control de inclinación

ELECTRICAL SCHEMATIC
SHEET 1 OF 1
MT-7000
59945352
REV. 1

SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES

OVERVIEW

BEFORE YOU OPERATE, MAINTAIN OR IN ANY OTHER WAY, OPERATE THIS UNIT:

READ and STUDY this manual. KNOW how to safely use the unit's controls and what you must do for safe maintenance.

ALWAYS wear or use the proper safety items required for your personal protection.

If you have ANY QUESTIONS about the safe use or maintenance of this unit, ASK YOUR SUPERVISOR OR CONTACT ANY INGERSOLL-RAND DISTRIBUTOR. NEVER GUESS - ALWAYS CHECK.

PRE-START INSPECTION

INSPECT your machine daily. Ensure the routine maintenance and lubrication are being dutifully performed. Have any malfunctioning, broken or missing parts corrected or replaced before use. DO NOT operate a damaged or poorly maintained machine. You risk lives when operating faulty equipment, INCLUDING your own.

VERIFY that all the instruction and safety labels are in place and readable. These are as important as any other equipment on the machine.

CLEAN any foreign material from the steps, and operator's platform to reduce the danger of slipping.

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

CHECK for WARNING tags placed on the machine. DO NOT operate the equipment until repairs have been made and the WARNING tags are removed by authorized personnel.

KNOW the location of the Emergency Shut-Down Control if the machine is so equipped.

ALWAYS know the capability and limitations of your equipment - - - speed, gradeability, steering and braking.

BE AWARE of the dimensions of your machine - - - height and width, as well as your transporter dimensions and weight.

WATCH for overhanging obstructions such as wires or tree limbs.

CHECK for any conditions that could be dangerous - - - holes, banks, underground culverts, manhole covers, water meter pits, curb and/or street boxes.

STARTING

USE the hand rails and steps to get on and off the unit. ALWAYS maintain a 3-point contact when climbing onto or off of the machine.

READ and FOLLOW ALL instruction decals.

BEFORE you start the unit, ENSURE the Propulsion Control Lever is in "Neutral", Conveyor Belt is in "Neutral", and the Cutter Drum is "Off".

BEFORE you start the unit, ENSURE the Parking Brake is in the APPLY position.

START the engine from the operator's position only.

Jump starting the engine is NOT RECOMMENDED. If you do jump start, use EXTREME CAUTION. Prior to jump starting, ENSURE:

Propulsion Control is in "Neutral".

A TRAINED OPERATOR is at the controls when the engine starts.

The Parking Brake is applied.

OPERATING

Always make sure that no person or obstruction is in your line of travel BEFORE starting the unit in motion.

NEVER climb onto, or climb off the unit while it is in motion.

USE extreme caution and be observant when working in close quarters or congested areas.

Continued

OPERATING - CON'T.

NEVER carry passengers.

KNOW the area in which you are working. Familiarize yourself with work site obstructions and any other potential hazards in the area.

KNOW and USE the hand signals required for particular jobs and know who has the responsibility for signaling.

DO NOT work in the vacinity of overhanging banks or on grades that could cause the machine to slide or roll over.

Never descend an incline in a speed range greater than that which was used to ascend the incline. If you must descend a steep incline, use LO speed position.

Use HI travel speed only for traveling TO and FROM the job site. ALL MILLING must be done in the LO speed position.

NEVER allow anyone under the machine with the engine running.

ALWAYS look in all directions BEFORE changing your direction of travel.

DO NOT attempt to control machine travel speed with the throttle control. When operating the unit, maintain the engine speed at full (Operating RPM) throttle.

DO NOT tow or push the unit, except as explained in SECTION 5 of this manual under "TOWING".

DO NOT run the engine in a closed building for an extended length of time. EXHAUST FUMES CAN KILL.

STOPPING

Always park the machine on solid, level ground. If this is not possible, always park the machine at a right angle to the slope.

AVOID leaving the operator's platform with the engine running. ALWAYS move the propulsion control lever to neutral, apply the parking brake (APPLY position), lower the machine, position the throttle control at "Idle RPM", turn the ignition switch to the "OFF" position, and lock all lockable compartments.

USE proper flags, barriers and warning devices especially when parking in areas of traffic.

MAINTENANCE

AVOID, whenever possible, servicing, cleaning or examining the unit with the engine running.

AVOID, whenever possible, servicing or providing maintenance to the unit unless the tracks are adequately chocked, and the elevation lock pins are in place.

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

AVOID removing the pressurized radiator cap until the engine's cooling system has cooled.

DO NOT alter the engine governor settings from that indicated in the engine manual and the engine option plate.

ALWAYS replace damaged or lost decals. Refer to the Parts Manual for the proper location and part number of all decals.

DISCONNECT the battery cables or turn the MASTER Power Switch to OFF when working on the electrical system, or when welding on the unit.

BE SURE the battery area is well ventilated (clear of fumes) should it become necessary to connect a jump battery or battery charger. Fumes from the battery can ignite by a spark and explode.

IF battery charging is required, be sure that the battery charger is off when making the connections.

BE SURE the correct battery polarity is observed [negative (-) to negative (-) and positive (+) to positive (+)] when connecting to a battery charger or jumper cables.

TRANSPORTING AND HAULING

DO NOT attempt to load the unit without knowledge and experience with the operation of the machine.

ALWAYS use a ramp when loading the unit on the transporter. Be sure ramps are of adequate strength, low angle and proper height.

USE proper chock blocks in front and in rear of the wheels of the transporter when loading the unit.

BE SURE to approach the transporter loading ramps squarely to make sure the unit does not drop off the side of the ramp.

Continued

TRANSPORTING AND HAULING - CON'T.

KEEP the transporter deck clean of clay, oil, ice or frost or any other material which can become slippery.

USE proper chock blocks in front and rear of each track. Lower the machine to its lowest level position.

Shut down the engine, and lock all lockable compartments.

ALWAYS know the overall height of the machine and hauling vehicle. Observe height and weight regulations and overhead objects to be sure you can safely pass beneath them.

When roading you unit on a public access, obey all traffic regulations and be sure that the proper clearance flags, lights and warning signs, including the "Slow Moving Vehicle" emblem, are properly displayed. Know your approximate stopping distance at any given speed. Never turn corners at excessive speeds. Look in all directions before reversing your direction of travel.

⚠ DANGER

A loose machine can shift or fall while being transported.

Tie down the machine securely before moving the hauling machine or transporter.

1. Position the unit on the transporter centered from side to side and apply the parking brake.

2. With adequate chains or cables and blocks, secure the unit to the deck of the transporter to meet ICC or local regulations.

HAZARDOUS SUBSTANCE PRECAUTION

The following information is provided to assist the owners and operators of Ingersoll-Rand Road Machinery Equipment. Further information may be obtained by contacting your Ingersoll-Rand Road Machinery Equipment Distributor.

The following substances are used in the manufacture of this machine and may be hazardous to health if used incorrectly.

SUBSTANCE	PRECAUTION
Antifreeze (Water cooled engine)	Avoid ingestion, skin contact and breathing fumes.
Hydraulic Oil	Avoid ingestion, skin contact and breathing fumes.
Engine Lubricating Oil	Avoid ingestion, skin contact and breathing fumes.
Preservative Grease	Avoid ingestion, skin contact and breathing fumes.
Rust Preventative	Avoid ingestion, skin contact and breathing fumes.
Engine Fuel	Avoid ingestion, skin contact and breathing fumes.
Battery Fluid	Avoid ingestion, skin contact and breathing fumes.
SAE Gear Oil	Avoid ingestion, skin contact and breathing fumes.

The following substances may be produced during the operation of this machine and may be hazardous to health.

SUBSTANCE	PRECAUTION
Engine Exhaust Fumes	Avoid breathing.
Engine Exhaust Fumes	Avoid build-up of fumes in confined spaces.
Electric Motor Dust (Brushes/Insulation)	Avoid breathing during maintenance.
Brake Lining Dust *	Avoid breathing during maintenance.

* Only on machines with dry axle brakes.

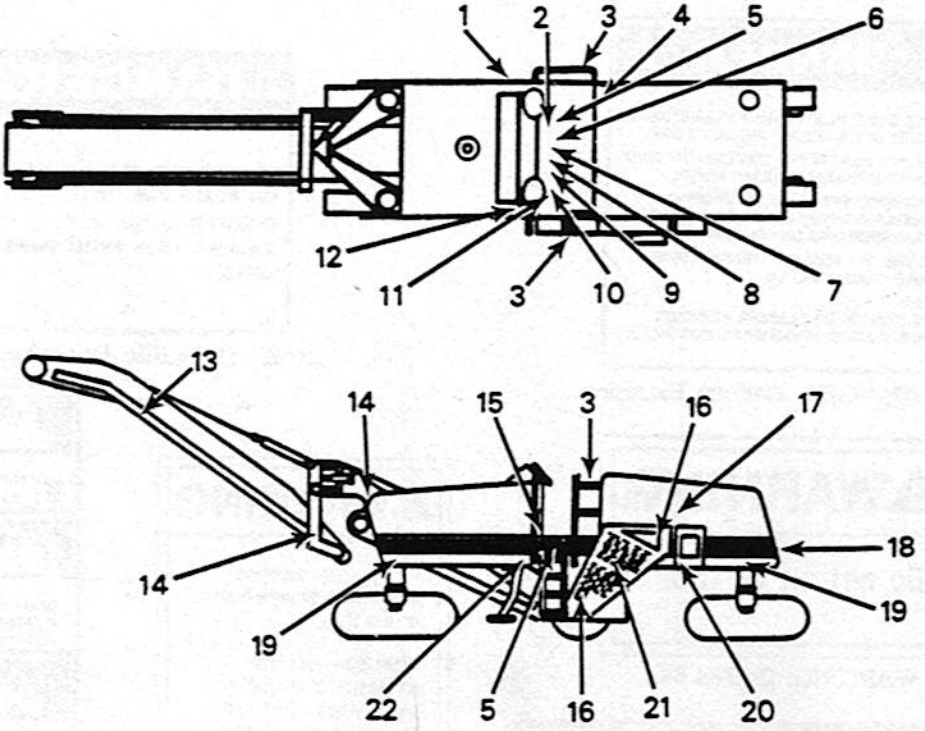


Figure 1-1. Safety-Related Decals (Sheet 1 of 3)

REF. NO.	DECAL	NO. REQ'D	LOCATION
1	DANGER: Platform Extension...	1	TOP
2	DANGER: Powerline...	2	TOP
3	WARNING: Do Not Sit...	2	TOP
4	WARNING: Right Side Platform...	1	TOP
5	Lubrication Chart	2	CONSOLE
6	WARNING: Misoperation...	2	CONSOLE
7	Starting Procedure	1	CONSOLE
8	Operating Procedure	1	CONSOLE
9	Shutdown Procedure	1	CONSOLE
10	Transport Procedure	1	CONSOLE
11	DANGER: Do Not Operate...	1	LEFT SIDE
12	DANGER: Do Not Stand...	1	LEFT SIDE
13	CAUTION: Conveyor Must Be...	2	BOTH SIDES
14	WARNING: Conveyor Swing...	4	BOTH SIDES
15	CAUTION: Climbing on...	2	BOTH SIDES
16	WARNING: Open Door...	2	LEFT SIDE
17	DANGER: Shutoff Engine...	2	BOTH SIDES
18	WARNING: Machine Can Move...	2	BOTH SIDES
19	DANGER: Lock Legs...	4	BOTH SIDES
20	DANGER: Pin Moldboard...	2	BOTH SIDES
21	DANGER: Do Not Perform...	1	RIGHT SIDE
22	CAUTION: Skis...	2	BOTH SIDES

Figure 1-1. Safety-Related Decals (Sheet 2 of 3)

⚠ DANGER ⚠

MAKE SURE PLATFORM EXTENSION IS SECURE IN ITS MOUNT PRIOR TO USE.

REMOVE PLATFORM EXTENSION AND SECURE STRAIGHT RAILING WHEN:

- WORKING WITH SIDE TO TRAFFIC
- WORKING WITH SIDE TO OBSTACLES
- TRANSPORTING OR ROADING MACHINE

FAILURE TO FOLLOW PRECAUTIONS COULD CAUSE YOU TO:

- FALL
- BE STRUCK BY PASSING VEHICLES
- BE STRUCK BY PROJECTING OBSTACLES

1. DANGER: Platform Extension...

⚠DANGER⚠

TO PREVENT SERIOUS INJURY OR DEATH DUE TO ELECTROCUTION, KEEP MACHINE AWAY FROM POWER LINES.

2. DANGER: Powerline...

⚠WARNING

Do not sit on rail.

3. WARNING: Do Not Sit...

⚠WARNING

Falling from machine can cause severe injury or death.

Right side platform extension must be in place when filling fuel tank from operators platform.

4. WARNING: Right Side Platform...

DANGER

SHUTOFF ENGINE PRIOR TO PERFORMING ANY MAINTENANCE

WARNING

SHUTOFF ENGINE AND BLEED AIR RESERVOIR PRIOR TO PERFORMING ANY MAINTENANCE ON THE AIRY SYSTEM

WARNING

IMPROPER MAINTENANCE CAN BE HAZARDOUS. UNDERSTAND MAINTENANCE SAFETY PRIOR TO WORKING. CONSULT MACHINE MANUAL AND INGERSOLL-RAND DEALER.

WARNING

WEAR SAFETY GOGGLES AND USE A SOFT FACED HAMMER WHEN INSTALLING CUTTER TEETH.

5. Lubrication Chart

⚠ WARNING ⚠

Before operating this machine, read and understand the Operator's manual supplied by your supervisor.

The misoperation of any equipment can result in serious injury or death.

6. Misoperation...

PRESTARTING

Parking Brake - PULL TO APPLY
Hoses, Covers, Guards, Rollers, Engine, Fittings, Safety Railing, Cutter Drum & Tracks - INSPECT FOR DAMAGE AND CORRECT
Fluid Levels - CHECK
DO NOT OPERATE FAULTY EQUIPMENT
ALLOW NO PASSENGERS

STARTING

Consult Operator's Manual - SEE YOUR SUPERVISOR
Platform Extension/Guard Rail - SECURE
Propulsion Control - NEUTRAL
Conveyor Belt Control - OFF
Cutter Drum - OFF
Throttle - IDLE RPM
Parking Brake - APPLY
Work Area - CLEAR
WHILE ENGAGING STARTER
Ignition Switch - PUSH & TURN CLOCKWISE (30 SECONDS MAXIMUM)
Brake Light - VERIFY ON
Cutter/Drum Light - VERIFY OFF
Filter Indicator Lights - VERIFY OFF

7. Starting Procedure

OPERATING

Windscreen -CLOSED AND PINNED
Loading Bars - STOWED
Cutter/Drum - VALVE ON (PULL)
Cutter/Drum - BUTTON START (PUSH)
Grade/Slope Controls - SET AS DESIRED
REFER TO OPERATOR'S MANUAL
Water Supply - VALVE ON
Water Spray - ON
Throttle - OPERATING RPM
Position Conveyor
Conveyor Belt - ON
Parking Brake - RELEASE
Propulsion Control -
SLOWLY MOVE FOR MACHINE TRAVEL
NEUTRAL FOR NORMAL BRAKING

8. Operating Procedure

SHUTDOWN

Cutter/Drum - OFF (PUSH)
Water Spray - OFF
Grade/Slope Controls - OFF
Conveyor Belt - OFF
Machine - ON LEVEL SURFACE
Propulsion - NEUTRAL
Parking Brake - APPLY
Loading Bars - SECURE IN UP LOCKED POSITION
Throttle - IDLE RPM
Engine - IDLE 3 MINUTES
Ignition Switch - TURN OFF
Console Cover - CLOSE AND LOCK
Water Supply - OFF

9. Shutdown Procedure

TRANSPORT

Hauling:
Machine - CHOCK TRACKS
- SECURE SAFELY TO TRAILER
Conveyor - SUPPORT

CONSULT OPERATOR'S MANUAL FOR ADDITIONAL INFORMATION

Towing:
DO NOT TOW UNTIL YOU REFER TO OPERATOR'S MANUAL FOR INSTRUCTION

10. Transport Procedure

⚠ DANGER ⚠

DO NOT OPERATE THIS MACHINE UNLESS YOU:

- Read and understand the Operator's Manual.
- Have the permission of your supervisor to operate the machine. THE MISOPERATION OF ANY EQUIPMENT CAN RESULT IN SERIOUS INJURY OR DEATH.
- Be sure people and objects are clear of the cutter drum before it is turned on.
- Carefully lower the cutter drum into the cut using front elevation control levers. Failure to do so could result in sudden backward movement of the machine.
- Never work on the cutter drum with the engine running.
- EMERGENCY SHUTDOWN
  Turn Ignition Switch to OFF.
- Allow no one on engine cowling or water tank with engine running. Stay on the operator's deck when operating the machine.
- Do not operate the machine until the leg locking bars are in the stowed position.
- Keep machine clear of power lines.

11. DANGER: Do Not Operate...

Continued

Figure 1-1. Safety-Related Decals (Sheet 3 of 3)

⚠ DANGER ⚠

DO NOT STAND ON LEFT PLATFORM EXTENSION WITH SIDE TO TRAFFIC OR OBSTACLES.

FAILURE TO FOLLOW PRECAUTIONS COULD CAUSE YOU TO:

- FALL
- BE STRUCK BY PASSING VEHICLES
- BE STRUCK BY PROJECTING OBSTACLES

12. DANGER: Do Not Stand...

⚠ WARNING ⚠

TO AVOID FALLING, BEING CAUGHT, OR CRUSHED
- NEVER CLIMB CONVEYOR.
- STAY CLEAR WHEN MACHINE IS RUNNING. BELT MOVES AND CONVEYOR SWINGS SIDEWAYS.

14. WARNING: Conveyor Swing

⚠WARNING

Moving parts
can cause severe injury.

Do not open door
while engine is running.

16. WARNING: Open Door...

⚠ DANGER ⚠

TO AVOID VERY SERIOUS INJURY, BEFORE WORKING UNDER MACHINE:
- FULLY RAISE MACHINE.
- PIN ALL FOUR LEGS.

CUTTER TEETH MAY FLY FREE DURING REMOVAL. KEEP SELF AND OTHERS CLEAR.

19. DANGER: Lock Legs...

⚠ DANGER ⚠

DO NOT PERFORM ANY MAINTENANCE ON THE CUTTER DRUM WITH THE ENGINE RUNNING.

21. DANGER: Do Not Perform...

⚠ CAUTION ⚠

CONVEYOR MUST BE BLOCKED UP DURING TRUCK TRANSPORT OF MACHINE.
FAILURE TO BLOCK UP CONVEYOR WILL CAUSE DAMAGE TO UNIT.

13. CAUTION: Conveyor Must Be...

⚠ CAUTION ⚠

TO AVOID INJURY, DO NOT CLIMB ONTO MACHINE WHEN IT IS MOVING.

15. CAUTION: Climbing on...

⚠ DANGER ⚠

SHUT OFF ENGINE BEFORE ENTERING ENGINE COMPARTMENT.

17. DANGER: Shutoff Engine...

⚠ DANGER

Unexpected backward movement.
Can cause injury, death or property damage.

Stay clear.

18. WARNING: Machine Can Move...

⚠ DANGER ⚠

PIN MOLDBOARD SECURELY IN OPEN OR CLOSED POSITION. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH.

20. DANGER: Pin Moldboard...

⚠CAUTION

Ski can pinch feet and cause personal injury.

Keep feet away from ski.

22. CAUTION: Skis...

SECTION 2 - INTRODUCTION

CONGRATULATIONS! You have just acquired an Ingersoll-Rand Milling Machine...an application-designed machine with your needs in mind. The MT-7000 is designed for those big jobs where time and productivity is of the utmost importance.

The MT-7000's 76,000 pound operating weight is driven at working speeds of up to 115 feet per minute by a 525 hp turbocharged aftercooled Cummins engine. An engine load control system automatically matches milling speed to cutting conditions for maximum productivity.

Hydrostatic propulsion provides positive traction and dynamic braking. Each track has its own hydraulic motor drive with a planetary gear reducer.

It's 78 inch cutting drum is easily accessible behind the moldboard which is hydraulically raised to facilitate easy replacement of it's cutting tools. Direct V-belt drum drive to the cutter drum with an automatic cutter drive belt tensioning provide excellent torque transfer from the engine to cutter drum.

The full width operator's console is designed for efficient and convenient operation. Key controls are duplicated on both side of the machine.

The MT-7000 can cut flush to a curb or other vertical obstruction. This feature virtually eliminates secondary clean up. Hydromechanical sensors are simple and reliable and provide fine control of cutting depth up to 10 inches. Both operator and ground man can adjust the depth of cut while the machine is operating.

Four-mode steering allows the operator to select between front, rear, crab and coordinated steer for excellent maneuverability.

Safe operation depends on reliable equipment and the use of proper operating procedures. Performing the checks and services described in this manual will help keep your machine in good condition. These recommended operation procedures will help you to avoid unsafe practices.

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.

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.

Always replace guards and cover panels before operating.

NOTE

Some illustrations in this manual show units with optional equipment installed. This optional equipment may be purchased from your local Ingersoll-Rand Road Machinery Equipment 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 Road Machinery Equipment Distributor for non-routine maintenance information that is not covered in this publication.

Record the Machine Serial Number which is found on the Vehicle Identification Plate located on the side of the machine. Refer to Figure 2-1.

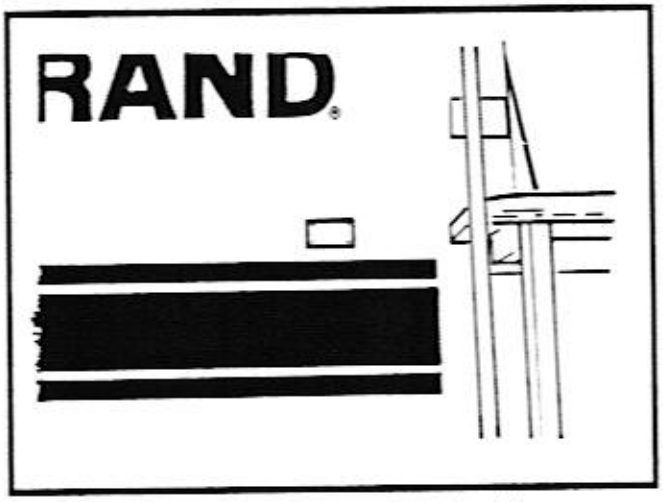


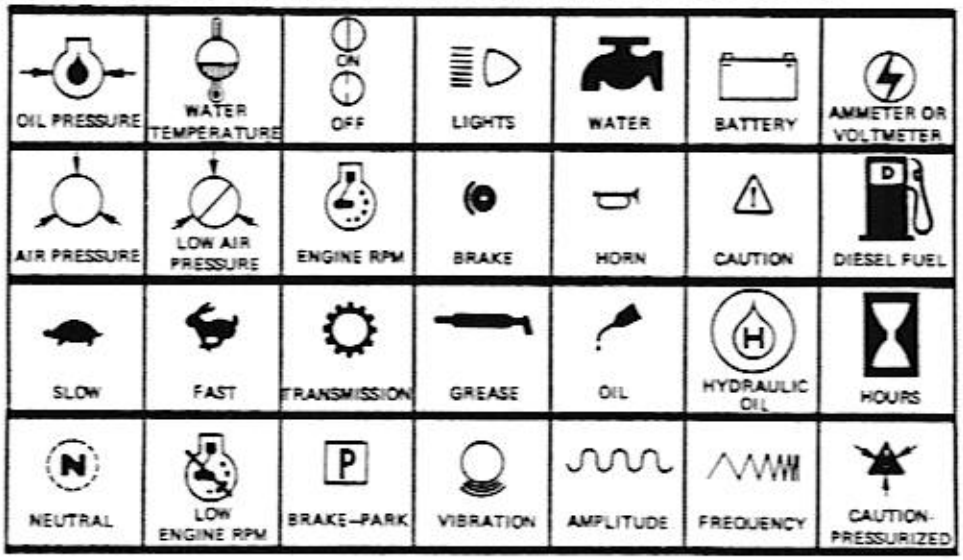
Figure 2-1. Vehicle Identification Plate

Check to ensure that the Parts and Operators Manuals are with the machine and are stored in the Manual Pouch located in the engine compartment.

SECTION 3 – SYMBOL IDENTIFICATION AND METRIC CONVERSION

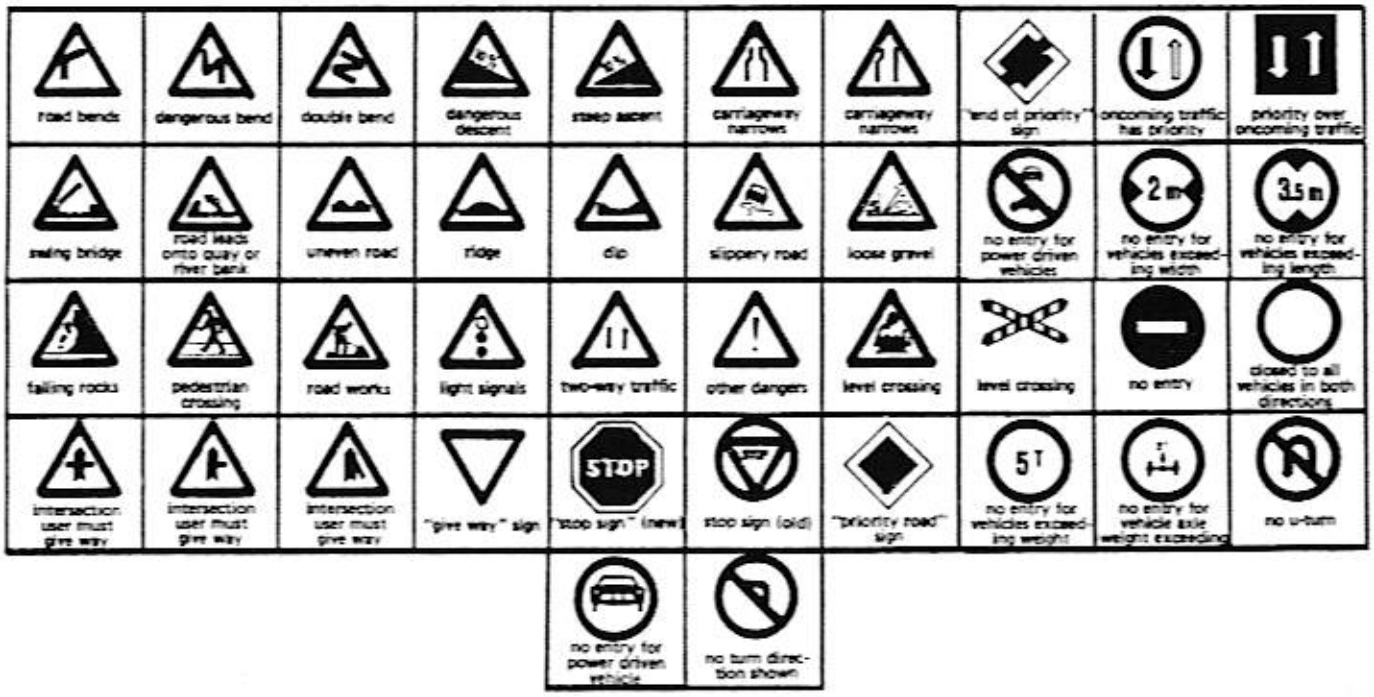
INTERNATIONAL MACHINE SYMBOLS

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.



SECTION 3 - SYMBOL IDENTIFICATION AND METRIC CONVERSION

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	0.1450
kilopascal	bars	0.01
kilowatts	horsepower	1.341
liters	gallons (U.S. liq)	0.2642
liters	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	0.737
pints (liq)	liters	0.4732
pounds	kilograms	0.4536
pounds	Newtons	0.225
pound feet	Newton-meter	1.356
pounds/ft	kgs/meter	1.488
pounds/sq in	bars	0.06895
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	temperature (°C)	5/9
tons (short)	tons (metric)	0.9078
vibrations/min	Hertz	0.0167

SECTION 4 - OPERATING CONTROLS AND INSTRUMENTS

4

NOTE

The following paragraphs describe the controls and instruments located on the machine. The numbers in ( ) represent the index numbers from the Figure titled "Controls and Instruments".

1. Propulsion Pressure Gauge
2. Conveyor Pressure Gauge
3. Control Pressure
4. Engine Water Temperature Gauge
5. Engine Oil Pressure Gauge
6. Voltmeter
7. Steering Wheel
8. Horn Button
9. R. H. Sensor Grade Depth Switch
10. Traction Flow Dividers Switch
11. Dash Lights
12. Propulsion Control Lever
13. Right Hydraulic Grade Sensor Lever
14. Conveyor Swing Control Lever
15. Conveyor Elevation Control Lever
16. Hydraulic Oil Temperature Gauge
17. Fuel Gauge
18. Air Pressure Gauge
19. Low Air Pressure Indicator
20. Cutter Drum Start Switch
21. Cutter Drum System Switch
22. Cutter Drum Engaged Indicator
23. Water Level Indicator
24. Tachometer/Hourmeter
25. Rear Elevation Control Lever
26. Right Front Elevation Control Lever
27. Left Front Elevation Control Lever
28. Moldboard Control Lever
29. Water Spray Control Lever
30. Horsepower Load Control Lever
32. Parking Brake Control Lever
33. Front/Rear Steering Control Lever
34. Travel Speed Control Lever
35. Conveyor Belt Control Lever
36. Left Hydraulic Grade Sensor Lever
37. Hydraulic Filter Indicator Lights Tester Switch
38. Conveyor Hydraulic Filter Restriction Indicator
39. Propulsion Hydraulic Filter Restriction Indicator
40. Fan Drive Hydraulic Filter Restriction Indicator
41. Moldboard Down Pressure Control
42. Automatic Shutdown Override Switch
43. Ignition Switch
44. Engine Throttle Lever
45. Steering Coordination Control Switches
46. Dash Lights Switch
47. Beacon Light Switch
48. Conveyor Lights Switch
49. Drum Lights Switch
50. Side Lights Switch
51. Rear Lights Switch
52. Front Lights Switch
53. Electric Grade/Slope Control Switches
54. Circuit Breakers
55. L.H. Sensor Grade Depth Switch
56. Water Supply Shut-Off Valve
57. Master Power Switch
58. Air Restriction Indicator (Not Shown)
59. Moldboard Positioning Switches
60. Hand Held Slope Controls (Optional)
61. Load Control Adjustment Screw
62. Water Flow Control Valves

Figure 4-8. Controls an ruments (Sheet 1 of 2)

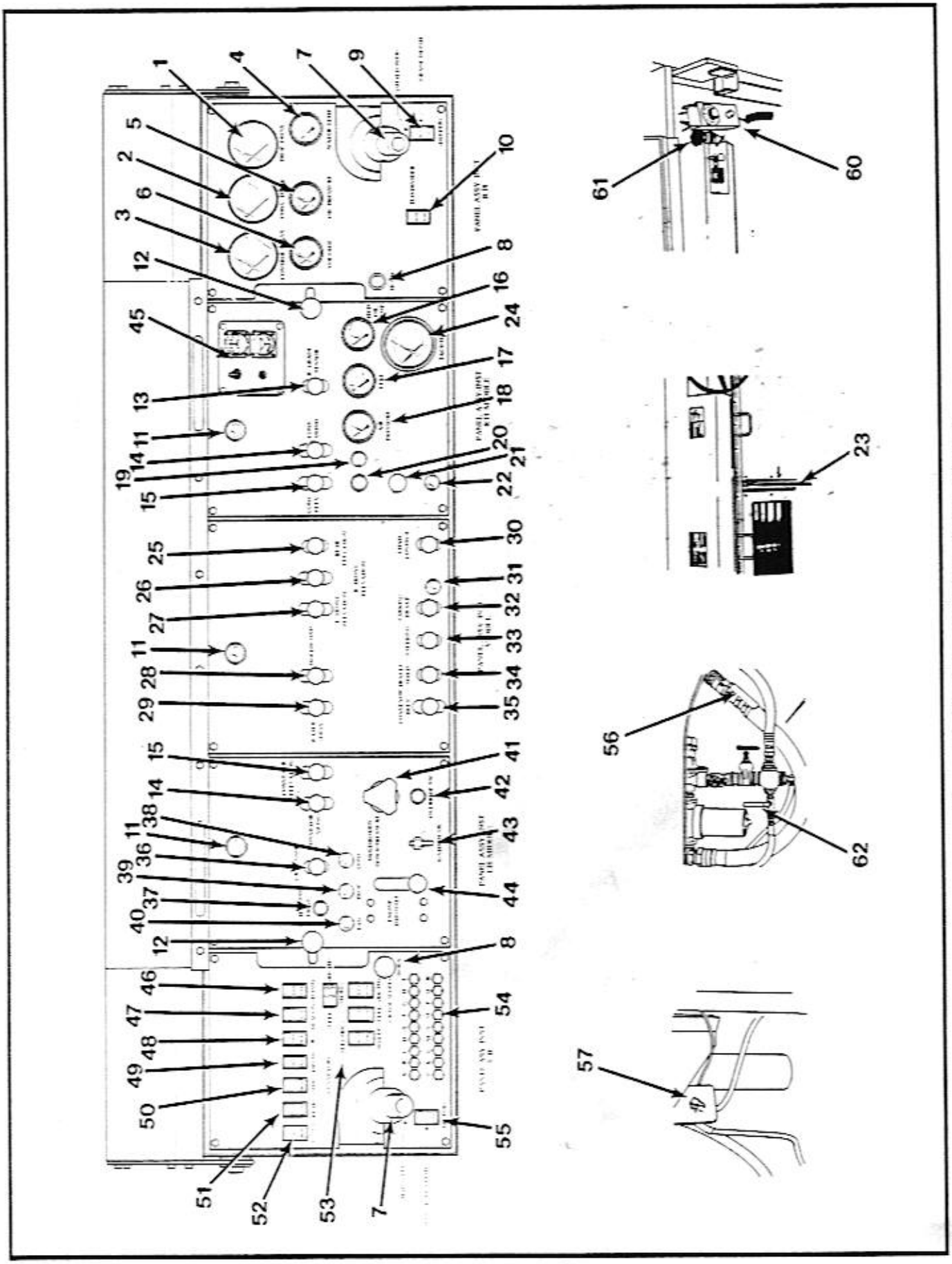


Figure 4-8. Controls and Instruments (Sheet 2 of 2)

LEG TUBE LOCK BARS

The Leg Tube Lock Bars are located at each of the leg tubes. Ensure that the leg tube lock bars are installed any time that the leg tube cylinders are being worked on.

VANDALISM PROTECTION

The milling machine is equipped with Vandalism Protection. When leaving the unit unattended, lock all lockable compartments. Refer to Figures 4-1 thru 4-7 for the various lockable items.

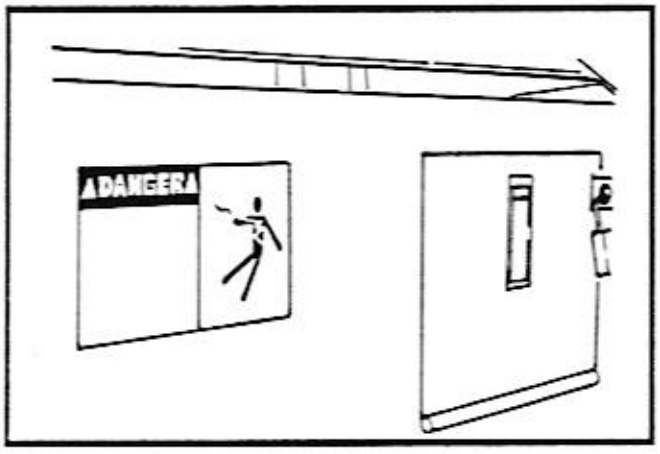


Figure 4-1. Slope Control Storage Compartment

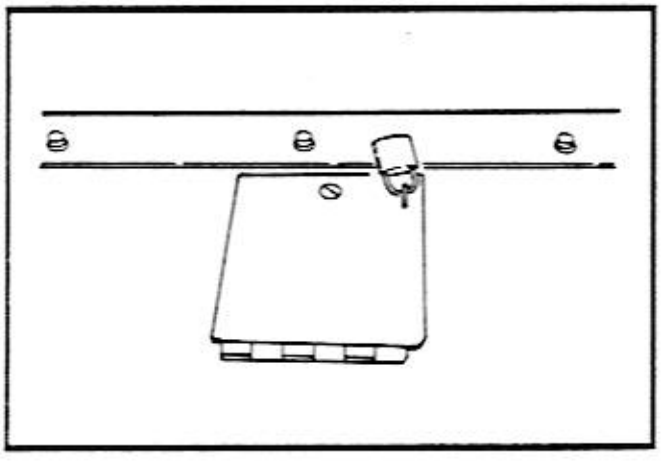


Figure 4-2. Hydraulic Oil Fill Cap

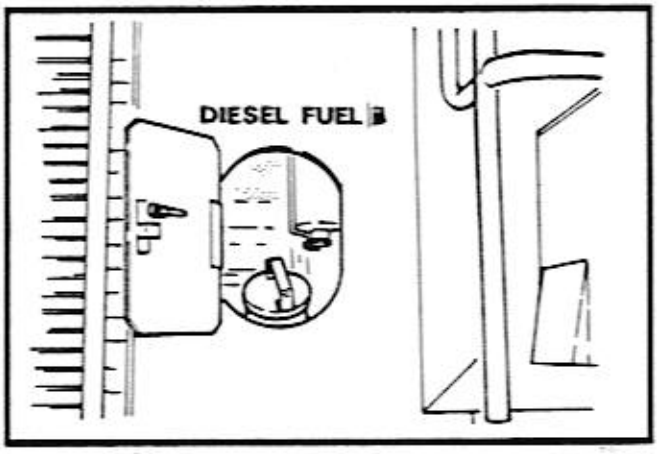


Figure 4-3. Diesel Fuel Cap

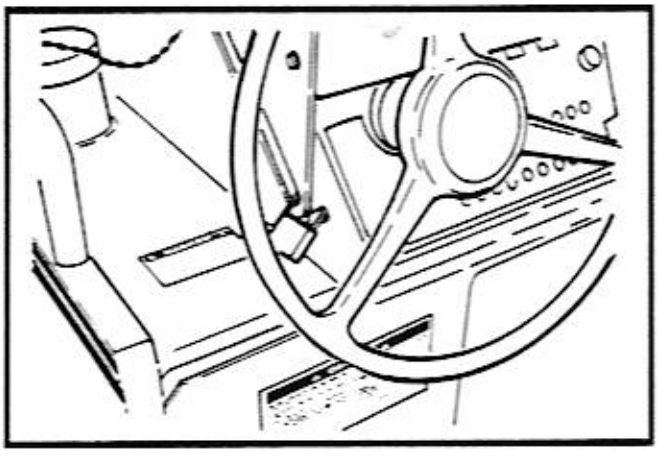


Figure 4-4. Instrument Panel Cover

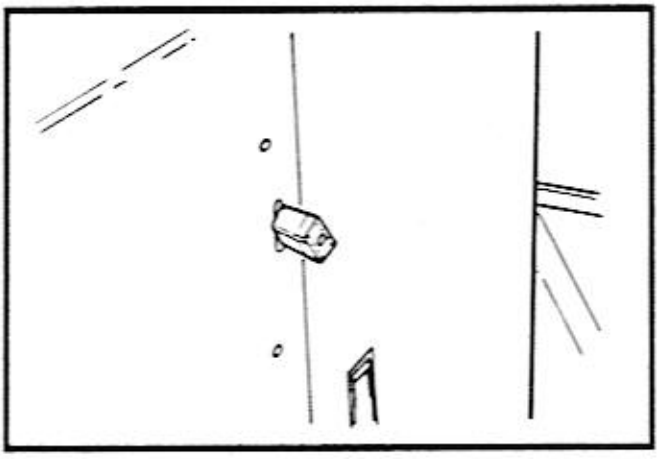


Figure 4-5. Front Engine Compartment Door

VANDALISM PROTECTION - CON'T.

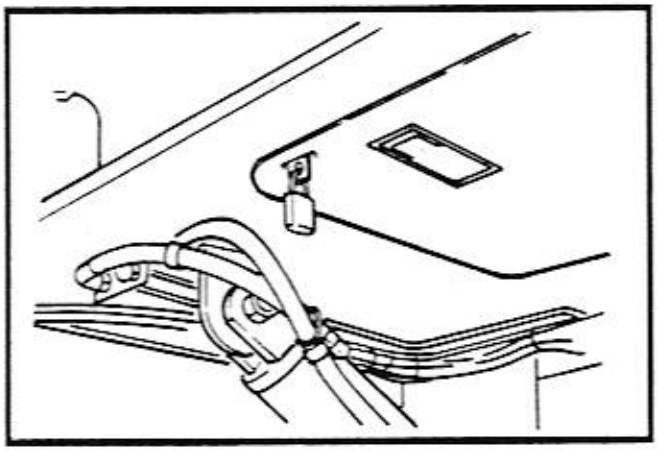


Figure 4-6. Engine Belly Compartment Door

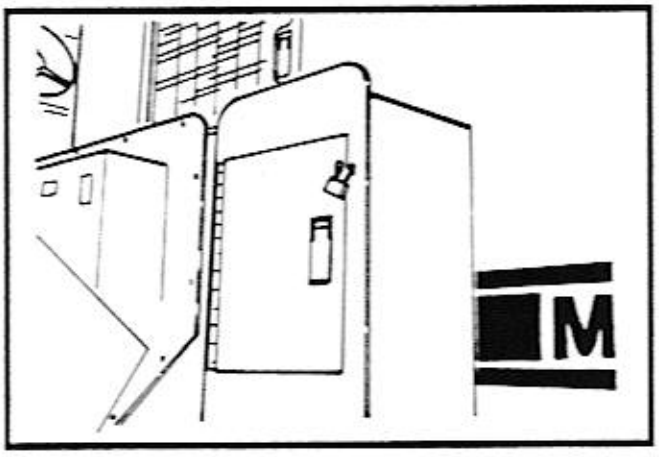


Figure 4-7. Tool Box

PROPULSION PRESSURE GAUGE

The PROPULSION PRESSURE Gauge (1) is located on the upper right side of the right console panel. The gauge indicates the propulsion pressure on a scale calibrated from zero (0) to 6000 PSI and zero (0) to 41,400 kPa. Normal operating range is approximately 2000 to 5000 PSI. Propulsion pressure will vary depending upon how hard the machine is being worked.

CONVEYOR PRESSURE GAUGE

The CONVEYOR PRESSURE Gauge (2) is located on the right console panel beside the Propulsion Pressure Gauge. The gauge indicates the conveyor pressure on a dual scale calibrated from zero (0) to 5000 PSI and zero (0) to 35,000 kPa. Normal operating range is approximately 1500 to 3000 PSI.

CONTROL PRESSURE

The CONTROL PRESSURE Gauge (3) is located on the right console panel beside the Conveyor Pressure Gauge. The gauge indicates control system pressure on a dual scale calibrated from zero (0) to 5000 PSI and zero (0) to 35,000 kPa. Normal operating range is approximately 3000 PSI.

NOTE

Engine gauge readings are given as a guide only. Readings may be slightly higher or lower depending on the individual engine condition. If in doubt, refer to the applicable engine service or operation manual.

ENGINE WATER TEMPERATURE GAUGE

The Engine Water Temperature (WATER TEMP) Gauge (4) is located on the right console panel below the Propulsion Pressure Gauge. The gauge indicates engine water temperature on a dual scale calibrated from 140 to 320 degrees F and 60 to 160 degrees C. Normal operating range is approximately 175 to 200 degrees F.

ENGINE OIL PRESSURE GAUGE

The ENGINE OIL PRESSURE Gauge (5) is located on the right console panel beside the Water Temperature Gauge. The gauge indicates engine oil pressure on a dual scale calibrated from zero (0) to 125 PSI and zero (0) to 862 kPa. Normal pressure is approximately 50 to 70 PSI at operating RPM and 20 PSI at idle RPM.

VOLTMETER

The Voltmeter (VOLTAGE) (6) is located on right console panel beside the Engine Oil Pressure Gauge. With the Ignition Switch in the ON position, it indicates battery condition on a scale calibrated from 20 to 32 volts. With the engine running, it indicates output voltage of the alternator. Normal output will be approximately 28 volts.

STEERING WHEEL

There are two Steering Wheels (7) on the machine. One is on the left side of the front console and one on the right side of the front console. Turning the steering wheel in either a clockwise or counterclockwise direction will cause the machine to turn in the manner selected on the Steering Control Lever (either FRONT OR REAR) or the optional Steering Coordination Control Switches (CRAB, TRAIL, COORDINATE). Refer to SECTION 5 - OPERATING INSTRUCTIONS for more detailed instructions on the steering system.

HORN BUTTON

There are six HORN Buttons (8) on the machine. One is on the right side console panel while another is on the left side console panel. The others are located on either side of the front and rear of the machine. The console mounted Horn Buttons are used by the operator to alert personnel of a change in machine direction. The Horn Buttons mounted on the side of the machine are used by the ground personnel to alert the operator or other personnel of changing travel or milling conditions.

R. H. SENSOR GRADE DEPTH SWITCH

The Right Hand Sensor GRADE DEPTH Switch (9) is located on the right console panel below the Steering Wheel. It is a three position momentary contact switch. Positioning and holding the switch in the upper (SHALLOWER) position raises the machine thereby milling to a shallower depth. Positioning and holding the switch in the lower (DEEPER) position lowers the machine thereby milling to a deeper depth. The switch will spring return to the middle (neutral) position when released. There is also a switch mounted on the right side of the machine for use by the ground man. If both switches are operated for opposite functions at the same time, the circuit breaker will be tripped and must be reset.

TRACTION FLOW DIVIDERS SWITCH

The Traction Flow Dividers Switch (10) is a two position switch located on the right console panel beside the Right Hand Sensor Grade Depth Switch. It is used to prevent "spin-out". When positioned to DISENGAGED, all four tracks provide the same amount of tractive effort when a wheel is slipping. In the ENGAGED position, more tractive effort is provided to the track that has less traction. The traction flow dividers are automatically engaged any time that the drum is engaged.

DASH LIGHTS

There are three Dash Lights (11) located on the console panels. One is located on each of the three middle console panels. The Dash Lights are controlled by the Dash Light Switch (46) located on the left side console panel.

PROPULSION CONTROL LEVER

There are two PROPULSION CONTROL Levers (12) on the machine. One is located on the right side of the console while the other is on the left side of the console. The Propulsion Control varies the machines direction and speed of travel. It also functions as the control for hydrostatic braking. The control has three positions: Forward (F), Neutral (N), and Reverse (R) with variable speed ranges in either direction.

⚠ WARNING

Loss of machine control.

Moving the propulsion (F-N-R) control quickly may cause loss of machine control, lurching or serious injury.

Move the propulsion (F-N-R) control slowly.

To propel the machine Forward, gradually move the Propulsion Control forward. To stop the travel of the machine, move the control, slowly, back to the Neutral position.

To propel the machine in Reverse, gradually move the control backward toward the operator. To stop the travel of the machine, move the lever slowly back into the Neutral position. This also provides hydrostatic braking.

An electrical interlock switch on the Propulsion Control allows the engine to be started only when the Propulsion Control is in the Neutral position.

RIGHT HYDRAULIC GRADE SENSOR LEVER

The RIGHT HYDRAULIC GRADE SENSOR Lever (13) is located on the right middle console panel beside the Propulsion Control Lever. The lever has an ON and OFF position. When positioned to the ON position, automatic control of the right side leg tube cylinders is provided, and the right side of the machine will lower or raise to the predetermined depth as preset on the sensors at the side of the machine. In the OFF position, the elevation of the right side of the machine is controlled by the operator using the Right Front Elevation control. When both the Left and Right Hydraulic Grade Sensor Levers are positioned to ON, both the left and right side leg tube cylinders are automatically controlled to raise or lower the machine to the predetermined depth as preset on the sensors at the side of the machine. To raise the machine out of a cut, position both of the sensors to OFF and use the appropriate manual controls.

CONVEYOR SWING CONTROL LEVER

⚠ DANGER

Electrocution hazard.

Conveyor contact with power lines will result in serious injury or death.

Use extreme care when operating the conveyor swing or elevation control.

Continued

CONVEYOR SWING CONTROL LEVER - CON'T.

The CONVEYOR SWING Lever (14) is located on both the right middle console panel and left middle console panel beside the Right or Left Hydraulic Grade Sensor Lever.Positioning the lever away from the operator to the LEFT position causes the conveyor to swing to the left. Positioning the lever toward the operator to the RIGHT position causes the conveyor to swing to the right. To stop conveyor movement, return the lever to the neutral (N) position.

CONVEYOR ELEVATION CONTROL LEVER

The CONVEYOR ELEVATION Control Levers (15) are located on the left and right middle console panels beside the Conveyor Swing Levers. Positioning the lever away from the operator to the RAISE position, raises the conveyor. Positioning the lever toward the operator to the LOWER position, lowers the conveyor.

HYDRAULIC OIL TEMPERATURE GAUGE

The Hydraulic Oil Temperature (HYD. OIL TEMP.) Gauge (16) is located on the right middle console panel beside the Propulsion Control. The gauge indicates hydraulic oil temperature on a dual scale calibrated from 100 to 280 degrees F and 38 to 138 degrees C. Maximum operating temperature should be no more than 180 degrees F.

FUEL GAUGE

The FUEL Gauge (17) is located on the right middle console panel beside the Hydraulic Oil Temperature Gauge. It receives a signal for a sender in the fuel tank and indicates fuel quantity on a scale calibrated from empty (0) to full (4/4).

AIR PRESSURE GAUGE

The AIR PRESSURE Gauge (18) is located on the right middle console panel beside the Fuel Gauge. The gauge indicates air pressure on a dual scale calibrated from 10 to 150 PSI and zero (0) to 1000 kPa. Normal air pressure should be approximately 100 to 120 PSI.

LOW AIR PRESSURE INDICATOR

The LOW AIR PRESSURE Indicator (19) is a red indicator light located on the right middle console panel beside the Air Pressure Gauge. It will be illuminated when the air pressure is below 90 PSI. If air pressure drops below approximately 80 PSI, the cutter drum clutch will automatically disengage.

CUTTER DRUM START SWITCH

The CUTTER DRUM Start Switch (20) is a push button type switch located on the right middle console panel beside the Low Air Pressure Indicator. When depressed and held momentarily (after the Cutter Drum System Switch has been pulled), the cutter drum will begin to rotate. Hold the switch in until the yellow Cutter Drum Engaged Indicator light comes on.

⚠ DANGER

Cutting or crushing hazard.

Contact with rotating cutter drum can cause serious injury or death. Contact with pavement can cause rotating cutter drum to propel machine backwards.

Ensure that all personnel are out of thedrum area and the cutter teeth are not touching the pavement.

CUTTER DRUM SYSTEM SWITCH

The CUTTER DRUM System Switch (21) is located on the right middle console panel. This switch must be pulled outward to energize the cutter drum system, before the Cutter Drum Start Switch is pushed. Push inward to shut off the drum.

CUTTER DRUM ENGAGED INDICATOR

The CUTTER DRUM Engaged Indicator (22) is a yellow indicator light located on the right middle console panel. This indicator will be illuminated when the cutter drum clutch is engaged with an air pressure of at least 80 psi.

WATER LEVEL INDICATOR

The Water Level Indicator (23) is located below the right middle console panel. The ball type float in the tube, indicates the level of water in the water tank.

TACHOMETER/HOURMETER

The Tachometer/Hourmeter (ENGINE RPM -HOURMETER) (24) is located on the right middle console panel below the Hydraulic Oil Temperature Gauge. The Tachometer measures engine RPM x 100 on a scale from zero (0) to 30. In addition the engine Hourmeter measures engine operating hours and tenths of an hour.

REAR ELEVATION CONTROL LEVER

The REAR ELEVATION Control Lever (25) is located on the right side of the middle console panel. The Rear Elevation Control Lever is used to raise or lower the rear of the machine. Positioning the lever away from the operator to the RAISE position causes the leg cylinders to raise the rear of the machine. Positioning the lever toward the operator to the LOWER position lowers the rear of the machine.

RIGHT FRONT ELEVATION CONTROL LEVER

The RIGHT FRONT ELEVATION Control Lever (26) is located on the middle console panel beside the Rear Elevation Control Lever. When the left and right grade controls are positioned to OFF, the Right Front Elevation Control Lever, when positioned to RAISE, will cause the right front leg cylinder to lift that side of the machine. Positioning the lever toward the operator, to the LOWER position, will lower that side of the machine.

LEFT FRONT ELEVATION CONTROL LEVER

The LEFT FRONT ELEVATION Control Lever (27) is located on the middle console panel beside the Right Front Elevation Control Lever. When the left and right grade controls are positioned to OFF, the Left Front Elevation Control Lever, when positioned to RAISE, will cause the left front leg cylinder to lift that side of the machine. Positioning the lever toward the operator to the LOWER position will lower that side of the machine.

MOLDBOARD CONTROL LEVER

The MOLDBOARD Control Lever (28) is located on the middle console panel below the Dash Light. The moldboard keeps the milled material inside the box so that it can be directed to the conveyor. It also cleans the milled surface. Positioning the lever away from the operator to the RAISE position will raise the moldboard. Positioning the lever toward the operator to the LOWER position will lower the moldboard. Positioning the control lever to the center (N) position allows the moldboard to stay in that position unless forced upward by milled material.

Always perform milling operations with the moldboard in the LOWER position. This allows it to float with the surface. Use the "N" position when opening the drum access door.

⚠ WARNING

Severe cutting or crushing hazard.

An opening moldboard door may cause serious injury or death.

Do not use the Moldboard Control Lever. Use only the Moldboard Positioning Switches located on either side of the machine.

⚠ CAUTION

Severe moldboard damage.

Failure to raise the moldboard will cause damage to he moldboard cylinders.

Always raise the moldboard before backing up the machine.

WATER SPRAY CONTROL LEVER

The WATER SPRAY Control Lever (29) is located on the left side of the middle console panel. When positioned away from the operator to the ON position, the water pump is activated. Positioning the lever toward the operator to the OFF position shuts off the water pump. Always ensure that the main water supply valve is open before activating the water pump. If the water pump should be operated without water, it must be allowed to cool before it comes into contact with water or the seals in the pump will be damaged.

HORSEPOWER LOAD CONTROL LEVER

The Horsepower LOAD CONTROL Lever (30) is located on the lower right side of the middle console panel. Positioning the lever away from the operator to the AUTO position activates the automatic load control system. Positioning the lever toward the operator to the MANUAL position shuts down the automatic load control system. This system when activated, balances the engine loading with the travel speed. The more the engine loading, the slower the travel speed. The load control may be adjusted if it is desired to more evenly match engine speed to travel speed. Refer to Load Control Adjustment Screw (61) in this section. Refer to SECTION 5 - OPERATING PROCEDURES for more detailed information.

PARKING BRAKE APPLIED INDICATOR

The Parking Brake Applied Indicator (31) is a red indicator located on the middle console panel beside the Parking Brake. When illuminated, it indicates that the parking brake is engaged.

PARKING BRAKE CONTROL LEVER

The PARKING BRAKE Control Lever (32) is located on the middle console panel beside the Steering Lever and controls the spring applied, hydraulically released parking brakes. Positioning the lever away from the operator to the RELEASE position, provides hydraulic pressure to overcome the spring pressure and release the parking brakes. This will cause the Parking Brake Indicator Light to go out. Positioning the lever toward the operator, to the APPLY position, bleeds off the hydraulic pressure allowing the spring applied brakes to be applied. DO NOT attempt to stop the machine with the Parking Brakes without first returning the Propulsion Control to neutral.

⚠ CAUTION

Brake damage.

Release the brakes before trying to move the machine.

FRONT/REAR STEERING CONTROL LEVER

The Front/Rear STEERING Control Lever (33) is located on the lower portion of the middle console panel beside the Parking Brake Indicator. The lever is used to select either the front or rear tracks of the machine for manual steering. Positioning the lever away from the operator to FRONT selects the front tracks and positoning the lever toward the operator to REAR selects the rear tracks. Once the desired tracks have been selected, use either Steering Wheel to do the actual steering. Refer to Steering in Section 5 -OPERATING INSTRUCTIONS, for more detailed information on steering options and precautions.

TRAVEL SPEED CONTROL LEVER

The TRAVEL SPEED Control Lever (34) is located on the lower portion of the middle console panel beside the Steering Control Lever. Positioning the lever away from the operator to the HI position or toward the operator to the LO position, controls the variable displacement traction motors. Always position the Travel Speed Control Lever to LO when performing milling operations.

CONVEYOR BELT CONTROL LEVER

The CONVEYOR BELT Control Lever (35) is located on the lower left portion of the middle console panel beside the Travel Speed Control Lever. Positioning the lever away from the operator, to the FORWARD position, will cause the belt to travel in a forward direction. Positioning the lever toward the operator, to the REVERSE position, will cause the belt to travel in reverse.

LEFT HYDRAULIC GRADE SENSOR LEVER

The LEFT HYDRAULIC GRADE SENSOR Lever (36) is located on the left middle console panel beside the Conveyor Swing Lever. The lever has an ON and OFF position. When positioned to the ON position, automatic control of the left side leg tube cylinders is provided, and the left side of the machine will lower or raise to the predetermined depth as preset on the sensors at the side of the machine. In the OFF position, the elevation of the left side of the machine is controlled by the operator using the Left Front controls. When both the Left and Right Hydraulic Grade Sensor Levers are positioned to ON, both the left and right side leg tube cylinders are automatically controlled to raise or lower the machine to the predetermined depth as preset on the sensors at the side of the machine. To raise the machine out of a cut, position both of the sensors to OFF and use the appropriate manual controls.

HYDRAULIC FILTER INDICATOR LIGHTS TESTER SWITCH

The HYDRAULIC FILTER INDICATOR LIGHTS TESTER Switch (37) is located on the left middle console panel beside the Propulsion Control. When depressed and held, the Hydraulic Filter indicators will be illuminated. If any indicator light does not illuminate, it should be replaced or the problem corrected before proceeding.

CONVEYOR HYDRAULIC FILTER RESTRICTION INDICATOR

The CONVEYOR Hydraulic Filter Restriction Indicator (38) is a red indicator located on the left middle console panel. If this indicator is ever illuminated (and the oil is at operating temperature), shut down the machine and change the filter before proceeding.

PROPULSION HYDRAULIC FILTER RESTRICTION INDICATOR

The PROPULSION Hydraulic Filter Restriction Indicator (39) is a red indicator located on the left middle console panel. If this indicator is ever illuminated (and the oil is at operating temperature), shut down the machine and change the filter before proceeding.

FAN DRIVE HYDRAULIC FILTER RESTRICTION INDICATOR

The FAN DRIVE Hydraulic Filter Restriction Indicator (40) is a red indicator located on the left middle console panel. If this indicator is ever illuminated (and the oil is at operating temperature), shut down the machine and change the filter before proceeding.

MOLDBOARD DOWN PRESSURE CONTROL

The MOLDBOARD DOWN PRESSURE Control (41) is a pressure reducing valve for adjusting the moldboard down pressure. It is located on the right side of the left middle console panel. Turn the control clockwise to INCREASE the moldboard down pressure and counterclockwise to DECREASE the moldboard down pressure.

AUTOMATIC SHUTDOWN OVERRIDE SWITCH

The AUTOMATIC SHUTDOWN OVERRIDE Switch (42) is located on the left middle console panel beside the Ignition Switch. The switch must be held in while turning the Ignition Switch to start the engine. This momentarily overrides the low oil pressure signal which will prevent the engine from starting. Do not rely on this switch to prevent the engine from starting. The engine will start, even if this switch is not depressed, as long as the engine is cranked for a long enough time to allow oil pressure to build up.

IGNITION SWITCH

The IGNITION SWITCH (43) is a three position switch located on the bottom of the left middle console panel. When the switch is turned clockwise to the first position (ON), the electrical system is energized. When turned past the ON position to the second position (START), the starter will engage. Once the engine starts, release the Ignition Switch (and the Automatic Shutdown Override Switch) immediately and the Ignition Switch will spring return to the ON position.

NOTICE

Starter may overheat if operated longer than 30 seconds.

If the engine fails to start, allow the starter to cool 2 to 3 minutes before trying again.

NOTE

It may be necessary to hold in the Automatic Shutdown Override Switch for a couple of seconds after the engine has started to ensure that the engine does not shutdown again. The switch, when depressed, overrides the engine low oil pressure shutdown switch.

ENGINE THROTTLE LEVER

The ENGINE THROTTLE Lever (44) is located on the left middle console panel. It is connected to the engine governor by a cable. Positioning the lever away from the operator, to the OPERATING position, provides for obtaining full engine rpm. Pulling the lever downward toward the operator, to the IDLE position, provides for engine idle speed.

STEERING COORDINATION CONTROL SWITCHES

The Steering Coordination (STRG. COORDINATION) Control Switches (45) are located at the top of the right middle console panel. The switches provide for using the steering wheel for; manually steering the front tracks, trailing, automatic coordinated steering of both the front and rear tracks, or automatic crabbing. There is a "trim screw" beside the switches that is used for very fine adjustments of the rear tracks to allow for very close curb cuttings. The Front/Rear Steering Control Lever must be in the FRONT position for these switches to work. Refer to SECTION 5 - OPERATING INSTRUCTIONS for more detailed information.

DASH LIGHTS SWITCH

The Dash Lights (DASH) Switch (46) is a two position switch located on the left console panel. Positioning the switch to ON turns on the three dash panel lights.

BEACON LIGHT SWITCH

The BEACON Light Switch (47) is a two position switch located on the left console panel. Positioning the switch to ON activates the beacon light circuit.

CONVEYOR LIGHTS SWITCH

The CONVEYOR Lights Switch (48) is a two position switch located on the left console panel. Positioning the switch to ON turns on the two conveyor flood lights.

DRUM LIGHTS SWITCH

The DRUM Lights Switch (49) is a two position switch located on the left side of the console panel. Positioning the switch to ON turns on the two drum flood lights.

SIDE LIGHTS SWITCH

The SIDE Lights Switch (50) is a two position switch located on the left console panel. Positioning the switch to ON turns on the side flood lights.

REAR LIGHTS SWITCH

The REAR Lights Switch (51) is a two position switch located on the left console panel. Positioning the switch to ON turns on the two rear flood lights.

FRONT LIGHTS SWITCH

The FRONT Lights Switch (52) is a two position switch located on the left console panel. Positioning the switch to ON turns on the two front flood lights.

ELECTRIC GRADE/SLOPE CONTROL SWITCHES

The ELECTRIC GRADE/SLOPE Control Switches (53) are located on the left console panel and are used to control the grade and slope of the milling operation. Positioning the POWER switch to the ON position energizes the system. Positioning the Left GRADE/SLOPE switch to SLOPE (with the SLOPE switch set to LEFT) sends a signal to the servo valves and the left side of the machine will control the slope of the cut while the right side of the machine will control the grade (depth) of the cut. Selecting the right side of the machine for SLOPE will allow the right side of the machine to control the slope while the left side of the machine controls the grade. Refer to SECTION 5 - OPERATING INSTRUCTIONS for more detailed information.

CIRCUIT BREAKERS

The Circuit Breakers (54) are located on the lower portion of the left console panel. They are used to protect the individual electrical circuits on the machine. To reset a circuit breaker, push the circuit breaker in until it resets. The main circuit breaker (not shown) is in the engine compartment.

L. H. SENSOR GRADE DEPTH SWITCH

The Left Hand Sensor GRADE DEPTH Switch (55) is located on the left console panel below the steering wheel. It is a three position momentary contact switch. Positioning and holding the switch in the upper (SHALLOWER) position raises the machine thereby milling to a shallower depth. Positioning and holding the switch in the lower (DEEPER) position lowers the machine thereby milling to a deeper depth. The switch will spring return to the middle (neutral) position when released. There is also a switch mounted on the right side of the machine for use by the ground man. If both switches are operated for opposite functions at the same time, the circuit breaker will be tripped and must be reset.

WATER SUPPLY SHUT-OFF VALVE

The Water Supply Shut-Off Valve (56) is located under the water tank on the left side of the machine. It is the valve located in-line between the water pump and the water tank. It must remain completely open when the water pump is activated.

MASTER POWER SWITCH

The MASTER POWER Switch (57) is located in the engine compartment above the batteries. The switch breaks the circuit between the positive terminals of the batteries and the Ignition Switch. Always turn the Master Power Switch to the OFF position and remove the key when working on the machine.

⚠ CAUTION

Alternator Damage.

Using master power switch to shut-down engine will cause alternator damage.

Always shut-down engine with ignition switch.

AIR RESTRICTION INDICATOR (Not Shown)

The Air Restriction Indicator (58) is located in the air inlet piping. When the indicator shows a red signal (at 25 inches water), a plugged air cleaner element is indicated and the elements must be either cleaned or replaced. After servicing the air cleaner, be sure to reset the restriction indicator by pushing in on the button on the bottom of the indicator.

SECTION 5 - OPERATING INSTRUCTIONS

Contents

SAFETY CHECKS - PRE-STARTING

Before starting each day, in addition to the 10 hour daily routine maintnenace, check or inspect thefollowing items to ensure trouble free operation.

⚠ WARNING

Unexpected machine motion or moving parts can cut or crush.

Install the leg lock bars/pins, apply the parking brake, shut down the engine, and shut off the master switch before working on the machine.

⚠ WARNING

Improper maintenance can be hazardous.

Read and understand SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES before you perform any maintenance, service or repairs.

1. Inspect the entire unit for damaged or missing parts. Check fluid lines, hoses, fittings, filler openings, drain plugs, pressure cap, tracks, muffler, engine, safety rails, 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. Ensure that sensor linkage is properly connected (both sides). Check to see that moving parts are free to move.

3. Visually inspect cutter teeth for wear and replace as necessary. Refer to Cutter Tooth Replacement in Section 14 of this Manual.

⚠ DANGER

Crushing or cutting hazard.

Cutter drum motion will cause severe cutting or crushing.

Install the leg lock bars/pins, apply the parking brake, pin the moldboard in the up position, shut down the engine and shut off the Master Switch before working in the cutter drum area.

4. Make sure that the steps and operators platform are clean and clear of all foreign material.

5. Use the units ROUTINE MAINTENANCE sections of this manual in conjunction with the Lubrication Chart to perform any required fluid checks and/or maintenance.

6. Check coolant level in the radiator expansion tank. Coolant level with a cold engine should be to the bottom of the neck at all times to allow for the coolant to expand at engine operating temperature without overflowing the system. If you need to add coolant, use a reliable brand of permanent anti-freeze in a 50-50 mixture.

Continued

SAFETY CHECKS - PRESTARTING - CON'T.

⚠ WARNING

Injury can occur when removing the radiator cap.

Steam or fluid escaping from the radiator can burn. Inhibitor contains alkali, avoid contact with skin and eyes.

Always shut down the engine and allow to cool down before removing the radiator cap. Remove cap slowly to relieve pressure. Avoid contact with steam or escaping fluid.

⚠ WARNING

Fuel is flammable. May cause injury and property damage.

Shut down the engine, extinguish all open flames and do not smoke while filling the fuel tank.

Always wipe up any spilled fuel.

7. Check the fuel level. If necessary, fill the diesel fuel tank with clean No. 2 diesel fuel per the specifications outlined in Section 6 of this manual.

8. Check the hydraulic oil level. If necessary, fill the reservoir with a fresh, clean, anti-wear hydraulic oil as specified in Section 6 of this manual.

9. Check the water tank and add clean water if necessary. Open the main water supply valve located under the left side of the machine.

10. Check the battery electrolyte level. If necessary, add only clean, distilled water as specified in Section 8 of this manual.

11. **DO NOT** operate faulty equipment.

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

13. 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.

14. Set the guard rails in place at the side of the operators platform.

15. Know the job site requirements, such as the milling depth and slope.

START-UP PROCEDURE

If you are in doubt of the operation of this machine after reading these procedures - see your supervisor. Read and understand all of the instructions prior to starting the machine.

1. Ensure that the Parking Brake is in the APPLY position.

2. Ensure that the Propulsion control is positioned to "Neutral" (N).

3. Ensure that the Conveyor Belt control is positioned to "Neutral" (N).

4. En sure that the Cutter Drum is OFF and that the Cutter Drum Indicator light is not on.

5. En sure that the Engine Throttle is in the IDLE RPM position.

6. Position the HorsepowerLoad Control Lever in Manual.

7. Ensure that Grade/Slope Sensor controls are OFF.

8. Ensure that the Water Spray control is OFF.

9. Clear the work area of all personnel and obstructions.

10. Turn the Master Power Switch to ON.

Continued

START-UP PROCEDURE - CON'T.

⚠ WARNING

Starting aids are extremely flammable and can explode.

Overloading the engine air intake system could result in an explosion.

Avoid overloading the engine air intake system with starting aids.

11. For cold weather starting, use starting aids as necessary, however, refer to the engine operators manual and Cold Weather Starting in this section before doing so.

12. Push in and hold the Automatic Shutdown Override Switch while turning the Ignition Switch to the start position. Hold in this position until the engine starts.

NOTE

Neutral safety switches will prevent the engine from cranking unless the propulsion, conveyor, and cutter drum controls are in the neutral of OFF position. In addition, the engine compartment belly door must be closed.

NOTICE

Starter may overheat if operated longer than 30 seconds.

If the engine fails to start, allow the starter to cool 2 to 3 minutes before trying again.

13. Once the engine has started, allow the Ignition Switch to return to its normal, ON position. Release the Automatic Shutdown Override Switch.

NOTE

It may be necessary to hold in the Automatic Shutdown Override Switch for a couple of seconds after the engine has started to ensure that the engine does not shut-down again. The switch, when depressed and held, overrides the engine low oil pressure shut-down switch.

NOTICE

Incorrect oil pressure or temperature can cause engine damage.

If gauges do not display the proper readings, shut down the engine and correct the malfunction before operation.

14. Verify that the Parking Brake Indicator light is "on".

15. Verify that the Cutter Drum Indicator light is "off".

16. Verify that all three Hydraulic Filters Indicator lights are "off".

17. Verify that the Low Air Pressure Indicator light goes out when air pressure reaches system pressure.

18. To prevent damage to the hydraulic components, warm up the hydraulic system oil before operating the machine. Allow the engine to run at slow throttle for a few minutes before normal operation. Never race the engine during the warm up period.

NOTICE

Idling the engine unnecessarily for long periods of time wastes fuel and fouls injector nozzles.

Unburned fuel causes carbon formation; oil dillution; formation of lacquer or gummy deposits on the valves, pistons and rings; and rapid accumulation of sludge in the engine.

Do not idle unnecessarily for long periods of time.

Continued

OPERATING PROCEDURES

⚠ DANGER

Improper operation can cause serious injury or death.

Read and understand this Section before you operate this machine.

NOTICE

Machine damage.

Continually check all indicators and gauges. If they do not display the proper readings, shut down the engine immediately and correct the malfunction before continuing operation.

1. Ensure that the engine and hydraulic system have been properly warmed up.

2. Stow the elevation locking bars and pins.

3. Ensure that the moldboard is in the up position.

4. Lower the rear of the machine until the gauge rods are even with the top of the gauge bars. Refer to Figure 5-1.

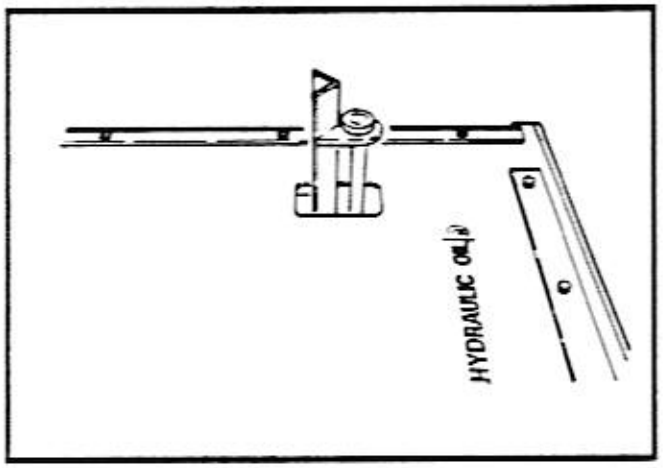


Figure 5-1. Gauge Rods and Bars

⚠ WARNING

Machine motion can cause severe cutting or crushing.

Machine will raise or lower as sensors are adjusted.

You must have a trained operator at the control console with the brake ON and the Drum Control OFF before adjusting the sensors.

5. Adjust the sensor valve assemblies. Refer to the adjustment procedures in this Section.

6. If not already done, open the main water supply valve FULLY. It is located on the left side of the machine in front of the drum box. Refer to Figure 5-2. Do not run the water pump dry.

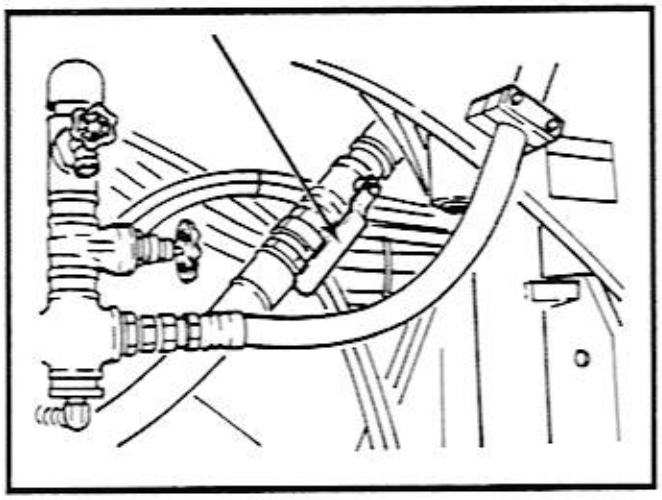


Figure 5-2. Water Supply Valve

7. Position the Water Spray control to ON.

⚠ DANGER

Cutter drum motion will cause severe cutting or crushing.

Ensure that all personnel are out of the drum area before starting the cutter drum.

8. Pull the Cutter Drum System Switch out while depressing the Cutter Drum Start Switch. The cutter drum will start to rotate. Hold the Start Switch depressed until the Cutter Drum On Indicator is lit.

Continued

OPERATING PROCEDURE - CON'T.

9. Position the Travel Speed Switch to LO.

10. Position the manual Steering Control and the Electric Steering Control Switch to the desired position.

11. Position the Engine Throttle to OPERATING RPM and the engine Load Control to AUTO or MANUAL as desired. Refer to Load Control Adjustment in this Section.

12. Position the Conveyor Belt control to the FORWARD position and use the Conveyor Swing and Elevation Controls to move the conveyor to the desired position.

13. Release the Parking Brakes by moving the control to the RELEASE position.

⚠ DANGER

Runaway machine.

If the cutter teeth hit a hidden metal object, the machine could jump backward.

Ensure that all personnel are at least 10 feet from the front or rear of the machine.

14. Move the Propulsion Control Lever, slowly, to start the machine moving. The more you move the lever, the faster the machine moves. To stop the machine, slowly move the control back to neutral. Always remember to raise the moldboard when you travel backwards.

15. Use the Left and Right Front Elevation Control Levers to gradually lower the machine into the cut. Hold both levers in the LOWER position until the ground crew member signals that the correct cutting depth has been reached, then release the levers. If cutting deeper than 6 inches, refer to CUTTING DEEPER THAN 6 INCHES in this section.

16. Position the Grade Sensors to ON. The sensors will automatically adjust the cut to the predetermined depth.

17. Lower the moldboard and leave in the LOWER position. Contact with the pavement should be slight. Use the Moldboard Down Pressure Control Valve to adjust the pressure until the moldboard appears to "float" on the surface. The moldboard should not be catching or dragging. It should leave the cut surface visible.

18. Make any necessary adjustments to the propulsion speed, conveyor controls, and moldboard pressure to achieve a smooth cutting operation with a nice cutting pattern and the engine not lugging.

19. Refer to STOPPING BETWEEN TRUCKS in this Section for the proper stopping technique to use between truck loads.

⚠ CAUTION

Moldboard damage.

Watch the moldboard on sharp radius cuts. It can be damaged if allowed to catch on something.

To back up:

a. Disengage the cutter drum by positioning the Cutter Drum Switch inward to the STOP position. The cutter drum will continue to rotate for a minute or so before coming to a complete stop.

b. Raise the moldboard fully.

c. Raise the machine.

d. Move the Propulsion Control Lever to the reverse position; the farther you move the lever from the "neutral" position, the faster the machine travels.

SHUT-DOWN PROCEDURE

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

2. Disengage the cutter drum clutch by pushing the Cutter Drum System Switch in. The Cutter Drum Indicator light should go out.

3. Set the Parking Brake by positioning the lever to APPLY.

4. Move the Conveyor Belt lever to the neutral (N) position.

5. Raise the Moldboard all the way.

6. Position the Grade/Slope controls to OFF.

7. Raise the front and rear of the machine by using the Right, Left, and Rear Elevation Control Levers as necessary.

8. Place the front and rear elevation locking bars and pins into the locked position.

Continued

SHUT-DOWN PROCEDURE - CON'T.

9. Position the Engine Throttle in the IDLE RPM position. Allow the engine to idle for a few minutes to avoid high internal heat rise and to allow for heat dissipation.

10. Position the Water Spray Control Lever to the OFF position.

11. Turn the Ignition Switch to OFF. After the engine stops turn the Master Switch to the OFF position.

⚠ CAUTION

Alternator damage.

Using master power switch to shut-down engine will cause alternator damage.

Always shut-down engine with ignition switch.

12. Shut off the water supply valve under the machine.

EMERGENCY SHUT-DOWN PROCEDURE

1. Immediately position the Ignition Switch to OFF.

2. Correct the problem that caused the emergency shut-down situation.

3. After the problem is corrected, start the engine according to the START-UP PROCEDURES in this Section.

COLD WEATHER STARTING

⚠ WARNING

Starting aids are extremely flammable and can explode.

Overloading the engine air intake system could result in an explosion.

Avoid overloading the engine air intake system with starting aids.

The most familiar type of starting aid is the conventional spray can. Starting the engine using an ether spray can is a two man operation requiring one to direct the ether at the air cleaner and a second person to start the engine. Care must be taken to insure that excessive starting fluid is not used.

1. Before attempting to start the engine with the starting fluid, turn the engine over for three (3) to five (5) seconds to generate heat in the combustion chambers.

2. While continuing to crank, spray the starting fluid into the air cleaner, until the engine starts. Do not use an excessive amount of starting fluid.

TOWING

If it should become necessary to tow the MT-7000, remove the right front tubing cover under the console panel. Disconnect the 1st large line to the right of the water level indicator tube. Connect a source of controlled hydraulic pressure (no more than 500 psi) to this line and apply hydraulic pressure until the brakes are released. To reapply the brakes, relieve the source of hydraulic pressure. Refer to Figure 5-3.

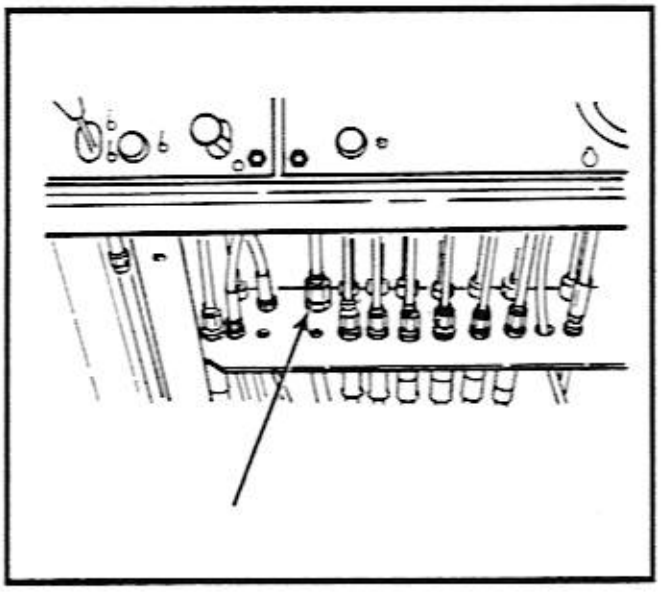


Figure 5-3. Towing Release Line

HYDRAULIC GRADE SENSOR NULL ADJUSTMENT

⚠ WARNING

Machine motion will cause severe cutting or crushing.

Machine will raise or lower as sensors are adjusted.

You must have a trained operator at the control console with the brake ON and the Drum Control OFF before adjusting the sensors.

NOTE

This procedure is made up of two parts. The linkage must first be zeroed and the grade sensor "null" adjustment must be made. The sensors must then be zeroed with the cutter drum. Refer to Figure 5-4.

ZEROING THE LINKAGE AND GRADE SENSOR "NULL" ADJUSTMENT.

NOTE

This procedure is for adjusting one sensor. The sensor assemblies will each have to be adjusted separately. Ensure that the sensor you are not adjusting is positioned to OFF.

1. Ensure that the sensor bar (1) is held in place, in the swivel (2), by the detent balls (3) and that the jam nuts (4) are tight.

2. Loosen the capscrew (7) on the linkage arm (8) until the linkage is free to rotate on the servo valve shaft (9).

3. Place a 0.09 inch shim between the ski leg (5) and the stop block (6).

4. Back the jam nut (10) off several turns. Rotate the sensor bar (1) until motion produces 0.34 inch clearance at the closest point between the link assembly (11) and the lever stop (12).

5. Tighten the jam nut (10) on the rod end of the sensor bar (1) against the sensor bar to lock the adjustment in place.

NOTE

At this point, the linkage system should be in the "0" position and the servo valve can be "Nulled".

6. Start the engine and position the drum about 4 inches above the ground, using the front and rear elevation control levers.

7. Position the Left Hydraulic Grade Sensor Lever to the ON position. At the same time, use a screwdriver to turn the servo shaft (9). Adjust the shaft to a point where the machine does not move up or down. This is the "Null" position. Raise the ski, if the machine lowers, instead of raises when you turn the shaft out of the "Null" position, then the shaft is in the wrong quadrant. It must be turned to the next adjustment "Null" point, and "Nulled" again. Tighten the capscrew (7) after the null point is reached.

8. Remove the 0.09 inch shim from between the stop block (6) and the ski leg (5).

ZEROING THE SENSORS WITH THE CUTTER DRUM.

1. Position the machine on level ground with the cutter teeth just touching the ground, and the Right and Left Hydraulic Grade Sensors positioned to OFF.

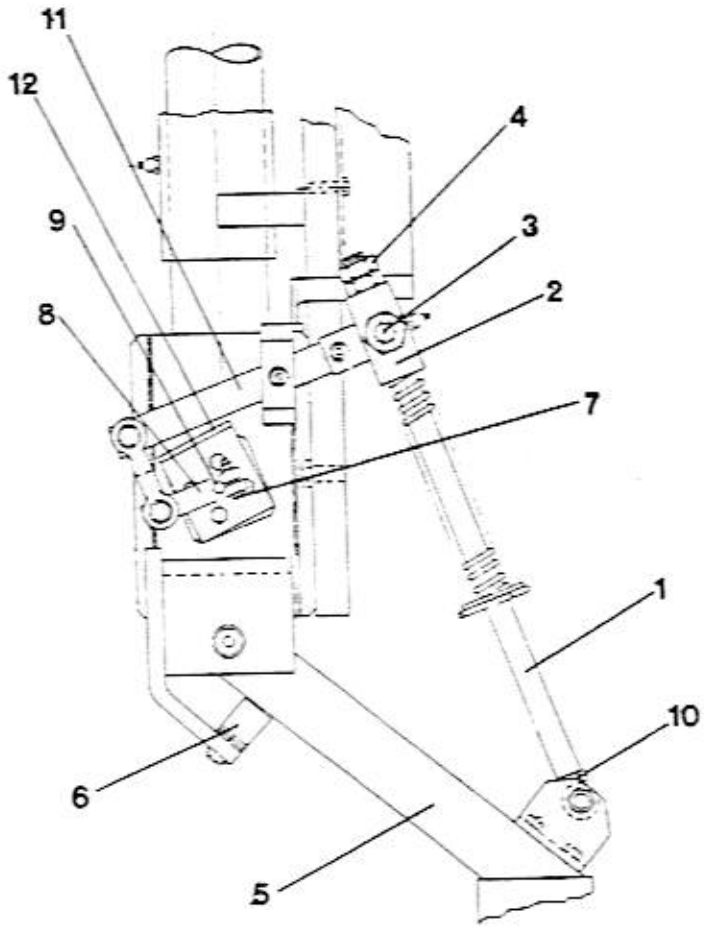
2. Ensure that the sensor bar (1) is held in place in the swivel (2) by the detent balls (3), and that the jam nuts (4) are tight.

3. Lower the grade sensor until the ski/wheel touches the ground with 0.09 inch clearance between the ski weld (5) and the stop block (6).

4. Loosen the indicator lock set screw. Move the top of the indicator to "0" on the depth scale and tighten the lock set screw.

Continued

HYDRAULIC GRADE SENSOR NULL ADJUSTMENT - CON'T.



1. Sensor Block
2. Swivel
3. Detent Ball Plunger
4. Jam Nut
5. Ski Weld
6. Stop Block
7. Capscrew
8. Linkage Arm
9. Servo Valve Shaft
10. Jam Nut
11. Link Assembly

Figure 5-4. Hydraulic Grade Sensor Null Adjustment

STEERING COORDINATION CONTROL

Use the following information in Table 5-1 to determine the proper switch positions for the different types of steering operations or modes desired.

Remember the following items:

1. With the STEERING Control Lever in the FRONT position, the rear tracks are being steered electrically.

2. With the STEERING Control Lever in the REAR position, only the rear tracks are being steered. The front tracks are not controlled and will travel in the direction they were pointed when they were last steered. The front tracks can change the direction they are steering due to changes in machine elevation. An adjustment to front track position may be necessary if the machine steers in a direction other than the desired direction. This front track position can only be changed if the STEERING Control Lever is positioned to the FRONT position.

3. With the STEERING Control Lever in the REAR position, the electrical steering control system for the rear tracks is totally disengaged and the tracks are being steered manually only.

4. The STEERING Control Lever determines the tracks that you are steering manually, either FRONT or REAR.

Mode	Manual Steer Selector Lever Position	Electric Box Selector Switch Position	Track Position	Use
Front Steering	Front	Trail		Normal
Rear Steering	Rear	Makes no difference (not activated)		Backing Up
Crab Steering	Front	Crab		Moving Over *
Coordinated Steering	Front	Coordinate		Tight Turns
Trim-Rear	Front	Trail		Curb or Inclines **

* Use this mode or type of steering when it is necessary to move the machine either left or right in a short distance and still remain parallel to the original direction of travel.

** Use this mode or type of steering when it is desirable to keep the rear of the machine up very close to a curb while milling or when milling on a slight incline where it is desirable to ensure that the tracks do not slide down toward the low side of the incline.

Table 5-1. Steering Logic Chart

STEERING COORDINATION CONTROL - CON'T.

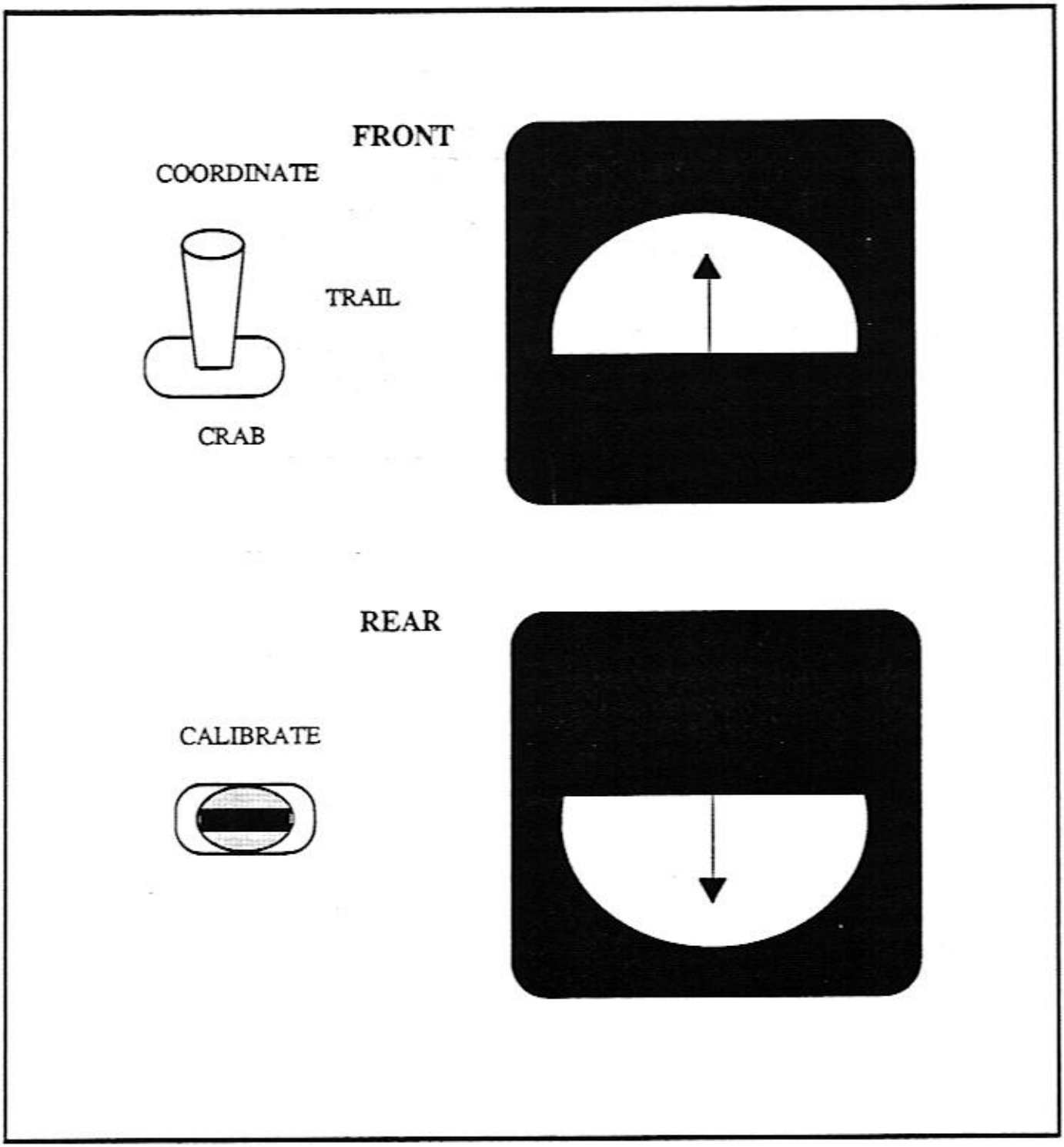


Figure 5-5. Steering Coordination Control Switches

ELECTRIC GRADE/SLOPE CONTROL

Use the following information in Table 5-2 to determine the proper switch positions for the different types of grade/slope modes desired.

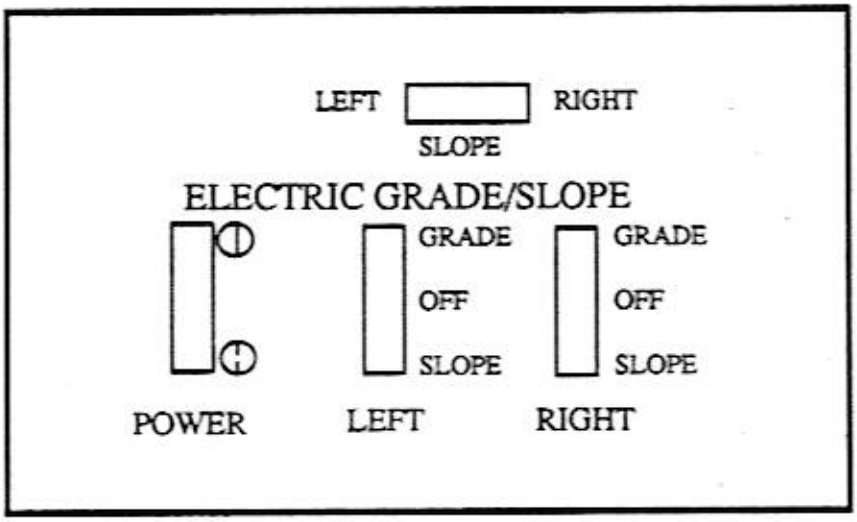


Figure 5-6. Electric Grade/Slope Controls

Control Mode		Grade/Slope		Slope Switch
Left Side	Right Side	Left Switch	Right Switch	
Hyd. Grade	Elect. Grade	OFF	GRADE	Makes No Difference
Hyd. Grade	Hyd. Grade	OFF	OFF	Makes No Difference
Elect. Grade	Hyd. Grade	GRADE	OFF	Makes No Difference
Slope	Hyd. Grade	SLOPE	OFF	LEFT
Hyd. Grade	Slope	OFF	SLOPE	RIGHT
Slope	Elect. Grade	SLOPE	GRADE	LEFT
Elect. Grade	Slope	GRADE	SLOPE	RIGHT
Elect. Grade	Elect. Grade	GRADE	GRADE	Makes No Difference

Table 5-2. Grade/Slope Logic Chart

LOAD CONTROL ADJUSTMENT

To ensure that the load control will function properly, it must first be adjusted. With the engine at full engine rpm, with the Propulsion Control Lever in the full Forward position, and while performing milling operations, back off the adjustment screw until the engine is not lugging down. The engine rpm should be approximately 2300. While traveling, adjust the screw until the engine just starts to lug down (approximately 2050 to 2100 rpm). This will have the load control system properly adjusted. With the system properly adjusted, the machine propulsion will automatically slow as the machine starts milling harder cuts. Tractive effort will increase as engine speed drops to around 2100 rpm.

NOTE

The Load Control may be "fine tuned" or adjusted by turning the knob (screw). Course adjustments may be made by pushing in on the control knob button and pushing or pulling the cable to the desired position. There is around a three (3) inch stroke on the cable which is about 10 complete turns on the knob. Pull completely up on the knob to "unload" the engine.

STOPPING BETWEEN TRUCKS

The following is a procedure that can be used when it is necessary to stop the milling machine and wait while changing trucks.

⚠ DANGER

Unexpected machine motion.

Do not move the Load Control Lever from the AUTO position or the machine will move in the direction selected on the Propulsion Control Lever.

The operator must remain on the machine and at the controls at all times when using this procedure. If a long wait is expected or it is desired to perform any maintenance, the machine must be shut-down. Refer to Shut-Down Procedure in this Section.

1. Leave the Propulsion Control Lever in the operating position. Do not move the lever back to Neutral. Leave the Load Control Lever in AUTO.

2. Stop movement of the machine by moving the ENGINE THROTTLE Control Lever back toward the IDLE position to an rpm that is less than what is needed to propel the machine. This will be approximately 1500 rpm. This will allow the conveyor to unload.

3. Position the WATER SPRAY Control Lever to OFF.

4. Position the CONVEYOR BELT Control Lever to the Neutral position.

5. Allow the new truck to pull into position.

6. Position the CONVEYOR BELT Control Lever to FORWARD.

7. Position the WATER SPRAY Control Lever to ON.

8. Slowly move the ENGINE THROTTLE Control Lever to the OPERATING position.

CUTTING DEEPER THAN SIX (6) INCHES

If a milling depth of six (6) inches or greater is desired, the auxiliary skirt pad must be removed from the left side. If a milling depth of greater than eight (8) inches is desired, the side skirt must be removed from both sides in addition to the auxilliary skirt pad.

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 an area where lubrication is required.

SECTION 6 - FUEL AND LUBRICATION SPECIFICATIONS

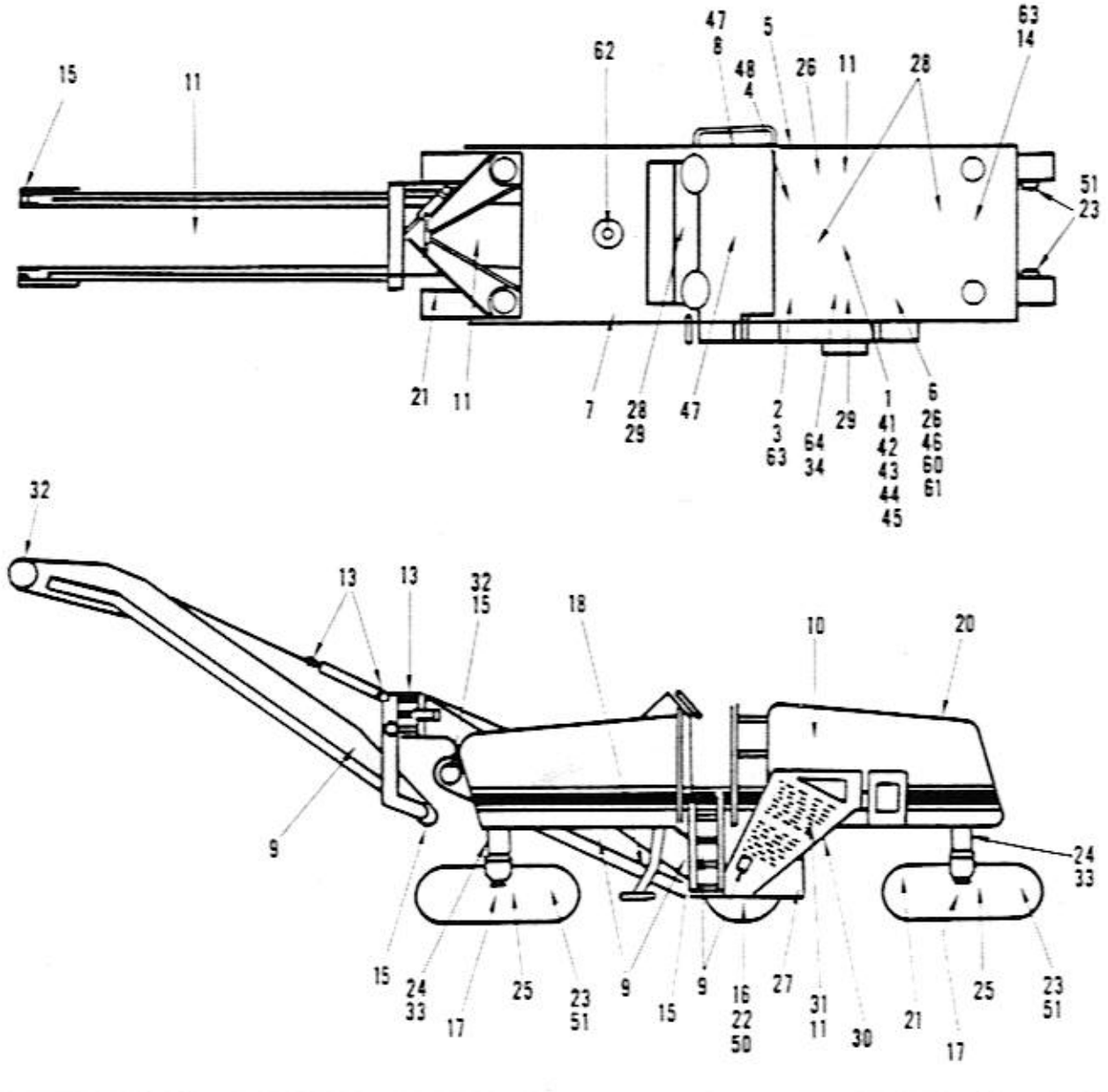
SERVICE INTERVAL	REF. NO.	DESCRIPTION	SERVICE	LUBRICANT	QUANTITY
10 HOURS OR DAILY	1	Engine Oil	S, A	SAE 15W40 CD	Dipstick Full Mark
	2	Engine Coolant	S, A	Water & Antifreeze	AR
	3	Battery	S, A	Distilled Water	AR
	4	Air Cleaner	S, Cl, C, AR	———	2 Elements
	5	Fuel Tank	S, A	# 2 Diesel Fuel	AR
	6	Hydraulic Oil	S, A	46 ISO-VG	Fill to Cntr 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	———	26
	10	Air Tank	D	———	1
	11	Belts-Conveyor, Drum Drive & Engine	S, AD, AR	———	———
	13	Conveyor Grease Fittings	G	MPG-EP Grease	11 Fittings, 4 Shots
	14	Visual Check Radiator & Oil Cooler	S	———	———
	15	Conveyor Pulley Bearings	G	MPG-EP Grease	6 Fittings, Purge
	16	Cutter Planetary Seal Excluder	G	MPG-EP Grease	1 Fitting, 6 Shots
	17	Yoke Pivot Bearings	G	MPG-EP Grease	8 Fittings, 4 Shots
	18	Grade Sensors	G	MPG-EP Grease	6 Fittings, 2 Shots
50 HOURS OR WEEKLY	20	Visual Inspection of Fasteners	S, T	———	AR
	21	Steering Pins	G	MPG-EP Grease	20 Fittings, 2 Shots
	22	Cutter Planetary	S, A	SAE 90 EP	FTLH
	23	Track Drive Planetaries	S, A	SAE 90 EP	FTLH
	24	Leg Tubes (Prior to S/N 5066)	G	Never Seeze	Coat 4 Cyls AR
	24	Leg Tubes (Eff. w S/N 5066)	C	Dry Graphite Paint	Coat 4 Cyls AR
	25	Track Tension	S, AD, AR	———	4
	26	Hydraulic Filters	S, C, AR	———	4
	27	Moldboard Door Pins	Cl, G	MPG-EP Grease	2 Fittings, 4 Shots
	28	Start Interlocks	S	———	3
	29	Clutch Interlocks	S	———	2
	30	Moldboard Cylinder	G	MPG-EP Grease	4 Fittings, 2 Shots
	31	Drum Drive Belt Adjuster	G	MPG-EP Grease	3 Fittings, 2 Shots
	32	Conveyor Drive Motor Carrier Bearings	S	SAE 90 EP	———
	33	Jack Cylinder Bearings	G	MPG-EP Grease	4 Fittings, 2 Shots
	34	Clutch Rotary Swivel	A	SAE 30	Fill
250 HOURS OR QUARTERLY	41	Engine Oil	D, F	SAE 15W40 CD	Dipstick Full Mark
	42	Engine Oil Filter	C	———	2
	43	Engine Oil Bypass Filter	C	———	1
	44	Fuel Filter	C	———	2
	45	Engine Coolant Filter	C	———	1
	46	Traction Suction Oil Filters	C	———	1
	47	Drum Coolant	S, A	Water & Antifreeze 50/50 mix	AR
	48	PreCleaner Tubes	S, Cl	———	AR
500 HOURS OR SEMI-ANNUALLY	50	Cutter Planetary	D, F	SAE 90 EP	FTLH
	51	Track Drive Planetaries	D, F	SAE 90 EP	FTLH
1000 HOURS OR ANNUALLY	60	Suction Strainers	Cl	———	4
	61	Hydraulic Oil Tank	D, Cl, F	46 ISO-VG	Cntr of Gauge
	62	Water Tank	D, Cl	———	———
	63	Engine Coolant	D, F	Water & Antifreeze	AR
	64	Clutch Bearings	G	MPG-EP Grease	2 Fittings, Purge

SERVICE FUNCTIONS: A - ADD C - CHANGE F - FILL S - CHECK AD - ADJUST CL - CLEAN FTLH - FILL TO LEVEL HOLE T - TO
AR - AS REQUIRED D - DRAIN G - GREASE NOTE: FOR ENGINE MAINTENANCE SEE ENGINE OPERATION GUIDE MANUAL

Lubrication Diagram (Sheet 1 of 2)

⚠ WARNING

Improper maintenance can be hazardous.
Understand maintenance safety prior to working.
Consult machine manual and Ingersoll-Rand Dealer.



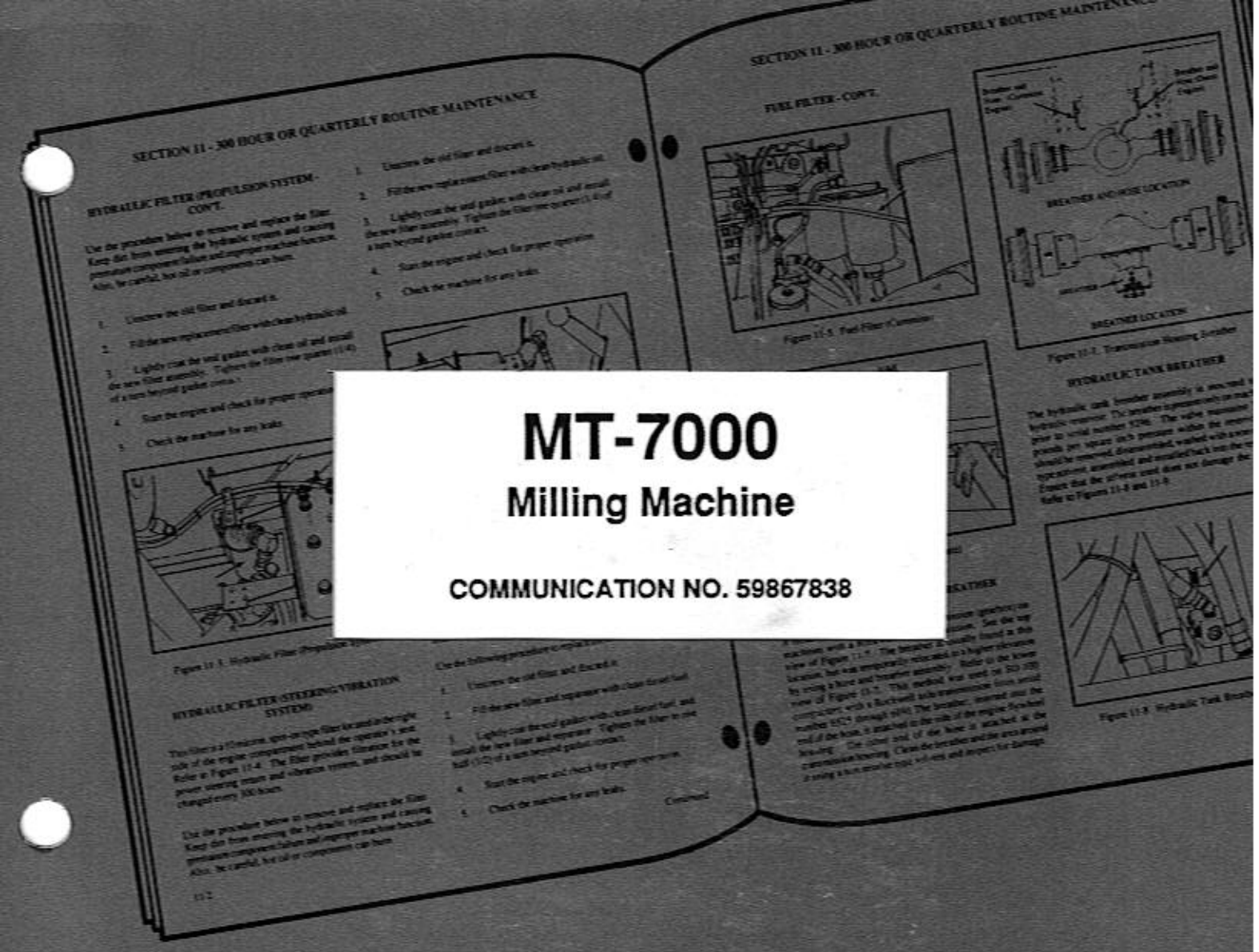
Lubrication Chart - Sheet 2 of 2

GENERAL INFORMATION - CON'T.

FLUID CAPACITIES

FLUID/OIL	APPROXIMATE CAPACITY
Diesel Fuel #2 ASTMD-975-60T	250 Gallons (946 Liters)
Hydraulic Oil	555 Gallons (208 Liters)
Water Tank	1000 Gallons (3785 Liters)
Engine Oil (Refer to the engine Operator's Manual	46 Quarts (43.5 Liters)
Engine Coolant	144 Quarts (136 Liters)
Drum Coolant	130 Gallons (492 Liters)
Track Drive Planetary	8 Pints (1.9 Liters)
Cutter Planetary	13 Pints 6.2 Liters)
Drum Input Unit	1 Pint (0.5 Liter)

Table 6-1. Fluid Capacities



MT-7000

Milling Machine

COMMUNICATION NO. 59867838

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 miniature pointing hands.

REVISION LOG

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OPERATION AND
MAINTENANCE MANUAL
COMMUNICATION NO. 59867838

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REVISION LEVEL	DATE

NOTE

This manual replaces the MT-7000 Milling Machine Operation and Maintenance Manual (CPN 59867838) originally issued on 06-02-86 and all revisions to that manual.

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SECTION	PAGE NO.	REVISION LEVEL

MT-7000 MILLING MACHINE
OPERATION AND
MAINTENANCE MANUAL
COMMUNICATION NO. 59867838

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 the drum area before turning drum on. • Keep guards in place and operational.
ENTIRE MACHINE	• Personal injury or death. • Electrocution hazard.	• All maintenance is to be performed with the engine shutdown and the 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 elevation controls. • Keep ten feet from rear of the machine when cutting.
CONVEYOR	• Moving belt and swing conveyor can cause crushing, falling or snagging hazard.	• Stay clear of conveyor when machine is running.
WHEELS/TRACK	• Machine in motion can cause crushing, falling or snagging hazard.	• Stay clear of wheels/tracks when machine is running.
GRADE SENSOR ADJUSTMENT	• Operator or ground man may be struck by passing vehicle.	• Stay clear of passing traffic.

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.

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 emulsibility) for separation of water, air and contaminants. Resistance to the formation of gums, sludges, acids, tars, and varnishes. High lubricity and film strength.

Table 6-2. Requirements for Hydraulic Oil

The following are only a few examples of the commercial brand oils meeting specifications for use at temperatures above 10° F (-12° C):

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

For temperatures below 10° F (-12° C), the following oils meet specifications:

Auto. Trans. Fluid ——— Type F
Mobil Oil Company ——— Mobil DTE 13M
Shell Oil Company ——— Tellus T-27

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° (C°)
75W	-40 (-40)
80W	-15 (-26)
85W	+10 (-12)
90	+20 (- 7)
140	+40 (+5)
250	+50 (+10)

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° F (177° C) min.
Oil Viscosity	75 SUS Minimum at 210° F (99° C)
Water Resistance	Excellent

Under 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° F (38° C).

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 90% 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 lube oil change interval recommendations. It is recommended 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.

FUEL OIL SPECIFICATIONS

CLOUD POINT

The *cloud point* is that temperature at which wax crystals begin 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

VISCOSITY (ASTM D-445)	1.3 to 5.8 centistokes per second at 104° F (1.3 to 5.8 mm/sec at 40° C).
CETANE NUMBER (ASTM D-613)	40 minimum except in cold weather or in service with prolonged idle, a higher cetane number is desirable.
SULFUR CONTENT (ASTM D-129 or 1552)	Not to exceed 1 percent by weight.
WATER AND SEDIMENT (ASTM D-1796)	Not to exceed 0.1 percent by volume.
CARBON RESIDUE (Ramsbottom, ASTM-D-524 or Conradson ASTM D-189)	Not to exceed 0.25 percent by weight on 10 percent volume residue.
FLASH POINT (ASTM D-93)	At least 125° F (52° C) or legal temperature if higher than 125° F (52° C).
DENSITY (ASTM D-287)	30 to 42° API gravity at 60° F (0.816 to 0.876 g/cc at 15° C).
CLOUD POINT (ASTM D-97)	10° F (6° C) below lowest ambient temperature at which the fuel is expected to operate.
ACTIVE SULFUR	Copper strip corrosion not to exceed No. 2 rating after 3 hours at 122° F (49° C).
ASH (ASTM D-482)	Not to exceed 0.02 percent by weight.
DISTILLATION (ASTM D-86)	The distillation curve must be smooth and continuous. At least 90 percent of the fuel must evaporate at less than 680°F (360° C). All of the fuel must evaporate at less than 725° F.

FUEL OIL SPECIFICATIONS FOR ENGINES

Commercial diesel engines are made 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*

Continued

FUEL OIL SPECIFICATIONS - CON'T.

Number, Sulfur Content, and Cloud Point are four of the most important properties of diesel fuels that must be controlled to ensure satisfactory engine operation.

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° F (6° C) 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 Content, and Cloud Point* property limits shown in the FUEL OIL SELECTION CHART.

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

HAZARDOUS SUBSTANCE PRECAUTION

The following information is provided to assist the owners and operators of Ingersoll-Rand Road Machinery Equipment.

Further information may be obtained by contacting your Ingersoll-Rand Road Machinery Equipment Distributor.

The following substances are used in the manufacture of this machine and may be hazardous to health if used incorrectly.

SUBSTANCE	PRECAUTION
Antifreeze (Water cooled engine)	Avoid ingestion, skin contact and breathing fumes.
Hydraulic Oil	Avoid ingestion, skin contact and breathing fumes.
Engine Lubricating Oil	Avoid ingestion, skin contact and breathing fumes.
Preservative Grease	Avoid ingestion, skin contact and breathing fumes.
Rust Preventative	Avoid ingestion, skin contact and breathing fumes.
Engine Fuel	Avoid ingestion, skin contact and breathing fumes.
Battery	Avoid ingestion, skin contact and breathing fumes.
SAE Gear Oil	Avoid ingestion, skin contact and breathing fumes.

The following substances may be produced during the operation of this machine and may be hazardous to health.

SUBSTANCE	PRECAUTION
Engine Exhaust Fumes	Avoid breathing.
Engine Exhaust Fumes	Avoid build-up of fumes in confined spaces.
Electric Motor Dust (Brushes/Insulation)	Avoid breathing during maintenance.
Brake Lining Dust *	Avoid breathing during maintenance.

* Only on machines with dry axle brakes.

SECTION 7 - INITIAL BREAK-IN MAINTENANCE

Contents | Page

⚠ WARNING

Unexpected machine motion or moving parts can cut or crush.

Install the leg lock bars/pins, apply the parking brake, shut down the engine, and shut off the master switch before working on the machine.

⚠ WARNING

Improper maintenance can be hazardous.

Read and understand SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES before you perform any maintenance, service or repairs.

GENERAL

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 after 50 to 100 hours of operation **IN ADDITION TO** the 10 hour, 50 hour 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.

TRACK DRIVE PLANETARY

Change the oil. For the procedure, refer to SECTION 12 - 500 HOUR OR SEMI-ANNUAL ROUTINE MAINTENANCE.

SECTION 8 - 10 HOUR OR DAILY ROUTINE MAINTENANCE

⚠ WARNING

Unexpected machine motion or moving parts can cut or crush.

Install the leg lock bars/pins, apply the parking brake, shut down the engine, and shut off the master switch before working on the machine.

⚠ WARNING

Improper maintenance can be hazardous.

Read and understand SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES before you perform any maintenance, service or repairs.

ENGINE OIL

Check the engine's oil level at the start of each day and maintain it to the full mark on the dipstick. The engine oil dipstick and fill are located on the left side of the engine. Gain access through the operators platform engine

If low, fill the crankcase with SAE 15W40 CD (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.

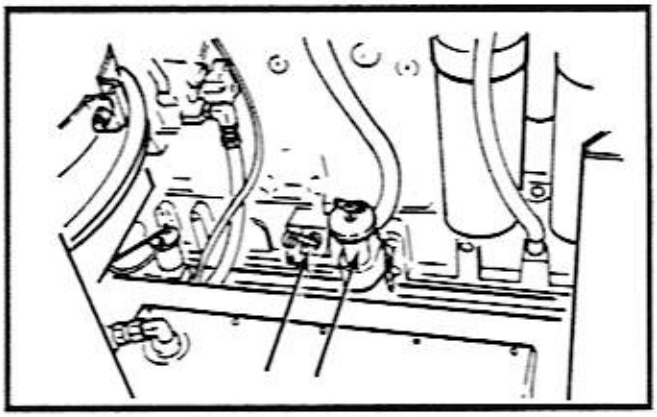


Figure 8-1. Engine Oil Dipstick and Fill

AIR CLEANER

The air cleaner is the dry type with two replaceable elements. It is located in the engine compartment. Gain access through the engine compartment door at the operators platform. Refer to Figure 8-2.

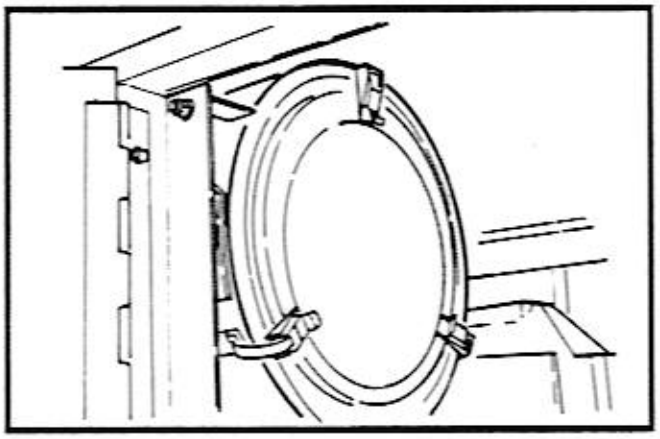


Figure 8-2. Air Cleaner

Continued

AIR CLEANER - CON'T.

The 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. Dust passing the air cleaner, even through small holes, can cause rapid engine wear. Ensure all connections between the air cleaner and the engine are tight and sealed. If these connections are all well sealed, and there is still evidence of dust leakage, check the following places for possible trouble.

NOTE

Dust that gets by the air cleaner system can often be detected by looking for dust streaks on the air transfer tubing or just inside the intake manifold inlet.

1. Inspect the air cleaner outlet tube for damage.

2. Ensure that the element gasket washer is not damaged and the washer's rubber face seals against the element.

3. Inspect the element gasket for damage.

4. Check for structural failures. Any damaged parts must be replaced.

FILTER ELEMENT REPLACEMENT

⚠ CAUTION

Engine damage.

Raw, unfiltered air can cause engine damage.

Never service the air cleaner while the engine is running.

1. Loosen the three (3) latches securing the cover in place and remove the cover.

2. Remove the thumbscrew and washer; then withdraw the elements.

3. Clean the primary element as outlined in ELEMENT CLEANING. Do not clean the safety element. Replace the primary element after 25 inches of restriction is read on the restriction indicator. Replace the safety element only when the indicator on the safety element shows as necessary.

4. Inspect all parts of the intake system and air cleaner.

5. Install the cleaned or new element into the air cleaner body, securing it with the washer and thumbscrew.

6. Ensure that the O-ring around the air cleaner body is in place and not damaged.

7. Install the cover on the air cleaner body and secure with the latches.

ELEMENT CLEANING

Washing in a water-detergent solution or blowing out with compressed air are two accepted methods for cleaning the element of the air cleaners. If the elements contain substantial amounts of soot or oil fumes, washing in water works better than compressed air. If the contaminant is found to be mostly loose dust, either method works equally well.

If cleaned with compressed air, elements can be put back into service immediately; however, if cleaned by washing, elements must be dried before returning them to service.

NOTE

Some elements are partially covered by a plastic sleeve with fins. The covered portion can be cleaned with water or air without removing the sleeve. Use a stiff fiber (not wire) brush to remove oil and grease deposits from the sleeve and fins. Never remove the sleeve and fins from the element.

Cleaning With Compressed Air.

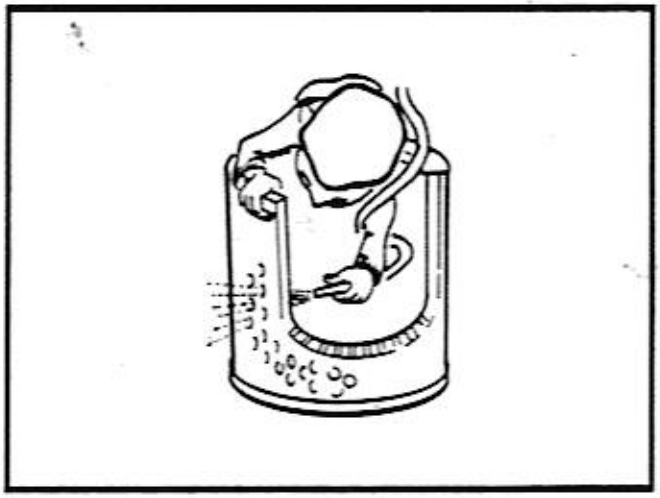


Figure 8-3. Cleaning with Compressed Air

NOTICE

Excessive air pressure can damage the element.

Pressure at the air nozzle must not exceed 40 PSI.

Continued

AIR CLEANER - CON'T.

ELEMENT CLEANING - CON'T.

Cleaning with Compressed Air - Con't.

1. Direct a jet of clean, dry air from the inside of the filter element, perpendicular to the pleats.

2. Move the air jet up and down along the pleats, slowly rotating the element, until no more dust is being removed. Do not rupture the element with the nozzle or the air jet.

Cleaning With Water.

1. The elements can be cleaned by washing with water and a good non-sudsing detergent. Direct a jet of clean, dry air from the inside of the filter element. When the loose dust and soot have been removed, the element is ready to be washed. Fuel or solvents can damage the element and explode or burn.

⚠ WARNING

Fuel or solvents are extremely flammable.

May cause severe injury or death.

Never use fuel or solvents to clean the elements.

2. Dissolve the detergent in a small amount of cool water.

3. Add warm water [approximately 100 degrees F (38 degrees C)] to get the proper proportions of detergent and water (about one cup of detergent to five gallons of water).

4. Soak the element in the solution for at least 15 minutes. Refer to Figure 8-4.

5. Agitate the element for about two minutes to loosen the dirt.

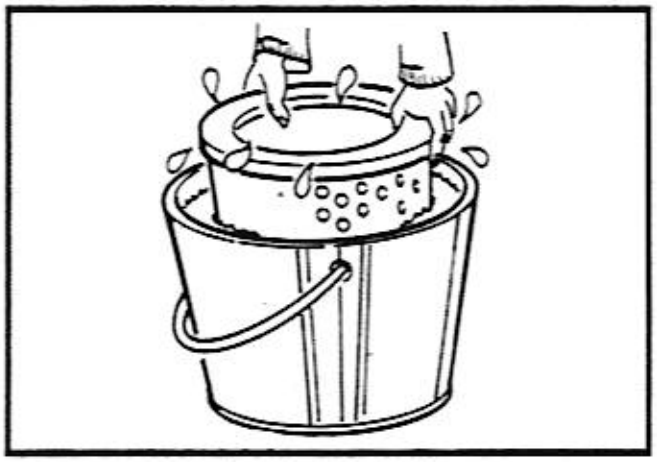


Figure 8-4. Soaking the Element

NOTICE

Excessive water pressure can damage the element.

Keep water pressure at hose or tap below 40 PSI (276 kPa).

6. Rinse the element with clean water until the water coming through the element is clean. Air-dry the element thoroughly before using. Refer to Figure 8-5.

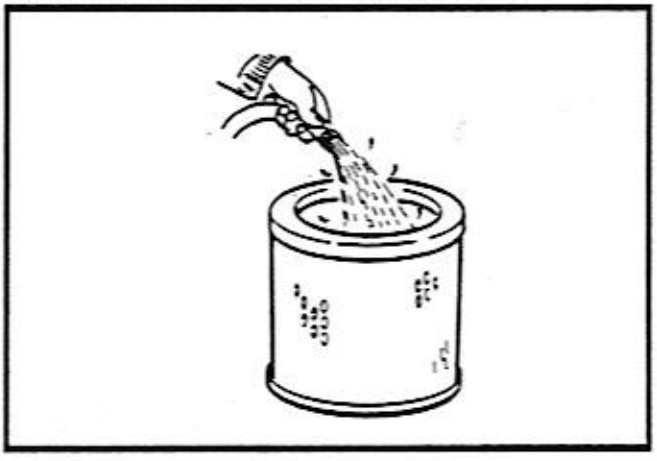


Figure 8-5. Rinsing the Element

NOTICE

Element damage can occur during drying.

Never use light bulbs for drying elements.

Heated air [maximum temperature 160 degrees F (71 degrees C)] must have circulation when drying elements.

Continued

AIR CLEANER - CON'T.

ELEMENT CLEANING - CON'T.

Cleaning with Water - Con't.

7. Mechanized drying methods can be used.

INSPECTION

Element.

After cleaning the filter element, inspect the element for damage. Look for dust on the clean air side, the slightest rupture, or damaged gaskets. A good method to use to detect ruptures in the element is to place a light inside the element and look toward the light from the outside. Any hole in the element, even the smallest, will pass dust to the engine and cause unnecessary engine wear. Element replacement is recommended if such holes are evident. Do not touch the element with the light source.

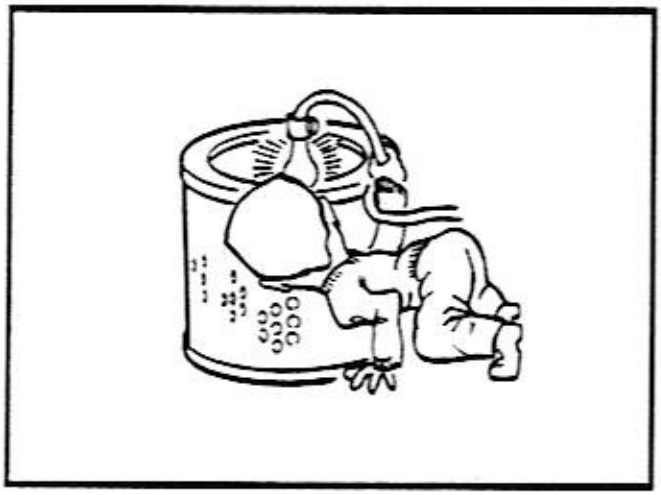


Figure 8-6. Inspecting for Damage

Air Cleaner Body.

Before installing the filter element, remove any foreign material (leaves, lint, or other foreign matter) that may have collected inside the air cleaner body. Inspect the inside of the body for dents or other damage that would interfere with air flow or with the fins on the element or inside the body. Repair any body dents, being careful not to damage the sealing surfaces.

Air Cleaner Safety Element.

The combustion air for the engine is first cleaned by the primary air cleaner element. The air is then drawn through the safety element which is contained within the primary element. This safety element should not need cleaned and should only be replaced every three (3) times the primary element is replaced, yearly or when the indicator shows it needs to be replaced.

Engine Air Precleaner.

The precleaner should never need cleaned as it is aspirated by the engine. The exhaust vacuum from the engine will draw any contaminants in the precleaner out through the exhaust. Refer to Figure 8-7.

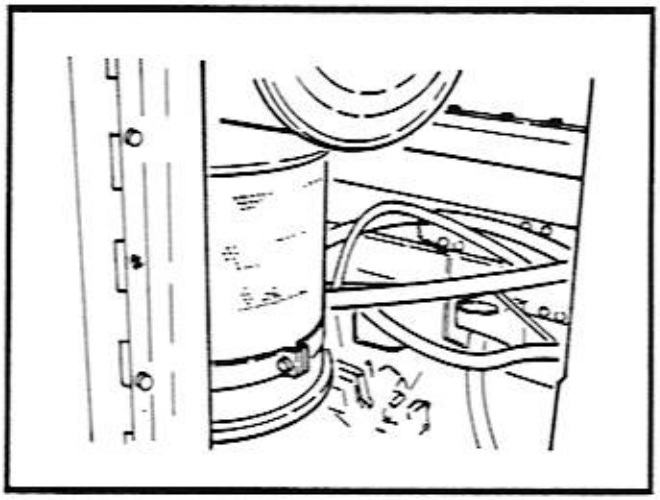


Figure 8-7. Engine Air Precleaner

Duct Work.

1. Check the intake pipe cap and screen for accumulation of leaves, trash, and other debris that could restrict air flow. Repair the screen or replace the cap if any large holes are found in the screen.

2. Check all mounting hardware for security to eliminate possible vibration of intake piping. Such vibration leads to early failure of hoses, clamps, and mounting parts, and can cause hoses to slip off the connecting pipes, allowing unfiltered air into the engine air intake.

3. Check hoses for cracks, chafing, or deterioration, and replace at the first sign of probable failure.

BATTERY

The batteries are located in the engine compartment on the left side of the machine. Access is gained by opening the engine compartment door. Refer to Figure 8-8.

Continued

BATTERY - CON'T.

NOTE

The information on non-maintenance free batteries is provide in the advent that the batteries are replaced with non-maintenance free batteries.

⚠ WARNING

Batteries contain an acid and can cause injury.

Battery fumes can ignite and explode. Skin and eye contact with the battery fluid can cause injury.

Do not smoke when observing battery fluid level. Avoid skin and eye contact with the battery fluid. If contact occurs, flush area immediately with water.

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.

⚠ WARNING

Batteries give off fumes that can explode.

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

Do not smoke or use an open flame near a battery.

Check that electrolyte level is to the full indicator and add clean, distilled water, if required. Use a battery

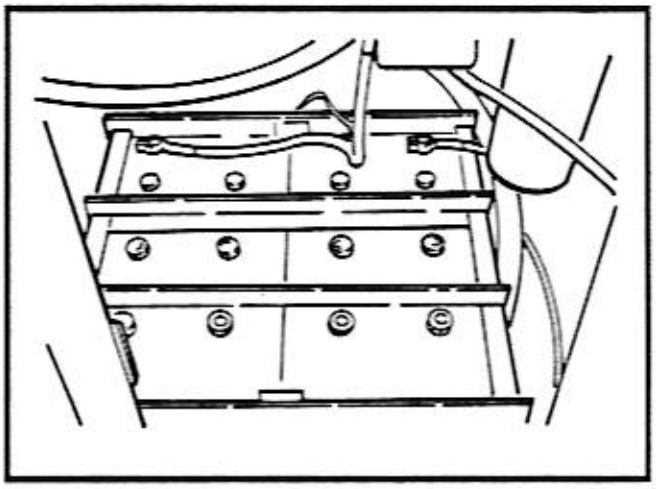


Figure 8-8. Battery

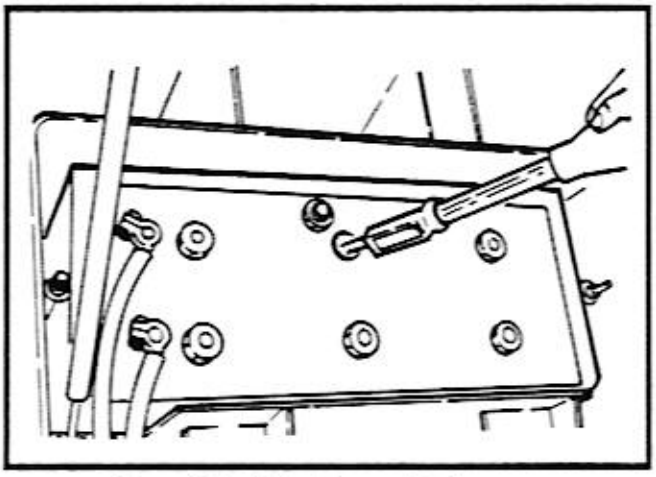


Figure 8-9. Using Battery Hydrometer

hydrometer to measure the specific gravity in each cell. A fully charged battery will read 1.265 specific gravity at 80°F. Refer to Figure 8-9.

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" (0.004) for every 10°F. difference. An example of this calculation:

Continued

BATTERY - CON'T.

TEMPERATURE BELOW 80°F	
Hydrometer Reading	1.250
Acid Temperature (20°F)	
Subtract (6 x 0.004)	0.024 Spec Gravity
Corrected Spec. Gravity	1.226
TEMPERATURE ABOVE 80°F	
Hydrometer Reading	1.235
Acid Temperature (100°F)	
Add (2 x 0.004)	0.008 Spec Gravity
Corrected Spec. Gravity	1.243

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

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

FUEL FILTER

There are two fuel filters located on the machine. Gain access by opening the fuel tank filler cap door. Open the drain cock on each of the filters and drain off approximately one (1) cup of fuel and any collected water and sediment. Close the drain cock tightly when done. Refer to Figure 8-10.

FUEL TANK

The diesel fuel tank cap is located on the right rear section of the machine. The fuel cap is located on the right side. Fuel capacity is approximately 250 gallons. To prevent moisture condensation, fill the tank at the end of each working day. If the fuel tank must be drained, use the drain plug on the bottom of the tank.

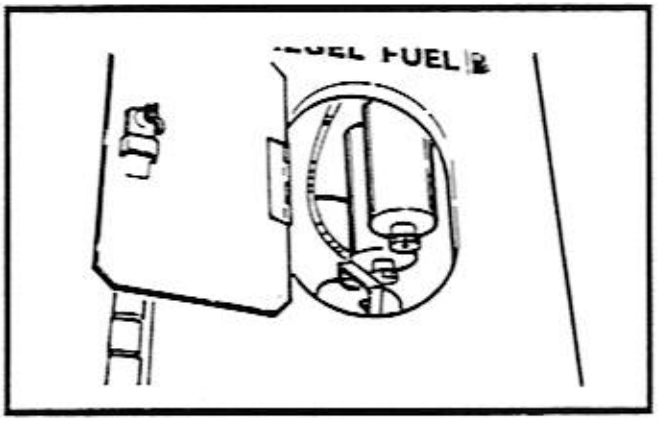


Figure 8-10. Fuel Filters

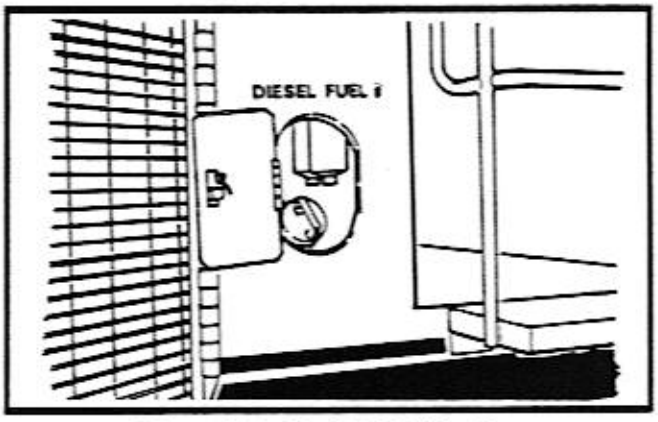


Figure 8-11. Fuel Tank Filler Cap

ENGINE COOLANT

⚠ CAUTION

Injury can occur when removing the radiator/expansion tank cap.

Steam or fluid escaping from the radiator can burn. Inhibitor contains alkali, avoid contact with skin and eyes.

Always shut down the engine and allow to cool down before removing radiator/expansion tank cap. Remove cap slowly to relieve pressure. Avoid contact with steam or escaping fluid.

Continued

ENGINE COOLANT - CON'T.

The radiator/expansion tank should be checked for coolant level and proper coolant mix to provide adequate heat transfer and anti-freeze protection. Refer to Figure 8-12.

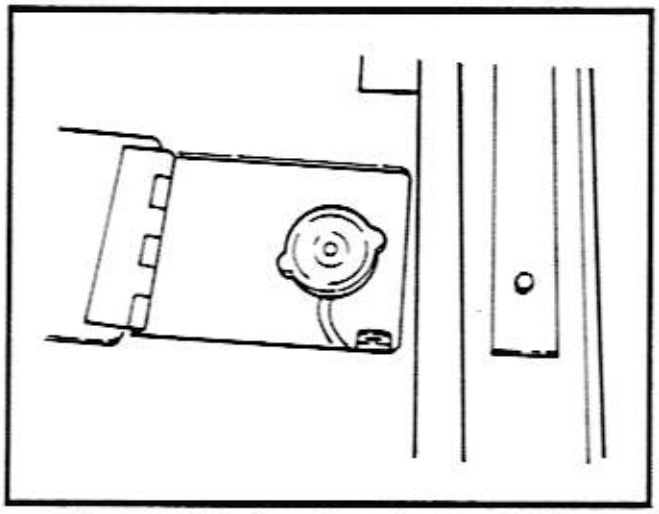


Figure 8-12. Radiator/Expansion Tank Fill Cap

Maintain the engine coolant to the bottom of the fill cap tube with clean, drinkable water. It is recommended to use a 50-50 anti-freeze mixture, plus the addition of a separate lubricant and corrosion inhibitor to aid in water pump lubrication and guard against internal corrosion and freezing.

BELTS

Check conveyor, cutter drum drive, and engine belts for wear, breaks, cracks or other damage. If the belt is loose, refer to SECTION 14 - ROUTINE ADJUSTMENTS, and adjust the belts.

HYDRAULIC OIL

NOTICE

Dirt in the hydraulic system will lead to premature component failure.

A clean, contaminant-free system is extremely important to the machine's proper function.

Take extra care when working around or on the hydraulic system to ensure its complete cleanliness.

Since the operating reservoir supplies oil for the unit's hydraulic system, it is essential that the hydraulic oil level be checked daily or every 10 hours, whichever comes first.

Maintain the oil level to the center of the operating reservoir gauge at all times. Hydraulic oil specifications are described in Section 6 of this manual and proper changing procedures are described in SECTION 12 - 500 HOUR OR SEMI-ANNUAL ROUTINE MAINTENANCE.

Check the oil level on the sight level gauge located inside the right side of the engine compartment. The fill cap is located on the top right side of the machine. A drain plug is provided on the bottom of the tank. Ensure that the tank is filled with clean hydraulic oil from previously unopened containers, first filtering the oil through a 10 micron filter. Refer to Figures 8-13.

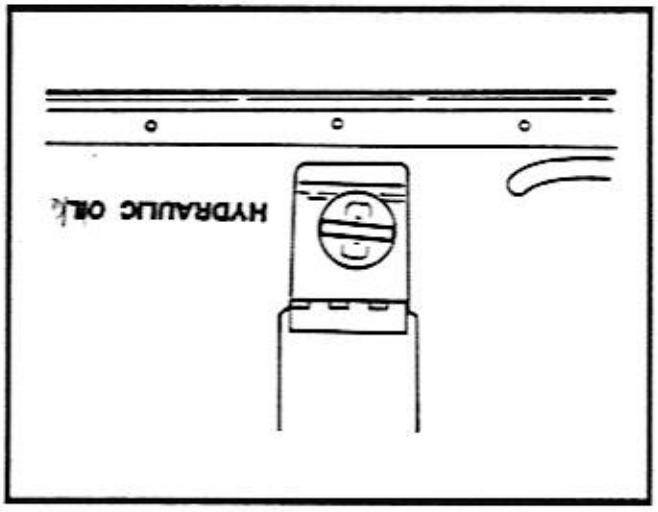


Figure 8-13. Hydraulic Oil Fill

WATER STRAINER

The Water Strainer is accessible from the left side of the machinenext to the water pump assembly. Unscrew the filter on a daily basis and remove any imbedded impurities with a stiff fiber brush. Refer to Figure 8-14.

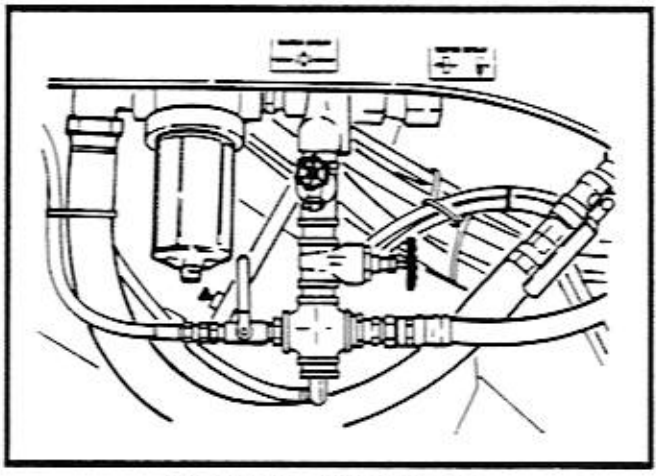


Figure 8-14. Water Strainer

CUTTER DRUM BEARING

Lubricate the one fitting located on the right side 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. Rotate the drum by hand while lubricating the bearing. Refer to Figure 8-15.

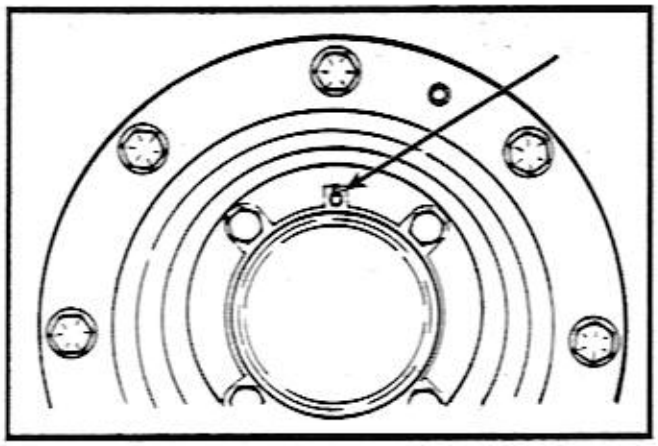


Figure 8-15. Cutter Drum Bearing

WATER NOZZLES

The water spray system cools the cutter teeth and keeps the dust to a minimum while the machine is cutting. There are a total of 26 water spray nozzles to cover the cutter drum and the conveyor. They can be removed for cleaning. Use a cleaning wire to help remove any obstructions from the nozzle orifice.

AIR TANK

If your machine is not equipped with an Auto Drain Valve, drain the air tank daily to remove any impurities or water from the air tank. The tank is located on the left side of the engine compartment. The drain valve is on the bottom of the tank. Refer to Figure 8-16.

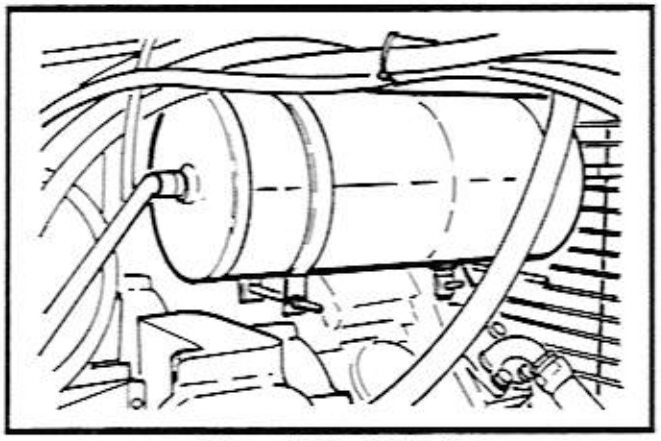


Figure 8-16. Air Tank

CONVEYOR GREASE FITTINGS

Lubricate the fittings using four (4) shots of MPG-EP grease. The fittings are located on the swing and elevation cylinder as well as the conveyor mount structure.

RADIATOR AND OIL COOLER

Visually check the radiator and hydraulic oil cooler for leaks and any other damage.

CONVEYOR PULLEY BEARINGS

Lubricate the six (6) conveyor pulley bearings with MPG-EP grease until grease is purged from each of the bearing areas. Each of the motor driven pulley bearing shafts has one (1) grease fitting. The other two (2) bearing shafts have two (2) fittings each. Grease the bearings 10 hours or daily at the end of the shift and before and after wash-down to ensure that any water is flushed out of the bearings.

CUTTER PLANETARY SEAL EXCLUDER

On the cutter drum drive side (left side of the machine), the one (1) grease fitting is to be lubricated with six (6) shots of MPG-EP grease. The fitting is visible from the bottom of the cutter drum area. The drum should be rotated by hand while the seal excluder is being lubricated. Refer to Figure 8-17. The MT-7000E does not have a seal excluder.

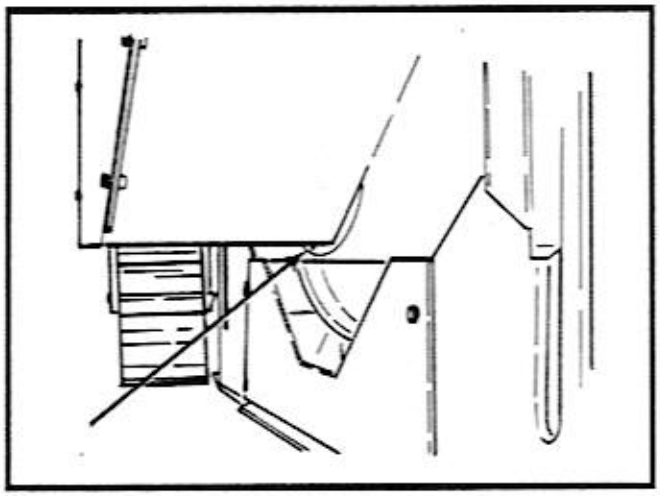


Figure 8-17. Cutter Drum Planetary Seal Excluder

YOKE PIVOT BEARINGS

Lubricate the eight (8) yoke pivot bearings with four (4) shots of MPG-EP grease. The fittings are located on the bottom of the yoke on eigher side of the track. Refer to Figure 8-18.

Continued

YOKE PIVOT BEARINGS - CON'T.

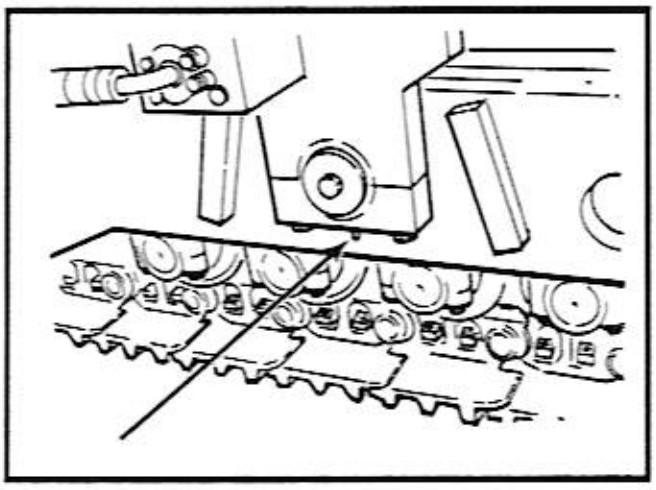


Figure 8-18. Yoke Pivot Bearings

GRADE SENSORS

Lubricate the fittings with two (2) shots of MPG-EP grease. Refer to Figure 8-19.

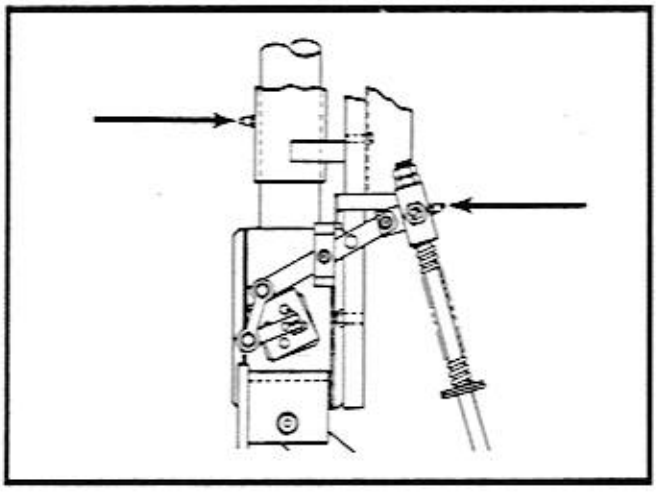


Figure 8-19. Grade Sensors

CONVEYOR WASH DOWN

The conveyor should be washed down at least daily and more often if build-up of milled material is occurring around the idler and pulley assemblies. The machine is equipped with a high pressure wash system for this purpose.

Use a standard garden type water hose on the boiler cock provided on the outlet under the operators platform. Ensure that you do not run the water tank out of water and run the water pump without water. If for some reason the pump should be ran dry, allow the pump to cool before allowing it to contact water or the water pump seal will be damaged.

After washing down the machine, you should lubricate any areas contacted by the water spray. The high pressure wash system can force water into areas that should be filled with grease.

When washing down the conveyor, ensure that the conveyor rollers are cleaned of any asphalt buildup.

SECTION 9 - 50 HOURS OR WEEKLY ROUTINE MAINTENANCE

Contents

⚠ WARNING

Unexpected machine motion or moving parts can cut or crush.

Install the leg lock bars/pins, apply the parking brake, shut down the engine, and shut off the master switch before working on the machine.

⚠ WARNING

Improper maintenance can be hazardous.

Read and understand SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES before you perform any maintenance, service or repairs.

FASTENERS

Check to ensure that all critical fasteners have the correct torque value. Refer to SECTION 17 - SPECIFICATIONS for torque values.

CUTTER PLANETARY

To check the oil in the cutter drum planetary:

1. Remove the water spray nozzles (left side of cutter drum) at the 9 o'clock and the 12 o'clock positions. Refer to Figure 9-1.

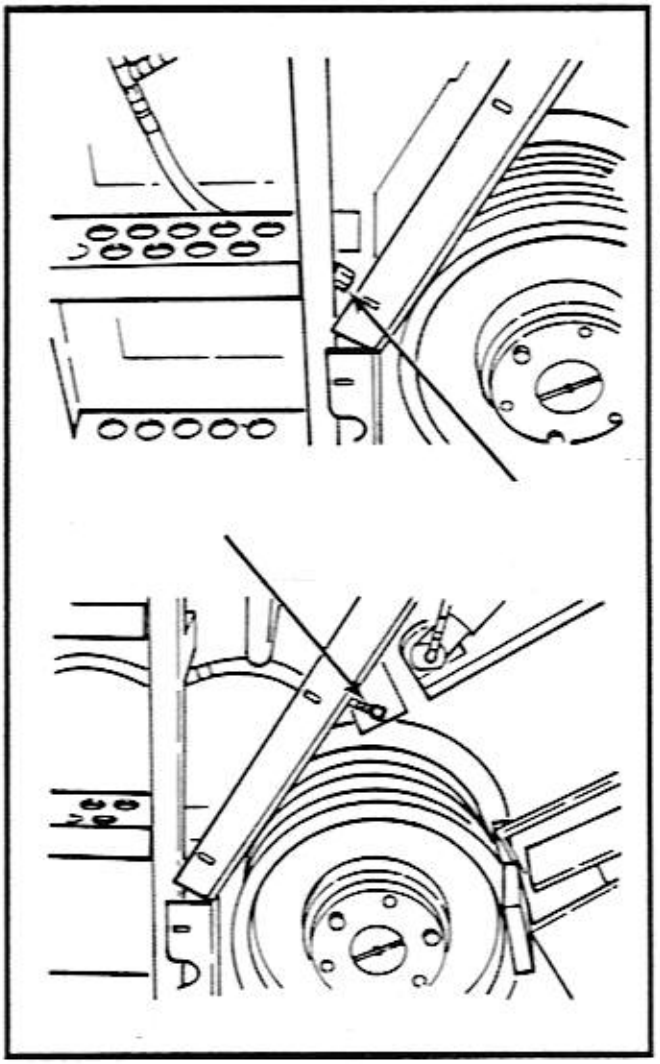


Figure 9-1. Cutter Planetary Check Plugs

Continued

CUTTER PLANETARY - CON'T.

2. Rotate the cutter drum with the drum turning tool until the plugs are in the 9 o'clock and 12 o'clock positions.

3. Remove the plugs to check the oil level. The oil level should be maintained to the bottom of the plug (9 o'clock position).

4. If necessary, add SAE 90 EP (MIL-L-2105) oil through the 12 o'clock hole.

5. Allow the oil to stop flowing and then clean and install the plugs.

6. Operate the machine and check for leaks.

TRACK DRIVE PLANETARIES

On each of the four (4) tracks is a planetary gearbox that requires an oil check. To check the oil in the track drive planetaries:

1. Rotate the track planetaries until the plugs are in the 12 o'clock, 6 o'clock and 3 o'clock or 9 o'clock positions. Refer to Figure 9-2.

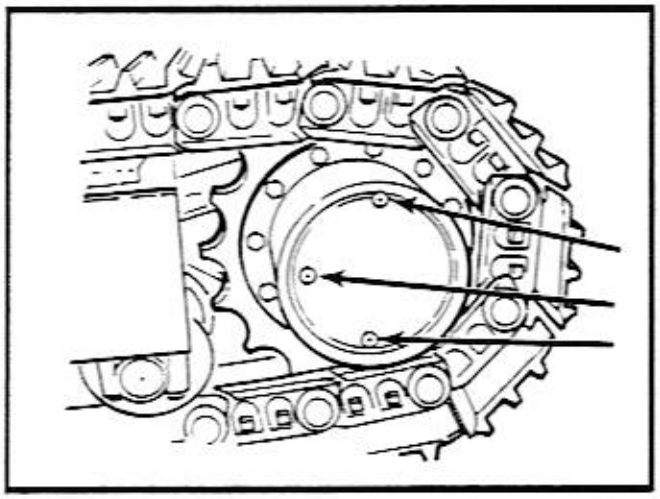


Figure 9-2. Track Drive Planetary

2. Remove the 12 o'clock and 3 or 9 o'clock plugs. If oil is required, add SAE 90 EP oil (MIL-L-2105). Fill through the selected 12 o'clock port until oil flows from the 3 o'clock or 9 o'clock port.

3. Allow the oil to stop flowing and then clean, install and tighten both plugs.

4. Operate the machine and check for leaks.

LEG TUBES

Coat the leg tubes with Slip Plate Graphite Based Dry Film Lubricant **only as needed.** Do not use Never Seeze. The purpose of the graphite is to prevent rusting **not** provide lubrication. If you should notice rusting, it should be removed with steel wool and then slip plate applied to the affected area only. Refer to Figure 9-3.

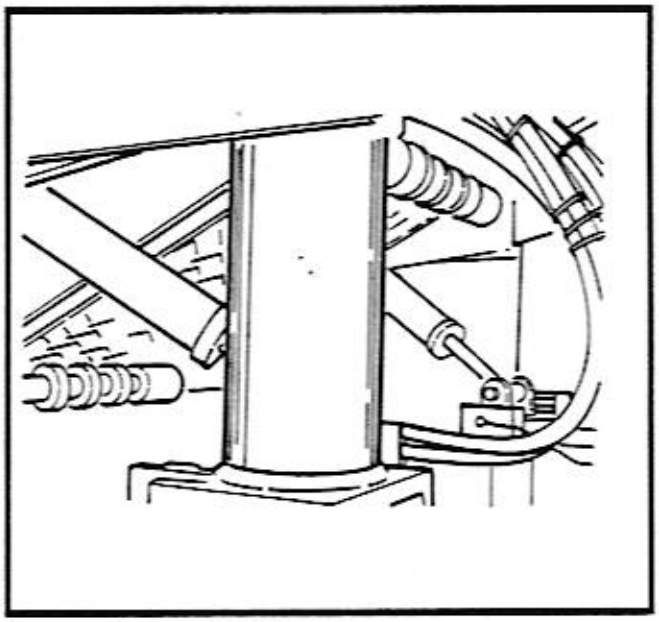


Figure 9-3. Leg Tube

TRACK TENSION ADJUSTMENT

1. Using a grease gun, fill the hydraulic adjuster with grease forcing the track idler to extend to it's fullest. Refer to Figure 9-4.

2. Scribe a mark on the track frame at the end of the fully extended track idler.

3. Remove the grease gun from the grease fitting. Unscrew the fitting slightly until grease extrudes, allowing the track idler to retract until the track just touches the track frame and the idler is no more that 1/8 to 1/4 inch from the mark scribed on the track frame.

4. Tighten the grease fitting and recheck the track adjustment.

5. The track should be adjusted if the track starts to ride the top rail of the track frame.

Continued

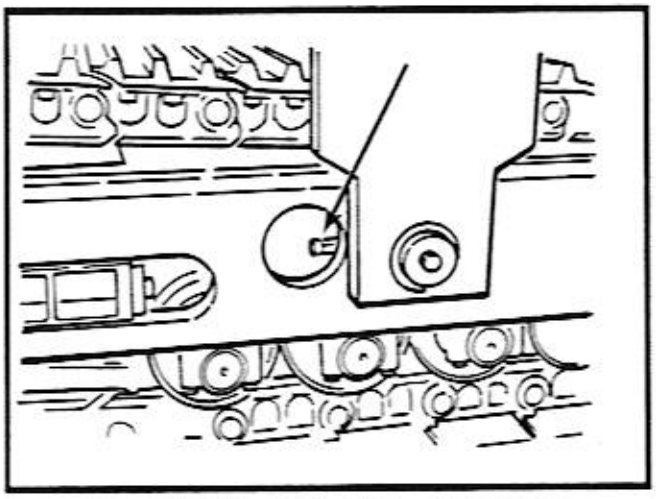


Figure 9-4. Track Idler Hydraulic Adjuster

HYDRAULIC FILTERS

Check the hydraulic filters to ensure there are no leaks. Normally the filters should not be changed unless the Hydraulic Filter Restriction Indicator on the front console indicates a dirty filter. Also check the manual filter bypass indicators on each filter to see if any filter needs changed. The filters are located inside the engine compartment, mounted on the reservoir. Refer to Figure 9-5.

1. Unscrew the old filter cartridge and discard it.

2. Clean the gasket sealing.

3. Coat the new filter gasket with clean hydraulic oil.

4. Install the new filter and tighten 1/2 to 3/4 of a turn past the point where the filter gasket contacts the base.

5. Start the engine and check for any leaks.

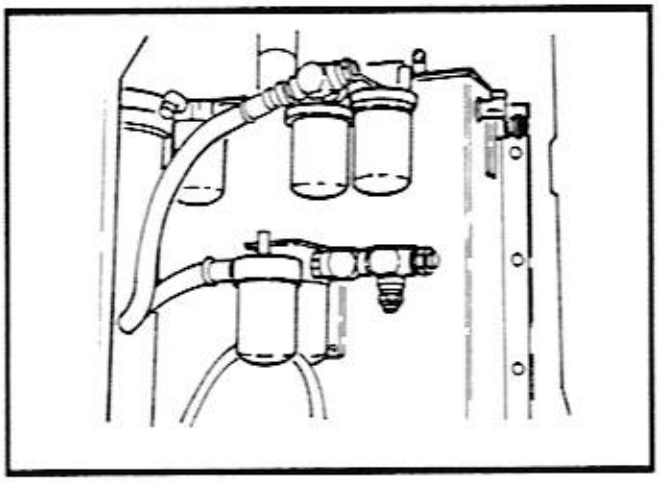


Figure 9-5. Reservoir Mounted Hydraulic Filters

MOLDBOARD DOOR PINS

Lubricate through each of the two (2) fittings with two (2) shots of MPG-EP grease. Refer to Figure 9-6.

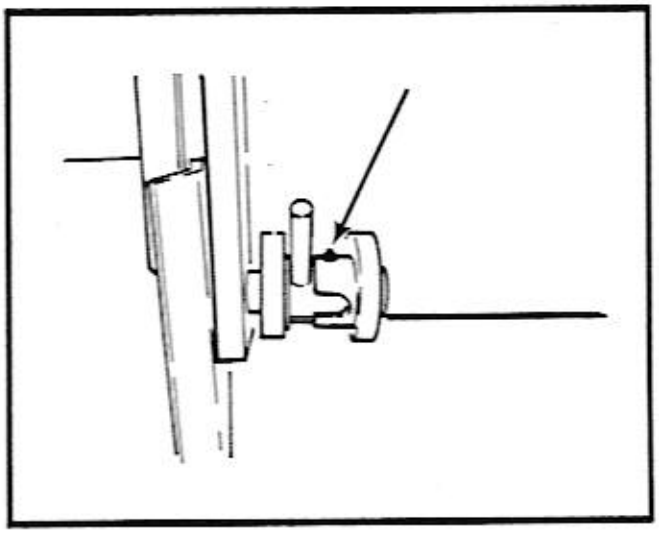


Figure 9-6. Moldboard Door Pins

MOLDBOARD CYLINDER

There are two (2) fittings per cylinder. Lubricate through each of the four (4) fittings with two (2) shots of MPG-EP grease. Refer to Figure 9-7.

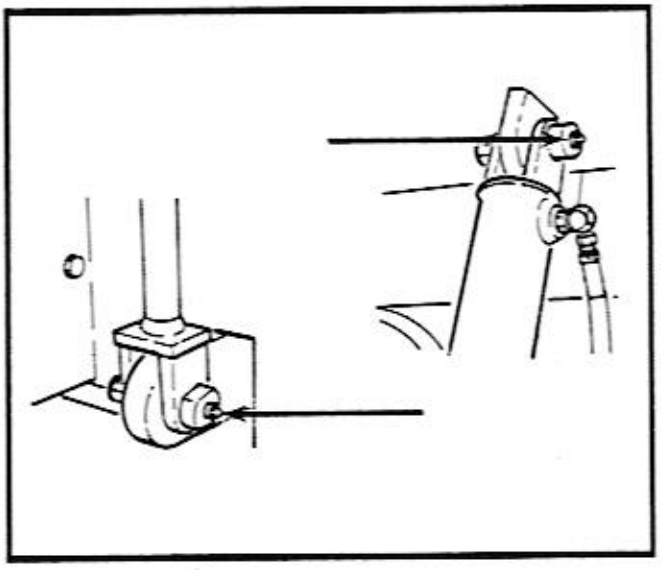


Figure 9-7. Moldboard Cylinder

Continued

START INTERLOCKS

Unexpected machine motion or moving parts can cut or crush.

If an interlock should not function properly, you could be crushed.

Do not allow anyone under the machine when checking the start interlocks.

Check to ensure that each of the start interlocks are functioning as required.

1. Open the engine compartment belly door with the engine shut down.

2. Ensure that no one is under the machine and check to ensure that the engine will not start.

3. Close the belly door and ensure that the engine will now start.

4. With the engine shutdown, position the Propulsion Control Lever to either Forward or Reverse.

5. Ensure that no one is under the machine, or in front or back of the machine, and check to ensure that the engine will not start.

6. Position the Propulsion Control lever to neutral (N) and check that the engine will now start. Shut down the engine.

7. Repeat steps 4 thru 6 for the Conveyor Control.

8. Engage the clutch and ensure that the engine will not start.

9. Disengage the clutch and check that the engine will now start.

CLUTCH INTERLOCKS

Unexpected machine motion or moving parts can cut or crush.

If an interlock should not function properly, you could be crushed.

Do not allow anyone under the machine when checking the cluch interlocks.

1. With the engine shut-down, pull out the Cutter Drum switch to energize the cutter drum circuit.

2. Turn the Ignition Switch key to Start. The engine should not turn over and try to start.

3. With the Cutter Drum Switch pulled out, depress and hold the Cutter Drum push button switch.

4. Turn the Ignition Switch key to Start. The engine should not start.

DRUM DRIVE BELT ADJUSTER

Lubricate each of the three (3) fittings with two (2) shots of MPG-EP grease. There are three fittings on the outside of the belt guard. Refer to Figure 9-8.

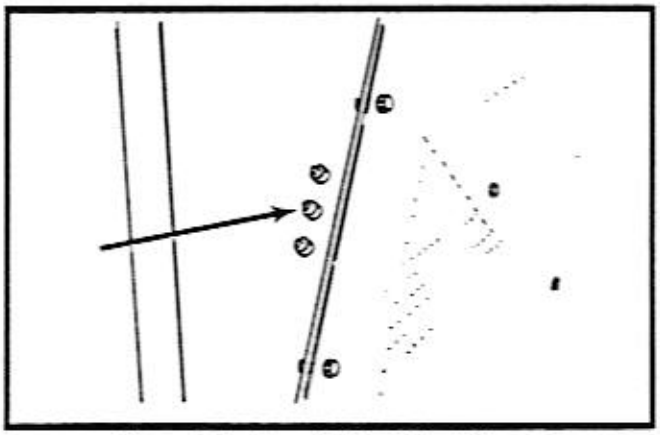


Figure 9-8. Drum Drive Belt Adjuster

CONVEYOR DRIVE MOTOR CARRIER BEARINGS

Check the oil in the carrier by removing the check/fill plug located on the carrier. Refer to Figure 9-9. Effective with S/N 5090, the motor is lubricated by the machine hydraulic system.

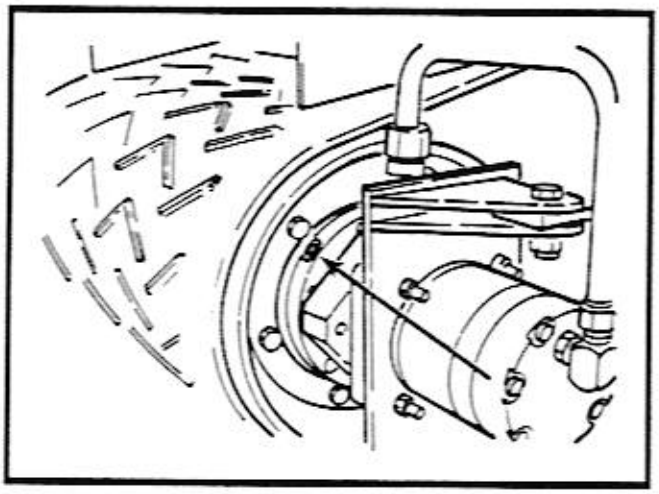


Figure 9-9. Conveyor Drive Motor Carrier Bearings

JACK CYLINDER BEARINGS

Lubricate thru the four (4) fittings with two (2) shots of MPG-EP grease. The fittings are located on the under side of the bearing between the top of the track and the bottom of the jack cylinder. Refer to Figure 9-10.

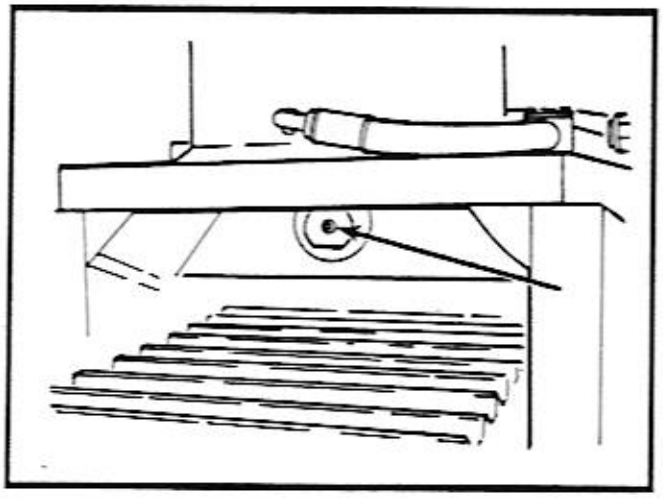


Figure 9-10. Jack Cylinder Bearings

STEERING CHAIN (TRANSDUCER)

Lubricate the steering chain weekly with motor oil. Do not overlubricate to the point where dirt or other milled material builds up on the chain or transducer sprockets.

CLUTCH ROTARY SWIVEL

Lubricate the clutch rotary swivel with several drops of SAE 30 engine oil. The check ball on the swivel must be pushed in and oil added until the swivel is full. Refer to Figure 9-11. Effective with S/N 5091, the clutch rotary swivel does not need lubricated.

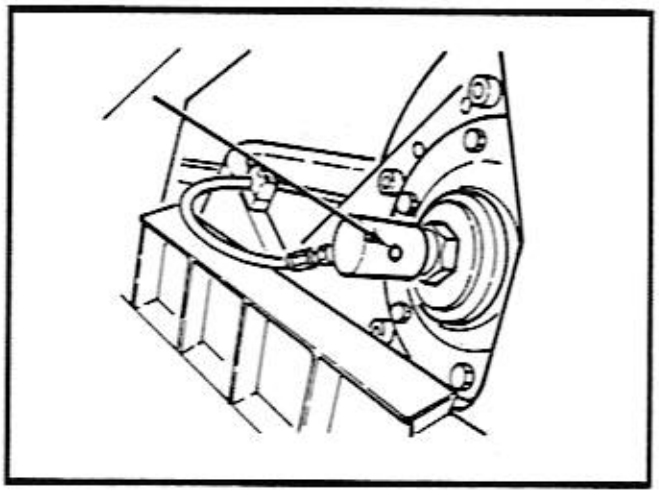


Figure 9-11. Clutch Rotary Swivel

STEERING PINS

Located under the front and rear of the machine are the steering pins. Lubricate the 20 fittings with two (2) shots of MPG-EP grease. There are fittings at each end of the steering cylinders, tie rods, and the mounting pins. Refer to Figure 9-12.

STEERING PINS - CON'T.

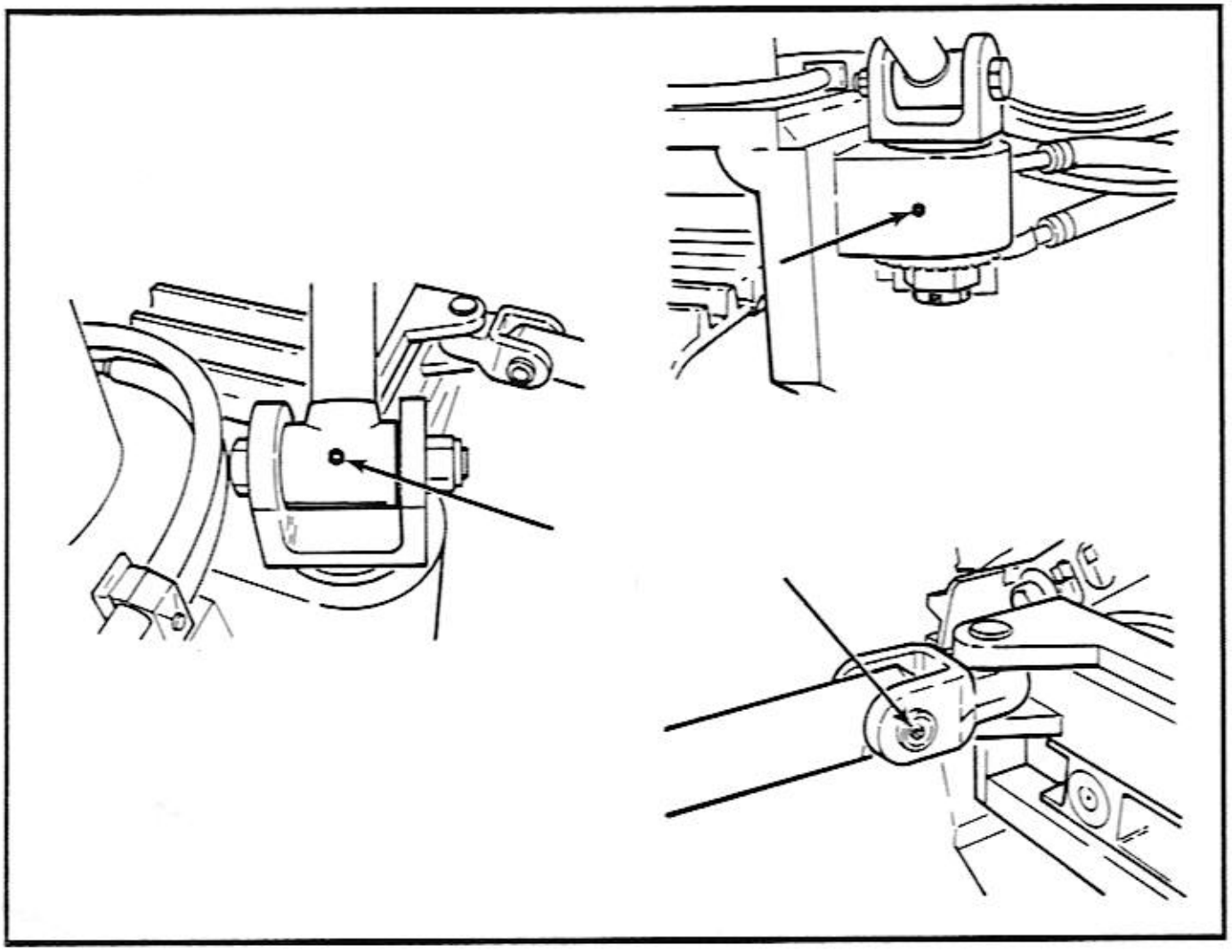


Figure 9-12. Steering Pins

SECTION 10 - 100 HOURS OR MONTHLY ROUTINE MAINTENANCE

NOTE
No 100 Hour or Monthly Routine Maintenance is required.

SECTION 11 - 250 HOURS OR QUARTERLY ROUTINE MAINTENANCE

Contents Page

⚠ WARNING

Unexpected machine motion or moving parts can cut or crush.

Install the leg lock bars/pins, apply the parking brake, shut down the engine, and shut off the master switch before working on the machine.

⚠ WARNING

Improper maintenance can be hazardous.

Read and understand SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES before you perform any maintenance, service or repairs.

ENGINE OIL AND FILTERS

The engine oil is filtered by means of a pair of spin-on type filters and a bypass filter. Change both the engine oil and the filters. To ensure complete removal of all contaminants still suspended in the oil, perform the oil change while the engine is still warm.

⚠ WARNING

Hot oil or components can burn.

Oil must be at normal operating temperature when draining.

Avoid contact with hot oil or components.

1. Position the machine on level ground, apply the parking brake, shut down the engine and chock the tracks.

2. Be careful, hot oil or components can burn. Remove the drain plug from the engine oil pan and allow the oil to drain completely. Clean and install the drain plug. Refer to Figure 11-1.

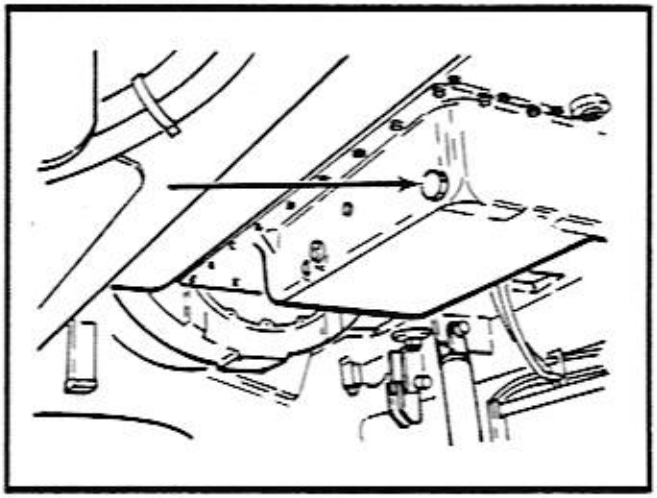


Figure 11-1. Engine Oil Drain Plug

3. Unscrew and remove both of the used engine oil filters and the engine oil bypass filter. The engine oil filters are located on the left side of the engine beside the engine oil fill. The bypass filter is located in the engine compartment above the batteries. Be sure that the old filter gasket does not remain attached to the filter base. Refer to Figure 11-2 and 11-3.

Continued

11

ENGINE OIL AND FILTERS - CON'T.

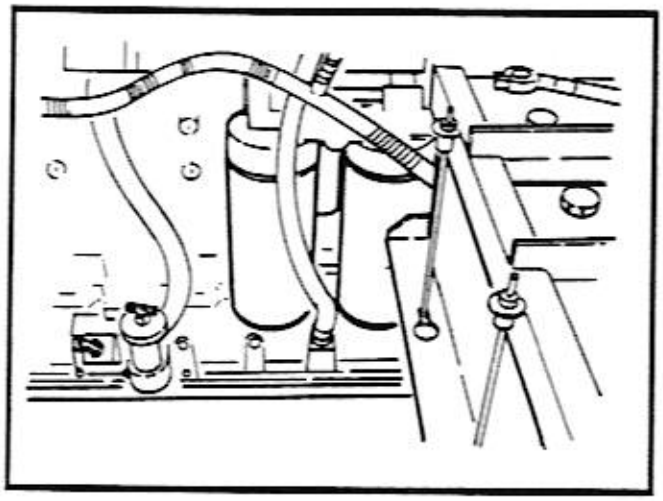


Figure 11-2. Engine Oil Filters

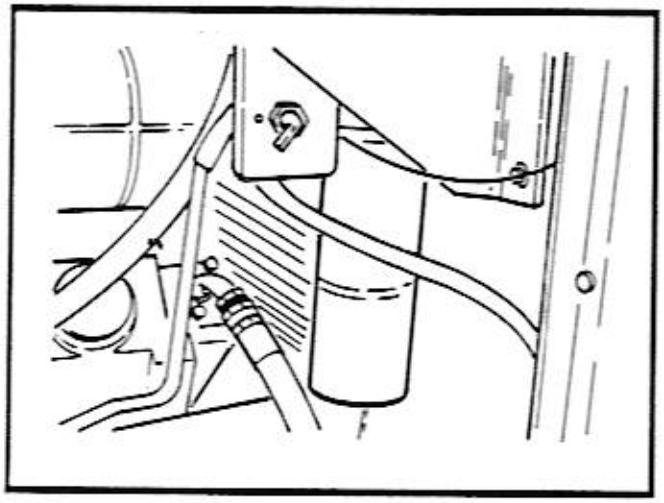


Figure 11-3. Engine Oil Bypass Filter

4. Wipe the filter bases with a clean dry cloth.

5. Apply a thin coat of clean motor oil to the gaskets on the new filters.

6. Install the new filter and tighten 1/2 to 3/4 of a turn after the gasket and the filter base make contact.

7. Fill the crankcase with SAE 15W40 CD engine oil to the full mark on the dipstick. Do not overfill.

8. Start the engine, allow it warm up and check for any leaks. Shut-down the engine and after 15 minutes, recheck the oil level. Add oil as necessary to bring the level to the full mark.

FUEL FILTERS

The two fuel filters are located inside the fuel tank filler cap door on the right side of the machine. Gain access through the access door. The filters are the replaceable, spin-on type. Refer to Figure 11-4.

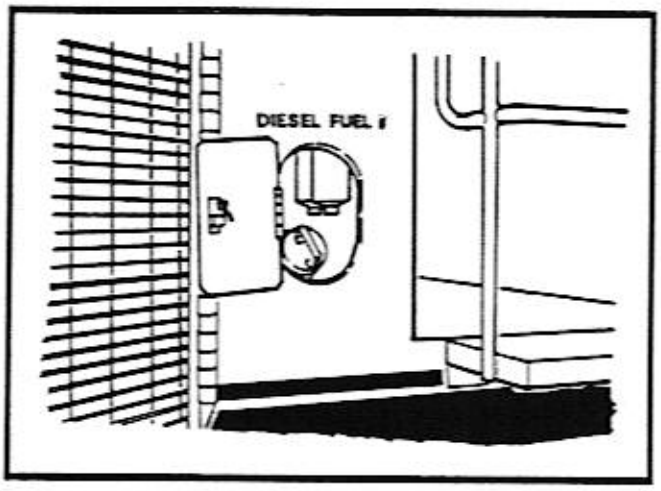


Figure 11-4. Fuel Filters

Replace both filters as follows:

1. Unscrew the old filter cartridges and discard them.

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

3. Fill the new replacement cartridges completely full with new fuel.

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

5. Install the new filters and tighten 1/2 to 3/4 of a turn past the point where the filter gasket first contacts the base.

6. Start the engine and check for any leaks.

TRACTION SUCTION OIL FILTER

The traction suction oil filter is the single filter located on the upper inside corner of the hydraulic reservoir. Gain access by opening the belly door. Change the filter as follows: Refer to Figure 11-5.

1. Unscrew the old cartridge and discard.

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

3. Coat the new filter element gasket surface with clean hydraulic oil.

Continued

TRACTION SUCTION OIL FILTER - CON'T.

4. Install the new filter cartridge and tighten 1/2 to 3/4 of a turn beyond the point where the filter gasket first contacts the base.

5. Start the engine and check for any leaks.

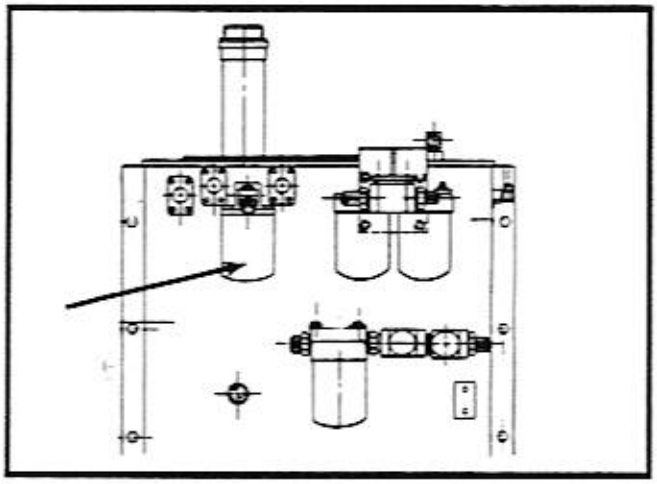


Figure 11-5. Traction Suction Oil Filter

DRUM COOLANT

Within the drum is a mixture of water and anti-freeze to aid in cooling of the Cutter Drum. Check and if necessary, add a 50-50 mixture of water and a permanent type anti-freeze. The plugs to check/drain the drum are located on the right side of the drum. Maintain the level at approximately eight (8) inches below the fill plug with the fill plug in the 12 o'clock position. Refer to Figure 11-6.

ENGINE COOLANT FILTER

⚠ WARNING

Hot engine coolant or components can burn.

Be careful when removing engine coolant filter.

The engine coolant filter is located on the right side of the engine. Gain access through the belly door into the engine compartment. There is a shut-off valve on the line that should be closed before removing the filter. Change the filter at this time interval. Ensure that the valve is opened prior to starting the engine. Refer to Figure 11-7.

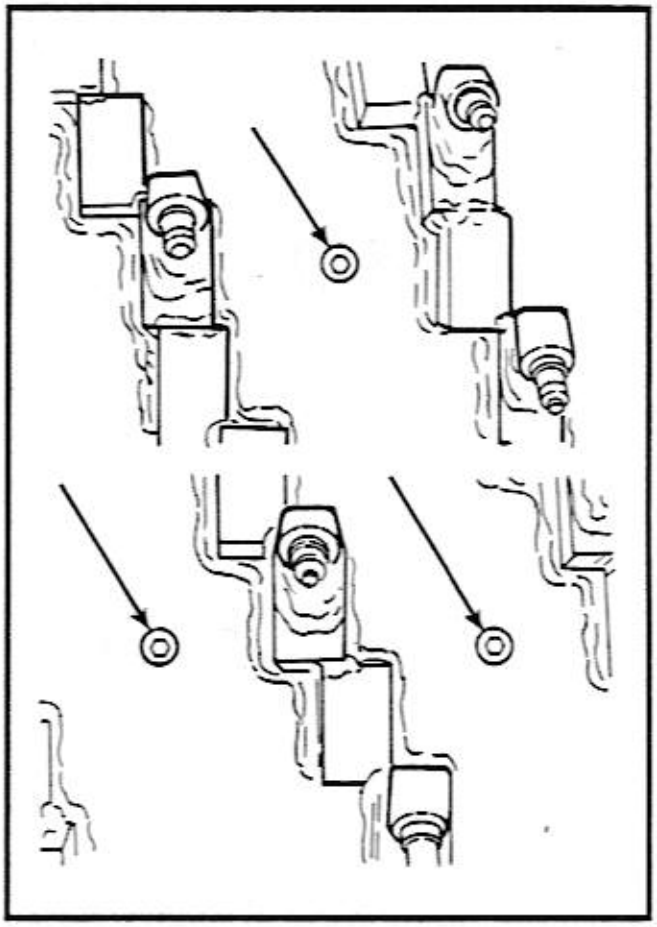


Figure 11-6. Drum Coolant Plugs

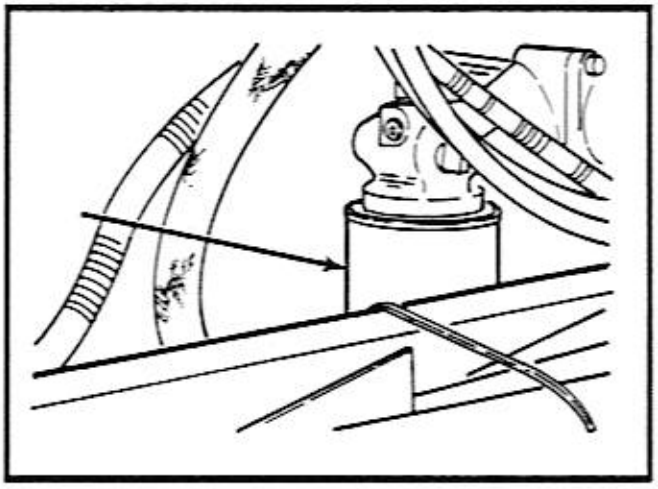


Figure 11-7. Engine Coolant Filter

PRECLEANER TUBES

Remove the cap from the bottom of the engine air precleaner and check the tubes. Ensure that no debris or dust has accumulated in the tubing.

CONTROL SYSTEM PRESSURE FILTER

Effective with S/N 5076, 5083, 5085, 5090 and later, there is a pressure filter in the fittings prior to the servo valves. These filters are added to protect the individual servo valves from contaminents that might be in the hydaulic tnak. This filter should be removed and cleaned at this time interval.

⚠ CAUTION

Hydraulic system contamination.

Ensure that the fitting, servo valve and the area around the servo valve are completely cleanded prior to removing the fitting.

1. Completely clean the area around the servo valve, fitting and hose.

2. Remove the fitting and if necessary, clean the filter in solvent and check for damage. If necessary, replace the filter.

3. Install the filter and operate the system. Check for any leakage.

SECTION 12 - 500 HOURS OR SEMI-ANNUAL ROUTINE MAINTENANCE

⚠ WARNING

Unexpected machine motion or moving parts can cut or crush.

Install the leg lock bars/pins, apply the parking brake, shut down the engine, and shut off the master switch before working on the machine.

⚠ WARNING

Improper maintenance can be hazardous.

Read and understand SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES before you perform any maintenance, service or repairs.

CUTTER DRUM PLANETARY

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

⚠ WARNING

Hot oil or components can burn.

Oil must be at normal operating temperature when draining.

Avoid contact with hot oil or components.

1. Position the machine on level ground, apply the Parking Brakes, chock the tracks and remove the two (2) plugs from the planetary. Gain access to the plugs by removing the two water nozzles on the left side of the machine. One nozzle is behind the steps, the other is behind the cutter drum belt cover. Refer to Figure 12-1.

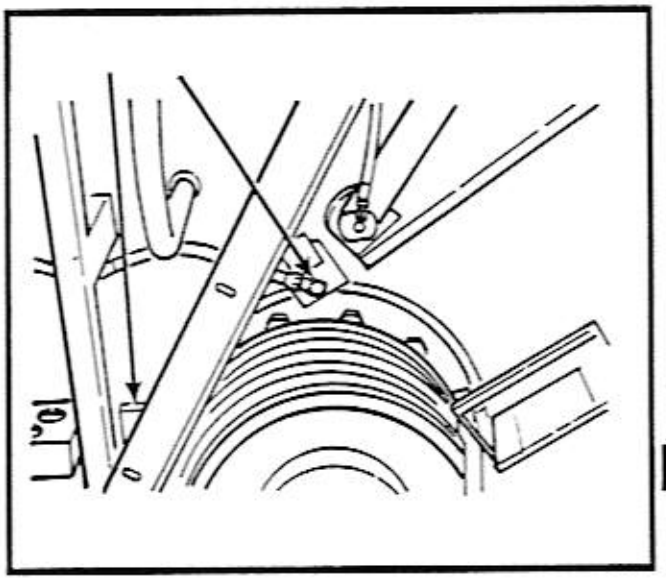


Figure 12-1. Cutter Drum Planetary Plugs

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

3. 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 the 9 o'clock position.

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

Continued

CUTTER DRUM PLANETARY - CON'T.

5. Allow the oil to stop flowing from the port. Clean and install the plugs.

6. Operate the cutter drum and check for leaks.

TRACK DRIVE PLANETARY

The oil in each of the four (4) track planetaries is also to be changed, using the following procedures:

⚠ WARNING

Hot oil or components can burn.

Oil must be at normal operating temperature when draining.

Avoid contact with hot oil or components.

1. Position the machine on level ground with the plugs in the 12 o'clock, 6 o'clock and 3 or 9 o'clock positions. Apply the Parking Brakes, shut down the engine and chock the tracks

2. Remove the three (3) plugs from each of the gearboxes. Refer to Figure 12-2. Be careful, hot oil or components can burn.

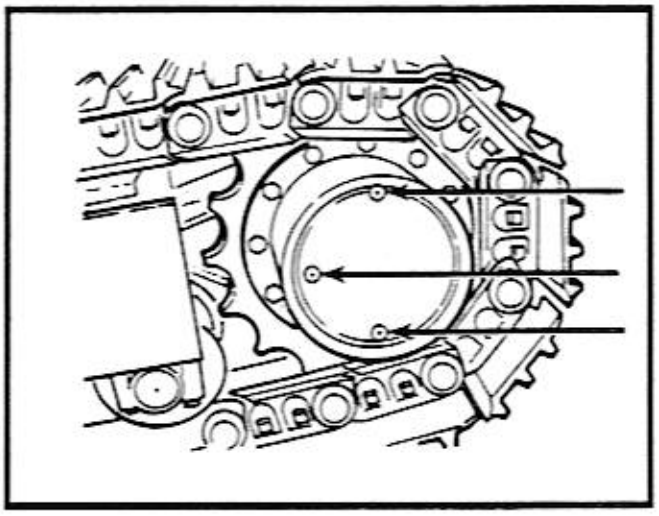


Figure 12-2. Track Planetary Plugs

2. Allow the oil to completely drain from the 6 o'clock position plug.

3. Once the oil has completely drained, clean and install the plug into the 6 o'clock position.

4. Add SAE 90 EP (MIL-L-2105) oil thru the 12 o'clock until oil starts to flow from the 3 o'clock or 9 o'clock port.

5. Allow the oil to stop flowing. Clean and install the plugs into the planetary.

6. Operate the machine and check for any leaks.

SECTION 13 - 1000 HOUR OR ANNUAL ROUTINE MAINTENANCE

Contents Page

⚠ WARNING

Unexpected machine motion or moving parts can cut or crush.

Install the leg lock bars/pins, apply the parking brake, shut down the engine, and shut off the master switch before working on the machine.

⚠ WARNING

Improper maintenance can be hazardous.

Read and understand SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES before you perform any maintenance, service or repairs.

HYDRAULIC OIL TANK AND SUCTION STRAINERS

The hydraulic oil is to be changed in the operating reservoir, the operating reservoir tank is to be cleaned; and the strainers cleaned in solvent or replaced if necessary.

⚠ WARNING

Hot oil or components can burn.

Oil must be at normal operating temperature when draining.

Avoid contact with hot oil or components.

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

2. Remove the tank cover.

3. Each strainer is at the end of a pipe. Remove the pipe and strainer as an assembly. If the strainer is damaged, replace it. Refer to Figure 13-1.

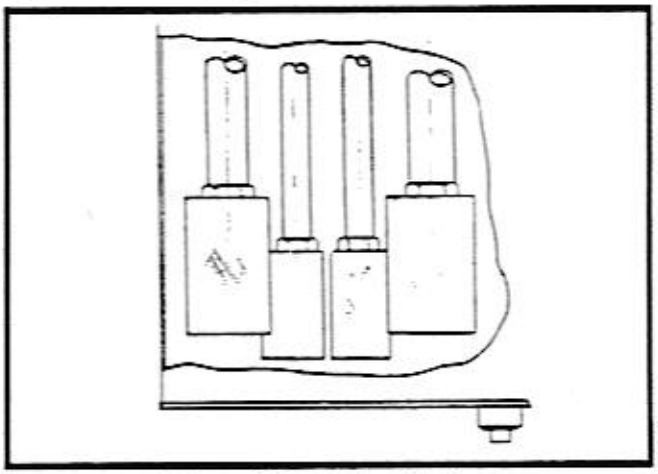


Figure 13-1. Suction Strainers

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

NOTICE

A partially plugged strainer will lead to contamination and a sluggish operating machine.

Ensure that the strainer is cleaner or replaced.

Continued

HYDRAULIC OIL TANK AND SUCTION STRAINERS - CON'T.

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

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

7. Replace the strainer assemblies in the tank.

8. Install the drain plug, new cover gasket, tank cover, sheet metal and all mounting hardware.

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 level sight gauge registers full.

NOTICE

Dirt in the hydraulic system will lead to premature component failure.

A clean, contaminant-free system is extremely important to the machine's proper function.

Take extra care when working around or on the hydraulic system to ensure its complete cleanliness.

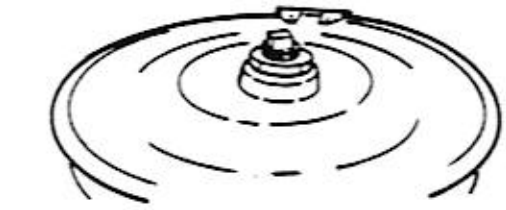
WATER TANK

At least once a year and more often if conditions warrant, drain and clean the water tank. To drain the tank, remove the plug from the bottom of the tank. A large access cover is located on the top of the tank to aid in cleaning. Be careful to not slip and fall when inside the tank. Refer to Figure 13-2. When clean, fill the tank with clean potable water.

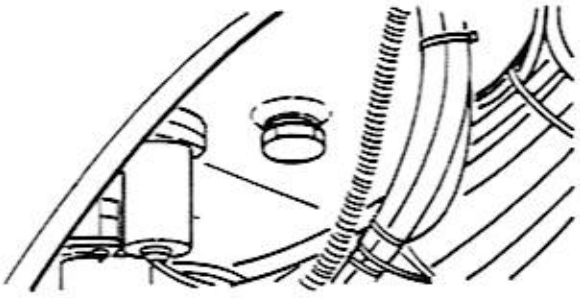
ENGINE COOLANT

Every 1000 hours of operation, or yearly, whichever comes first, the radiator, engine and the engine coolant recovery tank are to be drained and flushed .

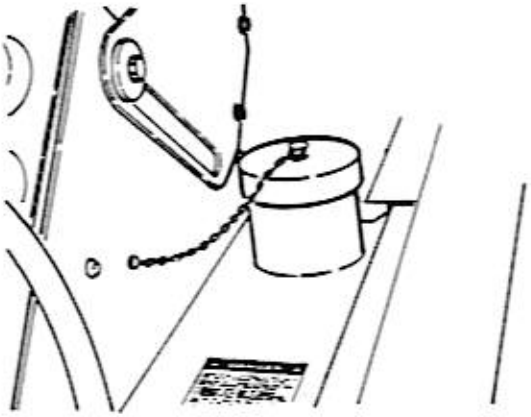
Drain and flush out the recovery tank. To drain the radiator, a petcock is provided on the base of the radiator. At the same interval, drain the engine block. Refer to the engine operator's manual for the proper procedure.



ACCESS COVER



DRAIN PLUG



FILL

Figure 13-2. Water Tank

ENGINE COOLANT - CON'T.

⚠ CAUTION

Injury can occur when removing the radiator cap.

Steam or fluid escaping from the radiator can burn. Inhibitor contains alkali, avoid contact with skin and eyes.

Always shut down the engine and allow to cool down before removing radiator cap. Remove the cap slowly to relieve pressure. Avoid contact with steam or escaping fluid.

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 corrosion inhibitor to aid in water pump lubrication and guard against internal corrosion and freezing.

CLUTCH BEARINGS

Lubricate thru the two fittings on the clutch bearings with MPG-EP grease until the old grease is purged. Refer to Figure 13-3.

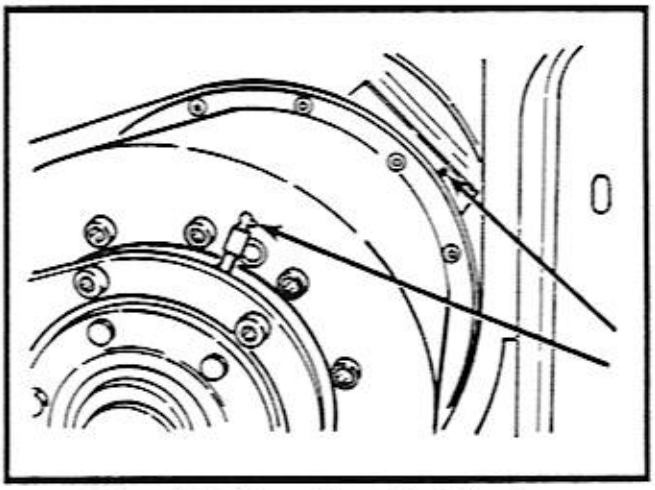


Figure 13-3. Cutter Drum Clutch Bearings

LEG TUBE BUSHINGS

Effective with S/N 5066, the machines have Nylatron leg tube bushings. These bushings should be replaced every year. Refer to the MT-7000 Service Manual for the proper procedure.

PULLEY PADS

On the MT-7000E machines, the tail and head pulleys on the primary conveyor have pads that can be replaced as they wear. The belt saver pads are on the tail pulley and the traction pads are on the head pulley. Both pads slide into place for easy changing.

SECTION 14 - ROUTINE ADJUSTMENTS

⚠ WARNING

Unexpected machine motion or moving parts can cut or crush.

Install the leg lock bars/pins, apply the parking brake, shut down the engine, and shut off the master switch before working on the machine.

⚠ WARNING

Improper maintenance can be hazardous.

Read and understand SECTION 1 - SAFETY PRECAUTIONS AND GUIDELINES before you perform any maintenance, service or repairs.

ENGINE V-BELT

There is only one (1) belt on the engine. This belt drives the alternator. Refer to Figure 14-1. Belt tension should be 125 to 135 pounds for a new alternator belt and 60 to 100 for a used belt (one that has been in operation for more than 10 minutes). If you are using a belt tension gauge similar to the one shown in Figure 14-2, the belt tension is read directly.

Always check the belt tension after 30 minutes running time for a new belt. This will ensure that the belt is properly "set".

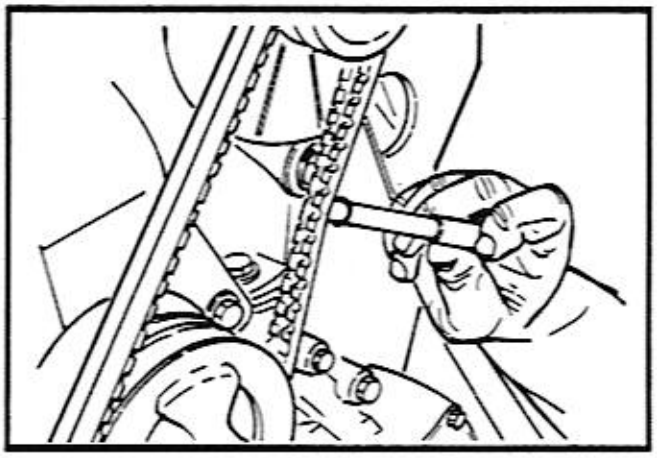


Figure 14-1. Checking V-Belt Tension (Typical)

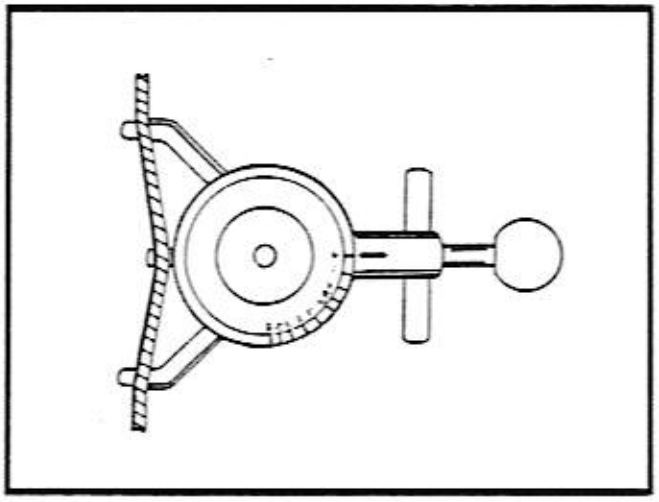


Figure 14-2. Engine V-Belt Tension Gauge

CUTTER DRUM CLUTCH ADJUSTMENT

NOTE

No adjustment is necessary for the cutter drum clutch.

14

CUTTER DRUM BELT ADJUSTMENT

Due to the hydraulically operated belt tensioner, the cutter drum belt will never need tensioned. The pressure control valve is preset to 750 psi and should not be adjusted. Overtightening the belt will lead to shorter belt life.

CONVEYOR BELT ADJUSTMENT

⚠ WARNING

Danger of falling.

Never climb on the conveyor belt to adjust the head pulley.

Always use a safe method of reaching the head pulley.

CONVEYOR BELT TENSION ADJUSTMENT

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 the belt; that would cause the belt to stretch or cause excessive bearing loading.

1. Loosen the locking nuts on the adjusting rods, on each side of the primary conveyor. Refer to Figure 14-3.

2. Turn the locking nuts, on each side of the conveyor, an equal amount in the desired direction until the proper belt tension is achieved. Tighten the lock nuts.

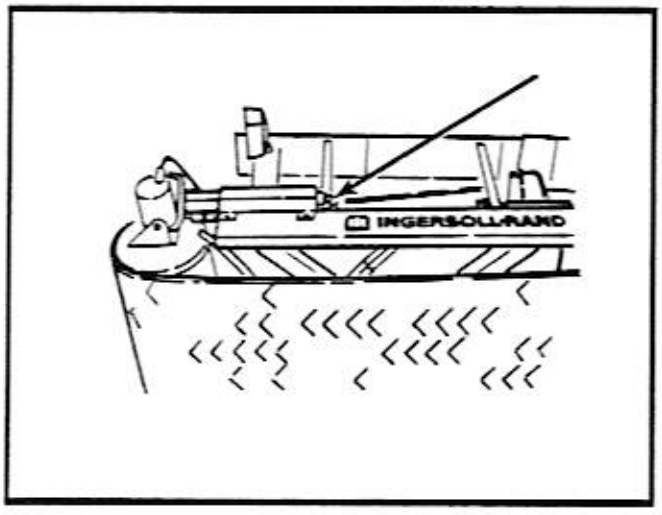


Figure 14-3. Conveyor Belt Adjusting Rods

3. Run the conveyor and verify the belt tension. When the tension is proper, tighten the adjusting hardware.

CONVEYOR BELT TRACKING ADJUSTMENT

When shipped from the factory, the conveyor belt will run perfectly within the sides of the conveyor. However, after the belt has been run for a while under load, the belt will have a tendency to stretch and will need to be adjusted.

Keep the following things in mind when adjusting the conveyor belt tension and tracking:

1. Any adjustments should be started with the return run working toward the tail pulley and then follow with the top run in the direction of belt travel. Only a few of the rollers or idlers will need to be adjusted.

2. Start adjustment with the belt empty.

3. After adjustment, permit the belt to run for several minutes and at least three full belt revolutions after each idler adjustment to determine if additional tracking is required.

4. If the belt has overcorrected, it should be restored by moving back the same idler (s), and not by shifting additional idlers or rollers.

5. Troughed idler sets behave just like flat idlers.

6. The belt moves toward that end of the roller/idler that it contacts first. Refer to Figure 14-4.

Use the following procedure to adjust the tracking of the conveyor belts (s).

1. Identify where the belt is hitting the conveyor side frame or where it is the most out of the center position.

2. Slightly adjust the three or four idlers or rollers just prior to the point where the belt is the most out of center. Remember that a slight adjustment can make a big difference in the way the belt moves.

3. Allow the belt to run for several minutes and at least three full belt revolutions after the adjustment to determine if additional tracking adjustment is required.

4. Repeat steps 1 through 3 if further adjustment is necessary.

Continued

CONVEYOR BELT ADJUSTMENT - CONT'.

CONVEYOR BELT TRACKING ADJUSTMENT - CONT.

Basic Principle and Rule of Belt Tracking

" The belt moves toward that end of the roller/idler that it contacts first."

You can demonstrate this for yourself by using a pencil or small rod and a book. The pencil will work the same as a roller or idler. The book represents the belt.

Lay a small rod or round pencil on a flat surface in a skewed direction as shown.

If a book is now laid across the rod or pencil and gently pushed in a line directly away from yourself, the book will tend to shift to the left or right depending upon which end of the rod or pencil the moving book contacts first.

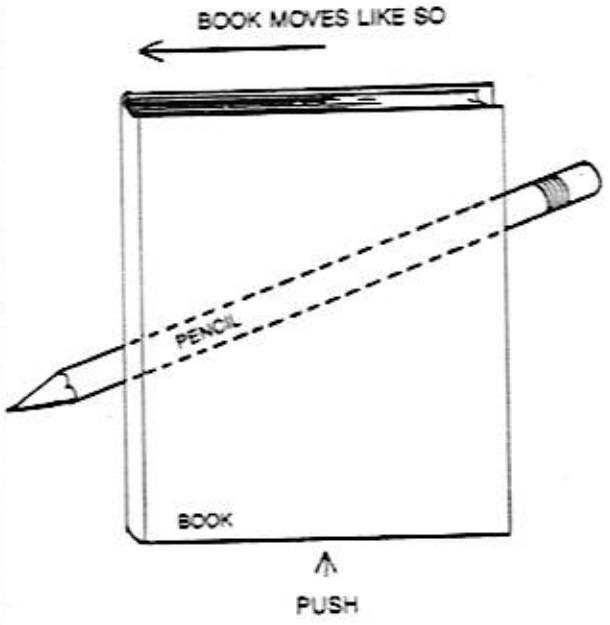


Figure 14-4. Basic Principle and Rule of Belt Tracking

TRACK ADJUSTMENT

The track must be adjusted as follows: Refer to Figure 14-5.

NOTICE

Track adjustment is tighter on this machine than on the majority of other types of milling machines.

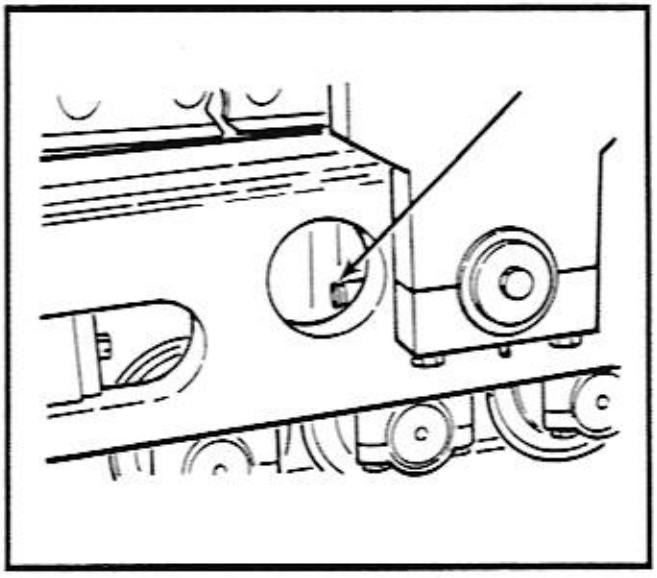


Figure 14-5. Track Adjustment

1. Using a grease gun, fill the hydraulic adjuster with grease forcing the track idler to extend to it's fullest.

2. Scribe a mark on the track frame at the end of the fully extended track idler.

3. Remove the grease gun from the grease fitting. Unscrew the fitting slightly until grease extrudes. Allow the track idler to retract until the track just touches the track frame and the idler is no more than 1/8 to 1/4 inch from the mark scribed on the track frame.

4. Tighten the grease fitting and recheck the track adjustment.

5. The track should be adjusted if the track starts to ride the top rail of the track frame.

CUTTER TOOTH REPLACEMENT

⚠ DANGER

Unexpected machine motion or moving parts can cut or crush.

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

Engine is shut down.
Leg locking pins are installed.
Parking Brake is applied.
Tracks are chocked.
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 tooth. The concrete tooth is much thicker through the body than athe asphalt tooth. Sizes and shapes will vary depending upon the manufacturer. Due to various milling conditions, life expectancy of teeth may vary. To replace the teeth:

1. Position Moldboard Control in the Neutral position and use the jog valves (side mounted Moldboard Positioning Switches) to open the drum access door. Pin the door open and shut down the engine.

2. Insert the drum turning tool (stored in the tool box) into the slot in the drum sheave. Rotate the drum with the tool to position the teeth for replacement.

3. Remove the teeth with one of these tools: a soft faced hammer and punch, an air tool or tooth removal tool from a tooth manufacturer. Tap out the tooth from the bottom of the holder. Stay clear of the tooth as it is removed. Drive the teeth away from your body and use care as the teeth may be hot or the flange may be sharp.

⚠ WARNING

Cutter teeth can fly free.

Wear goggles, hard hat and ear plugs at all times when changing teeth.

4. Grasp each tooth with pliers around the spring retainer as shown in the Figure titled Cutter Tooth Installation, and insert it into the tooth holder. Lubrication of the tooth at this time will make it easier to remove the tooth later. Refer to Figure 14-6.

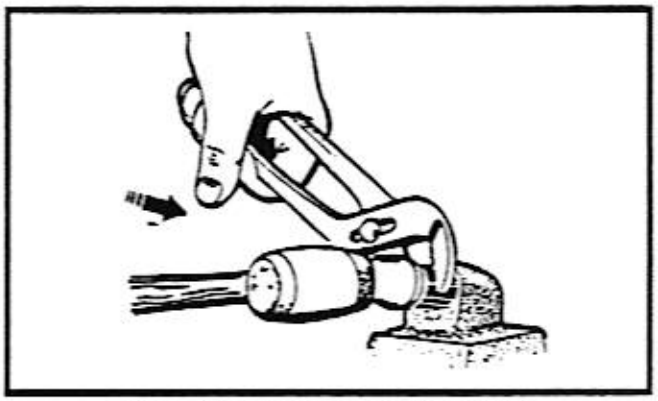


Figure 14-6. Cutter Tooth Installation

⚠ WARNING

Carbide teeth can shatter if hit with a hard object.

Use a soft faced hammer to prevent the carbide teeth from shattering. Always wear eye protection to avoid injury.

5. Tap the new tooth into place with a soft faced hammer.

6. After the tooth is in place, make sure that the tooth rotates freely in the holder. If the tooth does not rotate, remove the tooth and correct the problem. The tooth must rotate freely for proper tooth life.

7. Rotate the cutter drum with the tool until all worn teeth have been replaced.

⚠ WARNING

Rotating or loose tool can cause injury or death.

Drum turning tool can rotate or fly free of drum.

Always remove the drum turning tool prior to operating the machine.

Carbide teeth can shatter.

Failure to pick up discarded or replaced teeth can damage new teeth in rotating drum.

Continued

CUTTER TOOTH REPLACEMENT - CON'T.

8. When finished, return the drum turning tool to the tool box.

A complete set of teeth can be changed in approximately 1/2 hour. Unless other wise specified, your milling machine will come to you with asphalt cutter teeth installed.

CONVEYOR FLASHING

The conveyor flashing can be adjusted to ensure that the bottom of the flashing just contacts the conveyor belt. This will ensure that the material is contained on the belt.

SECTION 15 - MISCELLANEOUS AND OPTIONAL EQUIPMENT

ELECTRONIC STEERING COORDINATION

The electronic Steering Coordination system provides for using the steering wheel for; manually steering either the front or rear tracks, automatic coordinated steering of both the front and rear tracks, or automatic crabbing. For more details, contact your Ingersoll-Rand distributor.

SLOPE CONTROL

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, as desired; the ski mounted sensor assembly controls the other side. For more details, contract your Ingersoll-rand distributor.

ELECTRIC GRADE/SLOPE

The Electric Grade/Slope system provides for automatic control of the grade and slope of the milling operation without the operator having to compensate for surface changes during milling. For more details, contact your Ingersoll-Rand distributor.

MINING DRUM

The optional Mining Drum is a heavier drum with larger tooth holders and teeth. It is available for use in mining or excavation operations. For more details, contact your Ingersoll-Rand distributor.

CARBIDE MOLDBOARD

An optional Carbide Moldboard Blade is available for use when working in hard milling areas. For more details, contact your Ingersoll-Rand distributor.

SUN CANOPY

An optional Sun Canopy is available for operator comfort. The canopy pins into either a traveling or working position. For more details, contact your Ingersoll-Rand distributor.

RUBBER TRACK PADS

Optional Rubber Track Pads are available and bolt directly onto the track. For more details, contact your Ingersoll-Rand distributor.

CONVEYOR COVER

An optional Conveyor Cover is available to help prevent spillage and add in dust reduction. The cover sections bolt into position on the conveyor. For more details, contact your Ingersoll-Rand distributor.

AIR COMPRESSOR

An optional gasoline powered Air Compressor is available to provide an air supply for operating air tools. The compressor is mounted on the left rear of the machine. For more details, contact your Ingersoll-Rand distributor.

FRONT LEG DEPTH GAUGE

Optional Front Leg Depth Gauges are available to aid the ground man in controlling cutting depth when the automatic grade/slope control system is not being used. For more details, contact your Ingersoll-Rand distributor.

SECTION 16 - SCHEMATICS

SCHEMATICS

All electrical and hydraulic schematics for the machine are provided here. In addition, there is a copy of A.N.S.I. Graphical Symbols to explain the symbols used on the hydraulic schematic.

NOTE

All schematics are current as of the date of printing and are subject to change without notice.

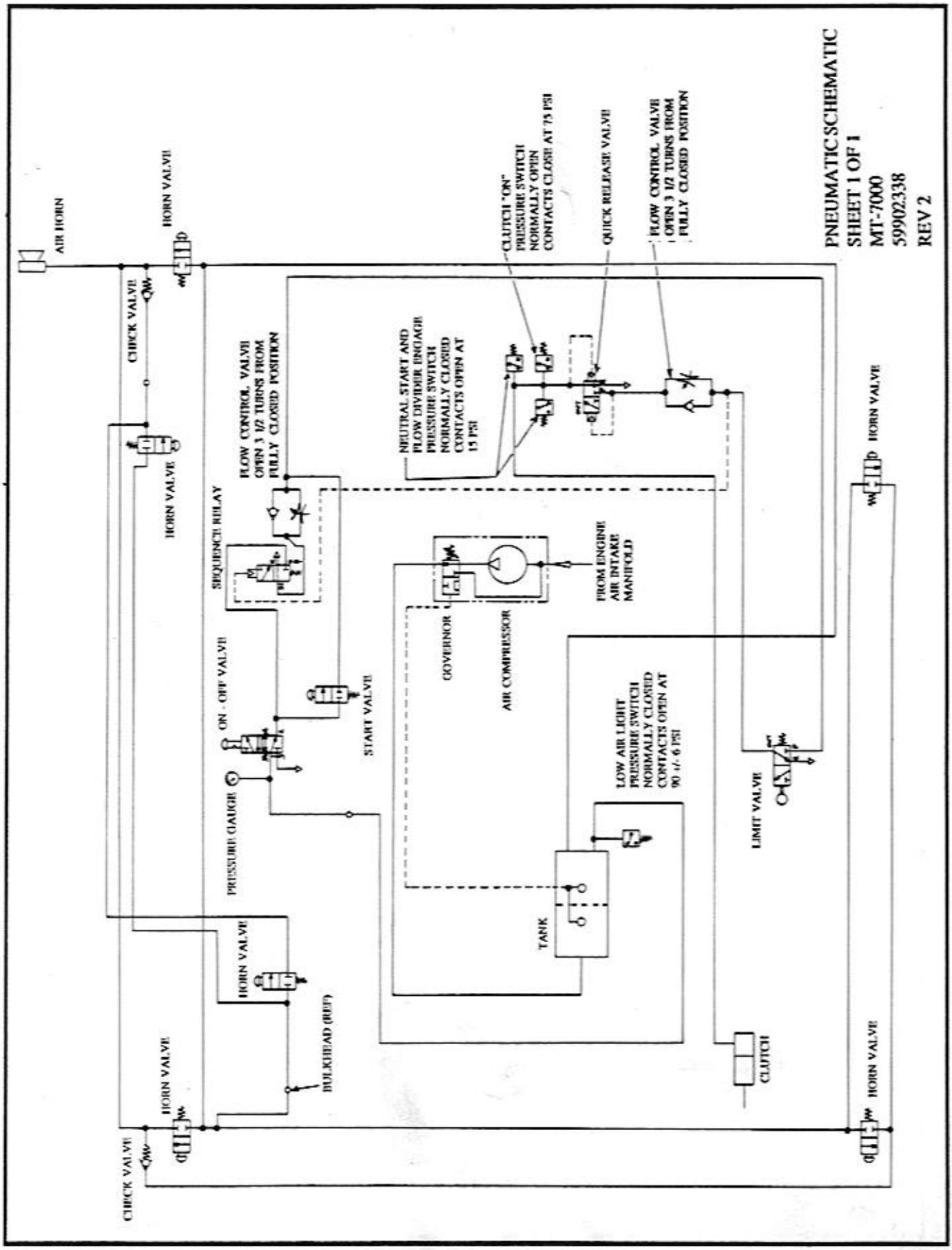
LINES AND LINE FUNCTIONS	
line, working	
Line, Pilot	
Line, drain	
connection	
line, flexible	
lines, joining	
lines passing	
direction of flow	
line to reservoir above fluid level	
below fluid level	
line to vented manifold	
plug or plugged connection	
restriction fixed	
restriction variable	
PUMPS	
single, fixed displacement	
single, variable displacement	
ACTUATORS	
motor, fixed displacement reversible	
motor, fixed displacement non reversible	
motor, variable displacement reversible	

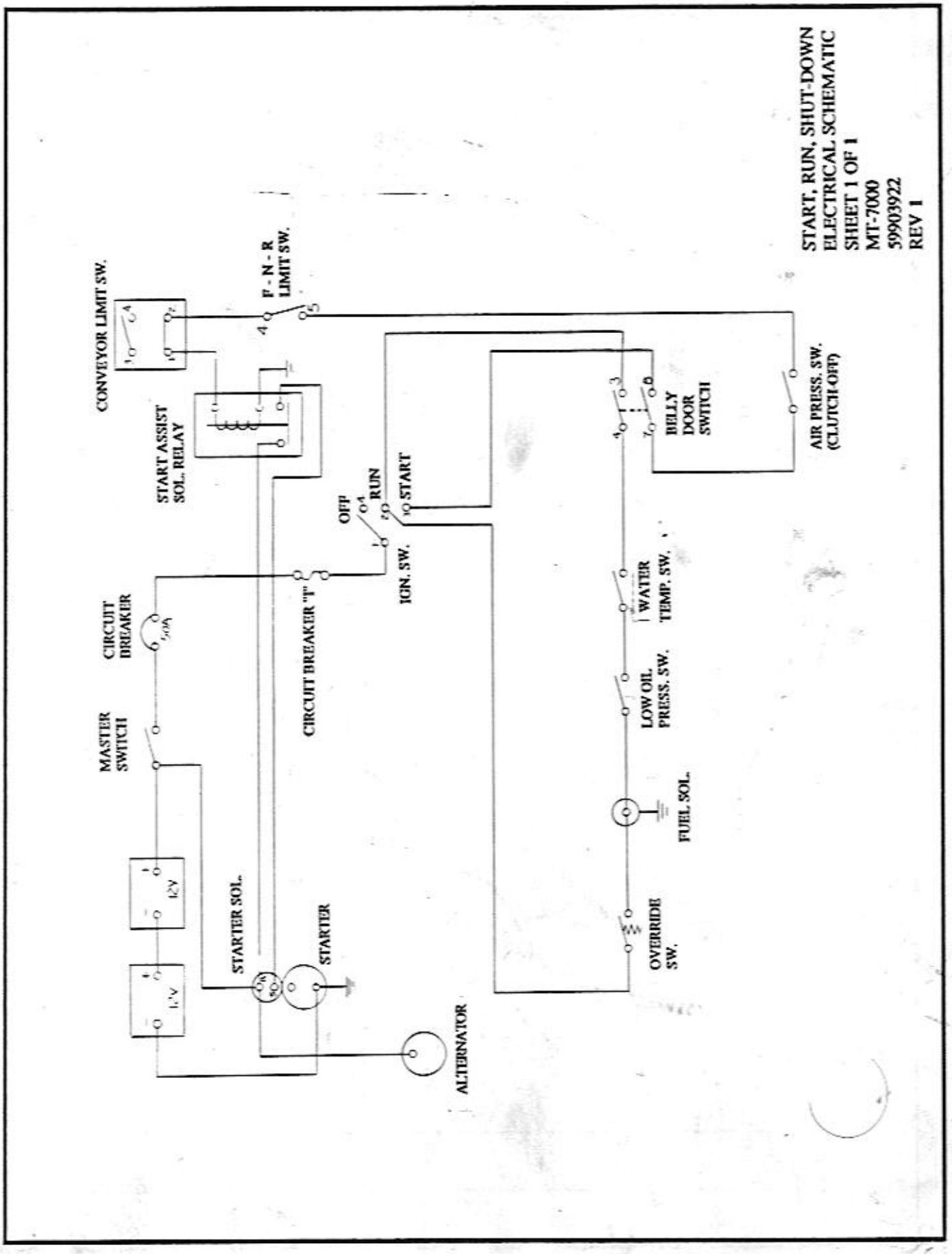
cylinder single acting	
cylinder double acting differential	
non-differential	
VALVES	
check	
on-off (manual shut-off)	
pressure relief	
pressure reducing	
flow control, adj non-compensated	
flow control adjustable (temperature and pressure compensated)	
two position two connection	
two position three connection	
two position four connection	
three position four connection	
two position in transition	
valves capable of infinite, positioning (horizonial bars indicate infinite positioning ability)	

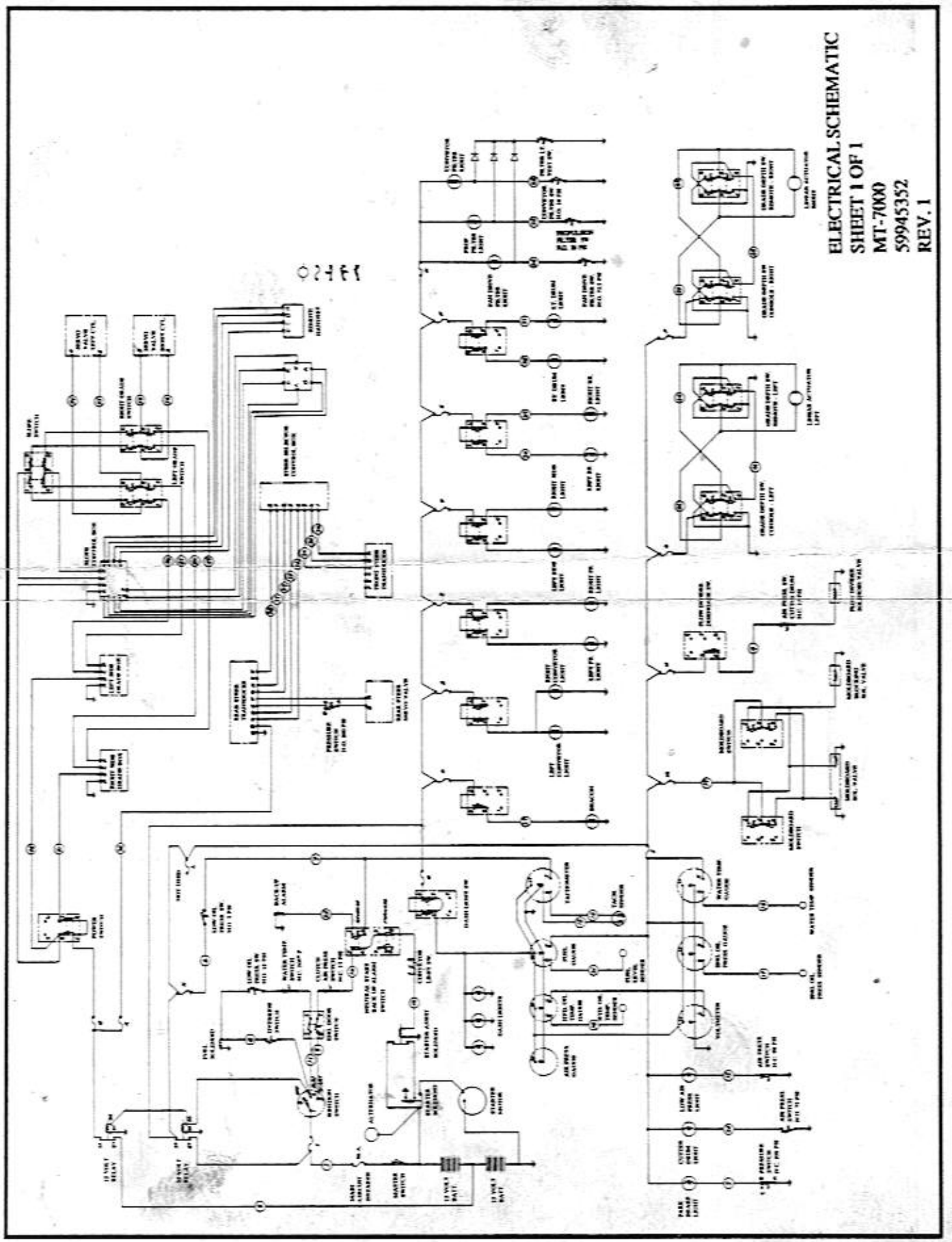
METHODS OF OPERATION	
spring	
manual	
push button	
push-pull lever	
pedal or treadle	
mechanical	
detent	
pressure compensated	
solenoid,single winding	
reversing motor	
pilot pressure remote supppply	
internal supply	

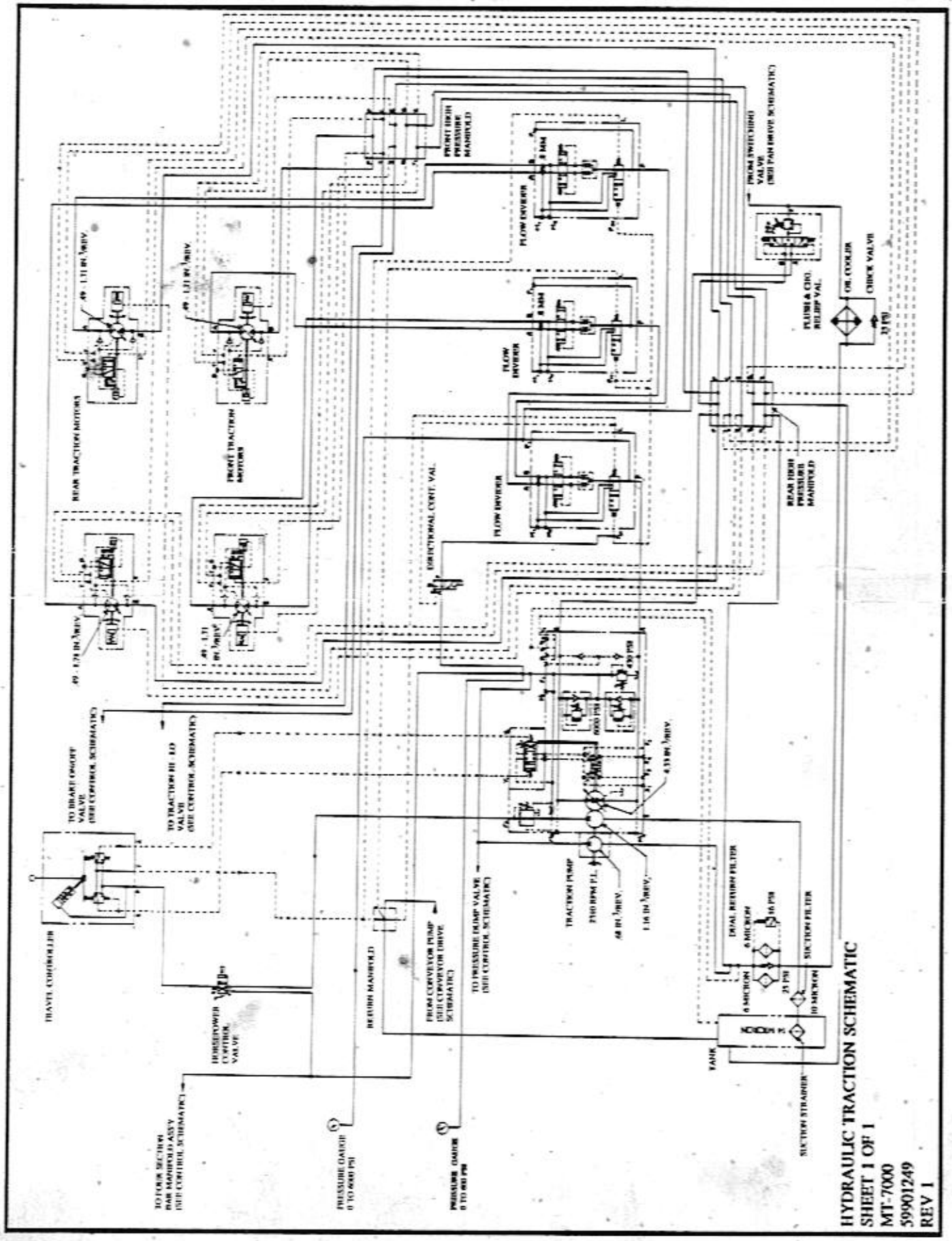
MISCELLANEOUS	
rotating shaft	
enclosure	
reservour vented	
pressurized	
pressure gauge	
electric motor	
accumulator, spring loaded	
accumulator gas charged	
heater	
cooler	
temperature controller	
filter, strainer	

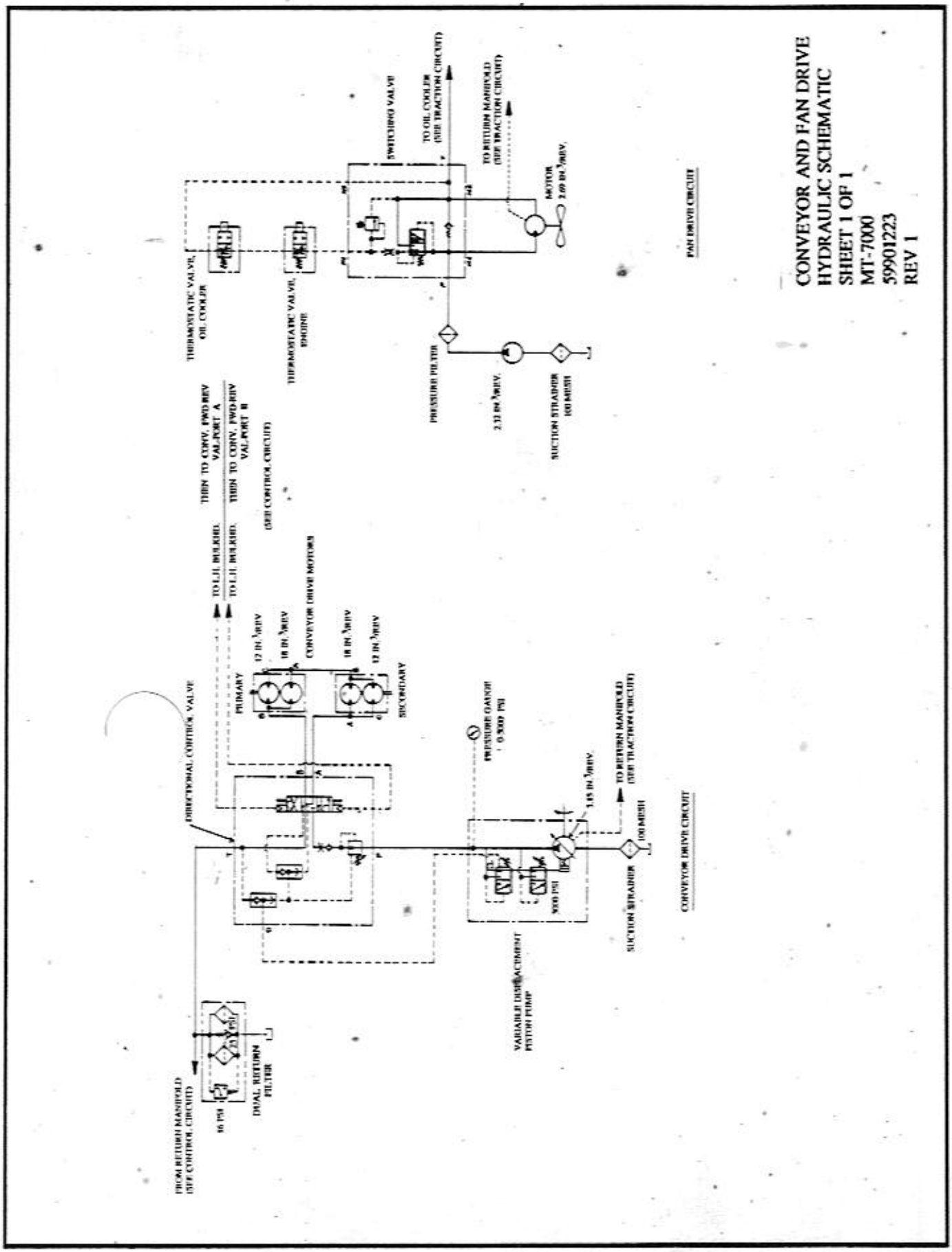
A.N.S.I. Graphical Symbols

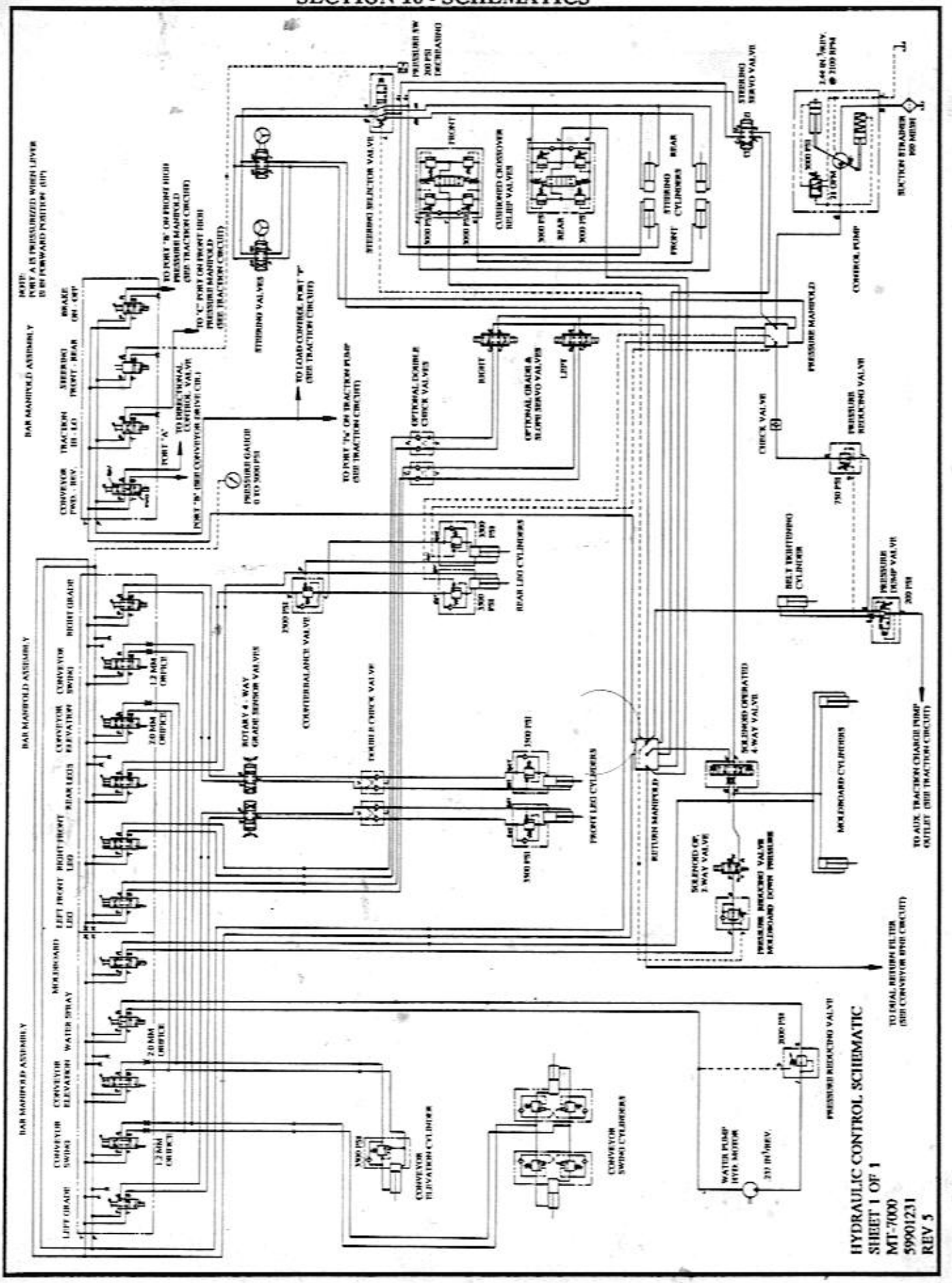

PNEUMATIC SCHEMATIC
SHEET 1 OF 1
MT-7000
59902338
REV 2
AIR HORN
HORN VALVE
CHECK VALVE
HORN VALVE
FLOW CONTROL VALVE
OPEN 3 1/2 TURNS FROM
FULLY CLOSED POSITION
SEQUENCE RELAY
NEUTRAL START AND
FLOW DIVIDER ENGAGE
PRESSURE SWITCH
NORMALLY CLOSED
CONTACTS OPEN AT
15 PSI
CLUTCH "ON"
PRESSURE SWITCH
NORMALLY OPEN
CONTACTS CLOSE AT 75 PSI
QUICK RELEASE VALVE
FLOW CONTROL VALVE
OPEN 3 1/2 TURNS FROM
FULLY CLOSED POSITION
HORN VALVE
FROM ENGINE
AIR INTAKE
MANIFOLD
GOVERNOR
AIR COMPRESSOR
ON - OFF VALVE
START VALVE
PRESSURE GAUGE
LOW AIR LIGHT
PRESSURE SWITCH
NORMALLY CLOSED
CONTACTS OPEN AT
90 +/- 6 PSI
TANK
LIMIT VALVE
HORN VALVE
BULKHEAD (REF)
CLUTCH
HORN VALVE
CHECK VALVE
HORN VALVE


START, RUN, SHUT-DOWN
ELECTRICAL SCHEMATIC
SHEET 1 OF 1
MT-7000
59903922
REV 1
CONVEYOR LIMIT SW.
F - N - R
LIMIT SW.
START ASSIST
SOL. RELAY
OFF
RUN
START
IGN. SW.
BELLY
DOOR
SWITCH
AIR PRESS. SW.
(CLUTCH OFF)
CIRCUIT
BREAKER
CIRCUIT BREAKER "I"
WATER
TEMP. SW.
MASTER
SWITCH
LOW OIL
PRESS. SW.
FUEL SOL.
STARTER SOL.
STARTER
OVERRIDE
SW.
ALTERNATOR


ELECTRICAL SCHEMATIC
SHEET 1 OF 1
MT-7000
59945352
REV. 1


HYDRAULIC TRACTION SCHEMATIC
SHEET 1 OF 1
MT-7000
59901249
REV 1


CONVEYOR AND FAN DRIVE
HYDRAULIC SCHEMATIC
SHEET 1 OF 1
MT-7000
59901223
REV 1
FAN DRIVE CIRCUIT
CONVEYOR DRIVE CIRCUIT
SWITCHING VALVE
TO OIL COOLER (SEE TRACTION CIRCUIT)
TO RETURN MANIFOLD (SEE TRACTION CIRCUIT)
MOTOR
THERMOSTATIC VALVE, OIL COOLER
THERMOSTATIC VALVE, ENGINE
PRESSURE FILTER
SUCTION STRAINER
TRIM TO CONV. FWD REV VALPORT A
TRIM TO CONV. FWD REV VALPORT B
(SEE CONTROL CIRCUIT)
TO F.D. MOTORS
CONVEYOR DRIVE MOTORS
PRIMARY
SECONDARY
DIRECTIONAL CONTROL VALVE
PRESSURE GAUGE
TO RETURN MANIFOLD (SEE TRACTION CIRCUIT)
SUCTION STRAINER
VARIABLE DISPLACEMENT PISTON PUMP
FROM RETURN MANIFOLD (SEE CONTROL CIRCUIT)
DUAL RETURN FILTER


HYDRAULIC CONTROL SCHEMATIC
SHEET 1 OF 1
MT-7000
59901231
REV 5
BAR MANIFOLD ASSEMBLY
STEERING VALVES
STEERING SELECTOR VALVE
CUSHIONED CROSSOVER RELIEF VALVES
STEERING CYLINDERS
PRESSURE MANIFOLD
CHECK VALVE
PRESSURE REDUCING VALVE
OPTIONAL DOUBLE CHECK VALVES
OPTIONAL GRADE & SLOPE SERVO VALVES
REAR LEG CYLINDERS
FRONT LEG CYLINDERS
COUNTERBALANCE VALVE
ROTARY 4 - WAY GRADE SENSOR VALVES
DOUBLE CHECK VALVE
SOLENOID DERATED 4 WAY VALVE
SOLENOID OPERATED 2 WAY VALVE
MOLDBOARD CYLINDERS
BELT TIGHTENING CYLINDER
CONVEYOR SWING CYLINDERS
CONVEYOR ELEVATION CYLINDER
WATER PUMP
RETURN MANIFOLD
TO AUX. TRACTION CHARGE PUMP OUTLET (SEE TRACTION CIRCUIT)
TO FINAL RETURN FILTER (SEE CONVEYOR HYDRAULIC CIRCUIT)