5XI SERIES TRACTOR SERVICE MANUAL

Table of Contents – Page 1 of 2

5XI SERIES TRACTOR SERVICE MANUAL

Table of Contents – Page 2 of 2

TORO

5xi Series Tractor Service Manual

ABOUT THIS MANUAL

This service manual was written expressly for Toro Wheel Horse 5xi series garden tractors. The Toro Company has made every effort to make the information in this manual complete and correct.

This manual was written for the service technician; basic mechanical/electrical skills are assumed. The Table of Contents lists the systems and the related topics covered in this manual.

For information on the electrical system, please refer to the Toro Electrical Demystification Guide (492-4404). For information specific to the engines used on these garden tractors, refer to the appropriate engine manufacturer's service and repair instructions.

We are hopeful that you will find this manual a valuable addition to your service shop. If you have any questions or comments regarding this manual, please contact us at the following address:

The Toro Company
Consumer Service Training Department
8111 Lyndale Avenue South
Bloomington, MN 55420

The Toro Company reserves the right to change product specifications or this manual without notice.

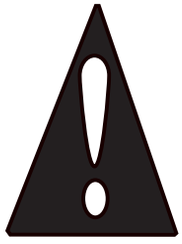
Copyright© All Rights Reserved
©1997 The Toro Company

TABLE OF CONTENTS

QUICK REFERENCE SECTION

SERVICE SECTION

Table of Contents



This symbol means WARNING or PERSONAL SAFETY INSTRUCTION - read the instruction because it has to do with your safety. Failure to comply with the instruction may result in personal injury or even death.

This manual is intended as a service and repair manual only. The safety instructions provided herein are for troubleshooting, service, and repair of the 5xi series garden tractor. The tractor and attachment operator's manuals contain safety information and operating tips for safe operating practices. Operator's manuals are available through your local Toro distributor or:

The Toro Company
Publications Department
8111 Lyndale Avenue South
Bloomington, MN 55420

THINK SAFETY FIRST

Avoid unexpected starting of engine...

Always turn off the engine and disconnect the spark plug wire(s) before cleaning, adjusting, or repair.

Avoid lacerations and amputations...

Stay clear of all moving parts whenever the engine is running. Treat all normally moving parts as if they were moving whenever the engine is running or has the potential to start.

Avoid burns...

Do not touch the engine, muffler, or other components which may increase in temperature during operation, while the unit is running or shortly after it has been running.

Avoid fires and explosions...

Avoid spilling fuel and never smoke while working with any type of fuel or lubricant. Wipe up any spilled fuel or oil immediately. Never remove the fuel cap or add fuel when the engine is running. Always use approved, labeled containers for storing or transporting fuel and lubricants.

Avoid asphyxiation...

Never operate an engine in a confined area without proper ventilation.

Avoid injury from batteries...

Battery acid is poisonous and can cause burns. Avoid contact with skin, eyes, and clothing. Battery gases can explode. Keep cigarettes, sparks, and flames away from the battery.

Avoid injury due to inferior parts...

Use only original equipment parts to ensure that important safety criteria are met.

Avoid injury to bystanders...

Always clear the area of bystanders before starting or testing powered equipment.

Avoid injury due to projectiles...

Always clear the area of sticks, rocks, or any other debris that could be picked up and thrown by the powered equipment.

Avoid modifications...

Never alter or modify any part unless it is a factory approved procedure.

Avoid unsafe operation...

Always test the safety interlock system after making adjustments or repairs on the machine. Refer to the Electrical chapter later in this manual for more information.

SPECIFICATIONS

Product Lineup

Model (International)	Name	Engine	HP	Drive Type
73470	518xi	Kohler	18	Eaton 11 Hydro, 2 speed Uni-Drive® transaxle
73540 (73541)	520xi	Kohler	20	Eaton 11 Hydro, 2 speed Uni-Drive® transaxle
73560	522xi	Kohler	22	Eaton 11 Hydro, 2 speed Uni-Drive® transaxle
73545 (73546)	520Lxi	Kawasaki	20	Eaton 11 Hydro, 2 speed Uni-Drive® transaxle
73550 (73551)	523Dxi	Daihatsu	23	Eaton 11 Hydro, 2 speed Uni-Drive® transaxle

Tractor Specifications

Item	73470	73540 (73541)	73560	73545 (73546)	73550 (73551)
Fuel Tank Capacity	4.25 gal (16.1l)	4.25 gal (16.1l)	4.25 gal (16.1l)	4.25 gal (16.1l)	4.25 gal (16.1l)
Hydraulic System Capacity	6 Qts (5.7l)	6 Qts (6.6 l)	7 Qts (6.6 l)	7 Qts (6.6 l)	7 Qts (6.6 l)
Battery Size (Cold Cranking Amps)	12V 380CCA	12V 380CCA	12V 380CCA	12V 380CCA	12V 495CCA
Ground Speed Forward (High Range)	0-7.4 mph (11.9 km/hr)	0-7.4 mph (11.9 km/hr)	0-7.4 mph (11.9 km/hr)	0-7.4 mph (11.9 km/hr)	0-7.4 mph (11.9 km/hr)
Ground Speed Forward (Low Range)	0-4.4 mph (7.1 km/hr)	0-4.4 mph (7.1 km/hr)	0-4.4 mph (7.1 km/hr)	0-4.4 mph (7.1 km/hr)	0-4.4 mph (7.1 km/hr)
Ground Speed Reverse (High Range)	0-3.4 mph (5.48 km/hr)	0-3.4 mph (5.48 km/hr)	0-3.4 mph (5.48 km/hr)	0-3.4 mph (5.48 km/hr)	0-3.4 mph (5.48 km/hr)
Tire Size - Front	16 x 7.5-8	16 x 7.5-8	16 x 7.5-8	16 x 7.5-8	16 x 7.5-8
Tire Size - Rear	23 x 10.5-12	23 x 10.5-12	23 x 10.5-12	23 x 10.5-12	23 x 10.5-12
Tire Pressure	12 psi (82.7 kPa)	12 psi (82.7 kPa)	12 psi (82.7 kPa)	12 psi (82.7 kPa)	12 psi (82.7 kPa)
Wheel Base	52 in (132.1 cm)	52 in (132.1 cm)	52 in (132.1 cm)	52 in (132.1 cm)	52 in (132.1 cm)
Turning Radius	20 in (50.8 cm)	20 in (50.8 cm)	20 in (50.8 cm)	20 in (50.8 cm)	20 in (50.8 cm)
Total Width	40.5 in (102.8 cm)	40.5 in (102.8 cm)	40.5 in (102.8 cm)	40.5 in (102.8 cm)	40.5 in (102.8 cm)
Length	76.5 in (196.9 mm)	76.5 in (196.9 mm)	76.5 in (196.9 mm)	76.5 in (196.9 mm)	76.5 in (196.9 mm)

Note: Specifications shown are for 1998 models. Subsequent production may vary. As part of a continuous improvement process, the Toro Company reserves the right to change specifications without notice.

Attachments and Accessories (partial listing)

Part # (International)	Description	Drive Belt	Spindle Belt
78353 (78442)	42" Rear Discharge Mower	95-4093	95-4230
78357 (78444)	44" Side Discharge Mower	95-4094	95-4228
78358	44" Recycler® Mower	95-4094	95-4228
78363 (78448)	48" Side Discharge Mower	95-4095	95-3878
78364	48" Recycler® Mower	95-4095	95-3878
78370 (78452)	52" Side Discharge Mower	95-4094	94-2501
78375	52" Recycler® Mower	95-4094	94-2501
78395 (78469)	60" Side Discharge Mower	95-4093	95-4229
79375*	36" Tiller	Front 94-7877	Rear 94-7878
79355*	48" Snow/Dozer Blade		
79356*	50" Mid-Mount Grader Blade		
79305 (79444)	44" Vac/Bagger	93-8007	
79310 (79448)	48" Vac/Bagger	79-7490	
79977	Front Mount Dethatcher		
79365	42" Single Stage Snowthrower	95-3918	
79366 ***	44" Two Stage Snowthrower	95-3917	
79919	Snow Cab		
79210	Roll-Over-Protection System (ROPS)		
95-4220	Rear Attach-A-Matic® (from Parts)		
79947**	Bucket Loader		
94-2050	Dual Wheel Adapter Kit (From Parts)		
94-7800	Clevis Hitch (From Parts)		
94-4090	48" Blade Retrofit Kit (From Parts)		
95-4091	Diesel Block Heater (From Parts)		
95-7858	Sidelight Kit (From Parts)		
86041	44" Recycler® Kit		
79195	48" Recycler® Kit		
79185	52" Recycler® Kit		
79948	Weight Box		

* Requires 95-4220 Rear Attach-A-Matic®
** Requires 79948 weight Box
***Requires rear wheel weights, 95-4220 Rear Attach-A-Matic®

SPECIFICATIONS

Engine Specifications (air-cooled)

Item	73470	73540 (73541)	73560
Manufacturer/Model	Kohler/CH18S	Kohler/CH20S	Kohler/CH22S
Horsepower (kW)	18 HP (13.4 kW)	20 HP (14.9 kW)	22 HP (16.4 kW)
Oil Viscosity Over 0° F (-18° C)	10W-30	10W-30	10W-30
Below 32°F (0° C)	5W-20 or 5W-30	5W-20 or 5W-30	5W-20 or 5W-30
Oil Capacity (With Filter) 2.1 Qts. (2 l)	U.S. Qts.	U.S. Qts.	U.S. Qts.
Spark Plug (Champion # Shown)	RC12YC	RC12YC	RC12YC
Spark Plug Gap	.030 in (.76 mm)	.030 in (.76 mm)	.030 in (.76 mm)
Recommended Engine Speed (No Load) (International Unit)	3400 RPM 2300 RPM	3400 RPM 2300 RPM	3400 RPM 2300 RPM
Idle Speed	1400 RPM	1400 RPM	1400 RPM
Charging System Output	15 amps	15 amps	15 amps
Head Bolt Torque	30 ft·lb (40.7 N·m)	30 ft·lb (40.7 N·m)	30 ft·lb (40.7 N·m)
Connecting Rod Torque	130 in·lb (17.3 N·m)	130 in·lb (17.3 N·m)	130 in·lb (17.3 N·m)
Flywheel Torque	49 ft·lb (66.4 N·m)	49 ft·lb (66.4 N·m)	49 ft·lb (66.4 N·m)

Engine Specifications (liquid-cooled)

Item	73545 (73546)	73550 (73551)
Manufacturer/Model	Kawasaki/FD620D	Daihatsu/582447 Diesel
Horsepower (kW)	20 HP (14.9 kW)	23 HP (17.1)
Oil Viscosity Over 40° F (5°C)	10W-30 or 10W-40 Above 0°F (-18°C)	10W-30 or 10W-40 Above 0°F (-18°C)
Below 40° F (5°C)	5W-20 or 5W-30 Below 32° F (0° C)	5W-30 Below 50° F (10°C)
Oil Capacity (With Filter)	1.9 U.S. Qts. (1.8l)	3.5 U.S. Qts. (3.3 l)
Coolant Capacity	4.1 Qts.	5 Qts.
Spark Plug (NGK # Shown)	BMR4A	N/A
Spark Plug Gap	.024 -.028 in (0.6 - 0.7 mm)	N/A
Recommended Engine Speed (International Units)	3400 RPM 2300 RPM	3400 RPM 2200 RPM
Idle Speed	1550	1850
Charging System Output	20 amps	40 amps
Head Bolt Torque	15 ft·lb (21 N·m)	25 ft·lb (34 N·m)
Connecting Rod Torque	15 ft·lb (21 N·m)	27 ft·lb (36 N·m)
Flywheel Torque	80 ft·lb (110 N·m)	35 ft·lb (47 N·m)

Service Schedule

Item	Kohler, Manual Steering	Kohler, Power Steering	Kawasaki	Daihatsu
Grease Zerks				
Front wheel spindles (2)	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.
Front axle pivot (1)	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.
Maintenance panel (3)	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.
Pulley box (2)	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.
Deck spindles (3) until resistance is felt	Every 25 hrs.	Every 25 hrs.	Every 25 hrs.	Every 25 hrs.
Deck idler & wheels (3) 60"	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.
60" deck gage wheels grease	Every 25 hrs.	Every 25 hrs.	Every 25 hrs.	Every 25 hrs.
Foot pedal shaft (1)	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.
Steering (1) one pump	Every 50 hrs.	N/A	N/A	N/A
Engine				
Check oil level	Every use	Every use	Every use	Every use
Oil change	@ 5 hrs. Every 100 hrs.	@ 5 hrs. Every 100 hrs.	@ 5 hrs. Every 100 hrs.	@ 5 hrs. Every 100 hrs.
Oil filter change	Every 200 hrs.	Every 200 hrs.	Every 200 hrs.	@ 50 hrs. Every 200 hrs.
Air filter	Every 100 hrs.	Every 100 hrs.	Every 100 hrs.	Every 100 hrs.
Precleaner clean & oil	Every 25 hrs.	Every 25 hrs.	Every 25 hrs.	N/A
Fuel filter	Every 100 hrs.	Every 100 hrs.	Every 100 hrs.	Every 400 hrs.
Radiator level check	N/A	N/A	Every use	Every use
Radiator screen clean	N/A	N/A	Every use	Every use
Radiator flush	N/A	N/A	Every 400 hrs. or 2 yrs.	Every 400 hrs. or 2 yrs.
Change spark plugs	Every 200 hrs.	Every 200 hrs.	Every 100 hrs.	N/A
Drain water from fuel filter	N/A	N/A	N/A	Every use
Check fan belt	N/A	N/A	Every 100 hrs.	Every 100 hrs.

@ = initial service

NOTE: Service more frequently under dry/dirty/dusty conditions

MAINTENANCE TABLE

Service Schedule (cont'd)

Item	Kohler, Manual Steering	Kohler, Power Steering	Kawasaki	Daihatsu
Transaxle & Hydraulics				
Oil level check	25 hrs.	25 hrs.	25 hrs.	25 hrs.
Oil change	Every 200 hrs.	Every 200 hrs.	Every 200 hrs.	Every 200 hrs.
Oil filter change	@ 50 hrs.; Every 200 hrs.	@ 50 hrs.; Every 200 hrs.	@ 50 hrs.; Every 200 hrs.	@ 50 hrs.; Every 200 hrs.
Clean power steering screen	N/A	@ 50 hrs.; Every 200 hrs.	@ 50 hrs.; Every 200 hrs.	@ 50 hrs.; Every 200 hrs.
Miscellaneous				
Check PTO belt tension	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.	Every 50 hrs.
Check battery electrolyte	Every 25 hrs.	Every 25 hrs.	Every 25 hrs.	Every 25 hrs.
Tire pressure	Every 25 hrs.	Every 25 hrs.	Every 25 hrs.	Every 25 hrs.
Safety interlock	Every use	Every use	Every use	Every use
Clean clippings from deck	Every use	Every use	Every use	Every use
Check under hood for grass build up	Every use	Every use	Every use	Every use
Check service brake function	Every use	Every use	Every use	Every use
Clean 3 air intake screens	Every use	Every use	Every use	Every use
Clean rear transaxle cover	Every use	Every use	Every use	Every use

@ = initial service

QUICK REFERENCE SECTION

SERVICE SECTION

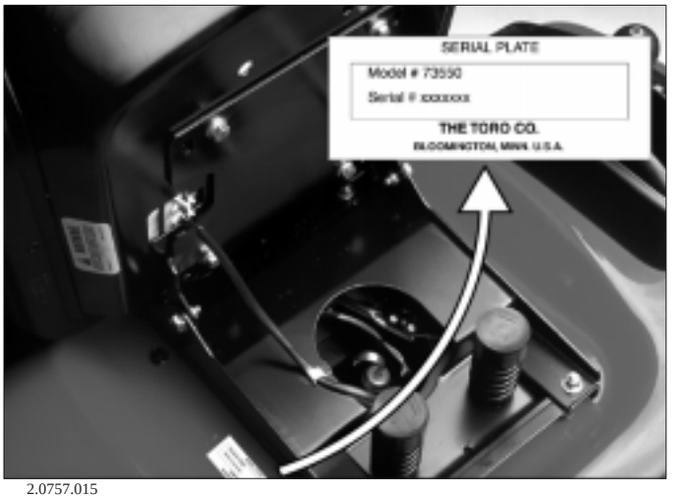
Table of Contents

CHASSIS

MODEL/SERIAL NUMBER LOCATION

The tractor model and serial number plate location is shown in the illustration.

The engine has its own model and serial number identification. Consult the appropriate engine manufacturer's service literature for the location and translation of the engine model and serial number information.



2.0757.015

GREASING AND LUBRICATION

2

Service Interval/Specification

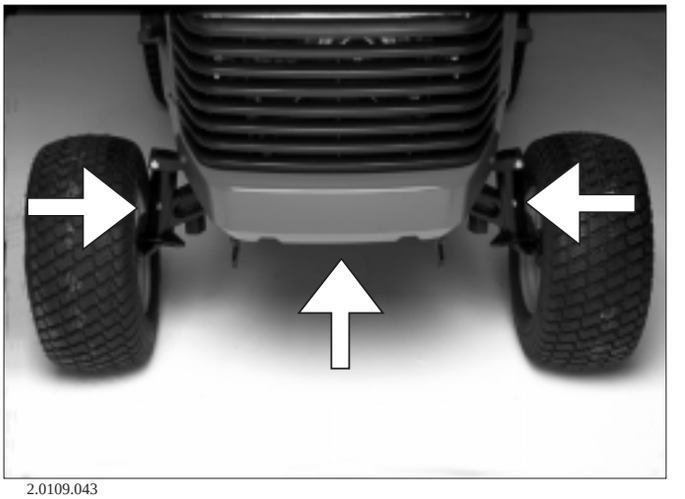
The machine should be greased every 50 hours or yearly, whichever occurs first. You should grease more frequently when operating conditions are extremely dusty or sandy. See the maintenance table in section 1c.

Grease Type: General-purpose lithium base grease

2.0109.033

Lubrication Points

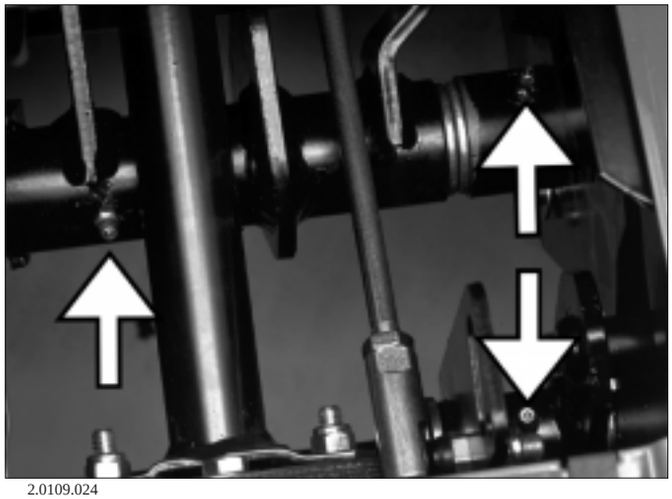
There are 3 grease zerks on the front axle; one on at each spindle and one at the center pivot.



2.0109.043

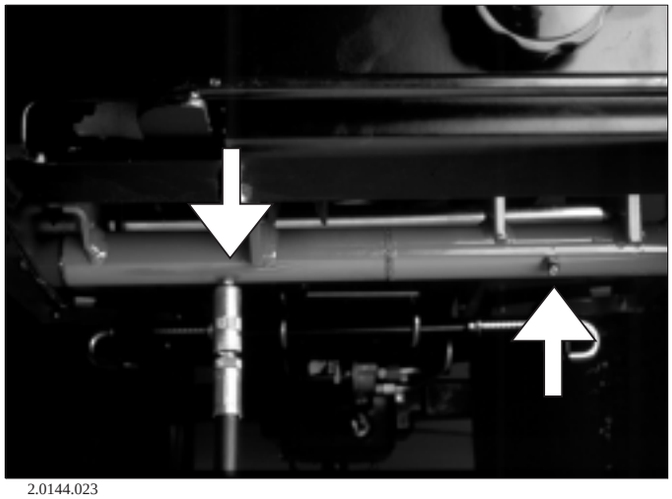
2.0109.026

Remove the maintenance panel located in the tunnel in front of the seat.



2.0109.024

This will allow access to the 3 zerk fittings below.



2.0144.023

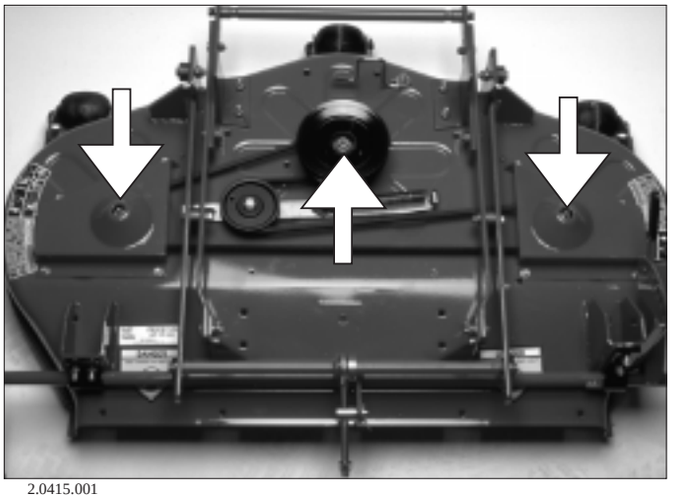
The pulley box for the mower deck contains 2 zerk fittings; one at each pulley pivot.

GREASING AND LUBRICATION (cont'd)

There are 3 zerk fittings located on the mower deck spindles. Apply grease until resistance is felt from the grease gun handle (2-3 pumps).

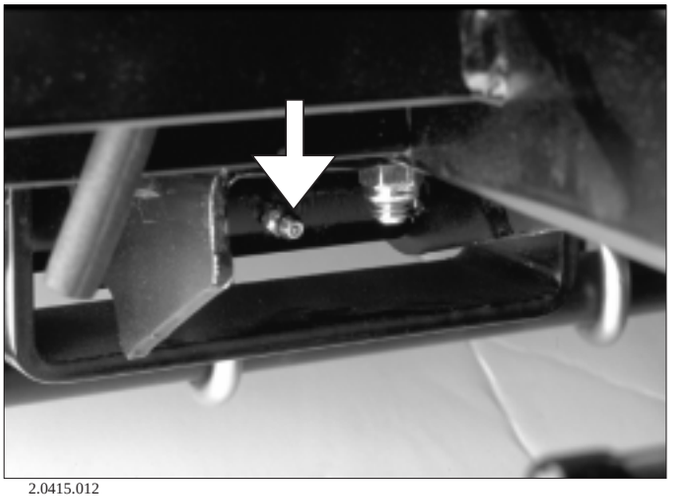
Also lubricate the mower deck idler arm on decks so equipped.

The 60" deck has zerk fittings on the gage wheels, grease every 25 hours of operation.



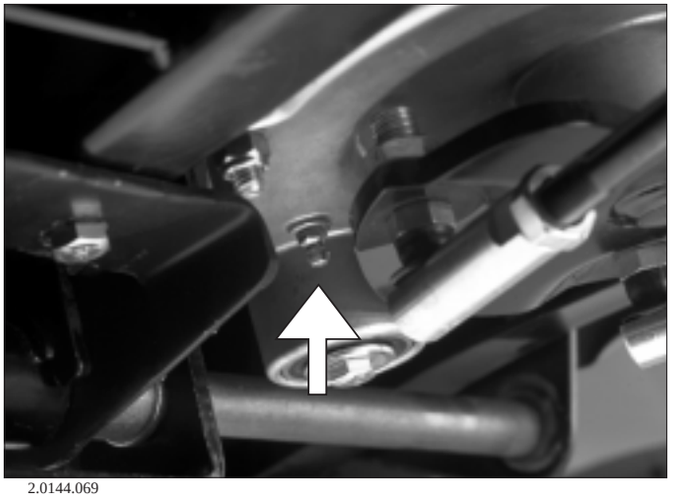
2.0415.001

There is 1 zerk fitting located on the foot pedal shaft which requires greasing.



2.0415.012

Models with manual steering have a lubrication point on the steering gear. Do not force excessive amounts of grease into this fitting (one pump of the grease gun handle only).



2.0144.069

REAR FENDERS, FOOTRESTS, & TUNNEL

General Information

2.0109.039

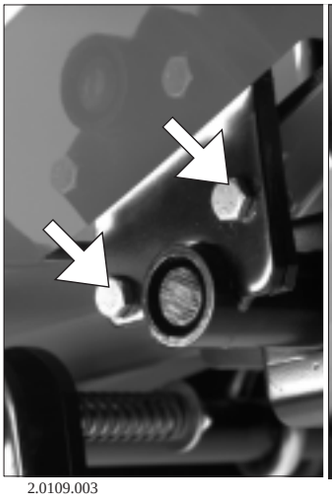
The seat, rear fenders, footrests, and tunnel can be removed as a unit providing easy access to chassis components.

Removal

2.0109.021

1. Disconnect the electrical connections for the seat switch, cruise control, and taillights (as applicable) from the wiring harness.

   NOTE: The cruise control and taillights share the same connector, which is located under the right fender.



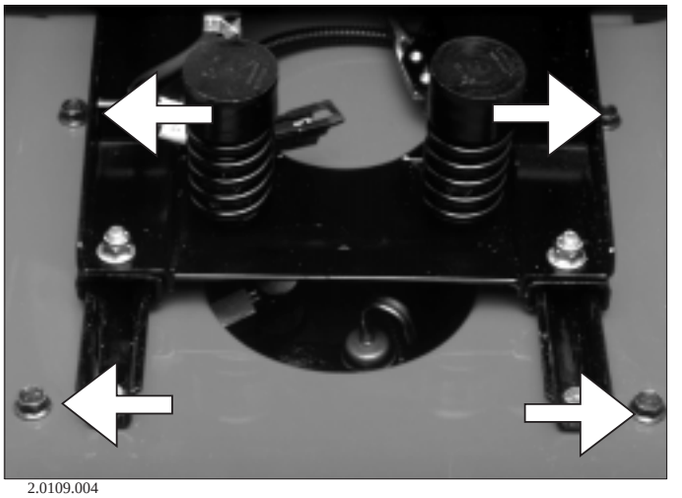
2.0109.003

2.0109.020

2. Remove the brake and motion control pedals.

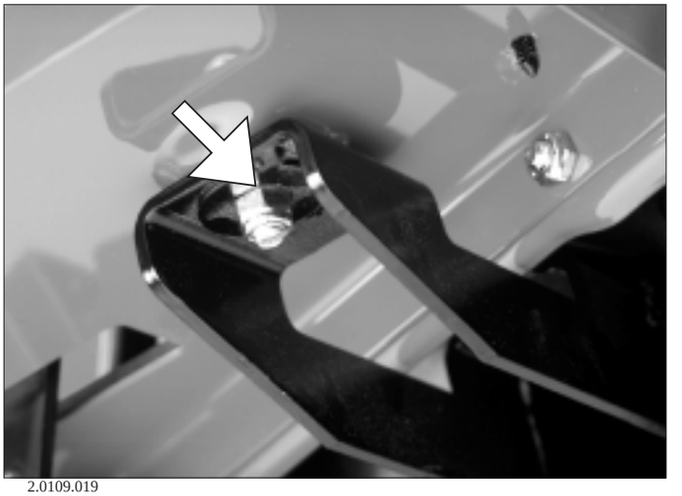
REAR FENDERS, FOOTRESTS, & TUNNEL (cont'd)

3. Remove the four bolts securing the fenders to the frame (two on each side of the seat).



2.0109.004

4. Remove the nuts from the front footrest supports and the clamps from the rear supports.



2.0109.019

5. Remove the three air intake screens.

2.0109.015

2.0109.017

6. Remove the knob for the transaxle range selector.

2.0109.014

7. With the help of an assistant, lift the rear of the fender assembly until it clears the transaxle shift lever. Then remove the assembly to the rear of the tractor.

2.0109.039

Reassembly

Reverse steps 1-7 to reassemble the seat, rear fenders, footrests, and tunnel.

NOTE: Failure to keep all hoses in place on the top of the fuel tank could result in improper operation of the fuel vent or supply system.

NOTE: Do not pinch any wiring between the fender assembly and the top edges of the frame.

FRONT WHEEL TOE-IN

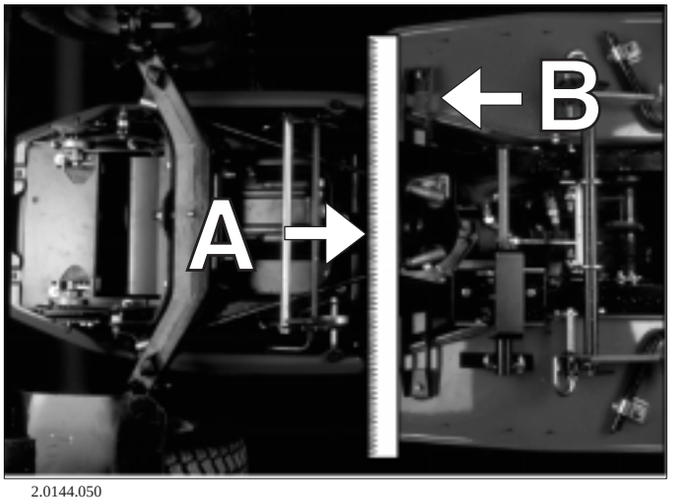
Specification/Service Interval

If there is uneven tire wear, lawn scuffing, or hard steering, toe-in may need to be adjusted. Toe-in should be 1/8" - 1/4" (3 to 6 mm) on the front wheels. This should be checked every 100 hours or once a year, whichever occurs first.

2.0109.043

Measurement

1. Disengage the PTO, set the parking brake, and turn the ignition key to ***OFF*** to stop the engine. Remove the key.
2. Turn wheels straight ahead. Square the lower steering plate to the center line of the frame rails by aligning a straight edge (A) with the footrest support (B) as shown.
3. Push the front of the tires out to remove normal looseness in the linkage.



2.0144.050

4. Measure the distance between both front tires at spindle level (at the front and rear of the wheels).
5. The front measurement should be 1/8" to 1/4" (3 to 6 mm) less than the rear measurement.

If adjustment is needed, follow the steps outlined on the next page.

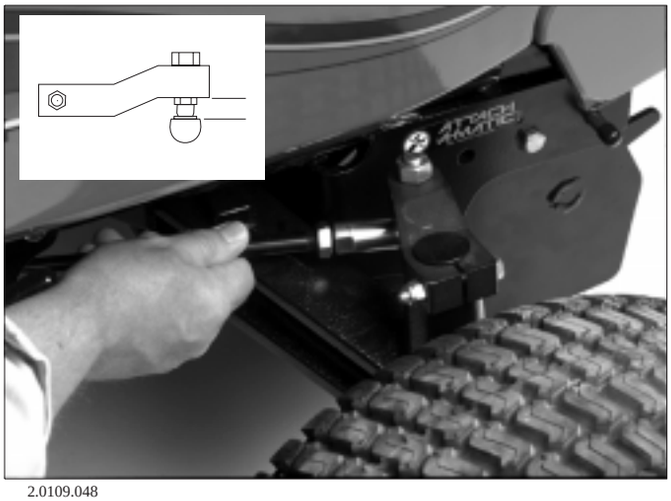
Note: The black steering tie rod end goes to the front and has right hand threads.

2.0109.035

2.0109.047

Adjustment

1. Loosen the jam nuts at the ends of the steering rods.



2.0109.048

2. Rotate both steering rods equal amounts to adjust the toe-in to 1/8" to 1/4" (3 to 6 mm) .
3. Recheck the toe-in as described earlier.

   IMPORTANT: Make sure that the flat surface on the top of the front tie rod ends are parallel to the bottom of the steering arms (inset).

2.0109.046

Spindle Alignment

When installing the spindle to the steering arm, you must align the wheel so that it is parallel to the steering arm as shown.

STEERING WHEEL

Remove Steering Wheel

1. Remove plastic trim cover.
2. Loosen the nut securing the wheel.

2.0144.051

3. Install puller as shown. Tighten forcing screw to remove steering wheel.

   NOTE: Install large flat washers on puller bolts to protect steering wheel.

2.0144.053

Reassembly

1. Place the steering wheel on the shaft, carefully aligning the splines.

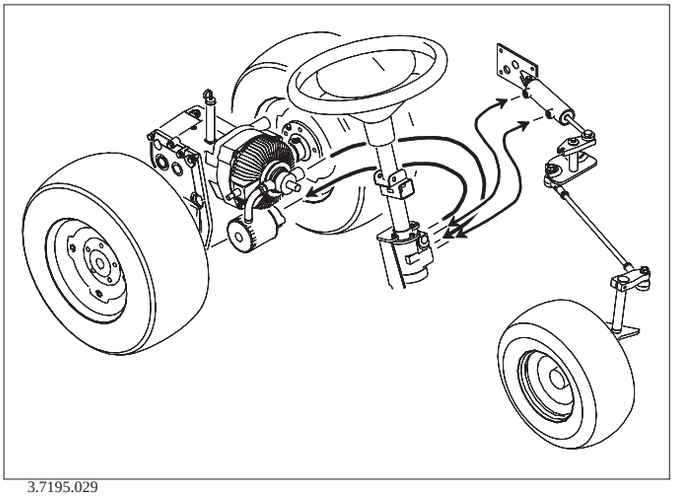
NOTE: On manual steering models, be sure to align steering wheel in the “straight ahead” position. There is **no** fixed “straight ahead” position on power steering models.

2. Torque the retaining nut to 45 - 50 ft·lbs.
3. Replace the trim cover.

2.0144.052

POWER STEERING

General Information



3.7195.029

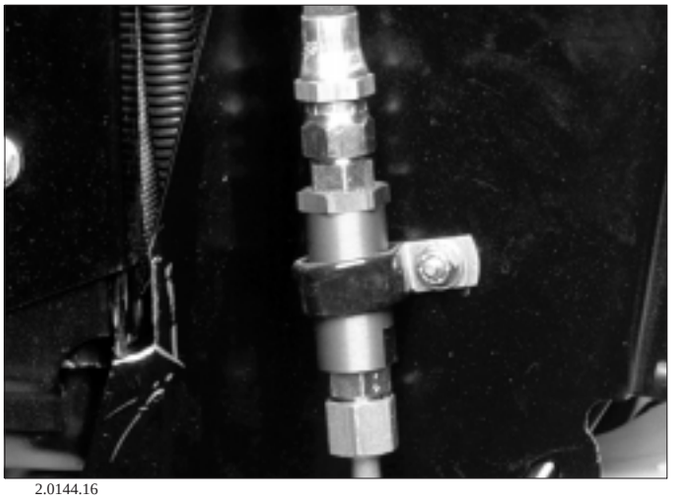
The 22 HP, 20 HP liquid-cooled and 23 HP diesel tractors are equipped with power steering.

This system routes pressurized hydraulic fluid supplied by the hydrostatic transmission to a directional valve located at the base of the steering column. When the steering wheel is turned, this valve directs pressure to a double acting hydraulic cylinder, causing the steering plate to pivot as the cylinder extends or contracts. Tie rods attached to the steering plate turn the front spindles.

2.0109.044

When the tractor is not running, some oil will drain from the power steering system. When this happens, it will be necessary to purge the air from the system. This is done by turning the steering wheel with the engine running until the wheels turn fully and smoothly in both directions.

Maintenance



2.0144.16

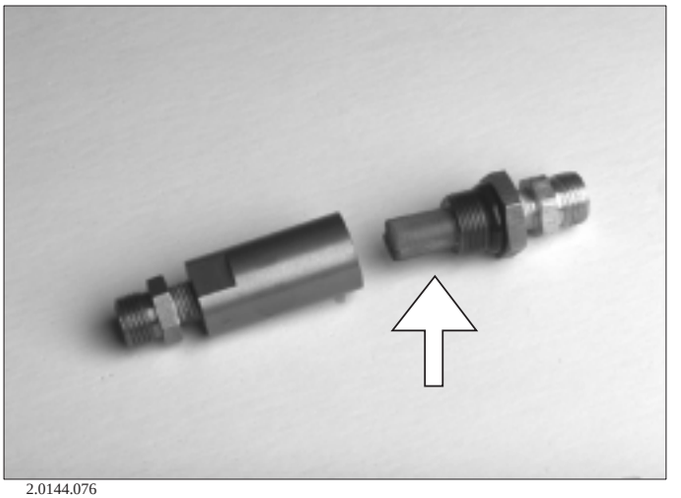
The power steering system is equipped with an in-line filter screen. It should be cleaned after initial 50 hours, then every 200 hours, or if the power steering gets noisy.

To clean the power steering screen:

1. Remove the left and center air intake screens.
2. Remove the screen housing from the clamp securing it to the left-hand side of steering tower.
3. Remove the top hose first to prevent oil from back-flushing the screen.
4. Remove the hydraulic lines, and seal the ends to keep out dirt.

POWER STEERING (cont'd)

3. Disassemble the housing, and clean the screen with solvent.



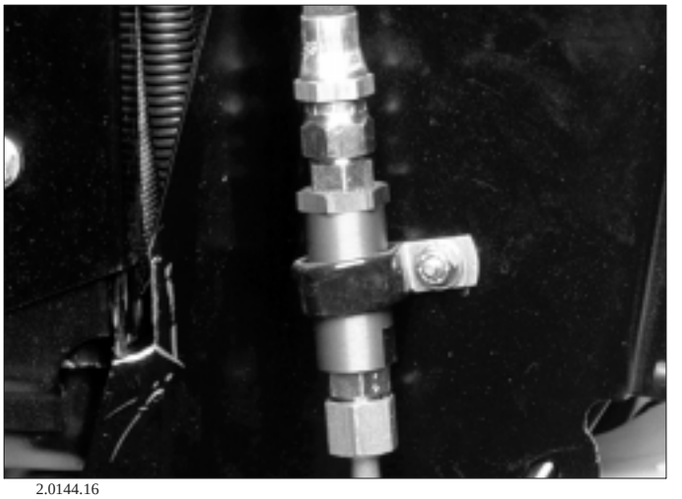
2.0144.076

4. Inspect the "O" rings that seal the lines and housing. Replace them if there are any signs of cuts or deterioration, (i.e. hardening or swelling of the rubber).

   Lubricate the "O" rings before reassembly.

2.0144.086

5. Reassemble the housing, replace the lines, and secure to steering tower.
6. Bleed air from the system by turning the steering wheel from stop to stop several times.
7. Check the hydrostatic transmission fluid level.



2.0144.16

SMART TURN™ STEERING

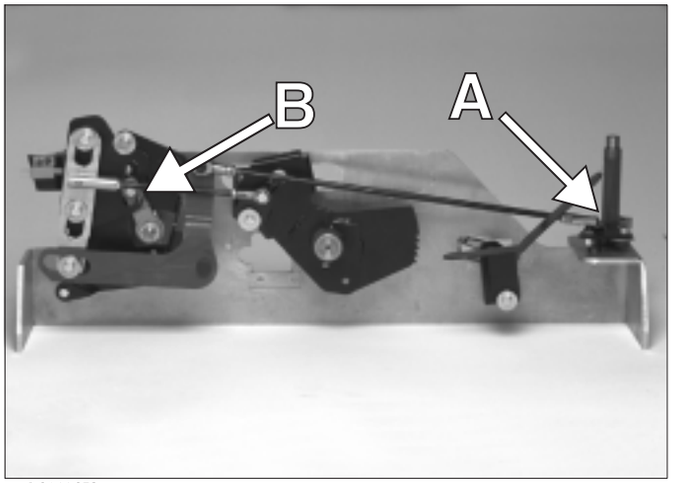
General Information

2.3653.005

The Smart Turn Steering™ feature automatically lowers the speed of the tractor in tight turns. The decrease in speed is directly proportional to the sharpness of the turn, up to a maximum speed reduction of approximately 40% .

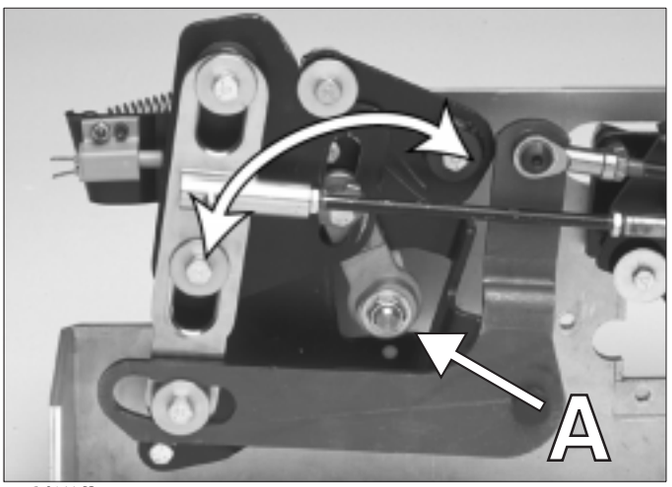
The Smart Turn Steering feature permits sharp turns to be made without always having to change speed control position. The original speed is restored as the turn is completed.

Theory of Operation



2.0144.059

The steering plate (A) is attached to the speed control lever (B) on the hydrostatic transmission through a system of linkage and levers.



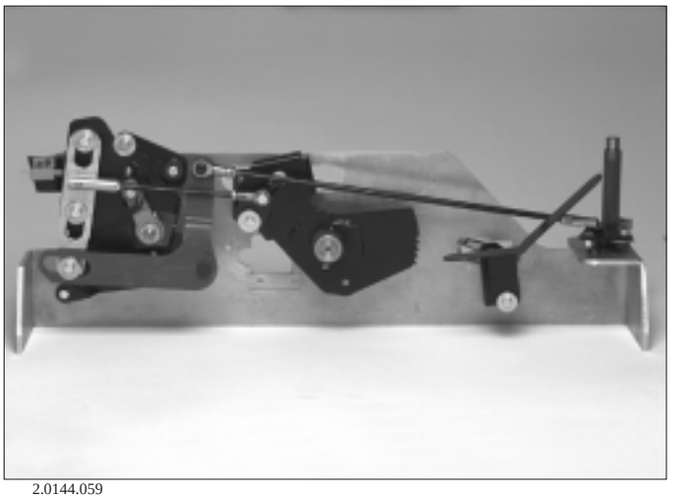
2.0144.63

When the steering wheel is turned, the linkage pushes the speed control lever (A) on the hydrostatic transmission towards the neutral position and slows the tractor.

SMART TURN™ STEERING (cont'd)

Inspection

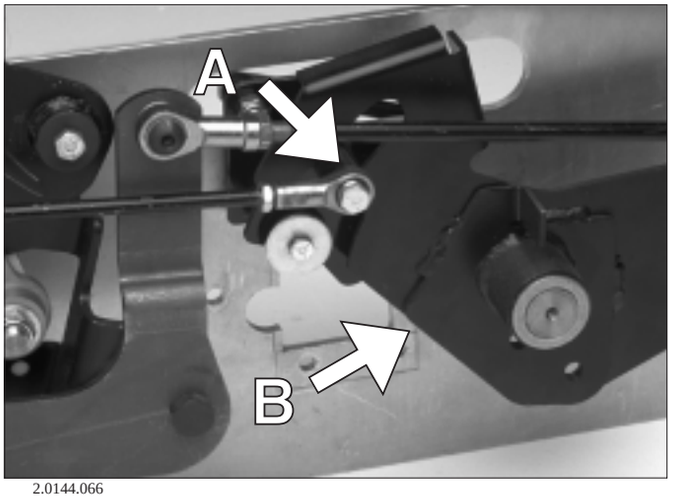
The Smart Turn Steering system was set-up at the factory and should not need any adjustment. Adjustment must be verified if the transaxle is removed and reinstalled.



2.0144.059

Correct adjustment can be verified by checking the position of the bushing (A) in the slot of the brake pivot plate (B). The bushing should not contact either side of the slot.

Correct adjustment can be verified by removing the maintenance panel and visually checking the position of bushing (A). It should be centered in the slot in the brake pivot (B). The bushing should not contact either side of the slot when the brake is applied.



2.0144.066

Adjustments

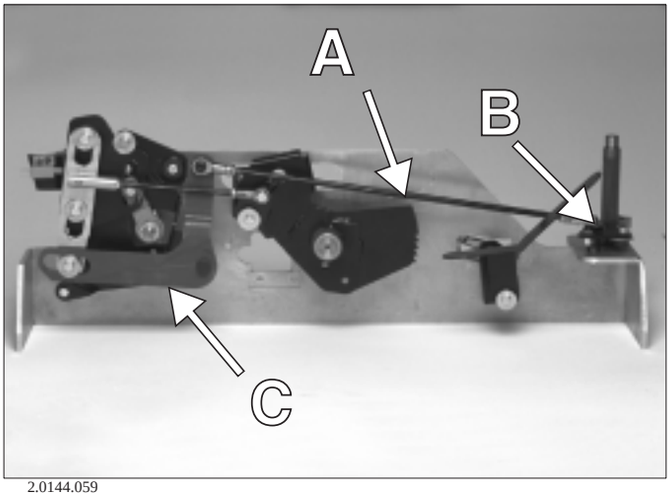
IMPORTANT: The adjustment procedure must be performed in the sequence given.

If adjustment of the system is necessary:

1. Remove the rear fenders and tunnel from the tractor as outlined on page 2-7.

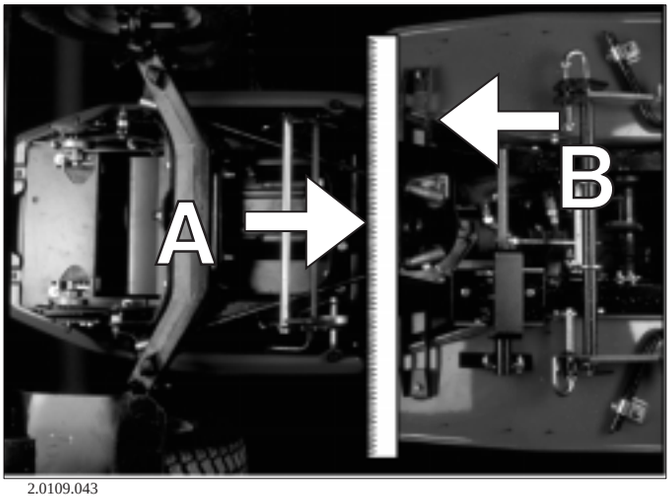
NOTE: It is important that the toe-in is properly adjusted before adjusting the Smart Turn Steering linkage. Verify setting by following the procedure starting on page 2-10.

2.0109.014



2.0144.059

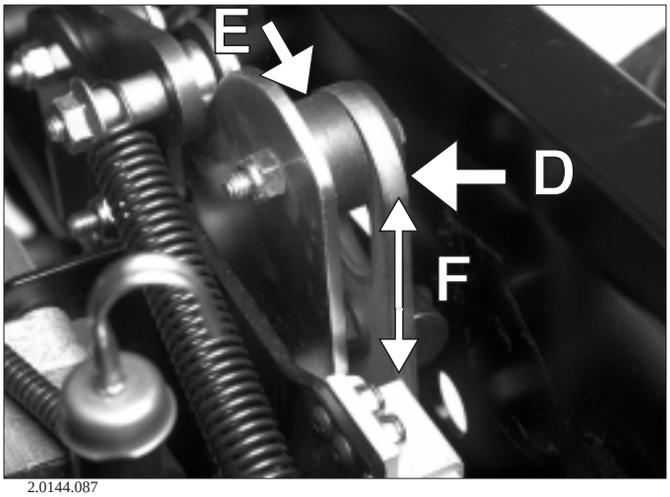
2. Check the adjustment of link (A) which connects the lower steering plate (B) to the bell crank (C). To do this:



2.0109.043

A. Align the front wheels straight ahead so that the front of the lower steering plate is square to the frame rails of the tractor. Verify the alignment by placing a straight edge across the front edge of the lower steering plate (A), aligning it with the foot rest support (B) as described on page 2-10.

Note: Keep wheels aligned straight ahead except where noted.



2.0144.087

B. Check the slider (D) making sure it is all the way down, flush with top of spacer (E).

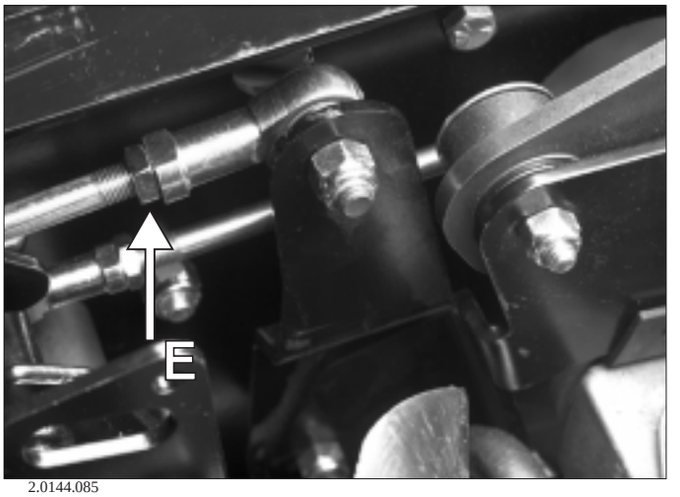
IMPORTANT: There must be a slight vertical looseness (F) in the slider or there may be binding in the pedal linkages. Lift up on the slider to check.

SMART TURN™ STEERING (cont'd)

If the slider is not adjusted correctly, loosen jam nuts (E), and turn the link to adjust the length. Then tighten the jam nuts securely.

NOTE: The front jam nut is left hand thread, and the rear jam nut is right hand thread.

NOTE: Jam nuts "E" are marked with paint at the factory to discourage unnecessary tampering.

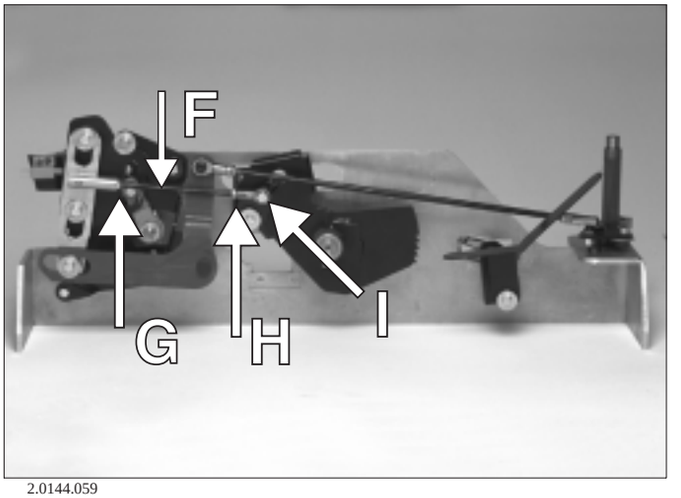


2.0144.085

3. Test the adjustment of link (F) (see page 2-16). If adjustment is necessary:

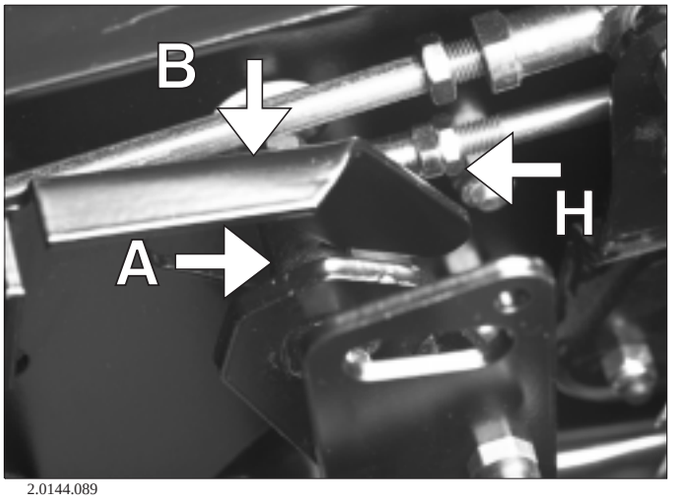
   A. Depress the brake. Push forward lightly on link (F) to remove slack from the system.

G - Rear Jam Nut (Right Hand Thread)
H - Front Jam Nut (Left Hand Thread)
I - Front Rod End Fitting

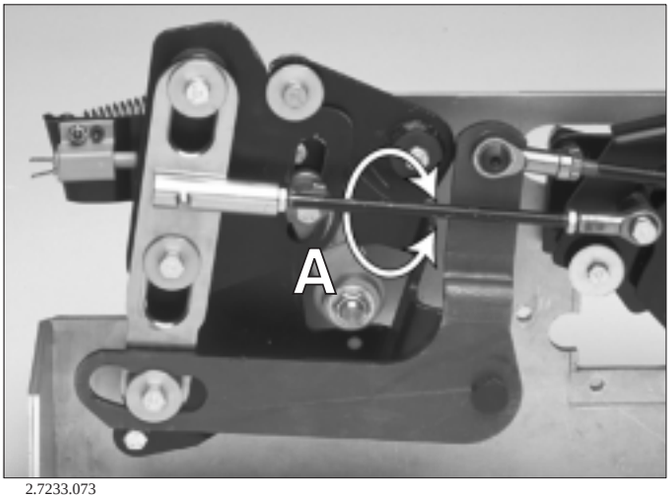


2.0144.059

Check the bushing (A) making sure it is centered in the slot in the brake pivot plate (B). If the bushing contacts the sides of the slot, loosen jam nuts (G and H), and turn the link until the bushing is centered in the slot.



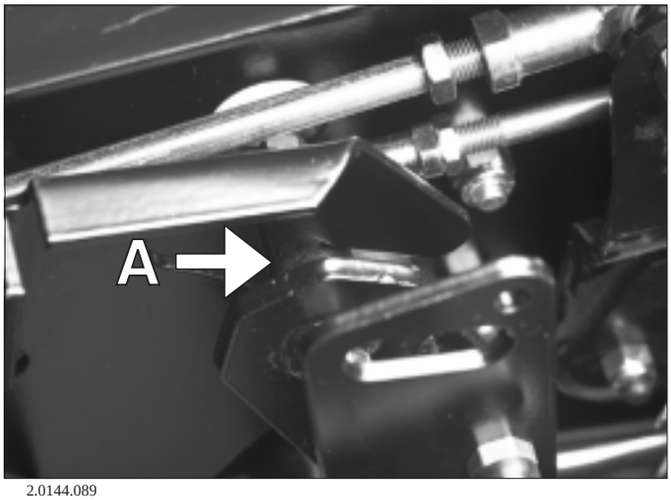
2.0144.089



2.7233.073

Tighten the rear jam nut first. Hold the front rod end fitting while tightening the front jam nut.

IMPORTANT: There must be axial looseness in the rod (A) or there may be binding in the pedal linkages.



2.0144.089

Test the adjustment by cycling the brake. The slot should travel over bushing (A) without touching.

2.0144.072

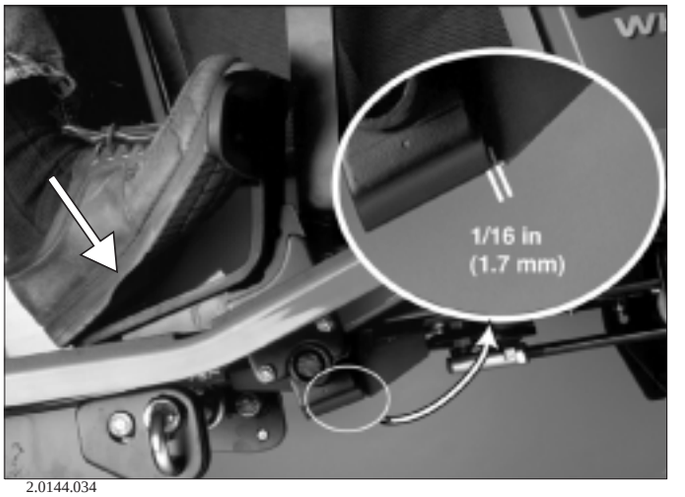
4. Check the neutral adjustment. If the tractor creeps in neutral, adjust the motion control lever following the procedure on page 3-8, Neutral Adjustment in the Hydrostatic Drive section of this manual.

MOTION CONTROL PEDAL

Adjustment

1. Push the motion control pedal to the full reverse position.
2. Check the clearance between the pedal support and the reverse stop.
3. Adjust the rod as necessary to obtain the correct clearance.

   Clearance: 1/16" (1.7 mm)



2.0144.034

TIRE PRESSURE

Pressure: 12 psi (82.7 kPa) front and rear.

Check the tire pressure after every 25 operating hours or monthly, whichever occurs first. Check the tires when they are cold to get the most accurate pressure reading.

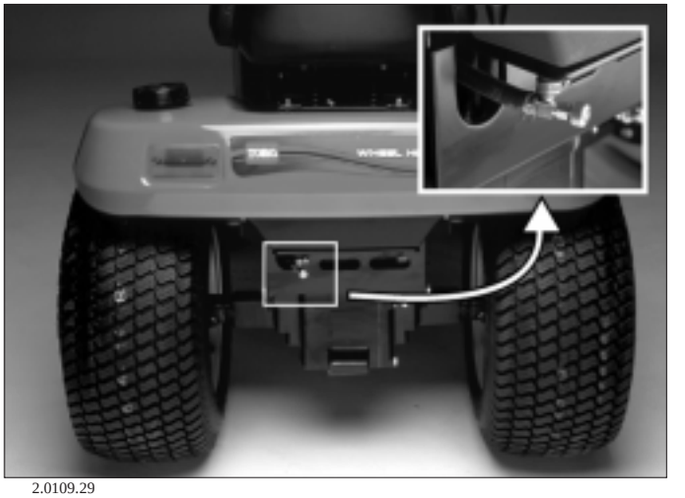
Since tire pressure affects the position of the mower deck, it is important to check the tire pressure before leveling the mower and to maintain the the correct tire pressure to preserve the level adjustment.

2.0109.045

FUEL TANK SHUT-OFF VALVE

The fuel shut-off valve is located on the bottom of the fuel tank.

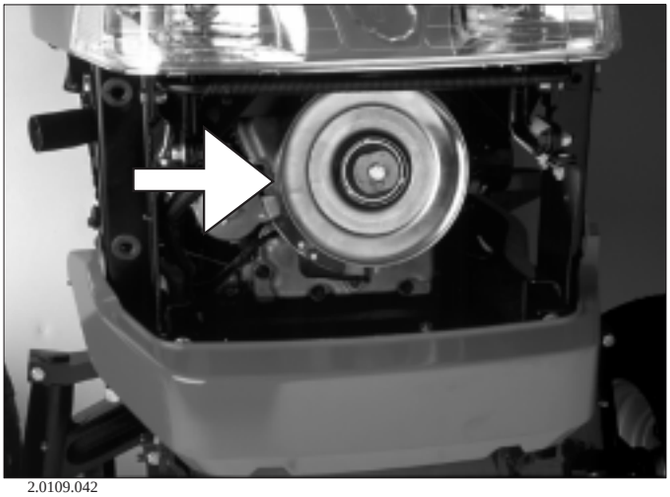
Normally the shut-off valve is kept in the ON position. However, if transporting the tractor on a trailer or truck, it is good practice to place the valve in the OFF position. Although unlikely with this tractor's fuel system design, closing the fuel valve will prevent the possibility of the carburetor flooding over while going over bumps and filling the crankcase with gasoline.



2.0109.29

ELECTRIC PTO CLUTCH

General Information



2.0109.042

The 5xi series garden tractor is equipped with a heavy-duty electric clutch.

This clutch is maintenance free and, therefore, requires no air gap adjustment.

Note: Troubleshooting procedures, for the electric PTO system, are located in the Electrical section of this manual.

If the clutch is replaced, apply high temperature Never Seize to the crankshaft threads, use a new thread locking patch bolt torque to 50 - 60 ft·lb (70 - 84 N·m).

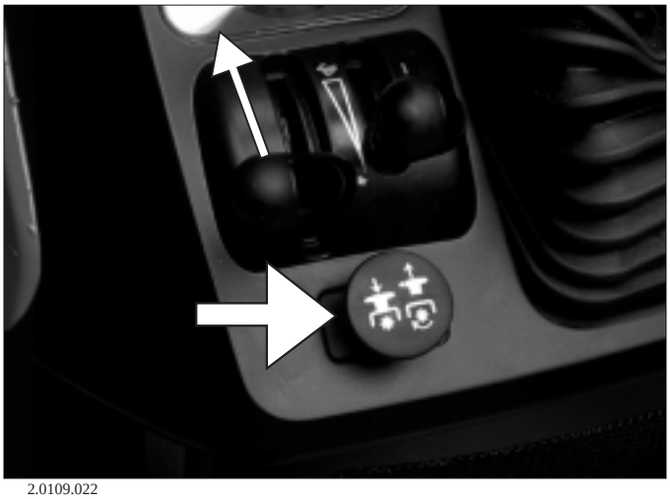
Break-In

2.0757.021

The following break-in procedure must be performed as part of predelivery service or when a new clutch is installed.

NOTE: There must be a PTO driven attachment installed to provide a load in order to burnish the clutch facings properly.

NOTE: After burnish procedure is complete to maximize deck drive life, always engage clutch at full throttle.



2.0109.022

1. Run the engine at full throttle and engage the clutch bringing the load to full speed. Then disengage the clutch.
2. Let the load come to a full stop, then engage again.
3. Repeat these procedures (1 and 2) 5 times.

DRIVE SHAFT

General Information

Power is transmitted from the engine to the transmission by a drive shaft running between the frame rails.

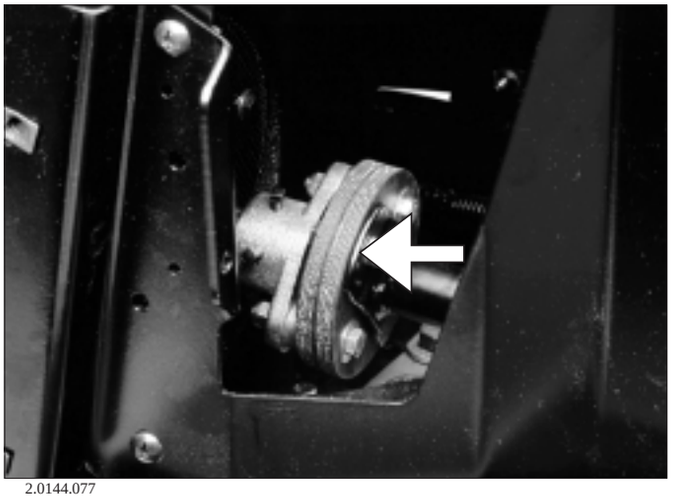
The drive shaft is supported by two flexible couplings located at each end.

The drive shaft assembly requires no periodic maintenance or adjustments.

2.0144.005

Inspection

Visually inspect the flexible couplings for tears, fraying, or deterioration.

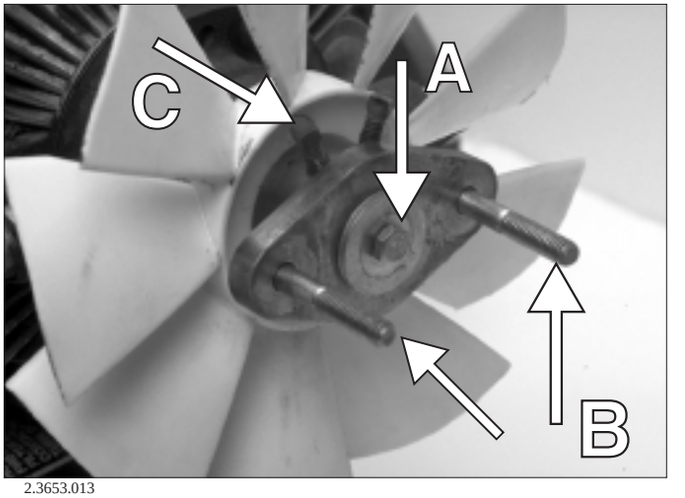


2.0144.077

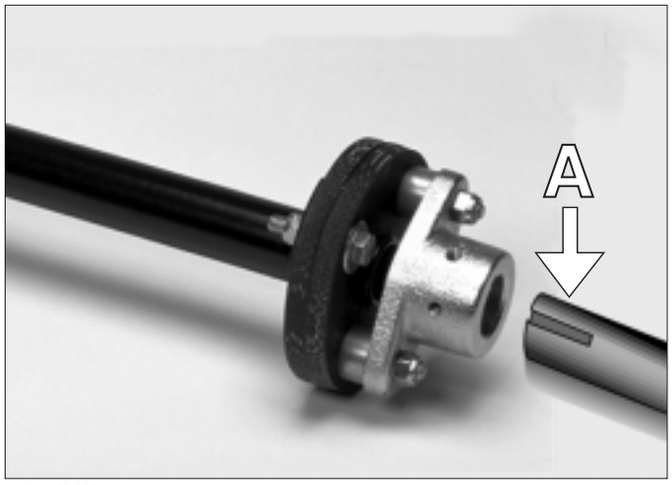
Assembly

1. Insert the two drive shaft retaining screws (B) through the rear flange with the bolt heads toward the transmission. Place the rear flange over the woodruff key on the transmission input shaft. Torque the retaining bolt (A) to 90 - 120 in·lbs (122 - 163 N·m).
2. Torque the two set screws (C) to 120 - 160 in·lbs (163 - 217 N·m).

   IMPORTANT: Assembly procedure must be performed in the correct sequence.

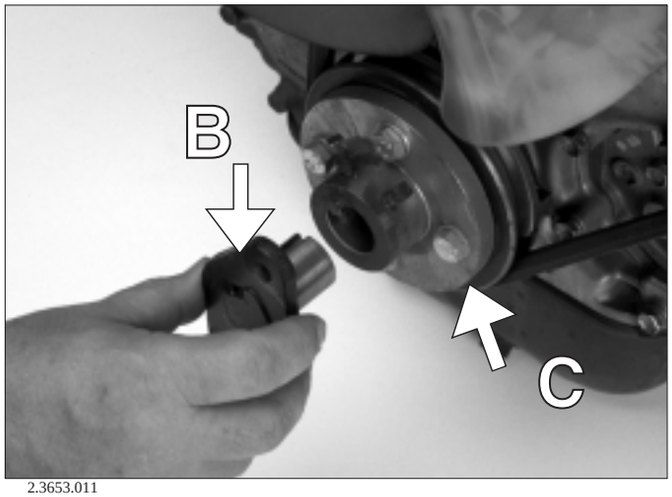


2.3653.013



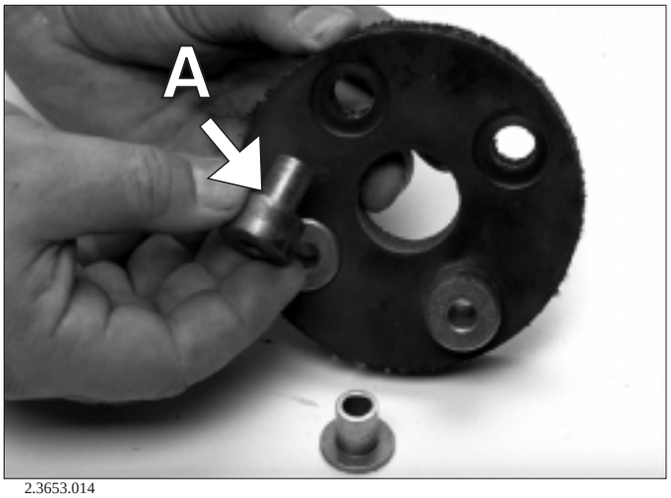
2.7162.005

3. On the engine end of the driveshaft, slide the front flange over the square key on the engine crankshaft (A).



2.3653.011

Note: On diesel powered tractors, the key is fitted to the flange (B). Then the flange is slid into a hub (C) mounted to the crankshaft's pulley.



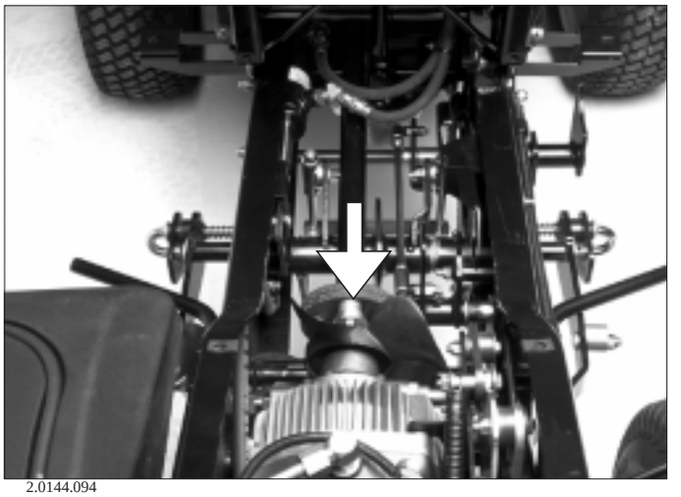
2.3653.014

4. Install the four spacers through the rubber couplings making sure they are properly seated and squared to the coupling.

   Note: The spacers with the tall heads (A) attach the coupling to the flange on the transmission.

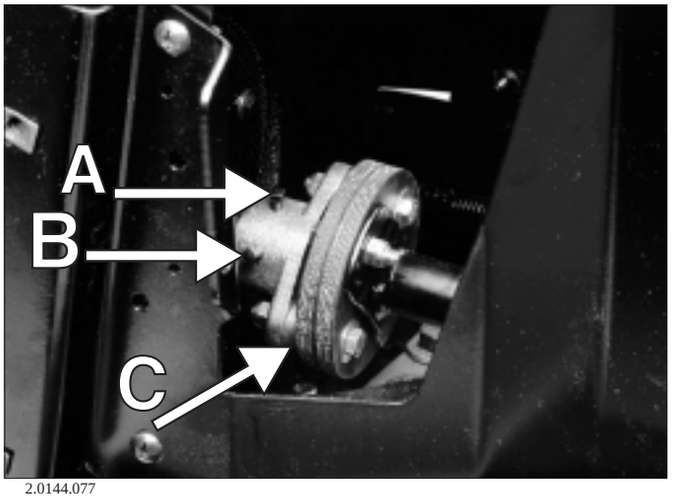
DRIVE SHAFT (cont'd)

5. Install the drive shaft to the rear flange by sliding the long head spacers over the bolts. Torque the nuts to 170 - 220 in·lbs (231 - 299 N·m).


2.0144.094

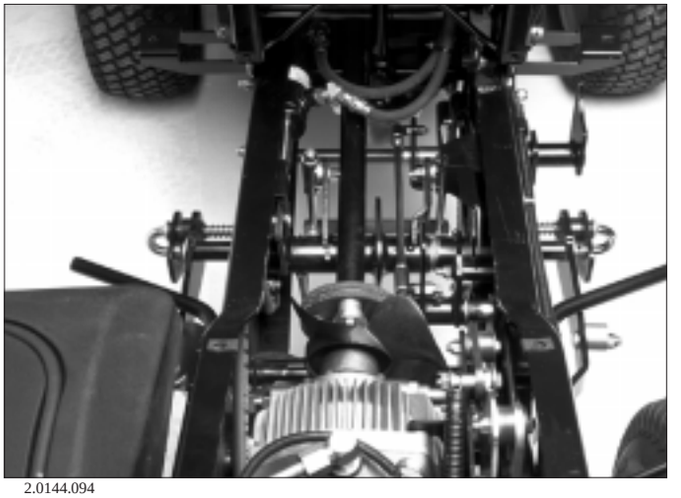
6. Align the bolt holes in the tall headed spacers (C) in the front flexible coupling with the bolt holes in the flange and slide flange on shaft up to the spacers. Install the nuts, bolts, and washers. Washer and bolt head are against flexible coupling; nut is on back side of flange. Then torque the bolts to 170 - 220 in·lbs (231 - 299 N·m).
7. Torque the two set screws(A) and (B) to 120 - 160 in·lbs (163 - 217 N·m).

   The flex coupling should be deformed no more than 1/8" out of flat.



2.0144.077

Rotate the drive shaft, and check for excessive run out which can cause vibration.


2.0144.094

QUICK REFERENCE SECTION

SERVICE SECTION

Table of Contents

Whenever a problem occurs with the hydrostatic drive system, you should always check these items first:

1. Transmission oil is at proper level and air is bled from system.
2. Make sure the high-low speed lever is not in neutral.
3. Speed control linkage is functioning properly.
4. Cruise control is turned off.

Tractor will not operate in either direction because the engine bogs down or stalls.

Possible Cause	Corrective Action
Low transmission oil level	Fill to full “F” mark on dipstick (when trans. is cold)
Motion control linkage	Adjust, repair, or replace
The brake is sticking	Repair linkage; replace brake assembly
Brake adjustment it too tight	Adjust the brake

Tractor goes forward only at partial speed and is slow or does not operate in reverse.

Possible Cause	Corrective Action
The cruise control was engaged when the High-Low range lever was in “N.”	Turn the cruise control off
The engine is running at partial speed	Move the throttle to “FAST.”
The Linkage is out of adjustment	Verify full motion is obtain on motion control shaft. Adjust if necessary.
There is Internal hydro wear	Repair/replace transmission

Tractor will not operation in either direction.

Possible Cause	Corrective Action
The transmission oil is low	Fill to full “F” mark on transmission oil dipstick when transmission is cold
The control linkage needs adjustment or replacement	Adjust, repair, or replace
The parking brake was not released or the parking brake is not releasing	Release the parking brake or check the linkage
The drive shaft or wheel hub key has been damaged	Replace
Faulty transmission/transaxle	Repair/replace transmission/transaxle
The power steering filter is dirty	Clean power steering filter

TROUBLESHOOTING (cont'd)

Tractor operates erratically.

Possible Cause	Corrective Action
The transmission control linkage needs adjustment or replacement	Adjust, repair, or replace
The transmission oil level is low	Fill to the full "F" mark on the transmission oil dipstick when transmission is cold
The transmission is faulty	Repair/replace

Tractor operates in both directions but with loss of power. Condition becomes worse as transmission becomes hot.

Possible Cause	Corrective Action
The transmission oil level is low	Fill to the full "F" mark on the transmission dipstick when transmission is cold
The transmission shows signs of overheating or water contamination	Replace the transmission oil and filter
The cooling fan and/or transmission cooling fins are faulty or dirty	Clean the transmission and/or replace the fan.
The engine is not operating at full throttle	Increase the engine speed to full throttle
The power steering filter is dirty	Clean the power steering filter

Transmission overheating.

Possible Cause	Corrective Action
Not operating engine at full throttle	Increase engine speed to full throttle
Low oil level	Fill full "F" mark on dipstick (when trans. is cold)
Accumulation of dirt and debris on hydrostatic trans.	Clean
Loose fan or broken blades	Repair or replace

Abnormal vibration or noise.

Possible Cause	Corrective Action
The engine mounting bolts are loose	Tighten the engine mounting bolts
The idler pulley or cutter deck blade is loose	Tighten the appropriate pulley
The transaxle cooling fan is loose	Repair or replace as necessary
There is a problem with the electric clutch	Repair or replace as necessary

TRANSAXLE FLUID

General Information

2.0144.029

All models of the 5xi series tractor are equipped with the Toro Wheel Horse transaxle with the Eaton model 11 hydrostatic transmission. The transmission is equipped with a charge pump which supplies hydraulic pressure to operate the attachment lift and power steering on units so equipped . The charge pump also provides pressurized fluid to the transmission pump to make up for normal internal leakage.

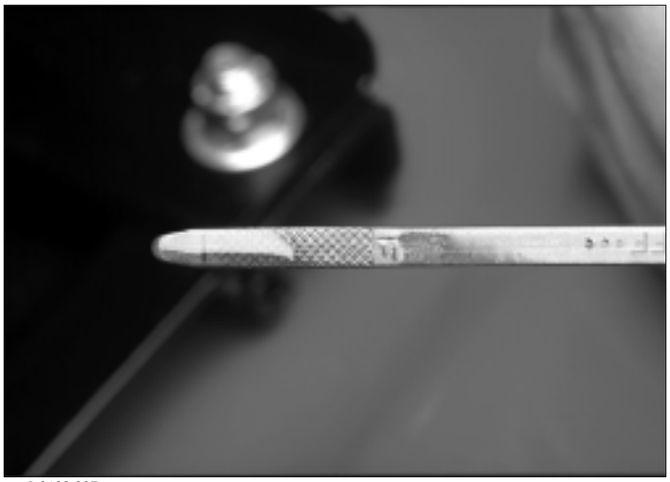
FLUID TYPE: SAE 10W-30 detergent oil (API service SH or higher).

Checking Fluid Level

2.0757.015

1. The transaxle fluid level must be checked when the machine is cold and parked on a level surface.
2. Tilt the seat forward.
3. Clean around the dipstick to prevent dirt from falling into the system when the dipstick is removed.

   NOTE: Allowing dirt in the reservoir may result in severe damage to the transmission.



2.0109.007

4. Remove the dipstick. If necessary, add oil to the Full line on the dipstick.

   IMPORTANT: Do not fill the reservoir above the FULL line as the reservoir may overflow during use.

TRANSAXLE FLUID (cont'd)

Fluid Change

The hydrostatic fluid should be changed every 200 hours of operation.

Remove the drain plug and drain the transaxle fluid into a suitable container.

Replace the drain plug, and fill the transaxle to the FULL mark with 10W-30 detergent oil with an API service rating of SH or higher.

System Capacity (refill capacity is 4.5 quarts):

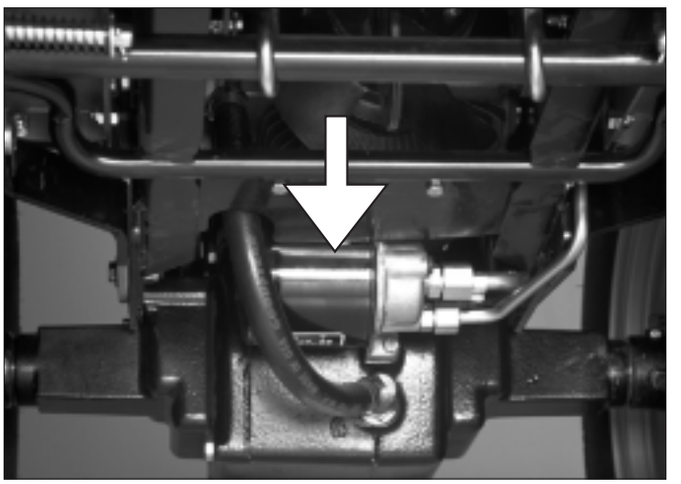
With power steering: 7 qts. (6.6 l)

Without power steering: 6 qts. (5.6 l)

2.0415.004

Filter change

The transaxle is equipped with a 10 micron spin-on oil filter. This filter should be changed after the first 50 hours of operation and then every 200 hours thereafter.



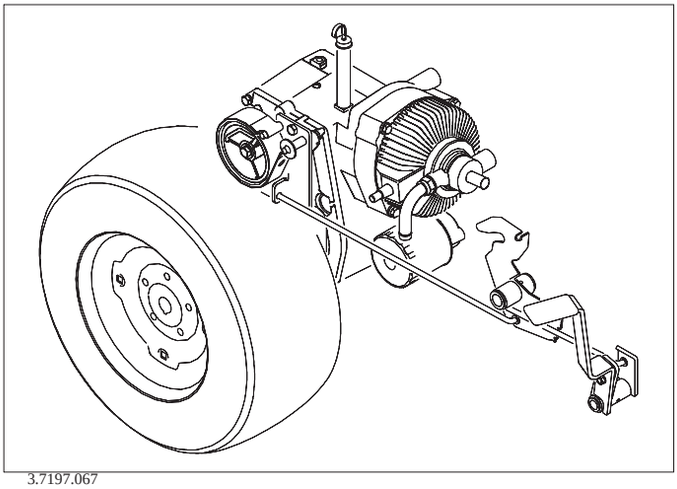
2.0144.031

When replacing the filter, coat the gasket with transaxle fluid. Tighten until the gasket contacts the base, then an additional 1/2 turn.

2.0144.014

BRAKE

General Information



3.7197.067

The 5xi series series tractor is equipped with an external band parking brake which is located on the right side of the transaxle.

When the brake pedal is pressed, the linkage returns the transmission to neutral, then applies the brake.

The primary function of the brake is to keep the tractor from rolling after it has been stopped. It can also be locked in the applied position and serves as the parking brake.

Adjustment

2.0109.005

1. Place the transmission in neutral.
2. Depress the brake pedal. There should be 2" (51 mm) of free travel.

2.0109.010

4. Turn the adjustment nut until the above condition is met.

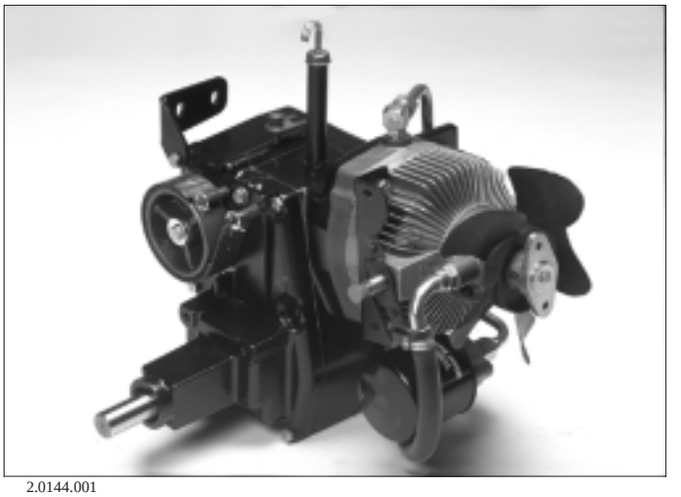
   CAUTION: Do not overtighten the adjustment nut.

NEUTRAL ADJUSTMENT

General Information

The hydrostatic transmission linkage is designed to be self-centering or “return to neutral”. If the wheels continue to drive with no pressure on the control pedal (tractor creeps), neutral adjustment is required.

CAUTION: The hydrostatic cooling fan will be spinning. Use extreme caution to avoid making contact with the fan while performing this adjustment.

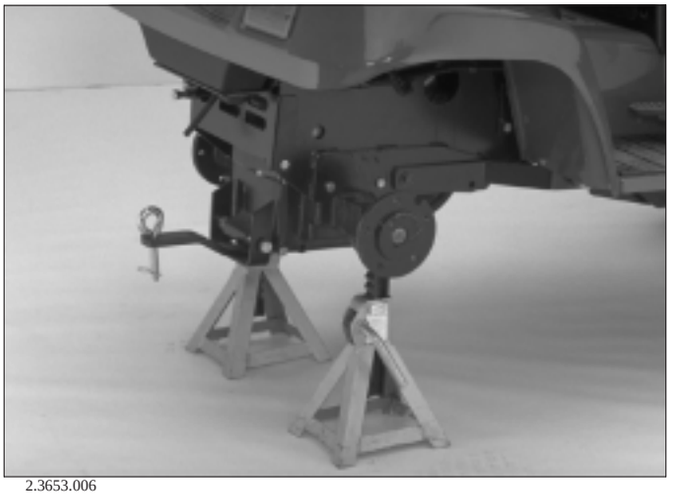


2.0144.001

Adjustment Procedure

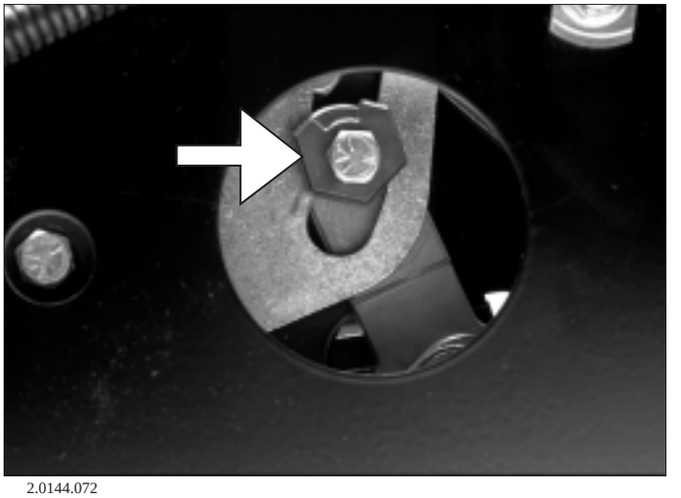
1. Bring the hydrostatic transmission up to operating temperature.
2. Place the rear axle on jack stands, and remove the rear wheels.

NOTE: Do not set the parking brake.

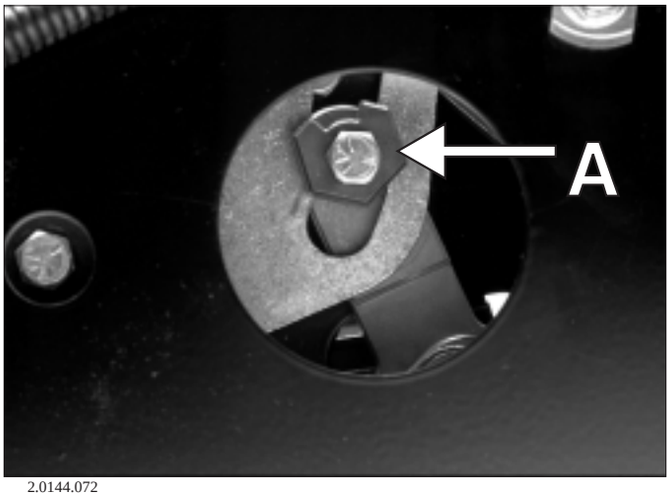


2.3653.006

3. To gain access to the adjustment eccentric, turn the front wheels in either direction to the steering stop.

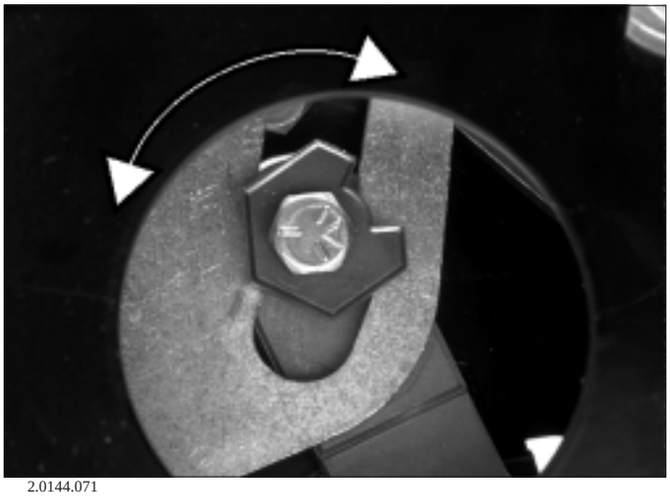


2.0144.072



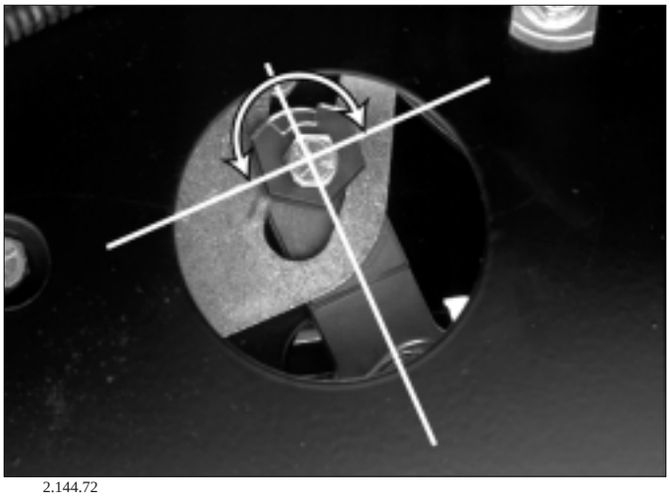
2.0144.072

4. Loosen the through bolt just enough to allow rotation of the eccentric (A).



2.0144.071

5. With the engine running, rotate the eccentric until the right rear wheel hub begins to turn. Note the position of the eccentric. Rotate the eccentric in the opposite direction until the wheel hub again begins to turn.



2.144.72

6. Center the eccentric between these points, and tighten the through bolt while holding the eccentric.

   NOTE: Do not turn the eccentric more than 90° in either direction. Notch in eccentric must be away from pivot point of control arm.

GASOLINE ENGINE

QUICK REFERENCE SECTION

SERVICE SECTION

Table of Contents

Engine cranks but will not start.

Possible Cause	Corrective Action
Incorrect starting procedure	Ensure throttle is at full, and choke is on
The fuel tank is empty	Fill with fresh fuel
The fuel shut-off valve is closed	Open fuel shut-off valve
Dirt or water is in the fuel system	Drain and flush fuel system; add fresh fuel
Clogged fuel line	Clean or replace
The spark plug lead is disconnected	Reconnect spark plug
The kill relay not energized	Inspect safety switches and wiring
A spark plug is faulty	Replace spark plug
Faulty ignition module	Replace ignition module

Starter does not crank.

Possible Cause	Corrective Action
Blown or loose fuse	Determine cause, correct and replace fuse
Battery is discharged	Charge battery or replace if necessary
Safety interlock system malfunctioning	Inspect safety switches and wiring harness
Faulty starter or starter solenoid	Replace
Seized internal engine components	Replace
Poor ground; loose connections	Clean and tighten

Engine starts but does not keep running.

Possible Cause	Corrective Action
Misadjusted or faulty choke or throttle control cable	Adjust or replace
The fuel tank vent is restricted	Vent system hoses kinked or plugged, clean or repair
Dirt or water in the fuel system	Drain and flush fuel system; add fresh fuel
The fuel filter is clogged	Replace the fuel filter
The fuel pump is faulty	Repair or replace
The carburetor is faulty	Clean or rebuild
Loose wires or poor connections	Check and tighten wire connections
The cylinder head gasket is faulty	Replace

Engine is difficult to start.

Possible Cause	Corrective Action
Improper starting procedure	Ensure throttle is at full, and choke is on
Dirt or water in the fuel system	Drain and flush fuel system, add fresh fuel
Clogged fuel filter	Replace
Loose wires or poor connections	Troubleshoot and repair
Misadjusted or faulty choke or throttle control cable	Adjust or replace
Faulty spark plug	Replace
Low compression	Test compression, correct as needed

TROUBLESHOOTING (cont'd)

Engine runs but knocks or misses.

Possible Cause	Corrective Action
Dirt, water, or stale fuel is in the fuel system	Drain and flush the fuel system; add fresh fuel
A spark plug lead is loose	Reconnect the spark plug lead
A spark plug is faulty	Replace the spark plug
Loose wires or poor connections	Check and tighten wire connections
Engine overheating	See *ENGINE OVERHEATS*

Engine will not idle.

Possible Cause	Corrective Action
The fuel tank is restricted	Check hoses, clean or replace
Dirt or water is in the fuel system	Drain and flush fuel system; add fresh fuel
A spark plug is faulty	Replace the spark plug
Carburetor idle passages are plugged	Clean or replace carburetor
The Idle speed adjusting screw is incorrectly set	Reset to factory specifications
The fuel pump is faulty	Repair or replace
Low compression	Test compression, correct as needed

Engine overheats.

Possible Cause	Corrective Action
(3) air intake screens are dirty	Clean with every use
Restricted air flow into the engine or radiator	Inspect & clean the (3) air intake screens & radiator screen
The crankcase oil level is incorrect	Fill or drain to the full mark
The fuel mixture is lean	Clean carburetor, check float level, and inspect main jet
Excessive loading	Reduce load; use lower ground speed
Defective thermostat	Replace the thermostat
More coolant is needed	Check and add coolant

Engine loses power.

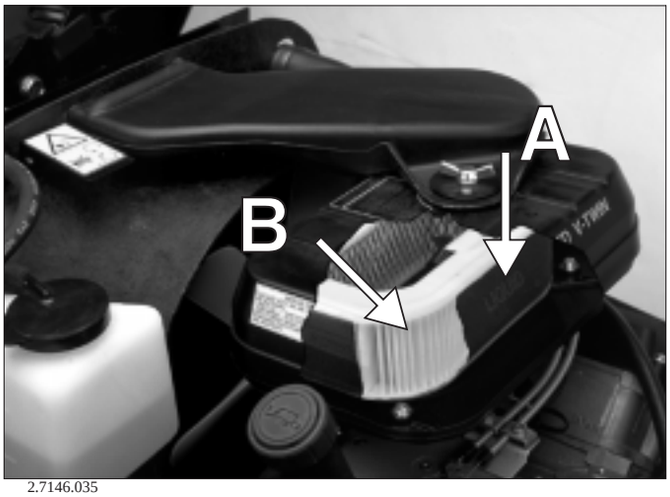
Possible Cause	Corrective Action
The crankcase oil level is incorrect	Fill or drain to the full mark
The air cleaner element is dirty	Clean or replace
Dirt, water, or stale fuel is in the fuel system	Drain and flush fuel system; add fresh fuel
The engine is overheated	See ENGINE OVERHEATS
A spark plug is faulty	Replace the spark plug
Low compression	Test compression, correct as needed

Engine knocks.

Possible Cause	Corrective Action
Old or improper fuel	Drain system and add fresh fuel
Internal wear or damage	Inspection required

AIR CLEANER

Service Interval/Specification



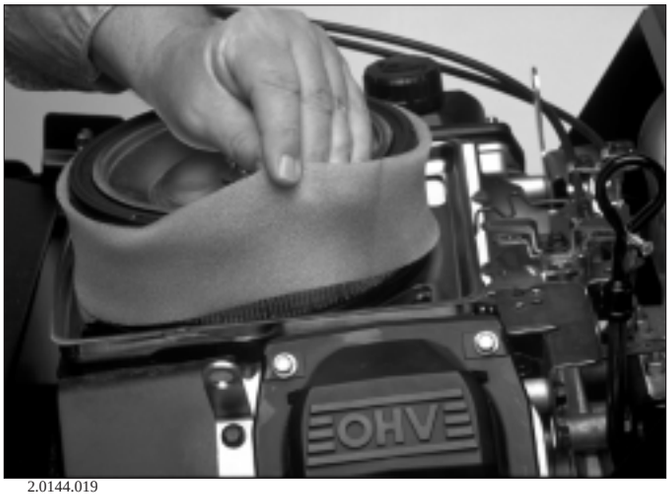
2.7146.035

Foam Element (A): Clean and re-oil after every 25 operating hours, or yearly, whichever occurs first.

Paper Element (B): Replace after every 100 operating hours or yearly, whichever comes first.

NOTE: Service the air cleaner more frequently (every few hours) if operating conditions are extremely dusty or sandy.

Cleaning



2.0144.019

FOAM ELEMENT

1. Wash the foam element in liquid soap and warm water. When the element is clean, rinse it thoroughly.
2. Dry the element by squeezing it in a clean cloth.
3. Put one or two ounces of oil in the element. Squeeze the element to distribute the oil.

   IMPORTANT: Replace the foam element if it is torn or worn.


2.0144.099

PAPER ELEMENT

1. Lightly tap the element on a flat surface to remove dust and dirt.
2. Inspect the element for tears, an oily film, or damage to the rubber seal.

   IMPORTANT: Never clean the paper element with pressurized air or liquids, such as solvent, gasoline, or kerosene. Replace the paper element if it is damaged or defective.

GASOLINE ENGINE

ENGINE OIL

Service Interval

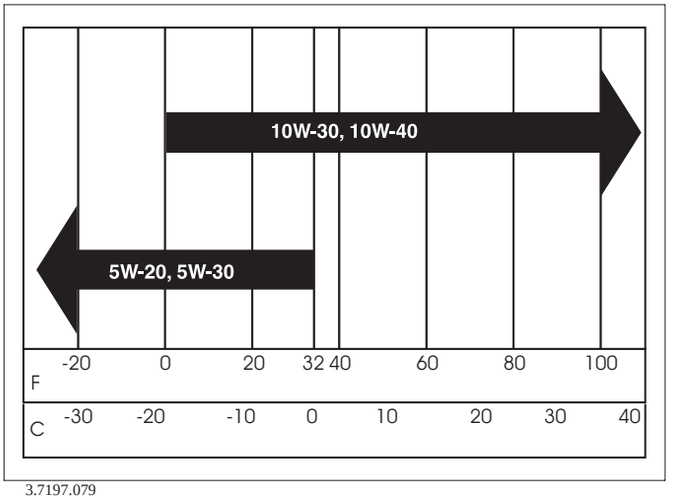
Oil Type: Detergent oil (API service SH or higher).

Crankcase capacity (with filter): 3.8 pt. (1.8 l).

Viscosity: See table.

Change oil:

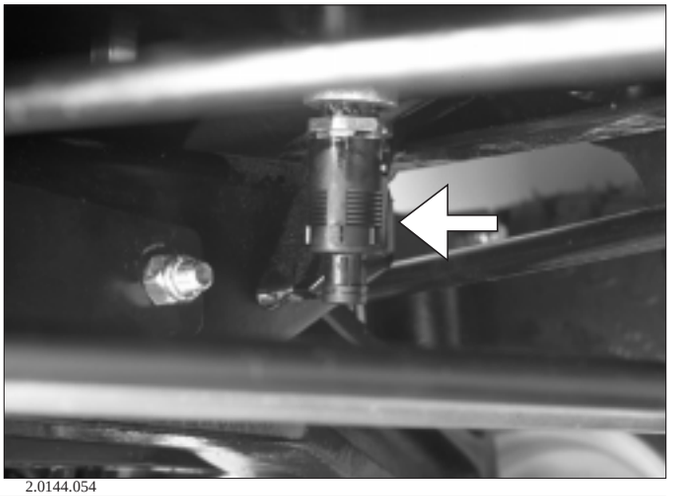
- After first 5 operating hours.
- After every 100 operating hours.



3.7197.079

Changing/Draining

1. Run the engine for five minutes.
2. Park the machine so the drain side is slightly lower than the opposite side. Set the parking brake and turn the engine off.
3. Slide a piece of 1/2" (12 mm) hose over the oil drain.
4. Open the drain by turning it clockwise 1/8 turn and pull it out.
5. Let oil drain completely. Close drain.
6. Refill with recommended oil.

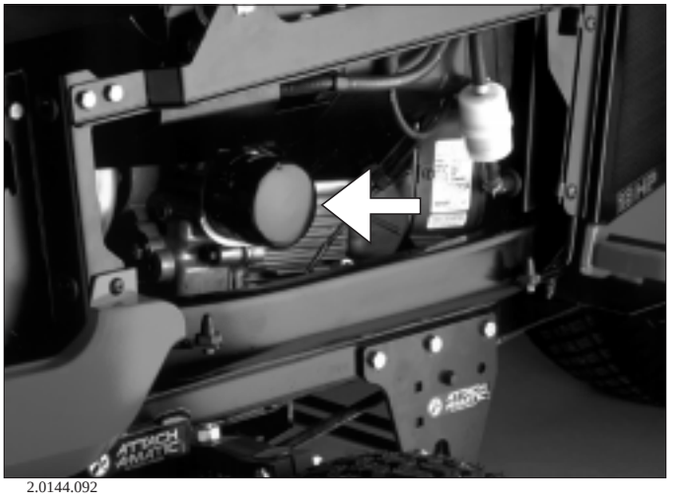

2.0144.054

OIL FILTER

Service Interval/Specification

Replace the oil filter every 200 hours or every other oil change.

NOTE: Change the oil filter more frequently when operating conditions are extremely dusty.

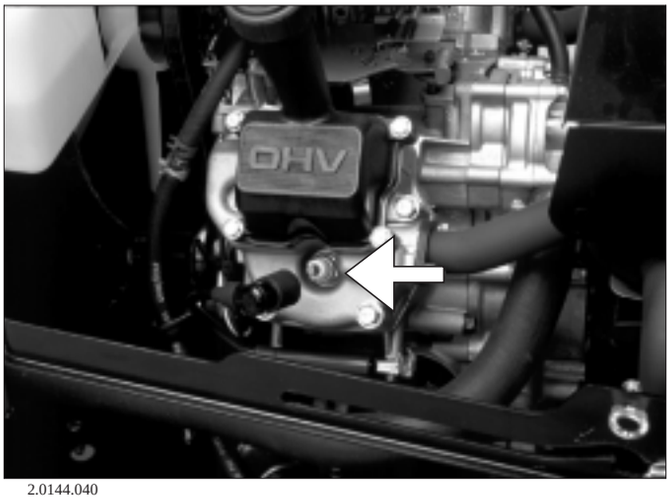

2.0144.092

3.0144.014

Changing

1. Drain the oil from the engine.
2. Remove the old filter and wipe the filter adapter gasket surface.
3. Apply a thin coat of new oil to the rubber gasket on the replacement filter.
4. Install the new filter to the filter adapter. Turn the filter clockwise until the gasket contacts the filter adapter, then tighten the filter an additional 1/2 turn.
5. Fill the crankcase with the proper oil.

SPARK PLUG



2.0144.040

Service Interval/Specification

Kohler Engines

Type: Champion RC12YC (or equivalent)
Air Gap: 0.030 in (.76 mm)

Kawasaki Engines

Type: NGK BMR4A
Air Gap: .024 - .028 in (0.6 - 0.7 mm)

Install new spark plugs after every 100 operating hours/Kawasaki, 200 hours/Kohler. Check the spark plugs after every 25 operating hours. Make sure the air gap is correct before installing the the spark plug.

2.0144.011

If the insulator on the spark plug is light brown or gray, the engine is running properly. A black coating on the insulator indicates the air cleaner may be dirty.

IMPORTANT: Never clean the spark plugs. Always replace the spark plugs when it has a black coating, worn electrodes, an oily film, or cracks.

SPARK PLUG (cont'd)

Installation

Install the spark plugs and metal washer. Make sure the air gap (.028) is set correctly. Torque the spark plugs to specifications.

Spark plug torque:

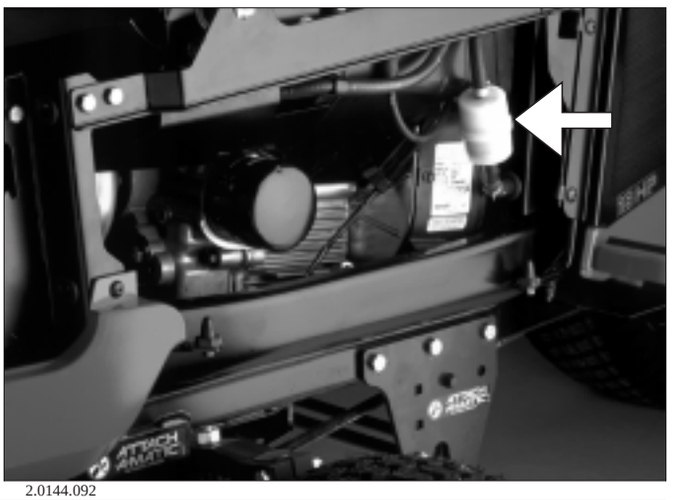
Kohler engines	18-22 ft·lbs (24-30 N·m)
Kawasaki engines	18 ft·lbs (25 N·m)

2.0144.048

FUEL FILTER

Service Interval

Replace the fuel filter after every 100 operating hours or yearly, whichever occurs first.



2.0144.092

COOLING SYSTEM, AIR

General Information

Models 518xi, 520xi, and 522xi are equipped with air-cooled engines.

The engine is cooled by air drawn through the air intake screen by a fan attached to the flywheel. Engine heat is carried away when shrouds attached to the engine direct the air flow through fins located on the cylinders and cylinder heads.

2.0109.40

2.0415.008

Maintenance

Inspect air intake screens often. Keep cooling and combustion air paths free of debris at all times.

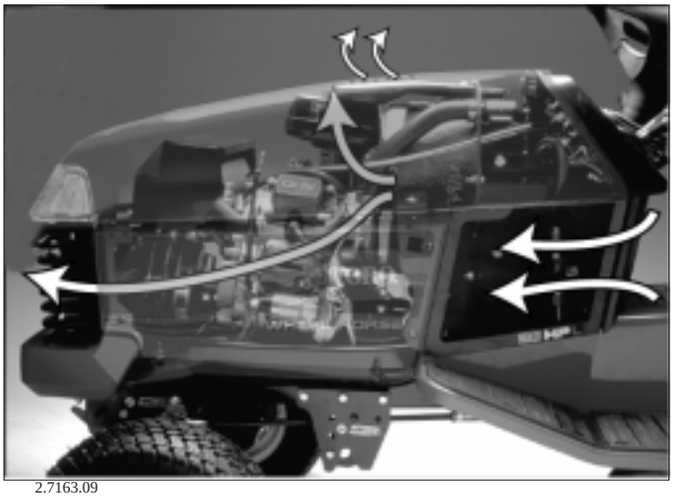
Consult the engine manufacturer's service manual for specific instructions and service intervals.

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

It is preferable to blow dirt out, rather than washing it out. If water is used, keep it away from electrical items.

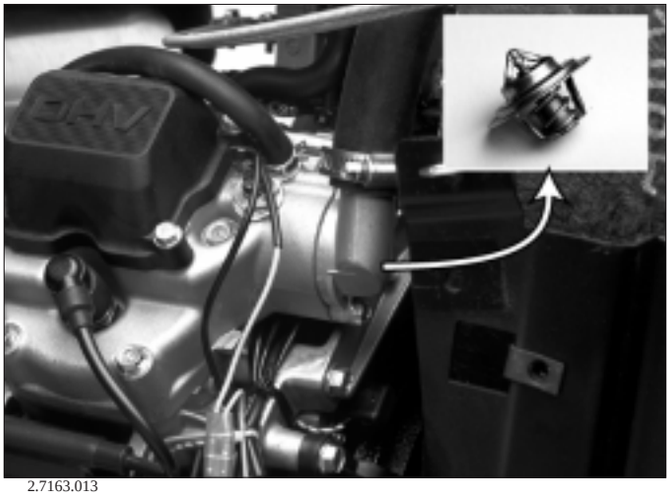
COOLING SYSTEM, LIQUID

General Information


2.7163.09

Models 520Lxi are equipped with a liquid-cooled engine.

This engine uses a gear driven water pump to circulate coolant through passages in the engine block and cylinder heads. The coolant carries engine heat to a radiator which transfers the heat stored in the coolant to the surrounding air by drawing the cooler ambient air through fins in the radiator with a belt driven fan.


2.7163.013

Engine temperature is maintained by a thermostat which opens at approximately 150° F (66° C). When the thermostat is open, it allows coolant to flow through the radiator. When the coolant temperature falls below 150° F (66° C) the thermostat closes, bypassing the radiator allowing faster warm-up and consistent operating temperature.

The cooling system is pressurized at operating temperature to prevent evaporation and raise the boiling point of the coolant .

COOLING SYSTEM, LIQUID (cont'd)

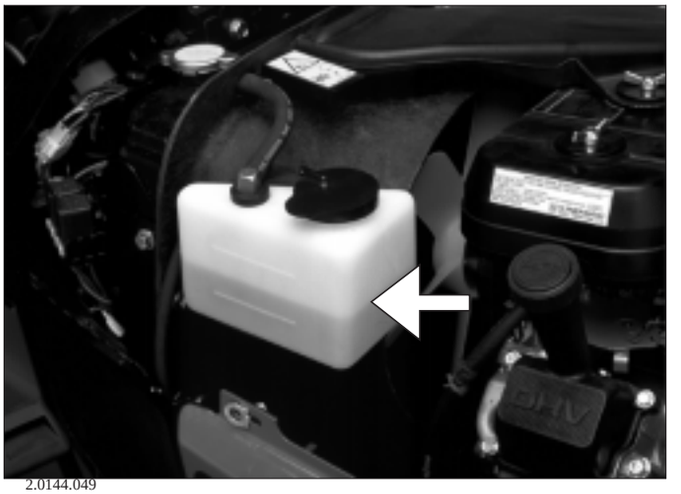
Maintenance

Inspect the cooling system often. Carefully clean grass clippings and other debris from air intake screens and radiator fins.

2.0144.012

Maintain coolant level in the coolant recovery tank between two lines on reservoir bottle with a 50/50 mix of antifreeze and water.

Caution: Do not remove the radiator cap when the engine is hot. Discharge of hot coolant can cause severe burns.

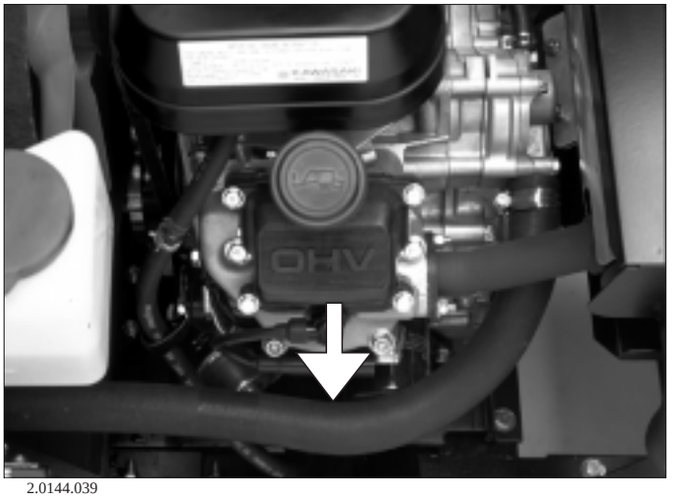


2.0144.049

Inspect coolant hoses and fan belt for deterioration every 100 hours of operation. Replace when deterioration is noted.

Watch for signs of leaks such as rust streaks or puddles of coolant under the tractor.

Change engine coolant according to the service interval and instructions in the engine manufacturer's service manual.



2.0144.039

DIESEL ENGINE

QUICK REFERENCE SECTION

SERVICE SECTION

Table of Contents

Warning: Diesel fuel under high pressure. Cover fittings before loosening. High pressure fuel can penetrate skin causing blood poisoning or infection.

Engine cranks but will not start.

Possible Cause	Corrective Action
Contaminated fuel	Clean fuel system
Incorrect starting procedure	Activate glow plugs before attempting to start
The fuel tank is empty	Fill with fresh fuel
The fuel shut-off valve is closed	Open the fuel shut- off valve
Dirt or water is in the fuel system	Drain and flush fuel system; add fresh fuel
Clogged fuel line	Clean or replace
Air in fuel	Bleed nozzles, check for leaks on suction side of system
Inoperative glow plugs	Check fuse, glow plugs, and wiring
Inoperative fuel solenoid	Check wiring, start switch, and fuel solenoid
Slow cranking speed	Check battery, oil viscosity,and starter motor
Insufficient combustion air supply	Check air filter and combustion air path
Low compression	Perform cylinder leak down test. Adjust, repair, or replace affected parts.

Starter does not crank.

Possible Cause	Corrective Action
The fuse is blown or loose	Correct or replace the fuse
The battery is discharged	Charge the battery or replace it
The safety interlock system is malfunctioning	Inspect safety switches and wiring harness
A faulty starter, starter solenoid, relay, or ignition switch	Replace
Seized internal engine components	Replace

Engine starts but does not keep running.

Possible Cause	Corrective Action
Contaminated fuel	Clean fuel system
Air in fuel	Bleed nozzles, check for leaks on suction side of system
Waxing fuel below 32° F (0° C)	Use a winter blend fuel when the ambient temperature is below freezing
The fuel filter is clogged	Replace the fuel filter
Dirt or water in the fuel system	Drain fuel filter. Flush fuel system if necessary
The fuel tank vent is restricted	Vent system hoses kinked or plugged, clean or replace
Loose wires or poor connectors	Check and tighten wire connections

TROUBLESHOOTING (cont'd)

Engine is difficult to start.

Possible Cause	Corrective Action
Improper starting procedure	Activate glow plugs before attempting to start
Air in fuel	Bleed nozzles, check for leaks on suction side of system
Inoperative glow plugs	Check fuse, glow plugs, and wiring
Insufficient combustion air supply	Check air filter and combustion air path
Faulty injection nozzles	Test nozzles, clean or replace as necessary
Clogged fuel filter	Replace
Incorrect injection pump timing	Perform complete timing procedure
Low ambient temperature	Activate block heater, check oil viscosity
Worn injection pump (hard starting warm)	Check fuel supply from nozzles
Low compression	Perform cylinder leakage test

Engine runs but knocks or misses.

Possible Cause	Corrective Action
Air in fuel	Bleed nozzles, check for leaks on suction side of system
Dirt, water, or stale fuel in fuel system	Drain and flush fuel filter; add fresh fuel
Faulty injection nozzle(s)	Test nozzles, clean or replace as necessary
Low compression	Perform cylinder leakage test

Engine will not idle.

Possible Cause	Corrective Action
Air in fuel	Bleed nozzles, check for leaks on suction side of system
Idle speed too low	Adjust idle speed
The fuel injection pump is faulty	Repair or replace as necessary
The fuel tank vent is restricted	Check hoses, clean, or replace
Dirt or water is in the fuel system	Drain and flush fuel system; add fresh fuel

Engine overheats.

Possible Cause	Corrective Action
(3) air intake screens are dirty	Clean with every use
More coolant is needed	Check and add coolant
Restricted air flow through radiator	Clean debris from radiator and cooling air path
Defective thermostat	Replace the thermostat
The crankcase oil level is incorrect	Fill or drain to the full mark
Faulty thermostat	Replace
Excessive loading	Reduce load; use lower ground speed

Engine loses power.

Possible Cause	Corrective Action
Insufficient combustion air supply	Check air filter and combustion air path
Air in fuel	Bleed nozzles, check for leaks on suction side of system
Dirt, water, or stale fuel is in the fuel system	Drain and flush fuel system; add fresh fuel
Faulty injection nozzle(s)	Test nozzles, clean or replace as necessary
Incorrect injection pump timing	Perform complete timing procedure
Faulty injection pump	Repair or replace as necessary
Low compression	Perform cylinder leakage test
The vent hole in the fuel tank vent fitting is plugged	Repair or replace vent system
The engine load is excessive	Reduce ground speed
The crankcase oil level is incorrect	Fill or drain to the full mark

Engine knocks.

Possible Cause	Corrective Action
Sticking injection nozzles	Clean or replace nozzles
Incorrect injection pump timing	Perform complete timing procedure
Excessive carbon build-up	Clean carbon from cylinder head and piston
Internal wear or damage	Inspection required

Excessive black smoke from exhaust.

Possible Cause	Corrective Action
Insufficient combustion air supply	Check air filter and combustion air path
Incorrect injection pump timing	Perform complete timing procedure
Improper fuel	Drain fuel system and refill with specified fuel
Faulty injection nozzles	Clean or replace nozzles

Excessive white smoke from exhaust.

Possible Cause	Corrective Action
Low engine temperature	Check thermostat
Inoperative glow plugs	Check fuse, glow plugs, and wiring
Faulty injection nozzles	Clean or replace nozzles
Incorrect injection pump timing	Perform complete timing procedure
Low compression	Perform cylinder leakage test

DIESEL ENGINE

AIR CLEANER

Service Interval/Specification

Paper Element**:** Replace after every 100 operating hours or yearly, whichever comes first.

NOTE: Service the air cleaner more frequently (every few hours) if operating conditions are extremely dusty or sandy.

3.7230.079

Cleaning

1. Lightly tap the element on a flat surface to remove dust and dirt.
2. Inspect the element for tears, an oily film, or damage to the rubber seal.

   IMPORTANT: Never clean the paper element with pressurized air or liquids, such as solvent, gasoline, or kerosene. Replace the paper element if it is damaged, defective, or cannot be cleaned thoroughly.

2.3653.007

ENGINE OIL

Service Interval

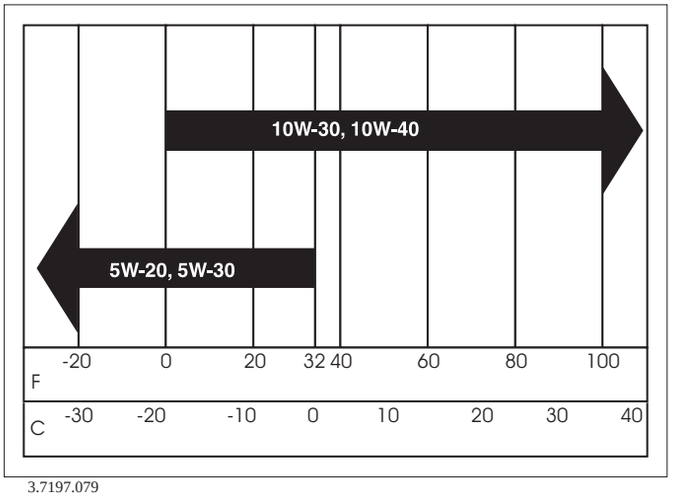
Oil Type: Detergent oil (API service CD or higher).

Crankcase capacity (with filter): 3.5 Qts (3.3 l).

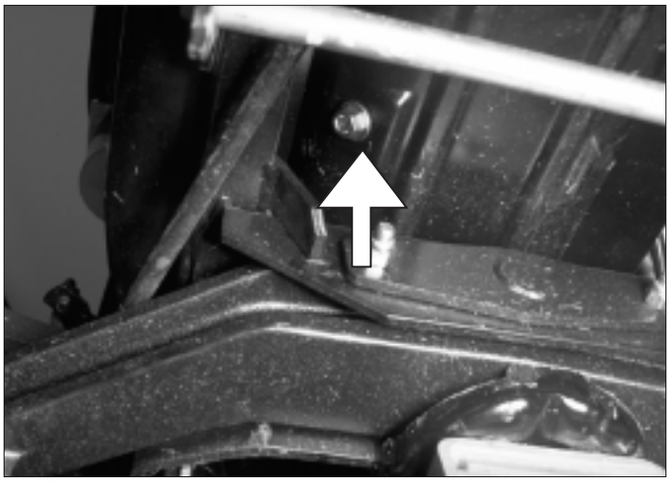
Viscosity: See table.

Change oil:

- After first 50 operating hours.
- After every 100 operating hours



3.7197.079

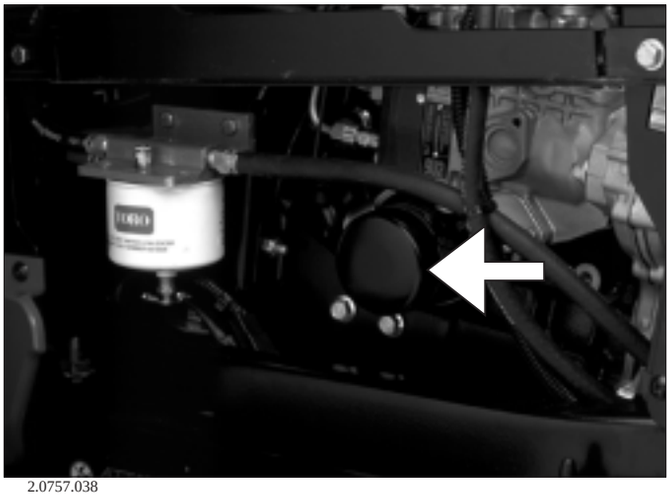


2.0757.008

Changing/Draining

1. Run the engine for five minutes.
2. Park the machine so the drain side is slightly lower than the opposite side. Set the parking brake and turn the engine off.
3. Remove the drain plug.
4. Let oil drain completely. Close drain.
5. Refill to specified level with recommended oil.

OIL FILTER



2.0757.038

Service Interval/Specification

Replace the oil filter after the first 50 hours of operation. Then replace every 200 hours or every other oil change.

2.0144.014

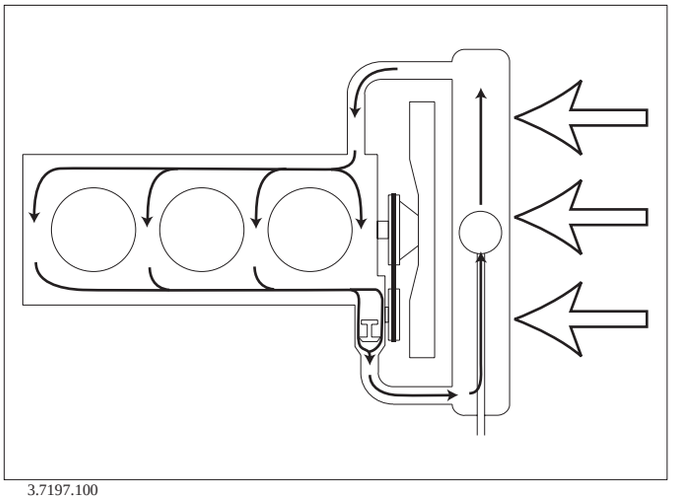
Changing

1. Drain the oil from the engine.
2. Remove the old filter and wipe the filter adapter gasket surface.
3. Apply a thin coat of new oil to the rubber gasket on the replacement filter.
4. Install the new filter to the filter adapter. Turn the filter clockwise until the gasket contacts the filter adapter, then tighten the filter an additional 1/2 turn.
5. Fill the crankcase to the specified level with the proper oil.

COOLING SYSTEM

General Information

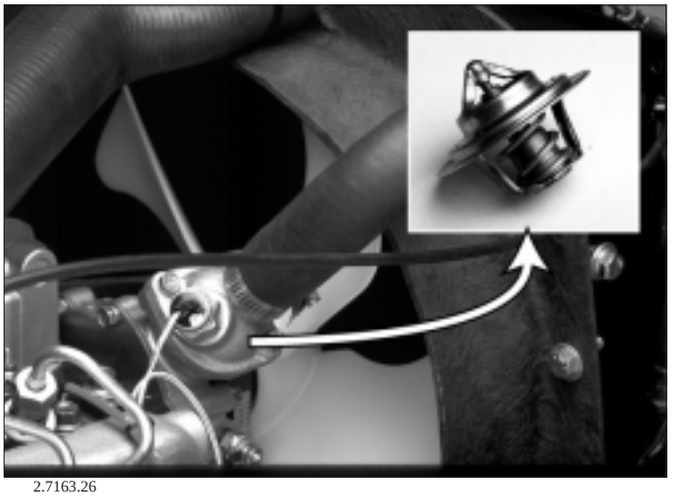
A belt driven water pump circulates coolant through passages in the engine block and cylinder heads. The coolant carries engine heat to a radiator which transfers the heat stored in the coolant to the surrounding air by drawing the cooler ambient air through fins in the radiator with the fan.



3.7197.100

Engine temperature is maintained by a thermostat which opens at approximately 180° F (82° C). When the thermostat is open, it allows coolant to flow through the radiator. When the coolant temperature falls below 180° F (82° C), the thermostat closes, bypassing the radiator allowing faster warm-up and consistent operating temperature.

The cooling system is pressurized at operating temperature to prevent evaporation and raise the boiling point of the coolant.



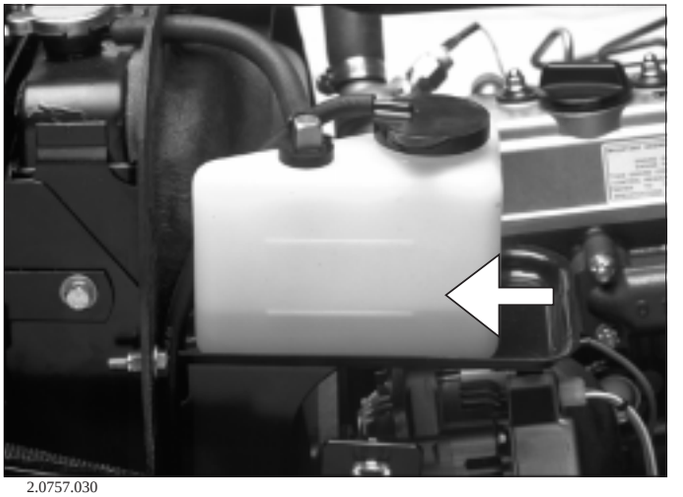
2.7163.26

Maintenance

Inspect cooling system often. Carefully clean grass clippings and other debris from air intake screens and radiator fins.

Maintain coolant level in the coolant recovery tank between the two lines with a 50/50 mix of antifreeze and water.

Caution: Do not remove the radiator cap when the engine is hot. Discharge of hot coolant can cause severe burns.



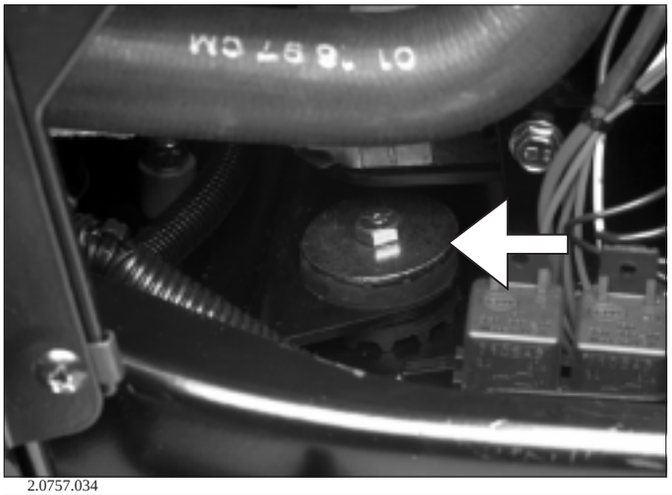
2.0757.030

2.0757.007

- Inspect coolant hoses and fan belt for deterioration every 400 hours or 2 years of operation. Replace when deterioration is noted.
- Watch for signs of leaks such as rust streaks or puddles of coolant under the tractor.
- Change engine coolant according to the service interval and instructions in the engine manufacturer's service manual.

ENGINE MOUNTS

Engine Mounting



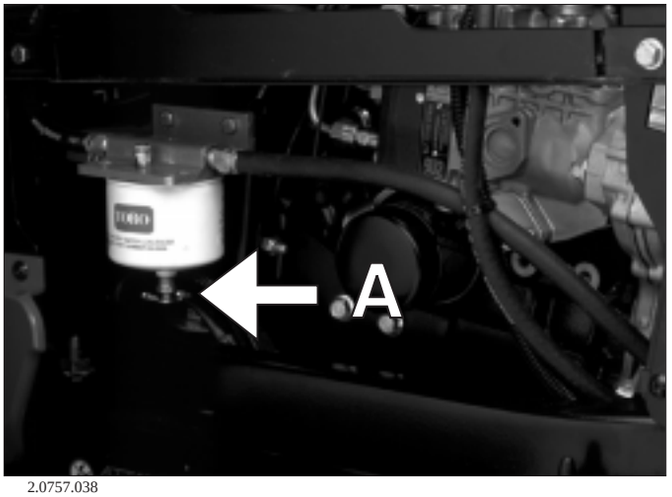
2.0757.034

The diesel engine is mounted on vibration dampening rubber isolators. Inspect these engine mounts for damage from chemicals, deterioration of the rubber, or loose fasteners.

5

FUEL SYSTEM

Fuel Filter



2.0757.038

The diesel fuel system is equipped with a fuel filter/water separator. This filter should be replaced every 400 hours of operation. Any water accumulation should be drained by opening the petcock (A) before each use.

GLOW PLUGS

Cold Start Up

The diesel engines are equipped with glow plugs to provide fast start-ups and minimize white smoke from the exhaust. The glow plug system is activated by turning the ignition switch to the ON position. An indicator light will go out when the engine is ready to start.

2.0757.006

QUICK REFERENCE SECTION

SERVICE SECTION

Table of Contents

ELECTRICAL

BATTERY

Service Interval/Specification

Check the electrolyte level in the battery every 25 hours. Always keep the battery clean and fully charged. If the battery terminals are corroded, clean them with a solution of four parts water and one part baking soda. Apply a light coating of grease to the battery terminals to prevent corrosion.

Voltage/Cold Cranking Amps

Gasoline Engines	12V 380 CCA
Diesel Engines	12V 495 CCA

2.0109.012

Removal

1. Disengage the PTO, set the parking brake, turn the ignition key to ***OFF*** and remove the key.
2. Remove the grille.
3. Remove the battery hold down.
4. Disconnect the negative (black) ground cable from the battery post.
5. Disconnect the positive (red) cable from the battery post.

IMPORTANT: Always hold the battery vertical to avoid spilling battery acid.

WARNING: When removing or installing the battery, do not allow the battery terminals to touch any metal parts of the tractor (below the headlights).

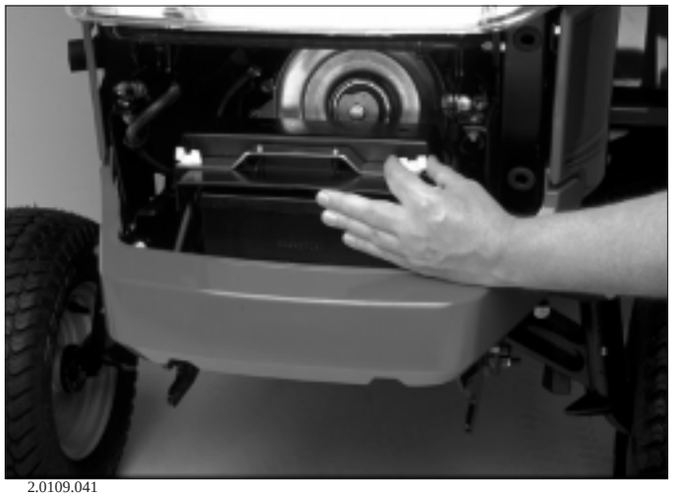
2.0109.038

Battery Heat Shield

All gasoline engines are equipped with a heat shield which is incorporated into the battery hold down. Replace the heat shield after servicing to protect the battery from heat.

NOTE: Failure to reinstall the heat shield after servicing the battery can result in shortened battery life and/or battery damage.

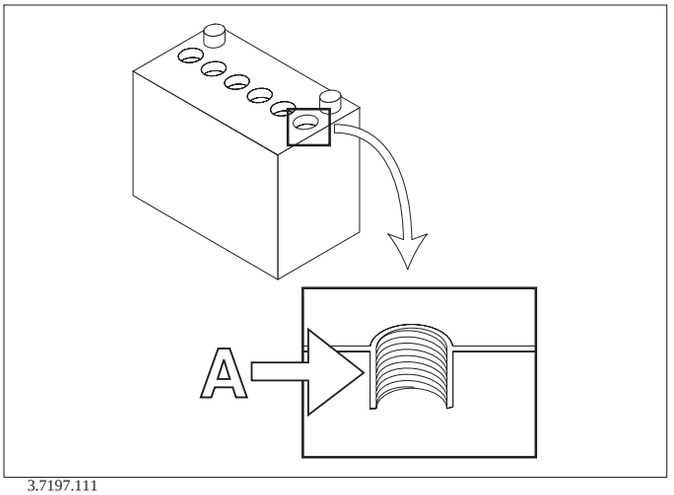
2.0109.016



2.0109.041

Installation

1. Install the battery into the chassis.
2. Connect the positive (red) cable to the positive (+) battery post.
3. Connect the negative (black) cable to the negative (-) battery post.
4. Secure the battery with the hold down rods.
5. Install the grille.



3.7197.111

Electrolyte Level

1. With the engine off, remove the covers on the battery.
2. The electrolyte must be up to the lower part of the tube (A). Do not allow electrolyte to get below the top of the plates.
3. If the electrolyte is low, add distilled water to achieve the specified level. (See: Adding Water)

2.0144.093

Adding Water

The best time to add distilled water to the battery is just before you operate the machine.

1. Clean the top of the battery.
2. Remove the filler caps.
3. Slowly pour distilled water into each battery cell until the level is up to the lower part of the tube.

   IMPORTANT: Do not overfill the battery. Electrolyte (sulfuric acid) can cause severe corrosion and damage to the chassis.
4. Replace the filler caps.

BATTERY (cont'd)

Charging

IMPORTANT: Always keep the battery fully charged (1.260 specific gravity). This helps prevent battery damage when the temperature is below 32° F (0 °C).

1. Remove the battery from the chassis.
2. Check the electrolyte level.
3. Remove the filler caps and connect a 3 to 4 amp battery charger. Charge at a rate of 4 amps (12V) or less for 4 hours. Do not overcharge the battery. Install the filler caps after the battery is charged.
4. Install the battery in the chassis.

2.0144.070

FUSE

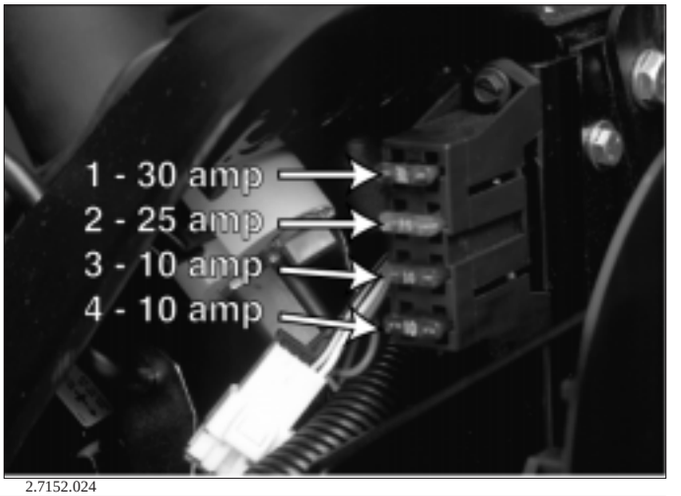
General Information/Specification

The electrical system is protected by fuses. If a fuse blows, check component/circuit for a malfunction or short.

Fuse:

1. Main/Starter - 30 amp, blade type.
2. Alternator - 25 amp, blade type.
3. Dash, Interlock, and Cruise Control - 10 amp, blade type.
4. Headlights/Taillights - 10 amp, blade type.

NOTE: The number 2 fuse on diesel tractors is for the starter and is 15 amp.

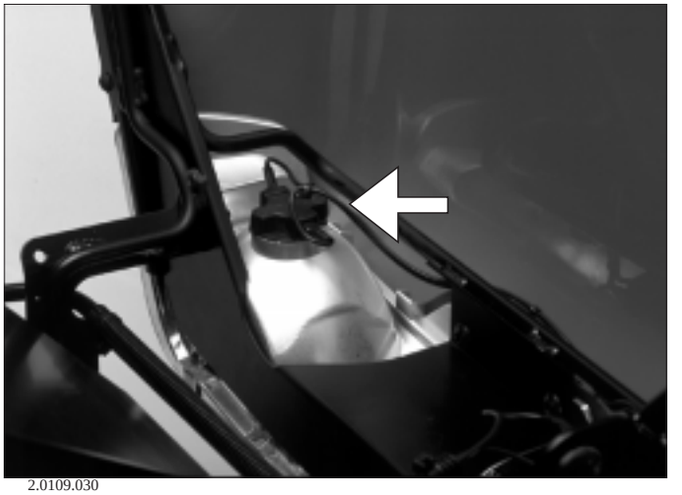


2.7152.024

HEADLIGHTS

Bulb Removal

1. Disengage the PTO, set the parking brake, turn the ignition key to ***OFF***, and remove the key.
2. Pull the wire connectors off both bulb holder terminals.
3. Rotate the bulb holder 1/4 turn counterclockwise and remove it from the reflector.
4. Push and rotate the bulb counterclockwise until it stops (approximately 1/4 turn) and remove.



2.0109.030

2.0757.031

Bulb Installation

1. Align the pins on the bulb with the slots in the bulb holder and insert. Push and rotate the bulb clockwise until it stops.
2. Align the tabs on the bulb holder with the slots in the reflector, insert and rotate 1/4 turn clockwise until it stops.
3. Push the wire connectors onto the terminals.

   Bulb Number: GE 1156

INSTRUMENT PANEL LIGHTS

2.0144.024

Bulb Removal

1. Disengage the PTO, set the parking brake, turn the ignition key to ***OFF***, and remove the key.
2. Turn the bulb holder 1/4 turn counterclockwise, and remove it from the panel
3. Pull the bulb straight out of the bulb holder.

   Bulb Number: GE 194

2.0144.018

Bulb Replacement

1. Align the bulb with the slot in the bulb holder and push the bulb into the slot.
2. Align the tabs on the bulb holder with the slots in the panel. Insert the bulb being careful not to damage the printed circuit connectors.

   Rotate the bulb approximately 1/4 turn until it stops.

   Bulb Number: GE 194

TAILLIGHTS

Bulb Removal

1. Remove the taillight assembly from the fender.
2. Rotate the bulb holder 1/4 turn counterclockwise and remove it from the housing.
3. Push and rotate the bulb counterclockwise until it stops (approximately 1/4 turn).

   Bulb Number: GE 194

2.0757.027

ELECTRIC CLUTCH TROUBLESHOOTING

General Information

Equipment Needed: Volt/Ohm and Ampmeter

The following troubleshooting steps will help you determine if the clutch has failed or is the cause of the electrical problem.

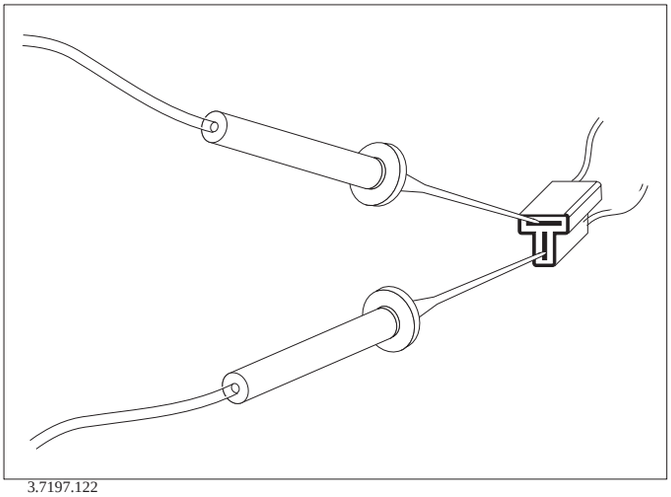
2.0144.006

Coil Resistance Measurement

Equipment: Volt/Ohmmeter

1. Disengage the PTO, set the parking brake, turn the ignition key to ***OFF***, and remove the key.
2. Disconnect the clutch wire connector.
3. Set the volt/ohmmeter to check resistance (ohms).

2.0144.080



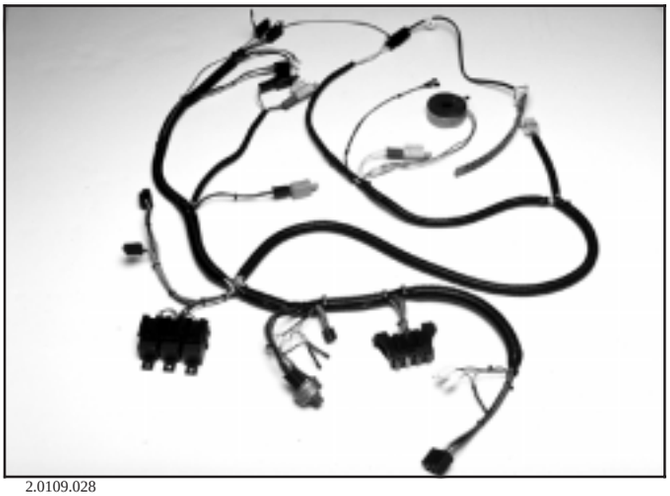
3.7197.122

4. Connect the meter lead wires to the wires in the clutch connector.

   The meter should read between 2.40 and 3.40 ohms. If the readings are not within specifications, the coil has failed and the clutch must be replaced.

   If the resistance is within specifications, the electric clutch is not the source of the problem.

SAFETY INTERLOCK SYSTEM



2.0109.028

Purpose

The safety interlock system is designed to prevent the engine from starting unless:

1. You are sitting on the seat.
2. The brake pedal is depressed.
3. The power take off (PTO) is *OFF.*

   The system will also kill the engine if you attempt to operate the clutch or drive system when you are not in the seat.

6

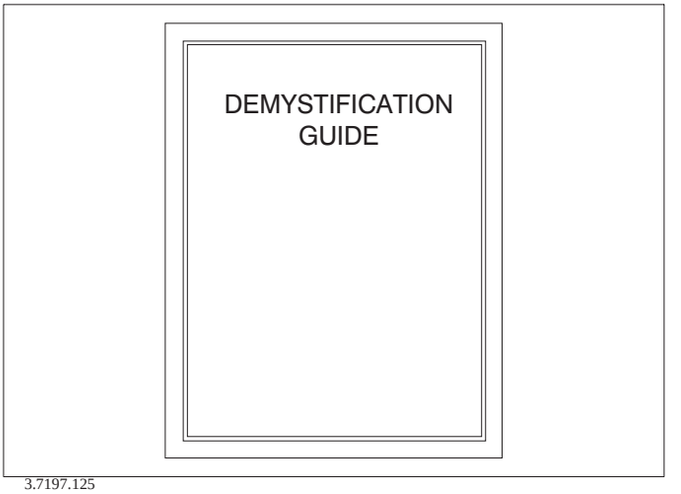
Testing

Test	PTO Switch	Parking Brake	Seat	Expected Result
Starting	On	On	Operator On	No Start
Starting	Off	Off	Operator On	No Start
Starting	Off	On	Operator Off	No Start
Running	Off	Off	Operator Off	Engine Stalls

1. Set the parking brake. Move the PTO to ***ON***. Now turn the ignition key to ***START***; the engine should not crank.
2. Push the PTO to ***OFF*** and release the parking brake. Now turn the ignition to ***START***; the engine should not crank.
3. Set the parking brake and move the PTO to ***OFF***. Start the engine. While the engine is running, release the parking brake and rise from the seat; the engine should stop.

SAFETY INTERLOCK SYSTEM (cont'd)

If the system fails any of these tests, you will need to troubleshoot the system. The *260 series Electrical Demystification Guide* (form no. 492-4404) describes how to test individual switches and circuits.



3.7197.125

CRUISE CONTROL

General Information

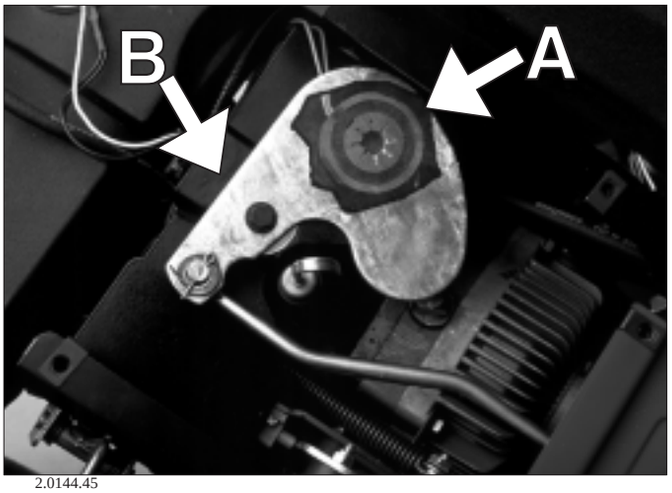
The 520xi and larger tractors are equipped with an electric cruise control that, when activated, locks the motion control lever in position to maintain a constant speed. The Smart Turn Steering system overrides the cruise control in a sharp turn slowing the tractor until the turn is completed. The tractor then accelerates to resume the set speed.

2.0757.001

Theory of Operation

The cruise control is activated with a switch located on the right side fender. When the tractor is at the desired speed, activating the switch energizes an electromagnet.

2.0757.004

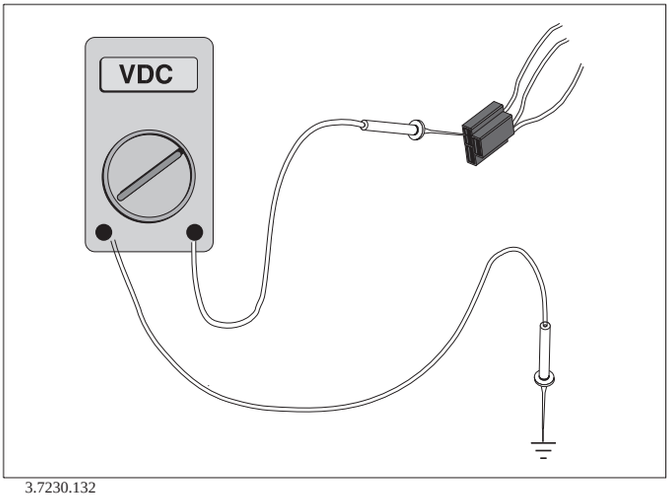


2.0144.45

This magnet (A) is mounted below a control plate (B). The control plate is connected to the speed control lever. When the cruise control is activated, the magnet clamps the control plate in position which holds the speed control lever at the desired speed.

Tapping the brake pedal or shutting the switch off deactivates the system. The foot pedal can be used to override the cruise control; the pre-set speed will resume when the pedal is released.

NOTE: Activating cruise in neutral or at very slow speeds will prevent full speed operation.



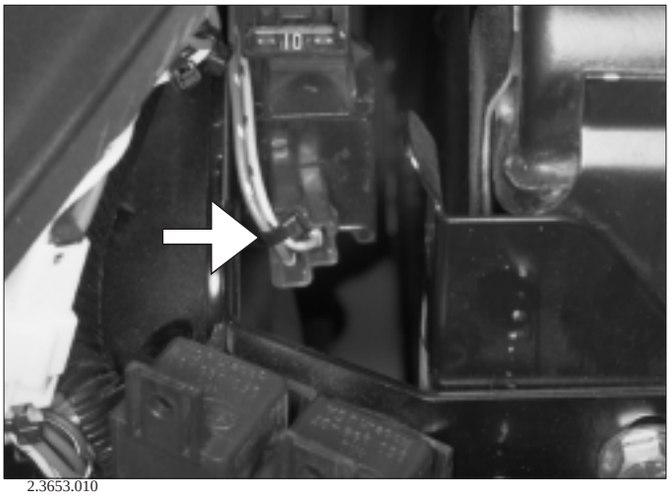
3.7230.132

Troubleshooting

Disconnect the three pin connector from the cruise control module. Turn the ignition switch to the “on” position. Make sure the parking brake is disengaged. Measure the voltage at each of the pins in the following conditions:

Wire Color	Cruise Off	Cruise On	Cruise held in engage position
Yellow	0 V	12 V	12 V
Brown	0 V	0 V	12 V
Black	0 V	0 V	0 V

If you do not get these results, the problem is in the switches or wiring between the module and the switches or magnet.


2.3653.010

Reconnect the three pin connector to the module. Measure the voltage at each of the pins on the connector in the following conditions:

Wire Color	Cruise Off	Cruise On See note 1	Cruise held in engage position
Yellow	0 V	12 V	0.6 to 1.3 V
Brown	0 V	0 V	0.6 to 1.3 V
Black (see note 2	0 V	0 V	0 V

If you do not get the results shown above and have successfully completed the test described in the test above, replace the module.

Note 1: Press and release brake to reset circuit .

Note 2: Voltage at black wire indicates faulty ground

FUEL GAUGE

General Information

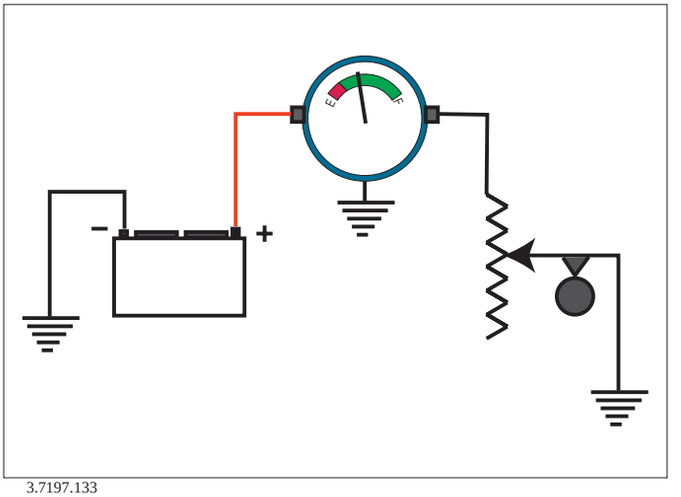
The fuel gauge consists of a level indicator (gauge) located in the instrument panel and a sender located in the fuel tank.

2.0144.074

2.0144.074

Theory of Operation

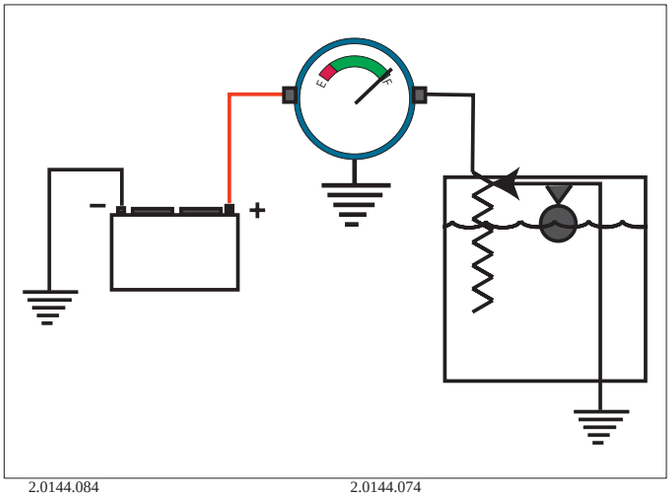
B+ is supplied to one side of the fuel gauge. The other side of the gauge is connected to ground through the sender.



3.7197.133

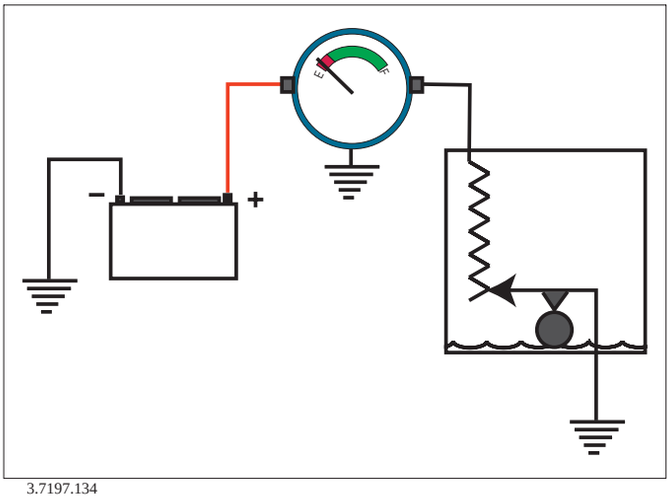
When the ignition switch is in the ON position, current flow through the gauge winding causes the needle to move. The greater the current, the closer the needle moves to the Full mark.

2.0144.075



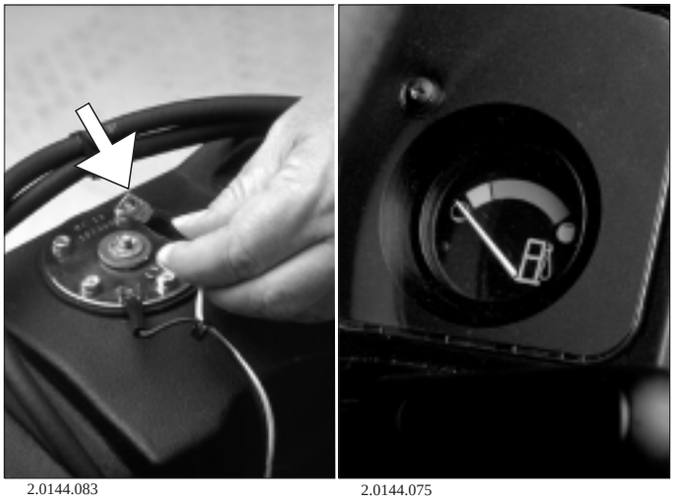
2.0144.084 2.0144.074

The amount of current flow is controlled by the sender which consists of a rheostat connected to a float mounted in the fuel tank. When the tank is Full, the float is high and the resistance of the rheostat is low, allowing more current flow which moves the needle to the Full mark.



3.7197.134

As fuel is consumed, the float moves down increasing the resistance and allows less current flow. This causes the needle to move toward empty.



2.0144.083 2.0144.075

Troubleshooting

If the fuel gauge is inoperative:

1. Disconnect the wire from the sender. When the circuit is open (no current flow), the gauge should read empty.

FUEL GAUGE (cont'd)

2. Connect the wire to ground (maximum current). The gauge should read Full.

   If conditions 1 and 2 are not met, the problem is in the wiring or the gauge.

2.0144.056

2.0144.075

If conditions 1 and 2 above are met, the problem is with the sender.

To test the sender:

1. Remove the sender from the fuel tank.
2. Connect an ohmmeter from the wire terminal to the sender body (ground).
3. Move the float through its travel. The resistance should range from 20-35 ohms when the float is up. When the float is all the way down, the resistance should be 240-265 ohms.

2.0144.015

CHARGING SYSTEM

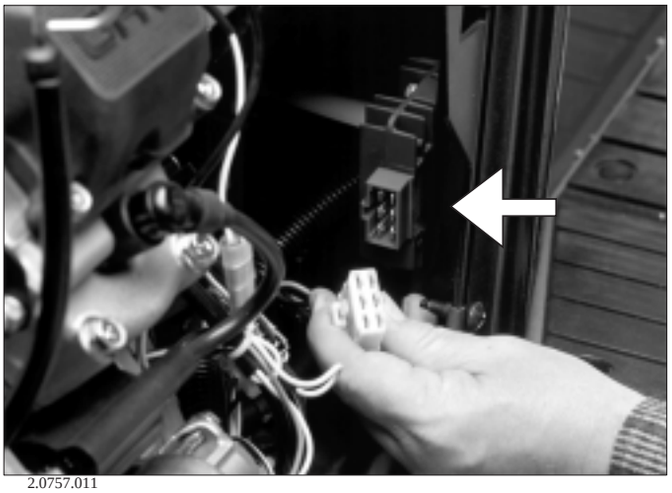
General Information

All gasoline fueled tractor charging systems consist of a permanent magnet flywheel alternator and a separate voltage regulator/rectifier.

The air-cooled Kohler engines have a 15 amp charging system.

The regulator on these units is mounted on the engine.

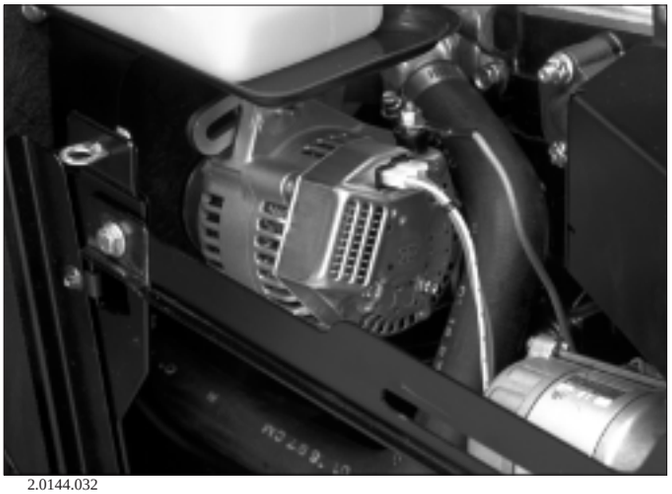
2.0757.028



2.0757.011

Tractors powered by liquid-cooled Kawasaki engines have a 20 amp alternator.

The voltage regulator on these units is mounted to the tractor.



2.0144.032

Diesel tractors are equipped with a belt driven alternator with an integral voltage regulator.

Testing

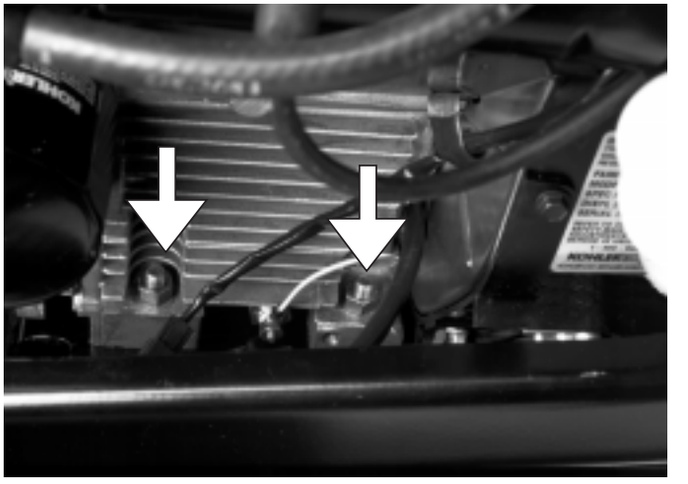
2.0144.056

Connect a voltmeter across the battery. The voltage should read between 13.8 -14.2 VDC at 3400 RPM with the lights on. If the voltage is low or you suspect a charging system fault, follow the troubleshooting instructions in the engine manufacturer's service manual.

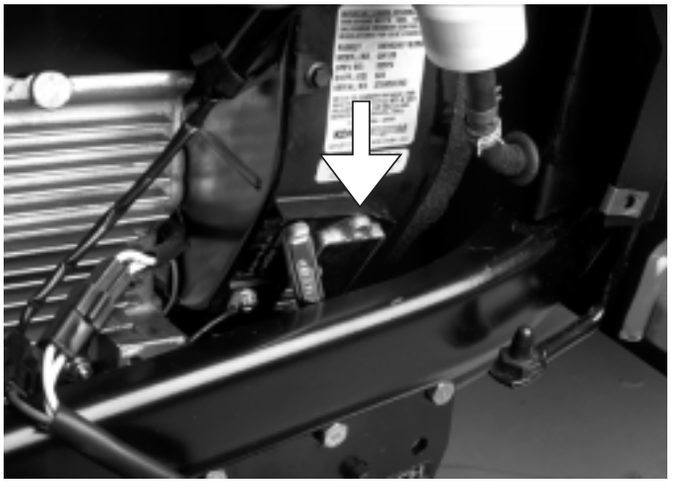
CHARGING SYSTEM (cont'd)

Voltage Regulator Replacement

On air-cooled engines, it is necessary to raise the voltage regulator side of the engine (right-hand side) to provide clearance for removal of the voltage regulator. Remove the two engine mounting bolts on the voltage regulator side of the engine. Loosen the engine mounting bolts on the side opposite the voltage regulator.

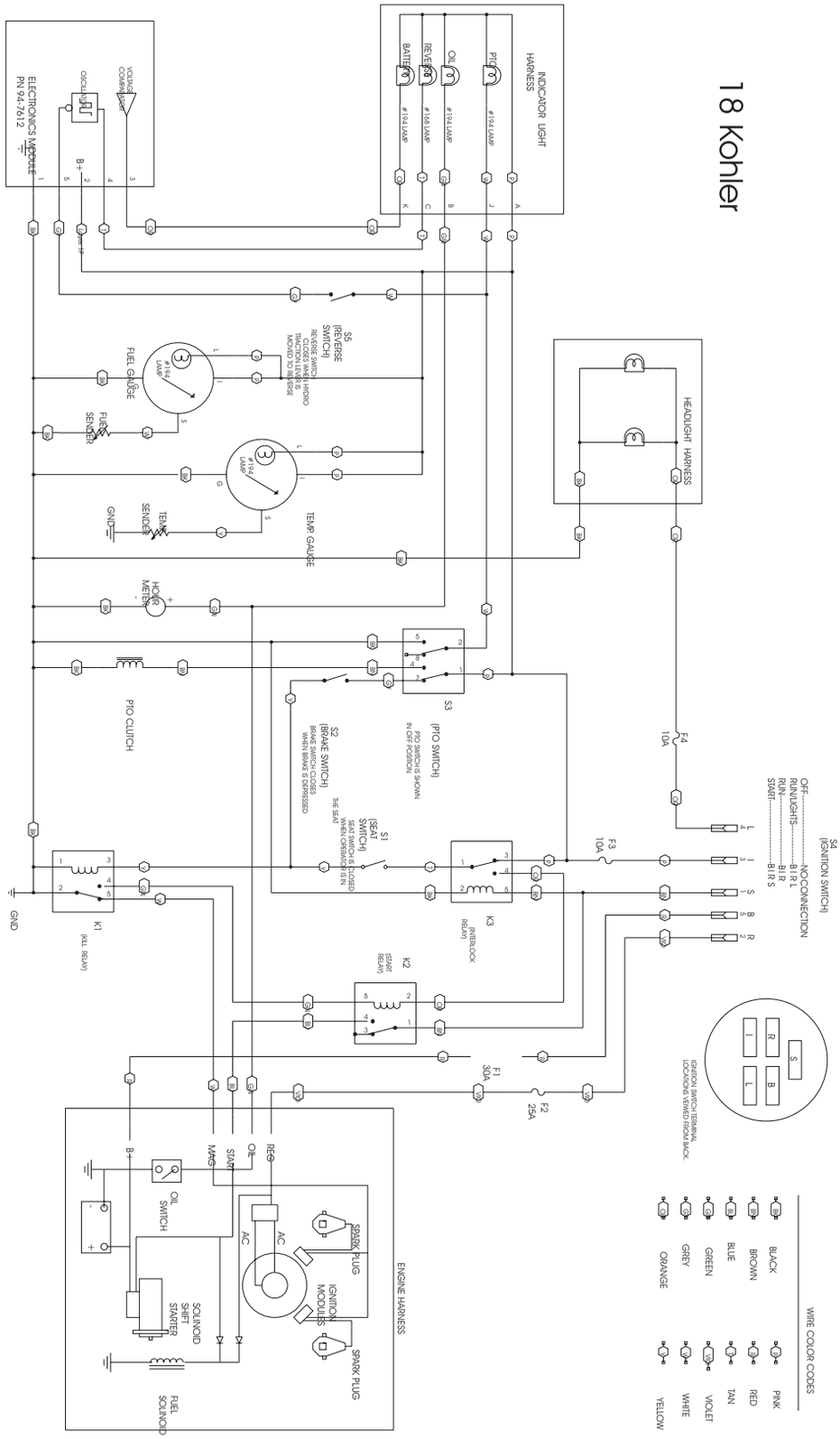


Raise the engine, disconnect the wires, and remove the voltage regulator.

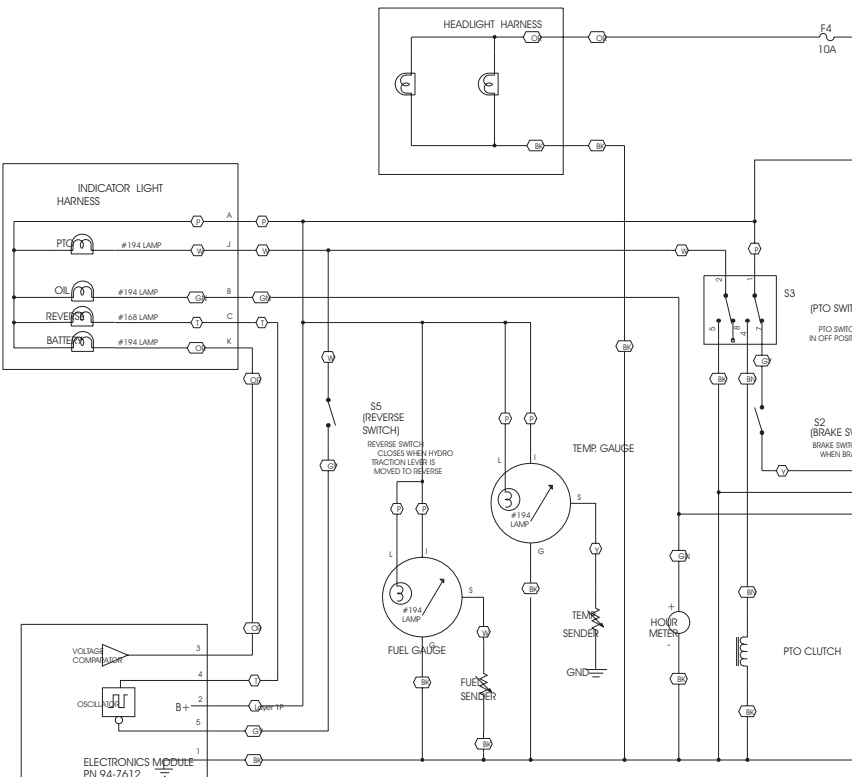


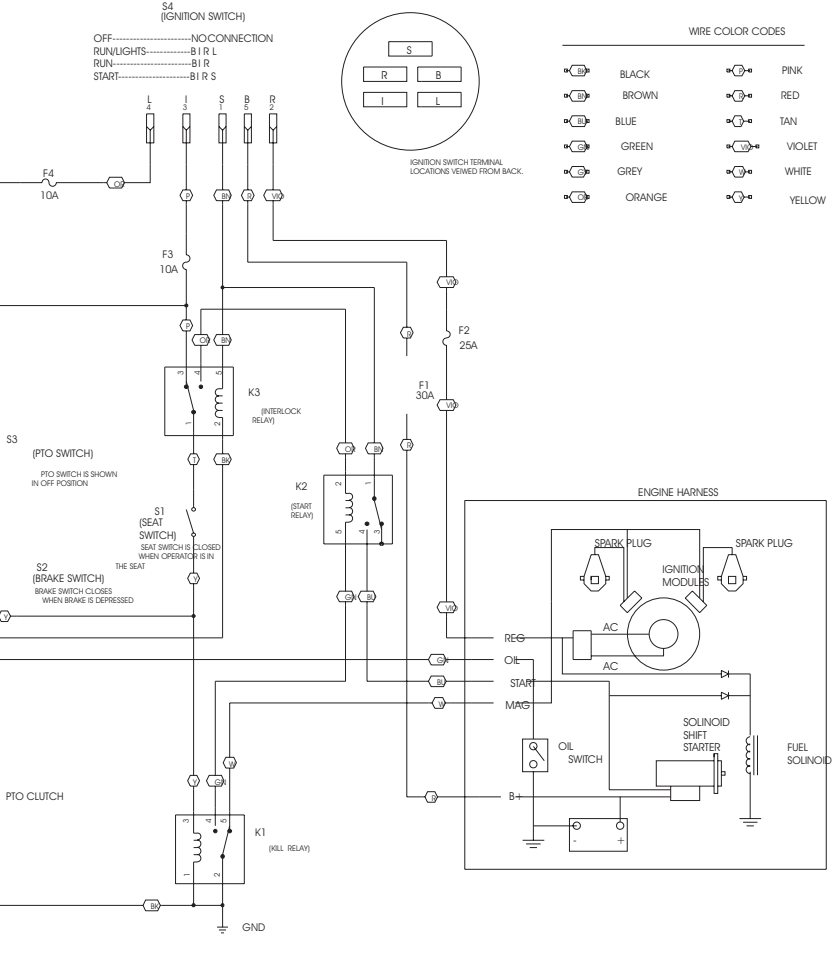
SCHEMATICS

518xi

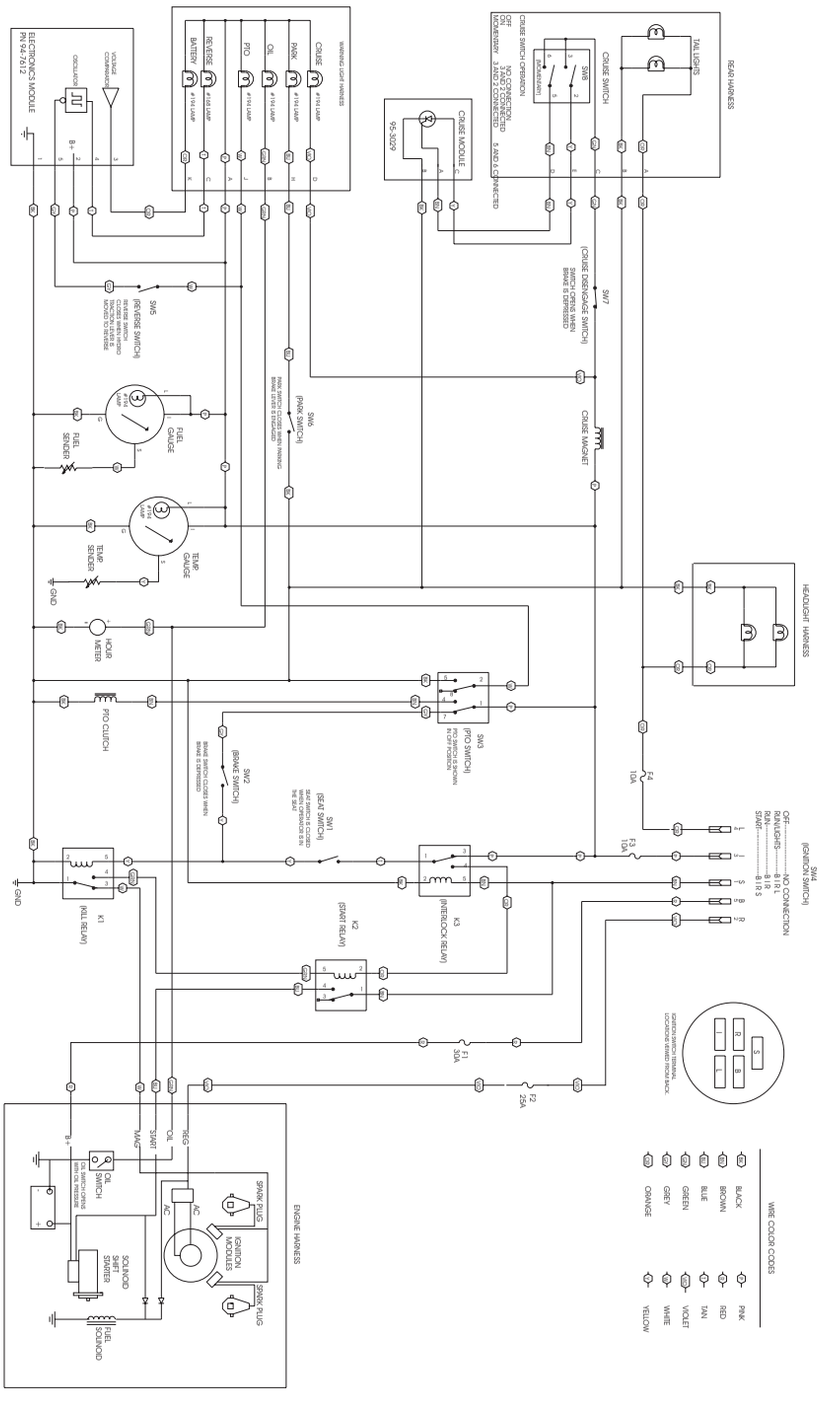


18 Kohler

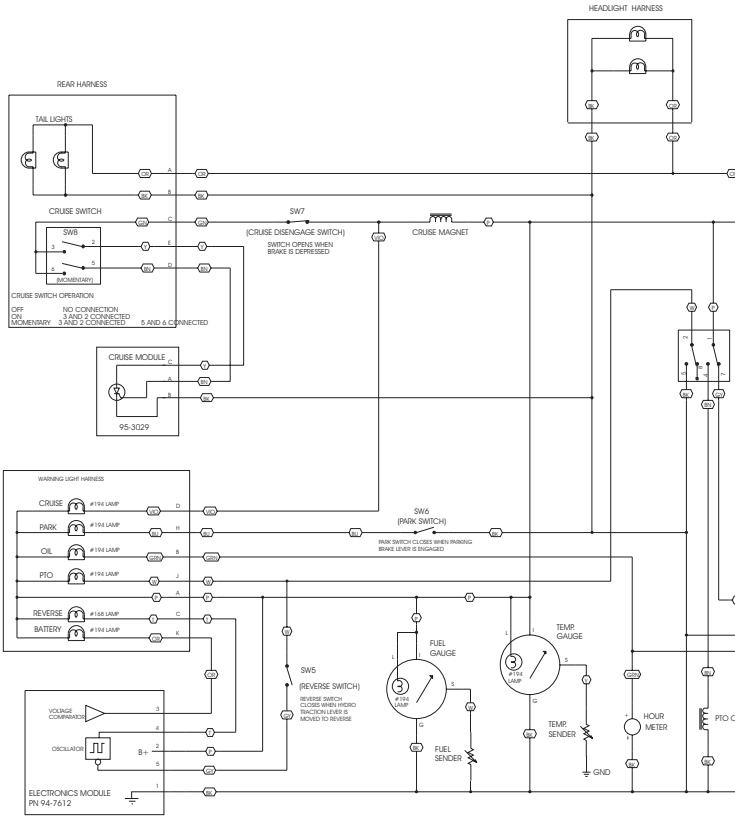

HEADLIGHT HARNESS
F4
10A
INDICATOR LIGHT
HARNESS
PTO
#194 LAMP
OIL
#194 LAMP
REVERSE
#168 LAMP
BATTERY
#194 LAMP
S3
(PTO SWIT
S5
(REVERSE
SWITCH)
REVERSE SWITCH
CLOSES WHEN HYDRO
TRACTION LEVER IS
MOVED TO REVERSE
TEMP. GAUGE
#194
LAMP
FUEL GAUGE
#194
LAMP
TEMP
SENDER
FUEL
SENDER
GND
HOUR
METER
PTO CLUTCH
S2
(BRAKE SW
VOLTAGE
COMPARATOR
OSCILLATOR
B+
ELECTRONICS MODULE
PN 94-7612

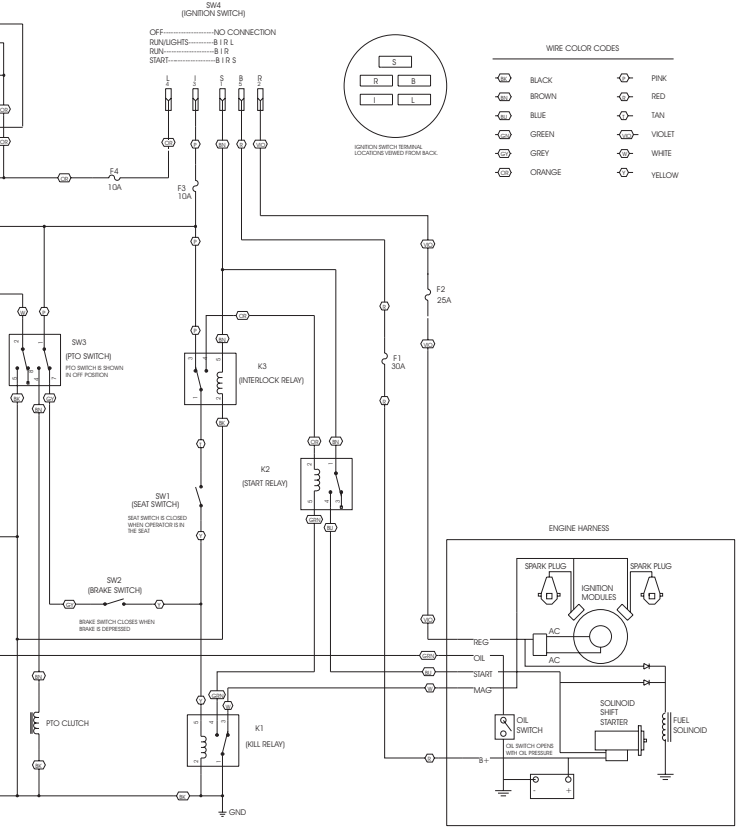

S4
(IGNITION SWITCH)
OFF----------NO CONNECTION
RUN/LIGHTS----------B I R L
RUN----------B I R
START----------B I R S
L 4
I 3
S 1
B 5
R 2
S
R
B
I
L
IGNITION SWITCH TERMINAL LOCATIONS VEIWED FROM BACK.
WIRE COLOR CODES
BK BLACK
BR BROWN
BL BLUE
G GREEN
GY GREY
O ORANGE
P PINK
R RED
T TAN
V VIOLET
W WHITE
Y YELLOW
F4
10A
F3
10A
F2
25A
F1
30A
K3
(INTERLOCK RELAY)
K2
(START RELAY)
K1
(KILL RELAY)
S3
(PTO SWITCH)
PTO SWITCH IS SHOWN IN OFF POSITION
S1
(SEAT SWITCH)
SEAT SWITCH IS CLOSED WHEN OPERATOR IS IN THE SEAT
S2
(BRAKE SWITCH)
BRAKE SWITCH CLOSES WHEN BRAKE IS DEPRESSED
PTO CLUTCH
GND
ENGINE HARNESS
SPARK PLUG
SPARK PLUG
IGNITION MODULES
AC
AC
REG
OIL
START
MAG
B+
OIL SWITCH
SOLINOID SHIFT STARTER
FUEL SOLINOID

520/522xi

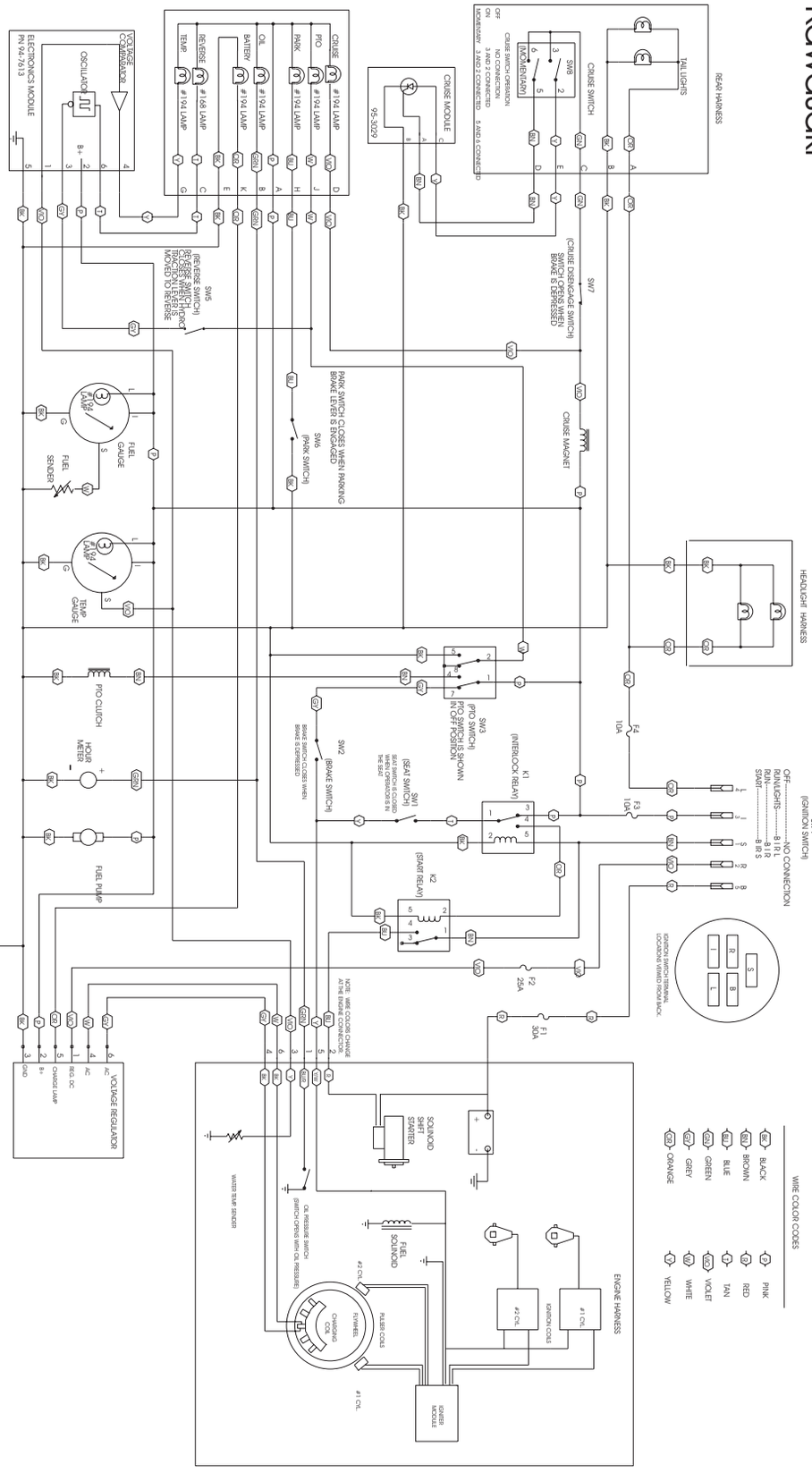

20 & 22 Kohler
REAR HARNESS
TAIL LIGHTS
CRUISE SWITCH
SW8
CRUISE SWITCH OPERATION
OFF NO CONNECTION
CRUISE 3 AND 4 CONNECTED
UP/OVERRIDE 3 AND 5 CONNECTED
CRUISE MODULE
PS-300P
WARNING LIGHT HARNESS
CRUISE
PARK
OIL
PTO
CHARGE
RESERVE BATTERY
#1141 LAMP
ELECTRONICS MODULE PN 94-7612
VOLTAGE COMPARATOR
OSCILLATOR
SW5 (REVERSE SWITCH)
SW7 (CRUISE DISENGAGE SWITCH)
CRUISE MAGNET
SW4 (PARK SWITCH)
FUEL GAUGE
FUEL SENDER
TEMP GAUGE
TEMP SENDER
GND
HOUR METER
HEADLIGHT HARNESS
PTO CLUTCH
SW3 (PTO SWITCH)
SW2 (BRAKE SWITCH)
SW1 (SEAT SWITCH)
F4 10A
F3 10A
SW4 (IGNITION SWITCH)
OFF NO CONNECTION
RUN/LIGHTS B TO L
START B TO S
K1 (KILL RELAY)
K2 (START RELAY)
K3 (INTERLOCK RELAY)
F1 30A
F2 25A
WIRE COLOR CODES
BLACK
BROWN
RED
TAN
GREEN
BLUE
VIOLET
GREY
ORANGE
PINK
WHITE
YELLOW
ENGINE HARNESS
OIL SWITCH
SPARK PLUG
IGNITION MODULES
SOLENOID SHIFT STARTER
FUEL SOLENOID
MAG
START
OIL
REG

20 & 22 Kohler

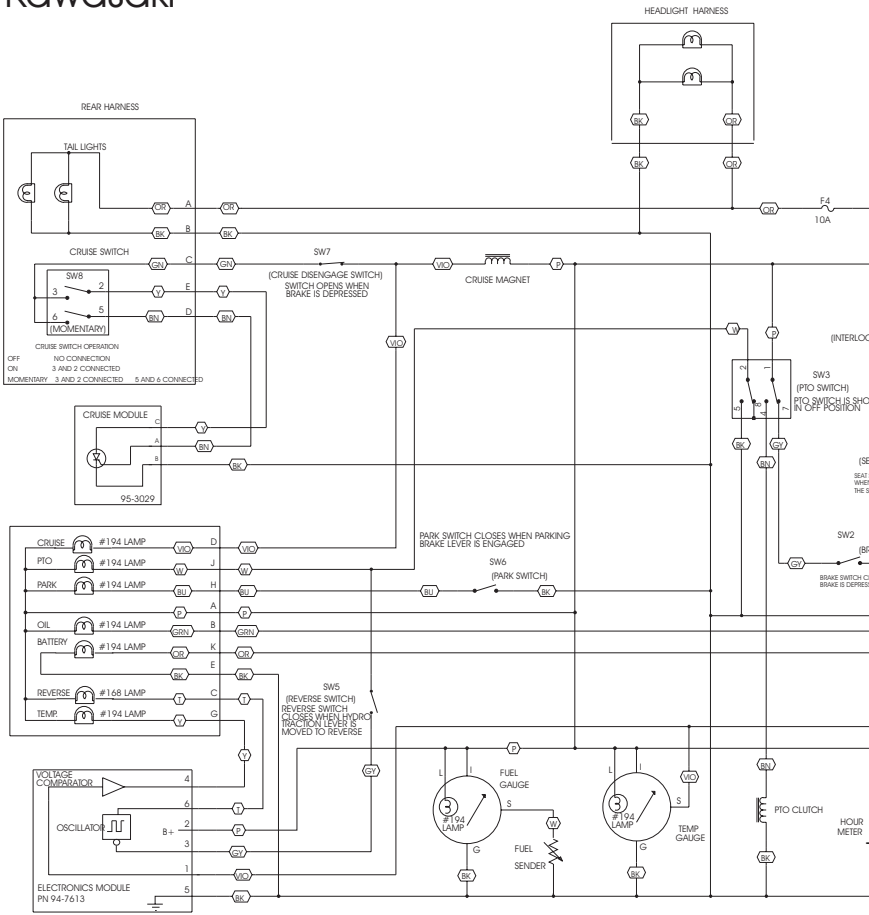

HEADLIGHT HARNESS
REAR HARNESS
TAIL LIGHTS
CRUISE SWITCH
SW8
(MOMENTARY)
CRUISE SWITCH OPERATION
OFF NO CONNECTION
ON 3 AND 2 CONNECTED
MOMENTARY 3 AND 2 CONNECTED 5 AND 6 CONNECTED
SW7
(CRUISE DISENGAGE SWITCH)
SWITCH OPENS WHEN BRAKE IS DEPRESSED
CRUISE MAGNET
CRUISE MODULE
95-3029
WARNING LIGHT HARNESS
CRUISE #194 LAMP
PARK #194 LAMP
OIL #194 LAMP
PTO #194 LAMP
REVERSE #168 LAMP
BATTERY #194 LAMP
SW6
(PARK SWITCH)
PARK SWITCH CLOSES WHEN PARKING BRAKE LEVER IS ENGAGED
SW5
(REVERSE SWITCH)
REVERSE SWITCH CLOSES WHEN HYDRO TRACTION LEVER IS MOVED TO REVERSE
FUEL GAUGE
#194 LAMP
FUEL SENDER
TEMP. GAUGE
#194 LAMP
TEMP. SENDER
GND
HOUR METER
PTO C
VOLTAGE COMPARATOR
OSCILLATOR
B+
ELECTRONICS MODULE
PN 94-7612

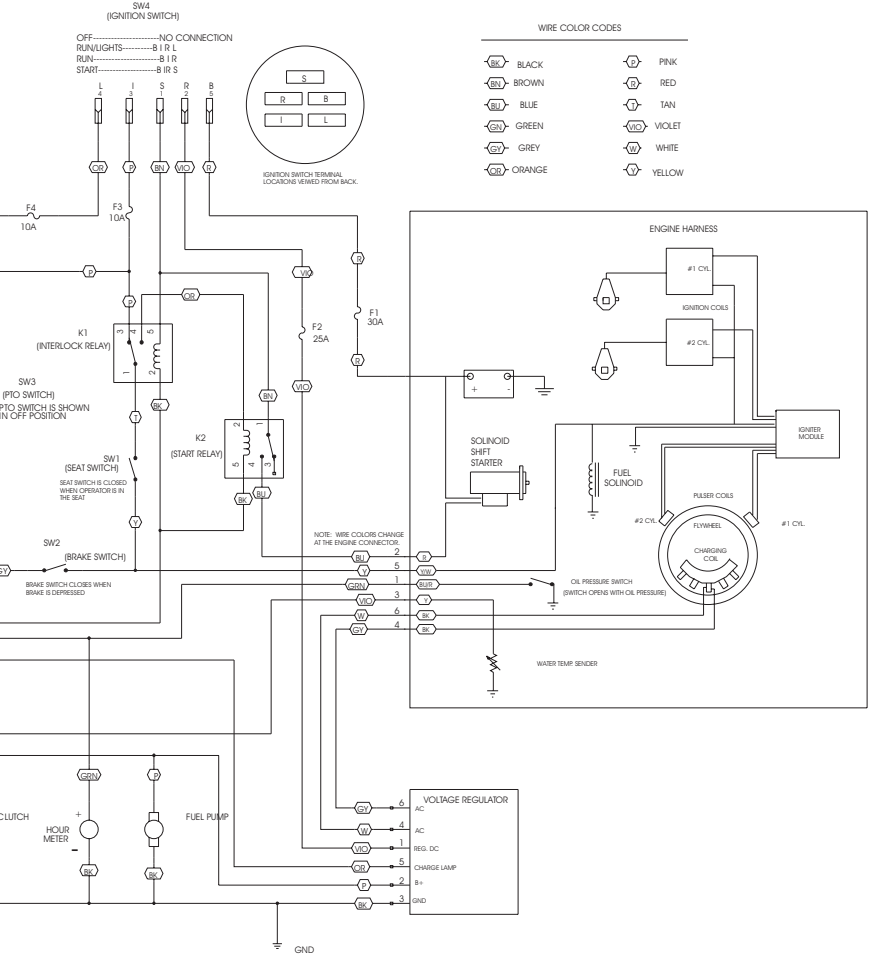

SW4
(IGNITION SWITCH)
OFF----------NO CONNECTION
RUN/LIGHTS----------B I R L
RUN----------B I R
START----------B I R S
L I
I J
S T
B E
R F
S
R B
I L
IGNITION SWITCH TERMINAL LOCATIONS VIEWED FROM BACK.
WIRE COLOR CODES
BK BLACK
BN BROWN
BU BLUE
GN GREEN
GY GREY
OR ORANGE
P PINK
R RED
T TAN
V VIOLET
W WHITE
Y YELLOW
F4 10A
F3 10A
F2 25A
F1 30A
SW3
(PTO SWITCH)
PTO SWITCH IS SHOWN IN OFF POSITION
K3
(INTERLOCK RELAY)
K2
(START RELAY)
SW1
(SEAT SWITCH)
SEAT SWITCH IS CLOSED WHEN OPERATOR IS IN THE SEAT
SW2
(BRAKE SWITCH)
BRAKE SWITCH CLOSES WHEN BRAKE IS DEPRESSED
PTO CLUTCH
K1
(KILL RELAY)
GND
ENGINE HARNESS
SPARK PLUG
SPARK PLUG
IGNITION MODULES
AC
AC
REG
OIL
START
MAG
B+
OIL SWITCH
OIL SWITCH OPENS WITH OIL PRESSURE
SOLINOID SHIFT STARTER
FUEL SOLINOID

520Lxi

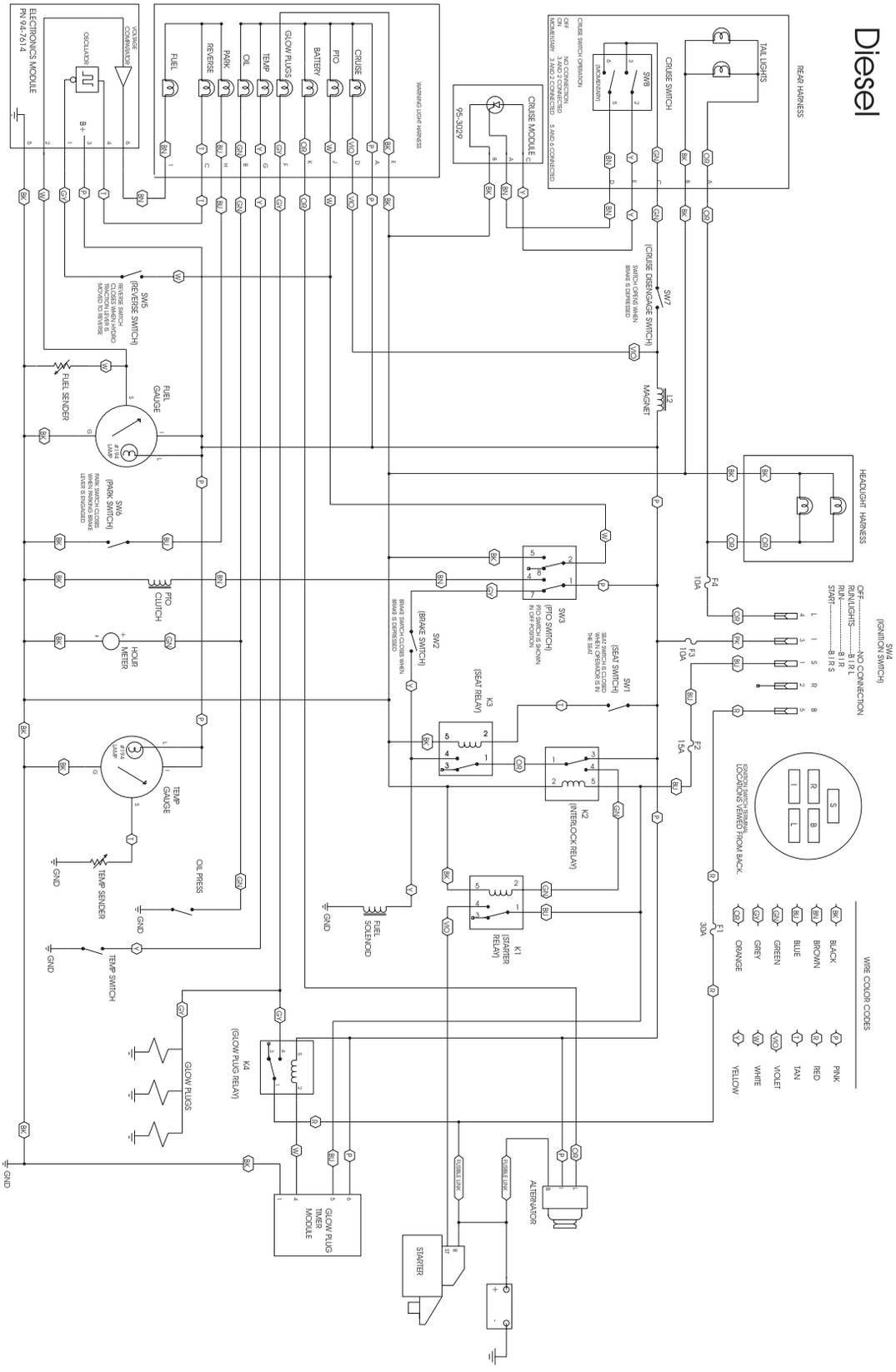

Kawasaki
REAR HARNESS
TAIL LIGHTS
CRUISE SWITCH
SW8
CRUISE MODULE
95-3029
CRUISE MAGNET
SW7
(CRUISE DISENGAGE SWITCH)
SW5
(REVERSE SWITCH)
SW6
(PARK SWITCH)
PARK SWITCH CLOSES WHEN PARKING BRAKE LEVER IS ENGAGED
FUEL GAUGE
FUEL SENDER
TEMP GAUGE
PTO CLUTCH
HOUR METER
FUEL PUMP
GND
HEADLIGHT HARNESS
SW4
(IGNITION SWITCH)
OFF ---------- NO CONNECTION
RUN/LIGHTS ---------- B I R L
RUN ---------- B I R
START ---------- B IR S
F4 10A
F3 10A
F2 25A
F1 30A
SW3
(PTO SWITCH)
SW2
(BRAKE SWITCH)
SW1
(SEAT SWITCH)
K1
(INTERLOCK RELAY)
K2
(START RELAY)
VOLTAGE REGULATOR
ELECTRONICS MODULE
PN 92-7613
VOLTAGE COMPARATOR
OSCILLATOR
WIRE COLOR CODES
BLACK
BROWN
BLUE
GREEN
GREY
ORANGE
PINK
RED
TAN
VIOLET
WHITE
YELLOW
ENGINE HARNESS
SOLENOID SHIFT STARTER
FUEL SOLENOID
#2 CYL
#1 CYL
FLYWHEEL
CHARGING COIL
PULSER COILS
IGNITER MODULE
WATER TEMP SENDER
OIL PRESSURE SWITCH

Kawasaki

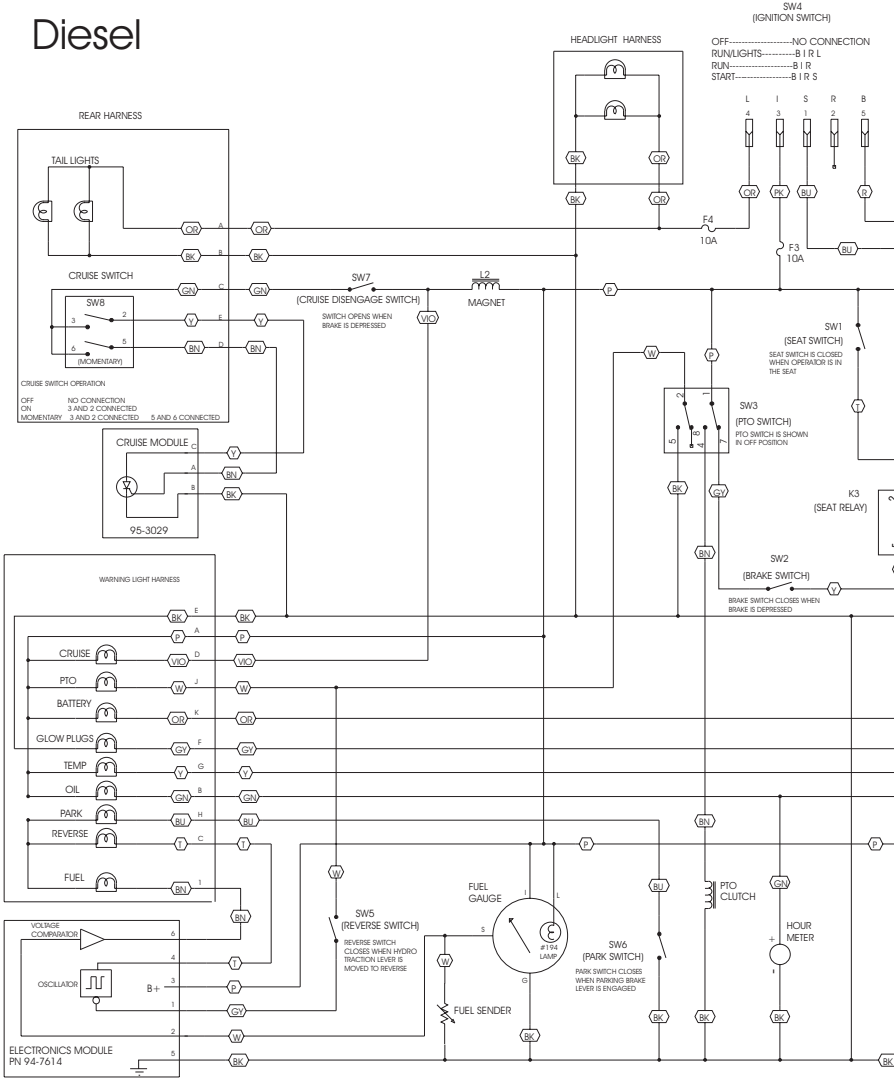

HEADLIGHT HARNESS
BK
OR
REAR HARNESS
TAIL LIGHTS
CRUISE SWITCH
SW8
(MOMENTARY)
CRUISE SWITCH OPERATION
OFF NO CONNECTION
ON 3 AND 2 CONNECTED
MOMENTARY 3 AND 2 CONNECTED 5 AND 6 CONNECTED
SW7
(CRUISE DISENGAGE SWITCH)
SWITCH OPENS WHEN BRAKE IS DEPRESSED
CRUISE MAGNET
F4
10A
CRUISE MODULE
95-3029
CRUISE
PTO
PARK
OIL
BATTERY
REVERSE
TEMP.
#194 LAMP
#168 LAMP
PARK SWITCH CLOSES WHEN PARKING BRAKE LEVER IS ENGAGED
SW6
(PARK SWITCH)
SW5
(REVERSE SWITCH)
REVERSE SWITCH CLOSES WHEN HYDRO TRACTION LEVER IS MOVED TO REVERSE
VOLTAGE COMPARATOR
OSCILLATOR
ELECTRONICS MODULE
PN 94-7613
FUEL GAUGE
FUEL SENDER
TEMP GAUGE
PTO CLUTCH
HOUR METER
SW3
(PTO SWITCH)
SW2

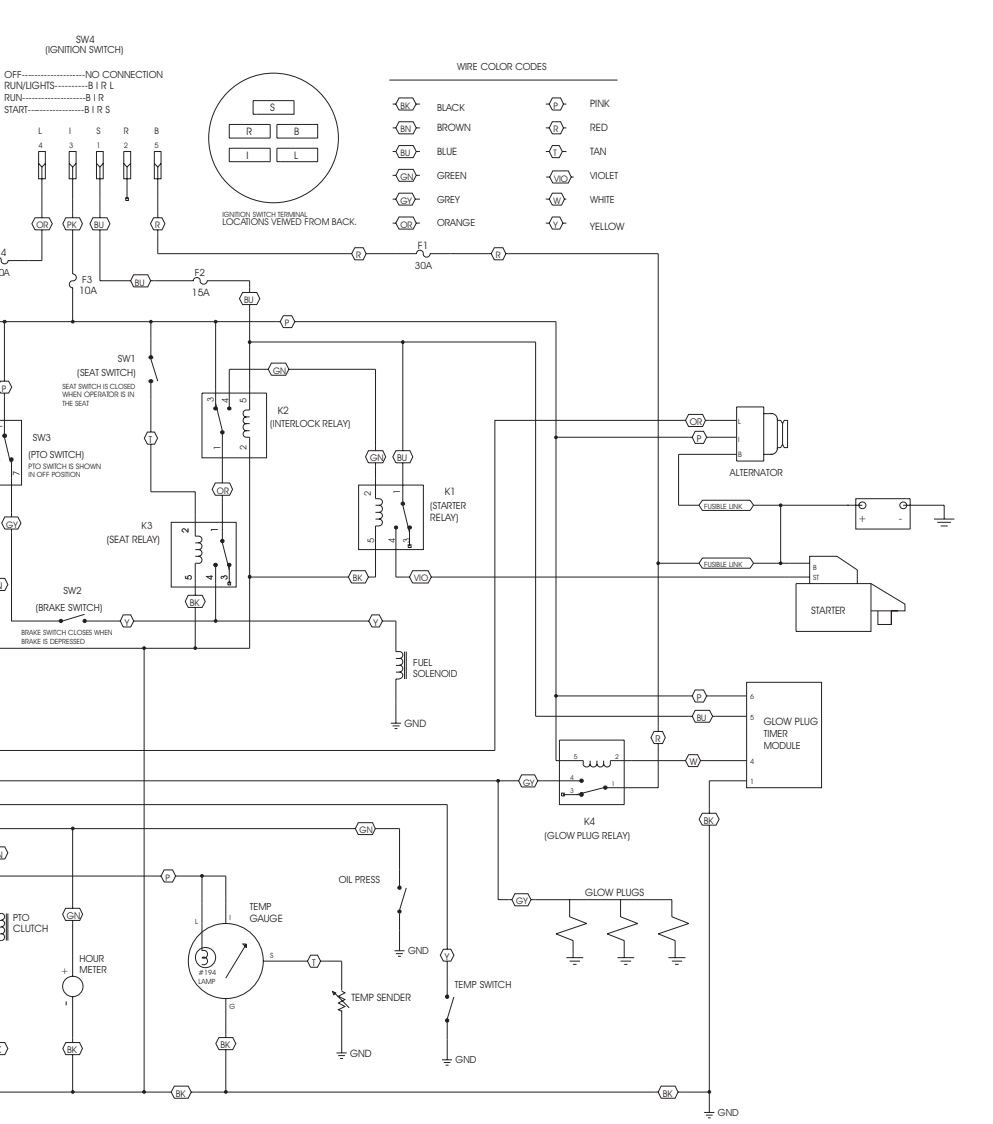

SW4
(IGNITION SWITCH)
OFF----------NO CONNECTION
RUN/LIGHTS----------B I R L
RUN----------B I R
START----------B I R S
L 4
I 3
S 1
R 2
B 5
S
R
B
I
L
IGNITION SWITCH TERMINAL LOCATIONS VIEWED FROM BACK.
WIRE COLOR CODES
BK BLACK
BN BROWN
BU BLUE
GN GREEN
GY GREY
OR ORANGE
P PINK
R RED
T TAN
VIO VIOLET
W WHITE
Y YELLOW
F4
10A
F3
10A
F2
25A
F1
30A
K1
(INTERLOCK RELAY)
SW3
(PTO SWITCH)
PTO SWITCH IS SHOWN IN OFF POSITION
K2
(START RELAY)
SW1
(SEAT SWITCH)
SEAT SWITCH IS CLOSED WHEN OPERATOR IS IN THE SEAT
SW2
(BRAKE SWITCH)
BRAKE SWITCH CLOSES WHEN BRAKE IS DEPRESSED
ENGINE HARNESS
#1 CYL.
IGNITION COILS
#2 CYL.
IGNITER MODULE
SOLINOID SHIFT STARTER
FUEL SOLINOID
PULSER COILS
#2 CYL.
#1 CYL.
FLYWHEEL
CHARGING COIL
NOTE: WIRE COLORS CHANGE AT THE ENGINE CONNECTOR.
OIL PRESSURE SWITCH (SWITCH OPENS WITH OIL PRESSURE)
WATER TEMP. SENDER
VOLTAGE REGULATOR
AC
AC
REG. DC
CHARGE LAMP
B+
GND
HOUR METER
FUEL PUMP
CLUTCH
GND

520Dxi


Diesel
REAR HARNESS
TAIL LIGHTS
CRUISE SWITCH
SW8
CRUISE MODULE
95-3029
HEADLIGHT HARNESS
SW4 (IGNITION SWITCH)
OFF.....NO CONNECTION
RUN-LIGHTS.....B I L
RUN.....B I R S
START.....B I R S
F1 30A
F2 15A
F3 10A
F4 10A
SW7 (CRUISE DISENGAGE SWITCH)
SWITCH OPENS WHEN BRAKE IS DEPRESSED
L2 MAGNET
SW5 (REVERSE SWITCH)
REVERSE SWITCH CLOSES WHEN HYDRO CONTROL LEVER IS MOVED TO REVERSE
FUEL SENDER
FUEL GAUGE
SW6 (PARK SWITCH)
PARK SWITCH CLOSE WHEN PARKING BRAKE LEVER IS ENGAGED
PTO CLUTCH
HOUR METER
SW2 (BRAKE SWITCH)
BRAKE SWITCH CLOSE WHEN BRAKE IS DEPRESSED
SW3 (PTO SWITCH)
PTO SWITCH IS SHOWN IN OFF POSITION
SW1 (SEAT SWITCH)
SEAT SWITCH CLOSES WHEN OPERATOR IS IN THE SEAT
K3 (SEAT RELAY)
K2 (INTERLOCK RELAY)
K1 (STARTER RELAY)
K4 (GLOW PLUG RELAY)
ROCKER SWITCH TERMINAL LOCATIONS VIEWED FROM BACK
WIRE COLOR CODES
BLACK
BROWN
RED
PINK
BLUE
GREEN
TAN
VIOLET
GREY
ORANGE
WHITE
YELLOW
TEMP GAUGE
TEMP SENDER
TEMP SWITCH
OIL PRESS
FUEL SOLENOID
GLOW PLUGS
GLOW PLUG TIMER MODULE
ALTERNATOR
STARTER
CRIBBLE LINK
GND
ELECTRONICS MODULE PN 94-7614
OSCILLATOR
VOLTAGE COMPARATOR
FUEL
REVERSE
PARK
OIL
TEMP
GLOW PLUGS
BATTERY
PTO
CRUISE
WARNING LIGHT HARNESS

Diesel


SW4
(IGNITION SWITCH)
OFF----------NO CONNECTION
RUN/LIGHTS----------B I R L
RUN----------B I R
START----------B I R S
L I S R B
4 3 1 2 5
HEADLIGHT HARNESS
REAR HARNESS
TAIL LIGHTS
CRUISE SWITCH
SW8
(MOMENTARY)
CRUISE SWITCH OPERATION
OFF NO CONNECTION
ON 3 AND 2 CONNECTED
MOMENTARY 3 AND 2 CONNECTED 5 AND 6 CONNECTED
CRUISE MODULE
95-3029
SW7
(CRUISE DISENGAGE SWITCH)
SWITCH OPENS WHEN BRAKE IS DEPRESSED
L2
MAGNET
F4
10A
F3
10A
SW1
(SEAT SWITCH)
SEAT SWITCH IS CLOSED WHEN OPERATOR IS IN THE SEAT
SW3
(PTO SWITCH)
PTO SWITCH IS SHOWN IN OFF POSITION
K3
(SEAT RELAY)
SW2
(BRAKE SWITCH)
BRAKE SWITCH CLOSES WHEN BRAKE IS DEPRESSED
WARNING LIGHT HARNESS
CRUISE
PTO
BATTERY
GLOW PLUGS
TEMP
OIL
PARK
REVERSE
FUEL
VOLTAGE COMPARATOR
OSCILLATOR
B+
ELECTRONICS MODULE
PN 94-7614
SW5
(REVERSE SWITCH)
REVERSE SWITCH CLOSES WHEN HYDRO TRACTION LEVER IS MOVED TO REVERSE
FUEL GAUGE
#194 LAMP
FUEL SENDER
SW6
(PARK SWITCH)
PARK SWITCH CLOSES WHEN PARKING BRAKE LEVER IS ENGAGED
PTO CLUTCH
HOUR METER


SW4
(IGNITION SWITCH)
OFF----------NO CONNECTION
RUN/LIGHTS----------B I R L
RUN----------B I R
START----------B I R S
L I S R B
4 3 1 2 5
S
R B
I L
IGNITION SWITCH TERMINAL LOCATIONS VIEWED FROM BACK.
WIRE COLOR CODES
BK BLACK
BN BROWN
BU BLUE
GN GREEN
GY GREY
OR ORANGE
P PINK
R RED
T TAN
VIO VIOLET
W WHITE
Y YELLOW
F1 30A
F2 15A
F3 10A
SW1
(SEAT SWITCH)
SEAT SWITCH IS CLOSED WHEN OPERATOR IS IN THE SEAT
SW3
(PTO SWITCH)
PTO SWITCH IS SHOWN IN OFF POSITION
SW2
(BRAKE SWITCH)
BRAKE SWITCH CLOSES WHEN BRAKE IS DEPRESSED
K1
(STARTER RELAY)
K2
(INTERLOCK RELAY)
K3
(SEAT RELAY)
K4
(GLOW PLUG RELAY)
ALTERNATOR
FUSIBLE LINK
FUSIBLE LINK
STARTER
B
ST
FUEL SOLENOID
GND
GLOW PLUG TIMER MODULE
GLOW PLUGS
OIL PRESS
TEMP GAUGE
#194 LAMP
TEMP SENDER
TEMP SWITCH
PTO CLUTCH
HOUR METER
GND
GND
GND
GND
GND