DH326 Crawler/Bulldozer

OWNERS MANUAL

DH326R Rubber Track Version

DH326S Steel Track Version

Contents

Important Safety Precautions

Before operating the Crawler, please read this manual carefully - paying particular attention to the safety precautions on the following pages.

In this section, and throughout this manual, the safety-alert symbol ⚠ is used to draw your attention to potential safety hazards. Three levels of hazard are identified; progressing to the most serious hazards, they are:

"Caution" alerts you to actions that could result in minor injury, or could damage the Crawler or its implements and thus result in possible safety hazards:

CAUTION!
Inspect the machine before you operate, and make any necessary adjustments!

"Warning" alerts you to safety hazards that could result in serious injury or even death.

WARNING!
To avoid tipping, drive up and down slopes - not across them!

"Danger" alerts you to safety hazards that could, like "Warning," result in serious injury or death -but is restricted to the most serious hazards or those that could occur suddenly or with little warning.

DANGER!
Explosive gases could cause blindness or other serious injury. Shield your eyes!

Safety - Precautions When Driving

IMPORTANT: Read this section before attempting to drive the Crawler.

DANGER!

Look behind and around the Crawler before and while backing up.

Never allow children or any other riders on the Crawler or any implements. Keep children out of the area where you are working, and remain alert for them to appear unexpectedly. Never carry children in a trailer.

Never allow children or untrained persons to operate the Crawler.

Be extra careful when you approach shrubbery or other objects that can block your view.

WARNING!

Read and understand the operation sections of this manual before attempting to drive the Crawler.

To avoid tipping, drive up and down slopes - not across them. Drive slowly on slopes, and be careful when changing direction. If you must back down a slope, disengage any implement and back down slowly.

Avoid sudden turns. Slow down before turning.

Watch for holes or other hidden hazards. Keep away from drop-offs.

Use only approved hitches for pulling loads. Pull only those loads that you can safely control.

Keep all guards, shields, and other safety devices in place and in proper working order.

Before dismounting the Crawler: stop the engine, lower the blade and remove the key.

Crawler exhaust contains carbon monoxide gas, which can cause unconsciousness and possible death if operated in an enclosed space.

The muffler is very hot during operation and for some time after the engine stops. Never touch it until it cools down.

CAUTION!

Follow the instructions under "Operating the Crawler" before using the Crawler for normal operations.

Inspect the Crawler before you operate it, and make any necessary adjustments. Check that the brakes and steering work.

Always repair or replace parts promptly if damaged, badly worn, or missing.
If the Crawler or its implement hits an object, stop and inspect it. Make any necessary repairs before continuing.

Stop the Crawler if anyone else comes near it.

Never leave the Crawler unattended if the engine is running.

Always operate the Crawler in daylight or with all headlights and rear lights operating properly.

Watch for traffic if operating near roadways, or when crossing them.

CAUTION!
Never wear headphones when operating the Crawler.

Wear appropriate clothing. Avoid loose-fitting clothing. Wear sturdy shoes. Wear appropriate safety equipment, such as earplugs.

Ensure that any operator is physically capable of operating the Crawler safely, and of maintaining proper attention to possible safety hazards. Never operate the Crawler if you are tired or under the influence of alcohol or drugs. Also, be advised that the use of any type of medication may affect your ability to effectively and safely operate this equipment: if using any medication, check with your doctor before operating the equipment.

Never stop the tractor with the brake/steering pedals only. Always use the clutch handle and brake pedals if needed.

Safety — Precautions When Driving on Roadways

IMPORTANT: Operation on any roadway is not recommended and may be illegal in your area. Check with local authorities first.

Safety - Precautions When Parking

IMPORTANT: Read this section before parking the Crawler.

WARNING!
Before dismounting the Crawler:lower the blade, stop the engine, shift into low gear and remove the key.

CAUTION!

Stop the Crawler on level ground - not on a slope.

Lower the blade to the ground.

Lower any attachments to the ground.

Disengage the power take-off.

Never leave the operator's seat until the engine and all parts have stopped moving.

Safety - Precautions When Storing the Crawler

IMPORTANT: Read this section before storing the crawler.

WARNING!

NEVER STORE THE CRAWLER WITH THE BLADE RAISED! Always lower the blade to the ground and release all stored hydraulic pressure by actuating the control levers.

NEVER STORE THE CRAWLER WITH AN IMPLEMENT ATTACHED IN THE RAISED POSITION! Always lower the implement to the ground and release all stored hydraulic pressure by actuating the control levers.

Never store the Crawler inside a building with fuel in its tank, if fumes could reach an open flame or spark.

Allow the engine and exhaust system to cool before storing the Crawler in an enclosed area.

If you have to run the engine in a confined area, provide adequate ventilation. Use an exhaust pipe extension if necessary.

CAUTION!

Remove the battery when storing the battery. Store the battery in a cool dry place where it will not freeze and where children will not have access to it.

Safety - General Maintenance Precautions

IMPORTANT: Read this section before attempting maintenance or repair on the Crawler.

DANGER!

Keep your hands and foot, clothing and jewelry, and long hair away from any moving parts.

WARNING!

Never attempt to service the Crawler while it is moving. Lower all implements, stop the engine, and remove the key. Allow the engine to cool.

If the engine must be run while servicing, be sure the transmission is in neutral and an observer is at the stop lever.

Keep all safety devices in place, and in proper working condition.

If any components must be raised or removed for servicing, support them securely.

Before servicing the electrical system, or before welding on the Crawler, disconnect the negative cable from the battery.

CAUTION!

Never attempt to service the Crawler or its implements unless you are a skilled, trained mechanic. Study the service section of this manual before attempting any service procedures.

Keep the service area clean and dry.

Never modify the Crawler or implements except as authorized by the factory.

Never wear headphones when servicing. Wear appropriate clothing. Avoid loose-fitting clothing. Wear appropriate safety equipment.

Keep all parts of the Crawler and implements in good condition and properly installed. Always repair or replace parts promptly if damaged, badly worn, or missing. Check frequently for loose fasteners.

Keep the Crawler and implements clean. Remove any oil or grease deposits, and any debris.

Safety - Battery Precautions

IMPORTANT: Read this section before operating the Crawler, and before attempting any maintenance on the battery.

DANGER!

Explosive gases can cause blindness or other serious injury - always shield your eyes when servicing the battery.

WARNING!

Sulfuric acid can cause blindness or severe burns. In case of contact:

- Flush eyes immediately with water.
- Get medical help fast.

Keep battery vent caps tight. Keep the battery level.

Keep battery out of reach of children.

When removing or installing the battery:

- Keep sparks and open flame away, and do not smoke.
- Wear gloves and eye protection.
- Never allow direct metal contact across the battery posts.
- When removing the battery, disconnect the negative cable first. When installing, disconnect the positive cable first.

When jump-starting from a booster battery:

- Keep sparks and open flame away, and do not smoke.
- Wear gloves and eye protection.
- Never try to jump-start a frozen battery. Warm it to 60° F first.
- Never connect the negative jumper cable to the negative terminal of the booster battery. Always connect to a good ground location as far away from the booster battery as possible.

When charging the battery:

- Keep sparks and open flame away, and do not smoke.
- Wear gloves and eye protection.
- Never check the battery charge by placing a metal object across its posts.
- When disconnecting the battery, remove the negative cable first. When connecting, install the negative cable last.
- Never charge a frozen battery. Warm it to 60° F first.
- Unplug the charger before connecting or disconnecting the battery cables.

Crawler Specifications

Dimensions(mm)	DH326R	DH326S
Overall length with blade	2960	2960
Overall width (blade width, straight)	1640	1640
Overall height to top of ROPS	2285	2285
Tractor width (no blade)	1450	1445
Track length on ground	1500	1400
Height of blade	675	675
Blade lift height	500	500
Digging Depth	100	100
Track Gauge	1150	1150
Track Width	300	295
Ground clearance	240	240

Designed Speeds (In km/h at maximum power output)

DIMENSION	DH326R	DH326S
Forward/Reverse		
1 Low	0.84	0.86
2 Low	1.06	1.09
3 Low	1.73	1.77
4 Low	2.74	2.81
1 High	3.30	3.38
2 High	4.16	4.27
3 High	6.78	6.95
4 High	10.75	11.02

Performance Data

DIMENSION	DH326R	DH326S
Operating Weight	2800 kg	2830 kg
Max. Drawbar Pull	1960 kg	2400 kg
Blade Capacity	0.67m^3	0.67m^3

Engine

Model	TY395I
Bore/Stroke/Capacity/Cylinder	95mm/105 mm/2.23L/3
Maximum Power / rpm	22kW/2000 rpm
Maximum Torque / speed	121Nm/1400 rpm
Optimum Fuel Consumption	243g/kWh
Fuel	Diesel
Lubrication	Full pressure by rotary pump

Crawler Specifications(continued)

Transmission

Shuttle Clutch	Multiple wet cerametallic disk shuttle clutch, hydraulic control
Gearbox	2- shaft , 8 gears, sliding gear shift
Main Drive	Spiral bevel gear
Final Drive	Externally meshed spur gear

Brakes and Steering

Steering paddles integrated with brake paddles.

Steering Clutches	Multiple dry cerametallic disk clutches, pedal control
Brakes	Band brakes, pedal control

Undercarriage-rollers

Track Frame	Semi rigid
Track Rollers (each side, steel track version)	5 + 1
Track Rollers (each side, rubber track version)	6 + 1
Track Recoil System	Helical Spring, Screw Adjusted
Number of Shoes (each side)	DH326S/40
	DH326R/Rubber Track, Chain Links 42

Hydraulic System-Blade and Hitch

Pump/Model	Gear type, CBTE316FR
Capacity at governed RPM	32 lpm, 8.3 gpm
Relief valve pressure	16 MPa (2230 psi)
Control Valve	4-spool
Blade control(6 in 1 joystick control)	Lift: Raise, Hold, Lower, Float
	Angle: Right, Hold, Left
	Tilt: Right, Hold, Left
Blade Cylinders	Double Acting
Blade Lift -Qty. 2	63 mm × 255 mm
Blade Angle-Qty. 2	63 mm × 280 mm
Blade Tilt-Qty. 1	63 mm × 50 mm
Hitch Control (Single lever control)	Raise, Hold, Lower(float)
Elevating Ram	Single Acting
Bore & Stroke	80 mm × 100 mm
Lifting Capacity at hitch point	7350 N, 1650 lbs
Hitch Linkage	Rear 3-Point Hitch, Category 1

Crawler Specifications(continued)

Hydraulic System-Shuttle Clutch

Pump/Model	Gear type, CBT1-E306HL
Capacity	1.6 gpm
Relief valve pressure	0.3MPa, 40 psi
Control Valve	Rotary type

Electrical System

System Ooltage	12 V
Self-rectifying Alternator	200 W
Starter	3 kW
Battery	105 Ah
Front Head Lamp-Qty. 2	55 W
Rear Lamp-Qty. 1	55 W

Power Take-off

Type	Mechanical Dependent
Speed	540 rpm at 1812 Engine rpm
Shaft Diameter	1 3/8", 6 splines

Capacities

Fuel	11.9 gallons
Engine Oil Sump	1.6 gallons
Gearbox	2.9 gallons
Hydraulic System (right oil tank)	7.9 gallons
Shuttle Clutch (left oil tank)	8.7 gallons
Coolant	2.3 gallons
Final Drives (each)	0.5 gallons

Fuel

Type of Fuel to Use

- Summer [ambient temperature above 50°F]: No.1 or No. 2-diesel fuel
- Winter [ambient temperature below 50°F]: No.1 diesel fuel

Precautions When Adding Fuel – ***Fuel tank is located under hood!***

To prevent engine trouble and prolong the engine's service life, **always** use clean diesel fuel. Observe the following precautions when adding fuel:

- Turn off the engine before adding fuel.
- Avoid flame or spark, and don't smoke, while adding fuel.
- Allow fuel to settle in the storage tank at least 48 hours before you fill the tractor fuel tank. Never put the fuel that is in the bottom of a storage tank into the tractor's fuel tank.
- Filter the fuel before it goes into the fuel tank, always use the refueling screen provided.
- Keep the refueling device(s) clean.
- Clean the fuel tank and sediment bowl, change the fuel filter regularly.

Lubrication **(See Fig. 12 on page 23)**

Type of Lubricant to Use

- **Engine sump;** lifter; injection pump
  - Ambient temp. below 32° F: 10 weight (high ash level oil), Shell Rimula or equal
  - Ambient temp. 32° to 77° F: 30 weight (high ash level oil), Shell Rimula or equal
  - Ambient temp. above 77° F: 40 weight (high ash level oil), Shell Rimula or equal
- **Transmission box;** transfer case
  - Ambient temp. below 50° F: 30 weight (high ash level oil), Shell Rimula or equal
  - Ambient temp. above 50° F: 40 weight (high ash level oil), Shell Rimula or equal
- **Final Drive;**
  - 90W Gear Lube
- **Hydraulic Sump;**
  - All seasons: AW/AL Hydraulic ISO 32 SAE 10
- **Grease nipples**
  - All seasons: Premium EP industrial grease (grade 1)
    A combination of lithium and calcium soaps

There are grease points located at all wear points on the tractor. Lubricating them as specified will greatly increase component life!

Water

Fill the radiator with a 50% mixture of a high, single phase, ethylene glycol quality (anti-freeze) and clean soft water, to prevent the accumulation of scale in the engine cooling system. Scale will reduce the system's cooling efficiency.

In selecting an appropriate anti-freeze be sure it is a low silicate, all purpose coolant designed for heavy duty diesel use.

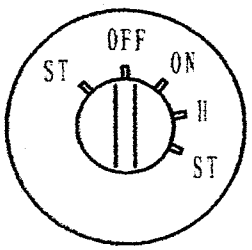
Operation

Important Notices

1. A new or recently overhauled crawler can be operated at normal load **after** it's running-in according to the Run-in procedures listed in this manual.
2. Before each use, check that all fasteners, nuts and bolts are tight. Pay special attention to the drive sprocket and connecting bolts of the cross bar.
3. Check all hydraulic lines, electrical circuits and coolant before starting engine.
4. Use only clean diesel fuel. Use of diesel conditioner is recommended year round.
5. Pay close attention to all gauges during each start of the engine and during the initial warm up period.
6. Do not drive the steel tracked crawler at high speed across a hard surface.
7. Track should always have a sag of 2/3 to 1". If not, adjust accordingly.
8. Keep the radiator and bug screen clear of dust, dirt, debris and bugs. Clean often when working in a dusty environment.
9. Check anti-freeze level prior to cold weather.

Controls, Instruments and Switches

Key Switch



OFF = Off position. All circuits are disconnected.
Turning key clockwise to start a cold engine:
ON = Normal run position. All circuits except starter and glow plugs are connected. After starting, key is to be kept in this position.
H = Applies power to the glow plugs. You must hold the key in this position to use this function. Typically about 15 seconds.
ST = Engages starter. Typically after preheating a cold engine.
Turning key counter-clockwise to start a warm engine:
ST = Engages starter directly only. Return switch to ON position after starting.

Hand Throttle

Pull up on the handle to increase engine speed, push downward to decrease engine speed.

Shut-off Pull Rod

Located on dashboard. Pull out on this rod to stop the engine. Always make sure it is all the way in before attempting to start the engine.

Operation(continued)

Controls, Instruments and Switches(continued)

Front Head Lamp Switch

Pull out to turn on the two front headlamps. Push in to turn them off.

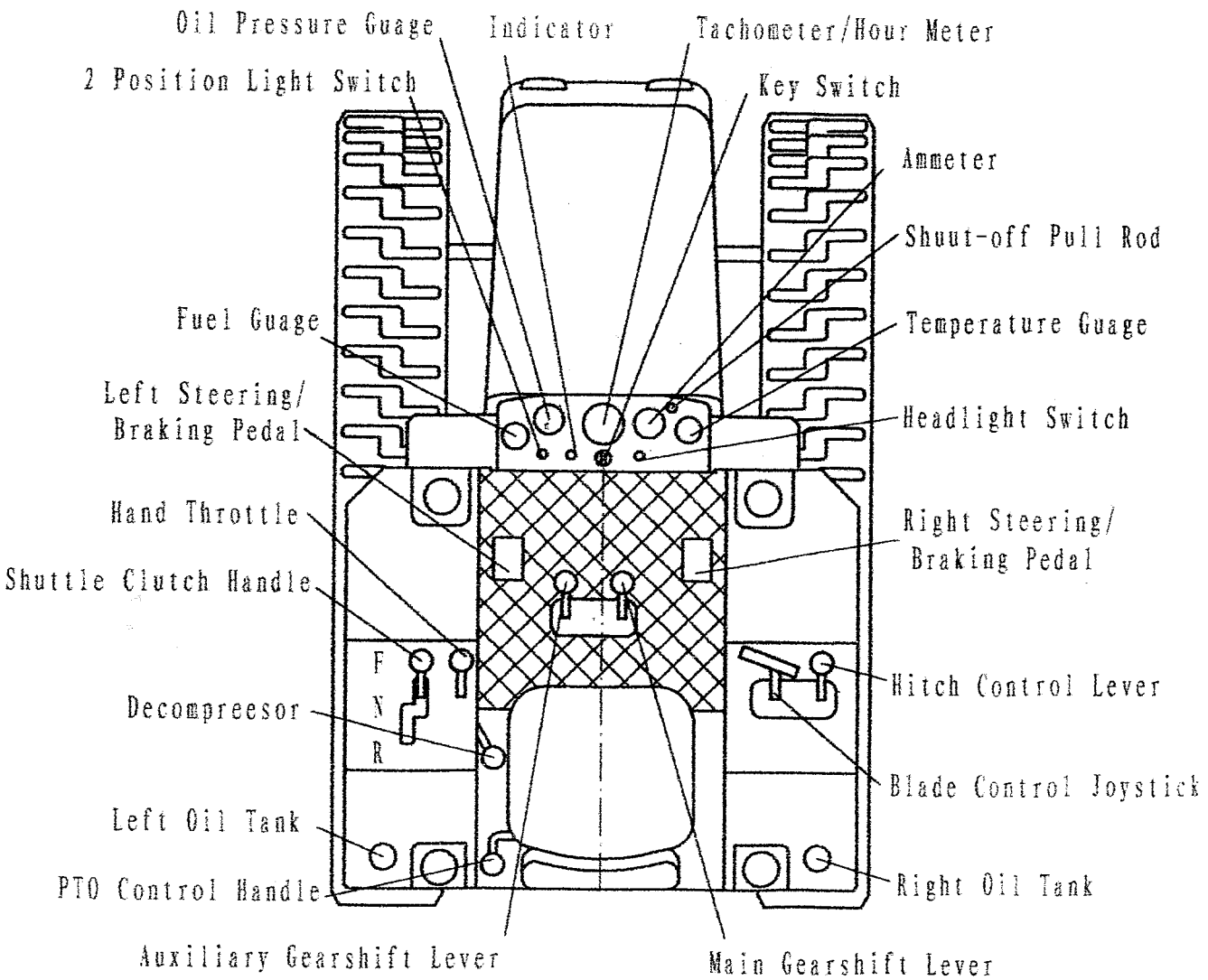
2 Position Light Switch

Pull out to the first stop to turn on just the guage lamps. Pull all the way out to turn on the guage lamps and the rear work light.

PTO Control Handle

The shuttle clutch handle must be in the neutral position before attemping to engage the PTO. When the PTO control handle is in the neutral position, the shaft is disengaged.

Move the handle towards the rear of the crawler for 540 rpm speed.



Gauge and Lever Location

Operation (continued)

Starting and Driving the Crawler

Engine Pre-Start Checklist.

Prior to starting, check the following and adjust level as needed:

- ✓ Engine oil level.
- ✓ Transmission oil level.
- ✓ Coolant and fuel levels.
- ✓ Inlet to fuel filter bowl is open.
- ✓ Hydraulic Tank level.
- ✓ Make sure the shut-off pull rod is all the way forward.
- ✓ Put the hand throttle to 1/3 open position. (About 1/3 of the way up)
- ✓ Put the control levers of the gearbox and PTO in the neutral position.
- ✓ Insert key into key switch.

Starting the Engine

Starting a warm engine

1. Put the shuttle clutch handle in the neutral position.
2. Turn key counter-clockwise to the ST position. The starter will engage.
3. When engine starts, turn key clockwise to the ON position to engage all circuits. **DO NOT** turn past the ON position when engine is running or damage may result.

Starting a cold engine

1. Put the shuttle clutch handle in the neutral position.
2. Turn the key clockwise to the H position for approximately 20 to 30 seconds and then to position ST .
3. When engine starts, turn key counter-clockwise to the ON position to engage all circuits.

Starting Precautions

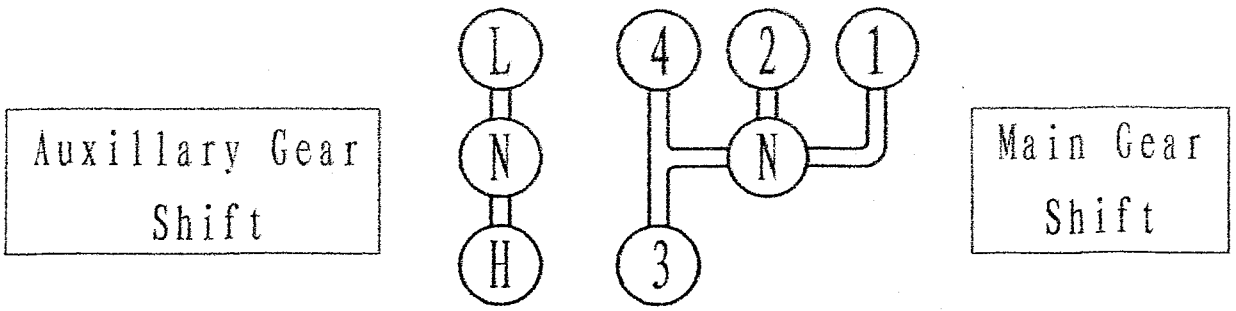
1. Do not hold the key switch in the ST position for longer than 15 seconds. Continuous cranking will damage the starter. Wait 2 minutes between attempts to protect the starter and battery.
2. If the engine will not start after three attempts, check shut-off pull rod, fuel supply, etc.
3. After the engine starts, keep it running at approximately 600 rpm until the water temperature reaches normal and the oil pressure maintains 0.2 – 0.5 Mpa.

Operation(continued)

Starting and Driving the Crawler(continued)

Putting the Crawler in gear

1. Check to be sure that there are no obstacles or persons around the crawler.
2. Check that the shuttle clutch handle is in the neutral position. With the engine at low speed, Put the Main and Auxiliary gear levers in the requried position for the work to be performed. See figure below.
3. Push the shuttle clutch handle towards the front of the crawler for forward shift, or move the handle towards the rear of the crawler for reverse shift, then increasing the hand throttle so the crawler begins to move smoothly.



Steering and Braking the Crawler

The steering pedals are integrated with the brake pedals. Control of the brakes is sequential with the steering clutches and controlled with the same pedals.

1. While moving on level ground, partially depress one of the steering/brake pedals. This will separate the steering clutch without engaging the brake. The crawler will turn to the same side as the steering/brake pedal that is depressed.
2. Depressing the steering/brake pedal completely separates the steering clutch and engages the brake on the same side. Therefore, the turn is much sharper.
3. While driving on slopes, use only low gear and do not shift gears excessively.
4. Practice on gentle slopes first before using the crawler on steeper slopes. ***DO NOT MAKE A SPOT TURN ON ANY SLOPE!***
5. While driving down a steep slope, the steering procedure is in reverse order than that on level ground. That is, for left turning, step down on the right pedal. For right turning, step down on the left pedal. The reason is that depressing the pedal separates the steering clutch on the same side. On level ground, the drive sprocket on this side will stop and the tractor will turn to the same side. However, if the crawler is traveling on a steep slope and the pedal is depressed, that side of the track will slip down at a higher rate of speed due to gravity and the crawler will turn to the other side.

Operation (continued)

Starting and Driving the Crawler (continued)

Selection of Proper Gears

When shifting gears, the clutch pedal must be completely depressed to avoid damage to the gears. Riding the clutch will significantly reduce its service life!

1. The highest productivity and maximum economization can be obtained by selecting the proper gears. If the engine sounds "heavy" and emits dark exhaust, it is necessary to shift to a lower gear to avoid overload.
2. When shifting gears:
    i. Put the shuttle clutch handle in the neutral position.
    ii. After the crawler stops, shift the lever into the required gear. If the desired gear cannot be engaged, try engaging and disengaging the clutch (double-clutch) and retry the desired gear.

What to watch for while driving:

1. Keep an eye on your gauges:
    - ✓ The oil gauge should read 0.2 – 0.5 Mpa.
    - ✓ The water temperature should read 70 – 90 Celsius.
    - ✓ The ammeter should be in the middle or "+" charging.

    Stop if you notice any gauges not reading withing parameters!

2. Listen carefully to the engine and transmission. If you suddenly hear abnormal sounds, shut down the unit investigate.
3. Keep an eye on the exhaust. Black exhaust indicates an overloaded condition.
4. If the clutch slips or disengages completely without depressing the pedal, shut down the unit.
5. Do not ride the clutch or use the clutch to control the speed of the crawler.

Stopping and Shutting down the Crawler

1. Reduce the hand throttle to slow the crawler.
2. Put the shuttle clutch handle in the neutral position and then step on the brake pedal. When the tractor stops, shift into neutral gear.
3. Release the brake pedals and let the engine run at idle speed.
4. Keep the engine running to allow the temperature of the oil and water drop. Do not shut the engine down while it is at a high temperature!
5. After the engine has cooled down, reduce the hand throttle to minimum.
6. Lower the blade and implements.
7. Pull out the shut-off pull rod to stop the engine. Push it back in once the engine has stopped.
8. Remove the key from key switch.

Operation (continued)

Control of 6-Way Blade, Hitch and PTO

6-Way Blade

Depending on the model of crawler, the blade is controlled by either three levers or one joystick on the right hand side of the operator. See operating label next to the controls for their function. **Always lower the blade to the ground when dismounting the crawler!**

Hitch Lift

The hitch lift control lever is located on the right side outside of the controls for the blade. It is the furthest lever from the operator. Pull it straight back to raise the hitch. Push it forward and the hitch lowers by gravity. With the lever at the neutral position, the hitch floats between its last position and the highest position.

Control and Operation of the PTO Shaft

Follow all safety warnings when attaching implements to the PTO shaft. Always make sure the engine is off before attempting to attach any implement!

After safely and properly installing an implement, operate the PTO as follows:

1. Follow engine starting procedures.
2. Put the shuttle clutch handle in the neutral position.
3. Move the PTO control lever to desired speed.
4. Push the shuttle clutch handle towards the front of the crawler for 540 rpm speed, while listening to implement. Stop if any strange noises are detected.
5. When the PTO is not in use, the lever should be kept in the neutral position.

Run-In of the Crawler

A new or recently overhauled crawler should only be used after a run-in period for maximum service life.

Preparatory Work Before Run-In

1. Clean up the appearance of the crawler by wiping down all surfaces to remove dirt, oil and grease.
2. Check and tighten all outer nuts and bolts.
3. Fill lubricating oil and cooling systems to their proper levels.
4. Check to be sure that the fuel tank is full of the proper fuel.

Running-In

1. Engine at idle speed - 10 Minute running-in

- ✓ Start the engine as per instructions and allow the engine to idle at 600 rpm.
- ✓ Check that the cooling temperature is slowly rising and levels out in normal range.
- ✓ Check that oil pressure is maintaining between 0.2 – 0.5 MPa.
- ✓ Check the engine compartment for any fluid or air leakage.

  CAUTION: The engine compartment contains moving parts that could cause serious injury. Use extreme caution when checking compartment!

- ✓ Listen for any abnormal or unusual noises.
- ✓ Check and record the readings of ammeter, temperature and oil pressure guages.

2. Hydraulic hitch linkage - 10 Minute running-in

- ✓ Attach an implement to the hitch.
- ✓ Start the engine as per instructions and allow the engine to idle at 600 rpm.
- ✓ Raise the hitch linkage and lower it smoothly for more than 20 times in a 10 minute period.
- ✓ Check for smooth operation while raising and lowering the hitch.
- ✓ Check for any fluid leaks from the system.

3. Driving without any load - 2-Hour running-in

The engine should be started as per instructions and allowed to come to normal operating temperature. Raise the blade. The crawler should then be driven on flat ground (not a paved road) at appoximately 1000-1200 rpms according to the following schedule:

Gears	1 Low	2 Low	3 Low	1 High	Reverse 1
Time (min)	20	30	30	30	10

3. Driving without any load - 2-Hour running-in (continued)

The 2 hours of driving will give the operator an opportunity to check the proper operation of left/right steering and braking and to become familiar with the unit. During the course of driving, remember to continously check the following:

- ✓ Sound of the engine and transmission.
- ✓ Operation of clutch, brake, steering and gearshift.
- ✓ Check that all temperatures and pressures on the guages stay in the normal range.

TO PREVENT DAMAGE, SHUT THE UNIT DOWN IF ANY READINGS ARE OUT OF RANGE OR ABNORMAL ENGINE OR TRANSMISSION NOISES ARE HEARD. CORRECT ANY ABNORMAL CONDITIONS PRIOR TO CONTINUING RUN-IN.

4. Loaded condition - 48-Hour running-in

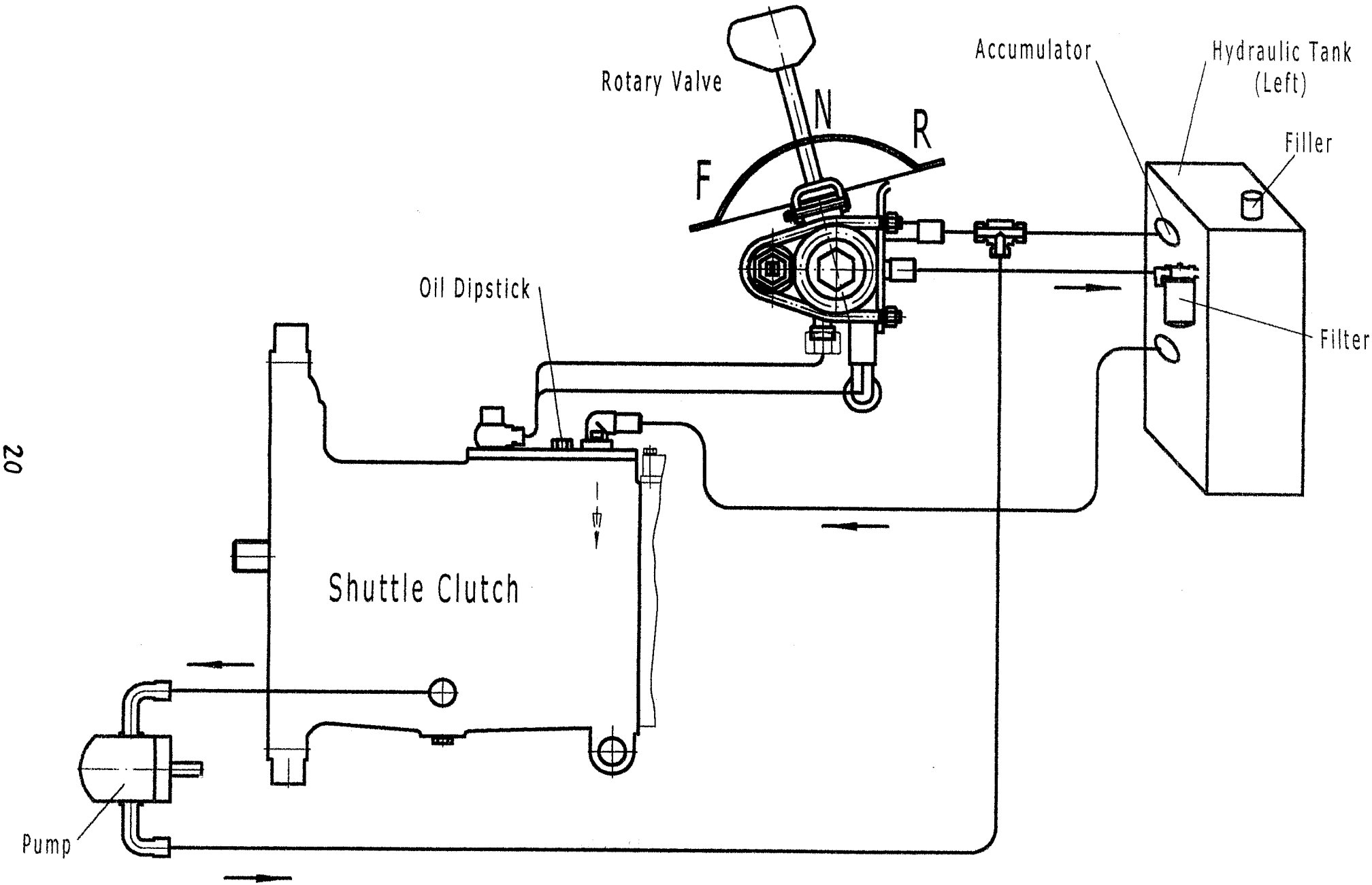
Loaded conditions mean running the tractor under a certain given traction load. The load should gradually be increased from light to heavy while the gear speed is increase from low to high. Loaded run-in should be performed according to the following schedule:

	1 Low	2 Low	3 Low	1 High
Load (N)	3 Hours	4 Hours	5 Hours	5 Hours
2500	3 Hours	5 Hours	5 Hours	5 Hours
5000	3 Hours	5 Hours	5 Hours	5 Hours
7500	3 Hours	5 Hours	5 Hours	0 Hours

5. Post Run-in maintenance

After running-in, the following maintenance should be performed:

- ✓ Change the engine oil and oil filter. Inpect used oil for any contamination.
- ✓ Change the transmission oil. Inpsect used oil for any contamination.
- ✓ Change the fuel filter.
- ✓ Check the hydraulic flued fluid for the lift. Add as needed.
- ✓ Check the condition and strength of the coolant in the radiator. Adjust as needed.
- ✓ Lubricate all points as shown in Figure 12.
- ✓ Check the track tension. Adjust if the sag exceeds 1 inch.
- ✓ Inspect the brake and steering pedals free travel. Adjust if needed.
- ✓ Inspect and tighten all exterior nuts and bolts.



Hydraulic System-Shuttle Clutch

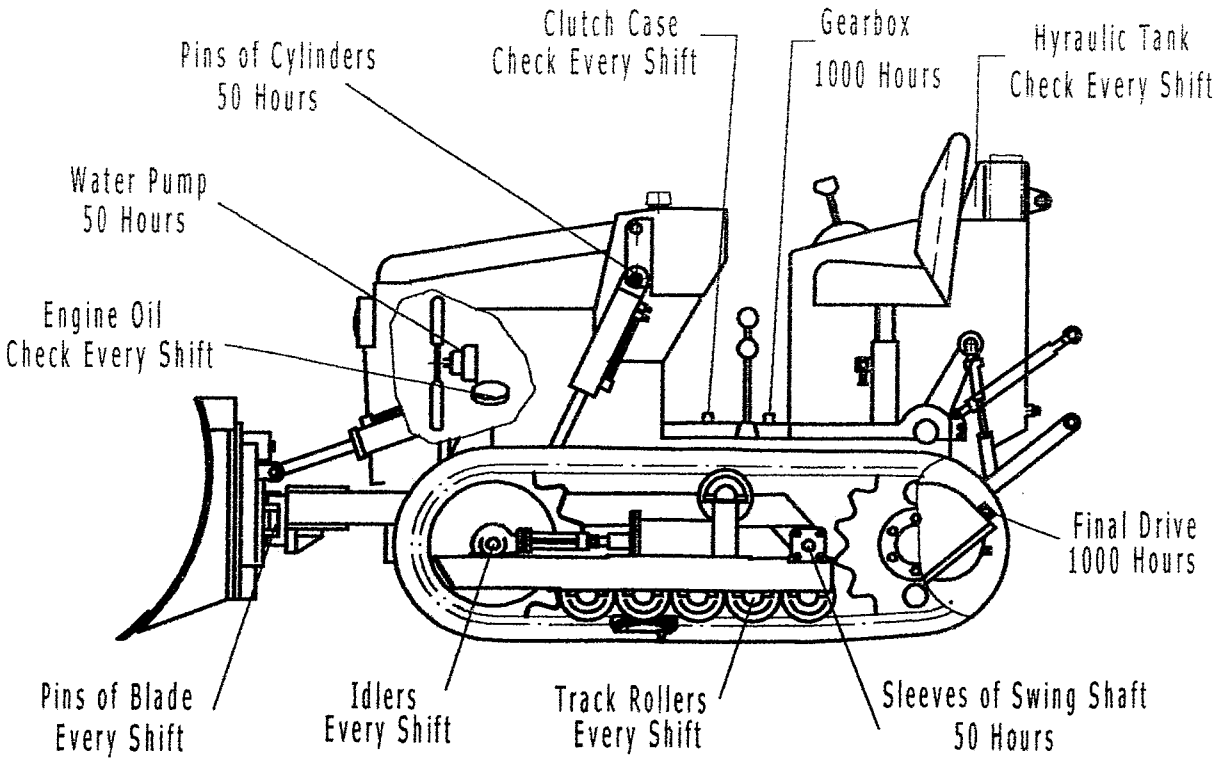


Fig.12 Lubrication Points

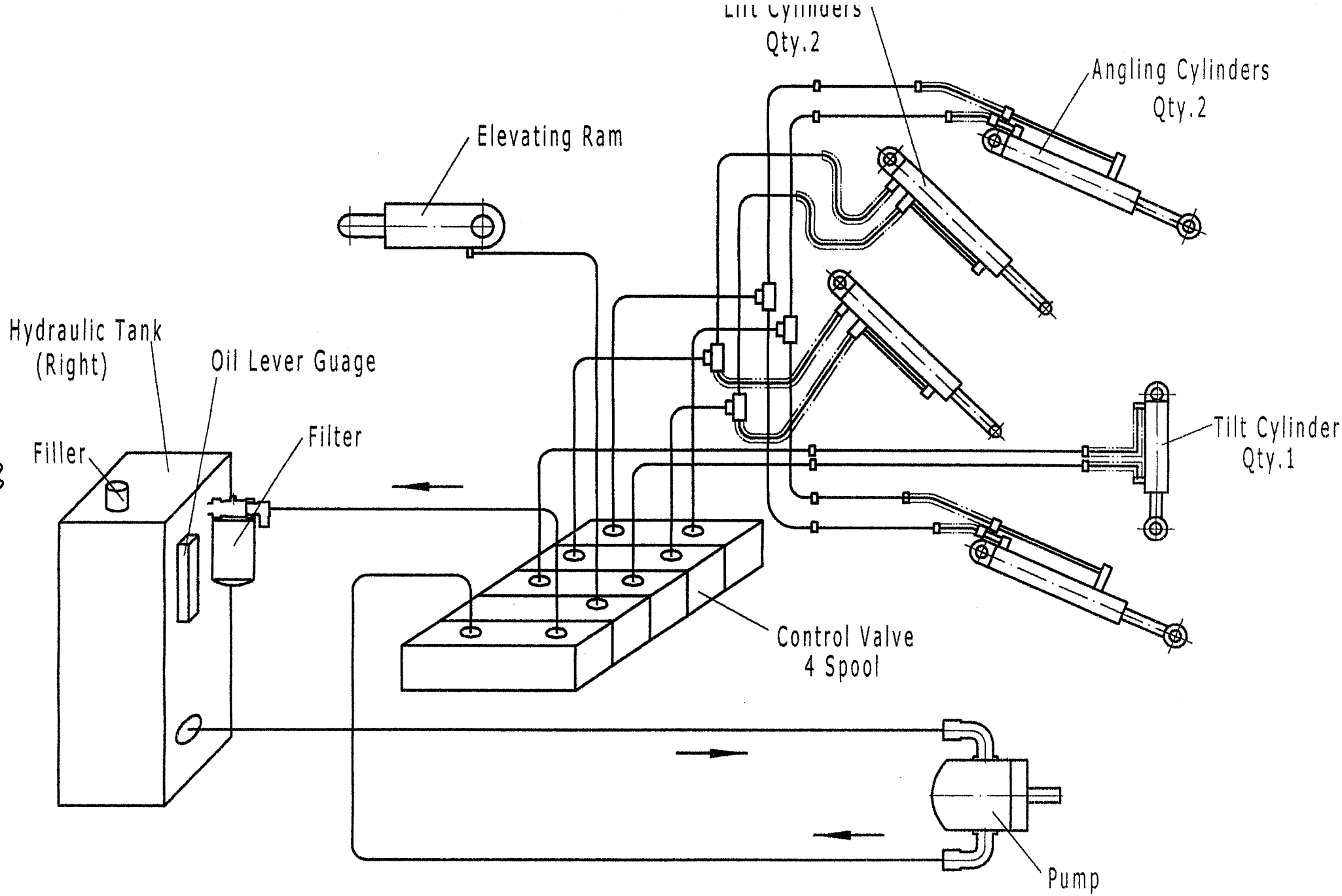
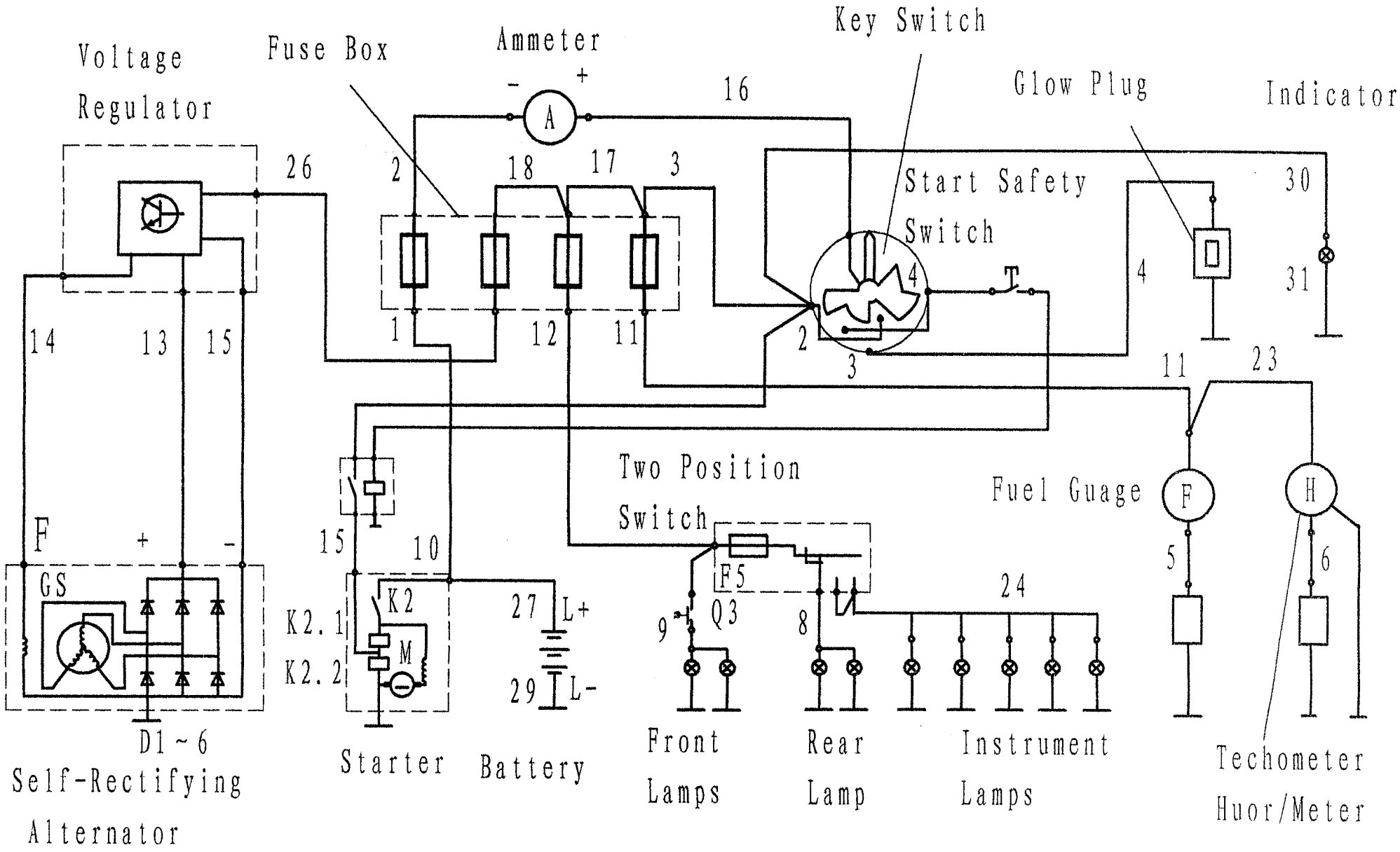


Fig.13 Hydraulic System-Blade and Hitch



Wiring Schematic

Routine Maintenance

In order to keep your crawler in normal operating condition and prolong its service life, this preventative maintenance schedule should be followed as a minimum. Based on the working hours, the maintenance schedules are classified as follows:

It is recommended that you do a visual inspection of the crawler each time you operate it. Do a walk around and check for leaks and loose fasteners.

Preventative Maintenance (every 8-12 hours use)

- ✓ Clean dirt and mud away from the crawler. Pay special attention to the track and suspension while cleaning.
- ✓ Check for proper engine oil level.
- ✓ Check for proper amount of fuel.
- ✓ Check the air filter. Clean as needed.
- ✓ Check the track tension. If it sags more than 2/3", adjust accordingly.
- ✓ Inspect for loose bolts and fittings. Again, check all fasteners on the drive sprocket and cross bar.
- ✓ Check for fluid leaks from the engine, bottom of crawler and hydraulic system. Repair if needed.
- ✓ Grease the following:
    - Track Rollers
    - Idlers
    - Pins and pivot points of the 6-way blade

1st Class Maintenance (every 50 hours of operation)

- ✓ Complete the Preventative Maintenance.
- ✓ Clean the air filter.
- ✓ Change the engine oil and oil filter.
- ✓ Change the fuel filter.
- ✓ Check the water-trap filter and clean as necessary. Purge air from line after cleaning.
- ✓ Grease the following:
    - Sleeves of the swing shaft
    - Water Pump
    - Pins of all hydraulic cylinders

2nd Class Maintenance (every 250 hours of operation)

- ✓ Complete all Preventative Maintenance
- ✓ Complete the 1st Class Maintenance, including changing the engine oil and oil filter.
- ✓ Clean the air filter.
- ✓ Change the fuel filter.
- ✓ Inspect the brake and steering pedals free travel. Adjust if necessary.
- ✓ Check the tension of the fan belt. If belt deflects more than ½ inch, adjust as needed.

3rd Class Maintenance (every 1000 hours of operation)

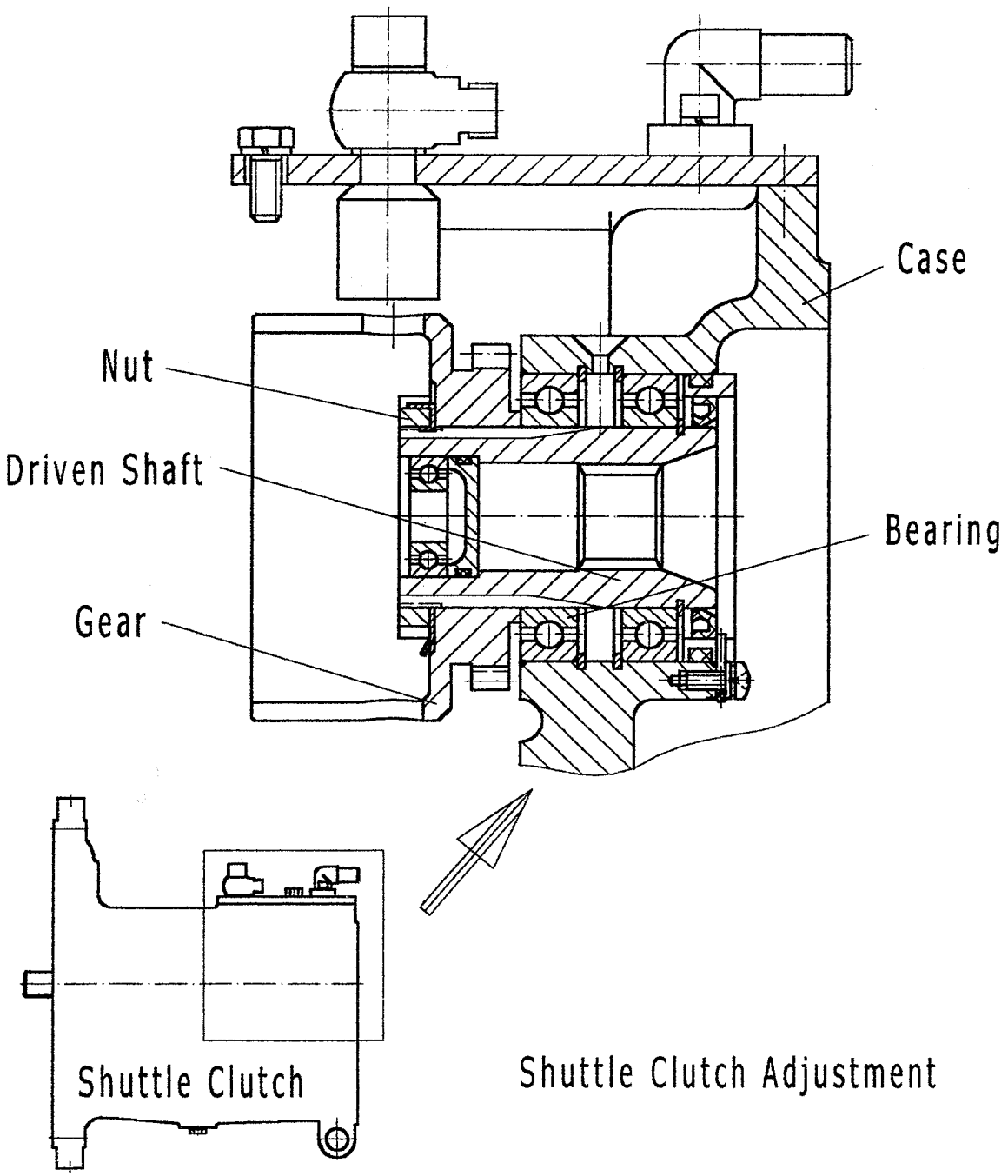
- ✓ Complete all Preventative Maintenance.
- ✓ Complete all 1st Class and 2nd Class Maintenance.
- ✓ Check the following parts of the engine:
    - Check the injection pressure
    - Check for proper atomization. Clean, adjust or replace injector as needed.
    - Check the clearance of the inlet and exhaust valves.
        - Inlet valve clearance = 0.35mm
        - Exhaust valve clearance = 0.40mm
- ✓ Check that the cylinder head bolts are torque to specification.
- ✓ Check the bolts for the connecting rod and flywheel. Tighten to specifications.
- ✓ Inspect the wiring system for loose or broken connections.
- ✓ Change the engine oil and oil filter.
- ✓ Change the air filter.
- ✓ Change the transmission oil.
- ✓ Change the final drive oil.
- ✓ Change the fuel filter.

ADJUSTMENTS

This section covers checking and adjusting the components of the chassis. Engine components are covered in the "Engine" section.

Shuttle Clutch

1. After pre-tightening the driven shaft, the total friction torque of the driven shaft should be kept within the range of 1.0—1.5Nm.
2. The other parts of shuttle clutch should be assemblied need no adjustment.

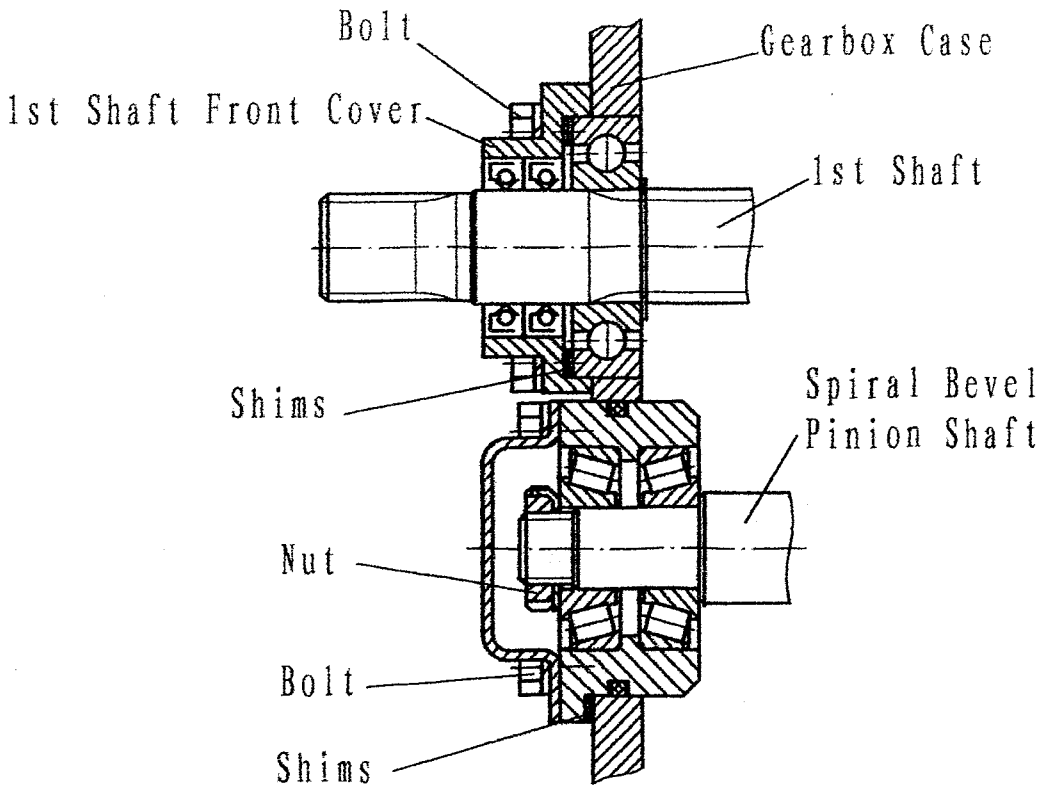


Shuttle Clutch Adjustment

Gearbox and Main Drive

Adjustment of the 1st Shaft

1. Insert several adjusting shims between the 1st shaft front cover and the gearbox case body.
2. Tighten the four bolts on the 1st shaft front cover of the gearbox case. The torque on these bolts should be kept within the rand of 30 – 30 Nm.
3. Measure the clearance between the 1st shaft front cover and the gearbox case body with a feeler gauge. If there is no clearance, increase the number of shims of the primary shaft.
4. Decrease the number of adjusting shims of the first shaft if axial clearance appears. The proper axial clearance of the 1st shaft should be kept within the range of 0.05 – 0.10mm.



Adjustment of 1st Shaft and
Spiral Bevel Pinion Shaft

Adjustment of the Spiral Bevel Pinion Shaft

1. After pre-tightening the tapered roller bearing of the spiral bevel pinion shaft, the total friction torque of the spiral bevel pinion shaft should be kept within the range of 1.0 – 1.5 Nm.

Gearbox and Main Drive

Adjustment of a Pair of Spiral Bevel Gears

The adjustment of a pair of spiral bevel gears should be started after 1 to 2 minutes of testing in a positive and negative direction while there is no oil in the gearbox case. The backlash between two spiral bevel gears should be kept within 0.15 – 0.25 mm and the ideal imprint is as shown in Fig. 8 and Table 1.

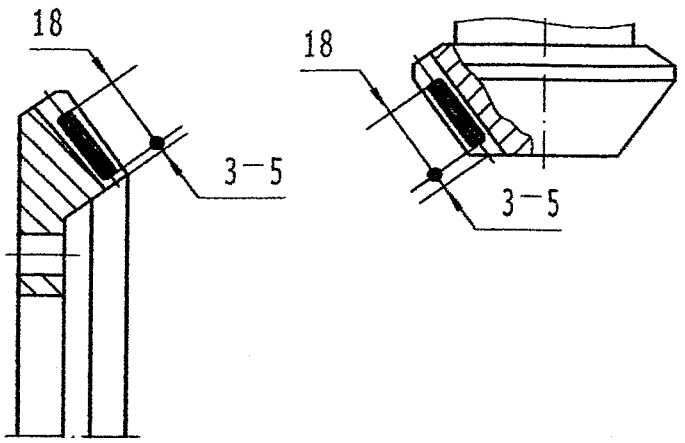


Fig.8 Ideal imprint of spiral bevel gears

The imprint of the spiral bevel pinion should be higher than that of the spiral bevel gear. With light load, the length of the imprint should be about half of the total length of the gear tooth. Because of shifting to the larger ends of the gears with full load, the imprint of the gears should approach the small ends while in first installing or inspecting. The adjustment of a pair of spiral gears under various conditions is shown in Table 1.

The adjustment of the imprint of a pair of spiral gears is realized by increasing or decreasing the number of shims of the spiral bevel pinion shaft and the adjusting nuts on both sides of the bevel gear. At the same time, the adjusting nuts are also used to pre-tighten the tapered roller bearings of the main drive shaft. After pre-tightening the tapered roller bearing, the measured total friction torque of the bevel gear shaft should be kept within the rand of 0.7 – 1.0 Nm.

Adjustment of a Pair of Spiral Bevel Gears (continued)

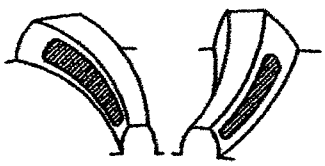
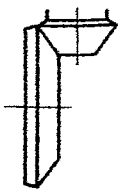
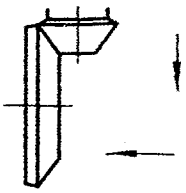
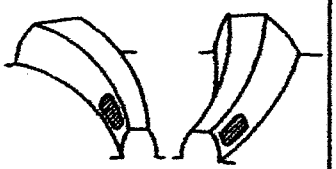
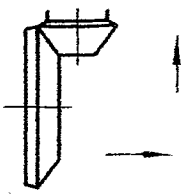
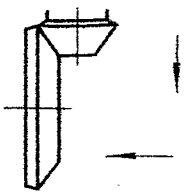
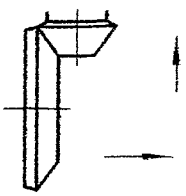
Imprints		Adjusting method	Moving direction of the gears
pinion	bevel gear		
		Normal imprint (Ideal imprint)	
		Move the bevel gear off the pinion. If the backlash is too big, move the pinion inward.	
		Move the bevel gear close to the pinion. If the backlash is too small, move the bevel gear outward.	
		Move the pinion close to the bevel gear. If the backlash is too small, move the pinion outward.	
		Move the pinion off the bevel gear. If the backlash is too big, move bevel gear inward.	

Table 1. Adjustment of the imprint and backlash of the spiral bevel gears

Adjusting the Final Drive

1. Tighten the six bolts on the outer cover of the final drive case. The tightening torque should be kept within the range of 30 – 35Nm.
2. Tighten the four bolts on the inner cover of the final drive case. The tightening torque should be kept within the range of 35 – 40 Nm.
3. Measure the clearance between the inner cover and the final drive case body with a feeler gauge. If there is no clearance, increase the number of shims of the final drive shaft.
4. Insert enough shims to maintain a gap between the inner cover and the case body within a range of 0.03 – 0.10 mm. See Fig. 9.

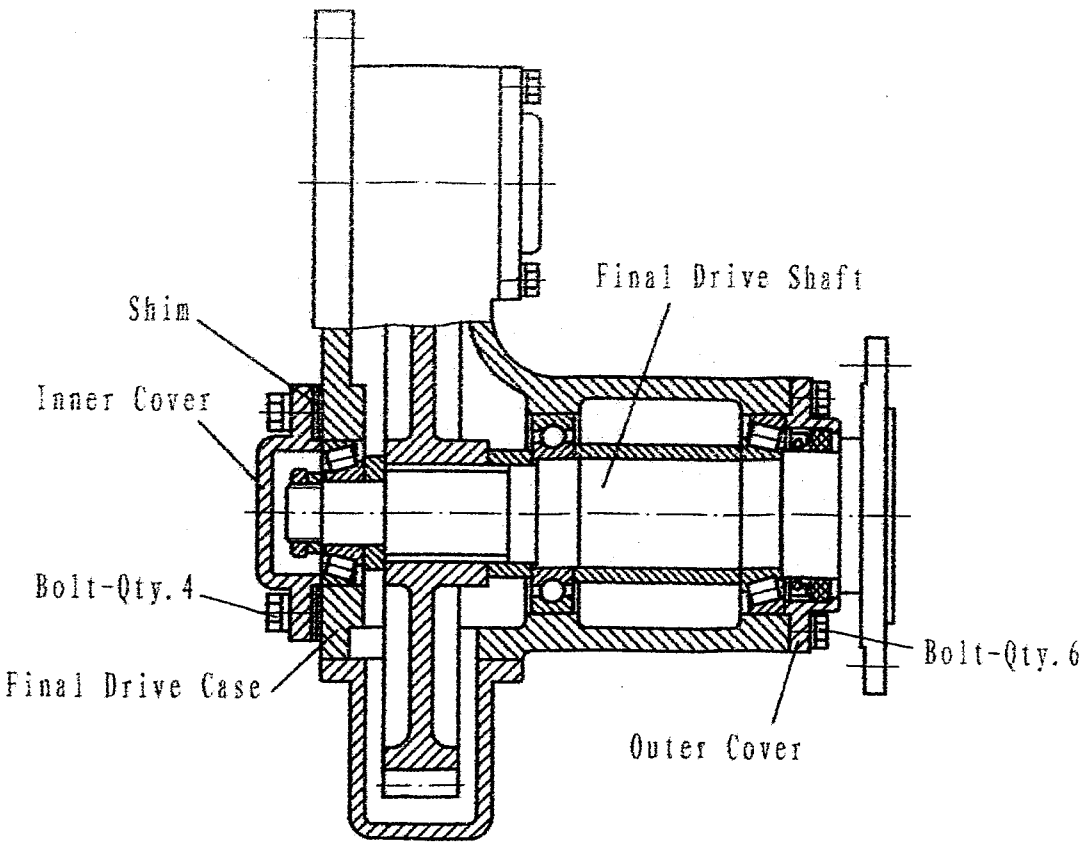


Fig. 9 Adjustment of the Final Drive

Brakes and Steering Clutch Mechanism

The steering pedals are integrated with the brake pedals. Control of brakes is operated sequentially with steering clutches and controlled with the same pedals. Adjustment is as follows:

1. Screw in the two adjusting bolts to their extreme end, then screw out 1 turn. At this point, the clearance between the brake band and the hub should be kept within the range of 1.2 to 1.5 mm. Lock the two bolts in position.
2. Turn the nuts on the sequent fork to extend the brake pull rod, let the pin on the end of the brake arm move toward in the front of the groove, as shown in Fig.10, Detail A1.
3. Turn the steering adjusting nuts to shorten or extend the steering pull rod to adjust the steering free play to the value shown in Fig.10.
4. Turn the nuts on the sequent fork to shorten the brake pull rod to adjust the braking free play to the value shown in Fig.10.
5. Depress the brake and steering pedal completely. The distance between the pedal and bulkhead (right or left side) should exceed 30 mm. Also, the pin on the end of the brake arm should move back in the rear of the groove, as shown in Fig.10, Detail A2.
6. Lock all nuts on the steering adjusting rod, steering pull rod and braking pull rod.

Important: After adjustments are properly completely, depress the brake and steering pedal completely to verify that the steering clutch is separated completely and the brake is applied.

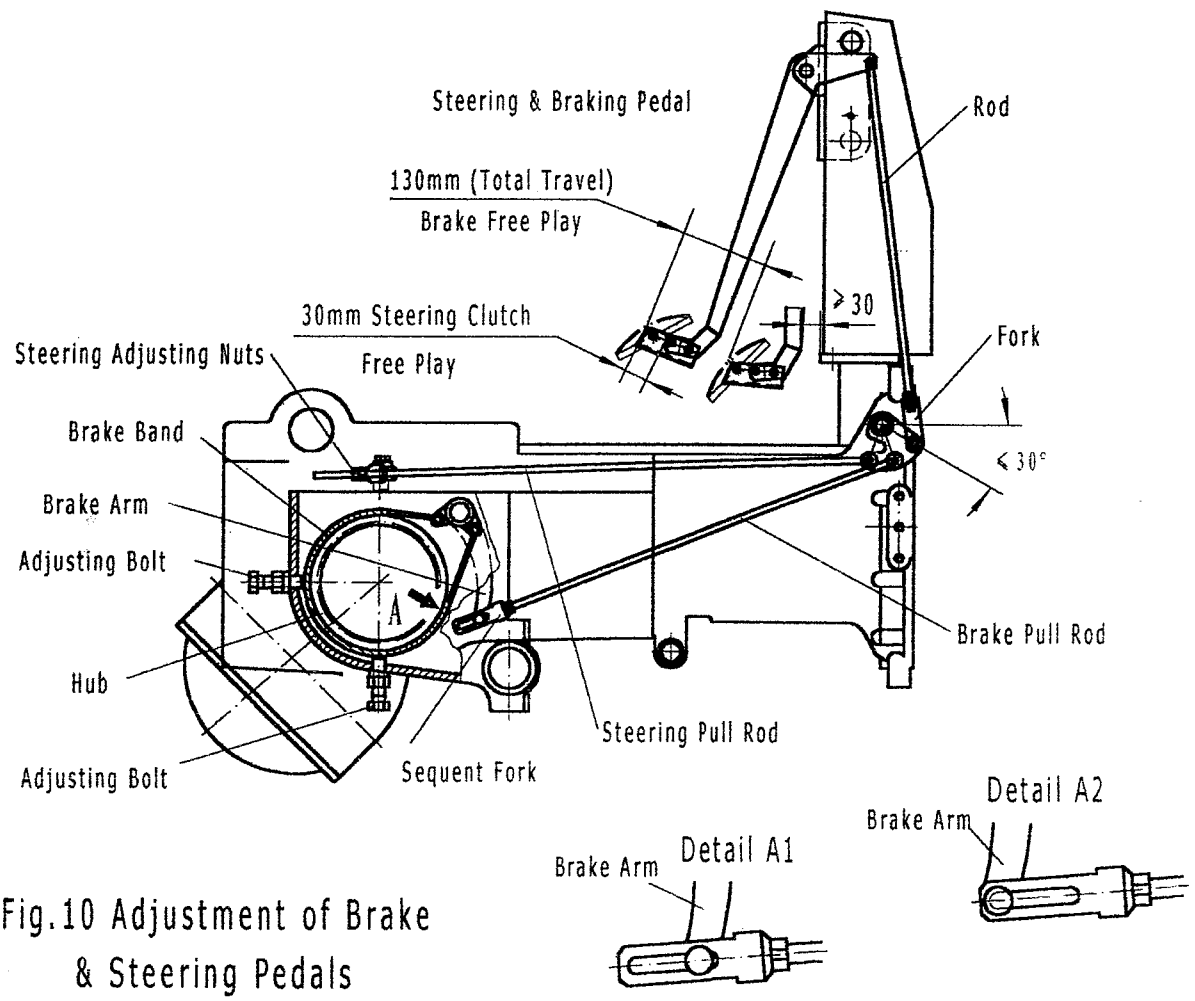


Fig.10 Adjustment of Brake & Steering Pedals

Track Tension

When properly adjusted, tracks should have a sag of 1.5 to 2.5 cm (2/3 to 1 inch) as measured at ta point half way between the carrier roller and drive sprocket. See Fig. 11.

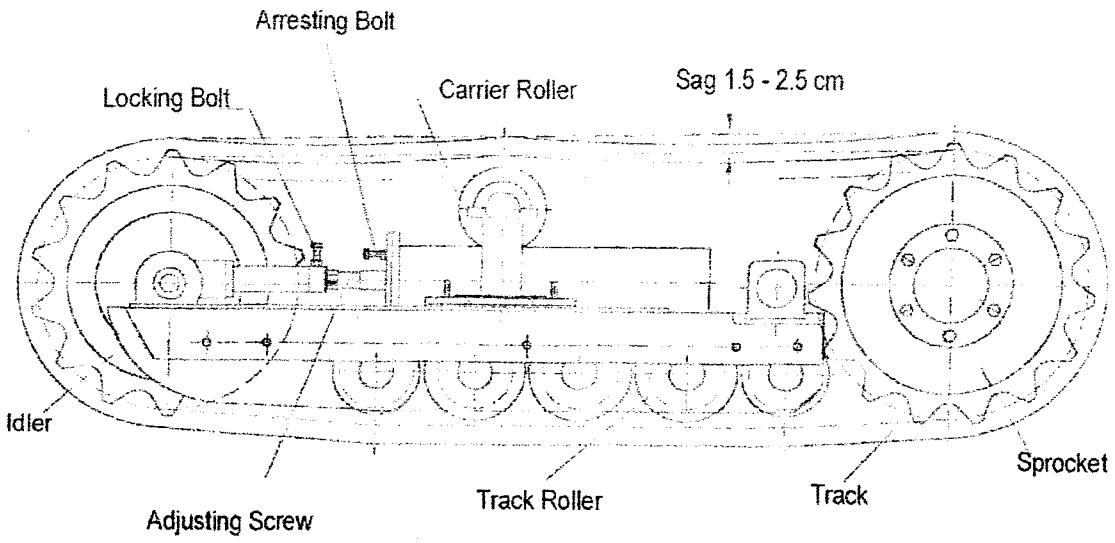


Fig. 11 Track Tension Adjustment

The amount of sag will increase with operation. Adjust the amount of tension by the following procedure:

1. Drive the tractor forward onto hard, level ground with the portion of track on the ground being straight and taunt. The upper portion of the track should sag as in Fig. 11.
2. Loosen the locking bolt for the adjusting screw.
3. Turn the adjusting screw until the track sags about 2 cm (3/4"). Tighten locking bolt.
4. If the spring cap turns with the adjusting screw, turn the arresting bolt into the groove of the spring cap. This will hold the spring cap in place. After adjusting, turn the arresting bolt back to its original position.
5. For steel tracks, after several tension adjustments, the idler may move forward to its maximum length of travel. In this case, take off one piece of track shoe from the track and re-adjust the tension.

Troubleshooting

See the engine section for engine problems.

Shuttle Clutch

Symptoms	Possible Cause	Remedy
1. Clutch slipping.	A. Low oil level in hydraulic tank (left).	A. Add oil to proper level.
	B. Air leak in suction line.	B. Tighten fittings and/or repair leak.
	C. Oil pressure too low.	C. Adjust pressure to specification.
	D. Seal damaged in line.	D. Replace seal.
	E. Seal damaged in valve.	E. Replace seal.
2. Clutch not disengaging completely or difficult shifting.	A. Bearing damaged.	A. Replace bearing.
	B. Clutch disk and/or plate stuck.	B. Replace disk and plate.

Gearbox

Symptoms	**Possible Cause**	**Remedy**
1. Crawler stops abruptly.	A. Pressure of gearshift shaft self locking spring not enough.	A. Replace spring.
	B. Axial force due to open tape of gear spline.	B. Replace gear.
	C. After shifting gears, drive and driven gears are not engaged with complete gear width.	C. Inspect the travel of gear shift and the postion of the gears.
	D. Gear teeth facing wrong direction or tooth surface wom unevenly.	D. Replace the gear.
2. Shifting gears is difficult or impossible.	A. Clutch not completely disengaged.	A. Inspect as per clutch section.
	B. Rounding of gear, end worn or broken.	B. Inspect and replace.
	C. Slide gear too tight on spline shaft.	C. Replace gear and shaft.
3. Abnormal sound from transfer case of gearbox.	A. Not enough lubrication.	A. Check dipstick and add fluid to proper level.
	B. Bearing or gear severely worn.	B. Replace gear or bearing.
	C. Rag or hard spot on tooth surface.	C. Replace gear.

Troubleshooting (continued)

Brake

Symptoms	Possible Cause	Remedy
1. Brake not responding.	A. Grease or oil on brake band.	A. Eliminate oil leak and replace band.
	B. Brake band worn excessively.	B. Replace band.
	C. Brake free play excessive.	C. Adjust.
2. Brake not releasing or hot.	A. Free play too small.	A. Adjust.
	B. Clearance between brake bands too small.	B. Adjust.
	C. Brake arm hung up.	C. Check return spring for tension.

Steering Clutch

Symptoms	Possible Cause	Remedy
1. Steering clutch slipping. (Heavy load and sound of exhaust is not heavy, the tractor gives weak traction, travels slowly or turns to one side automatically.)	A. Grease or oil on clutch disc face.	A. Replace disc.
	B. Clutch disc excessively worn.	B. Replace disc.
	C. Steering free play too small.	C. Adjust.
2. Steering clutch separates, but not completely. (With a light load, the tractor cannot make a sharp or spot turn.)	A. Steering free play excessive.	A. Adjust.
	B. Brake free play too small.	B. Adjust.

Troubleshooting (continued)

Hydraulic Lift System

Symptoms	Possible Cause	Remedy
1. Loaded hitch won't raise or raises slowly.	A. Low oil level in hydraulic sump.	A. Add oil to proper level.
	B. Air leak in suction line.	B. Tighten fittings and/or repair leak.
	C. Filter plugged.	C. Replace filter.
	D. Oil pressure too low.	D. Adjust pressure to specification.
	E. Seal damaged in cylinder.	E. Replace seal.
	F. Seal damaged in valve.	F. Replace seal or valve.
	G. Hydraulic Pump or drive defective.	G. Replace pump or drive.
2. Unloaded hitch won't raise.	A. See A through F above.	A. Follow remedy as recommended.
	B. Safety valve bad or leaking.	B. Replace valve.
	C. Hydraulic pump or drive defective.	C. Replace pump or drive.
3. Unable to lower lift.	A. Main control valve stuck in lift position.	A. Clean valve.
4. Lift jumps or vibrates while raising or slowly lowers from neutral position.	A. Seal or sleeve worn in control valve.	A. Replace parts.
	B. Lift cylinder or seal worn.	B. Replace parts.
	C. Safety valve bleeding by.	C. Replace safety valve.
	D. Implement too heavy.	D. Use only correctly rated implements.

Troubleshooting (continued)

Starter

Symptoms	Possible Cause	Remedy
1. Starter won't start.	A. Low battery charge, loose or dirty connections.	A. Charge battery, tighten and clean connections.
	B. Blown fuse.	B. Determine and repair cause, replace fuse.
	C. Connection to key switch defective.	C. Repair connection.
	D. Solenoid defective.	D. Check and replace if defective.
	E. Brush insulation is broken or grounding.	E. Check and replace.
	F. Glow plug key switch connection defective.	F. Repair.
	G. Starter defective.	G. Replace.
2. Starter weak.	A. Low battery charge, loose or dirty connections.	A. Charge battery, tighten and clean connections.
	B. Brush worn, brush spring weak or brush surface dirty.	B. Check and replace.
	C. Partial short circuit of solenoid, armature, or connections.	C. Check and replace.
3. Unable to engage starter or grinding noise.	A. Excessive wear of starter drive gear or flywheel.	A. Check and replace.
	B. Start switch closes before starter drive gear and flywheel engage.	B. Adjust.