

2510 Cruz-Crane Carrier Mounted Service Manual

S-406182M1

CASE

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THIS SAFETY ALERT SYMBOL INDICATES IMPORTANT SAFETY MESSAGES IN THIS MANUAL. WHEN YOU SEE THIS SYMBOL, CAREFULLY READ THE MESSAGE THAT FOLLOWS AND BE ALERT TO THE POSSIBILITY OF PERSONAL INJURY OR DEATH.



WARNING: To prevent eye injuries wear safety glasses when servicing this machine.



WARNING: Never smoke while refueling, servicing the fuel system or working with batteries.



CAUTION: Do not service machine with engine running. If necessary to make checks with engine running, have one man stay at the controls while the other makes the check.



WARNING: To prevent injury from burns always use a non-flammable solvent for cleaning component parts. **DO NOT** use gasoline or other flammable substances.



When servicing the machine, tag mark both ignition switches to alert other operators and prevent accidental start-ups.



Keep fire extinguishers and first aid kit handy and know how to use them.



Before starting engine make sure all operating controls are in **NEUTRAL**.



POISON/DANGER: BATTERY ACID CAUSES SEVERE BURNS. BATTERIES CONTAIN SULFURIC ACID. Avoid contact with skin, eyes, or clothing.



WARNING: Always be sure Carrier transmission is in neutral before attempting to start engine from either cab. Earlier units are not equipped with a neutral start switch. If engine is started when transmission is in gear, Carrier will be set in motion.

Anti-dote: **EXTERNAL:** flush with water. **INTERNAL:** drink large quantities of water or milk. Follow with Milk of Magnesia, beaten egg or vegetable oil. Call physician immediately. **EYES:** Flush with water for 15 minutes and get prompt medical attention. **KEEP OUT OF REACH OF CHILDREN.**



CAUTION: Never leave engine running when machine is unattended.



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



CAUTION: Keep hands, feet and loose clothing away from moving parts when machine is operating.



CAUTION: Be extremely careful when working with tires. Tires can come apart with explosive force. Never attempt to disassemble a wheel with an inflated tire mounted on it.



WARNING: To avoid personal injury, keep hands clear of turntable ring gear while turntable is being rotated.

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manual**

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SAFETY PRECAUTIONS

DROTT® CRUZ-CRANE



Disconnect both leads from the batteries when working on the engine or electrical system. Always disconnect the Ground lead first.



CAUTION: When checking coolant level, remove radiator cap slowly to relieve pressure within the system.



WARNING: Never attempt to disconnect any hydraulic lines unless boom is firmly supported or blocked, load is lowered to the ground and hydraulic line pressure is relieved by working the controls back and forth several times with engine off.



CAUTION: Before disconnecting any air lines, bleed air reservoirs and relieve pressure in system and lines.



CAUTION: Do not reach inside open panel chord boom unless engine is shut down and boom is secured to prevent it from extending or retracting.



WARNING: Wire rope clamps and wedge sockets must be properly installed to help ensure safe lifts.



DANGER: Replace wire rope at the first sign of defect or damage. The cost of wire rope is nothing compared to a human life.



CAUTION: Before making any lifts, check the load charts on the machine. Make sure you will be in the safe load area and that the hook block is properly reeved for the test load.



Wipe oil spills immediately and keep work area as clean as possible. A cluttered work area invites accidents.



Clean rubber parts by washing in clean denatured alcohol or brake fluid. **DO NOT** use mineral base cleaning solvents such as acetone or paint thinner on any rubber parts. If a mineral base solvent is used, the rubber will start to deteriorate and continue to deteriorate after the part is put back into service. The continued deterioration of the rubber could cause the part to fail.



WARNING: Never operate the alternator on an open circuit. With no battery or other electrical load on the circuit, a voltage buildup will occur within the alternator. This voltage buildup could be extremely dangerous to anyone touching the alternator "BAT" terminal.



DANGER: When servicing the heater, do not operate it in an enclosed area unless the exhaust gas is piped to the outside. Exhaust gases may contain carbon monoxide - a colorless, odorless and poisonous gas.



Never handle wire rope with bare hands. Wear gloves.



WARNING: This machine must be level when checking torque on turntable bearing capscrews. Since it is necessary to disconnect the swing brake, the boom will swing to the down side unless the machine is level. Blocking or resting the boom in the required position is not recommended.

INTRODUCTION

This manual is designed to serve as a guide in maintaining the 2510 CRUZ-CRANE. The information contained herein should be used in conjunction with the Carrier Manufacturer's Manual.

The scope of this manual is limited to components installed by DROTT Manufacturing. To avoid duplication, service information on the Hendrickson Carrier is only briefly discussed. The reader is referred back to the Hendrickson Parts-Service Manual for detailed information.

A separate section entitled "Scheduled Preventive Maintenance" is provided to cover all components which require periodic maintenance. Refer to this section whenever performing normal maintenance. It includes a Maintenance Schedule, Component Capacities and Lube Charts for easy reference. If more detailed information is desired, refer to the sections on Servicing the various systems.

The CRANE components are divided into four general systems - mechanical, air, electrical and hydraulic. Each system and each component is explained to provide the understanding necessary for good troubleshooting. Troubleshooting Charts are included for easy reference.

Disassembly and repair procedures for individual system components are found near the end of each section. Written instructions are supplemented with exploded views and illustrations.

Torque Charts and Schematic Drawings of the air, electrical and hydraulic systems are located in back of this manual for easy reference when servicing and troubleshooting the unit.

If further service information is required, contact your nearest DROTT dealer or Service Representative for assistance.

PARTS AND SERVICE

When writing or calling the dealer or manufacturer about your DROTT machine, always refer to the model and serial number as well as the part name and location. The Crane serial plate is located on the lower left front side of the Crane Cab (figure 1). The Carrier serial plate is located inside the Carrier Cab door (figure 2). The engine serial number can be found on the Option Plate (located on the left valve cover on the Detroit Diesel engine and on the left front side on the Cummins engine).

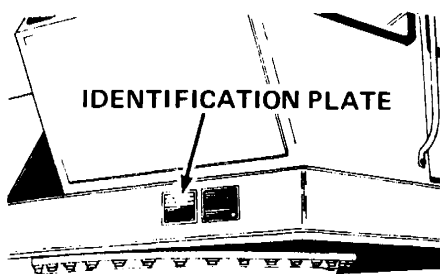


Figure 1. Crane Identification

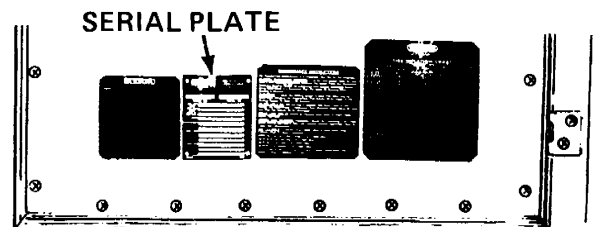


Figure 2. Carrier Identification

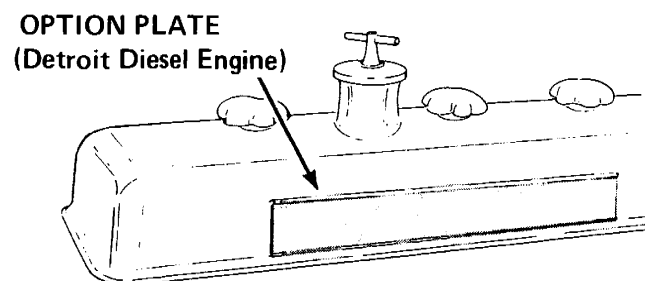


Figure 3. Engine Identification

Each of the main components (pumps, winches, transmission, axles, etc.) is equipped with its own serial plate located on the component housing.

NOMENCLATURE

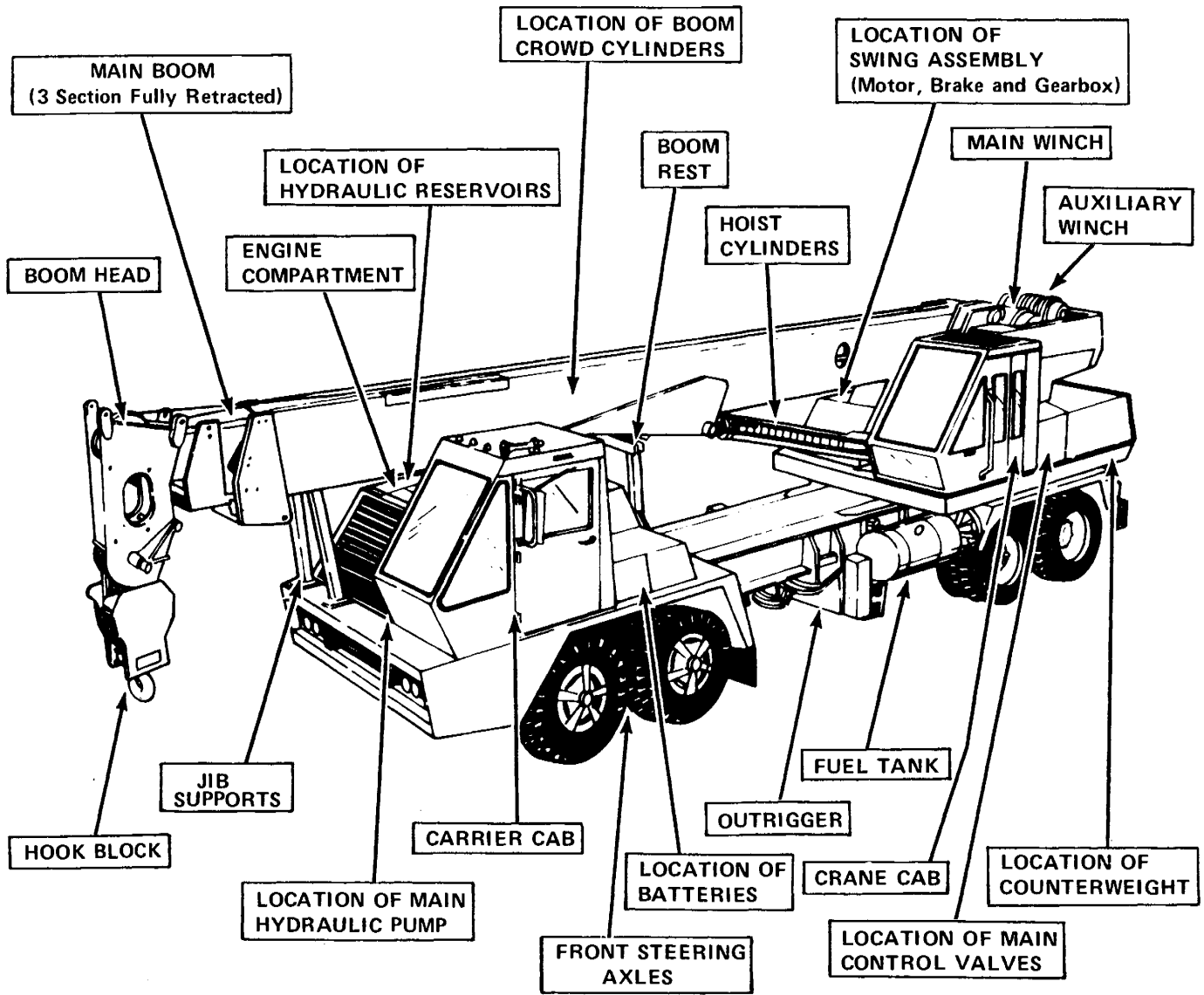


Figure 4. Nomenclature

GENERAL DESCRIPTION

The 2510 CRUZ-CRANE is a carrier-mounted, hydraulic crane. Power for both CARRIER and CRANE operation is supplied by a single engine. In addition to propelling the Carrier, the engine serves the following functions:

- a) drives a tandem gear pump which supplies hydraulic power for Crane operation,
- b) drives a single pump, which powers the outrigger and steering functions,
- c) drives an air compressor which provides pneumatic power for brakes and outrigger remote control,
- d) drives an alternator which supplies electrical energy to recharge the batteries and operate the carrier and crane electrical systems.

Figure 5 illustrates the power distribution from the engine to the various hydraulic, air and electrical systems.

In the hydraulic systems, oil from the tandem pump is routed to the HOIST, CROWD, SWING and WINCH circuits through four control valve banks. Oil from the single section pump is routed to the Outrigger and Steering cylinders through the appropriate control valves.

All three systems (air, electrical and hydraulic) are employed in the outrigger remote control circuit. This circuit is electric-over-air-over-hydraulic. Electrically operated (solenoid) valves control the air flow to the cylinders used for shifting the hydraulic control spools.

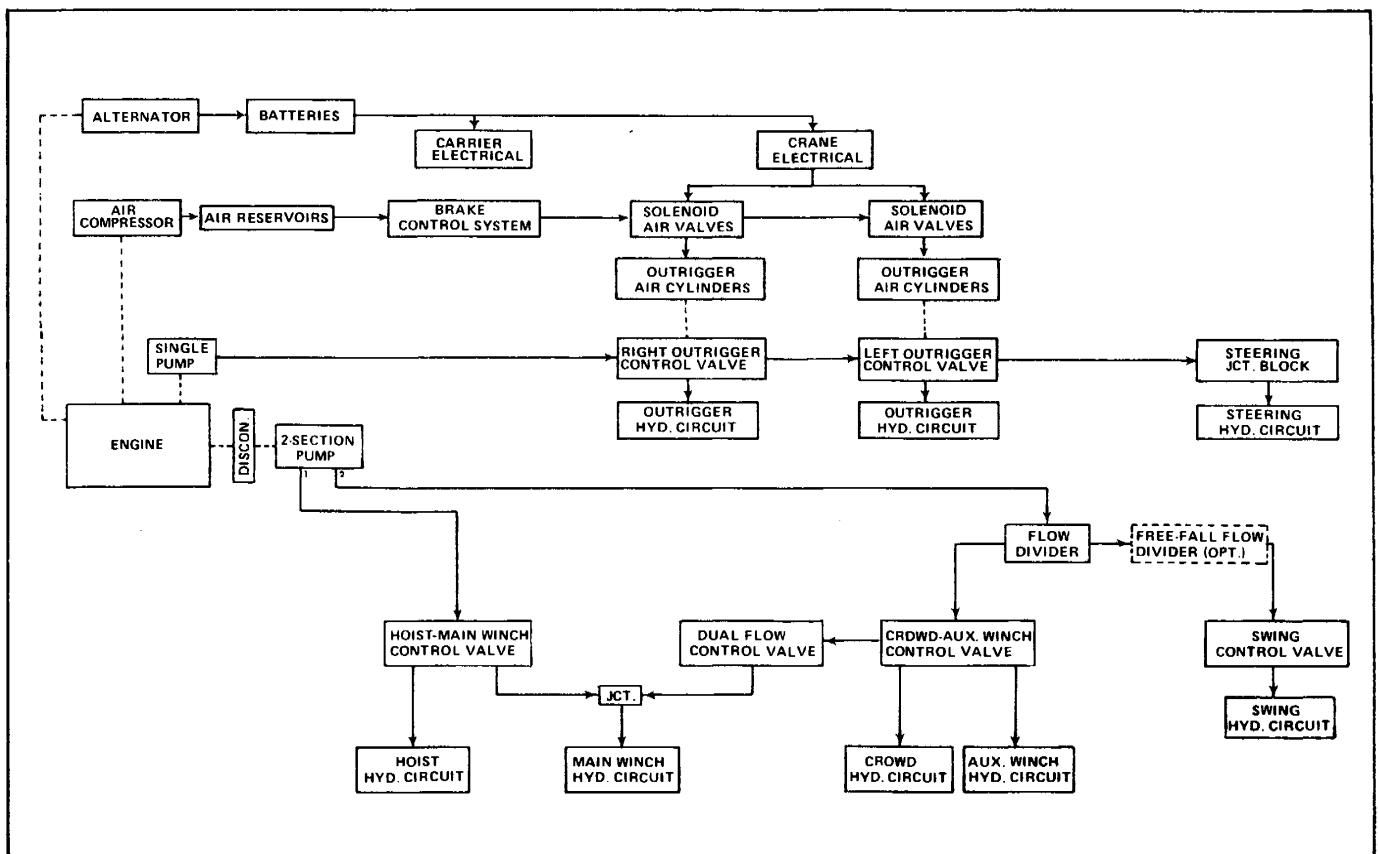


Figure 5. Power Distribution Diagram

DIRECTIONAL REFERENCE

The Crane turntable rotates 360°. In this manual all references to LEFT, RIGHT, FRONT and REAR (for either turntable or carrier) are given in relation to the Operator's seated position with each respective cab.

LEFT is the Operator's left hand, RIGHT is the Operator's right hand. Directional reference for both Carrier and Crane are the same when the machine is in TRAVEL position (see figure 6).

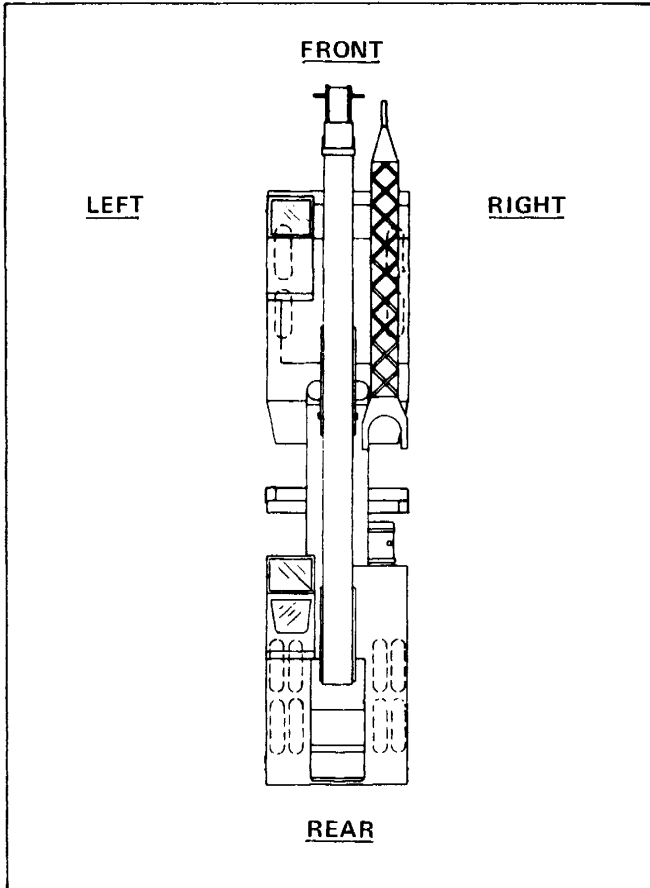


Figure 6. Machine Directional Reference

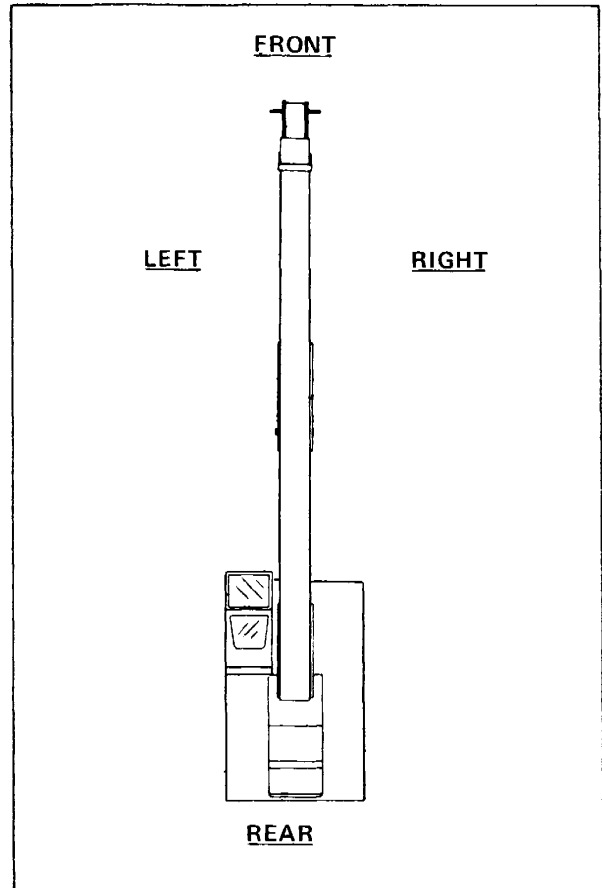












Figure 7. Crane Turntable Directional Reference

INTERNATIONAL SYMBOLS

Symbols speak a universal language. The International Symbols shown here are used in the Service Chart for easier identification of the service components.

						
HYDRAULIC RESERVOIR	HYDRAULIC FILTER	FILTER, AIR	AIR PRESSURE	ENGINE	TRANSMISSION	GEAR BOX
						
				DIESEL FUEL	LUBRICATE with Multipurpose Grease	COOLANT

SECTION 1

SCHEDULED PREVENTIVE MAINTENANCE

INTRODUCTION

Scheduled preventive maintenance is essential to keeping the machine in top operating condition. Decide from the start upon a maintenance schedule that will best suit your particular needs. The type of work being done, the size of loads, ground and weather conditions should all be taken into consideration when establishing a schedule.

Use the hourmeter, along with a calendar and checklist to ensure that all recommended maintenance is performed at prescribed intervals. Our recommendations are based upon average operating conditions, and should be considered as the **MINIMUM** requirements.

Depart from the recommended intervals only when conditions warrant shortening them, or when changes in ambient temperature require it. The recommended intervals should be shortened whenever the machine is operated under extreme conditions, such as on a dusty job site, in extreme heat or cold, under intermittent operation or extremely heavy loads.

LUBRICANTS

It is not the policy of DROTT Manufacturing to publish lists of approved lubricants or to guarantee lubricant performance. The responsibility for the quality of any lubricant rests solely with the Distributor or Manufacturer.

In various paragraphs of this manual, you will find the statement "Use (lubricant brand name) or functional equivalent". This statement does not constitute an unconditional guarantee of the performance of the brand of oil mentioned; it is intended only as a guide to the type of lubricant recommended for a given application.

SPARK ARRESTORS

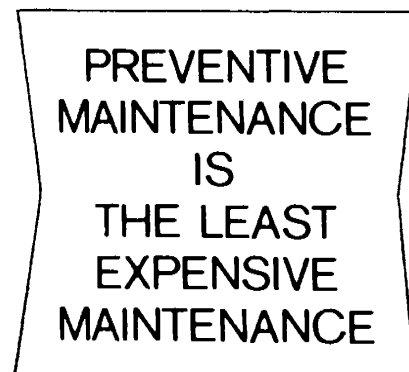
Laws of some states or provinces may require that this unit be equipped with a **SPARK ARRESTOR** or **SPARK ARRESTING MUFFLERS**. The State of California, as an example, is one state which has such regulations for agricultural and forestry applications, plus a regulation for construction applications in forest-covered, brush-covered or grass-covered lands.

Typically, such laws and regulations require spark arresting devices to be maintained in good working order and typically to be attached to the exhaust system on naturally aspirated engines (engines without a turbo-charger).

CLEANING SOUNDPROOFING INSULATION

Care must be taken when cleaning Cab interiors which have soundproofing insulation installed. To clean the insulating material, use only a vacuum cleaner, or damp cloth with plain water, or mild detergent solution.

DO NOT steam clean, wash, or rinse with a water hose, etc., since only a slight wetting of the insulation will substantially reduce its soundproofing ability.



**PREVENTIVE
MAINTENANCE
IS
THE LEAST
EXPENSIVE
MAINTENANCE**

HYDRAULIC OIL RECOMMENDATIONS

DROTT DHF Fluid is recommended for year-round use in the hydraulic system; or, as an alternate, use SAE 10W (system temperatures 0° to 180° F. [-18° to 82° C.]) SAE 20-20W (system temperatures 50° to 210° F. [10° to 90° C]), and SAE 5W or SAE 5W-20 (arctic conditions).

Viscosity: The viscosity of the oil at starting should not exceed 4000 SSU or drop below 60 SSU for sustained high temperature operation. The optimum operating conditions are between 80 SSU and 180

SSU. The viscosity index should not be less than 90 (for this service).

Arctic Conditions: The use of an auxiliary heater, a warm-up period avoiding high speed operation of hydraulic components until the system is warm, and the use of SAE 5W or SAE 5W-20 oils may be necessary, provided the viscosity requirements for sustained high temperature operation are not exceeded at maximum operation temperatures. See paragraph on Viscosity above.

HYDRAULIC SYSTEM OPERATING PRESSURES

VALVE/CIRCUIT	LOCATION	PRESSURE SETTING	
		psi	kPa
Main Relief No. 1	Inlet to Hoist/Main Winch valve	2500	17 200
Main Relief No. 2	Inlet to Crowd/Aux. Winch valve	2500	17 200
Steering Relief	In Steering Junction Block	1000	6895
Outriggers	Inlet to outrigger control valves	2000	13 790
Swing Port Reliefs	At work ports of Swing Control valve	2050	14 100
Winch Free-fall	In Freefall Flow Divider	550	3790
Aux. Winch Brake	In Brake Valve	250	1720
Hoist Counterbalance	On Hoist Cylinders	DO NOT ADJUST	
Crowd Counterbalance	In Crowd Cylinders	DO NOT ADJUST	
Crowd Sequencing	In-line between control valve and cylinders	DO NOT ADJUST	

ENGINE RPM SPECIFICATIONS

ENGINE	IDLE	HIGH	GOVERNED
Cummins NH-230	600	2310	2100
Detroit Diesel 6-71N	600	2310	2100

TIRE PRESSURES

SIZE	TRAVEL	LIFTING ON RUBBER
11:00 x 20	75 psi (517 kPa)	90 psi (620 kPa)

COMPONENT CAPACITIES AND LUBRICANTS

COMPONENT	CAPACITIES	RECOMMENDED LUBRICANTS
Engine Crankcase	28 qts. (26.5 liters) + 4 qts. (3.8 liters) with filter	See Engine Manual
Cooling System		
Detroit Diesel	10-3/4 gals. (41 liters)	1/2 Ethylene Glycol and 1/2 water
Cummins	10-1/4 gals. (39 liters)	
Fuel Tank	60 gals. (225 liters)	Refer to Engine Manual
Transmission (Main)	2-3/4 gals. (10.4 liters)	EP 80-90 Gearlube
Transmission (Auxiliary)	1-1/2 gals. (5.7 liters)	SAE 90 Gearlube
Road Ranger Transmission	4 gals. (15 liters)	SAE 90 Gearlube
Differentials		
1st axle	4 gals. (15 liters)	EP 80-90 Gearlube
2nd axle	3-1/2 gals. (13.2 liters)	
Pump Disconnect		SAE 90 Gearlube
Hydraulic System Capacities		
Upper	154 gals. (583 liters)	DHF or see Hydraulic Oil Recommendations on page 10.
Carrier	68 qts. (64 liters)	
Hydraulic Reservoir - Crane	101 gals. (383 liters)	
Hydraulic Reservoir - Carrier	17 gals. (64 liters)	
Swing Gearbox	11 pints (5.2 liters)	SAE 30 Motor Oil
Accelerator Master Cylinder		Type "A" Hydraulic Brake Fluid - must meet or exceed SAE Spec J1703C
Swing Brake Master Cylinder		

PREVENTIVE MAINTENANCE SCHEDULE

END OF 1ST DAY OR 10 HOURS

Engine Refer to Engine Manufacturer’s literature
 Hydraulic In-line Filters Replace paper element, clean screen

END OF 1ST WEEK OR 50 HOURS

Turntable Bearing Capscrews Check for proper torque

DAILY OR EVERY 10 HOURS

Engine Crankcase Check oil level and fill
 Radiator Check coolant level and fill
 Engine Air Cleaner Remove dust from collector tube
 Fuel Tank Fill at end of shift to prevent condensation
 Tires Check pressures and inflate
 Air Reservoirs and Air System Drain at end of each shift, check for leaks
 Hydraulic Reservoirs Check oil level and fill; check for leaks
 Turntable Open Gear Lubricate
 Safety Devices Check operation
 Outriggers Clean mud and dirt from channels
 Reeving Check operation; inspect clamps and connections
 Operator’s Cab Clean thoroughly, check operation
 Controls Check for binding or being out of adjustment

WEEKLY OR EVERY 50 HOURS

Engine Refer to Engine Manufacturer’s literature
 Radiator Clean fins, check coolant level
 Batteries Check electrolyte level and fill
 Swing Gearbox Check oil level and fill
 Turntable Bearing Lubricate
 Grease fittings Lubricate (see PICTORIAL LISTING)
 Boom Slides Lubricate
 Pin Retainers Check (visual)
 Outriggers Lubricate sliding boxes
 Accelerator and Swing Brake Master Cylinders Check fluid level and fill
 Pump Disconnect Check oil level

MONTHLY OR EVERY 250 HOURS

Carrier Steering and Brakes Check for proper operation
 Turntable Bearing Capscrews Check Torque
 Sheaves, Drums, Hooks and Wire Rope Inspect for defects
 Bubble level indicator Re-calibrate

PREVENTIVE MAINTENANCE SCHEDULE

MONTHLY OR EVERY 250 HOURS (CON'T.)

Controls	Inspect for wear and proper adjustment
Boom angle, length and load indicators	Re-calibrate
Crane House Brake, Swing Brake	Check for proper operation
Air Cleaner	Service full flow bag
Boom and Jibs	Inspect structurals for weld fractures, cracks or signs of fatigue

EVERY 2 MONTHS OR 500 HOURS

In-line Hydraulic Filters	Replace paper element, clean screen
Hydraulic Reservoir Breather	Clean or replace element
Center Swivel	Apply 1 shot of grease

EVERY 6 MONTHS OR 1500 HOURS

Engine	See Engine Manufacturer's Literature
Cooling System	Drain, flush and refill
Differentials	See Carrier Manufacturer's Manual
Batteries	Check specific gravity, clean connections
Hydraulic System	Drain and refill, service filters and breather
Pump Disconnect	Drain and refill
Swing Gearbox	Drain and refill, clean breather
Gearmatic Winch Final Drive Assembly (Without Free-Fall)	Drain and refill

EVERY 1000 MILES

Crane Carrier	Lubricate all fittings (See Pictorial Listing)
Transmission(s)	Check oil level and fill
Differentials	Check lubricant level and fill
Drive Shafts, Steering linkage and cylinder	Grease

EVERY 5000 MILES

Clutch Throwout Bearing	Lubricate (See Carrier Manufacturer's Manual)
Transmission(s)	Drain and refill (See Carrier Manual)
Wheel Bearings	Repack
Air Shutters	Service
Fuel Filter	Replace

EVERY 7000 MILES

Carrier Hydraulic System Bypass Filters	Replace
Air Cleaner	Replace full flow bag

SERVICE CHART

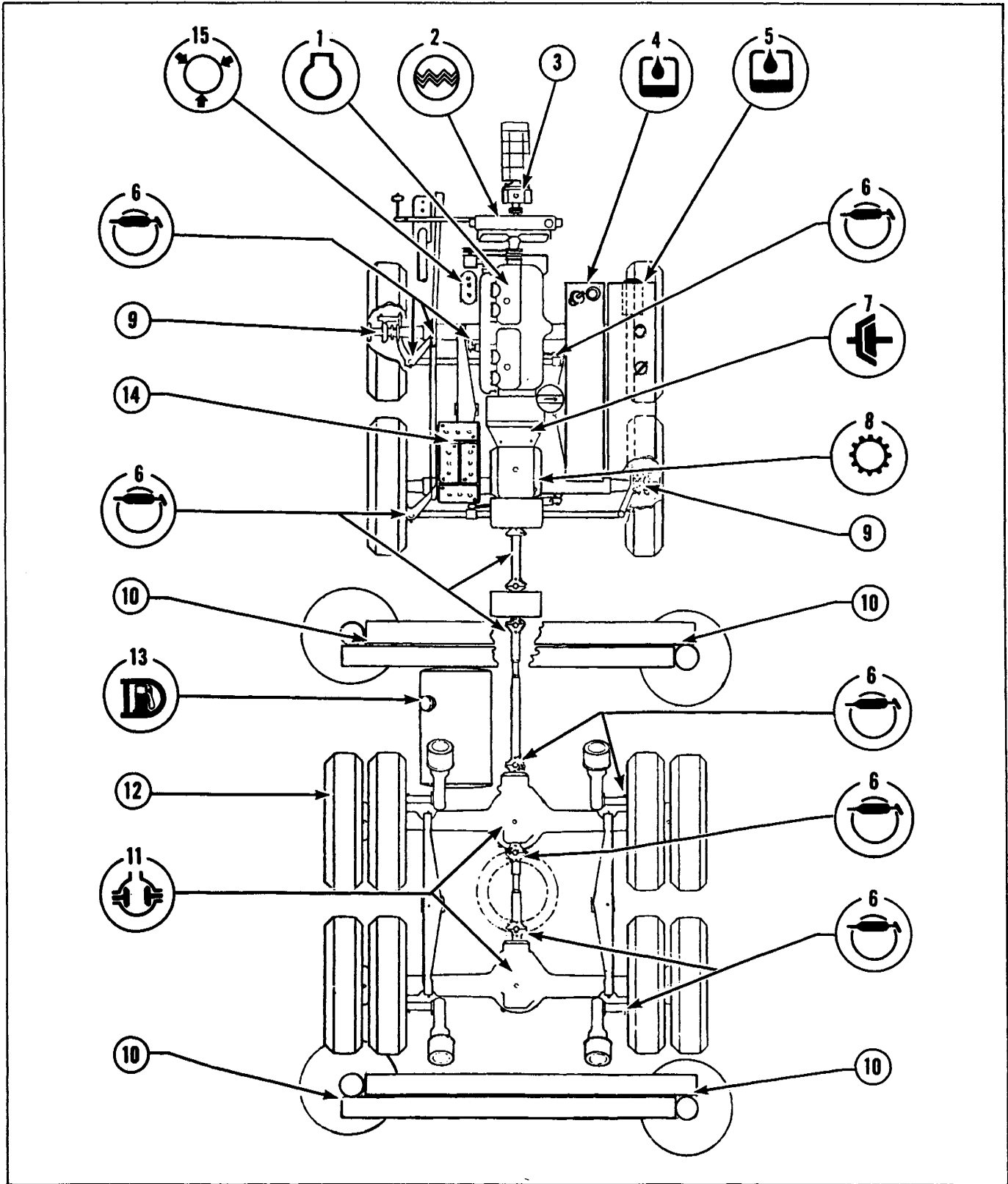


Figure 8. Service Points on Carrier

SERVICE CHART

1. **ENGINE** - Daily or every 10 hours check oil level and remove dust from air cleaner collector tube. Weekly or every 50 hours change oil and filter. Clean oil pump screen as needed. Monthly or every 250 hours service air cleaner. Refer to Carrier Manufacturer's Manual.
2. **COOLING SYSTEM** - Daily or every 10 hours check coolant level. Weekly or every 50 hours clean radiator fins. Every 6 months or 1500 hours drain and flush system, replace filter. See page 19 and Carrier Manufacturer's Manual.
3. **PUMP DISCONNECT** - Weekly or every 50 hours check oil level. Every 6 months or 1500 hours drain and refill, clean breather. See page 26.
4. **HYDRAULIC SYSTEM and FILTERS (Carrier)** - Daily or every 10 hours check oil level. Every 7,000 miles change bypass filters. Every 6 months or 1500 hours change oil, clean breather. See page 24 and Carrier Manufacturer's Manual.
5. **HYDRAULIC SYSTEM and FILTERS - (Crane)** - Daily or every 10 hours check oil level. Every 2 months or 500 hours service the in-line filters. Replace reservoir breather element. Every 6 months or 1500 hours change oil, clean reservoir screen. See page 118.
6. **LUBRICATION FITTINGS** - Grease. See Pictorial Listing and Carrier Manual.
7. **CLUTCH** - Every 5,000 miles, lubricate clutch release bearing (with engine running). See Carrier Manufacturer's Manual.
8. **TRANSMISSION** - Every 1,000 miles check oil level. Change oil and filter as required. See Carrier Manufacturer's Manual.
9. **WHEEL BEARINGS** - Every 5,000 to 15,000 miles repack bearings. See Carrier Manufacturer's Manual.
10. **OUTRIGGERS** - Daily or every 10 hours clean dirt from box channels. Weekly or every 50 hours lubricate sliding boxes.
11. **DIFFERENTIALS** - Every 1,000 miles check oil level. Drain as required and refill to level of check plug. See Carrier Manufacturer's Manual.
12. **TIRES** - Daily or every 10 hours check pressure. See page 10.
13. **FUEL TANK** - Fill at end of shift to prevent condensation. See Carrier Manufacturer's Manual.
14. **BATTERIES** - Weekly or every 50 hours check electrolyte level. Every 6 months or 1500 hours check specific gravity; clean connections. See page 107 and Carrier Manufacturer's Manual.
15. **AIR SYSTEM** - Daily or every 10 hours drain condensation and oil buildup in main reservoirs. Check for leaks. See page 25.

(CONTINUED ON FOLLOWING PAGE)

SERVICE CHART

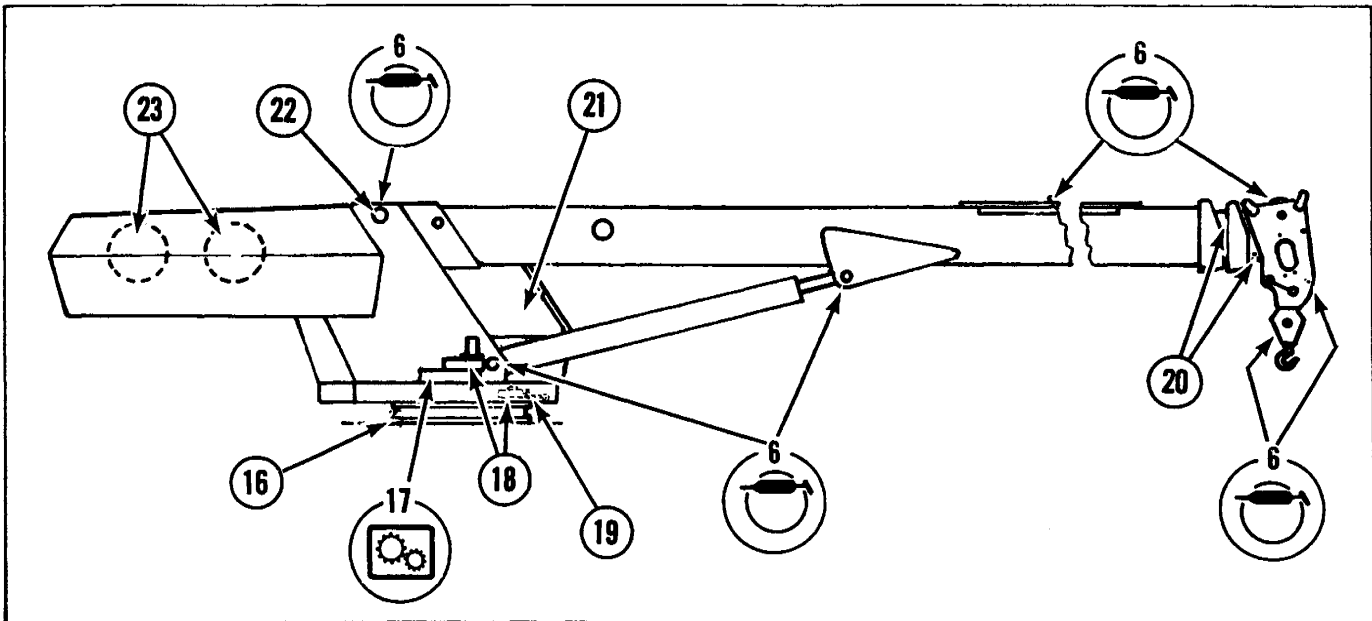


Figure 9. Service Points on Upperstructure

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>16. TURNTABLE BEARING - Daily or every 10 hours lubricate ring gear. Weekly or every 50 hours lubricate bearing. Torque turntable capscrews after 1st week or 50 hours, and monthly or 250 hours thereafter. See page 30.</p> <p>17. SWING GEARBOX - Weekly or every 50 hours check oil. Every 6 months or 1500 hours drain and refill. Clean breather. See page 29.</p> <p>18. SWING BRAKE - Weekly, every 50 hours or as required adjust brake; check fluid in master cylinder. Adjust house brake as required. See page 28.</p> <p>19. ACCELERATOR MASTER CYLINDER - Weekly or every 50 hours check fluid level. See page 22.</p> <p>20. BOOM and SLIDES - Weekly or every 50 hours lubricate slides with STP Oil Treatment or functional equivalent. Monthly or every 250 hours, check for structural fatigue, cracks or other damage. See page 33.</p> | <p>21. OPERATOR'S CAB and INSTRUMENTS - Daily or every 10 hours clean cab thoroughly and check controls for proper operation. Monthly or every 250 hours, or as required, re-calibrate bubble level indicator, boom angle indicator and load indicator, if machine is so equipped. See Operator's manual.</p> <p>22. PIN RETAINERS - Weekly or every 50 hours, visually check pin retainers on hoist cylinders and boom pivot pins.</p> <p>23. WINCHES and WIRE ROPE - Inspect wire rope frequently and replace as necessary. Weekly or every 50 hours lubricate sheaves. See page 37. and Pictorial Listing of grease fittings.</p> <p>Gearmatic Winches - Weekly or every 50 hours check oil level in Final Drive Housing - (units not equipped with Free-Fall). Every 6 months or 1500 hours, drain and refill. Every 12 months, or after 500 hours of actual winch operation, disassemble and inspect winch components as outlined on page 41.</p> <p>Braden Winches - Monthly or every 250 hours check lubricant level. Drain, flush with kerosene and refill after first 2 months. Drain and refill every 6 months or 1500 hours thereafter. See page 42.</p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

PICTORIAL LISTING OF LUBRICATION FITTINGS

REF.	LOCATION/TITLE	QTY.	INTERVAL
10	Boom Pivot Pin	1	Weekly/50 hours
11	Top of Main Boom	2	Weekly/50 hours
12	Boom Head and Block Sheaves	1 per sheave	Weekly/50 hours
13,14	Hoist Cylinders	2 per cylinder	Weekly/50 hours
15	Turntable Bearing	4	Weekly/50 hours
16	Control Linkage Below Cab	10	Weekly/50 hours
17	Control Pedals	4	Weekly/50 hours
18	Control Linkages behind Operator's Seat	3	Weekly/50 hours
19	Center Swivel	1	2 Months/500 hours
20	Pump Disconnect Linkage and Drive Shaft	2	Weekly/50 hours
21	Drive Shafts	3 per shaft	1000 miles
22	Steering Link and Cylinders	6	1000 miles
23	Steering Knuckles, Tie Rods and Brake Cam Levers	20	1000 miles
24	Clutch Throwout Bearing	1	5000 miles

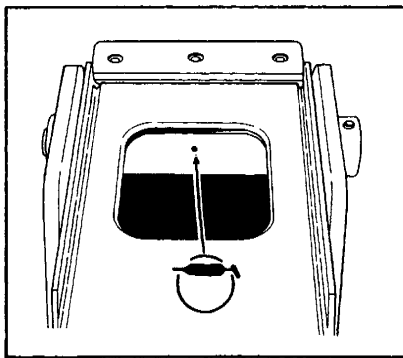


Figure 10.

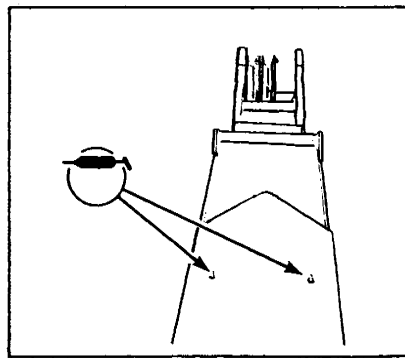


Figure 11.

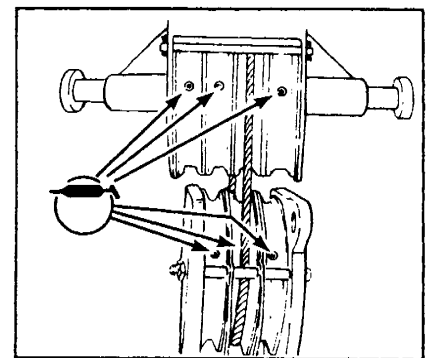


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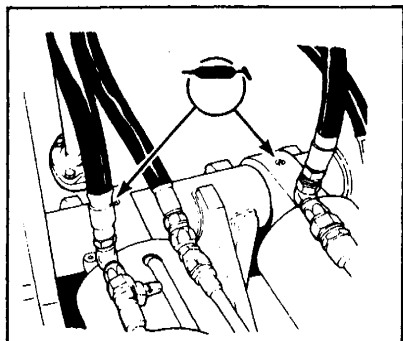


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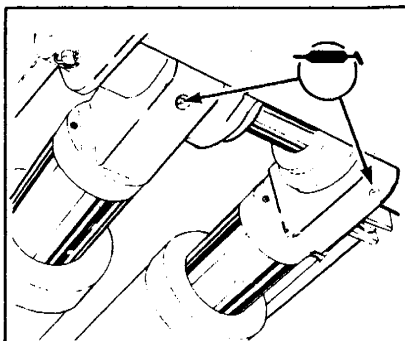


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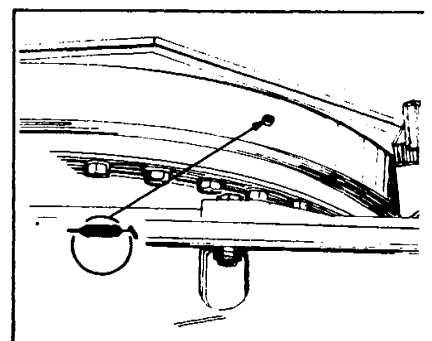


Figure 15.

PICTORIAL LISTING OF LUBRICATION FITTINGS

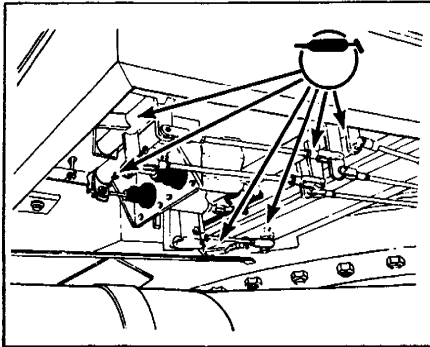


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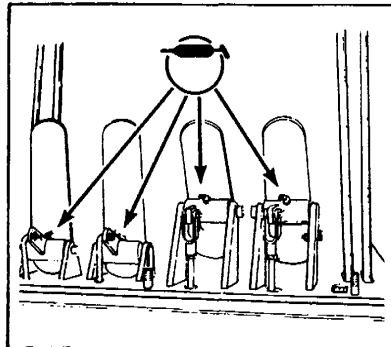


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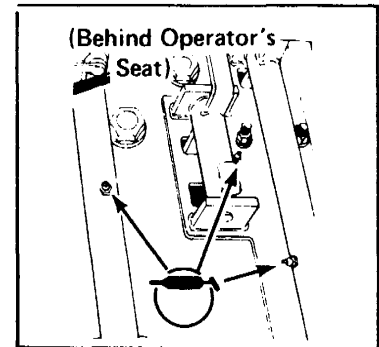


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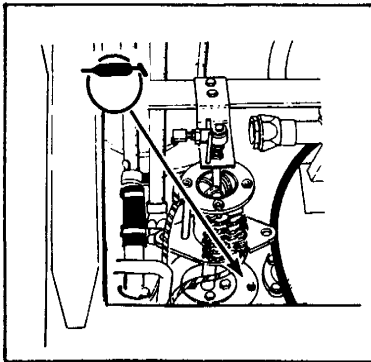


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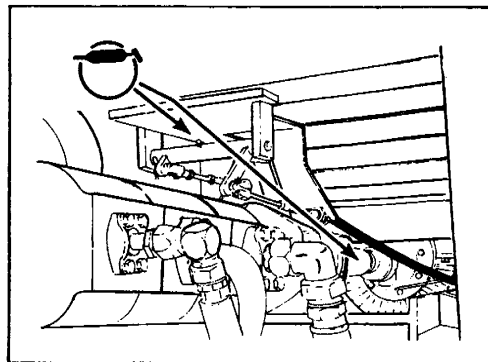


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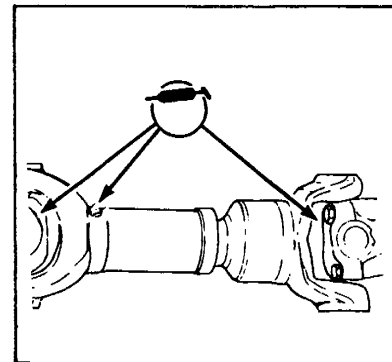


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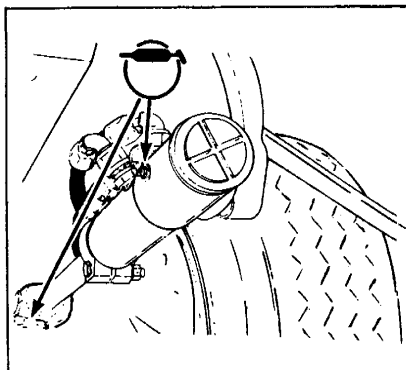


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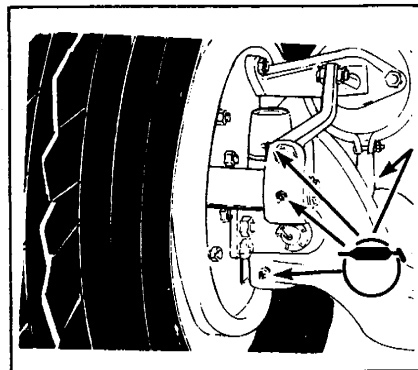


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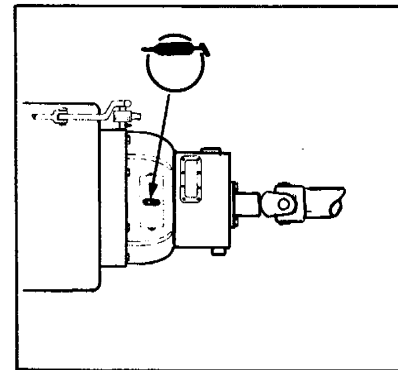


Figure 24.

SECTION 2

SERVICING THE CARRIER AND ENGINE

INTRODUCTION

Refer to the Carrier Manufacturer's Manual for information on the Carrier and engine components. Supplemental information on components which are common to both the Carrier and Crane is included below.

Engine Maintenance and Service

The Engine Manufacturer's Manual is included in the Carrier Manufacturer's Manual. Refer to the engine manual for specifications, maintenance, tune-ups and governor adjustments. For major servicing or overhaul, contact your nearest Cummins or Detroit Diesel distributor.

ENGINE COOLING SYSTEM

To ensure proper engine operating temperatures, the entire cooling system should be checked daily. Coolant level should be within 2" (50 mm) of top of filler neck.



CAUTION: When checking coolant level, remove radiator cap slowly to relieve pressure within the system.

If coolant level is consistently low, check for leaks in the radiator, connecting hoses or water pump.

Clean radiator fins periodically. Use compressed air to blow out dust accumulations and other obstacles. Check fan belts regularly for frays, proper tension and alignment.

Drain and flush the cooling system twice a year, preferably Spring and Fall. Use the following procedure:

1. Open petcock on radiator and engine block. Allow system to drain.

2. Close petcocks, then refill system with clear water.
3. Run engine for approximately fifteen minutes to circulate the water throughout the system.
4. Drain system, then refill with recommended coolant (see below).

IMPORTANT: If engine is still hot, refill slowly to prevent rapid cooling and distortion of engine castings.

5. Run engine for several minutes to circulate the coolant and remove entrapped air. Recheck coolant level. Add coolant as needed.

Coolant Recommendations

When shipped from the factory, the cooling system on the CRUZ-CRANE is filled with permanent type anti-freeze solution of 1/2 water and 1/2 ethylene glycol base. Any high boiling point type anti-freeze is acceptable. However, sealant type anti-freeze should be avoided.

IMPORTANT: Anti-freeze with sealer additives is not recommended. The sealer could plug the cooling system passages on the Detroit Diesel engine or clog the water filter on the Cummins engine.

Corrosion Inhibitors

A non-chromate type inhibitor should be used with either water or ethylene glycol base solution to retard rust and scale buildup within the cooling system. Borates, nitrates and nitrites are acceptable corrosion inhibitors. Do NOT use chromates or soluble oil as a corrosion inhibitor.

All corrosion inhibitors, no matter what type being used, will dissipate under normal operating conditions and should therefore be replenished at approximately 500 hour intervals.

ENGINE AIR CLEANER

The air cleaner is designed to filter the air needed by the engine for combustion. Loose connections, damaged hoses or a clogged filter element defeat the purpose of the air cleaner and can result in extensive wear on the engine.

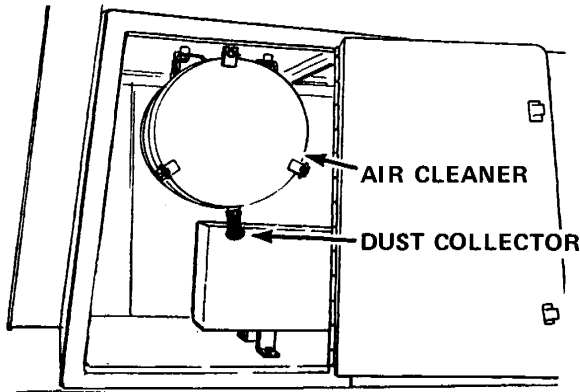


Figure 25. Engine Air Cleaner

Scheduled Maintenance

Daily or every 50 hours remove dust from collector tube. Monthly, every 250 hours or every 7000 miles, whichever comes first, replace the full flow bag. See instructions on air cleaner housing and in Carrier Manufacturer's Manual.

Engine Performance

Peak engine performance depends upon many factors such as compression, timing, fuel injection, throttle linkage and governor adjustment, proper cooling, lubrication and an adequate supply of clean air and fuel.

Since the engine powers both the Carrier and Crane, engine performance will affect total machine operation. Proper engine maintenance is essential to ensure satisfactory machine performance. See "Engine Maintenance and Service" instructions.

Performance Check

The recommended engine rpm range is shown in the Chart below. Maximum governed rpm is determined by running engine at full throttle under minimum load conditions (all controls in neutral and pump disengaged).

ENGINE RPM SPECIFICATIONS			
ENGINE	IDLE	HIGH	GOVERNED
Cummins NH-230	600	2310	2100
Detroit Diesel 6-71N	600	2310	2100

NOTE: Engine should be warmed to operating temperature before any performance checks are made.

The tachometer in the Carrier instrument panel may be used to check engine rpm, if the gauge is known to be accurate. If gauge is suspected of being inaccurate, use a strob-tachometer aimed at a chalk mark on the engine crankshaft pulley. Connect the RED wire of strob-tachometer to Positive (+) terminal from the batteries and the BLACK wire to the negative (-) terminal from the batteries. Aim the timing light at chalk mark, then adjust strob-tachometer until timing light "stops" chalk mark. Read tachometer.

NOTE: If engine speeds do not conform to specifications and throttle linkage is suspected as the cause, disconnect the linkage and work governor lever by hand. If engine operates at recommended rpm with throttle linkage disconnected, linkage requires adjustment.

Throttle Linkage - General Description

NOTE: The Cummins engine has a Mechanical Variable Speed (M.V.S.) governor in addition to the "standard" governor. The M.V.S. governor operates in series with the standard governor to permit operation at any desired (near constant) speed setting within the range of the standard governor. Refer to the Carrier Manufacturer's Manual for detailed description.