



**SATOH
TRACTOR
BUCK
INSTRUCTION
BOOK**



SATOH AGRICULTURAL MACHINE MFG. CO., LTD.



Any improper handling of the tractor could lead to an accident. Prior to the operation of the tractor, be sure to read this Instruction Manual carefully and have a thorough understanding of the description. In particular, the instructions given in "Safety Precautions" must be strictly followed.

SAFETY PRECAUTION

- ☆ When running the tractor at high speed or on roads, make sure the right and left brake pedals are interlocked so that they will not be operated independently.
- ☆ Make sure that a guard is in place when operating the belt pulley or P.T.O. driven shaft.
- ☆ Always wear relatively tight and belted clothing when operating the tractor. Loose jackets, shirts sleeves or other loose clothing should not be worn because of the danger of catching them in moving parts, engine or implement.
- ☆ When leaving the tractor, be sure to stop the engine, apply the parking brake and pull out the starter key.
- ☆ Never make a sharp turn at high speed.
- ☆ When descending a slope in reverse, be sure not to abruptly operate the clutch or the brake.
- ☆ Never operate the differential lock when running on a public road.
- ☆ When making a sharp turn, confirm that the differential lock is disengaged.
- ☆ Never operate the tractor on a slope that seems to be dangerous. Do not operate the clutch, brake, throttle lever and steering wheel abruptly on a slope as it is dangerous. Be careful particularly when running on a slippery road.
- ☆ Do not carry any persons on the tractor, nor on the linkage drawbars and implement.
- ☆ When towing, set the hitch point below the center line of the rear axle.
- ☆ When refuelling, be sure to stop the engine. Also take special care so that fuel will not catch fire.
- ☆ Use a safe fuel container. Fill the tank outdoors and wipe up spilled fuel. Replace the fuel cap securely.
- ☆ Never touch engine parts after operating the tractor or the engine until parts have had sufficient time to cool.
- ☆ Always keep positive battery post covered with rubber boot on the end of the cable.
- ☆ Never operate the tractor engine in a closed building where carbon monoxide fumes can collect.
- ☆ Do not allow children to operate the tractor, nor adults to operate it without proper instructions.
- ☆ When mounting an implement on the tractor, be sure to follow the instructions given in "Safety Precautions" in the implement Operation Manual.

SATOH

BUCK

Model S-470 & S-470D

With 3-cylinder K3B Diesel Engine

INSTRUCTION BOOK



SATOH AGRICULTURAL MACHINE MFG. CO.,LTD.

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INTRODUCTION

Equipped with a 3-cylinder, 18.5 HP diesel engine, the SATOH S-470 and S-470D tractors are, respectively, 2-wheel and 4-wheel drive type farm tractors with big capacity, high quality performance and outstanding durability providing increased economy.

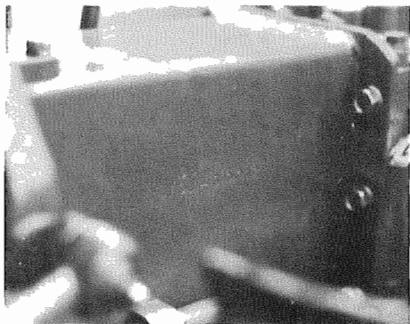
Making the best use of long experiences and the latest technology of the SATOH engineers, the S-470 and S-470D are built sturdy and rugged in all their components which consist of unsurpassed and precision machined parts. The careful assembling work coupled with quite severe performance test and strict quality control makes assurance of high quality and top performance for the S-470 and S-470D.

This instruction manual contains information on the operation, lubrication and maintenance of your SATOH tractor. The information contained is comprehensive and essential, and is designed to assist you, even if unexperienced, in utilizing your tractor.

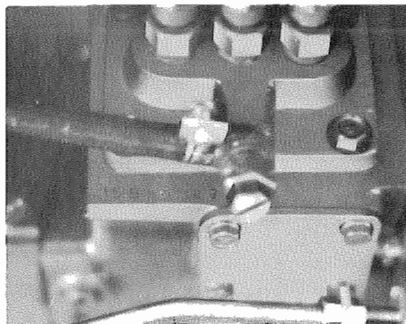
How well your SATOH tractor continues to give satisfactory performance depends greatly upon the manner in which it is operated. It is, therefore, requested that this manual be read carefully and kept ready for use so that the operation and maintenance services will properly be carried out in order to keep the tractor in top mechanical condition at all times.

Should any information as to your tractor be required, consult your SATOH dealer or distributor stating the machine and engine serial numbers of the tractor concerned.

We are sure you will be happy with SATOH tractor.



Tractor Serial No.



Engine Serial No.

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TREATMENT OF A NEW TRACTOR

All components of SATOH tractors model S-470 & S-470D are subject to stringent checking during assembly in the factory. However, a new tractor should be carefully checked over by the operator himself. For the first 25 ~ 50 hours operation, heavy duty work should be avoided. If heavy duty work is unavoidable, drive in a gear one stage lower than you would normally use, and run the engine at lower speed.

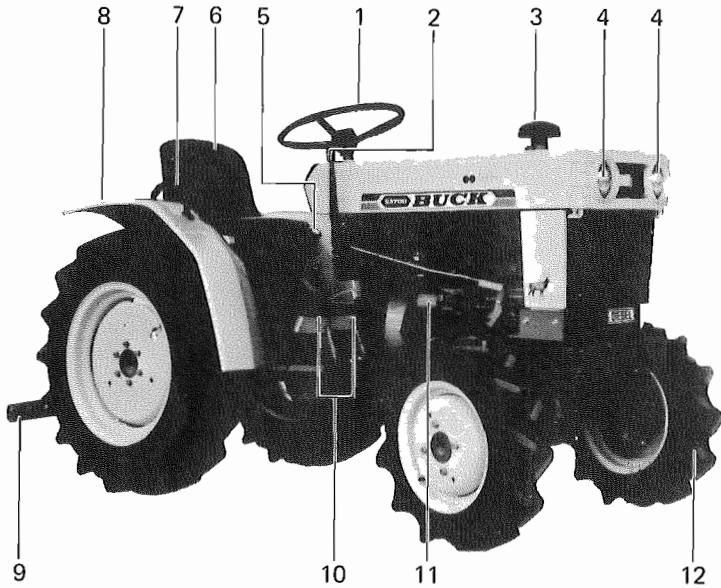
50-HOUR SERVICE

When the tractor is brand new, after the first 50 hours running, the following service, maintenance and checking should be carried out.

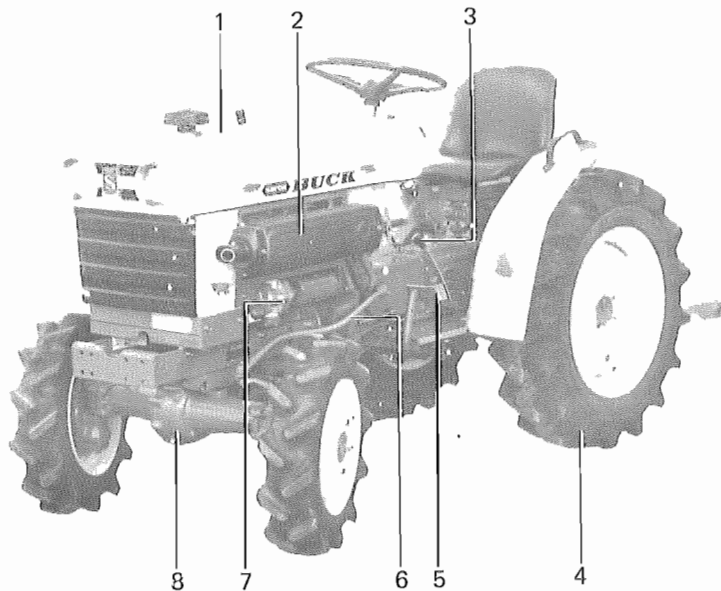
- (1) Replace the engine oil filter and engine oil.
- (2) Replace the transmission oil and clean the hydraulic oil filter.
- (3) Retighten all bolts and nuts.
- (4) Check and adjust the fan belt tension.
- (5) Check the wheels to see if their condition is good and tire pressure is correct.
- (6) Retighten the cylinder head bolts and adjust valve clearances.
- (7) Front axle diff. case and gear case oil replacement of 4-wheel drive tractor.
- (8) Cooling water replacement.
- (9) Air cleaner element cleaning.
- (10) Clean the fuel filter.
- (11) Check the front hub for end-play.
- (12) Check the battery electrolyte.

This 50-hour Service is an essential procedure for keeping the tractor in top condition, so it must be done properly.

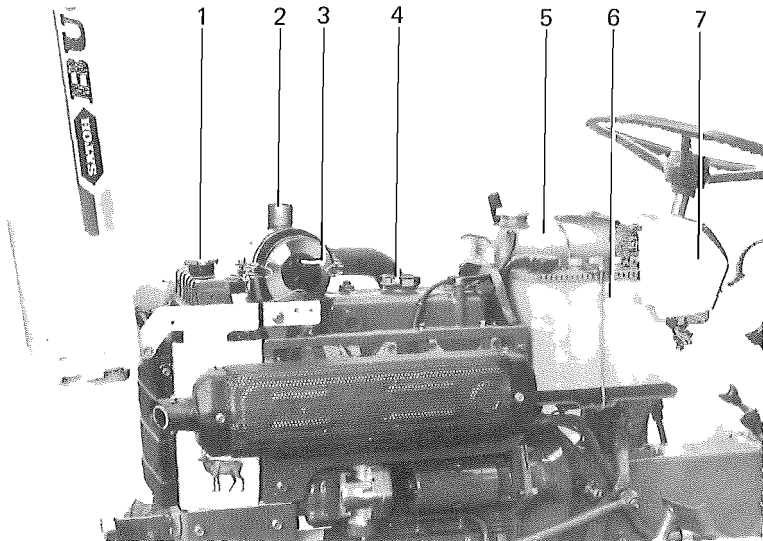
EXTERNAL VIEW AND NOMENCLATURE OF EACH PART



- | | |
|------------------------|------------------------|
| 1. Steering wheel | 7. Arm rest |
| 2. Speed control lever | 8. Rear fender |
| 3. Air cleaner cap | 9. 3 point linkage |
| 4. Head light | 10. Brake pedal |
| 5. Main shift lever | 11. Engine oil filter |
| 6. Seat | 12. 4-WD AG front tire |



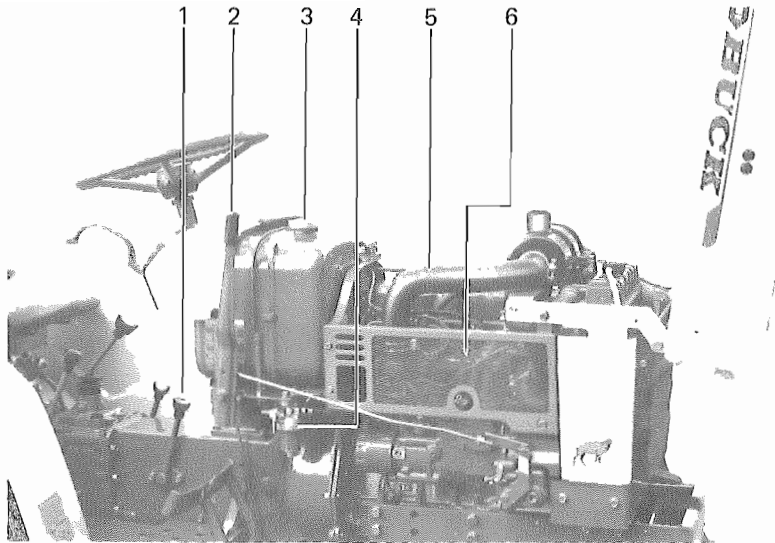
- | | |
|-------------------------|--------------------------------|
| 1. Bonnet | 5. Clutch pedal |
| 2. Muffler | 6. Drag link |
| 3. PTO gear shift lever | 7. Hydraulic pump |
| 4. Rear tire | 8. Front drive diff. gear case |



- | | |
|----------------------------|---------------------|
| 1. Radiator cap | 5. Fuel tank |
| 2. Cyclon type air cleaner | 6. Battery |
| 3. Air cleaner dust pan | 7. Instrument panel |
| 4. Engine oil filler cap | |

For opening the bonnet loosen the air cleaner cap for removing; after its removing remove the hook on the left side of the bonnet.

After the bonnet is closed make secure setting of the hook, install the cleaner cap and tighten the clamp enough.



1. 4-WD shift lever
2. Throttle lever
3. Fuel tank cap

4. Fuel filter
5. Air cleaner hose
6. Safety guard

SECTION 1. OPERATION

STARTING AND STOPPING THE ENGINE

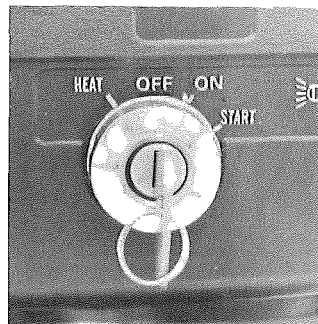
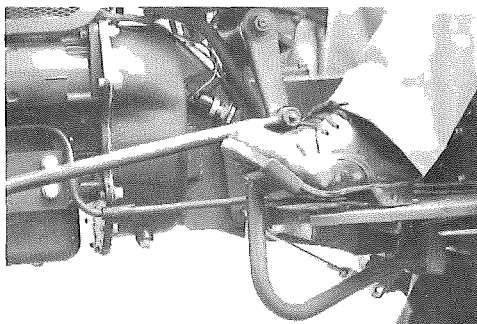
Before starting the engine, be sure to check the following points.

1. Confirm that the fuel tank is filled with sufficient fuel.
2. Check the amount of oil in the engine, and transmission and check cooling water level.
3. Always perform the daily maintenance described in SECTION 2.

STARTING

On the S-470 and S-470D, the safety starter switch is provided for preventing unforeseen accidents from breaking out in starting the engine. Installed between the starter switch and starter motor, the safety starter switch works as a kind of circuit breaker by which, in case that the clutch is not disengaged completely, the electric circuit in the engine starter motor can hardly be closed even when the starter key is turned to START.

1. Set the throttle lever at the center between idling and high speed.



2. After applying the parking brake, place the main shift lever and PTO shift lever in neutral. Then, fully depress the clutch pedal.
3. Insert the starter key into the key switch and turn it counterclockwise and hold it at "Heat" position to heat the glow plugs. As soon as the glow signal lamp on instrument panel glows red, about 30 seconds later rapidly turn the key to the "Start" position and the starter motor will rotate and the engine will start.

4. When the engine is started, take your hand off the key and the key then automatically returns to the "ON" position. The key must be in the "ON" position while the engine is running.
Never rotate the engine at high revolutions. Run the engine at approximately 1,300 ~ 1,500 rpm and after the engine temperature rises, shift the throttle lever to SLOW (900 rpm).
5. After starting the engine, make sure the battery charge warning lamp, water temperature warning lamp and engine oil pressure warning lamp are off. If any one of the lamp will not turn off or light up, stop the engine immediately, check for the cause and then take necessary countermeasures.
6. If the engine does not start on the first attempt, do not rotate the starter motor continuously more than 10 sec. Then heat the glow plug well and restart the engine.
7. Warm up the engine especially in cold weather, before working.

STARTING IN COLD WEATHER

1. Shift the speed control lever to the position of the maximum revolution, and then the injection pump smoke set is automatically released and fuel injection is increased.
When the engine starts the smoke set is automatically reset.
2. To start the engine in cold weather, heat the glow plug long enough to raise the temperature sufficiently in the combustion chamber.

NOTES:

- 1) After the engine has started confirm that the engine is running smoothly listening carefully to ascertain if nothing abnormal sounds, and inspect for oil and water leakage.
 - 2) In case fuel runs out, be sure to bleed the fuel system after refilling the fuel tank; otherwise the engine may not be started (or even stopped soon after started). (See SECTION 3. BLEEDING THE FUEL SYSTEM)
-

IMPORTANT:

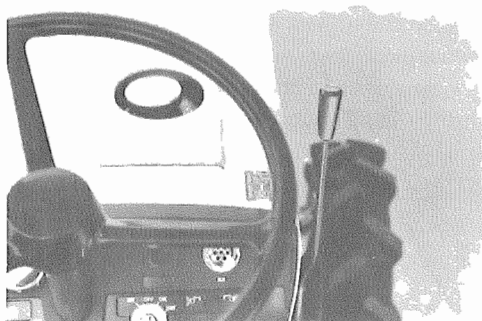


Never use ether to start the engine of model S-470 & S-470D tractors.

STOPPING

After idling the engine for a while by setting the speed control lever at the appropriate position, bring the throttle lever fully to the "STOP" position, and fuel is then cut off and the engine will stop.

Be sure to turn the starter key "OFF" when the engine has been stopped. When the operator leaves the tractor, be sure to apply the parking brake and take out the key.

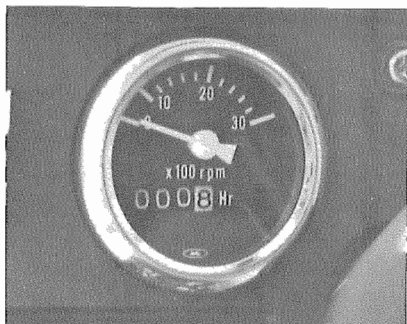


INSTRUMENTS AND CONTROLS

TRACTOR METER

The tractor meter, which reads the engine speed and hours of operation, is mounted on the instrument panel.

The engine speed meter is in the upper portion which indicates the engine speed in rpm. The hour meter located in the lower center shows the accumulated running hours at rated engine speed.



OIL PRESSURE WARNING LAMP

When the starter key is switched "ON", this lamp glows yellow. When oil is circulating normally while the engine is running, the lamp turns off. If the lamp still glows yellow after the engine has been started, stop the engine immediately and check the engine lubrication oil level. If that is OK, check the oil pressure switch and cabling. If there are any defective switches or cables, replace them.

BATTERY CHARGE WARNING LAMP

When the starter switch is set to "ON", this lamp glows red. When the battery is being charged normally while the engine is running the lamp turns off. If the lamp continues to glow, stop the engine immediately and check the alternator, regulator and cabling. If anything defective is found, replace it.

WATER TEMPERATURE WARNING LAMP

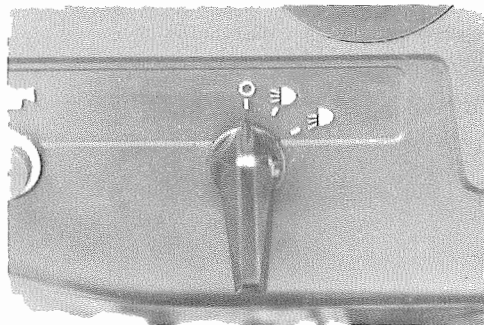
Under normal operating condition, the warning lamp will not turn on with the starter key at "ON" position. When the coolant temperature rises abnormally, the warning lamp lights up, indicating overheating. Check the coolant capacity and fan belt, and recondition, as required.

NOTE: _____

Utmost care should be taken when removing the radiator cap with the engine overheated.

LIGHT SWITCH

The headlight switch is located on the left side of the instrument panel.

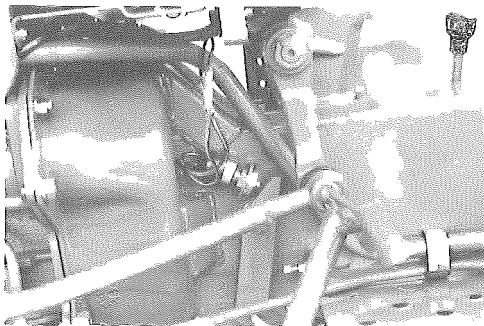


- OFF Lights are off.
- ☉ Headlight is on.
- ☉ Headlight is dimmed and directed downwards.

NOTE:

The switch for the working lamp (optional) is incorporated in the light itself.

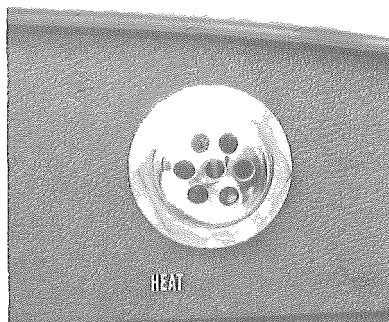
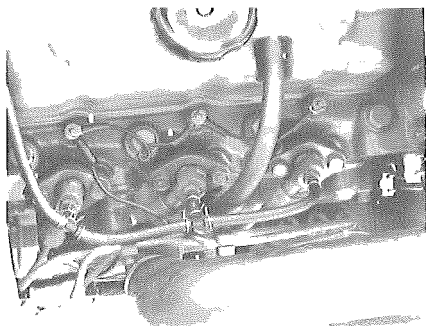
SAFETY STARTER SWITCH



As mentioned previously in this book, the safety starter switch is provided on SATOH S-470 and S-470D tractors for preventing unforeseen accidents at starting the engine. Assembled in the engine starting system between the starter switch and the starter motor, the safety starter switch works as a circuit breaker in relation to the clutch pedal operations; unless the clutch pedal is fully depressed to completely interrupt the power from the engine to the transmission, the safety starter switch remains off, keeping the starter motor circuit to open even when the starter key is turned to START.

GLOW PLUG

The engine of the SATOH tractors model K3B is fitted with sheathed type glow plugs which preheat the combustion chamber so that the engine may be started easily even in cold weather.



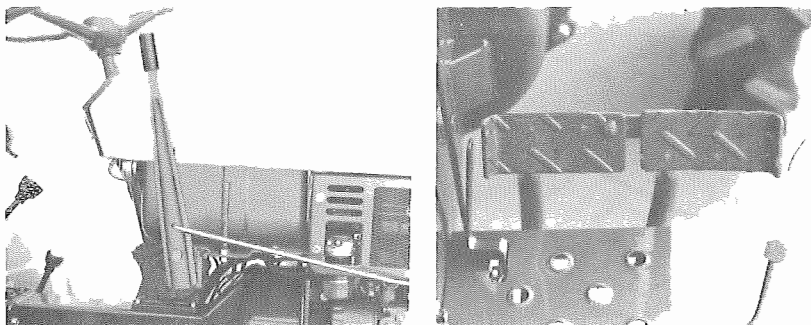
GLOW SIGNAL LAMP

The glow signal lamp which indicates the heating state of the glow plug in the combustion chamber is installed on the instrument panel. It is easily seen from the heating condition of the glow signal lamp resistance wire.

SPEED CONTROL LEVER

When the speed control lever is pulled fully toward the operator, the engine speed reaches the maximum of 2,800 rpm.

The rated speed of the engine model K3B is 2,600 rpm. This engine speed is not only the most appropriate one to get the longest service life from your tractor but also the most economical one. It is the best therefore, to run the engine at the rate of 2,600 rpm.



FOOT SPEED CONTROL PEDAL

The foot speed control pedal is installed on the right side of the step. When the hand throttle lever is in the idling position, the engine speed can be controlled freely within the range by depressing the pedal.

NOTE:

When the hand speed control lever is in a high rev. position, the foot speed control pedal also moves into the position for those rev. When this is done the revolution cannot be controlled by means of the foot pedal within the range below the rev. set by hand lever.

CLUTCH

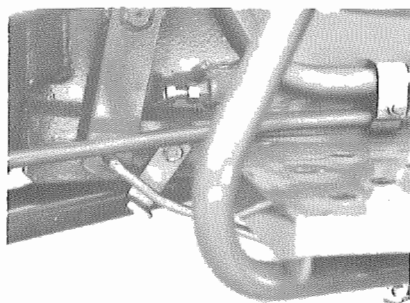
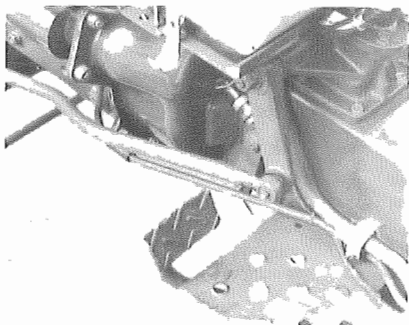
Depress the clutch pedal fully to bring the machine to a complete halt when shifting the gear in the transmission for changing the machine propelling speed. For shifting the PTO gears and shifting the 4-WD gear follow the similar manner.

Lowering the speed, when the tractor is overloaded, by half engaging the clutch or changing gear at high speed will damage the clutch lining.

De-clutching must be performed completely in one clean quick movement with the engine revs. lowered as much as possible.

NOTE:

When the tractor is not used, the clutch should be disengaged by depressing the clutch pedal and the clutch lever should be hooked so that clutch linings will not get stuck.



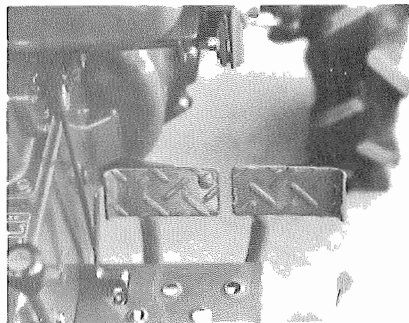
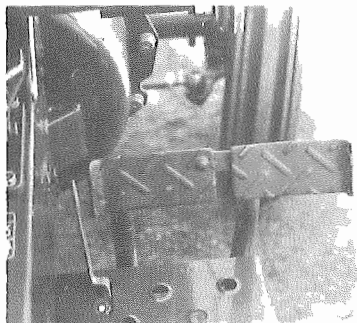
BRAKE

The brake on SATOH tractors model S-470 & S-470D is of internal expansion type and is dirt-and water-proof.

There are two pedals provided on the right side of the transmission case which are interlocked by a locking plate. The brake is applied by depressing these pedals. To stop the tractor, lower the engine revolutions, depress the clutch pedal and then the brake pedal. To shorten the braking distance, lower the engine revolutions quickly, depress the brake pedal and then the clutch pedal just before the engine stops.

For turning in a confined space the right and left axles can be braked independently by removing the locking plate interlocking the right and left brake pedals. When travelling at high speed or on roads make sure that the right and left brake pedals are interlocked by means of the locking plate.

When starting to travel on roads after one of the brakes has been operated more often than the other, check the balance of the right and left brakes beforehand. It is also necessary to check brake balance once a week. If you fail to check the brake balance or to interlock the right and left brake pedals, there is the most likelihood that an accident will occur.

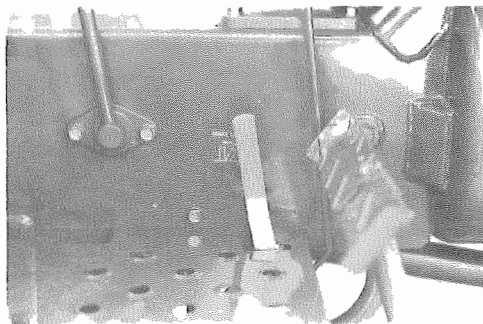


PARKING BRAKE

When parking, apply the parking brake by locking the main brake pedals in the following manner:

Interlock the right and left brake pedals by the locking plate. Keeping the pedals depressed, lock the pedals by the parking brake lever.

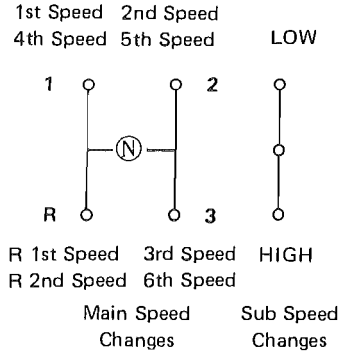
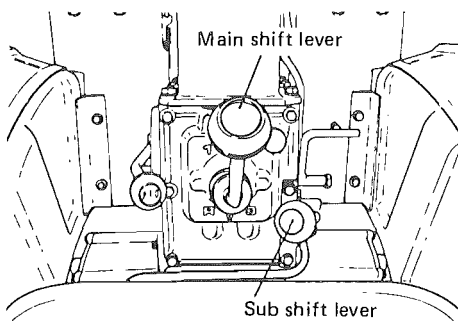
For releasing lock of the parking brake, depress the brake pedal further stronger, and push the parking lever forwards.



8-SPEED TRANSMISSION

The gear shift positions are as shown in the diagram below. By combination of the main and sub shift levers, six forward speeds and two reverse speeds can be obtained.

The first, second, and third forward speed and first reverse speed can be obtained with sub shift lever in the LOW position, and the fourth, fifth, and sixth forward speed and second reverse speed can be obtained with the sub shift lever in the HIGH position.

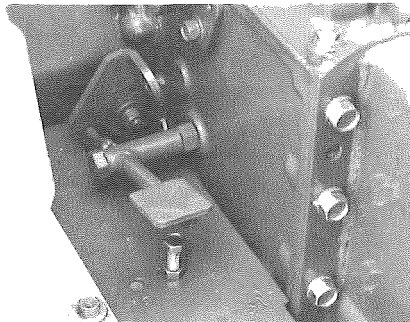


NOTE:

When you change the gear shift, lower the engine speed and depress the clutch pedal to disengage the transmission clutch. After stopping the tractor, shift the gears.

DIFFERENTIAL LOCK

This device links the right and left wheels in the transmission and rotates them at the same speed to prevent either wheel from slipping and to increase traction force.



ENGAGING THE DIFFERENTIAL LOCK

Before the tractor slips and the speed is lowered, depress the pedal with your right foot and engage the differential lock. If the differential lock does not engage at the first attempt, repeat the operation more forcibly. If it still does not engage, lower the engine speed and after disengaging the running clutch, repeat the whole operation as described above.

RELEASING THE DIFFERENTIAL LOCK

The differential lock is automatically released by the force of the spring when you put your right foot off the pedal. However, under particular conditions, there may be occasions when the lock does not release.

When this occurs, depress the right and left brake pedals alternately and quickly until the lock is released. If this happens during plowing, depress the pedal on the unplowed side and the lock will be released.

When the right and left brakes are interlocked, the lock is released by turning the steering wheel sharply to the left and the right. When the differential lock is not released by any of these means, reverse the tractor a short distance.

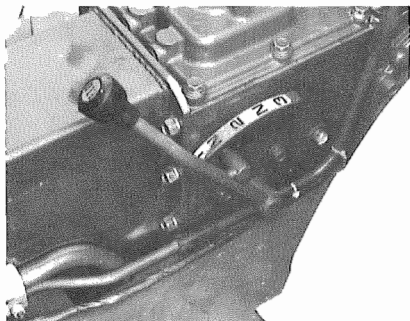
NOTE: _____

Refrain from using the differential lock when running at high speed or on the road.

POWER TAKE OFF

By operating the PTO shift lever located on the upper left of the transmission case, the three PTO speeds – 544 rpm, 802 rpm, 1,314 rpm – can be selected.

When shifting the PTO shift lever, depress the clutch pedal fully to interrupt the power from the engine and make sure the machine is brought to a complete halt.



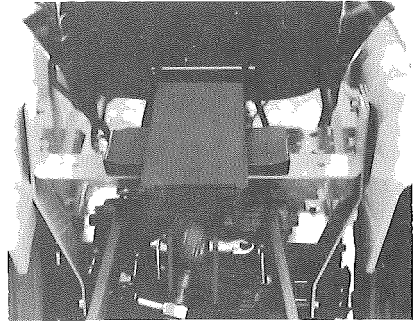
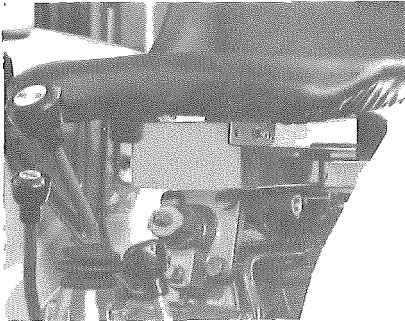
First 544 rpm/2,600 engine rpm
Second 802 rpm/2,600 engine rpm
Third 1,314 rpm/2,600 engine rpm

Standard PTO speed:

540 rpm/2,580 engine rpm (first)
1,000 rpm/1,978 engine rpm (third)

OPERATOR'S SEAT

A deluxe foam rubber operator's seat is provided on the S-470 and S-470D. It is adjustable in 3 stages at intervals of 28mm (1.10") to suit it to the operator's stature.



TOOL BOX

The tool box is located under the operator's seat. To use the tool box, turn the seat downward to the front.

REAR TREAD ADJUSTMENT

2-WHEEL DRIVE AND 4-WHEEL DRIVE

The rear tread can be adjusted by changing the left and right tires to each other. This adjustment is applicable to either specification – of 2-WD or 4-WD and ES or AG tire.

2-WD and 4-WD tread

AG Tire	Standard tread	740 mm (29.1 in.)
	Max. tread	890 mm (35.0 in.)
ES Tire	Standard tread	770 mm (30.3 in.)
	Max. tread	860 mm (33.9 in.)
Rear wheel tightening torque		8.5 ~ 9.5 kg-m (61 ~ 69 ft-lb)

FRONT TREAD OF 4-WHEEL DRIVE

4-wheel drive front tread is as shown below.

Front tread

AG Tire	785 mm (30.9 in.)	
ES Tire	800 mm (31.5 in.)	
Axle housing and gear case tightening torque		6 ~ 7 kg-m (43 ~ 50 ft-lb)

Front tire tightening torque

4-WD	8.5 ~ 9.5 kg-m (61 ~ 69 ft-lb)
2-WD	5.0 ~ 6.0 kg-m (36 ~ 43 ft-lb)



IMPORTANT:

1. Avoid widening front tread of the 4-wheel drive tractor by switching the right and left front tires as this may cause serious troubles on the steering linkage.
2. Check at frequent intervals to make sure that the front wheel is tightened securely to specified torque and that the axle housing and gear case are secured each other to specified torque.

REAR WHEEL INSTALLATION

Make sure that the rear tires are mounted so that the lugs on the tire form the staggered V's in series as viewed from the front of the tractor.



BALLAST WEIGHT

The slipping not only damages the tire but also results in working inefficiency and greater fuel consumption. Slipping, therefore, must be minimized as much as possible. For that purpose, ballast weights are available as optional equipment. It is recommended that the tractor be provided with ballast weights when working in the place where slipping is likely to occur. The ballast weights can be attached in front (2-WD AG only) and rear wheel discs and the front of the chassis. Ballast can also be applied by putting water into the tires instead of using the ballast weights. For this operation, pay particular attention to the temperature and air pressure.

In cold weather where the temperature drops below 0°C (32°F), use water with antifreeze and never fill the tire with only water. It is of course possible for you to employ a combination of water in the tire and ballast weights. Consult your dealer concerning the water injector and method of injection.

Front wheel weight :

2-WD AG Tire out side 16 kg (35.2 lb) x 2 = 32 kg (70.5 lb)

Rear wheel weight :

2-WD and 4-WD AG & ES 23 kg (50.71 lb) x 2 = 46 kg (101.3 lb)

Chassis weight :

2-WD and 4-WD 25 kg (55.1 lb) x 1 = 25 kg (55.1 lb)

TIRE PRESSURE

Tire pressure should be checked frequently. Either too high or too low pressure results in deterioration of the tire. To properly maintain the tires, make sure that the tire pressure is checked at least once a week.

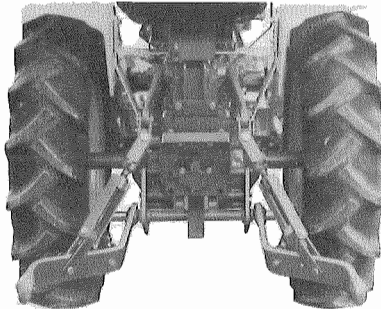
		Tire size	Ply	Pressure	Valve type
AG	Front 2-WD	450 – 10	2	1.4 kg/cm ² (19.9 psi)	TR–13
	Front 4-WD	5 – 12	2	1.2 kg/cm ² (17.1 psi)	TR–13
	Rear 2 & 4-WD	8 – 18	4	1.6 kg/cm ² (22.6 psi)	TR–218A
ES	Front 2-WD	20x8.00–10	4	1.7 kg/cm ² (24.2 psi)	TR–413
	Front 4-WD	6 – 12	2	1.0 kg/cm ² (14.2 psi)	TR–13
	Rear 2 & 4-WD	9.5 – 18	4	1.4 kg/cm ² (19.9 psi)	TR–218A

NOTE:

Air pressure of the tires must be changed according to the loading weight on the tires. For more details, please call and talk with your local Satoh dealer.

3-POINT LINKAGE

- The Satoh tractor, model S-470 and S-470D, is provided with a 3-point link of category 1. The implement which is to be mounted, must match the 3-point link.



NOTE:

When an implement is towed with the linkage drawbar installed on lower links the lower links should be always kept horizontal.

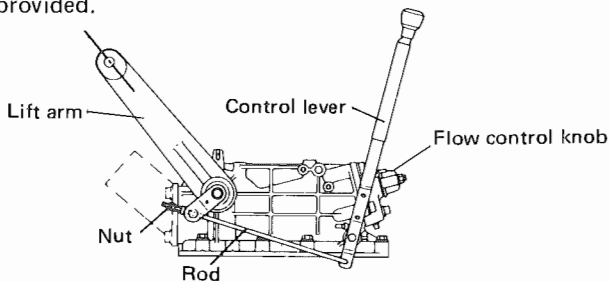
HYDRAULIC SYSTEM

Employed for S-470 and S-470D is SATOH "live" hydraulic system that makes the hydraulic energy available whenever needed while the engine is running, the hydraulic pump being directly mounted on the timing gear case of the engine.

The oil used is SAE #80 gear oil, the same as that for the transmission system and is filtered through a 100-mesh oil filter.

Lift hold down control can be made by operating the hydraulic control lever, which is on the right side of the operator's seat. Down speed control and locking of the implement to be mounted on the tractor can be down in use of the flow control knob.

The implement to be mounted on the tractor, such as front loaders, can be operated by the hydraulics taken out externally through the tap hole of PT3/8 provided.

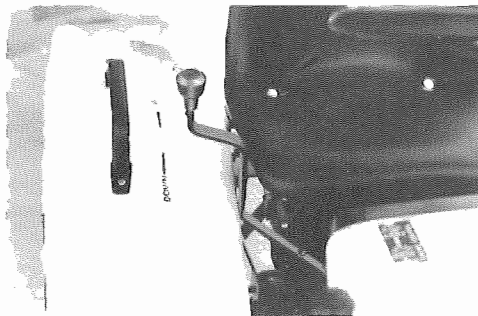


Mechanism and Operation of Hydraulic System

To operate the Satoh tractor properly, a good knowledge of the operation of each hydraulic mechanism is required.

LIFT

When the hydraulic control lever on the right side of the seat is moved fully backward, the hydraulic oil is forced to flow through the hydraulic control valve to the cylinder. When the implement is moved up to a specific position, the control valve is automatically placed in Neutral by the feedback rod, and thus the implement is held in the lift position.



DOWN

When the hydraulic control lever is moved fully to the front, the hydraulic oil flows from the cylinder back to the tank through the control valve.

HOLD

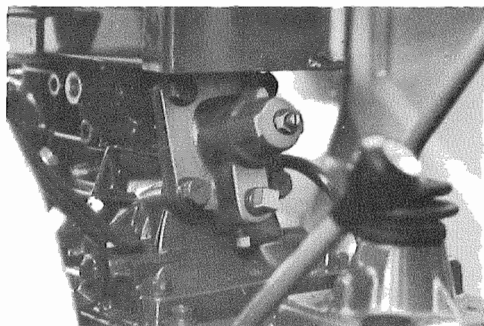
When the implement fully moves up, the control valve is placed in Neutral by the feedback rod connected to the ram shaft, and thus the implement is held in its position.

To hold the implement halfway, quickly return the control lever to the NEUTRAL position while the implement is moving up or down. The implement can be held in any desired position.

FLOW CONTROL KNOB

The flow control knob which controls the lowering speed of the implement is located in front of the hydraulic case under the seat.

When the knob is turned clockwise, the lowering speed slows down, and when further turned, the control valve is closed. As a result, the implement will be held in its position and not move downward any more. Turning the knob counterclockwise makes the lowering speed faster.



INSTALLING THE EXTERNAL HYDRAULIC ADAPTER (OPTIONAL)

When the hydraulic adapter is used :

Loosen the three bolts on the left side of the hydraulic case, and remove the cap taking care not to drop the O-ring.

Fit the O-ring correctly to the hydraulic adapter and install it on the hydraulic case.

Tightening torque : 2.5 ~ 3.0 kg-m (18 ~ 22 ft-lb)

Connect the outlet of external hydraulic adapter, inlet of the control valve attached to the implement mounted on the tractor, outlet of the control valve, and oil return port of the external hydraulic adapter by pipes.

Start the engine and by operating the control valve of the implement mounted on the tractor bleed the cylinder and pipes. Then check the pipe joints for oil leakage.

NOTES: _____

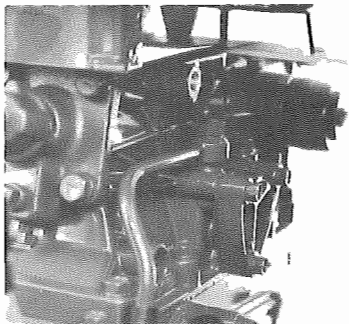
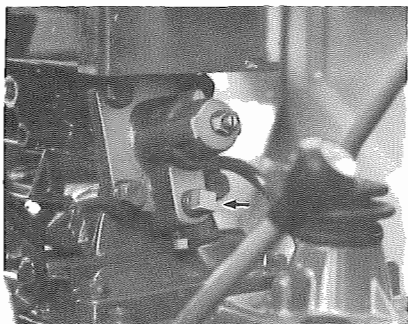
To use the external hydraulic adaptor the implement mounted on the tractor must have a double action control valve.

HYDRAULIC EXTERNAL SERVICE

When the Tractor's Control Valve is Used :

The control valve attached to the tractor is of a single action type, and therefore the implement mounted on the tractor must also be of a single action type.

Connect the hydraulic external service plug and cylinder plug of the implement with a rubber hose. Start the engine and place the hydraulic control lever in the Lift position. By operating the safety valve bleed the air completely from the cylinder and pipes, and lock the flow control knob. When the hydraulic control lever is placed in "Lift", the implement moves upward, when placed in "Down" the implement moves downward.

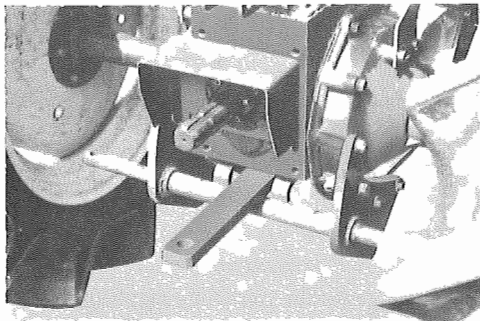


NOTES: _____

The hydraulic control lever will not return to "Neutral" automatically, so the control lever must be returned to Neutral when the implement reaches a maximum height. If the control lever is left in "Lift" the safety valve starts operation and the temperature of hydraulic oil rises thus causing trouble to the machine. Be sure to move the control lever back to Neutral.

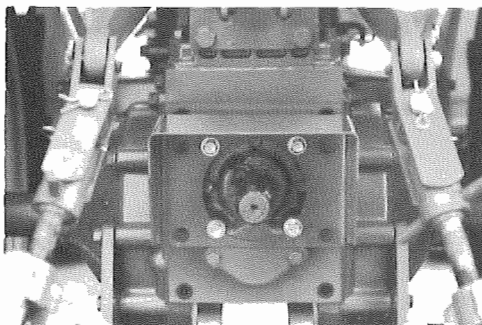
DRAWBAR

The permanent drawbar is provided as standard. To pull an attachment or trailer, be sure to use the drawbar.



PTO GUARD

In any type of operation, be sure to install the PTO guard for additional safety.



FRONT PTO (OPTIONAL)

In the case of BUCK quite the same front PTO as for BEAVER can be used in either specification of 2-WD or 4-WD. When assembling the front PTO to BUCK, install the flange to the rubber coupling with the care that the boss may face to the front side. For further details please contact the nearest Satoh Dealer.

VERTICAL EXHAUST

The standard muffler setting part is formed square. Make installation of the standard muffler setting it vertically upright and install a tail pipe (optional), and then it will be usable as up-swept muffler.

SECTION 2. REGULAR MAINTENANCE

To keep your tractor operating in the top condition and to assure its proper performance and reliability for a long period of time, periodic inspection is indispensable. If your tractor is not periodically serviced, the result will be such that its performance and operating life will be reduced. Also a major breakdown is more likely to occur, which will entail much more expense than that which you would pay for regular maintenance.

Maintenance and servicing of SATOH S-470 & S-470D are very important items, however, the procedure is very simple. Carry out daily checking, greasing and periodic service by carefully following the instructions given in this manual. In addition to daily inspection the following servicing must be carried out.

50-hour service to be carried out on a new tractor.

A-service Service every 50 hours

B-service Service every 100 hours

C-service Service every 300 hours

D-service Service every 400 hours

NOTE: _____

The tractor should always be kept clean. Before greasing or removing the oil pan plug and filter cap, be sure to wipe the surface clean. When using tools for repairing inside the engine, transmission, fuel tank or hydraulic unit, clean the tools before use. Be careful especially when refueling. If dust or water gets in the fuel, engine trouble will be experienced, resulting in loss of power and the unexpected necessity of parts replacement. The tractor should be serviced indoors where is plenty of room and it is as clean as possible.

SERVICE SCHEDULE

Observe the following service schedule. This service schedule is applied to tractors which are operated under normal conditions. When your tractor is frequently operated in muddy places, greasing must be carried out more frequently and when the tractor is often operated in dusty places, clean the air cleaner element and fuel filter more frequently. Extra servicing must be carried out according to the situation.

SERVICE SCHEDULE CHART

Hours of operation	A service	B service	C service	D service
50	○	○		
100	○	○		
150	○			
200	○	○		
250	○			
300	○	○	○	
350	○			
400	○	○		○

- * After completing the first 400 hours operation, repeat the items according to the service schedule given in the above chart.
- * Usually B service is carried out every 100 hours. For a new tractor, however, B service should be carried out at the 50 hours service.

DAILY INSPECTION

1. Check for leakage of oil, water or fuel, and if any repair the part.
2. Check the engine oil, transmission oil and cooling water. If the quantity is not proper, remedy the shortage.
3. After finishing work, replenish fuel upto 25 mm (1 inch) below the fuel tank filler cap.
4. After working in a dusty place, clean the air cleaner element and after working in a place with dry grass, clean the radiator and radiator screen.
5. Tighten nuts and bolts.
Make further tightening of the setting bolts of front wheel, rear wheel, and then of other bolts and nuts.
6. After working in a muddy place, grease the king pins, front axle center pin and brake shaft via the grease nipples provided.
7. Check the tire pressure and adjust if necessary.
8. Check the brake and clutch pedals for free play.
If it is not as specified, make necessary adjustments.
9. All moving portions must be cleaned and lubricated with engine oil so that they work smoothly. Lubrication has the reverse effect in an extremely dry or dusty place. Therefore avoid lubrication if working in such a place.

10. Check the electrolyte level in the battery and if it is below the specified level add distilled water.
11. Check the fan belt tension and if it is slack adjust it.
12. Check the oil level in the front axle gear case of the 4-wheel drive tractor.

A-SERVICE (Every 50 hours of operation)

NOTES:

- 1) A new tractor needs careful attention. The following should be read carefully to understand all the things to be done.
 - 2) Some items described here are the same as for daily inspection but special care should be given to them when carrying out the 50 hours service.
-

50 HOURS SERVICE FOR A NEW TRACTOR

1. Replace the engine oil and engine oil filter
2. Cooling water replacement and check and adjust the fan belt tension.
3. Clean the engine fuel filter.
4. Clean the air cleaner element.
5. Replace the transmission oil.
6. Clean the hydraulic oil filter.
7. Tighten the engine cylinder head bolts and adjust the valve clearances.
8. Check the front hub for end-play and tire pressure is correct.
9. Replace oil in the front axle differential case and the front gear case of the 4-wheel drive tractor.
10. Check the battery electrolyte.
11. Retighten all bolts and nuts.

50 HOURS SERVICE FOR A TRACTOR THAT IS NOT NEW

1. Cleaning the air cleaner element.
Thoroughly clean the element using compressed air. Wipe dust off the dust pan and body. (See SECTION 3. SERVICE INFORMATION)
2. Brake adjustment.
Adjust the brakes so that the right and left brake pedals operate the brakes evenly. Adjust the pedals so that they have the proper free play. (See SECTION 3. SERVICE INFORMATION)
3. Clutch adjustment.
Adjust the clutch pedal so as to obtain proper free play. (See SECTION 3. SERVICE INFORMATION.)

4. Cooling water replenishment.
Check that the specified quantity of cooling water is put in and if it is not, fill with water up to 25.4 mm (1 inch) below the filler cap. The maximum level of cooling water cannot be filled up in one operation. When cooling water has been completely drained, fill with new water, then run the engine at low rev. for a short period and then fill to the specified level again.
Check the water hose for damage and inspect joint sections for leaks.

NOTE: _____

In cold weather, check the specific gravity of the antifreeze water mixture.

5. Tightening nuts and bolts.
Tighten all nuts and bolts as much as possible because vibration is always noticed when the tractor is operated. At the same time, check the ballast weight bolts for tightness.
6. Greasing.
See page 31, "Greasing diagram".
7. Checking the front hub for end-play.
8. Checking the battery electrolyte.

B-SERVICE (Every 100 hours of operation)

NOTE: _____

Carry it out at the same time as DAILY INSPECTION AND A-SERVICE

1. Replacing the engine oil.
The engine oil should be replaced at the first 50 hours service and again replaced after 50 hours running.
Thereafter, replace the oil every 100 hours of operation.
2. Replace the engine oil filter with a new one.
3. Check the specific gravity of the battery electrolyte.
4. Clean the fuel filter.

C-SERVICE (Every 300 hours of operation)

Carry out as follows along with DAILY INSPECTION, A-SERVICE and B-SERVICE.

1. Replace the transmission case oil.
2. Clean up the hydraulic oil filter.
3. Replace the oil in the front axle differential case and the front gear case of the 4-wheel drive tractor.

D-SERVICE (Every 400 hours of operation)



Carry out as follows at the same time as DAILY INSPECTION, A SERVICE, B-SERVICE and C-SERVICE.

1. Replace the air cleaner element.

The element is usually replaced every 400 hours, but, for different operating conditions, judge the timing of the replacement by inspecting the element.

2. Replace the cooling water.
3. Clean the outside of the radiator.
4. Check the valve clearance.
5. Check the injection nozzle.
Check the nozzle condition and injection pressure.
6. Replace the fuel filter.

RECOMMENDED LUBRICANTS AND FUEL

Application	Air Temperature	A.P I. classification	Grade	Mobil Mobil	Esso 	Shell 
Engine	Below -7°C (20°F)	CC CD	Multigrade SAE 10W	Mobil Delvac 1210	Esso LUBE D-3 10W Esso LUBE HDX 10W Esso LUBE HD 10W	Shell myrina oil 10W Shell Rimula CT 10W Shell Rotella TX 10W-30 Shell Rotella SX 10W
	-7°C to 32°C (20°F to 90°F)	CC CD	Multigrade SAE 20W SAE 20 SAE 30	Mobil Delvac 1220 Mobil Delvac 1230	Esso LUBE D-3 30 Esso LUBE HDX 30 Esso LUBE HD 30	Shell myrina 30 Shell Rimula CT 30 Shell Rotella TX 30 Shell Rotella SX 30 Shell Multigrade 20W-40
	Above 32°C (90°F)	CC CD	Multigrade SAE 40	Mobil Delvac 1230	Esso LUBE D-3 40 Esso LUBE HDX 40 Esso LUBE HD 40	Shell myrina oil 40 Shell Rimula CT 40 Shell Rotella TX 40 Shell Rotella SX 40
Transmission hydraulic system and steering gear box	Below -7°C (20°F)	SAE #80		Mobilfluid-423 or Mobil A.T.F. -220	Essolub HDX 10W or Essolub XD3-10W	Dentax 80
	-7°C to 32°C (20°F to 90°F)					
	Above 32°C (90°F)			Mobilube C80	Esso Gear Oil	Dentax 90
4-WD front diff. case and kingpin case		SAE #80 or #90		Mobilube GX	Esso gear Oil GP80 or 90	Shell Super deluxe EP
Antifreeze				Parmagone	Esso Antifreeze	Shell Antifreeze

MAINTENANCE INTERVAL CHART

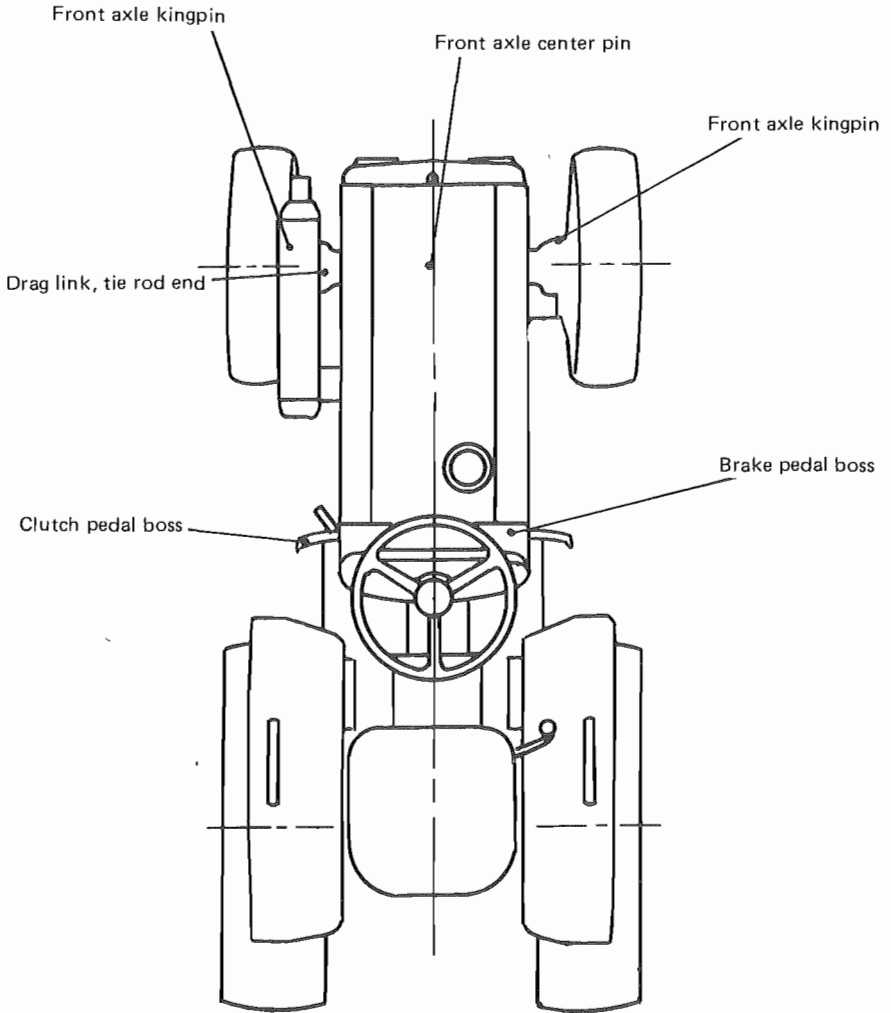
No.	Items	Maintenance Interval								Thereafter every
		50	100	150	200	250	300	350	400	
1	Engine oil replacement	●	●		●		●		●	100
2	Engine oil filter element replacement	●	●		●		●		●	100
3	Engine fuel filter element cleaning-up and replacement	○	○		○		○		●	100 400
4	Air cleaner element cleaning-up and replacement	○	○	○	○	○	○	○	●	○ 50 ● 400
5	Injection nozzle pressure check								⊕	400
6	Transmission oil replacement	●					●			300
7	Hydraulic oil filter element cleaning-up	○					○			300
8	4-WD front axle diff. case and front gear case oil and replacement	●					●			300
9	Valve clearance	⊕							⊕	400
10	Cooling water	●	⊕	⊕	⊕	⊕	⊕	⊕	●	400
11	Specific gravity of battery electrolyte check	⊕	⊕		⊕		⊕		⊕	200
12										
13										
14										

- Replacement
- Clean-up
- ⊕ Check

NOTE:

It is advised the intervals mentioned in the above list regarding replacing, cleaning-up and checking are for the standard cases and then desired to make each work so as to meet the requirement depending upon the usage condition of the tractors.

MAINTENANCE CHART



SECTION 3. SERVICE INFORMATION

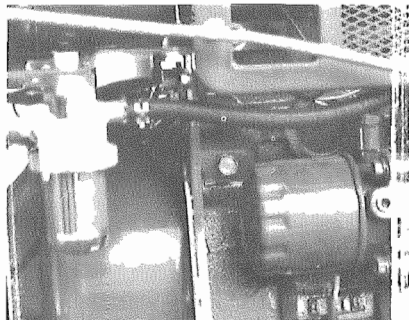
This section describes service information required for regular maintenance and adjustment and also the ways to carry out these jobs.

NOTE:

When carrying out the maintenance services or adjustments, place the tractor on as open and level ground as possible. Before removing caps, plugs, and covers, wipe clean the surrounding surfaces so as not to allow dust or dirt to enter the inside of the engine and the tractor.

PRECAUTIONS ON COOLING SYSTEM IN COLD WEATHER

Frozen cooling water damages the cylinder block. To avoid such a trouble, mix antifreeze into cooling water, or thoroughly drain cooling water from the cylinder block and radiator in case the tractor is stored or not used for a long time in cold weather.



NOTE:

For details of the engine block heater, consult a Satoh dealer.

ANTIFREEZE

When adding antifreeze solution, the following rules should be observed, otherwise, the cylinder block will rust.

1. This tractor's engine is of a diesel type and its cylinder block is made of cast iron. Therefore, suitable antifreeze solution for such a cast engine block must be used.

2. Before adding mixture of antifreeze and water, completely drain cooling water and clean the radiator with detergent.
3. Water to be added to antifreeze should be clean and soft water.
4. When antifreeze is no longer used, drain and wash the cooling system using detergent and fill it again with clean water. Do not re-use antifreeze drained from the engine.
5. Treat antifreeze carefully so that it may not remove paint from the cylinder block.
6. Any antifreeze solution (antifreeze and water), even if it is permanent antifreeze, should not be used for more than 2 years.
7. Confirm that there are no leak from the hose joints or cylinder head gasket.
8. Antifreeze with proper density to suit the climate in your area should be used.
9. When antifreeze is used over a long period in winter, measure the specific gravity frequently.

NOTE : _____

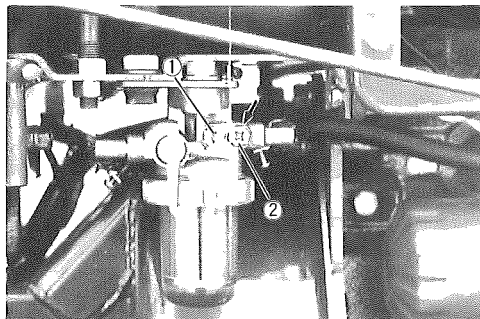
Consult your dealer concerning detergent and antifreeze.

FUEL SYSTEM AIR BLEEDING

If fuel is exhausted the engine stops or when the fuel filter element is cleaned, air is induced into the fuel line. In such a case, the fuel system must be bled after refilling the fuel tank. If air is left in the fuel line, the engine cannot be started.

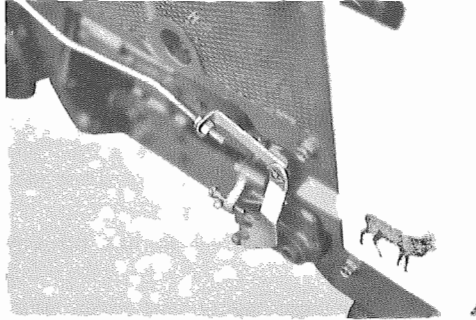
FUEL FILTER AIR BLEEDING

Fill the fuel tank up to the proper level. Loosen the No. 1 air vent screw shown in the following photo and tighten it up after filling in fuel until no air is noticed. And then loosen the No. 2 air vent screw, fill in fuel until no air is noticed and tighten up the air vent screw in the same manner as for the No. 1 screw.



FUEL PUMP AIR BLEEDING

Loosen the air vent screw of the fuel pump to let the fuel to overflow. When no more air bubbles in the fuel, tighten the screw.

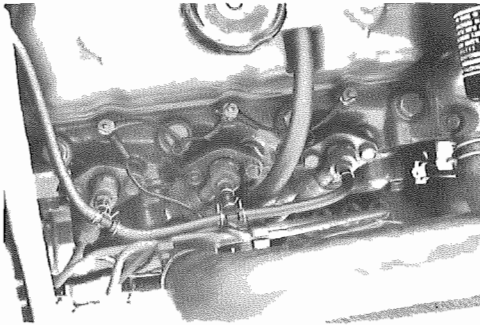


NOTE:

With this operation, the engine can be started, but if not, bleed the injection pipe.

FUEL PIPE AIR BLEEDING

Loosen the nut of the injection nozzle and shift the throttle lever to the high speed position. Then, start the engine by operating the starter motor and make sure the fuel is discharged properly at the loosened nozzle connection. Tighten the nut to the specified torque.



Start the engine according to the steps covered by "Starting the Engine".

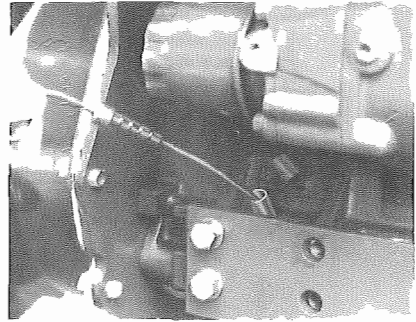
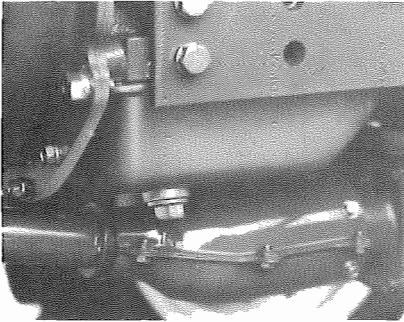
NOTE:

Unless air is completely bled, the engine can not be started; in such a case, perform air bleeding again to let remaining air completely out of the system.

ENGINE OIL REPLACEMENT

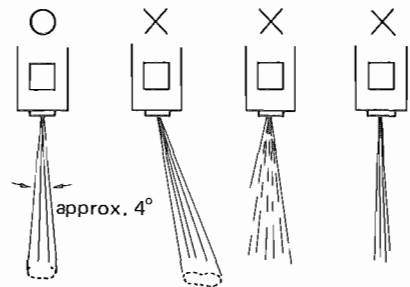
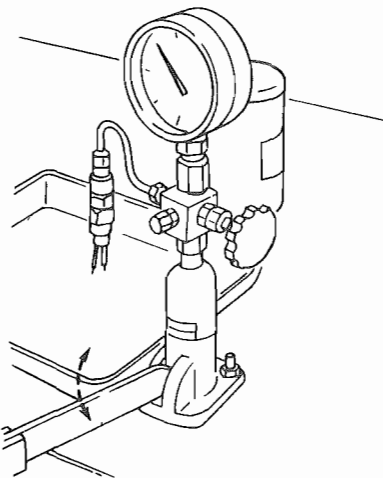
Remove the plug of the engine oil pan and completely drain the used oil. Supply the specified oil up to the specified level. It should be noted that dirty oil is more easily discharged when it is warm.

Replacing engine oil should be carried out while the tractor is placed horizontally.



INJECTION NOZZLE INSPECTION

When the injection pressure of the nozzle is lowered or injection deteriorates, the exhaust gas becomes extremely black resulting in the loss of engine power and the engine will also make more noise. Be sure to always maintain the correct injection pressure [120 kg/cm^2 (1706 psi)].



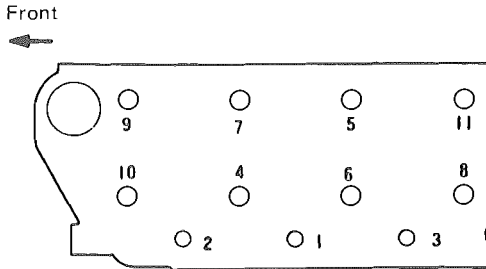
CYLINDER HEAD BOLT TIGHTENING

Tighten the cylinder head bolts of a new tractor after 50 hours operation. When the old gasket has been replaced with a new one, tighten the bolts to the specified torque.

Tightening torque of the cylinder head bolts :

M12 11 ~ 12 kg-m (80 ~ 87 ft-lb)

M10 7 ~ 8 kg-m (51 ~ 58 ft-lb)



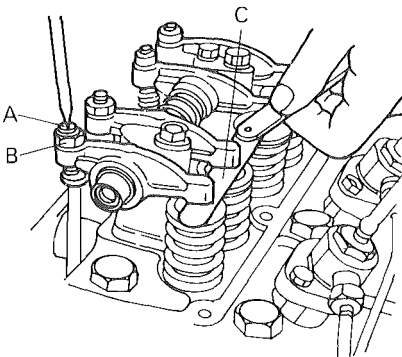
Bolt tightening sequence is as shown in the Fig. For even tightening of the bolts, the first tightening should be half the specified torque and then tighten it further until the specified torque is obtained.

NOTE: _____

After tightening the cylinder head bolts, adjust the valve clearances.

VALVE CLEARANCE ADJUSTMENT

Adjust the valve clearances when the sound of the tapets is loud or when the engine does not run smoothly without anything abnormal with the fuel system.

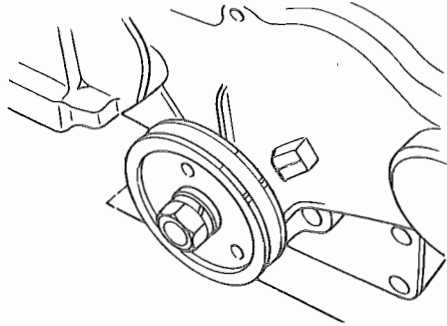


Adjust the valve clearances by loosening the lock nut (B), the adjusting screw (A) using a screwdriver and then applying a thickness gauge to (C). When locking the adjusting screw by means of the lock nut (B), support the adjusting screw firmly using a screwdriver so that both are not rotated together.

Valve clearance : Intake & Exhaust
0.25 mm (0.01 inch) in cold seasons

VALVE CLEARANCE ADJUSTMENT PROCEDURE

1. The valve clearance should be checked with a cold engine and with the piston at top dead center on the compression stroke.
The top dead center on the compression stroke of No. 1 piston can be determined by the timing marks on the crank pulley and timing gear case.



2. Position the piston in No. 1 cylinder at top dead center on compression stroke and adjust its intake and exhaust valve clearance.
3. Then rotate the crankshaft 240 -deg. clockwise to move the piston of No. 3 cylinder to top dead center on compression stroke, and adjust its valve clearance.
4. Then rotate the crankshaft 240 -deg. clockwise to move piston of No. 2 cylinder to top dead center on compression stroke, and adjust its valve clearance.

COOLING SYSTEM

The cooling water must be soft water. Hose joints, radiator drain cock, cylinder block drain cock, etc. should be tightened correctly so that no water leakage will occur. Also confirm the correct tension of the fan belt.

The front of the radiator is provided with screen (optional) to prevent dust from entering. After working in dusty places cleaning is required.



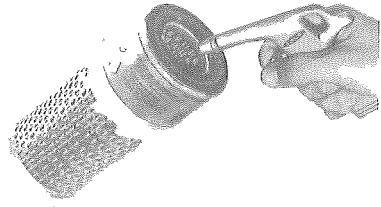
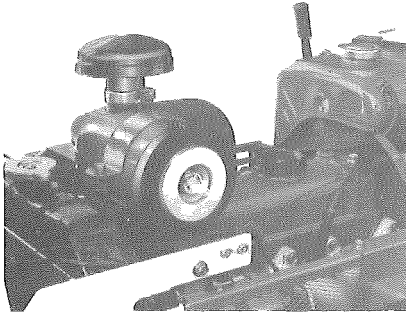
Pour water into the radiator up to the filler port, and start the engine. After running the engine for a while, add water again up to the filler port.

AIR CLEANER

The air cleaner element, when remarkably stained or clogged, may prevent smooth start of the engine or deteriorate its performance, preventing normal operation. Keep the element always clean to ensure full performance of engine.

Clean the element in the following procedure.

1. Remove the dust pan clamp and take out the dust pan. Clean the separator plate ass'y and dust pan.
2. Unscrew the butterfly bolt and take out the element. Blow the compressed air to remove dust completely. Blow out the dust from the inside of the rubber seal and tap hole.
3. The element may be washed in synthetic detergent. After washing, rinse the element completely and dry before mounting. Never use it before drying up completely.
4. Be careful not to allow the dust in the body ass'y and on the pressure-fitted surface of the element seal to enter the air hose. Disconnect the air hose when cleaning the cleaner body by blowing the air.



Assembling the element

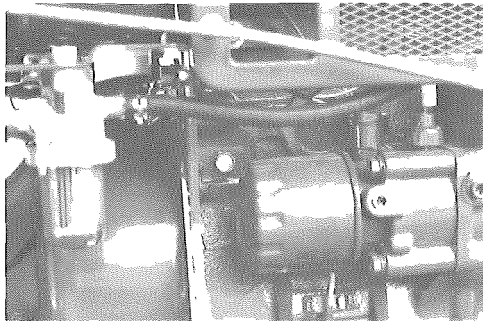
Assemble the element to the body and fasten with the butterfly bolt completely. Assemble the separator plate ass'y to the dust pan ass'y and install it to the body ass'y taking care of the top mark.

NOTES:

1. When operating in extremely dusty conditions, service the filter more frequently than specified.
2. Clean the element with compressed air below 7 kg/cm^2 (100 psi).

ENGINE OIL FILTER REPLACEMENT

When necessary the cartridge type engine oil filter is removed with the special tool and replaced with a new filter.

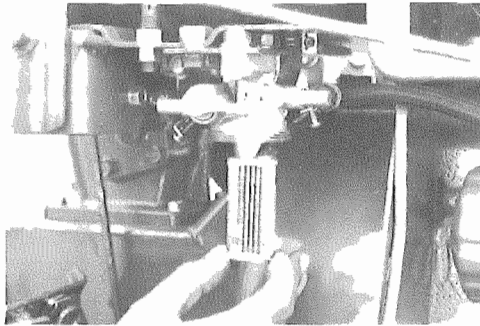


NOTES: _____

1. Lightly apply the engine oil or grease to the seal surface of the oil filter before mounting.
 2. After the oil filter has been screwed in and the rubber seal comes in contact with the case surface, screw in the filter 2/3 turn further by hand.
 3. After mounting, start the engine and inspect the seal surface for leaks.
-

FUEL FILTER ELEMENT REPLACEMENT

Fuel filter element is inserted in the filter body in the cup. To replace the element close the filter body cock, loosen the ring nut and remove the cup. After removing the element clean it or replace it, if necessary. After installed the cleaned or new element to the filter body, install the cleaned cup to the body with care about "O" ring and then tighten it enough. Loosen the air vent screw, open the cock, fill the cup with fuel, and after confirmed no more air left tighten the air vent screw. Ensuring no fuel leakage is required.



NOTES: _____

In case the engine won't start loosen the fuel pump air vent screw and purge it of air.

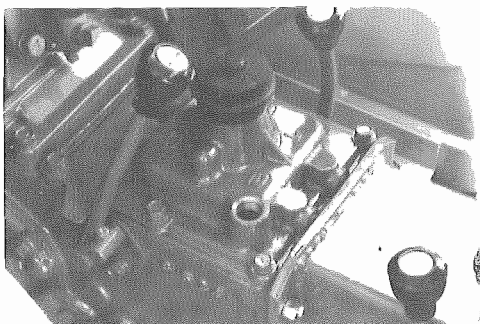
TRANSMISSION CASE OIL REPLACEMENT



Remove the drain plugs, both right and left, under the rear part of the transmission case, and drain the transmission oil.

NOTE: _____
When replacing the transmission oil, it is necessary to clean the oil filter element at the same time.

To fill the transmission case with oil, tighten the drain plugs first, and pour the oil into the filler port in the shift cover up to the specified level.

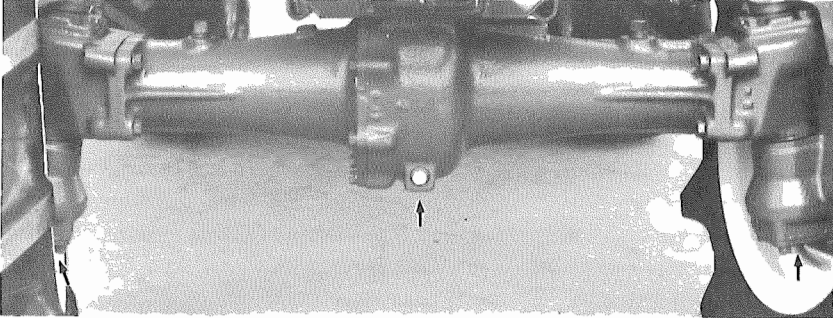


NOTE: _____
When replacing the transmission oil, it is advisable to run the tractor so that the oil is warmed up. This makes oil drain easy.

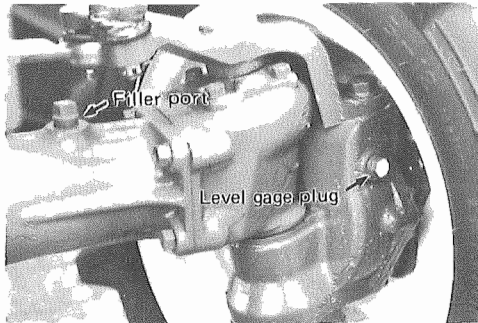
REPLACEMENT OF 4-WHEEL DRIVE FRONT AXLE OIL

DIFFERENTIAL CASE OIL AND KINGPIN GEAR CASE OIL

Remove the drain plugs at the bottom of the left and right kingpin gear cases and the differential gear case. After drained oil completely, tighten the plug securely.



In the case of the front axle differential gear case and the kingpin gear case make lubrication up to the half of the specified level from the lubricating ports on the right and left side of the front axle.



Remove the kingpin gear case oil level plug in enough time after replenished oil. Check and see the oil level as specified and then tighten the plug enough and securely.

CLEAN-UP HYDRAULIC OIL FILTER

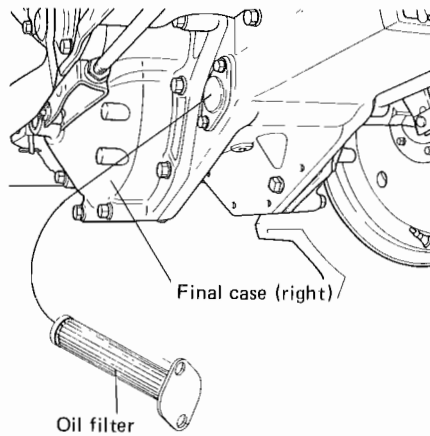
Remove the filter at the time of draining the transmission case oil, and clean the filter.

Loosen the two bolts and remove the hydraulic oil filter under the right part of the transmission case.

The removed oil filter should be thoroughly cleaned in the detergent solution.

If the filter has breaks, repair or replace with a new one.

After installing the filter, make sure there is no oil leakage.



NOTES:

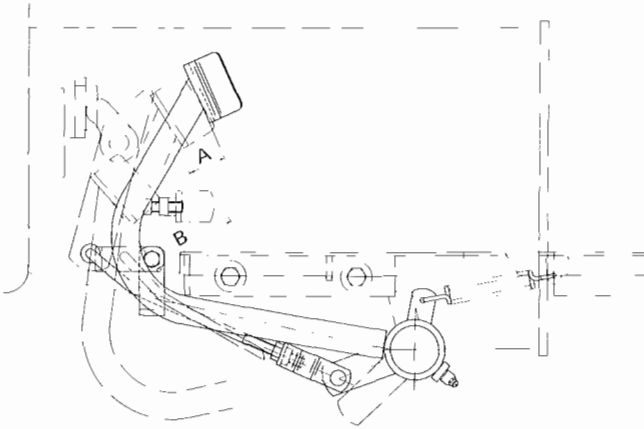
1. If the transmission oil drained has to be reused, wipe clean the surrounding surfaces of the drain plug before draining, so that dust or dirt will not get into oil.
2. Oil replacement should be carried out every 300 hours under normal operating conditions. If oil deteriorates excessively, replace it earlier than specified.
3. For installing of the oil filter make sure that the pipe end of the filter is securely inserted into the hole beside the suction pipe, and then install the cover.

CLUTCH PEDAL ADJUSTMENT

Clutch pedal free play is very important and it must be always maintained to be correct. If there is no free play, the clutch disc will wear quickly, while too much free play will cause difficult disengagement of the clutch even if the pedal is fully depressed, resulting in hard gear shift.

FREE PLAY ADJUSTMENT

The free play in the clutch pedal should be between 25 and 30 mm (1 and 1.2 inch) and stroke is 60 ~ 75 mm (2.4 ~ 3.0 inch).



After loosened the clevis lock nut pull the split pin out of the setting pin for the clutch pedal and joint, remove the pin and adjust the clutch pedal free play to be 25 ~ 30 mm (1 ~ 1.2 inch) turning the joint. After proper adjustment set the cotter pin and lock the clevis securely with lock nut.

NOTE:

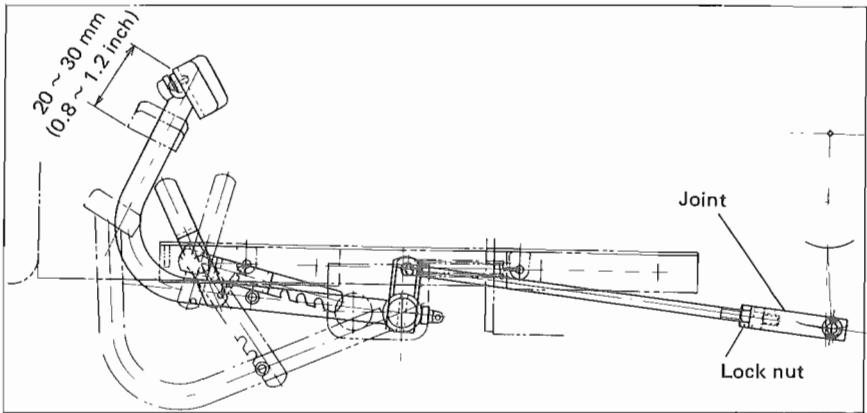
This adjustment is important for maintaining the clearance between the release lever and the release bearing to obtain a smooth gear shift and transfer all the driving power to the transmission.

BRAKE PEDAL ADJUSTMENT

Free play of the brake pedal must be maintained within the correct range, otherwise, accidents may occur or power will be lost.

Before the brake on one side becomes unadjustable even by means of the rod, caused by earlier wear of the brake lining due to its more frequent use than the other, periodically interchange the right and left brake shoes. Special care should be taken in the case of frequent using of only the brake on the same side.

FREE PLAY ADJUSTMENT



1. Adjust the brake rod adjusting nut so that the pedal free play will be 20 ~ 30 mm (0.8 ~ 1.2 inch).
2. Confirm that the right and left brakes operate simultaneously by running the tractor. If not adjust both of them by means of the rod.

NOTE:

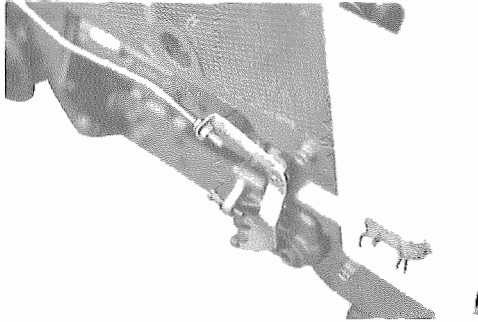
When running on roads, make sure that the right and left brake pedals are linked.

THROTTLE LEVER ADJUSTMENT

The engine speed can be controlled by operating the throttle lever on the right side of the instrument panel and foot throttle pedal in front of the right side step. The range of speed control is as follows:

Low idle speed	900 rpm
High idle speed	2,800 rpm

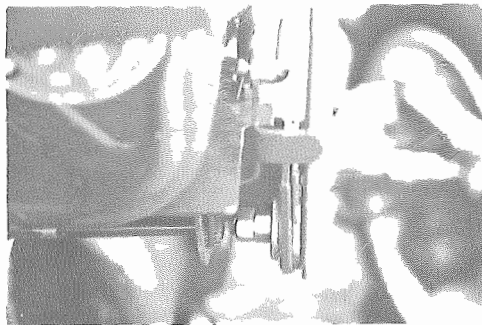
1. When the throttle lever on the right side of the instrument panel is moved gently back and forth, there is a position where the change of resistance is felt. That is, there is a recess in which the steel ball is forced by spring. This is the low idle speed position.
2. Place the throttle lever in the low idle speed position, and loosen the nut securing the speed control rod to the joint. While watching the tachometer on the instrument panel, turn the nut so that the engine idles at 900 rpm, and lock the nut.



3. Pulling the throttle lever fully backward allows the engine to run at the maximum of 2,800 rpm.
4. Pushing the throttle lever fully forward causes the engine to stop running.

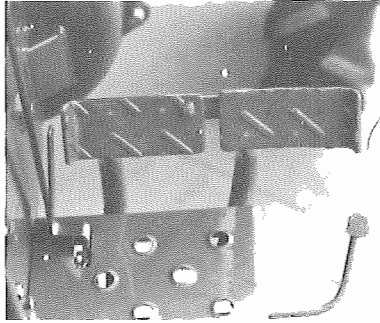
NOTES:

1. The high speed adjusting bolt is pre-adjusted and sealed, before leaving the factory, so that the engine runs at the maximum speed specified with the throttle lever pulled fully backward. If such specified speed is not obtained, consult your SATOH dealer.
 2. Adjust the throttle lever properly with the nut at the throttle lever supporting point so that it may not be moved by the vibration of the engine nor by the tensioned governor spring and besides may control the engine speed smoothly enough.
-



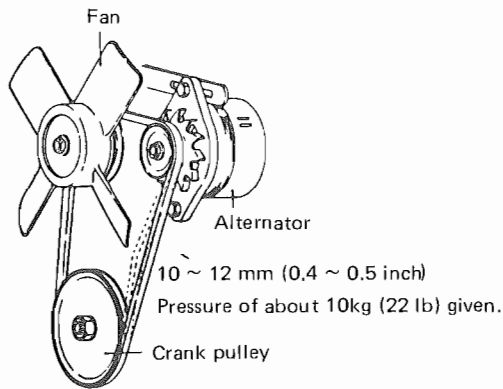
FOOT THROTTLE PEDAL ADJUSTMENT

By adjusting the hand throttle lever idle speed, the foot throttle idle speed can be automatically adjusted.



FAN BELT TENSION ADJUSTMENT

Proper fan belt tension is 10 ~ 12 mm (0.4 ~ 0.5 inch) with a thumb pressure halfway between the water pump pulley and alternator pulley. To adjust the tension, loosen the alternator bracket bolt and the adjust plate bolt and move the alternator in or out. After proper tension is obtained, tighten the bolt securely. Check the belt for cracks and damages.

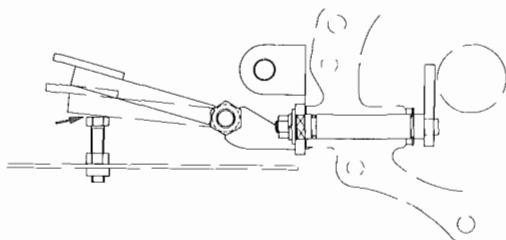


DIFFERENTIAL LOCK PEDAL ADJUSTMENT

There is no necessity of frequent adjustment of the differential lock. The adjustment was properly made at the factory before shipment. If the pedal stroke becomes too small and the differential lock is difficult to operate, adjust it by means of the adjust bolt.

1. Depress the differential lock pedal fully.
2. In this state, turn the adjust bolt so that its head will contact the pedal.

3. After contacting, turn the bolt by 1/4 to 1/2 turn in the loosening direction. Then tighten the locknut.



HYDRAULIC CONTROL ADJUSTMENT

The hydraulic system of the SATOH tractor is adjusted and tested before it leaves the factory and needs no more adjustment in the field. Should it, however, show unsatisfactory operation, adjust it in the following manner

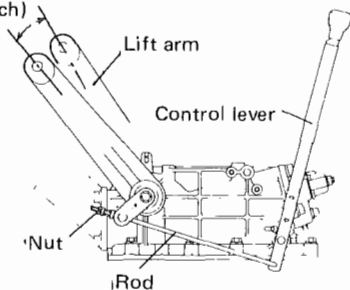
The Satoh tractor hydraulic mechanism is so designed that when the attachment moves up to a specific position, the hydraulic control lever moves back to the neutral position automatically. If the control lever will not return, adjust as follows

1. Disconnect the lift rod from the lift arm.
2. Set the lift arm to UP position with the control lever. When at UP position, check and adjust the free-play (A) to be about 5 ~ 15 mm (0.20 ~ 0.6 inch).

Unless the above free-play is obtained, the control lever will not automatically return to NEUTRAL position.

3. If the play is too small or there is no play, shift the adjust nut toward the control lever (in the tightening direction).
4. If the play is too large, shift the adjust nut toward to rod end (loosening direction).

5 ~ 15 mm (0.20 ~ 0.6 inch)

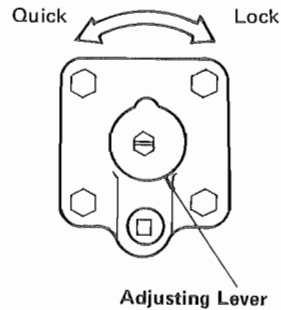
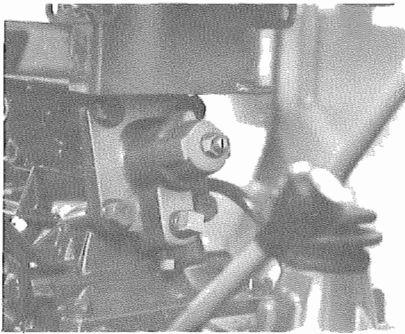


FLOW CONTROL KNOB

Loosen the flow control knob tightening nut and then remove the knob by patting.

Install the knob so that the spring pin may be set in the position of a quarter hour – the spring pin which is installed to the knob with the adjuster fully screwed in clockwise. And then install the spring washer and tighten it with nut.

Start the engine set the control lever up to the upward position and lift the implement. At this time be sure to check after setting the knob at the locking position that the implement is held at the lifted position without going down even if the control lever is shifted to the downward position. In case that the implement is noticed to go down, turn the adjuster further clockwise until the implement is held properly.



NOTES:

Check and see that the implement is completely held even when the flow control knob is locked and the control lever is lowered.

HYDRAULIC PUMP RELIEF VALVE

The hydraulic system on S-470 and S-470D is equipped with a pump relief valve to protect the hydraulic pump and pipe line against accidents caused by high hydraulic pressure in the system. The set pressure is 135 kg/cm² (1,920 psi) at full flow. Never disturb nor disassemble the pump relief valve since its adjustment requires special tools and instruments.

EXTERNAL HYDRAULIC SERVICE

No adjustment is required, but check for oil leaks at hose joints. If there is any problem, consult a satoh dealer.



Before disconnecting hydraulic line relieve all hydraulic pressure.

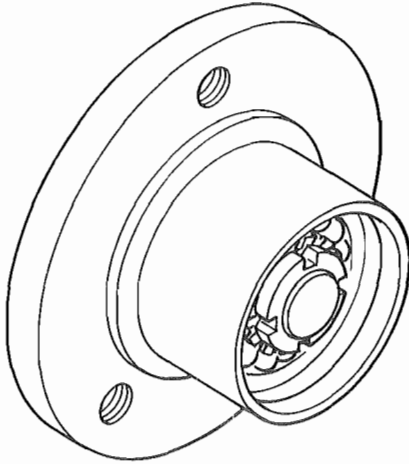
FRONT AXLE CENTER PIN AND FRONT HUB

A heavy load is always applied to the front axle center pin; therefore sufficient grease is always required at this point. Check the pin for deterioration at frequent intervals.

The front hub has been lubricated with grease and carefully assembled in the factory. However, further checking every 50 hours is required.

When grease is insufficient or pre-load is incorrect supply more grease or adjust the pre-load.

Front wheel hub frictional torque : 0.04 ~ 0.06 kg-m (0.29 ~ 0.43 ft-lb)



BATTERY

NOTE:

The electrical system on S-470 and S-470D is of negative earth type. Care should be taken to ensure that the battery terminals are correctly connected when installing the battery.

The battery equipped is POLYMION battery model G100-S6.

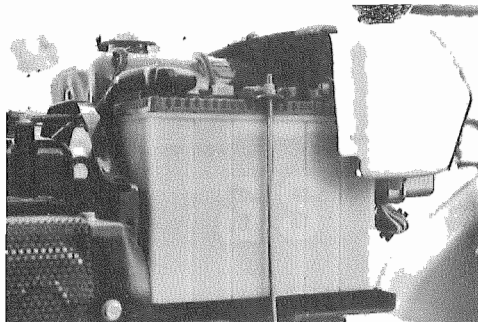
Though small-sized, it shows 40% high performance as compared with the conventional batteries of the same size.

Offering some 100AH of engine starting energy, the G100-S6 battery powers the engine effectively specially in cold weather.

Daily checking and servicing are the same as for previous batteries.

1. The specific gravity of the electrolyte is 1.280 ± 0.010 at 20°C (68°F).

2. The amount of electrolyte should be between the lower and upper levels indicated on the outside of the battery case. Particularly in hot weather, frequently check the level of battery electrolyte.



NOTE:

Usually, battery electrolyte will not freeze. However, when the specific gravity is lowered, the fluid will freeze more easily. Don't forget to turn off the lamp and don't treat the battery in such a way as the battery is discharged rapidly. In particular, when the battery is not used for a long period of time in cold weather, check the specific gravity and charge the battery periodically.

If the battery has to be recharged, a slow-charging operation should be carried out at the lowest possible charging rate (so much as 3A for G100-S6 45AH battery).

If the specific gravity of the electrolyte reads less than 1.200, the battery should be slow-charged but never quick-charged.

For more information, consult your Satoh dealer or distributor.

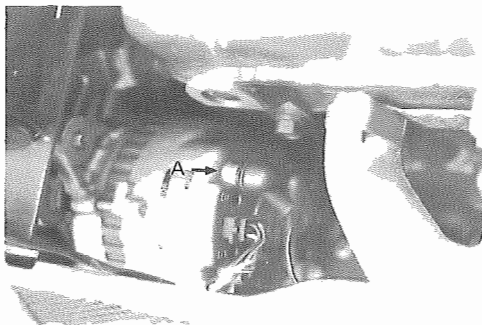
AC GENERATOR

Generator installed on S-470 or S-470D is of an alternator type. Sealed bearings are employed for this generator, so that lubrication is not necessary.

During maintenance, pay attention to the following points.

1. The generator is negative-grounded and if the polarity is reversed, the diode will be damaged. Be careful enough when connecting it to the battery.

2. As the battery voltage is always connected to the terminal A, never run the engine with the terminal A disconnected.



3. Don't water the alternator at high pressure.
4. Pay full attention to the belt tension so that normal charging may be made.
5. During operation, be sure to set the starter switch at "ON".

STARTER MOTOR

Facilities and instruments are necessary for servicing the starter motor. When the rotational force of the motor is weak, measure the battery voltage because it may be caused by insufficient battery capacity. When the voltage is correct and there is still inferior rotation, let your SATOH dealer check the carbon brushes for deterioration and magnetic switch for defective performance. The motor sometimes does not start even when the light is sufficiently bright. The cause may be due to trouble in the regulator or a loose battery terminal connection.

When the starter motor does not operate, don't continue to drive it because it will result in damage to the motor or battery. In this case, consult your SATOH dealer.

REGULATOR

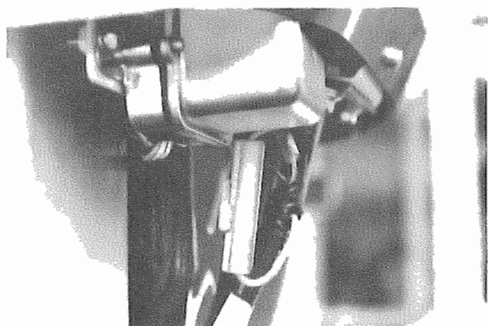
The regulator is an important part for the electrical system protection of your tractor. When trouble occurs with the regulator, consult your SATOH dealer because specific knowledge and special instruments are required to repair it.

GLOW PLUG

The glow plugs are of a sheathed type and connected in parallel. Therefore, if one of the plugs is disconnected, performance is not totally defective. When the heat wire of the glow plugs is disconnected, the pre-heat time of the control resistance is abnormally prolonged. When the center polarity, the body and the sheath come in contact with one another, the glow signal lamp will be heated quickly and the wiring of the pre-heated circuit will burn out.

Consult your SATOH dealer when trouble with the glow plug is experienced.

FUSE

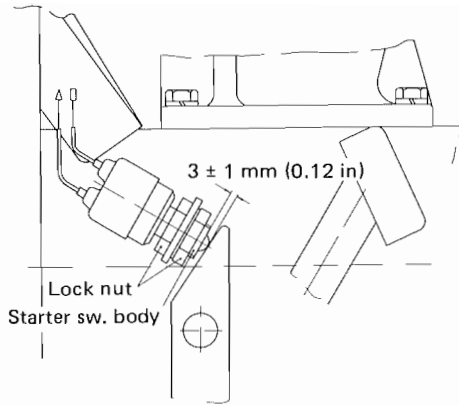


A fuse is installed in the circuit to protect the electrical system against trouble.

The fuse capacity is 15 Ah, and it is placed in the cylindrical holder under the instrument panel. If the fuse is burned out, check for the possible cause first, and replace it with a specified one. Never use a fuse of a larger capacity.

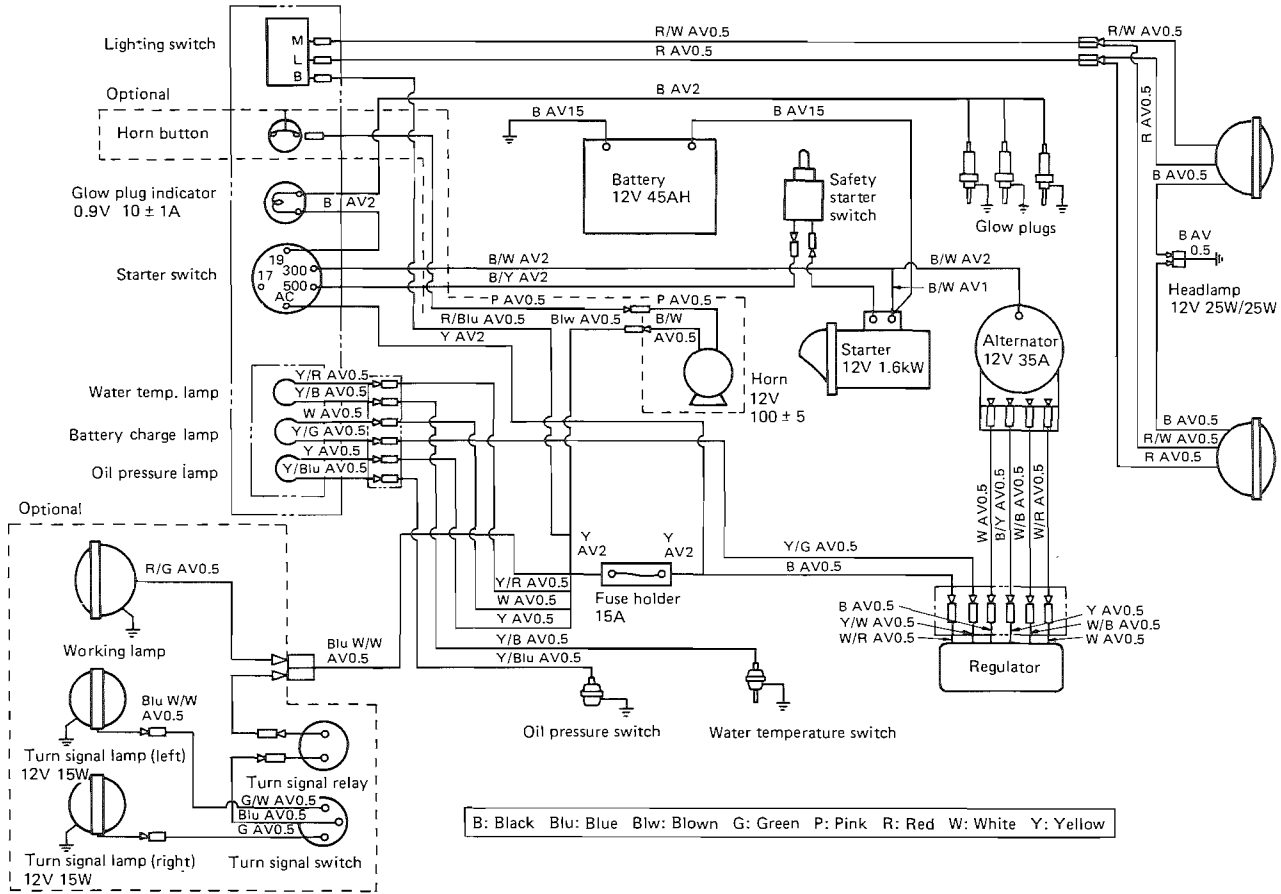
SAFETY STARTER SWITCH ADJUSTMENT

After properly adjusting the clutch pedal free play and stroke, make adjustment in use of the lock nut so that the plunger of the switch is protruding 3 ± 1 mm (0.12 inch) out of the end of the safety starter switch body when fully depressing the clutch pedal, and then lock it up.



Upon completion of adjustment, confirm that the starter motor does not rotate when the clutch pedal is released.

WIRING DIAGRAM



SECTION 4. SPECIFICATIONS AND DATA

TRACTOR MODEL

S-470 BUCK (2-WD Diesel tractor)
S-470D BUCK (4 WD Diesel tractor)

ENGINE (Mitsubishi Diesel Engine)

Model K3B
Type Water cooled vertical 4-cycle over-
head valve in line diesel engine
Number of cylinder 3
Piston displacement 849 cc (51.81 cu. in.)
Bore x Stroke 68 x 78 mm (2.68 x 3.07 in)
Compression ratio 23 : 1
Max. bare horse power 18.5 PH/2,600 rpm
Max. torque 4.8 kg-m (34.7 ft-lb)/1,800 rpm
Max. engine rpm 2,800 rpm
Idling speed 900 rpm
Compression pressure 34 kg/cm² (483.6 psi)/280 rpm
Injection order 1 - 3 - 2
Weight 125 kg (276 lb) Dry
Valve clearance Intake 0.25 mm (0.01 in) at cold
 Exhaust 0.25 mm (0.01 in) at cold

COOLING SYSTEM

Thermostat Wax type
Radiator cap pressure 0.7 kg/cm² (10 psi)
Water pump Centrifugal impeller type

FUEL EQUIPMENT

Fuel No. 2 Diesel fuel
Fuel injection pump Bosch M type
Injection nozzle Throttle type
Fuel filter Paper element type

LUBRICATION SYSTEM

Oil pump	Trochoid type pump
Oil filter	Paper element filter cartridge type
Oil pressure . . . . .	.6 kg/cm ² (85.3 psi)

AIR CLEANER

Type	Cyclon dry air cleaner
Filter	Dry paper element type

GOVERNOR

Type	Centrifugal weight type
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ELECTRICAL SYSTEM

Battery	G100-S6 Polymion 12V – 45Ah
Generator	12V – 15A
Starting motor	12V – 1.6 kw Magnet type
Glow plug	10.5V – 10A Sheathed type

CHASSIS

DIMENSION

Model	S-470 (2-WD)	S-470D (4-WD)
Overall length	1,990mm(78.4 in)	1,995mm(78.5 in)
Overall width	937mm(36.9 in)	Same as 2-WD
Overall height (to steering)	1,200mm(47.2 in)	Same as 2-WD
Wheel base	1,280mm(50.4 in)	1,300mm(51.2 in)
Ground clearance	285mm(11.2 in)	235mm(9.3 in)
Tread		
Front AG tire	720mm(28.3 in)	785mm(30.9 in)
Front ES tire	795mm(31.3 in)	800mm(31.5 in)
Rear AG tire (Standard)	740mm(29.1 in)	Same as 2-WD
Rear AG tire (Maximum)	890mm(35.0 in)	Same as 2-WD
Rear ES tire (Standard)	770mm(30.3 in)	Same as 2-WD
Rear ES tire (Maximum)	860mm(33.9 in)	Same as 2-WD
Weight	525kg(1,156.4 lb)	575kg(1,266.5 lb)
Turning radius (with brakes)	1,700mm(67 in)	1,800mm(71 in)

CLUTCH

Clutch type Dry single disc plate
Torque capacity 9.42 kg-m (68.1 ft-lb)

TRANSMISSION

Number of shift lever 2
Speed steps 6-Forward 2-Reverse
Speed change method. Selective sliding gear type
Differential gear Beval gear type
Differential lock With differential lock

POWER TAKE OFF

Power take off shaft. 1-3/8 6 spline SAE standard
PTO Horse power 14.6 Hp/2,600 rpm
PTO Shaft speed 544 rpm, 802 rpm, 1,314 rpm,/
2,600 engine rpm
Standard PTO speed (L) 540 rpm/2,580 engine rpm
(H) 1,000 rpm/1,978 engine rpm
Direction of rotation Clockwise as viewed from the rear

BRAKE

Type. Foot operating internal expansion
water-proof dry type
Parking brake Main brake use hand operating lock
type

STEERING

Steering type (2-WD) Worm and sector type
(4-WD) Ball screw type
Toe-in (2-WD) & (4-WD) . . . 6mm \pm 2mm ($\frac{5}{32}$ in \sim $\frac{10}{32}$ in)

HYDRAULIC SYSTEM (Satoh live hydraulic system)

Control	Lift, hold, down, flow control and lift lock
Type of cylinder	Single acting cylinder
Diameter of piston.	60 mm (2.36 in)
Stroke of piston	71 mm (2.80 in)
Pressure of relief valve	135 kg/cm ² (1,920 psi)
Pump model.	GP1/15 AG
Type of hydraulic pump	Pressure loading type
Output of hydraulic pump	13.2 ℓ (3.5 gal)/min at 2,800 engine rpm (5.27 cc/rev design output)
Implement lock valve	With lock valve
Hydraulic oil	SAE #80 gear oil, same as transmission oil
External service.	PT3/8 Tap
Hydraulic adapter plate	Optional
Lift capacity (at lower link end) Category "1" . . . . .	.500 kg(1,430 lb)

3-POINT LINKAGE

"Category 1"

Lifting capacity . . . . .	.500 kg (1.100 lb)
Top hitch pin hole dia. . . . .	.19.5 mm (0.77 in)
Lower link stud hole dia. . . . .	.22.5 mm (0.89 in)
Width of cross-shaft. . . . .	.683 mm (26.9 in)

DRAWBAR

Type.	Permanent type
Max. drawbar pull (2-WD). . . . .	.39J kg (860 lb)
(4-WD). . . . .	.590 kg (1,300 lb)
Max. drawbar Hp (2-WD and 4-WD) . . .	10.2 Hp

TIRE

		Tire size	Ply	Lug pattern	Allowable load
AG	Front 2-WD	4.50-10	2	Three Rib.	155 kg (340 lb)
	Front 4-WD	5-12	2	Farm Lug.	150 kg (330 lb)
	Rear 2 & 4-WD	8-18	4	Farm Lug.	515 kg (1,135 lb)
ES	Front 2-WD	20x8.00-10	4	Pillow Dia.	410 kg (900 lb)
	Front 4-WD	6-12	2	Diamond	180 kg (400 lb)
	Rear 2 & 4-WD	9.5-18	4	Diamond	600 kg (1,320 lb)

TRAVELLING SPEED

Tire size 8-18 AG 2-WD and 4-WD at engine speed 2,600 rpm

		Km/Hr	Mil/Hr	M/Sec.
	F-1	1.09	0.68	0.30
	F-2	1.66	1.03	0.46
	F-3	2.82	1.75	0.78
	F-4	4.81	2.99	1.34
	F-5	7.29	4.53	2.03
Max.	F-6	13.37	8.30	3.71
	R-1	1.40	0.87	0.39
	R-2	6.15	3.82	1.71

Tire size 9.5-18 ES tire 2-WD and 4-WD at engine speed 2,600 rpm

		Km/Hr	Mil/Hr	M/Sec.
	F-1	1.13	0.70	0.31
	F-2	1.72	1.07	0.48
	F-3	2.92	1.81	0.81
	F-4	4.99	3.10	1.39
	F-5	7.55	4.69	2.10
Max.	F-6	13.84	8.60	3.84
	R-1	1.45	0.90	0.40
	R-2	6.37	3.96	1.77

CAPACITY

Engine oil . . . . .	.3 ℓ (6 pint)
Fuel tank . . . . .	.15 ℓ (4 gal)
Transmission case oil . . . . .	.12 ℓ (3 gal 1 qt)
Steering gear box oil	
2-WD and 4-WD . . . . .	.0.3 ℓ (0.64 pint)
Hydraulic oil	Same as transmission oil
4-WD front axle (with diff. case) . . . . .	.2.5 ℓ (5.5 pint)
Cooling water . . . . .	.5 ℓ (5 qt)

* Specifications are subject to change without notice.





SATOH SATOH AGRICULTURAL MACHINE MFG. CO.,LTD.