

# Mirage<sup>®</sup> Propane Burnisher

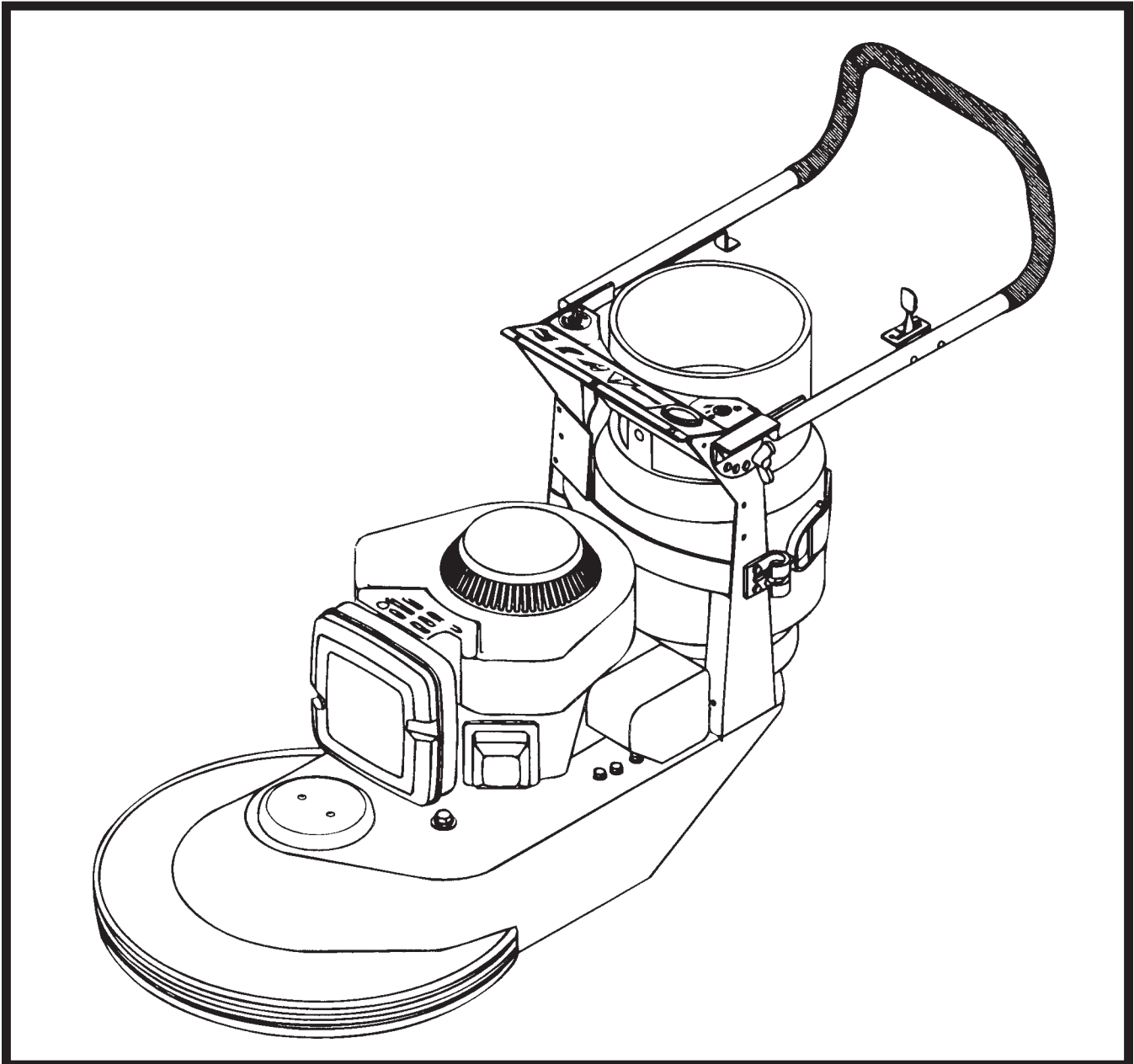
Model: M220024KA  
M220021K17 M220028KA  
M220021K17C M220021N14  
M220024K17 M220024N20  
M220024K17C M220028N20  
M220028K17  
M220028K17C

OPERATION

SERVICE

PARTS

CARE



Revised 11/98

**Minuteman<sup>®</sup>**

# MINUTEMAN MIRAGE PROPANE BUFFERS

ORIGINAL - Please Photo Copy

## DAILY SERVICE AND MAINTENANCE LOG

MONTH: \_\_\_\_\_

DAY	OPERATOR INITIALS	EACH USE						50 HOURS			100 HOURS			300 HOURS OR AS NEEDED				MISCELLANEOUS WORK PERFORMED
		HOURS METER READING	OIL CHECKED	DUST FILTER CLEANED	PAD/HOLDER CHECKED	BELT TENSION CHECKED	HOSE CONNECTION CHECKED	CLEAN AIR FILTERS	WASH MOTOR	INSPECT & TIGHTEN ALL BOLTS	CHANGE ENGINE OIL	CHANGE OIL FILTER	CHANGE SPARK PLUG	ADJUST/REPLACE E.V. BELT	REPLACE HOSES / CONNECTIONS	PERFORM EMISSION TEST	ADJUST CARBURETOR / REGULATOR	
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Notes or Remarks:

Consult Original Owners Manual for all Adjustments and Procedures

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# UNPACKING INFORMATION

## INSPECTION

Carefully unpack and inspect your Burnisher for shipping damage. Each unit is tested and thoroughly inspected before shipment and any damage is the responsibility of the delivering carrier who should be notified immediately.

## ENGINES

Engines are shipped **with** oil & coolant. Refer to engine manual for correct weight and quantity. Briggs V-twin 16 hp, Briggs 14 hp single cylinder, Kawasaki. Before starting engine check all levels. Do not overfill.

## PROPANE TANK

The tank supplied with this equipment is a vertical vapor withdrawal 20 lb. tank. Do not overfill. Fill tank to **80%** of rated capacity. Safety fill, Aluminum unpolished, polished, and steel. All propane tanks are equipped with this special warning sticker. Please read.

### WARNING:

**Vapor withdrawal tank weight fill only! Failure to weight fill tank will void warranty and cause damage to propane components! Tare weight is stamped on the tank.**

## USER TIPS

- Allow only qualified and trained personnel to operate a Minuteman Propane Buffer.
- Always maintain your Minuteman Propane Buffer, follow operating and maintenance instructions.
- Always check oil level before starting.
- Always keep accurate records of maintenance and service in a maintenance log book.
- Never overfill a propane fuel tank. Be sure to follow safety instructions for venting overfilled tanks in safety section in this manual.
- Never leave machine unattended with engine running.
- Never change or alter fuel system unless authorized by Minuteman International Inc. Service Department.
- Always keep nuts and bolts tightened and hose connection snug.
- Always clean recoil dust filters after 1 hour of use, and keep propane buffer clean.
- Always store propane tank outside in an approved, secured, and tamper proof enclosure to provide safety from vandalism and accidents.
- Never use a non-UL listed fuel tank on your propane buffer.
- Always operate your propane buffer, with exhaust (muffler) pointed away from merchandise, furniture, etc. Heat from exhaust may cause damage.
- Never use a spray buff product over top of the engine. This could cause damage to engine if product got into cooling system.
- For all engine repairs refer to the engine manual included with this parts and instruction book.
- Engine will not start if rego coupling is crossed, (fuel line connection) make sure fuel line connection is properly done.
- Always check fuel system for leaks with soapy water. (Hoses, regulators, connections)
- Never smoke while operating or working on propane buffer.
- Do not attempt to change a pad while buffer engine is running.
- Keep hands, feet, hair, clothing, etc. away from buffing pad, pulleys, and any other moving parts on equipment.
- If you smell gas, do not touch any electric switch, extinguish any open flame and contact your gas supplier, and open windows.
- If there is any smell of propane fuel, check immediately for leaks.
- Do not store any other flammable liquids or vapors in the vicinity of propane storage area, machine storage area or any other appliance.
- Do not place flammable objects such as matches, fuel, etc., close to the engine while it is running.
- Never attempt to repair a propane fuel tank by yourself. Tanks can only be repaired by a Department of Transportation authorized facility.
- For repairs or adjustments on your Propane Buffer use only an authorized Minuteman Service Center.



Visible escaping gas vapor is extremely cold (ICE). Degrees (-44) avoid contact.



Propane gas is heavier than air. The gas will settle to the lowest possible area and build upwards.



Build-up of propane vapor in any enclosed area, can cause an explosion if ignited. Operate only in well-ventilated areas.

# SAFETY PRECAUTIONS

Before operating the engine, read the Operator's Manual and become familiar with it and the equipment. Safe and efficient operation can be achieved only if the equipment is properly operated and maintained.

The following symbols, found throughout this manual, alert you to potentially dangerous conditions to the operator, service personnel, or the equipment.

**▲ DANGER** This symbol warns of immediate hazards that will result in severe personal injury or death.

**▲ WARNING** This symbol refers to a hazard or unsafe practice that can result in severe personal injury or death.

**▲ CAUTION** This symbol refers to a hazard or unsafe practice that can result in personal injury or product or property damage.

Fuels, electrical equipment, batteries, exhaust gases and moving parts present potential hazards that can result in severe personal injury. Take care in following these recommended procedures. All local, state and federal codes should be consulted and complied with.

## GENERAL

- Provide appropriate fire extinguishers and install in convenient locations. Use an extinguisher rated ABC by NFPA.
- Make sure that all fasteners on the engine are secure and accurately torqued. Keep guards in position over fans, driving belts, etc.
- If it is necessary to make adjustments while the engine is running, use extreme caution when close to hot exhausts, moving parts, etc.
- Used engine oils have been identified by some state or federal agencies as causing cancer or reproductive toxicity. When checking or changing engine oil, take care not to ingest, breathe the fumes, or contact used oil.
- Do not work on this equipment when mentally or physically fatigued, or after consuming any alcohol or drug that makes the operation of equipment unsafe.

## BATTERIES

- Before starting work on the engine, disconnect batteries to prevent inadvertent starting of the engine.
- DO NOT SMOKE while servicing batteries. Lead acid batteries give off a highly explosive hydrogen gas which can be ignited by flame, electrical arcing or by smoking.
- Verify battery polarity before connecting battery cables. Connect negative cable last.

## FUEL SYSTEM

- DO NOT fill fuel tanks while engine is running.
- DO NOT smoke or use an open flame in the vicinity of the engine or fuel tank. Internal combustion engine fuels are highly flammable.
- Fuel line must be LP approved, adequately secured, and free from leaks. Piping at the engine should be approved flexible line. Do not use copper piping for flexible lines as copper will work harder and become brittle enough to break.
- Be sure all fuel supplies have a positive shut-off valve.

## PROTECT AGAINST MOVING PARTS

- Do not wear loose clothing in the vicinity of moving parts, such as PTO shafts, flywheels, blowers, couplings, fans belts, etc.
- Keep your hands away from moving parts.

## EXHAUST SYSTEM

- Exhaust products of any internal combustion engine are toxic and can cause injury, or death if inhaled. When operating the engine in a confined area, make sure the ventilation system is operating properly.
- DO NOT use exhaust gases to heat a compartment.
- Make sure that your exhaust system is free of leaks. Make sure that exhaust manifolds are secure and are not warped by bolts unevenly torqued.

## EXHAUST GAS IS DEADLY!

Exhaust gases contain carbon monoxide, a poisonous gas that can cause unconsciousness and death. It is an odorless and colorless gas formed during combustion of hydrocarbon fuels. Symptoms of carbon monoxide poisoning are:

- Dizziness
- Headache
- Weakness and Sleepiness
- Throbbing in Temples
- Vomiting
- Muscular Twitching

If you experience any of these symptoms, get out into fresh air immediately, shut down the unit and do not use it until it has been inspected.

The best protection against carbon monoxide inhalation is proper installation and regular, frequent inspections of the complete exhaust system. If you notice a change in the sound or appearance of exhaust system, shut the unit down immediately and have it inspected and repaired at once by a competent mechanic.

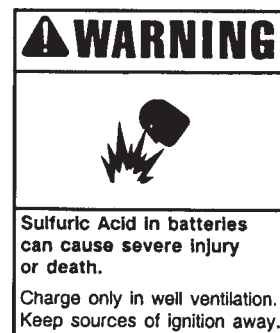
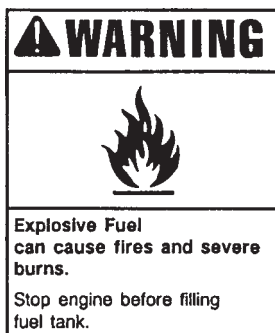
## KEEP THE UNIT AND SURROUNDING AREA CLEAN

- Make sure that oily rags are not left on or near the engine.
- Remove all unnecessary grease and oil from the unit. Accumulated grease and oil can cause overheating and subsequent engine damage and present a potential fire hazard.

# SAFETY INFORMATION

## For Your Safety!

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



### Accidental Starts!

Before servicing the engine or equipment, always disconnect the spark plug lead to prevent the engine from starting accidentally. Ground the lead to prevent sparks that could cause fires.

On engines equipped with a 12-volt battery and/or electric start, disconnect the battery cables from the battery. Always disconnect the negative (-) cable first.

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 fuel vapors are present.

### **▲ WARNING: Over-speed is Hazardous!**

Never tamper with the governor components or settings to increase the maximum speed. Severe personal injury and damage to the engine or equipment can result if operated at speed above maximum ratings.

### 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 and systems.

### **▲ CAUTION: High Voltage!**

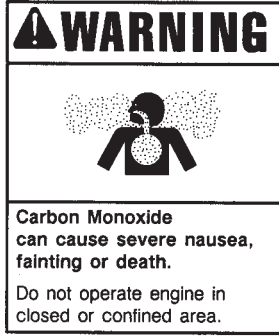
Never touch electrical wires or components while the engine is running. They can be sources of electrical shock which could cause severe injury or burns.

### Dangerous Acid, Explosive Gases!

Batteries contain sulfuric acid. To prevent acid burns, avoid contact with skin, eyes and clothing. 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 gasoline vapors are present.

# SAFETY INFORMATION CONTINUED



## 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.



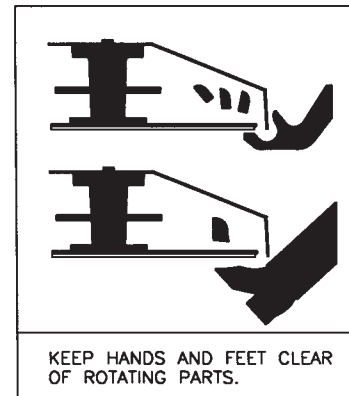
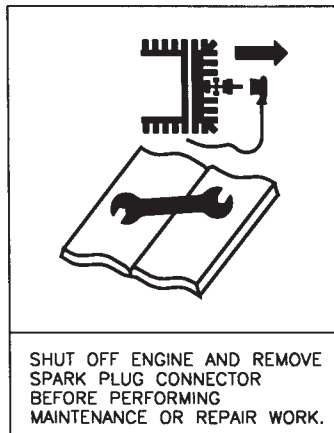
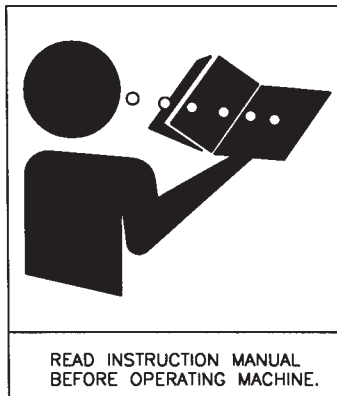
## Rotating Parts!

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



## Hot Parts!

The crankcase, cylinder head, exhaust system, and other 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 SET-UP

## PRE-START CHECKS

Inspect the engine visually. Check for loose or missing parts and any damage that may have occurred in shipment.

Refer to Engine Owners Manual for the crankcase oil capacity.

**CAUTION** *Starting the engine without oil will result in severe engine damage. Add oil prior to starting the engine.*

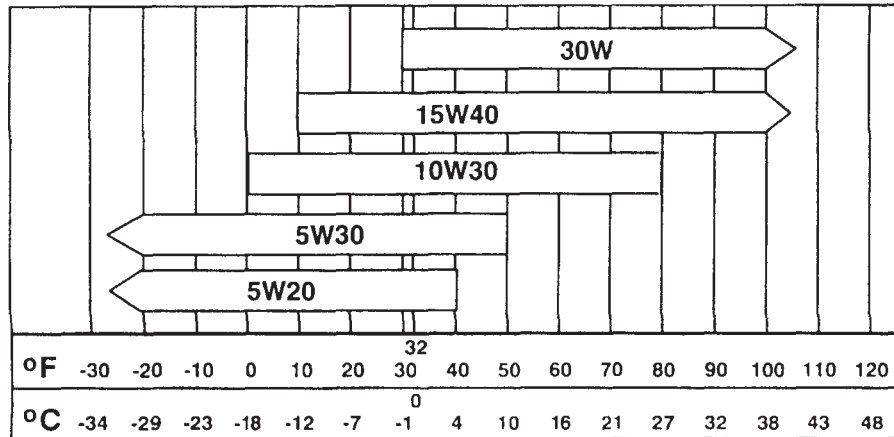
Single-grade oil is preferable when temperatures are consistently -over 30°F (0°C). Multigrade oils are best when wide temperature variations are anticipated.

## CRANKCASE OIL RECOMMENDATIONS

Use premium quality motor oil with the API (American Petroleum Institute) designation SG on the container. Figure 1 shows the recommended oil weight for the temperature range that the engine will be operated in. Make sure the engine oil weight is correct for the expected temperature range.

**WARNING** *Crankcase pressure can blow out hot oil, that can cause severe personal injury. Do not check the oil level while the engine is running.*

**CAUTION** *Excess oil can cause high oil consumption, high operating temperatures, and oil foaming. Do not overfill the crankcase.*



ANTICIPATED AMBIENT TEMPERATURE

TABLE 1 FIGURE 1



# PROPANE BURNISHER SET-UP

## CHECK OIL

Refer to engine manual for the type of oil, and instructions for checking oil. It is important to note engine manufacturers differ in the way oil is checked. Add oil if needed. Refer to Page 12.

## HANDLE ADJUSTMENT

Adjust handle by loosening wing nuts on each side of handle. Rotate handle to desired position and reinstall wing nuts.

## PROPANE TANK INSTALLATION

Buffer is supplied with 20 lb., 5 gallon capacity D.O.T. and U.L. listed tank. **DO NOT OVERFILL.** Overfilling will cause regulator to freeze. This could cause damage to your equipment. Hold tank in place by clamping the toggle assembly to the tank band around the tank. Adjustments to the toggle assembly are made by screwing toggle in or out on the toggle clamp. Connect fuel hose to the tank valve by turning coupling to the right (clockwise). Hand tighten only, making sure not to cross thread the coupling.

## REMOVING TANK

To loosen turn coupling to the left (counter clockwise). Undo the tank strap, remove tank and store in approved area. Do not store tank with machine in the janitor's closet.

**CONNECTING THE BATTERY** (for battery start machines only)  
Connect the **RED** positive cable first, then connect the black negative cable last.

## INSTALLATION/CHANGING PAD

1. With engine off, turn the machine over on the operator's RIGHT side (starter side) for the Briggs & Stratton models. This can be easily done by pushing down on the right side of the handle with some force while the machine is tilted back.
2. Remove the center cup retainer and carefully pull old pad off the pad driver assembly.
3. Inspect the pad holder for cracks or damage. Replace if necessary. **NOTE: A DAMAGED PAD HOLDER ROTATING AT HIGH SPEEDS MAY BE AN EXTREME HAZARD IF IT SHOULD COME APART.**
4. Pull center from new pad, enter pad on pad holder and secure with center cup retainer.
5. Press pad on to the pad driver assembly making sure pad fits inside the lip of the pad driver assembly, to prevent pad from elongating, attach center cup retainer.
6. Return machine to the upright position.

## TRANSPORTATION

When transporting a propane powered floor machine with the fuel cylinder attached, the cylinder should be securely fastened with service valve closed and coupling not attached. The machine should be secured to the vehicle to avoid movement. Tanks separate from the machine should be secured to avoid movement. **NEVER STORE MACHINES WITH TANKS IN AN ENCLOSED VAN OR TRAILER. ALWAYS CHECK TANKS FOR OVERFILL BEFORE TRANSPORTATION.**

## STARTING AND OPERATION PROCEDURE

**CAUTION: NEVER ALLOW MACHINE TO RUN FOR MORE THAN 10 SECONDS IN ONE SPOT OR DAMAGE WILL OCCUR TO THE FLOOR!**

1. Check oil and fuel levels. Make sure oil and propane tank is not overfilled.
2. Check and clean recoil dust filter and carburetor filter. Make sure air filter is free of dust and debris. Never run buffer for more than 1 hour without cleaning air filter. Change filters when necessary.
3. Check pad and pad assembly, to make sure pad is centered and clean, and look for any problems with pad driver. To do this turn machine over on its right side.
4. Check belt tension, again turn machine over on its right side and squeeze belt together. Belt should depress between 1/4 and 1/2 inch. To change see maintenance instructions. (Page 13)
5. Open propane service valve, turn counter-clockwise to open.
6. Tilt machine backward with pad off the floor, move throttle to SLOW/IDLE position. **Never start machine with pad on the floor.**
7. With Battery start machine, turn the key-switch to the start position for approximately 5 seconds. If machine fails to start, return ignition switch to the run position, do not turn off. Allow approximately 30 seconds between tries, never engage starter more than 10 seconds at a time.
  - a. **Never start buffer with pad on the floor, this will cause the starter to burn out prematurely!**
  - b. **Never use starting fluids or any other forms of flammable substance to assist the engine in starting!**
8. Allow engine to warm up and run at normal operating speed before engaging pad with floor. Make sure pad is off the floor before engaging the clutch. Once machine is at normal operating speed and clutch is engaged, start walking and slowly lower the machine to the floor and begin burnishing the floor. **NOTE: Catalytic mufflers work more efficiently when they are hot, emissions may be higher when muffler is cold. Direct drive machines have no clutch. Pad is moving when engine starts. Once engine starts you are ready to burnish.**
9. Machines with mechanical clutches: **NOTE: Never engage clutch with pad on floor.** Once machine has reached normal operating speed clutch is engaged automatically at 2400 engine RPM and start burnishing. Start burnishing when pad has reached top speed.
10. Always burnish on the right hand, so exhaust fumes are blown to the inside of the aisle. Be careful exhaust fumes and muffler are extremely hot and will damage merchandise. **NOTE: Do not expose skin to muffler or manifold - extreme heat, will burn.**
11. For normal stops of the machine, turn propane service valve clockwise, to starve the engine of its fuel. Do not stop machine by using the throttle or ignition key, you can trap fuel in the lines, which can cause a backfire and cause damage to the engine. **NOTE: In case of emergency always turn ignition key off. NOTE: Machines without clutch, the pad starts to rotate immediately when engine starts. Pad stops rotating when engine is off! No clutch!**

# OPERATION INFORMATION

## ENGINE BREAK-IN

Engine break-in as a result of proper care during the first hours of operation of a new or rebuilt engine results in the ideal fitting of all internal moving metal parts, which is essential for top engine performance. For controlled engine break-in.

1. Operate the equipment as it is intended to be operated. However, for the first 3 hours, if possible, operate the equipment at about half the available engine power, occasionally operating at full engine power for brief periods. Also, if possible, avoid prolonged low-speed, low-power operation during engine break-in.
2. Proper engine oil is especially critical during break-in because of the higher engine temperatures that can be expected. See RECOMMENDED ENGINE OIL. Change the oil if it is not appropriate for the ambient temperatures during the break-in periods. See Table 1, Figure 1 Page 6.
3. Check the oil level twice a day or after every 4 hours of operation during the first 24 hours of operation.
4. Change the oil and oil filter after the first 5 hours of operation.

## OPERATION IN DUSTY CONDITIONS

1. Keep the engine cooling fins and flywheel air inlet screen and precleaner (filter) clean.
2. Perform air cleaner maintenance more often than normal - as required.
3. Change the engine oil and oil filter more often than normal. See Table 2, Page 10.

## OPERATION IN HOT WEATHER

Pay particular attention to the following items when operating the engine in temperatures above 100°F (38°C):

1. Keep the engine cooling fins and flywheel air inlet screen and precleaner (filter) clean: See to it that nothing obstructs air flow to and from the engine.
2. Check the oil level more frequently.
3. Change the oil and oil filter more often than normal. See Table 2, Page 10.
4. Make sure the engine oil viscosity is appropriate for the ambient temperature and change the oil if necessary. See Table 1, Figure 1 page 6.

## OPERATION IN COLD WEATHER

Pay particular attention to the following items when operating the engine in temperatures below freezing.

Make sure the engine oil viscosity is appropriate for the ambient temperatures and change the oil if necessary. See Table 1. If the temperature drops before you have the chance to change the oil, warm up the engine by moving the equipment into a heated space before attempting to start the engine or change oil.

After engine has reached operating temperature while pad is still off the floor. Before lowering burnishing head, adjust throttle to operating speed. After slowly lowering machine to floor, place hands lightly on the handle and allow the **machine** to create the floor pressure. Bearing down and pushing hard will lead to premature belt problems and operator fatigue. For smoother turns and greater maneuverability, buff aisles from the right side first. **CAUTION: DO NOT RUN MACHINE FOR MORE THAN 15 SECONDS IN ONE SPOT OR BURNING WILL OCCUR.**

## IDLING AND STOPPING THE MACHINE

If for any reason the machine needs to be idled for **short** periods, simply tilt machine back on its rear caster and shift throttle back (toward operator) into Idle Position. Machine will now idle safely. **(CAUTION: DO NOT IDLE BUFFER ON REAR CASTER FOR MORE THAN TWO MINUTES. This will raise the emissions level.)**

**To stop machine** tilt back on rear caster, turn valve on propane tank off, and allow fuel in the lines to be used up. **FOR EMERGENCY SHUT OFF ONLY.** Battery start models: turn off ignition switch. Electric start models: use emergency stop switch on right side of control panel.

## STORAGE

Only authorized and properly trained personnel should have access to propane tanks and machine.

Making sure tank valve is closed, remove tank from buffer. Local Fire Codes may require storing tank in separate location. **We recommend this, as well as following Local Fire Codes.**

Store machine and tank away from objects that may fall and damage them.

Never store tank or buffer near open flame or heat producing devices.

Make sure machine is cleaned properly before stored.

To prevent damage pad holder, the pad **SHOULD** remain on machine during storage.

## EMERGENCY STOP

Turn ignition key to OFF position.

Units with emission control device and clutch. Release bail on handle to activate kill switch. (Model M220028KA).

## IGNITION SWITCH

Battery models only. Do not cold crank for more than 10 seconds.

# MAINTENANCE SCHEDULE

## PERIODIC MAINTENANCE SCHEDULE

Following the maintenance schedule and using the engine properly will result in longer engine life, better performance and safer operation. Perform each maintenance procedure after the number of operating hours indicated. These service intervals are recommended for normal operating conditions. For operation in hot or dusty conditions, service the engine more frequently. Neglecting routine maintenance can result in premature engine failure.

For any abnormalities in operation, unusual noises from the engine or accessories, loss of power, overheating, etc., contact your nearest Engine Service Center.

Refer to the following Maintenance Procedures section for routine maintenance procedures.

**TABLE 2. PERIODIC MAINTENANCE SCHEDULE**

SERVICE THESE ITEMS	AFTER EACH CYCLE OF INDICATED HOURS					
	1	8	25	50	100	200
Recoil Dust Filter	X					
Inspect Engine Generally		X <sup>1</sup>				
Check Oil Level	X					
Service Air Cleaner Element and Element Wrapper			X <sup>2</sup>			
Change Crankcase Oil		X <sup>3</sup>		X		
Replace Oil Filter (Onan, Kawaski Models)		X <sup>3</sup>			X	
Clean Cooling Fins				X <sup>2</sup>		
Clean Spark Arrester				X		
Check Valve Clearance					X <sup>4</sup>	X
Replace Air Cleaner Element						X <sup>2</sup>
Check or Replace Spark Plug						X

1 - Check for fuel leaks. With engine running, visually and audibly check exhaust system for leaks.

2 - Perform more often when running under severe operating conditions.

3 - Required for initial break-in only.

4 - Required for initial 100 hours, 200 hour interval thereafter. For detailed maintenance, refer to the Engine Service Manual.

**▲WARNING** *Breathing exhaust gases can result in severe personal injury or death. Do not use air cleaner, exhaust elbow, or connecting parts as a supporting step. Damage to these and connecting parts can cause an exhaust leak.*

# MAINTENANCE PROCEDURES

**▲WARNING** *Accidental starting of the engine can result in severe personal injury or death. Disconnect the 110 VAC power cord from the starter switch junction box or disconnect the negative (-) battery cable on 12 VDC starter models. Also disconnect the spark plug wire while servicing the engine, controls, or associated equipment.*

## HOURLY CHECK

Due to the large amount of dust that can be encountered in floor care applications, the recoil dust filter should be checked after each hour of operation. Remove and clean the filter.

## DAILY CHECKS

The operator should make a complete visual and audible inspection of the engine daily. Check the following before starting the engine for the first time each day.

1. Check all fuel lines and fitting for possible leakage.
2. Check crankcase oil level with the engine off. If engine has been run, allow a minimum of 10 minutes for the oil to drain down before checking. Check oil level with machine in operating position. Do not operate engine with the oil level below the ADD mark or above the FULL mark.
3. Inspect exhaust system for possible leakage and cracks. Locate leaks in muffler and piping while the engine is operating. Repair leaks immediately.
4. Inspect air cleaner system for leaks. Make certain all clamps and fittings are tight and free of potential leaks.
5. Check the engine cooling system to make sure the cooling fins and ducting area are clean. Remove dust, dirt or oil from the cooling surfaces.

## DAILY (8 HOUR) MAINTENANCE

The operator should check the following before the first start of the day and after every eight hours of operation:

1. Inspect fuel lines and fittings for leaks. Repair leaks immediately.
2. Look and listen for exhaust system leaks while the engine is running. Look for cracks and severe rusting in the muffler and tailpipe. Have all leaks repaired before continuing to operate the equipment.

**▲CAUTION** *Hot exhaust parts can cause severe burns. Allow the engine time to cool before servicing the exhaust system.*

3. Check the engine for dirt and debris and clean the flywheel air inlet screen and cylinder cooling fins as necessary. On floorcare equipment engines, remove the cooling air precleaner element every 4 to 8 hours of operation and wash it in warm water and mild detergent. Rinse it thoroughly and let it dry before reusing it. Do not oil the element.

**▲CAUTION** *A clogged flywheel air inlet precleaner or screen or dirty cooling fins can cause overheating and engine damage. Keep the cooling fins and air inlet screen clean.*

4. Check the engine oil level. The equipment must be parked on a level surface and the engine stopped. To get an accurate reading, wait a minute or so to allow the oil to settle in the crankcase if the engine has been running.

## ENGINE MAINTENANCE

1. Cooling Fin Maintenance: Remove the blower housing and other cooling shrouds. Clean the cooling fins as necessary using compressed air or pressure washer. Reinstall all housings and shrouds.
2. Head Bolt Maintenance: Refer to Engine Manufacturer's Service manual.

## BELT MAINTENANCE

NOTE: To inspect the belt it is necessary to turn the machine over. The machine should be turned to the operator's right side for all Briggs & Stratton models. If the belt is badly cracked or worn, it should be replaced. To check for the proper tightness, squeeze the belt together. The belt should depress between 1/4 and 1/2 inch. To change belt follow these instructions:

- Turn burnisher over on the right side.
- Remove the pad holder by holding the end of the shaft on the top of the machine with a 3/4 inch wrench and turn the pad holder counter-clockwise.
- Using the 3/4 inch wrench to turn the end of the spindle shaft on the top of the machine while removing the old belt from the spindle pulley.
- Check engine pulley for correct alignment with the spindle pulley. Check hardware attaching pulleys for correct tightness.
- Install the new belt onto the engine pulley.
- Reinstall the new belt onto the spindle pulley using the 3/4 inch wrench to turn the spindle clockwise. Make sure the belt is correctly placed on the idler pulley.
- Check belt for correct operation.
- Check all hardware for correct tightness.

## FUEL SYSTEM

The fuel system works from vacuum created by the engine running. Turning the cylinder service valve on pressurizes the system for flow to the carburetor once the engine starts to crank.

1. Engine Dust Filter: **FAILURE TO MAINTAIN A CLEAN ENGINE FILTER MAY CAUSE THE EXHAUST EMISSIONS TO ELEVATE TO DANGEROUS LEVELS. ALSO, IT WILL CAUSE THE ENGINE TO OVERHEAT, AND EVENTUALLY DAMAGE THE ENGINE.** The engine dust filter should be cleaned each hour and after each use by shaking out the dust and then rinsing with soapy water. Allow filter to air dry, do not wring out water, this could damage the filter, (squeeze out).
2. Fuel System Adjustment: The carburetor and regulator have been pre-set at the factory and do not require any modification. Only authorized, trained personnel should work on the fuel system of a propane buffer.

# MAINTENANCE PROCEDURES

NOTE: N.F.P.A. rule 58 8-1.4 states, "In the interest of safety, each person engaged in installing, repairing, filling, or otherwise servicing an LP-Gas engine fuel system shall be properly trained in the necessary procedures".

- Hose and Fuel Connections: Inspection: Check for gas leaks by using a soapy water solution around all connections with service valve turned on so the fuel system is pressurized. Inspect all hoses for abrasions and other signs of wear. Replace all damaged and worn hoses. Fixing Leaking Joints: Uncouple bad joint, clean joint and apply pipe sealing compound (use a Loctite Pipe Sealant with Teflon or equivalent) to clean joint. Re-couple the joint, tighten plus 1/2 turn. Recheck for leaks.
- Carburetor Air Filter: **NOTE:** *Failure to service and clean carburetor air cleaner may produce excessive carbon monoxide emissions.*
  - Remove cover from the air cleaner.
  - Remove foam pre-cleaner and use the same procedure for cleaning the foam pre-cleaner.
  - Rinse in mild detergent and squeeze out excess water, do not wring out.
  - Clean filter seal, making sure no dust is allowed in the carburetor inlet.
  - Inspect paper element. Replace if dirty, bent or damaged.
  - Install the clean paper element, pre-cleaner, and attached air cleaner cover.

## OIL CHANGE

**WARNING** *Hot crankcase oil can cause burns if it contacts the skin. Wear protective clothing and keep fingers and hands clear when draining oil.*

Used oil is harmful to the environment. Pour used oil into a sealed container and deliver it to the nearest recycling center or automotive service station.

## CHANGING THE OIL

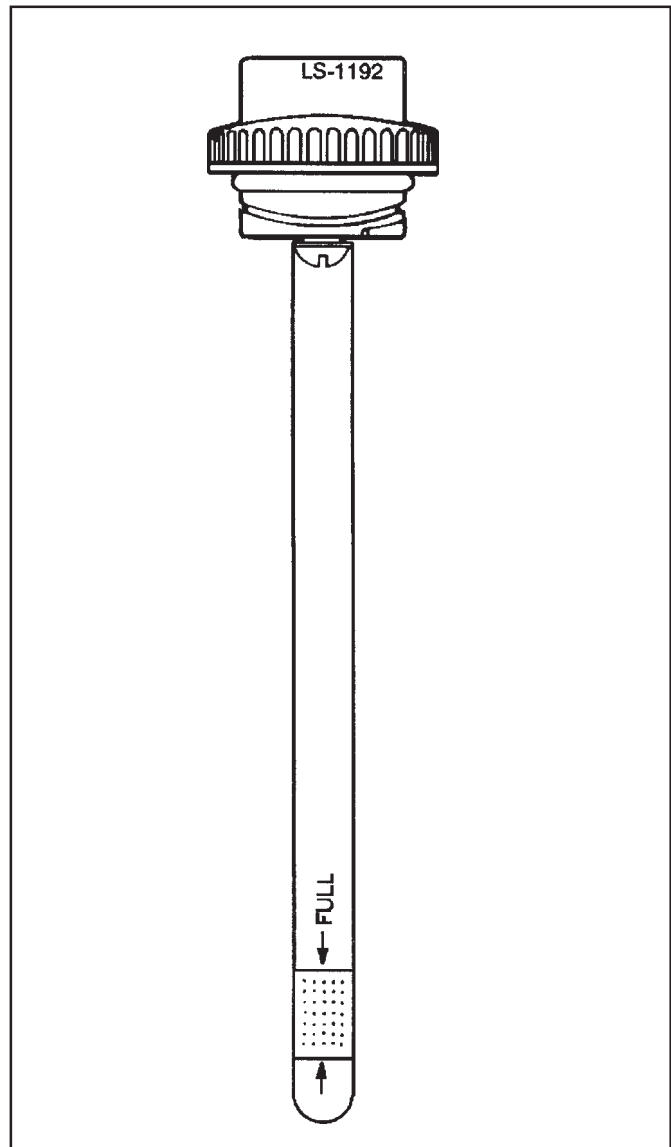
- Run engine for 5 minutes to warm oil, then stop engine by closing the service valve on the tank. Turn the key to the off position (if battery start).
- Locate the oil drain pipe located the right side of the engine at its base. Remove the cap on the oil drain tube by turning counter clockwise with a wrench.
- Allow oil to drain completely into the receptacle.
- Replace the cap by turning clockwise.
- Remove oil fill cap. Always refer to the Engine Manual for recommended oil and amount.
- Check oil level with dip stick in oil fill cap. Add additional oil if necessary. **NOTE: TO CHECK OIL ON THE BRIGGS & STRATTON MODELS, SCREW THE CAP IN AND OUT AGAIN. ALWAYS MAKE SURE THE MACHINE IS SITTING LEVEL WHEN CHECKING OIL. Ref. to Page 14.**
- Replace fill cap. Hand tighten only.

If the oil level is low, add API Class SG or SH oil (also SG/CD, SG/CE, SH/CD or SH/CE) having an SAE viscosity grade appropriate for the expected temperatures, as indicated by Table 1.

DO NOT FILL TO A LEVEL ABOVE THE FULL MARK ON THE DIPSTICK. Drain the excess oil if too much has been added.

**CAUTION** *Too much oil can cause high oil consumption, high operating temperatures and oil foaming. Too little oil can cause severe engine damage. Keep the oil level between the Full and Add marks on the dipstick.*

Reinstall the dipstick and cap after checking or adding oil, turning it clockwise until it is secure.



OIL FILL CAP AND DIPSTICK



# TROUBLESHOOTING

Table 3 provides basic troubleshooting guidance. If you fail to resolve the problem after taking the corrective actions suggested, contact the equipment or engine dealer.

**WARNING** *Hot engine parts can cause severe burns. Always allow the engine time to cool before performing any maintenance or service.*

**WARNING** *Many troubleshooting procedures present hazards that can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity, and machinery hazards should perform service procedures. Review Safety Precautions.*

**TABLE 3. TROUBLESHOOTING**

<b>Problem</b>	<b>Corrective Action</b>
1. The engine fails to crank	<ul style="list-style-type: none"> <li>a. Clean and tighten the positive (+) and negative (-) battery cable connections at the battery and the engine if equipt.</li> <li>b. Recharge the battery. Refer to the equipment or battery manufacturer's recommendations.</li> </ul>
2. The engine cranks slowly.	<ul style="list-style-type: none"> <li>a. Clean and tighten the positive (+) and negative (-) battery cable connections at the battery and the engine if equipt.</li> <li>c. Recharge the battery. Refer to the equipment or battery manufacturer's recommendations.</li> <li>c. Change engine oil to oil having the proper viscosity for the ambient temperature. See Table 1.</li> </ul>
3. The engine cranks but fails to start.	<ul style="list-style-type: none"> <li>a. Check the fuel tank or LPG container and fill as necessary.</li> <li>b. Check, and if necessary, reconnect the fuel line to the <i>vapor-withdrawal fitting</i> on the LPG container.</li> <li>c. Open any closed fuel shut-off valve.</li> <li>d. Check engine oil level and add oil as necessary.</li> <li>e. Service the air cleaner.</li> <li>f. Clean the air precleaner (floorcare engines).</li> <li>g. Replace the spark plugs.</li> </ul>
4. The engine runs and then stops.	<ul style="list-style-type: none"> <li>a. Check the fuel tank or LPG container and fill as necessary. <i>On cold days the LPG container may have to be kept at least half full to provide the rate of vaporization necessary to keep up with the engine fuel demand.</i></li> <li>b. Check, and if necessary, reconnect the fuel line to the <i>vapor-withdrawal fitting</i> on the LPG container.</li> <li>c. Check the engine oil level and add oil as necessary. Drain excess oil if the level is above the dipstick FULL mark.</li> </ul>
5. The engine exhausts black smoke.	<ul style="list-style-type: none"> <li>a. Service the air cleaner.</li> </ul>
6. The engine misfires.	<ul style="list-style-type: none"> <li>a. Replace the spark plugs.</li> </ul>

# TROUBLE SHOOTING

## ENGINE WILL NOT START

### **CAUSES:**

No fuel, blown head gasket, ignition coil, dirty air cleaner, wires broken or disconnected, engine overload, insufficient vacuum, bad spark plug, fuel system out of adjustment.

### **SOLUTION:**

Refer to engine manual for servicing and instruction.

## HARD TO START

### **CAUSES:**

Dirty fuel line, dirty air filter, bad spark plug, blown head gasket, low oil, engine overload, carburetor needs adjustment, regulator needs adjustment, insufficient vacuum, timing, coil or valves need adjusting.

**SOLUTION:** Refer to engine manual for servicing and instruction.

## ENGINE LACKS POWER

### **CAUSES:**

Head gasket leaks, governor needs adjustment, check air filter, insufficient vacuum, bad spark plug, no compression worn rings, improper valve clearance, fuel line dirty, improper oil level.

### **SOLUTION:**

Refer to engine manual for servicing and instruction.

## SMELL OF BURNED RUBBER

### **CAUSE:**

Belt out of adjustment.

### **SOLUTION:**

Refer to Maintenance Procedures.

## EXCESS VIBRATION

### **CAUSE:**

Engine overload, loose bolts on engine or deck of unit, no fuel or dirt in fuel, dirty air filters, faulty spark plug, pad not centered.

### **SOLUTION:**

Refer to engine manual for servicing and instruction.

## MACHINE PULLS TO ONE SIDE

### **CAUSE:**

Bent wheel bracket, wheel is wearing too much on one side.

### **SOLUTION:**

Check for bent bracket or worn wheel.

## MACHINE "BOGS DOWN" WHEN IN USE

### **CAUSE:**

Too much pressure or operator is bearing down too hard.  
Dirty air filters.

### **SOLUTION:**

Follow proper operating instructions, let machine operate on its own weight, do not apply upward pressure to handle of machine.

## ENGINE STOPS RUNNING

### **CAUSE:**

Out of fuel, faulty spark plug, low oil, dirty air filters, high exhaust emissions.

### **SOLUTIONS:**

Refer to engine manual for servicing and instruction.

## HIGH FUEL CONSUMPTION

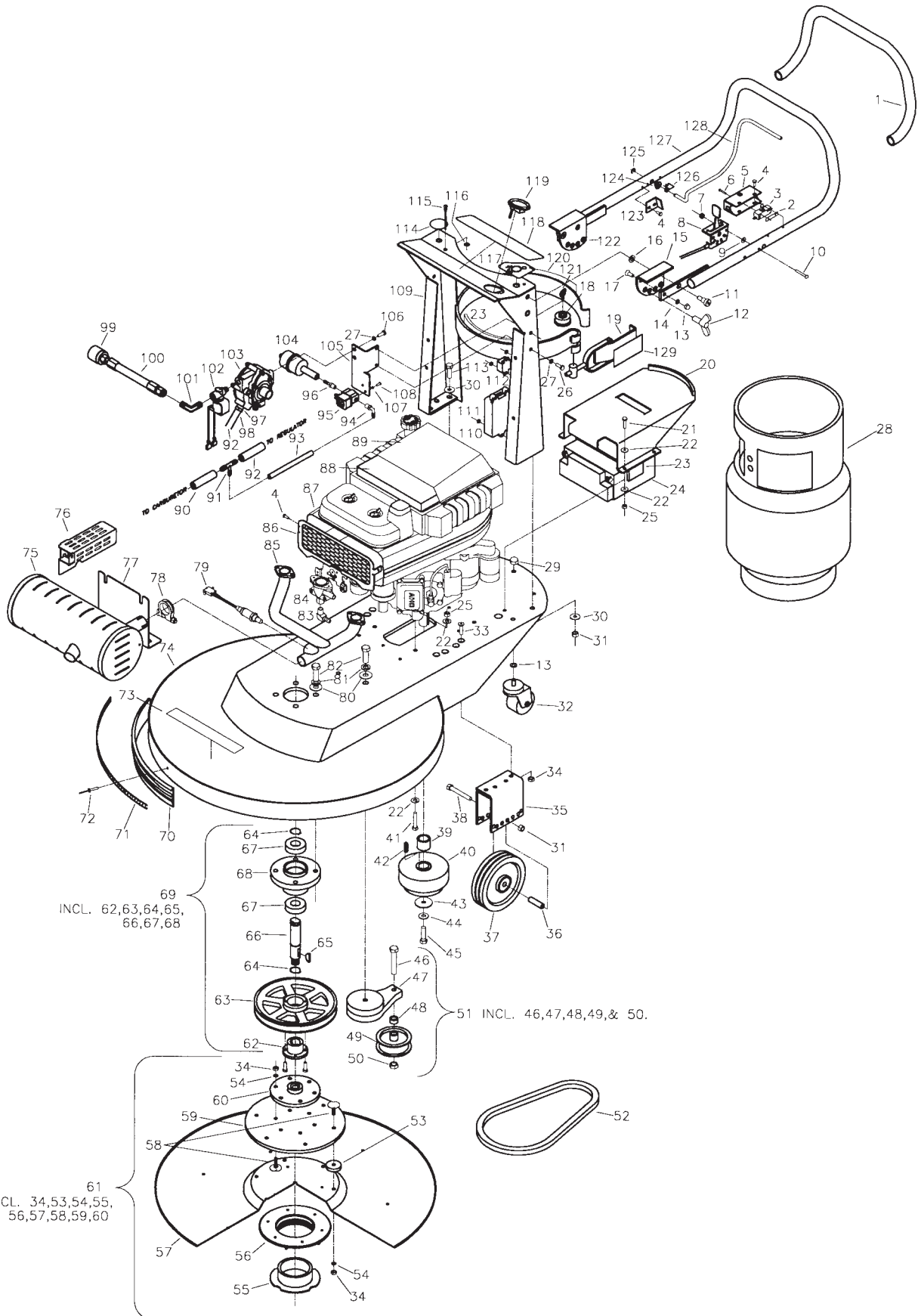
### **CAUSE:**

Dirty air filters, dirty air cleaners.

### **SOLUTION:**

Keep engine and air filters clean.

# ENGINE 16HP KAWASAKI

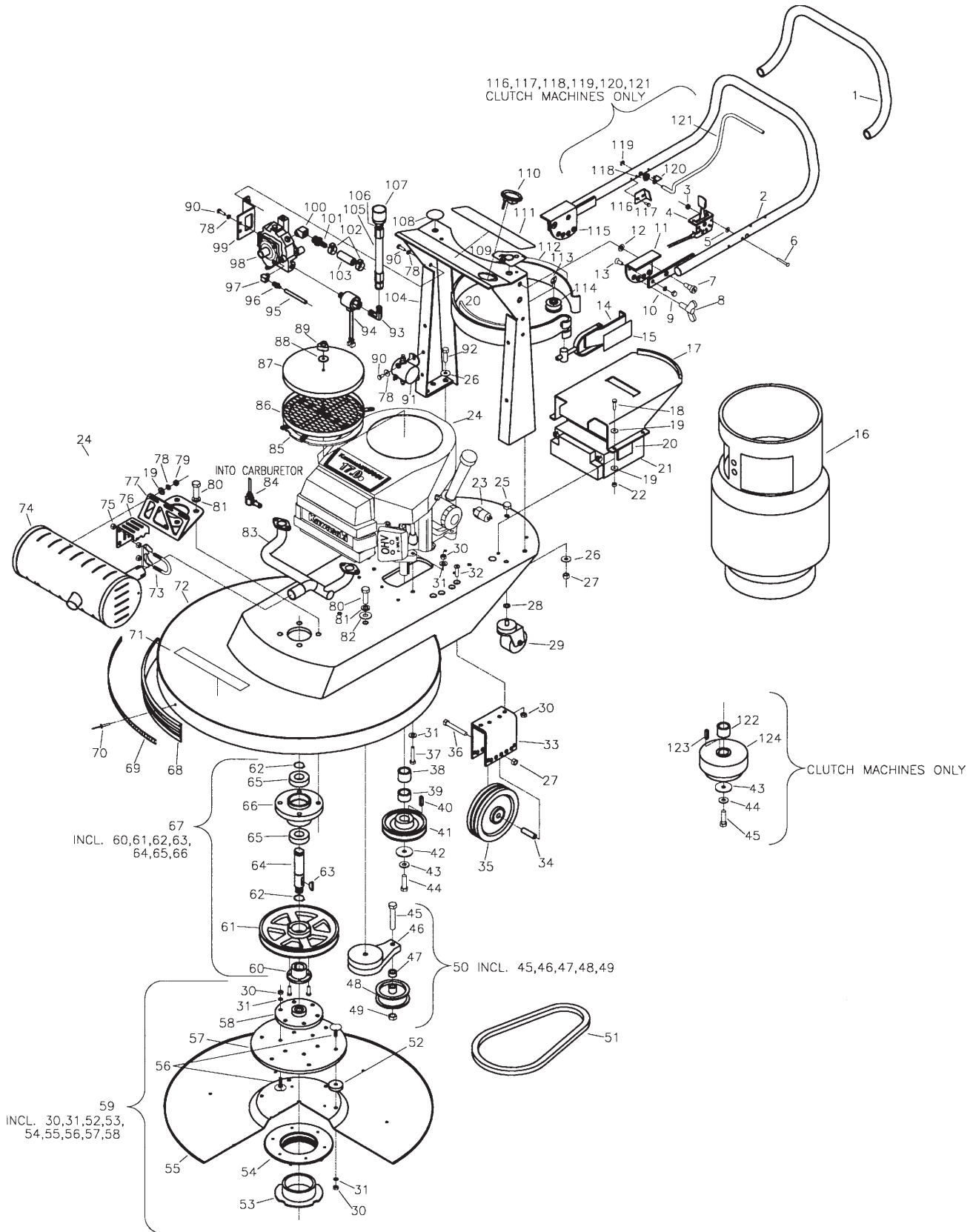




# PARTS LIST for 16 HP KAWASAKI

Item	Part No.	Qty.	Description	Item	Part No.	Qty.	Description
1	360108	1	Handle Sleeve	67	762093	2	Bearing
2	711430	1	Nut, Tinnerman (M220028KA)	68	220023MCH	1	Bearing Housing
3	740029	1	Switch (M220028KA)	69	220026	1	Pulley Assy. (M220024KA)
4	711104	6	SCR-ST-A 10 x .50	69A	220178	1	Pulley Assy. (M220028KA)
5	220116	1	Switch Box (M220028KA)	70	220120	1	Skirt (M220024KA)
6	710207	2	SCR-MC 6-32 x .87 (M220028KA)	70A	220062	1	Skirt (M220028KA)
7	712638	2	Nut-Hex 10-24 Nyloc	71	220121	1	Skirt Retainer (M220024KA)
8	83-25-B-36	1	Throttle Cable Assy.	71A	220122	1	Skirt Retainer (M220028KA)
9	711503	14	WSR-Flat #10	72	828893	12	Pop Rivet
10	515-10-24	2	SCR-RD HD 10-24 x 1 1/2	73	715385	1	Decal - Minuteman
11	712099PLT	2	BLT-SHLDR 1/2 x 1/2	74	220024PTD	1	Casting (M220024KA)
12	260287	2	Wing Bolt 1/2-13	74A	220028PTD	1	Casting (M220028KA)
13	711353	2	Nut-Acorn 5/16-18	75	220156	1	Muffler (M220024KA)
14	711545	2	WSR-Helical 5/16	75A	220186	1	Muffler (M220028KA)
15	220036	1	Pivot Bracket - Left	76	220188	1	Heat Shield (M220024KA)
16	81-166-A	2	Special Washer	76A	220189	1	Heat Shield (M220028KA)
17	710200	2	SCR-FH 5/16-18 x .375	77	220210	1	Muffler Bracket (M220024KA)
18	741056	1	Keyswitch w/Ground	77A	220195	1	Muffler Bracket (M220028KA)
19	220131	1	Buckle TB2-61	78	220099	1	Muffler Clamp
20	220393	1	Battery Cover Weldment	79	741081-1	1	Oxygen Sensor Assy.
21	713007	4	BLT-HH 1/4-20 x 2.00	80	711509	5	WSR-Flat 1/2
22	711505	16	WSR-Flat 1/4	81	711547	5	WSR-Helical 1/2
23	220056	3	Felt 2 x 10	82	713071	5	BLT-HH 1/2-13 x 1 1/2
24	956725	1	Battery 12V	83	220174	1	Hose Barb 3/8 x 1/4 MPT
25	711377	8	Nut-Nyloc 1/4-20	84	220154	1	Propane Kit
26	713000	4	BLT-HH 1/4-20 x 1/2 #5	85	220162	1	Exhaust Manifold
27	711544	6	WSR-Helical 1/4	86	220386	1	Finger Guard Weldment
28	220117	1	Propane Tank Polished	87	220150	1	Engine 16 HP Kawasaki
29	711354	1	Nut-Acorn 3/8-16	88	220084	1	Foam Filter
30	711507	8	WSR-Flat .37 x 1.12 x .06	89	220211	1	Filter Cover
31	711380	6	Nut-Nyloc 3/8-16	90	220169	1	Fuel Hose 3/8 ID x 18"
32	430029	1	Caster	91	220388	1	Tee Union
33	713168	8	SCR-FH SC 5/16-18 x 1.25	92	220170	1	Fuel Hose 3/8 ID x 4"
34	711374	8	Nut-Nyloc 5/16	93	220389	1	Air Bleed Hose
35	220053	2	Wheel Bracket Weldment	94	220171	1	Hose Barb 1/4 x 1/8 MPT
36	220049	2	Bushing .381 x .5 x 1.75	95	741083	1	Air Solenoid
37	430138-1	2	Wheel 6" w/Ballbearing	96	220172	1	Hose Barb 1/4 x 1/8 MPT
38	713049	2	BLT-HH 3/8-16 x 2.75	97	220165	1	Hose Barb Assy.
39	220182	1	Spacer	98	450076	4	Crimp Clamp
40	220185	1	Clutch	99	62-252-A	1	Connector - Female
41	713007	4	BLT-HH 1/4-20 x 2.00	100	341201	1	High Pressure Hose
42	220181	1	Key 1/4 x 1/4 x 2.69	101	80-113-A	1	90° Male El Flared
43	82-138-B-3	1	Special Washer	102	220103	1	Electric Lockoff Assy.
44	350242	1	Belleville Washer 7/16	103	220101	1	Regulator
45	60-716-24	1	BLT-HH 7/16-20 x 1.5	104	741084	1	Air Filter Assy.
46	712112	1	BLT-HH 1/2-13 x 2.75	105	220176	1	Regulator Bracket
47	220040	1	Rotary Tensioner	106	711203	2	BLT-HH 1/4-20 x .62
48	77-81-A	1	Spacer	107	711542	2	WSR-Helical #8
49	220041	1	Belt Idler w/Bushing	108	710329	2	SCR-MC 8-32 x .50
50	711334	1	Nut-Hex 1/2-13	109	220147	1	Tank Frame Weldment
51	220010	1	Belt Tensioner Assy.	110	741080	1	Emissions Control Unit
52	220097	1	V Belt BX44T (M220024KA)	111	711350	6	Nut-Hex 10-32 Nyloc
52A	220180	1	V Belt BX50T (M220028KA)	112	741300	1	Terminal Block
53	220019	6	Gimbal Spacer Disc	113	713043	4	BLT-HH 3/8-16 x 1 1/4 #5
54	711506	12	WSR-Flat 5/16	114	715501	1	Decal - Made in USA
55	760401	1	Center Cup	115	741082	1	Led Assy.
56	760402	1	Center Cup Retainer	116	711449	1	Pushnut - 5/16
57	220051	1	Metal Spinning (M220024KA)	117	715245	1	Decal - Ignition Switch
57A	220061	1	Metal Spinning (M220028KA)	118	715192	1	Decal - Dashboard
58	220020	12	BLT-Special Elevator	119	741007	1	Hour Meter
59	220018	1	Gimbal Disc	120	715242	1	Decal - Propane Warning
60	220022	1	Adapter	121	220212	2	Key - Ignition Replacement
61	220152	1	Pad Driver Assy. (M220024KA)	122	220037	1	Pivot Bracket - Right
61A	220153	1	Pad Driver Assy. (M220028KA)	123	220137	1	Bail Stop (M220028KA)
62	220045	1	Split Tapered Bushing	124	829052	2	Nylon Bushing (M220028KA)
63	220044	1	Pulley (M220024KA)	125	711721	2	Retaining Ring (M220028KA)
63A	220179	1	Pulley (M220028KA)	126	220112	1	Torsion Spring (M220028KA)
64	711719	2	Retaining Ring - Ext. 1.00	127	220025	1	Handle Tube Weldment
65	220003	1	Key-Woodruff 5/16 x 1	128	220115	1	Switch Bail (M220028KA)
66	220002	1	Drive Shaft	129	715343	1	Decal, Propane Warning

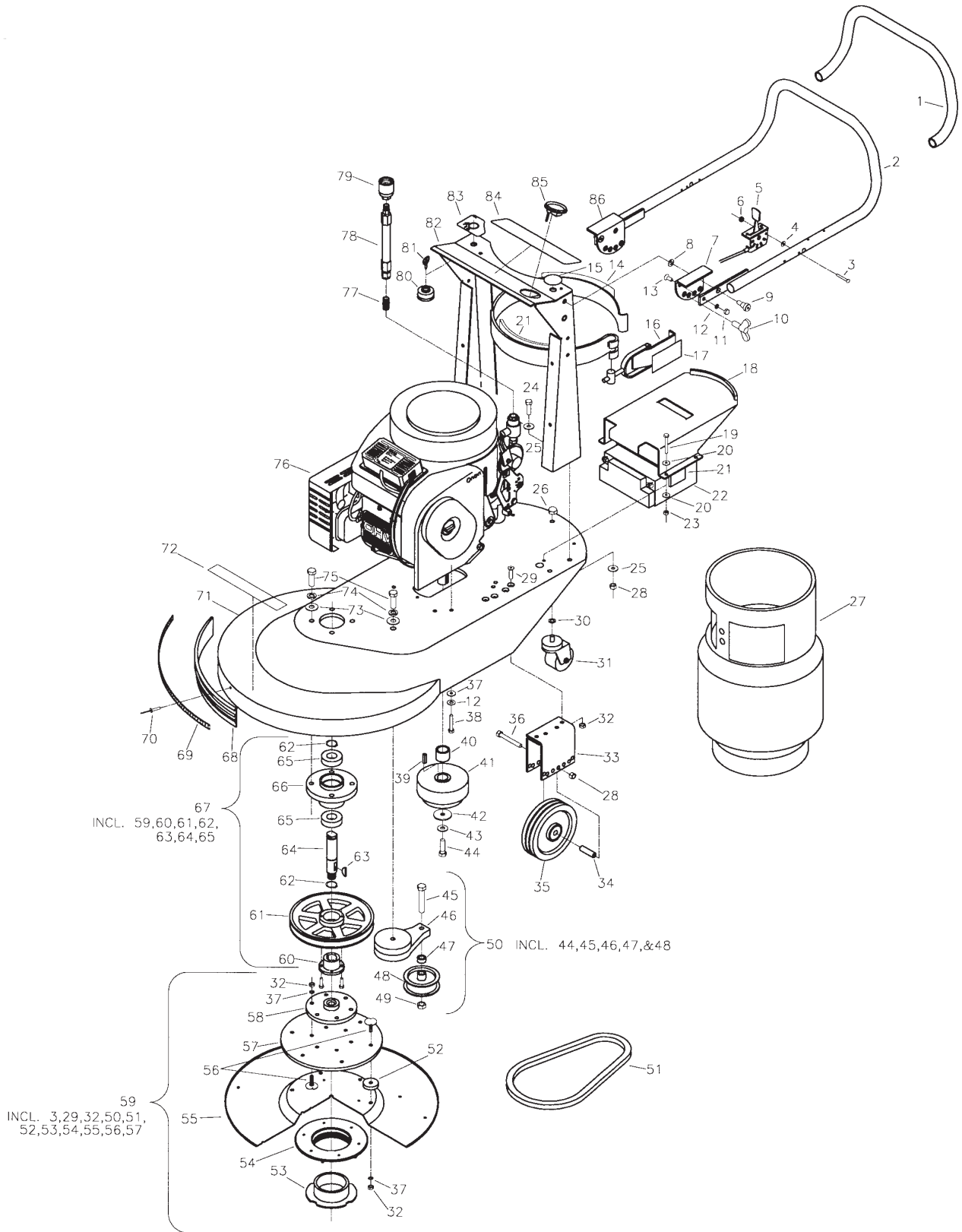
# ENGINE 17HP AIR COOLED KAWASAKI



# PARTS LIST FOR ENGINE 17HP AIR COOLED KAWASAKI

Item	Part No.	Qty.	Description	Item	Part No.	Qty.	Description
1	360108	1	Handle Sleeve	65	762093	2	Bearing
2	220025	1	Handle Tube Weldment	66	220023MCH	1	Bearing Housing
3	712638	2	Nut-Hex 10-24 Nyloc	67	220026	1	Pulley Assy.
4	220226	1	Throttle Cable Assembly	67A	220178	1	Pulley Assy. (M220028K17, K17C)
5	711503	4	WSR-Flat #10	68	220016	1	Skirt (M220021K17, K17C)
6	515-10-24	2	SCR-RD HD 10-24 x 1 1/2	68A	220120	1	Skirt (M220024K17, K17C)
7	712099PLT	2	BLT-Shoulder 1/2 x 1/2	68B	220062	1	Skirt (M220028K17, K17C)
8	260287	2	Wing Bolt 1/2-13	69	220119	1	Skirt Retainer (M220021K17, K17C)
9	711353	2	Nut-Acorn 5/16-18	69A	220121	1	Skirt Retainer (M220024K17, K17C)
10	711545	2	WSR-Helical 5/16	69B	220122	1	Skirt Retainer (M220028K17, K17C)
11	220036	1	Pivot Bracket - Left	70	828894	12	Pop Rivet
12	81-166-A	2	Special Washer	71	715385	1	Decal - Minuteman
13	710200	2	SCR-FH 5/16-18 x .375	72	220021PTD	1	Casting (M220021K17, K17C)
14	220131	1	Buckle TB2-61	72A	220024PTD	1	Casting (M220024K17, K17C)
15	715343	1	Decal, Propane Warning	72B	220028PTD	1	Casting (M220028K17, K17C)
16	220118	1	Propane Tank Steel	73	220242	1	Muffler Clamp
17	220393	1	Battery Cover Weldment	74	220156	1	Muffler
18	713007	6	BLT-HH 1/4-20 x 2.00	75	711383	2	Nut-Hex Ctr. Loc 5/16-18
19	711505	13	WSR-Flat 1/4	76	220188	1	Heat Shield
20	220056	3	Felt 2x10	77	220236	1	Muffler Bracket
21	956725	1	Battery 12V	77A	220248	1	Muffler Bracket (M220028K17, K17C)
22	711373	6	Nut-Nyloc 1/4-20	78	711544	7	WSR-Helical 1/4
23	741175	1	Oil Pressure Switch	79	711316	1	Nut-Hex 1/4-20
24	220214	1	Engine 17HP Kawasaki	80	713071	5	BLT-HH 1/2-13 x 1 1/2
25	711354	1	Nut-Acorn 3/8-16	81	711547	5	WSR-Helical 1/2
26	711515	8	WSR-Flat .406 x .812 x .06	82	711509	5	WSR-Flat 1/2
27	711380	6	Nut-Nyloc 3/8-16	83	220213	1	Exhaust Manifold
28	711546	1	WSR-Helical 3/8	83A	220244	1	Exhaust Manifold (M220028K17, K17C)
29	430029	1	Caster	84	220233	1	Spud-In Tube
30	711374	24	Nut-Nyloc 5/16	85	220241	1	Debris Guard Gasket
31	711506	28	WSR-Flat 5/16	86	220240	1	Debris Guard
32	713168	8	SCR-FH SC 5/16-18 x 1.25	87	220111	1	Debris Filter
33	220053	2	Wheel Bracket Weldment	88	711519	1	WSR-Flat .25 x 1.01 x .06
34	220049	2	Bushing .381 x .5 x 1.75	89	833214	1	Knob - 3-Sided
35	430138-1	2	Wheel 6" w/Bushing	90	713000	6	BLT-HH 1/4-20 x 1/2 #5
36	713049	2	BLT-HH 3/8-16 x 2.75	91	742201	1	Solenoid
37	713031	4	BLT-HH 5/16-18 x 2.00	92	713043	4	BLT-HH 3/8-16 x 1 1/4 #5
38	220198	1	Spacer	93	80-113-A	1	90° Male El Flared
39	72-179-A	1	Spacer	94	220221	1	Electric Lockoff Assy.
40	833621	1	Key 1/4 x 1/4 x 1.00	95	220267	1	Vacuum Hose 30"
41	220197	1	Pulley - 4.6 OD	96	350280	1	Hose Barb 1/8 x 1/8 NPT
41A	220196	1	Pulley - 4.0 OD (M220028K17, K17C)	97	220246	1	Elbow - 90 1/8 MPT x 1/8 FPT
42	82-138-B-3	1	Special Washer	98	220217	1	Regulator
43	350242	1	Belleville Washer 7/16	99	220237	1	Regulator Bracket
44	60-716-24	1	BLT-HH 7/16-20 x 1.5	100	220245	1	Elbow - 45 3/8 MPT x 1/8 FPT
45	712112	1	BLT-HH 1/2-13 x 2.75	101	342430	1	Hose Barb
46	220040	1	Rotary Tensioner	102	450076	2	Crimp Clamp
47	77-81-A	1	Spacer	103	220067	1	Fuel Hose - 3/8 ID x 24"
48	220041	1	Belt Idler w/Bushing	104	220266	1	Tank Frame Weldment
49	364-816	1	Nut-Nyloc 1/2-13	105	220070	1	High Pressure Hose
50	220010	1	Belt Tensioner Assy.	106	220065	1	45° Male Elbow 1/4 x 3/8
51	220097	1	V Belt BX44T (M220021K17, K17C)	107	62-252-A	1	Connector - Female
51A	220144	1	V Belt BX47T (M220024K17, K17C)	108	715501	1	Decal - Made In USA
51B	220187	1	V Belt BX55T (M220028K17, K17C)	109	715245	1	Decal - Ignition Switch
52	220019	6	Gimbal Spacer Disc	110	741007	1	Hour Meter
53	760401	1	Center Cup	111	715192	1	Decal - Dashboard
54	760402	1	Center Cup Retainer	112	715242	1	Decal - Propane Warning
55	220005	1	Metal Spinning (M220021K17, K17C)	113	220212	2	Key - Ignition, Replacement
55A	220051	1	Metal Spinning (M220024K17, K17C)	114	741056	1	Keypress w/Ground
55B	220061	1	Metal Spinning (M220028K17, K17C)	115	220037	1	Pivot Bracket - Right
56	220020	12	BLT-Special Elevator	116	220137	1	Ball Stop
57	220018	1	Gimbal Disc	117	711104	1	SCR-ST-A 10 x .50
58	220022	1	Adapter	118	829052	2	Nylon Bushing
59	220151	1	Pad Driver Assy. (M220021K17, K17C)	119	711721	2	Retaining Ring
59A	220152	1	Pad Driver Assy. (M220024K17, K17C)	120	220112	1	Torsion Spring
59B	220153	1	Pad Driver Assy. (M220028K17, K17C)	121	220115	1	Switch Bail
60	220045	1	Split Tapered Bushing	122	220182	1	Spacer
61	220044	1	Pulley	123	220181	1	Key 1/4 x 1/4 x 2.69
61A	220179	1	Pulley (M220028K17, K17C)	124	220185	1	Clutch
62	711719	2	Retaining Ring - Ext. 1.00		220234	1	Spark Plug
63	220003	1	Key - Woodruff 5/16 x 1		220235	1	Air Filter
64	220002	1	Drive Shaft		K220-3	1	Optional Clutch Kit

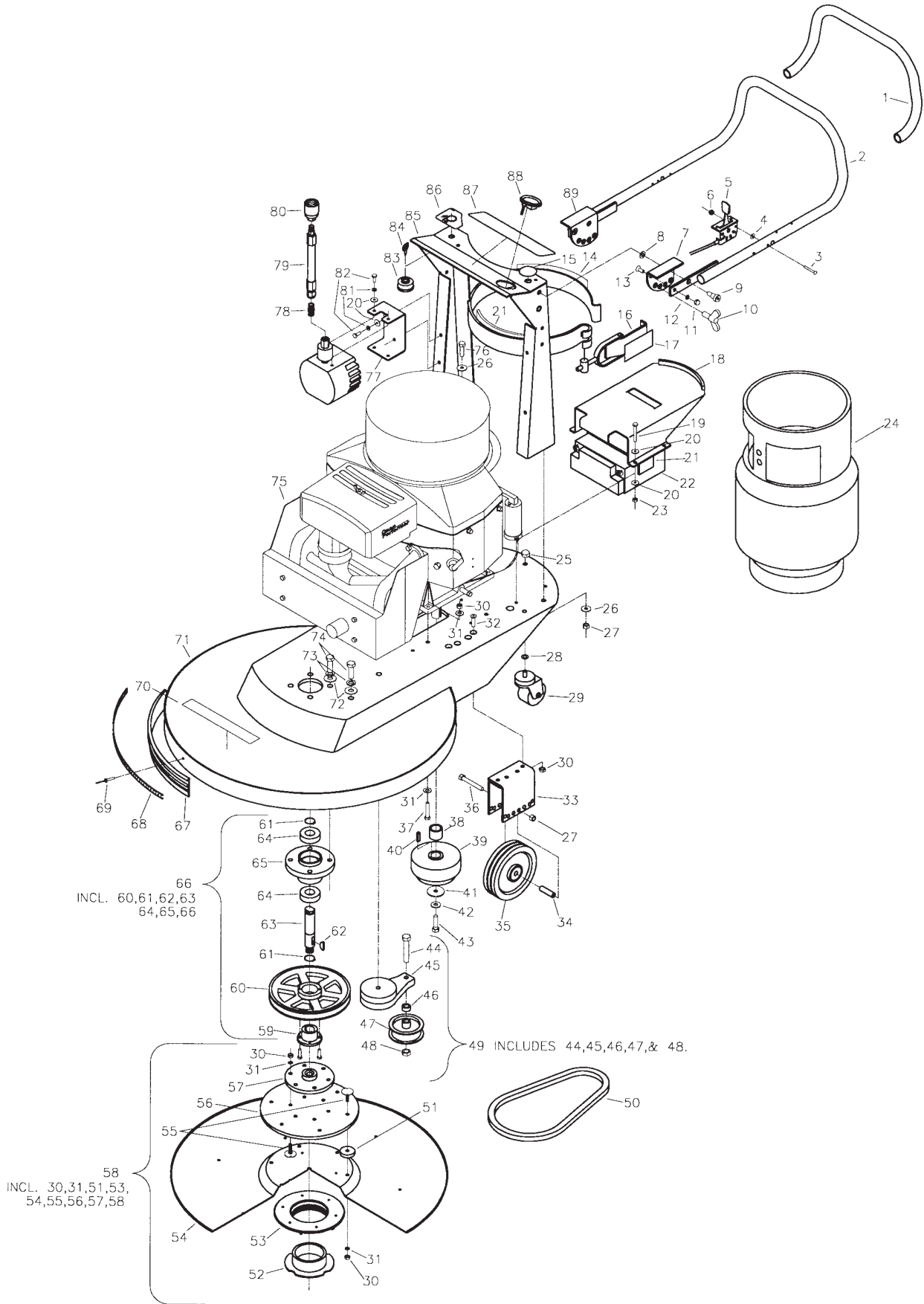
# ENGINE 14 HP ONAN



# PARTS LIST for 14 HP ONAN

Item	Part No.	Qty.	Description	Item	Part No.	Qty.	Description
1	360108	1	Handle Sleeve	44	60-716-24	1	BLT-HH 7/16-20 x 1.5
2	220025	1	Handle Tube Weldment	45	712112	1	BLT-HH 1/2-13 x 2.75
3	515-10-24	2	SCR-RD HD 10-24 X 1 1/2	46	220040	1	Rotary Tensioner
4	711503	14	WSR-Flat #10	47	77-81-A	1	Spacer
5	83-25-B-33	1	Throttle Cable Assy.	48	220041	1	Belt Idler w/Bushing
6	712638	2	Nut-Hex 10-24 Nyloc	49	364-816	1	Nut-Hex 1/2-13
7	220036	1	Pivot Bracket - Left	50	220010	1	Belt Tensioner Assy.
8	81-166-A	2	Special Washer	51	220097	1	V Belt BX44T
9	712099PLT	2	BLT-SHLDR 1/2 x 1/2	52	220019	6	Gimbal Spacer Disc
10	260287	2	Wing, Bolt 1/2-13	53	760401	1	Center Cup
11	711353	2	Nut, Acorn 5/16-18	54	760402	1	Center Cup Retainer
12	711545	2	WSR-Helical 5/16	55	220005	1	Metal Backing Plate
13	710200	2	SCR-FH 5/16 x 3/4	56	220020	12	BLT-Special Elevator
14	715242	1	Decal-Propane Warning	57	220018	1	Gimbal Disc
15	715501	1	Decal - Made in USA	58	220022	1	Adapter
16	220131	1	Buckle TB2-61	59	220151	1	Pad Driver Assy.
17	715343	1	Decal - Propane Warning	60	220045	1	Split Tapered Bushing
18	220393	1	Battery Cover Weldment	61	220044	1	Pulley
19	713007	4	BLT-HH 1/4-20 x 2.00	62	711719	2	Retaining Ring, Ext. 1.00
20	711505	16	WSR-Flat 1/4	63	220003	1	Key, Woodruff 5/16 x 1
21	220056	3	Felt 2 x 10	64	220002	1	Drive Shaft
22	956725	1	Battery 12V	65	762093	2	Bearing
23	711373	8	Nut-Nyloc 1/4-20	66	220023MCH	1	Bearing Housing
24	713043	4	BLT-HH 3/8-16 x 1 1/4 #5	67	220026	1	Pulley Bearing Assy.
25	711515	8	WSR-Flat .406 x .812 x .06	68	220016	1	Skirt
26	711354	1	Nut-Acorn 3/8-16	69	220119	1	Skirt Retainer
27	220118	1	Propane Tank	70	828894	6	Pop Rivet
28	711380	6	Nut-Nyloc 3/8-16	71	220021PTD	1	Casting
29	713168	8	SCR-FH 5/16-18 x 1.25	72	715385	1	Decal - Minuteman
30	711546	1	WSR-Helical 3/8	73	711509	5	WSR-Flat 1/2
31	430029	1	Caster	74	711547	5	WSR-Helical 1/2
32	711374	24	Nut-Nyloc 5/16	75	713071	5	BLT-HH 1/2-13 x 1 1/2
33	220053	2	Wheel Bracket Weldment	76	220300	1	Engine, 14 HP Onan
34	220049	2	Bushing .381 x .5 x 1.75	77	341210	1	Flared Male Connector
35	430138-1	2	Wheel 6" w/Ballbearing	78	220070	1	High Pressure Hose
36	713049	2	BLT-HH 3/8-16 x 2.75	79	62-252-A	1	Connector, Female
37	711506	4	WSR-Flat 5/16	80	741366	1	Keyswitch
38	713170	4	BLT-HWH 5/16-18 x 1.25 Taptite	81	220212	1	Key - Ignition, Replacement
39	220182	1	Spacer	82	220192	1	Tank Frame Weldment
40	220181	1	Key .25 x .25 x 2.69	83	715266	1	Decal - Ignition
41	220185	1	Clutch	84	715192	1	Decal - Dash
42	82-138-B-3	1	Special Washer	85	741007	1	Hour Meter
43	350242	1	Belleville Washer 7/16	86	220037	1	Pivot Bracket - Right

# ENGINE 20 HP ONAN

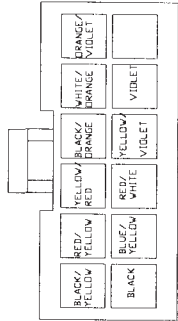
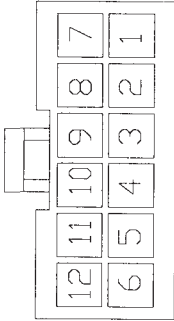
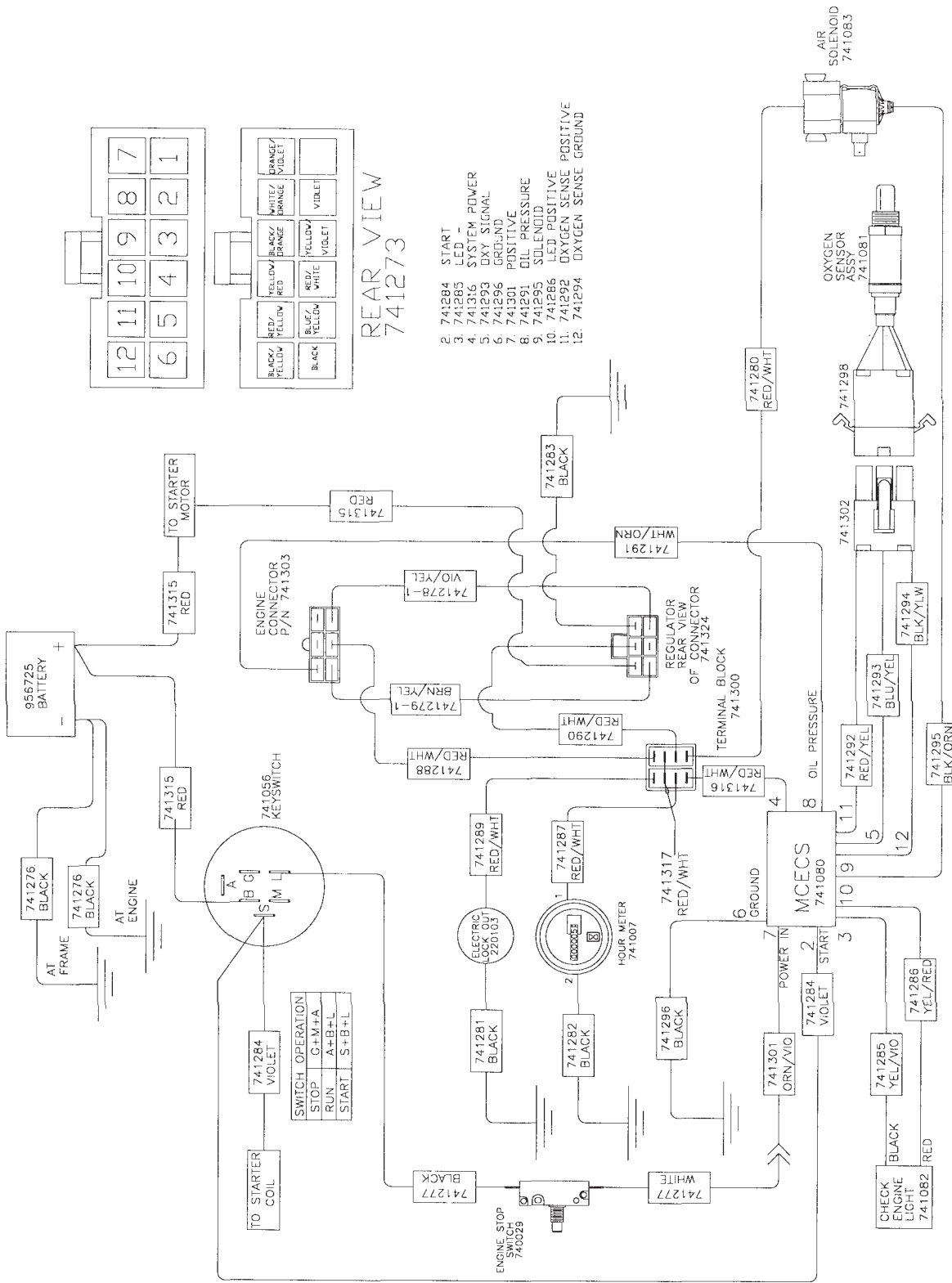




# PARTS LIST for 20 HP ONAN

Item	Part No.	Qty.	Description	Item	Part No.	Qty.	Description
1	360108	1	Handle Sleeve	50	220194	1	V Belt BX50 (M220024N20)
2	220025	1	Handle Tube Weldment	50A	220199	1	V Belt BX50 (M220028N20)
3	515-10-24	2	SCR 10-24 X 1 1/2	51	220019	6	Gimbal Spacer Disc
4	711503	14	WSR-Flat #10	52	760401	1	Center Cup
5	83-25-B-33	1	Throttle Cable Assy.	53	760402	1	Center Cup Retainer
6	712638	2	Nut-Hex 10-24 Nyloc	54	220051	1	Metal Plate (M220024N20)
7	220036	1	Pivot Bracket - Left	54A	220061	1	Metal Plate (M220028N20)
8	81-166-A	2	Special Washer	55	220020	12	BLT-Special Elevator
9	712099PLT	2	BLT-SHLDR 1/2 x 1/2	56	220018	1	Gimbal Disc
10	260287	2	Wing, Bolt 1/2-13	57	220022	1	Adapter
11	711353	2	Nut, Acorn 5/16-18	58	220152	1	Pad Driver Assy. (M220024N20)
12	711545	2	WSR-Helical 5/16	58A	220153	1	Pad Driver Assy. (M220028N20)
13	710200	2	SCR-FH 5/16-18 x .375	59	220045	1	Split Tapered Bushing
14	715242	1	Decal-Propane Warning	60	220044	1	Pulley (M220024N20)
15	715501	1	Decal - Made in USA	60A	220179	1	Pulley (M220028N20)
16	220131	1	Buckle TB2-61	61	711719	2	Retaining Ring, Ext. 1.00
17	715343	1	Decal - Propane Warning	62	220003	1	Key, Woodruff 5/16 x 1
18	220393	1	Battery Cover Weldment	63	220002	1	Drive Shaft
19	713007	4	BLT-HH 1/4-20 x 2.00	64	762093	2	Bearing
20	711505	16	WSR-Flat 1/4	65	220023MCH	1	Bearing Housing
21	220056	3	Felt 2 x 10	66	220026	1	Pulley Assy. (M220024N20)
22	956725	1	Battery 12V	66A	220178	1	Pulley Assy. (M220028N20)
23	711373	8	Nut-Nyloc 1/4-20	67	220120	1	Skirt (M220024N20)
24	220117	1	Propane Tank Polished	67A	220062	1	Skirt (M20028N20)
25	711354	1	Nut-Acorn 3/8-16	68	220121	1	Skirt Retainer (M220024N20)
26	711507	8	WSR-Flat .37 X 1.12 X .06	68A	220122	1	Skirt Retainer (M220028N20)
27	711380	6	Nut-Nyloc 3/8-16	69	828894	12	Pop Rivet
28	711546	1	WSR-Helical 3/8	70	715385	1	Decal - Minuteman
29	430029	1	Caster	71	220024PTD	1	Casting (M220024N20)
30	711374	12	Nut-Nyloc 5/16	71A	220028PTD	1	Casting (M220028N20)
31	711506	16	WSR-Flat 5/16	72	711509	5	WSR-Flat 1/2
32	713168	8	SCR-FH SC 5/16-18 x 1.25	73	711547	5	WSR-Helical 1/2
33	220053	2	Wheel Bracket Weldment	74	713071	5	BLT-HH 1/2-13 x 1 1/2
34	220049	2	Bushing .381 x .5 x 1.75	75	220350	1	Engine, Onan 20 HP
35	430138-1	2	Wheel 6" w/Ballbearing	76	713043	4	BLT-HH 1/2-13 x 1 1/2
36	713049	2	BLT-HH 3/8-16 x 2.75	77	220193	1	Regulator Mounting Bracket
37	713030	4	BLT-HH 5/16-18 x 1 3/4 #5	78	341210	1	Flared Male Connector
38	220182	1	Spacer	79	220070	1	High Pressure Hose
39	220185	1	Clutch	80	62-252-A	1	Connector, Female
40	220181	1	Key 1/4 x 1/4 x 2.69	81	711544	6	WSR-Helical 1/4
41	82-138-B-3	1	Special Washer	82	713002	6	BLT-HH 1/4-20 x 3/4 #5
42	350242	1	Belleville Washer 7/16	83	741366	1	Keyswitch
43	60-716-24	1	BLT-HH 7/16-20 x 1.5	84	220212	1	Key - Ignition, Replacement
44	712112	1	BLT-HH 1/2-13 x 2.75	85	220192	1	Tank Frame Weldment
45	220040	1	Rotary Tensioner	86	715266	1	Decal - Ignition
46	77-81-A	1	Spacer	87	715192	1	Decal - Dashboard
47	220041	1	Belt Idler w/Bushing	88	741007	1	Hour Meter
48	364-816	1	Nut-Hex 1/2-13	89	220037	1	Pivot Bracket - Right
49	220010	1	Belt Tensioner Assy.				

# KAWASAKI 16HP WIRING DIAGRAM



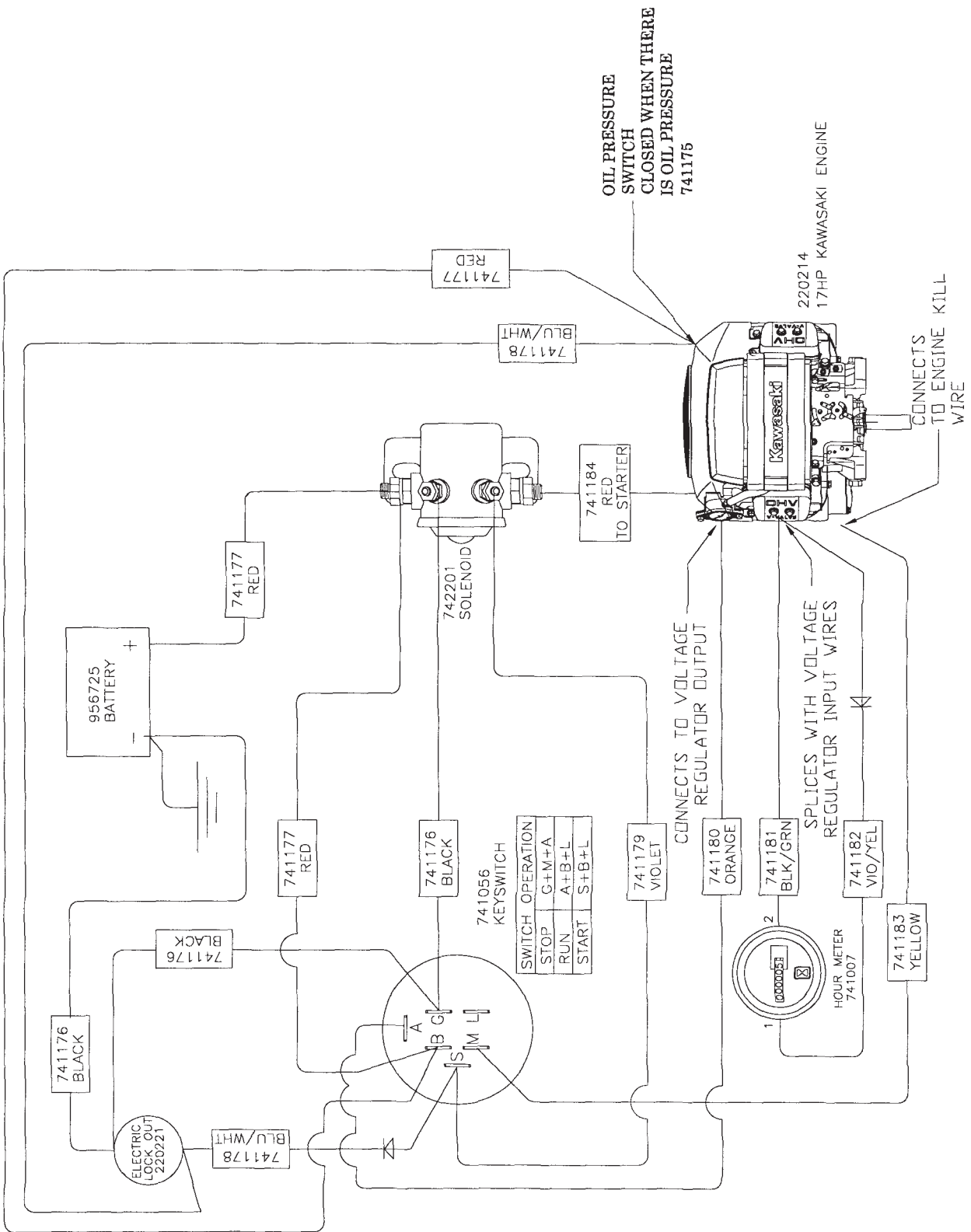
REAR VIEW  
741273

2. 741284 START
3. 741285 LED -
4. 741316 SYSTEM POWER
5. 741293 OXY SIGNAL
6. 741296 GROUND
7. 741301 POSITIVE
8. 741291 OIL PRESSURE
9. 741295 SOLENOID
10. 741286 LED POSITIVE
11. 741292 OXYGEN SENSE
12. 741294 OXYGEN SENSE POSITIVE

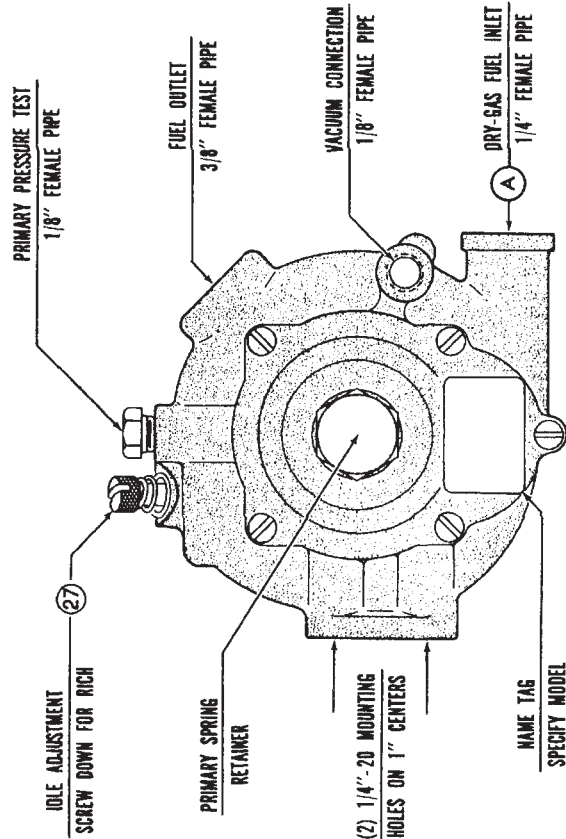
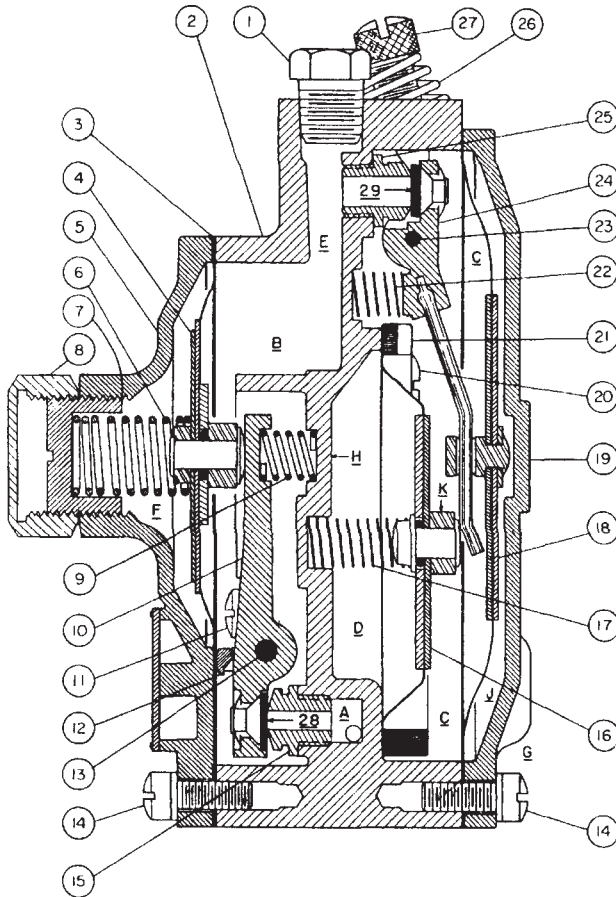
MCECS ANALYZER ASSEMBLY  
741151 (SOLD SEPERATELY)



# KAWASAKI 17HP WIRING DIAGRAM



# MODEL 50 DRY-GAS REGULATOR, CROSS SECTION, PARTS LIST



Item	Part No.	Qty.	Description		
**	60-RBK		Kit, Rebuilding		
**	60-RCK		Kit, Complete		
**	60-RK		Kit, Repair		
1	P3-13	1	Plug, 1/8" Pipe, Hex	1	1
2	50-1	1	Casting, Reg. Body		
3	2G-150	1	Gasket with 60-10A		
4	60-10A	1	Diaphragm, Primary	1	1
5	60-7	1	Cover, Primary		
6	60-8	1	Spring, Primary	1	1
7	60-31	1	Retainer Spring		
8	60-32A	1	Cap, Retainer		
9	60-4	1	Spring, Primary	1	1
10	60-2B	1	Lever, Primary	1	1
11	103205-F	2	Screw, Machine	2	2
12	60-5	1	Bridge Primary		
13	60-3	1	Pin, Pivot	1	1
14	103210-FS	10	Screw with Lockwasher	10	4
15	60-29A	1	Orifice, Primary		
16	60-15A	1	Diaphragm, Vac Lock	1	1
17	60-14	1	Spring, Vac Lock	1	1
18	60-22A	1	Diaphragm, Secondary	1	1
19	60-23	1	Cover, Secondary		
20	103206-P	4	Screw, Machine	4	4
21	60-16	1	Ring, Vac Lock		
22	60-17	1	Spring, Machine		
23	60-18	1	Pin, Pivot	1	1
24	60-19B	1	Lever, Secondary	1	1
25	60-28	1	Orifice, Secondary		
26	400-21	1	Spring, Idle		
27	PS-20A	1	Screw, Idle	1	1
NS	103204-P	2	Screw, Machine	2	2

Order by Part No. NOT by Reference No

## REGULATOR OPERATION

LP-gas vapor enters at point (A), then passes into primary area (B) at point (28), where pressure is reduced from up to 250 p.s.i. at the tank to 4 p.s.i. in area (B). Fuel pressure against diaphragm (4) overcomes spring (6) and as movement increases, spring (9) will close lever (10). The primary diaphragm breather (not shown in drawing), is vented to secondary chamber so that rupture of this diaphragm would direct fuel into the carburetor.

Fuel now moves through passage (E), past secondary valve (29) into secondary area (C). As negative pressure (vacuum) is created at carburetor venturi and is transmitted through dry-gas hose to chamber (C) atmospheric pressure, exerted through vent hole (G), forces down secondary diaphragm (18), secondary lever (24) and spring (22). Fuel will flow in proportion to air velocity through carburetor venturi, insuring an ideal mixture at all engine speeds.

Whenever engine is operating, vacuum diaphragm (16) is down against floor (H) and spring (17) is collapsed. The idle and starting adjustment is made with tapered screw (27) which regulates the whisker wire system (not shown), opening up secondary orifice slightly (but only when vacuum diaphragm is drawn down). Very little vacuum is needed to start this vacuum diaphragm travel; 0.2" Mercury to start and 0.5" Mercury for full travel. The instant engine stops rotating, loss of vacuum in section (D) releases diaphragm (16), causing bumper (K) to push against secondary lever (24), overcoming action of whisker wire and insuring 100% lockoff.

This patented Beam design will lock off primary pressures up to five times in excess of normal, permits starting without priming or choking.

# WARRANTY INFORMATION

**CARB SMALL ENGINE CERTIFICATION  
MANUFACTURER: MINUTEMAN  
INTERNATIONAL INC  
ENGINE FAMILY:  
WMNTS.4372K1  
XMTRS.2492K3  
XMTRS.4942K2**

## **CALIFORNIA EMISSION CONTROL SYSTEM WARRANTY STATEMENT**

The California Air Resources Board and Minuteman International, Inc. are pleased to explain the emission control system warranty on your 1998 and later utility engine. In California, new utility and lawn and garden equipment engines must be designed, built and equipped to meet the State's stringent anti-smog standards. Minuteman International, Inc. must warrant the emission control system the your utility equipment engine for the periods of time listed below provided there has been no abuse, neglect or improper maintenance for your utility equipment engine.

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

Where a warrantable condition exists, Minuteman International, Inc. will repair your utility equipment engine at no cost to you including diagnosis, parts and labor.

## **MANUFACTURER'S WARRANTY COVERAGE**

The 1998 and later utility and lawn and garden equipment engines are warranted for two years. If any emission-related part on your engine is defective, the part will be repaired or replaced by Minuteman International, Inc.

## **OWNER'S WARRANTY RESPONSIBILITIES**

As the utility and lawn and garden equipment, you are responsible for the performance the required maintenance listed in your owner's manual. Minuteman International, Inc. recommends that you retain all receipts covering maintenance on your utility equipment, but Minuteman International, Inc. cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance. As the utility equipment engine owner you should, however, be aware that Minuteman International, Inc. may deny you warranty

coverage if you utility equipment engine or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.

You are responsible for presenting your utility equipment to a Minuteman International, Inc. distribution center as soon as the problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days.

If you have any questions regarding your warranty rights and responsibilities, you should contact Minuteman International, Inc. at 1-800-323-9420. Minuteman International, Inc. 111 South Rohlwing Road, Addison, IL 60101.

## **MANUFACTURER'S EXPLANATION OF WARRANTY COVERAGE**

The engine manufacturer warrants to the original owner and each subsequent purchaser that each subsequent purchaser that each new engine will be free from manufacturing defects in materials or workmanship under normal use during a period of two (2) years from the date of delivery, provided it is operated and maintained in accordance with engine owner manual operating instructions.

Repair or replacement of any warranted part will be performed at no cost to the owner at a warranty station. For the Minuteman International, Inc. repair station nearest you call 1-800-323-9420.

**CARB SMALL ENGINE CERTIFICATION  
MANUFACTURER: MINUTEMAN  
INTERNATIONAL, INC.  
ENGINE FAMILY:  
WMNTS.4372K1  
XMTRS.2492K3  
XMTRS.4942K2**

Any warranted part which is not scheduled for replacement as required maintenance, or which is scheduled only for regular inspection to the effect of "repair or replace as necessary" is warranted for the warranty period. Any warranted part which is scheduled for replacement as required maintenance is warranted for the period of time up to the first scheduled replacement point for that part.

The owner will not be charged for diagnostic labor which leads to the determination that a warranted part is defective; if the diagnostic service is

performed at a warranty station. Minuteman International, Inc. is liable for damages to other engine components caused by failure of a warranted part still under warranty. Minuteman International, Inc. is not liable for failure of warranted parts caused by the use of add-on modified parts.

Warranty service or repairs are available at all Minuteman International, Inc service centers that are franchised to service this engine.

Any Minuteman International, Inc. approved replacement part may be used in the performance of warranty maintenance or repairs on emission-related parts and will be provided to the owner without charge if the part is still under warranty.

The owner is responsible for the performance of the required maintenance, as defined in the Minuteman International, Inc. owner's manual for this engine.

## **SPECIFIC EMISSION-RELATED WARRANTED PARTS**

### **Fuel Metering System**

Carburetor and internal parts  
LPG Regulator

### **Air Induction System**

Air intake manifold  
Air filter element  
Air filter element-prefilter

### **Ignition System**

Spark plug  
Magneto

### **Catalyst or Thermal Reactor System**

Exhaust manifold  
Muffler

### **Miscellaneous items used in above systems**

Fuel line and vacuum hoses, wire  
harness, connectors & assemblies

To obtain warranty service, you must take your equipment together with proof of original retail purchase date, at your expense to an authorized engine dealer. If upon a warranty inspection, a defect is identified, such warranty repairs or replacement will be made without charge for parts or labor. All parts replaced under warranty will be considered as part of the original product and any warranty on those parts will expire coincident with the original product warranty.

**Issue Date: 11/11/97**

# LIMITED WARRANTY

Minuteman International, Inc. warrants to the original purchaser/user that this product is free from defects in workmanship and materials under normal use and service for a period of two years for the engine and three years for machine components from date of purchase. In addition, Minuteman International, Inc. will, at its option, honor labor warranty claims for the first 12 months on machine components only from date of sale, provided such claims are submitted through and approved by factory authorized repair stations. Minuteman International, Inc. will, at its option, repair or replace without charge, except for transportation costs, parts that fail under normal use and service when operated and maintained in accordance with the applicable operation and instruction manuals.

This warranty does not apply to normal wear, or to items whose life is dependent on their use and care, such as belts, cords, switches, hoses, rubber parts, electrical motor components or adjustments. Parts not manufactured by Minuteman International, Inc. such as engines, batteries, battery chargers, hydraulic pumps, and tires are covered by and subject to the warranties and/or guarantees of their manufacturers. Please contact Minuteman International, Inc. for procedures in warranty claims against these manufacturers.

**Special warning to purchaser** — Use of replacement filters and/or prefilters not manufactured by Minuteman International, Inc. or its designated licensees, will void all warranties expressed or implied.

A potential health hazard exists without exact original equipment replacement.

All warranted items become the sole property of Minuteman International, Inc. or its original manufacturer, whichever the case may be.

Minuteman International, Inc. disclaims any implied warranty, including the warranty of merchantability and the warranty of fitness for a particular purpose. Minuteman International, Inc. assumes no responsibility for any special, incidental or consequential damages.

This limited warranty is applicable only in the U.S.A. and Canada, and is extended only to the original user/purchaser of this product. Customers outside the U.S.A. and Canada should contact their local distributor for export warranty policies. Minuteman International, Inc. is not responsible for costs or repairs performed by persons other than those specifically authorized by Minuteman International, Inc. This warranty does not apply to damage from transportation, alterations by unauthorized persons, misuse or abuse of the equipment, use of non-compatible chemicals, or damage to property, or loss of income due to malfunctions of the product.

If a difficulty develops with this machine, you should contact the dealer from whom it was purchased.

This warranty gives you specific legal rights, and you may have other rights which vary from state to state. Some states do not allow the exclusion or limitation of special, incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above exclusions and limitations may not apply to you.

## ***Minuteman***<sup>®</sup>

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