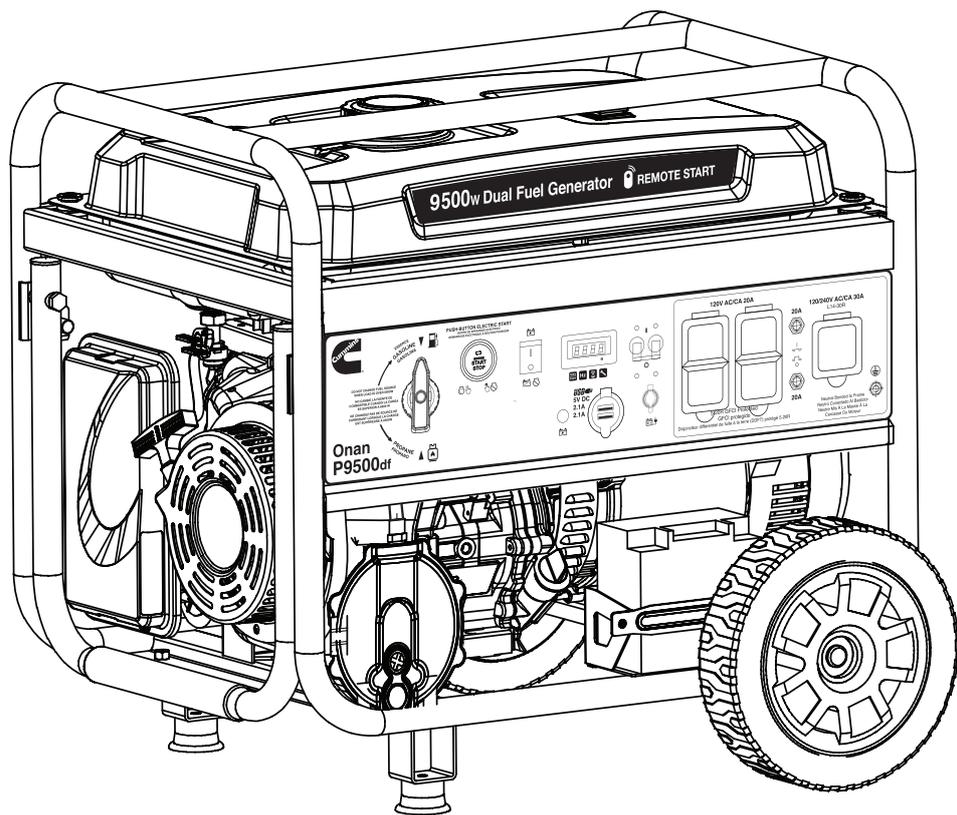


# Service Manual

## Onan P950df Dual Fuel Portable Generator



# INTRODUCTION

## INTRODUCTION

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**⚠ WARNING:** Operating, servicing, and maintaining this equipment can expose you to chemicals including engine exhaust, carbon monoxide, phthalates, and lead, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, and wear gloves or wash your hands frequently when servicing this equipment. For more information go to [www.P65warnings.ca.gov](http://www.P65warnings.ca.gov).

#### DISCLAIMERS

All information, illustrations, and specifications in this manual were in effect at the time of publishing.

The illustrations used in this manual are intended as representative reference views only. We reserve the right to make any specification or design change without notice.

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<b>⚠ DANGER</b>	
	Read this manual before using or performing maintenance on this product. Failure to follow the instructions and safety precautions in this manual can result in serious injury or death.

# INTRODUCTION

## SPECIFICATIONS

Specifications	
<b>Running Watts:</b>	7500 Gas / 6750 LPG
<b>Peak Watts:</b>	9500 Gas / 8550 LPG
<b>Rated Voltage:</b>	120/240V
<b>Rated frequency:</b>	60 Hz @ 3600 RPM
<b>Phase:</b>	Single phase
<b>Total Harmonic Distortion:</b>	≤ 23%
<b>Engine Displacement:</b>	420 cc
<b>Starting Type:</b>	Recoil, Electric Start, Remote
<b>Fuel Capacity:</b>	6.6 Gallons (25 Liters)
<b>Fuel Type:</b>	87–93 octane*
<b>Oil Capacity:</b>	1.16 US Quart (1.1 Liter)
<b>Oil Type:</b>	SAE 10W-30
<b>Spark Plug:</b>	A064D660 (F7TC)
<b>Spark Plug Gap:</b>	0.024 – 0.032 in. (0.60 – 0.80 mm)
<b>Valve Intake Clearance:</b>	0.0031 – 0.0047 in. (0.08 – 0.12 mm)
<b>Valve Exhaust Clearance:</b>	0.0051 – 0.0067 in. (0.13 – 0.17 mm)
<b>AC Grounding System:</b>	Bonded to frame
<b>Voltage Regulator:</b>	AVR
<b>Alternator Type:</b>	Brushed
<b>Maximum Ambient Temperature:</b>	104°F (40°C)
<b>Certifications:</b>	<ul style="list-style-type: none"><li>• EPA</li><li>• CARB</li></ul>

\*Ethanol content of 10% or less. DO NOT use E15 or E85.

## NOTICE

This product is designed and rated for continuous operation at ambient temperatures up to 104°F (40°C). If needed, this product can be operated at temperatures ranging from 5°F (15°C)–122°F (50°C) for short periods. If the product is exposed to temperatures outside of this range during storage, it should be brought back within this range before operation. This product must always be operated outdoors in a well-ventilated area and away from doors, windows, and other vents.

Maximum wattage and current are subject to and limited by such factors as fuel BTU content, ambient temperature, altitude, engine conditions, etc. Maximum power decreases about 3.5% for each 1,000 feet above sea level, and will also decrease about 1% for each 10°F (6°C) above 60°F (16°C) ambient temperature.



**1-800-CUMMINS**  
(1-800-286-6467)

# SAFETY

## SAFETY

### SAFETY DEFINITIONS

The words DANGER, WARNING, CAUTION and NOTICE are used throughout this manual to highlight important information. Make sure that the meanings of this safety information is known to all who operate, perform maintenance on, or are near the generator.



This safety alert symbol appears with most safety statements. It means attention, be alert, your safety is involved! Please read and abide by the message that follows the safety alerts symbol.

#### ⚠ 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

Indicates a situation which can cause damage to the generator, personal property, and/or the environment, or cause the equipment to operate improperly.

**Note:** Indicates a procedure, practice or condition that should be followed for the generator to function in the manner intended.

### DISCLAIMERS

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## SAFETY SYMBOLS

Follow all safety information contained in this manual and on the generator.

Symbol	Description
	Safety Alert Symbol
	Electrocution Hazard
	Asphyxiation Hazard
	Burn Hazard. Do not touch hot surfaces.
	Electrical Shock Hazard
	Fire Hazard
	Maintain Safe Distance
	Lifting Hazard
	Read Manufacturer's Instructions
	Do Not Operate in Wet Conditions
	Ground. Consult with electrician to determine grounding requirements before operation.

## ⚠ DANGER

Using a generator indoors CAN KILL YOU IN MINUTES. Generator exhaust contains carbon monoxide. This is a poison you cannot see or smell.



NEVER use inside a home or garage, EVEN IF doors and windows are open.



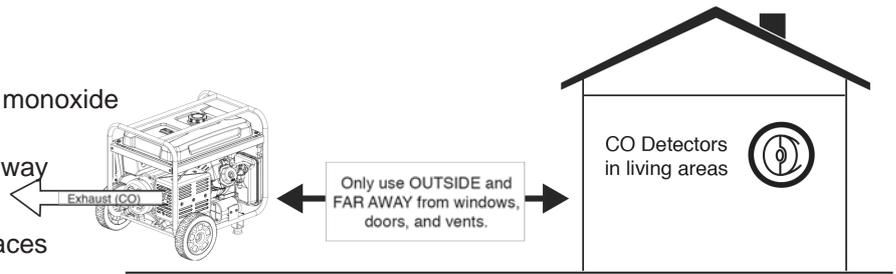
Only use OUTSIDE and far away from windows, doors, and vents.

## SAFETY INSTRUCTIONS

### CORRECT USE

Example location to reduce risk of carbon monoxide poisoning

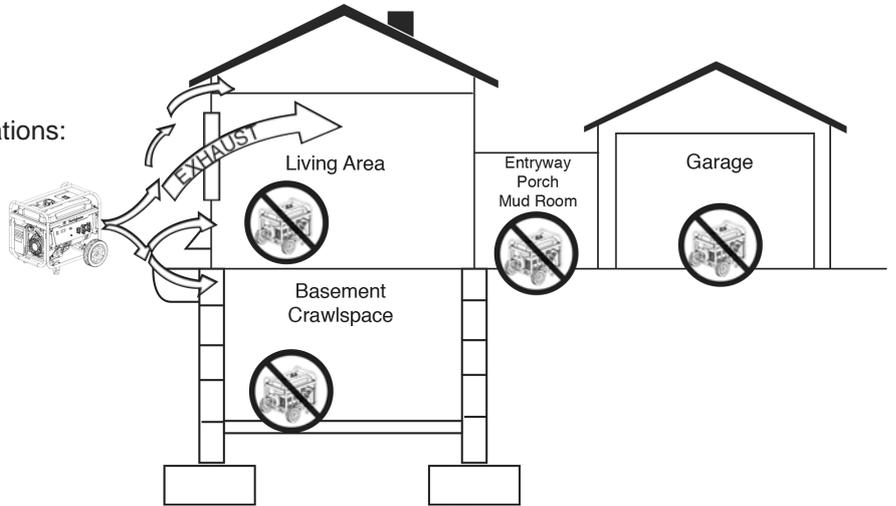
- ONLY use outside and downwind, far away from windows, doors and vents.
- Direct exhaust away from occupied spaces



### INCORRECT USE

Do not operate in any of the following locations:

- Near any door, window, or vent
- Garage
- Basement
- Crawl Space
- Living Area
- Attic
- Entry Way
- Porch
- Mudroom



Carbon monoxide (CO) is an odorless, colorless, tasteless and non-irritating gas. You cannot see it or smell it. Red blood cells, however, have a greater affinity for CO than for oxygen. Therefore, exposure even to low levels of CO for a prolonged period can lead to asphyxiation (lack of oxygen) resulting in death. Mild effects of CO poisoning include eye irritation, dizziness, headaches, fatigue and the inability to think clearly. More extreme symptoms include vomiting, seizures and collapse. Engine-driven generators produce harmful levels of carbon monoxide that can injure or kill you.

- Pay attention for signs of CO poisoning.
- Check the exhaust system for corrosion, obstruction, and leaks every time you start the generator set and every eight hours when you run it continuously.

### ⚠ WARNING

**Carbon monoxide (CO) gas can cause nausea, fainting, or death. Residents can be exposed to lethal levels of CO when the generator set is running. Depending on air temperature and wind, CO can accumulate in or near the home.**

### NOTICE

To protect yourself and others from the dangers of CO poisoning, install battery powered carbon monoxide detectors or plug in carbon monoxide detectors with battery back up in living areas.

- Locate the generator set in an area where there are no windows, doors, or other access points into the home.
- Make sure all CO detectors are installed and working properly.

### ⚠ DANGER

Fire and electrocution hazard. Do not connect to a building's electrical system unless the generator and transfer switch have been properly installed and the electrical output has been verified by a qualified electrician. The connection must isolate the generator power from utility power and must comply with all applicable laws and electrical codes.

### ⚠ DANGER

Electrocution hazard. Never use the generator in a location that is wet or damp. Never expose the generator to rain, snow, water spray, or standing water while in use. Protect the generator from all hazardous weather conditions. Moisture or ice can cause a short circuit or other malfunction in the electrical circuit.

# SAFETY

## ⚠ WARNING

Hazardous Voltage. Contact with high voltages can cause severe electrical shock, burns or death

## ⚠ WARNING

Faulty electrical generating equipment can cause severe personal injury or death Generators must be operated by trained and experienced person in accordance with the installation instructions and all applicable codes

Before operating or performing maintenance on the generator, read the manuals and become familiar with them and the equipment. Safe and efficient operation can be achieved only if the equipment is properly operated and maintained. Many accidents are caused by failure to follow fundamental rules and precautions.

## ⚠ WARNING

**Incorrect operation and maintenance of electrical generating equipment can result in severe personal injury or death. Read and follow all Safety Precautions, Warnings, and Cautions throughout this manual and the documentation supplied with the generator**

Before starting work on the generator set, disconnect the battery charger from its AC source, then disconnect the starting batteries using an insulated wrench, negative (-) cable first. This will prevent accidental starting.

## ⚠ DANGER

**Moving parts can cause severe personal injury or death.** Keep hands, clothing, and jewelry away from moving parts

## NOTICE

It is the policy of Cummins Inc to perform all electrical work in a de-energized state However, employees or suppliers may be permitted to occasionally perform work on energized electrical equipment only when qualified and authorized to do so and when troubleshooting, or if de-energizing the equipment would create a greater risk or make the task impossible and all other alternatives

## NOTICE

Exposed energized electrical work is only allowed as per the relevant procedures and must be undertaken by a Cummins authorized person with any appropriate energized work permit for the work to be performed while using proper PPE, tools and equipment

## GENERAL SAFETY PRECAUTIONS

- Never use the generator to power medical support equipment.
- Do not operate the generator when you are tired or under the influence of drugs, alcohol, or medication.
- Do not use generator with electrical cords which are worn, frayed, bare, or otherwise damaged.
- All electrical tools and appliances operated from this generator must be properly grounded by use of a third wire or be double-insulated.
- When this generator is used to supply a building wiring system the generator must be installed by a qualified electrician and connected to a transfer switch as a separately derived system in accordance with NFPA 70, National Electrical Code.
- If you begin to feel sick, dizzy, or weak while using the generator, move to fresh air IMMEDIATELY. See a doctor, as you can have carbon monoxide poisoning.
- Only use OUTSIDE and far away from windows, doors, and vents as recommended by the US Department of Health and Human Services Centers for Disease Control and Prevention. Your specific home and/or wind conditions may require additional distance.
- While operating and storing, keep at least 3 feet of clearance on all sides of the generator, including overhead. Allow the generator to cool a minimum of 30 minutes before storage. Heat created by the muffler and exhaust gases could be hot enough to cause serious burns and/or ignite combustible objects.
- Do not touch the muffler or engine. They are very HOT and will cause severe burns. Do not put body parts or any flammable or combustible materials in the direct path of the exhaust.
- Always remove any tools or other service equipment used during maintenance away from the generator before operating.
- Avoid skin contact with engine oil or gasoline. Wear protective clothing and equipment. Wash all exposed skin with soap and water.
- A transfer switch must be installed by a licensed electrician approved by the authority having jurisdiction. The installation must comply with all applicable laws and electrical codes.
- Before starting work on the generator, disconnect the battery charger from its AC source, then disconnect the starting battery using an insulated wrench, negative (-) cable first. This will prevent accidental starting.
- Make sure that fasteners on the generator set are secure. Tighten supports and clamps; keep guards in position.
- Do not wear loose clothing or jewelry in the vicinity of moving parts or while working on electrical equipment. Loose clothing and jewelry can become caught in moving parts. If any adjustments must be made while

the unit is running, use extreme caution around hot or moving parts, etc.

- Materials drawn into the generator, as well as accumulated grease and oil, are a fire hazard. Fire can cause severe burns or death. Keep the generator and the surrounding area clean and free from obstructions. Make sure the generator is mounted in a manner to prevent combustible materials from accumulating under the unit.
- Keep hands, clothing, and jewelry away from moving parts.
- Use proper PPE. Do not wear jewelry and make sure that any conductive items are removed from pockets as these items can fall into equipment and the resulting short circuit can cause shock or burning. Refer to standard NFPA 70E for PPE standards.

## FUEL SAFETY

### NOTICE

Keep multi type ABC fire extinguishers close by. Class A fires involve ordinary combustible materials such as wood and cloth. Class B fires involve combustible and flammable liquid fuels and gaseous fuels. Class C fires involve live electrical equipment (Refer to NFPA No 10 in the applicable region)

### ⚠ WARNING

Fire and explosion hazard. NEVER use a gas container or any other fuel item that appears to be damaged

- Store fuel in a container approved for gasoline.
- DO NOT smoke when filling the generator with gasoline.
- DO NOT allow the generator's gas tank to overflow when filling.
- Shut down the engine and allow it to cool for five minutes before adding gasoline or oil to the generator.
- NEVER remove the fuel cap when the generator is running. Shut off the engine and allow the unit to cool at least five minutes. Remove the fuel cap slowly to release pressure, keep fuel from escaping around the cap, and to avoid the heat from the muffler igniting fuel vapors. Tighten the fuel cap securely after refueling.
- Wipe spilled fuel from the unit.
- NEVER attempt to burn off spilled fuel.
- NEVER overfill the fuel tank. Leave room for fuel to expand. Overfilling the fuel tank can result in a sudden overflow of gasoline and result in spilled gasoline coming in contact with HOT surfaces.
- Spilled fuel can ignite. If fuel is spilled on the generator, wipe up any spills immediately. Dispose of rag properly. Allow area of spilled fuel to dry before operating the generator.
- Wear eye protection while refueling.

- NEVER use gasoline as a cleaning agent.
- Store any containers containing gasoline in a well-ventilated area, away from any combustibles or source of ignition.

## GASOLINE AND GASOLINE VAPOR (GAS)

### ⚠ DANGER

Fire and explosion hazard. Gasoline is highly explosive and flammable and can cause severe burns or death.

- In case of a gas fire, do not attempt to extinguish the flame if the fuel tank valve is in the ON position. Introducing an extinguisher to a generator with an open fuel switch could create an explosion hazard.
- Gas has a distinctive odor, this will help detect potential leaks quickly.
- Gas vapors can cause a fire if ignited.
- Gasoline is a skin irritant and needs to be cleaned up immediately if it comes in contact with the skin.

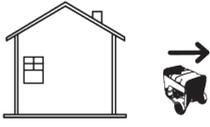
## FUEL REQUIREMENTS

- CLEAN, FRESH, unleaded gasoline, 87–93 octane.
- Up to 10% ethanol (gasohol) is acceptable (where available; non-ethanol fuel is recommended).
- DO NOT use E85 or E15.
- DO NOT use a gas oil mix.
- DO NOT modify the engine to run on alternate fuels.
- DO NOT fuel indoors.
- DO NOT create a spark or flame while fueling.
- Wear eye protection while refueling.
- Never use gasoline as a cleaning agent.
- Store any containers containing gasoline in a well-ventilated area, away from any combustibles or source of ignition.

# SAFETY

## GENERATOR LOCATION

Read and understand all safety information before starting the generator.

<b>⚠ DANGER</b>	
Using a generator indoors CAN KILL YOU IN MINUTES. Generator exhaust contains carbon monoxide. This is a poison you cannot see or smell.	
	
NEVER use inside a home or garage, EVEN IF doors and windows are open.	Only use OUTSIDE and far away from windows, doors, and vents.

NEVER operate the generator inside any building, including garages, basements, crawlspaces, sheds, enclosure, or compartment, including the generator compartment of a recreational vehicle.

<b>⚠ DANGER</b>
Electrocution hazard. Never use the generator in a location that is wet or damp. Never expose the generator to rain, snow, water spray, or standing water while in use. Protect the generator from all hazardous weather conditions. Moisture or ice can cause a short circuit or other malfunction in the electrical circuit. Using a generator or electrical appliance in wet conditions, such as rain or snow, or near a pool or sprinkler system, or when your hands are wet, could result in electrocution

<b>⚠ WARNING</b>
Fire hazard. Only operate the generator on a solid, level surface. Operating the generator on a surface with loose material such as sand or grass clippings can cause debris to be ingested by the generator that could block cooling vents or the air intake system. Allow the generator to cool for 30 minutes before transport or storage.

The generator should be on a flat, level surface at all times (Even while not in operation). The generator must have at least 5 ft. (1.5 m) of clearance from all combustible material.

DO NOT operate the generator in the back of a SUV, camper, trailer, truck bed (regular, flat, or otherwise), under stairs, next to walls or buildings, or in any other location that will not allow for adequate cooling of the generator and/or the muffler. DO NOT contain generators during operation.

<b>⚠ DANGER</b>
Asphyxiation hazard. Place the generator in a well-ventilated area. DO NOT place the generator near vents or intakes where exhaust fumes could be drawn into occupied or confined spaces. Carefully consider wind and air currents when positioning generator.

# SERVICE INFORMATION

## SERVICE INFORMATION

### ABOUT THIS MANUAL

This manual provides troubleshooting and repair information for the generators listed on the front cover. The information contained within the manual is based on information available at the time of going to print. In line with the Cummins Inc. policy of continuous development and improvement, information may change at any time without notice. The users should therefore make sure that before commencing any work, they have the latest information available.

This manual contains schematics that are included to help in troubleshooting. The schematics that are maintained with the unit should be updated when modifications are made to the unit.

Operating and basic maintenance instructions are in the applicable generator user manual. Read and carefully observe all instructions and precautions in this manual.

### RELATED LITERATURE

Before any attempt is made to operate the generator set, the operator should take time to read all of the manuals supplied with the generator set and familiarize themselves with the warnings and operating procedures.

#### NOTICE

Keep multi-type ABC fire extinguishers close by. Class A fires involve ordinary combustible materials such as wood and cloth. Class B fires involve combustible and flammable liquid fuels and gaseous fuels. Class C fires involve live electrical equipment. (Refer to NFPA No. 10 in the applicable region.)

A generator must be operated and maintained properly if you are to expect safe and reliable operation.

### SERVICE RULES

- Use genuine Cummins recommended parts and lubricants or their equivalents. Parts that do not meet Cummins design specifications may damage the engine.
- Always install new gaskets, O-rings, etc., when reassembling.
- When tightening bolts or nuts, begin with larger-diameter or inner bolts first and tighten to the specified torque diagonally, unless a particular sequence is specified.
- Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before reassembly.
- After reassembly, check all parts for proper installation and operation.
- Many screws used in this machine are self-tapping. Be aware that cross-threading or over tightening these screws will strip the threads and ruin the hole.

- Use only metric tools when servicing this engine. Metric bolts, nuts and screws are not interchangeable with non metric fasteners. The use of incorrect tools and fasteners will damage the engine.

### ELECTRIC PRECAUTIONS

- Hold the connector body to disconnect the connector. Do not disconnect by pulling the wire harness. To disconnect the locking connector, be sure to unlock first, and then disconnect.
- Check the connector terminals for bent, excessive extrusion, missing terminal, or other abnormalities before connecting the connector.
- To connect, insert the connector fully. If the connector is a locking type, be sure that it is locked securely.
- Check the connector cover for breakage and check whether the connector female terminal is open excessively. Then, connect the connector securely. Check the connector terminal for rust. Remove the rust using an emery paper or equivalent material before connecting the connector.
- Set the harness clips in the specified places of the frame securely, and clamp the wire harnesses.
- Clamp the wire harnesses securely so that they do not interfere with the rotating parts, moving parts and the hot parts.
- Route and connect the wire harnesses properly. Be sure that the harnesses are not loose, twisted or pulled tight.
- Route the wire harnesses properly so that they do not contact with the shape edges and corners, and the end of the bolts and screws on the body.
- If a wire harness contacts the end of the bolts/screws or sharp edges and corners, protect the contact part of the harness with a tube or by winding with an electrician's insulating tape. If the wire harness has a grommet, set the grommet securely.
- Take care not to pinch the wire harnesses during installation of a part. If a wire harness has the damaged insulation, repair by winding with the electrician's insulating tape.
- Read the tester manufacturer's operation instructions carefully before operation with tester.
- Follow the instructions of the Service Manual. Be sure that the battery built in a tester is fully charged and check the meter before inspection using the tester.

# SERVICE INFORMATION

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## SERIAL NUMBER LOCATION

This unit has a serial number label on the back near the top of the unit.



# SPECIFICATIONS

## SPECIFICATIONS

### TORQUE SPECIFICATIONS

Item*	Screw diameter	Tightening torque	
		Minimum	Maximum
Head cover bolt	M8	8 N-m/71 in-lb	12 N-m/106 in-lb
Drain plug	M10	30 N-m/265 in-lb	40 N-m/354 in-lb
Spark plug	M14	20 N-m/177 in-lb	30 N-m/265 in-lb
Cylinder head bolt	M8	45 N-m/400 in-lb	50 N-m/440 in-lb
Flywheel nut	M14	100 N-m/885 in-lb	120 N-m/1062 in-lb
Muffler nut	M8	20 N-m/177 in-lb	30 N-m/265 in-lb
Crankcase cover bolt	M8	26 N-m/230 in-lb	30 N-m/265 in-lb
Connecting rod bolt	M8	19 N-m/165 in-lb	21 N-m/185 in-lb
Rocker arm adjust lock nut	M6	8 N-m/71 in-lb	12 N-m/106 in-lb

\* Use standard torque values for fasteners not listed.

### TEMPERATURE

Item	Temperature	
	Minimum	Maximum
Oil temperature	n/a	160°C/320°F
Spark plug temperature	n/a	240°C/464°F

### RESISTANCE & CLEARANCE

Item	Clearance	
	Minimum	Maximum
Spark plug clearance	0.6 mm/0.024 in	0.8 mm/0.0315 in
Ignition coil clearance	0.4 mm/0.0157 in	0.6 mm/0.0236 in

### VALVE CLEARANCE

Intake Valve Clearance	0.08 mm/0.0031 in	0.12 mm/0.0047 in
Exhaust Valve Clearance	0.13 mm/0.0051 in	0.17 mm/0.0067 in

Ignition coil	Resistance	Primary side	0.9-1.1Ω
		Second side	4.9-5.1KΩ

### MOTOR

Part	Item	Wire color	Resistance
DC winding	Resistance	blue-blue	0.085
Sub winding	Resistance	white-white	0.22
Main winding	Resistance	red-blue-black	0.51

Cylinder compression	94Psi
Stepper motor resistance values	150Ω±7%
Starter relay resistance value	2.8-3Ω
Ignition coil clearance (from rotor trigger)	0.4-0.6 mm/0.0157-0.0236 in

# SPECIFICATIONS

## ENGINE MAINTENANCE STANDARDS

Part	Item	Standard	Service limit	
Engine	Maximum speed without load	3750±50rpm	–	
Cylinder	Sleeve I.D.	90.005-90.015 mm	90.1	
Piston	Skirt O.D.	89.97-89.98 mm	89.9	
	Pin bore I.D.	20.002-20.003 mm	20.02	
Piston pin	O.D.	19.994-20 mm	19.89	
Piston rings	1st ring	Height (H)	1.17-1.19 mm	1.15
		Ring side clearance	0.02-0.06 mm	0.1
		Ring end clearance	0.15-0.3 mm	0.5
		Width (WD)	3.1±0.1 mm	2.95
	2nd ring	Height (H)	1.17-1.19 mm	1.15
		Ring side clearance	0.02-0.06 mm	0.1
		Ring end clearance	0.25-0.4 mm	0.6
		Width (WD)	3.4±0.1 mm	3.25
	Oil ring	Height (H)	2.38-2.45 mm	2.3
		Ring side clearance	0.06-0.15 mm	0.2
		Ring end clearance	0.2-0.7 mm	0.9
		Width (WD)	2±0.1 mm	1.8
Connecting rod	Small end I.D.	20.006-20.017 mm	20.05	
	Big end I.D.	36.02-36.03 mm	30.06	
Crankshaft	Crank pin O.D.	35.965-35.980 mm	35.92	
Valves	Valve clearance	IN	0.08-0.12 mm	–
		EX	0.13-0.17 mm	–
	Stem O.D.	IN	6.565-6.58 mm	6.5
		EX	6.565-6.58 mm	6.5
	Guide I.D.	IN	6.6-6.615 mm	6.65
		EX	6.6-6.615 mm	6.65
	Seat width	IN/EX	6.6-6.615 mm	6.65
	Valve spring	Free length	IN/EX	36.7±0.5 mm
Cam wheel	Cam height	IN	6.59±0.8 mm	6.3
		EX	6.07±0.8 mm	5.8
Carburetor	Main jet	BS306-0010		
	Float height	2-4 mm		

# TROUBLESHOOTING

## TROUBLESHOOTING

### TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	CORRECTION	SEE...
HARD STARTING OR ENGINE WILL NOT START	Is there gasoline in the fuel tank?	Refill fuel tank and restart the engine.	
	Is the spark plug wet with fuel?	- Clogged fuel line, fuel valve, fuel filter or breather tube. - Float valve malfunction. - Clogged carburetor.	<b>“SPARK PLUG MAINTENANCE” on page 24</b>
	Is there spark at the spark plug?	Clean the electrode, and try to start without closing the choke. If flooding is severe, check the carburetor float valve.	
		Check ignition system and grounds.	<b>“IGNITION SYSTEM” on page 16</b>
IGNITION	No spark / Abnormal	<ul style="list-style-type: none"> <li>• Measure the spark plug gap and perform the spark plug test. Standard clearance 0.024 – 0.032 in. (0.60 – 0.80 mm)</li> <li>• Perform the spark test again using a new spark plug. Replace the spark plug.</li> <li>• Check again with a new spark plug cap. Faulty spark plug cap. Install new spark plug cap.</li> <li>• Check the ignition switch. Replace the ignition switch.</li> </ul>	<b>“SPARK TEST” on page 17</b>
		Disconnect the low oil sensor and perform spark test. Replace low oil sensor.	<b>“SPARK TEST” on page 17</b> <b>“CHECKING THE LOW OIL SENSOR” on page 17</b>
		Check the ignition coil resistance. Replace the ignition coil.	<b>“IGNITION SYSTEM” on page 16</b>
		Check the resistance of motor ignition. Replace the motor stator. Replace the TCI module. Check ignition coil air gap. Readjust air gap.	<b>“IGNITION SYSTEM” on page 16</b>
		Inspect wire harness and flame out switch, replace if necessary.	
LOW ENGINE OIL, BUT MOTOR DOES NOT STOP	Continuity or no continuity?	Drain out oil completely, disconnect the oil sensor wire harness, and check the continuity between black wire and the chassis ground. Check and repair all wire connections. Replace the oil level alarm	<b>“CHECKING THE LOW OIL SENSOR” on page 17</b>
		Ground the white lead from the indicator module to the engine block to ensure that the engine will stop when the low oil alarm lamp is lit. Repair or replace the wire harnesses	
		Indicator module fault, replace the module.	

# TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	CORRECTION	SEE...
ENGINE STOPS RUNNING	Sufficient oil?	Check the oil level and oil sensor. Fill the oil reservoir to the proper level and restart the engine.	“ENGINE OIL LEVEL CHECK” on page 23
	No fuel?	Check fuel level. Fill the tank with fuel and restart the engine.	
	Fuel Blocked?	Check the fuel valve and fuel filter for blockage. Clear the fuel valve and replace the fuel filter	
		Check the fuel supply hose for blockage. Clear or replace the fuel supply hose	
	Abnormal?	Check the carburetor gasket for leakage. Tighten carburetor bolts or replace gasket as required.	“CARBURETOR INSPECTION” on page 18.
		Perform the throttle control system test. Refer to step motor inspection section in service manual.	“THROTTLE STEPPER MOTOR” on page 20
		Check ignition coil. Readjust the coil clearance	
	Measure the cylinder compression. 1. Check the valve clearance 2. Check the carbon deposit in combustion chamber 3. Check the piston, piston ring(s) and cylinder for damage	“CHECK COMPRESSION:” on page 17	
ENGINE SPEED DOES NOT INCREASE OR IS UNSTABLE	Air Filter Blocked?	Check the air filter element for blockage. Clear the air filter element.	“AIR FILTER MAINTENANCE” on page 22.
	Spark Arrestor Blocked?	Inspect spark arrestor for carbon build up. Remove and clean carbon deposits.	“SPARK ARRESTOR SERVICE” on page 25
	Abnormal Spark Plug?	Remove the spark plug and check the electrode clearance for carbon deposit. Clean electrode or replace spark plug.	“SPARK PLUG MAINTENANCE” on page 24
	Carburetor and Nozzle Blocked?	Check the carburetor and nozzle for blockage.	“CARBURETOR INSPECTION” on page 18
	Carburetor Gasket Abnormal?	Check carburetor gasket. Replace gasket if damaged.	“CARBURETOR INSPECTION” on page 18.
	Cylinder Compression Abnormal?	Check cylinder compression 1. Check the valve clearance. 2. Check the carbon deposit in combustion chamber. 3. Check the piston, piston ring(s) and cylinder for damage.	“CHECK COMPRESSION:” on page 17 “VALVE CLEARANCE” on page 27
		Perform the throttle control system test.	“THROTTLE STEPPER MOTOR” on page 20
ENGINE SPEED TOO HIGH OR TOO LOW	Abnormal AC output?	Check the AC output. See .	“NO OR LOW AC OUTPUT” on page 20
	Abnormal throttle control motor?	Check the throttle control motor. Replace the throttle control motor.	“THROTTLE STEPPER MOTOR” on page 20
	Abnormal ECO switch and connection wire?	Check ECO switch and connection wire. Replace the ECO switch.	“ECO SWITCH / IGNITION SWITCH” on page 22
		Replace the inverter unit	
NO POWER TO OUTLETS	Circuit breaker tripped?	Check and reset circuit breakers/main circuit breaker.	“CHECK MAIN CIRCUIT BREAKER” on page 18.
	Voltage issues at alternator?	Check alternator voltage (continuity tests).	“CHECK LOAD VOLTAGE AND FREQUENCY” on page 18
		Check Automatic Voltage Regulator. If bad, replace AVR. If OK, replace alternator.	

# TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSE	CORRECTION	SEE...
POOR PERFORMANCE OR ENGINE STALLING ON PROPANE	Propane fuel line kinked or crushed?	Inspect propane fuel line and remove kinks or other obstructions.	
	Fuel selector valve not properly positioned?	Rotate the fuel valve fully until the pointer is directly in line with the desired fuel.	
	Gasoline not purged from the carburetor before switching to propane.	Close the propane fuel tank valve. Move the fuel selector switch to gas. Start the engine and allow the engine to run until the gasoline has been consumed in the carburetor. Begin propane start up procedure.	

# TEST PROCEDURES

## TEST PROCEDURES

The test procedures in this Manual are not necessarily the only acceptable methods for diagnosing the condition of components and circuits. All possible methods that might be used for system diagnosis have not been evaluated. If any diagnostic method is used other than the method presented in this Manual, the technician must ensure that neither his personal safety nor the product's safety will be endangered by the procedure or method that has been selected.

## IGNITION SYSTEM

Check Engine / Cylinder Leak

Down Test / Compression Test

Most engine problems may be classified as one or a combination of the following:

- Will not start
- Starts hard
- Lack of power
- Runs rough
- Vibration
- Overheating
- High oil consumption

A Cylinder Leak Down Tester checks the sealing (compression) ability of the engine by measuring air leakage from the combustion chamber. Compression loss can present many different symptoms. This test is designed to detect the section of the engine where the fault lies before replacing the engine.

1. Remove a spark plug.
2. Gain access to the flywheel. Remove the valve cover.
3. Rotate the engine crankshaft until the piston reaches top dead center (TDC). Both valves should be closed.
4. Lock the flywheel at top dead center.
5. Attach cylinder leak down tester adapter to spark plug hole.
6. Connect an air source of at least 90 psi to the leak down tester.
7. Adjust the regulated pressure on the gauge to 80 psi.
8. Read the right hand gauge on the tester for cylinder pressure. 20 percent leakage is normally acceptable. Use good judgment, and listen for air escaping at the carburetor, the exhaust, and the crankcase breather.

This will determine where the fault lies.

RESULTS	ACTION
Air escapes at the carburetor	Check intake valve

RESULTS	ACTION
Air escapes through the exhaust	Check exhaust valve
Air escapes through the breather	Check piston rings
Air escapes from the cylinder head	Replace head gasket

## CHECK STARTER MOTOR

Conditions Affecting Starter Motor Performance:

- A binding or seizing condition in the Starter Motor bearings.
- A shorted, open or grounded armature.
  - a. Shorted, armature (wire insulation worn and wires touching one another). Will be indicated by low or no RPM.
  - b. Open armature (wire broken) will be indicated by low or no RPM and excessive current draw.
  - c. Grounded armature (wire insulation worn and wire touching armature lamination or shaft). Will be indicated by excessive current draw or no RPM.
- A defective Starter Motor switch.
- Broken, damaged or weak magnets.
- Starter drive dirty or binding.

## PROCEDURE

The battery should have been checked prior to this test and should be fully charged.

1. Set a voltmeter to measure DC voltage (12 VDC).
2. Connect the meter positive (+) test lead to the Starter Contactor stud which has the small jumper wire connected to the Starter.
3. Connect the common (-) test lead to the Starter Motor frame.
4. Set the Start-Stop Switch to its START position and observe the meter. Meter should indicate battery voltage, Starter Motor should operate and engine should crank.

## RESULTS

- If battery voltage is indicated on the meter but Starter Motor did not operate, remove and bench test the Starter Motor (see following test).
- If battery voltage is indicated and the Starter Motor tried to engage (pinion engaged), but engine did not crank, check for mechanical binding of the engine or rotor.

**Note:** If a starting problem is encountered, the engine itself should be thoroughly checked to eliminate it as the cause of starting difficulty. It is a good practice to check the engine for freedom of rotation by removing the spark plugs and turning the crankshaft over slowly by hand to be sure it rotates freely.

# TEST PROCEDURES

## ▲ WARNING

DO NOT ROTATE ENGINE WITH ELECTRIC STARTER WITH SPARK PLUG REMOVED. ARCING AT THE SPARK PLUG END MAY IGNITE THE GASOLINE VAPOR EXITING THE SPARK PLUG HOLE.

## CHECK COMPRESSION

Lost or reduced engine compression can result in (a) failure of the engine to start, or (b) rough operation.

One or more of the following will usually cause loss of compression:

- Blown or leaking cylinder head gasket.
- Improperly seated or sticking-valves.
- Worn piston rings or cylinder. (This will also result in high oil consumption).

1. Remove the spark plug.
2. Insert a compression gauge into the cylinder.
3. Crank the engine until there is no further increase in pressure.
4. Record the highest reading obtained.

## RESULTS

Normal compression is approximately 50-90 Psi.

## CHECKING THE LOW OIL SENSOR

1. Remove the maintenance cover and locate the oil sensor lead which is below and to the right of the dipstick.
2. Disconnect the low oil sensor when the engine is running.
3. Ground the yellow lead (Female connector) from the indicator module to the engine block, to ensure that the engine will stop when the low oil alarm lamp is lit.
4. After insuring that the engine oil is at the proper level, test the continuity between the (Male connector) from the oil sensor and the case of the engine. No continuity indicates a normal condition.
5. Continuity between the oil sensor lead and engine when the oil is drained from the engine indicates a normal condition.

## ▲ CAUTION

No continuity with the oil drained would indicate a faulty oil sensor or damaged wire that must be repaired or replaced. Failure to do so can lead to permanent damage if the engine runs low on oil.

## SPARK TEST

## ▲ WARNING

Make sure no fuel has spilled on the engine and that the plug is not wet with fuel. To avoid fire hazards, do not allow sparks near the plug hole. Never hold the spark plug lead with wet hands while performing this test.

1. Turn the battery switch to the ON position. Verify that the low oil indicator is not illuminated. If ON, add oil to bring the level to the upper limit.
2. Remove the maintenance cover.
3. Clamp the carburetor inlet fuel line and drain the carburetor float bowl.
4. Remove spark plug and pull on the starter rope several times to remove any unburned fuel from the combustion chamber.
5. Install the spark plug to the plug boot.
6. Turn the battery switch to the ON position.
7. Ground the negative electrode (threaded part) of the spark plug to the cylinder head cover.
8. Pull the recoil handle and check for spark at the spark plug. If there is no spark, replace the spark plug with a new one and recheck for spark.

## CHECK NO LOAD VOLTAGE AND FREQUENCY

1. Disconnect or turn OFF all electrical loads connected to the generator.
2. Set a volt meter to measure AC voltage.
3. Reset all circuit breakers to the ON position.
4. Start the engine and let it stabilize and warm up.
5. Place the meter test leads into an outlet.
6. Read the AC voltage.
7. Connect an AC frequency meter.
8. Read the AC frequency.

# TEST PROCEDURES

## CHECK LOAD VOLTAGE AND FREQUENCY

Perform this test in the same manner as Check No Load Voltage and Frequency, but apply a load to the generator equal to its rated capacity. With load applied check voltage and frequency. Frequency should not drop below about 59 Hertz with the load applied.

Voltage should not drop below about 120 VAC with load applied.

### RESULTS

1. If voltage and/or frequency drop excessively when the load is applied, continue troubleshooting the engine.
2. If load voltage and frequency are within limits, end tests.

## CHECK LOAD WATTS & AMPERAGE

Add up the wattages or amperages of all loads powered by the generator at one time. If desired, a clamp-on ammeter may be used to measure current flow.

If the unit is overloaded, reduce the load.

## CHECK MAIN CIRCUIT BREAKER

The generator has circuit breakers located on the control panel. If outlets are not receiving power, make sure the breakers are set to ON or "Closed". If a breaker is suspected to have failed, perform the following test.

1. Set a Volt meter to measure resistance.
2. With the generator shut down, disconnect all wires from the suspected circuit breaker terminals to prevent interaction.
3. With the generator shut down, connect one meter test lead to a one terminal of the breaker and the other meter test lead to the other terminal.
4. Set the breaker to its ON or "Closed" position. The meter should read CONTINUITY.
5. Set the breaker to its OFF or "Open" position and the meter should indicate INFINITY.

### RESULTS

1. If the circuit breaker tests good, continue with troubleshooting.
2. If the breaker tests bad, it should be replaced.

## MEASURE STATOR OUTPUT VOLTAGE WHILE RUNNING

Unplug the connector from the inverter and start the engine, check voltage between pins 1 & 4, between pins 2 & 4, and between pins 1 & 2. Note, the engine will be running at a high RPM.

There should be approximately 300 VAC at each test

with the engine running at high speed. If one or more of the three tests fail, the problem is either a damaged wire harness or a defective alternator. If the wire harness is the problem, look for and repair the damage.

If the alternator is the problem, the stator will need to be replaced. If all three tests are OK, the problem is likely the inverter.

## CARBURETOR INSPECTION

Use the following procedure to access and disassemble the carburetor for inspection.

1. Make sure engine is off and the generator is cold.
2. Drain all fuel from the fuel tank and the carburetor float. Refer to the Maintenance section for instructions.
3. Remove the air filter cover by unlocking the two locks and pulling off.



4. Remove the foam filter holder by removing the bolts.



# TEST PROCEDURES

5. Remove bolt holding carbon canister rack and pull out.



6. Pull out the breather tube from air filter assembly and then remove the air filter base



7. Remove the stepper motor assembly and the air gasket.



8. Remove the throttle lever and the spring C.



9. Remove the wire tie and wire clamp that fix the tube and wire harness.



10. Remove the low pressure hose and the fuel hose by squeezing clamp and pulling off.



11. Remove the bolt on the bottom of the carburetor float.



## ⚠ WARNING

There may be some gasoline left in the float so make sure to place container under to catch any remaining fuel.

# TEST PROCEDURES

## STATOR INSPECTION

### DC CHARGING WINDING

Measure the resistance between the two blue terminals.  
**Blue-Blue, 0.0765~0.0935  $\Omega$**

### SUB WINDING

Measure the resistance between the two sub winding terminals.  
**White-White, 0.198~0.242  $\Omega$**

### MAIN WINDING

Measure the resistance between each of the main winding terminals.  
**Black-Black-Black, 0.459~0.561  $\Omega$**

## NO OR LOW AC OUTPUT

### ⚠ WARNING

High voltage and electrical current present. Touching the non-insulated portions of the meter leads or generator wiring can cause shock or electrocution. Wear insulated gloves and avoid handling non-insulated wiring.

Use a load bank to verify the customer's initial complaint and the generator's performance after the repairs.

1. With the engine running, check that the overload indicator light is OFF and the AC circuit protector is ON.
2. Check the AC output indicator light. If ON, inspect the AC receptacle or wiring to the receptacle. If OFF, procedure below.
3. Remove the maintenance cover.
4. Disconnect the 6-pin connector. With the 6-pin connector disconnected, the ECO mode will not operate.
5. Manually set the RPM by moving the throttle lever with your finger.

## THROTTLE STEPPER MOTOR

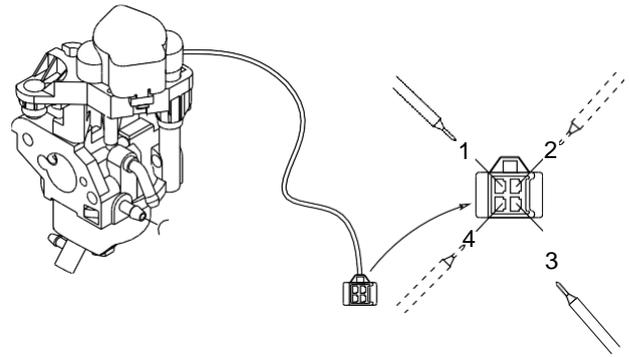
Measure the resistance of stepper motor lead-out wire.

### STANDARD RESISTANCE

Between 1 and 3 50~60 $\Omega$

Between 2 and 4 50~60 $\Omega$

Replace the stepper motor if the resistance exceeds the above range.



## OPERATION CHECK

Start the engine and stop it. Make sure that the throttle stepper motor functions and the carburetor throttle arm moves properly.

- At start: Returns from the full open position to the full close position.
- At stop: Returns to the full open position.

If the throttle stepper motor does not operate properly, replace.

## AUTOMATIC CHOKE INSPECTION/ADJUSTMENT

The choke on the operates automatically. When the unit is off, the choke will return to the closed position.

The automatic choke consists of the back pressure check valve and the vacuum pot, figure 1.

Items to check if the automatic choke fails to operate.

- Check all vacuum hoses for cracks or damage, replace as necessary.
- Check the back pressure check valve for leaks or a defective diaphragm.
- Check all choke linkage to insure it operates smoothly and that the choke closes and opens fully.
- To insure that the choke is closing fully, remove the filter and check the choke. Loosen the set screw and make sure that the butterfly closes completely, then re-tighten the set screw.
- To check the vacuum pot for leaks, disconnect the vacuum hose from the barbed fitting.

Move the choke lever to the open position and block off the barbed fitting on the choke pot, figure 2. The choke should stay in the open position as long as the fitting is closed off.

# TEST PROCEDURES

## RECOIL STARTER

### DISASSEMBLY/ASSEMBLY

#### ⚠ CAUTION

Drain all gasoline from the fuel tank before disassembly. Keep the unit away from all heat, flame and sparks.

1. Disconnect the battery.
2. Remove front and rear panels.
3. Remove the left and right covers.
4. Drain all gasoline from the fuel tank.
5. Remove the fuel tank and the inverter.
6. Remove (3) M6 flange bolts and the recoil starter.
7. Reinstall the inverter side covers and end panels.

### STARTER MOTOR DISASSEMBLY

1. Disconnect the battery.
2. Remove front and rear panels.
3. Remove the left and right covers
4. Using an 8mm socket remove 2-mounting bolt.
5. Remove the starter and the cable.

### STARTER SOLENOID

1. Using a volt ohm meter, check the resistances of the electromagnetic coil of the starter relay by connecting the red positive lead to the ¼" spade and the black negative lead to the metal body of the relay.

### RESISTANCE Ω

2. Check the function of the start relay by connecting 12 volts + to the ¼" spade terminal and 12 volts negative to the metal base or body. There should be a clicking sound as the relay is activated. While the relay remains activated, use the volt ohm meter check continuity between the two lugs. If there is no continuity the relay is defective.

**Note:** There must only be continuity between the battery and the starter terminals when the relay is activated.

### IGNITION COIL

#### INSPECTION

1. Remove the control panel and locate the 2-pin primary coil plug with a Blue and Black wire and unplug it from the control panel.

#### PRIMARY RESISTANCE

2. Attach the two leads of tester to the Blue and Black wires and measure the primary resistance of the ignition coil.

3. If there is no resistance, check for continuity between the black wire and chassis ground. If there is no continuity repair or correct as necessary.

4. Replace the coil if there is no resistance or the value is outside of the values shown.

#### SECONDARY RESISTANCE

5. To check the secondary resistance, attach one lead of the tester to the black wire of the primary plug of the ignition coil and the other lead to the spark plug cap.

6. If there is no resistance remove the spark plug cap and check the lead itself.

7. Replace the spark plug cap or coil if there is no resistance or the value is outside of the values shown.

### THROTTLE STOP SCREW

Install the throttle stop screw after installing the pilot jet.

1. Install so that the throttle valve is at the full closed position and the screw end does not come out of the bracket.

2. Start the engine, turn the ECO throttle switch on. Wait until the engine warms up.

3. Turn the throttle stop screw in until the engine speed starts to increase: then turn the screw out 3/5 turns.

### IGNITION COIL/DISASSEMBLY

1. Disconnect the battery if applicable.

2. Remove front and rear panel.

3. Remove the left and right cover.

4. Remove the fuel tank and the inverter.

5. Remove the inlet fan cover.

#### ADJUSTMENT

Adjust the clearance between the ignition coil and the outer magnet trigger of the rotor.

1. Loosen the ignition coil bolts and Insert a feeler gauge between the ignition coil and the permanent magnet of the rotor, (Both sides need to be adjusted equally) and re-tighten the bolts.

2. Rotate the rotor to make sure there is interference with the flyweights.

### STEPPER MOTOR CONNECTIONS

Check the stepper motor connections on the inverter for debris or damaged/bent pins.

Measure the resistance of the step motor lead-out wire. Replace the step motor if the resistance exceeds the

# TEST PROCEDURES

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ranges shown.

## **ECO SWITCH / IGNITION SWITCH**

Check for continuity between the switch terminals. There must be no continuity with the switch turned ON, and continuity with the switch turned OFF.

## **AC CIRCUIT BREAKER**

There must be continuity with the switch turned ON. There must be no continuity with the switch turned OFF.

## **AC RECEPTACLE**

Connect both terminals of the receptacle with a jumper wire to short. There must be continuity between the lead wire terminals.

There must be no continuity between the ground terminal of the receptacle and the receptacle installation fitting.

## **FLOAT LEVEL HEIGHT**

With the carburetor in an upright position, measure the distance between the float top and carburetor body when the float just contacts the float valve.

Standard float height: 12.00 mm (0.47in)

If the height is outside the specification, replace the float. Check the float operation.

# MAINTENANCE

## MAINTENANCE

### ⚠ WARNING

Accidental start-up. Disconnect the spark plug boot from the spark plug when performing maintenance on the generator.

## MAINTENANCE SCHEDULE

Regular maintenance will improve performance and extend the service life of the generator. Follow the hourly or calendar intervals, whichever occurs first. More frequent service is required when operating in adverse conditions as noted below.

<b>Before Each Use</b>
Check engine oil
<b>After First 25 Hours or First Month</b>
Change engine oil
<b>After 50 Hours or Every 6 Months</b>
Change engine oil <sup>1</sup> Clean air filter <sup>2</sup>
<b>After 100 Hours or Every 6 Months</b>
Inspect/clean spark arrestor Inspect/clean spark plug Replace fuel filter <sup>3</sup> Inspect/adjust valve clearance <sup>3</sup>
<b>After 300 Hours or Every Year</b>
Replace spark plug Replace air filter

<sup>1</sup> Change oil every month when operating under heavy load or in high temperatures.

<sup>2</sup> Clean more often under dirty or dusty conditions. Replace air filter if it cannot be adequately cleaned.

<sup>3</sup> Recommend service to be performed by authorized Cummins service dealer.

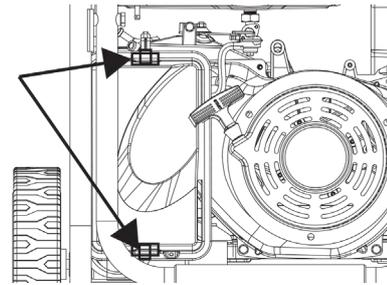
## AIR FILTER MAINTENANCE

### ⚠ WARNING

Fire hazard. Never use gasoline or other flammable solvents to clean the air filter. Use only household detergent soap to clean the air filter.

The air filter must be cleaned after every 50 hours of use or six months (frequency should be increased if the generator is operated in a dusty environment).

1. Place the generator on a level surface and allow the engine to cool for several minutes.
2. Release the top and bottom clips then remove the air filter cover.



3. Remove the air filters. Use compressed air to clean the coarse air filter.

**Note:** The foam air filter element is oil soaked. Use an appropriate cleaning container.

### NOTICE

Avoid skin contact with engine oil. Wear protective clothing and equipment. Wash all exposed skin with soap and water.

4. Remove the foam air filter and wash it by submerging the element in a solution of household detergent soap and warm water. Slowly squeeze the foam to thoroughly clean.

### NOTICE

**DO NOT** twist or tear the foam air filter element during cleaning or drying. Only apply slow but firm squeezing action.

5. Rinse the air filter element by submerging it in fresh water and applying a slow squeezing action. Allow the filter to dry thoroughly.

### NOTICE

**DO NOT** pollute. Follow the guidelines of the EPA or other governmental agencies for proper disposal of hazardous materials. Consult local authorities or reclamation facility.

6. Dip the foam air filter in clean engine oil then squeeze out all excess oil. The engine will smoke when started if too much oil is left in the filter.
7. Install the foam air filter in the housing, then the coarse air filter. Install the air cleaner cover and secure with the cover clips.

# MAINTENANCE

## ENGINE OIL LEVEL CHECK

### ⚠ CAUTION

Avoid skin contact with engine oil. Wear protective clothing and equipment. Wash all exposed skin with soap and water.

### NOTICE

Always use the specified engine oil. Failure to use the specified engine oil can cause accelerated wear and/or shorten the life of the engine.

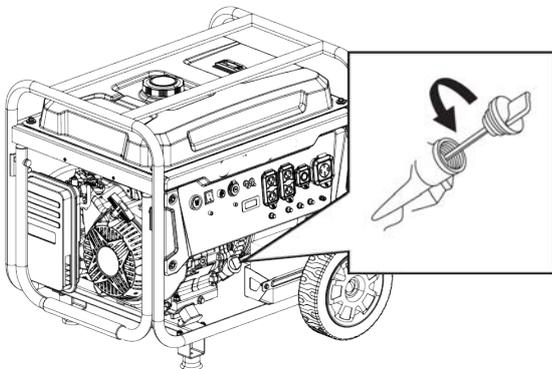
When using the generator under extreme, dirty, dusty conditions or in extremely hot weather, change the oil more frequently.

Ambient air temperature will affect engine oil performance. Change the type of engine oil used based on weather conditions.

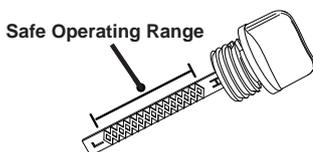
Recommended Engine Oil Type									
		10W-30							
	5W-30						10W-40		
	5W-30 Synthetic								
°F	-20	0	20	40	60	80	100	120	
°C	-28.9	-17.8	-6.7	4.4	15.6	26.7	37.8	48.9	
	Ambient temperature								

Check the engine oil level before each use or every 100 hours of operation.

1. Place the generator on a level surface and allow the engine to cool for several minutes.
2. Remove the oil access cover.
3. With a damp rag, clean around the oil dipstick.
4. Remove the oil dipstick and wipe the dipstick clean.



5. Screw the dipstick fully into the filler neck. Remove the dipstick and verify that the oil level is within safe operating range.



6. If low, add recommended engine oil incrementally and recheck until the level is between the L and H marks on the dipstick. DO NOT overfill. If over the full mark on dipstick, drain the oil to reduce oil level to the full mark on dipstick.

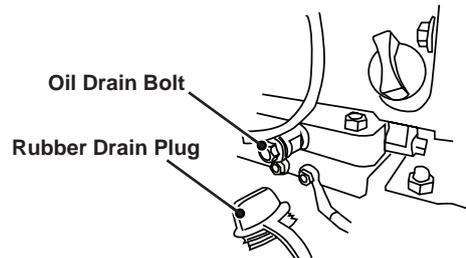
7. Replace the oil dipstick and hand-tighten.

8. Install the oil access cover.

## ENGINE OIL CHANGE

When using the generator under extreme, dirty, dusty conditions or in extremely hot weather, change the oil more frequently. Change the oil while the engine is still warm from operation.

1. Place the generator on a level surface and allow the engine to cool for several minutes.
2. Remove the engine service cover. Disconnect the spark plug wire from the spark plug and place the wire where it cannot contact the spark plug.
3. Remove the oil access cover.
4. With a damp rag, clean around the oil dipstick. Remove the dipstick and wipe clean.
5. Remove the rubber plug under the oil drain bolt and place an oil pan (or suitable container) under the drain hole.
6. Using a 10mm wrench, remove the oil drain bolt and allow the oil to drain.



7. Install the oil drain plug and tighten securely. Install the rubber plug.

**Note:** A new oil drain plug crush washer is recommended at each oil change.

8. Slowly pour oil into the oil fill opening until the level is between the L and H marks on the dipstick. Stop frequently to check the oil level. DO NOT overfill.

**Maximum oil capacity:** 0.63 US qt (0.60 L)

9. Replace the dipstick and hand-tighten.

10. Connect the spark plug wire and install the engine service cover.

# MAINTENANCE

## NOTICE

Do not pollute. Follow the guidelines of the EPA or other governmental agencies for proper disposal of hazardous materials. Consult local authorities or reclamation facility.

## SPARK PLUG MAINTENANCE

Inspect and clean the spark plug after every 100 hours of use or six months. Replace the spark plug after 300 hours of use or every year.

## NOTICE

**ALWAYS** use the Cummins OEM or compatible non-resistor-type spark plug. Use of resistor-type spark plug can result in rough idling, misfire, or may prevent the engine from starting.

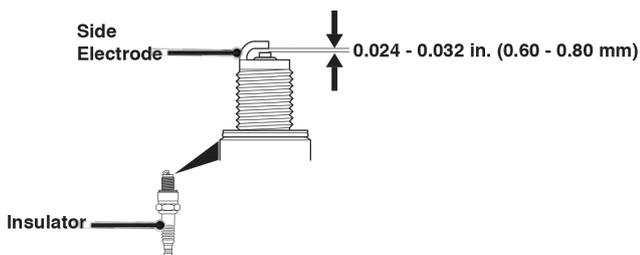
1. Place the generator on a level surface and allow the engine to cool.
2. Remove the engine service cover.
3. Remove the spark plug boot by firmly pulling the spark plug boot directly away from the engine.
4. Clean the area around the spark plug.
5. Remove the spark plug with the included spark plug socket wrench.

## NOTICE

Never apply any side load or move the spark plug laterally when removing the spark plug.

6. Inspect the spark plug. Replace if electrodes are pitted, burned, or the insulator is cracked. Only use a recommended replacement plug.
7. Measure the spark plug electrode gap with a wire-type feeler gauge. If necessary, correct the gap by carefully bending the side electrode.

**Spark plug gap:** 0.024 – 0.032 in. (0.60 – 0.80 mm)

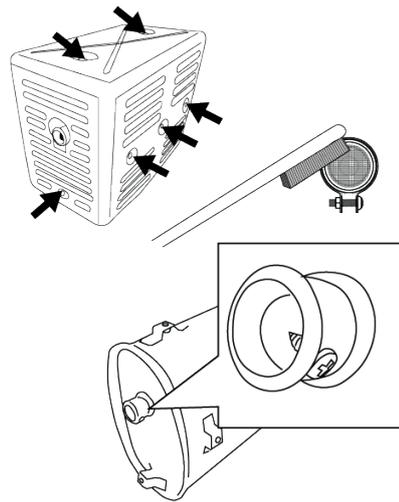


8. Carefully install the spark plug finger tight, then tighten as additional 3/8 to 1/2 turn with the spark plug wrench.
9. Install the spark plug boot and engine service cover.

## SPARK ARRESTOR SERVICE

Check and clean the spark arrestor after every 100 hours of use or six months. Failure to clean the spark arrestor will result in degraded engine performance.

1. Place the generator on a level surface and allow the muffler to cool before servicing the spark arrestor.
2. Remove the cover screws and the muffler cover. Use a screw driver to remove the spark arrestor.
3. Carefully remove the carbon deposits from the spark arrestor screen with a wire brush. The spark arrestor must be free of breaks and tears. Replace the spark arrestor if damaged.



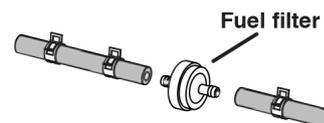
4. Reinstall the spark arrestor and muffler cover.

## FUEL FILTER

Replace the fuel filter after 100 hours of use.

**Note:** Have an appropriate gasoline container and rags ready to catch residual fuel in the filter and fuel line.

1. Allow the generator to cool completely.
2. Turn the fuel valve to the OFF position.



3. Note the orientation of the fuel filter. Using pliers, remove the fuel line clamps and remove the fuel filter.
4. Install the new fuel filter in the reverse order of removal.

# MAINTENANCE

## BATTERY MAINTENANCE

The battery shipped with the generator has been fully charged. A battery may lose some charge when not in use for prolonged periods of time. If the battery is unable to crank the engine, plug the included 12V charger into the battery charging port on the control panel.

**Note:** If the generator is not run, charge the battery overnight once a month.

### ⚠ CAUTION

The supplied battery charger is not a trickle charger and is not intended for continuous use. Do not use the battery charger for more than 8 hours (overnight) to prevent overcharging the battery.

**Note:** Once started, the generator will charge the battery after 30–60 minutes of use. If you do not regularly run the generator, charge the battery overnight once a month to keep it ready for use. Charge the battery in a dry location. Plug the charger into the battery charging port on the control panel. Plug the wall receptacle end of the battery charger into a 120 Volt AC wall outlet.

5. Unplug the battery charger from wall outlet and control panel jack after 8 hours of charging.

## BATTERY REPLACEMENT

**Battery, 12V/6.5 Ah**

### ⚠ WARNING

Burn hazard. The battery contains sulfuric acid (electrolyte) which is highly corrosive and poisonous. Wear protective clothing and eye protection when working near the battery. Keep children away from the battery.

### ⚠ CAUTION

Battery posts, terminals contain lead and lead compounds. Wash hands after handling.

1. Loosen and remove the bolt on the battery hold-down plate and swing the plate out.
2. Disconnect the quick-connect plugs and remove the battery from the unit.
3. Disconnect the quick-disconnect cable leads from the battery.
4. On the replacement battery, connect the white (-) quick-connect cable to the battery negative terminal. Slide the rubber boot over the connection hardware.
5. Connect the red (+) quick-connect cable to the battery positive terminal.

6. Slide the rubber boot over the connection hardware.
7. Install the battery into the generator. Reinstall the battery hold-down plate and tighten the bolt.
8. Connect the quick-connect plug.

### NOTICE

Dispose of the used battery properly according to the guidelines established by your local or state government.

## STORAGE

Proper storage preparation is required for trouble-free operation and generator longevity.

### NOTICE

Gasoline stored for as little as 30 days can deteriorate, causing gum, varnish, and corrosive buildup in fuel lines, fuel passages and the engine. This corrosive buildup restricts the flow of fuel, which can prevent the engine from starting after a prolonged storage period. The use of fuel stabilizer significantly increases the storage life of gasoline. Full-time use of fuel stabilizer is recommended. Follow the manufacturer's instructions for use.

STORAGE TIME	RECOMMENDED PROCEDURE
Less than 1 month	No service required.
2 to 6 months	Fill with fresh gasoline and add gasoline stabilizer. Drain the carburetor float bowl.
6 months or longer	Drain the fuel tank and carburetor float bowl.

## SHORT TERM STORAGE

- Allow the generator to cool a minimum of 30 minutes before storage.
- Replace all protective covers on the generator control panel.
- Wipe the generator with a moist cloth. Clean any debris from the air inlets under the control panel and muffler cooling vents.
- Store the generator in a well-ventilated, dry location away from sparks, open flames, pilot lights, heat, and other sources of ignition such as areas with a spark-producing electric motor or where power tools are operated.
- Do not store the generator or gasoline near furnaces, water heaters, or any other appliances that produce heat or have automatic ignitions.
- With the engine and exhaust system cool and all surfaces dry, cover the generator to keep out dust. Do not use a plastic sheet as a dust cover. Non-porous materials trap moisture and promote rust and corrosion.

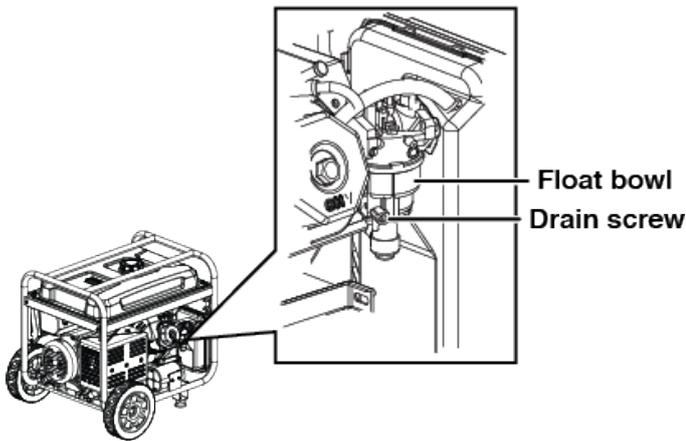
# MAINTENANCE

## LONG TERM STORAGE

Even properly stabilized fuel can leave residue and cause corrosion if left long term. If storing the generator for two to six months, drain the float bowl to prevent gum and varnish buildup in the carburetor.

### DRAINING THE FLOAT BOWL

1. Turn the fuel tank valve to the OFF position.
2. Locate the drain hose extending from the bottom of the carburetor float bowl.



3. Place an appropriate gasoline container under the drain screw to catch the drained fuel.
4. Loosen the float bowl drain screw and allow the fuel to drain. Tighten the float bowl drain screw.

### DRAINING THE FUEL TANK

If storing the generator for longer than six months, drain the fuel tank to prevent fuel separation, deterioration, and deposits in the fuel system.

1. Unscrew the fuel tank cap. Remove the fuel screen filter by slightly compressing it while removing it from the tank.
2. Using a commercially available gasoline hand pump (not included), siphon the gasoline from the fuel tank into an approved gasoline container. DO NOT use an electric pump.
3. Reinstall the fuel screen filter and the fuel tank cap.
4. Start the generator and allow it to run until the generator engine stops.
5. Push the battery switch to the OFF position.
6. Disconnect the battery quick-connect plugs.
7. Remove the spark plug.
8. Put a teaspoon of engine oil into the cylinder and pull the recoil handle until resistance is felt. At this position the piston is coming up on its compression stroke and both valves are closed. Storing the engine in this position will

help prevent internal corrosion. Return the recoil handle gently.

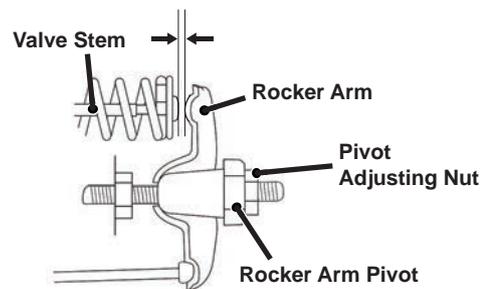
9. Reinstall the spark plug. Leave the spark plug boot disconnected to prevent accidental starting.

## VALVE CLEARANCE

### NOTICE

Checking and adjusting valve clearance **must** be done when the engine is cold.

1. Remove the rocker arm cover and carefully remove the gasket. If the gasket is torn or damaged, it **must** be replaced.
2. Remove the spark plug so the engine can be rotated more easily.
3. Rotate the engine to top dead center (TDC) by pulling the recoil handle slowly. Looking through the spark plug hole, the piston should be at the top (both valves are closed).
4. Both the rocker arms should be loose at TDC on the compression stroke. If they are not, rotate the engine 360°.
5. Insert a feeler gauge between the rocker arm and the valve stem to measure valve clearance.



	Intake Valve	Exhaust Valve
Valve Clearance	0.0031 – 0.0047 in (0.08 – 0.12 mm)	0.0051 – 0.0067 in (0.13 – 0.17 mm)
Torque	8-12 N•m	8-12 N•m

6. If an adjustment is necessary, hold the rocker arm pivot and loosen the pivot adjusting nut.
7. Turn the rocker arm pivot to obtain the specified clearance. Hold the rocker arm pivot and re-tighten the pivot adjusting nut to the specified torque.

**Torque: 106 inch-pound (12 N•m)**

8. Perform this procedure for the other valve.
9. Install the gasket, rocker arm cover, and spark plug.

# HAK INSTALLATION GUIDE

## HIGH-ALTITUDE KIT INSTALLATION GUIDE

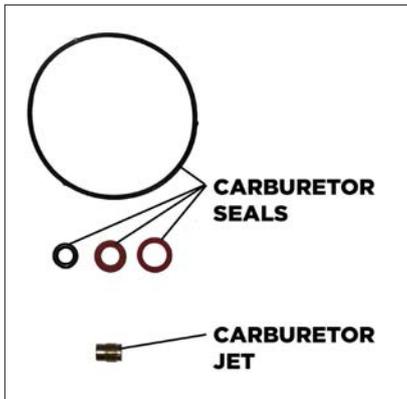
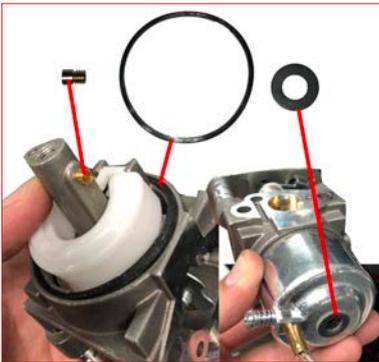
The P9500DF requires TWO kits for high-altitude installation: the high-altitude kit, and the propane regulator jet altitude kit. Instructions for both are included here.

### ⚠ WARNING

Before performing any maintenance make sure the engine is cold and the boot is removed from the spark plug.

### INCLUDED IN THIS KIT

**HIGH-ALTITUDE KIT FOR 98CC GASOLINE INVERTER**  
- Part No. A058V084



### FOUR DIFFERENT CARBURETOR JETS INCLUDED



## ALTITUDE RANGE

Altitude Range	Kit Part Number	Number on Jet
0-2000ft	Not required	NA
2000-3000ft	A058V084 - A	58
3000-5000ft	A058V084 - B	57
5000-6000ft	A058V084 - C	56
6000-7000ft	A058V0 - D	55

### NOTICE

- This high-altitude kit is to be used at elevations above 2000 feet.
- At elevations above 7000 feet, the engine may experience decreased performance, even with the high-altitude kit.
- If the carburetor is replaced, the proper high-altitude kit jet will need to be installed into the replacement carburetor.
- The warranty may be void if necessary adjustments are not made for high altitude use.
- DO NOT throw away any carburetor jets. You may need them again if you change altitude of operation.

## INSTALL THE HIGH-ALTITUDE KIT

1. Make sure engine is off and the generator is cold.
2. Drain all fuel from the fuel tank and carburetor float.
3. Remove the air filter cover by unlocking the two locks and pulling off.



4. Remove the foam filter holder by removing the 6 pcs bolts.



# HAK INSTALLATION GUIDE

5. Remove bolt holding air filter assembly to the engine block.



6. Pull out the breather tube from air filter assembly and then remove the air filter base.



7. Remove the stepper motor assembly and air gasket.



8. Remove the throttle lever and the spring C.



9. Remove the wire tie and wire clamp that fix the tube and wire harness.



10. Remove the low pressure hose and the fuel hose by squeezing the clamp and pulling off.



11. Remove the bolt on the bottom of the carburetor float.

## **⚠ WARNING**

There may be some gasoline left in the float. Place a container under it to catch any remaining fuel.



# HAK INSTALLATION GUIDE

12. Using a flat head screwdriver, remove the side jet. Install the proper high altitude jet on the carburetor, and assemble the carburetor properly. The torque of bolt on carburetor is 8-10 N-m (70.81-88.51 in-lb). DO NOT DISCARD OLD CARBURETOR JET.



13. Reinstall float bowl gasket and then reinstall the float bowl. If the gasket is worn use the replacement included.

14. Reinstall the carburetor and work back from step 10 to reassemble.

**Note: If your carburetor is adjusted for high altitude do not use at low altitude as the generator will run too lean and damage the engine.**

## INSTALL THE PROPANE REGULATOR JET ALTITUDE KIT

Installation guide for propane regulator jet altitude kit for Cummins P9500df generator.

### ⚠ WARNING

Before performing any maintenance make sure the engine is cold and the boot is removed from the spark plug.

This high-altitude kit is to be used at elevations above 2000 feet.

- At elevations above 7000 feet, the engine may experience decreased performance, even with the high-altitude kit.
- If the carburetor is replaced, the proper high-altitude kit jet will need to be installed into the replacement carburetor.
- The warranty may be void if necessary adjustments are not made for high altitude use.
- DO NOT throw away any carburetor jets. You may need them again if you change altitude of operation.

## PROPANE REGULATOR KIT FOR 420CC GASOLINE GENERATOR

Determine the correct kit from the date of manufacture found in the serial number.

Example:

A058U9671219172800811

Altitude Range	Kit Part Number
0-2000ft	Not required
2000-3000ft	A058V085 - 4.2
3000-5000ft	A058V085 - 4.1
5000-6000ft	A058V085 - 4.0
6000-7000ft	A058V085 - 3.9

			
2,000-3,000ft JET 4.2	3,000-5,000ft JET 4.1	5,000-6,000ft JET 4.0	6,000-7,000ft JET 3.9

Altitude Range	Kit Part Number
0-2000ft	Not required
2000-3000ft	A065P007 - 5.6
3000-5000ft	A065P007 - 5.4
5000-6000ft	A065P007 - 5.2
6000-7000ft	A065P007 - 5.0

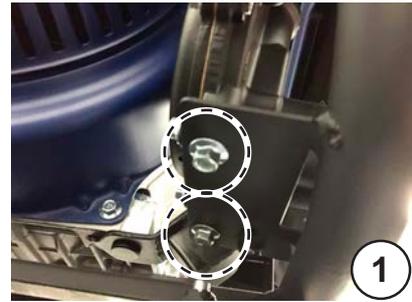
			
2,000-3,000ft JET 5.6	3,000-5,000ft JET 5.4	5,000-6,000ft JET 5.2	6,000-7,000ft JET 5.0

# HAK INSTALLATION GUIDE

1. Remove two bolts under propane regulator to remove it from its mount.
2. Remove propane connection from top regulator.
3. Remove jet from top of regulator.
4. Pick correct propane jet for desired altitude and install.

Height ASL (Above Sea Level)	Kit A058V085 Manufactured before 7/19	Kit A065P007 Manufactured 7/19 and later
0-2,000ft	Not required	Not required
2,000-3,000ft	Jet 4.2	Jet 5.6
3,000-5,000ft	Jet 4.1	Jet 5.4
5,000-6,000ft	Jet 4.0	Jet 5.2
6,000-7,000ft	Jet 3.9	Jet 5.0

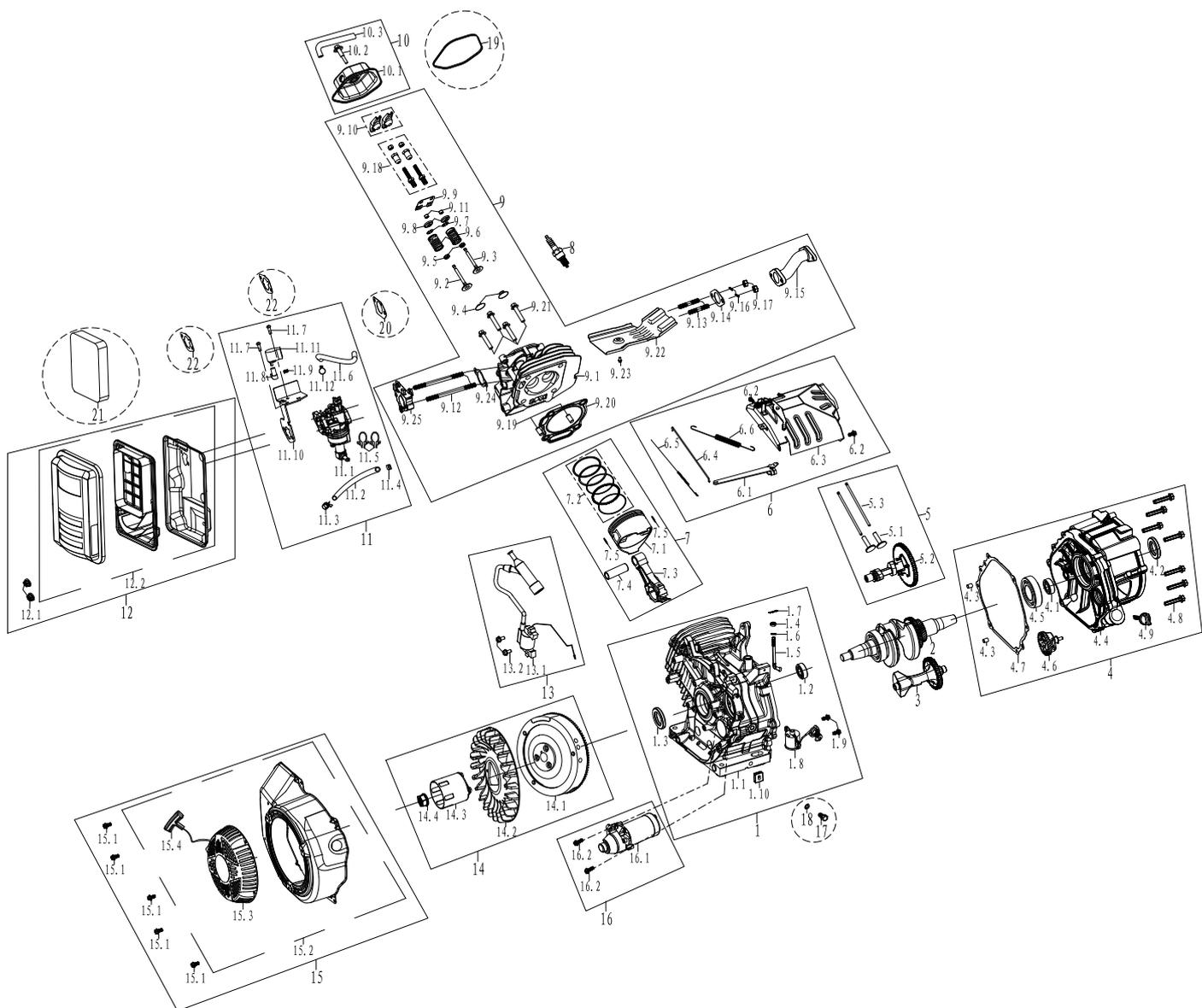
5. Reconnect propane connection at the top of the regulator.
6. Reinstall bolts on bottom of the regulator to secure it to the frame.
7. Make sure connections are air tight. Test with soapy water to make sure there are no leaks.



# EXPLODED VIEW

## EXPLODED VIEWS AND PARTS LISTS

### ENGINE EXPLODED VIEW



# EXPLODED VIEW

## ENGINE PARTS LIST

NO.	DESCRIPTION
1	CRANKCASE ASSEMBLY
1.1	CRANKCASE
1.2	BEARING
1.3	CRANKCASE OIL SEAL
1.4	SWING ROD OIL SEAL
1.5	RACKING BAR
1.6	SWINGING ROD GASKET
1.7	RETAINING CLIP
1.8	OIL SENSOR ASSEMBLY
1.9	BOLT M6X16
1.10	RUBBER CABLE BLOCK
2	CRANKSHAFT
3	BALANCE SHAFT
4	CRANKCASE COVER ASSEMBLY
4.1	BEARING
4.2	CRANKCASE OIL SEAL
4.3	CRANKCASE LOCATING PIN
4.4	CRANKCASE COVER
4.5	BEARING
4.6	CENTRIFUGAL GOVERNOR GEAR ASSEMBLY
4.7	CRANKCASE SEAL WASHER
4.8	BOLT M8X40
4.9	DIPSTICK ASSEMBLY
5	CAMSHAFT ASSEMBLY
5.1	VALVE LIFTER
5.2	CAMSHAFT ASSEMBLY
5.3	PUSH ROD
6	SPEED GOVERNOR ASSEMBLY
6.1	SPEED REGULATING ARM
6.2	BOLT M6X12
6.3	SPEED CONTROLLER
6.4	THROTTLE LEVER
6.5	SPRING C
6.6	SPRING B
7	PISTON & PISTON RING ASSEMBLY
7.1	PISTON
7.2	PISTON RING ASSEMBLY
7.3	CONNECTING ROD ASSEMBLY
7.4	PISTON PIN
7.5	PISTON PIN RING
8	SPARK PLUG
9	CYLINDER HEAD ASSEMBLY
9.1	CYLINDER HEAD
9.2	INTAKE VALVE
9.3	EXHAUST VALVE
9.4	INTAKE VALVE SPRING LOWER SEAT

NO.	DESCRIPTION
9.5	VALVE SEAL
9.6	VALVE SPRING
9.7	VALVE LOCK CLAMP
9.8	EXHAUST VALVE SPRING SEAT
9.9	VALVE RETAINER ASSEMBLY
9.10	ROCKING ARM
9.11	TOP CAP
9.12	AIR INLET STUD STUD BOLT
9.13	AIR EXHAUST STUD STUD BOLT
9.14	EXHAUST SEAL WASHER
9.15	MUFFLER CONNECTING PIPE
9.16	SPRING WASHER
9.17	NUT M8
9.18	ROCKING ARM WITH TIGHT BOLT ASSEMBLY
9.19	CYLINDER HEAD LOCATING PIN
9.20	CYLINDER HEAD GASKET
9.21	BOLT M10X80
9.22	WIND-LEAD-COVER
9.23	BOLT M6X12
9.24	INTAKE GASKET
9.25	CARBURETOR CONNECTION BLOCK
10	CYLINDER HEAD COVER ASSEMBLY
10.1	CYLINDER HEAD COVER
10.2	CYLINDER HEAD COVER FASTENING BOLT
10.3	BREATHER TUBE
11	CARBURETOR ASSEMBLY
11.1	CARBURETOR ASSEMBLY
11.2	FUEL HOSE
11.3	FUEL LINE CLAMP
11.4	FUEL LINE RUBBER SLEEVE
11.5	Q-SHAPE CABLE CLIP
11.6	LOW PRESSURE HOSE
11.7	CROSS SCREW STUD M4*8
11.8	STEPPER MOTOR DRIVE SHAFT
11.9	SPRING
11.10	BRACKET
11.11	STEPPER MOTOR
11.12	LOW PRESSURE HOSE HOOP
12	AIR FILTER ASSEMBLY
12.1	NUT M6
12.2	AIR FILTER ASSEMBLY
13	IGNITER ASSEMBLY
13.1	IGNITER ASSEMBLY
13.2	BOLT M6X25
14	FLYWHEEL ASSEMBLY
14.1	FLYWHEEL

# EXPLODED VIEW

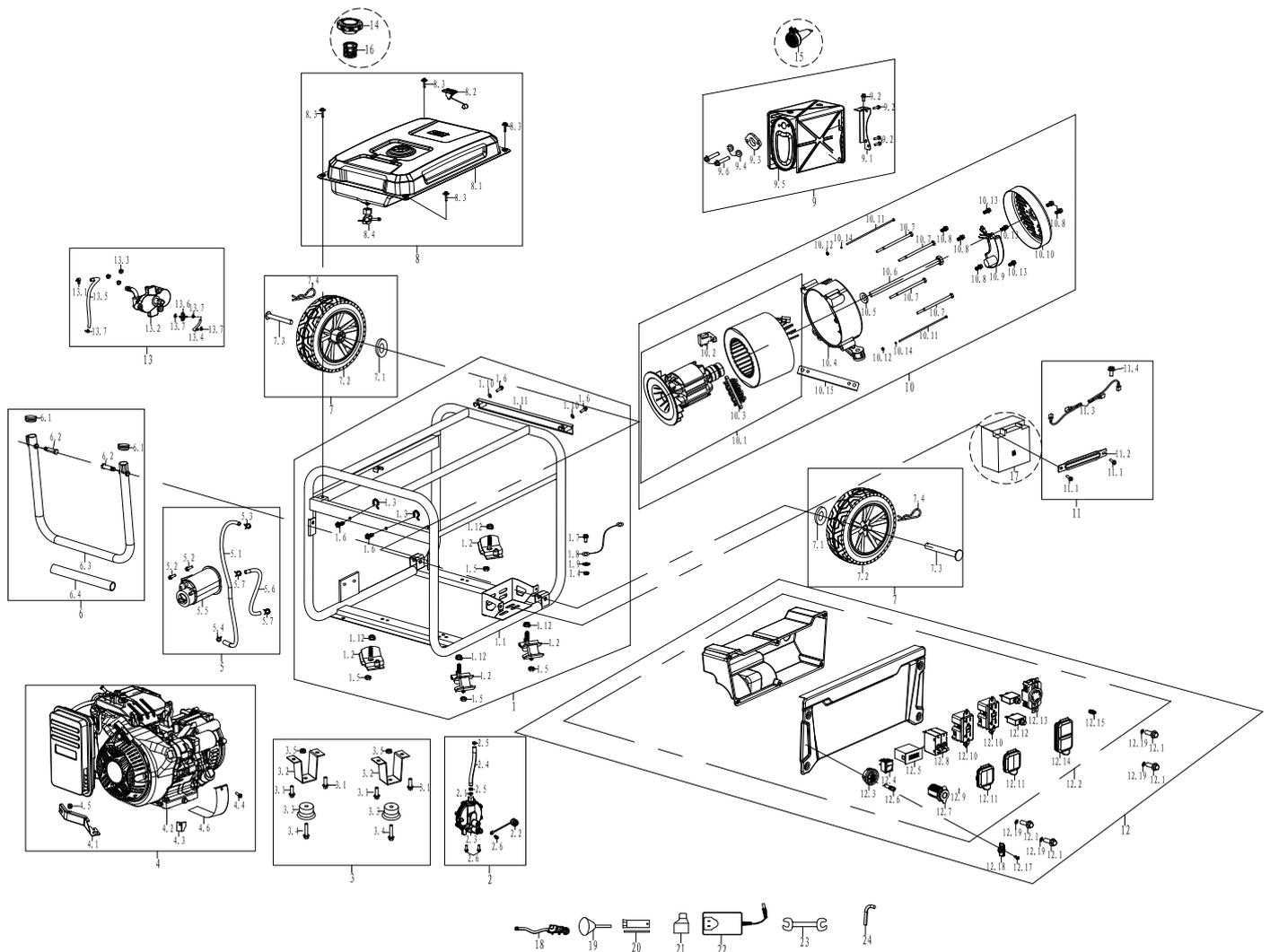
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## ENGINE PARTS LIST CONTINUED

NO.	DESCRIPTION
14.2	IMPELLER
14.3	STARTER PULLEY
14.4	FLYWHEEL NUT
15	RECOIL STARTER ASSEMBLY
15.1	BOLT M6X12
15.2	STARTER ASSEMBLY
15.3	START PULLER
15.4	PULL
16	STARTER MOTOR ASSEMBLY
16.1	STARTING MOTOR ASSEMBLY
16.2	BOLT M8*35
17	OIL DRAIN BOLT
18	OIL DRAIN BOLT WASHER
19	CYLINDER HEAD COVER SEAL WASHER
20	CARBURETOR WASHER
21	AIR FILTER
22	AIR GASKET

# EXPLODED VIEW

## GENERATOR EXPLODED VIEW



# EXPLODED VIEW

## GENERATOR PARTS LIST

NO.	DESCRIPTION
1	FRAME ASSEMBLY
1.1	FRAME
1.2	SHOCK ABSORBER
1.3	FUEL HOSE CLIP
1.4	NUT M8
1.5	NUT M8
1.6	BOLT M6X12
1.7	BOLT M8X16
1.8	FRAME WIRE
1.9	TOOTH WASHER
1.10	PAPER WASHER
1.11	ACTIVITY DISTANCE TUBE
1.12	NUT M10
2	PRESSURE REDUCING VALVE ASSEMBLY
2.1	PAPER WASHER
2.2	PROTECTIVE CASE
2.3	PRESSURE REDUCING VALVE ASSEMBLY
2.4	LOW PRESSURE HOSE
2.5	LOW PRESSURE HOSE HOOP
2.6	BOLT M6X12
3	FOOT BRACKET ASSEMBLY
3.1	BOLT M8X16
3.2	FOOT BRACKET ASSEMBLY
3.3	FOOT BRACKET SHOCK ABSORBER
3.4	BOLT M6X28
3.5	NUT M6
4	ENGINE ASSEMBLY
4.1	AIR FILTER BRACKET
4.2	ENGINE ASSEMBLY DHLG420E
4.3	DUST BOARD
4.4	BOLT M5X12
4.5	NUT M6
4.6	CRANKCASE COVER
5	CARBON CANISTER ASSEMBLY
5.1	CARBON CANISTER AND FUEL TANK CONNECTING PIPE
5.2	BOLT M6X12
5.3	FUEL HOSE CLIP
5.4	FUEL HOSE CLIP
5.5	CARBON CANISTER ASSEMBLY
5.6	CARBON CANISTER AND AIR FILTER CONNECTING PIPE
5.7	FUEL HOSE CLIP
6	HANDLE WELDING ASSEMBLY
6.1	HANDLE PLUG
6.2	BOLT M10
6.3	HANDLE

NO.	DESCRIPTION
6.4	HANDLE RUBBER SLEEVE
7	WHEEL ASSEMBLY
7.1	FLAT WASHER
7.2	WHEEL
7.3	AXLE
7.4	STOP REFUND
8	FUEL TANK ASSEMBLY
8.1	FUEL TANK
8.2	FUEL GAUGE
8.3	BOLT M6X25
8.4	FUEL SWITCH
9	EXHAUST MUFFLER ASSEMBLY
9.1	MUFFLER MOUNTING BRACKET
9.2	BOLT M8X16
9.3	MUFFLER CONNECTING PIPE GASKET
9.4	SPRING WASHER
9.5	MUFFLER
9.6	BOLT M8X30
10	ALTERNATOR ASSEMBLY
10.1	ALTERNATOR ASSEMBLY
10.2	CARBON BRUSH
10.3	TERMINAL ASSEMBLY
10.4	ALTERNATOR TAIL BRACKET
10.5	GASKET
10.6	BOLT M10X1.25X275
10.7	BOLT M6X190
10.8	BOLT M5X12
10.9	AVR
10.10	ALTERNATOR TAIL COVER
10.11	BOLT M5X230
10.12	NUT M5
10.13	BOLT M5X16
10.14	SPRING WASHER
10.15	TAIL BRACKET FIXING PLATE
11	BATTERY BRACKET ASSEMBLY
11.1	BOLT M6X12
11.2	BATTERY PRESSURE PLATE
11.3	BATTERY WIRING ASSEMBLY
11.4	BOLT M6X12
12	CONTROL PANEL ASSEMBLY
12.1	BOLT M6X12
12.2	CONTROL PANEL ASSEMBLY
12.3	ONE PUSH BUTTON SWITCH
12.4	IGNITION SWITCH
12.5	TIME ACCUMULATOR
12.6	INDICATOR LIGHT
12.7	DC SOCKET

# EXPLODED VIEW

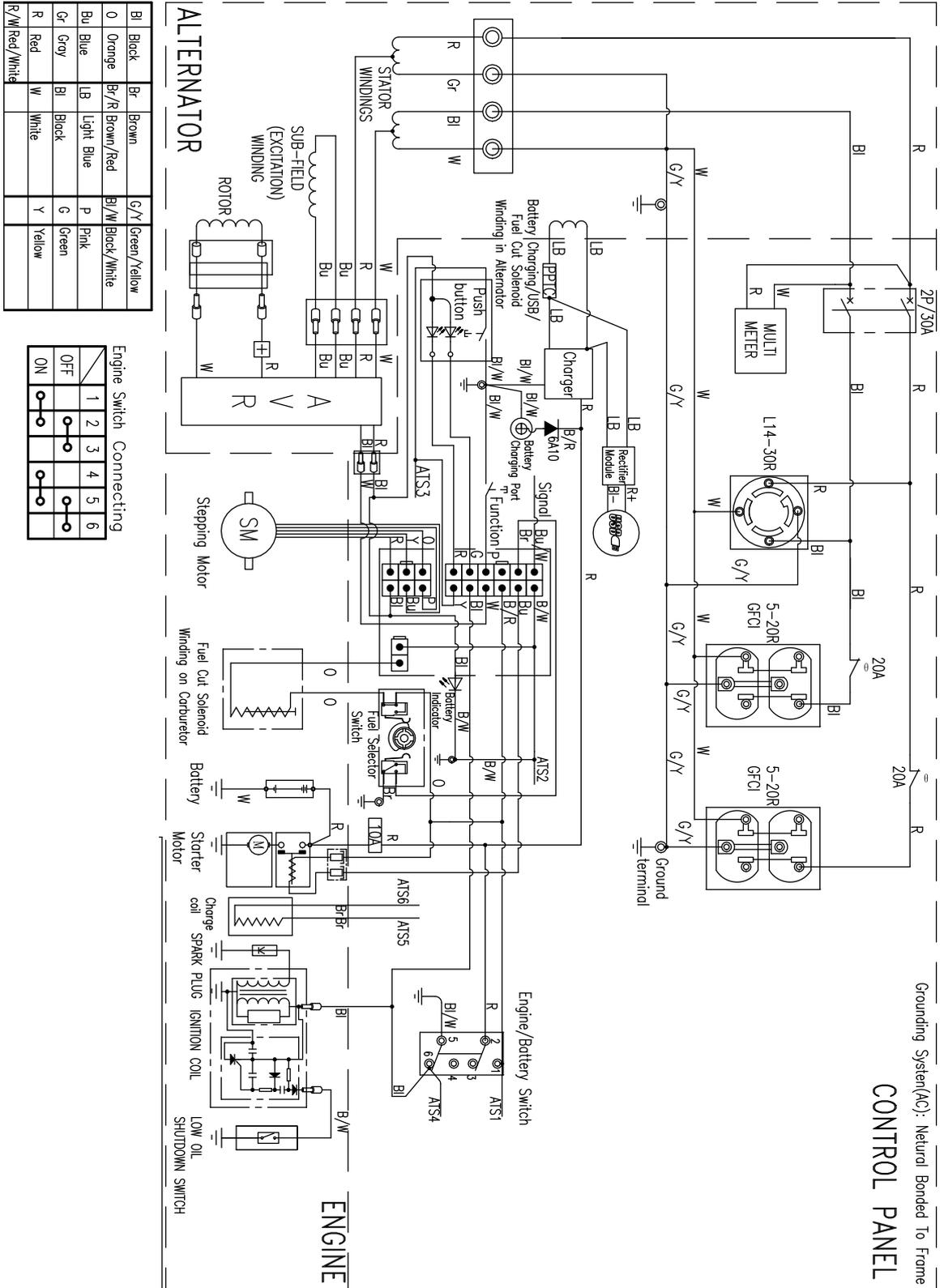
## GENERATOR PARTS LIST CONTINUED

NO.	DESCRIPTION
12.8	BREAKER
12.9	SOCKET
12.10	SOCKET
12.11	WATERPROOF CAP
12.12	THERMAL PROTECTOR
12.13	SOCKET
12.14	WATERPROOF CAP
12.15	GROUND TERMINAL ASSEMBLY
12.17	HEXAGON SOCKET PAN HEAD SCREWS
12.18	SWITCH TURNTABLE ASSEMBLY
12.19	PAPER WASHER
13	DUAL FUEL SELECTOR SWITCH
13.1	FUEL HOSE CLIP
13.2	FUEL SWITCH ASSEMBLY
13.3	NUT M5
13.4	FUEL HOSE
13.5	FUEL HOSE
13.6	FUEL FILTER
13.7	FUEL HOSE CLIP
14	FUEL CAP
15	SPARK ARRESTER
16	FUEL TANK FILTER
17	BATTERY
18	PRESSURE REDUCING VALVE
19	FUNNEL
20	SPARK PLUG WRENCH
21	OIL BOTTLE
22	CHARGER
23	WRENCH
24	NYLON BRAIDED TUBE

# SCHEMATICS

## SCHEMATICS

## SCHEMATICS



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