

# OPERATION MANUAL



## **MODEL DCA-6SPX4F PORTABLE GENERATOR (KUBOTA D1105-E4B-BGDE-1 DIESEL ENGINE)**

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**THIS MANUAL MUST ACCOMPANY THE EQUIPMENT AT ALL TIMES.**

 **WARNING** 

**CALIFORNIA — Proposition 65 Warning**

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects and other reproductive harm.

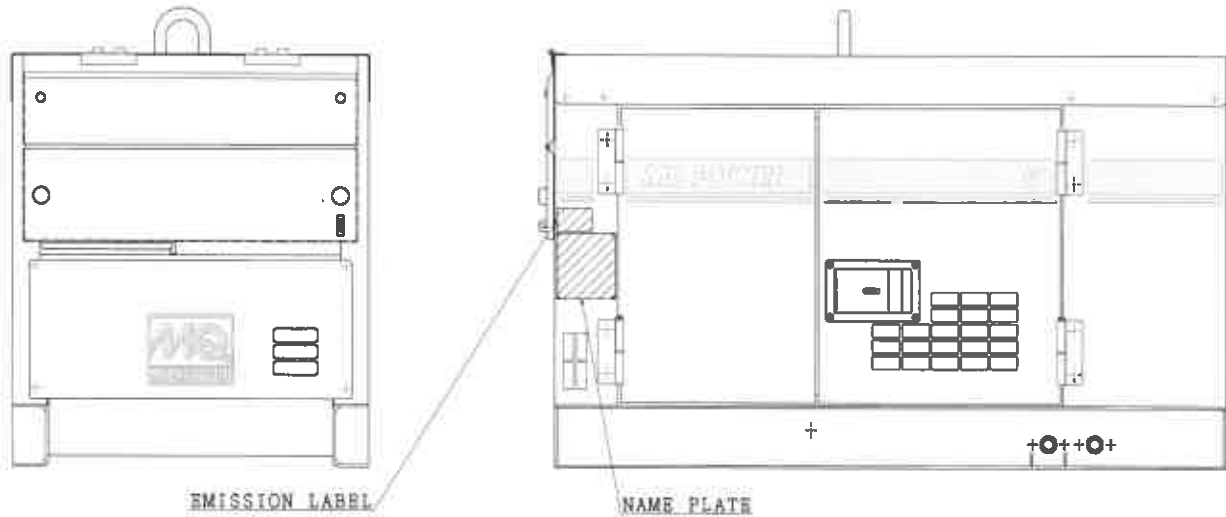
**DCA6SPX4F GENERATOR**

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**NOTICE**  
Specifications and part numbers are subject to change without notice.

# NAMEPLATE AND EMISSION LABEL/SAFETY INFORMATION

## NAMEPLATE AND EMISSION LABEL

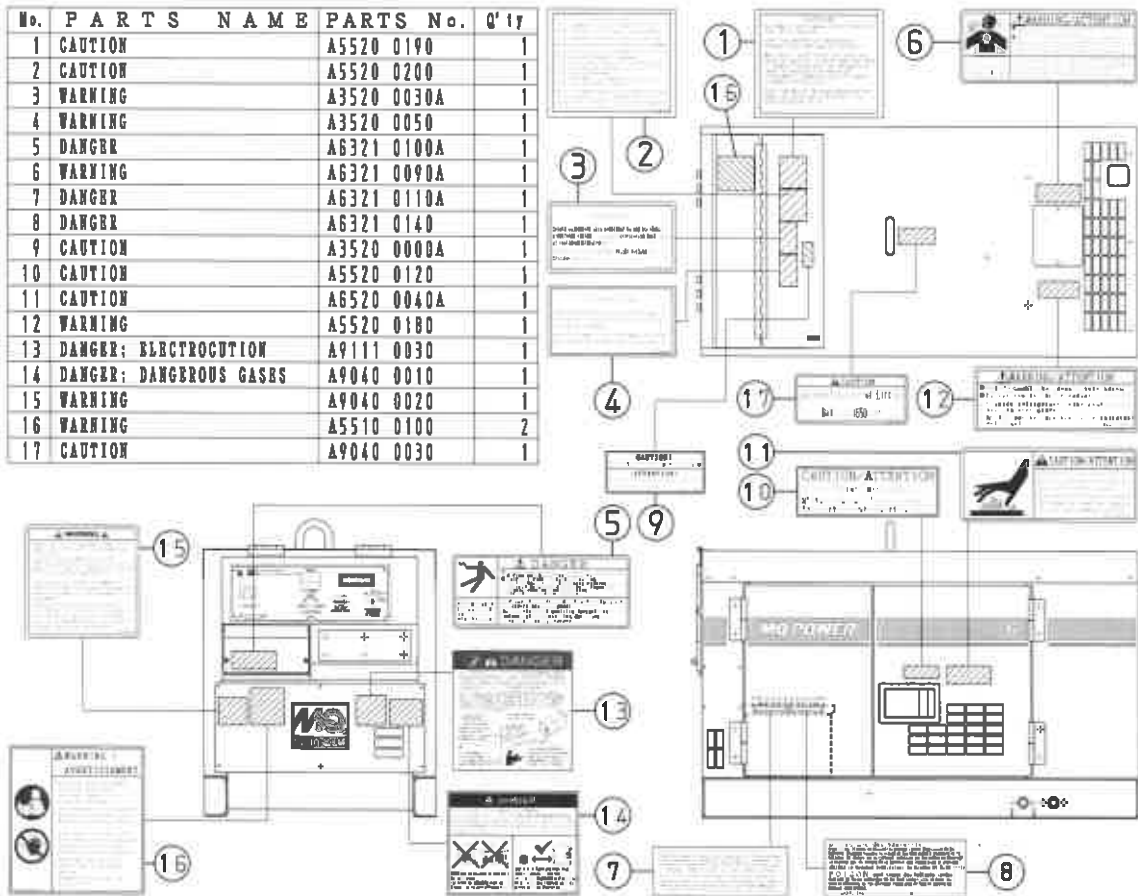


## SAFETY LABEL

Safety labels are attached to the following positions of the machine.

- Keep these safety labels clean at all times.
- When safety labels are damaged or lost, contact your nearest dealer or MULTIQUP INC. parts department for replacements.

No.	PARTS NAME	PARTS No.	Q'ty
1	CAUTION	A5520 0190	1
2	CAUTION	A5520 0200	1
3	WARNING	A3520 0030A	1
4	WARNING	A3520 0050	1
5	DANGER	A6321 0100A	1
6	WARNING	A6321 0090A	1
7	DANGER	A6321 0110A	1
8	DANGER	A6321 0140	1
9	CAUTION	A3520 0000A	1
10	CAUTION	A5520 0120	1
11	CAUTION	A6520 0040A	1
12	WARNING	A5520 0180	1
13	DANGER: ELECTROCUTION	A9111 0030	1
14	DANGER: DANGEROUS GASES	A9040 0010	1
15	WARNING	A9040 0020	1
16	WARNING	A5510 0100	2
17	CAUTION	A9040 0030	1




# SAFETY INFORMATION

Do not operate or service the equipment before reading the entire manual. Safety precautions should be followed at all times when operating this equipment. Failure to read and understand the safety messages and operating instructions could result in injury to yourself and others.


## SAFETY MESSAGES

The four safety messages shown below will inform you about potential hazards that could injure you or others. The safety messages specifically address the level of exposure to the operator and are preceded by one of four words: **DANGER**, **WARNING**, **CAUTION** or **NOTICE**.


## SAFETY SYMBOLS

 **DANGER**

Indicates a hazardous situation which, if not avoided, **WILL** result in **DEATH** or **SERIOUS INJURY**.

 **WARNING**

Indicates a hazardous situation which, if not avoided, **COULD** result in **DEATH** or **SERIOUS INJURY**.








 **CAUTION**

Indicates a hazardous situation which, if not avoided, **COULD** result in **MINOR** or **MODERATE INJURY**.

**NOTICE**

Addresses practices not related to personal injury.

Potential hazards associated with the operation of this equipment will be referenced with hazard symbols which may appear throughout this manual in conjunction with safety messages.

Symbol	Safety Hazard
	Lethal exhaust gas hazards
	Explosive fuel hazards
	Burn hazards
	Overspeed hazards
	Rotating parts hazards
	Pressurized fluid hazards
	Electric shock hazards

# SAFETY INFORMATION

## GENERAL SAFETY

### ⚠ WARNING

- To avoid burn, electrical shock and personal injury, place the generator in a place where pedestrians or children are not likely to touch the generator.

### ⚠ CAUTION

- NEVER operate this equipment without proper protective clothing, shatterproof glasses, respiratory protection, hearing protection, steel-toed boots and other protective devices required by the job or city and state regulations.



- NEVER operate this equipment when not feeling well due to fatigue, illness or when under medication.
- NEVER operate this equipment under the influence of drugs or alcohol.



- ALWAYS check the equipment for loosened threads or bolts before starting.
- DO NOT use the equipment for any purpose other than its intended purposes or applications.

### NOTICE

- This equipment should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult to read.
- Manufacturer does not assume responsibility for any accident due to equipment modifications. Unauthorized equipment modification will void all warranties.

- NEVER use accessories or attachments that are not recommended by MQ Power for this equipment. Damage to the equipment and/or injury to user may result.

- ALWAYS know the location of the nearest fire extinguisher.



- ALWAYS know the location of the nearest first aid kit.



- ALWAYS know the location of the nearest phone or keep a phone on the job site. Also, know the phone numbers of the nearest ambulance, doctor and fire department. This information will be invaluable in the case of an emergency.



## GENERATOR SAFETY

### ⚠ DANGER

- NEVER operate the equipment in an explosive atmosphere or near combustible materials. An explosion or fire could result causing severe bodily harm or even death.



### ⚠ WARNING

- NEVER disconnect any emergency or safety devices. These devices are intended for operator safety. Disconnection of these devices can cause severe injury, bodily harm or even death. Disconnection of any of these devices will void all warranties.

### ⚠ CAUTION

- NEVER lubricate components or attempt service on a running machine.

### NOTICE

- ALWAYS ensure generator is on level ground before use.
- ALWAYS keep the machine in proper running condition.
- Fix damage to machine and replace any broken parts immediately.
- ALWAYS store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children and unauthorized personnel.

# SAFETY INFORMATION

## ENGINE SAFETY

### DANGER

- Exhaust contains poisonous carbon monoxide, a colorless and odorless gas. Breathing carbon monoxide can cause carbon monoxide poisoning and may lead to death.
- **NEVER** operate the generator in an area that is confined, or even partly enclosed area.
- **NEVER** operate the generator inside a garage, house, or near open windows, doors or vents.
- The engine of the generator requires an adequate free flow of cooling air. **NEVER** operate this generator in any enclosed or narrow area where free flow of the air is restricted.



### WARNING

- **DO NOT** place hands or fingers inside engine compartment when engine is running.
- To avoid burn, malfunction and fire, **NEVER** operate the engine with heat shields or guards removed.
- Keep fingers, hands hair and clothing away from all moving parts to prevent injury.
- **DO NOT** remove the radiator cap while the engine is hot. High pressure boiling water will gush out of the radiator and severely scald any persons in the general area of the generator.
- **DO NOT** remove the coolant drain plug while the engine is hot. Hot coolant will gush out of the coolant tank and severely scald any persons in the general area of the generator.
- **DO NOT** remove the engine oil drain plug while the engine is hot. Hot oil will gush out of the oil tank and severely scald any persons in the general area of the generator.
- To avoid fire and overheat, **DO NOT** enclose the generator in any structure.
- Moving parts can cause severe injury. **DO NOT** operate with doors open. Stop the engine before servicing.
- Operation of the generator may create sparks that can start fires around dry vegetation. A spark arrester may be required. The operator should contact local fire agencies for laws or regulation relating to fire prevention requirements.



### CAUTION

- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing equipment.



### NOTICE

- **NEVER** run engine without an air filter or with a dirty air filter. Severe engine damage may occur. Service air filter frequently to prevent engine malfunction.
- **NEVER** tamper with the factory settings of the engine or engine governor. Damage to the engine or equipment can result if operating in speed ranges above the maximum allowable.



- Wet stacking is a common problem with diesel engines which are operated for extended periods with light or no load applied. When a diesel engine operates without sufficient load (less than 40% of the rated output), it will not operate at its optimum temperature. This will allow unburned fuel to accumulate in the exhaust system, which can foul the fuel injectors, engine valves and exhaust system, including turbochargers, and reduce the operating performance.

In order for a diesel engine to operate at peak efficiency, it must be able to provide fuel and air in the proper ratio and at a high enough engine temperature for the engine to completely burn all of the fuel.

Wet stacking does not usually cause any permanent damage and can be alleviated if additional load is applied to relieve the condition. It can reduce the system performance and increase maintenance. Applying an increasing load over a period of time until the excess fuel is burned off and the system capacity is reached usually can repair the condition. This can take several hours to burn off the accumulated unburned fuel.

- State Health Safety Codes and Public Resources Codes specify that in certain locations, spark arresters must be used on internal combustion engines that use hydrocarbon fuels. A spark arrester is a device designed to prevent accidental discharge of sparks or flames from the engine exhaust. Spark arresters are qualified and rated by the United States Forest Service for this purpose. In order to comply with local laws regarding spark arresters, consult the engine distributor or the local Health and Safety Administrator.

### FUEL SAFETY

#### DANGER

- **DO NOT** start the engine near spilled fuel or combustible fluids. Diesel fuel is extremely flammable and its vapors can cause an explosion if ignited.
- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.
- **ALWAYS** use extreme caution when working with flammable liquids.
- **DO NOT** fill the fuel tank while the engine is running or hot.
- **DO NOT** overfill tank, since spilled fuel could ignite if it comes into contact with hot engine parts or sparks from the ignition system.
- Store fuel in appropriate containers, in well-ventilated areas and away from sparks and flames.
- **NEVER** use fuel as a cleaning agent.
- **DO NOT** smoke around or near the equipment. Fire or explosion could result from fuel vapors or if fuel is spilled on a hot engine.





## SAFETY INFORMATION

### ELECTRICAL SAFETY

#### DANGER

- **NEVER** insert any objects into the output receptacles during operation. These are extremely dangerous. There is the possibility of **electrical shock, electrocution or death.**



- **NEVER** operate the generator or the electrical appliance when your hands are wet. There is the possibility of electrical shock and electrocution.



- To avoid electrical shock and personal injury, stop the engine and turn all circuit breakers OFF before performing maintenance on the generator or making contact with output receptacles.

- Backfeed to a utility system can cause **electrocution** and/or property damage. **NEVER** connect the generator to a building's electrical system without a transfer switch or other approved device. All installations should be performed by a **licensed electrician** in accordance with all applicable laws and electrical codes. Failure to do so could result in electrical shock or burn, causing **serious injury or even death.**



### Power Cord/Cable Safety

#### DANGER

- **NEVER** let power cords or cables lay in water.
- **NEVER** stand in water while AC power from the generator is being transferred to a load.
- **NEVER** use **damaged** or **worn** cables or cords when connecting equipment to generator. Inspect for cuts in the insulation.
- **NEVER** grab or touch a live power cord or cable with wet hands. The possibility exists of **electrical shock, electrocution or death.**



- Make sure power cables are securely connected to the generator's output receptacles. Incorrect connections may cause electrical shock and damage to the generator.

#### NOTICE

- **ALWAYS** make certain that proper power or extension cord has been selected for the job. See Cable Selection Chart in this manual.

### Grounding Safety

#### DANGER

- **ALWAYS** make sure that electrical circuits are properly grounded to a suitable earth ground (ground rod) per the National Electrical Code (NEC) and local codes before operating generator. **Severe Injury or death by electrocution** can result from operating an ungrounded generator.
- **NEVER** use gas piping as an electrical ground.

# SAFETY INFORMATION

## BATTERY SAFETY

### DANGER

- **DO NOT** drop the battery. There is a possibility that the battery will explode.
- **DO NOT** expose the battery to open flames, sparks, cigarettes, etc. The battery contains combustible gases and liquids. If these gases and liquids come into contact with a flame or spark, an explosion could occur.



### WARNING

- **ALWAYS** wear safety glasses when handling the battery to avoid eye irritation. The battery contains acids that can cause injury to the eyes and skin.
- Use well-insulated gloves when picking up the battery.
- **ALWAYS** keep the battery charged. If the battery is not charged, combustible gas will build up.
- **ALWAYS** recharge the battery in a well-ventilated environment to avoid the risk of a dangerous concentration of combustible gasses.
- If the battery liquid (dilute sulfuric acid) comes into contact with **clothing or skin**, rinse skin or clothing immediately with plenty of water.
- If the battery liquid (dilute sulfuric acid) comes into contact with **eyes**, rinse eyes immediately with plenty of water and contact the nearest doctor or hospital to seek medical attention.



### CAUTION

- **ALWAYS** disconnect the **NEGATIVE** battery terminal before performing service on the generator.
- **ALWAYS** keep battery cables in good working condition. Repair or replace all worn cables.

## MOVING SAFETY

### CAUTION

- A centrally located lifting position is provided on top of the generator and is the only safe method of lifting.
- Improper stacking of the generator can cause severe personal injury or death. When stacking, be sure to observe the following. Make sure the bonnet of the generator is free from damage and the fixing bolts are tightened properly. Place the generator on a solid foundation which can withstand the weight. The generators can be double stacked, but the stacked generator must be equal or smaller than those below. **DO NOT** operate the generators when they are stacked.

## ENVIRONMENTAL SAFETY/DECOMMISSIONING

### NOTICE

Decommissioning is a controlled process used to safely retire a piece of equipment that is no longer serviceable. If the equipment poses an unacceptable and unrepairable safety risk due to wear or damage or is no longer cost effective to maintain (beyond life-cycle reliability) and is to be decommissioned (demolition and dismantlement), be sure to follow rules below.

- **DO NOT** pour waste or oil directly onto the ground, down a drain or into any water source.
- Contact your country's Department of Public Works or recycling agency in your area and arrange for proper disposal of any electrical components, waste or oil associated with this equipment.
- When the life cycle of this equipment is over, remove the battery and bring to the appropriate facility for lead reclamation. Use safety precautions when handling batteries that contain sulfuric acid.
- When the life cycle of this equipment is over, it is recommended that the frame and all other metal parts be sent to a recycling center.



Metal recycling involves the collection of metal from discarded products and its transformation into raw materials to use in manufacturing a new product.

Recyclers and manufacturers alike promote the process of recycling metal. Using a metal recycling center promotes energy cost savings.

## EMISSIONS INFORMATION

### NOTICE

The diesel engine used in this equipment has been designed to reduce harmful levels of carbon monoxide (CO), hydrocarbons (HC) and nitrogen oxides (NOx) contained in diesel exhaust emissions.

This engine has been certified to meet US EPA Evaporative emissions requirements in the installed configuration.

Attempting to modify or make adjustments to the engine emission system by unauthorized personnel without proper training could damage the equipment or create an unsafe condition.

Additionally, modifying the fuel system may adversely affect evaporative emissions, resulting in fines or other penalties.

### Emission Control Label

The emission control label is an integral part of the emission system and is strictly controlled by regulations. The label must remain with the engine for its entire life. If a replacement emission label is needed, please contact your authorized engine distributor.

## SPECIFICATIONS (GENERATOR)

Table 1. Specifications (Generator)		
<b>AC Generator 60 Hz AC Power Source</b>	Model	DCA-6SPX4F
	Type	4-Pole Brushless Revolving Field Type
	Excitation	Solid State, Statically Excited System
	Speed	1,800 RPM
	Cooling System	Self-Ventilation
	Stand by Output	7 kW
	Continuous Power Output	6 kW
	Rated Voltage	120/240V
	Current Stand by/Continuous (120V)	58.3/50 amps
	Current Stand by/Continuous (240V)	29.2/25 amps
	Phase	Single Phase (4 wire)
	Frequency	60 Hz
	Power Factor	1
<b>Battery</b>	12V -36Ah	
<b>Dimensions (L x W x H)</b>	25.6 x 48.4 X 33.3 in. (650 X 1,230 X 845 mm)	
<b>Dry Net Weight</b>	831 lbs. (377 kg)	

### NOTICE

In keeping with Multiquip's policy of constantly improving its products, the specifications quoted herein are subject to change without prior notice.

## SPECIFICATIONS (ENGINE)

**Table 2. Specifications (Engine)**

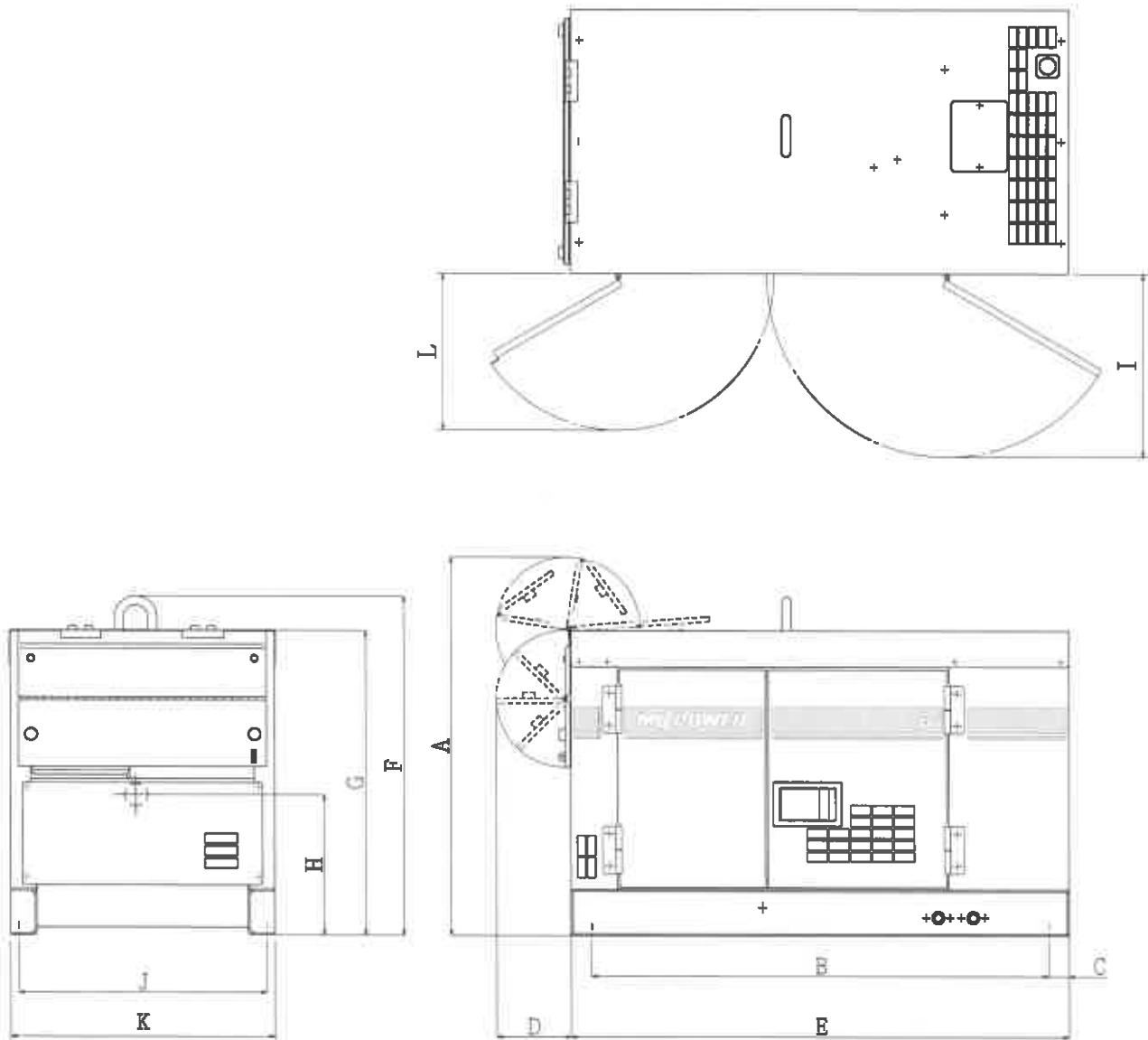
<b>Engine</b>	Kubota Engine Model	D1105-E4B-BGDE-1-S1
	Tier	4
	Gen. Enclosure Color	White
	Type	Vertical, water-cooled, 4-cycle diesel engine
	Bore X Stroke	3.07 in. X 3.09 in. (78 mm x 78.4 mm.)
	Displacement	68.53 cu.-in. (1123 cm <sup>3</sup> )
	Number of Cylinders	3
	Max Output	15.4~17.0 H.P./3600 R.P.M.
	Fuel	#2 Diesel Fuel
	Fuel Capacity	Not installed
	Fuel Consumption	0.70 gals(2.65 liters)/hr.
	Coolant Capacity	4.23 quarts (4.0 liters)
	Lube Oil Capacity	5.39 quarts (5.1 liters)
	Oil Alert System	Yes
	Starting Method	Electric Start
Battery	12 Volt @ 36 Ah	

### Effects of Altitude and Heat

The maximum output of the engines listed above are applicable to supplying electrical power for continuous service at ambient conditions in accordance with SAE Test cord J607. The above ambient conditions are at standard sea level, with a barometric reading of 29.92 inches and a temperature of 60° F (15.5° C).

Generally, the engine's output power will decrease 3.5% for each 1000 feet (305 meters) of altitude above sea level, and 1% for each 10° F (5.6° C) above the standard temperature of 60° F (15.5° C).

# DIMENSIONS



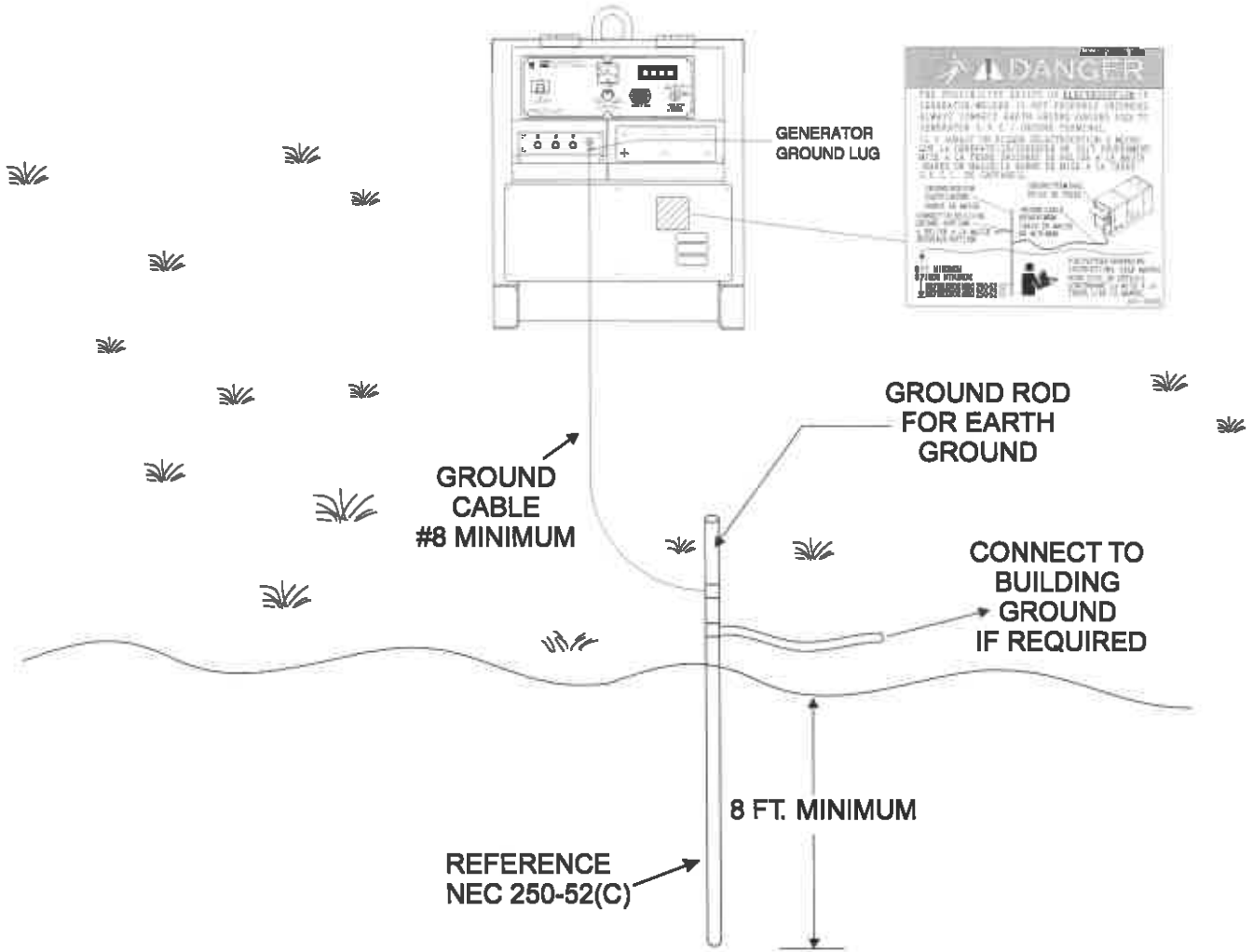
**Figure 1. Dimensions**

Table 3. Dimensions				
Housing	A	B	C	D
	approx. 37.2in (945 mm)	44.5 in (1130 mm)	2.0 in (50 mm)	approx. 7.3 in (185 mm)
	E	F	G	H
	48.4 in (1230 mm)	33.3 in (845 mm)	29.9 in (760 mm)	13.8 in (350 mm)
I	J	K	L	
approx. 17.9 in (455 mm)	24.0 in (610 mm)	25.6 in (650 mm)	approx. 15.4 in (390 mm)	
approx. Dry Weight	831 lbs (377 kg)			
approx. Total Weight	860 lbs (390 kg)			

**CONNECTING THE GROUND**

The nut and ground terminal on the generator should always be used to connect the generator to a suitable ground. The ground cable should be #8 size wire minimum.

At the generator, connect the terminal of the ground cable between the lock washer and the nut (Figure 2) and tighten the nut fully. Connect the other end of the ground cable to a suitable earth ground (ground rod).




**Figure 2. Generator Grounding**


## OUTDOOR INSTALLATION

Install the generator in an area that is free of debris, bystanders, and overhead obstructions. Make sure the generator is on secure level ground so that it cannot slide or shift around. Also install the generator in a manner so that the exhaust will not be discharged in the direction of nearby homes.

The installation site must be relatively free from moisture and dust. All electrical equipment should be protected from excessive moisture. Failure to do will result in deterioration of the insulation and will result in short circuits and grounding.

Foreign materials such as dust, sand, lint and abrasive materials have a tendency to cause excessive wear to engine and alternator parts.

 **WARNING**

 Pay close attention to ventilation when operating the generator inside tunnels and caves. The engine exhaust contains noxious elements. Engine exhaust must be routed to a ventilated area

## INDOOR INSTALLATION

Exhaust gases from gas engines are extremely poisonous. Whenever an engine is installed indoors the exhaust fumes must be vented to the outside. The engine should be installed at least two feet from any outside wall. Using an exhaust pipe which is too long or too small can cause excessive back pressure which will cause the engine to heat excessively and possibly burn the valves.

## MOUNTING

The generator must be mounted on a solid foundation (such as concrete) and set firmly on the foundation to isolate vibration of the generator when it is running. The generator must set at least 6 inches above the floor or grade level (in accordance to NFPA 110, Chapter 54.1). **DO NOT** remove the metal skids on the bottom of the generator. They are to resist damage to the bottom of the generator and to maintain alignment.

## GENERATOR GROUNDING

### NOTICE

The Occupational Safety and Health Administration (OSHA) and the National Electrical Code (NEC) recommend that if the generator is providing electrical power to a structure (home, office shop, trailer or similar) it **must** be connected to a grounding electrode system, such a driven ground rod (Figure 2).

If applicable, to guard against electrical shock and possible damage to the equipment, it is important to provide a good **EARTH** ground, (Figure 2).

### NOTICE

**ALWAYS** check with State, Province, District and Municipalities for electrical grounding requirements before using generator.

Article 250 (Grounding) of the NEC handbook provides guidelines for proper grounding and specifies that the cable ground shall be connected to the grounding system of the building as close to the point of cable entry as practical.

1. Use one of the following wire types to connect the generator to earth ground.
  - a. Copper
  - b. Aluminum

### NOTICE

Reference Conductor Grounding Table, Article 250 of the NEC handbook for proper conductor wire size. Wire size is determined by the maximum amperage of the generator.

2. When grounding of the generator (Figure 3) is required, connect one end of the ground cable to the ground lug on the generator. Connect the other end of the ground cable to the ground rod (earth ground).
3. NEC article 250 specifies that the earth ground rod should be buried a minimum of 8 ft. into the ground.

### NOTICE

When connecting the generator to any buildings electrical system **ALWAYS** consult with a licensed electrician.

### Generator

The Multiquip DCA6SPX4F generator is a 6.0 kW (continuous output), 7.0 kW (max output) A.C. generator designed as a portable dual purpose power source for 60 Hz (single phase) 120/240V for lighting facilities, power tools, submersible pumps and other industrial and construction machinery.

### Control Panel

The control box is provided with the following:

- 1 Phase 3 wire Output Terminal
- AC Voltmeter
- Circuit Breaker @25 Amps
- Starter Switch
- Warning Lamp Unit
- Hour Meter
- Ground Terminal
- Voltage Regulator

### Engine Protection System

Engine protection fail safe features are provided in the event of low oil pressure, high coolant temperature, and failure of the battery to charge. If any of the above conditions occur while operating the generator it will cause a complete unit shut down.

### Battery Charge Alarm

This unit is equipped with a protective shutdown device that signals the emergency relay and automatically stops the engine when loss of charge from the engine alternator occurs. An indicator lamp will be displayed on the control panel.

### Water Temperature Alarm

This unit is equipped with a temperature switch that signals the emergency relay and automatically stops the engine when the temperature of the engine coolant becomes abnormally high. The coolant temperature switch will not function properly if the machine is operated with less than the proper amount of coolant.

### Oil Pressure Warning Alarm

This unit is equipped with a protective device that detects low oil pressure. If the lubricating oil pressure of this unit should become abnormally low, the oil pressure switch signals the emergency relay to shutdown the engine. If this condition should occur, please refer to the engine troubleshooting table in this manual.

### Excitation System

The DCA6SPX4F generator use a brushless exciter to create rated output electricity. This system will use the mechanical energy generated by the 1800 RPM engine to spin the rotor (or armature) inside the generator (or alternator end).

Excitation current is sourced from the battery to the excitation winding in the stator. Current applied to this coil creates a magnetic field. The rotating armature within the stator is then induced with AC current.

### Engine

The DCA6SPX4F generator is powered by a water-cooled, 4-cycle KUBOTA diesel engine. This engine is designed to meet every performance requirement of the generator. Reference Table 2, engine specifications.

In keeping with Multiquip's policy of constantly improving its products, the specifications quoted herein are subject to change without prior notice.



## COMPONENTS (GENERATOR)

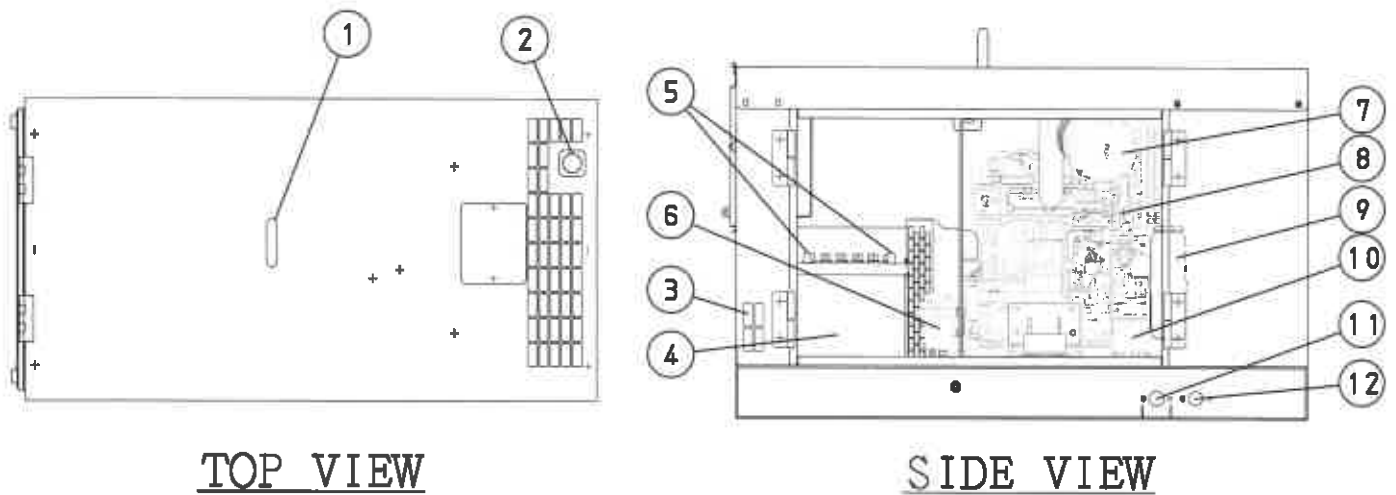


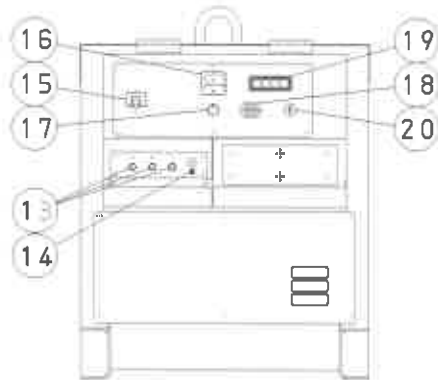
Figure 3. Generator Components (1 of 2)

1. **Lifting Hook** — Use this hook to lift the generator - 826 lb. (375kg)
2. **Air Outlet Exhaust** — Allows engine exhaust to exit the generator into the open air. **NEVER** block this opening.
3. **Air Inlet Vent** — Allows outside air to enter the generator. **NEVER** block this opening.
4. **Battery** — Provides +12 VDC power for the generator. When replacing the battery (12V 36 AH) use only the recommended battery type.
5. **Battery Terminals** — Connect these output cables to the terminals on the battery. Always pay close attention to the polarity of the terminals when connecting to the battery, **RED** (positive), and **BLACK** (negative).
6. **Fuel Filter** — Prevents dirt and other debris from entering the fuel system. Change fuel filter as recommended in the maintenance section of this manual.
7. **Engine Air Cleaner** — Prevents dirt and other debris from entering the air intake system. Lift locking latch on air filter cannister to gain access to filter element.
8. **Engine Oil Filler Port** — Remove this cap to add engine oil. Use only recommended oil type. See Table 6.
9. **Expansion Bottle** — Supplies coolant to the radiator when radiator coolant level is low. Fill to indicated level as shown on expansion bottle.
10. **Oil Filter** — Provides filtering for the engine oil. Change oil filter as recommended in the maintenance section of this manual.
11. **Oil Drain Plug** — Remove this plug to drain oil from the engine.
12. **Coolant Drain Plug** — Remove this plug to drain coolant from the radiator.

### NOTICE

This **KUBOTA** engine is equipped with a low oil shutdown capability. A built-in sensor will automatically turn off the engine should the oil level fall below a safe operating condition. Make sure the generator is placed on level ground. Placing the generator on level ground will ensure that the low oil sensor will function properly.

## COMPONENTS (GENERATOR)



REAR VIEW

Figure 4. Generator Components (2 of 2)

13. **120/240V 1 Phase 3 wire Output Terminal** — Provides 240V, 60Hz output at 25amps, or 120V, 60Hz at 25 amps x2.
14. **Frame Ground Lug** — Connect a ground strap between this lug and a ground rod. Make sure that the ground rod is inserted deep into ground to provide a good earth ground. Consult with local Electrical and Safety Codes for proper connection based on condition of use.
15. **Main Breaker** — 2-pole 25 amp circuit breaker protects the generator from short circuiting or overloading. When starting the generator, always have this circuit breaker placed in the "OFF" position.
16. **AC Voltmeter** — This voltmeter indicates (with a mark) the rated 60 Hz (single-phase) output voltage. In addition the voltmeter can also be used as a diagnostic tool. If the voltmeter indicator (needle) is below the rated voltage, engine problems may exist (low/high RPM's). To prevent damage to the generator or power tools, turn the generator OFF and consult your authorized Multiquip service dealer.
17. **Voltage Control Regulator** — Allows  $\pm 5\%$  manual adjustment of the generator output voltage.
18. **Hour Meter** — Indicates number of hours machine has been in use or hours engine was run.

19. **Warning Lamp Display** — Lights red when the following conditions occur:

- **Oil Pressure Lamp** — If the oil pressure drops suddenly, the oil pressure lamp will turn on, and the generator will shut down.
- **Charge Lamp** — The charge lamp will turn on when loss of engine alternator charge exists and the generator will shut down.
- **Water Temperature Lamp** — The water temperature lamp will turn on if the temperature rises to an abnormally high level, and the generator will shut down.

20. **Starter Switch** — With key inserted turn clockwise to start engine.

## COMPONENTS (ENGINE)

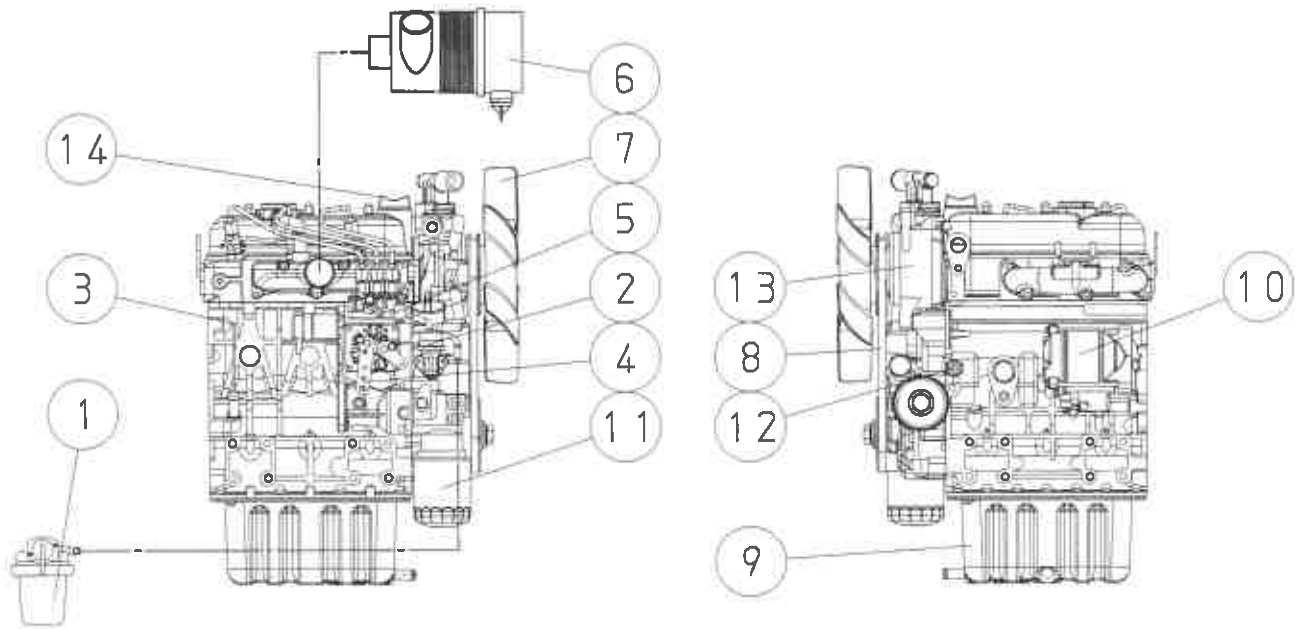


Figure 5. Kubota D1105 Series

### INITIAL SERVICING

The engine (Figure 5) must be checked for proper lubrication and filled with fuel prior to operation. Refer to the manufacturer's engine manual for instructions and details of operation and servicing.

1. **Fuel Filter** — Prevents dirt and other debris from entering the fuel system. Replace filter as recommended in the maintenance section of this manual.
2. **Fuel Feed Pump** — Pumps fuel to the injection system.
3. **Oil Dip Stick/Gauge** — Remove to check amount and condition of oil in crankcase. Refill or replace with recommended type oil as listed in Table 6.
4. **Speed Control Lever** — Controls engine speed. This lever is factory set at 1800 rpm to maintain proper voltage and frequency. **DO NOT** adjust this lever out of factory range.
5. **Injector Pump** — Provides fuel under pressure to the injector nozzles.
6. **Air Filter** — Prevents dirt and other debris from entering the air intake system. Loosen clips on side of air filter canister to gain access to filter element. Replace with manufacturer's recommended air cleaner type only.
7. **Cooling Fan Blades** — Make sure cooling fan blades are not bent or broken. A damaged fan blade can cause the engine to run hot and overheat.
8. **Fan V-Belt** — **ALWAYS** make sure V-belt is properly tensioned. A loose or defective V-belt can adversely affect the performance of the generator.
9. **Crankcase** — Fill with recommended type oil as listed in Table 6. Crankcase holds a maximum of 5.39 quarts (5.1 liters) of motor oil.
10. **Starter** — Starts engine when ignition key is rotated clockwise to the "START" position.
11. **Oil Filter** — Spin-on type, filters oil contaminants. Replace filter as recommended in the maintenance section of this manual.
12. **Oil Pressure Switch** — Monitors engine oil pressure. In the event of low oil pressure engine will shutdown.
13. **Alternator** — Provides power to the +12VDC electrical system. Replace with manufacturer's recommended alternator type only.
14. **Oil Filler Cap** — Fill with the recommended oil type as listed in Table 6.

## Single Phase Load – 60 Hz

Always be sure to check the nameplate on the generator and equipment to insure the wattage, amperage and frequency requirements are satisfactorily supplied by the generator for operating the equipment.

Generally, the wattage listed on the nameplate of the equipment is its rated output. Equipment may require 130–150% more wattage than the rating on the nameplate, as the wattage is influenced by the efficiency, power factor and starting system of the equipment.

### NOTICE

If wattage is not given on the equipment's name plate, approximate wattage may be determined by multiplying nameplate voltage by the nameplate amperage

$$\text{WATTS} = \text{VOLTAGE} \times \text{AMPERAGE}$$

The power factor of this generators is 1.0 See Table 4 below when connecting loads.

Table 4. Power Factor By Load

Type Of Load	Power Factor
Single-phase induction motors	0.4 - 0.75
Electric heaters, incandescent lamps	1.0
Fluorescent lamps, mercury lamps	0.4 - 0.9
Electronic devices, communication equipment	1.0
Common power tools	0.8

### NOTICE

When connecting power tools or equipment pay close attention to the required starting current capacity.

To determine the running wattage for your load, multiply the running wattage as indicated by steps 1, 2, and 3 below:

#### 1. INCANDESCENT LOADS

Lights, heaters and similar appliances. Total the running wattage and multiply by 1.

Example:

29 light bulbs @ 100W each = 2.9 kW  
use a 3 kW generator.

#### 2. SMALL MOTORS

Drills and other small power tools. Total the running wattage and multiply by 2.

Example:

A 1 inch drill runs at 1 kW  
use a 2 kW generator

#### 3. LARGE MOTORS

Submersible pumps, table saws etc. Total the running wattage and multiply by 3.

Example:

A conveyor belt runs at 8 kW  
use a 24 kW generator.

### NOTICE

Motors and motor-driven equipment draw much greater current for starting than during operation. Always use an adequate size extension cable which can carry the required load.

## Extension Cables

When electric power is to be provided to various tools or loads at some distance from the generator, extension cords are normally used. **Cables should be sized to allow for distance in length and amperage so that the voltage drop between the generators and point of use (load) is held to a minimum.** Use the cable selection chart (Table 5) as a guide for selecting proper cable size.

### ! DANGER

**NEVER** use power tools or equipment that do not have a ground capability, the possibility exists of electrocution, electrical shock or burn, which can cause severe bodily harm or even **DEATH!**

## Circuit Breakers

**ALWAYS** place the circuit breakers in the **OFF** position prior to starting the engine.

Table 5. Cable Selection (60 Hz, Single Phase Operation)						
Current In Amperes	Load In Watts		Maximum Allowable Cable Length			
	120 Volts	240 Volts	#10 Wire	#12 Wire	#14 Wire	#16 Wire
2.5	300	600	1000 ft.	600 ft.	375 ft.	250 ft.
5	600	1200	500 ft.	300 ft.	200 ft.	125 ft.
7.5	900	1800	350 ft.	200 ft.	125 ft.	100 ft.
10	1200	2400	250 ft.	150 ft.	100 ft.	
15	1800	3600	150 ft.	100 ft.	65 ft.	
20	2400	4800	125 ft.	75 ft.	50 ft.	

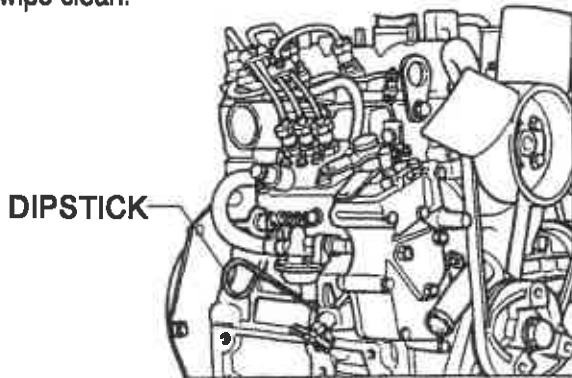
**CAUTION:** Equipment damage can result from low voltage.

## Before Starting

1. Read the safety instructions at the beginning of the manual.
2. Clean the generator removing dirt and dust, particularly the engine cooling air inlet.
3. Check the air filter for dirt and dust. If the air filter is dirty, replace it with a new one as required.
4. Check fastening nuts and bolts for tightness.

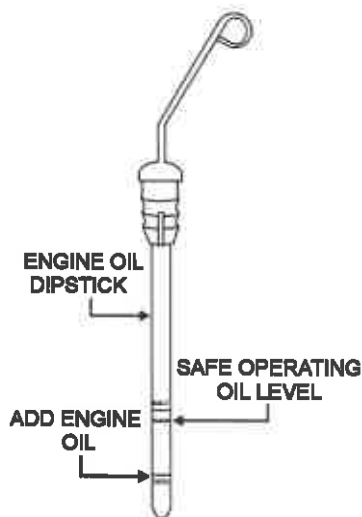
## Engine Oil Check

1. To check the engine oil level, place the generator on secure level ground with the engine stopped.
2. Remove the dipstick from its holder (Figure 6) and wipe clean.



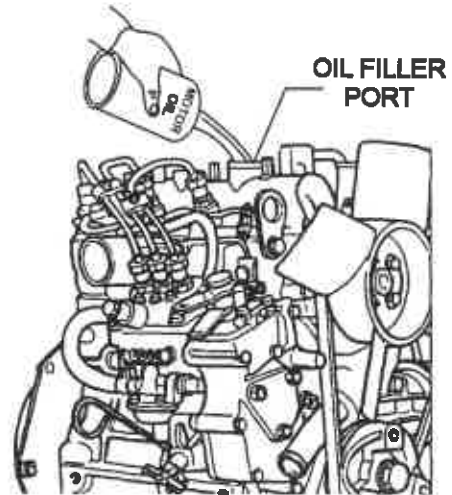
**Figure 6. Engine Oil Dipstick Removal**

3. Re-Insert dipstick (Figure 7), then remove dipstick from its holder. Check the oil level shown on the dipstick.



**Figure 7. Engine Oil Dipstick**

4. If the oil level is low, remove the oil filler cap (Figure 8) and fill to a safe operating level (max) as indicated by the dipstick. Fill with the recommended oil type as listed in Tale 6. Maximum oil capacity is 5.39 quarts (5.1 liters).



**Figure 8. Engine Oil Filler Port**

**Table 6. Oil Type**

Temperature	Oil Type
Above 77° F (25° C)	SAE 30 or SAE10W-30 SAE 15W-40
32°~ 77° F (0° ~ 25° C)	SAE 20 or SAE10W-30 SAE 15W-40
Below 32° F (0° C)	SAE 10 or SAE10W-30 SAE 15W-40


### NOTICE

When adding engine oil **DO NOT** overfill.

## Coolant (Antifreeze)

Kubota recommends Antifreeze/Summer Coolant for use in their engines, which can be purchased in concentrate (and mixed with 50% demineralized water) or pre-diluted. See the Kubota Engine Owner's Manual for further details

**WARNING**



If adding coolant/antifreeze mix to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. The possibility of hot coolant exists which can cause severe burns

Day-to-day addition of coolant is done from the recovery tank. When adding coolant to the radiator, **DO NOT** remove the radiator cap until the unit has completely cooled. See Table 7 for engine, radiator, and recovery tank coolant capacities. Make sure the coolant level in the recovery tank is always between the "FULL" and the "LOW" markings.

Table 7. Coolant Capacity	
Engine and Radiator	4.23 quarts (4.0 liters)
Reserve Tank (Full)	0.95 quarts (0.9 liters)

## Operation Freezing Weather

When operating in freezing weather, be certain the proper amount of antifreeze (Table 8) has been added.

Table 8. Anti-Freeze Operating Temperatures		
Vol % Anti-Freeze	Freezing Point	
	°C	°F
50	-37	-34

**NOTICE**

When the antifreeze is mixed with water, the antifreeze mixing ratio must be less than 50%.

## Fuel Piping

This machine has no fuel tank. Please connect an external tank as shown below.

1. Please set the fuel cock to the OFF position.
2. Connect the suction hose to the fuel filter. Then use a suction hose with an inner diameter of 7 mm and fix it with a hose clamp so that there is no leak after connection.
3. Connect the return hose to the engine. Then use a return hose with an inner diameter of 4mm and fix it with a hose clamp so that there is no leak after connection.
4. Make sure the fuel cock is in the ON position and there are no leaks at the joint.
5. Loosen the bolt at the inlet of the injection pump and remove the air inside the piping.
6. Tighten the bolt when all of the air has come out and the fuel overflows.

•Please set the external tank to a position higher than the engine, or pump the fuel to the engine using a fuel pump.

## CLEANING THE RADIATOR

The engine may overheat if the radiator fins become overloaded with dust or debris. Periodically clean the radiator fins with compressed air. Cleaning inside the machine is dangerous, so clean only with the engine turned off and the **negative** battery terminal disconnected.

## AIR CLEANER

Periodic cleaning/replacement of the air cleaner is necessary. Inspect it in accordance with the KUBOTA Engine Owner's Manual.

## Fan Belt Tension

A slack fan belt may contribute to overheating, or to insufficient charging of the battery. Inspect the fan belt for damage and wear and adjust it in accordance with the Kubota Engine Owner's Manual.

The fan belt tension is proper if the fan belt bends 10 to 15 mm (Figure 9) when depressed with the thumb as shown below.

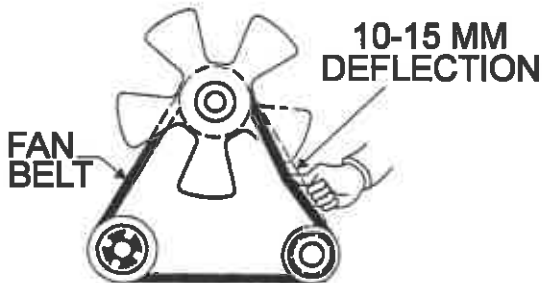


Figure 9 . Fan Belt Tension

### CAUTION



NEVER place hands near the belts or fan while the generator set is running.

## BATTERY

This unit is of negative ground. **DO NOT** connect in reverse. Always maintain battery fluid level between the specified marks. Battery life will be shortened if the fluid level is not properly maintained. Add only distilled water when replenishment is necessary. **DO NOT** over fill.

Check to see whether the battery cables are loose. Poor contact may result in poor starting or malfunctions. **Always** keep the terminals firmly tightened. Coat the terminals with an approved battery terminal treatment compound. Replace battery with only recommended type battery.

The battery is sufficiently charged if the specific gravity of the battery fluid is 1.28 (at 68° F). If the specific gravity should fall to 1.245 or lower, it indicates that the battery is dead and needs to be recharged or replaced.

Before charging the battery with an external electric source, be sure to disconnect the battery cables.

## Battery Cable Installation

**ALWAYS** be sure the battery cables (Figure 10) are properly connected to the battery terminals as shown below. The **red cable** is connected to the positive terminal of the battery, and the **black cable** is connected to the negative terminal of the battery.

### CAUTION

**ALWAYS** disconnect the negative terminal **FIRST** and reconnect negative terminal **LAST**.

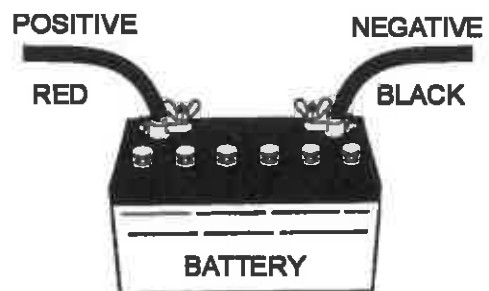


Figure 10. Battery Connections



When connecting the battery do the following:

1. **NEVER** connect the battery cables to the battery terminals when the **Ignition Switch** is in the **START** position. **ALWAYS** make sure that the **Ignition Switch** is in the **OFF** position when connecting the battery.
2. Place a small amount of battery terminal treatment compound around both battery terminals. This will ensure a good connection and will help prevent corrosion around the battery terminals.

### NOTICE

If the battery cable is connected incorrectly, electrical damage to the generator will occur. Pay close attention to the polarity of the battery when connecting the battery.

### CAUTION

Inadequate battery connections may cause poor starting of the generator and create other malfunctions.

## ALTERNATOR

The polarity of the alternator is a negative grounding type. When an inverted circuit connection takes place, the circuit will short instantaneously resulting the alternator failure.

**DO NOT** put water directly on the alternator. Entry of water into the alternator can cause corrosion and damage the alternator.

## WIRING

Inspect the entire generator for bad or worn electrical wiring or connections. If any wiring or connections are exposed (insulation missing) replace wiring immediately.

## PIPING AND HOSE CONNECTION

Inspect all piping, oil hose, and fuel hose connections for wear and tightness. Tighten all hose clamps and check hoses for leaks.

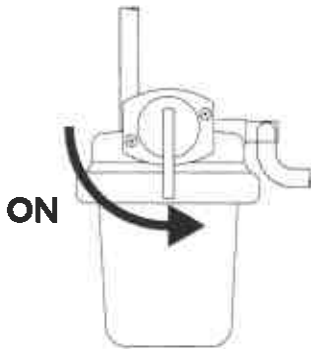
If any hose (**fuel or oil**) lines are defective replace them immediately.

## Before Starting the Engine

### ⚠ CAUTION

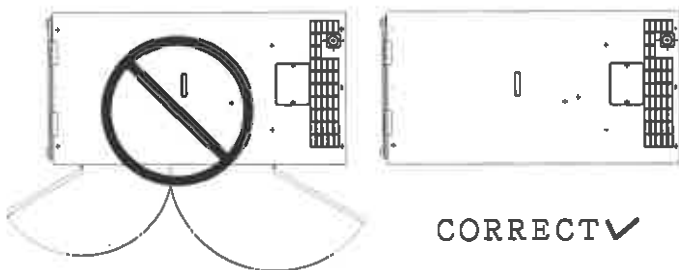
The engine's exhaust contains harmful emissions. **ALWAYS** have adequate ventilation when operating. Direct exhaust away from nearby personnel.

1. Open the cabinet door and turn the fuel cock lever (Figure 11) to the "ON" position.



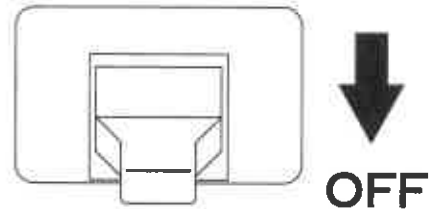
**Figure 11. Fuel Cock Lever (ON)**

2. **NEVER** operate the generator with the door *open* (Figure 12). Operation with the door open may cause insufficient cooling of the unit, and engine damage may result. Close the doors for normal operation.



**Figure 12. Generator Doors**

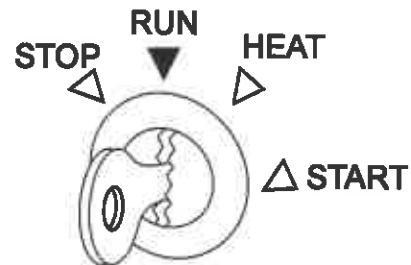
3. **NEVER** start the engine with the main circuit breaker in the **ON** position. Always place circuit breaker (Figure 13) in the **OFF** position before starting.



**Figure 13. Main Circuit Breaker (OFF)**

## Starting the Engine

1. Insert the key into the starter switch (Figure 14) and turn it to the "RUN" position. Check to see that the oil pressure and charge Lights on the "Warning Lamp Unit Display" are lit. If either light is not lit, check the system and wiring (refer to the Engine Operation Manual).



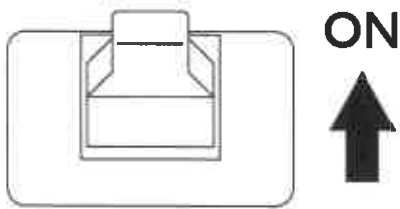
**Figure 14. Starter Switch**

2. Turn the ignition key to the **HEAT** position. When the preheat light goes off, turn the key to the **START** position to start the engine. As soon as the engine starts, release the key. The key will automatically return to the **RUN** position.
3. In cold weather conditions, it may be required to extend the duration of the **HEAT** position for proper starting.

4. If the engine does not start within 10 seconds after the key is turned to the **START** position, wait for about 30 seconds and repeat the procedure as described in step 1-3.
5. When the engine starts, the oil pressure light and charge light should go out. If these lights stay on, immediately stop the engine and check the system and wiring (refer to the Engine Operation Manual).

### Output Voltage Verification

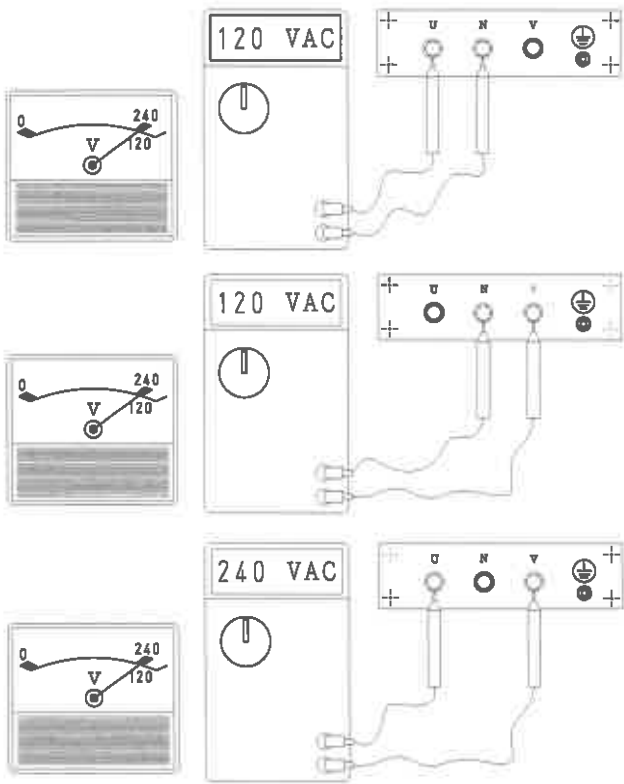
1. Place circuit breaker (Figure 15) in the **ON** position.



**Figure 15. Main Circuit Breaker (ON)**

## OPERATION/SHUTDOWN

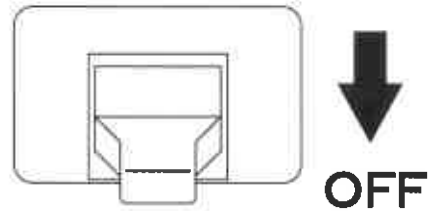
- 1 Phase 3 wire output terminal has dual voltage (120/240 volts). Using an external voltmeter as shown in Figure 16, verify that 120/240 VAC is present at the output terminal.



**Figure 16. Verification of output voltage**

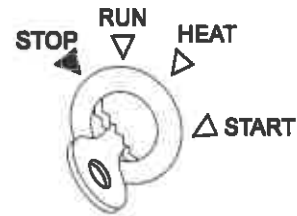
### Stopping the Engine (Normal Shutdown)

1. Place the circuit breaker (Figure 17) in the OFF position.



**Figure 17. Main Circuit Breaker (OFF)**

2. Let engine run with no load for 3-5 minutes.
3. Place the starter switch key (Figure 18) in the STOP position and remove the key. Place fuel cock lever in the OFF position.



**Figure 18. Starter Switch (Stop Position)**

6. Remove all load connections from the generator.

### Emergency Shutdown

1. Place starter switch key in STOP position. Remove key. Place fuel cock lever in the OFF position.

3. Connecting of loads (power tools, lighting etc.) to the generator receptacles can now be done.

## PREPARATION FOR LONG TERM STORAGE

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### Generator Storage

For storage of the generating set for over 30 days, the following is required:

- Run the engine until all the fuel is completely consumed.
- Drain the fuel tank completely, or add STA-BIL to the fuel
- Completely drain the oil from the crankcase and refill with fresh oil.
- Disconnect the ***negative battery cable*** from the battery.
- Clean all external parts of the generating set with a cloth.
- If generator is mounted on a trailer, jack trailer up and place on blocks so tires do not touch the ground and completely remove the tires.
- Cover the generator set and store in a clean, dry place.

# MAINTENANCE

Use Table 9 as a general maintenance guideline when servicing your engine. For more detail engine maintenance information, refer to the engine owner's manual supplied with your engine.

**Table 9. Engine Maintenance Schedule**

DESCRIPTION (3)	OPERATION	DAILY	FIRST MONTH OR 50 HRS.	EVERY 3 MONTHS OR 25 HRS.	EVERY 6 MONTHS OR 50 HRS.	EVERY YEAR OR 100 HRS.	EVERY 2 YEARS OR 200 HRS.	EVERY 8 YEARS OR 800 HRS.	EVERY 750 HRS. OR YEAR	
Engine Oil	CHECK	X								
	CHANGE		X			X (4)			X (5)	
Oil filter Cartridge	CHANGE		X				X (4)		X (5)	
Air Cleaner Element	CHECK	X			X					
	CHANGE				X (1)	X				
All Nuts & Bolts	RETIGHTEN IF NECESSARY	X								
Cooling Fins	CHECK				X					
Fuel Tank	CLEAN						X			
Fuel Filter	CLEAN					X	X	X		
Fuel Filter Element	CHANGE		X				X			
Fuel lines	CHANGE	Every 2 years, replace if necessary (2)								
Battery	CHANGE						X			
Radiator Hoses/ Clamps	CHANGE	Every 2 years, replace if necessary (2)								
Radiator Coolant	CHANGE						X			
Idle Speed	CHECK-ADJUST					X (2)				
Valve Clearance	CHECK-ADJUST							X (2)		
Fan Belt	CHECK TIGHTNESS					X				
WATER SEPARATOR	DRAIN					X				

(1) Service more frequently when used in **DUSTY** areas.

(2) These items should be serviced by your service dealer, unless you have the proper tools and are mechanically proficient. Refer to the KUBOTA Shop Manual for service procedures.

(3) For commercial use, log the hours of operation to determine proper maintenance intervals.

(4) When using engine oil of CF, CG-4, CH-4, CI-4 in API classification.

(5) When this machine is used as the power supply exclusively for the ground heater using the engine oil of CK-4 according to API classification.

### NOTICE

Thoroughly remove dirt and oil from the engine and control area. Clean or replace the air cleaner elements as necessary. Check and retighten all fasteners as necessary.

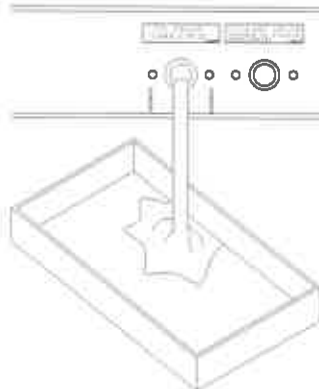
## Maintenance

Perform the scheduled maintenance procedures as defined by Table 9 and below:

### Engine Oil

**Every 100/750 hours:** Change engine oil after the first 50 hours of operation and 100/750 hours thereafter. Always check the crankcase oil level prior to each use, or when the fuel tank is filled. Insufficient oil may cause severe engine damage. Make sure generator is level when checking oil level. The oil level must be between the two notches on the dipstick as shown in Figure 7.

1. Remove engine oil drain plug located at the bottom of the generator enclosure (Figure 19) and drain oil from crankcase. For best results drain oil while engine is warm. Reinstall oil drain plug, and add engine oil as specified in Table 6. Crankcase oil capacity is 5.39 qts. (5.1 liters).



**Figure 19. Engine Oil Drain Plug**

### Oil Filter Cartridge

**Every 200/750 hours:** Replace the engine oil filter cartridge after every 200/750 hours of operation.

1. Clean oil filter mounting base, and coat oil filter seal (Figure 20) with clean engine oil.



**Figure 20. Oil Filter Cartridge**

2. Screw on new oil filter by hand until seal contacts the filter mounting base. Install drain bolt with sealing washer and hand tighten.

### NOTICE

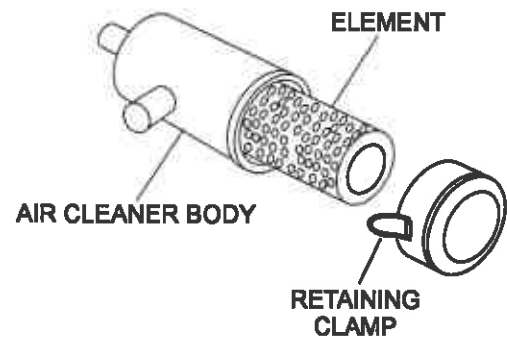
When installing the oil filter, coat rubber seal with a small amount of lubricant (motor oil). **DO NOT** over-tighten cartridge. Hand tighten only.

3. Replace engine oil with recommended type oil as listed in Table 6. For engine oil capacity, see Table 2 (engine specifications). Fill to upper limit as shown in Figure 8.

### Engine Air Cleaner

**Every 50 hours:** The air cleaner employed on the KUBOTA D1105 series engines. This is a dry type filter. **NEVER** apply oil to it. If the generator is used in severe dusty areas, service the air cleaner element more frequently.

1. Release the air cleaner retaining clamps (Figure 21) and remove the air cleaner element.



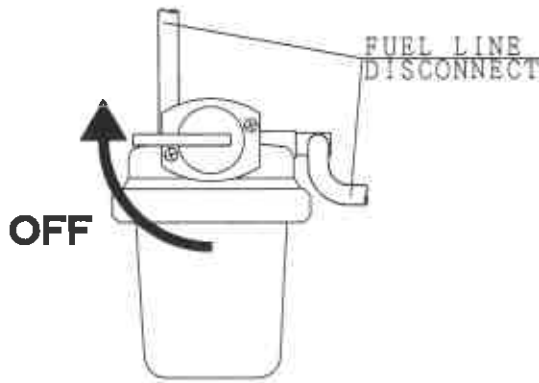
**Figure 21. Air Cleaner**

2. Wipe the inside of the air cleaner with a damp cloth and remove all dust and debris that may have accumulated inside air cleaner body.
3. Remove and replace filter element with a factory replacement only; do not oil.

## Cleaning the Fuel Filter

**Every 100 hours:** Clean fuel filter every 100 hours of operation or once a month to remove dust or water.

1. Place fuel cock lever (Figure 22) in the close position.
2. Disconnect fuel lines from fuel filter.

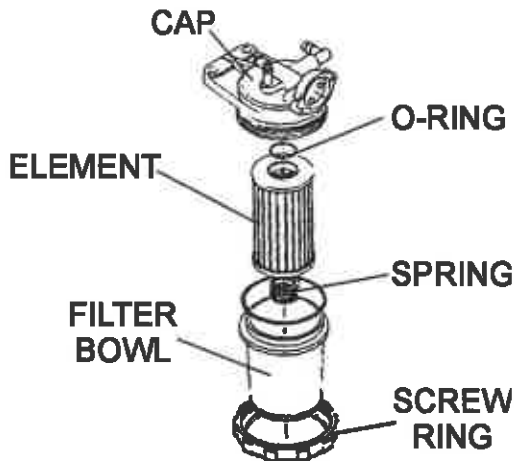


**Figure 22. Fuel Cock Lever (OFF)**

## Replacing Fuel Filter Element

**First 50 And Then Every 200 hours:** Replace fuel filter element.

1. Remove the top cap (Figure 23) from the fuel filter and rinse cap and filter bowl with diesel fuel.
2. Remove element, and rise with diesel fuel.
3. Reinstall fuel filter and connect fuel lines.



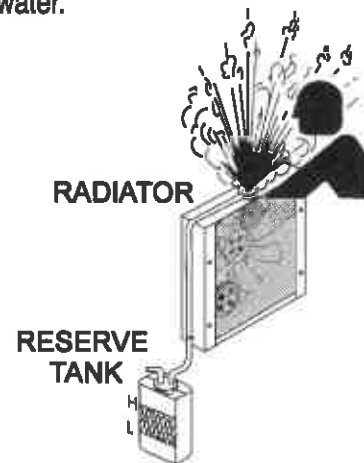
**Figure 23. Fuel Filter Disassembly**

4. Inspect all fuel lines every 50 hours.

## Radiator

**Check Daily:** Always check the level of the coolant in the radiator before starting the engine. Remove the radiator cap and verify that the coolant reaches top of radiator coils.

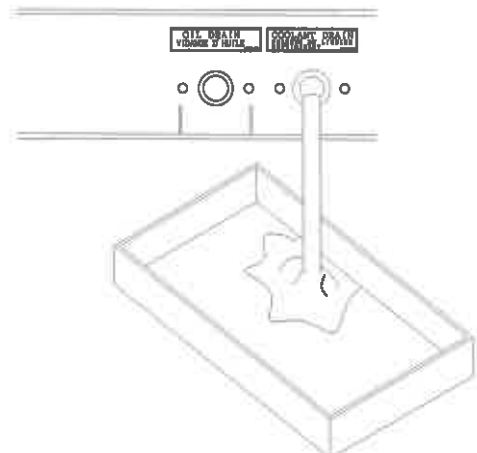
1. **DO NOT** remove the radiator cap while the coolant is hot. The possibility exists of severe burns or scalding from the coolant gushing out. Let the coolant cool before removing radiator cap.
2. Check coolant in the reserve tank daily (Figure 24). Make sure the level is between the FULL (H) and LOW (L) markings. Fill reserve tank with a mixture of 50/50 antifreeze/water.



**Figure 24. Radiator/Reserve Tank**

## Flushing Out Radiator and Replacing Coolant

1. Remove the radiator coolant plug (Figure 25) located at the bottom of the generator enclosure and drain the radiator coolant. Open the radiator cap while draining. Remove the overflow tank and drain.



**Figure 25. Coolant Drain Plug**



2. Flush the radiator by running clean tap water through radiator until signs of rust and dirt are removed. **DO NOT** clean radiator core with any objects, such as a screwdriver.
3. Check hoses for softening and kinks. Check clamps for signs of leakage; replace as needed.
4. Tighten coolant drain plug and reinstall the overflow tank.
5. Fill with coolant as recommended by the engine manufacturer.
6. Close radiator cap tightly.

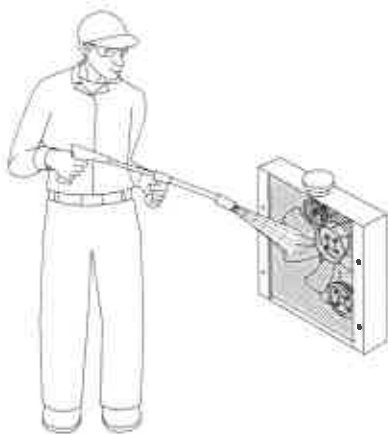
### WARNING



Allow engine to **cool** when flushing out radiator. Flushing the radiator while hot could cause serious burns from water or steam.

### RADIATOR CLEANING

The radiator (Figure 26) should be sprayed (cleaned) with a high pressure washer when excessive amounts of dirt and debris have accumulated on the cooling fins or tube. When using a high pressure washer, stand at least 5 feet (1.5 meters) away from the radiator to prevent damage to the fins and tube.



**Figure 26. Radiator Cleaning**

# GENERATOR WIRING DIAGRAM

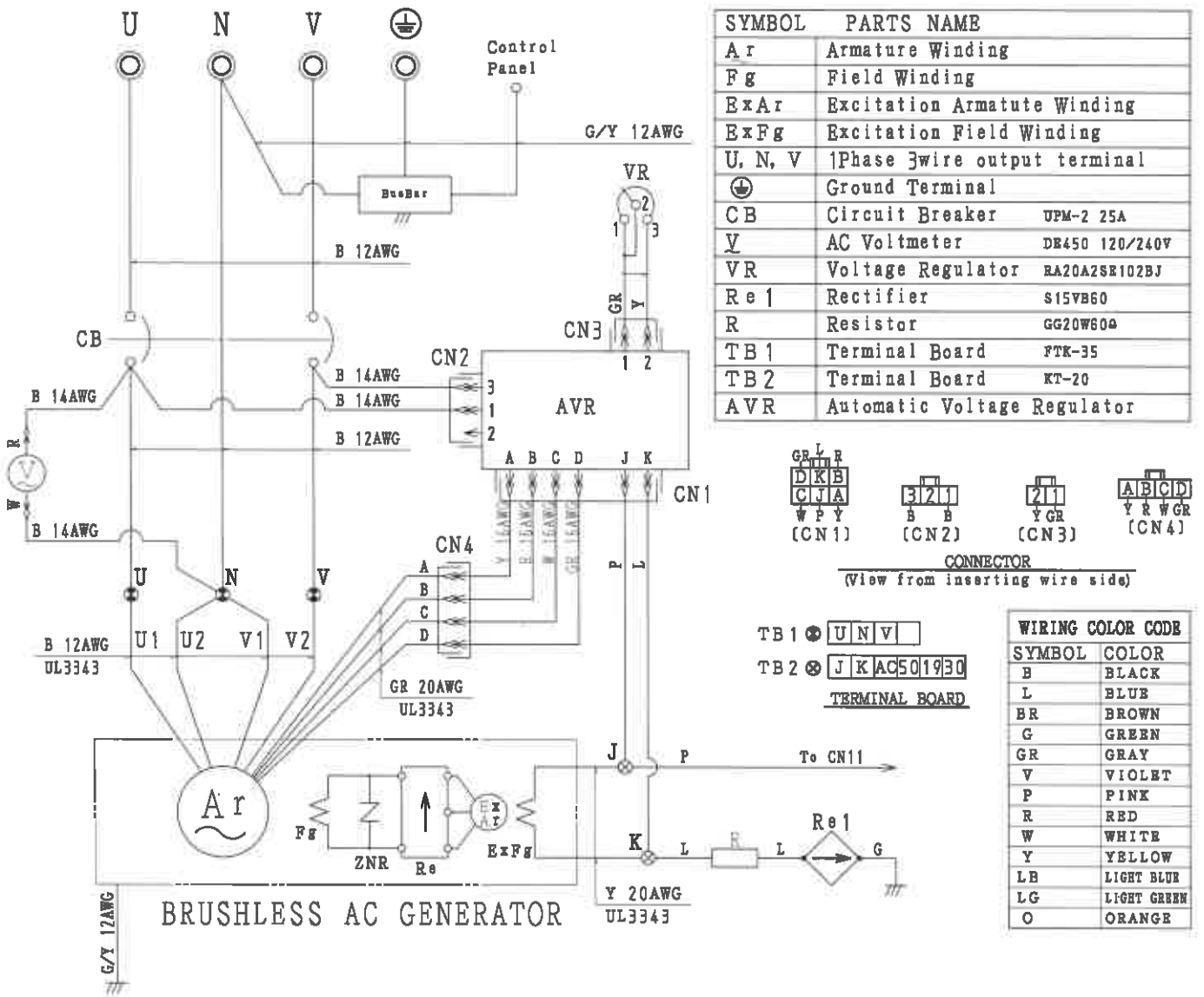
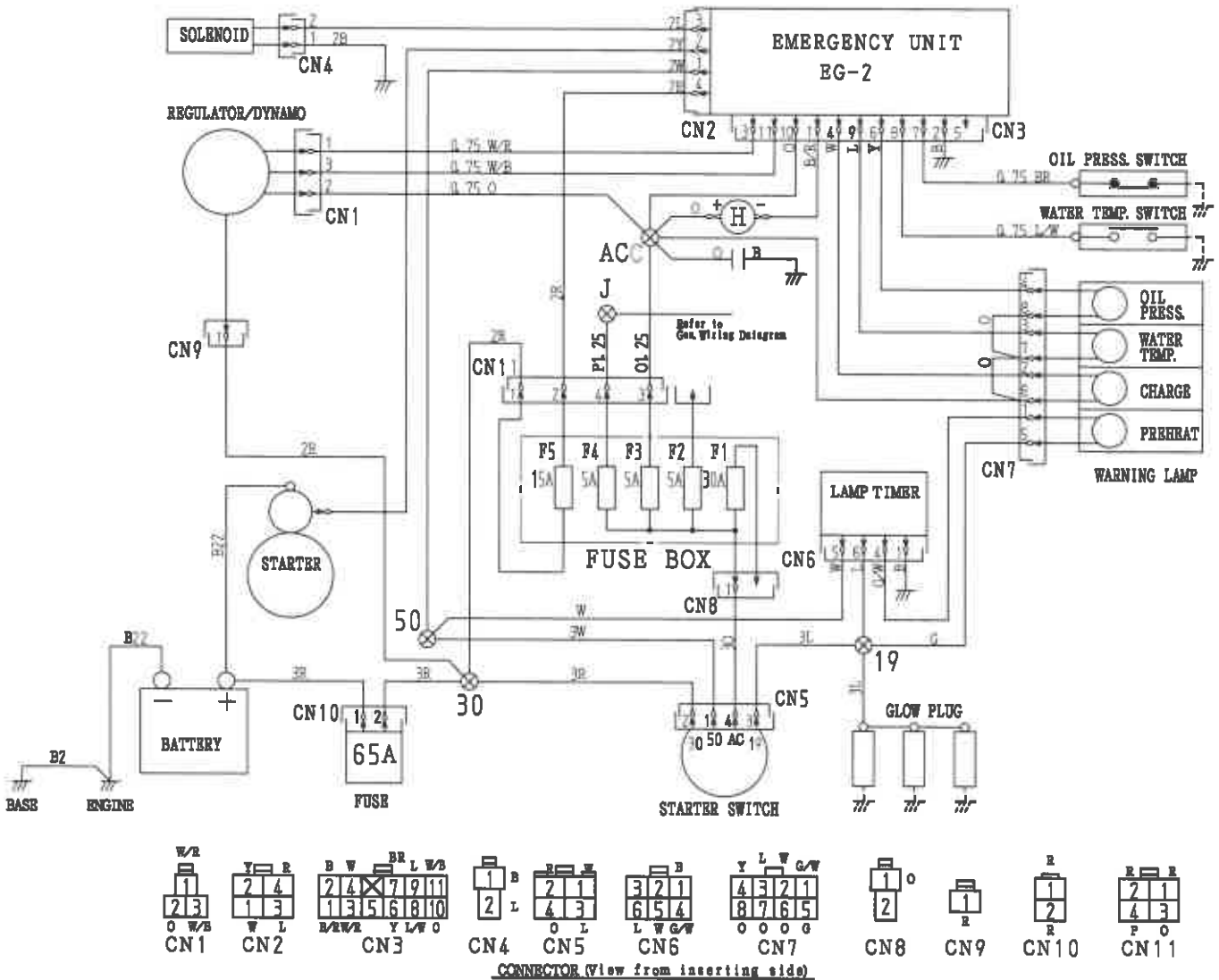


Figure 27. Generator Wiring Diagram (DCA6SPX4F)

# ENGINE WIRING DIAGRAM



WIRING COLOR CODE			
SYMBOL	COLOR	SYMBOL	COLOR
B	BLACK	R	RED
L	BLUE	W	WHITE
BR	BROWN	Y	YELLOW
G	GREEN	LB	LIGHT BLUE
GR	GRAY	LG	LIGHT GREEN
V	VIOLET	O	ORANGE
P	PINK		

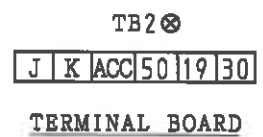
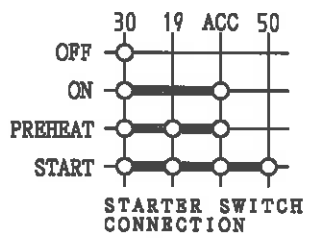


Figure 28. Engine Wiring Diagram

## TROUBLESHOOTING (ENGINE AND GENERATOR)

Table 10. Engine and Generator Troubleshooting

<b>SYMPTOM</b>	<b>POSSIBLE PROBLEM</b>	<b>SOLUTION</b>
Engine fails to start and starter does not rotate.	Dead Battery?	Replace Battery.
	Defective Starter Switch?	Replace Switch.
	Defective Starter?	Replace Starter.
	Fuse F5 Burned Out?	Replace Fuse.
Engine fails to start and starter rotates.	Broken Pre-Heat Circuit?	Check Pre-Heat Circuit.
	No Fuel?	Add Fuel.
	Defective Wiring?	Check Wiring.

## TROUBLESHOOTING (ENGINE)

**Table 11. Engine Troubleshooting**

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
Engine does not start.	No fuel?	Replenish fuel.
	Air in the fuel system?	Bleed system.
	Water in the fuel system?	Remove water from fuel tank.
	Fuel pipe clogged?	Clean fuel pipe.
	Fuel filter clogged?	Clean or change fuel filter.
	Excessively high viscosity of fuel or engine oil at low temperature?	Use the specified fuel or engine oil.
	Fuel with low cetane number?	Use the specified fuel.
	Fuel leak due to loose injection pipe retaining nut?	Tighten nut.
	Incorrect injection timing?	Adjust.
	Fuel cam shaft worn?	Replace.
	Injection nozzle clogged?	Clean injection nozzle.
	Injection pump malfunctioning?	Repair or replace.
	Seizure of crankshaft, camshaft, piston, cylinder liner or bearing?	Repair or replace.
	Compression leak from cylinder?	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder.
	Improper valve timing?	Correct or replace timing gear.
Piston ring and liner worn?	Replace.	
Excessive valve clearance?	Adjust.	
Starter does not run.	Battery discharged?	Charge battery.
	Starter malfunctioning?	Repair or replace.
	Key switch malfunctioning?	Repair or replace.
	Wiring disconnected?	Connect wiring.

## TROUBLESHOOTING (ENGINE)

**Table 11. Engine Troubleshooting (Continued)**

SYMPTOM	POSSIBLE PROBLEM	SOLUTION
Engine revolution is not smooth.	Fuel filter clogged or dirty?	Clean or change.
	Air cleaner clogged?	Clean or change.
	Fuel leak due to loose injection pipe retaining nut?	Tighten nut.
	Injection pump malfunctioning?	Repair or replace.
	Incorrect nozzle opening pressure?	Adjust.
	Injection nozzle stuck or clogged?	Repair or replace.
	Fuel over flow pipe clogged?	Clean.
	Governor malfunctioning?	Repair.
Either white or blue exhaust gas is observed.	Excessive engine oil?	Reduce to the specified level.
	Piston ring and liner worn or stuck?	Repair or replace.
	Incorrect injection timing?	Adjust.
	Deficient compression?	Adjust top clearance.
Either black or dark gray exhaust gas is observed.	Overload?	Lessen the load.
	Low grade fuel used?	Use the specified fuel.
	Fuel filter clogged?	Clean or change.
	Air cleaner clogged?	Clean or change.
	Deficient nozzle injection?	Repair or replace the nozzle.
Deficient output.	Incorrect injection timing?	Adjust.
	Engine's moving parts seem to be seizing?	Repair or replace.
	Uneven fuel injection?	Repair or replace the injection pump.
	Deficient nozzle injection?	Repair or replace the nozzle.
	Compression leak?	Replace head gasket, tighten cylinder head bolt, glow plug and nozzle holder.

# OPERATION MANUAL

## HERE'S HOW TO GET HELP

PLEASE HAVE THE MODEL AND SERIAL  
NUMBER ON-HAND WHEN CALLING

### UNITED STATES

#### ***Multiquip Corporate Office***

18910 Wilmington Ave.  
Carson, CA 90746  
Contact: mq@multiquip.com

Tel. (800) 421-1244  
Fax (310) 537-3927

#### ***MQ Parts Department***

800-427-1244  
310-537-3700

Fax: 800-672-7877

#### ***Service Department***

800-421-1244  
310-537-3700

#### ***Warranty Department***

800-421-1244  
310-537-3700

Fax: 310-943-2249

#### ***Technical Assistance***

800-478-1244

Fax: 310-943-2238

### CANADA

#### ***Multiquip***

4110 Industriel Boul.  
Laval, Quebec, Canada H7L 6V3  
Contact: infocanada@multiquip.com

Tel: (450) 625-2244  
Tel: (877) 963-4411  
Fax: (450) 625-8664

### UNITED KINGDOM

#### ***Multiquip (UK) Limited Head Office***

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