



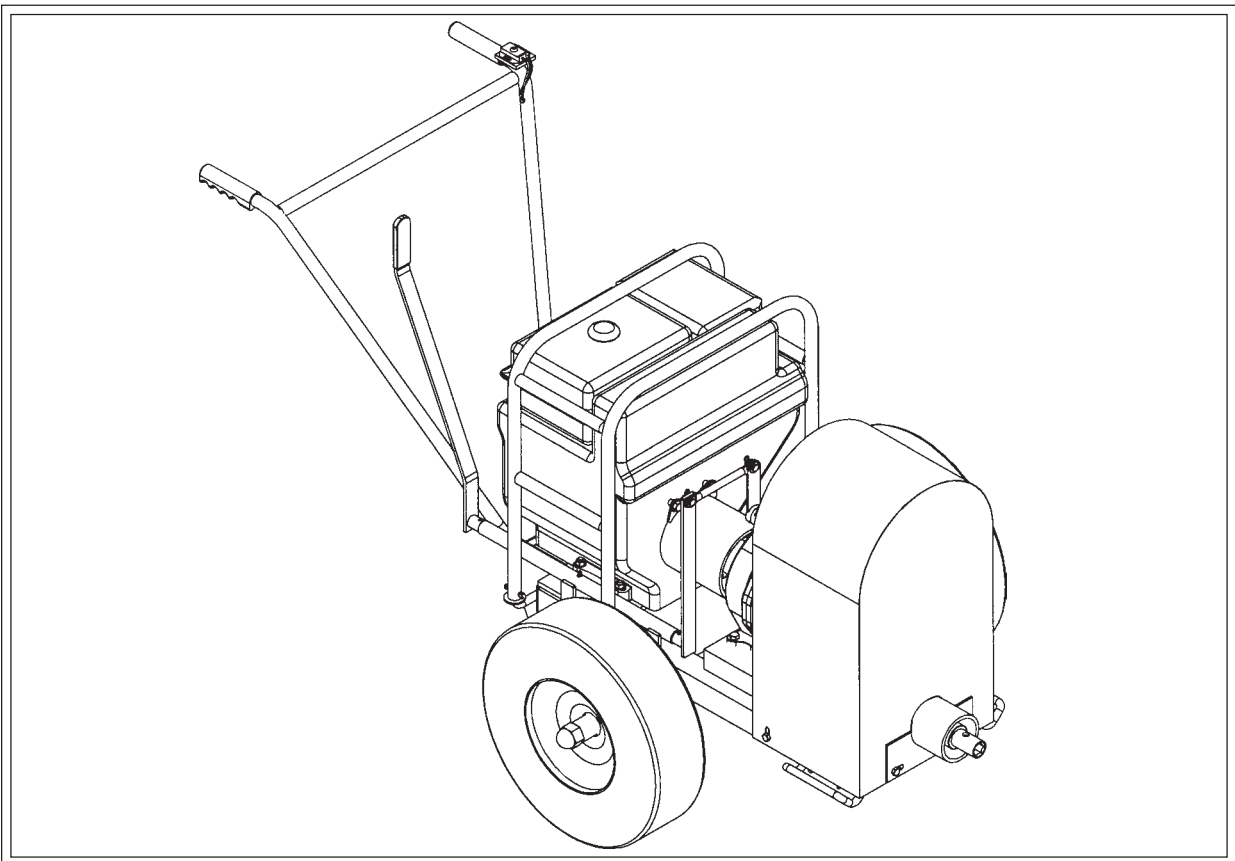
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## OPERATOR'S MANUAL

**CONTAINS:  
COMPONENTS AND  
REPAIR SECTIONS**

**MODEL M1800  
MOLEING MACHINE  
PART NO. M180000**

**Machine Serial No.:  
M180 XXX 0201 & Later  
Manual Part No.: E250001**



Machine Serial # \_\_\_\_\_

Purchased &  
Serviced Thru: \_\_\_\_\_

Purchase Date: \_\_\_\_\_

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Revision Date: 08.2002

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# MACHINE SAFETY AND OPERATION

## M1800

### Hazard Alert Decals

**BE AWARE OF SAFETY INFORMATION:** This is the safety-alert sign. This symbol is placed in the manual and on your machine to alert you to potential bodily injury or death.



### SIGNAL WORDS

The safety-alert icon is used with the following signal words: DANGER, WARNING and CAUTION. When you see these words in the manual or on decals on your machine, carefully read and follow all instructions. Watch for these words and learn their meanings.

**DANGER** - Imminent hazard which, if not avoided, will result in death or serious injury.



**WARNING** - Potentially hazardous situation which, if not avoided, could result in death or serious injury.



**CAUTION** - Potentially hazardous situation which, if not avoided, may result in minor personal injury or property damage.



**READ YOUR OPERATOR'S MANUAL:** This machine is designed to produce holes up to 2" by screw comaction in the advance direction, and up to 3 1/2" by screw compaction in the retract direction. It requires both an experienced operator and helper. **NEVER WORK ALONE. READ AND UNDERSTAND OPERATION MANUAL PROVIDED.**



### Specific Hazard Alert Decals

**UNDERGROUND UTILITIES:** Before starting work contact the local "one call" service in advance to mark all underground utilities. Make sure all underground utilities have been properly located, paying attention to any questionable areas in the immediate digging or boring area. Expose any utilities by non-destructive means before working.

Inadvertent contact with buried utilities may cause death or serious injury. Contact with electric lines can cause electrocution. Contact with gas lines can cause explosion or fire.

Know where and what type of utilities are in the area and how deep they are located.



# MACHINE SAFETY AND OPERATION

## M1800

**ENTANGLEMENT HAZARD:** The normal use of this machine requires rotating parts, in the form of the drill string, cutting head and reamer, to be exposed in front of the machine.

The machine is to be shut down whenever work is required on the drill string, or any rotating parts. This machine is **NEVER** to be operated with personnel near the drill string, except for the initial start of the MOLEING HEAD.

Never stand on or straddle the drill string, and avoid gloves and loose clothing on the job.



Inadvertent contact with drill rod, cutting head and/or reamer will cause death or serious injury.

Always use a rod guide when positioning drill rods during operation.

When removing cutting head, operator must shut down machine - then attend the removal of cutting head on exit side.

**MACHINE UPSET:** In order to “screw” the MOLEING HEAD into the ground, the machine must resist the torque applied to the rods by the engine. Under normal use the machine is stable, but if the head catches on an obstruction in the ground and the rotation stops suddenly, the machine can upset to the left. All MIGHTY MOLES are equipped with a safety device in the form of an **OPERATOR PRESENCE CONTROL** that will stop the action of the machine when released. The Operator Presence Control (OPC) is located on the left hand grip of the M1800.



The drill rods are designed with a limited measure of flexibility to allow insertion into the ground with the machine at a different elevation than the tunnel. If an excessive amount of rod is exposed behind the pit, and if the operator tries to aid the machine by pushing it, the rods may “whip.” McLaughlin Manufacturing Co. expressly limits the number of exposed rods behind the entrance pit to 2, during either insertion of the rods or removal of the rods.

Machine upset will cause death or serious injury

Inadvertent contact with underground obstacles may cause the machine to roll over. Operate only from designated operator position, see diagram on page 1.3.1.

**DO NOT** disable Operator Presence Control.

### **AVOID DEATH OR SERIOUS INJURY**

Refer to warning decals on the machine for safety instructions and to the Accident Prevention page of this manual for safety instructions and safe operating procedures.

# MACHINE SAFETY AND OPERATION

## M1800

### Warning Decal Placement



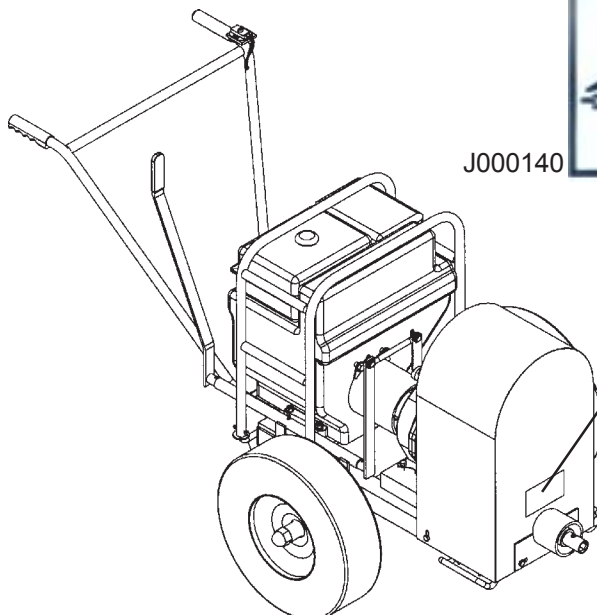
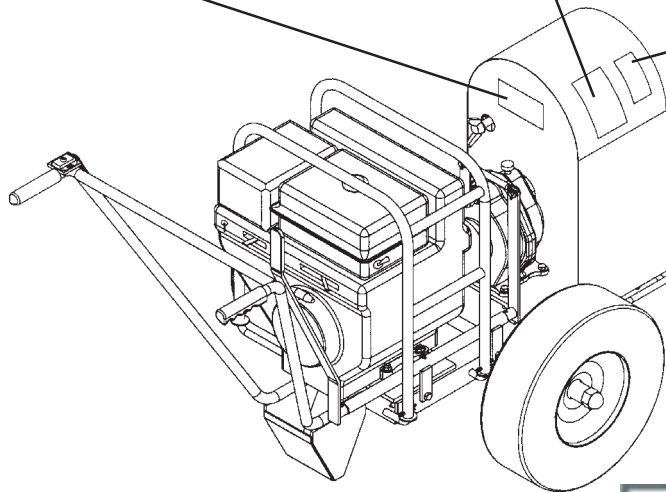
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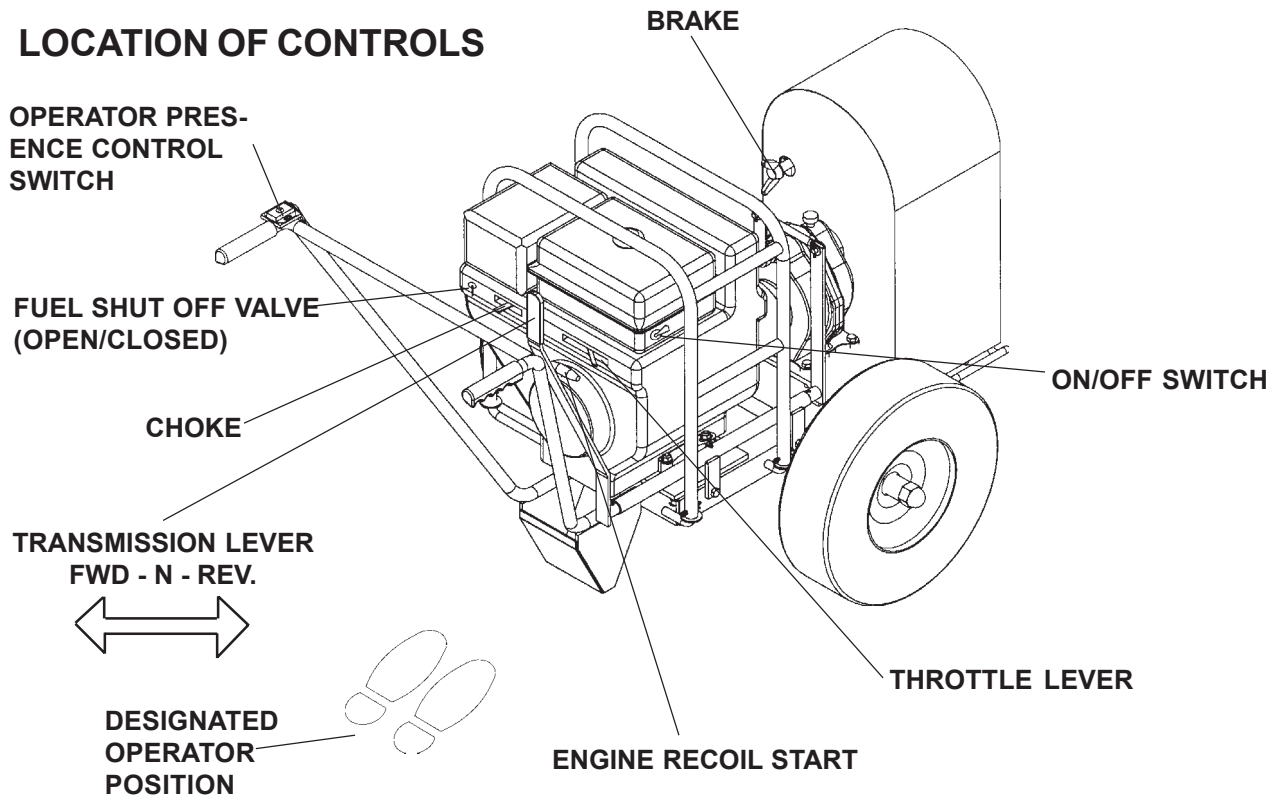
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# MACHINE SAFETY AND OPERATION

## M1800

### LOCATION OF CONTROLS



### JOBSITE

Before the entrance trench is constructed, contact the local "one call" service and all other underground plant owners to determine the location of existing services in the path of the proposed bore. **DO NOT** start excavating or boring until the area has been marked and cleared.

Working excavations more than 4 feet deep, must be constructed in accordance with Federal and local regulations. This is the responsibility of the contractor. McLaughlin Mfg. Co. recommends that the contractor be familiar with the requirements of (OSHA) regulations.

The working area at the site must be closed to all personnel not directly associated with the job. McLaughlin Mfg. Co. recommends that the exposed rotating rod be **GUARDED BY A SAFE DISTANCE. ALL PERSONNEL NOT DIRECTLY ASSOCIATED WITH THE JOB SHOULD BE KEPT AT LEAST 10 FEET (3m) BACK FROM THE EXPOSED ROTATING ROD.**

### PIT SIZE

An entrance trench will be required that is at least 4" (10 cm ) wide and 15' (4.5m) long. Standard drill rod M1556 - 7/8 (2.2 cm) dia requires an entrance pit length

Heavy duty rod M1575-1" (2.5 cm dia.) requires an entrance pit that is at least 10 times the depth of the entry point.

### OPERATION

The engine ignition circuit is controlled by the Operator Presence Control (OPC ) on the left side of the handle. Holding the OPC DOWN will allow the engine to run. Releasing the OPC will cause the engine to STOP.

The drill rod rotation speed is controlled by the throttle setting of the engine. The direction of the rotation is selected by the gear shift (FORWARD - NEUTRAL - REVERSE).

The ADVANCE of the drill rod and machine is caused by the "screw" action of the MOLE or REAMER selected for use. When MOLEING, the machine will ADVANCE when the transmission is in FORWARD, and RETRACT when the transmission is in REVERSE. When REAMING, the opposite action occurs and the machine will RETRACT when the transmission is in FORWARD and ADVANCE when the transmission is in REVERSE.

# MACHINE SAFETY AND OPERATION

## M1800

When operating this machine, always be aware of any slight tipping of the machine, or engine “lugging”. Whenever these conditions occur, be ready to release the Operator Presence Control immediately.

Select the moleing head to be used, and couple it to the lead section of rod. Couple additional rods as necessary to the lead section so that at least one full rod is on the ground behind the entrance trench. **NO MORE THAN 2 EXPOSED RODS, BEHIND THE ENTRANCE TRENCH, ARE TO BE COUPLED TO THE MOLEING MACHINE AT ANY TIME.**

### ROD CONNECTION

McLaughlin drill rods use a snap button connector for assembly. This provides a secure, flush connection that will pass through the compacted hole without interference. **DO NOT SUBSTITUTE PINS OR BOLTS FOR McLAUGHLIN SPRING-LOADED BUTTONS.**

### STARTING THE MOLE

A Helper and an Operator are required to safely operate McLaughlin Moleing Units. The Helper is required to hold the rods in starting position with the ROD GUIDE TOOL. (See Fig.2)

**McLaughlin Mfg. Co. prohibits the use of hands or any other tool other than the ROD GUIDE TOOL (provided) for starting the rods or aligning the MOLEING HEAD.**

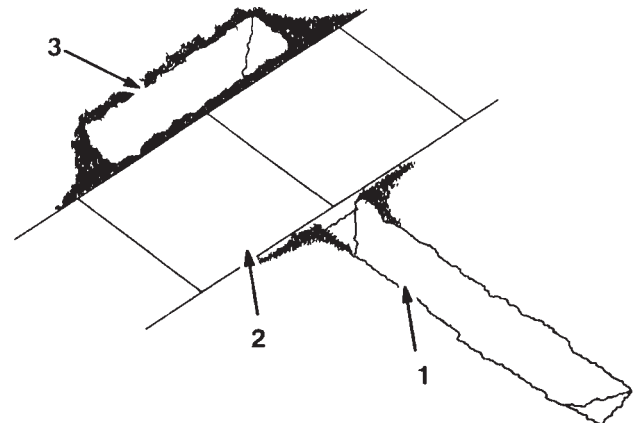
The position for the Helper is on top of the bank, on the right side of the trench with the tool just behind the moleing head. **AT NO TIME, SHALL PERSONNEL, BE IN THE ENTRANCE TRENCH WHEN THE MACHINE IS IN OPERATION.**

The Operator is ALWAYS in attendance at the machine and the Helper is responsible for the direction of the bore, and attaching the tools and the service to be installed. As soon as the MOLEING HEAD has entered the face, the machine is to be shut down, and the rod guide removed.

At this point, the grade of the rods should be checked with a LEVELING TOOL to assure that the bore has been started within specifications. If the LEVELING TOOL indicates that the first rod is not within grade tolerance, the rod should be withdrawn and restarted.

Clear the area and start the machine. Use FORWARD rotation and the drill stem will advance itself into the face by the “screw” action of the MOLEING HEAD. When using the Mighty Mole for IN-LINE BORES water services 48” to 60” (1.2m to 1.5m) below the surface, allow the machine to advance until approximately 6” (15.2 cm) of the rod protrudes from the face.

Fig. 1



- 1. Entrance trench
- 2. Sidewalk
- 3. Exit trench

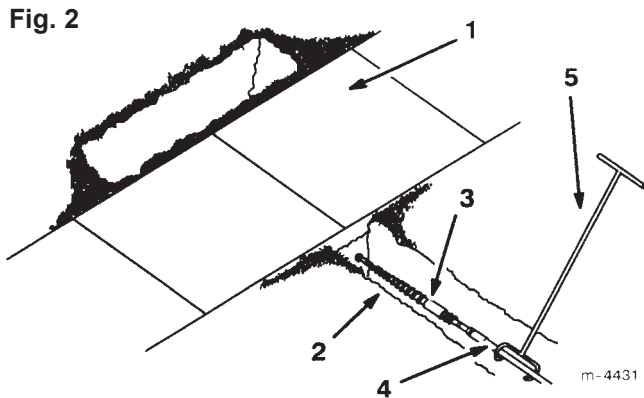
Stop advancing, shut down the machine, uncouple the rod at the chuck using the UNCOUPLER, and move the machine back to install another rod section. Continue to install rods until the exit trench area has been reached.

When using the Mighty Mole for SURFACE BORES below the surface, allow the machine to advance until it has reached the rear of the entrance trench. Stop advance, shut down the machine, uncouple the rod at the chuck using the UNCOUPLER and move the machine back to install another rod section. Continue to install rods until the exit trench area has been reached.

# MACHINE SAFETY AND OPERATION

## M1800

Stop advancing, shut down the machine, uncouple the rod at the chuck using the UNCOUPLER, and move the machine back to install another rod section. Continue to install rods until the exit trench area has been reached.

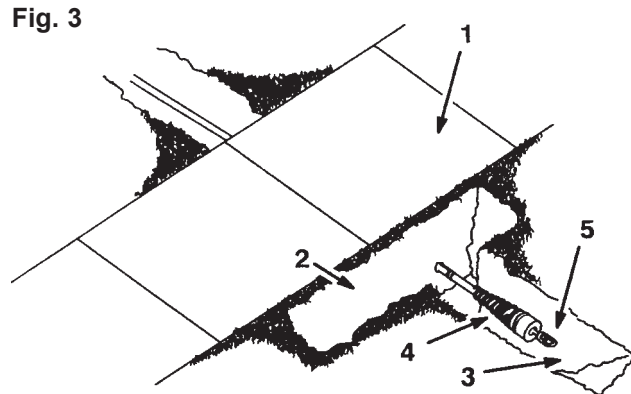


**Figure 4**

- |                         |                   |
|-------------------------|-------------------|
| 1. Sidewalk or driveway | 4. Rod            |
| 2. Entrance trench      | 5. Rod guide tool |
| 3. Boring bit           |                   |

When using the Mighty Mole for SURFACE BORES below the surface, allow the machine to advance until it has reached the rear of the entrance trench. (See Fig.2)

Stop advance, shut down the machine, uncouple the rod at the chuck using the UNCOUPLER and move the machine back to install another rod section. Continue to install rods until the exit trench area has been reached.



- |                               |           |
|-------------------------------|-----------|
| 1. Sidewalk or driveway       | 4. Reamer |
| 2. Exit trench                | 5. Swivel |
| 3. Shovel dug area around bit |           |

### REAMING OPERATION

Shut down the machine then, with both the Operator and Helper, open the exit trench, locate and uncouple the MOLEING HEAD. Couple a REAMER to the end of the exposed rod and attach the service to be installed to the swivel on the REAMER.

The Helper must not guide or touch the service being installed. The Helper must stay 10' from the service being installed. Failure of the swivel or unforeseen ground friction may make the service rotate and become an entanglement hazard. The Helper should notify the operator by radio if this happens.

Station the Helper at the exit trench to watch the service if necessary, and to secure the area while the work is being done. He should be in radio contact with the operator. Clear the entrance trench area and start the machine. (See Fig.3)

Use FORWARD rotation and the drill stem will RETRACT itself back into the entrance trench by the "screw" action of the REAMER. Allow the machine to RETRACT until the joint of the rod is beyond the end of the entrance trench. Stop ADVANCE, shut down the machine, uncouple and remove the rod, and manually move the machine to the edge of the trench and couple it to the drill string.

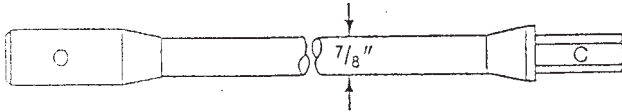
Clear the area, start the machine and continue to remove ONE ROD AT A TIME until the service has reached the entrance.



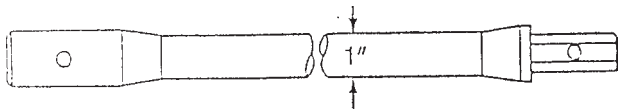


# DESCRIPTION AND USE OF TOOLS

## M1800



**Standard Drill Rod** 7/8" diameter (22.2mm), x 5', 10', and 20' lengths (1.5, 3, and 6 m). Supplied with either the standard 13/16" (20.64 mm) hex shank and socket with snap button connector, or the 1" (25.4 mm) hex Bulldog Connector.



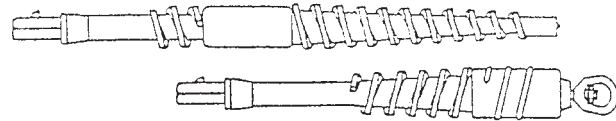
**Heavy Duty Drill Rod** 1" diameter (25.4mm), x 5', 10', and 20' lengths (1.5, 3, and 6m). Supplied with either the standard 13/16" (20.64 mm) hex shank and socket with snap button connector, or the 1" (25.4 mm) Bulldog Connector.



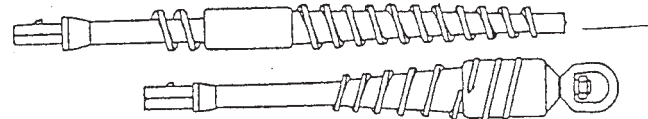
**1 1/4" Mole.** This is the smallest tool in the McLaughlin line. It is used primarily for the installation of small residential gas services (5/8" plastic). It is recommended for 25' to 30' (6.35 M - 7.62 M) (residential street crossings, with no reaming involved.) **THE SWIVEL SHANK CANNOT BE USED WITH THIS TOOL. NOT AVAILABLE WITH BULLDOG SHANK.**



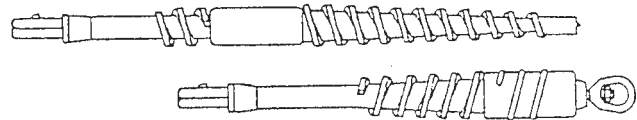
**1 3/8" Mole.** The Sand Mole is to be used only in sandy soil conditions where any degree of compaction is impossible. Usually no reaming pass is possible because the hole will collapse after the Sand Mole has passed through. The Swivel Shank can be used with this tool to retrieve small diameter electrical cable or similar services. **NOT AVAILABLE WITH BULLDOG SHANK.**



**1 7/16" Mole.** This tool is used in conjunction with the 2" Reamer. It is also used when the ground is very hard in the late fall and early winter. The reasoning behind this method is that there is very little displacement of the soil at any one time and the bore has a greater chance of success. **NOT AVAILABLE WITH BULLDOG SHANK.**



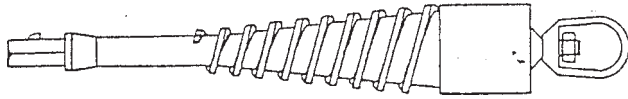
**1 3/4" Mole.** This tool is used in conjunction with the 2 1/2" Reamer, and is the most widely used tool. Most utility work will fall somewhere within this range. Installation of the service can be accomplished by reaming and pulling the service through simultaneously, or if the hole is large enough on the initial pass, the Swivel Shank can be used to pull the service through as the rods are withdrawn. Supplied with either the standard 13/16" (20.6 mm) hex shank, or the 1" (25.4mm) hex Bulldog Connector.



**2" Mole.** This Moleing Head is to be paired with the 2 7/8" Reamer for maximum effectiveness. It can also be used in conjunction with the Swivel Shank when enlarging the hole is not necessary. Supplied with either the standard 13/16" (20.6mm) hex shank, or the 1" (25.4mm) hex Bulldog Connector.

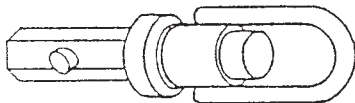
# DESCRIPTION AND USE OF TOOLS

## M1800



**Rod Guide.** PT# M157100 - Used at the start of the bore to locate and level the Mole and first rod at the entry face. At all times the help [unclear] the trench and holding the ROD GUIDE [unclear] standing on the right hand side of the trench. **ROD GUIDE IS REMOVED AFTER 1/2 OF THE LENGTH OF THE FIRST ROD HAS BEEN INSTALLED. ALWAYS USE GUIDE TOOL WHEN POSITIONING ROTATING DRILL RODS.**

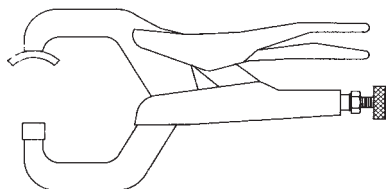
**3 1/4", 3 1/2" and 4 1/2 Reamers.** Whenever these tools are used, the soil condition must be ideal. By using these tools, 2" water and gas lines can be installed together with their connecting couplings. However, in some cases where the service is very heavy and awkward to handle underground, i.e. copper with large hex coupling, or plastic pipe that tends to snake in the hole, a cable or chain can be pulled through by the Reamer, and then attached to a backhoe to pull through the service. Supplied with either the standard 13/16" hex shank, or the 1" hex Bulldog Connector.



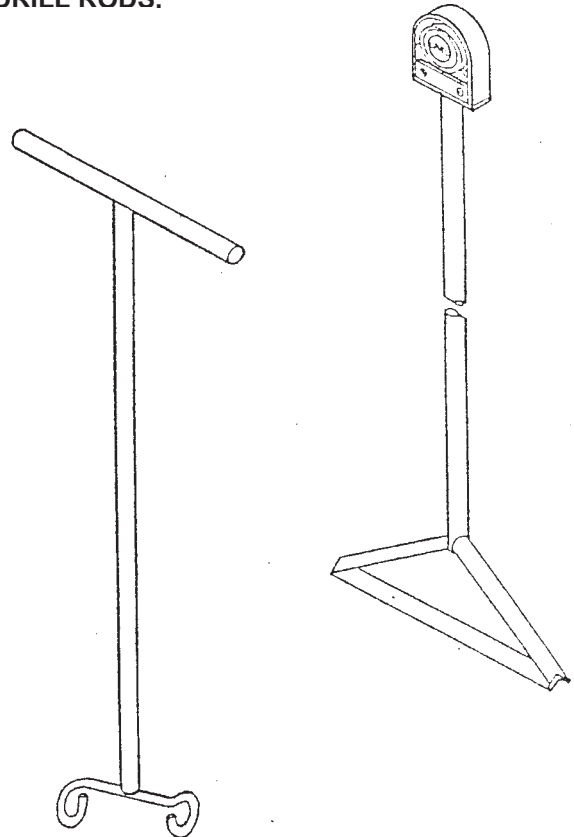
**Swivel.** This tool can be used with any Mole except the 1 1/4" (M-157200). Use this tool when no additional reaming is needed.



**Adapter.** For M-1800, and M-427 Gasoline and Hydraulic Machines. This component is a replacement part normally permanently coupled to the machine.



**Uncoupler.** Used for disengaging 13/16" (20.6mm) and 1" (25.4mm) snap button connectors on standard or heavy duty drill rods.



**Devil Level.** Used to determine the difference between the angle to the rod being installed and actual horizontal level. Always shut down the machine before using the level. Check as close to the face as practical. Keep base of tool clean to obtain accurate readings. Each one degree is a rise or fall of approximately 20 inches (50.8 cm) in 100 feet (25.4 M).

Moleing heads, reamers, adapters, and swivels are supplied with the proper hex size to match the rods being used. Always use a complete string of either standard or heavy duty rods, and select the tool with

**Refer to McLaughlin's Drilling Tools catalog for the complete line of moleing tools and accessories.**

# MACHINE SPECIFICATIONS

## M1800

### 1800 SPECIFICATIONS

#### Gasoline Powered Boring Unit

##### Boring Range:

##### ENGLISH

##### METRIC

Bore 1 1/4" - 2 1/2" Compacted holes  
Reams 3 1/2"

3.175cm -6.35cm  
8.9cm

**Engine:** 12 hp (9.8kW) gas, recoil start  
Max. engine rpm: 2550  
Idle rpm: ~ 1200

**Transmission:** Forward, Neutral, and Reverse

**Clutch:** Manual, 105 @ 2500 engine rpm Forward

**Final Drive:** 13/16" Hex

**Torque:** 445 ft/lbs. @ 2400 engine rpm

603 Nm @ 2400 rpm

**Fuel Tank:** 1.8 gallon

9.6 L

#### Dimensions

**Machine:** 34" (86.4 cm) wide x 66" (167.6cm) long x 34" (86.4 cm) high  
Weight: 320 lbs (145 kg)

# FILTERS AND FILL POINTS

## M1800

**1. Engine Fuel Fill** - Use only manufacturer's recommended fuel. See page 5.1.5.

**Check Daily**

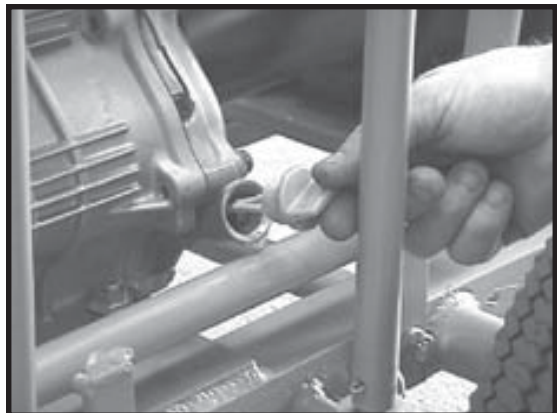
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**2. Engine Oil Level** - Follow manufacturer's instructions on oil types and maintenance intervals. See pages 5.1.4 - 5.1.9.

**Check Daily**

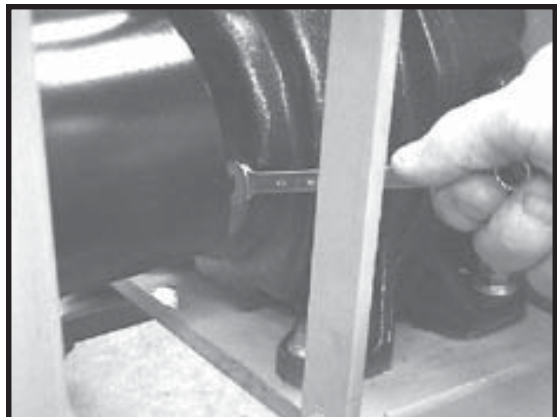
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**3. Transmission oil check** - Fill to check plug with 30 wt. non-detergent motor oil. After the transmission has run for its first 25-30 hours drain and refill with new oil. Thereafter change oil every 100-150 hours of operation or every six months, which ever comes first.

**Check Weekly**

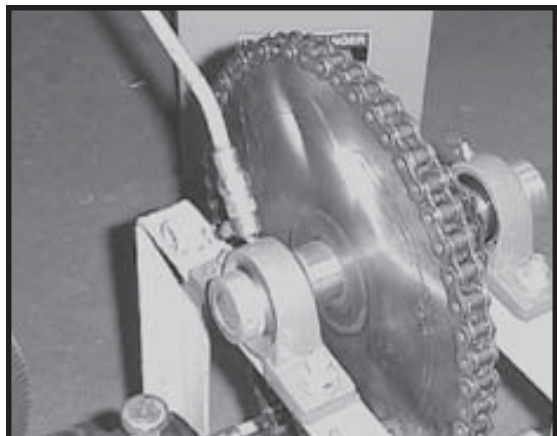
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**4. Lubrication** - As part of regular maintenance, lubricate upper and lower sprocket bearings, grease chain and lube wheel bearings when necessary.

**Check Monthly**

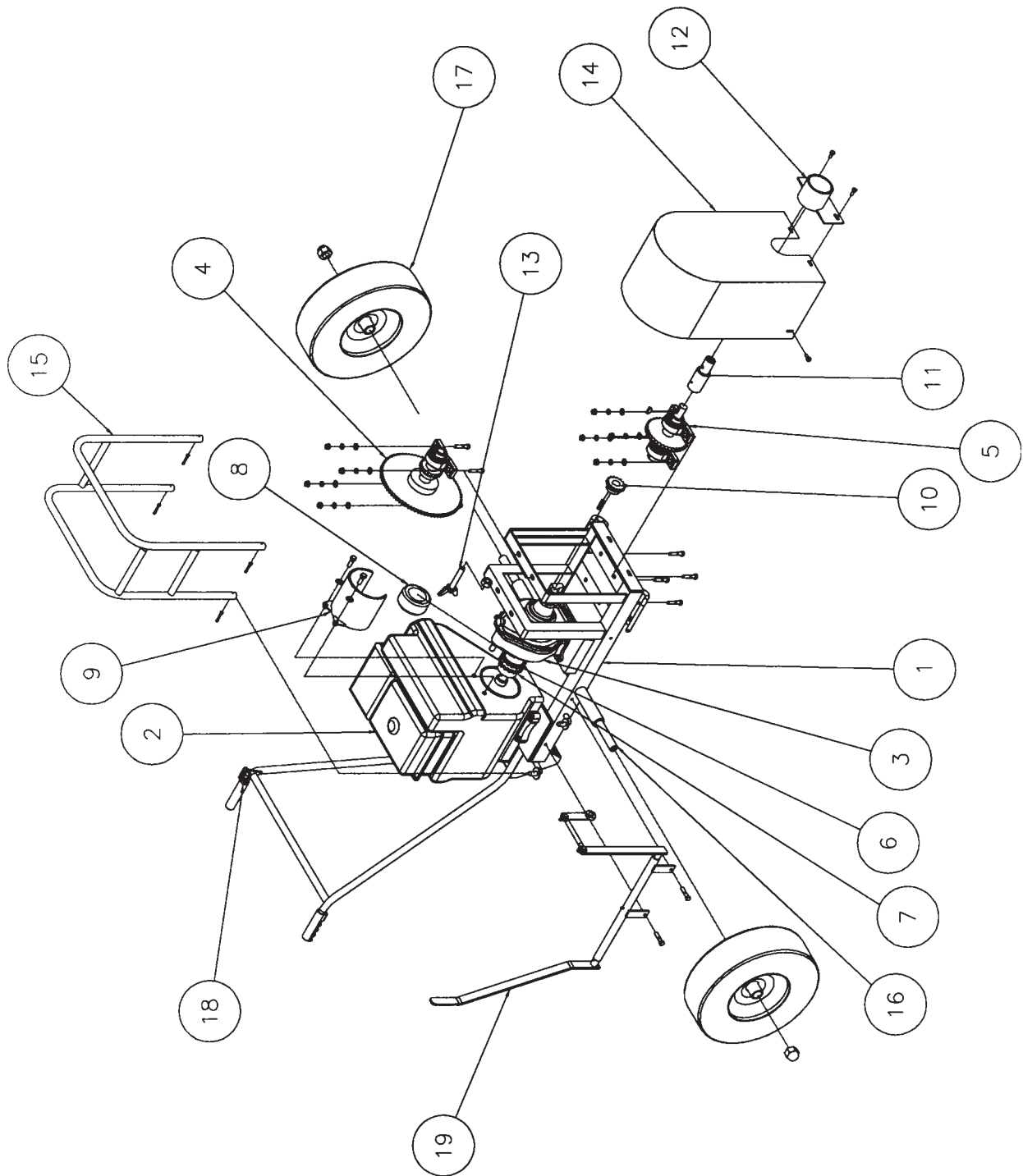
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**5. Air Pressure** - Each Tire, should be 30 psi. Grease chain and lube wheel bearings and pillow block bearings (as shown) when necessary.

# BORING UNIT COMPONENTS

## M1800



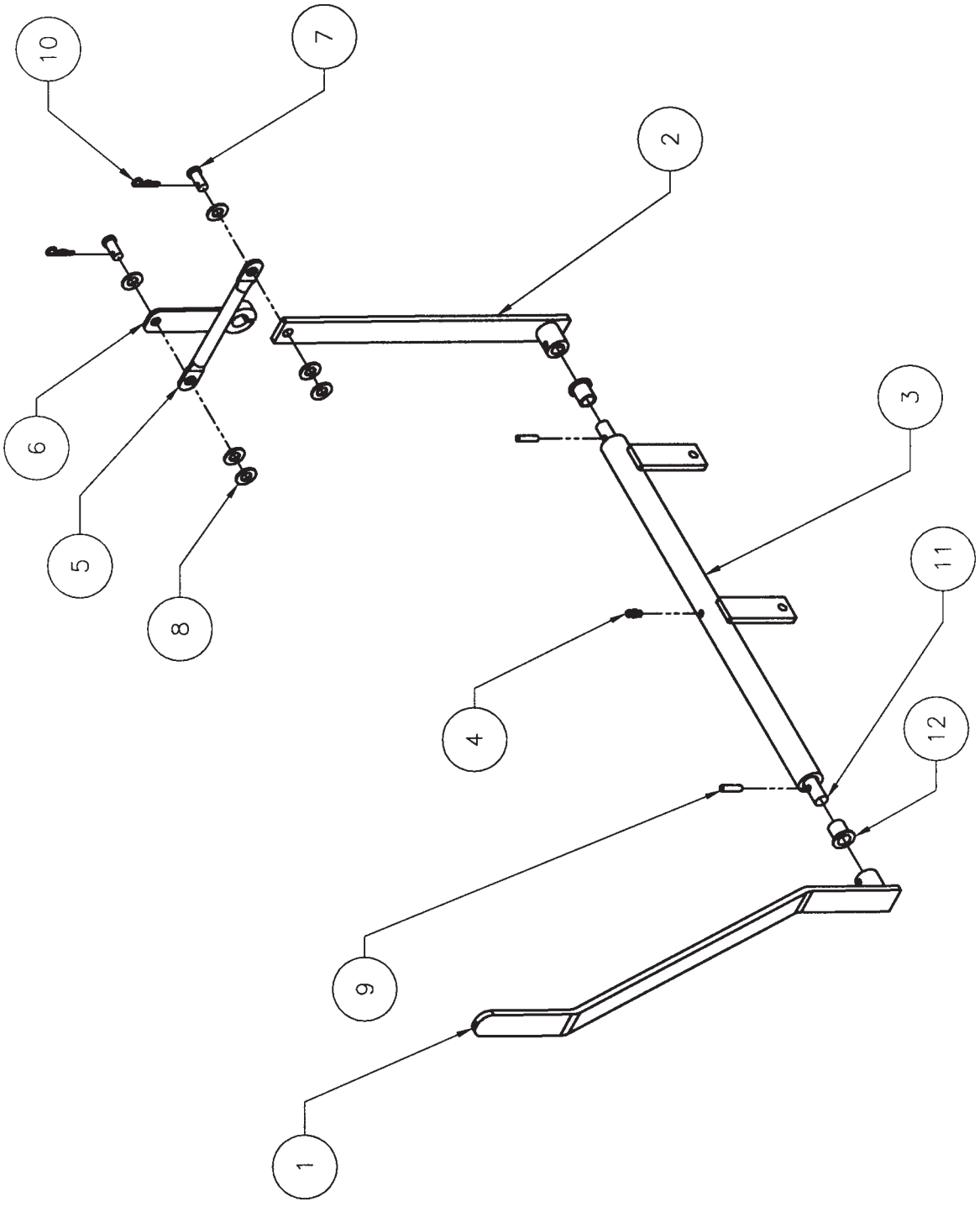
# BORING UNIT COMPONENTS

## M1800

ITEM #	QTY.	NUMBER	DESCRIPTION
1	1	M180180	Frame Weldment
2	1	P030100	Gas Powered Engine
	4	U000500	Screw, HC .375-16 X 2.0
	4	U210060	Washer, Lock .375
	4	U200060	Washer, Flat .375
	4	U120200	Nut, Whiz Lock .375-16
3	1	M180405	Transmission
	4	U000480	Screw, HC.375-16 X 1.75
	4	U210060	Washer, Lock .375
	4	U200060	Washer, Flat .375
	4	U120200	Nut, Whiz Lock .375-16
4	1	M185000	Upper Shaft Assembly
	1	M180900	Chain, Trans. to Upper Shaft
	1	M181500	Chain, Upper Shaft to Lower Shaft
	4	U000480	Screw, HC .375-16 X 1.75
	4	U210060	Washer, Lock .375
	4	U200060	Washer, Flat .375
	4	U120200	Nut, Whiz Lock .375-16
5	1	M185500	Lower Shaft Assembly
	1	U400040	Key, Woodruff .250 X 1.00 #15
	4	U000480	Screw, HC .375-16 X 1.75
	4	U210060	Washer, Lock .375
	4	U200060	Washer, Flat .375
	4	U120200	Nut, Whiz Lock .375-16
6	1	M180215	Sprocket, Transmission Input
	1	U410030	Key, Straight .1875 SQ. X 1.25
7	1	M180216	Sprocket, Engine Output
	1	U410060	Key, Straight .250 SQ. X 1.25
8	1	T260008	Chain, Delrin
9	1	M180227	Coupling Guard Weldment
10	1	M181700	Sprocket, Transmission Output
	1	U410060	Key, Straight .250 SQ. X 1.25
11	1	M182100	Chuck Weldment
12	1	M182500	Chuck Guard Weldment
13	1	M182400	Brake Screw
14	1	M182200	Chain Guard Weldment
	4	U000180	Screw, HC .312-18 X .75
	4	U200040	Washer, Flat .312
	4	U100040	Nut, Hex .312-18
15	1	M180198	Rollbar Weldment
	4	U320060	Pin, Cotter .188 X 1.5
16	1	M180003	Axel
17	2	M180200	Wheel w/ Bearings
	2	U100280	Nut, Acorn 1-8
18	1	M180233	Operator Presence Control
19	1	M120210	Transmission Clutch Assembly
	2	U000760	Screw, HC .438-14 X 1.25
	2	U210080	Washer, Lock .438
	2	U100100	Nut, Hex .438-14

# CLUTCH LINKAGE ASSEMBLY

## M1800





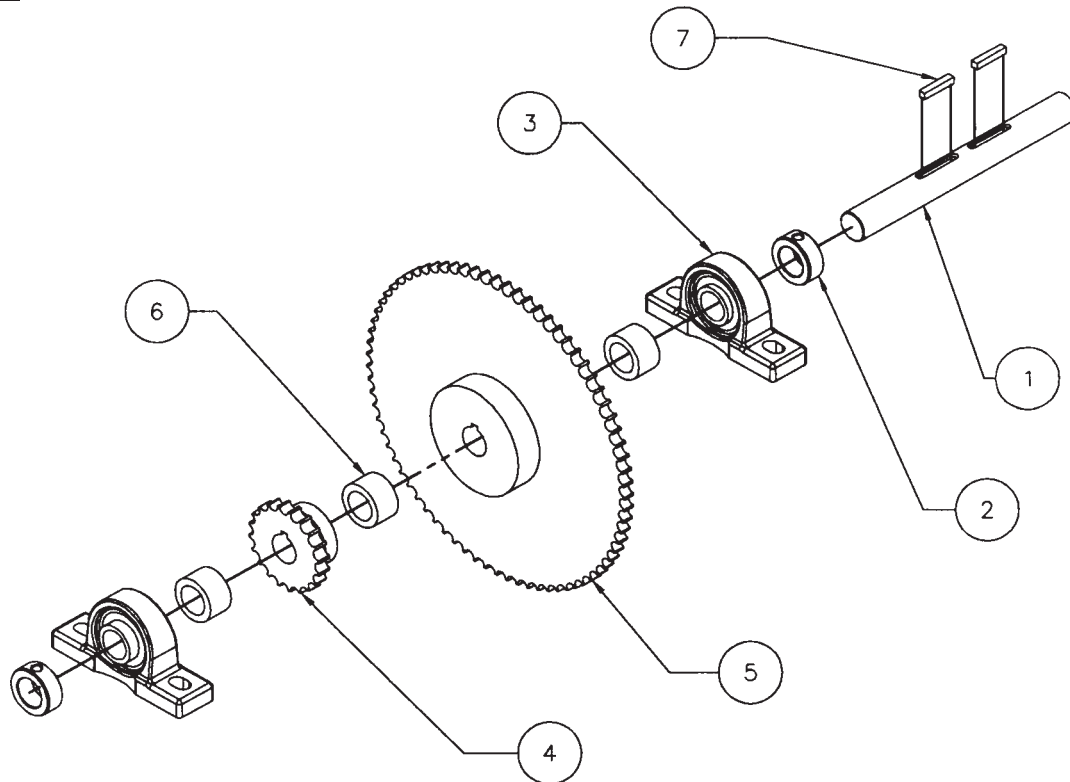
# **CLUTCH LINKAGE ASSEMBLY**

## **M1800**

<b>ITEM #</b>	<b>QTY.</b>	<b>NUMBER</b>	<b>DESCRIPTION</b>
1	1	M180208	Clutch Shift Handle Weldment
2	1	M180209	Transmission Shift Arm Weldment
3	1	M180214	Clutch Rod Sleeve Weldment
4	1	T500020	Grease Fitting
5	1	M183850	Arm Connecting Rod
6	1	M180213	Clutch Shift Arm Weldment
7	2	M183700	Clevis Pin
8	6	U200060	Washer, Flat .375
9	2	U310020	Pin, Roll 7/32 x 1.0
10	2	U340040	R-Clip 3/4"
11	1	M183400	Clutch Control Rod
12	2	M183100	Brass Bushing

# UPPER SHAFT ASSEMBLY

## M1800

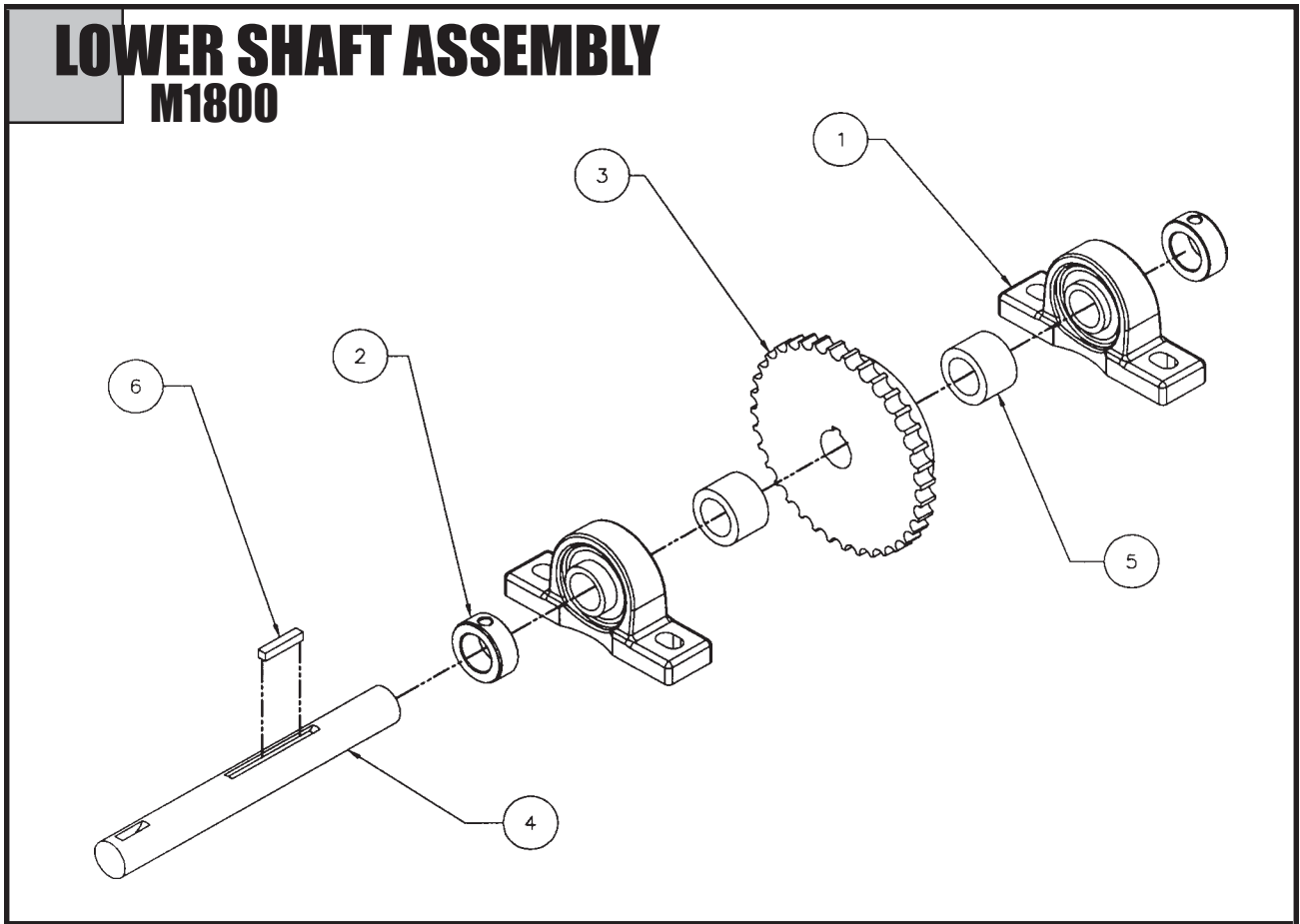


# UPPER SHAFT ASSEMBLY

## M1800

ITEM #	QTY.	NUMBER	DESCRIPTION
1	1	M181000	Upper Shaft
2	2	M181200	Lock Ring
3	2	M181100	Pillow Block Bearing
4	1	M180500	Front Sprocket
5	1	M180700	Rear Sprocket
6	3	M181300	Spacer
7	2	U410060	Key, .25 Sq. X 1.25"

# LOWER SHAFT ASSEMBLY M1800

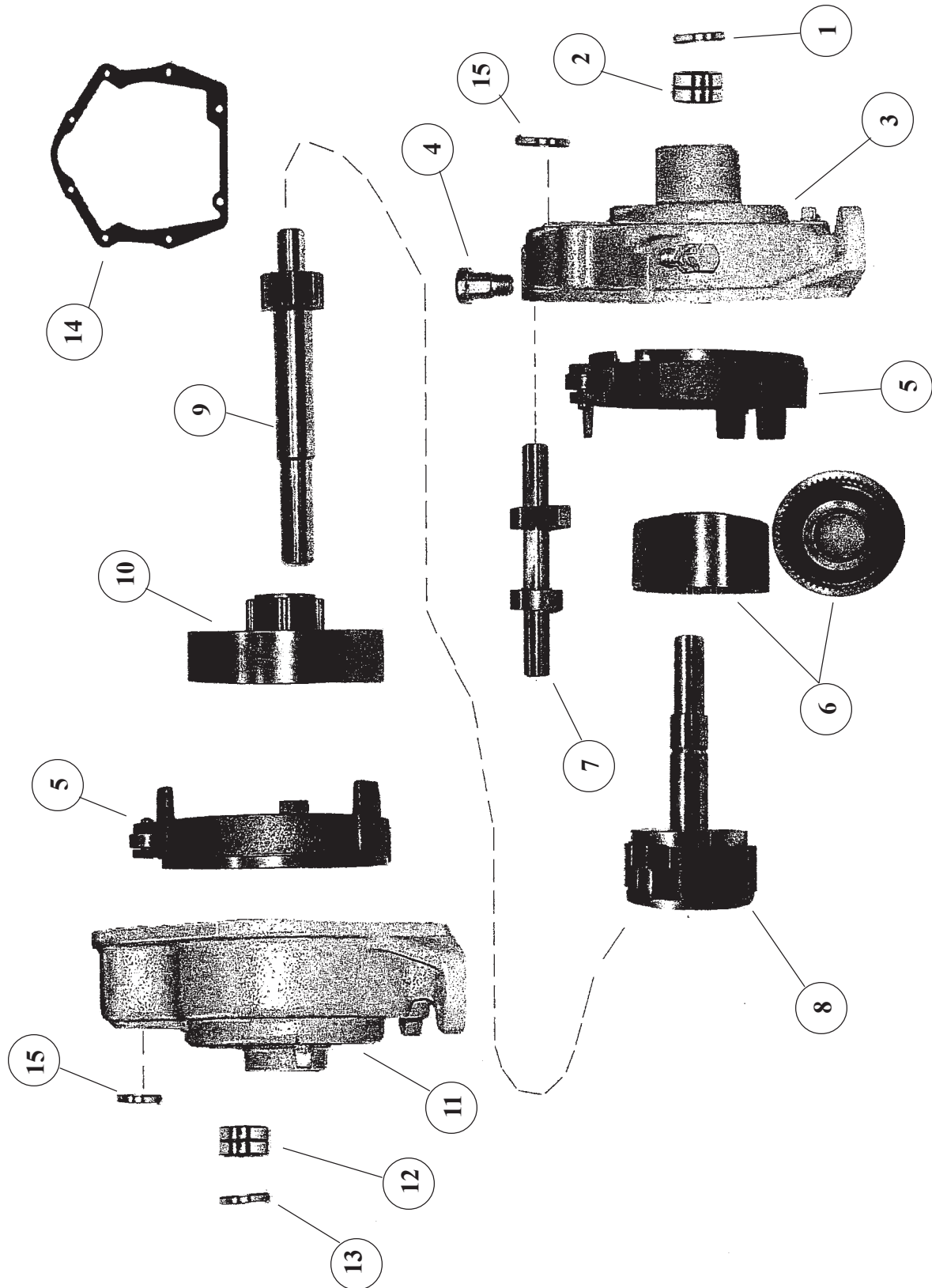


# LOWER SHAFT ASSEMBLY M1800

ITEM #	QTY.	NUMBER	DESCRIPTION
1	2	M181100	Pillow Block Bearing
2	2	M182000	Lock Ring
3	1	M181600	Sprocket, Lower Shaft
4	1	M181800	Lower Shaft
5	2	M181900	Spacer, Lower Shaft
6	1	U410060	Key, .250 Sq. X 1.25"

# TRANSMISSION COMPONENTS

## M1800



# TRANSMISSION COMPONENTS

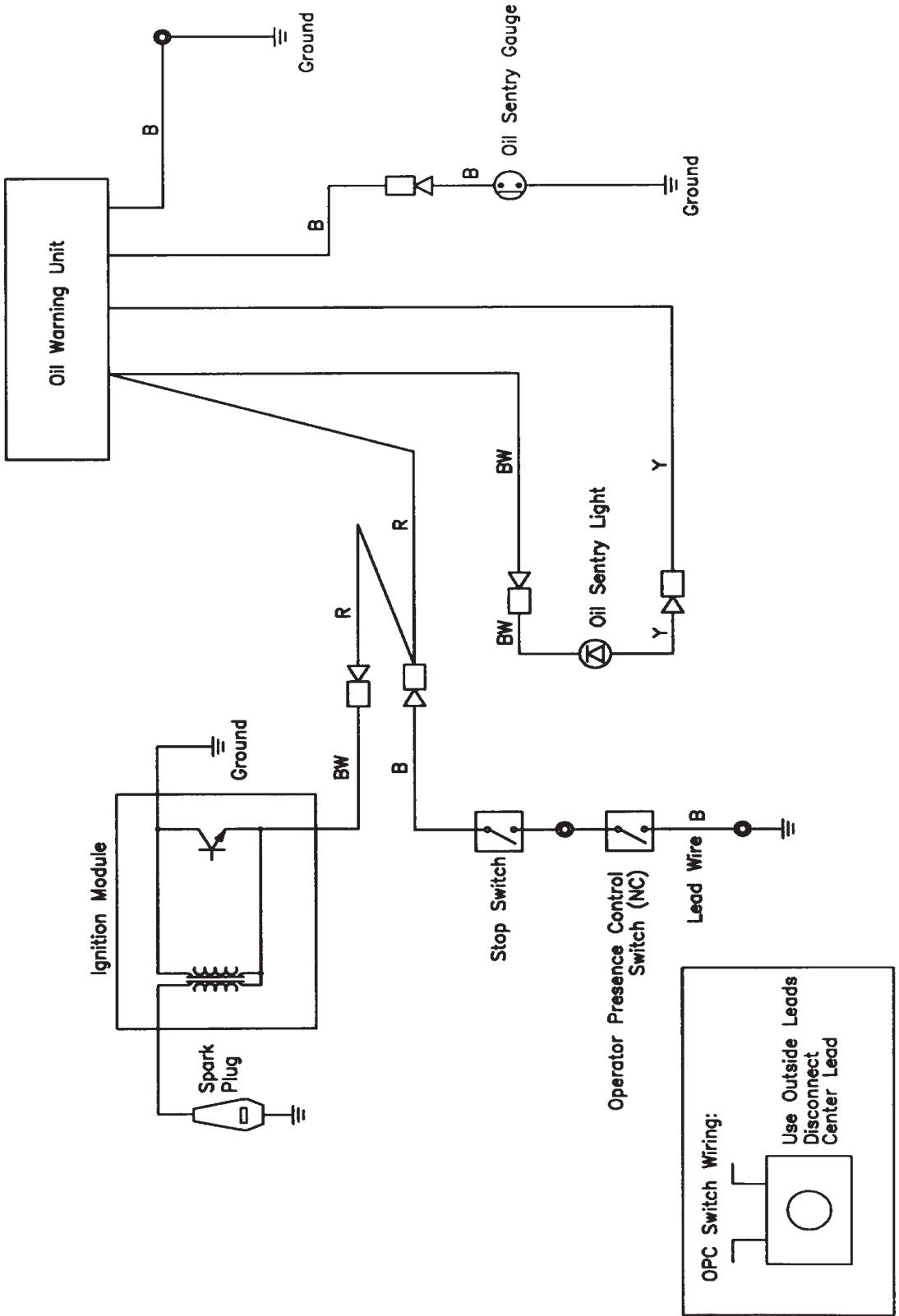
## M1800

ITEM #	QTY.	NUMBER	DESCRIPTION
1	1	P100001	Oil Seal
2	1	P100026	Bearing
3	1	P100047	Output Housing Assembly
	1	P100021	Bushing
	1	P100023	Adjustment Bolt
	1	P100024	Jam Nut
	2	P100014	Pipe Plug
4	1	P100022	Breather
5	2	P100003	Brake Band Assembly
6	1	P100042	Gear Drum Assembly
	1	P100018	Bushing
7	1	P100046	Cross Shaft Assembly
	2	P100056	Cam
	1	P100012	Cross Shaft
8	1	P100015	Gear Cage Assembly
	1	P100061	Output Shaft Assembly
	1	P100033	Gear Cover
	2	P100045	Short Pinion Assembly
	2	P100044	Long Pinion Assembly
	2	P100041	Bushing
	1	P100049	Bushing
9	1	P100050	Input Shaft
10	1	P100006	Flat Drum Assembly
	1	P100043	Gear Assembly
	1	P100010	Bushing
	1	P100009	Bushing
	1	P100008	Snap Ring
11	1	P100064	Input Housing Assembly
	1	P100023	Adjustment Bolt
	1	P100024	Jam Nut
	1	P100014	Pipe Plug
12	1	P100062	Bearing
13	1	P100063	Oil Seal
14	1	P100019	Gasket
15	2	P100051	Oil Seal
**	1	P100055	Key
**	1	P100004	Washer
**	1	P100011	Washer
**	1	P100016	Washer

\*\* Not shown.

# WIRING DIAGRAM

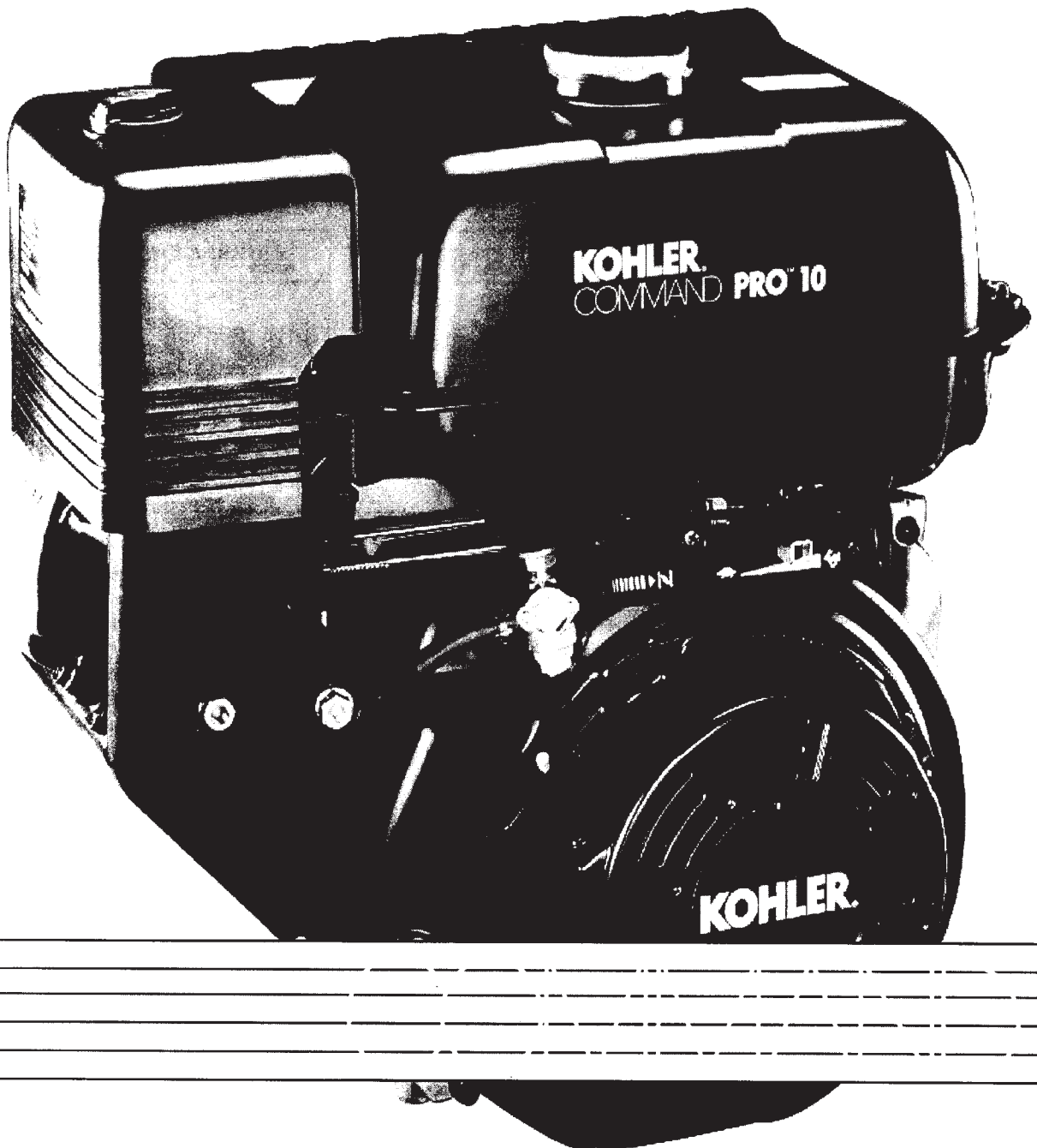
## M1800



**ENGINE**  
**M1800**

**KOHLER**.engines

**OWNER'S MANUAL**  
**CS4,CS6,CS8.5,CS10,CS12**



# ENGINE M1800

## Safety Precautions

To insure 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 warning 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.*



### WARNING



**Explosive Fuel can cause fires and severe burns.**

Stop engine before filling fuel tank.

#### 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.*



### WARNING



**Rotating Parts can cause severe injury.**

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.*



### WARNING



**Hot Parts can cause severe burns.**

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.*



### CAUTION



**Electrical Shock can cause injury.**

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.*

### California Proposition 65 Warning

*Engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.*



# ENGINE M1800

## Safety Precautions (Cont.)

### **WARNING**



**Accidental Starts can cause severe injury or death.**

Disconnect and ground spark plug lead before servicing.

### **WARNING**



**Carbon Monoxide can cause severe nausea, fainting or death.**

Do not operate engine in closed or confined area.

### **WARNING**



**Explosive Gas can cause fires and severe acid burns.**

Charge battery only in a well ventilated area. Keep sources of ignition away.

#### **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) Remove battery cables (remove negative (-) lead first). Reconnect negative (-) lead last when reconnecting battery.

#### **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.*

#### **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 gasoline vapors are present.*

**Congratulations** – You have selected a fine four-cycle, single 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 splash 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 oil fill/check plug, air cleaner, spark plug, and carburetor) are easily and quickly accessible.
- Parts subject to the most wear and tear (like the cylinder liner, crankshaft, and camshaft) are made from precision formulated cast iron. Because the cylinder liner can be rebored, these engines can last even longer.
- 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.

# ENGINE M1800

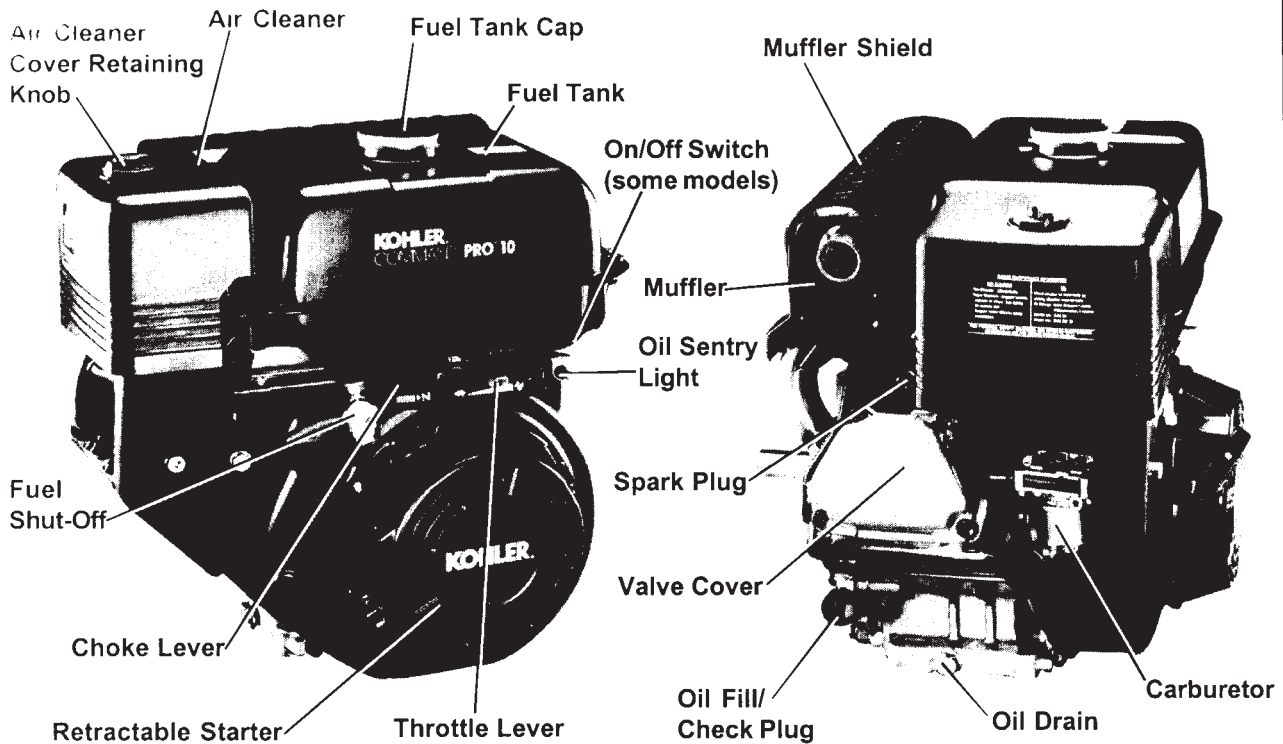


Figure 1. Location of Controls and Service Points on CS Engines.

## 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. Failure to use the correct oil, or using dirty oil, causes premature engine wear and failure.

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

## Oil Type

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

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

### RECOMMENDED SAE VISCOSITY GRADES

Kohler "Winter"										
10W-30										
5W-20, 5W-30										
Kohler "Command"										
10W			20W					30W		
F -20	-10	20	32	40	60	80	100			
C -30	-20	-10	0	10	20	30	40			
TEMPERATURE RANGE EXPECTED BEFORE NEXT OIL CHANGE										

Figure 2. Viscosity Grades Table.



Figure 3. Oil Container Logo.

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

# ENGINE M1800

## 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 the previous season, to minimize gum deposits in your fuel system and to insure 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 head will 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.

## 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 decal (or decals) 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.

<p><b>IMPORTANT ENGINE INFORMATION</b> THIS ENGINE CONFORMS TO U.S. EPA PHASE 1 &amp; 1995-2001 CALIFORNIA EMISSION CONTROL REGULATIONS FOR ULGE ENGINES</p> <p><b>FAMILY</b> <b>MODEL NO.</b> <b>SPEC. NO.</b> <b>DISPL (CC)</b> <b>SERIAL NO.</b></p> <p>REFER TO OWNER'S MANUAL FOR SAFETY, MAINTENANCE SPECS, AND ADJUSTMENTS. FOR SALES AND SERVICE IN US/CANADA CALL: 1-800-544-2444</p> <p><b>KOHLERengines</b> KOHLER CO. KOHLER, WI USA (Ref.*** - *****)</p>
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If your engine has this identification label, it is certified to meet EPA/CARB standards.

**Figure 4. Engine Identification Labels.**

# ENGINE M1800

## Operating Instructions

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

### Pre-Start Checklist

NOTE: This engine has been shipped without engine oil. Fill with oil, otherwise it will not start.

- Check oil level. Add oil if low. Do not overfill.
- Check fuel level. Add fuel if low.
- 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.



### **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.

### Cold Weather Starting Hints

1. Be sure to use the proper oil for the temperature expected. See Figure 2 on page 4.
2. Declutch all possible external loads.
3. Set speed control at part throttle position.
4. A warm battery has much more starting capacity than a cold battery.
5. Use fresh winter grade fuel. NOTE: Winter grade gasoline has a higher volatility to improve starting. Do not use gasoline left over from summer.

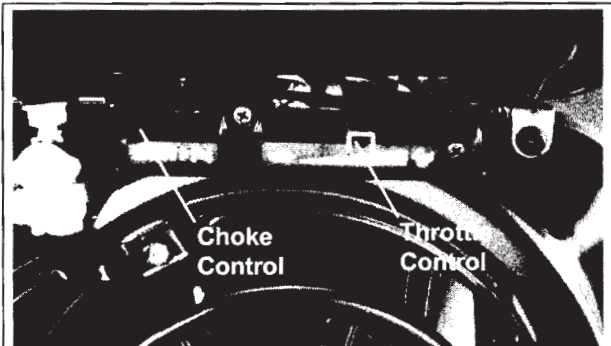


Figure 5. Control Panel.

### Starting

1. Turn fuel shut-off valve to "on" position. See Figure 6.

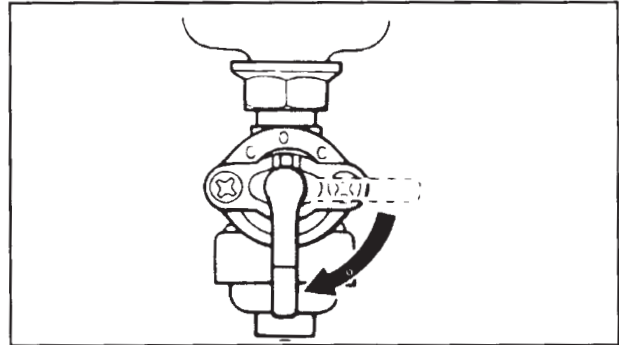


Figure 6. "On" Position of Fuel Shut-Off Valve.

2. **For a Cold Engine** – Place the throttle control midway between the "slow" and "fast" positions. See Figure 5. Place the choke control into the "on" position.

**For a Warm Engine (normal operating temperatures)** – Place the throttle control midway between the "slow" and "fast" positions. The choke is not required to start a warm engine.

3. Start the engine as follows:

**For Retractable Start Engine** – Turn engine On/Off switch to "on" (see Figure 7) and SLOWLY pull the starter handle until just past compression – STOP! Return starter handle, pull firmly with a smooth, steady motion to start. Pull the handle straight out to avoid excessive rope wear from the starter rope guide.

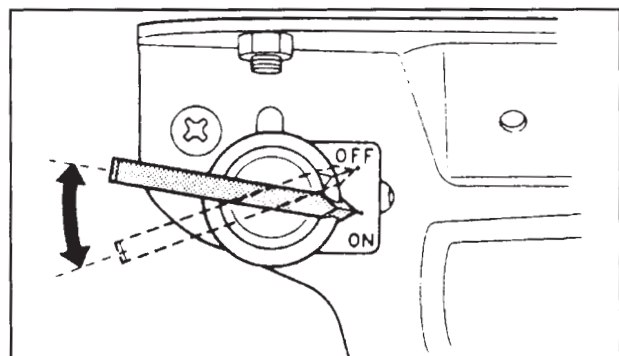


Figure 7. Retractable Start Engine On/Off Switch.

Extend the starting rope periodically and check its condition. If the rope is frayed, have it replaced immediately by your Kohler Engine Service Dealer.

# ENGINE M1800



## WARNING: Accidental Starts!

**Disabling engine. Accidental starting can cause severe injury or death.** Before extending and checking retractable starter rope, disable the engine as follows:  
1) Disconnect the spark plug lead(s). 2) Remove battery cables (remove negative (-) lead first). Reconnect negative (-) lead last when reconnecting battery.

**For an Electric Start Engine** – Activate the starter switch. Release the switch as soon as the engine starts.

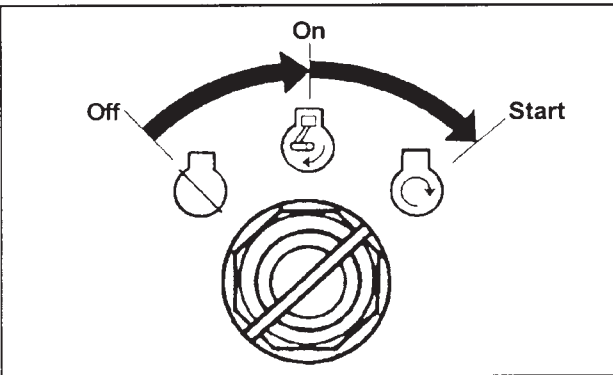


Figure 8. Electric Start Engine Starter Switch.

**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), the engine rotation must be allowed to come to a complete stop before attempting to restart the engine. If the start 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"). See your Kohler Engine Service Dealer for trouble analysis.

4. **For a Cold Engine** – Gradually return the choke control to the "off" position after the engine starts and warms up.

The engine/equipment may be operated during the warm up period, but it may be necessary to leave the choke partially on until the engine warms up.

## Stopping

1. If possible, remove the load.
2. Move the throttle control to the "slow" or "low" idle position. Allow the engine to run at idle for 30-60 seconds.
3. Move the throttle control to the "slow" position. Turn key switch or on/off switch to "off" position.
4. Close fuel shut-off valve.

## 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 13).

## Operating

### Angle of Operation

This engine will operate continuously at angles up to 20°. Check oil level to assure crankcase oil is up to the point of overfilling the filler neck.

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 20° in any direction. Engine damage could result from insufficient lubrication.

### Cooling

**NOTE:** If debris builds up on the grass screen or other cooling air intake 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.

# ENGINE M1800

## 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.

### **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) Remove battery cables (remove negative (-) lead first). Reconnect negative (-) lead last when reconnecting battery.

### 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>• Fill fuel tank.</li> <li>• Check oil level.</li> <li>• Check air cleaner for dirty, loose, or damaged parts.<sup>1</sup></li> <li>• Check air intake and cooling areas, clean as necessary.<sup>1</sup></li> <li>• Check fuel hose for cracks or damage. Replace if necessary.</li> <li>• Check exhaust system for leakage. Retighten or replace gasket if necessary.<sup>2</sup></li> <li>• Check choke operation.</li> <li>• Check retractable starter operation.</li> </ul>
Initial 1 month/20 Hour	<ul style="list-style-type: none"> <li>• Change oil.</li> <li>• Service precleaner element.<sup>1</sup></li> </ul>
Every 20 Hours Thereafter	<ul style="list-style-type: none"> <li>• Service precleaner element. Replace if necessary.<sup>1</sup></li> </ul>
Every 100 Hours	<ul style="list-style-type: none"> <li>• Change oil.</li> <li>• Replace air cleaner element.<sup>1</sup></li> <li>• Remove cooling shrouds and clean cooling areas.<sup>1</sup></li> <li>• Check all fittings and fasteners.</li> <li>• Clean fuel valve shut-off filter. Replace if necessary.</li> <li>• Check muffler screen/spark arrestor. Clean/replace if necessary.</li> <li>• Check spark plug condition, adjust gap, and clean. Replace if necessary.</li> </ul>
Annually or Every 300 Hours	<ul style="list-style-type: none"> <li>• Check and adjust valve clearance when engine is cold.<sup>2</sup></li> <li>• Check and adjust idle speed.</li> <li>• Check/have bendix starter drive serviced.<sup>2</sup></li> <li>• Check cooling fan for damage.</li> <li>• Have combustion chamber decarbonized.<sup>2</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.

### 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 oil fill/check plug before removing it.
3. Unthread and remove the oil fill/check plug.
4. The level should be up to but not over, the point of overflowing the filler neck.

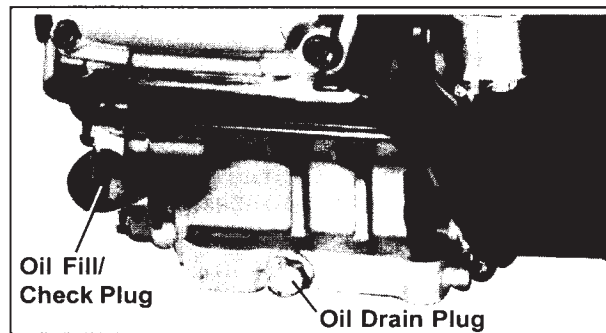


Figure 9. Location of Oil Drain and Check Plugs.

# ENGINE M1800

NOTE: Just because you can see oil in the crankcase doesn't mean the level is in the safe range. Bring the level up to the point of overflowing the filler neck.

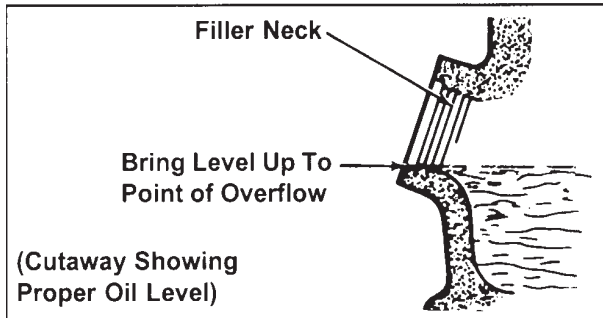


Figure 10. Proper Oil Level.

5. If the level is low, add oil of the proper type, up to the point of overflowing the filler neck. (Refer to "Oil Type" on page 4.) Always check the level 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 point of overflowing the filler neck.

## Oil Sentry™

Engines are equipped with an Oil Sentry™ oil monitor. When the oil level falls below the safe level, the engine stops automatically. Unless you refill with oil, the engine will not start again. See Figure 11.

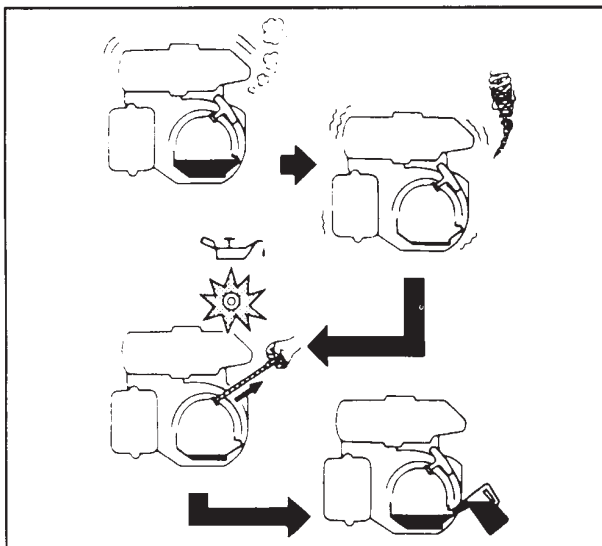


Figure 11.

NOTE: If the engine stalls or does not start, turn the engine switch to "on" position and then pull the recoil starter or attempt to start engine. If the oil warning light flickers for a few seconds, the engine oil is insufficient. Add oil and restart.

NOTE: Make sure the oil level is checked BEFORE EACH USE and is maintained up to the point of overflowing the filter neck.

## Change Oil

For a new engine, change oil after the first 20 hours of operation. Thereafter, change oil after every 100 hours of operation.

For an overhauled engine or those rebuilt with a new short block, use 10W-30 – weight service class SG or SH oil for the first 5 hours of operation. Change the oil after this initial run-in period. Refill with service class SG or SH 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 freely and carry away more impurities. Make sure the engine is level when filling, checking, or changing the oil.

Change the oil as follows (see Figure 9):

1. To keep dirt, debris, etc., out of the engine, clean the area around the oil fill cap/dipstick before removing it.
2. Remove the oil drain plug and oil fill/check plug. Be sure to allow ample time for complete drainage.
3. Reinstall the drain plug. Make sure it is tightened to **17.6 N·m (13 ft. lb.)** torque.
4. Fill the crankcase, with new oil of the proper type, up to the point of overflowing the filler neck. Refer to "Oil Type" on page 4. Always check the level before adding more oil.
5. Reinstall the oil fill/check plug and tighten securely.

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 point of overflowing the filler neck.

# ENGINE M1800

## Reduction Systems

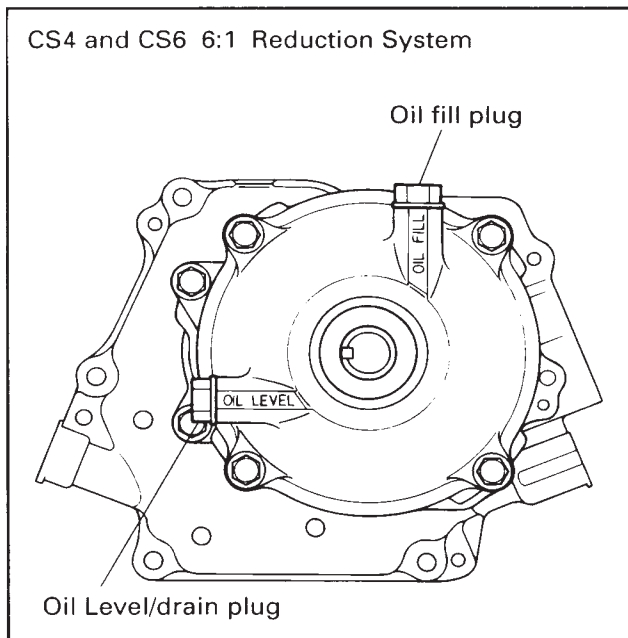
### 2:1 Reduction Systems

All 2:1 reduction systems are lubricated by the engine's crankcase oil through special openings in the closure plate. No special maintenance or service is necessary. Check and maintain the oil level as outlined on page 8 and 9.

### 6:1 Reduction Systems

CS4 and CS6: Use an internal pinion and ring gear system, independent of, and separated from the main crankcase lubrication. See Figure 10-A. Use the same weight oil in the reduction system that is being used in the crankcase. **Reduction System Capacity= .15 liters/5.07 fl.oz.** Change the reduction system oil every 300 hours.

**CS8.5, CS10, and CS12:** Use a geared reduction system, which is lubricated by the crankcase oil through holes in the closure plate. No special maintenance or servicing is required.



**Figure 10-A**

**To Drain:** Drain old oil out through the level/drain plug in the 8 o'clock position, tip engine as required.

**To Fill:** Engine must be level. Fill with new oil through the oil fill plug hole on top until the oil level is up to the bottom of the oil level/drain plug hole. Reinstall both plugs securely.



# ENGINE M1800

## Service Precleaner and Air Cleaner Element

This engine is equipped with a replaceable, high density paper air cleaner element. All engines are also equipped with an oiled, foam precleaner which covers the paper element. See Figure 12 on page 12.

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

Wash and reoil the precleaner every **20 hours** of operation (more often under extremely dusty or dirty conditions).

1. Loosen air cleaner cover 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 air cleaner cover and tighten the knob securely.

## Service Paper Element

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

1. Loosen the air cleaner cover knob and remove the cover. Remove the wing nut and air cleaner element with precleaner. Remove the precleaner from the element and service as necessary.

2. 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.
  3. When servicing the air cleaner, check the air cleaner base. Make sure it is secured and not bent or damaged. Also check the air cleaner element cover for damage or improper fit. Replace all bent or damaged air cleaner components.
- NOTE:** Before air cleaner reassembly make sure rubber seal is in position around stud. Inspect seal and replace if its condition is questionable in any way.
4. Position paper element on base. Secure with wing nut. Install the precleaner over the element. Reinstall air cleaner cover and tighten securely.

## Clean Air Intake/Cooling Areas

To ensure proper cooling, make sure the grass 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 grass 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 a dependable electronic magneto ignition system. Other than periodically checking/replacing the spark plug, 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 plug, see your Kohler Engine Service Dealer for trouble analysis.

# ENGINE M1800

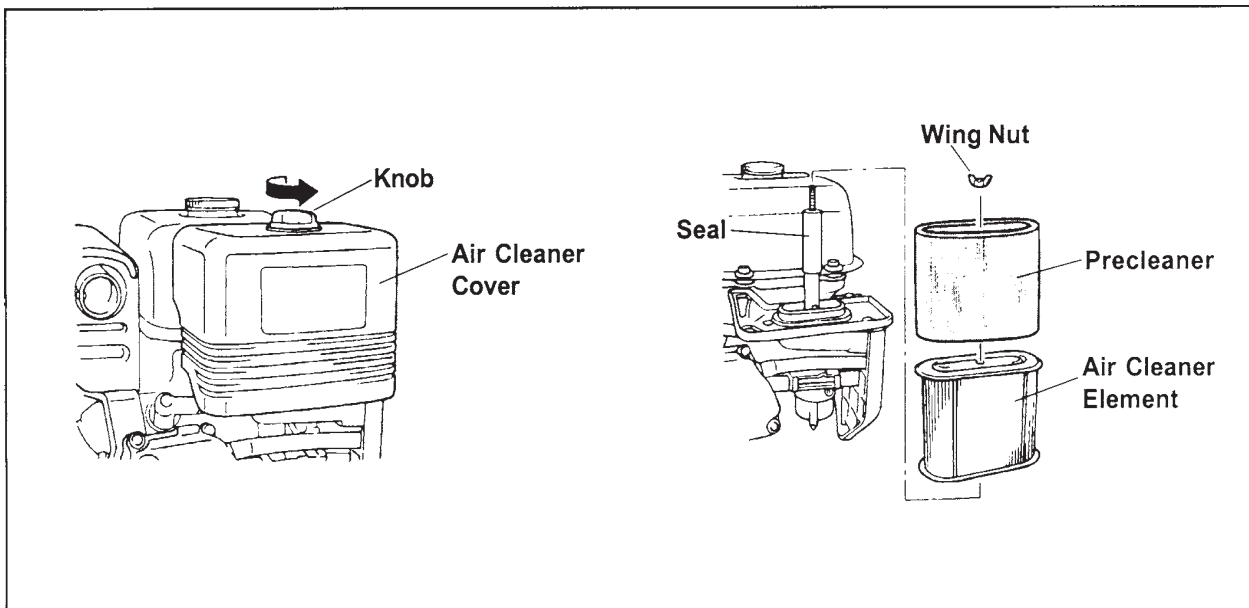


Figure 12. Air Cleaner System Components.

## Check Spark Plug

Annually or every **100 hours** of operation, remove the spark plug, check condition, and reset the gap or replace with new plug as necessary. Use a NGK BPR4ES/Champion® RN14YC (or equivalent) spark plug.

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

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

3. Check the gap using a wire feeler gauge. Adjust the gap to **0.7/0.8 mm (0.028/0.031 in.)** by carefully bending the ground electrode. See Figure 13.

4. Reinstall the spark plug into the cylinder head. Torque the spark plug to **20 N·m (14 ft. lb.)**.

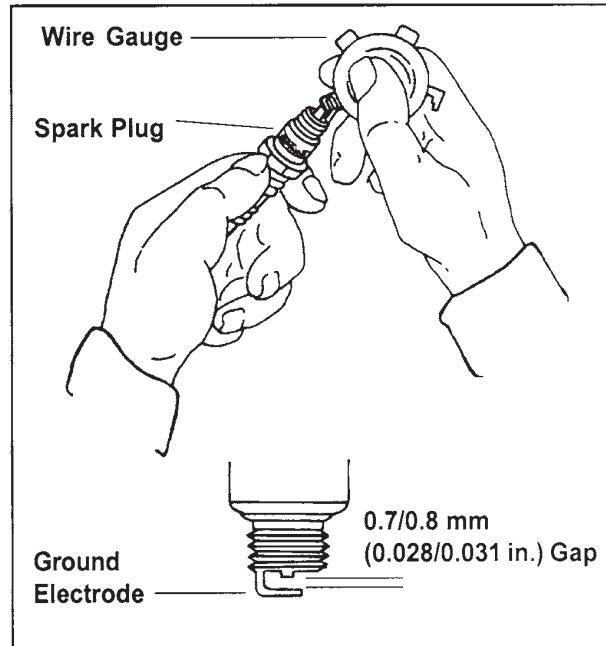


Figure 13. Servicing Spark Plug.

# ENGINE M1800

## 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 gasoline vapors are present.

NOTE: Do not apply 12 volt DC to kill terminal of ignition module.

## Fuel Valve

Engines are equipped with a fuel valve and integral screen filter located at the outlet of the fuel tank. See Figure 14. It controls and filters fuel flow from the tank to the carburetor.

Every 100 hours of operation clean filter screen and cup of any accumulated debris as follows:

### **⚠ CAUTION!**

Never use or be near fuel or solvent while smoking or in the vicinity of an open flame.

1. Stop the engine.
2. Turn the fuel valve lever to "off."
3. Remove the fuel valve cup and gasket.
4. Clean the cup with solvent and wipe it off.
5. Check the gasket. Replace it if damaged.
6. Reinstall the gasket and fuel valve cup.

### **⚠ CAUTION!**

Be sure the fuel valve cup is tightened securely.

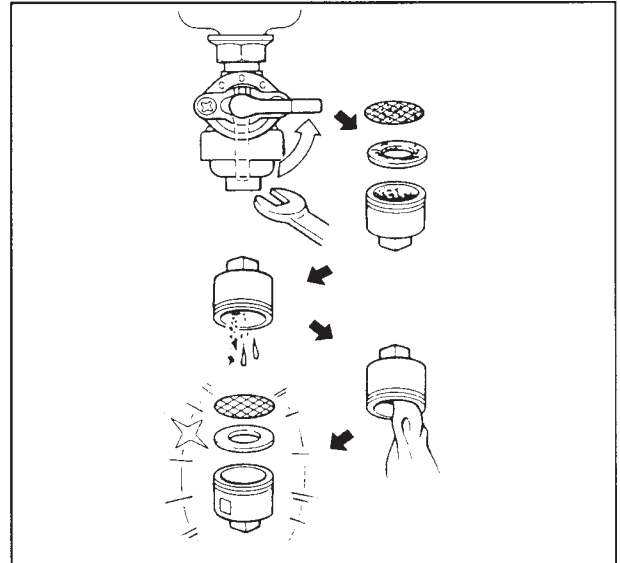


Figure 14. Fuel Valve.

## Fuel Tank Filter

A serviceable fuel tank filter is located under the fuel tank cap within the tank inlet to filter incoming fuel.

Daily or as required clean filter of any accumulation as follows:

1. Remove the fuel tank cap and filter.
2. Clean the filter with solvent. If damaged, replace.
3. Wipe the filter and insert it.

### **⚠ CAUTION!**

Be sure the tank cap is tightened securely.

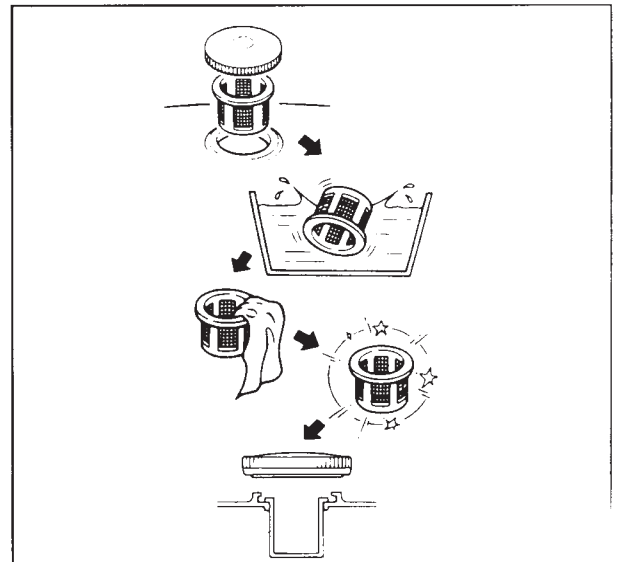


Figure 15. Fuel Tank Filter.

# ENGINE M1800

## Muffler Screen and Spark Arrestor

Engines are equipped with a muffler screen and spark arrestor for operational and environmental safety. One of two configurations will be used, determined by the engine model involved.

Every **100 hours** of operation, remove and clean or replace the muffler screen and/or spark arrestor following the instructions below.

### Muffler Screen CS4,CS6

#### ⚠ CAUTION!

*The engine and muffler will be very hot after the engine has been run.*

*Avoid touching the engine and muffler while they are still hot with any part of your body or clothing during inspection or repair.*

1. Remove the muffler screen.
2. Clean the carbon deposits out of the muffler screen using a wire brush.
3. Check the muffler screen. Replace it if damaged.
4. Install the muffler screen.

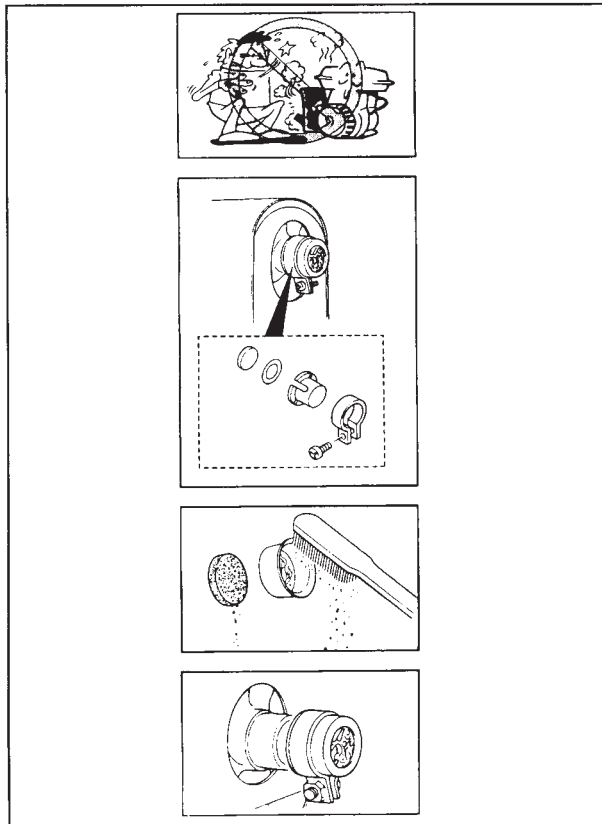


Figure 16. Muffler Screen.

### Muffler Screen and Spark Arrestor CS8.5,CS10,CS12

#### ⚠ CAUTION!

*The engine and muffler will be very hot after the engine has been run.*

*Avoid touching the engine and muffler while they are still hot with any part of your body or clothing during inspection or repair.*

1. Remove the muffler screen.
2. Remove the spark arrestor using a flathead screwdriver.
3. Clean the carbon deposits out of the muffler screen and spark arrestor using a wire brush.

#### ⚠ CAUTION!

*When cleaning, use the wire brush lightly to avoid damaging or scratching of the muffler screen and spark arrestor.*

4. Check the muffler screen and spark arrestor. Replace them if damaged.
5. Install the spark arrestor and muffler screen.

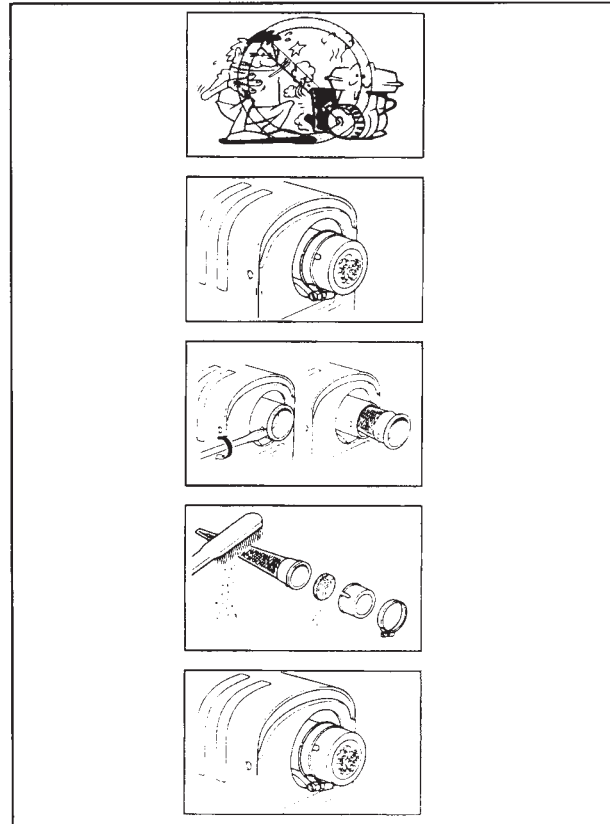


Figure 17. Muffler Screen and Spark Arrestor.

# ENGINE

## M1800

### Carburetor Troubleshooting and Adjustments

NOTE: Carburetor adjustments should be made only after the engine has warmed up.

The carburetor is designed to deliver the correct fuel-to-air mixture to the engine under all operating conditions. The high idle is set at the factory and cannot be adjusted. The low idle fuel adjusting needle is also set at the factory and has a limiting cap. It normally does not need adjustment.

If the engine is hard to start, runs roughly, or stalls at low idle speed, it may be necessary to adjust or service the carburetor.

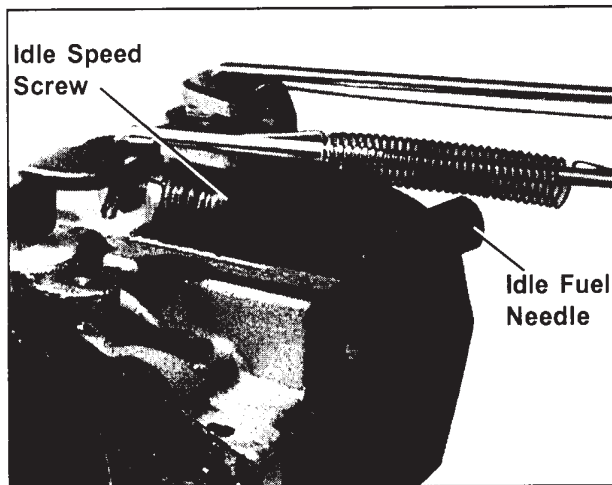


Figure 18. Carburetor.

### Troubleshooting

If engine troubles are experienced that appear to be fuel system related, check the following areas before adjusting the carburetor.

- Make sure the fuel tank is filled with clean, fresh gasoline.
- Make sure the fuel tank cap vent is not blocked and that it is operating properly.
- Make sure the fuel shut-off valve is fully open.
- Make sure fuel shut-off valve strainer, and in-line fuel filter (if used) are clean and unobstructed. Clean or replace as necessary.

- Make sure fuel is reaching the carburetor. This includes checking the fuel lines and components for restrictions or problems. Replace as necessary.
- Make sure On-Off switch is functioning properly.
- Make sure the air cleaner element is clean and all air cleaner components are fastened securely.

If, after checking the items listed above, the engine is hard to start, runs roughly, or stalls at low idle speed, it may be necessary to adjust or service the carburetor.

### Adjust Carburetor

NOTE: Certified engines have a limiter cap on the idle fuel adjusting needle. Adjustment can only be performed within the limits allowed by the cap.

1. Start the engine and run at half throttle for 5 to 10 minutes to warm up. The engine must be warm before making final settings.
2. **Low Idle Fuel Needle Setting:** Place the throttle into the “idle” or “slow” position. Turn the low idle fuel adjusting needle/cap in or out within adjustment range, to obtain the best low speed performance.
3. **Low Idle Speed Setting:** Place the throttle control into the “idle” or “slow” position. Set the low idle speed to **2000 RPM\*** ( $\pm 150$  RPM) by turning the low idle speed adjusting screw **in or out**. Check the speed using a tachometer.

\*NOTE: The actual low idle speed depends on the application — refer to equipment manufacturer's recommendations. The recommended low idle speed for basic engines is 2000 RPM. To ensure best results when setting the low idle fuel needle, the low idle speed must not exceed 2000 RPM ( $\pm 150$  RPM).

# ENGINE M1800

## 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.

Possible Cause Problem	No Fuel	Improper Fuel	Dirt In Fuel Line	Dirty Grass Screen	Incorrect Oil Level	Engine Overloaded	Dirty Air Cleaner	Faulty Spark Plug
Will Not Start	•		•		•	•	•	•
Hard Starting	•	•	•			•	•	•
Stops Suddenly	•		•	•	•	•	•	
Lacks Power		•	•	•	•	•	•	•
Operates Erratically		•	•	•		•	•	•
Knocks or Pings		•		•		•		•
Skips or Misfires		•	•	•			•	•
Backfires			•			•	•	•
Overheats			•	•	•	•	•	
High Fuel Consumption							•	•

## Storage

If the engine will be out of service for two months or more, use the following storage procedure:

1. Clean the exterior surfaces of the engine.
2. Change the oil while the engine is still warm from operation. See "Change Oil" on page 9.
3. The 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 manufacturers 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.  
  
To empty the system, run the engine until the tank and system are empty.
4. Remove the spark plug. Add one tablespoon of engine oil into the spark plug hole. Install the plug, but do not connect the plug lead. Crank the engine two or three revolutions.
5. Remove the spark plug. Cover the spark plug hole with your thumb, and turn the engine over until the piston is at the top of its stroke. (Pressure against the thumb is greatest.) Reinstall the plug, but do not connect the plug lead.
6. Store the engine in a clean, dry place.

## 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 5.

*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.

## Model Designation

Model CS4T for example: C designates Command engine, S designates slanted cylinder configuration, and 4 designates horsepower. A suffix letter designates a specific version as follows:

Suffix	Designates
T	Retractable Start
S	Electric Start
G	Tapered Crankshaft
P	Threaded Crankshaft
R	Gear Reduction (2:1 or 6:1)

# ENGINE M1800

## Specifications

Model:	.....	CS4	.....	CS6	.....	CS8.5	.....	CS10	.....	CS12		
Bore:	.....	in.(mm)	.....	2.20(56)	.....	2.60(66)	.....	3.07(78)	.....	3.07(78)	.....	3.35(85)
Stroke:	.....	in.(mm)	.....	1.97(50)	.....	1.97(50)	.....	2.48(63)	.....	2.48(63)	.....	2.48(63)
Displacement:	.....	in. <sup>3</sup> (cm <sup>3</sup> )	.....	7.51(123)	.....	10.44(171)	.....	18.37(301)	.....	18.37(301)	.....	21.79(357)
*Power (@ 3600RPM):	.....	HP(kW)	.....	4(2.98)	.....	6(4.47)	.....	8.5(6.33)	.....	10(7.45)	.....	12(8.95)
Max.Torque:	.....	ft.lbs.(N•m)	.....	5.1(6.9)	.....	7.2(9.8)	.....	14.5(19.6)	.....	14.5(19.6)	.....	16.7(22.6)
Compression Ratio:	.....		.....	8.3:1	.....	8.5:1	.....	8.1:1	.....	8.1:1	.....	8.1:1
Weight (Approx.):	.....	lbs.(kg.)	.....	38.6(17.5)	.....	38.6(17.5)	.....	70.5(31.9)	.....	70.5(31.9)	.....	70.5(31.9)
Oil Capacity (Approx.):	.....	U.S.quarts(liters)	.....	0.6(0.6)	.....	0.6(0.6)	.....	1.2(1.1)	.....	1.2(1.1)	.....	1.2(1.1)
Fuel Tank Capacity (Approx.):	.....	US.quarts(liters)	.....	4.1(3.9)	.....	4.1(3.9)	.....	7.3(6.9)	.....	7.3(6.9)	.....	7.3(6.9)

\*Horsepower ratings are established in accordance with Society of Automotive Engineers – Small Engine Test Code – J1349 GROSS. Kohler Co. reserves the right to change product specifications, design, and standard equipment without notice and without incurring obligation.

## LIMITED 2 YEAR COMMAND ENGINE WARRANTY

We warrant to the original consumer that each new COMMAND engine sold by us 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:

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.

WE 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.

ANY IMPLIED OR STATUARY WARRANTIES, INCLUDING WARRANTY 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 in 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. For the facility nearest you, consult your Yellow Pages or write Kohler Co., Attn: Engine Warranty Service Dept., Kohler, Wisconsin, 53044.

ENGINE DIVISION, KOHLER CO., KOHLER, WISCONSIN 53044

# ENGINE M1800

## KOHLER CO. FEDERAL AND CALIFORNIA EMISSION CONTROL SYSTEMS LIMITED WARRANTY UTILITY AND LAWN AND GARDEN 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 utility/lawn/garden equipment engine (herein 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, new 1997 and later model year engines must be designed, built and equipped, at the time of sale, 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.
- (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 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. Engine Service at 1-920-457-4441.

### 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)

Continued on next page



# ENGINE M1800

## 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.

# **TROUBLE SHOOTING & TIPS**

## **M1800**

When a problem occurs, do not overlook the simple causes. For example, starting problems could be caused by an empty fuel tank. The list below should help with some of the common causes of troubles.

### **Machine doesn't start:**

1. Make sure OPERATOR PRESENCE CONTROL BUTTON is depressed. For safety reasons the engine will not run unless button is depressed manually.
2. Check the ON/OFF SWITCH on engine, it should be turned to "ON".
3. Check FUEL SHUT OFF valve is set to open, "o".
4. Check fuel and oil levels.

### **Mole doesn't rotate:**

1. Check shift lever, it should be in FORWARD or REVERSE.
2. Make sure hand brake is released.
3. If output doesn't rotate, check tension on brake bands (one on each side of transmission.)

To perform adjustment, first loosen the jam nut to the desired band. Turn adjustment bolt in a fraction of a turn for more tension and out for less tension. Next, test the tension by engaging the operation lever by moving it towards its respective adjustment bolt. Repeat this procedure until the desired tension is accomplished. Never move the adjustment bolt more than a quarter to a half a turn for each adjustment cycle. After attaining the desired tension, tighten the jam nut securely.

Reference engine section for more information on maintenance and trouble shooting.

# **WARRANTY RETURN GOODS POLICY**

## **LIMITED WARRANTY**

The Manufacturer warrants its products to be free from defects in material and workmanship for a period of twelve months from the date of shipment from the factory. Hole Hammer pistons, bodies, and nose pieces are warranted to be free from defects in material and workmanship for a period of three years from the date of shipment from the factory. The Manufacturer shall not be responsible for any damage resulting to or caused by its products by reason of installation, improper storage, unauthorized service, alteration of the products, neglect or abuse, or use of the product in a manner inconsistent with its design. This warranty does not extend to any component parts not manufactured by Manufacturer; however, Manufacturer's warranty herein shall not limit any warranties made by manufacturers of component parts which extend to Buyer.

Claims for defects in material and workmanship shall be made in writing to Manufacturer within ten days of discovery of defect. Manufacturer may either send a service representative or have the product returned to its factory at Buyer's expense for inspection. Upon notification of defect, Manufacturer will issue a return goods authorization number to Buyer. The return goods authorization number must accompany the product returned. If judged by the Manufacturer to be defective in material or workmanship, the product will be replaced or repaired at the option of the manufacturer, free from all charges except authorized transportation. Buyer shall be responsible for all maintenance services consisting of lubrication and cleaning of equipment, replacing expandable parts, making minor adjustments and performing operating checks, all in accordance with procedures outlined in Manufacturer's maintenance literature.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES AND NO REPRESENTATIONS, GUARANTEES, OR WARRANTIES, EXPRESS OR IMPLIED, (INCLUDING BUT NOT LIMITED TO, A WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE), ARE MADE BY THE MANUFACTURER IN CONNECTION WITH THE MANUFACTURE OR SALE OF ITS PRODUCTS. NO EMPLOYEE, DISTRIBUTOR OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY ON BEHALF OF MANUFACTURER. THE REMEDIES OF BUYER SET FORTH HEREIN

ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER REMEDIES. THE LIABILITY OF MANUFACTURER WHETHER IN CONTRACT, TORT, UNDER ANY WARRANTY, OR OTHERWISE SHALL NOT EXTEND BEYOND ITS OBLIGATION TO REPAIR OR REPLACE, AT ITS OPTION ANY PRODUCT OR PART FOUND BY MANUFACTURER TO BE DEFECTIVE IN MATERIAL OR WORKMANSHIP. MANUFACTURER SHALL NOT BE LIABLE FOR COST OF INSTALLATION AND/OR REMOVAL OR BE RESPONSIBLE FOR DIRECT, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE.

FOR SERVICE OR ASSISTANCE, SEE THE AUTHORIZED McLAUGHLIN DEALER IN YOUR AREA.

## **GENERAL RETURNS OF MERCHANDISE**

1. All material returned to McLaughlin Mfg. Company must have a return authorization number. This number can be obtained by calling the dealer from whom the material was originally purchased.
2. All returned material must be shipped PREPAID.
3. Material without a material authorization number or returned collect will be refused at McLaughlin's dock.
4. All material ordered incorrectly or new material returned for no valid reason will be subject to a 20% restocking charge.
5. In the case of warranty claims, a letter explaining the problem or requesting repair must accompany the material.
6. On warranty consideration, all material shipped by McLaughlin will be invoiced until the defective material is returned for inspection. After inspection, credit will be issued for all parts deemed defective.
7. All return authorization numbers expire 30 days after issue. After this time, warranty claims and material returns are void, and merchandise must be paid in full.
8. McLaughlin must be notified and authorize all warranty work performed by dealer or other service personnel. This authorization must be obtained PRIOR to any work being performed for proper warranty consideration. Credit will not be issued for unauthorized service work performed.

