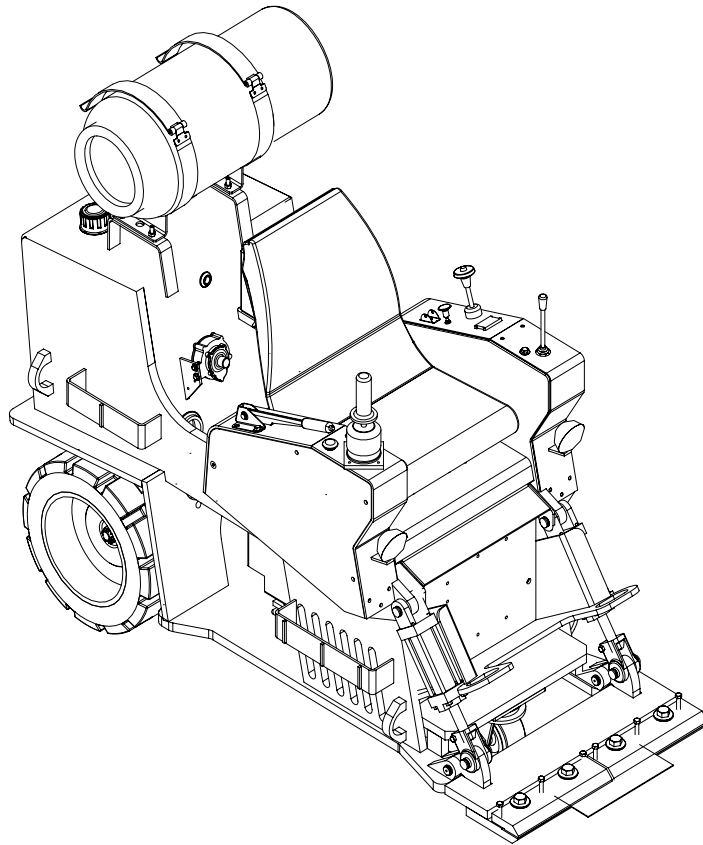


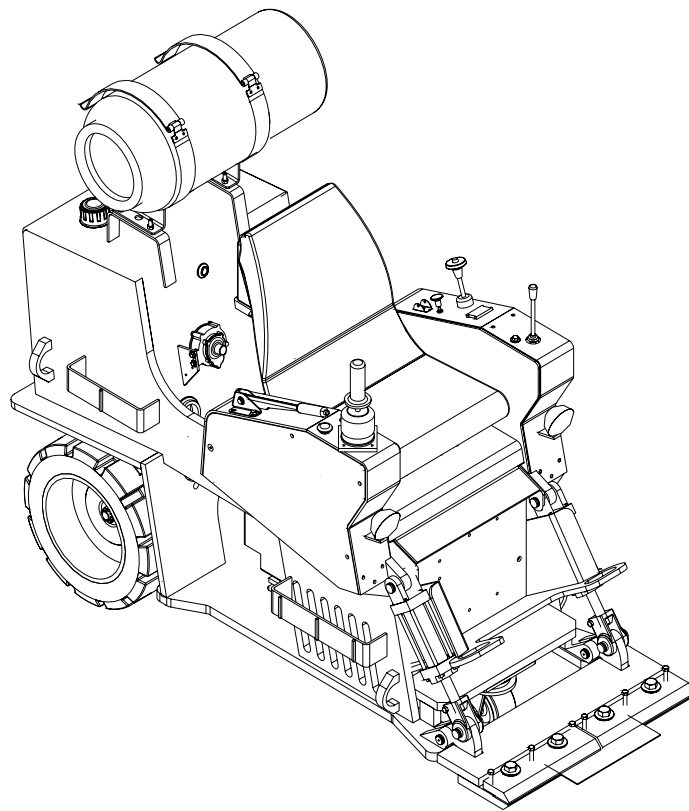
# **BLASTRAC**



**Model  
BMS – 270LP**

# **BLASTRAC**

## **Operating Instructions**



**Model**  
**BMS – 270LP**

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## **BLASTRAC LOCATIONS**

### **Headquarters/Manufacturing**

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Oklahoma City, Oklahoma 73114  
(405) 478-3440  
Fax (405) 478-5327  
(800) 256-3440

### **Service Centers**

#### **Northeast**

408 Bloomfield Drive, Unit 1  
West Berlin, New Jersey 08091  
(609) 768-7575  
Fax (609) 768-7473

#### **Midwest**

23767 C.R./Bldg B-16 Unit 2A  
Elkhart, Indiana 46514  
(877) 206-9898  
Fax (219) 259-9123

#### **Northwest**

22028 - 68<sup>th</sup> Avenue, South  
Kent, Washington 98032-0485  
(253) 395-4291  
Fax (253) 395-4287

#### **Southwest**

5220 Gaines Street  
San Diego, California 92110  
(619) 295-5505  
Fax (619) 295-0754

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## **Section 1**

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- 1.1 Rating
- 1.2 Unit Specification
- 1.3 Operative Range and Correct Usage
- 1.4 Machine Type Code

Technical Data

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## 1.1 Rating

---

Unit/Designation:           Blastrac® Multistripper

Machine Type:               BMS 270

Manufacturer:               **Blastrac**  
13201 North Santa Fe  
Oklahoma City, OK 73114

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## 1.2 Unit Specification

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Unit Specifications:

	Scraper
Length	76 inches
Width	30 inches
Height	58 inches
Weight	2,500 pounds

---

### **1.3 Operative Range and Correct Usage**

---

The BMS 270 is designed to remove VAT, VCT, ceramic tile, hardwood floors, mastic and cementitious materials from horizontal surfaces. Using this machine for purposes other than its intended use can result in equipment failure. The manufacturer will not be liable for damage resulting from such usage. The user will assume full responsibility for improper utilization.

---

### **1.4 Machine Code**

---

**BMS - 270**

**B -- lastrac**

**270 Width of Blade (27.0 inches)**

**M -- ulti**

**S -- craper**



---

## **Section 2**

---

- 2.1 Organizational Precautions
- 2.2 Safety Precautions/Operation
- 2.3 Safety Precautions/Maintenance
- 2.4 Precautions
- 2.5 “Safe” Condition
- 2.6 Caution Points

---

## 2.1 Organizational Precautions

---

The Operating Instructions should be kept in close proximity to the equipment. These instructions should be kept in a clean, dry area to use as a quick reference at all times. In addition to the Operating Instructions, general and legal information regarding accident prevention and environmental protection should be kept in the same location. This information should refer to regulations that pertain to the handling of dangerous materials or the need to wear protective clothing.

The Operating Instructions should be extended to include all necessary instructions such as supervision and notices relating to particular work practices (i.e. work organization, work procedures, staff allocation, etc.).

The personnel working with the equipment must read and understand the Operating Instructions for the BMS 270 and additional components such as the Kohler engine that are included in this manual before operation or maintenance of the equipment.

From time to time, the working practices of all personnel should be checked, especially with regard to the Safety Precautions.

Personnel operating the scraper or equipment should neither wear long, loose hair or clothing that can be caught in the equipment, nor jewelry of any kind, rings included. Personnel ignoring common safety practices risk possible injury by operating the machinery.

**All warnings and safety instructions must be kept in good readable condition.**

If the equipment exhibits any unusual change from its normal operation that may relate to its safety features, the equipment must be stopped immediately. Do not operate the machinery without a full complement of safety features.

Modifications or changes to the equipment that may compromise any safety feature should not be made without first contacting the manufacturer. These changes apply to the structure and/or the adjustment of devices that may compromise the safety characteristics of the equipment. Welding, for example, should not be performed on any supporting elements, near or on fuel tanks, or on the hydraulic oil reservoir.

---

**Safety Precautions**

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---

**2.1 Con't**

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Spare parts must comply with the technical specifications laid out by the original manufacturer. Original spare parts will comply with this requirement.

Periodic checks or inspections outlined in this instruction manual must be performed within the prescribed time limits.

Maintenance personnel should be sure they have the proper tools available to perform their assigned tasks.

The location of fire extinguishers and a working knowledge of their use is necessary.

Fire alarms must be respected and the available fire-fighting equipment should be noted.

---

## 2.2 Safety Precautions/Operation

---

### Normal Operation:

#### **Avoid any mode of operation which may impair safety!**

Take precautions to ensure that the equipment is in good working order and that it is only operated under safe conditions.

The equipment should be inspected for damage and defects at least once during every working shift. Starting and stopping procedures must be followed in accordance with the Operating Instructions. Before starting the equipment, be sure that no person is likely to be endangered by the machine movement.

**Warning!** Engine exhaust gases contain poisonous carbon monoxide. Carbon monoxide is odorless, colorless and can cause death if inhaled. Do not use equipment indoors without adequate ventilation.

---

## **2.3 Safety Precautions/Maintenance**

---

Adjustments, maintenance and inspection instructions given in the manual must be followed at the appropriate intervals as well as recommendations for the replacement of parts or assemblies. These activities must be carried out by qualified personnel.

Before carrying out any activities which affect machine operation, changes in production, the tooling or the adjustment of the equipment or any related safety device, follow the recommendations given in this instruction manual. If the equipment has been turned off completely in order to perform maintenance or repair work, precautions must be taken to ensure that it cannot be turned on inadvertently.

Before carrying out maintenance or repair work, let the engine and the exhaust system cool down, remove all traces of fat and oil, combustible fuel or cleaning fluids from the scraper, its connections and fittings, in particular. Do not use any aggressive cleaning products. Be sure that all cleaning rags are fiber free. Retighten all fittings found loose during maintenance and repair work!

If it has been necessary to dismantle safety devices during retooling, maintenance or repair work, be sure that they are reinstalled properly before starting the equipment.

Dispose of oils, liquids and used parts in accordance with local environmental regulations.

---

## 2.4 Precautions

---

### Gases, Dust, Steam, Smoke

Welding, flame-cutting and grinding work on the equipment can be done only if specifically authorized. The danger of fire or explosion exists when work of this nature is done. Begin maintenance work only when the equipment is turned off and put into its “safe” condition.

Before welding, cutting or grinding on the equipment, remove all dust and combustible materials from the area and provide adequate ventilation (risk of explosion).

When working in a confined space, adhere to the appropriate safety regulations.

Place fire extinguishers and fire blankets within easy reach.

**Warning!** Engine exhaust gases contain poisonous carbon monoxide. Carbon monoxide is odorless, colorless and can cause death if inhaled. Do not use equipment indoors without adequate ventilation.

---

## 2.5 “Safe” Condition

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### Definition:

State or condition of the equipment in which no dangerous mechanical, electrical, pneumatic or hydraulic hazards exist.

Putting the equipment into the safe condition:

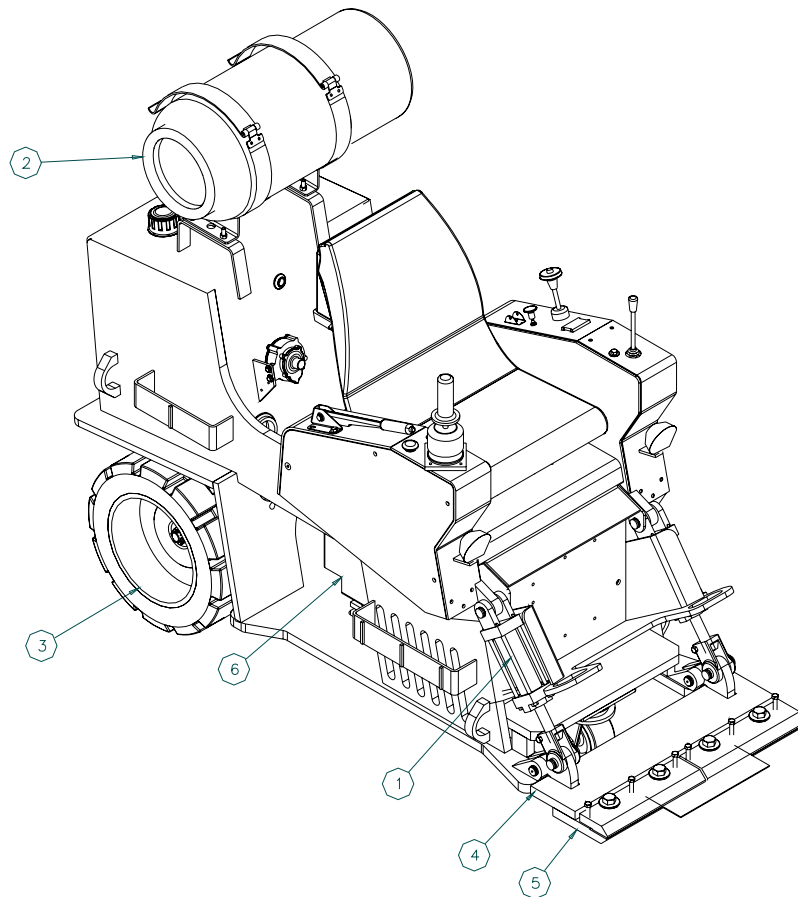
- Lower the blade.
- Turn off the ignition switch.
- Set the parking brake.
- Wait until all drives have stopped completely.
- Let the engine and exhaust system cool down.

### Safety Precautions

#### 2.6 Caution Points

Every machine that is not used in accordance with the safety recommendations can represent a danger to its operator or maintenance staff. The owner of the scraper is responsible for ensuring that the safety precautions are followed during operation and maintenance of the equipment, and that the necessary protective devices are used.

The unit has the following caution points:



1. Hydraulic Hoses
2. Flammable Fuel
3. Wheel Motion
4. Tool Movement
5. Tool
6. Hot Engine and Exhaust System



---

## **2.6 Con't**

---

Only use tools that are in good operating condition. Damaged tools should be replaced whenever possible.

Be certain that you and/or the personnel that work with the equipment have the proper clothing and accessories. These include gloves, goggles, safety shoes and other protective devices.

Be sure that the machine operators and maintenance personnel are familiar with the following:

- ❑ Lubrication, cleaning and repair work can only be done when the equipment is fully de-energized.
- ❑ Be sure that the equipment cannot be energized while any maintenance is being performed.
- ❑ Do not remove protective covers, panels, guards or open doors while any moving parts are energized.
- ❑ Be sure to replace all doors, panels and safety devices once maintenance is finished.
- ❑ Do not touch any moving parts or stand in their path.
- ❑ Before restarting the equipment, be certain that all personnel are clear of any danger zones.
- ❑ Before restarting the equipment, be certain that the engine and the exhaust system have cooled down.

---

## **Section 3**

---

- 3.1 Introduction
- 3.2 Operating Instructions
- 3.3 Attendance and Maintenance
- 3.4 Scope of Delivery
- 3.5 Description
- 3.6 Operating Elements
- 3.7 The Tools

---

## 3.1 Introduction

---

Blastrac wants to thank you for your decision to purchase the BMS 270 for your horizontal floor surface preparation needs.

The BMS 270 is designed to remove coatings, VAT, VCT, ceramic tile, wood flooring, carpeting and cementitious material from a variety of horizontal surfaces.

---

## 3.2 Operating Instructions

---

This manual has been written to support the operating and maintenance personnel. A good understanding of this manual will result in optimum equipment performance and proper maintenance techniques.

**For this reason, it is very important that all personnel operating and maintaining the BMS 270 read and understand this manual completely before operation or maintenance can begin.**

The BMS 270 has been manufactured for use in the U.S. In cases where personnel have an insufficient knowledge of the English language, proper training must be obtained before using the equipment.

All personnel must be familiar with the operation, major components, wear parts, function and the dimensions of the equipment before it can be operated.

Blastrac offers a training course in order to make the operating and maintenance staff familiar with all aspects of the equipment.

The initial start-up should be carefully monitored. The operator must know the starting sequence of the individual systems and components and fully understand their functions.

---

### **3.3 Attention and Maintenance**

---

Special attention and regular maintenance for the BMS 270 are extremely important for safe, reliable operation.

Blastrac recommends using only original spare and wear parts that are outlined in this manual. Machine owners should maintain a sufficient inventory of wear parts to help minimize down time.

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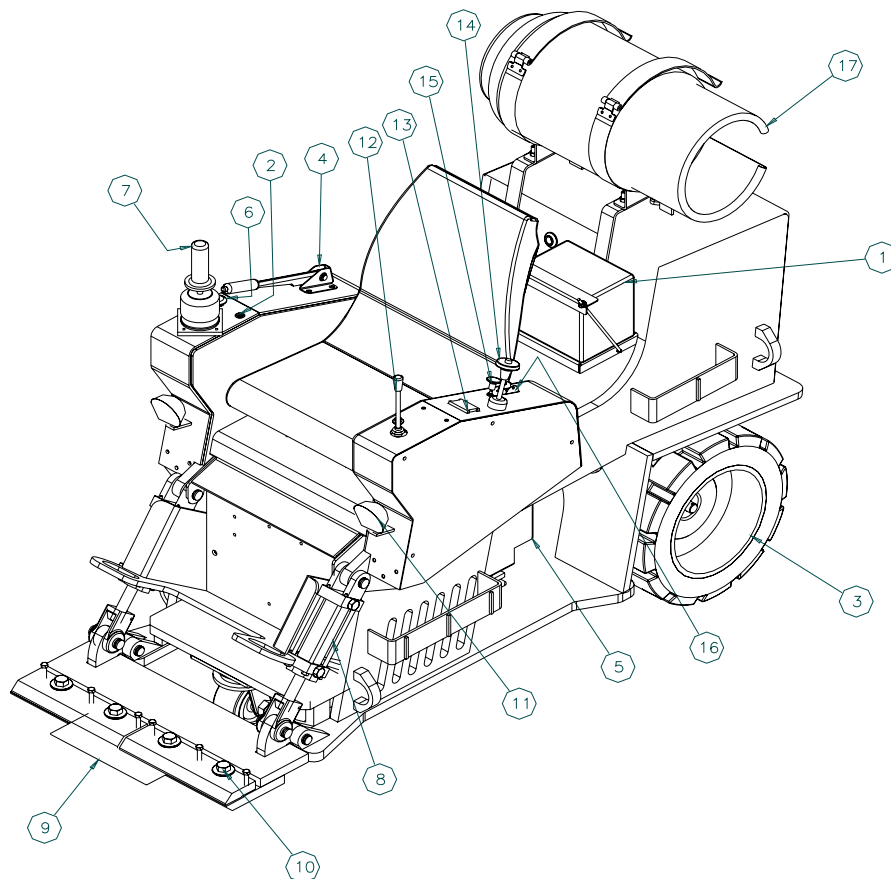
### **3.4 Delivery (Components)**

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System delivery includes:

- Stripper
- Tool holding fixture with two fastening bolts
- Tool as per order

### 3.5 Description



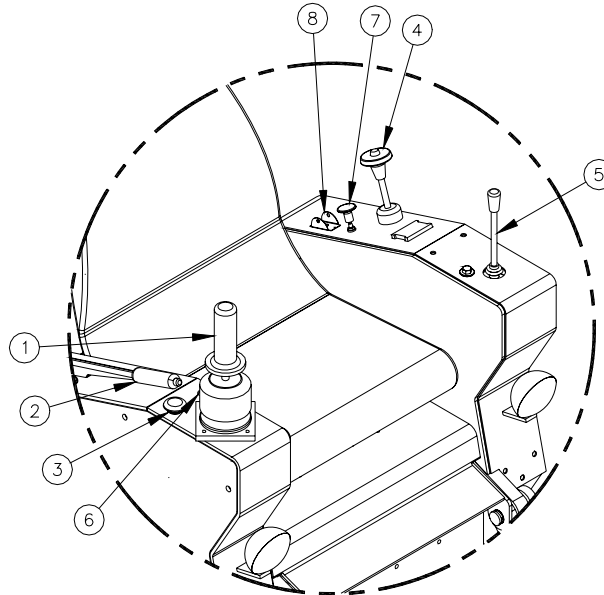
- |                        |                              |
|------------------------|------------------------------|
| 1. Battery Switch      | 10. Blade Holder             |
| 2. Ignition Switch     | 11. Lights                   |
| 3. Drive Wheels        | 12. Lift/Lower Blade Control |
| 4. Parking Brake       | 13. Tiny Tach                |
| 5. Engine              | 14. Engine Throttle          |
| 6. "E" Stop Button     | 15. Engine Choke             |
| 7. Directional Control | 16. Headlight Switch         |
| 8. Lift Cylinders      | 17. Propane Tank (LPG Type)  |
| 9. Blade               |                              |

The Multistripper (BMS 270) is designed for horizontal floor preparation. Paint, sealing material, and even thick coatings are completely removed by means of a tempered steel scraper blade. Two independent drive wheels give the scraper a high degree of maneuverability. All elements of the stripper are hydraulically driven.

---

### 3.6 Operating Controls

---



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#### I,II Steering Lever

---

1. Steering is controlled by means of two independently driven wheels. The driving speed is controlled by the movement of the steering lever.
  - A. Move the joystick forward, go forward;
  - B. Move to the right, turn right;
  - C. Move left, turn left;
  - D. Move back, go in reverse;
  - E. Any intermediate movement will give dual drive according to direction of the joystick movement.
  
2. Parking Brake
  - A. Pull lever up to set the brake;
  - B. Push the button in the end of the lever, this will release the brake.

### General

---

<b>3.6 Con't</b>
------------------

#### 3. Emergency Stop Button

- A. Push button down, all power is shut down. Machine is now in the “safe” mode;
- B. Twist button CW to release and allow the engine to restart.

#### 4. Throttle

- A. Push button on top and pull up to increase the engine speed (Course Adjustment);
- B. Twist knob CCW to fine adjust up and CW to fine adjust down;
- C. Push in button on top and push knob down to reduce engine speed to idle.

#### 5. Blade Control Lever

- A. Push lever forward to lower blade;
- B. Pull lever back to raise blade.

#### 6. Ignition Switch

- A. All the way CCW, switch is in off position;
- B. In mid-position, switch is on;
- C. All the way CW, switch is in the start position. The switch is spring loaded and will return to the on position when released.

#### 7. Engine Choke

- A. Pull up to actuate;
- B. Push down to shut off.

#### 8. Light Switch

- A. Forward position - ON;
- B. Backward position - OFF.

**General**

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**3.7 Tools**

---

Tool (Standard)	Field of Application
Blade Holder	Glued plastic tile mastic (soft)
Available in the following widths:	
<ul style="list-style-type: none"><li><input type="checkbox"/> 8 inch</li><li><input type="checkbox"/> 12 inch</li><li><input type="checkbox"/> 18 inch</li><li><input type="checkbox"/> Other widths (special order)</li></ul>	

---

**3.7.1 Blade Holder**

---

This tool can be equipped with two different blades having widths of 8 inches, 12 inches and 18 inches. The blade selection depends on the covering that is being removed. Mastic, for example, should be removed by using the wide scraper blade (12 inch or 18 inch). If the drive wheels of the machine lose traction, additional weights can be added above the drive wheels. In cases where additional weight does not help, reduce the blade width.

**Optional**

Tile Buster Blade	Ceramic Tile Removal Hardwood Floor Removal
Single/Narrow	Tough, small tile
Double/Narrow	Medium, small and large tile
Single/Wide	Medium, large tile
Double/Wide	Light, large and small tile
Weights	For traction and blade effectiveness
45 pounds each	Machine maximum capacity = 16 each



---

## **Section 4**

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- 4.1 General Information
- 4.2 Transport
- 4.3 Conditions for Initial Set-Up
- 4.4 Initial Set-Up
- 4.5 Dimensions, Space Required and Weights

## Transport

---

---

### 4.1 General Information

---

Blastrac strongly recommends that the initial start-up of the BMS 270 be performed or supervised by a Blastrac® representative. If a Blastrac representative is not involved, Blastrac will not assume any liability for damages resulting from faulty start-up or operation.

---

### 4.2 Transport

---

**All parts of the BMS 270 that can be difficult to transport are equipped with lifting eyes. This allows them to be easily lifted by any appropriate lifting device. For weights and dimensions of the machine, please see Chapter 1, “Technical Data”.**

The following parts should be transported separately:

- Stripper
- General Accessories

---

### 4.3 Conditions for Initial Set-up

---

During the initial set-up, be sure to observe the maximum permissible load for the floors. For the weights of the BMS 270 parts, please see Chapter 1, “Technical Data”.

---

### 4.4 Initial Set-Up

---

The initial set-up of the BMS 270 should be carried out in accordance with the instructions in Chapter 5, “Initial Operation”.

---

### 4.5 Dimensions, Space Required and Weights

---

#### Dimensions

(Please see “Technical Data”, Chapter 1.)

---

## **Section 5**

---

- 5.1 Preparations Before Initial Operation
- 5.2 Initial Operation

## Initial Operation

---

---

### 5.1 Preparations Before Initial Operation

---

Before energizing any part of the BMS 270, the equipment should be checked for leakage. All protective housings (guards) should be in place and properly connected. All personnel working in close proximity to the scraper must wear goggles and safety shoes. The operator should wear tight, protective clothing.

All connectors, plugs, cables and hoses should be handled carefully. Avoid any contact with hydraulic oil.

Only qualified personnel should be allowed to work on the hydraulic systems.

---

### 5.2 Initial Operation

---

1. Move scraper to surface to be treated.
  - a. Start engine and drive whenever possible.
  - b. Or release parking brake and push to the area to be worked.

**Hand push when this is the only way to get to the work area. While parking brake is released, the scraper will roll if on uneven floor or ground!**

2. Check the oil level in the scraper. The level should be in the upper third of the level indicator scale. If the oil level is lower, add oil prescribed by Blastrac (VAC REX 4259-DE) through the oil filler neck on the scraper tank. Do not overfill.
3. The outlet ball valve lever on the oil tank must be in the horizontal position.
4. Make sure that all operating levers on the stripper are in their neutral position.
5. Adjust the seat to select the operator's ideal sitting position which will enable him to reach the controls comfortably and see the work surface.
6. Be sure that all visible connections are secure. Retighten if necessary.

**Initial Operation**

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**5.2 Con't**

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7. Test the scraper by moving it with the help of the steering lever and check the proper function of the drive wheels.
8. The initial operation is finished when all necessary readjusting work has been completed and when you are sure that all systems are working normally.

**Hydraulic Oil:**

The total BMS 270 package requires approximately 20 gallons of hydraulic fluid to fill the scraper unit. Monitor the sight glass when filling the machine and do not overfill. The oil level should reach about two-thirds of the sight glass level in the unit. Once the oil level can be seen in the sight glass, add additional oil slowly to keep from overfilling the reservoir.

Blastrac recommends using Exxon Univs J-26 quality grade oil.

---

## **Section 6**

---

- 6.1 Operation
- 6.2 Shutting Down
- 6.3 Breakdown Procedures
- 6.4 “Safe” Condition
- 6.5 Start-up After Maintenance or Repair
- 6.6 Procedures Before and After Long Storage Time

---

**Operation**

---

---

**6.1 Operation**

---

Normal starting and operation of the multiscraper is the same as the procedure described in the Operation Instructions, “Initial Operation”, in Section 5.

Steering is accomplished by two independently driven wheels. The drive speed is dependent on the degree and direction of the control lever.

Lever “Forward” - Stripper Moves Forward	
Left Turn	Right Turn
Lever “Left”	Lever “Right”

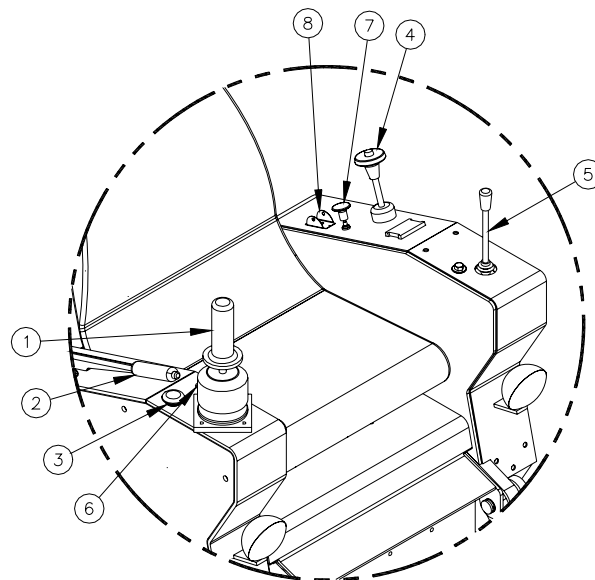
When the machine is being used for surface preparation, Blastrac recommends that the stripper operate in a “straight line” fashion. This method of operation will give the best results. Carefully monitor the work surface and adjust the speed if necessary.

### Operation

#### 6.2 Shutting Down

1. Lift the scraper blade. (Control #5)
2. Adjust throttle down to idle. (Control #4)
3. Turn ignition switch CCW to complete stop. (Control #6)

**Make sure to turn switch all the way CCW until it stops. This will ensure fan is shut off.**



4. Set parking brake. (Control #2)
5. Push “E” stop button to ensure “safe” condition. (Control #3)
6. Turn off propane tank valve.
7. Secure the scraper against accidental movement.



## Operation

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### 6.3 Breakdown Procedures

---

Follow all applicable safety guidelines when operating the equipment. These supercede all instructions in this manual.

---

### 6.4 “Safe” Condition

---

Before any maintenance or repair can be accomplished, the equipment must be put into its “Safe” condition. See Chapter 2, Safety Precautions.

---

### 6.5 Start-up After Maintenance or Repair

---

See manual, Initial Operation, Chapter 5.2.

---

### 6.6 Procedures Before and After Long Storage Time

---

Storage time in excess of three months.

#### Before Storage

- Shut down (see Shut Down Procedure, Section 6.4).
- Protect motors from dirt, dust, moisture, heat and shock.
- Clean the equipment and cover with protective tarp.
- Unused blank steel (inserts and scraper blades) should be covered with oil or other rust protection.

#### After Storage

See Section 5.2, Initial Operation.

---

**Section 7**

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- 7.1 Instructions
- 7.2 Maintenance and Inspection List
- 7.3 Repairs
- 7.4 Scraper
  - 7.4.1 Changing Scraper Blade
  - 7.4.2 Tool List for Scraper
- 7.5 Changing the Return Line Oil Filter
- 7.6 Lubricant Storage

## Maintenance

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### 7.1 Instructions

---

When performing maintenance and inspection work, refer to “Safety Instructions”, Chapter 2.

Operational breakdowns caused by insufficient or improper maintenance can cause very high repair costs and long down time for the equipment. Therefore, regular maintenance is imperative.

The following table contains time, inspection and maintenance information that should be followed for optimum machine performance.

This information is based on continuous operation. In cases where the indicated working hours do not correspond to the actual time the machine was in operation, the time intervals can be altered accordingly.

Because of different operating conditions, the time intervals for normal wear, inspection, maintenance and repair cannot be exact. Individual operating conditions will necessitate more applicable customized schedules.

Please do not hesitate to contact your Blastrac® specialist if further advice is needed.

**Before any maintenance or repair work is performed on the equipment, precautions must be taken to ensure that the machine cannot be turned on accidentally. The machinery must be placed in its “safe” condition.**

**When performing maintenance and repair work, be sure to follow the operation and maintenance instructions supplied on the individual part.**

Maintenance

## 7.2 Maintenance and Inspection List

<b>Working Hours/ Time Period</b>	<b>Check Points/ Maintenance Instructions</b>
12 hours after repair work	Check all safety devices. Check all accessible connectors/couplings.
Every three hours	Clean all foreign matter from under scraper clamp.
Daily	Check the equipment for leaks. Check for hose damage. Check the oil level in the scraper. Check the wheel tread for dirt buildup. Remove if necessary.
Bi-Monthly	Perform a complete wear check on the scraper unit and clean the unit completely. Check that all screw connections are secure.
Long storage period (maximum three months)	See Section 6.8. Contact your Blastrac® specialist.
50-60 hours	Replace the engine oil and filter of the scraper 50-60 hours after the initial operation.
Initial change first 50 to 60 hours, then every 150 hours, on hydraulic oil filter	Replace the scraper's hydraulic oil filter or when the dial shows "low flow".

---

## **7.3 Repairs**

---

Blastrac recommends using a Blastrac® specialist for the first repair work on the BMS 270 (or with the initial operation). This will give your maintenance staff the opportunity to receive the necessary training for your new Blastrac equipment.

These instructions will cover routine maintenance and wear part replacement.

When changing parts in-house, observe the following instructions and the individual step-by-step procedures.

Blastrac also recommends that you keep a sufficient inventory of wear parts as well as blade pivot parts. This will help eliminate unnecessary down time for your machine and help save on overall operating costs.

When replacing nuts and bolts on the BMS 270, be sure the replacements are of the same, exact quality as the original (strength, material, diameter, thread and length).

Before any maintenance or repair work can be accomplished on the equipment, precautions must be taken to ensure that it cannot be accidentally turned on.

---

**Maintenance**

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## **7.4 The Scraper**

---

In general, the scraper tool supplied with the machine is suitable to remove coverings or tiles which are bonded to the work surface.

---

### **7.4.1 Changing the Scraper Blade and Adjusting the Clamp**

---

1. Loosen the (2)  $\frac{3}{4}$  inch Hex bolts and tap both sides lightly to loosen.
2. Lift up blade clamp and pull out old blade.

**Use gloves while handling used blades. They are sharp and most likely hot from scraping.**

3. Clean all foreign matter from under and around the blade clamp.
4. Insert the new blade until it bottoms out on the corner step on the blade holder.
5. Tighten up the jack screws until blade clamp is flat with the blade. This will allow for clamping the blade with the most holding power.
6. Tighten the  $\frac{3}{4}$  inch Hex bolts down.

---

### **7.4.2 Tool List for Scraper**

---

#### **Blade**

1. 1 - Soft face hammer 1#
2. 1 - 1-1/8 inch wrench
3. 1 - Adjustable 8 inch wrench

Maintenance

---

---

## 7.5 Changing the Return Line Oil Filter

---

Be sure that only original Blastrac® spare parts are in stock. **CLEANING THE THROW-AWAY ELEMENT IS NOT POSSIBLE.**

### Changing the elements

1. Turn off the equipment and neutralize all hydraulic pressure.
2. Let the machine cool down.
3. Clean the filter housing with an appropriate medium and twist slightly to lift cover off housing.

**Beware that cover is under spring pressure. Hold down while twisting and removing the housing cover.**

4. Remove the filter element.
5. Check the O-ring and the support ring inside the filter housing for damage. Replace these elements, if necessary.
6. Drop in new filter cartridge.
7. Reinstall housing cover, twist to lock and tighten up the Hex screws to secure cover.

---

## 7.6 Lubricant Storage

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Store filter cartridges in their original pack to help eliminate dust and moisture contaminants and to minimize air oxidation. Store in a cool dry area.

**Lubricant storage should be environmentally safe. Take special care so that lubricants cannot penetrate the ground. Used oil and other lubricants must be disposed of properly. Follow all pertinent regulations.**





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## **Section 9**

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### 9.1 Stripper Troubleshooting

### Troubleshooting

#### 9.1 Stripper Troubleshooting

<b>Trouble</b>	<b>Possible Cause</b>	<b>Remedy</b>
The scraper moves without activating the steering/drive lever.	The adjusting mechanism is loose. The adjusting mechanism is defective.	Readjust lever or the adjusting Secure adjusting mechanism. Replace.
The scraper has no power.	Pressure relief valve or the on-off valves are defective. The flow control is defective. The drive components are defective. Oil temperature is too low. Wrong hydraulic oil was installed.	Have the hydraulics system checked by a specialist. Check the oil temperature. Do not operate in this condition, could cause more premature wear.
The scraper does not react when the steering/drive lever is actuated.	The operating elements are defective.	Check operating elements and replace if necessary. Or contact a Blastrac service dept.
The scraper does not react when the engine is running and energized.	The flow control of the scraper is in its zero position. The threaded couplings are not tightened correctly.	Open the flow control slowly. Tighten the couplings by hand.
The oil is very turbid.	There is water in the oil circuit. The oil has been contaminated due to excessive time between oil change.	Find and eliminate the cause for water penetration and change the oil. Change the oil and the filter.
Too much oil on the deck.	The deck has not been cleaned for a long time. The hose connections or the valves are not tight.	Clean the deck. Check the oil pan daily. Find the leak. Retighten the hose connection. Replace defective valve.
Oil foam leaking from oil tank.	The oil level is too high. The oil level is too low. The suction area is loose. The oil quality is bad.	Check and correct the oil level. Check the suction area of the variable displacement pump and gear pump for secure fit. Repair leak if necessary.

### Troubleshooting

#### 9.1 Con't

Trouble	Possible Cause	Remedy
The scraper cannot be moved by hand.	Parking brake set. The wheel motor is defective	Release parking brake. Check the motor's performance.
The scraper blade cannot be actuated.	The unit weight is too heavy. The cylinder actuating valve or the cylinder is defective.	Remove additional weights. Check the valve. Check the cylinder.
The scraper blade lifts immediately after being lowered.	The cylinder or the cylinder actuating valve is defective.	Have the cylinder and the cylinder actuating valve checked and the defective component replaced by a specialist.
With idle running, the scraper is extraordinarily loud.	The hydraulic components are defective.	Have the hydraulic system checked by a specialist.
The scraper does not work when the pump is generating pressure.	The hose couplings are not secured properly. The drive motor of the variable displacement pump is defective.	Retighten the hose couplings by hand. Call a Blastrac® specialist.
The hoses are worn. The steel sheath is visible.	There is friction wear. There is wear caused by force.	Replace the hose. Eliminate the wear cause.
The machine emits an extraordinarily loud hissing or whistling noise.	The valve, pressure relief valve or flow control are defective.	Have the hydraulic system checked by a specialist.
Too much play in the operating lever.	The operating elements are worn. The operating lever is loose.	Replace the operating elements. Tighten the fastening bolts.
Oil deposits are evident on the inner sides of the driving wheels.	The shaft seals of the wheel drives are not tight.	Have the motors overhauled.

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## **Section 10**

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### 10.1 Hydraulic System Diagrams

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## **10.1 Hydraulic System Diagrams**

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## **Section 11**

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11.1 Spare Parts

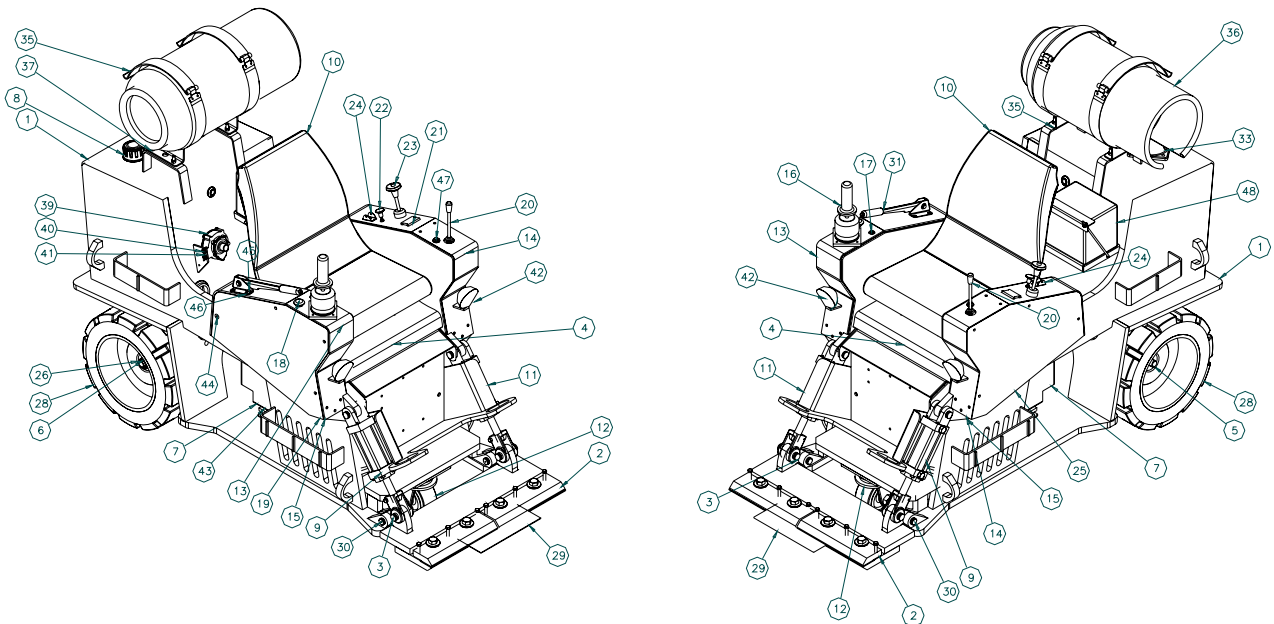
11.2 Scraper

11.3 Hydraulic Systems

11.4 Optional

### Spare Parts

#### 11.1 Spare Parts



ITEM	QTY.	CATALOG NO.	DRAWING NO.	DESCRIPTION
1	1	P000020	700-0001	Chassis Weldment
2	1	P000021	700-0008	Blade Weldment
3	4	P000310	--	Pin/Clevis 1" x 3-1/2"
4	1	P000031	700-0011	Seat Base Weldment
5	1	P000070	--	Motor (CCW) Hydraulic Drive
6	1	P000069	--	CW Drive Motor w/Brake
7	1	P000891	--	Engine Kohler 25 HP
8	1	4710014	4100006	Filter Assembly
9	2	P000262	--	3 x 4 Hydraulic Cylinder
10	1	P000463	--	Seat High Back w/Safety Switch
11	1	P000029	700-0008	Foot Plate Weldment
12	1	P000257	--	Boggy Wheel
13	1	P000065	700-0014	Right Side Control Pod Weldment
14	1	P000064	700-0013	Left Control Pod Weldment
15	4	P000223	700-0023	Bracket Side Pod Mounting
16	1	P000077	--	Joystick Drive Controller
17	1	07150007	--	Switch Ignition
18	1	P000320	--	Switch "E" Stop
19	1	P000223	700-0028	Cover Right Control Pod

**Spare Parts**

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**11.1 Con't**

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ITEM	QTY.	CATALOG NO.	DRAWING NO.	DESCRIPTION
20	1	P000076	--	Valve Left Joystick
21	1	07100007	--	Tiny Tach
22	1	P000066	--	Cable Choke
23	1	07300001	--	Cable Throttle
24	1	51000050	--	Switch Assembly Light
25	1	P000222	700-0028	Cover Left Control Pod
26	1	P001432	--	Nut/Hex 1-1/4"12UNF
27	1	P000129	--	Brake Parking
28	2	P000235	700-0024	Wheel/ Traction Drive
29	1	--	--	Blade Scrapper Various
30	2	P000226	700-0023	Pin Special Blade Pivot
31	1	P000066	--	Parking Brake Lever
32	1	P000849	--	Filter Return
33	4	500778	--	Screwcap Hex 3/8"-16LNC
34	2	07510005	--	Bracket Propone Tank
35	1	07510014	--	Tank Propane (Liquid)
36	4	5000600	--	Nut/Hex 3/8"-16UNC
37	1	P000075	--	Sight Glass
38	2	5001740	--	Screwcap Hex 1/4"-20UNC
39	2	5001020	--	Washer 1/4" Flat
40	2	P000462	--	Lights 3 1/2" Halogen
41	1	P000068	--	Pump Hydraulic
42	8	5008660	--	Screwsoc. Flat 3/8"-16UNC
43	10	5001990	--	Screwcap Hex 3/8"-16UNC
44	13	5001040	--	Washer Flat 3/8" DIA.
45	3	5001990	--	Screwcap Hex 3/8"-16UNC
46	1	07530022	--	Battery Willard



### Spare Parts

#### 11.2 Scraper

Item No.	Drawing No.	Description	Blastrac Part # (E.R.N.)	Qty.
1.	700-0001	Chassis	P000020	1
2.	700-0002	Blade Weldment	P000021	1
3.	---	Pin Clevis (1" x 3-1/2")	P000310	4
4.	700-0011	Seat Base Weldment	P000031	1
7.	---	25 HP Engine (Propane Fuel)	P000891	1
10.	---	High Back w/Safety Switch	P000463	1
11.	700-0008	Foot Plate Weldment	P000029	1
12.	---	Boggy Wheel	P000257	1
13.	700-0014	Control Pod Weldment (Right)	P000065	1
14.	700-0013	Control Pod Weldment (Left)	P000064	1
15.	700-0023	Side Pod Mounting Brackets	P000223	4
16.	---	Joystick Driver Controller	P000077	1
17.	---	Ignition Switch	07150007	1
18.	---	"E" Stop Switch	P000320	1
19.	700-0028	Control Pod Cover (Right)	P000223	1
20.	---	Joystick Blade Controller	P000076	1
21.	---	Tiny Tach	7100007	1
22.	---	Choke Cable	P000066	1
23.	---	Throttle Cable	7300004	1
24.	---	Light Switch Assembly	5100005	1
25.	700-0028	Control Pod Cover (Left)	P000222	1
27.	---	Parking Brake	P000129	1
28.	700-0024	Main Drive Wheels	P000235	2
30.	700-0023	Blade Pivot Pin (Special)	P000226	2
31.	---	Parking Brake Lever	P000086	1
33.	---	Filter Return	4210004	1
35.	---	Propane Tank Brackets	7510005	2
36.	---	Propane Tank (Liquid)	7510014	1
38.	---	Sight Glass/Temperature	P000085	1
42.	---	3-1/2" Dia. Halogen Utility Lights	P000462	2
43.	---	Hydraulic Pump	P000068	1
48.	---	12 Volt Battery	7530022	1

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## 11.3 Hydraulic Systems

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<b>Item No.</b>	<b>Drawing No.</b>	<b>Description</b>	<b>Blastrac Part # (E.R.N.)</b>	<b>Qty.</b>
5.	---	(CCW) Hydraulic Drive Motor	P000070	1
6.	---	(CW) Hydraulic Drive Motor	P000069	1
49.	---	(2) Spool Load Sensing Control Valve	P000075	1
50.	---	Single Axis Control Valve	P000076	1
51.	---	2 Axis Piloted Control Valve w/Shuttle	P000077	1
52.	---	2 Axis Piloted Control Valve w/o Shuttle	P000085	1
53.	---	Shuttle Cartridges	P000083	2
54.	---	Shuttle Valve Body SAE #6 Parts	P000084	2
55.	---	3"x 4" Hydraulic Cylinder (N/Mod)	P000262	2
56.	---	Handle for Single Axis Control Valve	P000079	1
57.	---	Hydraulic Fittings Kit	P000037	1
58.	---	Hydraulic Hose Kit	P000038	1

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## Spare Parts

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### 11.4 Optional

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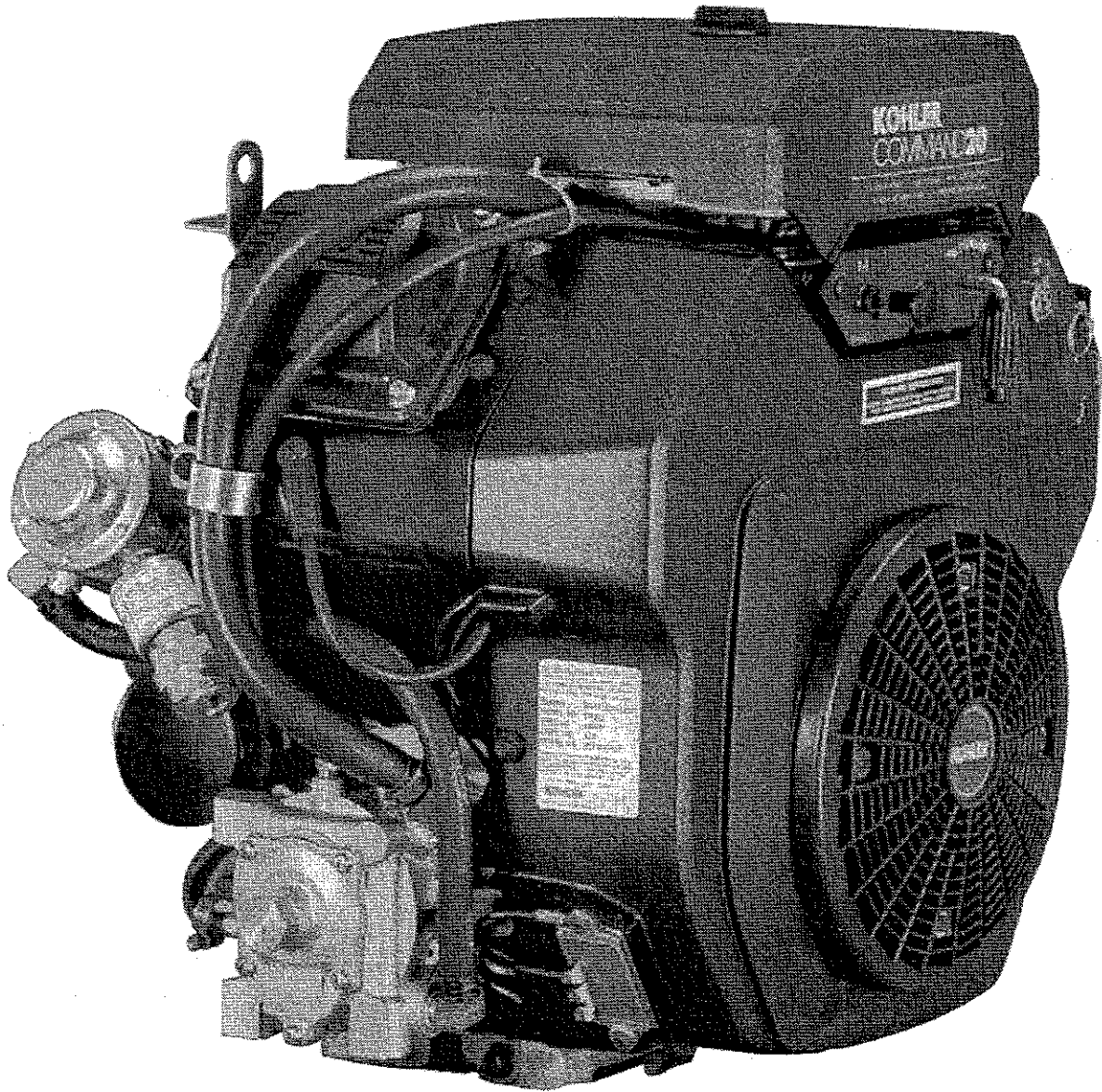
<b>Item No.</b>	<b>Drawing No.</b>	<b>Description</b>	<b>Blastrac Part # (E.R.N.)</b>	<b>Qty.</b>
70.	700-0028	Tile Buster Blade S/N	P000452	1
71.	700-0029	Tile Buster Blade D/N	P000458	1
72.	700-0030	Tile Buster Blade S/N	P000460	1
73.	700-0031	Tile Buster Blade D/W	P000461	1

# OWNER'S MANUAL

## COMMAND 20-25 HP

### HORIZONTAL CRANKSHAFT

LP Gas Fueled or Dual-Fueled (LP Gas – Gasoline)



**KOHLER**  
ENGINES

## Safety Precautions

To ensure safe operations please read the following statements and understand their meaning. Also refer to your equipment owner's manual for other important safety information. This manual contains safety precautions which are explained below. Please read carefully.

### **WARNING**

Warning is used to indicate the presence of a hazard that *can* cause severe personal injury, death, or substantial property damage if the warning is ignored.

### **CAUTION**

Caution is used to indicate the presence of a hazard that *will* or *can* cause *minor* personal injury or property damage if the caution is ignored.

### **NOTE**

Note is used to notify people of installation, operation, or maintenance information that is important but not hazard-related.

### **For Your Safety!**



*These precautions should be followed at all times. Failure to follow these precautions could result in injury to yourself and others.*

 <b>WARNING</b>



<b>Accidental Starts can cause severe injury or death.</b>
Disconnect and ground spark plug leads before servicing.

**Accidental Starts!**  
**Disabling engine. Accidental starting can cause severe injury or death.** Before working on the engine or equipment, disable the engine as follows: 1) Disconnect the spark plug lead(s). 2) Disconnect negative (-) battery cable from battery.



Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or LP/gasoline fuel vapors are present.

 <b>WARNING</b>

<b>Rotating Parts can cause severe injury.</b>
Stay away while engine is in operation.

**Rotating Parts!**  
Keep hands, feet, hair, and clothing away from all moving parts to prevent injury. Never operate the engine with covers, shrouds, or guards removed.

 <b>CAUTION</b>

<b>Electrical Shock can cause injury.</b>
Do not touch wires while engine is running.



**Electrical Shock!**  
Never touch electrical wires or components while the engine is running. They can be sources of electrical shock.

 <b>WARNING</b>

<b>Hot Parts can cause severe burns.</b>
Do not touch engine while operating or just after stopping.

**Hot Parts!**  
Engine components can get extremely hot from operation. To prevent severe burns, do not touch these areas while the engine is running, or immediately after it is turned off. Never operate the engine with heat shields or guards removed.

<b>California Proposition 65 Warning</b>
Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

## Safety Precautions (Cont.)

 <b>WARNING</b>

<b>Explosive Fuel can cause fires and severe burns.</b>
Stop engine before filling fuel tank.

### Explosive Fuel!



*LPG is extremely flammable and is heavier than air and tends to settle in low areas where a spark or flame could ignite the gas. Do not start or operate this engine in a poorly ventilated area where leaking gas could accumulate and endanger the safety of persons in the area.*

*To insure personal safety, installation and repair of LPG fuel supply systems must be performed only by qualified LPG system technicians. Improperly installed and maintained LPG equipment could cause fuel supply system or other components to malfunction, causing gas leaks.*

*Observe federal, state and local laws governing LPG fuel, storage, and systems.*



*– Continued in next column –*

*Gasoline is extremely flammable and its vapors can explode if ignited. Store gasoline only in approved containers, in well ventilated, unoccupied buildings, away from sparks or flames. Do not fill the fuel tank while the engine is hot or running, since spilled fuel could ignite if it comes in contact with hot parts or sparks from ignition. Do not start the engine near spilled fuel. Never use gasoline as a cleaning agent.*

 <b>WARNING</b>

<b>Carbon Monoxide can cause severe nausea, fainting or death.</b>
Do not operate engine in closed or confined area.

### Lethal Exhaust Gases!

*Engine exhaust gases contain poisonous carbon monoxide. Carbon monoxide is odorless, colorless, and can cause death if inhaled. Avoid inhaling exhaust fumes, and never run the engine in a closed building or confined area.*

 <b>WARNING</b>

<b>Explosive Gas can cause fires and severe acid burns.</b>
Charge battery only in a well ventilated area. Keep sources of ignition away.

### Explosive Gas!

*Batteries produce explosive hydrogen gas while being charged. To prevent a fire or explosion, charge batteries only in well ventilated areas. Keep sparks, open flames, and other sources of ignition away from the battery at all times. Keep batteries out of the reach of children. Remove all jewelry when servicing batteries.*

*Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or LP/gasoline fuel vapors are present.*

**Congratulations** – You have selected a fine four-cycle, twin cylinder, air-cooled engine. Kohler designs long life strength and on-the-job durability into each engine...making a Kohler engine dependable...dependability you can count on. Here are some reasons why:

- Efficient overhead valve design and full pressure lubrication provide maximum power, torque, and reliability under all operating conditions.
- Dependable, maintenance free electronic ignition ensures fast, easy starts time after time.
- Kohler engines are easy to service. All routine service areas (like the dipstick and oil fill, air cleaner, spark plugs, and carburetor) are easily and quickly accessible.
- Parts subject to the most wear and tear (like the cylinder liner\* and camshaft) are made from precision formulated cast iron. Because the cylinder liner\* can be rebored, these engines can last even longer.

\*CH25 engines have POWER-BORE™ Cylinders. These cylinders are plated with nickel-silicon to give increased power, virtually permanent cylinder life, superior oil control, and reduced exhaust emissions. These cylinders cannot be rebored.

- Every Kohler engine is backed by a worldwide network of over 10,000 distributors and dealers. Service support is just a phone call away. Call 1-800-544-2444 (U.S. & Canada) for Sales & Service assistance.

To keep your engine in top operating condition, follow the maintenance procedures in this manual.

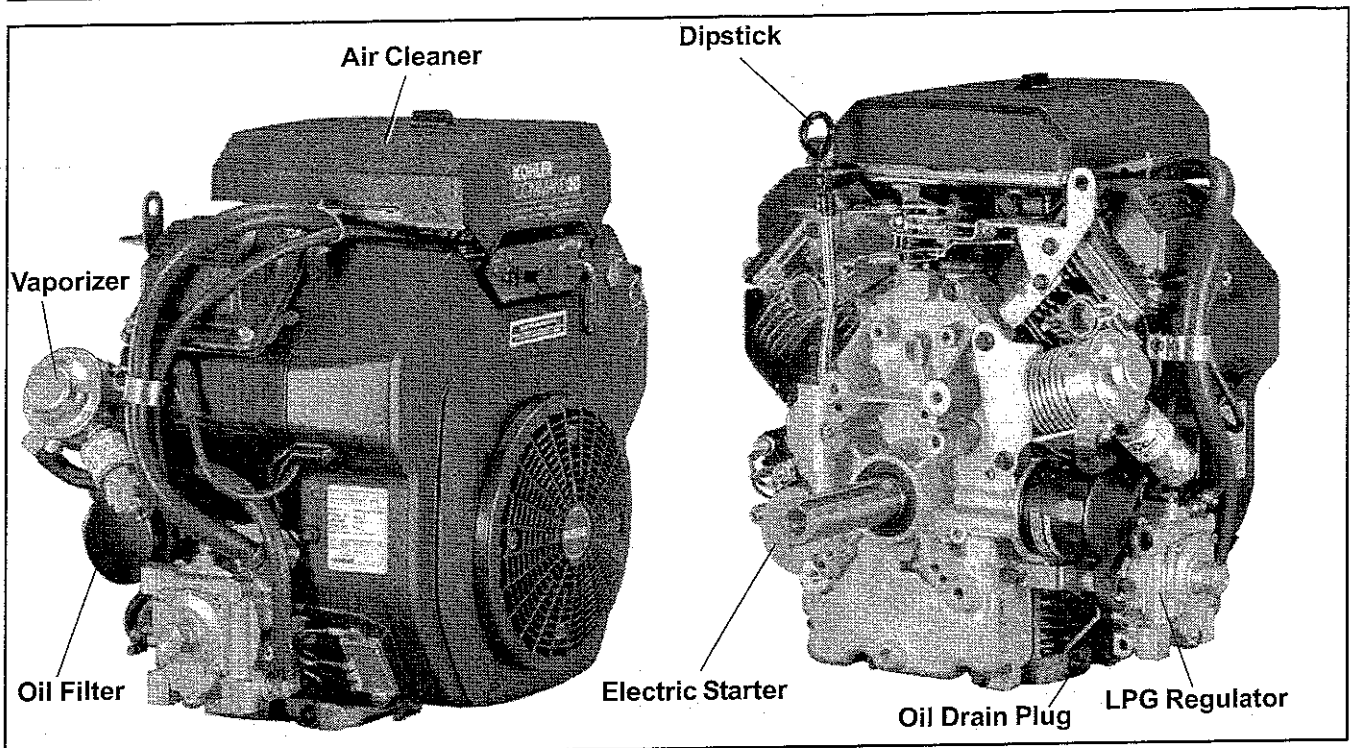


Figure 1. Typical Command Horizontal Shaft LP Gas Fueled Engine.

### Oil Recommendations

Using the proper type and weight of oil in the crankcase is extremely important. So is checking oil daily and changing oil regularly. Using oil that is incorrect or dirty can cause premature engine wear and failure.

**Synthetic oil** is recommended for use in LPG-fueled engines because there is less oxidation or thickening, and deposit accumulation on intake valves is substantially reduced. Conventional petroleum-based oil may be used, but valve service will be required every 500 hours to remove the accumulated deposits. Dual-fueled engines can use conventional oil without requiring special/additional valve service.

### Oil Type

Use high quality, oil of **API (American Petroleum Institute) service class SG, SH, SJ or higher**. Select the viscosity based on the air temperature at the time of operation as shown in the following table.

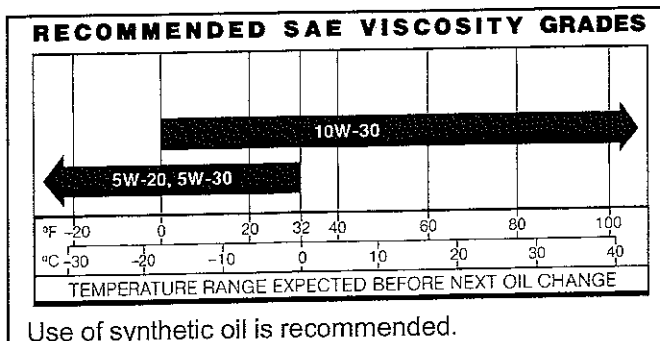


Figure 2. Viscosity Grades Table.

NOTE: Using other than service class SG, SH, SJ or higher oil or extending oil change intervals longer than recommended can cause engine damage.

A logo or symbol on oil containers identifies the API service class and SAE viscosity grade. See Figure 3.

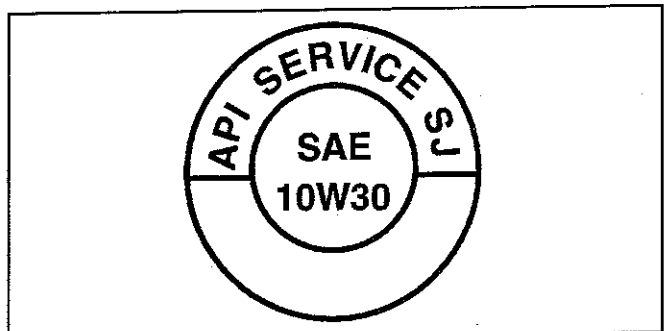


Figure 3. Oil Container Logo.

Refer to "Maintenance Instructions" beginning on page 8 for detailed oil check, oil change, and oil filter change procedures.

## LPG Engines

### LPG Fuel Recommendations

Liquefied Petroleum Gas (LPG) from an appropriate LP fuel tank (supplied separately) is required to operate this engine.



#### **WARNING: Pressurized LPG!**

*Fuel tanks are filled under pressure and should be handled with care. To prevent tank damage which could endanger the safety of the operator or persons in the area, do not drop or drag tanks on any surface. Use a hand truck when moving, or tilt the tank on its footing in a position slightly off vertical and roll it.*

*Avoid personal contact with LPG fuel to prevent frostbite. See a physician if frostbite occurs.*



#### **WARNING: Explosive Fuel!**

*LPG is extremely flammable, is heavier than air and tends to settle in low areas where a spark or flame could ignite the gas. Do not start or operate this engine in a poorly ventilated area where leaking gas could accumulate and endanger the safety of persons in the area.*

*LPG fuel consists primarily of propane, although the fuel supplier may sometimes mix other gases with propane.*

*Fuel tanks must be filled only by persons qualified in the handling of LPG. Tanks are filled by weight and should not be overfilled (never to more than 80 percent of total capacity). An air space must be present in the tank to allow fuel to expand.*

*Tanks must be removed from equipment before filling.*

### Dual-Fuel Engines

Dual-fuel engines are designed to operate on either LPG or gasoline. For LPG operation, the above information and warnings apply. For gasoline operation, the following information and warnings apply.

### Fuel Recommendations



#### **WARNING: Explosive Fuel!**

*Gasoline is extremely flammable and its vapors can explode if ignited. Store gasoline only in approved containers, in well ventilated, unoccupied buildings, away from sparks or flames. Do not fill the fuel tank while the engine is hot or running, since spilled fuel could ignite if it comes in contact with hot parts or sparks from ignition. Do not start the engine near spilled fuel. Never use gasoline as a cleaning agent.*

### General Recommendations

Purchase gasoline in small quantities and store in clean, approved containers. A container with a capacity of 2 gallons or less with a pouring spout is recommended. Such a container is easier to handle and helps eliminate spillage during refueling.

Do not use gasoline left over from previous season, to minimize gum deposits in your fuel system and to ensure easy starting.

Do not add oil to the gasoline.

Do not overfill the fuel tank. Leave room for the fuel to expand.

### Fuel Type

For best results, use only clean, fresh, **unleaded** gasoline with a pump sticker octane rating of 87 or higher. In countries using the Research method, it should be 90 octane minimum.

Unleaded gasoline is recommended as it leaves less combustion chamber deposits. Leaded gasoline may be used in areas where unleaded is not available and exhaust emissions are not regulated. Be aware however, that the cylinder heads may require more frequent service.

### Gasoline/Alcohol blends

Gasohol (up to 10% ethyl alcohol, 90% unleaded gasoline by volume) is approved as a fuel for Kohler engines. Other gasoline/alcohol blends are not approved.

### Gasoline/Ether blends

Methyl Tertiary Butyl Ether (MTBE) and unleaded gasoline blends (up to a maximum of 15% MTBE by volume) are approved as a fuel for Kohler engines. Other gasoline/ether blends are not approved.

### Model Designation

Model CH20S for example: C designates Command engine, H designates horizontal crankshaft, and 20 designates horsepower. A letter suffix designates a specific version as follows:

Suffix	Designates
S	Electric Start



## Engine Identification Numbers

When ordering parts, or in any communication involving an engine, always give the **Model, Specification, and Serial Numbers** of the engine.

The engine identification numbers appear on a decal affixed to the engine shrouding. Include letter suffixes, if there are any.

Record your engine identification numbers on the identification label below (Figure 4) for future reference.

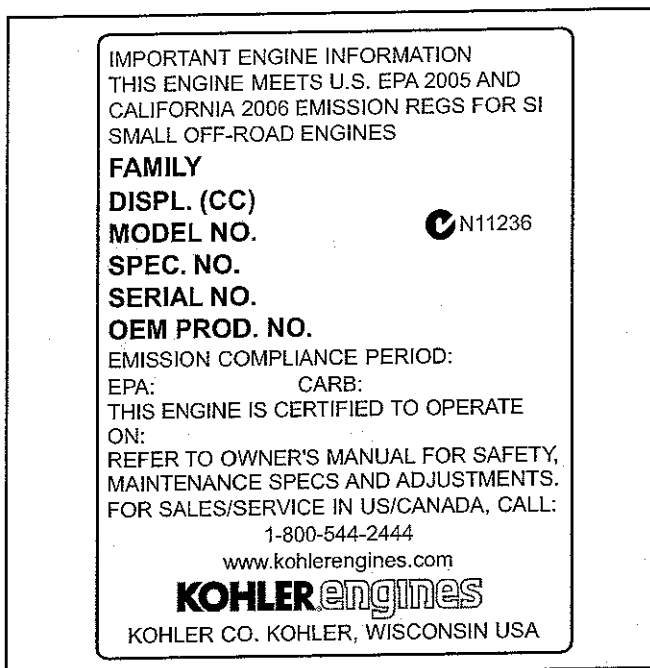


Figure 4. Engine Identification Label.

The Emission Compliance Period referred to on the Emission Control or Air Index label indicates the number of operating hours for which the engine has been shown to meet CARB emission requirements. The following table provides the Engine Compliance Period (in hours) associated with the category descriptor found on the certification label.

### Emission Compliance Period (Hours)

CARB	Moderate	Intermediate	Extended
	125 hours	250 hours	500 hours

Refer to certification label for engine displacement.

Exhaust Emission Control System for models CH20 LP, CH25 LP, and CH25 Dual Fuel (open loop), is EM. Exhaust Emission Control System for model CH25 Dual Fuel (closed loop) is EM, O2S, ECM.

## Operating Instructions

Also read the operating instructions of the equipment this engine powers.

### Pre-Start Checklist

- Check oil level. Add oil if low. Do not overfill.
- Check fuel gauge on LPG tank. Tanks should be filled to a specific weight. To insure safety and proper fuel system operation, tanks must not be overfilled.
- Check fuel lines, regulator, and other system components for leaks. Do not start engine until leaks are eliminated.
- Check cooling air intake areas and external surfaces of engine. Make sure they are clean and unobstructed.
- Check that the air cleaner components and all shrouds, equipment covers, and guards are in place and securely fastened.
- Check that any clutches or transmissions are disengaged or placed in neutral. This is especially important on equipment with hydrostatic drive. The shift lever must be exactly in neutral to prevent resistance which could keep the engine from starting.



### **WARNING: Lethal Exhaust Gases!**

Engine exhaust gases contain poisonous carbon monoxide. Carbon monoxide is odorless, colorless, and can cause death if inhaled. Avoid inhaling exhaust fumes, and never run the engine in a closed building or confined area.

Although LPG burns more efficiently and emits less carbon monoxide than gasoline, some carbon monoxide is produced. Avoid inhaling exhaust gases, especially over prolonged periods of time. Do not allow engine to run unattended.

### Cold Weather Starting Hints

1. Be sure to use the proper oil for the temperature expected. See Figure 2 on page 4.
2. Disengage all possible external loads.
3. Be sure the battery is in good condition. A warm battery has much more starting capacity than a cold battery.

## Starting

1. Place the throttle control in the **idle** position. Place the choke control into the **"on"** position. See Figure 5. On dual-fueled engines, place the three-position fuel control switch in the **gasoline** position and place the throttle control between half and full throttle (engine **must** be started and run on gasoline for 1 minute to heat up oxygen sensor).

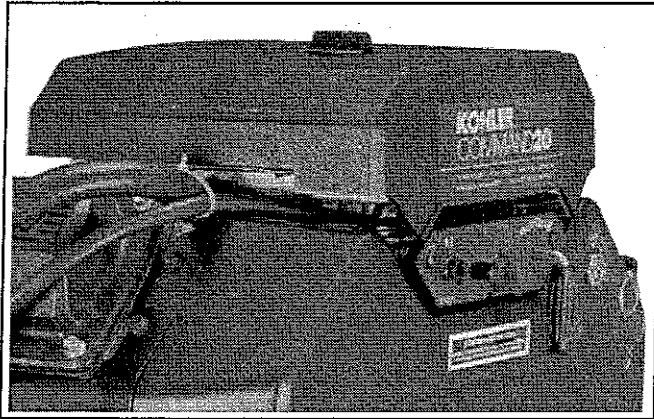


Figure 5. Optional Engine Mounted Throttle and Choke Controls.

2. Slowly turn the fuel valve on the LPG (propane) tank to full open position. For "gasoline only" operation on dual-fuel units, leave valve closed.
3. Start the engine by activating the key switch. Release the switch as soon as the engine starts. Return choke to **"off"** position after engine starts. On a cold engine, it may be necessary to leave choke partially on until engine begins to warm up. Dual-fuel engines must be allowed to warm up on gasoline for at least 1 minute. To switch to LPG operation, move the three-position switch to the LPG position.

NOTE: Do not crank the engine continuously for more than 10 seconds at a time. If the engine does not start, allow a 60 second cool down period between starting attempts. Failure to follow these guidelines can burn out the starter motor.

NOTE: If the engine develops sufficient speed to disengage the starter but does not keep running (a false start), engine rotation must be allowed to come to a complete stop before attempting to restart the engine. If the starter is engaged while the flywheel is rotating, the starter pinion and flywheel ring gear may clash, resulting in damage to the starter.

If the starter does not turn the engine over, shut off starter immediately. Do not make further attempts to start the engine until the condition is corrected. Do not jump start using another battery (refer to "Battery" on page 8). See your Kohler Engine Service Dealer for trouble analysis.

NOTE: Upon start-up, a metallic ticking may occur. This is caused by hydraulic lifter leakdown during storage. Run the engine for 5 minutes. The noise will normally cease in the first minute. If noise continues, run the engine at mid-throttle for 20 minutes. If noise persists, take the engine to your local Kohler Service outlet.

## Stopping

### LPG-Only Engines

1. Turn fuel valve on LPG tank to full closed position and allow the engine to continue running until it runs out of fuel. Turn ignition switch to **"off"** position.

### Dual-Fuel Engines

1. Dual-fuel engines may be stopped any of three ways:
  - a. When operating on LPG, one method is the same as described above for LPG-only engines.
  - b. LPG operation can also be stopped by moving the three-position fuel control switch to the **"off"** position and letting the engine run out of fuel. Turn off ignition switch. If engine will not be restarted for some time, also close fuel valve at LPG tank.
  - c. To stop the engine from gasoline operation, it should be running between half and full throttle. Move the three-position fuel control switch and/or the ignition switch to the **"off"** position.

In an **emergency**, move the throttle control to **stop** or turn the ignition switch off.

NOTE: Backfiring may occur when using the emergency stop method!

## Battery

A 12 volt battery is normally used. Refer to the operating instructions of the equipment this engine powers for specific battery requirements.

If the battery charge is not sufficient to crank the engine, recharge the battery (see page 12).

## Operating

### Angle of Operation

This engine will operate continuously at angles up to 25°. Check oil level to assure crankcase oil level is at the "F" mark on the dipstick.

Refer to the operating instructions of the equipment this engine powers. Because of equipment design or application, there may be more stringent restrictions regarding the angle of operation.

NOTE: Do not operate this engine continuously at angles exceeding 25° in any direction. Engine damage could result from insufficient lubrication.

## Cooling

NOTE: If debris builds up on the flywheel screen or other cooling areas, stop the engine immediately and clean. Operating the engine with blocked or dirty air intake and cooling areas can cause extensive damage due to overheating.



### WARNING: Hot Parts!

*Engine components can get extremely hot from operation. To prevent severe burns, do not touch these areas while the engine is running, or immediately after it is turned off. Never operate the engine with heat shields or guards removed.*

### Engine Speed

NOTE: Do not tamper with the governor setting to increase the maximum engine speed. Overspeed is hazardous and will void the engine warranty. The maximum allowable high speed for these engines is 3750 RPM, no load.

## Maintenance Instructions

**Maintenance, repair, or replacement of the emission control devices and systems, which are being done at the customers expense, may be performed by any\* non-road engine repair establishment or individual. Warranty repairs must be performed by an authorized Kohler service outlet.**

\*For safety and health reasons, many states require special licensing or certification for servicing LPG fuel systems. Check local and state regulations before choosing a repair establishment to perform fuel system repairs.



### WARNING: Accidental Starts!

**Disabling engine. Accidental starting can cause severe injury or death.** Before working on the engine or equipment, disable the engine as follows: 1) Disconnect the spark plug lead(s). 2) Disconnect negative (-) negative (-) battery cable from battery.

*Before disconnecting the negative (-) ground cable, make sure all switches are off. If on, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or LP/gasoline fuel vapors are present.*

## Maintenance Schedule

These required maintenance procedures should be performed at the frequency stated in the table. They should also be included as part of any seasonal tune-up.

Frequency	Maintenance Required
Daily or Before Starting Engine	<ul style="list-style-type: none"> <li>• Check fuel gauge on propane (LPG) tank. Fill gasoline tank (dual-fuel units only).</li> <li>• Check oil level.</li> <li>• Check air cleaner for dirty<sup>1</sup>, loose, or damaged parts.</li> <li>• Check air intake and cooling areas, clean as necessary<sup>1</sup>.</li> </ul>
Every 25 Hours	<ul style="list-style-type: none"> <li>• Service precleaner element<sup>1</sup>.</li> </ul>
Every 100 Hours	<ul style="list-style-type: none"> <li>• Replace air cleaner element<sup>1</sup>.</li> <li>• Change oil.</li> <li>• Remove cooling shrouds and clean cooling areas<sup>1</sup>.</li> <li>• Check oil cooler fins, clean as necessary (if equipped).</li> <li>• Check spark plug condition and gap.</li> </ul>
Every 200 Hours	<ul style="list-style-type: none"> <li>• Change oil filter.</li> <li>• Replace fuel filter (gasoline).</li> </ul>
Annually or Every 300 Hours	<ul style="list-style-type: none"> <li>• Replace spark plugs.</li> </ul>
Annually or Every 500 Hours	<ul style="list-style-type: none"> <li>• Check all lines (high pressure/vacuum) including fittings for leaks.</li> <li>• Have electric starter serviced<sup>2</sup>.</li> <li>• Have lock-off/filter serviced<sup>3</sup> (LP).</li> <li>• Have combustion deposits removed if using non-synthetic oil (not on dual-fuel engines).</li> <li>• Drain regulator of accumulated fuel deposits (Nikki regulators only).</li> </ul>
Every 1500 Hours	<ul style="list-style-type: none"> <li>• Have regulator disassembled, cleaned, and reset<sup>3</sup>.</li> </ul>

<sup>1</sup>Perform these maintenance procedures more frequently under extremely dusty, dirty conditions.

<sup>2</sup>Have a Kohler Engine Service Dealer perform this service.

<sup>3</sup>Must be performed by an Authorized Kohler Engine Dealer or qualified LP personnel **only**.

## Check Oil Level

The importance of checking and maintaining the proper oil level in the crankcase cannot be overemphasized. Check oil **BEFORE EACH USE** as follows:

1. Make sure the engine is stopped, level, and is cool so the oil has had time to drain into the sump.
2. To keep dirt, debris, etc., out of the engine, clean the area around the dipstick before removing it.
3. Remove the dipstick; wipe oil off. Reinsert the dipstick into the tube and press all the way down.
4. Remove the dipstick and check the oil level.

The oil level should be up to, but not over, the "F" mark on the dipstick. See Figure 6.

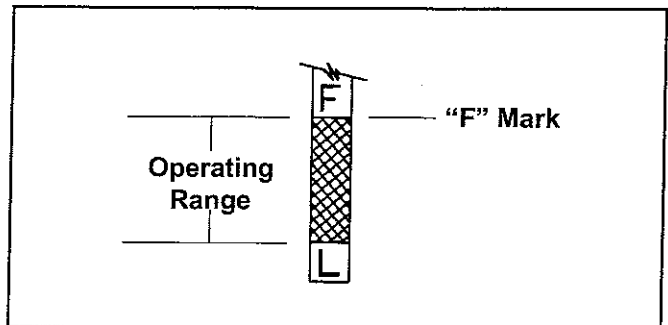


Figure 6. Oil Level Dipstick.

5. If the level is low, add oil of the proper type, up to the "F" mark on the dipstick. (Refer to "Oil Type" on page 4.) Always check the level with the dipstick before adding more oil.

**NOTE:** To prevent extensive engine wear or damage, always maintain the proper oil level in the crankcase. Never operate the engine with the oil level below the "L" mark or over the "F" mark on the dipstick.

## Oil Sentry™

Some engines are equipped with an optional Oil Sentry™ oil pressure switch. If the oil pressure decreases below an acceptable level, the Oil Sentry™ will either shut off the engine or activate a warning signal, depending on the application.

NOTE: Make sure the oil level is checked **BEFORE EACH USE** and is maintained up to the "F" mark on the dipstick. This includes engines equipped with Oil Sentry™.

## Change Oil and Oil Filter

### Change Oil

Change oil after every **100 hours** of operation. Refill with service class SG, SH, SJ or higher oil as specified in the "Viscosity Grades" table (Figure 2) on page 4.

Change the oil while the engine is still warm. The oil will flow more freely and carry away more impurities. Make sure the engine is level when filling, checking, and changing the oil.

Change the oil as follows (see Figure 7):

1. To keep dirt, debris, etc., out of the engine, clean the area around the oil fill cap/dipstick before removing it.
2. Remove one of the oil drain plugs, oil fill cap, and dipstick. Be sure to allow ample time for complete drainage.
3. Reinstall the drain plug. Make sure it is tightened to **13.6 N·m (10 ft. lb.)** torque.
4. Fill the crankcase, with new oil of the proper type, to the "F" mark on the dipstick. Refer to "Oil Type" on page 4. Always check the level with the dipstick before adding more oil.
5. Reinstall the oil fill cap and tighten securely. Reinstall dipstick.

NOTE: To prevent extensive engine wear or damage, always maintain the proper oil level in the crankcase. Never operate the engine with the oil level below the "L" mark or over the "F" mark on the dipstick.

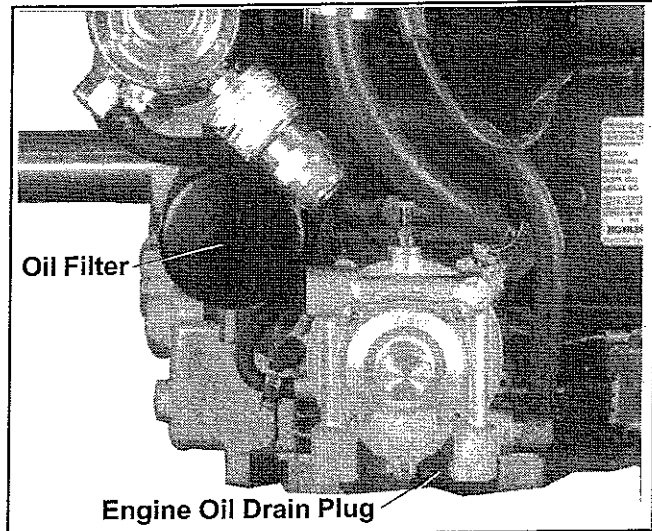


Figure 7. Oil Drain Plug and Oil Filter.

### Change Oil Filter

Replace the oil filter **at least every other oil change (every 200 hours of operation)**. Always use a genuine Kohler oil filter, Part No. 12 050 01-S.

Replace the oil filter as follows:

1. Drain the oil from the engine crankcase by removing one of the drain plugs and allowing ample time for complete drainage.
2. Before removing the oil filter, clean the area around the oil filter to keep dirt and debris out of the engine. Remove the old filter. Wipe off the surface where the oil filter mounts.
3. Place a new replacement filter in a shallow pan with the open end up. Pour new oil of the proper type in through the threaded center hole. Stop pouring when the oil reaches the bottom of the threads. Allow a minute or two for the oil to be absorbed by the filter material.
4. Apply a thin film of clean oil to the rubber gasket on the new filter.
5. Install the new oil filter onto the filter adapter. Turn the oil filter clockwise until the rubber gasket contacts the mounting surface, then tighten the filter an additional **2/3 to 1 turn**.
6. Reinstall the drain plug. Make sure it is tightened to **13.6 N·m (10 ft. lb.)** torque.
7. Fill the crankcase with new oil of the proper type to the "F" mark on the dipstick.

8. Test run the engine to check for leaks. Stop the engine, allow a minute for the oil to drain down, and recheck the level on the dipstick. Add more oil as necessary so the oil level is up to but not over the "F" mark on the dipstick.

### Service Precleaner and Air Cleaner Element

This engine is equipped with a replaceable, high density paper air cleaner element. Most engines are also equipped with an oiled, foam precleaner which surrounds the paper element. See Figures 8 and 9.

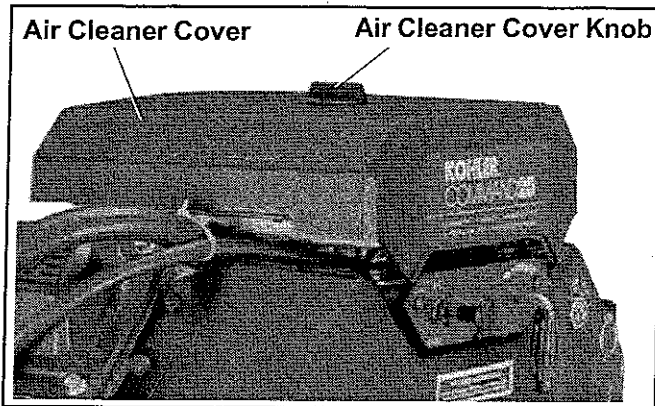


Figure 8. Air Cleaner Housing Components.

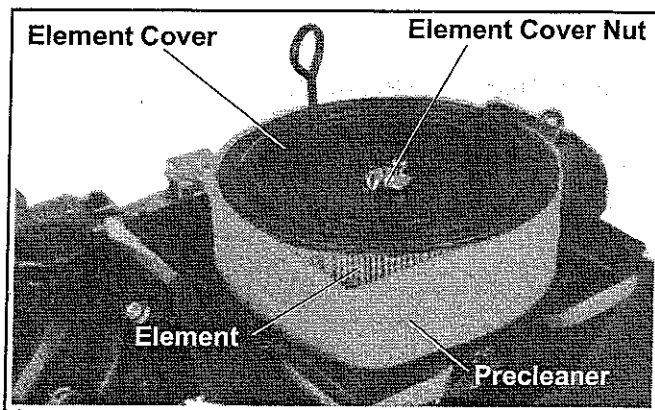


Figure 9. Air Cleaner System Components.

Check the air cleaner **daily or before starting the engine**. Check for a buildup of dirt and debris around the air cleaner system. Keep this area clean. Also check for loose or damaged components. Replace all bent or damaged air cleaner components.

NOTE: Operating the engine with loose or damaged air cleaner components could allow unfiltered air into the engine causing premature wear and failure.

### Service Precleaner

If so equipped, wash and reoil the precleaner every **25 hours** of operation (more often under extremely dusty or dirty conditions).

1. Loosen the cover retaining knob and remove the cover.
2. Remove the precleaner from the paper element.
3. Wash the precleaner in warm water with detergent. Rinse the precleaner thoroughly until all traces of detergent are eliminated. Squeeze out excess water (do not wring). Allow the precleaner to air dry.
4. Saturate the precleaner with new engine oil. Squeeze out all excess oil.
5. Reinstall the precleaner over the paper element.
6. Reinstall the air cleaner cover. Secure cover with the cover retaining knob.
7. When precleaner replacement is necessary order genuine Kohler parts.

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### Service Paper Element

Every **100 hours** of operation (more often under extremely dusty or dirty conditions) replace the paper element.

1. Loosen the cover retaining knob and remove the air cleaner cover.
2. Remove the element cover nut, element cover, and paper element/precleaner.
3. Remove the precleaner (if so equipped) from the paper element and service as instructed above.
4. **Do not wash the paper element or use pressurized air**, as this will damage the element. Replace a dirty, bent, or damaged element with a genuine Kohler element. Handle new elements carefully; do not use if the sealing surfaces are bent or damaged.
5. When servicing the air cleaner, check the air cleaner base. Make sure it is secured and not bent or damaged. Also, check the element cover for damage or improper fit. Replace all damaged air cleaner components.

NOTE: Before air cleaner reassembly make sure rubber seal is in position around stud. Inspect, making sure it is not damaged and seals with the element cover.

6. Reinstall the paper element, precleaner, element cover, element cover nut, and air cleaner cover. Secure cover with cover retaining knob.

- When element replacement is necessary order genuine Kohler parts.

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### Clean Air Intake/Cooling Areas

To ensure proper cooling, make sure the flywheel screen, cooling fins, and other external surfaces of the engine are kept clean **at all times**.

Every **100 hours** of operation (more often under extremely dusty, dirty conditions), remove the blower housing and other cooling shrouds. Clean the cooling fins and external surfaces as necessary. Make sure the cooling shrouds are reinstalled.

**NOTE:** Operating the engine with a blocked flywheel screen, dirty or plugged cooling fins, and/or cooling shrouds removed, will cause engine damage due to overheating.

### Ignition System

This engine is equipped with an electronic CD ignition system. Other than periodically checking/replacing the spark plugs, no maintenance, timing, or adjustments are necessary or possible with this system.

In the event starting problems should occur which are not corrected by replacing the spark plugs, see your Kohler Engine Service Dealer for trouble analysis.

### Check Spark Plugs

Every **100 hours** of operation, remove the spark plugs, check condition, and reset the gap or replace with new plugs as necessary. **Every 300 hours or annually** replace the spark plugs. Replacement spark plugs are Kohler Part No. 12 132 02-S (Champion® type RC12YC). Equivalent alternate brand plugs can also be used.

- Before removing the spark plug, clean the area around the base of the plug to keep dirt and debris out of the engine.
- Remove the plug and check its condition. Replace the plug if worn or reuse is questionable.

**NOTE:** Do not clean the spark plugs in a machine using abrasive grit. Some grit could remain in the spark plug and enter the engine causing extensive wear and damage.

- Check the gap using a wire feeler gauge. Adjust the gap to **0.76 mm (0.030 in.)** by carefully bending the ground electrode. See Figure 10.
- Reinstall the spark plug into the cylinder head. Torque the spark plug to **24.4-29.8 N·m (18-22 ft. lb.)**.

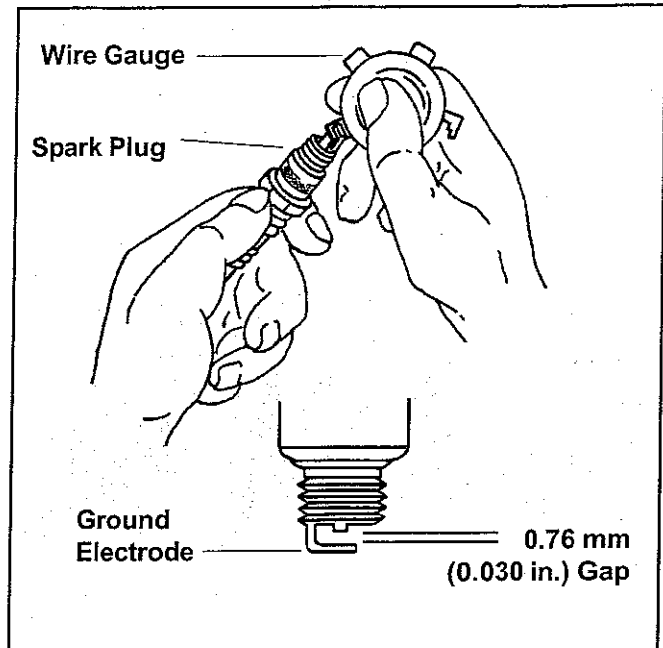


Figure 10. Servicing Spark Plug.

### Battery Charging



#### **WARNING: Explosive Gas!**

Batteries produce explosive hydrogen gas while being charged. To prevent a fire or explosion, charge batteries only in well ventilated areas. Keep sparks, open flames, and other sources of ignition away from the battery at all times. Keep batteries out of the reach of children. Remove all jewelry when servicing batteries.

Before disconnecting the negative (-) ground cable, make sure all switches are OFF. If ON, a spark will occur at the ground cable terminal which could cause an explosion if hydrogen gas or LP/gasoline fuel vapors are present.

Charging of battery should be performed as outlined by the original equipment manufacturer (OEM) in their operator's manual.

## Fuel Filter

The filter of the LP fuel system is an integral part within the lock-off/filter assembly. All service relating to the lock-off/filter is to be performed by an authorized Kohler Engine Service Dealer or qualified LP personnel only. Servicing of filter is recommended every 500 hours. The gasoline system (dual-fuel only) has an in-line fuel filter. Periodically inspect the filter and replace **every 200 operating hours**. Use a genuine Kohler filter, Part No. 24 050 02-S.

## Carburetor Troubleshooting and Adjustments

In compliance with government emission standards, the carburetor and the regulator are calibrated and preset to deliver the correct fuel-to-air mixture to the engine under all operating conditions and cannot be adjusted, except for low idle speed. Carburetor servicing is to be performed by an authorized Kohler Engine Service Dealer only. See Figure 11.

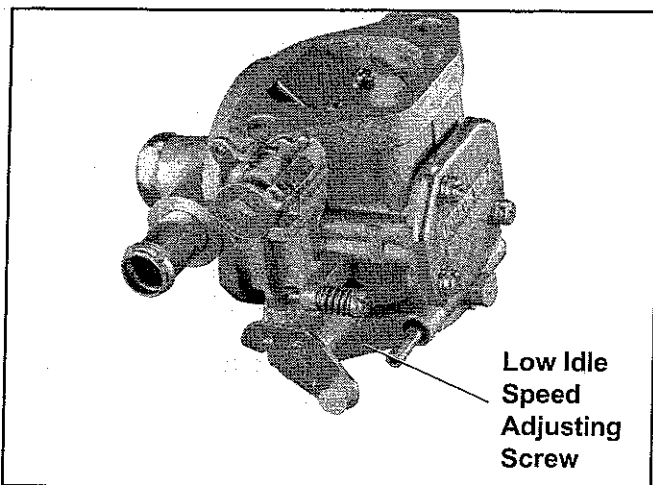


Figure 11.

## LPG Regulator

In compliance with government emission standards, the regulator is preset at the factory to provide the proper supply of fuel. No adjustment or resetting of regulator is to be made. All service relating to the regulator must be performed by an authorized Kohler Engine Service Dealer or qualified LP personnel only.

Over time, fuel deposits can accumulate inside the regulator. Draining of these deposits is recommended (Nikki regulators only) every 500 operating hours, or annually, whichever comes first.

### Nikki Regulators

#### Every 500 hours/annually drain regulator:

1. Turn fuel supply valve off, run engine out of fuel, and turn off ignition switch.
2. Disconnect and ground the spark plug leads.
3. Remove the 1/8" pipe plug from the bottom of regulator and drain any accumulated deposits. See Figure 12.

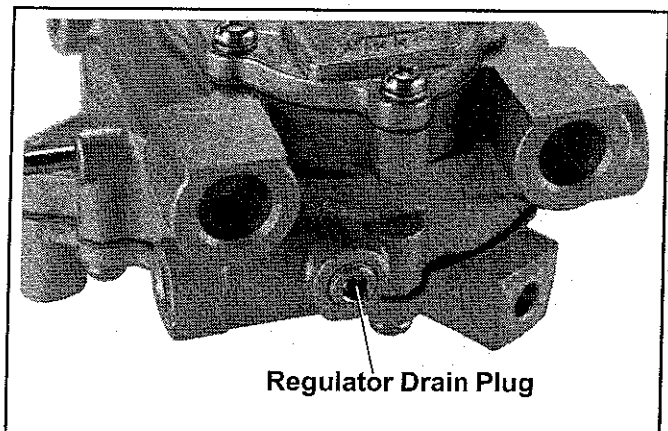


Figure 12. Nikki Regulator Drain Plug.

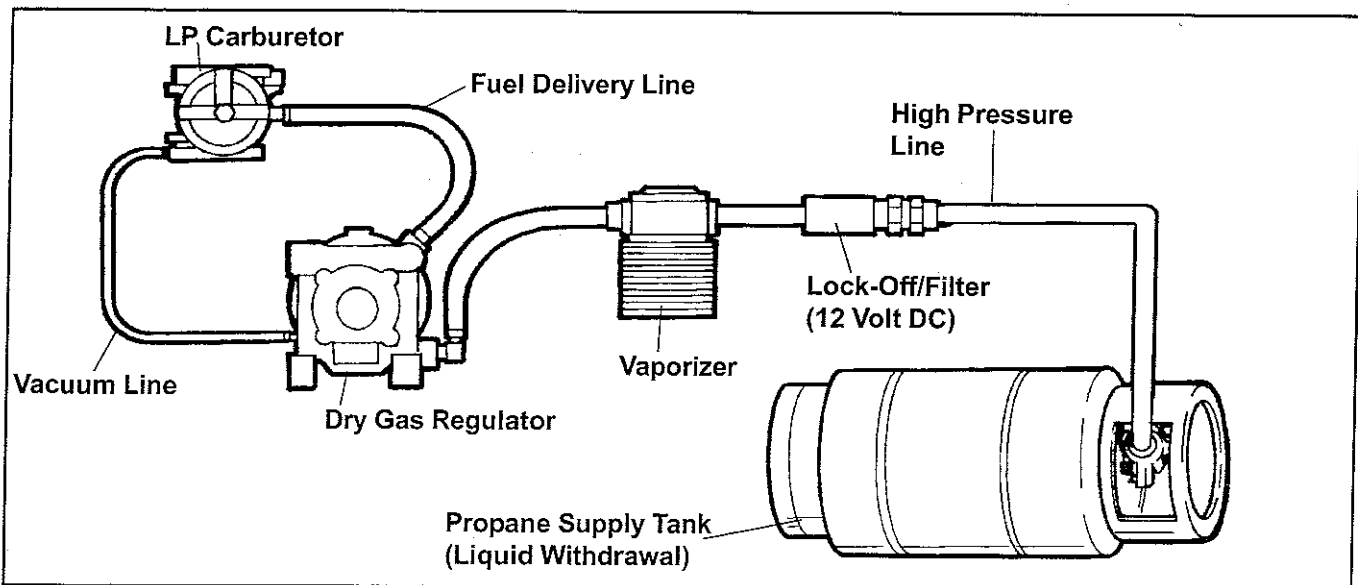


Figure 13. Schematic Showing Components of LP System.



- Reinstall plug using Teflon® pipe sealant (not Teflon® tape) on threads and tighten securely. If required, a replacement plug is available as Kohler Part No. X-75-23-S.

### All Regulators

#### Every 1500 Hours:

Complete cleaning (disassembling, servicing, and resetting) of regulator at 1500 hour intervals is recommended. As all adjustments and settings must be reset using specific test equipment, this must be performed by an **authorized Kohler Engine Service Dealer or qualified LP personnel only**.

### Lock-Off/Filter Assembly

This opens, closes, and filters the liquid fuel flow from the supply tank before reaching the vaporizer. Servicing, if required, is to be performed by an authorized Kohler Engine Service Dealer or qualified LP personnel only. See Figure 13.

### Vaporizer

The vaporizer changes the Liquified Petroleum (LP) from the supply tank to a gaseous/vapor state. Other than keeping the body clean, no maintenance, adjustment, or servicing is required. See Figure 13.

### Leakage Check/Testing

**Every 500 hours or annually.** With LPG tank valve fully opened, engine not running, turn key switch "on." Check all LPG system connections and lines for leaks using soapy water. Any leakage must be corrected **before** restarting engine. Have service performed by an authorized Kohler Engine Service Dealer or qualified LP personnel only.

### Troubleshooting

When troubles occur, be sure to check the simple causes which at first may seem too obvious to be considered. For example, a starting problem could be caused by an empty fuel tank. Some common causes of engine troubles are listed in the following table.

Do not attempt to service or replace major engine components, or any items that require special timing or adjustment procedures. Have your Kohler Engine Service Dealer do this work.

Cause Problem	No Fuel	Improper Fuel	Dirt In Fuel Line	Dirty/Restricted Lock-off Fuel Filter	Dirty Flywheel Screen	Incorrect Oil Level	Engine Overloaded	Dirty Air Cleaner	Faulty Spark Plug	Dirty/Possible Restricted Regulator
Will Not Start	.	.	.	.	.	.	.	.	.	.
Hard Starting	.	.	.	.	.	.	.	.	.	.
Stops Suddenly	.	.	.	.	.	.	.	.	.	.
Lacks Power	.	.	.	.	.	.	.	.	.	.
Operates Erratically	.	.	.	.	.	.	.	.	.	.
Knocks or Pings	.	.	.	.	.	.	.	.	.	.
Skips or Misfires	.	.	.	.	.	.	.	.	.	.
Backfires	.	.	.	.	.	.	.	.	.	.
Overheats	.	.	.	.	.	.	.	.	.	.
High Fuel Consumption	.	.	.	.	.	.	.	.	.	.

### Troubleshooting - Fuel Related

If engine problems are experienced that appear to be fuel system related, check the following areas before seeking service assistance.

- Make sure the LPG tank is properly filled (never to more than 80 percent of total capacity). An air space must be present in the tank to allow fuel to expand.
- Make sure the air cleaner element is clean and all air cleaner components are fastened securely.
- Check for loose, kinked, or cracked vacuum lines causing regulator not to open.
- Check to make sure the fuel valve on LPG tank is fully open.
- Check gauge on LPG tank to make sure pressure is sufficient to open the regulator.
- For problems with the gasoline system (dual-fuel), check that there is adequate fresh fuel in the tank, the fuel valve at the tank (if so equipped) is open, the fuel tank cap is properly vented, the lines are not kinked or blocked, and that the in-line filter is not dirty or restricted.

If after checking the items listed above, the engine is hard to start, runs roughly, or stalls at low idle speed, qualified fuel system servicing may be necessary. Contact your nearest authorized Kohler Engine Service Dealer for further assistance.

## Storage

When the engine is not in use, use the following storage procedure. Federal, state, or local laws governing LPG fuel tank storage may also apply. Follow the applicable storage laws.

1. Clean the exterior surfaces of the engine.
2. Change the oil and filter while the engine is still warm from operation. See "Change Oil and Oil Filter" on page 10.
3. Turn valve on LPG tank off and run engine until the fuel system is empty. Turn ignition key switch off. Separate LPG tank from the unit and store separately in an area designated for safe LPG tank storage. On dual-fuel units, the gasoline fuel system must be completely emptied, or the gasoline must be treated with a stabilizer to prevent deterioration. If you choose to use a stabilizer, follow the manufacturer's recommendations, and add the correct amount for the capacity of the fuel system. Fill the fuel tank with clean, fresh gasoline. Run the engine for 2-3 minutes to get stabilized fuel into the carburetor. Close fuel shut-off valve when unit is being stored or transported.
4. Remove the spark plugs. Add one tablespoon of engine oil into each spark plug hole. Install the plugs, but do not connect the plug leads. Crank the engine two or three revolutions.

## Specifications

Model:	CH20-22	CH25
Bore: .....	77 (3.03)	83 (3.27)
Stroke: .....	67 (2.64)	67 (2.64)
Displacement: .....	624 (38.1)	725 (44.0)
Power (@3600 RPM): .....	14.9 (20*)	18.4 (25*)
Max. Torque (@RPM): .....	44 (32) @2500	54 (39.5) @2400
Compression Ratio: .....	8.5:1	9.0:1
Weight: .....	41 (90)	43 (94)
Oil Capacity (w/filter): .....	2 (2.1)	2 (2.1)
Lubrication: .....	— Full Pressure w/full Flow Filter —	

Exhaust Emission Control System for models CH20 LP, CH25 LP, and CH25 Dual Fuel (open loop) is EM.  
Exhaust Emission Control System for model CH25 Dual Fuel (closed loop) is EM, O2S, ECM.

\*Horsepower ratings exceed Society of Automotive Engineers Small Engine Test Code J1940. Actual engine horsepower is lower and affected by, but not limited to, accessories (air cleaner, exhaust, charging, cooling, fuel pump, etc.), application, engine speed and ambient operating conditions (temperature, humidity, and altitude). Kohler reserves the right to change product specifications, designs and equipment without notice and without incurring obligation. A horsepower reduction of approximately 10 percent may be expected with the operation and use of LPG as fuel.

5. Store the engine in a clean, dry place. Store the fuel tank in a designated safe LPG storage area at all times when not in use.

## Parts Ordering

The engine Specification, Model, and Serial Numbers are required when ordering replacement parts from your Kohler Engine Service Dealer. These numbers are found on the identification plate which is affixed to the engine shrouding. Include letter suffixes if there are any. See "Engine Identification Numbers" on page 6.

*Always insist on genuine Kohler parts. All genuine Kohler parts meet strict standards for fit, reliability, and performance.*

## Major Repair

Major repair information is available in Kohler Engine Service Manuals. However, major repair generally requires the attention of a trained mechanic and the use of special tools and equipment. Your Kohler Engine Service Dealer has the facilities, training, and genuine Kohler replacement parts necessary to perform this service. For Sales & Service assistance call 1-800-544-2444 (U.S. & Canada) or contact your Kohler Engine Dealer or Service Distributor, they're in the Yellow Pages under Engines-Gasoline.

## LIMITED 2 YEAR COMMAND ENGINE WARRANTY

Kohler Co. warrants to the original consumer that each new Command engine sold by Kohler Co. will be free from manufacturing defects in materials or workmanship in normal service for a period of two (2) years from date of purchase, provided it is operated and maintained in accordance with Kohler Co.'s instructions and manuals.

Our obligation under this warranty is expressly limited, at our option, to the replacement or repair at Kohler Co., Kohler, Wisconsin 53044, or at a service facility designated by us of such parts as inspection shall disclose to have been defective.

### EXCLUSIONS:

Mufflers on engines used commercially (non-residential) are warranted for one (1) year from date of purchase, except catalytic mufflers, which are warranted for two (2) years.

This warranty does not apply to defects caused by casualty or unreasonable use, including faulty repairs by others and failure to provide reasonable and necessary maintenance.

The following items are not covered by this warranty:

Engine accessories such as fuel tanks, clutches, transmissions, power-drive assemblies, and batteries, unless supplied or installed by Kohler Co. These are subject to the warranties, if any, of their manufacturers.

KOHLER CO. AND/OR THE SELLER SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND, including but not limited to labor costs or transportation charges in connection with the repair or replacement of defective parts.

IMPLIED OR STATUTORY WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY LIMITED TO THE DURATION OF THIS WRITTEN WARRANTY. We make no other express warranty, nor is any one authorized to make any on our behalf.

Some states do not allow limitations on how long an implied warranty lasts, or the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

### TO OBTAIN WARRANTY SERVICE:

Purchaser must bring the engine to an authorized Kohler service facility. To locate the nearest facility, visit our website, [www.kohlerengines.com](http://www.kohlerengines.com), and click on SALES AND SERVICES to use the locator function, consult your Yellow Pages or telephone 1-800-544-2444.

ENGINE DIVISION, KOHLER CO., KOHLER, WISCONSIN 53044

## KOHLER CO. FEDERAL AND CALIFORNIA EMISSION CONTROL SYSTEMS LIMITED WARRANTY SMALL OFF-ROAD ENGINES

The U.S. Environmental Protection Agency (EPA), the California Air Resources Board (CARB), and Kohler Co. are pleased to explain the Federal and California Emission Control Systems Warranty on your small off-road equipment engine. For California, engines produced in 1995 and later must be designed, built and equipped to meet the state's stringent anti-smog standards. In other states, 1997 and later model year engines must be designed, built and equipped, to meet the U.S. EPA regulations for small non-road engines. The engine must be free from defects in materials and workmanship which cause it to fail to conform with U.S. EPA standards for the first two years of engine use from the date of sale to the ultimate purchaser. Kohler Co. must warrant the emission control system on the engine for the period of time listed above, provided there has been no abuse, neglect or improper maintenance.

The emission control system may include parts such as the carburetor or fuel injection system, the ignition system, and catalytic converter. Also included are the hoses, belts and connectors and other emission related assemblies.

Where a warrantable condition exists, Kohler Co. will repair the engine at no cost, including diagnosis (if the diagnostic work is performed at an authorized dealer), parts and labor.

### MANUFACTURER'S WARRANTY COVERAGE

Engines produced in 1995 or later are warranted for two years in California. In other states, 1997 and later model year engines are warranted for two years. If any emission related part on the engine is defective, the part will be repaired or replaced by Kohler Co. free of charge.

### OWNER'S WARRANTY RESPONSIBILITIES

- (a) The engine owner is responsible for the performance of the required maintenance listed in the owner's manual. Kohler Co. recommends that you retain all receipts covering maintenance on the engine, But Kohler Co. cannot deny warranty solely for the lack of receipts or for your failure to assure that all scheduled maintenance was performed.
- (b) Be aware, however, that Kohler Co. may deny warranty coverage if the engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

Continued on next page.

- (c) For warranty repairs, the engine must be presented to a Kohler Co. service center as soon as a problem exists. Call 1-800-544-2444 or access our website at [www.kohlerengines.com](http://www.kohlerengines.com), for the names of the nearest service centers. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

If you have any questions regarding warranty rights and responsibilities, you should contact Kohler Co. at 1-920-457-4441 and ask for an Engine Service representative.

#### COVERAGE

Kohler Co. warrants to the ultimate purchaser and each subsequent purchaser that the engine will be designed, built and equipped, at the time of sale, to meet all applicable regulations. Kohler Co. also warrants to the initial purchaser and each subsequent purchaser, that the engine is free from defects in materials and workmanship which cause the engine to fail to conform with applicable regulations for a period of two years.

Engines produced in 1995 or later are warranted for two years in California. For 1997 and later model years, EPA requires manufacturers to warrant engines for two years in all other states. These warranty periods will begin on the date the engine is purchased by the initial purchaser. If any emission related part on the engine is defective, the part will be replaced by Kohler Co. at no cost to the owner. Kohler Co. is liable for damages to other engine components caused by the failure of a warranted part still under warranty.

Kohler Co. shall remedy warranty defects at any authorized Kohler Co. engine dealer or warranty station. Warranty repair work done at an authorized dealer or warranty station shall be free of charge to the owner if such work determines that a warranted part is defective.

Listed below are the parts covered by the Federal and California Emission Control Systems Warranty. Some parts listed below may require scheduled maintenance and are warranted up to the first scheduled replacement point for that part. The warranted parts are:

- Oxygen sensor (if equipped)
- Intake manifold (if equipped)
- Exhaust manifold (if equipped)
- Catalytic muffler (if equipped)
- Fuel metering valve (if equipped)
- Spark advance module (if equipped)
- Crankcase breather
- Ignition module(s) with high tension lead
- Gaseous fuel regulator (if equipped)
- Electronic control unit (if equipped)
- Carburetor or fuel injection system
- Fuel lines (if equipped)
- Air filter, fuel filter, and spark plugs (only to first scheduled replacement point)

#### LIMITATIONS

This Emission Control Systems Warranty shall not cover any of the following:

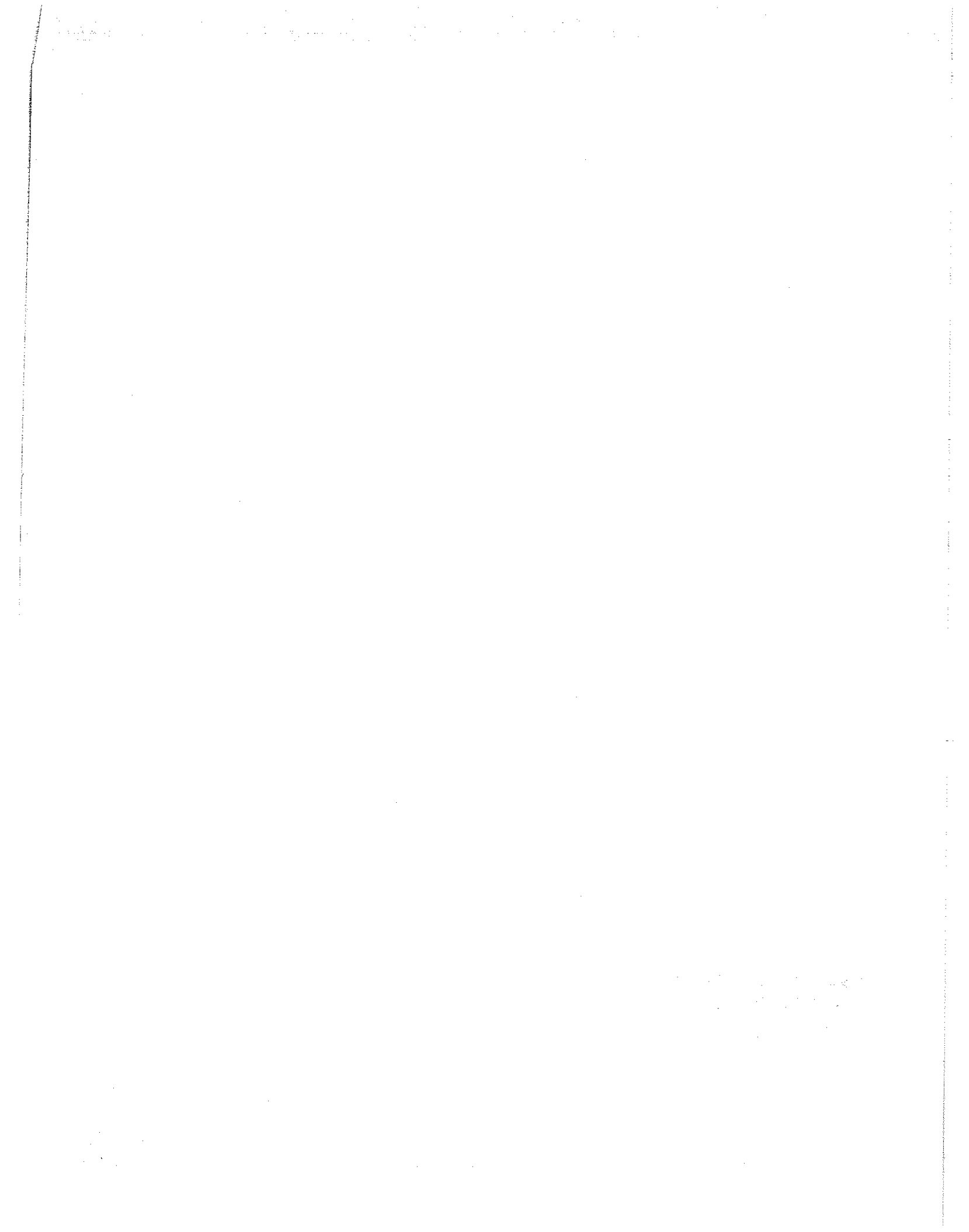
- (a) repair or replacement required because of misuse or neglect, improper maintenance, repairs improperly performed or replacements not conforming to Kohler Co. specifications that adversely affect performance and/or durability and alterations or modifications not recommended or approved in writing by Kohler Co.,
- (b) replacement of parts and other services and adjustments necessary for required maintenance at and after the first scheduled replacement point,
- (c) consequential damages such as loss of time, inconvenience, loss of use of the engine or equipment, etc.,
- (d) diagnosis and inspection fees that do not result in eligible warranty service being performed, and
- (e) any add-on or modified part, or malfunction of authorized parts due to the use of add-on or modified parts.

#### MAINTENANCE AND REPAIR REQUIREMENTS

The owner is responsible for the proper use and maintenance of the engine. Kohler Co. recommends that all receipts and records covering the performance of regular maintenance be retained in case questions arise. If the engine is resold during the warranty period, the maintenance records should be transferred to each subsequent owner. Kohler Co. reserves the right to deny warranty coverage if the engine has not been properly maintained; however, Kohler Co. may not deny warranty repairs solely because of the lack of repair maintenance or failure to keep maintenance records.

Normal maintenance, replacement or repair of emission control devices and systems may be performed by any repair establishment or individual; however, **warranty repairs must be performed by a Kohler authorized service center.** Any replacement part or service that is equivalent in performance and durability may be used in non-warranty maintenance or repairs, and shall not reduce the warranty obligations of the engine manufacturer.





# KOHLER<sup>®</sup> ENGINES

FOR SALES AND SERVICE INFORMATION  
IN U.S. AND CANADA, CALL 1-800-544-2444

ENGINE DIVISION, KOHLER CO., KOHLER, WISCONSIN 53044

FORM NO.: 24 590 03
ISSUED: 12/04
REVISED:
MAILED:

LITHO IN U.S.A.



1P24 590 03



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PO00891 (old BMS)  
BMS-270LP  
10-18-LP

**CRANKSHAFT - Group 1**

Crankshaft.....	24 014 20-S
Plug, cup.....	52 139 09-S
Spacer (A.R.).....	275066-S
Spacer (A.R.).....	275067-S

**CRANKCASE - Group 2**

Kit, Crankcase.....	24 561 138-S
Plug, cup.....	52 139 09-S
Plug, pipe 3/8" (2).....	X-75-10-S
Pin, locating.....	24 380 13-S
Seal, oil front.....	24 032 01-S
Camshaft.....	24 012 10-S
Shim, camshaft (A.R.).....	12 422 09-S
Shim, camshaft (A.R.).....	12 422 13-S
Shim, camshaft (A.R.).....	12 422 07-S
Shim, camshaft (A.R.).....	12 422 08-S
Shim, camshaft.....	12 422 10-S
Shim, camshaft (A.R.).....	12 422 11-S
Shim, camshaft (A.R.).....	12 422 12-S
Piston w/Ring Set (Std.) (2).....	24 874 06-S
Retainer, piston pin (4).....	24 018 01-S
Ring Set (Std.) (2).....	24 108 04-S
Connecting Rod (Std.) (2).....	24 067 13-S
Connecting Rod (.25) (2).....	24 067 14-S
Plug, drain (2).....	52 139 02-S
Shaft, governor cross.....	24 144 33-S
Seal, governor cross shaft.....	28 032 09-S
Retainer, ring.....	24 018 09-S
Washer, plain 9 mm.....	M-931010-S
Washer, flat.....	24 468 15-S

**OIL PAN/LUBRICATION - Group 3**

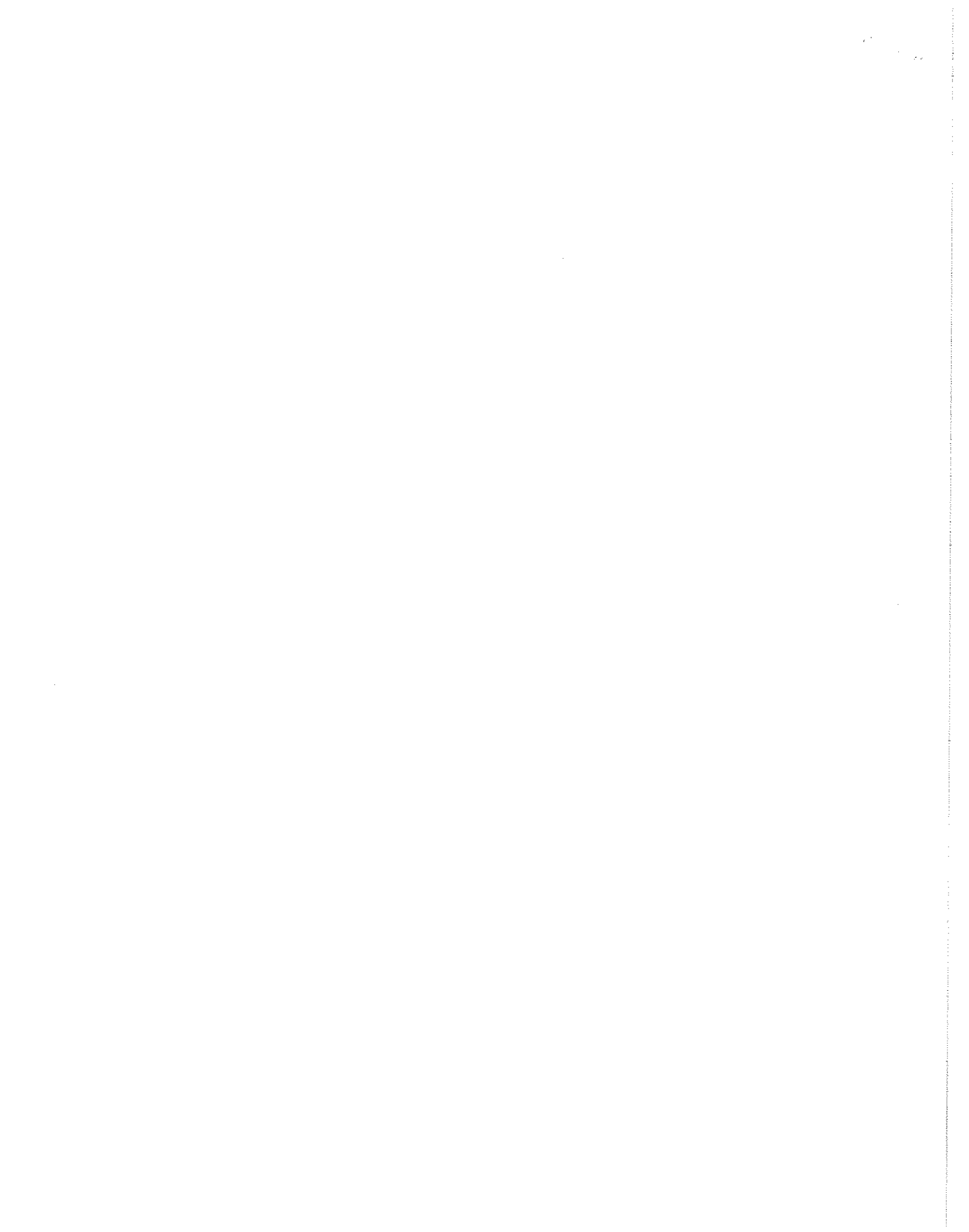
Plate, closure assembly.....	24 009 83-S
Seal, oil (PTO end).....	52 032 08-S
O-Ring.....	24 153 08-S
Kit, governor gear w/pin.....	24 043 12-S
Pin, governor regulating.....	12 380 01-S
Tab, locking.....	52 448 02-S
Tube, dipstick.....	24 123 08-S
Shaft, governor gear.....	12 144 02-S
Dipstick.....	24 038 06-S
Plug, allen hd. 1/8" pipe (2).....	X-75-23-S
Oil pump assembly.....	24 393 10-S
Pick-up, oil.....	24 381 04-S
O-Ring, oil pick-up.....	24 153 01-S
Washer, lock 3/8" (3).....	X-22-10-S
Screw, hex. flange M8x1.25x50 (3).....	12 086 13-S
Washer, plain 6 mm (2).....	M-631005-S
Screw, hex. flange M6x1.0x25 (2).....	M-645025-S
Filter, oil.....	12 050 01-S
Screw, hex. flange M8x1.25x45 (9).....	24 086 16-S
Screw, hex. flange M8x1.25x45.....	24 086 17-S
Nipple, oil filter.....	24 136 05-S
Cooler, oil - phenolic.....	24 594 06-S
Reed, oil relief.....	24 402 02-S

Pin, locating.....	24 380 13-S
Gasket, oil filter adapter.....	24 041 29-S
Switch, pressure.....	12 099 04-S
Screw, hex. hd. M4x0.7x10.....	M-448010-S
Kit, pump adapter.....	24 755 09-S
Screw, hex. cap 7/16-14x1/2 (4).....	X-8-21-S
Washer, lock 7/16" (4).....	X-23-1-S
Pin, alignment (4).....	52 380 06-S
Decal, oil sentry.....	25 113 05-S

**HEAD/VALVE/BREATHER - Group 4**

Head assembly, #2 cylinder.....	24 318 66-S
Stud, cylinder hd. M8x1.25x20, M10x1.5x33, 105 mm long (8).....	24 072 09-S
Nut, hex. flange M8x1.25 (8).....	24 100 10-S
Washer, flat 8 mm (8).....	24 468 16-S
Kit, retainer (4).....	12 755 03-S
Cap, valve spring (4).....	12 173 01-S
Spring, valve (4).....	24 089 02-S
Retainer, spring (4).....	235011-S
Seal, valve stem (2).....	24 032 05-S
Gasket, cylinder head (2).....	24 041 37-S
Valve, intake (Std.) (2).....	24 017 01-S
Valve, intake (.25) (2).....	24 017 02-S
Valve, exhaust (Std.) (2).....	24 016 01-S
Valve, exhaust (.25) (2).....	24 016 02-S
Reed, breather.....	24 402 03-S
Retainer, breather reed.....	12 018 01-S
Screw, hex. flange M5x0.8x10.....	M-545010-S
Kit, breather.....	24 033 01-S
Cover, breather.....	24 096 58-S
Gasket, breather.....	24 041 23-S
Plug, allen head 1/8" pipe.....	X-75-23-S
Screw, hex. flange M6x1.0x20 (4).....	M-645020-S
Hose, breather.....	24 326 37-S
Strap, lifting.....	24 445 01-S
Clamp, hose.....	X-426-3-S
Kit, valve cover - plain.....	24 755 74-S
O-Ring.....	24 153 16-S
Screw, shoulder (4).....	24 086 32-S
Filter, breather.....	24 050 01-S
Screw, hex. flange M6x1.0x34 (4).....	M-640034-S
Kit, valve train.....	24 755 66-S
Pivot, rocker arm (4).....	24 599 01-S
Rod, push (4).....	24 411 05-S
Arm, rocker (4).....	25 186 01-S
Lifter, valve (4).....	25 351 01-S
Head assembly, #1 cylinder.....	24 318 65-S
Kit, valve cover - oil fill.....	24 755 75-S
O-Ring.....	24 153 16-S
Screw, shoulder (4).....	24 086 32-S
O-Ring.....	24 153 09-S
Liner, exhaust port (2).....	24 605 01-S
Kit, oil fill cap.....	25 755 13-S
O-Ring, oil fill cap.....	24 153 03-S





**IGNITION/CHARGING - Group 5**

15 amp stator.....	54 755 09-S
Bracket, stator wire .....	24 126 71-S
Screw, hex. cap M5x0.8x25 (2).....	M-548025-S
Screw, hex. flange M10x1.5x46.....	12 086 14-S
Washer, plain 3/8".....	12 468 03-S
Flywheel assembly .....	24 025 05-S
Key .....	X-42-15-S
Fan .....	24 157 03-S
Module, ignition (2) <i>for Spark plug Wires</i> .....	24 584 15-S <sup>11</sup> <sub>5-34-02</sub>
Screw, hex. flange M5x0.8x20 (4).....	M-561025-S
Screw, phillips hd. 11-16x3/4" (2).....	24 086 18-S
Lead, green, (5" - 12 gauge - insulated grip barrel eyelets).....	24 518 12-S
Rectifier-regulator .....	25 403 05-S
Washer, plain 1/4" (2).....	X-25-63-S
Washer, plain 3/16" (2).....	X-25-92-S
Connector (3 contact).....	236602-S
Spark Plug (2).....	12 132 02-S
Nut, plastic (2).....	24 100 02-S
Screw, phillips hd. 11-16x1/2 (2).....	24 086 41-S
Module, speed advance.....	24 584 10-S
Clip, cable .....	210281-S
Harness, wiring.....	24 176 78-S
Clip, cable .....	47 154 01-S
Kit grass screen.....	54 755 15-S
asher, plain 1/4" (4).....	X-25-92-S
pacer (4) .....	24 112 04-S
Screw, hex. hd. M4x0.7x25 (4).....	M-403025-S
Decal, grass screen .....	24 113 18-S
Washer, lock 1/2".....	X-22-11-S
Bolt, shoulder M6x1.0x16 (4).....	25 086 47-S
Kit, wiring harness .....	54 755 02-S
Lead, violet (36-1/2" - 12 gauge - uninsulated push on tab - insulated grip barrel eyelet).....	25-518 34-S
Harness, wiring .....	24 176 50-S
Harness, wiring .....	24 176 41-S
Terminal (2).....	15 452 01-S
Lead, green (19-1/2" - 18 gauge - fully insulated push on tab terminals).....	24 518 09-S
Screw, sems hex. cap 10-16x1/2".....	X-67-3-S
Harness, wiring .....	25 176 02-S
Switch assembly, key .....	25 099 04-S
Washer.....	48 468 02-S
Key (set of 2).....	48 340 01-S1
Nut, key switch.....	48 100 01-S

**BLOWER HOUSING & BAFFLES - Group 6**

Housing, blower.....	24 027 18-S
Nut, plastic (2).....	24 100 01-S
t, plastic (2).....	24 100 02-S
ug, button 9/16".....	25 139 16-S
Screw, hex flange M5x0.8x16 (3).....	M-545016-S
Screw, hex flange M5x0.8x20 (4).....	M-545020-S
Screw, hex. flange M5x0.8x16.....	M-551016-S

Plate, backing - #1 side.....	24 146 20-S
Plate, backing - #2 side.....	24 146 17-S
Screw, hex. flange M6x1.0x16 (6).....	M-645016-S
Baffle, valley - #1 side.....	24 063 24-S
Baffle, valley - #2 side.....	24 063 17-S
Baffle, cylinder barrel - #2 side .....	24 063 48-S
Baffle, cylinder barrel - #1 side .....	24 063 30-S
Screw, hex. flange M5x0.8x10 (2).....	M-545010-S
Grommet.....	24 313 02-S
Decal, 25 HP.....	24 113 52-S

**STARTING SYSTEM - Group 7**

Screw, hex. flange M8x1.25x80 (2).....	M-839080-S
Nut, hex. flange M8x1.25.....	M-841080-S
Starter, solenoid shift .....	24 098 01-S
Drive, end cap.....	24 081 04-S
Lever, starter drive .....	12 090 10-S
Armature, starter .....	12 170 04-S
Drive, pinion.....	12 239 01-S
Commutator, end cap.....	24 301 01-S
Frame.....	12 471 01-S
Kit, starter repair.....	24 755 84-S
Nut, starter.....	52 100 09-S
Nut, starter (2).....	52 100 10-S
Insulator.....	52 168 01-S
Bolt, thru M5x0.8x99 (2).....	52 211 05-S
Kit, brush & spring.....	52 221 01-S
Spring, brush (4).....	52 089 09-S
Holder, brush.....	52 323 03-S
Solenoid.....	52 435 02-S

**FUEL SYSTEM - Group 8**

Kit, carburetor w/gasket.....	24 853 74-S
Gasket, carburetor.....	24 041 43-S
Gasket, air cleaner .....	24 041 06-S
Carburetor assembly (For information only not available separately).....	24 053 74
Screw, sems hex. cap M8x1.25x25 (2).....	24 086 47-S
Gasket, intake manifold .....	24 029 37-S
Screw, ctsk. hex. sckt. M6x1.0x16 (2).....	24 086 46-S
Screw, hex. flange M8x1.25x20 (2).....	M-839020-S
Assembly, regulator .....	24 403 10-S
Bracket, mounting.....	24 126 72-S
Clamp, hose (2).....	X-426-9-S
Clamp, hose (2).....	25 237 01-S
Hose, vacuum.....	24 353 26-S
Hose, regulator (2).....	24 353 23-S
Assembly, vaporizer.....	24 465 03-S
Hose, vaporizer.....	24 353 24-S
Washer.....	12 468 01-S
Decal, CO warning.....	25 113 19-S
<i>Fuel kit Solenoid for Carb</i> .....	<i>24-757-01</i>

**ENGINE CONTROLS - Group 9**

Washer, wave.....	41 468 03-S
Lever, throttle actuator.....	24 090 07-S
Lever, throttle control.....	24 090 03-S



Lever, choke.....	24 090 05-S
Bracket, control.....	24 126 56-S
Nut, hex. flange M5x0.8.....	M-541050-S
Washer, lock 1/4".....	X-20-1-S
Screw, hex. flange M4x0.7x30.....	M-401030-S
Washer, plain 11/32" (3).....	24 468 01-S
Nut, hex. M4x0.7.....	M-446030-S
Screw, hex. flange M5x0.8x20.....	M-545020-S
Nut, hex. flange M5x0.8.....	M-547050-S
Screw, hex. flange M6x1.0x16 (4).....	M-645016-S
Clamp, cable (2).....	12 237 01-S
Screw, hex. flange M5x0.8x16.....	M-545016-S
Nut, hex. flange M6x1.0.....	M-641060-S
Spring, linkage.....	24 089 01-S
Linkage, choke.....	24 079 02-S
Linkage, throttle.....	24 079 01-S
Bushing, linkage retaining.....	25 158 08-S
Bushing, throttle linkage.....	25 158 11-S
Spring, throttle limiter.....	24 089 51-S
Lever, governor.....	24 090 33-S
Spring, governor.....	24 089 46-S
Bolt, rd. hd. sq. neck M6x1.0x25.....	24 211 03-S

**AIR INTAKE/FILTRATION - Group 10**

Cover, air cleaner.....	24 096 67-S
Bracket, air cleaner base.....	24 126 74-S
Kit, knob w/seal.....	54 755 01-S
O-Ring.....	24 153 20-S
Knob, cover.....	25 341 03-S
Element, air cleaner..... 07100022.....	24 083 05-S
Cover, inner air cleaner.....	24 096 01-S
Gasket, intake manifold (2).....	24 041 01-S
Manifold, intake.....	24 164 34-S
Screw, hex. flange M6x1.0x55 (4).....	M-651055-S
Wing Nut.....	12 100 01-S
Gasket, air cleaner (2).....	277093-S
Seal, breather.....	230046-S
Element, air filter..... 07100013.....	24 083 03-S
Base, air cleaner.....	24 094 17-S
Screw, sltd. hex. hd. 10-32x3/4" (4).....	25 086 81-S
Connector, elbow.....	X-391-11-S

**EXHAUST - Group 11**

Stud, M8x1.25x33 (4).....	25 072 08-S
Gasket, exhaust (2).....	24 041 02-S
Nut, hex. flange M8x1.25 (4).....	M-841080-S
Manifold, exhaust.....	24 164 19-S
Manifold, exhaust.....	24 164 20-S
Bracket, muffler.....	24 126 15-S
Washer, spring 10 mm (2).....	24 468 14-S
Screw, hex. flange M8x1.25x25 (2).....	M-839025-S

Short Block.....	24 522 190
Miniblock.....	24 782 20
Gasket Set.....	24 755 113-S

