the ground circuit or make grounding through generator set (engine) so that to avoid the big current generated from welding operation hurt the electric appliance, inside of the generator set.
Please ensure the safety of generator set and reliable grounding.

2.2Towing Safety

Towing a trailer requires care! Both the trailer and vehicle must be in good condition and securely fastened to each other to reduce the possibility of an accident.

• Check that the hitch and coupling on the towing vehicle are rated equal to, or greater than, the trailer's "gross vehicle weight rating" (GVWR).

• Inspect the hitch and coupling for wear or damage. DO NOT tow trailer using defective parts!

• Make sure the coupling is securely fastened to the vehicle.

• Check tyres on trailer for tread wear, inflation, and condition.

• Connect breakaway safety line securely to towing vehicle.

• Make sure directional, reverse and trailer lights are connected and working properly.

• Check that wheel nuts are tight and that none are missing.

• Maximum recommended speed for highway towing is 75 kph. Recommended maximum off road towing speed is 15 kph (less on uneven terrain).

• Check that the road running lights are connected and operating, if applicable.

2.3 Pictograms and their meanings

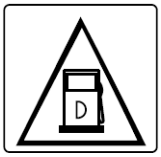
Safety notices are clearly mounted on the equipment to draw the operator's or maintenance technician's attention to the potential dangers and explain the action to be taken in the interest of safety. These notices are reproduced in this publication for ease of identification by the operator. Replace any notice that is missing or illegible.

Warning -Read the manual

Caution: risk of electric

Naked flames and unprotected lights prohibited. No smoking

Caution: high temperature, risk of burns



DIESEL FUEL WARNING

Lifting point required

USE FAN GUARDS

DIESEL FUEL LINE

Fork pockets for lifting Retention tank level high

3 GENERAL DESCRIPTION

3.1 Diesel Engine

The diesel engine powering the Tower light set has been chosen for its reliability and the fact that it has been specifically designed for powering tower lights. The engine is of the heavy duty industrial type and is fitted with all accessories to provide a reliable power supply. These accessories include, among others, a cartridge type dry air filter, a turbocharger fitted on some engines and a mechanical or electronic controlled engine speed governor.STAUNCH pay special attention to the User technical advantage of engines in the aspects of reducing exhaust gas, decrease fuel consumption rate and good noise level control.

3.2 Engine Electrical System

The engine electrical system is 12 volt , negative ground/earth. This system includes an electric engine starter, a battery and a battery charging alternator. For 12 volts electrical system one battery is given.

3.3 Cooling System

The engine cooling system comprises of a radiator, a high capacity pusher fan (air is 'blown' through the radiator). The alternator has its own internal fan to cool the alternator components. Note that the air is "pushed" through the radiator so that the cooling air is drawn past the alternator, then past the engine and finally through the radiator.

3.4 Pre-heater for generator set (Optional Spare Part)

Our generator set has been facilitated with heater for water jacket. The purpose to install the pre-heater is to ensure that the generator set can be started under low temperature and some emergency cases, and also it can prevent the generator sets from being damaged by cold winter weather.

3.5 Fuel tank and Base frame

The engine and alternator are coupled together and mounted on a heavy duty steel base-frame .This base frame includes a fuel tank with capacity of approximately 50 liters The tank is complete with filling cap and fuel level gauge and is connected by flexible joints to the intake piping and to the overflow piping containing fuel from the injector drain.

3.6 Vibration Isolation

The generator set is fitted with vibration isolators which are designed to reduce engine vibration being transmitted to the foundation on which the generator set is mounted. These isolators are fitted between the engine/alternator feet and the base frame.

3.7Material and features:(fig: 1)

- Light source with high photosynthetic efficiency:100lm/W
- Heatproof silicon sealing gasket. Working in -40℃~240℃, it is not easily to out of shape.
- Reflector surface with polishing and oxidation treatment, with high reflectivity.
- High strength steal bracket, surface with powder spraying treatment, firm, wind resistance, and antirust.
- The light fixture and the gear box are separated, convenient for installation and maintenance.
- For a 4x1000w tower light, it can illuminate areas greater than 4000m² at an average 20 lux.

3.8 Applicable places: Parking, sea/airport, mining, construction sites, rental and large area tower lighting.

4 ERGONOMIC IMPROVEMENT

4.1 Improved design for easy transportation

Forklift opening in the base frame, which better serves the needs of customers who need to move the tower light frequently.

4.2 Lubricant discharge hole which directly connect to outside

Our generator sets have been facilitated with lubricant discharge valve which connect directly to outside. This lubricant discharge valve is another humanized design feature of STAUNCH MACHINERY gen-set. It offers more convenient operation for the users. When you want to discharge surplus lubricant or change it, you can easily make it by opening the lubricant discharge ball valve.

4.3 Powder Coating

Powder Coatings are a blend of resins, curing agents and pigments, which are melt-mixed (extruded) and pulverized into finely divided particles. They are totally solvent free. Typically applied to metal products by electrostatic spray, the coated item is then heated and the powder melts into a smooth, continuous and encapsulating film. When thermosetting resins

are used, the coating changes chemically (crosslinking) during cure, resulting in a decorative / functional finish with superior performance characteristics.

4.4 External antifreeze adding holeFig:(2)(Optional**)**

For canopy generator set has been facilitated with external antifreeze filling hole. When user intends to add antifreeze, He only needs to open the antifreeze filling hole on the roof of canopy and the radiator's pressure valve cap to directly add antifreeze to the hole, and easily watch the anti-freeze level.(see figure:2)

4.5 External Diesel filling hole.Fig:(2) (Optional)

Canopy generator set has been designed with external diesel filling hole in order to refill the build in diesel tank and taking into consideration safety and access ease.

5 INSTALLATION, HANDLING AND STORAGE

5.1 Transportation

During the period of shipment, protection shall be made for the tower light set. In addition, the tower light set shall be tightly secured in the loading truck so that to avoid any vibration during shipment which will cause the tower light set's components loosen and even damaged. During the process of shipment, no people or other material is allowed to place above the tower light set so that to avoid damage caused by weight.

MOVE LIGHT TOWER TO DESIRED LOCATION KEEPING THE FOLLOWING IN MIND:

A. The light tower should not be placed where those working under the light are either:

1) Forced to look into the light regularly.

2) Forced to work with their backs to the light (shadows will block the light from the work area).

B. The area where the tower is positioned should be relatively level.

C. The light tower should be located on the same level or on ground higher than the area being lighted (higher light mounting heights reduce the shadow length).

5.2 Long term storage

For storage or long periods of inactivity, STAUNCH MACHINERY recommend the following:
Generators should be stored with oil filled to the correct capacity; Storage periods of 18 months and over may require special lubricants and treatments. If so please seek further advice from the engine manufacturer.
Before the generator is used after long term storage, all fuels and oils should be replaced. Generator mounts, pipes and hoses should be checked to ensure that they are un-perished following extended periods of storage. The generator should be stored in a clean dry area, ideally having a reasonable constant ambient temperature, and ideally not below freezing. The battery isolator switch should be switched off.

6 GEN-SET OPERATION

6.1 Inspect Before Operation

Operate the generator set without load once each week for 20 minutes. If the generator set is not connected to an automatic transfer switch (ATS) with an exercise option, exercise the unit in the presence of an operator.
The operator should perform all of the prestart checks before starting the exercise procedure. Start the generator set according to the starting procedure in the controller section of this manual. While the generator set is operating, listen for a smooth-running engine and visually inspect the generator set for fluid or exhaust leaks. Check the air inlets and outlets and remove any items restricting the air flow.
After finished installation, our diesel engine generator set can be put into use. Each time before starting the generator set, following items shall be checked without fail.

1. Make a general visual inspection on the engine and alternator. Check if there is any breakage, crack, indentation, leakage or looseness. Never operate the generating set before removing any fault, if any.

1. Take out foreign materials such as keys, tools, cleaning wool, papers etc. on the engine and the alternator.

2. Check the fuel level in the tank, refill with fuel if it is low.

3. Control the abrasion in the charge alternator belt and check periodically the belt tension according to producer' recommendation.

4. Check the oil level on the dipstick. Refill with an appropriate oil if it is low. Maintain the oil level at or near, not over, the full mark on the dipstick. (see figure:5)

5. Look at the water level by opening the radiator tap. If it is inadequate add more water. Water level must be 30 mm lover than the water filling neck. Engine cooling water must include antifreeze according to the coolest weather conditions in the area. (See figure:2)
   Note (Fluid may abruptly exit the cooling circuit and cause serious burns. Only remove the filler cap once the engine and cap have cooled sufficiently to enable them to be handled with bare hands. Firstly, loosen the cap slightly by one notch to eliminate any pressure, then remove it.)

6. A mixture of 50% antifreeze and 50% water provides a good protection in all area

7. Inspect the radiator air outlet hood, open if clogged and clear away all obstructions in front of the air outlet

8. Check the air filter. If the air filter is fitted with a dust control valve, press the tip of the valve to evacuate any accumulated dust particles. Check the air filter clogging indicator, if the indicator is red, clean the air filter.(see figure:7)

9. Keep the inlet opening open. Make sure that the generating set can easily take air from the environment (see figure:4)

10. Check the battery connection cables. Take care to tighten the loosened battery terminals with spanner and, cover with special substance and keep clean in order to avoid oxidation.

11. Check if the circuit breaker outlet switch is in OFF position.

12. Make sure that the emergency stop button is not pressed. (see figure:6)

6.2 GENERATING SET CONTROL SYSTEMS

To control and monitor the generator, an (DEEP SEA ELECTRONICS PLC) has been used. Control panel provides a means of starting and stopping the generating set, monitoring its operation and output and automatically shutting down the set in the event of critical condition arising such as low oil pressure or high engine temperature.

CAUTION: The module may instruct an engine start event due to external influences. Therefore, it is possible for the engine to start at any time without warning. Prior to performing any maintenance on the system, it is recommended that steps are taken to remove the battery and isolate supplies.

The following descriptions detail the sequences followed by a module containing the standard 'factory configuration'. Always refer to your configuration source for the exact sequences and timers observed by any particular module in the field.
Control of the module is via push buttons mounted on the front of the module:

6.2.1 Push Buttons

Display	Description	Display	Description
O	Stop/Reset	ATUO	Atue mode
▲ ▼	Scroll	⚠	Common Alarm Indicator
I	Start (when in Manual or Test mode)		

KEY FEATURES
• Back-lit text LCD display
• Front panel editing
• LED and LCD alarm indication
• Power Save mode
• CAN and Magnetic Pick-up/Alt. versions available (specify on ordering)
• PC and front panel configuration
• 6 Digital inputs
• 3 Analogue inputs
• 6 Outputs (4 configurable on Magnetic Pick-up/Alt., 6 configurable on CAN version)
• Configurable timers and alarms
• Alternative configuration
• Event Log (10)
• Remote Start input
• 3 Phase generator monitoring
• Current Monitoring and protection
• 3 Phase Mains (Utility) monitoring (DSE6120 only)
• Test button (DSE6120 only)
• Battery voltage monitoring
• Engine pre-heat
• Hours counter
• Comprehensive shutdown or warning on fault condition

KEY BENEFITS
• Ultimate size to feature ratio
• Increased input and output expansion capability via DSENet®
• Hours counter provides accurate information for monitoring and maintenance periods
• User-friendly set-up and button layout for ease of use
• Multiple parameters are monitored simultaneously which are clearly displayed on a large back-lit text display via multiple languages
• The module can be configured to suit a wide range of applications
• Compatible with a wide range of CAN engines including Tier 4
• Uses DSE Configuration Suite PC Software for simplified configuration
• License-free PC software
• IP65 rating (with optional gasket) offers increased resistance to water ingress

Emergency stop

The generator is equipped with an emergency stop button which should only be used in an emergency and not for general stopping.

6.2.2 Manual Mode of Operation

Press the button I to begin the start sequence (There is no Start Delay in this mode of operation). After the fuel solenoid is energized, then the starter motor is engaged. The engine is cranked for 10 sec. If the engine fails to fire during this cranking attempt then the starter motor is disengaged for 10 sec. This sequence should continue beyond the 3 cranking attempts, the start sequence will be terminated and Fail to Start !▂▄ fault will be displayed. When the engine fires, the starter motor is disengaged and locked out. Delayed alarms (under speed, low oil pressure etc) will be monitored after the end of the Safety On delay.
The generator will continue to run on load regardless of the state of the mains supply.Selecting stop O de-energizes the fuel solenoid, bringing the generator to a stop.

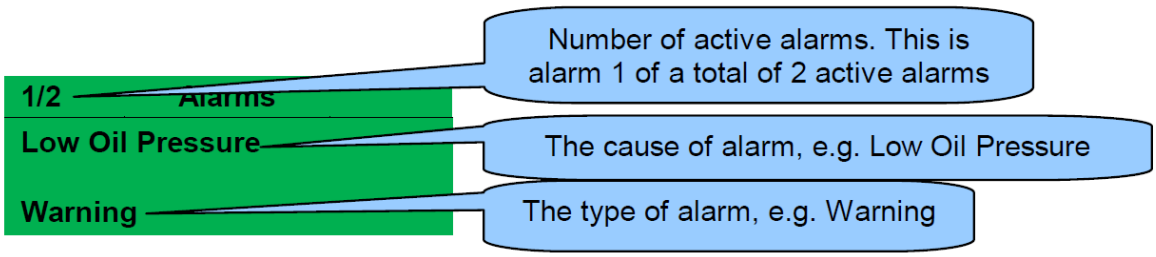
6.3 INFORMATION THAT CAN BE DISPLAYED

6.3.1 ALARMS

Warnings are non-critical alarm conditions and do not affect the operation of the generator system, they serve to draw the operators attention to an undesirable condition. By default, warning alarms are self-resetting when the fault condition is removed.

When an alarm is active, the Common Alarm LED, illuminates and a message appears on the module's display. If configured, the external audible alarm also sounds.

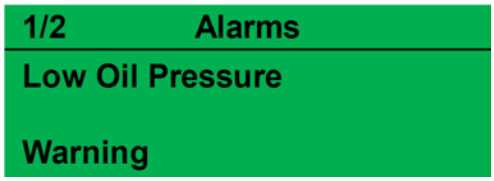
The external audible alarm is silenced by pressing the ***Alarm Reset / Lamp Test*** button. The LCD display jumps from the 'Information page' to display the Alarm Page

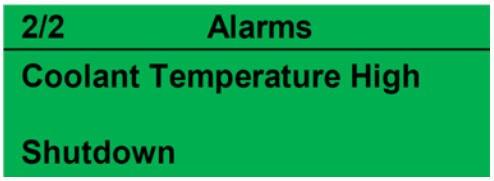


The LCD displays multiple alarms such as "Coolant Temperature High", "Emergency Stop" and "Low Coolant Warning". These automatically scroll in the order that they occurred.

In the event of an alarm, the LCD displays the appropriate text. If an additional alarm then occurs,
the module displays the appropriate text .

Example:



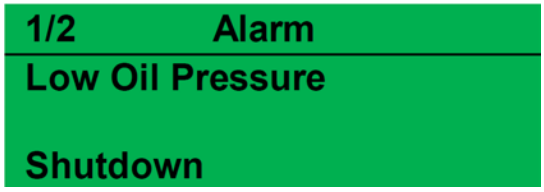


6.3.2 SHUTDOWN ALARMS

NOTE: The alarm condition must be rectified before a reset takes place. If the alarm condition remains, it is not be possible to reset the unit (The exception to this is the *Low OilPressure alarm* and similar *active from safety on* alarms, as the oil pressure is low with the engine at rest).

Shutdown alarms are latching and immediately stop the Generator. On initiation of the shutdown condition the module de-energizes all the Delayed Load Output and the Close Gen Output outputs to remove the load from the generator. Once this has occurred, the module shuts the generator set down immediately to prevent further damage. The alarm must be accepted and cleared, and the fault removed to reset the module.

Example



Shutdowns are latching alarms and to remove the fault, press the *Stop/Reset Mode* button on the module.

6.3.3 ENGINE

These pages contain instrumentation gathered about the engine measured or derived from the module's inputs, some of which may be obtained from the engine ECU.

- Engine Speed
- Oil Pressure
- Coolant Temperature
- Engine Battery Volts
- Engine Run Time
- Engine Fuel Level
- Oil Temperature
- Coolant Pressure
- Inlet Temperature
- Exhaust Temperature
- Fuel Temperature
- Turbo Pressure
- Fuel Pressure
- Fuel Consumption
- Fuel Used
- Fuel Level
- Flexible Sensors
- Engine Maintenance Alarm 1
- Engine Maintenance Alarm 2
- Engine Maintenance Alarm 3
- Engine ECU Link
- Tier 4 Engine Information

6.3.4 GENERATOR

These pages contain electrical values of the generator, measured or derived from the module's voltage inputs.

- Generator Voltage (ph-N)
- Generator Voltage (ph-ph)
- Generator Frequency
- Generator Current (A)
- Generator Load ph-N (kW)
- Generator Total Load (kW)
- Generator Load ph-N (kVA)
- Generator Total Load (kVA)
- Generator Power Factor Average
- Generator Load ph-N (kVAr)
- Generator Total Load (kVAr)
- Generator Accumulated Load (kWh, kVAh, kVArh)
- Generator Phase Sequence
- Active Configuration

6.3.5 SHUTDOWN ALARM ICONS AND THEIR MEANING

Icon	Fault	Description
	**Auxiliary Inputs**	The module detects that an auxiliary input which has been user configured to create a fault condition has become active.
	**Analogue Input Configured as Digital**	The analogue inputs can be configured to digital inputs. The module detects that an input configured to create a fault condition has become active.
	**Fail to Start**	The engine has failed to start after the configured number of start attempts
	**Low Oil Pressure**	The module detects that the engine oil pressure has fallen below the low oil pressure pre-alarm setting level after the Safety On timer has expired.
	**Engine High Temperature**	The module detects that the engine coolant temperature has exceeded the high engine temperature pre-alarm setting level after the Safety On timer has expired.
	**Under Speed**	The engine speed has fallen below the under speed pre alarm setting
	**Over Speed**	The engine speed has risen above the over speed pre alarm setting
	**Charge Failure**	The auxiliary charge alternator voltage is low as measured from the W/L terminal.
	**Low Fuel Level**	The level detected by the fuel level sensor is below the low fuel level pre-set alarm setting.
	**High Fuel Level**	The level detected by the fuel level sensor is above the high fuel level pre-set alarm setting.
	**Generator Under Voltage**	The generator output voltage has fallen below the pre-set alarm setting. after the Safety On timer has expired.
	**Generator Over Voltage**	The generator output voltage has risen above the pre-set alarm setting.
	**Generator Under Frequency**	The generator output frequency has fallen below the pre-set alarm setting after the Safety On timer has expired.
	**Generator Over Frequency**	The generator output frequency has risen above the pre-set alarm setting.
	**Delayed Over Current**	The measured current has risen above the configured trip level for a configured duration.
	**kW Overload**	The measured kW has risen above the configured trip level for a configured duration.
	**CAN ECU Fault**	The engine ECU has detected an alarm – CHECK ENGINE LIGHT Contact Engine Manufacturer for support.
	**CAN Data Fail**	The module is configured for CAN operation and does not detect data on the engine Can data link.
	**Emergency Stop**	The emergency stop button has been depressed. This failsafe (normally closed to emergency stop) input and immediately stops the set should the signal be removed.
	**Oil Sender Open Circuit**	The oil pressure sensor has been detected as being open circuit.
	**Coolant Temperature Sender Open Circuit**	The coolant temperature sensor has been detected as being open circuit.
	**Oil Filter Maintenance Alarm**	Maintenance due for oil filter.
	**Air Filter Maintenance Alarm**	Maintenance due for air filter
	**Fuel Filter Maintenance Alarm**	Maintenance due for fuel filter.

6.4 TRAILER AND TOWER LIGHT OPERATION

6.4.1 PUTTING INTO SERVICE

Before putting the lighting tower into service, make sure that it is properly located on completely level ground to ensure proper operation and secure it against unexpected winds. For maximum light coverage locate the Light Tower at ground level or in a spot higher than the area being lighted.

This equipment operated improperly or by untrained personnel can be dangerous. Read the operating instructions and familiarize yourself with the location and proper use of all instruments and controls. Inexperienced operators should receive instruction from someone familiar with the equipment before being allowed to operate or set up the light tower. The following points should be practiced at all times:

- The area immediately surrounding the light tower should be dry, clean, and free of debris.
- Position and operate the light tower on a firm, level surface.
- NEVER start a unit in need of repair.
- Lower tower when not in use, or if high winds or electrical storms are expected in the area.
- Make certain light tower is well grounded and securely fastened to a good earthen ground.
- The tower extends so Make sure area above trailer is open and clear of overhead wires and obstructions.
- Bulbs become extremely hot during use! Allow bulb and light fixture to cool 10-15 minutes before handling.
- Keep area behind trailer clear of people while raising and lowering mast.
- Keep all body parts and other loose items clear of winch and cable during operation and while in tension.
- NEVER raise, lower or turn mast while unit is operating.
- Trailer must be leveled and outriggers extended before raising tower. Outriggers must remain extended while tower is up.
- If, for any reason any part of mast hangs up or winch cable develops slack while raising or lowering tower, STOP immediately, and Contact an authorized service representative.
- NEVER remove safety pin or pull mast locking pin while tower is up.
- NEVER use tower if insulation on electrical cord is cut or worn through.
- NEVER operate lights without protective lens cover in place or with a lens cover that is cracked or damaged.
- Only use mild soap and water to clean the lens covers. Other chemicals may have an adverse effect on the glass.
- NEVER operate a unit while tired, distracted, or under the influence of drugs or alcohol

6.4.2 Adjusting LightsFig:(3)

Each light fixture can be aimed up, down, Position each fixture by loosening tool less light adjustersand aiming the light up or down. Tighten adjusters after positioning the lights.

6.4.3Leveling Trailer.

The trailer must be leveled and the outriggers extended before raising the tower. The outriggers must remain extended while the tower is up. Failure to level the trailer or extend the outriggers will severely reduce the stability of the unit and could allow the tower to tip and fall.

6.4.4 Operating the tower light. Fig:(4,5,6,7,8)

After leveling the tower light set. The lights should be oriented parallel to the control panel board before and during raising the tower light.

- Extend the outriggers by unscrewing the bolts under the trailer chassis and extend each outrigger by 40cm maximum, then fasten again each bolt.
- Turn the jack handle clockwise to start leveling the trailer. Adjust all four jacks by turning their handles clockwise until they are firmly in contact with the ground and the trailer is as level as possible.
- Do not start the gen-set under a load, that is, make sure that the lights circuit breakers on the control panel are switched off.
- After following the gen-set operation instruction mentioned above and after checking that the engine is up to temperature and running smoothly.
- Operating the tower is very simple, by using the raising and lowering switch located on the gen-set control panel and following these simple instructions. Open the tableau door then turn the tower light switch clockwise and holding it there in order to raise the tower, and counter clockwise to lower the tower. **(NEVER** raise the mast or operate the Light Tower in high speed winds.)
- Switch “ON” each individual circuit breaker **one by one at a time**. Fig()
- The ballast indicator lights will come on momentarily as the lights strike. As the lights warm up, the ballast indicator lights will continue to get brighter and then remain on. This confirms that power is coming from the ballasts to the lights.
- If an indicator light does not come on, the ballast may need to be serviced. If the indicator light comes on and stays lit but the related light is not illuminated, check the bulb or the mast wiring.
- The lights require a warm up period of 5-10 minutes before they reach full output. If the lights are shut down, they require a cool-down period of approximately 10-15 minutes before they can be switched on again.
- When checking or replacing the bulbs, wipe them with a clean cloth to avoid leaving any grease, oil residue or fingerprints on the glass. Any residue can create a hot spot on the bulb, causing premature bulb failure.
- **NEVER OPERATE THE LIGHTS WITHOUT THE PROTECTIVE LENS COVER OR WITH A LENS COVER THAT IS CRACKED OR DAMAGED!**
The bulbs in the light fixtures produce high temperatures and operate
Under pressure. A broken or missing lens cover could cause the Bulbs to shatter, causing injury. Bulbs become extremely hot in use! Allow bulb fixture to cool 10-15 Minutes before handling.
- **In order to rotate the tower left and right please follow these steps:**

1. Unscrew the tower lock screw located inside the tower light set.**fig:(9)**
2. Rotate the tower light to the desired position using the tower light handles.**fig:(10)**
3. Fasten the tower lock screw located inside the tower light.

6.4.5 Lowering the tower light:

1. Shutdown the light bulbs and allow them to cool-down period of approximately 10-15 minutes
2. Lower the tower light by following the same procedure as same as for raising it.

7 GENERAL PRECAUTIONS AND CONTROLS WHICH MUST BE DONE AFTER STARTING UP THE GENERATOR.

1. Check for any abnormal noise or vibration on the generating set.

2. Check if the exhaust system has any leakage.

3. Monitor the generating set operation by means of the control module LCD display. Check the engine temperature and oil pressure. Oil pressure must reach the normal value 10 seconds after the generating set operation.

4. If an engine block water heater is not available, run the generating set at no-load for 8 minutes and when the engine warm than apply on load (for manual models).

7.1 Warning about putting the gen-set under load.

Our gen-set cannot run under less than 25% load for a long time. Because inside engine, some parts use pressure for seal, such as between cylinder liner and piston and piston ring, between supercharger and supercharger rotor axle. For this kind of seal, when engine has about 1/3 load, which will fully come into play. And under this load, there will be followed failures:

1. Seal between piston and cylinder liner is poor, oil will go up and into combustor, and exhaust will emit blue smoke.

2. As for supercharged diesel gen-sets, because of under low load, no load, low supercharging pressure, it will easily cause the sealing effect(using pressure to seal) of supercharger oil seal(non contact) to decrease, then oil will go into supercharging chamber and then goes into cylinder together with inlet air.

3. A part of oil which goes into cylinder will take part in combustion, another part of oil cannot combust fully and will form carbon deposit at air valve, air inlet passage, piston top, piston ring and other places. And other part of oil will go out with exhaust air and form carbon deposit at exhaust pipe. When accumulated oil and carbon deposit are to some extent, they will drip from connector of exhaust manifold.

4. When oil in supercharging chamber of supercharger is accumulated to some extent, it will leak form junction of supercharger.

5. If gen-set runs under load for a long time, it will cause its moving parts to have serious abrading and engine combustion environment will worsen, finally it will cause overhaul ahead of time. So overseas diesel gen-set manufacturers always emphasize to make gen-set not to run under low load or no load as less time as possible. And it is ruled that the smallest load cannot be less than gen-set rated power 25% - 30%.

8 MAINTENANCE

8.1 Engine maintenance chart

○Check ◇Replace ●Contact STAUNCH MACHINERY

System	Check Item	Daily	Periodic Maintenance Interval						
			Every 50 hours	Every 250 hours	Every 500 hours	Every 1000 hours	Every 1500 hours	Every 2000 hours	Every 3000 hours
Cooling System	Check and Refill Engine Coolant	○							
	Check and Clean Radiator Fins		○						
	Check and Adjust Cooling Fan V-belt		○ 1st time	○ 2nd &after					
	Drain, Flush and Refill Cooling System With New Coolant					◇ or every 1 year which - ever comes first			
Cylinder Head	Adjust Intake/Exhaust Valve Clearance					●			
	Lap Intake/Exhaust Valve Seats (if required)							●	
Electrical Equipment	Check Indicators	○							
	Check Battery		○						
Engine Oil	Check Engine Oil Level	○							
	Drain and Fill Engine Oil		◇ 1st time	◇ 2nd &after					
	Replace Engine Oil Filter								
Engine Speed Control	Check and Adjust Governor Lever and Engine Speed Control	○		○					
Emission Control Warranty	Inspect, Clean And Test Fuel Injectors, if necessary						●		
	Inspect Turbocharger (Blower Wash as Necessary)								●
	Inspect, Clean And Test EGR Valve								●
	Clean EGR Lead Valve								●
	Clean EGR Cooler						●		
	Inspect Crankcase Breather System						●		
Fuel	Check and Refill Fuel Tank Level	○							
	Drain Fuel Tank			○					
	Drain Fuel Filter / Water Separator	○							
	Check Fuel Filter / Water Separator	○							
	Clean Fuel Filter / Water Separator				○				
	Replace Fuel Filter				◇				
Hoses	Replace Fuel System And Cooling System Hoses							or ◇ every 2 yrs.	
Intake And Exhaust	Clean Or Replace Air Cleaner Element			○	◇				
Complete Engine	Overall Visual Check Daily	○							

8.2 Storing gen-set in non-operable condition for 3 months or more.

8.2.1 Preparation for storage.

1.Drain engine oil, and pour in rust-preventive oil into the engine.
2.Prepare a fuel mixture containing 50% rust-preventive oil, and fill the fuel tank with it.
3.Operate the gen-set at rated speed for 5 to 10 minutes under no load.
4.Immediately before stopping the engine, spray volatile.
5.With the gen-set stopped, drain the fuel mixture from the fuel tank.
6.Apply rust-preventive oil liberally on the exposed sections of the gen-set.
7.Seal air inlet, exhaust outlet, breather and other openings with an adhesive cloth tape.
8.Loosen V-belt of engine.
9.Disconnect cables from the battery terminals, and charge the battery. Clean the terminals, apply a thin coat of grease to the terminals, and store the battery in a cool and dry room.
10. Cover the entire gen-set.

8.2.2 Maintenance during storage

Charge the battery once a month.
First, check the battery electrolyte for correct level and then charge the battery.

8.2.3 Using gen-set after storage

1.Remove the cover from the gen-set.
2.Connect a fully charged battery.
3.Adjust the tension of V-belt.
4.Remove sealing tapes from the openings of the engine.
5.Drain rust-preventive oil, and pour in appropriate engine oil.
6.Fill the fuel tank with fuel, and bleed the fuel system.
7.Inspect the entire gen-set.
8.Remove the rocker covers, and lubricate the valve mechanisms.
9.Shut off the fuel supply and crank the engine for about 10 seconds, and repeat this cranking 3 times at intervals of about 1 minute.
caution; to crank the engine, shut off the fuel supply to the engine and operate the starters.
10.Make sure the engine oil pressure rises.
11.Start the engine.
12.Apply load and increase the engine speed to the rated speed.

8.3 Engine Oil Recommendation

Due to differences in the engine size and engine description, and taking into consideration the environment by which the engine will operate, please contact staunch machinery in order to provide the correct grade and type of oil that will best serve your engine.

8.4 Oil Change Procedure

Note: Dispose of all waste materials (engine oil, fuel, filter, etc.) in an environmentally safe manner.
For best result please drain the oil while it is still warm.

8.4.1 Drain the oil.

1. Place the generator set master switch in the OFF position.
2. Disconnect the power to the battery charger.
3. Disconnect the generator set engine starting battery, negative (--) lead first.
4. Clean the area around the dipstick and oil fill cap.
5. Open the oil drain ball valve on the engine.
6. Remove the dipstick and oil fill cap. Allow time for the engine oil to drain completely.
7. Close the oil drain valve.
8. Replace the dipstick.

8.4.2 Replace the oil filter.

1. Clean the area around the oil filter. Remove the oil filter by rotating it counterclockwise with an oil filter wrench.
2. Clean the gasket sealing surface of the oil filter adapter.
3. Apply a light coat of clean oil to the rubber seal of the new oil filter.
4. Install the new oil filter following the instructions provided with the filter.

8.4.3 Fill with oil.

1. Fill the engine to the F mark on the dipstick. See The engine data sheet for the oil capacity
2. Reinstall the dipstick and the oil fill cap.
3. Check that the generator set master switch is in the OFF position.
4. Reconnect the generator set engine starting battery, negative (--) lead last. Reconnect the power to the battery charger.
5. Start and run the generator set for a minute to allow the oil pressure to reach operating range.
6. Stop the generator set, wait 1 minute, and then recheck the oil level. Add oil to bring the level up to the F mark on the dipstick.

8.4.4 Check for leaks.

1. Check for oil leaks.
2. Fix leaks and recheck the oil level.

8.4.5 Replacing Bulbs fig:(11)

Removal:

- Shut down the engine and allow the bulb to cool.
- Remove the screws **(a)** securing the flange rings **(b)** and remove the flange rings. Remove the lens **(c)** with the gasket **(d)** attached.
- Remove the hardware securing one side of the bulb stabilizer **(e)**. Once removed, swing the bulb stabilizer to the side and unscrew the bulb **(f)**.

Installation:

- Insert the bulb and secure it with the bulb stabilizer **(e)**.
- Install the gasket **(d)** around the lens **(c)** and secure the lens to the reflector with flange ring **(b)** and screws **(a)**.

8.4.6 Steel cables and pulley assemblies: Fig:(12)

- Periodically inspect the condition of cables every 100 hours or once a month.
- When the nominal diameter of the steel cable has decreased 10% from corrosion or abrasion, it should be replaced immediately.
- oInspect the wire stands and, in the event that one has broken, replace the steel cable as soon as possible
- If there is any kind of deformation: kink, knot or crushed spot, replace the cable immediately.
- Important: Always use steel cables specified by the lighting tower manufacturer
- When operating under highly corrosive conditions, coat the cables with oil every 300 hours or 3 months of operation.

9 ENGINE TROUBLESHOOTING CHART

SYMPTOM	PROBABLE CAUSE	ACTION
Engine oil pressure indicator	Low level of engine oil	Check and adjust oil level as necessary
	Too high an oil level	
	Clogged engine oil filter	Replace engine oil filter
Engine coolant indicator	Low engine coolant level	Add engine coolant
	Dirty radiator fins	Clean the radiator fins
	Engine coolant leaking	Contact Staunch machinery maintenance department
	V -belt loose or damaged	Adjust V -belt or replace
	Contaminated engine coolant	Contact Staunch machinery maintenance department
	Faulty engine coolant pump	
Battery Indicator	V -belt loose or damaged	Adjust V-belt or replace
	Battery failure	Check battery condition
	Faulty alternator	Contact Staunch machinery maintenance department
Battery indicator stays ON	Faulty alternator	. Contact Staunch machinery maintenance department
Engine oil pressure indicator stays ON	Faulty engine oil pressure switch	
	No or low level of engine oil	Check and adjust oil level as necessary
	Clogged engine oil filter	Replace engine oil filter
Starter motor operates but engine does not start	No diesel fuel	Refuel and prime fuel system
	Air in fuel system	Prime fuel system
	Improper diesel fuel	Replace with recommendeddiesel fuel
	Clogged fuel filter	Replace fuel filter
	Poor fuel injection	Contact Staunch machinery maintenance department
	Compressed air leakage from intake /exhaust valves	
	Faulty engine stop solenoid	

Starter motor does not operate or rotates too slowly (engine can be turned manually)	Battery needs charging	Check electrolyte, recharge
	Faulty cable connection at battery terminals	Clean terminals, retighten
	Faulty starter switch	Contact Staunch machinery maintenance department
	Faulty starter motor	
Engine cannot be manually turned	Inner parts seized or damaged	
Black exhaust smoke	Engine overloaded	Reduce load
	Clogged air cleaner element	Clean element or replace
	Improper diesel fuel	Replace with recommended ddiesel fuel
	Faulty spraying of fuel injection	Contact Staunch machinery maintenance department
	Excessive intake / exhaust valve clearance	
	Faulty EGR valve	
White exhaust smoke	Improper diesel fuel	Replace with recommended diesel fuel
	Faulty spray pattern of fuel injection	Contact Staunch machinery maintenance department
	Engine burning oil	
	Fuel injection timing delay	

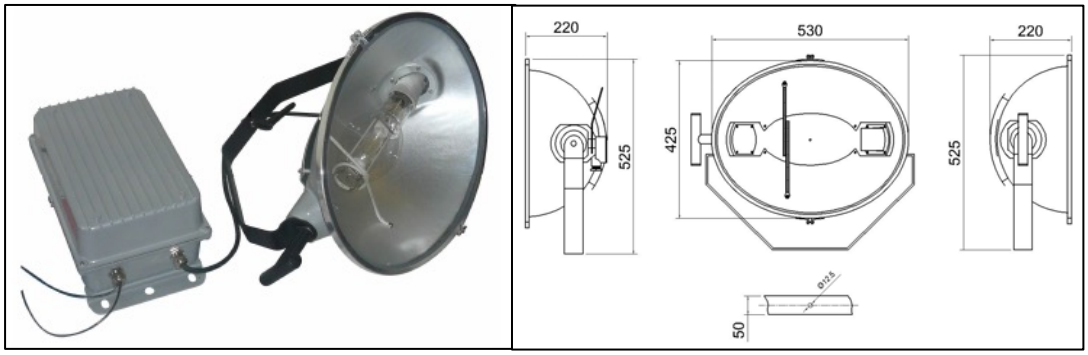


Fig 1: HALIDE FLOODLIGHT

Fig 3: ADJUSTING LIGHTS

Fig 2: EXTERNAL DIESEL FILLING HOLE

Fig 4: OPERATING THE TOWER LIGHT

Fig 5: OPERATING THE TOWER LIGHT

Fig 6: OPERATING THE TOWER LIGHT

Fig 7: OPERATING THE TOWER LIGHT

Fig 8: LOWERING THE TOWER LIGHT

Fig 9: ROTATING THE TOWER LIGHT

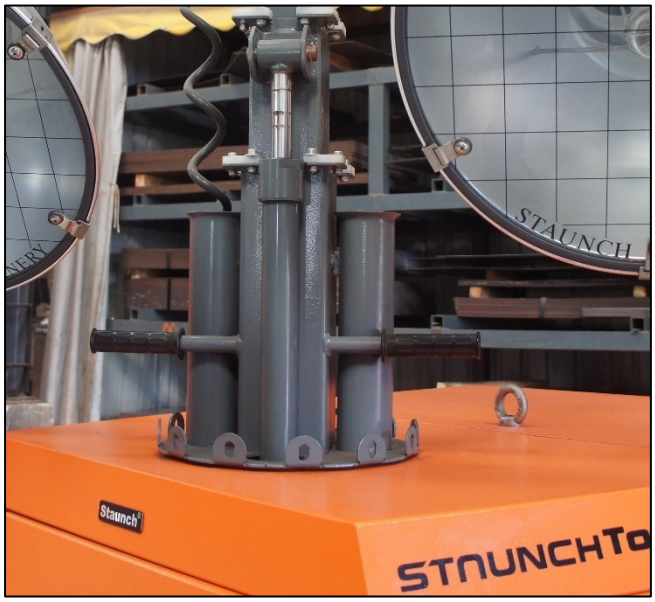


Fig 10: ROTATING THE TOWER LIGHT

Fig 12: COATING THE CABLES

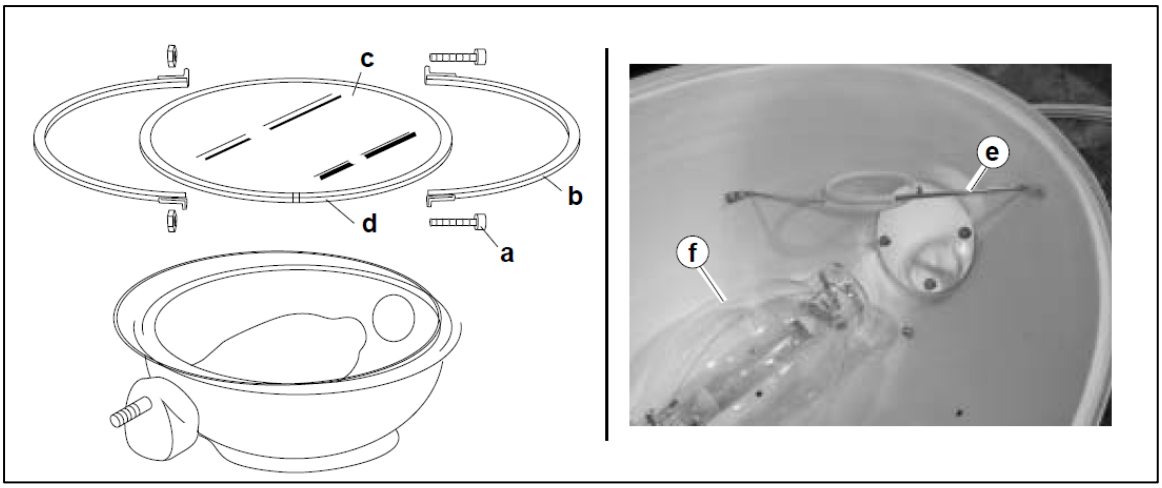


Fig:(11): REPLACING BULBS