



Ingersoll

COMPACT TRACTORS
226, 446 AND 448
Operator's Manual 9-9930



Ingersoll . . . the new name to say for Case garden tractors.

Ingersoll Equipment Co., Inc. Winneconne, Wisconsin 54986-9576



This Safety Alert Symbol Indicates Important Safety Messages In This Manual When You See This Symbol Carefully Read The Message That Follows and Be Alert To The Possibility Of Personal Injury Or Death

IF THIS MACHINE IS USED BY AN EMPLOYEE OR IS LOANED OR RENTED, MAKE ABSOLUTELY CERTAIN THAT THE OPERATOR(S), PRIOR TO OPERATING:

1. IS INSTRUCTED IN SAFE AND PROPER USE.
2. REVIEWS AND UNDERSTANDS THE MANUAL(S) PERTAINING TO THE MACHINE.

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WARNING

BEFORE STARTING ENGINE

**STUDY OPERATOR'S MANUAL SAFETY MESSAGES
READ ALL SAFETY SIGNS ON MACHINE
CLEAR THE AREA OF OTHER PERSONS**

LEARN & PRACTICE SAFE USE OF CONTROLS BEFORE OPERATING

IT IS YOUR RESPONSIBILITY TO UNDERSTAND AND FOLLOW MANUFACTURER'S INSTRUCTIONS ON MACHINE OPERATION, SERVICE, AND TO OBSERVE PERTINENT LAWS AND REGULATIONS. OPERATOR AND SERVICE MANUALS MAY BE OBTAINED FROM YOUR EQUIPMENT DEALER.

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SAFETY MESSAGES

The first twenty-three safety messages which follow are provided by the American National Standards Institute *(ANSI). Safety rules to supplement those provided by ANSI also appear on the following pages.

Study these rules carefully before starting and operating your Lawn and Garden Tractor.

* Rule Number 24, which does not apply to this product, has been omitted.



Separate Operator's Manuals are provided with the attachments purchased with your tractor. Refer to the appropriate attachment operators manual for specific operating instructions and safety messages that apply to the attachment.



CAUTION: Know the controls and how to stop quickly. **READ THE OWNER'S MANUAL.**



CAUTION: Do not allow children to operate the vehicle. Do not allow adults to operate it without proper instruction.



CAUTION: Do not carry passengers. Keep children and pets a safe distance away.



CAUTION: Clear the work area of objects which might be picked up and thrown.



CAUTION: Disengage all attachment clutches and shift into neutral before attempting to start the engine (motor).



CAUTION: Disengage power to attachment(s) and stop the engine (motor) before leaving the operator's position.



CAUTION: Disengage power to attachment(s) and stop the engine (motor) before making any repairs or adjustments.



CAUTION: Disengage power to attachment(s) when transporting or not in use.



CAUTION: Take all possible precautions when leaving the vehicle unattended, such as disengaging the power take-off, lowering the attachment(s), shifting into neutral, setting the parking brake, stopping the engine, and removing the key.



CAUTION: Do not stop or start suddenly when going up-hill or downhill. Mow down the face of steep slopes; never across or up the face. (This ANSI rule modified)



CAUTION: Reduce speed on the slopes and in sharp turns to prevent tipping or loss of control. Exercise extreme caution when changing direction on slopes.



CAUTION: Stay alert for holes in the terrain and other hidden hazards.



CAUTION: Use care when pulling loads or using heavy equipment.

- Use only approved draw-bar hitch point.
- Limit loads to those you can safely control.
- Do not turn sharply. Use care when backing.
- Use counterweight(s) or wheel weights when suggested in the owner's manual.



CAUTION: Watch out for traffic when crossing or near roadways.



CAUTION: When using any attachments, never direct discharge of material toward bystanders nor allow anyone near the vehicle while in operation.

CAUTION: Handle gasoline with care - it is highly flammable.



- a. Use approved gasoline container.
- b. Never remove the cap of the fuel tank or add gasoline to a running or hot engine, or fill the fuel tank indoors. Wipe up spilled gasoline.
- c. Open doors if the engine is run in the garage - exhaust fumes are dangerous. Do not run the engine (motor) indoors.



CAUTION: Keep the vehicle and attachments in good operating condition, and keep safety devices in place.



CAUTION: Keep all nuts, bolts, and screws tight to be sure the equipment is in safe working condition.



CAUTION: Never store the equipment with gasoline in the tank inside a building where fumes may reach an open flame or spark. Allow the engine to cool before storing in any enclosure.



CAUTION: To reduce fire hazard, keep the engine free of grass, leaves, or excessive grease.



CAUTION: The vehicle and attachments should be stopped and inspected for damage after striking a foreign object, and the damage should be repaired before restarting and operating the equipment.



CAUTION: Do not change the engine governor settings or overspeed the engine.



CAUTION: When using the vehicle with mower, proceed as follows:

- (1) Mow only in daylight or in good artificial light.
- (2) Never make a cutting height adjustment while the engine (motor) is running if the operator must dismount to do so.
- (3) Shut the engine (motor) off when removing the grass catcher or unclogging chute.
- (4) Check the blade mounting bolts for proper tightness at frequent intervals.



Remember, a careful operator is always the best insurance against an accident. Give complete and undivided attention to the job at hand.



CAUTION: Always shut off engine, remove key, set parking brake, and wait until all engine and attachment motion has stopped before dismounting from the operator's seat.



CAUTION: Only operate controls from the operator's seat to prevent injury.



CAUTION: Do not wear loose clothing which may catch in moving parts.



CAUTION: Do not smoke when working near fuel.



CAUTION: Drive at a speed slow enough to insure safety and complete control at all times.



CAUTION: Highway travel should be avoided. If necessary, use SMV safety emblem and lights for adequate warning to the operators of other vehicles. Check local government regulations.



CAUTION: Read operator's manuals.

Know location and function of all controls.

Keep all shields and safety switches functional.

Before starting engine: disengage attachment drive and place travel control in neutral.

Remove objects from the terrain that could be thrown by the attachment.

Keep people and pets a safe distance away.

Never carry passengers.

Always look behind tractor before backing.

On any incline that the tractor can be safely operated use low range/gear.

Front end tip over can occur when operating on loading ramps or hills, back up ramps or hills.

Drive forward going down ramps or hills.

To park tractor: place travel control in neutral, set parking brake, disengage attachment drive, shut engine off and remove key.

Park tractor before servicing or making adjustments to tractor or attachments.

Failure to observe these precautions could result in injury.



CAUTION: Place the transmission in neutral, set the parking brake and stop the engine before standing between the tractor and attachment when hitching.



Become thoroughly familiar with all tractor and attachment controls before operating.



WARNING: Improper operation of your tractor on hillsides and slopes can be dangerous. Avoid improper operation! Read and follow the instructions given in the section titled "Hillside Operation" in this manual before operating your tractor.



CAUTION: If necessary to move tractor on a trailer, always back up onto the trailer and drive off of trailer.



CAUTION: Hydraulic systems are highly pressurized. Escaping hydraulic oil, even an invisible pinhole leak, can penetrate body tissues causing serious injury. Use a piece of wood or cardboard when looking for leaks - never use the hands or other parts of the body.

Relieve hydraulic pressure before disconnecting circuits. When reassembling, make absolutely certain that all connections are tight.

If injured by hydraulic oil escaping under pressure, see a doctor immediately. Serious complications may arise if medical attention is not given at once.



CAUTION: When adjusting steering wheel free play make certain that some free play remains between the sector gear and pinion gear, since a tight fit, with no clearance between the two gears may cause binding and tooth failure.



CAUTION: When removing a battery, always disconnect the (-) negative ground cable first. When installing the battery, always connect the (-) negative ground cable last.



CAUTION: Storage areas for batteries must be well ventilated to prevent accumulation of hydrogen gas from newly recharged batteries.



DANGER: Batteries produce explosive charges. Keep sparks, flame and cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries.



CAUTION: When working around storage batteries, remember that all of the exposed metal parts are "live". Never lay a metal object across the terminals as a spark or short circuit may result. Sparks, lighted matches and exposed flames must be kept away from the battery due to the presence of explosive gas in the battery. The liquid in the batteries is acid. Use care not to spill it on hands or clothing.



POISON: Batteries contain sulfuric acid which can cause severe burns. Avoid contact with skin, eyes or clothing. Antidote: EXTERNAL, flush with water; INTERNAL, drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately; EYES, flush with water for 15 minutes and get prompt medical attention. Keep out of reach of children.



WARNING: To jump start this machine, connect positive jumper cable to battery terminal on starter solenoid and connect negative jumper cable to good engine ground. Start engine only when seated in operator's seat. Stop engine before leaving machine. Disconnect jumper cables. Any other method could result in uncontrolled machine movement.



CAUTION: Never wear rings or metal watch bands when working with the tractor electrical system or battery as you may ground a live circuit.



CAUTION: Too much air pressure in the tires can cause tire or rim failure. Never put more air pressure in a tire than specified in the operator's manual or on the sidewall of the tire. If the tire or rim explode because of too much pressure, injury can result.



CAUTION: Before attempting to service the attachment Drive Clutch, be sure to remove tractor key and spark plug wire(s).

IMPORTANT: Always install new decals whenever the old decals are destroyed, lost, painted over or illegible. When individual parts are replaced that have decals attached, be sure to install a new decal with the new part. Replacement decals are available from your dealer.

HILLSIDE (SLOPE) OPERATION



WARNING: Improper operation of your tractor on hillsides and slopes can be dangerous. Avoid improper operation! Read and follow the instructions given in the section titled "Hillside Operation" in this manual before operating your tractor.

Avoid operating tractor on hillsides and slopes. To minimize the possibility of accidents while operating on hills and/or rough terrain, obey a combination of rules, practices and good common sense.

These include:

1. Reading, understanding, and obeying all written safety messages appearing on decals on the machine and in operator's manuals.
2. Learning from your operator's manual and carefully from EXPERIENCE how to operate your tractor correctly. Know your tractor's limitations.
3. Knowing the terrain on which you are operating your tractor. There are terrain conditions on which your tractor cannot be operated!
4. Learning to expect changes in operating conditions. Adding or removing attachments or weight to your tractor will make your tractor perform differently. Rain, snow, loose gravel, wet grass, etc., change the tractive conditions of the terrain requiring changes in your operating technique or not to operate on that terrain.

The following paragraphs will cover these practices one at a time. Read and study them. The examples provided are not all inclusive but will give you a firm understanding of the requirements for avoiding accidents while operating your tractor.

Ingersoll Lawn and Garden Tractors are designed and built to comply with the Voluntary Standard ANSI B71.1 - 1980 (American National Standards Institute).

THE OPERATOR IS THE SOLE JUDGE AS TO THE DEGREE OF SLOPE ON WHICH THIS TRACTOR CAN BE SAFELY OPERATED. IF IN DOUBT THAT THIS TRACTOR CAN BE SAFELY OPERATED ON A PARTICULAR SLOPE, DO NOT OPERATE ON THAT SLOPE! COMMON SENSE MUST PREVAIL.

Read, Understand, Obey:

Safety messages are found on the tractor and in the operator's manuals. These must be understood by the tractor operator to be of value. Be sure that these messages are studied before starting and/or operating the tractor by an operator not familiar with this particular tractor.

Learn to Operate:

Learn your tractor's controls from decals on the tractor and from instructions in the operator's manual. Practice how to properly manipulate these controls. Practice must be done in a flat area, clear of obstacles and bystanders. Learn your tractor's operating characteristics and limitations. These include:

- a. amount of engine power available
- b. engine governor response
- c. tractive ability
- d. steering characteristics
- e. braking characteristics
- f. movement of travel lever
- g. forward and reverse ground speeds
- h. speed of attachment lift
- i. and others

Attempting any operation which approaches or exceeds the tractor's limitation is risking an accident.

Know the Terrain:

Know the terrain on which you are working. Find hidden obstacles by walking through and inspecting the area prior to operating your tractor on it. Mark obstacles, such as, rocks, ruts or holes with a 6 ft. long pole and red flag and stay well clear of these obstacles when operating.

Operate your tractor at a ground speed slow enough to insure complete control at all times.

Place the transmission in low gear and regulate the throttle control lever slowly and smoothly to maintain this safe speed. Do not stop on a hill or slope to change gears.

Always drive in a forward direction when proceeding downhill. Never drive up a hill. If necessary, back up a hill to the desired position. Always back up loading ramps and tilt bed trailers. If necessary to turn while on a hill, always turn downward.

Your judgement, based on operating experience is the final word in deciding if you should negotiate any given hill or slope. If you are in doubt about safety, **STAY OFF THE SLOPE.**

Under no circumstances should an inexperienced operator attempt to use your tractor on slopes or hill-sides.

You may encounter some terrain on which your tractor cannot be operated even if a different piece of equipment has operated there in the past.

Learn to Compensate for Changes in Operating Conditions:

Adding or removing attachments or ballast (such as wheel weights or fluid) change the weight and weight distribution of your tractor and, therefore, changes your tractor's operating characteristics.

Be alert to these changes. Practice operating the tractor after each change has been made.

Adding an attachment (weight) to the rear of the tractor reduces the weight on the front axle. Adding an attachment (weight) to the front of the tractor reduces weight on the rear of the tractor. You must add counterweight to the front if a rear mounted attachment is installed. You must add counterweight to the rear if a front mounted attachment is installed.

Tractive conditions will vary with weather and terrain and equipment.

Areas wet with dew or rain will be more slippery than when dry. Areas covered with loose gravel are more slippery than firm dry ground. Greater stopping distances are required in these slippery areas.

Spinning rear wheels tend to move the tractor sideways. The addition of tire chains will provide more traction to the rear wheels in the forward-reverse direction but less stability in the sideways direction. Chains will cause more abrupt starting and stopping.

The final word in safe tractor operation rests on your judgement.

If in doubt of your safety, **STAY OFF THE SLOPE.**

TO THE OWNER

The Maintenance you give your new tractor is important. Use this manual as your guide. Follow these instructions and tips to make sure your tractor operates efficiently for many years.

We are a factory authorized dealer. We have replacement parts which are the same as the original equipment.

If you need additional aid or information, contact us.

Your Authorized Dealer

NOTE: Ingersoll Equipment Co., Inc. reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.

NOTICE

A spark arrester or spark arrester muffler must be used on some machines. Check the laws in your area.

Some states have regulations for the use of this machine in agriculture, forestry and construction. These laws control the maintenance of spark arrester equipment. These laws also control the installation of spark arrester equipment on the exhaust system of naturally aspirated engines (engines without a turbocharger).

RADIO INTERFERENCE REGULATIONS OF CANADA

Tractors taken into Canada after September 1, 1976 must have resistor spark plugs.

Resistor spark plugs and resistor wires for the spark plug must be used for replacement.

The regulation label is applied to the engine. Do not remove or destroy this label.

PRODUCT IDENTIFICATION NUMBER (P.I.N)

When you need parts or information, or when you write to your authorized dealer, always give the:

For reference, write the numbers below

1. Tractor Model Number
2. Tractor Product Identification Number (P.I.N.)
3. Engine Model Number
4. Engine Serial Number
5. Engine Specification Number

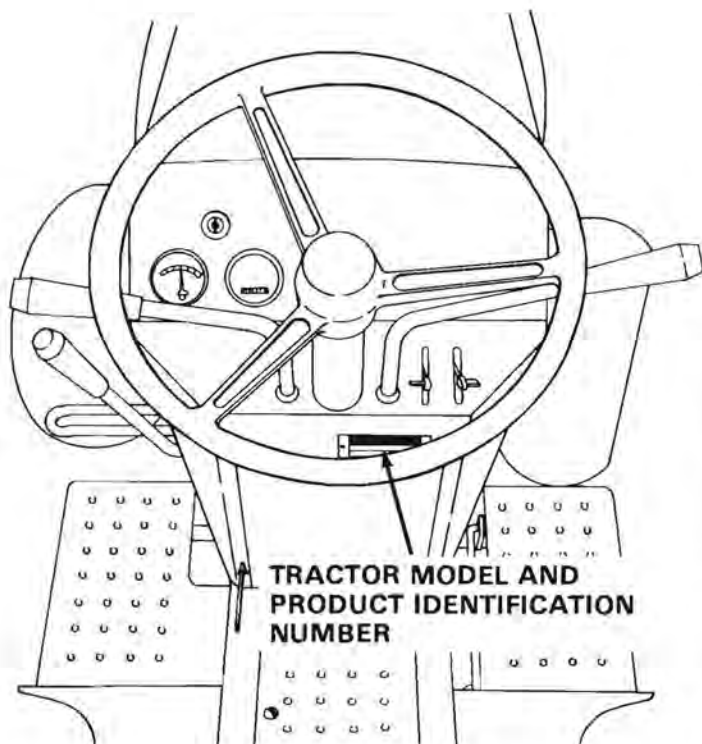


FIGURE 4

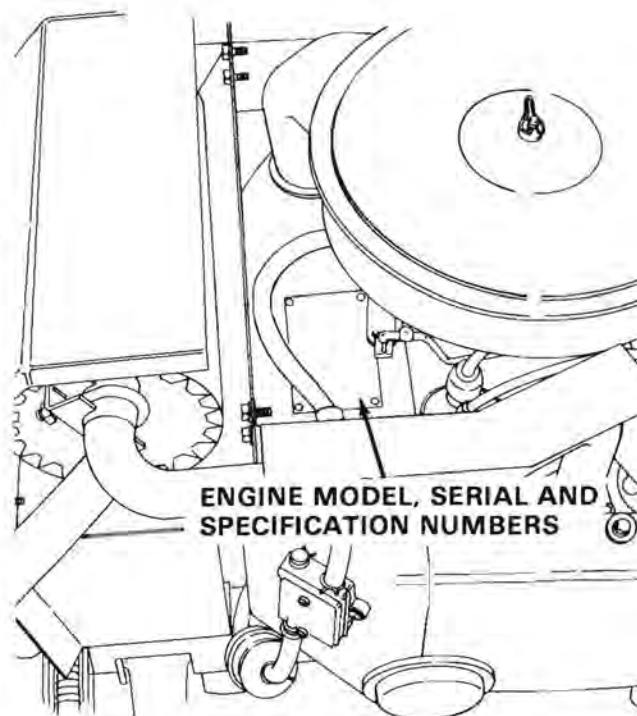


FIGURE 5

This book is for the following compact tractors:

MODEL	P.I.N.
226	14071775 and after
446	14074175 and after
448	14075830 and after

The words "Right, Left, Front and Rear" as used in this manual indicate directions when you are in the operator's seat in the normal operating position.

OPERATING INSTRUCTIONS

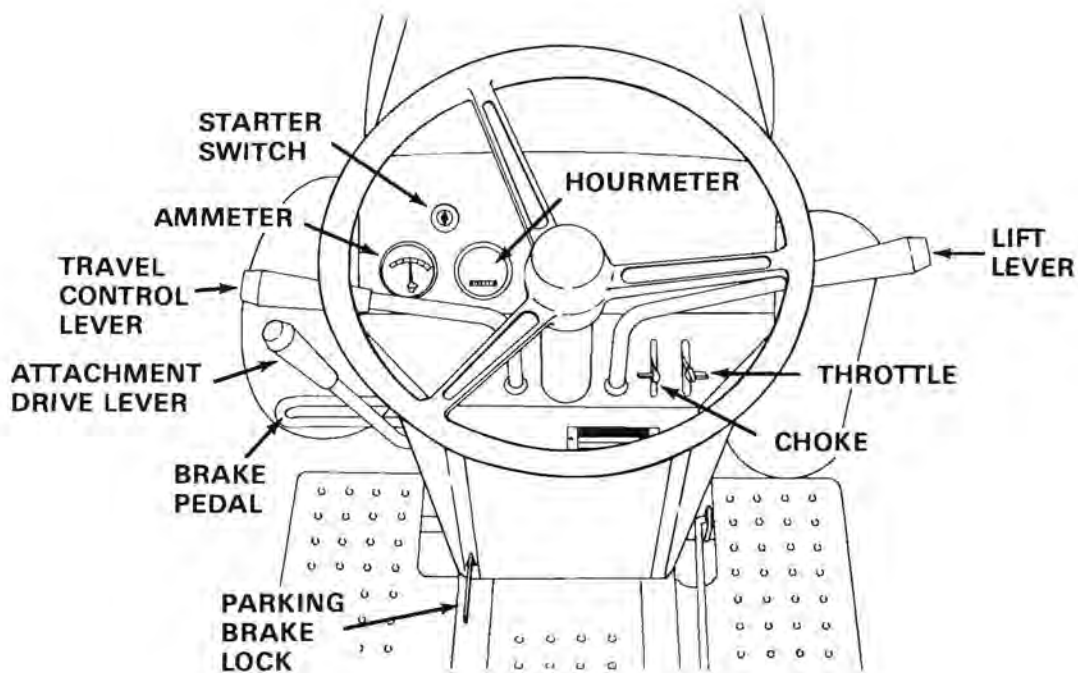


FIGURE 6

OPERATING CONTROLS AND INSTRUMENTS



CAUTION: Know the controls and how to stop quickly. **READ THE OWNER'S MANUAL.**



Become thoroughly familiar with all tractor and attachment controls before operating.



CAUTION: Only operate controls from the operator's seat to prevent injury.

1. IGNITION KEY AND STARTER SWITCH

TO START: Turn the key to the right and hold in the "START" position.

TO RUN: Release the key to the "RUN" position when the engine starts.

TO STOP: Turn the key to the left to the "OFF" position.

2. CHOKE

TO CLOSE THE CHOKE: Push the choke lever forward. Close the choke to start a cold engine.

TO OPEN THE CHOKE: Pull the choke lever rearward. Open the choke slowly after the engine starts.

The choke must be open during normal operation or when you start a warm engine.

3. THROTTLE

ENGINE LOW IDLE: Pull the throttle lever rearward. Put the throttle in the "SLOW" position when starting and when stopping the engine. This permits a warming and cooling period.

TO INCREASE ENGINE SPEED: Push the throttle lever forward until the needed engine speed is reached.

Decrease the engine speed during operation for maximum fuel efficiency. Do not cause engine lugging. Lugging will cause too much heat and damage to the engine.



CAUTION: Do not change the engine governor settings or overspeed the engine.

4. HEADLIGHTS

TO ILLUMINATE: Turn the key to the "LIGHTS" position after the engine is started.

If you use the lights while the engine is off or at low idle, the battery will discharge.

TO TURN OFF: Turn the key from the "LIGHTS" position.

5. AMMETER

The ammeter indicates the rate of current flowing to the battery. The ammeter reading will be high when the battery voltage is low. When the engine is started the reading will also be high.

The ammeter reading will gradually go back to zero as the battery voltage increases.

Stop the tractor and have the cause corrected if:

- a. The ammeter remains at "O" when the battery voltage is low.
- b. If the ammeter continues to give a high reading.

6. HOUR METER

The electric hourmeter records hours of operation whenever the key is in the "RUN" or "LIGHTS" position.

Utilize the hourmeter to meet the required maintenance schedule.

7. BRAKE PEDAL

TO ACTUATE THE BRAKE: Push the brake pedal fully down.

This action will return the travel control to the "NEUTRAL" position.

The tractor will come to a quick stop.

NOTE: Do not use the above method if possible.

Stop the tractor with the travel control lever.

The tractor can be stopped smoothly by slowly returning the travel control lever to the "NEUTRAL" position.

Actuate the brake fully if you can not stop the tractor with the travel control lever.

See the Operating Procedure Section of this manual for a more complete description of stopping travel.

8. PARKING BRAKE LOCK

TO ENGAGE: Push the brake pedal fully down.

Push down on the parking brake lock. Engage one of the notches with the bottom of the slot.

TO DISENGAGE: Push the brake pedal a small amount and release.

A spring will disengage the parking brake lock.

9. HYDRAULIC ATTACHMENT LIFT LEVER

TO LIFT: Run the engine

Pull the lever rearward.

Release the lever when the needed height is reached.

TO LOWER: Run the engine.

Push the lever forward a small amount.

Release the lever when the needed height is reached.

When you release this lever, a spring will automatically return the lever to the "NEUTRAL" position.

THE "FLOAT" POSITION: Push the lever fully forward.

A detent holds the lever in the "FLOAT" position. The lever must be manually returned to the "NEUTRAL" position from the "FLOAT" position.

The "FLOAT" position prevents hydraulic down pressure on the attachment.

See the instructions included with each attachment for correct attachment lift lever use.

10. ATTACHMENT DRIVE LEVER

TO ENGAGE: Push the lever forward until it is fully engaged.

TO DISENGAGE: Pull the lever rearward.

A neutral start switch is actuated by the attachment drive lever. The lever must be in the rear position (disengaged) before you can start the engine.

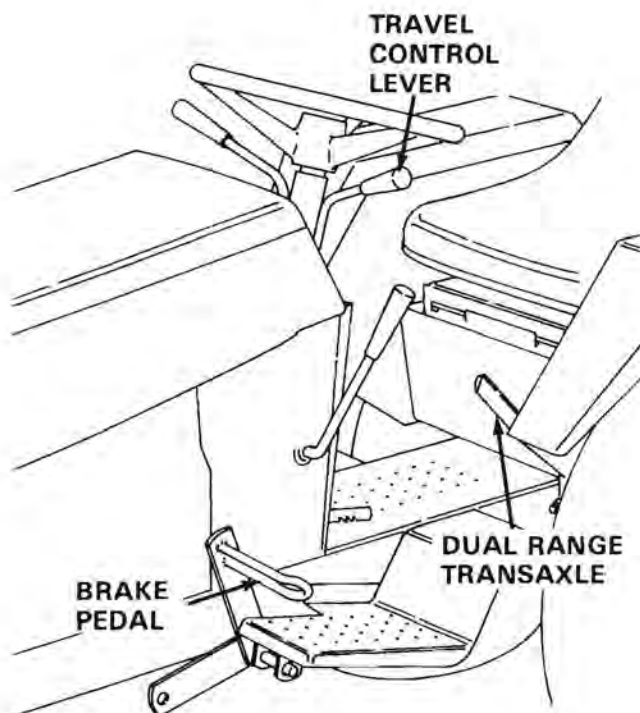


FIGURE 7

11. DUAL RANGE TRANSAXLE

TO SELECT LOW RANGE: Put the travel control lever in the "NEUTRAL" position.

Stop the tractor.

Pull the lever forward a small amount to go over the neutral locating pin.

Pull the lever up beyond the neutral locating pin and release.

TO SELECT NEUTRAL: Put the travel control lever in the "NEUTRAL" position.

Stop the tractor.

Pull the lever forward a small amount to go over the neutral locating pin.

Align the hole in the lever with the neutral locating pin and release the lever.

TO SELECT HIGH RANGE: Put the travel control lever in the "NEUTRAL" position.

Stop the tractor.

Pull the lever forward a small amount to go over the neutral locating pin.

Push the lever down beyond the neutral locating pin and release.

If the range shift does not move easily, rotate the gears.

To rotate the gears:

1. move the travel control lever a small amount into the "FORWARD" position.
2. return the travel control lever to the "NEUTRAL" position.

IMPORTANT: The range shift lever must be beyond the neutral locating pin while in "LOW" or "HIGH" range. If the lever is not in the correct position, damage to the gears will result.

12. TRAVEL CONTROL LEVER

TO STOP TRAVEL: Put the travel control lever in the "NEUTRAL" position.

TO START FORWARD TRAVEL: Depress the travel control lever slightly. Slowly and in small amounts move the travel control lever forward.

Speed and power will increase as the lever is moved toward the full forward position.

TO START REVERSE TRAVEL: Depress the travel control lever slightly. Slowly and in small amounts move the travel control lever rearward.

Speed and power will increase as the lever is moved toward the full reverse position.

DO NOT USE FULL SPEED IN REVERSE.

Depress the travel control lever whenever you change the lever position to have smoother operation and control.

The travel control lever automatically returns to the "NEUTRAL" position when the brake is actuated. The travel control lever can be moved from the "NEUTRAL" position with the brake actuated.

A neutral start switch is actuated by the travel control lever. The lever must be in the "NEUTRAL" position before you can start the engine.

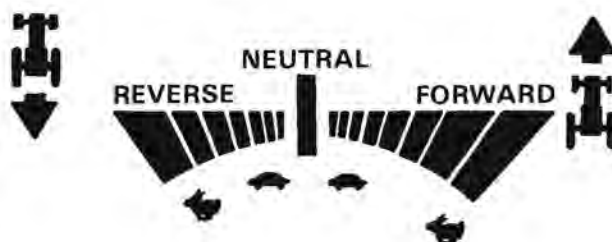


FIGURE 8

PRESTARTING CHECK LIST

CAUTION: Read operator's manuals.

Know location and function of all controls.

Keep all shields and safety switches functional.

Before starting engine: disengage attachment drive and place travel control in neutral.

Remove objects from the terrain that could be thrown by the attachment.

Keep people and pets a safe distance away.

Never carry passengers.

Always look behind tractor before backing.

On any incline that the tractor can be safely operated use low range/gear.

Front end tip over can occur when operating on loading ramps or hills, back up ramps or hills.

Drive forward going down ramps or hills.

To park tractor: place travel control in neutral, set parking brake, disengage attachment drive, shut engine off and remove key.

Park tractor before servicing or making adjustments to tractor or attachments.

Failure to observe these precautions could result in injury.



CAUTION: Do not wear loose clothing which may catch in moving parts.

CAUTION: Disengage power to attachment(s) and stop the engine (motor) before making any repairs or adjustments.

1. Use only clean fuel, oil, container and funnel.
2. Apply oil or grease to all the specified points shown in the Lubrication Chart.
3. Check the oil level in the engine and add oil as required.
4. Check the engine air cleaner and air intake screen for dirt or obstructions. Clean as required.

CAUTION: Handle gasoline with care — it is highly flammable.

a. Use approved gasoline container.

b. Never remove the cap of the fuel tank or add gasoline to a running or hot engine, or fill the fuel tank indoors. Wipe up spilled gasoline.

c. Open doors if the engine is run in the garage — exhaust fumes are dangerous. Do not run the engine (motor) indoors.



CAUTION: Do not smoke when working near fuel.

5. Fill the fuel tank with clean fuel. Clean the area around the fuel cap before you remove the cap. The requirements are listed in the Fuel Specifications Section of this manual.
6. Check the ventilation hole in fuel tank cap and clean as required.
7. Check all operating controls and instruments for correct function before using the tractor.

STARTING PROCEDURE (Operating the Tractor)



CAUTION: Only operate controls from the operator's seat to prevent injury.



CAUTION: Do not wear loose clothing which may catch in moving parts.

1. Put the travel control lever in the "NEUTRAL" position.
2. Pull the attachment drive lever rearward.



CAUTION: Disengage all attachment clutches and shift into neutral before attempting to start the engine (motor).

3. Push the choke lever forward to close the choke.

The choke setting will change according to the air temperature, engine temperature, and grade of fuel.

4. Push the throttle lever forward approximately 1/3 of the way between the "SLOW" and "FAST" positions.



CAUTION: Do not allow children to operate the vehicle. Do not allow adults to operate it without proper instruction.



CAUTION: Do not carry passengers. Keep children and pets a safe distance away.

5. Turn the ignition key to the right and hold in the "START" position. Release the key to the "RUN" position when the engine starts running.

NOTE: Release the key immediately when the engine starts. If you hold the key in the "START" position after the engine is running damage can occur. Release the key after 30 seconds if the engine does not start running. Wait 3 minutes before you try again.

6. Pull the choke lever rearward slowly after the engine starts running.

7. Permit the engine to warm before applying a load.

NOTE: The hydraulic system must be warm before you use the tractor when air temperatures are less than 32°F (0°C). Use the following procedure:

- a. Set the throttle 1/3 of the way between the "SLOW" and "FAST" position.
- b. Select the "NEUTRAL" position of the dual range transaxle.
- c. Move the travel control lever to the full "FORWARD" position.
- d. Run for several minutes before operating the tractor. A noise can occur when the hydraulic system is cold.

8. Set the throttle lever approximately 3/4 of the way between the "SLOW" and "FAST" positions for normal operation.

Decrease the engine speed during most operations for maximum fuel efficiency.

Do not permit engine lugging. Lugging will cause more than normal heat and damage to the engine.

IMPORTANT: DO NOT TRY TO START THE TRACTOR BY PUSHING OR TOWING. SERIOUS DAMAGE WILL HAPPEN TO THE DRIVE SYSTEM.



Separate Operator's Manuals are provided with the attachments purchased with your tractor. Refer to the appropriate attachment operators manual for specific operating instructions and safety messages that apply to the attachment.



Remember, a careful operator is always the best insurance against an accident. Give complete and undivided attention to the job at hand.

STOPPING PROCEDURE (OPERATING THE TRACTOR)

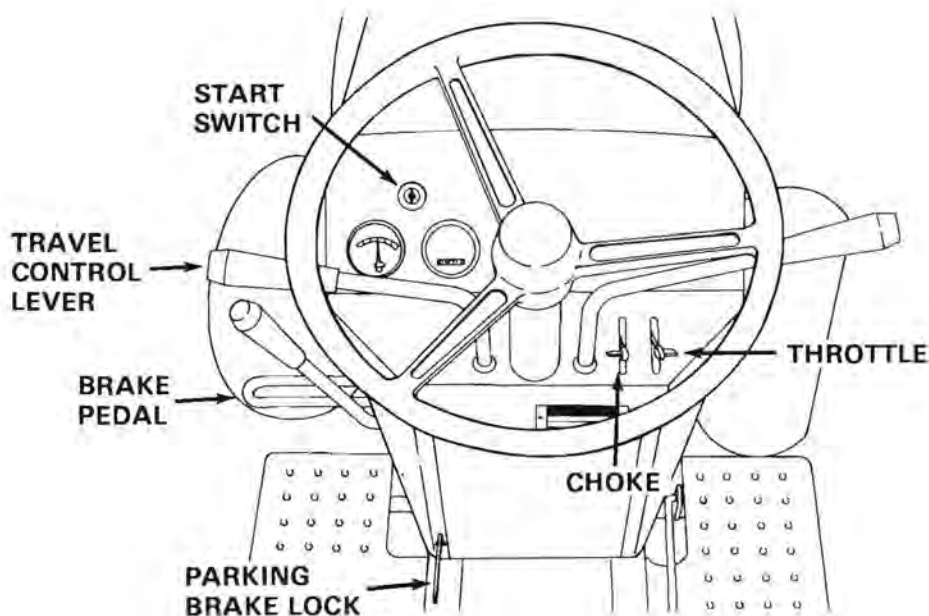


FIGURE 9



CAUTION: Know the controls and how to stop quickly. READ THE OWNER'S MANUAL.

1. Move the travel control lever to the "NEUTRAL" position.
2. Completely stop the tractor. Actuate the brake pedal if necessary.
3. Engage the parking brake lock.
4. Pull the throttle lever rearward to the "SLOW" position.
5. Permit the engine to cool. Run the engine at idle for several minutes if the work load was severe.



CAUTION: Always shut off engine, remove key, set parking brake, and wait until all engine and attachment motion has stopped before dismounting from the operator's seat.

6. Turn the key to the left to the "OFF" position and close the choke (Push the choke lever forward) at the same time.

NOTE: Muffler after bang can be prevented by closing the choke at the same time the key switch is turned to the "OFF" position. This action prevents the entry of air into the muffler as the engine comes to a stop and therefore prevents combustion within the muffler.

7. Remove the ignition key and open the choke (Pull the choke lever rearward).



CAUTION: Take all possible precautions when leaving the vehicle unattended, such as disengaging the power take-off, lowering the attachment(s), shifting into neutral, setting the parking brake, stopping the engine, and removing the key.



CAUTION: Disengage power to attachment(s) when transporting or not in use.

OPERATING PROCEDURE (OPERATING THE TRACTOR)

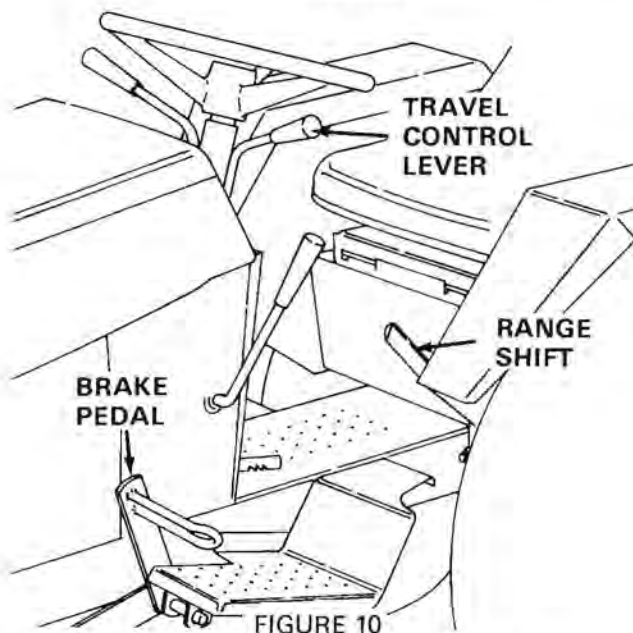
Operate the tractor for the first time on a flat area clear of obstructions and persons. Learn the operating characteristics of your tractor before trying the first job.

1. Select the correct gear range for the job.
2. "LOW" range is for all working operations and hillside use. Only use "LOW" range on hillsides or inclines.

CAUTION: Use care when pulling loads or using heavy equipment.



- a. Use only approved draw-bar hitch point.
- b. Limit loads to those you can safely control.
- c. Do not turn sharply. Use care when backing.
- d. Use counterweight(s) or wheel weights when suggested in the owner's manual.



3. "HIGH" range is for transport only, "HIGH" range must not be used for hillside operation.
4. If the range shift does not move easily, rotate the gears.

To rotate the gears:

- a. Move the travel control lever a small amount into the "FORWARD" position.

- b. Return the travel control lever to the "NEUTRAL" position.

IMPORTANT: Completely stop the tractor motion before changing the range. The range shift lever must be beyond the "NEUTRAL" locating pin when in the "LOW" or "HIGH" range. Gear damage will occur if the lever is not in the correct position.

5. Push the throttle lever forward until you get the needed engine speed.

Decrease engine speed during operation for maximum fuel efficiency. Do not cause engine lugging. Lugging will cause more than normal heat and damage to the engine.

6. TO USE FORWARD TRAVEL:

- a. Depress the travel control lever slightly and move it slowly and in small amounts from the "NEUTRAL" position toward the full "FORWARD" position.
- b. When you reach the correct speed, release the lever.
- c. Return the travel control lever to the "NEUTRAL" position to stop.
- d. Actuate the brake pedal if the "NEUTRAL" position does not stop the tractor.

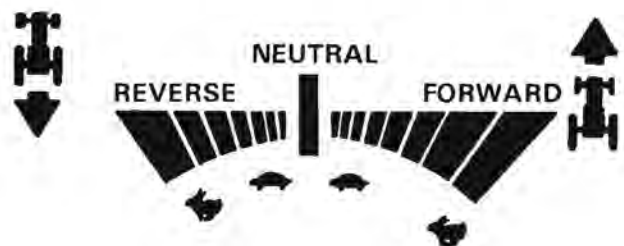


FIGURE 11 Travel Control

7. TO USE REVERSE TRAVEL:

- a. Depress the travel control lever slightly and move it slowly and in small amounts from the "NEUTRAL" position toward the full "REVERSE" position. Do not travel at full speed in reverse.
- b. Always keep your hand on the travel control lever when moving in reverse.

- c. Return the travel control lever to the "NEUTRAL" position to stop.
- d. Actuate the brake pedal if the "NEUTRAL" position does not stop the tractor.

Always be careful and look behind when you drive in reverse.

Do not travel in reverse down a hill or ramp. Use reverse travel to move up a hill or ramp. Always use forward travel when you come down a hill or ramp.



CAUTION: Do not stop or start suddenly when going up-hill or downhill. Mow down the face of steep slopes; never across or up the face. (This ANSI rule modified)



WARNING: Improper operation of your tractor on hillsides and slopes can be dangerous. Avoid improper operation! Read and follow the instructions given in the section titled "Hillside Operation" in this manual before operating your tractor.

8. The travel control lever controls both speed and power available to the rear wheels of the tractor.

During operation, the load on the tractor will change. Adjust the position of the travel control lever as required.

9. TO ACTUATE BRAKES - Hillside Operation

Hold the travel control lever in the needed position, then push on the brake pedal.

When you actuate the brake the travel control lever will return to the "NEUTRAL" position unless you hold the lever in the needed position.

The travel control lever can be moved (but the lever must be held) while the brake is actuated.

Keep the brakes in good repair and correctly adjusted at all times. See the preventive maintenance section of this manual or see your dealer for brake repair.

10. Do not move the travel control lever from "REVERSE" to "FORWARD" while the tractor is moving. This can cause the front of the tractor to raise off the ground. Stop reverse travel completely before you start forward travel. This is especially important while on a hill or slope.

11. The rear wheels can slip or spin and an engine overload can occur while you go up a small slope. Turn the front wheels toward the bottom of the hill before the loss of all traction or power.

Do not permit the tractor to move rearward down any slope or hillside.

a. A return to forward travel will cause too much torque at the rear wheels. The front wheels can raise off the ground and cause severe injury to the operator.

b. Turning the front wheels can cause too much thrust to the side. The tractor can roll over and cause severe injury to the operator.

Always use reverse travel to move up a hill or slope. Always use forward travel to move down a hill or slope.

12. Decrease the travel speed before you turn the tractor.

a. Move the travel control lever nearer to the "NEUTRAL" position.

b. Decrease the throttle setting.

c. Select "LOW" range in the dual range trans-axle.



CAUTION: Reduce speed on the slopes and in sharp turns to prevent tipping or loss of control. Exercise extreme caution when changing direction on slopes.



CAUTION: Clear the work area of objects which might be picked up and thrown.

13. Engage the attachment drive before you put a load on the attachment.

14. Actuate the lawnmower over an area of thin grass or an area that has been cut.



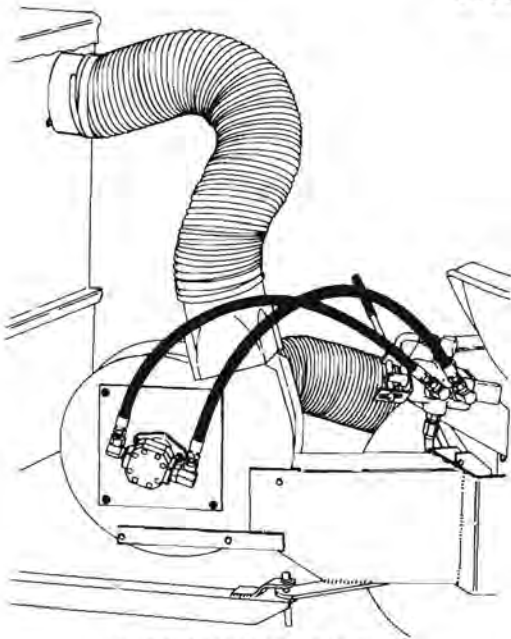
CAUTION: When using any attachments, never direct discharge of material toward bystanders nor allow anyone near the vehicle while in operation.

15. Actuate the tiller while in the transport position. Then lower the tiller into the soil to the needed depth.

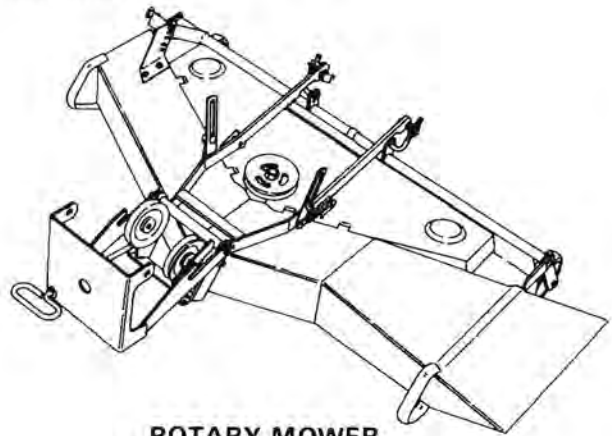
16. Actuate the snowcaster before you make contact with the snow.

17. Read your attachment manual for complete attachment operation information.

AVAILABLE ATTACHMENTS



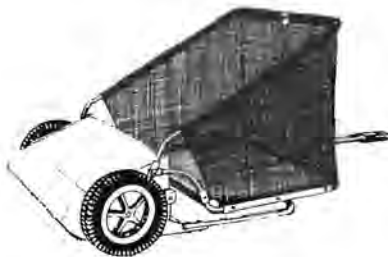
HYDRAULIC BLOWER



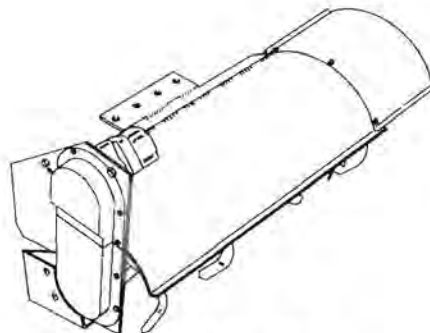
ROTARY MOWER



WOOD SPLITTER



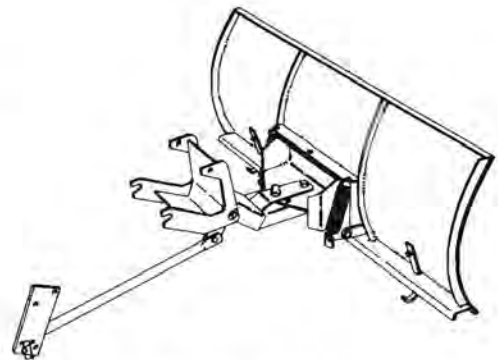
LAWN SWEEPER



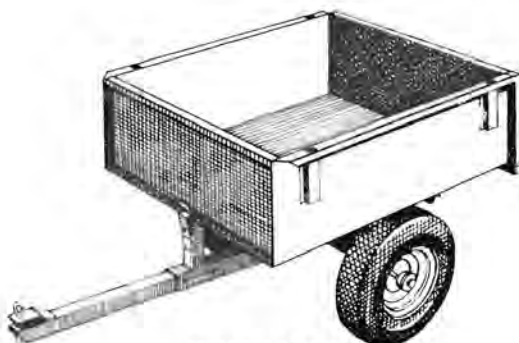
HYDRAULIC TILLER



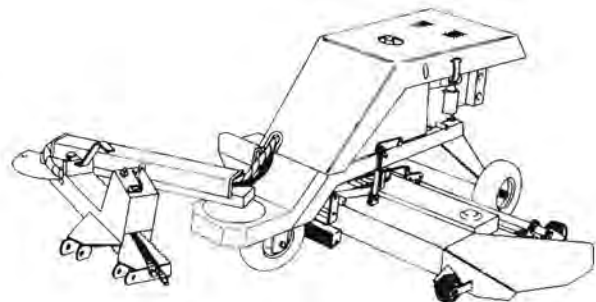
SNOWCASTER



UTILITY BLADE



DUMP CART



WING MOWER

PREVENTIVE MAINTENANCE



FIGURE 12

As the owner of an Ingersoll tractor, you have a machine that is made to high quality standards.

Preventive maintenance is important to you.

Preventive maintenance is the most efficient way to keep your tractor in top operating condition.

The first part of this manual covers instructions needed for daily operation. The following instructions will help you in maintenance and adjustment of your tractor.

MAINTENANCE PROCEDURE	PAGE	FREQUENCY
Check and clean obstructions from air intake screen	27	Daily
Check and clean obstructions from oil cooler	31	Daily
Check engine oil level. Add if required.	28	Daily
Wash air filter precleaner.	24	25 Hours
Grease front spindles, axle pivot pin, front wheel bearings, steering gear	33	25 Hours
Change engine oil	28	25 Hours
Replace engine oil filter	29	50 Hours
Check air filter - Replace if necessary	24	50 Hours
Check and clean obstructions from cooling fins and external surfaces	27	50 Hours
Oil travel lever, brake linkage	22	50 Hours
Check and adjust (if necessary) attachment drive clutch	34	50 Hours
Check battery electrolyte level. Add if necessary	18	50 Hours
*Have valves and tappet clearance checked	27	50 Hours
Check two speed transaxle oil	32	100 Hours
Check and clean or replace spark plug	20	100 Hours
*Have breaker points checked	21	100 Hours
*Have valves and tappet clearance checked	27	200 Hours
*Have cylinder head removed and cleaned (leaded fuel)	27	200 Hours
*Have cylinder head removed and cleaned (unleaded fuel)	27	400 Hours
*Have ignition timing checked	21	500 Hours
Change two speed transaxle oil	32	500 Hours
Change hydraulic system oil	32	500 Hours
Replace fuel filter	26	500 Hours

*Have these services done by an authorized dealer

[illegible]

SPECIFICATIONS

ENGINE

	226 & 446	448
Make	Onan	Onan
Model	B43M/GAO16	B48M/GAO18
Cycle	4 Cycle	4 Cycle
Number	2	2
Horsepower	16 (11.9 kw)	18 (13.4 kw)
Cylinder Bore	3-1/4" (82.5 mm)	3-1/4" (82.5 mm)
Piston Stroke	2-5/8" (66.6 mm)	2-7/8" (73 mm)
Displacement	43.3 in. ³ (710 cm ³)	47.7 in. ³ (780 cm ³)
Maximum No Load Speed	3600 RPM	3600 RPM
Low Idle Speed	1200 RPM	1200 RPM
Compression Ratio	7:1	6.6:1
Intake Valve Clearance (Cold)	.005" (.13 mm)	.005" (.13 mm)
Exhaust Valve Clearance (Cold)	.013 (.33 mm)	.013 (.33 mm)
Spark Plug Gap	.025" (0.64 mm)	.025" (0.64 mm)
Spark Plug Thread	14 mm	14 mm
Spark Plug Type	Champion RH18 Y or equivalent	
Breaker Point Gap	.021 in. (0.53 mm)	.021 in. (0.53 mm)
Ignition Timing	21° BTDC	21° BTDC
Cooling	Air Cooled with baffles that direct air around fins on the cylinder and cylinder head.	

ELECTRICAL SYSTEM

Battery	24 Ampere Hour at 20 Hour Rate 12 Volt Negative Ground
Starter	12 Volt Gear Drive
Headlights	12 Volt 32 Candle Power
Fuse	SAE 30 AMP
Flywheel Alternator	12 Volt 15 AMP with Rectifier/Regulator

HYDRAULIC SYSTEM

Reservoir	Atmospheric with vented fill cap
Pump	Gear type positive displacement 8 GPM @ 3000 RPM
Valve	Two spool, Open center with relief
Travel Circuit Relief Valve	2000 PSI (13 800 kPa)
Lift Circuit Relief Valve	575 PSI (3 970 kPa)

TRANSAXLE

Type	Hydraulically driven, two gear ranges
Differential	Standard Bevel Gear

SPEED RANGE

MODEL	FORWARD AND REVERSE
226	Low Range 4.0 MPH (6.4 km/H) High Range 9.4 MPH (15 km/H)
446, 448	Low Range 3.7 MPH (6 km/H) High Range 8.7 MPH (14 km/H)

TIRES

TYPE	SIZE	PLY	PRESSURE
Front	6.50 - 8	2	* 8 PSI (55 kPa)
Rear	8.00 - 16	2	* 8 PSI (55 kPa)
Rear	8.50 - 12	2	* 8 PSI (55 kPa)

*Inflate to 14 PSI (95 kPa) for certain attachments.

Consult your attachment Operator's Manual



CAUTION: Too much air pressure in the tires can cause tire or rim failure. Never put more air pressure in a tire than specified in the operator's manual or on the sidewall of the tire. If the tire or rim explode because of too much pressure, injury can result.

OVERALL MEASUREMENTS

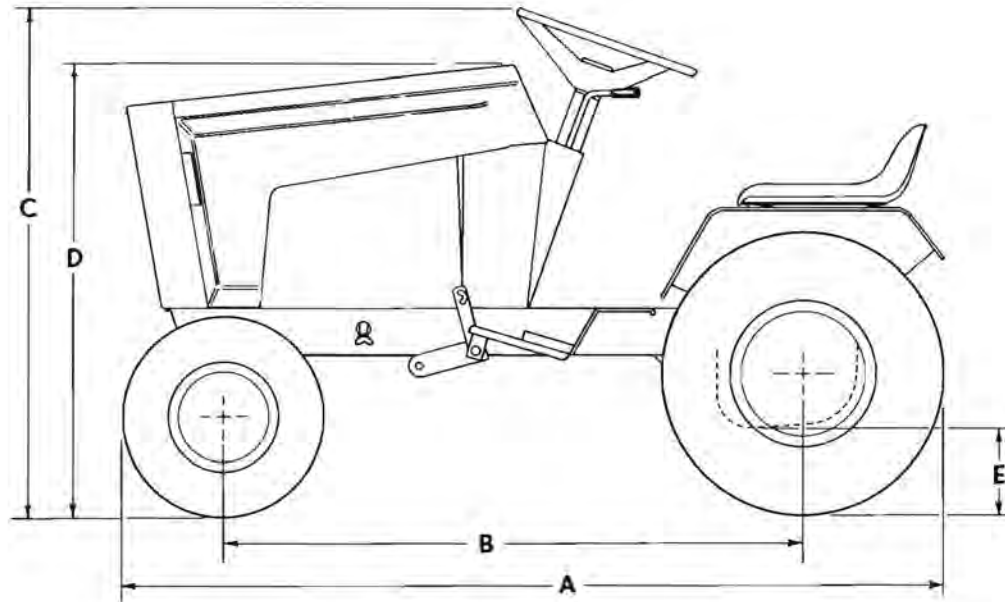


FIGURE 13

	226	446	448
A Overall Length	65" (1650 mm)	72" (1830 mm)	72" (1830 mm)
B Wheel Base	46" (1170 mm)	48" (1220 mm)	48" (1220 mm)
C Overall Height	40" (1020 mm)	43-1/2" (1110 mm)	43-1/2" (1110 mm)
D Hood Height - Rear	35-1/2" (900 mm)	38-1/2" (980 mm)	38-1/2" (980 mm)
E Minimum Ground Clearance at Gear Case	7-1/8" (180 mm)	11" (280 mm)	11" (280 mm)
Rear Wheel Tread	27-3/4" (700 mm)	31-1/2" (800 mm)	31-1/2" (800 mm)
Front Wheel Tread	28 3/4" (730 mm)	33-1/2" (850 mm)	33-1/2" (850 mm)
Overall Width	37" (940 mm)	41" (1050 mm)	41" (1050 mm)
Shipping Weight	715 lbs (325 kg)	770 lbs (350 kg.)	785 lbs. (355 kg.)
* Turning Radius	35 1/2" (900 mm)	31" (790 mm)	31" (790 mm)

*measured to inside
edge of inside rear
wheel

CAPACITIES

HYDRAULIC SYSTEM

REFILL - 6 qts. (5.6 l)

TOTAL SYSTEM - 6.5 qts. (6 l)

TRANSAXLE

1 pint (.5 l)

ENGINE CRANKCASE

1.75 qt. (1.6 l) without filter

2 qts. (1.8 l) with filter

FUEL TANK

3 gallons (11.4 l)

WIRING DIAGRAM

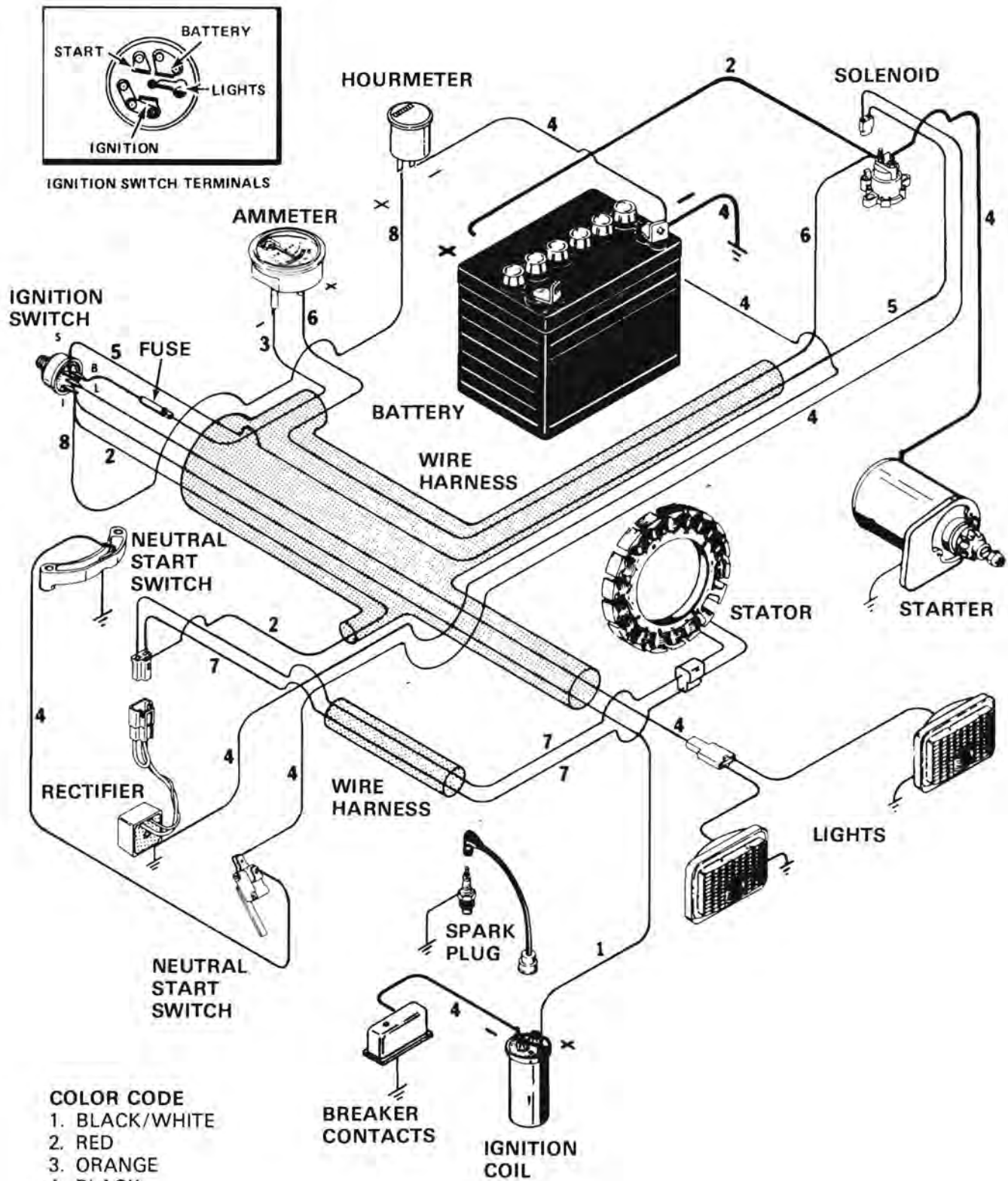


FIGURE 14

STORAGE BATTERY



DANGER: Batteries produce explosive charges. Keep sparks, flame and cigarettes away. Ventilate when charging or using in enclosed space. Always shield eyes when working near batteries.



CAUTION: Never wear rings or metal watch bands when working with the tractor electrical system or battery as you may ground a live circuit.



POISON: Batteries contain sulfuric acid which can cause severe burns. Avoid contact with skin, eyes or clothing. Antidote: **EXTERNAL**, flush with water; **INTERNAL**, drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately; **EYES**, flush with water for 15 minutes and get prompt medical attention. Keep out of reach of children.



CAUTION: When working around storage batteries, remember that all of the exposed metal parts are "live". Never lay a metal object across the terminals as a spark or short circuit may result. Sparks, lighted matches and exposed flames must be kept away from the battery due to the presence of explosive gas in the battery. The liquid in the batteries is acid. Use care not to spill it on hands or clothing.

BATTERY MAINTENANCE

1. Add distilled water, as required, to keep the water level above the cell separators. Check at 25 HOUR intervals of operation or every week. Normal water consumption is 1 ounce (30 ml) every 25 HOURS of operation. More than normal water consumption indicates:
 - a. a battery with a leak
 - b. a charging system that is charging too much

2. Make sure the battery is fastened in position. The battery cables must not contact the battery surface except at the connection.
3. Keep the battery in a clean and dry condition.
4. Use a hydrometer to check the specific gravity of the battery. If your battery will not keep the correct specific gravity, replace it. For the correct replacement battery see the specification section of this manual.

IMPORTANT: A battery having a specific gravity reading of 1.175 will become frozen at approximately 0°F (-18°C).

ADDING WATER

Always use mineral free or distilled water in your battery. When the temperature is 32°F (0°C) or less, immediately charge the battery after adding water. This will mix the water and electrolyte. If the water is not mixed, it will stay on top and become frozen.

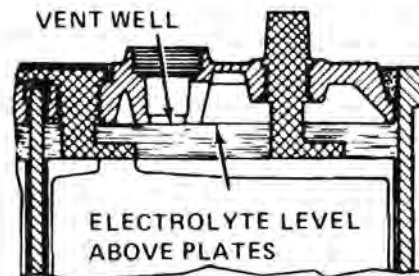


FIGURE 15

Make a weekly check of the electrolyte level.

1. Remove the battery caps.
2. Visually check each cell.
3. Add water before you see the separators.

NOTE: Do not fill too much. Keep the electrolyte level below the base of the filler tubes.

BATTERY CAPS

Always keep the battery caps in place and tight. Make sure the holes in the caps are open. Ventilation must occur to prevent pressure in the cells.

CABLE TERMINALS AND BATTERY POSTS

Keep the battery terminals clean and tight.

1. Remove all corrosion with a wire brush.
2. Wash with a neutral solution.
3. Apply a thin layer of light grease to prevent corrosion.



CAUTION: When removing a battery, always disconnect the (-) negative ground cable first. When installing the battery, always connect the (-) negative ground cable last.

IDLE BATTERY

When the tractor is not used regularly, the storage battery will slowly lose voltage. Charge the battery at regular intervals to keep the hydrometer reading at 1.250 or more.

HOW TO USE JUMPER CABLES AND A BOOSTER BATTERY

Always wear protective goggles and clothing when you work near batteries. Prevent acid from coming in contact with your skin or clothing.

Connect the jumper cables as shown below. Follow the numbers for the correct sequence of installation.

To remove the jumper cables, reverse the sequence.

To prevent any possible sparks near the battery:

1. Make sure the last connection is as far as possible from the battery.
2. Do not let the ends of the cables make contact with each other.
3. If the booster battery is on another machine, make sure machines do not make contact.

BATTERY TERMINAL
ON THE SOLENOID

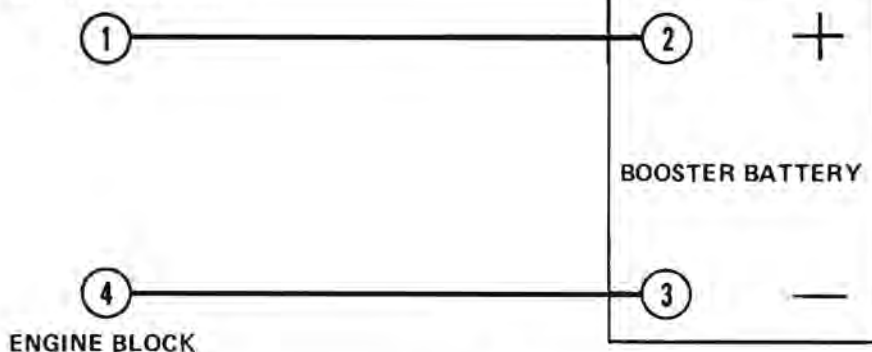


FIGURE 16



WARNING: To jump start this machine, connect positive jumper cable to battery terminal on starter solenoid and connect negative jumper cable to good engine ground. Start engine only when seated in operator's seat. Stop engine before leaving machine. Disconnect jumper cables. Any other method could result in uncontrolled machine movement.

SPARK PLUG

The original spark plug in your engine has a medium heat range. For correct replacement, consult the engine specification chart in this manual.

NOTE: During severe conditions of operation, the heat range of the spark plug is important. See your authorized dealer for the correct spark plug.

Frequently clean the outside of the spark plug to prevent a short circuit of the spark. Check, clean and gap the spark plug at 100 HOUR intervals of operation.

REMOVING THE SPARK PLUG

It is important to use the exact size wrench. The wrong size or type of wrench can cause distortion or break the spark plug.

Use a spark plug wrench or deep socket wrench with a thin wall. Make sure it is the correct size.

CLEANING AND SETTING THE GAP

Do not use a machine that cleans the spark plugs with grit.

1. Use a small knife or wire brush to clean the tip and threads.
2. Wash with a solvent to remove loose carbon and oil.
3. Dry with a clean cloth.
4. Set the gap. You will feel a small amount of pressure on the feeler gauge when the gap is correct.

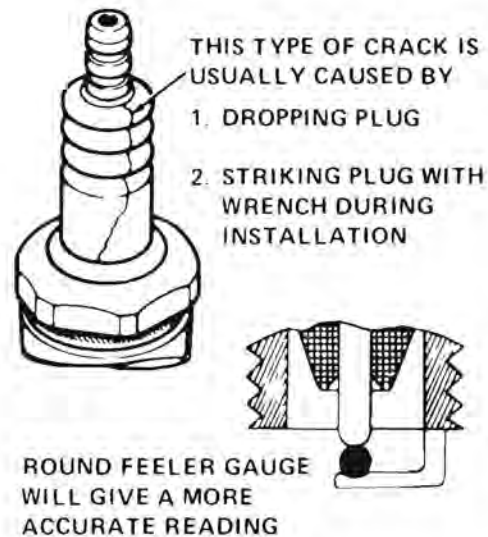


FIGURE 17

IMPORTANT: Do not bend the center tip.

INSTALLING THE SPARK PLUG

1. Put a new gasket on the spark plug.
2. Turn the spark plug into the engine.
3. After the spark plug is seated, tighten $\frac{3}{4}$ of a turn with a wrench. Use a torque specification of 27 foot pounds (36.6 newton metre) with a torque wrench. This will make sure that the spark plug seats and seals correctly.

HEADLIGHTS

To replace the headlight bulb:

1. Remove the two screws and retainers.
2. Remove the headlight receptacle.
3. Push in and turn counterclockwise to remove the bulb.
4. Push in and turn clockwise to install the new bulb.
5. Install the receptacle. Put one gasket between the lens and grille. Put the other gasket in the groove between the lens and the receptacle.
6. Install the retainers with the mounting screws.

NOTE: The new bulb will not illuminate until the receptacle has a ground connection.

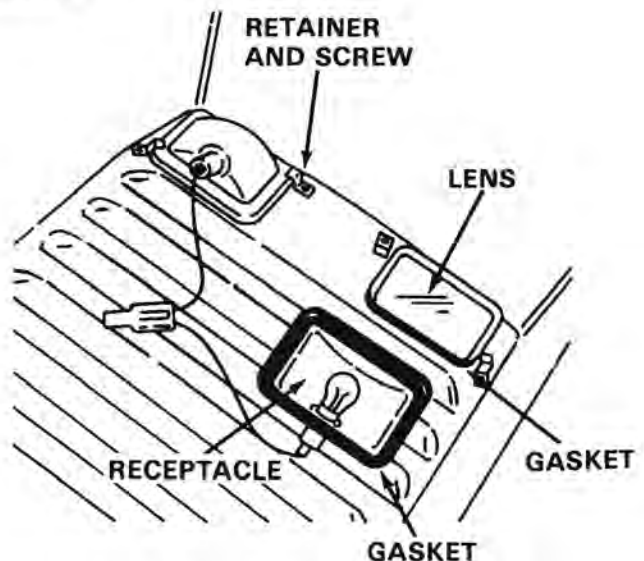


FIGURE 18

FUSE

The SAE 30 amp fuse is located next to the hydraulic oil reservoir. This fuse protects all circuits except the starter motor.

Use the following procedure to replace a fuse:

- a. Press the two "halves" of the fuse holder together, rotate and pull the halves apart.
- b. Remove the fuse.
- c. Inspect and clean the contacts of the fuse holder (if required).
- d. Install the new fuse.
- e. Align the notches, press the two "halves" together, rotate and release.

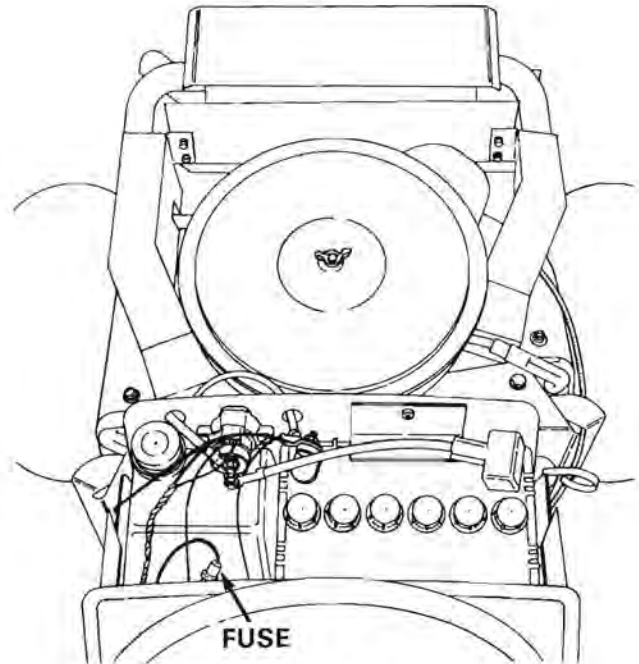


FIGURE 19

BREAKER POINTS AND CONDENSER

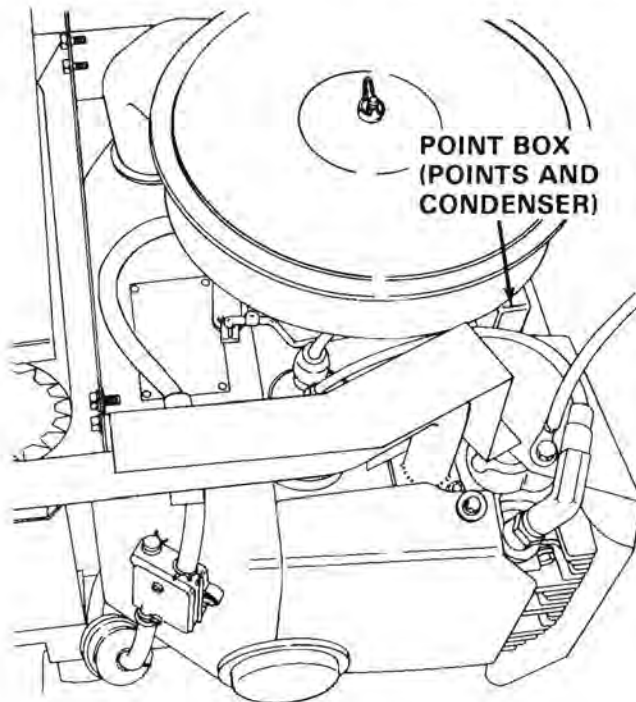


FIGURE 20

Remove the breaker point cover and inspect the breaker points for wear, burning or pitting. Perform this service at 100 HOUR intervals of operation.

The breaker points and condenser should be replaced and the ignition timing adjusted if burning or pitting is evident. The breaker point gap must be adjusted to .021" (.53 mm) when fully open.

See your authorized dealer for this service.

BRAKE

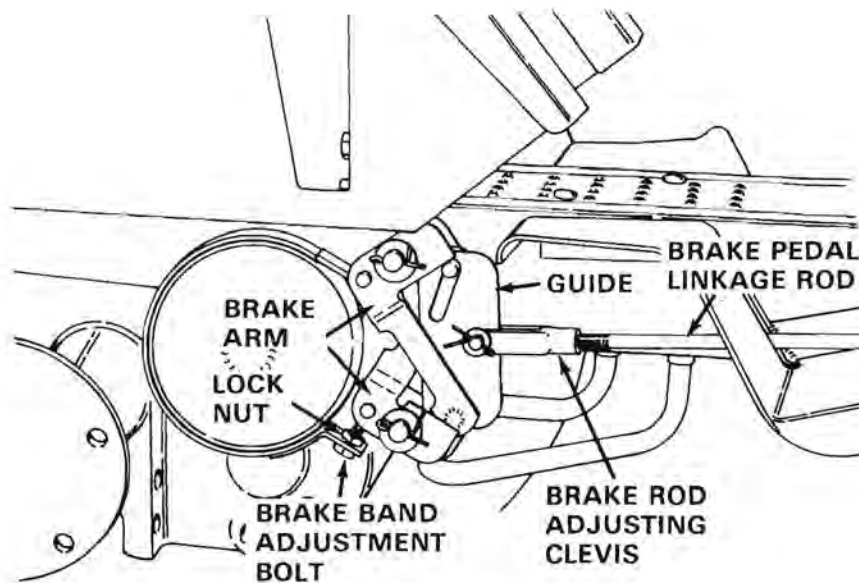


FIGURE 21

LUBRICATION

Apply several drops of oil to each pivot point on the brake linkage. Make sure no oil gets on the brake lining or the brake drum.

ADJUSTMENT

The brake is correctly adjusted when:

- a. a push of the pedal brings the tractor to a quick stop
- b. the travel control lever returns automatically to the "NEUTRAL" position from both "FORWARD" and "REVERSE".

Adjust the brakes if needed. Use the procedure below:

1. Put the tractor on a hard, level surface, a concrete floor for example.
2. Put the dual range lever in the "NEUTRAL" position.
3. Release the brakes.

4. Remove the cotter pin, clevis pin and clevis from the guide.
5. Loosen the lock nut.
6. Push the guide rearward. Make contact between the dowel pins and arms.
7. Tighten the adjusting bolt one half turn at a time. Push the tractor with medium force after each adjustment.
8. When the tractor can not be pushed with medium force, loosen the adjusting bolt one turn. Make sure the brake drum moves freely.

NOTE: Do not permit the adjusting bolt to become too tight. This will cause distortion of the brake band.

9. Tighten the lock nut.
10. Pull the guide forward until free movement stops.
11. Turn the clevis. Align the hole in the clevis with the hole in the guide. Install the clevis, clevis pin and a new cotter pin.

CARBURETOR

Carburetors are set at the factory and normally should not have to be adjusted.

MAIN FUEL ADJUSTMENT

The carburetor on your engine has a fixed jet main fuel orifice which is not adjustable.

IDLE FUEL ADJUSTMENT

1. Stop engine.
2. Turn idle fuel adjusting screw clockwise until it bottoms lightly.

IMPORTANT: Damage to fuel adjusting screws will result if they are turned in forcefully. Adjusting screws are screw-type needle valves which taper to critical dimensions.

3. Turn idle fuel adjusting screw counterclockwise 1-1/8" turns from bottom.

4. Start and run the engine until the operating temperature is reached.

5. Remove the load from the engine. Adjust the throttle lever until 1,200 RPM is reached. Adjust the screw for low idle until you reach the maximum RPM at this throttle setting.

IDLE SPEED ADJUSTMENT

1. Put the throttle lever in the "SLOW" position.
2. Turn the adjustment screw for the low idle speed in or out until 1,200 RPM is reached.
3. Adjust the throttle stop screw while the engine is running at 1,200 RPM. Make sure there is no load applied to the engine. Set the gap at approximately 1/32" (0.8 mm).



CAUTION: Do not change the engine governor settings or overspeed the engine.

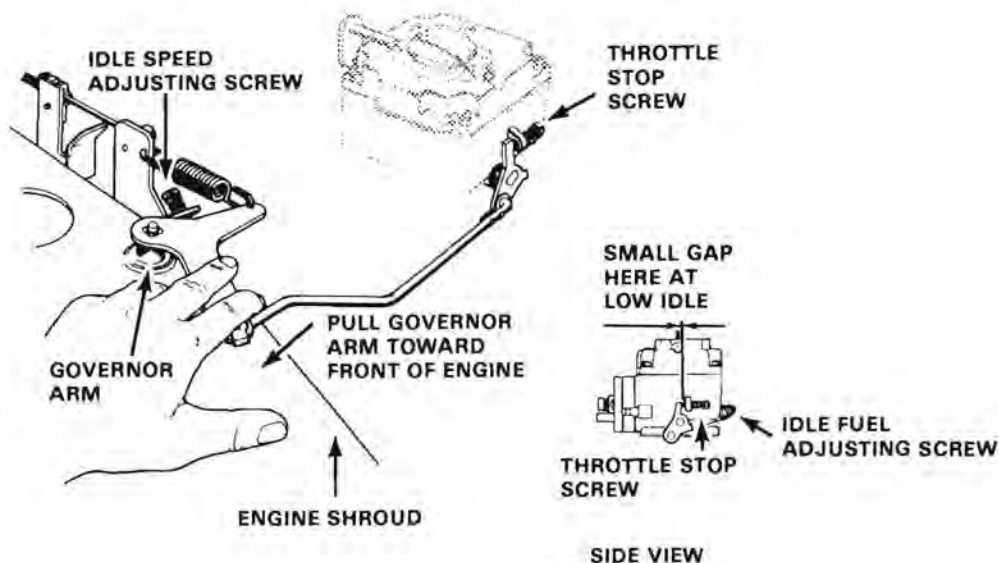


FIGURE 22

AIR CLEANER

Your tractor is equipped with a dry type air cleaner.

Remove and clean or replace the dry element after each 50 HOURS of operation.

Remove and clean the element more frequently under extremely dirty, dusty condition (most lawn and garden tractor working conditions are considered dirty and/or dusty).

Replace the element if (a) it is damaged or (b) dirt can not be easily removed.

IMPORTANT: Operating with a dirty or damaged air cleaner for only a brief period of time can ruin an engine.

Clean the element by tapping it lightly on a flat surface until the dirt falls off. Handle the element carefully to prevent damage.

Do not wash the element in any liquid or blow dirt off with compressed air. Both of these procedures will destroy the elements' ability to filter.

With the air cleaner disassembled, check the base plate to make sure it is secure and not bent or damaged. Also check other air cleaner and carburetor components such as the cover and gaskets for air leaks. Damaged or loose components could allow unfiltered air into the engine causing premature wear and failure.

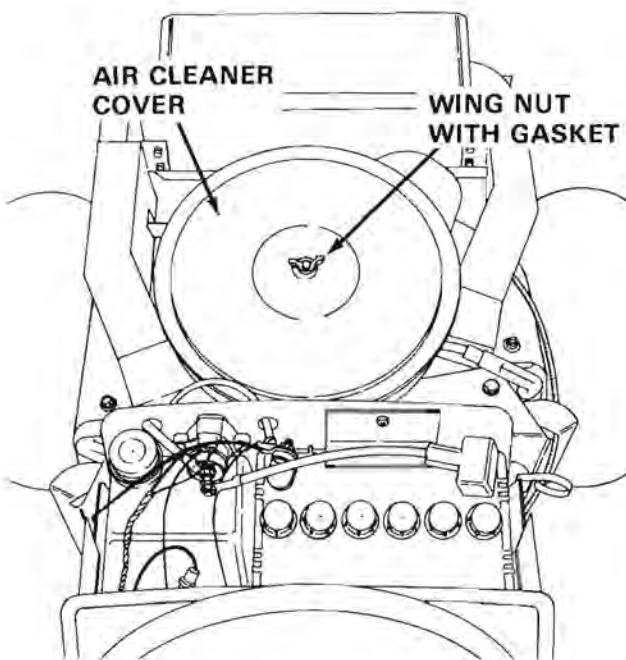


FIGURE 23

The air cleaner wing nut with its sealing gasket/washer must be finger tightened one-half to one full turn after the nut contacts the cover. Do not overtighten.

WASHING AND OILING INSTRUCTIONS FOR AIR CLEANER PRECLEANER (if used)

Remove and wash the air filter precleaner after 25 HOURS of operation.

Carefully remove the precleaner from the paper filter element.

Wash the precleaner thoroughly in a solution of detergent and water. Squeeze the precleaner dry and allow it to air dry.

Apply three tablespoons (43 grams) of SAE 30 engine oil to the precleaner. Squeeze the precleaner gently to distribute the oil and remove excess oil.

Install the precleaner over the paper filter element.

NOTE: Make sure precleaner is completely dry before oiling. Do not apply more than three tablespoons of oil to the precleaner. Restriction of the paper element and poor engine operation can occur if the precleaner is installed wet or with excess oil.

1. WASH
2. SQUEEZE DRY
3. COAT WITH OIL
4. INSTALL OVER PAPER ELEMENT



FIGURE 24

FUEL

Always use clean, fresh gasoline and a funnel with a filter. Use regular leaded gasoline for the first 25 HOURS of operation. After the first 25 HOURS, use regular no-lead gasoline with minimum octane ratings as follows:

Research Method	90
Motor Method	82
Average	87

In the United States the average octane rating is shown on gasoline pumps. In other countries, if the method is not given, it is the Research Method. No-lead fuel leaves less combustion chamber deposits. Leaded gasoline may be used only if no-lead gasoline is not available.



CAUTION: Never store the equipment with gasoline in the tank inside a building where fumes may reach an open flame or spark. Allow the engine to cool before storing in any enclosure.



CAUTION: Do not smoke when working near fuel.

CAUTION: Handle gasoline with care — it is highly flammable.

- a. Use approved gasoline container.
- b. Never remove the cap of the fuel tank or add gasoline to a running or hot engine, or fill the fuel tank indoors. Wipe up spilled gasoline.
- c. Open doors if the engine is run in the garage — exhaust fumes are dangerous. Do not run the engine (motor) indoors.



Purchase gasoline in small quantities. Fresh gasoline reduces chance of gum deposits forming and clogging the fuel system and ensures a fuel blended for the season. Do not use gasoline left over from the previous season.

Do not add oil to the gasoline.

If a restriction of fuel occurs, replace the filter and clean the vent in the fill cap.

IMPORTANT: Damage to fuel system components will occur if gasoline containing alcohol is used. Use only regular leaded or no lead gasoline which does not contain alcohol. Avoid using gas line de-icer additives.

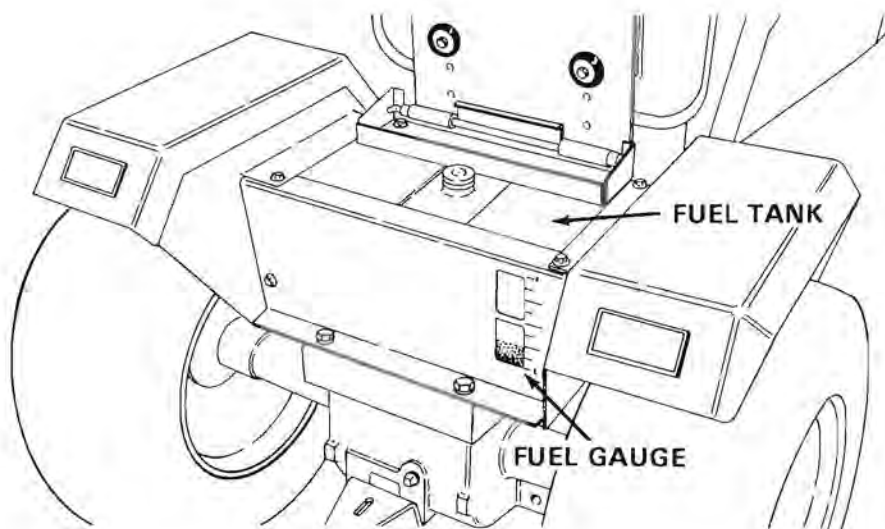


FIGURE 25

FUEL FILTER

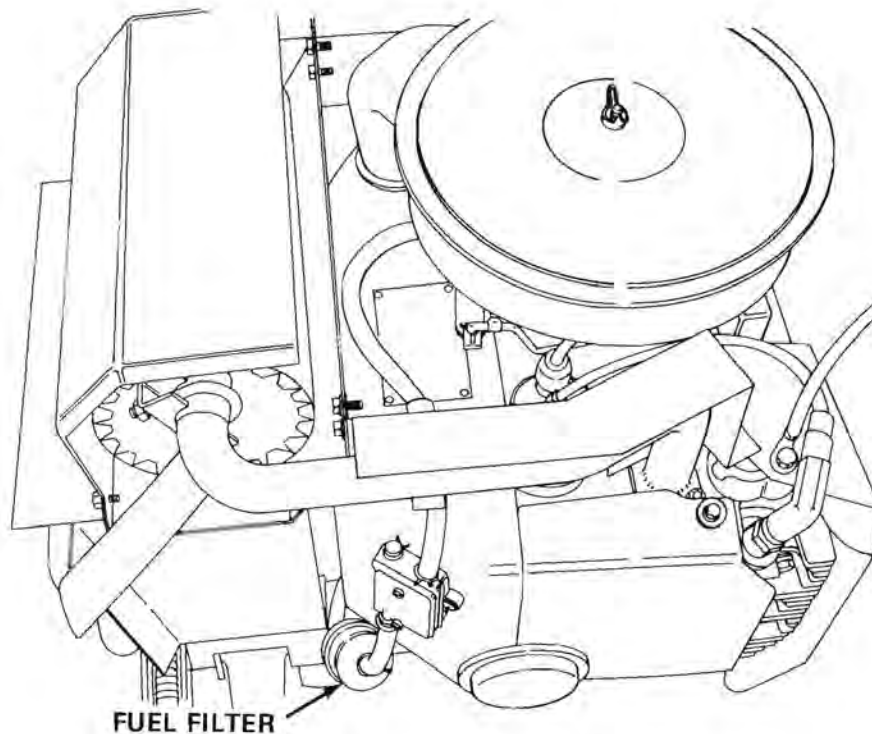


FIGURE 26

Replace the fuel filter after each 500 HOURS of use or when contamination or restriction is evident.

Use the following procedure to replace the fuel filter:

1. If possible, plan to replace the fuel filter when the fuel tank is as near empty as possible.
2. Place a piece of air tight plastic wrap under the fuel tank cap. This will block the vent in the cap and retard leakage of remaining gasoline when the filter is disconnected.

NOTE: Be sure to remove the plastic wrap after the fuel filter is replaced.

3. Place an approved container and funnel under the filter to catch spilled fuel.



CAUTION: Do not smoke when working near fuel.

4. Make sure that there is no source of ignition (such as flame, spark or cigarette) near by. Remove the fuel line from the engine side of the filter. Hold the filter as high as possible to minimize leakage.
5. Remove the filter from the fuel line.
6. Install the new filter insuring that the fuel flow direction arrow points toward the engine.
7. Insure that the clamps are secure.
8. Put approximately one quart of fuel in the tank and check for leaks. Repair any leaks before filling the fuel tank full.

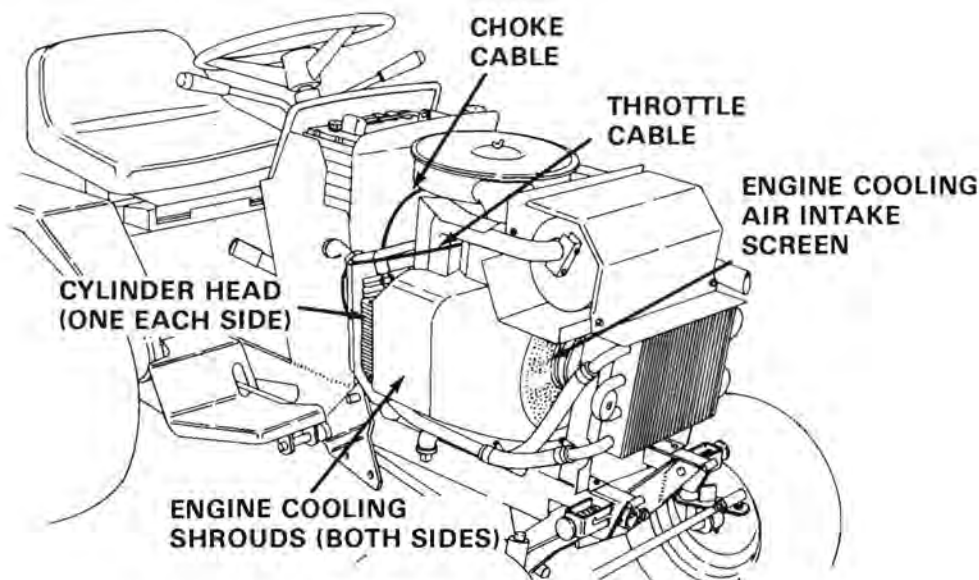


FIGURE 27

ENGINE VALVE SERVICE

The valve tappet clearances must be checked and adjusted (if necessary) after the first 50 HOURS of operation and after each 200 HOURS of operation thereafter. The correct valve clearances are listed in the specification section of this manual. Have this service done by an authorized dealer. The crankcase breather in the valve cover must be cleaned at this time.

ENGINE COOLING SYSTEM

The engine cooling air intake screen must be kept clean and unobstructed at all times.

Check the engine cooling air intake screen DAILY before operating your tractor and frequently during use.

If debris builds up on the screen during engine operation, STOP engine immediately and clean the debris off.

An obstructed screen can cause the engine to overheat and fail prematurely.

Remove the cooling shrouds and clean the cooling fins every 50 HOURS of operation (more often in extremely dusty conditions). Clean the external surfaces of your engine of dust, dirt and oil which can restrict cooling.

Reinstall the cooling shrouds before operating the engine. Operating the engine without the cooling shrouds in place can cause overheating and damage to the engine.

ENGINE CYLINDER HEAD SERVICE

The cylinder head must be removed and the buildup of carbon and other deposits must be cleaned periodically to prevent premature engine wear. This must be done after each 200 HOURS of operation if leaded gasoline is used and after each 400 HOURS of operation if unleaded gasoline is used. Have this service done by an authorized dealer.

THROTTLE AND CHOKE CABLES

Oil the cables with penetrating oil and/or light weight motor oil after each 50 HOURS of use. Do not oil the pivot at the handles as this will reduce the ability of the cable to hold its proper setting.

The following steps can be taken to prevent freezing of choke and throttle cables when the snowcaster attachment is used:

1. Always direct snowcaster discharge away from and down wind from the tractor.
2. Saturate cables with penetrating oil and/or light machine oil.
3. Keep cables dry and oil frequently.
4. Oil the cable only. Do not oil the friction device at the cable handle.

ENGINE OIL

The importance of checking and changing crankcase oil cannot be overemphasized.

DIRTY OIL CAUSES PREMATURE ENGINE WEAR AND FAILURE.

Oil level check:

Check the oil level in the engine crankcase **BEFORE EACH USE** when the engine is cool and the oil has drained back into pan.

- Position the tractor (engine) on a level surface when checking the oil. Stop the engine.
- Before checking the oil level wipe the area clean around the dipstick to prevent dirt from entering the engine.
- Pull the dipstick and wipe the oil off.

IMPORTANT: Always check the oil level when the engine is stopped. Do not remove the dipstick while the engine is running. Oil will be forced out the dipstick opening if the dipstick is removed while the engine is running.

- Reinsert the dipstick. Push it all the way down.
- Pull the dipstick and read the oil level.

- Add oil through the dipstick opening if necessary to bring the oil level up to, but not over, the "F" mark on the dipstick.

IMPORTANT: Do not operate engine with oil level below the "L" mark or over the "F" mark.

OIL TYPE

Use oil meeting the requirements of API service class "SE" or "CC". Select oil viscosity based on the air temperature at the time of operation, as shown.

AIR TEMPERATURE

OIL VISCOSITY

Above 32°F (0°C) SAE-30

0°F (-20°C) to 32°F (0°C) SAE 10W-30

Below 0°F (-20°C) SAE 5W-20

Avoid using multi-viscosity oil above 32° F (0°C). The use of multi-viscosity oil above 32° F (0°C) causes increased oil consumption and combustion deposits.

IMPORTANT: Do not use oil additives or viscosity improvers. These products are not formulated for air cooled engines and will solidify, causing engine failure.

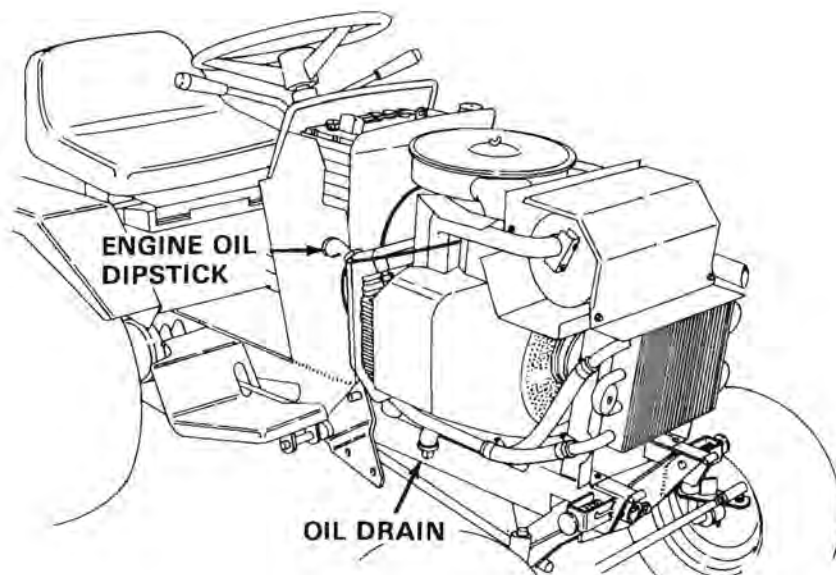


FIGURE 28

OIL CHANGE

FIRST CHANGE

Change the oil after the first 5 HOURS of operation when your engine is new.

REGULAR CHANGE

Change the oil at every 25 HOUR interval of operation or sooner if the oil becomes discolored. Change the oil filter at every 50 HOURS of operation (or every second oil change). **CHANGE OIL MORE FREQUENTLY UNDER DIRTY, DUSTY CONDITIONS.** (Most lawn and garden tractor working conditions are considered dirty and/or dusty.)

OIL CHANGE PROCEDURE

1. Position tractor on a level surface.
2. Drain oil while engine is still warm from operation. Warm oil will flow more freely and carry away more impurities.
3. Install the drain plug.
4. Fill through the dipstick opening to "F" mark on the dipstick with the proper oil. See the OIL TYPE section of this manual.

NOTE: Tractor (engine) **MUST** be level when checking or changing the oil.

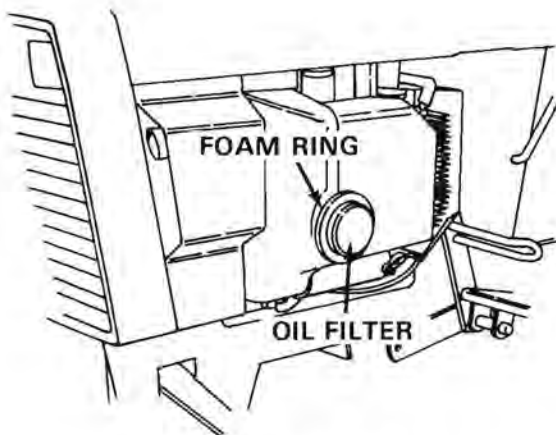


FIGURE 29

IMPORTANT: Do not operate engine with oil level below "L" mark or over the "F" mark.

OIL FILTER CHANGE PROCEDURE

1. Drain the engine oil as explained for OIL CHANGE PROCEDURE.
2. Remove and discard the oil filter. Save the foam ring to use with the new filter.
3. Install the new filter finger tight plus 1/4 to 1/2 turn.
4. Slip the foam ring over the new filter and push tight against the sheet metal.
5. Install the drain plug.
6. Fill through the dipstick opening to the "F" mark on the dipstick with the proper oil. See the OIL TYPE section of this manual.

NOTE: Tractor (engine) **MUST** be level when checking or changing the oil.

IMPORTANT: DO NOT operate engine with oil level below "L" mark or over the "F" mark.

7. Run the engine for 30 seconds at 1/2 throttle to fill the oil filter.
8. Stop the engine. Let the tractor stand five minutes, then pull the dipstick and wipe the oil off.

IMPORTANT: Always check the oil level when the engine is stopped. Do not remove the dipstick while the engine is running. Oil will be forced out the dipstick opening if the dipstick is removed while the engine is running.

9. Reinsert the dipstick. Push it all the way down.
10. Pull the dipstick and read the oil level.
11. Add oil through the dipstick opening to bring the oil level up to, but not over, the "F" mark on the dipstick.

HYDRAULIC OIL

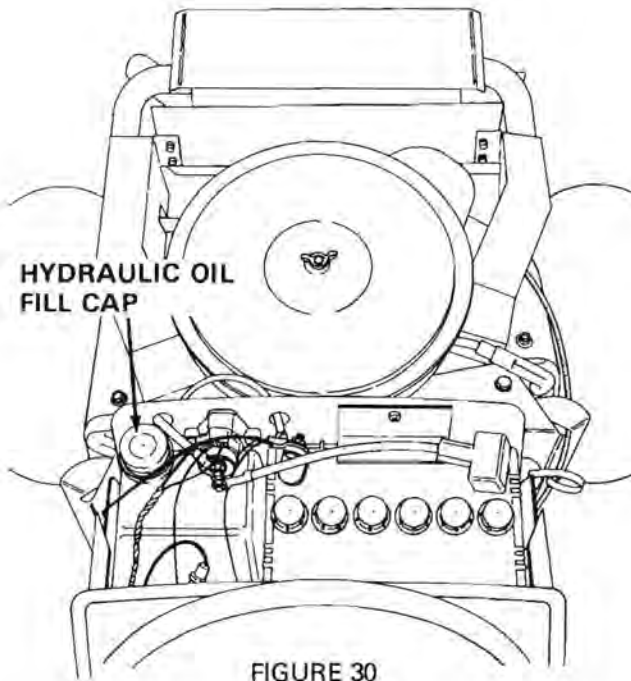


FIGURE 30

Change the hydraulic oil after each 500 HOURS of use. Replace the hydraulic oil seasonally according to the chart below.

AIR TEMPERATURE	OIL VISCOSITY
Above 32°F (0°C)	SAE 20W40*
Below 32°F (0°C)	SAE 5W20*

*Use API Service Classification SE or CC.

The oil level must be kept 5" to 6" (120 mm to 150 mm) down from the top of the filler neck.

Use the following procedure to drain the hydraulic system:

1. Remove the spark plug(s) from the engine.
2. Ground the spark plug wire(s) to the engine block.
3. Place an oil drain pan with a capacity of two gallons under the travel control valve.
4. Remove the 1/4" hex socket plug.
5. Crank the engine to "pump" the oil out the drain hole.
6. Install the drain plug, spark plug(s) and wire(s).
7. Fill the reservoir to 5" to 6" (120 mm to 150 mm) from the top of the filler neck.
8. Run the engine and (a) drive forward and reverse a short distance and (b) raise and lower the hydraulic lift two times. Check the oil level again.

IMPORTANT: Make sure oil reservoir is filled to the proper level. Overfilling will cause oil leakage. Underfilling will cause cavitation and intermittent drive.

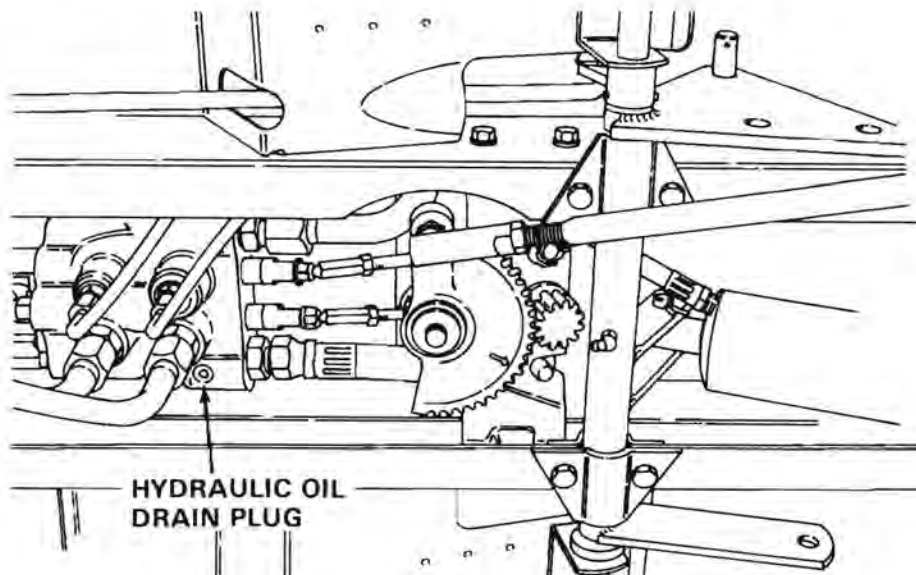


FIGURE 31

HYDRAULIC OIL COOLER

The hydraulic oil cooler must be kept clean and unobstructed at all times.

Check the hydraulic oil cooler DAILY before operating your tractor and frequently during use.

If debris builds up on the screen during tractor operation, STOP the tractor engine immediately and clean the debris off.

An obstructed hydraulic oil cooler can cause the tractor hydraulic system and engine to overheat and fail prematurely.

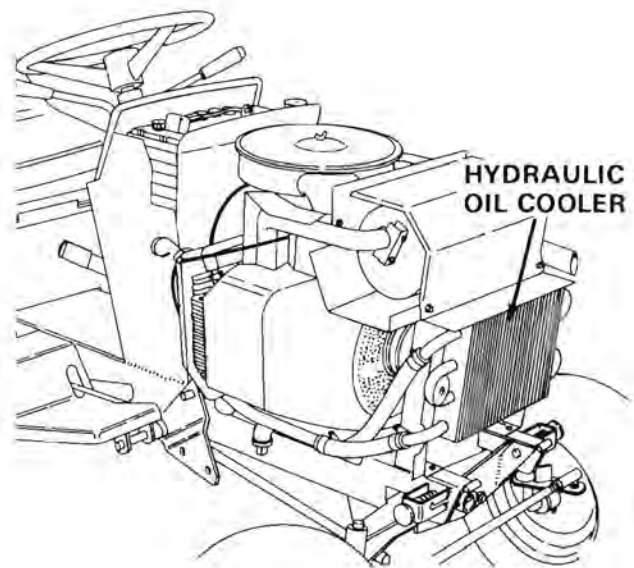


FIGURE 32

TRAVEL VALVE SPOOL ADJUSTMENT

The travel valve spool is correctly adjusted when the tractor does not move while the travel lever is in the "NEUTRAL" position.

If the travel valve spool needs adjustment, take the tractor to your authorized dealer.

RETURN TO "NEUTRAL" POSITION ADJUSTMENT

1. Make sure the travel valve spool is adjusted according to the above procedure.
2. Make sure the brake adjustment is correct. See the Brake Adjustment procedure section in the manual.
3. Follow the chart below:
4. Make sure the tab points forward when the adjusting nuts are tightened. This will prevent the spring from falling out.

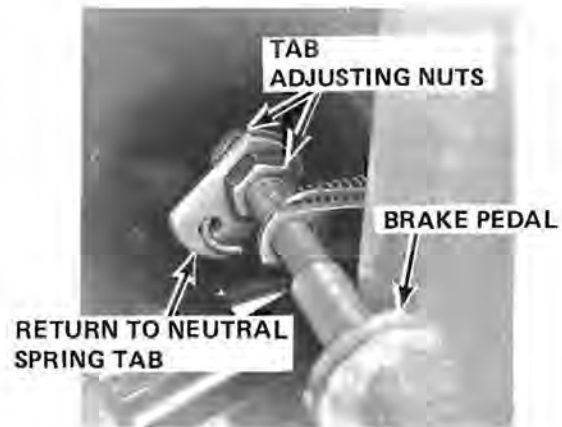


FIGURE 33

PROBLEM

- a. The travel lever returns to the "NEUTRAL" position from only the "FORWARD" position
- b. The travel lever returns to the "NEUTRAL" position from only the "REVERSE" position

SOLUTION

- a. Turn the tab adjustor nuts to move the spring to the right
- b. Turn the tab adjustor nuts to move the spring to the left

SEAT

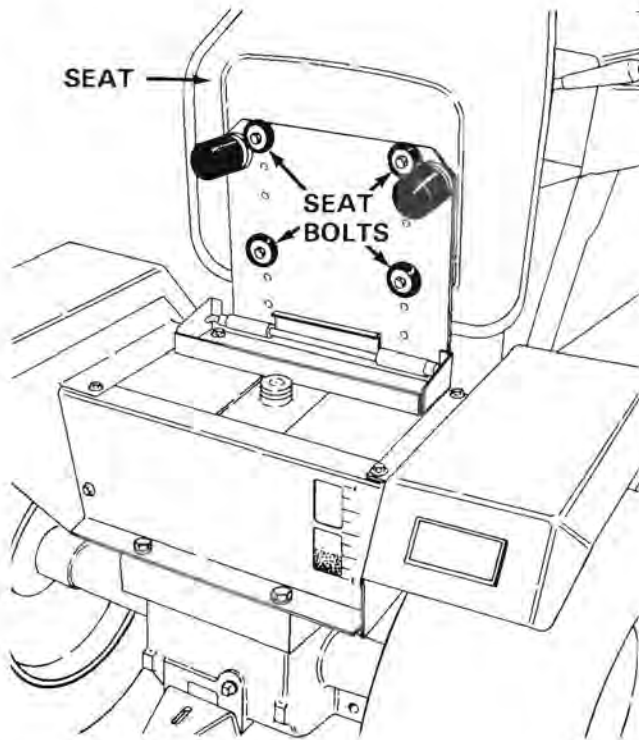


FIGURE 34

ADJUSTMENT

1. Remove the four bolts that hold the seat to the seat hinge.
2. Move the seat either forward or reverse to get the correct position on the seat hinge.
3. Install the bolts.

MAINTENANCE

1. Clean the seat regularly. Use a special vinyl cleaner. Do not use a solvent as this will damage the seat.
2. Severe heat or cold can damage the seat. Protection from these conditions is important. Put a cover on the seat for protection against weather conditions and water. It is best to put the tractor in a building when not in use.
3. During operation in severe weather conditions, you can easily damage the seat. Be careful not to damage the seat when you get on and off the tractor.
4. If the seat gets a small tear, apply a vinyl repair tape over the damaged area. Black vinyl repair tape can be purchased locally.

TRANSAXLE

Change the oil in the transmission after each 500 HOURS of operation.

The oil drain plug is located on the right hand side of the transaxle housing.

The oil level check plug is located on the right hand side of the transaxle housing just above the drain plug.

The oil fill plug is located on the rear of the transaxle housing.

AIR TEMPERATURE

All Temperatures

OIL TYPE & VISCOSITY

API Service Class SE or CC

SAE 20W40 or
SAE 80 EP Gear Lube

Capacity One Pint (.5 l).

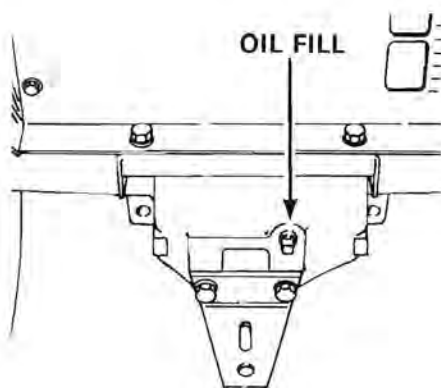


FIGURE 35

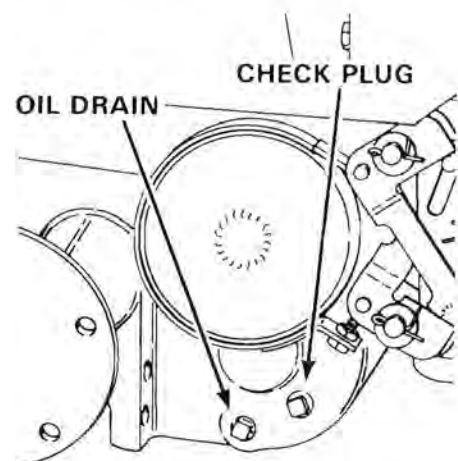


FIGURE 36

CHASSIS LUBRICATION

Apply grease after every 25 HOURS of operation to the:

a. front wheel spindles

NOTE: Lift front of tractor to permit grease to flow from top and bottom of spindle.

b. front wheel bearings

NOTE: Remove dust caps from front wheel hubs before greasing front wheel bearings. The trapped air behind the dust caps can prevent the full lubrication of the bearings.

c. axle pivot pin

d. steering gear - apply a small amount of grease to the gear teeth

e. lift shaft

Use number 1 multi-purpose grease (Lithium Base) for all lubrication fittings. Use as many strokes as required, until you see grease pushing out of assembly.

Always wipe dirt from fitting before applying the grease gun.

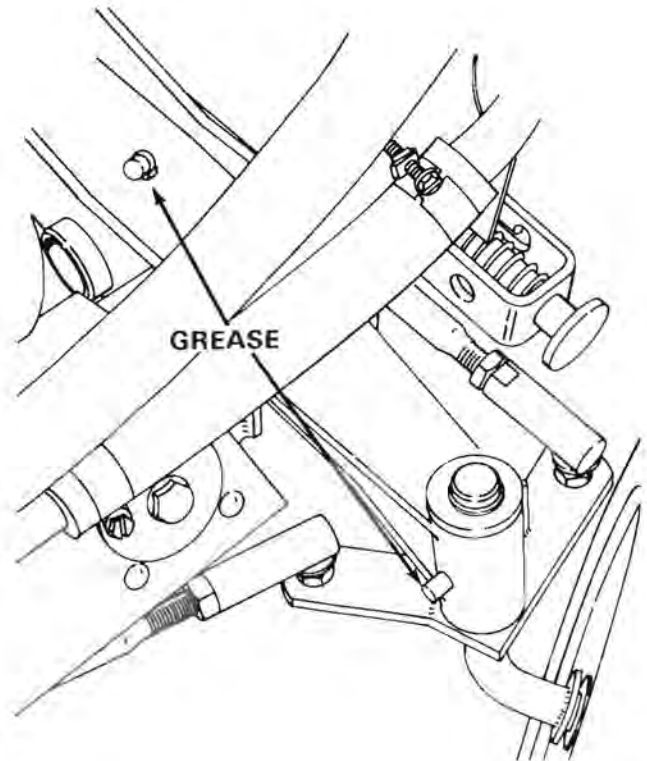


FIGURE 38 Front Wheel Spindle and Axle Pivot Pin

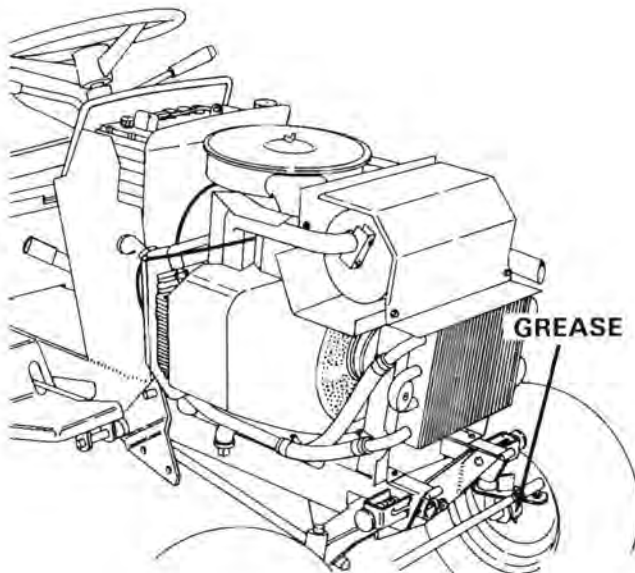


FIGURE 37 Front Wheel Bearings

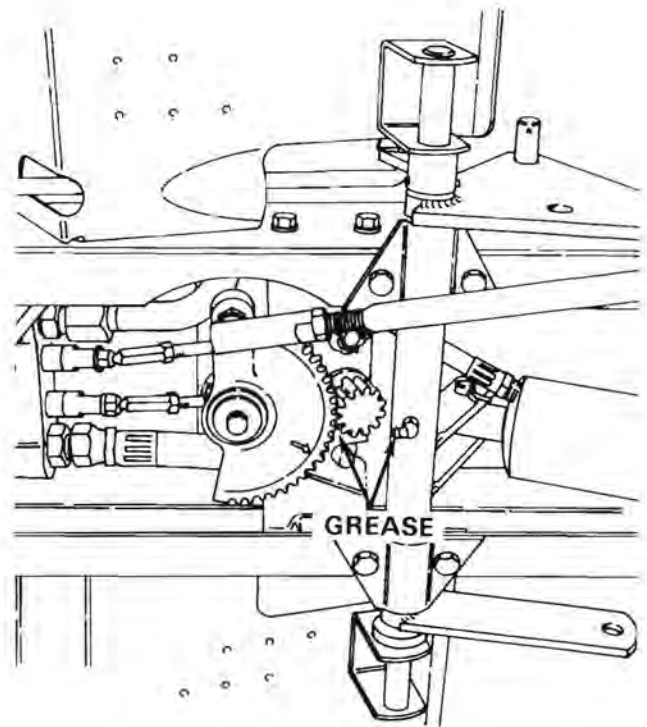


FIGURE 39 Steering Gear and Lift Shaft

ATTACHMENT DRIVE CLUTCH ADJUSTMENT

The attachment drive clutch on your tractor requires periodic adjustment. Check the clutch after every 50 HOURS of usage.

Adjustment is required if:

1. The attachment drive clutch engaging lever pushes forward "easily". A firm push is required to engage a properly adjusted clutch
- or
2. More than .030" (.75 mm) clearance exists between the clutch disc and backing plate when the clutch is in the disengaged position.

IMPORTANT: Adjust the clutch if required before operating an attachment. Operating an attachment when the clutch is in need of adjustment can result in slippage and damage to clutch parts.

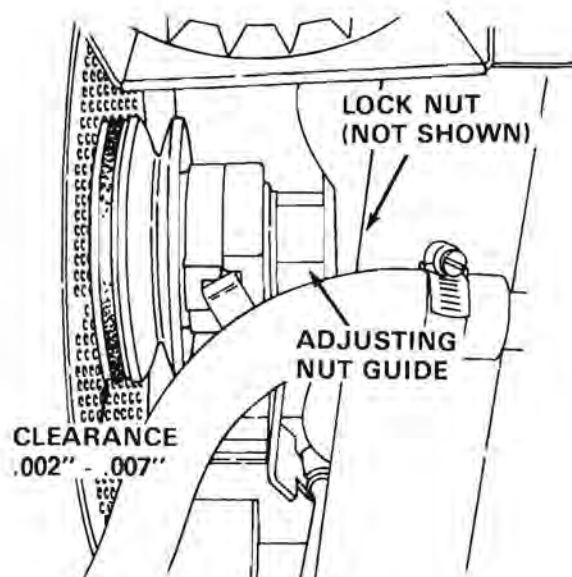


FIGURE 40

ADJUSTMENT PROCEDURE



CAUTION: Before attempting to service the Attachment Drive Clutch, be sure to remove tractor key and spark plug wire(s).

1. Remove the hood.
2. Remove the three screws securing the oil cooler to front support and swing cooler out.

NOTE: It is not necessary to drain hydraulic oil.

3. Hold the adjusting nut guide with a 1-3/4" open end wrench and loosen the "Right Hand Thread" lock nut.

NOTE: A special 1-3/4" wrench is available from your dealer.

4. Use a 1-3/4" open end wrench to turn adjusting nut guide.
 - a. Turn nut in to decrease clearance.
 - b. Turn nut out to increase clearance.

There is not enough room for the wrench handle to turn the adjusting nut guide one complete flat. Use the following procedure:

- a. Insert a large screwdriver through the timing sight hole and engage one of the teeth on the flywheel ring gear.

Remove the rubber hose between the blower housing and the air cleaner to uncover the timing sight hole.

- b. Turn the adjusting nut guide in the desired direction until the wrench handle touches an obstruction.
 - c. Remove the screwdriver from the flywheel ring gear.
 - d. Move the wrench handle to the opposite end of its travel while allowing the engine crankshaft to rotate.
 - e. Insert the screwdriver blade in the flywheel ring gear.
 - f. Repeat this procedure until the correct adjustment is achieved.
5. Adjust clearance to .002" to .007" (.05 to .17 mm). Measure clearance with two feeler gauges positioned 180° apart.
 6. Hold adjusting nut guide and tighten lock nut to 45 lb. ft. (60 Nm).

NOTE: If clearance becomes less than .002" (.05 mm) when tightening the lock nut, turn the adjusting nut out as far as necessary to maintain the proper clearance.

7. Reassemble oil cooler and hood.

IMPORTANT: The lock nut must be tightened to 45 lb ft (60 Nm) when the adjustment is completed. Failure to tighten this nut properly will cause the assembly to come loose and damage the clutch and oil cooler.

STEERING ADJUSTMENT



CAUTION: When adjusting steering wheel free play make certain that some free play remains between the sector gear and pinion gear, since a tight fit, with no clearance between the two gears may cause binding and tooth failure.

IMPORTANT: Check for loose or worn ball joints, drag link, or tie rod before adjusting the steering gear. Tighten or replace these components as required.

The tractor is assembled with shim washers between the steering gear and the support bracket. See the illustration. When the gear teeth wear, more free movement occurs. If too much free movement occurs adjust the steering gear.

1. Disconnect the drag link from the steering gear.
2. Remove the nut securing the steering gear.
3. Remove the steering gear.
4. Remove one or more shim washers from above the steering gear.
5. Put the steering gear in place on the pivot shaft.

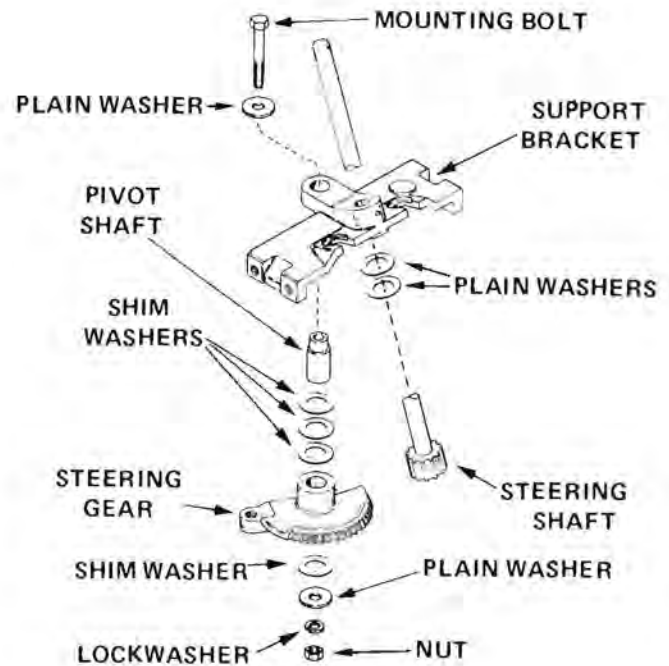


FIGURE 41

6. Put the shim washers, washers and the nut on the steering gear bolt and tighten securely. The total number of the shim washers must always be the same.

TOE-IN ADJUSTMENT

1. Put the tractor on a hard and level surface like a concrete floor.
2. Make sure the front tires have equal air pressure.
3. Find the centerline of the front tires. See the figure below.

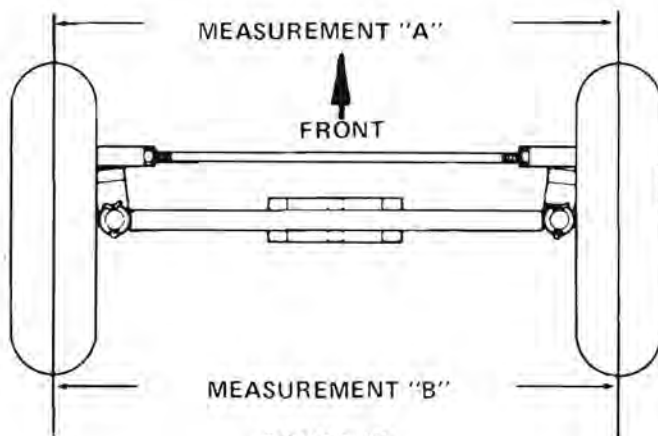


FIGURE 42

4. If you can not find the centerline:
 - a. raise the front wheels off the ground
 - b. spin each wheel and put a mark at the centerline with chalk
5. Measure the distance between each centerline or chalk mark.

Measurement "A" must be 1/8 to 3/8" (3.2 mm to 9.5 mm) less than measurement "B".

Both measurements, front and rear, must be taken at spindle height above the floor.

6. Loosen both lock nuts on the tie rod.

NOTE: Do not remove the ball joints from the king pins. Turn the tie rod to change the toe-in.

7. Turn the ball joints off of the tie rod to decrease the toe-in.
8. Turn the ball joints onto the tie rod to increase the toe-in.

MANUAL ORDERING PROCEDURE

1. Fill in your complete address (include street no.).
2. Fill in tractor serial number and model number (attachment model number also required for attachment manual orders).
3. Select manuals needed from manual list.
4. Fill in order form. Give:
 - a. equipment description (tractor, mower, etc.)
 - b. manual type (parts, service, operator's manual)
 - c. cost
 - d. quantity of each manual
5. Add up the total cost.
6. Include shipping and handling costs.
7. Send the order form and a check for the total cost to:

Ingersoll Service Parts
P. O. Box 2262, Oshkosh, WI 54903
Att: Literature Dept.

These manuals are available from the Ingersoll Equipment Co., Inc.:

 - a. Parts Manual (includes part numbers and exploded views of your equipment assemblies).
 - b. Operator's Manual (includes specifications, operating procedures and maintenance procedures for your equipment).
 - c. Service Manual (includes repair procedures for your tractor).

MANUAL LIST

DESCRIPTION	MANUAL TYPE & COST		
	PARTS MANUAL	OPERATOR'S MANUAL	SERVICE MANUAL
Tractor	\$2.50	\$2.00	\$20.00
Mower	\$1.00	\$2.00	N/A
Snowcaster	included w/mower	\$1.00	N/A
Blade	included w/mower	\$1.00	N/A
Tiller	\$1.00	\$1.50	N/A
Other	Please contact us for information.		

ORDER FORM

To order additional manuals for your tractor and attachments, fill in this order form and send to:

Ingersoll Service Parts
P. O. Box 2262, Oshkosh, WI 54903
Att: Literature Dept.

Name _____
Address _____
City _____
State _____ Zip _____

Tractor Model No. _____

Tractor Serial No. _____

Attachment Model No. _____

Attachment Serial No. _____

Qty.	Equipment Description	Manual Type	Cost

_____ Total

_____ Shipping & Handling*

_____ Total Cost

*Please include \$2.00 for orders under \$20.00. Please include \$3.00 for orders \$20.00 and over.

