wagner

A Division of Allied Systems Company

Maintenance & Lubrication

Logstacker

Maintenance and Lubrication

General

Machines receiving regular care from its operators and mechanics generally has decreased downtime and greater reliability. Information in this section provides guidance to keep the Log Stacker running at top operating efficiency. Procedures provided in this section can be performed with a standard shop tools.

Safety Precautions

The following safety precautions are included for your protection. Read them carefully prior to performing any maintenance and lubrication procedures.

1. **Read This Manual.**
   Be sure you understand the procedures outlined in this manual prior to performing any machine service or maintenance. Pay particular attention to any safety warnings presented. Don't hesitate to ask an Allied Systems Company Representitive if there are any questions.

2. **Perform Maintenance on Level Ground.**
   The machine should be on level ground and working or moving equipment whenever possible. The parking brake should be set and the wheels blocked.

3. **Remove Load.**
   The machine should be unloaded, with the carriage on the ground.

⚠ WARNING

WARNING: Never rely on the hydraulics to support any part of the machine during maintenance or lubrication. If necessary, support components with appropriate safety stands. NEVER stand under a component that is supported only by the hydraulics. Make sure it is resting on its mechanical stops or safety stands.

4. **Four Wheel Drive: Install Swivel Locking Pin.**
   All four wheel drive units are equipped with swivel locking pins. Always install pin when working in the area of the swivel hinge. The machine must be on a level surface. The swivel locking pin can be installed with the bogie turned right or left.

NOTE: Never operate the unit with the locking pins in the locked position. Damage to the machine could result.

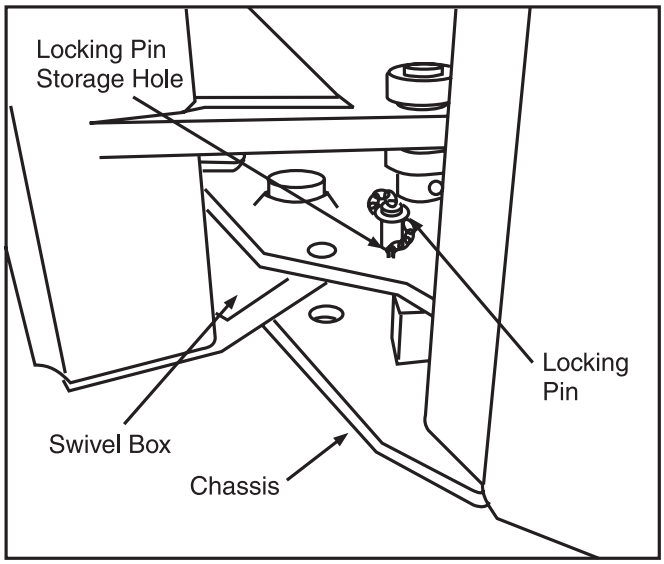

Figure 5-1: Typical Swivel Locking Pin Location

5. **Stop the Engine.**
   Before performing any maintenance or lubrication, remove the key from the switch, and tag the key swtich with "DO NOT START" to ensure the engine is not inadvertently started.

⚠ WARNING

Before performing any maintenance or lubrication, remove the key from the switch, and tag the key switch "DO NOT START", to ensure that the engine is not inadvertently started.

6. **Use Safe Ladders/Scaffolding.**
   It is essential that safe ladders, personnel lifts and/or scaffolding be used while servicing upper lubrication points. These areas can be dangerously slippery in wet, frosty or oily conditions.

Preventive Maintenance

Preventive maintenance is necessary to prevent premature equipment failure. The preventive maintenance system is based on a series of maintenance checks and servicing points. To be effective, the program demands strict adherence to a planned schedule.

Benefits of Preventive Maintenance
There are several benefits to a good preventive maintenance program. Some benefits include:

- **Promotes Safety -** equipment operates more efficiently and is more responsive to operator control.
- **Improves Equipment Availability -** equipment downtime is minimized saving money and increasing productivity.
- **Reduces Unexpected Downtime -** helps avoid operating equipment destruction by replacing or rebuilding parts before they fail.
- **Allows Planning of Daily Production** - by knowing the condition of available equipment.
- **Allows Planning of Maintenance Man Hours** - by distributing duties and necessary lead time for parts ordering.
- **Provides Complete History of Equipment** - based on performance, frequency and type of repairs and actual labor hours spent on maintenance.

Establishing a Preventive Maintenance Program
The key to an effective preventive maintenance program is diligence in following a maintenance schedule set at regular planned intervals. Such intervals should be made compatible with the nature of operation of the equipment and with the capabilities of the maintenance facility. In any event, the intervals and inspection requirements must be planned, regular, and consistent.

Specific maintenance should be completed using the following intervals:

- 10 hours (each shift or daily)
- 50 hours (weekly)
- 250 hours (monthly)
- 500 hours (quarterly)
- 1000 hours (semiannually)
- 2500 hours (annually)

Each successive schedule (e.g. weekly, monthly, quarterly, etc.) encompasses the former and is accumulative in nature. For example, when performing monthly maintenance, take note of the shift maintenance reports and remedy any discrepancy; then comply with the shift and weekly maintenance, and in addition perform the checks specified in the monthly schedule.

Maintenance Record Keeping
Check off each scheduled maintenance form as the inspection and service is performed. Quantities of replenished lubricants and hydraulic pressure readings should be recorded on the schedule form. Record all discrepancies regardless of their status (i.e. whether remedied or pending). Operators and mechanics should sign off forms and return them to the maintenance supervisor for approval and retention in an equipment unit file.

Accurately recorded maintenance forms give maintenance personnel an overall view of how equipment is performing under normal operating conditions. Good, easy to review records enable maintenance personnel to identify and evaluate problem areas and allow adjustment in the maintenance scheduling as required.

Shift Maintenance

Shift maintenance records are the building blocks of a preventive maintenance program and are usually completed by the operator. It consists of the routine (daily and weekly) servicing and lubrication of the major systems. On a daily basis, the operator should identify, remedy and/or record potential problem areas and recognize any change in the performance of the machine. Comments recorded on the shift maintenance report are a valuable tool to the maintenance department, and is important to the overall success of a preventive maintenance program.

Shift Maintenance Checklist
A recommended checklist is provided as an aid in developing a practical shift maintenance program. A shift maintenance report, based on this checklist, should be used to report defects found when making maintenance checks at the beginning of each shift.

Using the Checklist
The reference numbers in the left-hand column of the checklist indicate the physical location of each check point or lubrication point as it appears on the shift maintenance diagram. Circled reference numbers on the diagram indicate lubrication points. Boxed numbers indicate maintenance checkpoints.

Shift maintenance details are provided in the service maintenance check list.These procedures consist of checks easily performed by the operator.

Scheduled Maintenance

Periodic scheduled maintenance should be performed in a well-equipped maintenance facility by trained mechanics. The timely scheduling and completion of these periodic inspections by the maintenance department determine the length of machine downtime. Therefore, maintenance scheduling relies on a critical balance in the use of labor hours and the availability of equipment.

Scheduled Maintenance Checklist
A machine's operating environment affects the maintenance schedule. More frequent checks are required for machines operating in severe conditions, like heavy dust, extreme temperatures or extremely heavy loads.

These maintenance checklists are designed as a guide until adequate experience is obtained in establishing a schedule to meet your specific needs and operating environment.

A detailed list of component checks is provided with a suggested schedule basis given in hours of operation, or calendar time.

The engine manufacturer's operation and maintenance manual should be consulted and adhered to for additional engine related checks and/or maintenance details.

Establish a maintenance schedule using these checklists as a guide.

⚠ CAUTION

Failure to adhere to adhere to manufacturer's suggested maintenance schedules may result in loss of warranty coverage.

Using the Checklist
Although specific maintenance is identified in these checklists, location and procedure references are not provided in the columns.

Scheduled maintenance is normally performed by trained mechanics, who are knowledgeable of the equipment systems and component locations. Scheduled maintenance procedures can be found by referring to the appropriate section of the service manual.

Scheduled Oil Sampling

Use scheduled oil sampling (SOS) to monitor machine condition and maintenance requirements. Take oil samples from engine, transmission, axles, and hydraulic system when the oil is hot and well mixed to ensure an accurate analysis. Contact an Allied Systems Company Representative for complete information and assistance in establishing a scheduled oil sampling analysis program for your equipment.

Daily Maintenance & Lubrication

The chart below includes all points referenced in the Daily Maintenance and Lubrication Check List shown on the following page.

◯ Circled Numbers Indicate Lubrication Points

□ Boxed Numbers Indicate Maintenance Check Points

Note: Due to variations in engine types and models, the indicated location of engine filters (fuel, oil, coolant, etc.) are not shown. Consult your engine service manual for exact locations.

⚠ WARNING

The height of the upper lube points and maintenance check points make it essential that safe ladders and/or scaffolding be used while servicing the machine. These areas can be dangerously slippery under wet, frosty, icy, snowy or oily conditions.

Pressurized Axle (Optional)

⚠ WARNING

Some machines have pressurized front axle housings with 3 psi pressure. Shut off air supply to the axle, then open air drain cock located on axle housing bulkhead before checking axle oil level.

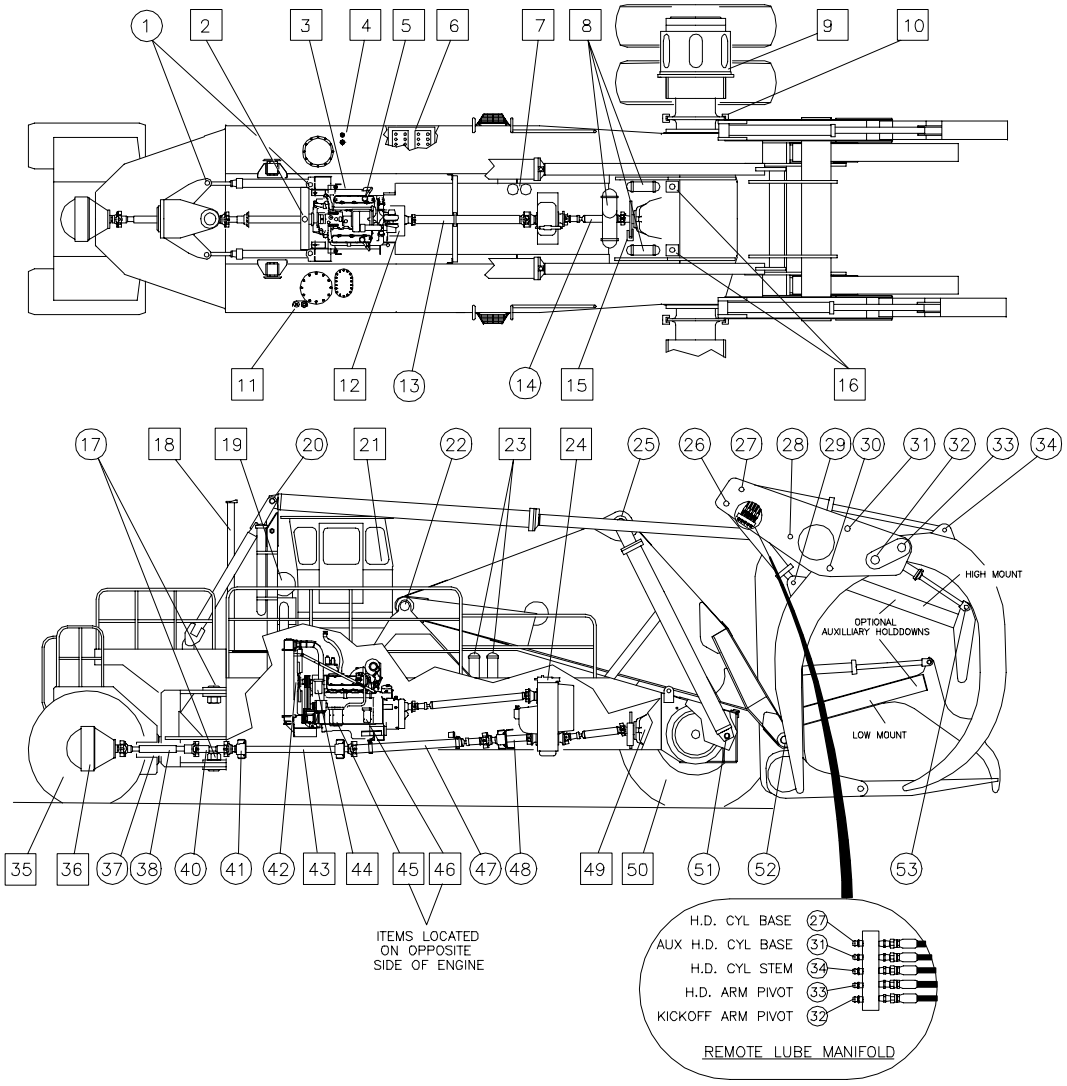

Figure 5-2b: Daily Maintenance and Service Check Points, Typical Four-Wheel Drive Machine

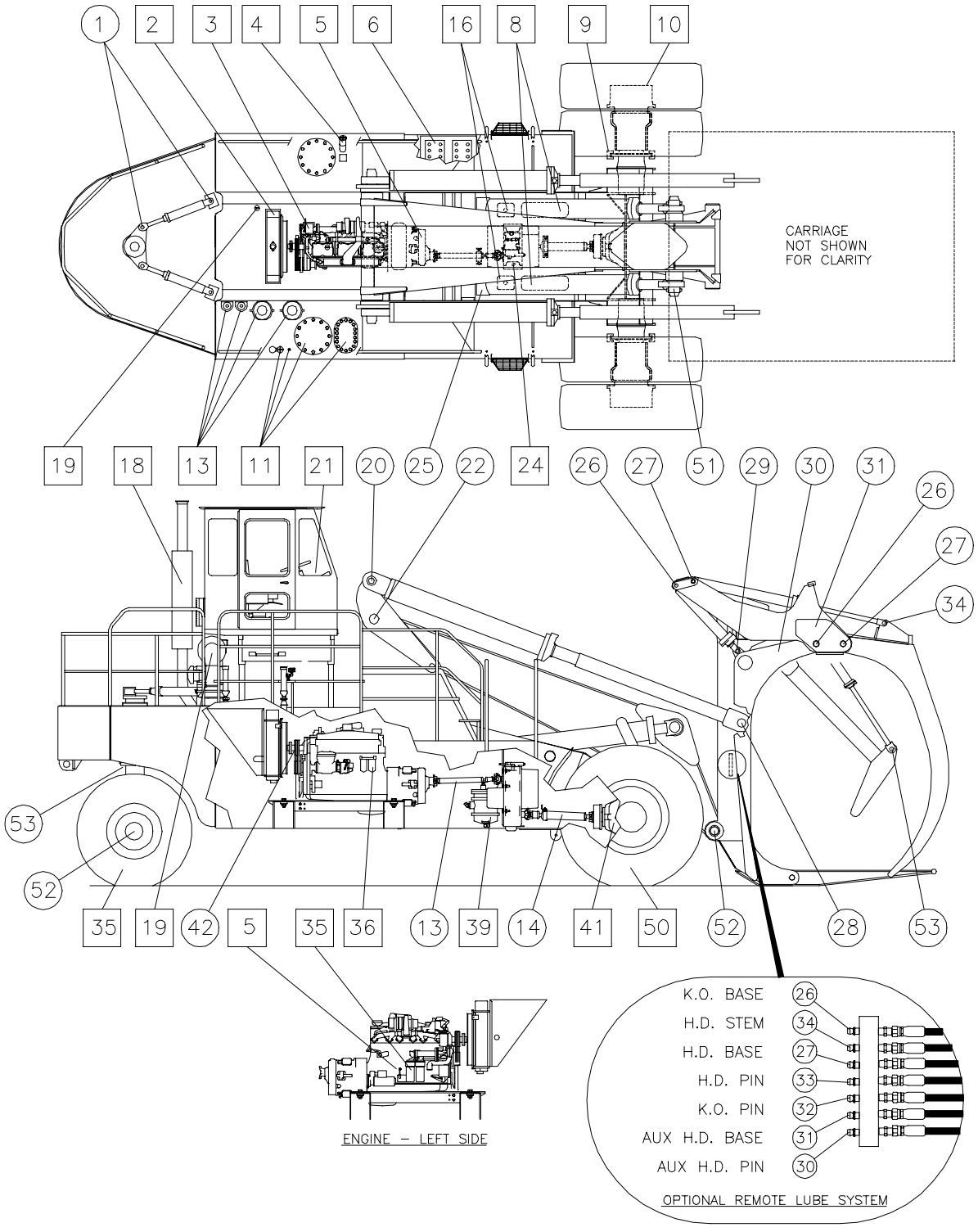

Figure 5-2a: Daily Maintenance and Service Check Points, Typical Two-Wheel Drive Machine

Lubrication Points

DAILY/EACH SHIFT

Before Engine Startup, Check the Following

Item			No. of Fittings
(1)	Steering Cylinder Pins		4
(22)	Boom to Chassis Pins		2
(52)	Boom to Carriage Pins*		3
(25) & (51)	Hoist Cylinder Pins*		4
(17)	Hinge Bearings *		2

50 HOURS OR WEEKLY

(20) & (28)	Tilt Cylinder Pins		4
(33)	Holddown arm pins		2
(32)	Kickoff arm pins		2
(27) & (34)	Holddown Cylinder Pins		4
(26) & (29)	Kickoff cylinder pins		4
(30)	Auxiliary holddown arm pins		2
(31) & (53)	Auxiliary holddown cylinder pin		4
(37)	Swivel Bearing	*b	1
(41)	Front and rear support bearings	*b	2
(13)	Driveline - converter to transmission	*a	3
(14)	Driveline - transmission to front axle	*a	3
(48)	Driveline - transmission to front support bearing	*a*b	3
(47)	Driveline - front support to mid support	*a*b	3
(43)	Driveline - mid support to rear support	*a*b	3
(40)	Driveline - rear support to hinge	*a*b	3
(38)	Driveline - hinge to rear axle	*a*b	3

250 HOURS

(33)	Fan Drive Bearing (Not on all engines)		1

500 HOURS

(30)	Tailwheel bearing	*c	2
(29)	Tailpost	*c	1

* When operating in water, lubricate submerged points more frequently
*a Use handgun or low pressure adapter; lubricate sparingly
*b Four wheel drive units only
*c Two wheel drive units only

Service Maintenance Check Lists

Daily/Each Shift

Item	OK	No	Add/Repair
[5] ENGINE (Check Oil Level -check for leaks)	____	_____	_____
[11] HYDRAULIC TANK (Check oil level - check for leaks)	____	_____	_____
[2] RADIATOR (Check coolant level - check for leaks)	____	_____	_____
[19] AIR CLEANER (Check indicator - clean or change element as req'd	____	_____	_____
[19] AIR INTAKE SYSTEM (Check for leaks and damage)	____	_____	_____
[42] ENGINE BELTS (Check for adjustment and wear)	____	_____	_____
[8] AIR TANKS (Check drain valves for correct operation	____	_____	_____
[2] RADIATOR & OIL COOLER (Are fins clean and unobstructed?)	____	_____	_____
[31] [50] WHEELS & TIRES (Check condition and pressure)	____	_____	_____
[8] HYDRAULIC BRAKE FLUID (Check fluid level - if so equipped)	____	_____	_____
- - LUBRICATE CHASSIS (Refer to lube chart)	____	_____	_____
- - ENGINE (Does it sound normal?)	____	_____	_____

After Starting the Engine, Check the Following

[3] INSTRUMENTS (Check for normal readings)	____	_____	_____
[15] CONTROLS (Check for normal operation)	____	_____	_____
[12] EXHAUST SYSTEM (Check for leaks and excessive emissions	____	_____	_____
[19] TRANSMISSION (Check oil level - check for leaks)	____	_____	_____

Note Anything Abnormal Or In Need Of Repair

LIGHTS _____ DEFROSTER _____
HORN _____ REVERSE WARNING HORN _____
WINDSHIELD WIPERS _____ HEATER _____ _____
AIR CONDITIONER _____ _____ _____

OPERATOR _____ SUPERVISOR _____ DATE _____
MODEL _____ SERIAL NUMBER _____ HOUR METER _____

Service Maintenance Check Lists

50 HOURS OR WEEKLY

Item	OK	No	Add/Repair
1. Repeat daily maintenance & lubrication check list	____	_____	_____
2. Check for fluid leaks (oil, fuel and water) and correct	____	_____	_____
3. Check brakes for adjustment and wear	____	_____	_____
4. Check wheel lug nuts and studs mechanically, Torque to Spec	____	_____	_____
5. Record engine RPM (at idle, high free idle and converter stall)	____	_____	_____
6. Empty dust cap bowl on air filter	____	_____	_____
7. Check transmission oil level (at operating temperature)	____	_____	_____
8. Check battery electrolyte level	____	_____	_____
9. Visually check for structural damage (inspect chassis & attachments for indication of fatigue or damage)	____	_____	_____

250 HOURS OR MONTHLY

Item	OK	No	Add/Repair
1. Repeat 50 hour check	____	_____	_____
2. Take engine oil sample for analysis *	____	_____	_____
3. Change engine oil and all filters *	____	_____	_____
4. Check axle differential and planetary oil level	____	_____	_____
5. Change cooling system filter (if so equipped)	____	_____	_____
6. Check all hydraulic pressures and record (see hydraulic schematic)	____	_____	_____
7. Check fire suppression system (if so equipped)	____	_____	_____
8. Check disc brake calipers, pads, rotors and lines (if so equipped)	____	_____	_____
9. Grease all non-Lube-For-Life drivelines	____	_____	_____
10. Check and adjust the parking brake (if required)	____	_____	_____

IMPORTANT: Consult the engine manufacturer's Operation and Maintenance Manual for additional engine related checks and/or details.

Service Maintenance Check Lists

500 HOURS OR QUARTERLY

Item	OK	No	Add/Repair
1. Repeat 250 hour check	____	____	____
2. Take oil samples of transmission, axle and hydraulic systems *	____	____	____
3. Drain and refill transmission, change filter *	____	____	____
4. Service fuel filters per manufacturer's recommendation *	____	____	____
5. Service hydraulic filters *	____	____	____
6. Inspect brake systems & components	____	____	____

1000 HOURS OR SEMI-ANNUALLY

Item	OK	No	Add/Repair
1. Repeat 500 hour check	____	____	____
2. Clean and flush cooling system	____	____	____
3. Check pins and bushings for excess wear	____	____	____
4. Drain, flush and refill differentials *	____	____	____
5. Drain, flush and refill planetaries *	____	____	____

2500 HOURS OR ANNUALLY

Item	OK	No	Add/Repair
1. Repeat 1000 hour check	____	____	
2. Check and recharge accumulators, record pressure (if so equipped)	____	____	____
3. Replace hoses as required, steam clean engine, tighten mounting bolts and turbocharger mounting bolts	____	____	____
4. Drain hydraulic tank, flush tank and refill	____	____	____
5. Change hydraulic oil and filters *	____	____	____

* Normal drain period and filter change intervals are for average environmental and duty-cycle conditions. Severe or sustained high operating temperatures or very dusty atmospheric conditions will cause accelerated deterioration and contamination. Change intervals should be adjusted according to the results of oil sampling analysis. Consult your Wagner dealer for assistance in establishing an oil sampling program for your equipment.

IMPORTANT: Consult the engine manufacturer's Operation and Maintenance Manual for additional engine related checks and/or details.

Service Maintenance Check Lists

Repairs

Problem: _____
_____
_____
_____
_____
_____

Parts: _____
_____
_____
_____
_____
_____

Mechanic: _____ Hours Labor: _____

Operator: _____ Supervisor: _____
Machine Model _____ Equipment No: _____
Date: _____ Shift: _____ Hour Meter: _____

Maintenance Procedures

General
Perform the following maintenance procedures at the beginning of each work shift. The number before each maintenance procedure corresponds with the numbers given in the Daily Maintenance and Service Check Points (Fig. 5-2). This provides an additional aid in locating each check point.

Before Starting Engine

5 **Engine Oil Level**
Check the oil level prior to starting the engine. Make sure that the area around the dipstick is clean and the machine is sitting on level ground.

NOTE: A 15-minute drain-back time is recommended is the engine has been running.

The oil level must be maintained between the "L" (low) mark and the "H" (high) mark, but as close to the "H" mark as possible.

⚠ CAUTION

CAUTION: Never operate the engine with the oil level below the "L" mark or above the "H" mark. Refer to the engine's Operation and Maintenance Manual for detailed engine service information.

Use only approved engine oil (see Lubricant Specifications, page 5-14). Do not overfill. Check engine for leaks.

11 **Hydraulic Oil Level**
Always check the hydraulic oil level prior to operation. The dipstick and fill pipe are located on the RH chassis deck, to the right of the operator's cab.

⚠ CAUTION

CAUTION: Always open the tank breather petcock (located on the breather pipe) before removing the dipstick, filler cap or in-tank filter cover plate. Failure to vent the tank can result in injury or a substantial oil spill. Be sure to close the petcock before operating the machine.

Check the oil level with the hoist cylinders retracted (down). The oil level should be at or near the "H" (high) mark on the dipstick. Fill with approved hydraulic fluid as required (see Lubricant Specifications). Do not overfill.

3 **Engine Coolant Level**
Daily inspection of the coolant level is recommended. Cooling systems using anti-aeration baffles restrict visual observation of the true coolant level. Although the coolant can be seen, the system may not be full. To gain a true fill, add water slowly up to the bottom of the fill neck and allow a 30-second settling period. Remember to compensate for the loss of anti-freeze when adding water.

⚠ WARNING

Never remove the radiator cap if the engine is hot. The coolant will be under pressure and could flash to steam with explosive force, causing severe burns. Remove the readiator cap only when the engine is cool.

NOTE: If the engine is hot, the coolant level will be higher than when it is cold.

Inspect the radiator daily for restrictions caused by leaves, dust, paper or bent fins. Inspect the radiator cap, hoses and connectors for any signs of leakage or damage.

19 **Air Cleaner**
The air cleaner is a cyclonic-type, dry air filter. A service indicator shows the condition of the filter. The indicator will show in the green zone when the filter is clean. The indicator will show red when the filter is restricted. If red appears in the indicator window, change the primary element and press the reset button on the indicator. Check the safety element and change as required.

42 **Engine Belts**
Check the tension of the drive belts by pressing with the thumb halfway between the pulleys. The belt should not deflect more than the values shown in the table (Fig. 5-3). If any belt is loose or worn, report to maintenance for corrective action.

Engine	Belt Deflection Inches (mm)
Cummins	3/8 to 5/8 (9.5 to 15.9)
Caterpillar	1/2 to 3/4 (13 to 19)

Figure 5-3: Engine Belt Deflection

8 **Air Tank Valves (If Applicable)**
Visually inspect the valves and connections for damage or leaks. There should be signs of water coming from the drain hoses. If not, report the condition to maintenance.

35 **50** **Wheels and Tires**
Visually inspect the tires for low air pressure and damage. Also check the wheel assemblies for cracks, loose or missing lug nuts, borken studs, etc.

16 **Hydraulic Brake Fluid**
Check the fluid level in each of the two brake reserviors. Each reservoir must be full. Clean the area around the filler cap before removing. Fill the reservoirs with transmission fluid. **Do not use automotive brake fluid.**

After Starting the Engine

5 **Engine**
After starting, check that the engine runs and sounds normal. It should come up to operating temperature within a few minutes after starting. If you notice unusual noises, leaks or excessive smoke, shut down the engine and immediately ocntact maintenance.

3 **Instruments**
Check all the instruments for normal readings immediately after starting the engine. Make sure that temperatures are within acceptable limits. Also, check that all controls function properly. They should be smooth and responsive.

14 **Air Intake System**
Inspect all connections for damage and air leaks. Look for damaged fittings and loose connections. Do not operate the machine if leaks are present. Dirt could enter the engine through the intake and cause severe damage.

1 **Exhaust System**
Check for exhaust leaks. Make sure that exhaust gases are not entering the operator's cab. Mounting brackets must be in place and all connections tight. Check for excessive smoke.

2 **Transmission Oil Level**
The level should be checked after engine warm-up, with 180° to 200° showing on the transmission temperature guage. The dipstick and fill tubes are located on the chassis deck, directly above the transmission. Check the level with th engine running at idle, at operating temperature, and with the transmission in neutral. The level should be between the "H" (high) and "L" (low) marks. Fill with approved fluid only. See Lubricant Specifications on page 5-14. Do not overfill. Inspect for leaks.

Operator Troubleshooting

The following tables list the most common problems that may be encountered by operators. If the problem cannot be solved using the corrective actions listed in this table, notify maintenance personnel.

Engine*

Symptom	Probable Cause	Corrective Action
Engine turns over but fails to start	Fuel Solenoid not energized or is faulty	Replace fuel solenoid
	Fuel Tank empty	Fill Tank
	Fuel shutoff valve at tank closed	Open Valve
	Fuel filter blocked	Replace filter
Engine Fails to turn over	Battery disconnect switches open	Close Switches
	Transmission not in neutral	Place lever in neutral
	Low battery condition	Check charge system
	Battery terminals corroded or loose	Clean and tighten terminals
	Insufficient fuel supply	Clean fuel strainers, replace filter, fill tank,tighten fuel lines
Engine runs unsteadily and power output is low	Air leak into fuel system	Clean fuel strainers, replace filter, fill tank,tighten fuel lines
	Contaminated fuel	Drain tank and lines, clean strainers, replace fuel
	Incorrect fuel	Drain tank and fill with proper fuel
	Air intake restricted	remove restriction
Exhaust smokes badly	Too much oil in sump	Drain to proper level
	Air intake restricted	Remove restriction
Engine overheats	Restricted airflow through radiator	Clean fins
Engine oil pressure low	Low coolant level	Check coolant level, fill as needed
	Low oil level	Check oil level
	Oil leaks	Tighten connections, Correct as required
	Contaminated oil	Change oil and filters

Transmission/ Converter*

Symptom	Probable Cause	Corrective Action
Transmission or converter overheats	Low oil level	Fill to proper level
	High oil level	Remove excess oil
	Restricted airflow for oil cooler	Remove restriction
Lack of Power	Low engine RPM at converter stall	Check engine (governor)
	High engine RPM at converter stall	Check engine (governor)
	Failing charge pump	Check torque converter

Wet Disc Brake System (If Applicable)*

Symptom	Probable Cause	Corrective Action
Brakes won't release	Loss of oil pressure - refer to service manual	Troubleshoot as required
Loss of braking efficiency - **Refer to Service Manual**	Air in hydraulic brake system	Check the pump
	Loss of accumulator pressure	Troubleshoot as required
	Low system pressure	Wait for system to recharge

* Also refer to the manufacturer's Operation and Maintenance Manual for additional information

Hydraulic System*

Symptom	Probable Cause	Corrective Action
No response to controls	Closed control shutoff valve	Open valve
	Low oil level	Fill tank to proper level
	Failed pilot pump/relief	Replace pump or relief
Sluggish operation or response to controls	Hydraulic oil cold	Allow adequate warm-up time
	low oil level	Fill tank to proper level
	Suction leak	Correct suction leak
	Plugged tank breather	Replace breather
	Restriction in circuit	Remove restriction, check filter
	Pump damaged/failing	Check engine speed
Excessive pump noise	Cavitation	Eliminate restriction in suction line, replace tank breather
	Aeration due to insufficient oil/poor oil quality	Fill tank to proper level, correct suction leak
Hydraulic system overheating	Low oil level	Fill tank to proper level
	Operating over pressure relief or excessive system leakage	Correct operating procedure, or replace system components

Electrical System*

Symptom	Probable Cause	Corrective Action
Engine fails to turn over	Battery disconnect switches open	Close switches
	Neutral start switch open	Place transmission shift lever in neutral
	Battery low	Test charge system
	Battery terminals corroded or loose	Clean/tighten terminals
	Other connections loose	Tighten connections
Voltmeter indicates discharge	Alternator drive belt slipping or broken	Tighten or replace belt
	Loose or corroded battery connections	Clean/tighten terminals
	Defective alternator or battery	Replace battery and/or alternator

* Also refer to the manufacturer's Operation and Maintenance Manual for additional information

Maintenance Specifications

Most of the required maintenance specifications, such as the hydraulic pressure relief settings, can be obtained from the Service Manual and the hydraulic schematic.

Note: Set Hydraulic pressures at 1500 rpm. Override should not be over 50-100 psi on control valves. Check or set pressures after hydraulic oil is above 100° F with calibrated gauges.

Wheel Nut Torque

Wheel nut torque for specific machines is located in the service manual under Section 3-5, wheels and tires.

Tire Inflation Pressure

Tire inflation pressure for specific machines is located in the service manual under Section 3-5, wheels and tires.

Lubricant Selection and Specifications

The efficiency and useful life of mechanical equipment is as dependent on proper lubrication as on proper engineering design. The importance of proper lubrication is increased because of the greater loads and pressures imposed on present day mobile heavy equipment. For this reason, we are vitally interested in promoting widespread usage of the best possible lubricants for Allied Systems Company products.

Because many brands of fluid are available, it is not practical to test each one. Selecting the correct fluid should be done with the help of a reputable oil supplier who is responsible for the quality of the fluid. Our lubricant recommendations are based on commercial products that have given excellent results in a wide range of operating conditions. In all cases, the lubricant supplier assumes all responsibility for the performance of his product and for product liability.

Allied Systems Company requires that lubricants meet, or exceed, the specifications of the oils listed above to avoid component failure and to qualify for warranty consideration. **Our suggested lubrication and selection and specification list is located in section 10-1 of the service manual.** If a cross reference to Mobil Oil Corporation specifications is required, please consult your local lubricant dealer.

When changing fluids use the following guidelines:

- Add only filtered fluids.
- It is important to service filters and breathers at the proper hourly intervals.
- If adding lubricants other than what is currently in the reservoir, a warranty of compatibility should be obtained from the oil supplier.
- When the fluid is changed due to changes in ambient temperatures, the system should be **completely drained** and the fluid replaced.