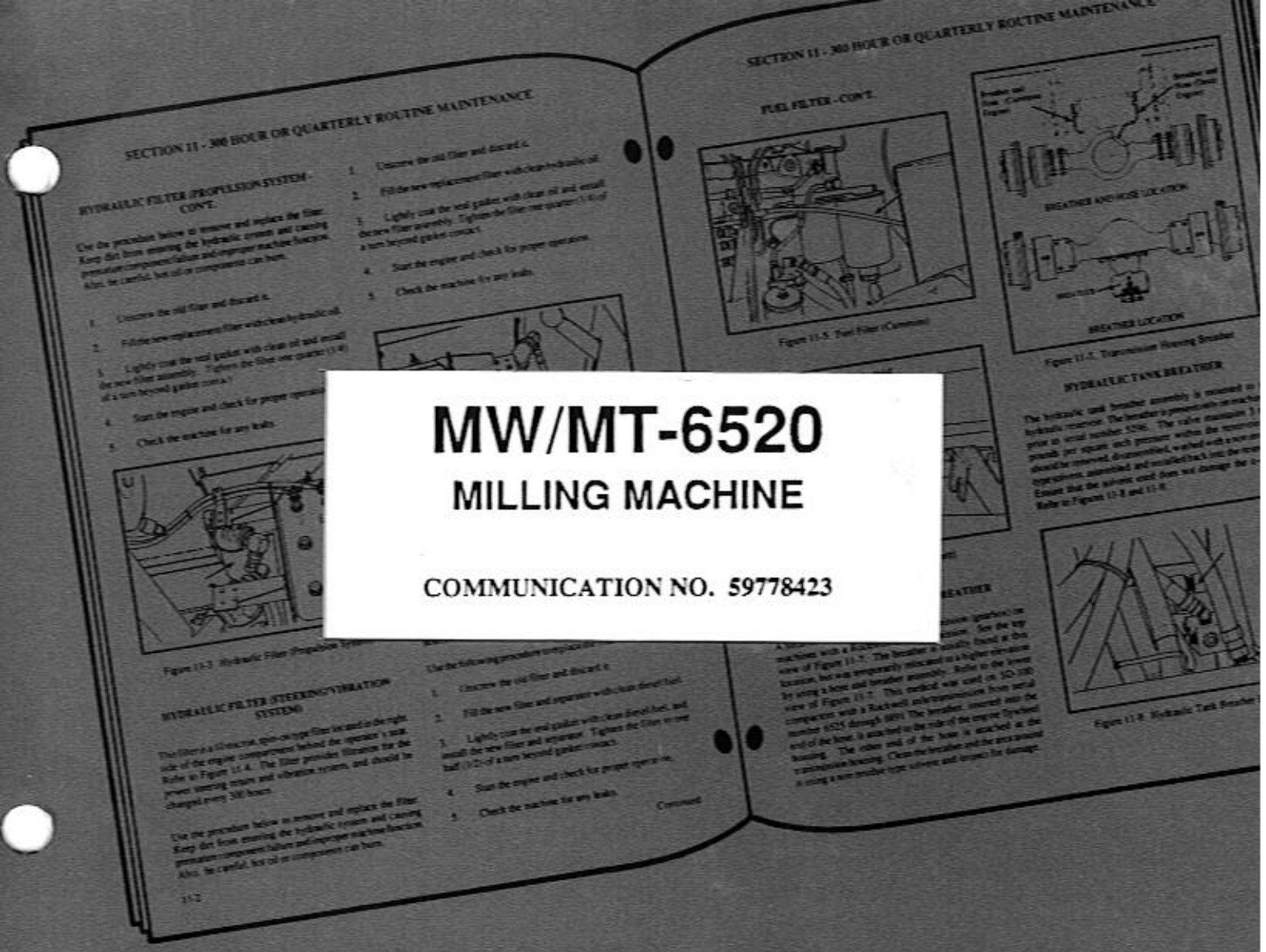

MW/MT-6520

MILLING MACHINE

COMMUNICATION NO. 59778423

INGERSOLL-RAND®

CONSTRUCTION EQUIPMENT

Operation & Maintenance Manual

ROAD MACHINERY DIVISION — SHIPPENSBURG, PA.

DO NOT REMOVE OPERATION MANUAL FROM MACHINE. REPLACE MANUAL IF DAMAGED.

INSTRUCTIONS

1. Insert latest changed pages. Destroy superseded pages.
2. The portion of text affected by changes is indicated by a vertical line in the outer margins of the page.
3. Changes to illustrations are indicated by minature pointing hands.
4. Changes to wiring diagrams are indicated by shaded areas.

REVISION LOG

MW/MT-6520
OPERATION AND
MAINTENANCE MANUAL
COMMUNICATION NO. 59778423

REVISION LEVEL	DATE
0 (Original Issue)	12-01-84
Revision 1	02-25-85
Revision 2	05-01-86

REVISION LEVEL	DATE

REVISION LEVEL	DATE

SECTION	PAGE NO.	REVISION LEVEL
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	ii	0
	CAR	2
	CAR	2
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2	2-1	0
3	3-1 - 3-2	0
4	4-1 - 4-2	0,2
	4-2A - 4-2B	2
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15	15-1	0
16	16-1 - 16-2	0,2
	16-2A - 16-2B	2
	16-3 - 16-6	0
17	17-1 - 17-3	0
18	18-1 - 18-3	0
	Back Cover/Warranty	0

To easily locate the major sections in this manual, the first page of each major section is imprinted with a black square in a position corresponding to the section position listed on this page. To use the rapid index, hold the manual and spread the edges of the pages with the right thumb until the square is located which corresponds to the index position of the section desired. Then open the book. The contents of these sections are listed on the first page of each section.

This manual should be used with all related supplemental books, engine and transmission manuals, and parts books. Related Service Bulletins should be reviewed to provide information regarding some of the recent changes.

If any questions arise concerning this publication or others, contact your local distributor for the latest available information.

Contents of this manual are based on information in effect at the time of publication and are subject to change without notice.

SECTION

MAJOR HAZARDS

⚠ DANGER ⚠		
AREA	HAZARD	SAFEGUARDS
WHERE HAZARD CAN OCCUR	*WHAT CAN HAPPEN IF PRECAUTIONS AND SAFEGUARDS ARE NOT OBSERVED*	*HOW TO AVOID THE HAZARD*
CUTTER DRUM	• Rotating Drum can cause severe injury or death	• Shut engine off during tooth replacement or repairs. • Clear objects and people from drum area before turning drum on. • Keep safeguards in place and operational.
ENTIRE MACHINE	• Personal injury or death • Electricution Hazard	• All maintenance is to be performed with engine shutdown and parking brake applied. • Keep machine away from power lines
UNDERSIDE	• Machine could fall • Cutter Drum Teeth may fly during removal	• Raise machine and pin (lock) all four legs. Shut off engine. • Keep out of path of teeth that are being removed. Wear hard hat and goggles.
REAR OF MACHINE	• During engagement of Cutter Drum, machine may have sudden backward movement • Machine can move backward during cutting	• Clear personnel from rear of machine. • Carefully lower Cutter Drum using Front Elevation Control Levers • Keep ten feet from rear of machine when cutting
CONVEYOR	• Moving Belt and Swinging Conveyor can cause crushing, falling or snagging hazard.	• Stay clear of conveyor whenever machine is running.
WHEELS/TRACK	• Machine in motion can cause crushing, falling or snagging hazard	• Stay clear of wheels/tracks whenever machine is running.
GRADE SENSOR ADJUSTMENT	• Operator or ground man may be struck by passing vehicle.	• Stay clear of passing traffic.

Contents Page Contents Page

SECTION 2 — INTRODUCTION

To provide a greater appreciation of the Ingersoll-Rand line of milling machines, let's first take a brief look at the road reclamation industry. There are many thousand miles of streets and highways that need resurfacing or repair. In the U.S. alone, we have a resource of 15 billion tons of reuseable materials in place.

Surface milling or cold planing is a process that involves removing damaged pavement and leaving behind a textured base on which new pavement can be laid. Governments, municipalities and communities are beginning to understand the benefits from cold planing. Reclaimed cuttings reduce the need for new aggregate by up to 50 percent. Drainage is improved and curb/gutter work is reduced.

Everyone benefits. The contractor saves on costs of aggregate, transportation and fuel. Project costs to governments and municipalities are reduced, so taxpayers benefit. And there's much less interruption to traffic flow.

The MT-6520 is a track mounted milling machine powered by a Detroit Diesel 8V-71T engine producing 362 horsepower at 2,100 RPM. The MW-6520 is a wheel mounted milling machine powered by a Caterpillar 3306 DITA engine producing 270 horsepower at 2,200 RPM. These are two highly productive machines in the size you need for cold planing of asphalt or concrete. The 6.5 foot or 2.0 meter wide cutter drum lets you mill a 12½ foot lane in only two passes. And you can cut right next to a gutter or twelve inch curb. These machines are designed and built by Ingersoll-Rand to be simple and reliable, and to give you outstanding economy.

Safety notes have been included throughout this manual to help you avoid injury and prevent damage to the equipment. These notes are not intended to cover all eventualities; it is impossible to anticipate and evaluate all possible methods of operation. Therefore you are the only person who can guarantee safe operation and maintenance.

Safe operation depends on reliable equipment and the use of proper operating procedures. Performing the checks and service described in this manual will help keep your unit in good condition. Recommended operational procedures in this book will help you to avoid unsafe practices.

It is important that any procedure not specifically recommended in this manual be thoroughly evaluated from the standpoint of safety before it is implemented.

⚠ WARNING ⚠

Some photographs in this manual may show guards or cover panels removed for purposes of clarity. Never operate the unit without all guards and cover panels in place.

NOTE

Some illustrations in this manual show units with optional equipment installed. This optional equipment may be purchased from your local Ingersoll-Rand Company distributor.

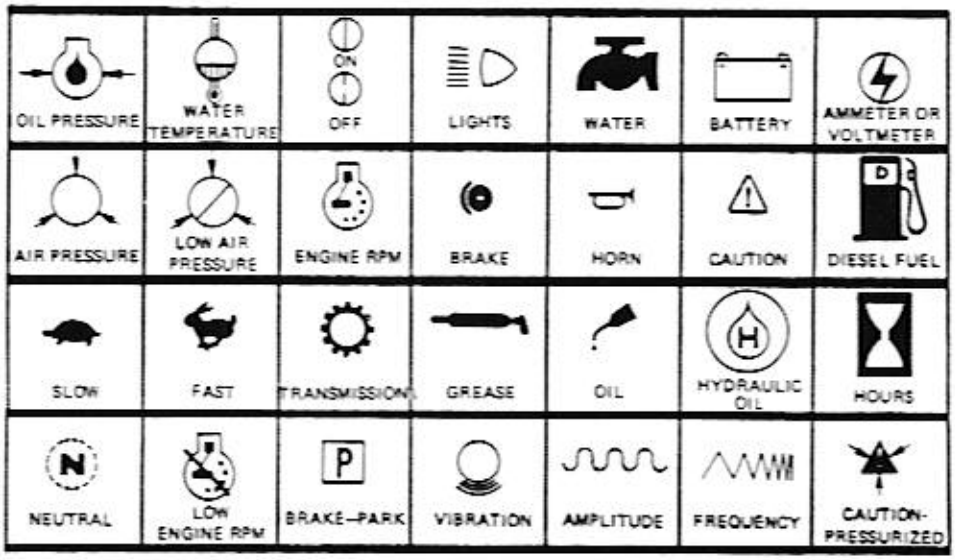
Some photographs in this manual may be taken of prototype models. Production models may vary in some detail.

Continuing improvement and advancement of product design may cause changes to your machine which may not be included in this publication. Each publication is reviewed and revised, as required, to update and include these changes in later editions. Ingersoll-Rand reserves the right to modify or make changes within a specific model group without notice and without incurring any liability to retrofit units previously shipped from the factory. Contact your Ingersoll-Rand dealer for non-routine maintenance that is not covered in this publication.

SECTION 3 – SYMBOL IDENTIFICATION AND METRIC CONVERSION

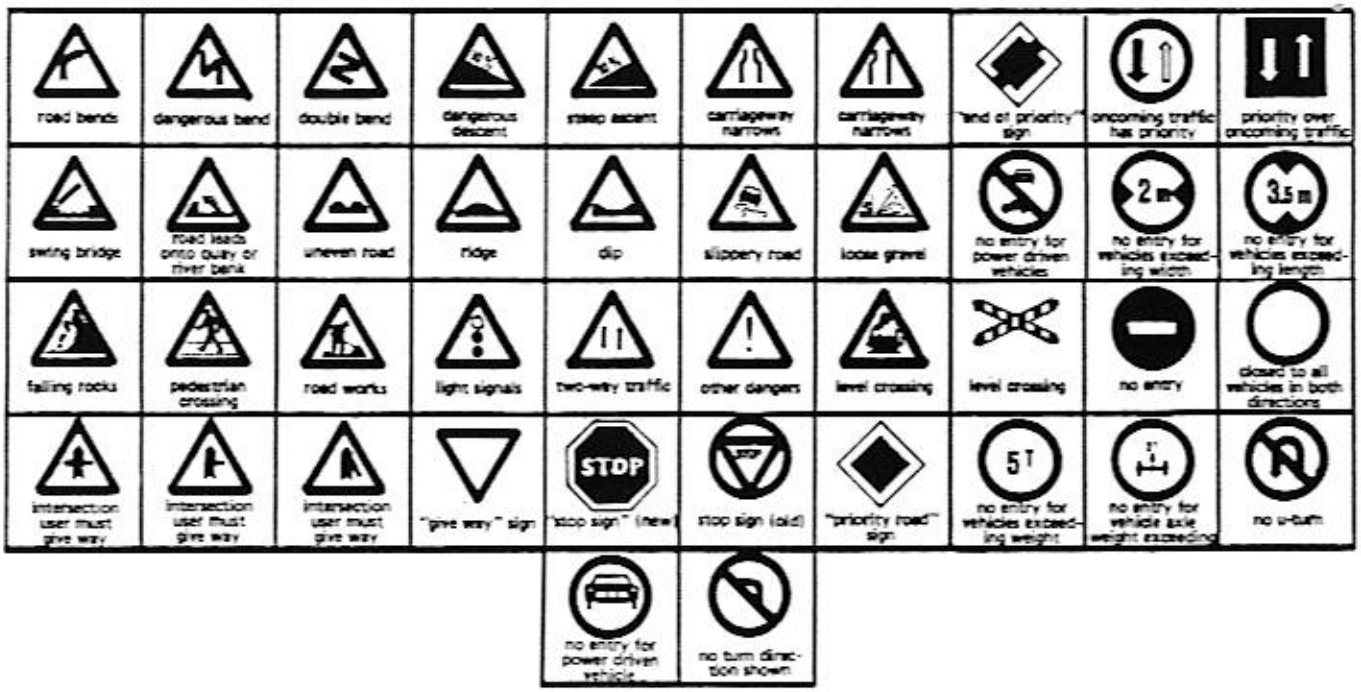
INTERNATIONAL MACHINE SYMBOLS

The following explains the meaning of international symbols that may appear on your machine.



INTERNATIONAL HIGHWAY SYMBOLS

The following symbols may also appear in a yellow square  instead of in a red triangle.



METRIC CONVERSION

TO CONVERT...	INTO...	MULTIPLY BY...
bars	pounds/sq. in.	14.50
bars	kilopascals	100.
centigrade	fahrenheit	(C° X 9/5) + 32
centimeters	inches	0.3937
centimeters	millimeters	10.0
circumference	radians	6.283
cubic centimeters	cu inches	0.06102
degrees (angle)	radians	0.01745
degrees/sec	revolutions/min	0.1667
feet	meters	0.3048
feet/min	meters/min	0.3048
foot-pounds	kg-meters	0.1383
gallons	liters	3.785
hertz	vibrations/min	60
horsepower	kilowatts	0.7457
inches	centimeters	2.540
inches	millimeters	25.40
kilograms	pounds	2.205
kilogram meters	foot-pounds	7.233
kilopascal	pounds/sq. in.	.1450
kilopascal	bars	.01
kilowatts	horsepower	1.341
liters	gallons (U.S. liq.)	0.2642
leters	pints (U.S. liq.)	2.113
liters	quarts (U.S. liq.)	1.057
meters	feet	3.281
meters	inches	39.37
meters/min	feet/sec	0.05468
miles/hr	kms/hr	1.609
millimeters	inches	0.03937
newtons	pounds	4.448
newton-meter	pound-feet	.737
pints (liq.)	leters	0.4732
pounds	kilograms	0.4536
pounds	Newtons	.225
pound feet	Newton-meter	1.356
pounds/ft	kgs/meter	1.488
pounds/sq in.	bars	.06895
pounds/sq in.	kilopascals	6.895
quarts (liq.)	liters	0.9463
radians	degrees	57.30
radians/sec	revolutions/min	9.549
revolutions/min	degrees/sec	6.0
revolutions/min	radians/sec	0.1047
temperature (°C) + 17.78	temperature (°F)	1.8
temperature (°F) -32	termperature (°C)	5/9
tons (short)	tons (metric)	0.9078
vibrations/min.	hertz	.0167

SECTION 4 - OPERATING CONTROLS AND INSTRUMENTS

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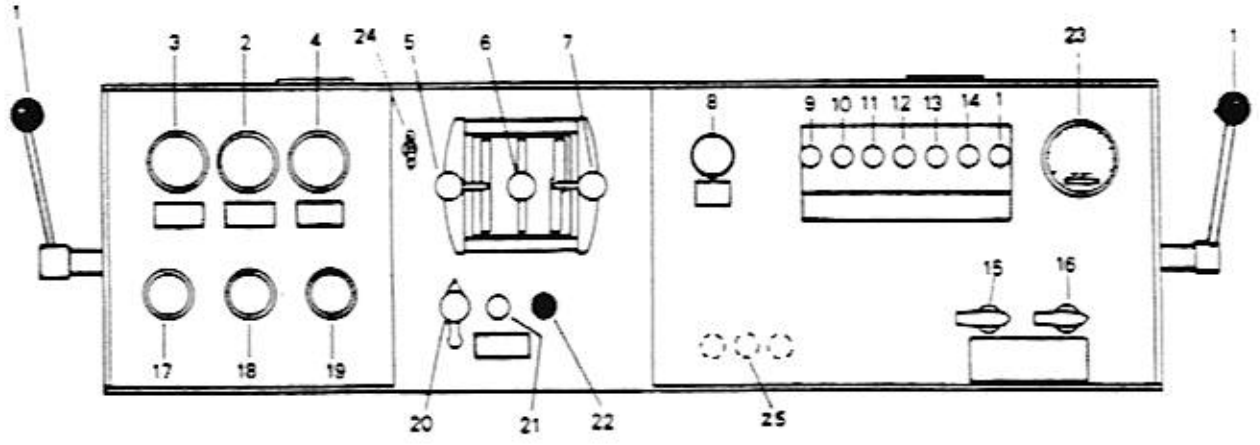
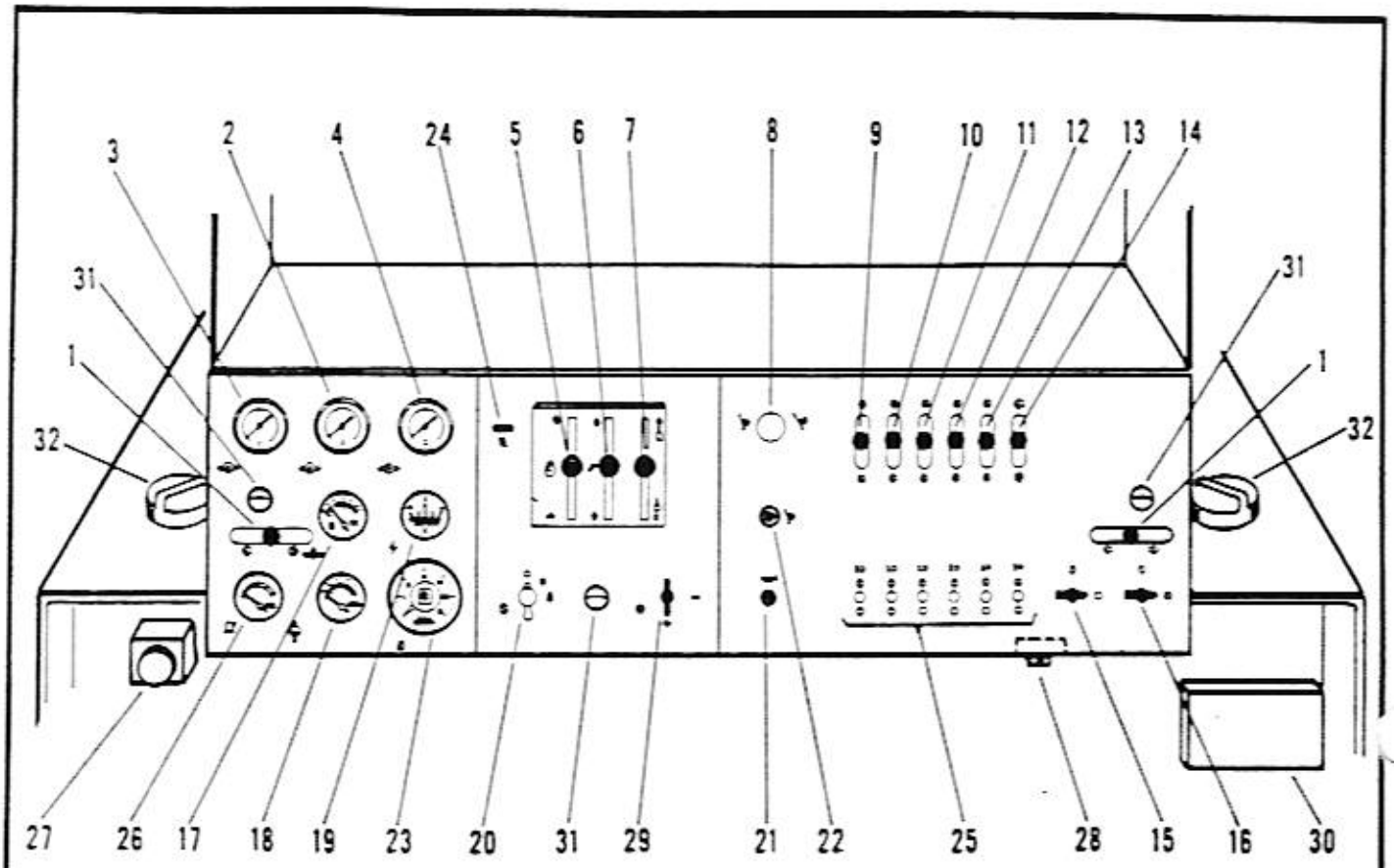


1. Steering Control
2. Control System Pressure Gauge
3. Conveyor Drive Pressure Gauge
4. Traction Drive Pressure Gauge
5. Throttle Control
6. Conveyor Control
7. Propulsion Control
8. Parking Brake Control Knob
9. Left Front Elevation Control
10. Right Front Elevation Control
11. L.S. Moldboard Elev. Control
12. R.S. Moldboard Elev. Control
13. Rear Elevation Control
14. Conveyor Swing Control
15. Left Grade Sensor
16. Right Grade Sensor
17. Oil Pressure Gauge
18. Water Temperature Gauge
19. Ammeter
20. Ignition Switch
21. Horn
22. Parking Brake Warning Light
23. Tachometer (Hourmeter)
24. Fuel Shut-Off Control
25. Light Switches - Optional
26. Fuel Gauge (Not Shown)

MW-6520 AND MT-6520 Prior to S/N 5086 W Manual Clutch



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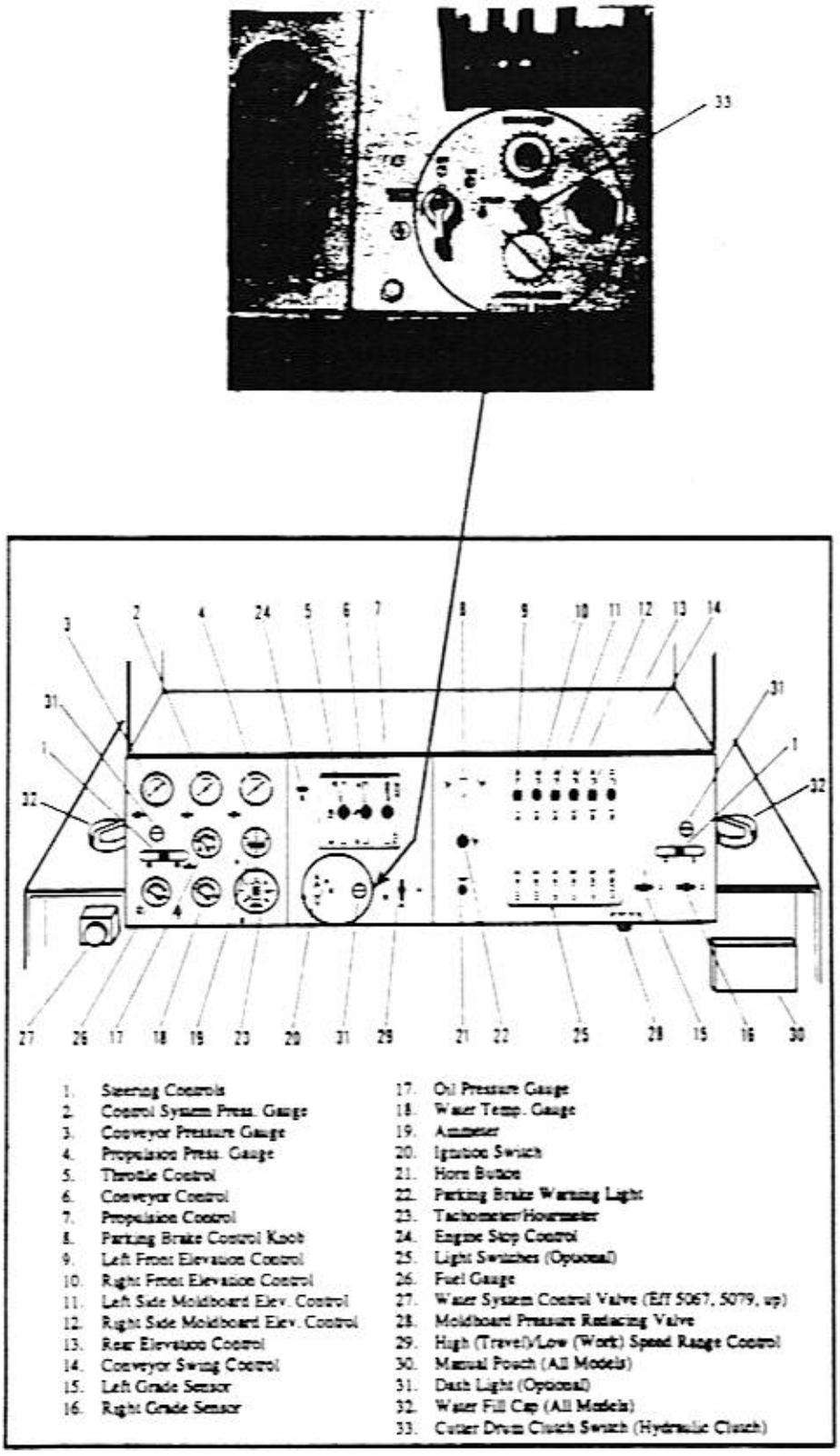
6. Conveyor Control
7. Propulsion Control
8. Parking Brake Control Knob
9. Left Front Elevation Control
10. Right Front Elevation Control
11. Left Side Moldboard Elevation Control
12. Right Side Moldboard Elevation Control
13. Rear Elevation Control
14. Conveyor Swing Control
15. Left Grade Sensor
16. Right Grade Sensor
17. Oil Pressure Gauge
18. Water Temp. Gauge
19. Ammeter
20. Ignition Switch
21. Horn Button
22. Parking Brake Warning Light
23. Tachometer/Hourmeter
24. Engine Stop Control
25. Light Switches (optional)
26. Fuel Gauge
27. Water System Control Valve (eff S/N 5067, 5079 up)
28. Moldboard Pressure Reducing Valve
29. High (Travel)/Low (Work) Speed Range Control
30. Manual Pouch (all models)
31. Dash Light (optional)
32. Water Fill Cap (all models)

MT-6520 Effective with S/N 5086 W Manual Clutch (Except as Noted)



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13. Rear Elevation Control
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20. Ignition Switch
21. Horn Button
22. Parking Brake Warning Light
23. Tachometer/Hourmeter
24. Engine Stop Control
25. Light Switches (Optional)
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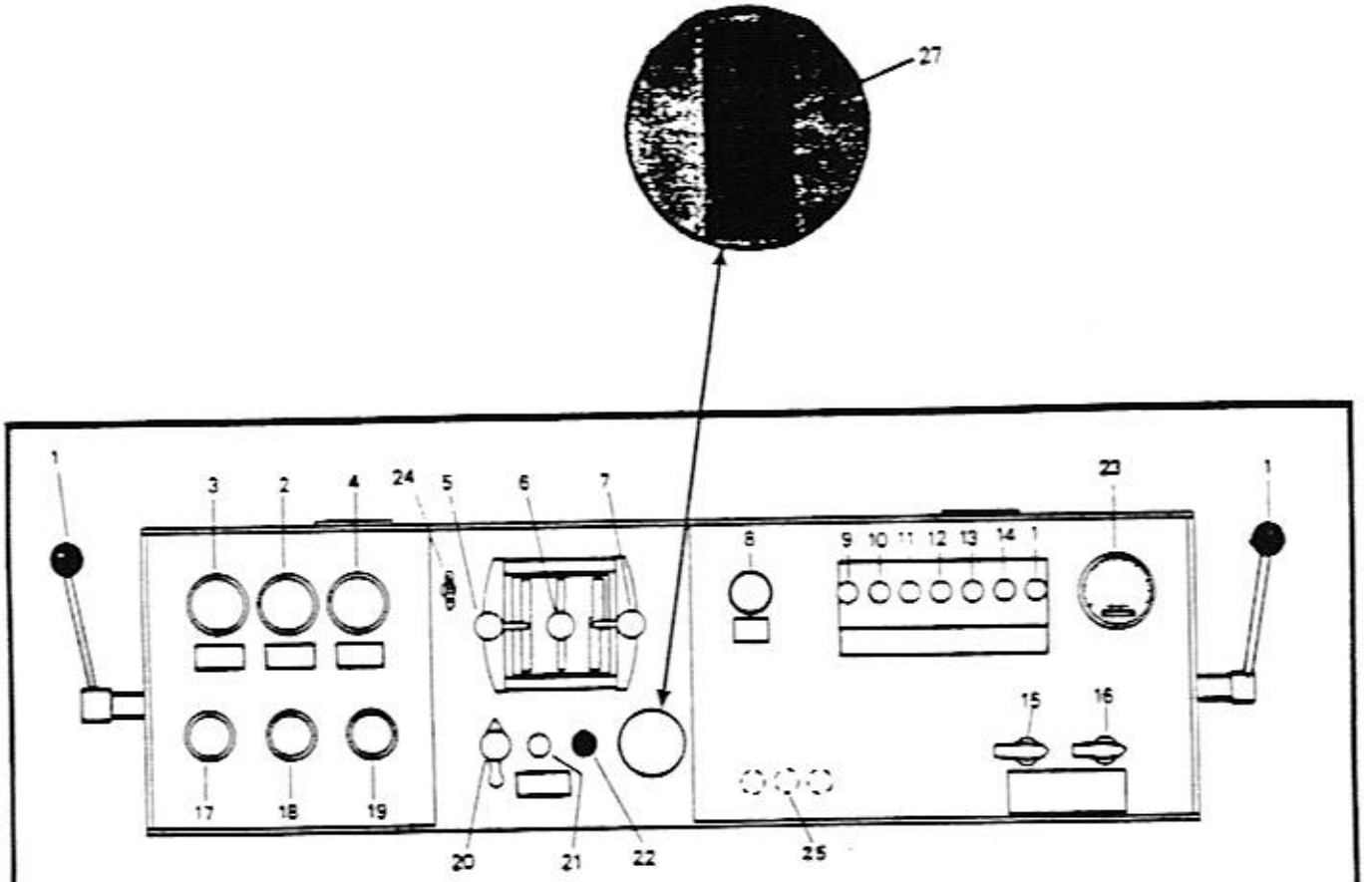
27. Water System Control Valve (Eff 5067, 5079, up)
28. Moldboard Pressure Reducing Valve
29. High (Travel)/Low (Work) Speed Range Control
30. Manual Pouch (All Models)
31. Dash Light (Optional)
32. Water Fill Cap (All Models)
33. Cutter Drum Clutch Switch (Hydraulic Clutch)

MT-6520 Effective w S/N 5086 w Hydraulic Clutch (Except as Noted)



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19. Ammeter
20. Ignition Switch
21. Horn
22. Parking Brake Warning Light
23. Tachometer (Hourmeter)
24. Fuel Shut-Off Control
25. Light Switches - Optional
26. Fuel Gauge (Not Shown)
27. Cutter Drum Clutch Switch

MT-6520 Prior to S/N 5086 w Hydraulic Clutch

STEERING CONTROLS – 1

You can steer from either the left or the right side of the operators platform. Levers control the hydraulic cylinder that turns the front wheels/tracks. To steer the machine, simply move one of the control levers in the direction indicated on the panel.

CONTROL SYSTEM PRESSURE GAUGE – 2

The control system pressure should register 1,850 psi. This system powers and controls the hydraulic cylinders that provide moldboard elevation control, conveyor swing, machine steering and machine elevation control.

CONVEYOR PRESSURE GAUGE – 3

The hydraulic pressure for the conveyor drive system should register 800-1600 psi with the conveyor running.

PROPULSION SYSTEM PRESSURE GAUGE – 4

The traction system pressure should register between 800-2500 psi (MW-6520) or 800-3500 psi (MT-6520), when the unit is operating.

THROTTLE CONTROL (CAT Only) – 5

The Throttle Control governs engine speed (RPM). With the lever positioned back towards the operator, past the detent, the fuel supply to the engine is shut off, stopping the engine. With the control positioned ahead of the detent, the engine will idle. Position the control farthest from the operator and the engine will run at full operating RPM. Always run at full operating RPM, when cutting, for greatest efficiency.

THROTTLE CONTROL (DDA Only)

The Throttle Control governs engine speed (RPM). With the lever positioned back towards the operator, the engine will idle. Position the control furthest from the operator and the engine will run at full operating RPM. Always run at full operating RPM, when cutting, for greatest efficiency.

CONVEYOR CONTROL – 6

On units prior to S/N 5115, the center lever controls the speed and direction of the conveyor belt. To stop the movement of the conveyor, position the lever in the neutral position. The further the control is moved in the desired direction, the faster the conveyor belt travels.

With heavier materials being unloaded, the travel of the conveyor can be increased. With lighter loads the travel speed is to be decreased to avoid the material "bouncing" off the belt.

Effective with S/N 5115, this lever controls only the direction of the conveyor belt. On these units you can vary the speed of the belt by turning a needle valve located on the left side of the operator's platform, next to the water system control valve.

⚠ CAUTION ⚠

When starting or shutting down the engine, ensure that the conveyor control is in the neutral position.

An electrical interlock switch on the conveyor control lever allows the engine to be started *only* when the conveyor is off.

PROPULSION CONTROL – 7

The Propulsion Control varies the units direction and speed of travel and functions as the control for hydrostatic braking. This control has three positions: Neutral, Forward and Reverse, with variable speed ranges in either direction.

To propel the unit Forward (towards the conveyor), move the Propulsion Control out of the Neutral position and gradually away from the operators station. To stop the travel of the unit, move the control back to the Neutral position, which provides hydrostatic braking.

⚠ CAUTION ⚠

Always move the lever away from neutral gradually. The further the lever is moved from its neutral position the greater the speed of the machine in that direction.

To propel the unit in Reverse, move the Control out of the Neutral position and gradually toward the operator. To stop the travel of the unit, move the lever back into neutral.

An electrical interlock switch on the propulsion control lever allows the engine to be started *only* when the propulsion lever is in neutral.

PARKING BRAKE CONTROL KNOB – 8

Located on the center console is the Control Knob for applying the Parking Brakes.

To set the spring applied, hydraulically released parking brakes, pull the control knob out.

Continued

PARKING BRAKE CONTROL KNOB – CON'T

Push in the Control Knob to release the parking brake, however, the engine must be running to provide hydraulic oil to compress the spring within the brake.

⚠ CAUTION ⚠

No attempt should be made to move the unit with the control knob pulled out and the parking brakes applied.

In an emergency situation, the Propulsion Control should be positioned in neutral and the parking brake applied (knob pulled out). DO NOT attempt to stop the machine with the Parking Brakes without returning the Propulsion Control to neutral.

MACHINE ELEVATION CONTROLS – 9,10, & 13

The elevation of the machine can be controlled manually be using a combination of three levers on the control panel. These controls are referred to as the "Left Front-Raise/Lower", "Right Front - Raise/Lower", and "Rear-Raise/Lower". The Left Front and Right Front raise and lower the machine independently from each other. The Rear Control raises and lowers the rear of the machine simultaneously by pulling the lever toward the operator, the machine will lower and by pushing the lever away from the operator the machine will raise.

MOLDBOARD ELEVATION CONTROLS – 11 & 12

The moldboard keeps the milled material inside the box so that it can be directed to the conveyor. It also cleans the milled surface.

Two levers control the cylinders that move the moldboard up and down. Pull the levers to lower the moldboard. Push the levers to raise the moldboard.

CONVEYOR SWING CONTROL – 14

The hydraulic cylinder that controls the swing of the conveyor is controlled by the lever on the control panel. By moving the lever away from the operator the conveyor will swing to the left and likewise by pulling the lever toward the operator the conveyor will swing to the right.

⚠ CAUTION ⚠

Use extreme caution when operating the conveyor swing control. Failure to do so could result in property damage or personal injury.

GRADE SENSOR CONTROL VALVES – 15 & 16

These controls, located on the lower, right hand side of the control panel select, manual "OFF" or automatic "ON" control of the elevation cylinder within the leg tubes. When positioned at OFF, the elevation of the front right and left side of the machine is controlled by the operator using the two Machine Elevation Controls labeled "Right Front, Left Front - Raise/Lower". The rear elevation is controlled by the lever labeled "Rear - Raise/Lower". When placing the Sensors in the "ON" position, the manual controls are overridden and the machine will lower itself to the preset position you determined by setting the R.H. and L.H. Sensor Assemblies on the sides of the machine. To raise the machine, position the Grade Sensors to "OFF" and use the appropriate manual controls.

OIL PRESSURE GAUGE – 17

This gauge registers the pressure of the engine's lubrication system. At normal operating speeds with the recommended oil viscosity the oil pressure should register between 45-70 psi. A lower pressure is normal at low idling speeds. If no pressure is indicated, stop the engine immediately.

WATER TEMPERATURE GAUGE – 18

The normal operating temperature of the engine should register on the gauge between 170° F. and 195° F. Somewhat higher temperatures may occur under certain conditions. If engine temperature rises above 210°F. shut engine down. Determine cause of overheating before restarting engine.

AMMETER – 19

The ammeter is part of the electrical circuit and indicates the rate of battery charge or discharge. The ammeter should indicate a slight positive (+) reading with the engine running.

IGNITION SWITCH – 20

When the ignition switch is turned clockwise the system is on and is in the running position. When the switch is pushed in and turned past the "ON" position, against a detent spring to the "START" position, the starter will engage. Once the engine starts, release the switch immediately and the spring will return the switch to the "ON" position.

Continued

IGNITION SWITCH – CON'T

⚠ CAUTION ⚠

Do not operate the starter for more than 30 seconds at a time. If the engine fails to start, allow the starter to cool 2-3 minutes before trying again.

NOTE

Engaging ignition switch will not start engine unless the propulsion control is in the neutral position, the clutch is disengaged and the conveyor is in neutral position.

HORN BUTTON – 21

The Horn is activated from the operator's station and is intended for use as a warning device only.

PARKING BRAKE WARNING LIGHT – 22

With the parking brake control knob pulled out, the Parking Brake Warning Light will glow red indicating that the brakes are applied.

⚠ CAUTION ⚠

Do not attempt to move the unit with the light illuminated.

When the Parking Brake Control Knob is pushed in, the Warning light will go out, indicating brake release.

⚠ CAUTION ⚠

If the warning light fails to go out, determine the cause and correct before operating.

TACHOMETER/HOURMETER (MT-6520 Only)— 23

The tachometer registers the engine operating speed (RPM in hundreds). The engine low idle is 900 RPM and the high idle is 2,300 RPM (No Load). Incorporated into the tachometer is the Hourmeter, which indicates the engine running time in hours.

NOTE

To insure a minimum amount of unit downtime, it is extremely important that the Hourmeter be used in conjunction with the units lubrication chart and your maintenance records and that servicing be performed at the correct time interval.

ENGINE STOP CONTROL (DDA Only) – 24

The MT-6520, with the Detroit Diesel Allison engine, has a Fuel Shut-Off Control, marked "STOP" located to the left of theThrottle control. By pulling the control, the fuel supply to the engine is cut off, in turn stopping the engine. This control must be pushed back in before the engine can be started.

FUEL GAUGE – 26

The fuel gauge shows the amount of fuel in the tank in ¼ increments.

WATER SYSTEM CONTROL VALVE – 27

When the valve knob is pulled out (water ON), the valve directs the flow of hydraulic oil from the engine mounted gear pump to the water pump drive motor. When the knob is pushed in (water-OFF), the valve directs the flow of hydraulic oil back to the hydraulic tank.

MOLDBOARD PRESSURE REDUCING VALVE – 28

The moldboard system is equipped with a pressure reducing valve for adjusting the moldboard down pressure. It is located under the control panel on the right hand side. It is adjusted by loosening the jam nut and turning the adjusting screw. This will vary the pressure the moldboard is applying to the milled surface. Pressure is adjustable from 300 psi (min.) to 1850 psi (max.). Loosen adjusting screw when the moldboard appears to be catching or dragging on the surface. Tighten the adjusting screw when the moldboard does not keep the loose material in the box or leave the milled surface clean.

HIGH/LOW SPEED RANGE CONTROL – 29

This two position, four way valve controls the variable displacement propulsion motors. Turning the knob clockwise will set your machine in the "HIGH" (Travel) range. Turning the knob counterclockwise will set your machine in the "LOW" (work) range.

⚠ CAUTION ⚠

Always use LOW range for cutting otherwise the machine could be damaged.

VANDAL PROTECTION

You can install padlocks on the following:

1. Console Cover (2). See Figure 4-1
2. Engine access doors (3). Figure 4-2
3. Water fill caps (2). See Figure 4-3
4. Fuel fill cap. See Figure 4-4
5. Hydraulic oil cap. See Figure 4-5
6. Radiator Fill Cover (Not shown)

When leaving your unit unattended lock all lockable compartments.

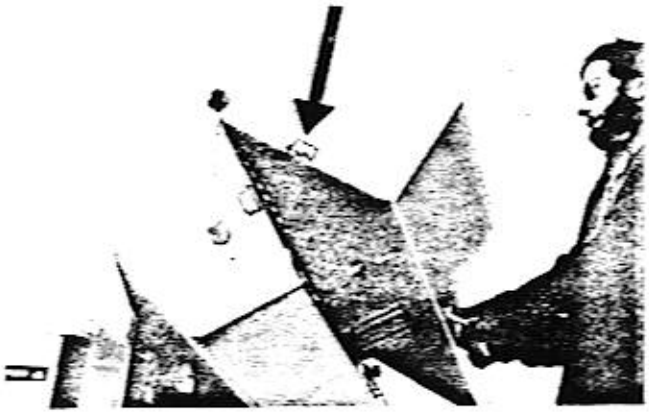


Figure 4-1

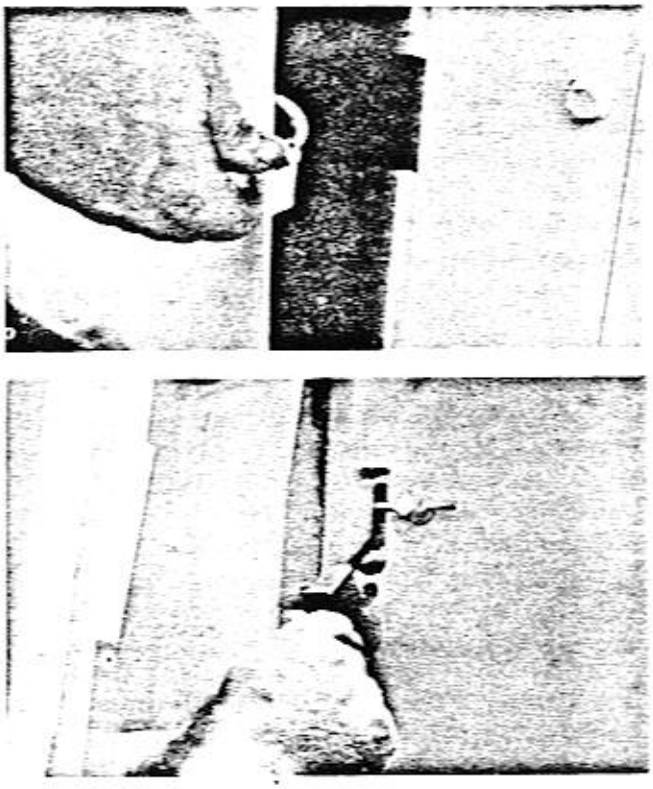


Figure 4-2

Figure 4-3

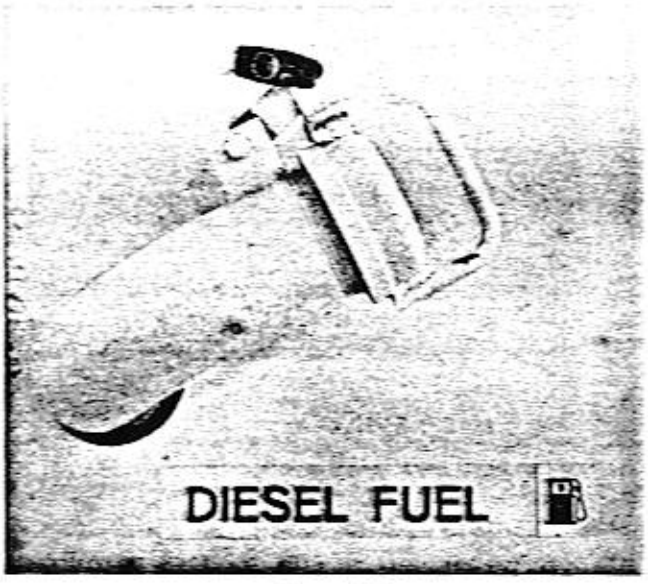


Figure 4-4

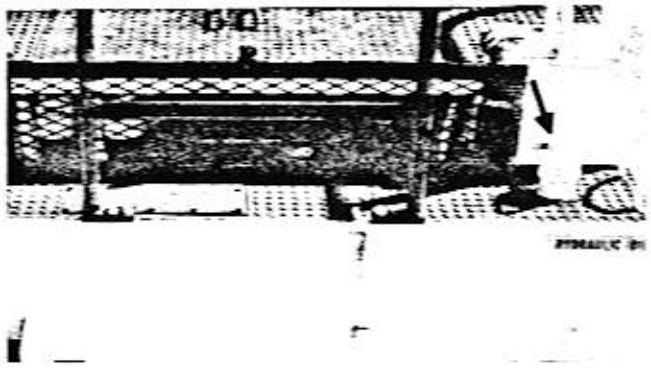


Figure 4-5

CUTTER DRUM CLUTCH LEVER (Manual Clutch)

The long lever on the firewall at the rear of the operators' platform is the Cutter Drum Clutch Lever. Notice the safety latch for the lever. When the clutch is disengaged, the lever should always be secured in the latch. Cutter drum rotation is started by moving the lever out of the safety latch and pulling it all the way to the left. You should hear a distinct "click" as the lever goes over center. If you do not hear it or if engagement feels soft, readjust the clutch as outlined "Section 14 - Routine Adjustments." See Figure 4-6. Always operate the engine at full operating RPM when the cutter drum is performing its function.

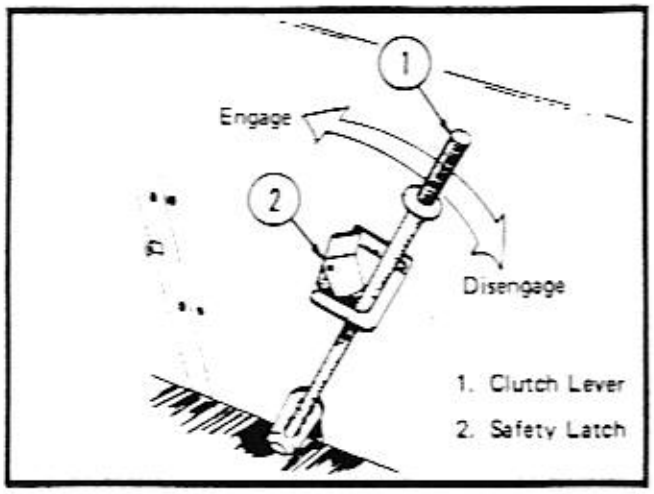


Figure 4-6

⚠ WARNING ⚠

Never leave the operators station with the Cutter Drum Control in the "ON" position.

ELECTRICAL SAFETY SWITCHES/ALARMS

1. Engine Shut Down Solenoid (DDA Engines only) – As a safety feature, anytime the drum cover is lifted, and the engine is running, a switch will close and activate a solenoid on the engine air intake system. This shuts off the air supply and the engine shuts down. Each time the solenoid is activated, you must reset the arm on the solenoid assembly by opening the engine access door on the operators platform, reaching inside and moving the lever up. The pin on the lever should "click" into place against the solenoid plunger (which is adjustable). See Figure 4-7.

Engine Fuel Shut-off (Cat engines) – This solenoid is also activated by the switch under the drum cover and will stop the engine if the drum cover is lifted. The ignition switch also controls the solenoid and can be used to re-start the engine.

2. Neutral Safety Start Switches – Three switches in the electrical starting circuit, allow the engine starting motor to turn only when:

a. Clutch is disengaged
b. Conveyor control is in neutral
c. Propulsion control is in neutral

The propulsion and conveyor switches are on the control lever assembly. The clutch switch is on the clutch linkage.

3. Audible alarms – There is an audible alarm on the operators platform. The alarm will sound when the engine oil pressure drops below 20 psi. The alarm should sound when the ignition switch is turned on and shut off when the engine has started.

The alarm will sound, also, when the engine coolant temperature rises above 210° F.

There is a back-up alarm to warn that the machine is moving backwards. The alarm switch is mounted on the propulsion pump at the linkage attachment point.

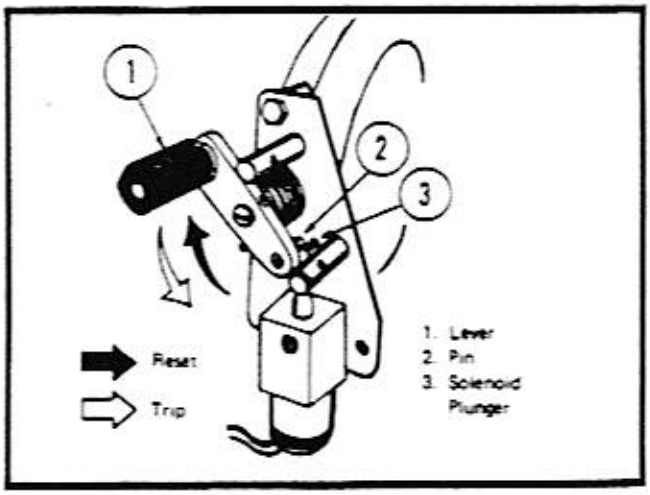


Figure 4-7

TANKS

1. Fuel Tank – The fuel tank is located under the engine assembly. The filler opening is on the left side of the machine behind the drum drive belts. The filler cap is lockable.

2. Hydraulic Oil Tank – The MW unit has a 40 gallon main tank and a 10 gallon reserve tank located at the rear of the machine. The fill cap is on the top right side of the

Continued

TANKS – CON'T

reserve tank located at the rear of the machine. The fill cap is on the top right side of the reserve tank. A hand pump is used to transfer oil from the reserve to the main tank. The pump is inside the right rear access door. See Figure 4-8.

The MT units have one 55 gallon tank located at the rear of the machine. Both the MW-6520 and MT-6520 units have tank access covers and drain plugs.

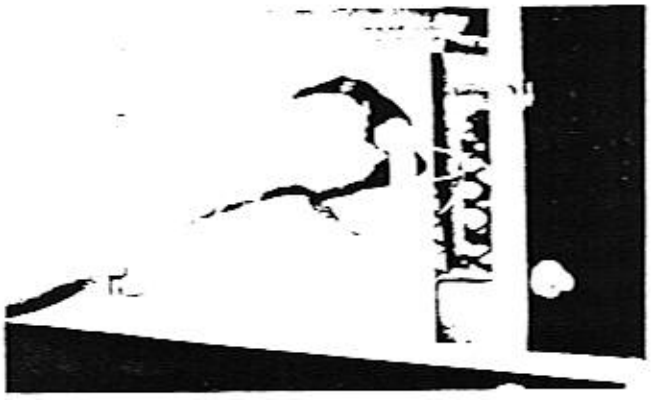


Figure 4-8

For Fuel and Hydraulic Oil Specifications refer to "Section 6 – Fuel and Lubrication Specifications".

ELEVATION LOCKS

There are locking bars and/or pins at each leg tube. Each of the two front lock bars can be set in either the locked or the unlocked position and secured with lock pins. Each of the rear lock pins can be installed in the holes provided when the machine is in the proper position. See Figure 4-9 and 4-10.

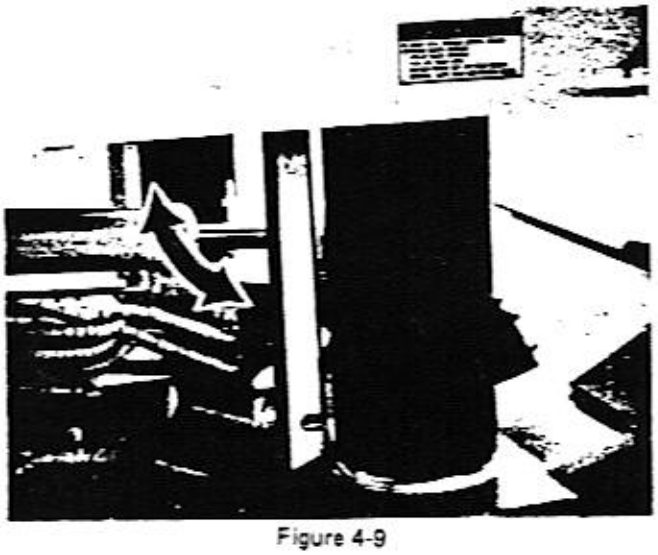


Figure 4-9

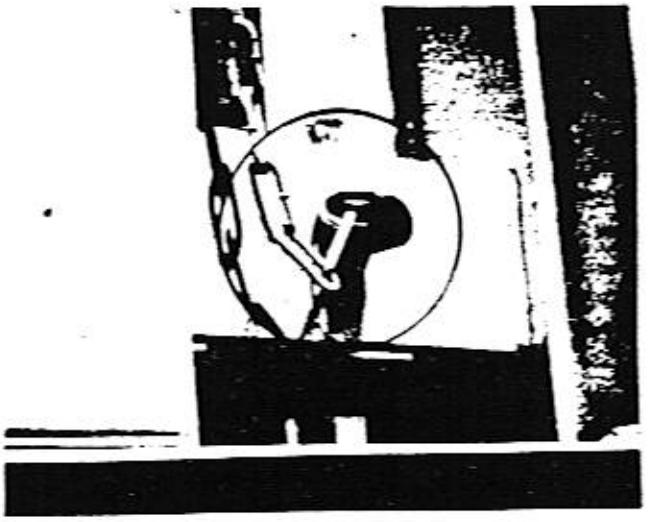


Figure 4-10

⚠ DANGER ⚠

All maintenance is to be performed with engine shut-down, parking brake applied and elevation locking bars in locked position.

SAFETY RAILING/GUARDS

There are safety rails around the deck areas of your machine for operator protection. The rails on the sides of the operators' platform are moveable to allow easy access to the work area. See Figure 4-11 And Figure 4-12

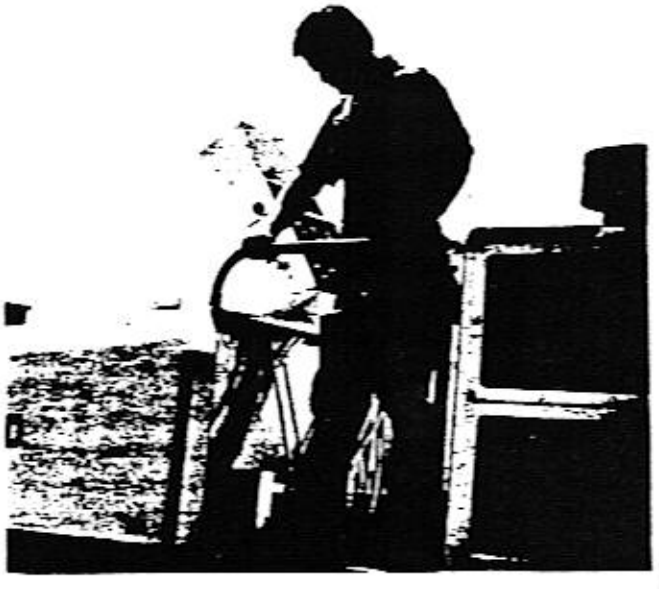


Figure 4-11

Continued

SAFETY RAILING/GUARDS – CON'T

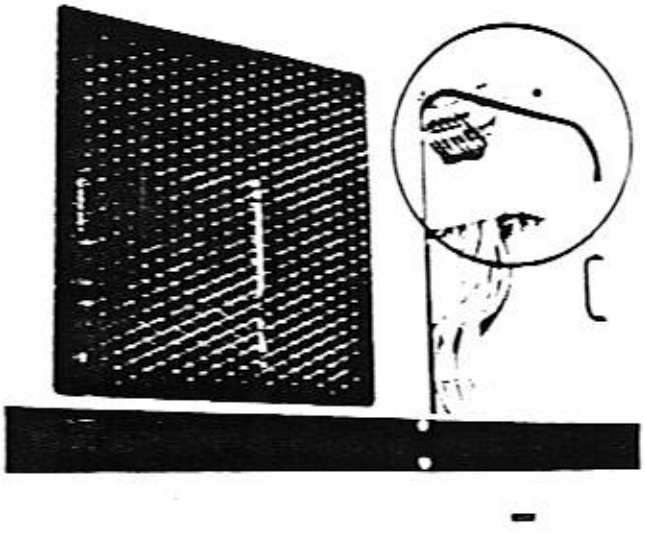


Figure 4-12

MACHINE LEVEL INDICATORS

The machine level indicators at the rear of the machine, on each corner, show the full range of travel, up and down, of the rear elevation cylinders. The two posts at each corner are used to set the rear elevation to the correct height for cutting. See Figure 4-13. Refer to "Section 5 – Operating Instructions" for more information.

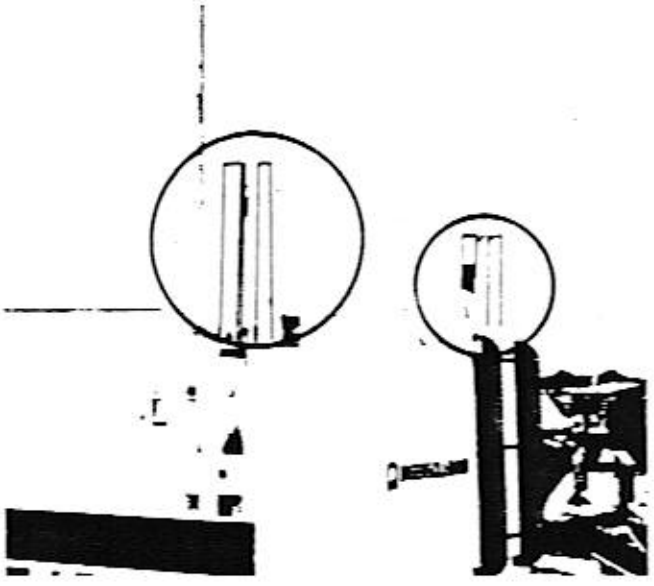


Figure 4-13

HOURMETER (MW-6520 Only)

The Hourmeter is mounted on the right side of the engine near the starter and indicates the engine running time in hours. See Figure 4-14

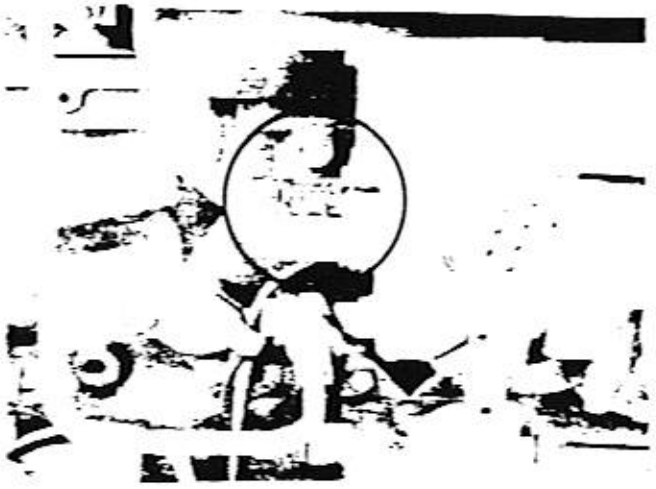


Figure 4-14

To insure a minimum amount of unit downtime, it is extremely important that the Hourmeter be used in conjunction with the unit's lubrication chart and your maintenance records and that servicing be performed at the correct time interval.

R.H. & L.H. SENSOR

Located on each side of the machine, connected to the ski is a sensor to adjust the desired cut. With the sensors connected to the skis and grade sensor control valves in the off position, adjustment is to be made by turning the crank handle on the top of each of the sensors. See Figure 4-15

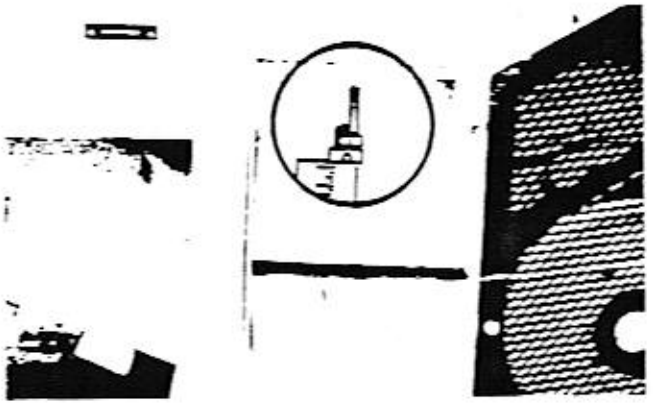


Figure 4-15

Continued

R.H. & L. H. SENSOR - CON'T.

Each complete turn of the crank handle is equal to 1/16 of an inch (16 turns equals one inch). Since the sensors are independent of each other, they are both to be adjusted to the desired cut per the job requirements. By turning the crank clockwise, you are allowing the cutter drum to cut deeper; turning counterclockwise gives a shallower cut.

If obstacles prevent you from using the right hand sensor (such as milling near the curb) you can position the sensor to attach to the dolly in front of the drum.

WATER PUMP VALVE

MW-6520 and MT-6520 Prior to S/N 5110 -

A gate valve turns on and off the water supply to the water pump. It is located below the main frame next to the water pump. Refer to Figure 4-16.

MT-6520 Effective with S/N 5110 -

A ball valve controls the water supply to the pump. It is located below the main frame next to the water pump.

Figure 4-16

LUBRICATION CHART

Look on the left side of your machine for the lubrication chart. The chart shows general component locations, service intervals and recommended lubricants. Refer to Section 6.

SERIAL NUMBER PLATE

This plate is on the left side of the main frame just ahead of the operators' deck. Refer to Figure 4-17.

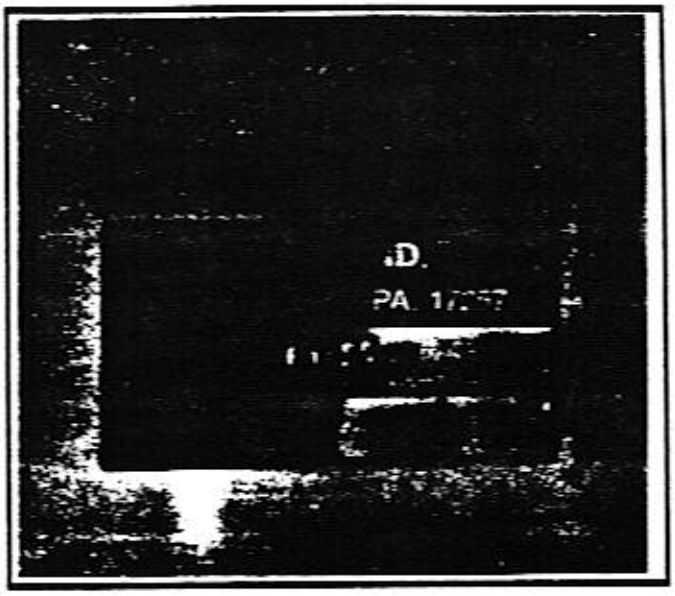


Figure 4-17

CUTTER DRUM CLUTCH SWITCH (HYDRAULIC CLUTCH)

To the right of the Ignition Switch is the Cutter Drum Clutch Switch for machines equipped with a hydraulic clutch. Pull the toggle switch out and position it to the desired function.

SECTION 5 - OPERATING INSTRUCTIONS

Contents

SAFETY CHECKS - PRESTARTING

⚠ WARNING ⚠

Before you do any maintenance, service or repairs, read and understand "Section 1 - Safety Precautions and Guidelines" of this manual to avoid personal injury.

Before starting, each day, in addition to the 10 hour daily routine maintenance, check or inspect the following items.

⚠ DANGER ⚠

Avoid doing any maintenance or repairs unless the front elevation locking bars and rear elevation lock pins are in the locked position. USE EXTREME CAUTION when working under the machine. You could be crushed.

1. Check fluid lines, hoses, fittings, filler openings, drain plugs, pressure cap, tires/track, muffler, engine, safety rail, guards, safety shrouds and the area underneath the unit for signs of leakage or damage. Fix any leaks and correct any damage before operating. Check safety decals. Replace decals if damaged or missing.

2. Make sure sensor linkage is properly connected (both sides). Lift skis and check to see that moving parts are free to move.

3. Visually inspect cutter teeth for wear.

4. Make sure steps and operators platform are clean and clear of any foreign material.

5. DO NOT operate faulty equipment.

6. Be aware of people and obstructions within your work area.

7. Mount the machine by holding on with both hands and stepping up (Three point contact). Always use handholds and steps. Do not jump off the machine.

8. Set the guard rails in place at the sides of the operators platform.

START-UP PROCEDURE

IF YOU ARE IN DOUBT OF THE OPERATION OF THIS UNIT AFTER READING THESE PROCEDURES - SEE YOUR SUPERVISOR.

1. Make sure that the Propulsion Control and the Conveyor Control are in Neutral position.

2. Set the Throttle Control to the Low Idle position.

3. Make certain that the clutch is disengaged (OFF) by either moving the Clutch Lever into the safety latch (on a manual clutch machine), or positioning the switch to DISENGAGED CUTTER DRUM on a machine with a hydraulic clutch.

4. Set the Sensor Control Valves, on the control panel, to the OFF position.

5. Ensure that the Parking Brake is applied (knob pulled outwards).

6. Clear the work area of people and equipment.

7. Push the Engine Stop Handle in (DDA engine only).

8. Push the Ignition Switch in and turn to the extreme right to start the engine.

NOTE

Neutral safety switches will prevent the engine from cranking unless the propulsion, conveyor and clutch controls are in the start-up position.

If the engine fails to start, but turns over, check the shut-down solenoid on the air intake. If the solenoid lever is in the stop position, you must reset it before the engine can be started. Refer to Electrical Safety Switches in Section 4 for additional information.

Continued

START-UP PROCEDURE – CON'T

⚠ CAUTION ⚠

Do not operate the starting motor longer than 30 seconds. If the engine does not start, allow the starter to cool 2-3 minutes before trying again.

Once the engine has started, allow the Ignition Switch to return to its normal, "On", position.

For cold weather starting, use starting aids as necessary, however, refer to the engine operators manual before doing so.

9. Allow the engine to run at low idle for a short interval before normal operation.

⚠ CAUTION ⚠

Avoid unnecessary engine idling. During long engine idling periods, the engine coolant temperature will fall below the normal operating range. Extended idling, especially in cold weather, will cause incomplete combustion of fuel and may lead to a shortened engine life.

To prevent damage to the hydraulic components, warm up hydraulic system oil before operating.

10. Verify that the Brake Light is on (Brake applied). If the brake light does not come on, determine the cause and make repair before operating.

OPERATING PROCEDURE

After the engine has warmed up, your milling machine is ready for operation. Read this section completely before you begin your cut.

1. Remove elevation lock pins/bars and stow them.

2. Observe gauges, check for normal operation.

3. Lower the rear of the machine until gauge rods are even with top of gauge bars. See Figure 5-1.

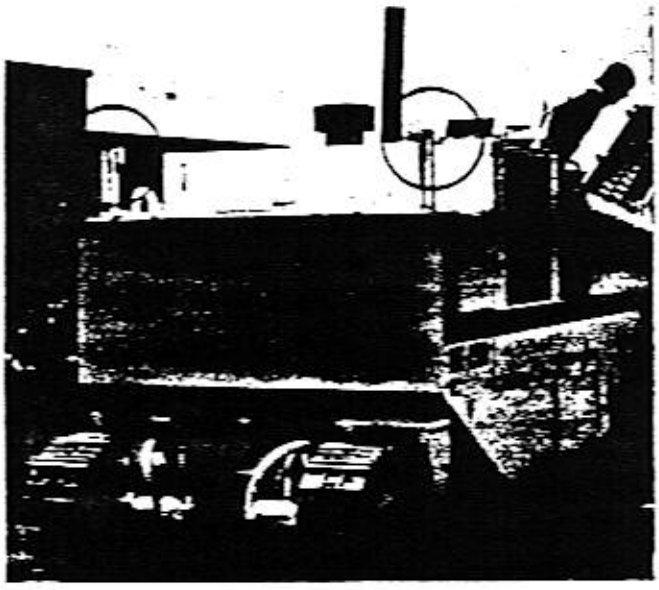


Figure 5-1

4. Make certain moldboard is in UP position.

5. Set sensors for the proper depth of cut, as follows:

⚠ WARNING ⚠

Keep feet clear of machine while adjusting sensors. Failure to do this could cause serious cutting injury.

a. Set Throttle to Low idle.

b. Stand clear and have operator manually lower front of machine, by operating controls simultaneously, until each ski (or dolly) just touches pavement. See Figure 5-2.

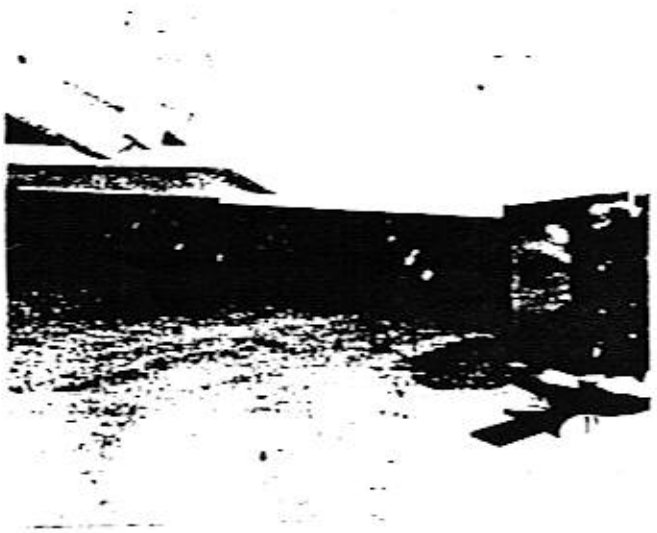


Figure 5-2

Continued

OPERATING PROCEDURE – CON'T

c. On left side of the machine (belt side), turn crank handle on depth indicator until pointer indicates "0" on the scale. See Figure 5-3. This will be the reference point.

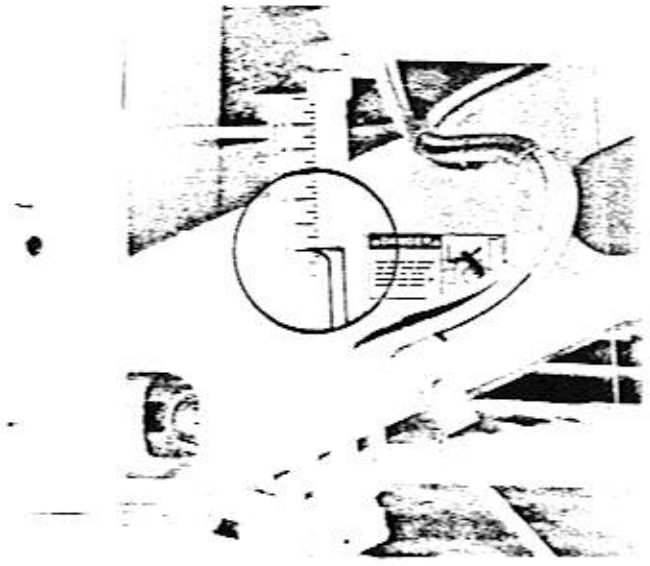


Figure 5-3

d. Have operator turn Left Sensor Control Valve "ON". Machine elevation may change rapidly; wait until machine stops moving.

e. Loosen the capscrew which secures linkage arm to sensor shaft. Then, use an offset flat blade screwdriver to turn the sensor shaft. (A Figure 5-4). Turn shaft (either way), as required, until cutter drum teeth just touch pavement. See Figure 5-4. Tighten capscrew to lock linkage to sensor shaft.

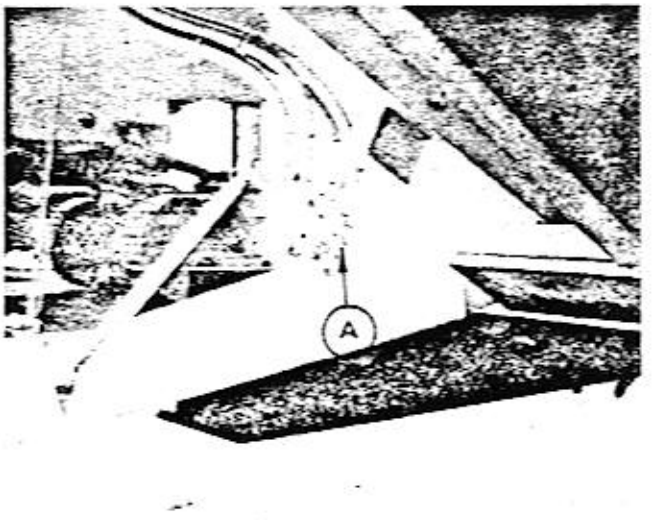


Figure 5-4

CHECK YOUR ADJUSTMENT Lift front ski by hand; machine should rise. If not and machine wants to drop, turn item A (Figure 5-4) sensor shaft 45º and recheck.

This has "nulled" the sensor to "zero" depth of cut.

f. Repeat procedure for right hand sensor.

g. Turn sensor control valves "OFF" and raise the front of the machine.

6. Crank both handles on top of depth indicators clockwise. The pointer will move away from "0" (Reference point zero cut) Crank handle until pointer moves to desired depth of cut (Each number on scale = 1 inch cut). See Figure 5-5.

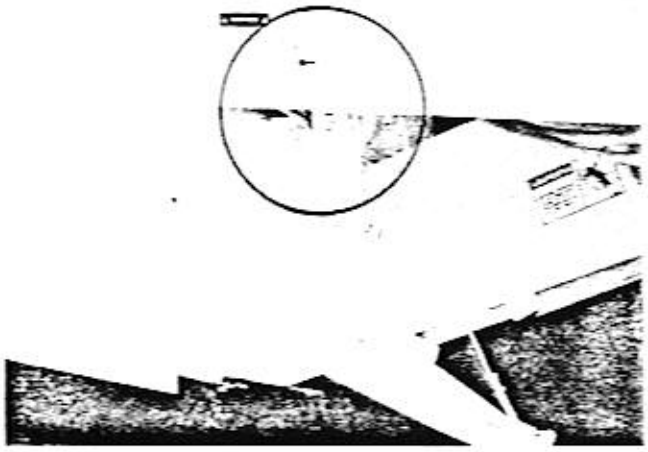


Figure 5-5

7. Open water gate valve fully. See Figure 5-6. The valve is located under the main frame on the left side, just ahead of the sensor assembly.

Figure 5-6

Continued

OPERATING PROCEDURE – CON'T

8. Pull out knob on water pump ON/OFF valve on console (MT-6520, S/N 5067, 5079 and up). Make sure water is spraying from all nozzles. On MW-6520 and MT 6520 (prior to S/N 5079 except S/N 5067) models the water pump will operate only when the conveyor belt is moving. See Figure 5-7, 5-8, 5-9, and 5-10.

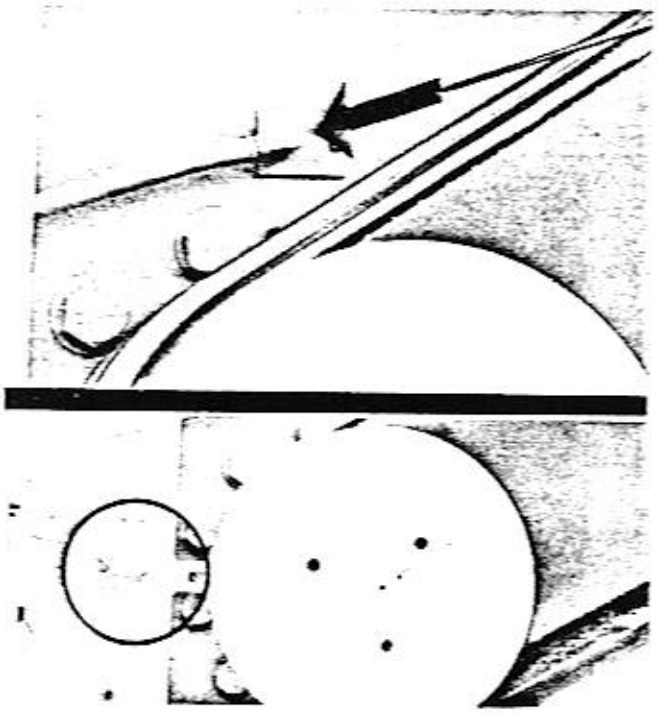


Figure 5-7

Figure 5-8

Figure 5-9

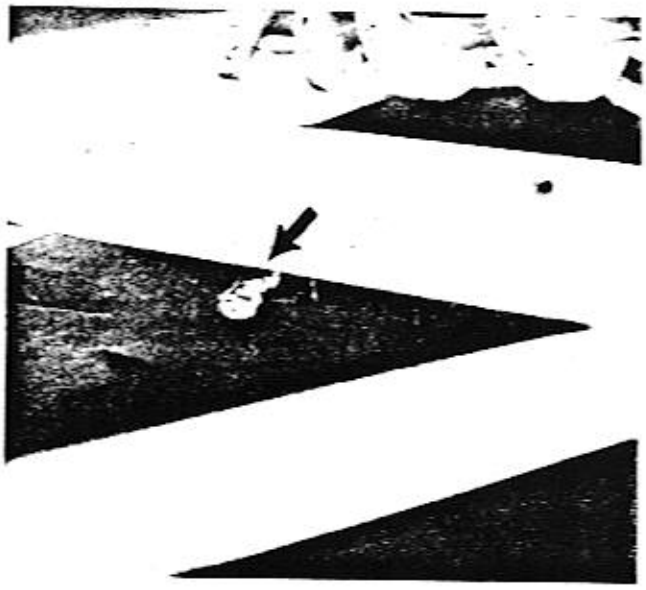


Figure 5-10

The water volume is adjustable. To increase water volume on MT-units, effective with S/N 5067, 5079 and up, loosen the locknut (A Figure 5-11) and turn the adjusting screw clockwise. To decrease water volume, turn screw counter-clockwise. The adjusting screw is on top of the water pump drive motor. The drive motor is under the main frame on the left side of the machine. See Figure 5-11.

To change water volume on MT units prior to S/N 5079 (except S/N 5067), and MW units, locate the relief valve on the discharge side of the water pump. Remove valve cap, loosen locknut and turn valve stem with a screwdriver. Screwing the stem "in" increases water volume; screwing it "out" decreases the water volume.

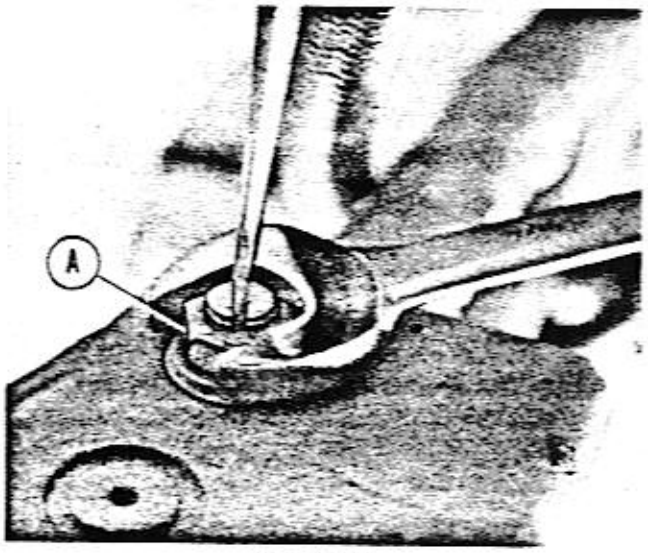


Figure 5-11

Continued

9. The operator on the control deck should place all safety railing into the operating position.

10. On units equipped with a hydraulic clutch, position the Cutter Drum toggle switch to ENGAGED. On units with a manual clutch, start cutter drum rotation by moving the Clutch Lever out of the safety latch, with both hands, and pulling all the way to the left. Refer to Figure 5-12. Follow the information on the instruction, warning, and danger decals next to the clutch lever.

DANGER

To avoid serious injury, be sure people and objects are clear of the cutter drum before it is turned on.

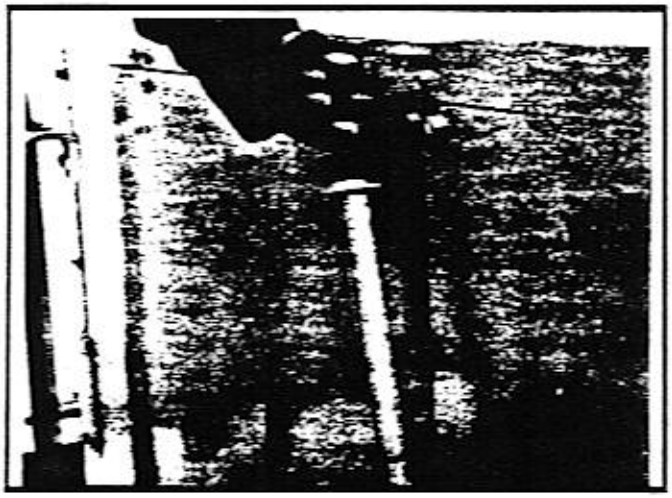


Figure 5-12

CAUTION

When the clutch lever is engaged, a distinct "click" must be heard when the lever goes overcenter. If engagement is soft or lacks resistance, readjust clutch engagement as specified. Failure to adjust will result in premature wear and ultimate failure.

In order to determine the clutch adjustment requirement, measure the force required to engage the clutch with a noticeable snap over center. A pull spring scale attached to the end of the clutch lever should indicate between 60 and 75 lbs. to completely engage the clutch. Never operate the machine if the force required to operate the lever is less than 60 lbs. or more than 75 lbs. Refer to Figure 5-13.

NOTE

No clutch adjustment is necessary on machines equipped with a hydraulically engaged clutch.

When clutch adjustements are required, remove the instruction coverplate. Locate and disengage the adjusting lock pin by compressing its spring. Refer to Figure 5-14. Hold the pin out while turning the adjusting yoke. Turn clockwise to decrease clearance between the clutch plates, increasing the lever pull. When the proper force is obtained to operate the clutch lever, release the adjusting pin. Continue to turn the yoke until the lockpin snaps into the closest lock position.

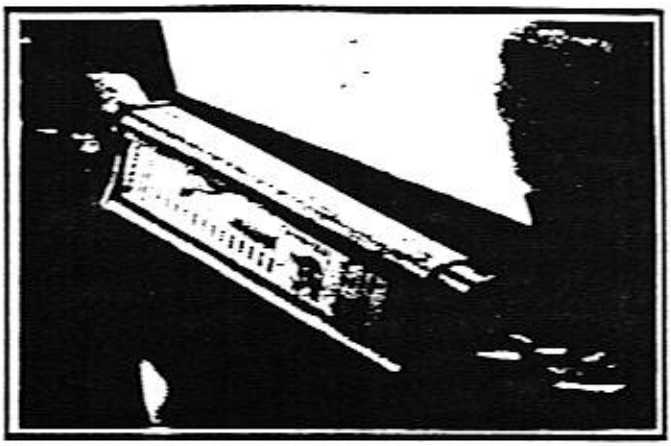


Figure 5-13

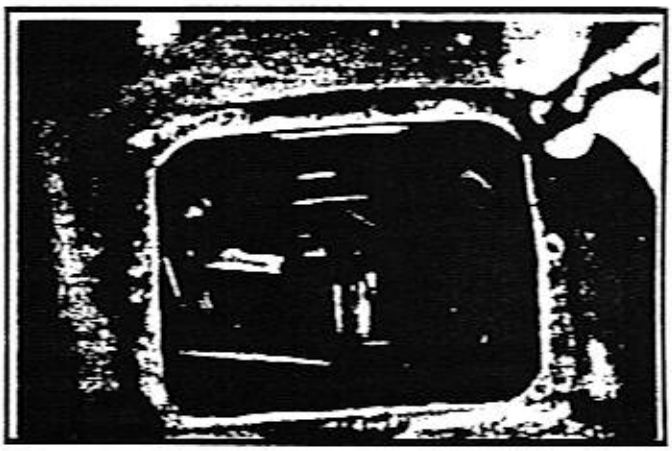


Figure 5-14

DANGER

Clutch lever should fully engage latch in the "OFF" position. If it does not, or when clutch (or belt tension on units prior to S/N 5092) is adjusted, clutch connecting rod must be readjusted to ensure lever is engaged in the latch.

OPERATING PROCEDURE – CON'T

To adjust, remove lower ball joint from pivot lever and turn ball joint one turn at a time until clutch lever is engaged in latch. See Figure 5-15. Re-install/tighten all hardware.

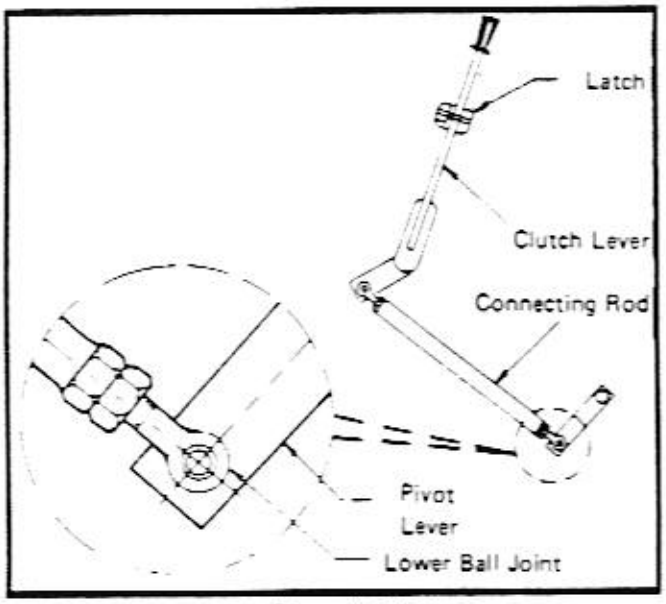


Figure 5-15

⚠ DANGER ⚠

Failure to readjust clutch lever into latch could result in unexpected cutter drum rotation.

11. With engine at high idle, start the conveyor belt in motion.

12. Push parking brake knob in (brakes released). Make sure brake light is off.

13. Make sure speed range selection valve is in the "LOW" (work) position, if unit is so equipped. Move the propulsion control handle forward. This will start machine moving. The farther you move the lever, the faster you go.

14. Gradually lower the machine into the cut. Use the front Elevation Control Levers. Hold both levers down until ground crew member signals that the correct cutting depth has been reached, then release levers.

15. Turn Grade Sensor Valves "ON". The sensors will automatically adjust cut to the predetermined depth.

16. Lower moldboard using both control levers simultaneously. Contact with the pavement should be slight. Use the pressure reducing valve to make fine adjustments to moldboard pressure. It is located under the console. Make any necessary adjustments to propulsion speed, conveyor speed, conveyor swing and moldboard pressure to achieve a smooth cutting operation. Use the steering levers to steer the machine (Check your machine for lever location and direction decals). The moldboard system is equipped with a pressure reducing valve for adjusting the moldboard down pressure. It is located under the control panel on the right hand side. It is adjustable by loosening the jam nut and turning the adjusting screw. This will vary the pressure the moldboard is applying to the milled surface. Pressure is adjustable from 300 psi (min.) to 1850 psi (max.). See Figure 5-16. Refer to "Section 4 – Operating controls and Instruments" for more information.

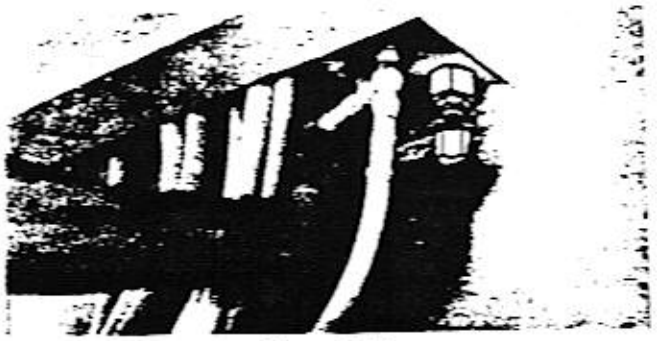


Figure 5-16

NOTES:

1. Normal braking is done by moving the Propulsion Control Handle back to neutral.

2. The right hand sensor can be connected to the wheeled dolly assembly or the right ski. The right ski can be removed when the sensor is attached to the wheeled dolly (This gives more clearance when cutting next to curbs). See Figure 5-17 and 5-18.

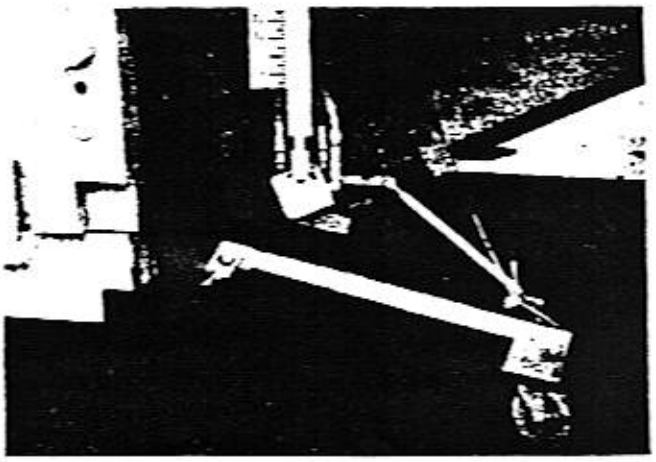


Figure 5-17

Continued

OPERATING PROCEDURE - CON'T

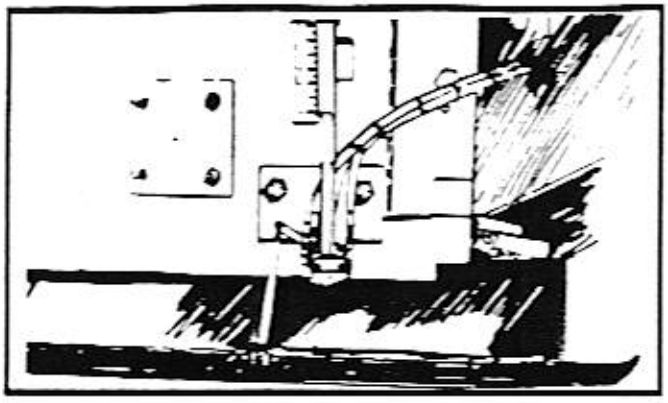


Figure 5-18

3. *To back up:*

a. Raise the moldboard (operate levers simultaneously).

b. Disengage the cutter drum clutch.

c. Raise the front of the machine.

d. Move the Propulsion Control Lever to reverse position; the farther you move the lever, the faster the machine goes.

⚠ CAUTION ⚠

Always raise moldboard when backing up. Failure to do this can damage moldboard cylinders.

SHUT-DOWN PROCEDURE

1. Stop movement of the machine by returning the Propulsion Control Lever to the neutral position. Every attempt should be made to stop movement of the unit on a solid, level surface.

2. Set the Parking Brake by pulling out the control knob on the center console.

3. Disengage the clutch. If so equipped, make sure that the lever is secured in the safety latch. If equipped with a hydraulic clutch, ensure that the drum switch is in the Disengaged Cutter Drum position.

4. Move the Conveyor Control Lever to the stop position.

5. Raise the mold board all the way.

6. Turn both Grade Sensor Valves to the "OFF" position.

7. Raise the front and rear of the machine manually by use of the Elevation Controls.

8. Place the front elevation locking bars (and pins) and the rear lock pins in the locked position.

9. Place the Throttle Control in the Low Idle position and allow the engine to idle for a short period of time.

10. a. DDA engine - Turn the Ignition Switch to the "OFF" position and pull out and hold engine stop handle (DDA) until engine stops.

b. Cat engine - Move throttle lever to bottom of lever gate until engine shuts down. Turn Ignition Switch to the "OFF" position.

11. Push in knob on Water Pump Control Valve (if equipped) and shut off main water supply valve.

EMERGENCY SHUT-DOWN PROCEDURE

D.D.A. ENGINE

⚠ DANGER ⚠

EMERGENCY SHUTDOWN PROCEDURE

In the event of an emergency situation: Pull the Engine Stop handle out.

Pulling Engine Stop handle out during operation:

- **Shuts down engine.**
- **Stops propulsion of the machine.**
- **Applies Parking Brake automatically.**

1. Immediately pull the Engine Stop Control (STOP) to the stop position.

2. Correct the problem that caused the emergency stop situation.

3. Prior to starting the engine, push the Engine Stop Control (STOP) to the normal running position and start the engine according to the START-UP PROCEDURES found in this Section.

EMERGENCY SHUT-DOWN PROCEDURE – CON'T.

CAT ENGINE

⚠ DANGER ⚠

EMERGENCY SHUTDOWN PROCEDURE

In the event of an emergency situation: Turn off ignition switch.

Turning off ignition switch during operation:

- **Shuts down engine.**
- **Stops propulsion of the machine.**
- **Applies parking brake automatically.**

1. Immediately turn the ignition switch to the OFF position.

2. Correct the problem that caused the emergency stop situation.

3. Start the engine according to the START-UP PROCEDURES found in this Section.

TOWING

Should it become necessary to tow a disabled milling machine, proceed as follows:

1. Ensure cutter drum is "OFF". Clutch Lever must be secured in safety latch.

2. Shut down engine (if operable) and chock all four tracks/wheels at the front and rear.

3. From rear of machine, remove both drive motors and brake units. Separate brake assemblies from motors. DO NOT disconnect hydraulic hoses. Support the items removed from suitable point on frame and protect from damage and contaminants. Put temporary covers over drive ends and openings to keep dust and dirt out.

4. Secure milling machine to towing vehicle.

5. Ensure that a qualified operator is aboard, while towing.

6. Remove chocks from tracks/wheels.

7. Tow machine for short distances at slow speed.

8. At conclusion of towing operation, chock tracks/wheels until repairs are complete.

9. If engine is operable, put front elevation locking bars and rear elevation locking pins in the locked position.

SECTION 6 - FUEL AND LUBRICATION SPECIFICATIONS

GENERAL INFORMATION

Lubrication is an essential part of preventive maintenance, affecting to a great extent the useful life of the unit. Different lubricants are needed and some components in the unit require more frequent lubrication than others. Therefore, it is important that the instructions regarding types of lubricants and the frequency of the application be explicitly followed. Periodic lubrication of the moving parts reduces to a minimum the possibility of mechanical failures.

The lubrication chart shows those items requiring regular service and the interval in which they should be performed. Details concerning fuel, oil and other lubricants follow the lubrication chart. A regular service program should be geared to the items listed under each interval. On the following pages each item is listed in the sequence in which lubrication and maintenance is to performed. These intervals are based on average operating conditions. In the event of extremely severe, dusty or wet operating conditions, more frequent lubrication than specified may be necessary.

Specific recommendations of brand and grade of lubricants are not made here due to regional availability, operating conditions, and the continual development of improved products. Where questions arise, refer to the component manufacturer's manual and a reliable supplier.

All oil levels are to be checked with the machine parked on a level surface, and while the oil is cold, unless otherwise specified.

On plug type check points, the oil levels are to be at the bottom edge of the check port.

All grease fittings are SAE STANDARD unless otherwise indicated. Grease non-sealed fittings until grease is seen extruding from the fitting. One ounce (28 grams) of EP-MPG equals one pump on a standard one pound (0.45 kg) grease gun.

Over lubrication on non-sealed fittings will not harm the fittings or components, but under lubrication will definitely lead to a shorter lifetime.

Unless otherwise indicated, items not equipped with grease fittings, such as linkages, pins, levers, etc. should be lubricated with oil once a week. Motor oil, applied sparingly, will provide the necessary lubrication and help prevent the formation of rust. An Anti-Seeze compound may be used if rust has not formed, otherwise the component must be cleaned first.

Grease fittings that are worn and will not hold the grease gun, or those that have a stuck check ball, must be replaced.

All filters and filter elements for air, fuel, engine oil, and hydraulic fluid must be obtained through Ingersoll-Rand. Ordering the recommended filters and elements as listed in the Parts Catalog will ensure the proper size and filtration for the machine. Use only genuine Ingersoll-Rand replacement parts.

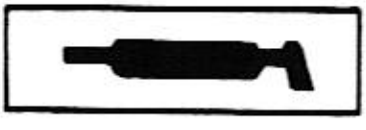
To prevent minor irregularities from developing into serious conditions that might involve shutdown and major repairs, several other services or checks are recommended for the same intervals as the periodic lubrication. The purpose of these services or checks, which require only a few minutes, is to ensure the uninterrupted and safe operation of the unit by revealing the need for adjustment caused by normal wear.

Thoroughly wash all fittings, caps, plugs, etc. with non-flammable, non-toxic cleaning solution before servicing, to prevent dirt from entering while performing the service.

Lubricants must be at operating temperature when draining.

Visually check the entire unit in regard to capscrews, nuts and pins being properly secured. Spot check several capscrews and nuts for proper torque. If any are found loose, a more thorough investigation must be made.

This symbol represents and area where lubrication is required.



LUBRICATION CHART (MW6520 w MANUAL CLUTCH)

A–ADD C–CHANGE D–DRAIN FTLH–FILL TO LEVEL HOLE S–CHECK
AD–ADJUST CL–CLEAN F–FILL G–GREASE T–TORQUE
AR–AS REQUIRED

NOTE: FOR ENGINE MAINTENANCE SEE OPERATORS MANUAL FOR THE ENGINE

SERVICE INTERVAL	REF. NO.	DESCRIPTION	SER-VICE	LUBRICANT	QUANTITY
10 HRS OR DAILY	1	Engine Oil	S A	SAE 40CC	Fill to Dipstick Full Mark
	2	Engine Coolant	S A	Water & Antifreeze	AR
	3	Battery	S A	Distilled Water	AR
	4	Air Cleaner	S CL	————	——
	5	Fuel Tank	S A	No.2 Diesel Fuel	AR
	6	Hydraulic Oil	S A	SUS 200 @ 100°F.	Fill to Center of Gauge
	7	Water Strainer	S CL	————	——
	8	Cutter Drum Bearing	G	MPG-EP Grease	1 Fitting - 25 Shots
	9	Water Nozzle	S CL AR	————	12
	10	Conveyor - Grease Bank	G	MPG-EP Grease	22 Fittings - 4 Shots
	11	Belts - Conveyor, Drive, & Engine	S-AD-AR	————	——
	12	Clutch Plate	S-AD-AR	————	——
	21	Clutch Throwout Brg.	G	MPG–EP Grease	1 Fitting 4-6 Shots
50 HRS OR WEEKLY	13	Visual Inspection All Fasteners	S T	————	AR
	14	Conveyor Swing Cylinder	G	MPG-EP Grease	2 Fittings - 2 Shots
	15	Steering Pins	G	MPG-EP Grease	2 Fittings - 2 Shots
	16	Cutter Planetary	S A	SAE 90 EP	FTLH
	17	Wheel Planetaries	S A	SAE 90 EP	FTLH
	18	Pump Drive Gear Box	S A	SAE 90 EP	Fill to Dipstick Full Mark
	19	Cutter Input Drive	S A	SAE 90 EP	FTLH
	20	Leg Tubes	G	Never – Seez *	Coat Cyl. A/R
	22	Clutch–Outboard Bearings	S-A-AD	SAE 30	Fill to Dipstick Full Mark
	23	Cutter Planetary Seal Excluder	G	MPG–EP Grease	1 Fitting 6 Shots
100 HRS OR MONTHLY	24	Engine Oil Filter	C	————	1
	25	Drum Coolant	S A	Water & Antifreeze	AR
	26	Engine Oil	D F	SAE 40 CC	Fill to Dipstick Full Mark
	27	Clutch - Shaft Bearings	G	MPG–EP Grease	2 Fittings 3 Shots
300 HRS OR QUARTERLY	28	Clutch–Outboard Bearings	D F	SAE 30	Fill to Dipstick Full Mark
	29	Fuel Strainer	C	————	1
	30	Cutter Input Breather	CL	————	————
	31	Pump Drive Breather	CL	————	————
	32	Hydraulic Oil Filters	C	————	3
	33	Hydraulic Tank Breather	C	————	1
	34	Engine Radiator Fan Hub	G	MPG-EP Grease	1 Fitting 2 Shots
	35	Fuel Filter	C	————	1
500 HRS OR SEMI-ANNUALLY	36	Cutter Planetary	D F	SAE 90 EP	FTLH
	37	Wheel Planetaries	D F	SAE 90 EP	FTLH
	38	Pump Drive Gear Box	D F	SAE 90 EP	Fill to Dipstick Full Mark
	39	Cutter Input Drive	D F	SAE 90 EP	FTLH
1000 HRS OR ANNUALLY	40	Suction Strainer	CL	————	————
	41	Hydraulic Oil Tank	D CL F	SUS 200 @ 100° F	Fill to Center of Gauge
	42	Water Tank	D CL	————	————
	43	Engine Coolant	D F	Water & Antifreeze	AR

*Never-Seez compound, a product containing multi-purpose grease, copper and graphite particles.

LUBRICATION CHART (MW6520 w MANUAL CLUTCH)

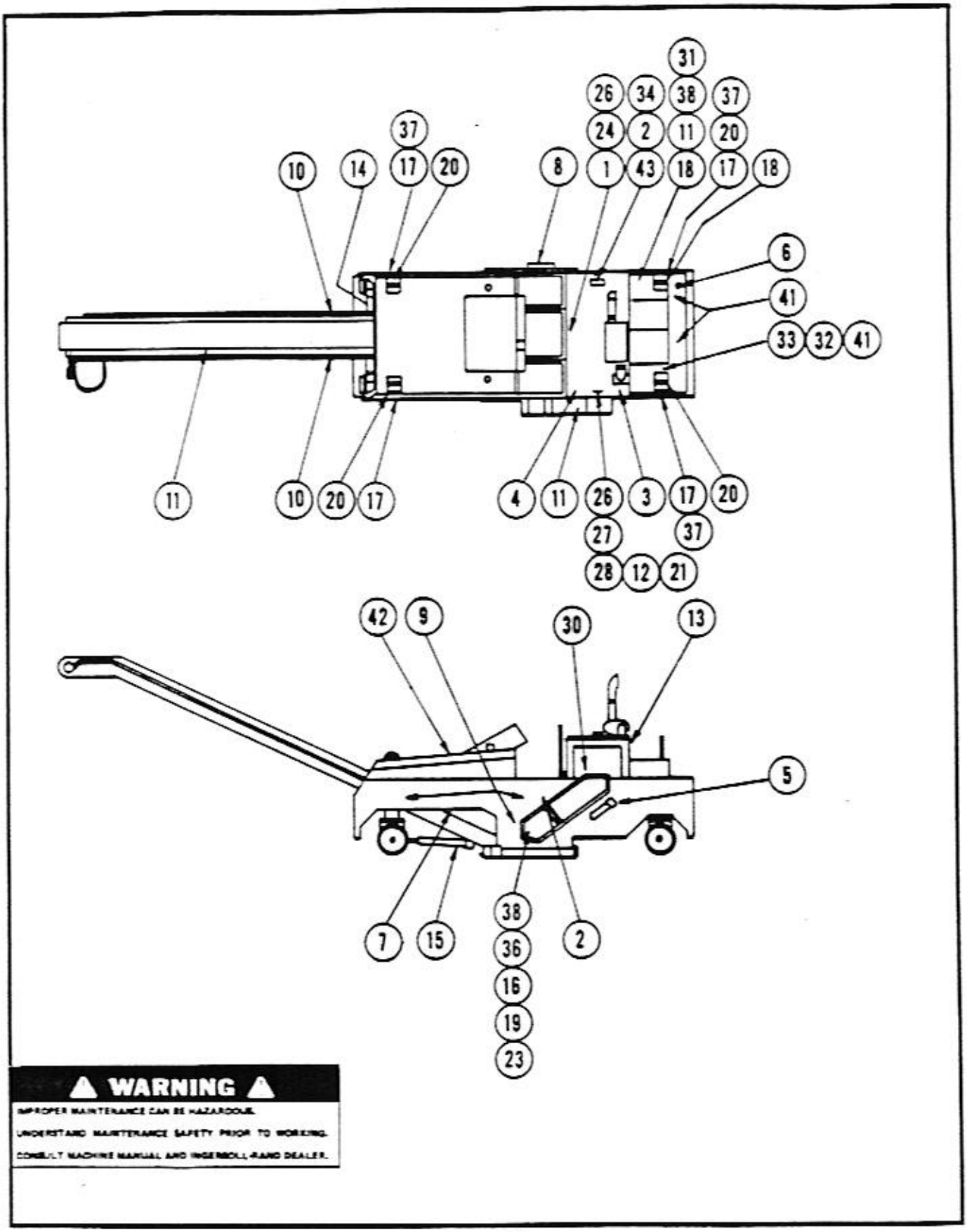


Figure 6-1

LUBRICATION CHART (MT6520 w MANUAL CLUTCH)

A–ADD
AD –ADJUST
AR –AS REQUIRED

C–CHANGE
CL –CLEAN

D–DRAIN
F–FILL

FTLH – FILL TO LEVEL HOLE
G–GREASE

S–CHECK
T–TORQUE

NOTE: FOR ENGINE MAINTENANCE SEE OPERATORS MANUAL FOR THE ENGINE

SERVICE INTERVAL	REF. NO.	DESCRIPTION	SER-VICE	LUBRICANT	QUANTITY
10 HRS OR DAILY	1	Engine Oil	S A	SAE 40CC	Fill to Dipstick Full Mark
	2	Engine Coolant	S A	Water & Antifreeze	AR
	3	Battery	S A	Distilled Water	AR
	4	Air Cleaner	S CL	————	——
	5	Fuel Tank	S A	No.2 Diesel Fuel	AR
	6	Hydraulic Oil	S A	SUS 200 @ 100°F.	Fill to Center of Gauge
	7	Water Strainer	S CL	————	——
	8	Cutter Drum Bearing	G	MPG-EP Grease	1 Fitting - 25 Shots
	9	Water Nozzle	S CL AR	————	12
	10	Water Pump Fitting	G	MPG–EP Grease	1 Fitting 2 Shots
	11	Belts - Conveyor, Drive, & Engine	S-AD-AR	————	————
	12	Clutch Plate	S-AD-AR	————	————
	15	Clutch Throwout Brg.	G	MPG-EP Grease	1 Fitting 4-6 Shots
50 HRS OR WEEKLY	13	Visual Inspection All Fasteners	S T	————	AR
	14	Conveyor Swing Cylinder	G	MPG-EP Grease	2 Fittings 2 Shots
	16	Steering Pins	G	MPG-EP Grease	8 Fittings 2 Shots
	17	Cutter Planetary	S A	SAE 90 EP	FTLH
	18	Track Drive Planetaries	S A	SAE 90 EP	FTLH
	19	Leg Tubes	G	Never-Seez *	Coat Cyl. A/R
	20	Clutch - Outboard Bearings	S-A-AD	SAE 30	Fill To Dipstick Full Mark
	21	Track Tension	S-AD-AR	————	4
	22	Cutter Input Drive	S A	SAE 90 EP	FTLH
	23	Cutter Planetary Seal Excluder	G	MPG-EP Grease	1 Fitting 6 Shots
100 HRS OR MONTHLY	24	Pump Drive U-Joints	G	MPG-EP Grease	2 Fittings 2 Shots
	25	Engine Oil Filter	C	————	1
	26	Drum Coolant	S A	Water & Antifreeze	AR
	27	Engine Oil	D F	SAE 40 CC	Fill To Dipstick Full Mark
	28	Clutch-Shaft Bearings	G	MPG-EP Grease	2 Fittings 3 Shots
300 HRS OR QUARTERLY	29	Clutch-Outboard Bearings	D F	SAE 30	Fill To Dipstick Full Mark
	30	Fuel Strainer	C	————	1
	31	Cutter Input Breather	CL	————	————
	32	Hydraulic Oil Filters	C	————	2
	33	Engine Fan Hub	G	MPG-EP Grease	1 Fitting 2 Shots
	34	Fuel Filter	C	————	1
500 HRS OR SEMI-ANNUALLY	35	Cutter Planetary	D F	SAE 90 EP	FTLH
	36	Track Drive Planetaries	D F	SAE 90 EP	FTLH
	37	Cutter Input Drive	D F	SAE 90 EP	FTLH
1000 HRS OR ANNUALLY	38	Suction Strainers	CL	————	————
	39	Hydraulic Oil Tank	D CL F	SUS 200 @ 100°F	Fill to Center of Gauge
	40	Water Tank	D CL	————	————
	41	Engine Coolant	D F	Water & Antifreeze	AR

*Never-Seez compound, a product containing multi-purpose grease, copper and graphite particles.

LUBRICATION CHART (MT6520 w MANUAL CLUTCH)

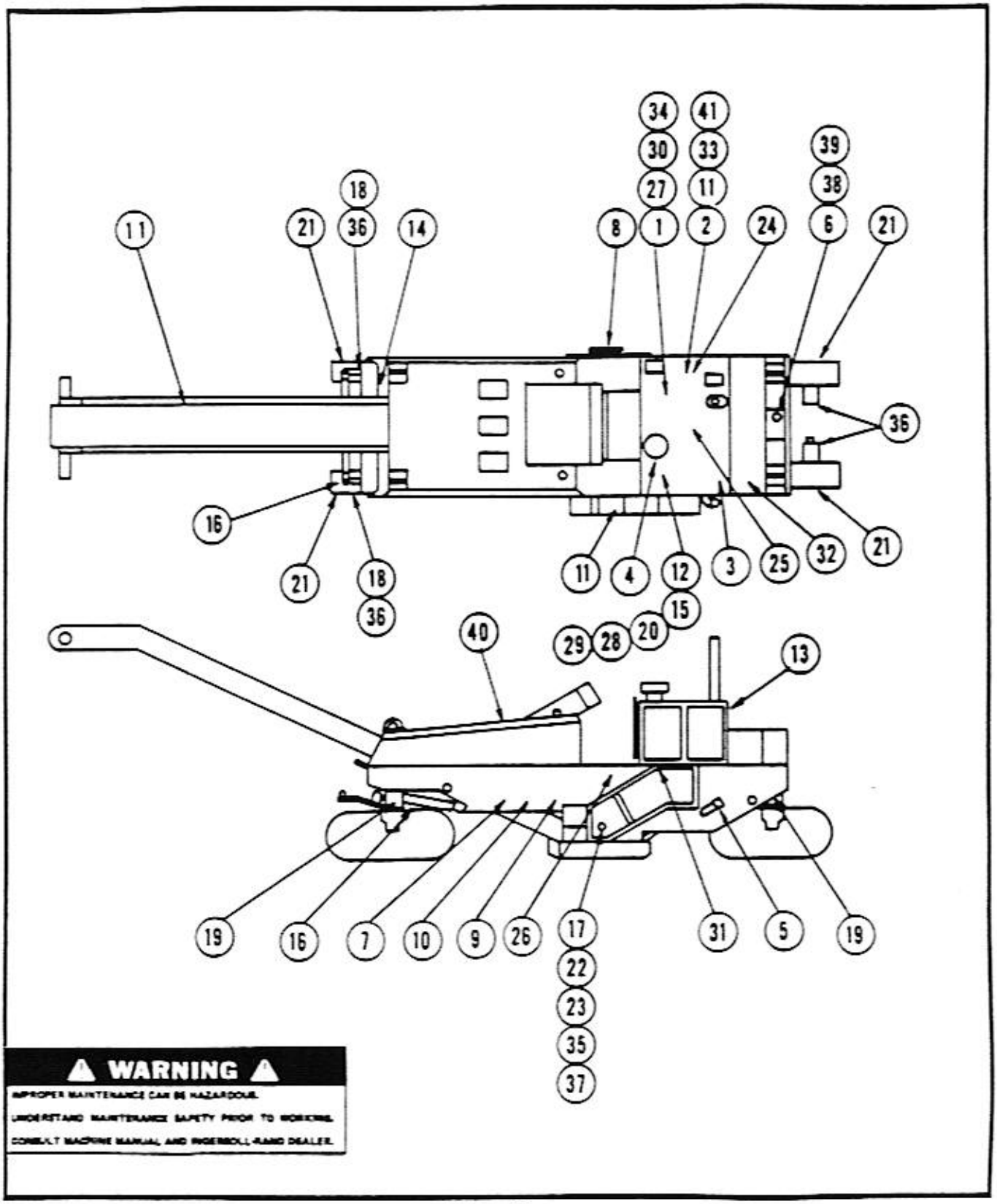


Figure 6-2

LUBRICATION CHART (MT6520 w HYDRAULIC CLUTCH)

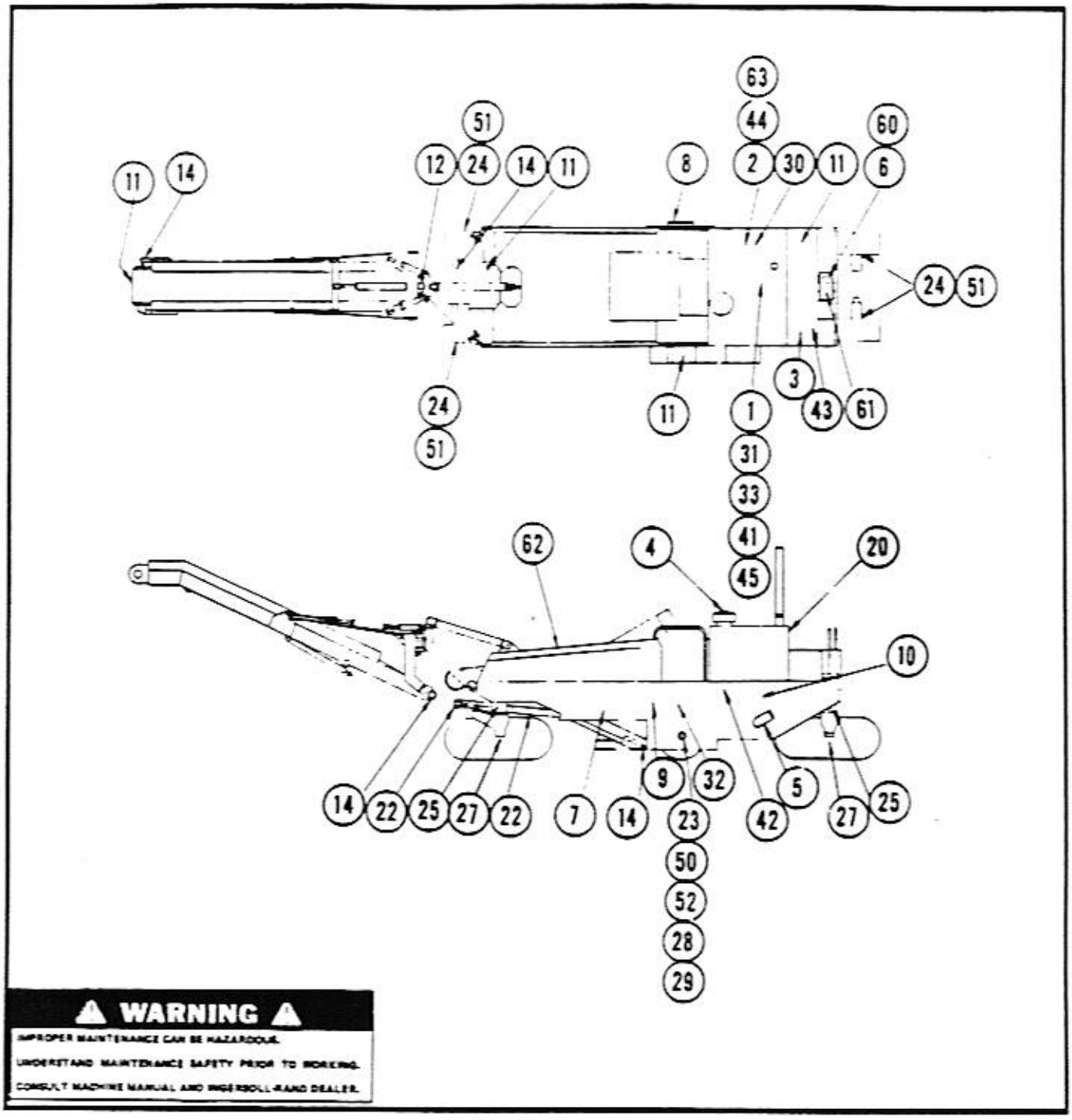
SERVICE INTERVAL	REF	DESCRIPTION	SERVICE	LUBRICANT	QUANTITY
10 HRS OR DAILY	1	ENGINE OIL	S A	SAE 40CC	FILL TO DIPSTICK FULL MARK
	2	ENGINE COOLANT	S A	WATER & ANTIFREEZE	AR
	3	BATTERY	S A	DISTILLED WATER	AR
	4	AIR CLEANER	S CL	———	———
	5	FUEL TANK	S A	# 2 DIESEL FUEL	AR
	6	HYDRAULIC OIL	S A	SUS 200 @ 100 °F	FILL TO CTR OF GAUGE
	7	WATER STRAINER	S CL	———	———
	8	CUTTER DRUM BEARING	G	MPG - EP GREASE	1 FITTING, 25 SHOTS
	9	WATER NOZZLE	S CL AR	———	15
	10	CLUTCH OIL	S A AR	MOBIL SHC-629/EQUAL	FTLH
	11	BELTS, CONVEYOR, DRIVE & ENGINE	S AD AR	———	———
	12	CONVEYOR GREASE FITTINGS	G	MPG-EP GREASE	9 FITTINGS, 4 SHOTS
	14	CONVEYOR PULLEY BRNGS	G	MPG-EP GREASE	6 FITTINGS, 6 SHOTS
50 HRS OR WEEKLY	20	VISUAL INSP ALL FASTENERS	S T	———	AR
	10	CLUTCH (INITIAL CHANGE)	C	MOBIL SHC-629/EQUAL	FTLH
	22	STEERING PINS	G	MPG-EP GREASE	9 FITTINS, 2 SHOTS
	23	CUTTER PLANETARY	S A	SAE 90 EP	FTLH
	24	TRACK DRIVE PLANETARIES	S A	SAE 90 EP	FTLH
	25	LEG TUBES	G	NEVER-SEEZE	COAT CYL. AR
	27	TRACK TENSION	S AD AR	———	4
	28	CUTTER INPUT DRIVE	S A	SAE 90 EP	FTLH
	29	CUTTER PLANETARY SEAL EXCLUDER	G	MPG-EP GREASE	1 FITTING, 6 SHOTS
100 HRS OR MONTHLY	30	DRIVE PUMP U-JOINTS	G	MPG-EP GREASE	2 FITTINGS, 2 SHOTS
	31	ENGINE OIL FILTER	C	———	1
	32	DRUM COOLANT	S A	WATER & ANTIFREEZE	AR
	33	ENGINE OIL	D F	SAE 40 CC	FILL TO DIPSTICK FULL MARK
300 HRS OR QUARTERLY	41	FUEL STRAINER	C	———	1
	42	CUTTER INPUT BREATHER	CL	———	———
	43	HYDRAULIC OIL FILTERS	C	———	2
	44	ENGINE RADIATOR FAN HUB	G	MPG-EP GREASE	1 FITTING, 2 SHOTS
	45	FUEL FILTER	C	———	1
500 HRS OR SEMI-ANNUAL	50	CUTTER PLANETARY	D F	SAE 90 EP	FTLH
	51	TRACK DRIVE PLANETARIES	D F	SAE 90 EP	FTLH
	10	CLUTCH	C	MOBIL SHC-629/EQUAL	FTLH
	52	CUTTER INPUT DRIVE	D F	SAE 90 EP	FTLH
1000 HRS OR ANNUAL	60	SUCTION STRAINERS	CL	———	———
	61	HYDRAULIC OIL TANK	D CL F	SUS 200 @ 100°F	FILL TO CTR OF GAUGE
	62	WATER TANK	D CL	———	———
	63	ENGINE COOLANT	D F	WATER & ANTIFREEZE	AR

SERVICE FUNCTIONS:

A - ADD	C - CHANGE	F - FILL	S - CHECK
AD - ADJUST	CL - CLEAN	FTLH - FILL TO LEVEL HOLE	T - TORQUE
AR - AS REQUIRED	D - DRAIN	G - GREASE	

NOTE: FOR ENGINE MAINTENANCE, SEE ENGINE OPERATION GUIDE MANUAL.

LUBRICATION CHART (MT6520 w HYDRAULIC CLUTCH)



LUBRICATING OIL/GREASE

EXTREME PRESSURE MULTIPURPOSE LUBRICANT

This gear lubricant is compounded to achieve high load carrying capacity and meet the requirements of either API-GL-5 or MIL-L-2105C. Unless otherwise specified, SAE 90 viscosity may be used for year-round service. Low temperature usage is restricted as follows.

SAE Viscosity Number	Minimum Ambient Temperature - $F^{o}(C^{o})$
75W	-40 (-40)
80W	-15 (-26)
85W	+10 (-12)
90	+20 (- 7)
140	+40 (+5)
250	+50 (+10)

HYDRAULIC CLUTCH LUBRICANT

This lubricant is a synthetic oil that is to be used in the hydraulic clutch on any machines so equipped. Use of any type of non-synthetic oil will lead to seal failure.

⚠ CAUTION ⚠

CHECK CLUTCH OIL LEVEL DAILY

USE ONLY APPROVED OIL FOR CLUTCH LUBRICATION TO INSURE CORRECT OPERATION AND WARRANTY PROTECTION.

USE OF A NON-SYNTHETIC OIL WILL LEAD TO SEAL FAILURE.

APPROVED OILS:

MOBIL: SHC-629
TEXACO: SYN-STAR GL-75W-140
AMERICAN OIL: AOSYN-1005
EXXON: SYNESSTIC 150

EXTREME PRESSURE MULTIPURPOSE GREASE

This is a lithium soap base grease with a high load carrying capacity. The following properties are recommended.

Timken OK Load	40 Lb. Minimum
Dropping Point	350 degrees F (177 degrees C) min.
Oil Viscosity	75 SUS Minimum at 210 degrees F (99 degrees C)
Water Resistance	Excellent

Undeer normal operating conditions, the following consistency grades are recommended.

NLGI No. 0 for sub-zero Fahrenheit temperatures.
NLGI No. 1 or No. 2 for normal ambient temperatures.
NLGI No. 2 or No. 3 for temperatures over 100 degrees F (38 degrees C).

SECTION 6 - FUEL AND LUBRICATION SPECIFICATIONS

HYDRAULIC OIL REQUIREMENTS AND SPECIFICATIONS

The quality of the hydraulic oil is important to the satisfactory performance of any hydraulic system. The oil serves as the power transmission medium, system coolant and lubricant. Selection of the proper oil is essential to ensure proper system performance and life. For the specifications and requirements that hydraulic oil, used in this unit, should meet, refer to the requirements in the table below.

REQUIREMENTS FOR HYDRAULIC OIL

Viscosity:	60 SUS minimum at operating temperature 7500 SUS maximum at starting temperature 150 to 225 SUS at 100° fahrenheit (generally) 44 to 48 SUS at 210° fahrenheit (generally)
Viscosity Index:	90 Minimum
Aniline Point:	-175 minimum
API Gravity:	28 minimum Parafinic oils: 28 or more; Mixed base: 24 to 28; Napthanic or asphaltic base: 24 or less
Recommended Additives:	Rust and oxidation inhibitors Foam depressant
Desirable Characteristics:	Stability of physical and chemical characteristics High demulsibility (low emulslibility) for separation of water, air and contaminants Resistance to the formation of gums, sludges, acids tars, and varnishes. High lubricity and film strength.

Table 6-1. Requirements for Hydraulic Oil

The following are only a few of the recommended oils for use at temperatures above 10°F (-12°C).

International Harvester ——— Hy Tran
Auto. Trans. Fluid ——— Type F
Mobil Oil Company ——— Mobil Fluid DTE 25
Sun Oil Company ——— Sun Oil 2105

For temperatures below 10°F (-12°C), the following oils are recommended.

Auto Transmission Fluid ——— Type F
Mobil Oil Company ——— Mobil DTE 13
Shell Oil Company ——— Tellus T-27

CATERPILLAR FUEL OIL SPECIFICATIONS

Use distillate fuels that conform to ASTM No.1 or No.2 Fuel Oil or No.1D or No.2D Diesel Fuel Oil. Specifications are preferred fuels and provide proven maximum engine service life.

Cetane No. 35 Minimum

Some crude oils and blended fuels are regarded as permissible and can be used with extra fuel filters and adjusted oil change periods. However, this will result in less than maximum engine service life.

Consult your Caterpillar dealer regarding the Caterpillar SPECIAL INSTRUCTION titled "FUELS FOR CATERPILLAR DIESEL ENGINE", FORM SEHS7067, which specifies requirements for other preferred and permissible fuels.

Fuel wax will plug the fuel filter in cold weather. Fuel cloud point should be below operating ambient temperature to avoid filter waxing and power loss.

The % of fuel sulphur content will effect the oil change interval.

Fuel Sulphur Content	Oil Change Interval
0 to 0.4%	normal interval
0.4 to 1.0%	½ normal interval
1.0% to 1.5%	¼ normal interval

CATERPILLAR LUBRICATING OIL SPECIFICATIONS

The abbreviations listed below follow SAE J754 nomenclature. The classifications follow SAE J183 classifications. The MIL specifications are USA Military Specifications. These definitions will be of assistance in purchasing.

ENGINE OILS (CD)

Use oils that meet Engine Service Classification CD (MIL-L2104C) or CD/TO-2.

LUBRICATING GREASE (MPG)

Use Multipurpose-type Grease (MPG). NLGI No.2 Grade is suitable for most temperatures. Use NLGI No.1 or No.0 Grade for extremely low temperatures.

ANTI–SEIZE LUBRICATING COMPOUND

Use a petroleum based grease with copper, graphite and other additives to improve anti-seize characteristics. The product should be "Never-Seez", manufactured by Never-Seez compound co. or other manufacturer's equal.

SECTION 6 - FUEL AND LUBRICATION SPECIFICATIONS

DETROIT DIESEL FUEL OIL SPECIFICATIONS

GENERAL CONSIDERATIONS

The quality of fuel oil used for high-speed diesel engine operation is a very important factor in obtaining satisfactory engine performance, long engine life, and acceptable exhaust emission levels.

COMPLETELY DISTILLED FUEL

Fuel selected should be completely distilled material. That is, the fuel should show at least 98% by volumn recovery when subjected to ASTM-D-86 distillation. Fuels marketed to meet Federal Specification VV-F-800 (grades DF-1 and DF-2) and ASTM Designation D-975 (grades 1-D and 2-D) meet the completely distilled criteria. The differences in properties of VV-F-800 and ASTM D-975 fuels are shown in the following table.

FEDERAL SPECIFICATION & ASTM DIESEL FUEL PROPERTIES

Specification or Classification Grade	VV-F-800 DF-1	ASTM D-975 1-D	VV-F-800 DF-2	ASTM D-975 2-D
Flash Point, min.	104°F 40°C	100°F 38°C	122°F 50°C	125°F 52°C
Carbon Residue (10% residuum), % max.	0.15	0.15	0.20	0.25
Water & Sediment, % by vol. max.	0.01	trace	0.01	0.05
Ash, % by wt., max	0.005	0.01	0.005	0.01
Distillation Temp., 90% by vol. recovery, min	——	——	——	540°F 282°C
max	572°F 300°C	550°F 288°C	626°F 330°C	640°F 338°C
End Point, max	626°F 330°C	– –	671°F 355°C	– –
Viscosity 100°F(38°C)				
Kinematic, cSt, min	1.4	1.4	2.0	2.0
Saybolt, SUS, min	—	—	—	32.6
Kinematic, cSt, max	3.0	2.5	4.3	4.3
Saybolt, SUS, max	—	34.4	—	40.1
Sulfur,% by wt., max	0.50	0.50	0.50	0.50
Cetane No.	45	40	45	40

FUEL SULFUR CONTENT

The *sulfur content* of the fuel should be as low as possible to avoid premature wear, excessive deposit formation, and minimize the sulfur dioxide exhausted into the atmosphere.

Limited amounts can be tolerated, but the amount of sulfur in the fuel and engine operating conditions can influence corrosion and deposit formation tendencies.

The detrimental effect of burning high sulfur fuel is reflected in Detroit Diesel lube oil change interval recommendations. Detroit Diesel recommends that the Total Base Number (TBN-ASTM D-664) of the lube oil be monitored frequently and that the oil drain interval possibly be reduced. Consult the FUEL OIL SELECTION CHART.

IGNITION QUALITY - CETANE NUMBER

There is a delay between the time the fuel is injected into the cylinder and the time that ignition occurs. The duration of this delay is expressed in terms of *cetane number* (rating). Rapidly ignited fuels have high cetane numbers (50 or above). Slowly ignited fuels have low cetane numbers (40 or below). The lower the ambient temperature, the greater the need for a high cetane fuel that will ignite rapidly.

Difficult starting may be experienced if the cetane number of the fuel is to low. Furthermore, engine knock and puffs of white smoke may be experienced during engine warmup expecially in severe cold weather when operating with a low cetane fuel. If this condition is allowed to continue for any prolonged period, harmful fuel derived deposits will accumulate within the combustion chamber. Consult the FUEL OIL SELECTION CHART.

DISTILLATION END POINT

Fuel can be burned in an engine only after it has been vaporized. The temperature at which fuel is completely vaporized is described as the *distillation end point* (ASTM D-86). The distillation (boiling) range of diesel fuels should be low enough to permit complete vaporization at combustion chamber temperatures. The combustion chamber temperature depends on ambient temperature, engine speed, and load. Mediocre to poor vaporization is more apt to occur during severe cold weather and/or light load operation. Therefore, engines will show better performance operating under the conditions described above when lower distillation end point fuels are used. Consult the FUEL OIL SELECTION CHART.

DETROIT DIESEL FUEL OIL SPECIFICATIONS

CLOUD POINT

The *cloud point* is that temperature at which wax crystals begine to form in diesel fuel. The selection of a suitable fuel for low temperature operability is the responsibility of the fuel supplier and the engine uses. Consult the FUEL OIL SELECTION CHART.

FUEL OIL SELECTION CHART

Application	General Fuel Classification	Final Boiling Point (max)	Cetane Number (min)	Sulfur Content (max)	Cloud Point
City Buses	No. 1-D	550°F 288°C	45	0.30	
	Winter No. 2-D*	675°F 357°C	45	0.50	SEE NOTES
	Summer No. 2-D*	675°F 357°C	40	0.50	
All Other Applications	Winter No. 2-D	675°F 357°C	40	0.50	SEE NOTES
	Summer No. 2-D	675°F 357°C	40	0.50	

*No. 2-D diesel fuel may be used in city coach engine models that have been certified to pass Federal and California emission standards.

Note 1: The cloud point should be 10°F (6°C) below the lowest expected fuel temperature to prevent clogging of the fuel filters by wax crystals.

Note 2: When prolonged idling periods or cold weather conditions below 32°F (0°C) are encountered, the use of lighter distillate fuels may be more practical. The same consideration must be made when operating at altitudes above 5,000 feet.

DETROIT DIESEL FUEL OIL SPECIFICATIONS FOR 2-CYCLE AND 4-CYCLE ENGINES

Detroit Diesel Allison designs, develops and manufactures commercial diesel engines to operate on diesel fuels classified by the ASTM as Designation D-975 (grades 1-D and 2-D). These grades are very similar to grades DF-1 and DF-2 of Federal Specification VV-F-800.

Burner fuels (furnace oils or domestic heating fuels) generally require an open flame for satisfactory combustion. The ignition quality (cetane rating) of burner fuels (ASTM D-396) is poor when compared to diesel fuels (ASTM D-975).

In some regions, however, fuel suppliers may distribute one fluid that is marketed as either diesel fuel (ASTM D-975) or domestic heating fuel (ASTM D-396) sometimes identified as burner, furnace, or residual fuel. Under these circumstances, the fuel should be investigated to determine whether the properties conform with those indicated in the FUEL OIL SPECIFICATION CHART.

The FUEL OIL SPECIFICATION CHART also will serve as a guide in the selection of the proper fuel for various applications. The fuels used must be clean, completely distilled, stable, and non-corrosive. *Distillation Range, Cetane Number, Sulfur Content, and Cloud Point* are four of the most important properties of diesel fuels that must be controlled to insure satisfactory engine operation.

Continued

DETROIT DIESEL FUEL OIL SPECIFICATIONS FOR 2-CYCLE AND 4-CYCLE ENGINES - CONT.

Engine speed, load, and ambient temperature all influence the selection of diesel fuels with respect to distillation range and cetane number.

All diesel fuels contain a certain amount of sulfur. To high a sulfur content results in excessive cylinder wear. For most satisfactory engine life, fuels containing less than 0.5% sulfur should be used.

During cold weather engine operation the *cloud point* (the temperature at which wax crystals begin to form in diesel fuel) should be 10^0F (6^0C) below the lowest expected fuel temperature in order to prevent clogging of the fuel filters by wax crystals.

A reputable fuel oil supplier is the only one who can assure you that the fuel you receive meets the *Distillation End Point, Cetane Number, Sulfur Caonsent, and Cloud Point* property limits shown in the FUEL OIL SELECTION CHART.

At temperatures below +32^{0}F (0^{0}C) particular attention must be given to cold weather starting aids for efficient engine starting and operation.

PROPOSED ASTM D-975, GRADE 3-D

Detroit Diesel Allison does NOT recommend the use of proposed grade 3-D diesel fuel in any of its engines. This grade of fuel was proposed, but not accepted by, the ASTM.

The grade 3-D which was proposed is undesireable in that it possesses poor ignition quality (i.e., lower cetane), allows greater sulfur content (up to 0.70% by weight), allows the formation of more carbon deposits (Conradson carbon residue), and allows the blending of heavier, more viscous boiling point fractions that are difficult to burn. The latter tend to increase combustion chamber deposits. This type of fuel usually manifests poor cold weather properties (wax formation tendencies). In addition, the poor ignition quality adversely affects noise and emission levels.

DETROIT DIESEL LUBRICATING OIL SPECIFICATIONS

API PERFORMANCE DESIGNATIONS, LUBE SUPPLIER, AND BRAND NAMES

Lubricants are blended to meet specific industry accepted tests developed by the American Society for Testing and Materials (ASTM). The service for which these products are intended is defined by the American Petroleum Institute (API). The lube supplier markets these products under a specific brand or trade name. The container identification indicates whether the contents meet or exceed specific API letter code designations (example: SF, CD).

RECOMMENDATION

Lubricating oils that meet the following performance levels, viscosity grades, sulfated ash limits and zinc requirements are recommended for Detroit Diesel engines. It is also recommended that the oil supplier provide to the user evidence of satisfactory performance of his products in Detroit Diesel engines.

LUBE OIL PERFORMANCE LEVELS

Lubricants are formulated to meet all the performance criteria defined in either commercial (API) and/or military specifications. Table L-1 shows the current commercial industry and military oil performance levels. The API letter designations are defined in SAE recommended practice J-183 published in the SAE Handbook.

TABLE L-1
LUBE OIL PERFORMANCE LEVELS

API PERFORMANCE DESIGNATION		COMPARABLE MILITARY SPECIFICATION	RECOMMENDED FOR USE IN DDA ENGINES		COMMENTS & CURRENT API OR MILITARY QUALIFICATION STATUS
DIESEL ENGINES	GASOLINE ENGINES		2-CYCLE	4-CYCLE	
CB	—	MIL-L-2104A (Supplement 1)	YES	NO	Obsolete, still limited availability
CC	—	MIL-L-2104B	YES	NO	Obsolete, still readily available
CD	—	MIL-L-451998 (Series 3)	YES	NO	Still limited availability
CC	SE	MIL-L-46152	YES	YES	Obsolete Diesel performance, intended for passenger cars burning gasoline
CC	SF	NONE	YES	YES	Primarily for passenger cars burning gasoline
CC	SC	MIL-L-2104C	YES	YES	Current spec for heavy duty diesel powered military vehicles, acceptable for commercial diesel powered vehicles
CD	SE		YES	YES	Diesel performance requirements are current. Gasoline fueled passenger cars performance requirements are obsolete
CD	SF		YES	YES	Meet current diesel & gasoline performance requirements
—	SF		NO	YES	Service station lubes

Specific oil performance level recommendations for 2-cycle and 4-cycle Detroit Diesel engines are indicated in Table L-1.

VISCOSITY GRADES

2-Cycle Engines

Single grade SAE-40 and 30 lubricants are preferred and recommended for use in all Detroit Diesel 2-cycle engines. Table L-2 shows a viscosity grade selection chart as related to ambient temperatures. Note that 15W-40 multigrade oils are recommended as a third choice for Series 53, 71 and 92 engines only when ambient temperatures are below 32°F (0°C).

TABLE L-2
VISCOSITY — SAE GRADE SELECTION CHART

Ambient Temperature		ENGINE SERIES 92, 71, 53 2-CYCLE		
Deg Fahr	Deg Celsius	First	Second	Third
↑ ↓ 50	↑ ↓ 10	SAE 40	SAE 30	None
↑ ↓ 32	↑ ↓ 0	SAE (40)	SAE 30 *	None
↑ ↓ 0	↑ ↓ −18	SAE (40)	SAE (30)	* 15W-40
↑ ↓ −25	↑ ↓ −32	SAE (40)	SAE (30)	(15W-40)

( ) Numbers in parentheses indicate that starting aids are required.

* Usually unaided starts can be accomplished.

OTHER MULTIGRADE OILS FOR 2-CYCLE ENGINES

15W-40 oils are the only acceptable multigrade lubricants that should be considered in Series 53, 71 and 92 engines if prolonged cold ambient temperatures below 32°F (0°C) are expected. Detroit Diesel Allison does not recommend the use of any multigrade oils other than 15W-40 in these 2-cycle engines. Never use any kind of multigrade oils in Series 149 engines.

SYNTHETIC OILS

Synthetic lubricants may be used in Detroit Diesel 2-cycle engines provided the ash limit, zinc requirements, and specified oil performance levels (for example, CD/SE or MIL-L-2104B, etc.) shown elsewhere in this specification are met. Viscosity grades SAE-40 or SAE-30 are recommended.

SECTION 7 - INITIAL BREAK-IN MAINTENANCE

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⚠ WARNING ⚠

Before performing any maintenance or repairs, read and understand "Section 1 - Safety Precautions and Guidelines" of this manual to avoid personal injury.

⚠ DANGER ⚠

Shut down engine and apply parking brake, before working on machine. Failure to do this can cause serious cutting or crushing injury.

Any new equipment requires an initial modification of the maintenance schedule to properly break-in the various systems and component units. Perform this one time initial break-in maintenance between 50 to 100 hours of operation IN ADDITION TO the 10 hours, 50 hours, and 100 hour maintenance tasks which are described on the following pages. After this initial phase, the regular intervals should be followed.

CUTTER DRUM PLANETARY

Change the oil. For the procedure, refer to Section 12 - 500 Hour or Semi-Annual Routine Maintenance.

WHEEL/TRACK PLANETARY

Change the oil. For the procedure, refer to Section 12 - 500 Hour or Semi-Annual Routine Maintenance.

CLUTCH

Adjust - For the procedure, refer to Section 14 - Routine Adjustments.

PUMP DRIVE GEARBOX (CAT)

Change the oil. For the procedure, refer to Section 12 - 500 Hour or Semi-Annual Routine Maintenance.

CUTTER INPUT DRIVE

Change the oil. For the procedure, refer to Section 12 - 500 Hour or Semi-Annual Routine Maintenance.

CLUTCH OUTBOARD BEARING

Change the oil. For units with a manual clutch, refer to Section 11 - 300 Hour or Quarterly Routine Maintenance. For units with a hydraulic clutch, refer to Section 12 - 500 Hour or Semi-Annual Routine Maintenance.

Contents

⚠ WARNING ⚠

Before performing any maintenance or repairs read and understand "Section 1 - Safety Precautions and Guidelines" of this manual to avoid personal injury.

⚠ DANGER ⚠

Shut down engine and apply parking brake, before working on machine. Failure to do this can cause serious cutting or crushing injury.

ENGINE OIL

Check the engine's oil level the start of each day and maintain it to the full mark on the dipstick. If low, fill the crankcase with SAE 40 CC (MIL-L-2104) weight oil for normal operating conditions year round. Additional detailed engine oil specifications can be found in "Section 6 – Fuel and Lubrication Specifications" of this manual. See Figure 8-1.

Figure 8-1

ENGINE COOLANT

⚠ WARNING ⚠

- **Always remove two step radiator cap with engine stopped.**
- **Remove filler cap slowly to relieve pressure. Steam can cause personal injury.**
- **Inhibitor contains alkali, avoid contact with skin and eyes to prevent personal injury.**

The radiator should be checked for coolant level and proper coolant mix to provide adequate heat transfer and anti-freeze protection.

Cat Engine – Maintain the engine coolant to 1½ inches from the bottom of the neck of the fill cap with clean, drinkable water. See Figure 8-2.

Figure 8-2

D.D.A. engine – Check coolant level by looking at sight gauge on the radiator expansion tank. The gauge should be completely full with a cold engine. If coolant is required, add only to the expansion tank through the fill opening at the top of the tank. See Figure 8-3.

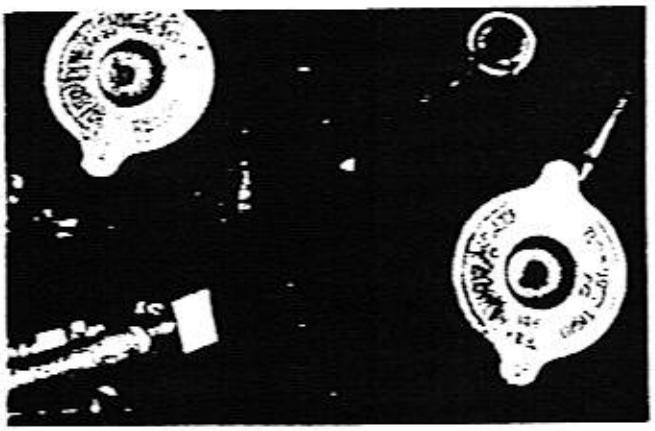

Figure 8-3

Use a 50-50 anti-freeze and water mixture, plus the addition of a separate lubricant and corrision inhibitor to aid in water pump lubrication and guard against internal corrosion and freezing.

BATTERY

The batteries are located in the engine compartment accessible from the left rear of the machine. See Figure 8-4.

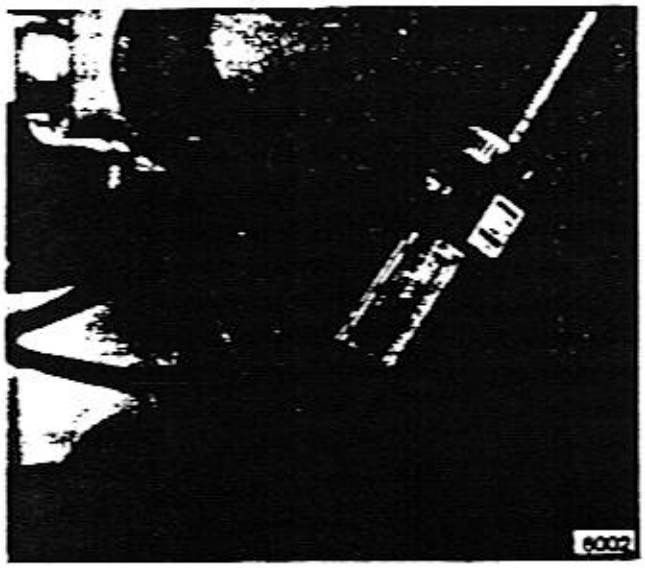

Figure 8-4

⚠ WARNING ⚠

Do not smoke when observing battery electrolyte level. Batteries give off fumes that can explode. Electrolyte is an acid and can cause personal injury if it contacts skin or eyes.

Check all battery connections, making sure they are tight and free of corrosion. Keep the battery clean at all times. Use a small amount of grease on the terminals to help keep them free of corrosion.

⚠ CAUTION ⚠

Be sure the battery area is well ventilated (clear of fumes) should it become necessary to connect a jump battery or battery charger.

Check that electrolyte level is to the full indicator and add clean, distilled water, if required. Use a battery hydrometer to measure the specific gravity in each cell. A fully charged battery will read 1.265 specific gravity at 80°F.

The hydrometer reading will not be absolutely correct until a temperature correction has been applied. At ordinary temperatures, the error will be very small, and no correction will be needed. However, at extreme temperatures, the correction is important, so the method of correction is explained in the following paragraph.

The temperature correction depends on the temperature of the electrolyte in the battery, NOT on the temperature of the air. To make the correction, the temperature of the electrolyte must be measured. The hydrometer is calibrated to read correctly at only one temperature (80° F.). The difference between this temperature and the electrolyte temperature is used to make the correction, at the rate of 4 "points of gravity" (.004) for every 10° F. difference. An example of this calculation:

BATTERY SPECIFICATIONS:

Amp Hour 20 Hr. Rate	225
Cranking Capacity @ 0° F. —	
Amp	300
Sec.	30
Volts.	10.40
Plates per Cell	29
Weight in pounds —	
Wet.	146.0
Dry.	104.0
Qts. Electrolyte to Fill	15.6 (14.8L)

Temperature below 80° F.	
Hydrometer Reading	1.250
Acid Temperature	20° F.
Subtract	.024 Spec. Gravity
Corrected Spec. Gravity	1.226
Temperature above 80° F.	
Hydrometer Reading	1.235
Acid Temperature	100° F.
Add	.008 Spec. Gravity
Corrected Spec. Gravity	1.243

Continued

BATTERY – CON'T

The following chart illustrates the typical ranges of specific gravity for a cell in various stages of charge. The values of specific gravity are given with respect to full charge reference values at 80° F. of 1.26 to 1.28.

TYPICAL RANGES OF SPECIFIC GRAVITY

1.260 Sp. Gr. to 1.280 Sp. Gr.	100% Charged
1.230 Sp. Gr. to 1.250 Sp. Gr.	75% Charged
1.200 Sp. Gr. to 1.220 Sp. Gr.	50% Charged
1.170 Sp. Gr. to 1.190 Sp. Gr.	25% Charged
1.140 Sp. Gr. to 1.160 Sp. Gr.	Very little useful capacity.
1.110 Sp. Gr. to 1.130 Sp. Gr.	Discharge

AIR CLEANER

The dry type air cleaner helps prolong the engine's life by preventing contaminants from being drawn into the intake manifold; it must be cleaned as often as dirt builds up to prevent air restriction.

When the air cleaner indicator, located on the air inlet pipe, (Cat engines) shows a red signal, a plugged air cleaner element is indicated and the element must either be cleaned or replaced. See Figure 8-5. DDA engines have a similar indicator under the air cleaner housing.

Figure 8-5

After servicing the air cleaner element be sure to reset the restriction indicator by pushing the button on the bottom of the unit.

TO SERVICE THE AIR CLEANER

1. Remove element from housing:

CAT Engine Only: Remove the precleaner cover and dump any dirt accumulation, then wipe the cover clean with a clean cloth. Remove element from housing. Make sure the cover seals all the way around the air cleaner body. See Figure 8-6.

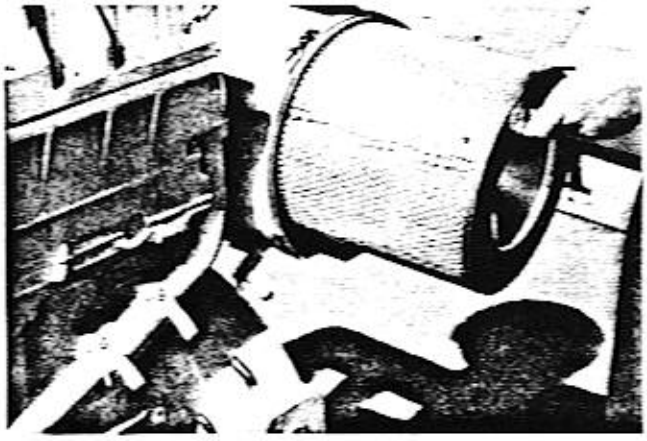

Figure 8-6

DDA Engine Only: Loosen the wing nut and pull the element from the housing using the handle provided. See Figure 8-7.

Figure 8-7

2. Wipe any dust out of the air cleaner housing with a damp cloth.

3. Install the element replacement, then close and secure the housing.

Continued

AIR CLEANER – CON'T

⚠ CAUTION ⚠

Use only factory recommended replacement elements. Other elements, although they may appear to fit, can cause severe engine wear.

4. Inspect the installation. Make sure that the air intake system piping joints are aligned and sealed. Check clamps for tightness, and make sure there are no cracks in the ducting or flexible connectors.

Make sure the cover (CAT Only) seals all the way around the air cleaner body.

CLEANING THE ELEMENT:

1. Before cleaning any reusable element, examine it carefully. Look for torn or punctured pleats, pin holes, and bent end covers of liners. Check the end gaskets. If damaged or missing, replace the element.

⚠ CAUTION ⚠

Do not attempt to rap, tap or pound dust out of an element. Severe damage to the filter can result. Do not attempt to clean or reuse an obviously damaged element.

2. If a light coating of dust is the main contaminant, compressed air can often be used to reclaim the element. Use this procedure:

a. Direct a stream of air up and down the pleats on the clean side of the element. Next, move the flow of air along the dirty side of the element to carry away the loosened dirt.

⚠ CAUTION ⚠

Do not allow air pressure to exceed 30 psi. Severe damage to the element may result.

3. Extremely dirty or sooty elements need more thorough cleaning. Clean these elements as follows:

a. Remove loose dust with a flow of water, 40 psi or less, or air 30 psi or less.

b. Soak the element in a solution of reputable filter cleaner for 15 minutes or more. DO NOT exceed 24 hours. DO NOT allow the temperature of the solution to exceed 140°F. Swish the element around occasionally or introduce bubbles of compressed air into the solution to shorten cleaning time.

c. Remove the element and rinse it from clean side to dirty side with a gentle stream of water (40 psi or less, no nozzle on the hose). Rinse until the water comes through clear.

d. Allow the element to air dry completely before reinstalling.

⚠ CAUTION ⚠

Do not use compressed air or light bulbs to shorten drying time. High pressure air can tear holes in wet paper pleats, and light bulbs can burn the element.

4. Inspect the element for holes and tears by looking through the element toward a light bulb. Pin holes or the slightest tears will admit enough airborne dirt to render the element unfit for service. Use of a damaged element can lead to rapid piston ring wear and serious engine damage. After cleaning, check the element and gaskets. If gaskets are damaged or missing, replace the element. Finally, DO NOT risk engine damage by overusing the element. Replace the element after six cleanings or yearly, whichever occurs first.

FUEL TANK

⚠ WARNING ⚠

Never fill the fuel tank with the engine running, near an open flame, or when smoking. Always wipe up any spilled fuel.

The fuel cap is located on left side on the rear of the machine. Fill the fuel tank at the end of each day to prevent moisture in the tank from condensing. Use No. 2 Diesel Fuel. See Figure 8-8.

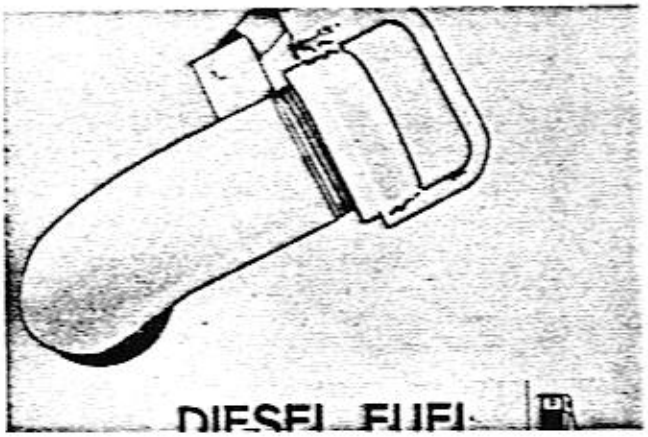

Figure 8-8

HYDRAULIC OIL

Since the reservoir supplies oil for the unit's hydraulic system, it is essential that the hydraulic oil level be checked daily. A sight gauge is located on the front of the tank and may be seen from the side or top access doors at the rear of the machine. Maintain oil in sight glass at all times. Hydraulic oil specifications are described in Section 6 of this manual and proper changing procedures are described in "Section 13 - 1000 Hour or Annual Routine Maintenance".

Remove the hydraulic fill cap and fill the tank. See Figure 8-9.

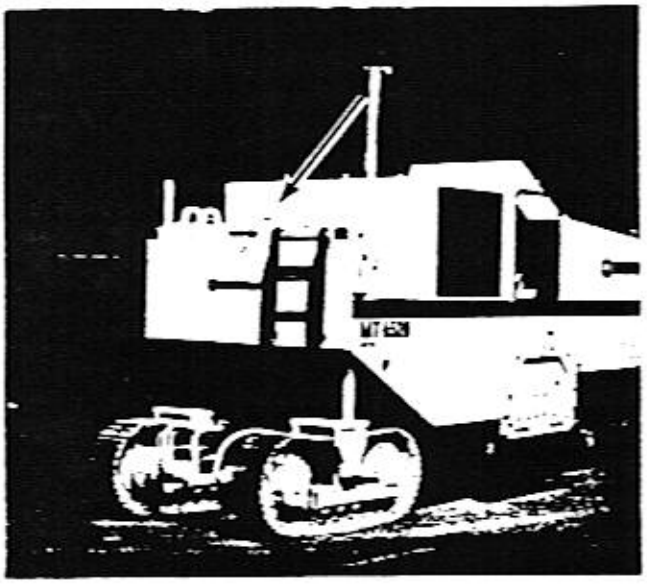

Figure 8-9

Use clean hydraulic oil from previously unopened containers. First, filter the oil through a 20 micron filter. Once the holding tank for hydraulic oil is filled (MW-6520 only), use the hand pump to transfer the oil through a 3 micron filter into the hydraulic reservoir. Repeat these steps until the oil registers full on the hydraulic tank sight gauge.

⚠ CAUTION ⚠

A clean, contaminant-free system is extremely important to the machine's proper function. Take extra care when working with the hydraulic system to insure its complete cleanliness.

WATER STRAINER

The Water Strainer is accessible from the left side of the machine next to the water pump assembly. Remove the bottom cap on a daily basis and remove any imbedded impurities from the strainer with a stiff fiber brush. See Figure 8-10.

Figure 8-10

CUTTER DRUM BEARING (Earlier Models)

Lubricate the one (1) fitting located on the right end of the cutter drum with 25 shots of multi-purpose EP grease. It is essential that this bearing be lubricated daily to ensure proper operation of the cutter drum. See Figure 8-11.

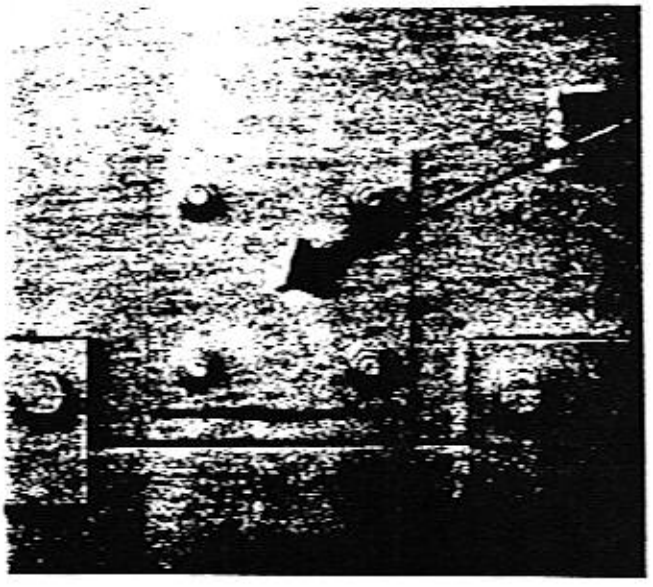

Figure 8-11

WATER NOZZLES

The water spray system cools the cutter teeth and keeps dust to a minimum while the machine is cutting. There are a total of twelve (12) water spray nozzles to cover the cutter drum that can be removed for cleaning. Use a cleaning wire to help remove any obstructions from the nozzles orifice.

WATER PUMP FITTING (Some MT-6520's)

Lubricate the one (1) fitting located on the water pump with 2 to 5 shots of MPG-EP grease. Refer to Figure 8-12.

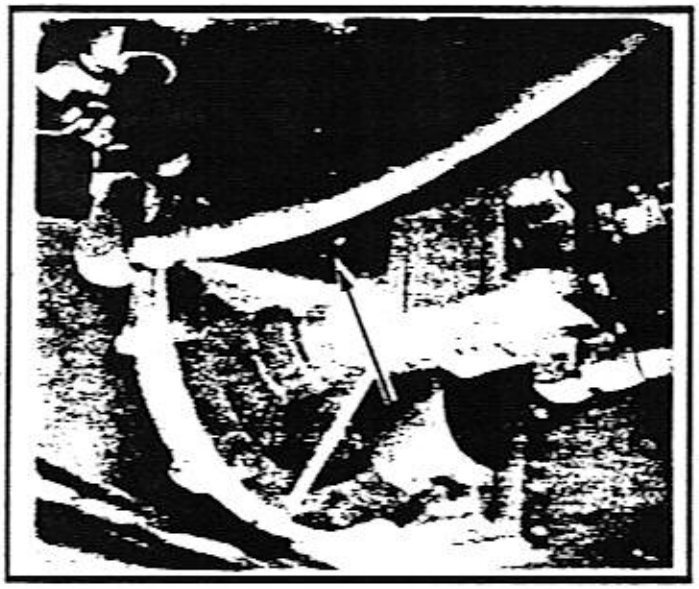

Figure 8-12

CONVEYOR GREASE BANK (Not All Models)

The Grease Bank is located on both sides of the conveyor and enables the rollers on the conveyor to be greased at one convenient location. Each of the 22 fittings is to be lubricated with four (4) shots of MPG-EP grease.

BELTS

Adjust the belts. Refer to Section 14.

MANUAL CLUTCH

Adjust the clutch. Refer to Section 14.

HYDRAULIC CLUTCH OIL

Check the oil in the hydraulic clutch by looking to ensure that oil is visible in the sight level gauge. If oil must be added, ensure that only the specified type on synthetic oil is used. Add oil as follows: Refer to Figure 8-13.

1. Remove the oil fill/breather and the sight level gauge.

2. Add the specified oil until oil just begins to drain from the oil level sight gauge extension pipe.

3. Allow the oil to completely drain. Clean and reinstall the sight level gauge and the fill/breather.

⚠ CAUTION ⚠

Use only the approved synthetic oil. Use of a non-synthetic oil will lead to seal failure. Refer to Section 6 of this manual for the list of approved lubricants.

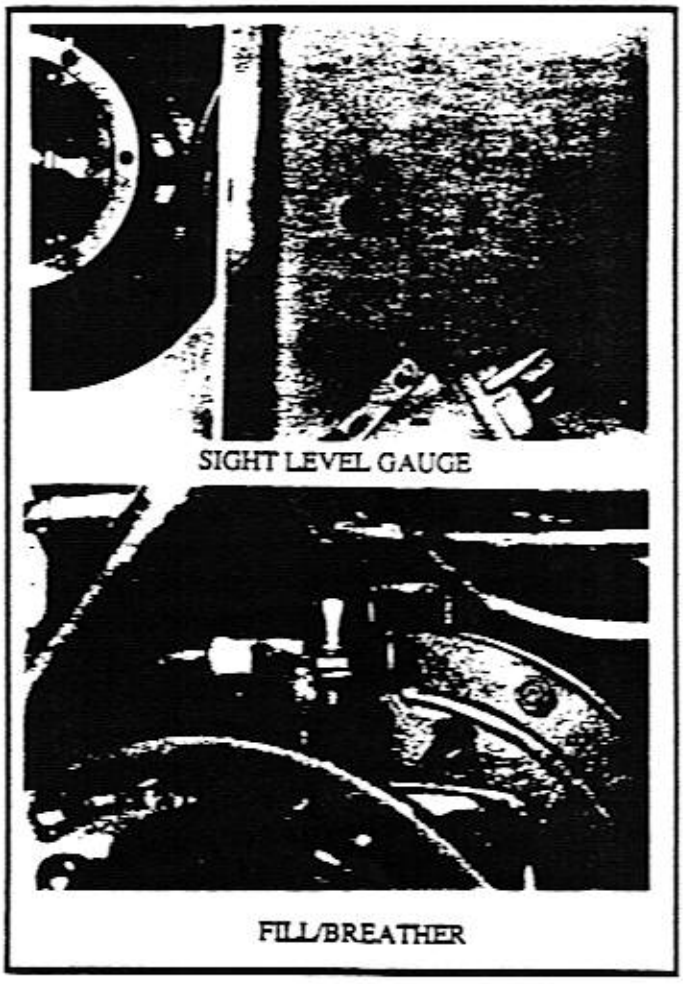

Figure 8-13

MANUAL CLUTCH THROW-OUT BEARING

Located on the clutch housing to the left of the inspection cover is the bearing grease fitting which requires three shots of MPG-EP grease. Refer to Figure 8-14.

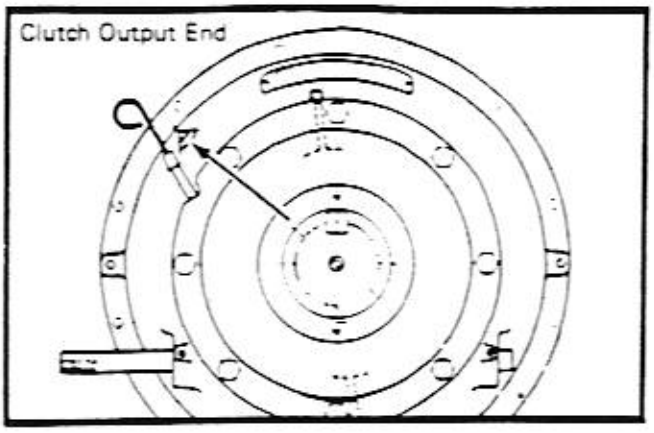

Figure 8-14

Contents Page

⚠ WARNING ⚠

Before performing any maintenance or repairs read and understand "Section 1 - Safety Precautions and Guidelines" of this manual to avoid personal injury.

⚠ DANGER ⚠

Shut down engine and apply parking brake, before working on machine. Failure to do this can cause serious cutting or crushing injury.

ALL FASTENERS

Make it a habit to check all critical fasteners to see that the correct torque valve is maintained. See Section 17.

CONVEYOR SWING CYLINDER (One Piece Only)

Located in the front of machine beneath the conveyor is the cylinder that controls the swing of the conveyor. Lubricate each fitting with two (2) shots of MPG-EP grease. There is a fitting at the rod end of the cylinder and a fitting at the base end. See Figure 9-1.

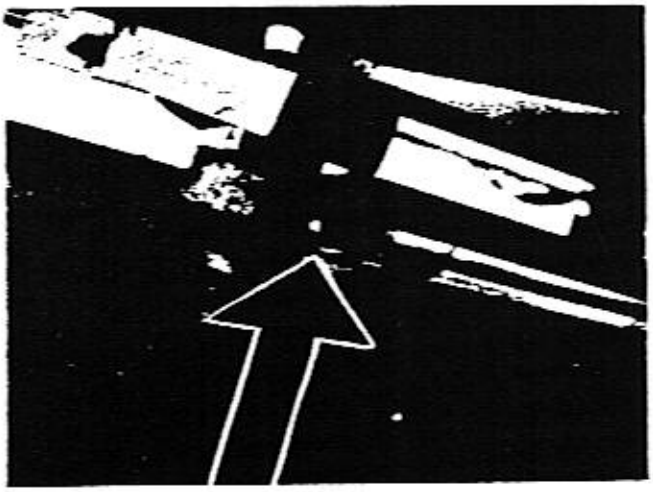

Figure 9-1

STEERING PINS (MT Only)

Located under the front of the machine are the steering pin fittings. There are fittings at each end of the steer cylinder and fittings at each end of the steer cross-link. Lubricate each fitting with two (2) shots of MPG-EP grease. See Figure 9-3.

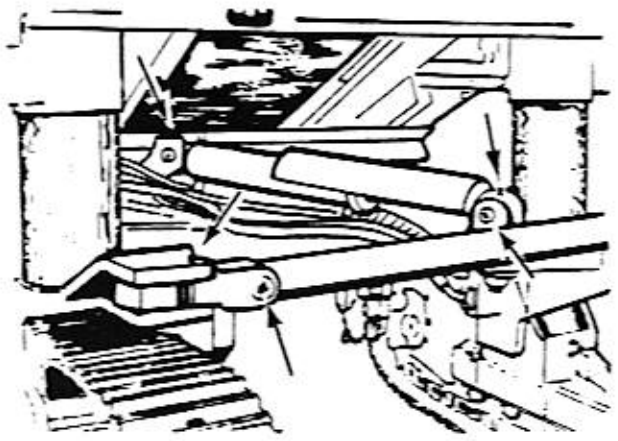

Figure 9-3

CUTTER DRUM PLANETARY

To check the oil in the cutter drum planetary, remove water spray nozzles at the 9 o'clock position (Figure 9-4) and the 12 o'clock position (Figure 9-5).

Figure 9-4

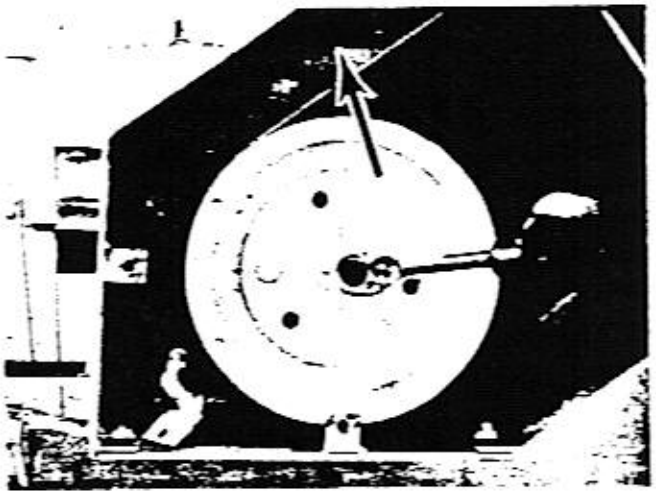

Figure 9-5

Rotate cutter drum with drum turning tool (if equipped) or a drag link socket until plugs are in 9 o'clock and 12 o'clock position. Remove plugs to check oil level. Replace them when you are done. Maintain oil level at 9 o'clock hole. Add, if necessary SAE 90EP (MIL-L-2105) oil through 12 o'clock hole.

WHEEL/TRACK DRIVE PLANETARY

On each of the four (4) wheels/tracks is a planetary gearbox that requires an oil check. To check the oil:

1. Rotate the wheel/track until the plugs are in the 12 o'clock/3 o'clock or 12 o'clock/9 o'clock position.

2. Remove both plugs and if oil is required, add SAE 90EP oil (MIL-L-2105). Fill through the 12 o'clock port until oil flows from the lower.

3. Allow oil to stop flowing from the lower port, then install and tighten both plugs.

4. Check for leaks. See Figure 9-6.

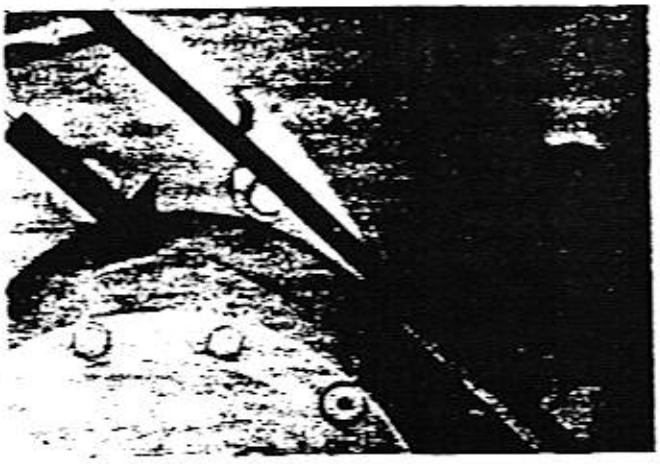

Figure 9-6

REAR/FRONT LEG TUBES

The machine travels up or down the leg tubes when elevating. Every 50 hours of operation or weekly, coat each leg tube with "Never-Seez" anti-seize compound or other manufacturers' equal, to allow smooth operation.

⚠ WARNING ⚠

DO NOT use your bare hands to apply the compound. Cuts or scrapes will occur.

See Figure 9-7.

Figure 9-7

MANUAL CLUTCH OUTBOARD BEARINGS

Mounted to the rear of the engine is the dry P.T.O. clutch assembly. The clutch outboard bearings are lubricated in an oil bath that requires routine lubrication checks. A dipstick for checking the oil is accessible from the left side of the machine above the guard that protects the cutter drum drive belts. Maintain the oil to the full mark on the dipstick. If required, add SAE 30 CC (MIL-L-2104) oil through the pipe plug/grease cap located next to the dipstick. See Figure 9-8.

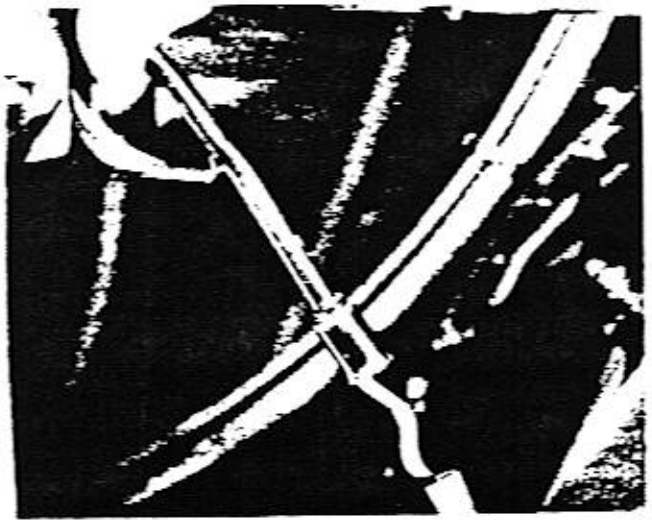

Figure 9-8

TRACK TENSION (MT-6520 Only)

Every 50 hours of operation, check the tracks for proper adjustment. Run the machine forward for at least 25 feet, (without backing up) before checking sag. Measured midpoint between the idler and sprocket, the deflection (dimension "A") on each track should equal from 1½ to 2 inches. See Figure 9-9.

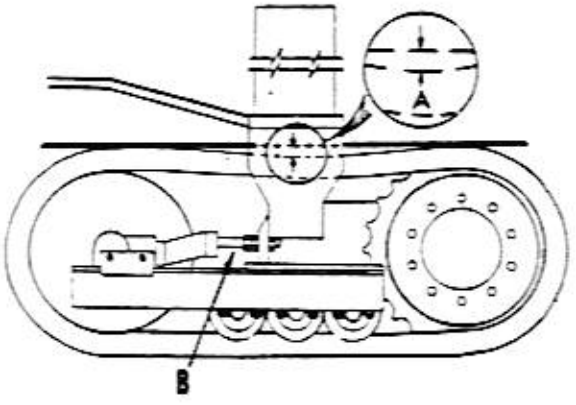

Figure 9-9

To accomplish this, place a straight edge, or run a string across the entire top length of the track and measure the sag between the straight edge and the top of the lowest track pad.

When adjustment is required, loosen the locknut on the adjusting rod "B" and turn the adjusting nuts in the desired direction. When complete, retighten the locknut.

⚠ CAUTION ⚠

DO NOT OVERTIGHTEN TRACKS. If you do, there will be excessive wear on the moving parts or track frames may bend.

CUTTER INPUT DRIVE

Located between the cutter drum sheave and the cutter drum gearbox is the reservoir for the cutter input drive bearings. Remove the belt guard, or open access door, to gain access to the fill port (at 12 o'clock position) located behind the cutter drum sheave.

Remove the level plug (at 3 o'clock position) to check the oil. The oil level is to be maintained to this port. If oil is required add SAE 90 EP (MIL-L-2105) oil until oil stops flowing from the level port. Replace the plug and check for leaks. See Figure 9-10.

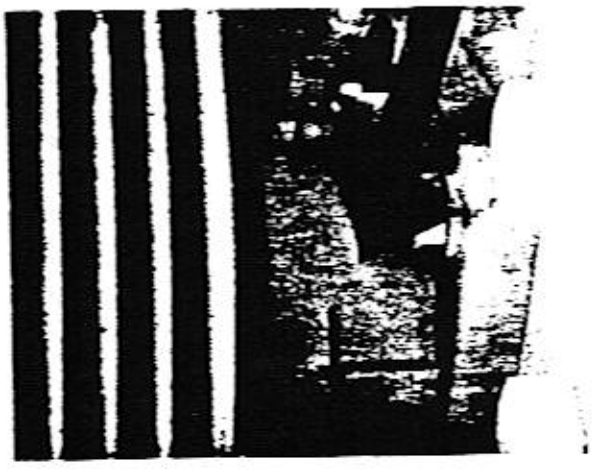

Figure 9-10

CUTTER PLANETARY SEAL DUST BOOT

On the cutter drum drive side, located just below the upper water nozzle is a grease fitting for the planetary seal excluder. The excluder protects the planetary from contaminants. Flush grease with 6 shots of MPG-EP grease. See Figure 9-11.

Figure 9-11

PUMP DRIVE GEARBOX OIL (CAT Engines Only)

Located adjacent to the engine is the pump drive gearbox that drives the hydrostatic pumps which power the propulsion, elevation and steering systems. A level plug is provided, in the rear end of the gearbox for checking the oil level.

Maintain the oil level to the level plug hole. If necessary add SAE 90 EP oil (MIL-L-2105) through the fill port, located on the top of the gearbox, until oil flows from the level plug hole. Clean and install all plugs. See Figure 9-12.

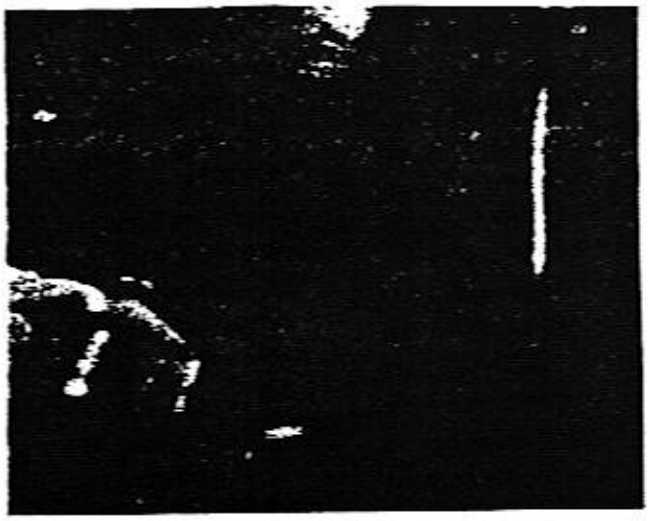

Figure 9-12

CONVEYOR SLIDE PLATE

There are two grease fittings on the conveyor slide plate. It has been determined that these parts no longer need to be lubricated.

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⚠ WARNING ⚠

Before performing any maintenance or repairs read and understand "Section 1 - Safety Precautions and Guidelines" of this manual to avoid personal injury.

⚠ DANGER ⚠

Shut down engine and apply parking brake, before working on machine. Failure to do this can cause serious cutting or crushing injury.

PROPULSION DRIVE U-JOINT ASSEMBLY (DDA Engines Only)

Remove access panels as required to reach the Propulsion Drive U-Joints. Lubricate two (2) fittings with two (2) shots of MPG-EP grease. See Figure 10-1.

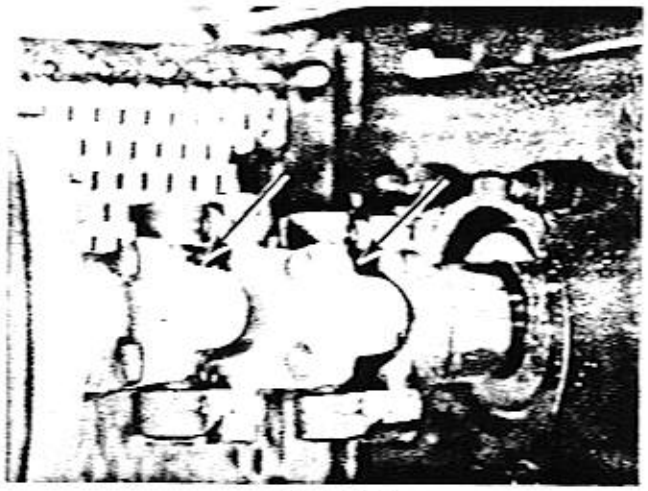

Figure 10-1

ENGINE OIL AND FILTER

The engine's oil is filtered by means of a spin-on type oil filter. Change both the engine oil and the filter. To assure complete removal of any contaminants still suspended in the oil, perform the oil change while the engine is still warm.

⚠ WARNING ⚠

Use extreme caution when working around a warm engine to avoid burns.

1. Remove drain plug from crankcase drain hose. See Figure 10-2. After draining the oil, clean and install the drain plug.

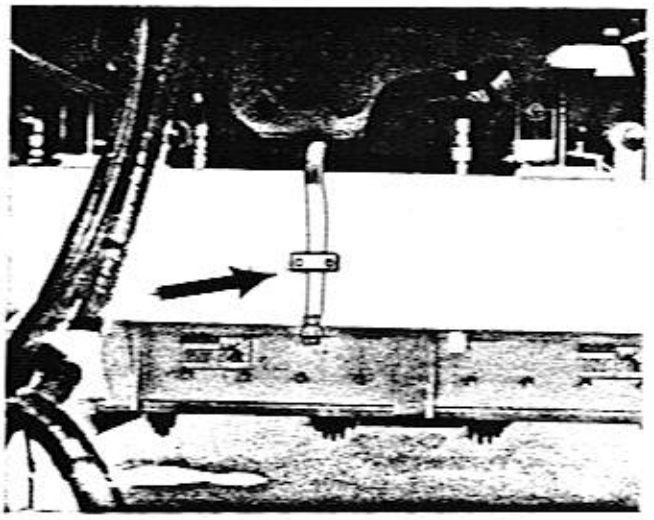

Figure 10-2

2. Unscrew and remove the used oil filter. Be sure the old filter gasket does not remain attached to the filter base, as leaking between the old and new filter gasket will result. For filter location, see Figure 10-3 and 10-4.

(Cat Engine)

Figure 10-3

Continued

ENGINE OIL AND FILTER – CON'T

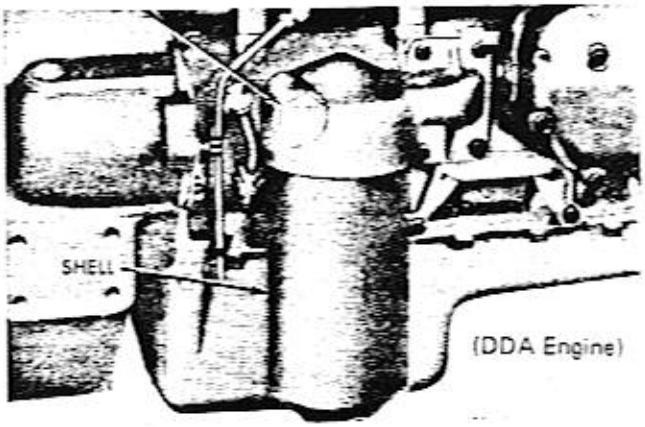

Figure 10-4

3. Wipe the filter base with a clean dry cloth.

4. Apply a thin coat of clean motor oil to the gasket on the new filter.

5. For the DDA engine only, pour clean engine oil into the new filter. Fill it 2/3 full. Do not pour any oil into a filter being used on a Cat engine.

6. Install new filter. Hand tighten it 1/2 to 2/3 of a turn after the gasket and the filter base make contact.

7. Fill the crankcase with SAE40CC oil (MIL-L2104) to the full mark on the dipstick.

8. Start the engine. Let it warm up and check for oil leaks.

DRUM COOLANT

Within the drum is a mixture of water and anti-freeze to aid in maintaining the temperature of the Cutter Drum at a safe level. At a regular interval of 100 operating hours, check and add if necessary a 50-50 mixture of water and a permanent type anti-freeze. The plugs to check/drain the level are located under the deck covers on the right side of the drum. Maintain level at eight (8) inches below fill plug (fill plug at 12 o'clock). See figure 10-5.

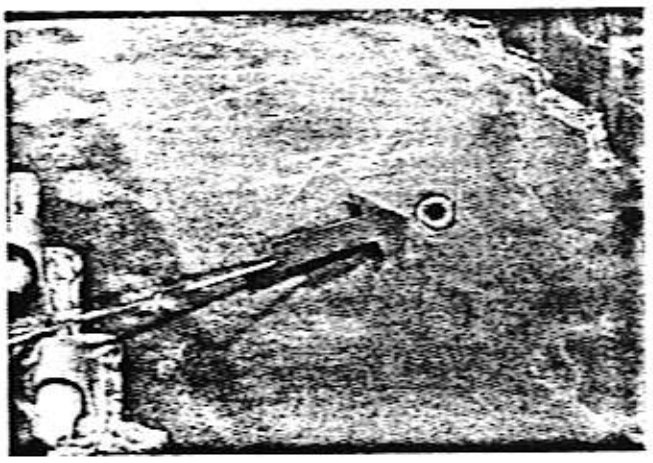

Figure 10-5

CLUTCH SHAFT BEARINGS

On each side of the clutch is a fitting to lubricate the operating shaft. Every 100 hours of operation lubricate each fitting with three (3) shots of MPG-EP grease. See Figure 10-6.

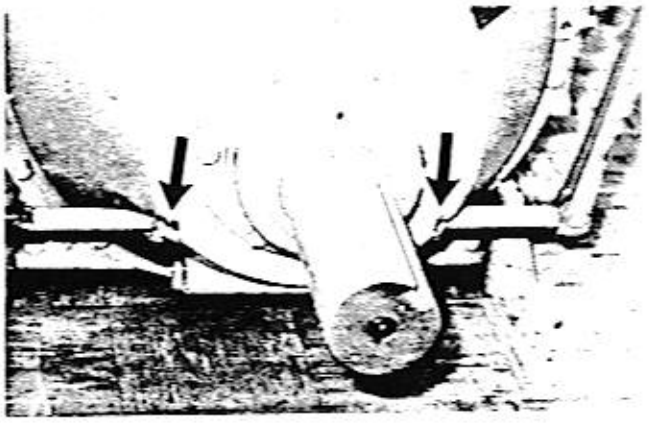

Figure 10-6

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⚠ WARNING ⚠

Before performing any maintenance or repairs read and understand "Section 1 - Safety Precautions and Guidelines" of this manual to avoid personal injury.

⚠ DANGER ⚠

Shut down engine and apply parking brake, before working on machine. Failure to do this can cause serious cutting or crushing injury.

MANUAL CLUTCH OUTBOARD BEARINGS

These tapered roller bearings are lubricated from oil contained in an oil cavity in the bearing carrier. To drain the oil remove the plug located on the bottom side of the bearing housing. See Figure 11-1.

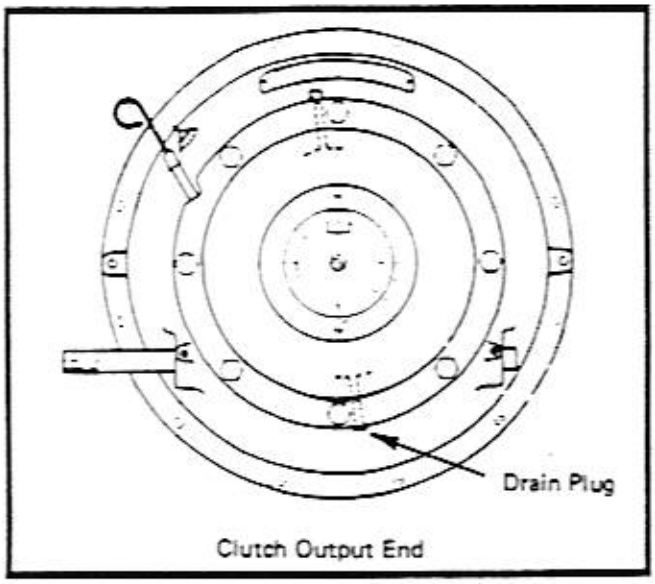

Figure 11-1

Refill, after reinstalling a clean plug, with SAE 30 (MIL-L-2104) oil through the port on the top of the clutch next to the dipstick. Maintain the oil to the full mark on the dipstick.

FUEL STRAINER AND FILTER (DDA Engines Only)

The Fuel Strainer and the Fuel Filter used on this unit utilize replaceable, spin-on type filters located on the right side of the engine. See Figure 11-2.

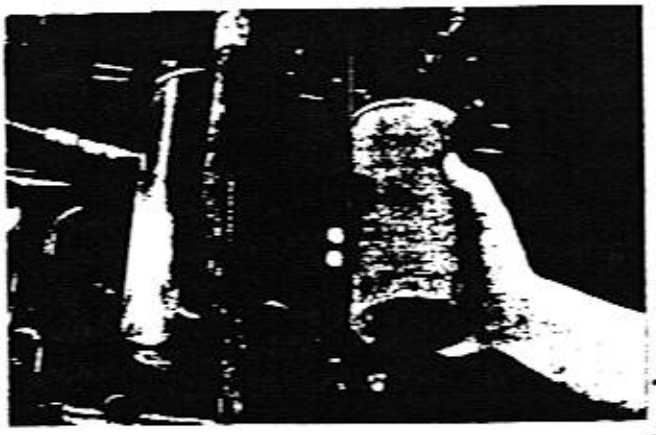

Figure 11-2

Replace both filters as follows:

1. Unscrew the old filter cartridge and strainer and discard them.

2. Clean gasket sealing surface on each filter base.

3. Fill the new replacement cartridges about two-thirds full with clean diesel fuel.

4. Coat the new filter gaskets lightly with clean fuel oil.

5. Install the new filters and tighten by hand two-thirds of a turn past the point where the filter gasket first contacts the base.

6. Start the engine and check for leaks.

FUEL PRIMARY AND FINAL FILTER (CAT Engines)

Replace Primary Filter as follows: See Figure 11-3.

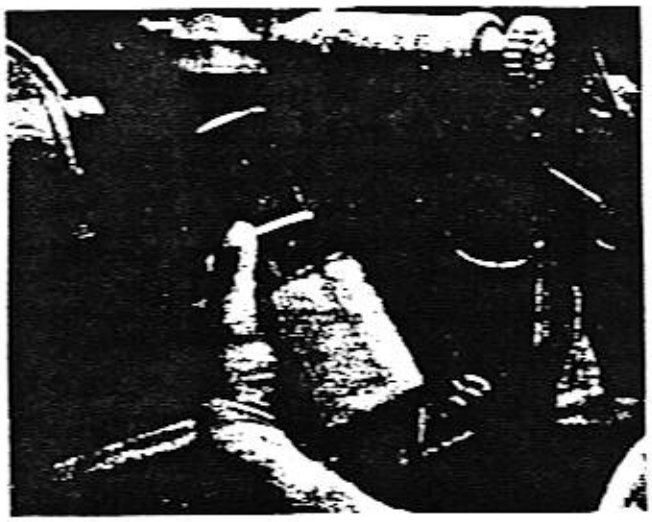

Figure 11-3

1. Stop the engine.

2. Loosen nut on filter cover and lower the filter assembly.

3. Remove the element. Wash cover and element in clean nonflammable solvent.

4. Replace the element in the shell and install the assembly as removed.

Replace the Final Filter as follows: See Figure 11-4.

1. Unscrew and discard the old filter. Be sure that no gasket material remains on the filter base.

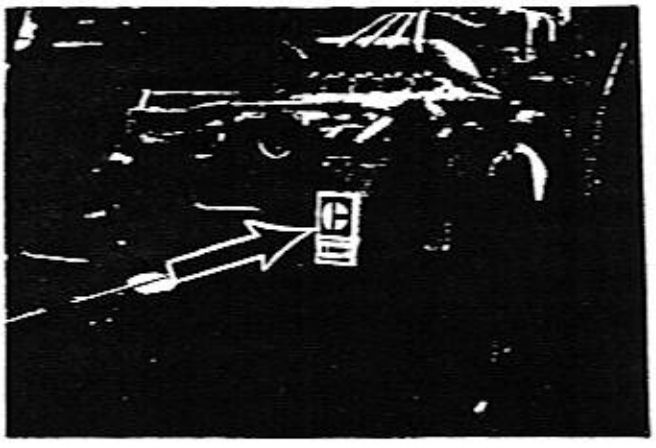

Figure 11-4

2. Clean the gasket sealing surface on the filter base.

3. Coat the new filter gasket, lightly, with clean fuel oil.

4. Install the new filter by hand. Tighten it ½ turn past the point where the filter gasket first contacts the base.

Prime the fuel system after filter replacement.

NOTE

To prime the fuel system, refer to the operator's manual for the engine. Failure to prime the fuel system allows air to remain in the fuel lines and prevents the engine from starting or causes misfiring.

⚠ CAUTION ⚠

Do not pour fuel into the new filter element before installing. Doing so allows unfiltered fuel to enter the engine and could prevent the engine from starting or not running smoothly.

Start the engine and check for leaks after filter replacement.

PUMP DRIVE BREATHER (CAT Engines Only)

The pump drive has a 5 psi pressure relief valve breather located on the top of the pump drive gearbox. Clean all dirt and possible contaminants from around the breather. Remove the breather, wash in solvent, dry thoroughly, reinstall and tighten. See Figure 11-5.

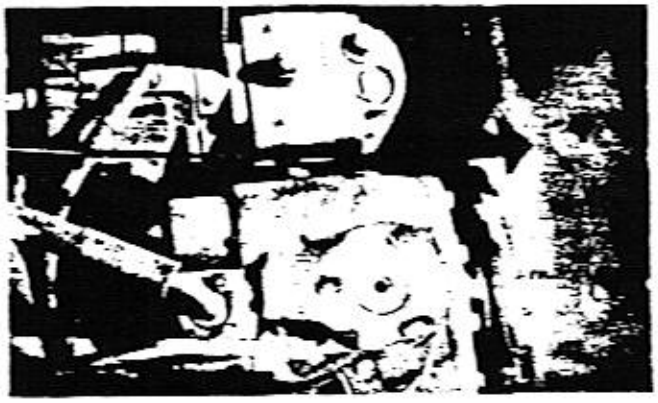

Figure 11-5

⚠ CAUTION ⚠

Be sure that the area around the breather is clean before removing. Dirt in this area may contaminate the oil and lead to rapid wear.

HYDRAULIC OIL FILTERS

There are spin-on hydraulic oil filters located in the engine compartment, accessible through the access doors. All filters should be replaced. MW-6520 machines have three (3) 10-micron filters and two (2) 3-micron return filters. MT-6520 machines have two (2) 3-micron return filters and two (2) 10-micron suction filters. Unscrew the old filters and discard. Fill each new cartridge with clean hydraulic oil (lightly oil the gasket on the filter) and install. Tighten ¼ of a turn beyond gasket contact. Check for leaks after starting the engine. See Figure 11-6, 11-7, and 11-8. Do not fill horizontally mounted filters with oil before installation.

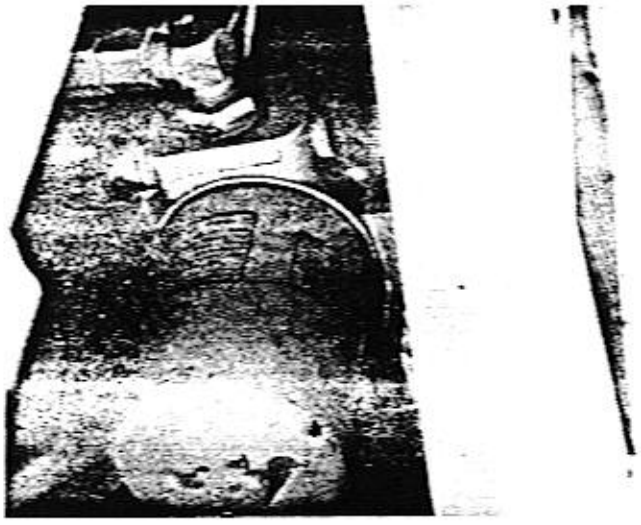

Figure 11-6

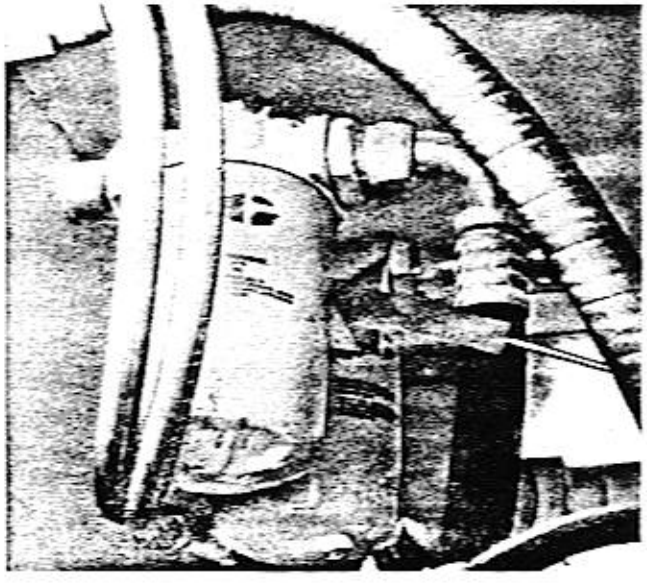

Figure 11-7

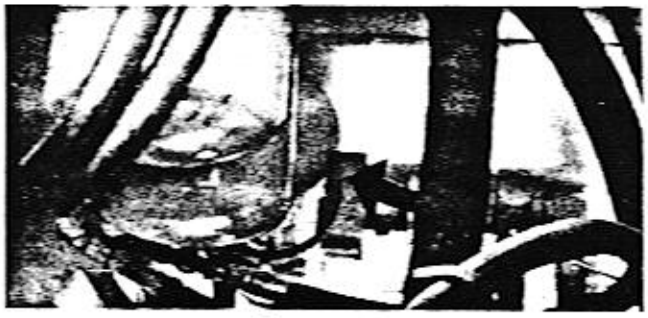

Figure 11-8

HYDRAULIC TANK BREATHER (MW-6520 Only)

Located near the rear left lift leg is the Hydraulic Tank Breather. This breather is a 20 micron hydraulic filter and should be changed every 300 hours of operation. Unscrew the old filter and discard. Lightly oil the gasket on the filter and screw the filter on. Tighten ¼ of a turn beyond gasket contact. See Figure 11-9.

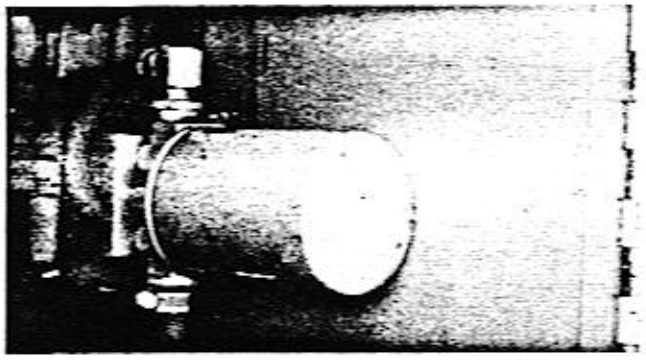

Figure 11-9

ENGINE FAN HUB

To ensure smooth operation of the fan hub lubricate the one (1) fitting with two (2) shots of MPG-EP grease every 300 hours of operation. See Figure 11-10.

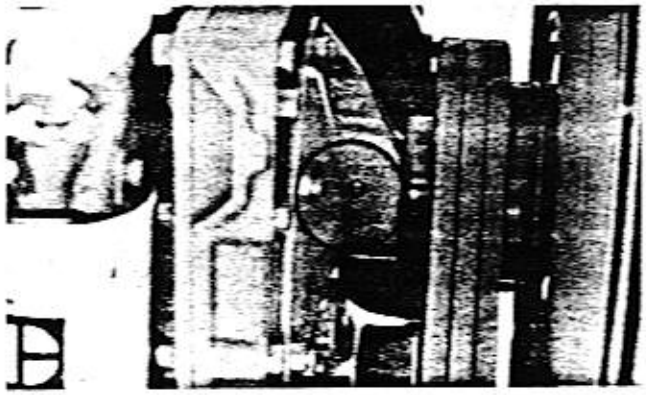

Figure 11-10

CUTTER DRUM INPUT BREATHER

This breather is located on the left side of the machine and attached to the inside of the belt guard. See Figure 11-11.

Figure 11-11

Clean breather as follows:

1. Unscrew breather from coupling.

2. Clean breather by soaking in non-flamable solvent and allow to air dry.

NOTE

Do not disassemble by removing the cap. The breather relief pressure is factory preset, disassembly will alter the setting.

3. Check operation by inserting a pencil tip into the threaded opening and pushing in on the poppet. If the poppet moves off its seat and you feel spring pressure on it, the breather is okay. If the poppet does not move or is loose, replace the breather.

4. Replace breather in coupling.

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⚠ WARNING ⚠

Before performing any maintenance or repairs, read and understand Section 1 - Safety Precautions and Guidelines of this manual to avoid personal injury.

⚠ DANGER ⚠

Shut down engine and apply parking brake, before working on the machine. Failure to do this can cause serious cutting or crushing injury.

CUTTER DRUM PLANETARY

The oil in the Cutter Drum Planetary is to be changed using the following procedure:

⚠ WARNING ⚠

Oil is to be at operating temperature for draining. Use caution, hot oil or components can cause burns if they contact skin.

⚠ DANGER ⚠

Be certain that the Parking Brakes are applied, elevation locking bars are in the locked position and the machine is properly chocked. Failure to do so could result in very serious injury.

1. Position the machine on level ground, apply the parking brakes, chock the machine and remove the two (2) plugs from the planetary. Refer to Figure 12-1.

2. Position the cutter drum so that one of the check/fill ports is in the 6 o'clock position.

3. Oil will drain from the 6 o'clock port.

4. Once the oil has completely drained, position the planetary so that one port is in the 12 o'clock position, and the other port is at 9 o'clock.

5. Add SAE 90 EP oil (MIL-L-2105) thru the 12 o'clock port until oil flows from the 9 o'clock port.

6. Allow the oil to stop flowing from the 9 o'clock port, then install and tighten both plugs.

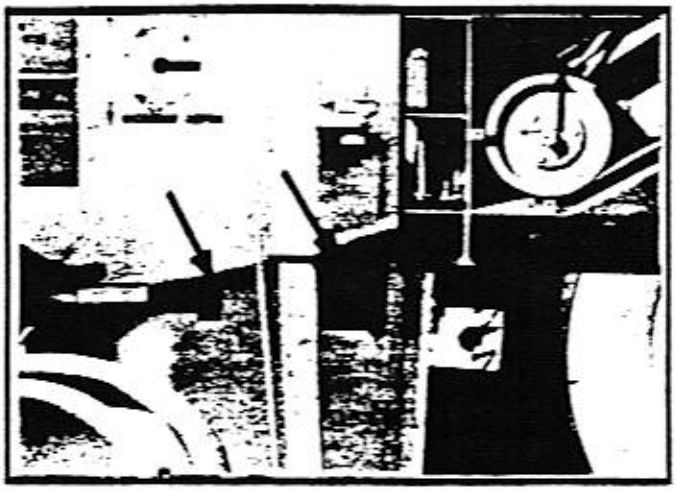

Figure 12-1

7. Check for leaks.

WHEEL/TRACK PLANETARY

The oil in each of the four (4) Wheel/Track Planetaries is also to be change, using the following procedure:

⚠ DANGER ⚠

Be certain that the Parking Brakes are applied, elevation locking bars are in the locked position, and the machine is properly chocked. Failure to do so could result in very serious injury.

⚠ WARNING ⚠

Oil is to be at operating temperature for draining. Use caution, hot oil or components can cause burns if they contact skin.

Continued

WHEEL/TRACK PLANETARY – CON'T

1. Position the machine on level ground, apply the parking brakes, chock the machine and remove the two (2) plugs from each of the gearboxes. See Figure 12-2.

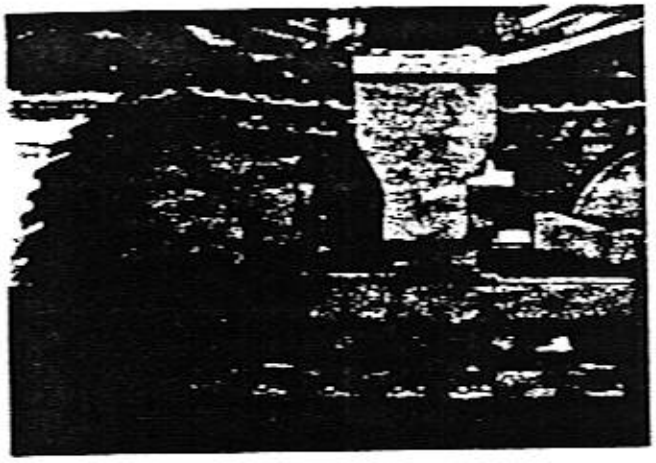

Figure 12-2

2. Position the wheel/track so that one of the check/fill ports is in the 6 o'clock position.

3. Oil will drain from the 6 o'clock port.

4. Once the oil has completely drained, position the wheel so that one port is in the 12 o'clock position.

5. Add SAE 90 EP oil (MIL-L-2105) thru the 12 o'clock port until oil flows from the lower port.

6. Allow the oil to stop flowing from the lower port, then install and tighten both plugs.

7. Check for leaks.

PUMP DRIVE GEARBOX OIL (CAT Engines Only)

The Pump Drive Gearbox Oil should also be changed, using the following procedure:

⚠ DANGER ⚠

Be certain the Parking Brakes are applied, elevation locking bars are in locked position and machine is properly chocked. Failure to do so could result in very serious injury.

1. Remove the drain, level and fill plugs. The drain plug is located on the underside of the pump drive and the fill plug is located beside the breather. See Figure 12-3 and 12-4.

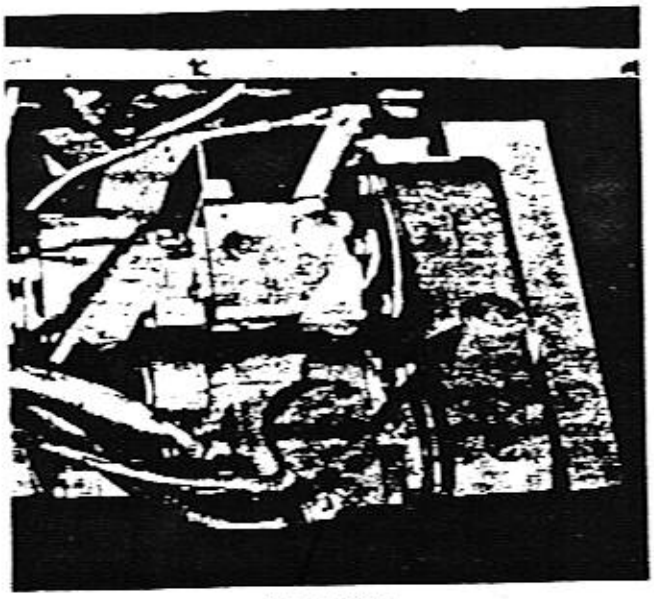

Figure 12-3

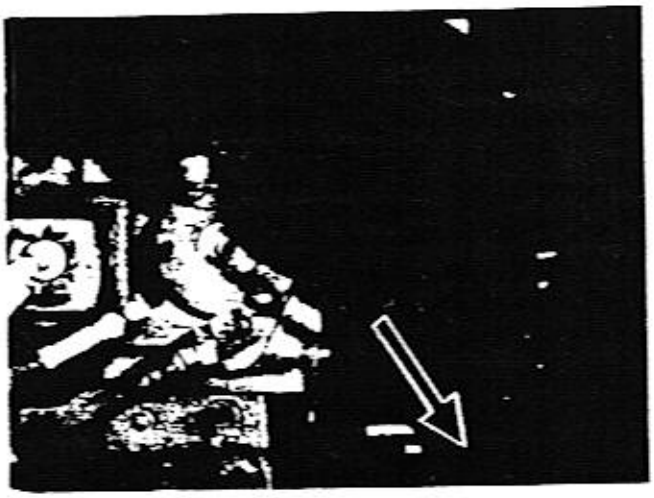

Figure 12-4

⚠ WARNING ⚠

Oil is to be at operating temperature for draining. Use caution, hot oil or components can cause burns if they contact skin.

2. Allow the oil to drain.

3. After cleaning the magnetic drain plug, reinstall and tighten.

4. Fill with SAE 90 EP gear oil (MIL-L-2105) until oil flows out the level port.

5. Reinstall the fill and level plugs and tighten.

6. Check for leaks.

CUTTER DRUM INPUT ASSEMBLY

⚠ DANGER ⚠

Be certain that the Parking Brakes are applied, elevation locking bars are in the locked position, and the machine is properly chocked. Failure to do so could result in very serious injury.

The oil in the Cutter Input Drive Bearing Reservoir is to be changed using the following procedures:

1. Remove the belt guard (on earlier models) or open the access door.

2. Remove the drain plug, located on the bottom of the reservoir, and the check/fill plug. Refer to Figure 12-5.

3. Drain the oil and reinstall the drain plug.

4. Add SAE 90 EP oil (MIL-L-2105) oil through the fill port until the oil begins to overflow. Once the oil stops flowing, install the check/fill plug.

5. After a short perior of machine operation, check for leaks.

HYDRAULIC CLUTCH OIL

The oil in the clutch is to be changed using the following procedure: Refer to Figure 12-6.

1. Remove the oil drain and fill plugs. Remove the sight level glass from the end of the extension pipe.

2. Allow the oil to completely drain. Clean and reinstall the drain plug.

3. Fill through the fill hole until oil flows from the extension pipe. Allow the oil to stop flowing and install the plugs and the sight level glass.

⚠ CAUTION ⚠

Use only the approved synthetic oil. Use of a non-synthetic oil will lead to seal failure. Refer to Section 6 of this manual for the list of approved lubricants.

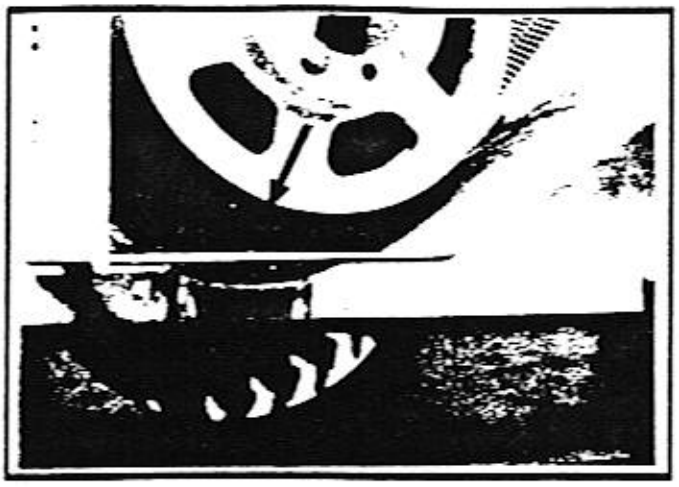

Figure 12-5

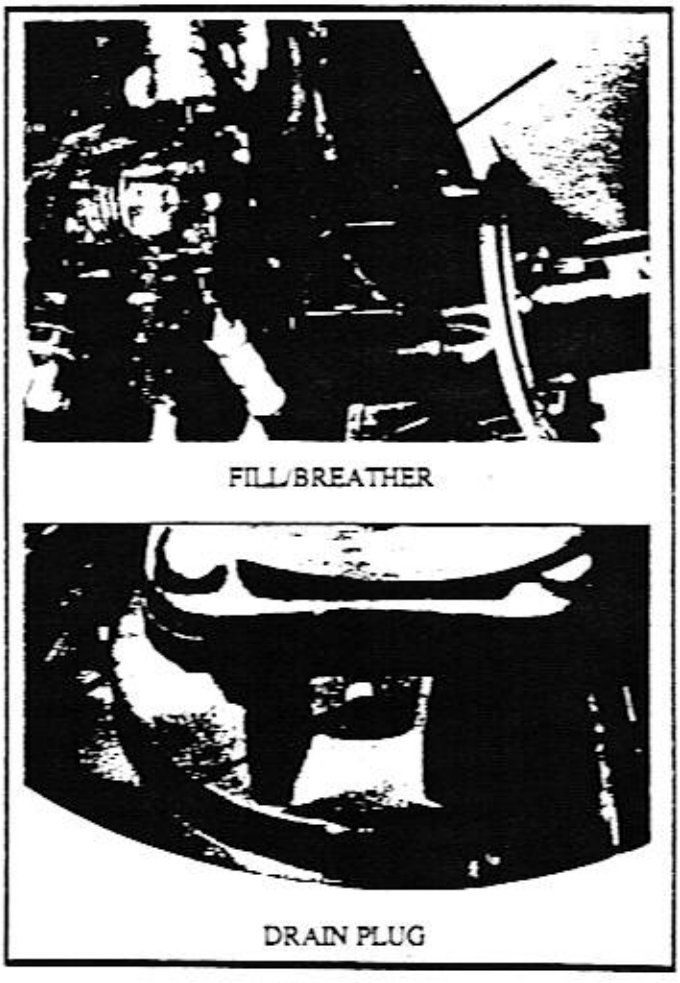

Figure 12-6

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⚠ WARNING ⚠

Before performing any maintenance or repairs read and understand "Section 1 - Safety Precautions and Guidelines" of this manual to avoid personal injury.

⚠ DANGER ⚠

Shut down engine and apply parking brake, before working on machine. Failure to do this can cause serious cutting or crushing injury.

HYDRAULIC OIL TANK AND SUCTION STRAINERS

At this interval, the Hydraulic oil is to be changed, the tank cleaned, and the Suction Strainers are to be cleaned in solvent or replaced if necessary.

⚠ WARNING ⚠

Hydraulic oil must be at normal operating temperature when draining the system. Caution should be taken when working with a warm system. You can be burned by hot fluid.

1. Drain the reservoir by removing the magnetic drain plug located on the bottom of the tank. Clean the plug.

2. Remove the twelve (12) 5/16-18 capscrews and lockwashers and remove the tank cover. See Figure 13-1.

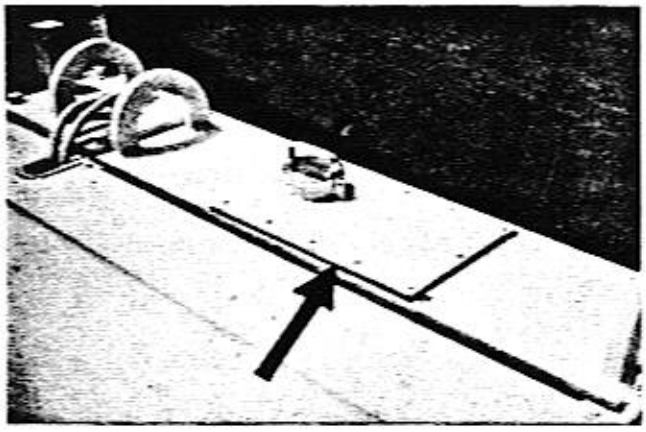

Figure 13-1

⚠ WARNING ⚠

Use care when working within the hydraulic oil tank. Wrench slipping may cause possible injury.

3. Each strainer is at the bottom of a pipe. Remove pipe and strainer as an assembly. If the strainer is damaged, replace it. See Figure 13-2.

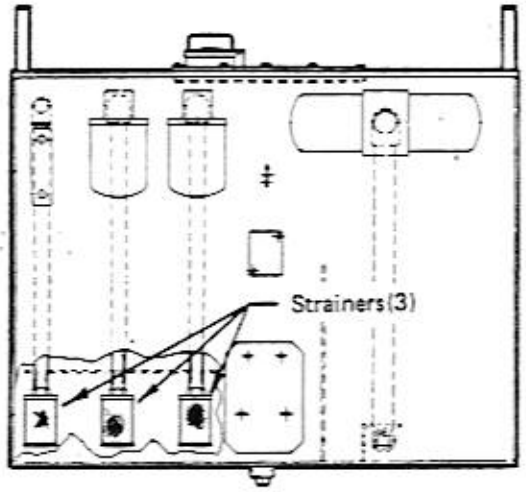

Figure 13-2

4. Clean strainers in a solvent, using a stiff fiber brush, to help remove imbedded impurities.

⚠ CAUTION ⚠

If imbedded particles cannot be removed, replace strainer. A partially plugged strainer will cause high vacuum, resulting in a "sluggish" operating machine and contribute to a contaminated hydraulic system.

5. Air-blow the strainer dry from the inside out.

6. Clean all dirt and contaminants from within the reservoir.

7. Replace strainer assemblies in tank.

8. Install the drain plug, new gasket, cover and all attaching hardware.

Continued

HYDRAULIC OIL TANK AND SUCTION STRAINER CON'T

9. Remove the hydraulic fill cap and fill the tank with clean hydraulic oil from previously unopened containers. First filter the oil through a 10 micron filter. Use oil as specified in "Section 6 – Fuel and Lubrication Specifications" of this manual. Fill until the oil sight gauge registers full.

⚠ CAUTION ⚠

A clean contaminant-free hydraulic system is extremely important to the machine's proper function. Use extra care when working on the hydraulic system.

WATER TANK

At least once a year, more often if conditions warrant, drain and clean the water tank. To drain the water, remove the plug located on the bottom of the tank. Fill the tank with clean drinkable water.

ENGINE COOLANT

Every 1000 hours of operation or yearly whichever occurs first the radiator is to be drained and flushed.

To drain the radiator a petcock is provided on the base of the radiator. At the same interval, drain the engine block. Refer to the engine operator's manual for the correct procedure.

⚠ WARNING ⚠

- **ALWAYS inspect the cooling system with engine stopped.**
- **REMOVE fill cap SLOWLY to relieve pressure. Steam can cause personal injury.**
- **Inhibitor contains alkali. AVOID contact with skin and eyes to prevent personal injury.**
- **Hot coolant will burn. Allow it to cool down before you drain it.**

Refill the radiator with clean, drinkable water. It is recommended to use a 50-50 anti-freeze and water mixture plus the addition of a separate lubricant and corrision inhibitor to aid in water pump lubrication and guard against internal corrision and freezing. On CAT Engines, maintain the coolant level 1½" from the bottom of the filler neck. On D.D.A. Engines fill to the proper level in the sight gauge.

AIR CLEANER ELEMENT

Replace used element with a new one. See Section 8.

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⚠ WARNING ⚠

Before performing any maintenance or repairs read and understand "Section 1 - Safety Precautions and Guidelines" of this manual to avoid personal injury.

⚠ DANGER ⚠

Shut down engine and apply parking brake, before working on machine. Failure to do this can cause serious cutting or crushing injury.

MANUAL CLUTCH ADJUSTMENT

⚠ CAUTION ⚠

When Clutch Lever is engaged, a distinct "click" must be heard when lever goes overcenter. If engagement is soft or lacks resistance, readjust clutch engagement as specified. Failure to adjust will result in premature wear and ultimate failure.

In order to determine clutch adjustment requirement, measure the force required to engage the clutch with a noticeable snap over center. A pull spring scale attached to the end of the clutch lever should indicate between 60 lbs. and 75 lbs. to completely engage the clutch. Never operate machine if the force required to the lever is less than 60 lbs. or more than 75 lbs. See Figure 14-1.

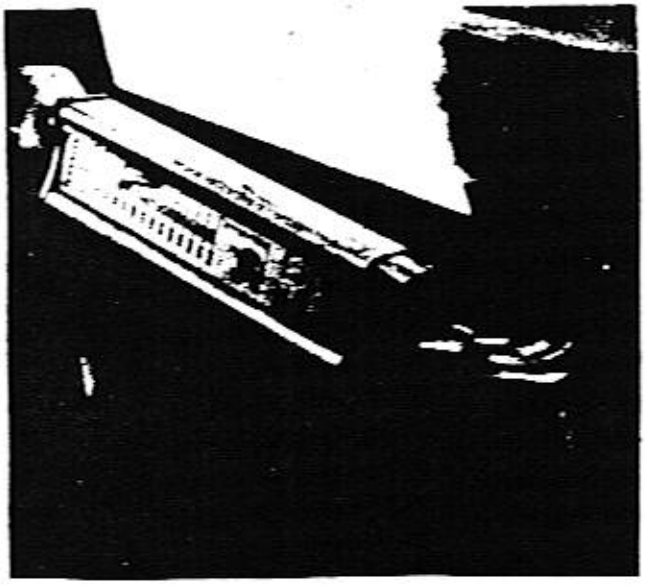

Figure 14-1

When adjustments are required, remove the instruction coverplate. Locate and disengage the adjusting lock pin by compressing its spring. See Figure 14-2. Hold the pin out while turning the adjusting yoke. Turn clockwise to decrease clearance between the clutch plates, increasing the lever pull. When the proper force is obtained to operate the clutch lever, release the adjusting pin. Continue to turn the yoke until the lockpin snaps into the closest lock position.

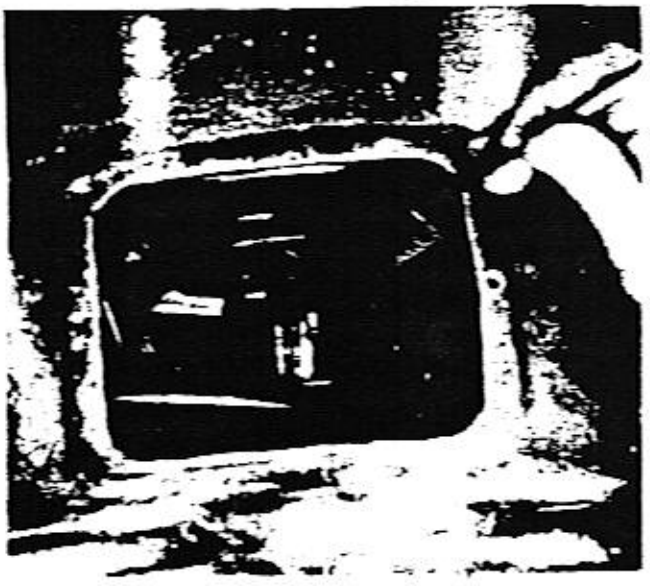

Figure 14-2

⚠ CAUTION ⚠

After adjustment and/or inspection ensure lubrication as described on the Lubrication Chart is performed. Failure to lubricate can cause unit down-time.

Continued

MANUAL CLUTCH ADJUSTMENT - CON'T.

After the clutch is properly adjusted, the clutch linkage should then be adjusted. On units with a turnbuckle, loosen the jam nuts and turn until the clutch lever is engaged in the latch. On other units, remove the lower ball joint from the pivot lever and turn ball joint one turn at a time until the clutch lever is engaged in the latch. Tighten all hardware.

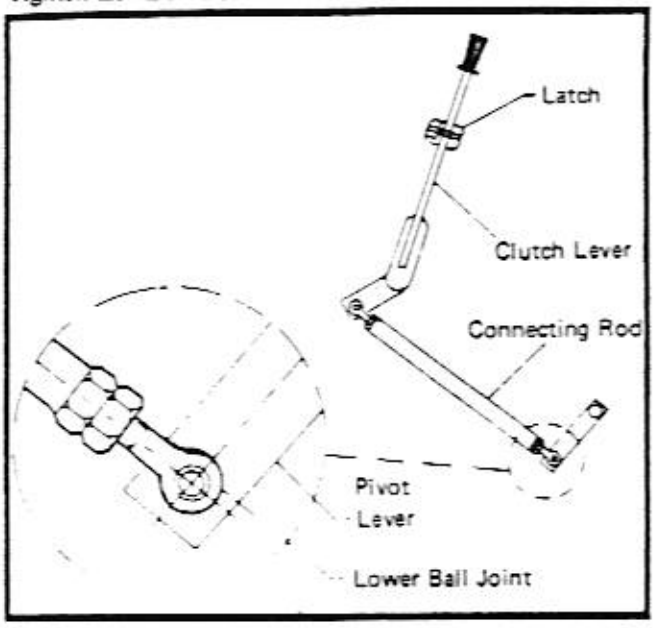

Figure 14-3

⚠ DANGER ⚠

Failure to readjust clutch lever into latch could result in unexpected cutter drum rotation. This could cause serious injury.

CUTTER TEETH REPLACEMENT

⚠ DANGER ⚠

Prior to changing any teeth or performing any service to the drum, insure the following:

- **Engine is shut down.**
- **Parking Brake Control Knob is pulled out. (Brake-ON)**
- **Wheels/Tracks are chocked.**
- **Elevation locking bars and pins are in the locked position.**
- **Verify instrument cover is closed and locked.**
- **Clutch is in the "OFF" position.**

Failure to do the above could result in very serious injury or death.

There are two basic types of cutter teeth - concrete and asphalt. Both types have carbide tips. The difference between the two is the diameter of the concrete tooth is much thicker through the body. Due to various milling conditions, life expectancy of teeth may vary.

To replace teeth:

1. Insert a draglink socket or drum turning tool (mounted inside cutter drum V-belt guard on some models) into slot in drum sheave. Rotate drum with tool to position teeth for replacement. See Figure 14-4.

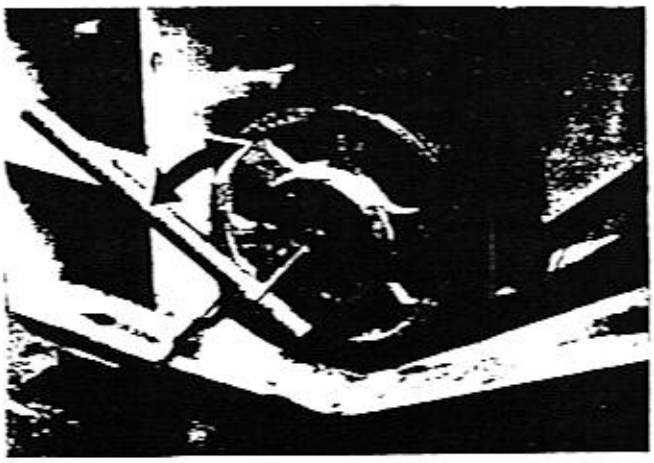

Figure 14-4

2. Remove teeth with one of these tools: a soft faced hammer and punch, an air tool or tooth removal tool from tooth manufacturer. Tap out tooth from the bottom of the holder. Stay clear of the tooth as it is removed. See Figure 14-5.

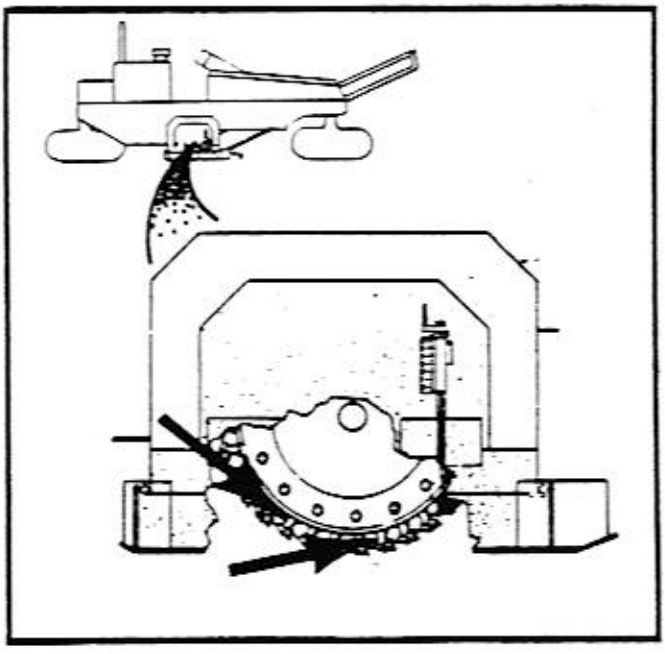

Figure 14-5

Continued

CUTTER TEETH REPLACEMENT – CON'T

⚠ CAUTION ⚠

Cutter teeth can fly free. Wear goggles, hard hat and ear plugs at all times when changing teeth.

3. Install teeth by gripping the retainer with pliers and tapping into place through top of holder. Use a soft face hammer. See Figure 14-6.

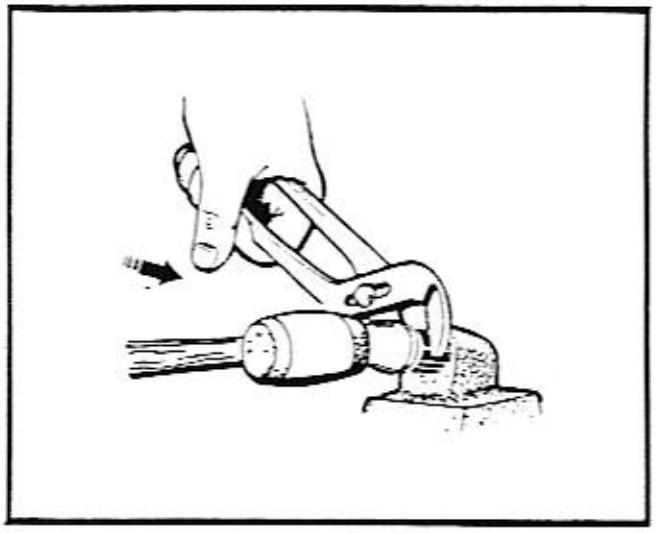

Figure 14-6

⚠ CAUTION ⚠

Carbide tips can shatter if you don't use a soft face hammer.

After installation, you should be able to rotate the teeth by hand. If you cannot rotate a tooth, remove it and determine the problem. Correct the problem.

Rotate drum with socket or tool to position teeth for replacement.

A complete set of teeth can be changed in approximately one hour. Unless otherwise specified, your milling machine will come to you with asphalt cutter teeth installed.

⚠ WARNING ⚠

Always remove drum turning tool prior to operating machine. Failure to do so could result in serious injury.

CONVEYOR BELT

The conveyor belt should be tightened until the slack side of the belt does not hit the cross members of the bottom of the conveyor frame. Do not overtighten belt; that would cause the belt to stretch or cause excessive bearing load.

Units prior to S/N 5080 except S/N 5067.

⚠ WARNING ⚠

Always use a safe method to reach the head pulley if conveyor belt adjustments are required.

1. Loosen locking nuts on adjusting rods on each side of conveyor. See Figure 14-7.

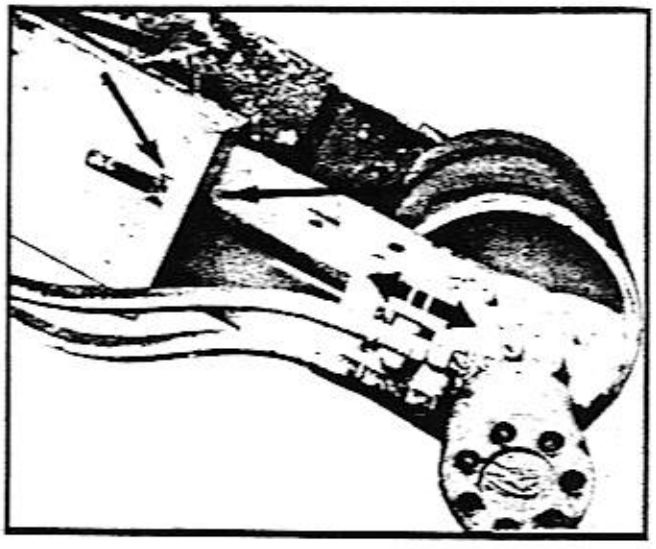

Figure 14-7

2. To adjust tension, turn the locking nuts, on each side, in the desired direction.

3. Run the conveyor and verify adjustment of belt tracking and correct tension. Tighten all adjusting hardware when completed.

Units effective with S/N 5067, 5080 and up.

1. Loosen locking nuts on motor mounting plates on each side of conveyor. See Figure 14-8.

2. Turn the adjusting nuts on each side to move the pulley in or out as required.

3. Tighten locking nuts on each side and re-check belt tracking and tension.

Continued

CONVEYOR BELT – CON'T

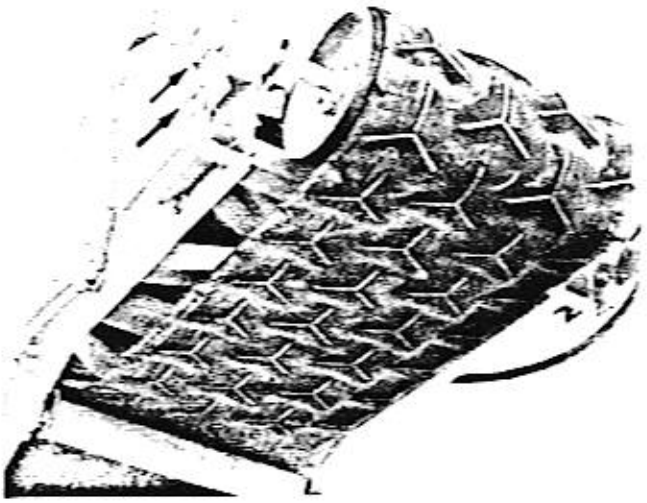

Figure 14-8

CUTTER DRUM V-BELTS

The cutter drum drive belt tension must also be maintained for proper belt life. The entire unit performance depends on a properly adjusted belt. Either an over-tensioned or a loose belt will cause premature failure.

MW-6520 and MT-6520 prior to S/N 5092.

1. Remove belt guard assembly.

2. Loosen the bolts (A) securing the power pack to the unit main frame assembly. See Figure 14-9.

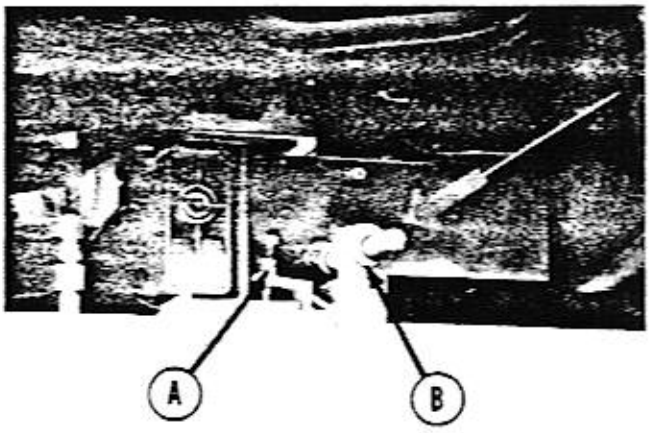

Figure 14-9

3. Loosen adjusting rod locknuts (B) on both sides and adjust the tension. Always turn the nuts equally to keep the engine in line so the belts will run true. See Figure 14-9.

MT-6520's will have two power-band belts. Proper adjustment will be to maintain 3/4 inch deflection at the mid-point of each belt with 80 lbs. of force.

MW-6520's have an eight belt set. Proper adjustment will be 3/4 inch deflection at the mid-point of each belt with 28 lbs. of force (new) or 18-21 lbs. of force (broken-in).

4. Use a straight edge to check the vertical and horizontal alignment of the two sheaves. See Figure 14-10.

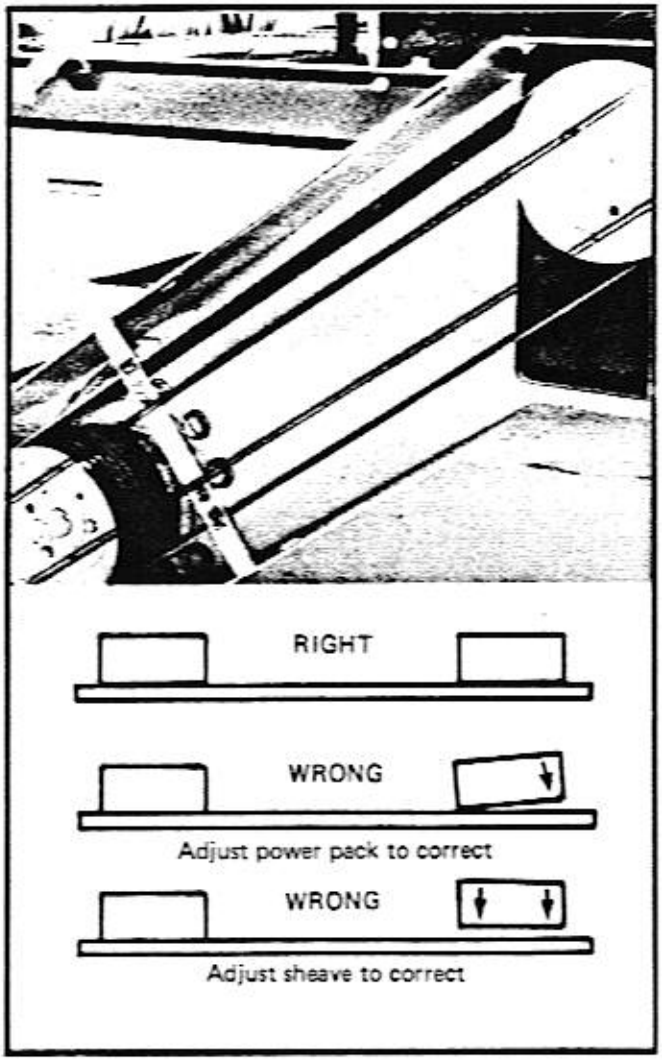

Figure 14-10

5. When you have the correct tension and alignment, tighten the locknuts. See Figure 14-9.

6. Replace belt guard assembly.

Continued

CUTTER DRUM V-BELTS – CON'T

MT-6520 effective with S/N 5092.

MT-6520's will have two power band belts. An idler wheel is used to adjust belt tension. New belts, properly adjusted, take a force of 224 lbs. (applied to both belts at midspan) to cause a 7/8" belt deflection. When broken-in, belts take a force of 112 lbs. to 174 lbs. to cause a 7/8" deflection.

To adjust:

1. Open belt guard door.

2. Loosen the four (4) idler lock screws. See Figure 14-11.

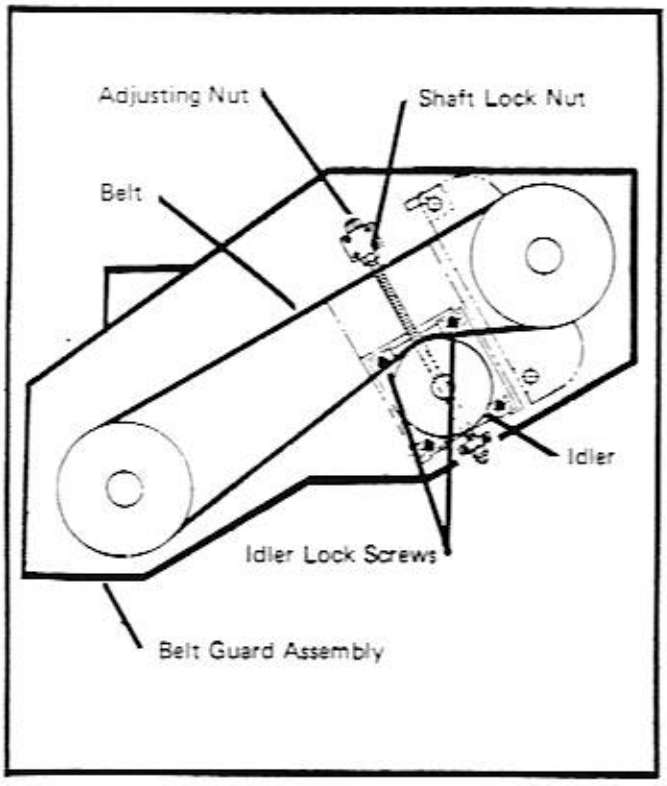

Figure 14-11

3. Loosen the adjusting shaft lock nut.

4. Turn the adjusting nut, until you reach the proper belt tension.

5. Tighten lock nut on adjusting shaft.

6. Tighten four (4) idler lock screws.

7. Close and secure belt guard door.

PUMP DRIVE V-BELTS (CAT Engines Only)

To drive the gearbox, proper belt tension must be maintained. Correct belt tension is a deflection of one-half inch midspan when 10 to 15 lbs. of force is applied to one belt. The use of a belt-tension gauge is required. See Figure 14-12.

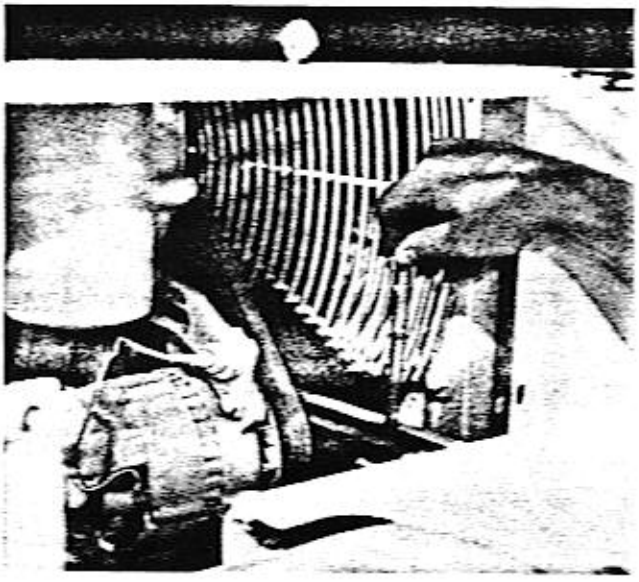

Figure 14-12

If adjustment is necessary, loosen the locking bolt under the pump drive gearbox and the jam nuts on the threaded rod between the engine and gearbox. See Figure 14-13. Tighten one locknut until proper adjustment is made. Secure mounting hardware under gearbox and locknuts on the threaded rod. Generally belts will ride smoothly. If quivering or flopping is observed check belt tension. Do not overtighten as belt damage could result.

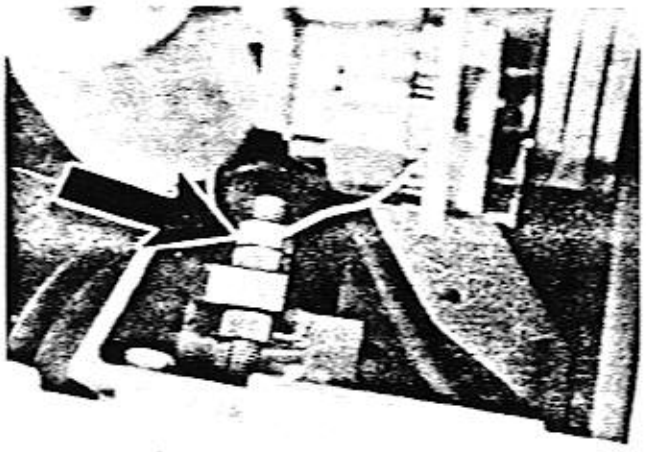

Figure 14-13

ENGINE V-BELTS

Belt tension for the fan and alternator for both Caterpillar and Detroit Diesel engines should be at 7/16 inch deflection, midspan, with 10 lbs. of force applied. If adjustment is necessary, loosen the required mounting hardware for each component and make the required adjustment. See Figure 14-14.

Figure 14-14

If you are using a belt tension gauge similar to the one shown in Figure 14-15, the belt tension is read directly.

On Detroit Diesel engines the fan drive belts should be at 60-80 lb. tension. The alternator drive belts should be at 40-50 lb. tension.

On Cat engines the belts should be at 120 ± 5 lb. tension (New) or 90 ± 10 (after running for 30 minutes at rated speed).

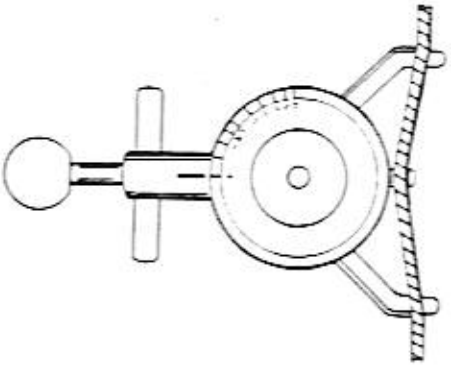

Figure 14-15

Note:

1. *Check tension after 30 minutes running time for new belts.*

2. *Check with gauge manufacturer if calibration is required for change in belt configuration.*

SECTION 15 – MISCELLANEOUS AND OPTIONAL EQUIPMENT

LIGHTS

This option consists of:

Headlamps – front mount (2)
Turn Signals – front and rear mount (4)
Brake Light/Running Light – Rear mount (2)
(with License Plate Light on right side)
Reflectors – Rear mount (2)
License Plate Holder – Rear Mount

The switches are located on the operators console. For more details contact your distributor.

ROTATING BEACON

The optional rotating beacon mounted on top of the engine cowling gives a visible warning to traffic. It is controlled by a switch mounted on the operators panel. This safety feature is especially valuable during the early morning and evening hours when visibility is limited. For more details contact your distributor.

AIR COMPRESSOR

This option has an Ingersoll-Rand air compressor package mounted on the back of the machine. The compressor is powered by a 11 hp gas engine. An air tool (with air hose) is stored in a lockable tool box. This option is especially useful for frequent cutter teeth changes. For more details, contact your distributor.

MT-6520 SLOPE CONTROL OPTION

With this option, the operator is able to set the desired finished slope by means of a hand crank and indicator dial. A "black box" measures the angle of the machine relative to gravity. If the angle changes, the "black box" activates a servo valve which will operate the proper front lift cylinder. This will bring the machine back to the set angle. This system will control either the left or right side; the ski mounted sensor assembly controls the other side. For more details contact your distributor.

FOLDABLE EXHAUST STACK

This option reduces the overall heighth of the machine to make it easier to haul the machine. For more details, contact your distributor.

SLOW MOVING EMBLEM

The optional slow moving emblem is mounted on the back of the machine. It warns approaching vehicles that the machine is operating at reduced speed. For more details, contact your distributor.

CONVEYOR COVER

This option consists of six sheet steel interlocking covers. This option is desirable for use in areas where dust control is necessary. For more details contact your distributor.

CIRCUIT BREAKER

Optional trip/reset circuit breakers mounted under the edge of the operators panel allow the operator to reset individual breakers should a temporary short or power surge occur. The breakers replace the fuses in the electrical system. For more details contact your distributor.

ENGINE WARNING LIGHT

This option alerts the operator with a visual signal. Should the engine oil pressure drop below a predetermined level, a switch on the sender lights a warning light on the operators panel. Also, should the engine temperature rise above a predetermined level, another switch lights the warning light on the operators panel. For more details, contact your distributor.

RUBBER TRACK PADS

This option is available on machines for use in areas where specifications require rubber track pads or "grousers". The bonded rubber pads are also available to replace unbonded triple grouser and master link assemblies on MT-6520's. For details, contact your distributor.

BACK–UP ALARM

The alarm is located on the top side of the fuel tank facing the rear. It is designed to sound an alarm to warn anyone in the path of the machine when it is traveling in the reverse direction.

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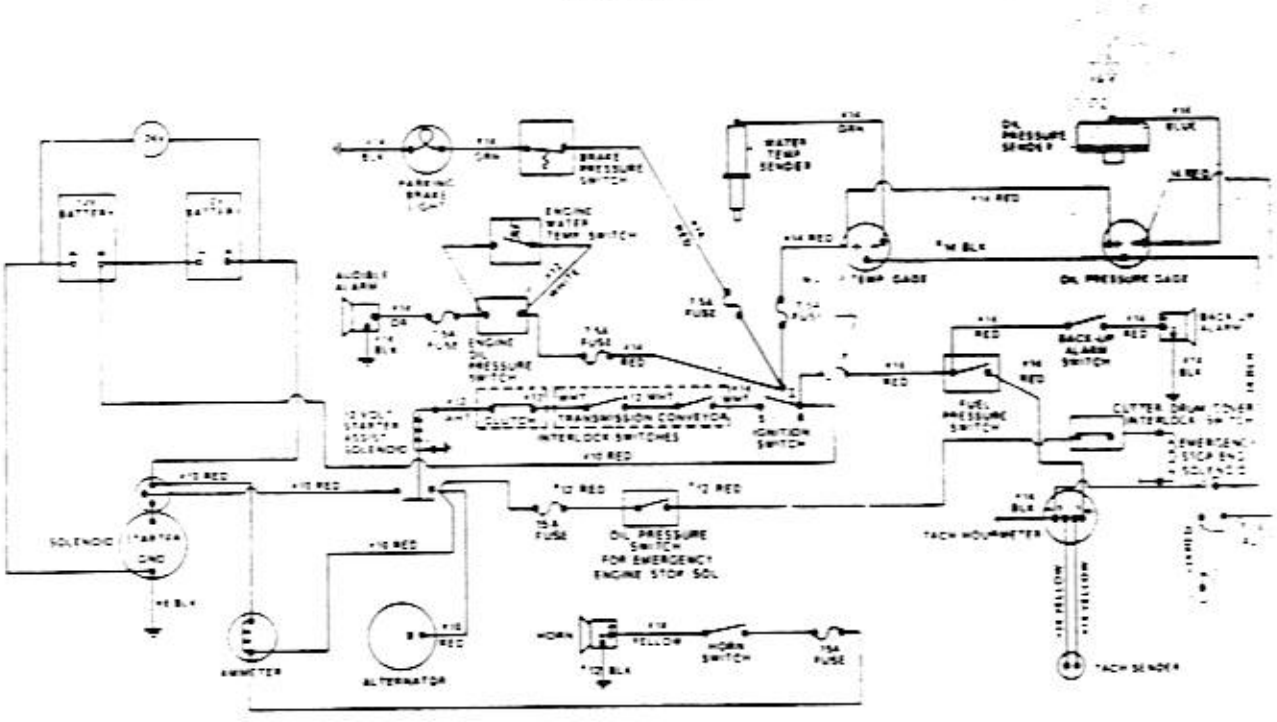
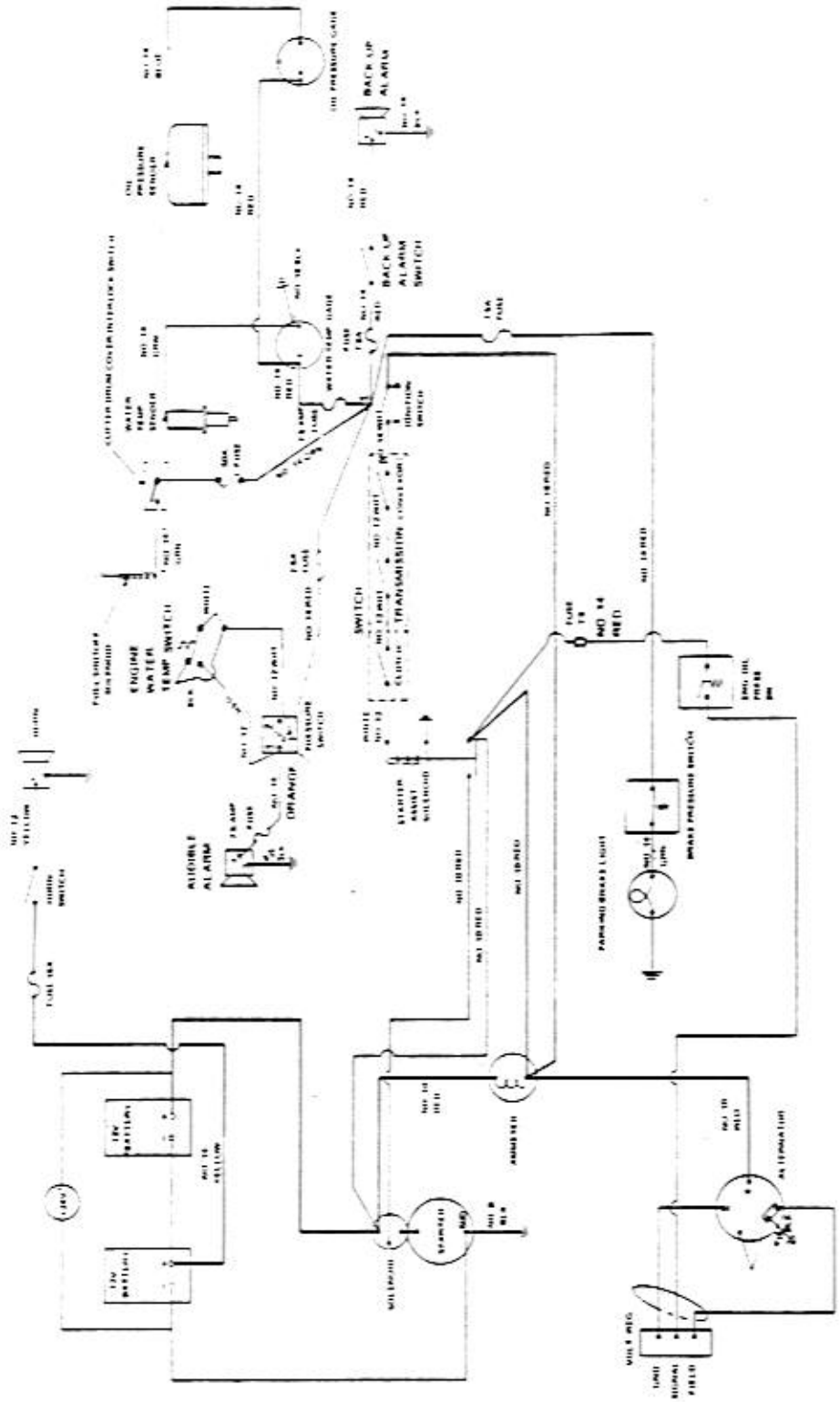
MT6520 ELECTRICAL SCHEMATIC (Manual Clutch)

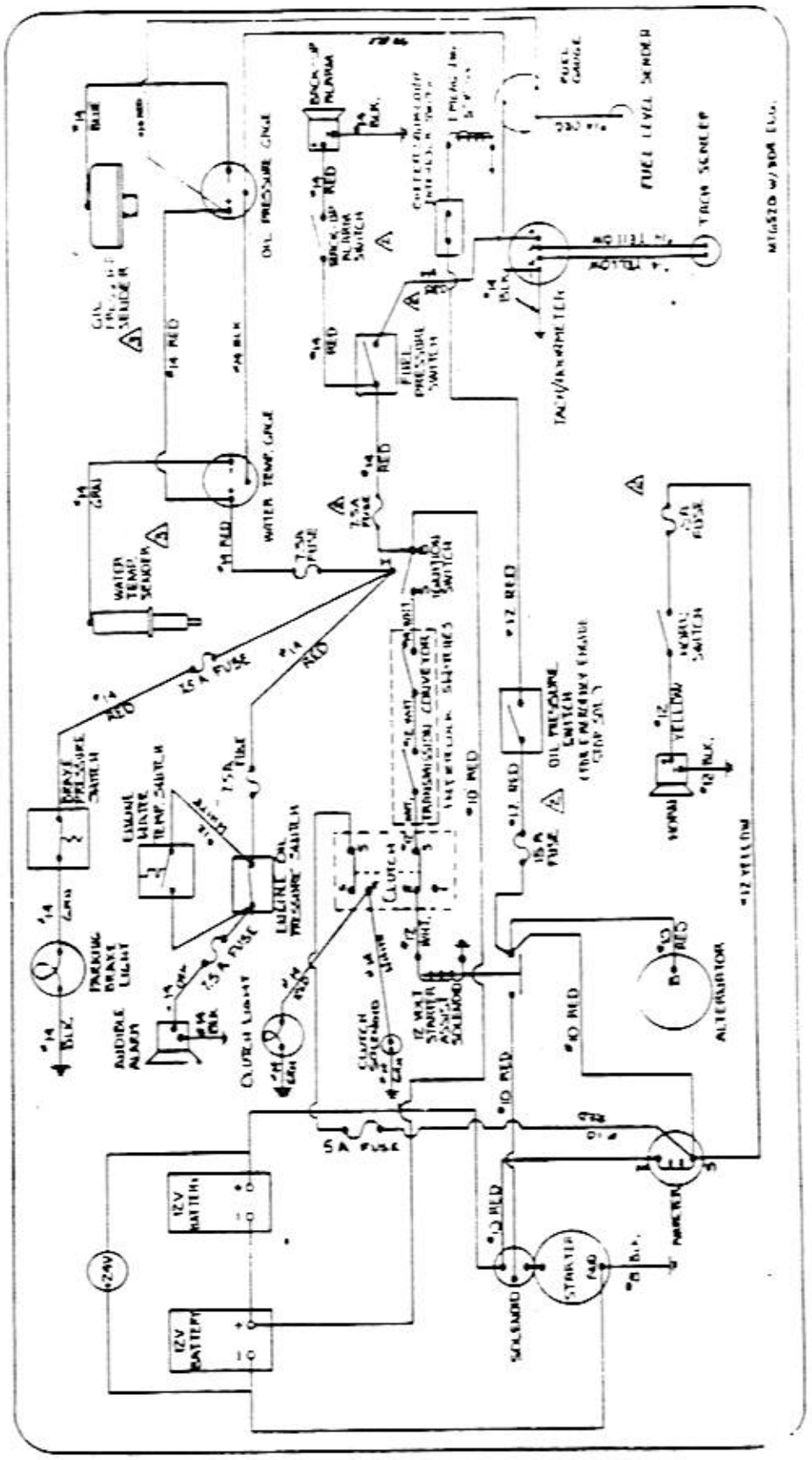
(DDA engine)



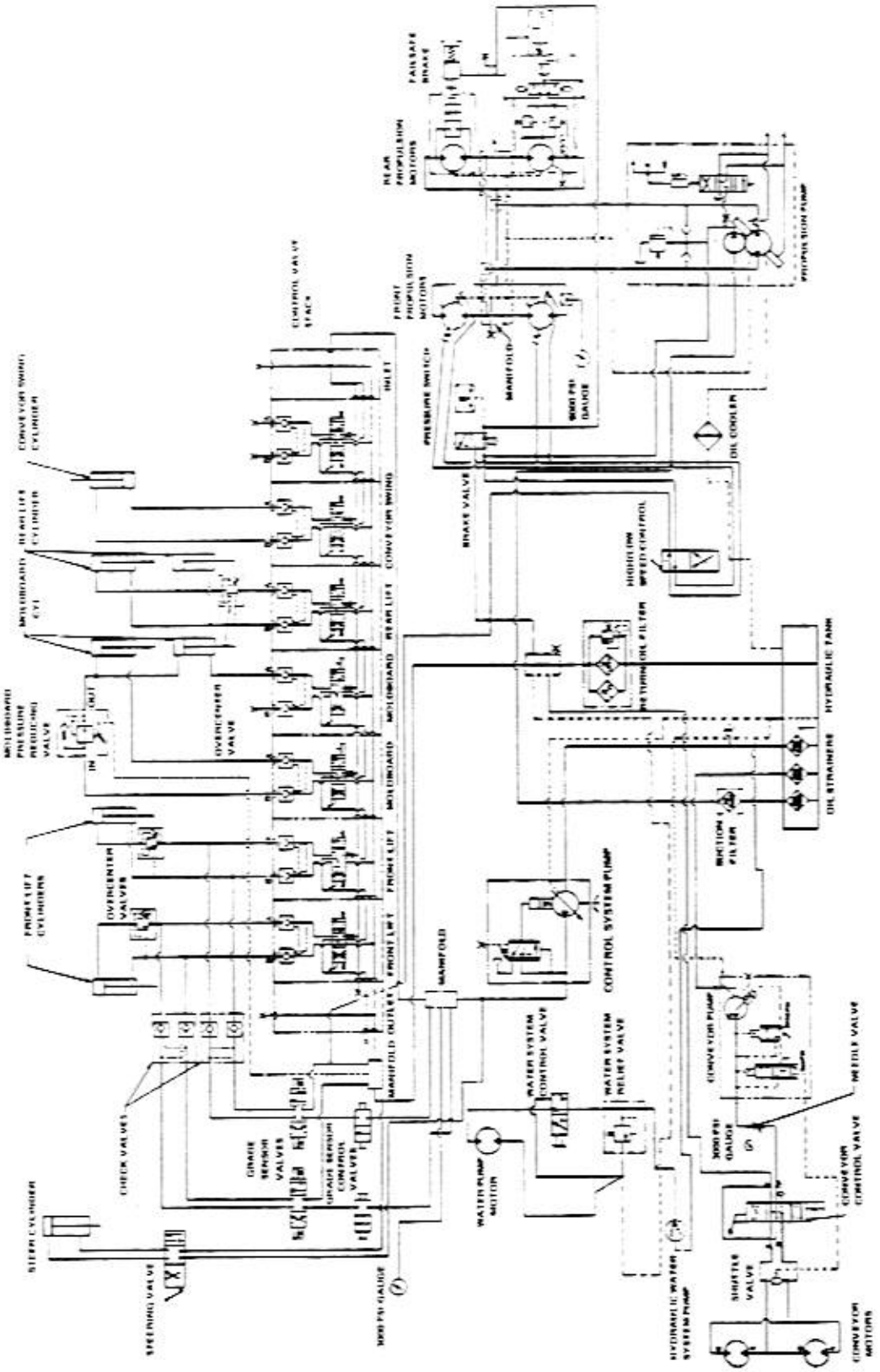
MW6520 ELECTRICAL SCHEMATIC (Manual Clutch)
(Cat engine)



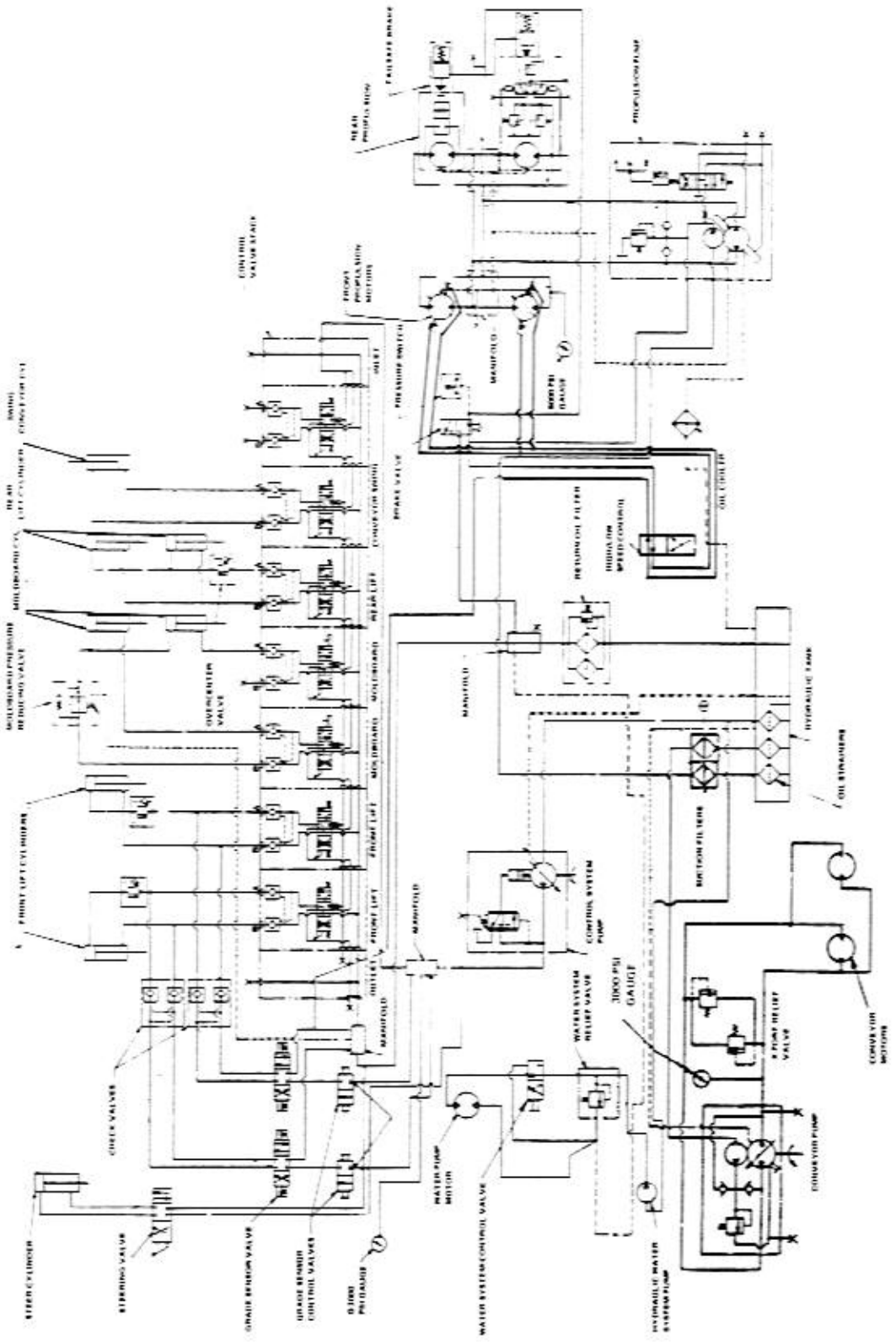
MT-6520 ELECTRICAL SCHEMATIC (Hydraulic Clutch)



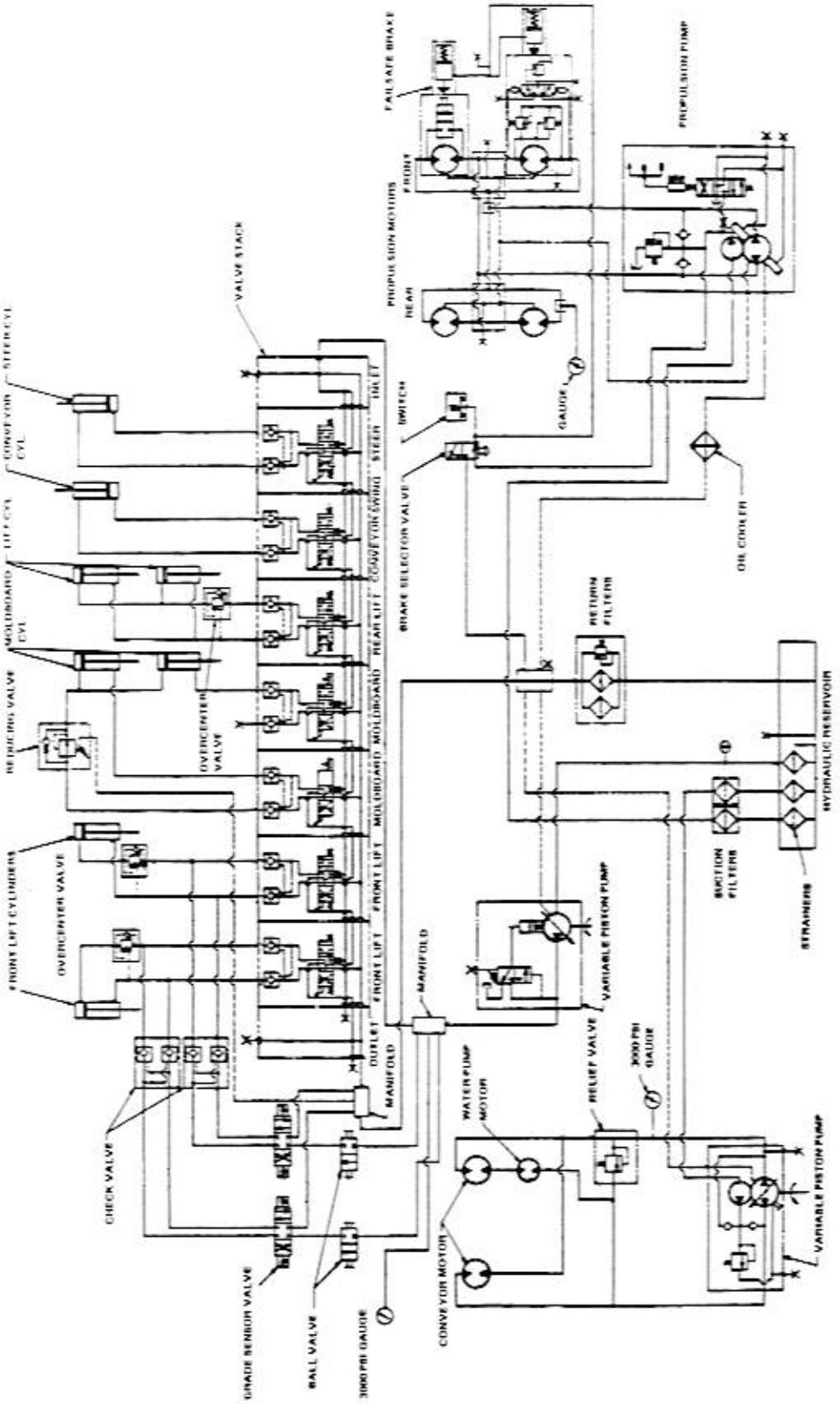
HYDRAULIC – MT-6520 Effective with S/N 5112



HYDRAULIC – MT-6520 Effective S/N 5080 to 5112
(Includes S/N 5067)



HYDRAULIC – MT-6520 Prior to S/N 5080, except 5067



HYDRAULIC – MW-6520