Model 75 Articulated Tractor Shovel

CLARK EQUIPMENT

MICHIGAN

OPERATORS MANUAL

No. 2592

MODEL 75 Articulated TRACTOR SHOVEL

Information contained herein pertains to Machine Serial Numbers listed below:

CUMMINS — 1ACC101 thru 1ACC999
— 408A101 thru 408A999
— 408B101 and After

G.M. — 409A101 thru 409A999
409B101 and After

CLARK EQUIPMENT COMPANY
Construction Machinery Division

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This warranty does not apply in respect of damage to or defects in any product caused by overloading or other misuse, neglect or accident, nor does this warranty apply to any product which has been repaired or altered in any way which, in the sole judgment of Distributor, affects the performance, stability or general purpose for which it was manufactured.

THIS WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES (EXCEPT OF TITLE), EXPRESSED OR IMPLIED, AND THERE ARE NO WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL DISTRIBUTOR BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES.

This warranty does not apply to parts or trade accessories not manufactured by CLARK, or attachments not manufactured or sold by CLARK. Buyer shall rely solely on the existing warranties, if any, of the respective manufacturers thereof.

CLARK EQUIPMENT

IMPROVEMENTS

It is CLARK'S policy to constantly strive to improve its products. The right therefore is reserved to make changes in design and improvements whenever it is believed the efficiency of the product will be improved thereby, but without incurring any obligation to incorporate such improvements in any product which has been shipped or is in service.

Revised May 1, 1966

MICHIGAN

OPERATORS MANUAL

No. 2592

MODEL 75
Articulated
TRACTOR SHOVEL

Information contained herein pertains to Machine Serial Numbers listed below:

CUMMINS — 1ACC101 thru 1ACC999
— 408A101 thru 408A999
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G.M. — 409A101 thru 409A999
409B101 and After

Record Your Machine Serial Number and Engine Model Specification and Serial Number Here

Machine Serial 408 B 216

Engine Model C T 416 C

Engine Serial 675458

CLARK EQUIPMENT COMPANY
Construction Machinery Division

1M706B

Printed in U.S.A.

TO OWNERS

The purpose of this manual is to serve as a guide to the proper operation, lubrication and minor adjustment of the MICHIGAN Tractor Shovel. Study this manual carefully before starting or operating the machine the first time. Become familiar with all controls and procedures, and keep the manual on the machine for handy reference.

You have purchased this MICHIGAN Tractor Shovel with the expectation that it would give you long and faithful service. In its construction we have taken every precaution to see that you get an efficient, long lived, satisfactory machine. It is our sincere hope that you derive from its operation the full measure of value and utility which you looked forward to when purchasing it.

For these reasons, we take the liberty of suggesting that your MICHIGAN Tractor Shovel will always respond at its best with considerate treatment and care. The slight outlay in personal attention and cost required to give it regular and proper lubrication, inspection at stated intervals, and such adjustments as may be indicated, will repay you many times in low cost operation and trouble-free service.

Whenever repair or replacement of component parts is required, only Clark-approved parts as listed in the applicable parts manual should be used. Use of "will-fit" or non-approved parts may endanger proper operation and performance of the equipment. The Clark Equipment Company does not warrant repair or replacement parts, nor failures resulting from the use thereof, which are not supplied by or approved by the Clark Equipment Company.

CLARK EQUIPMENT COMPANY
Construction Machinery Division
BENTON HARBOR, MICHIGAN, U.S.A.

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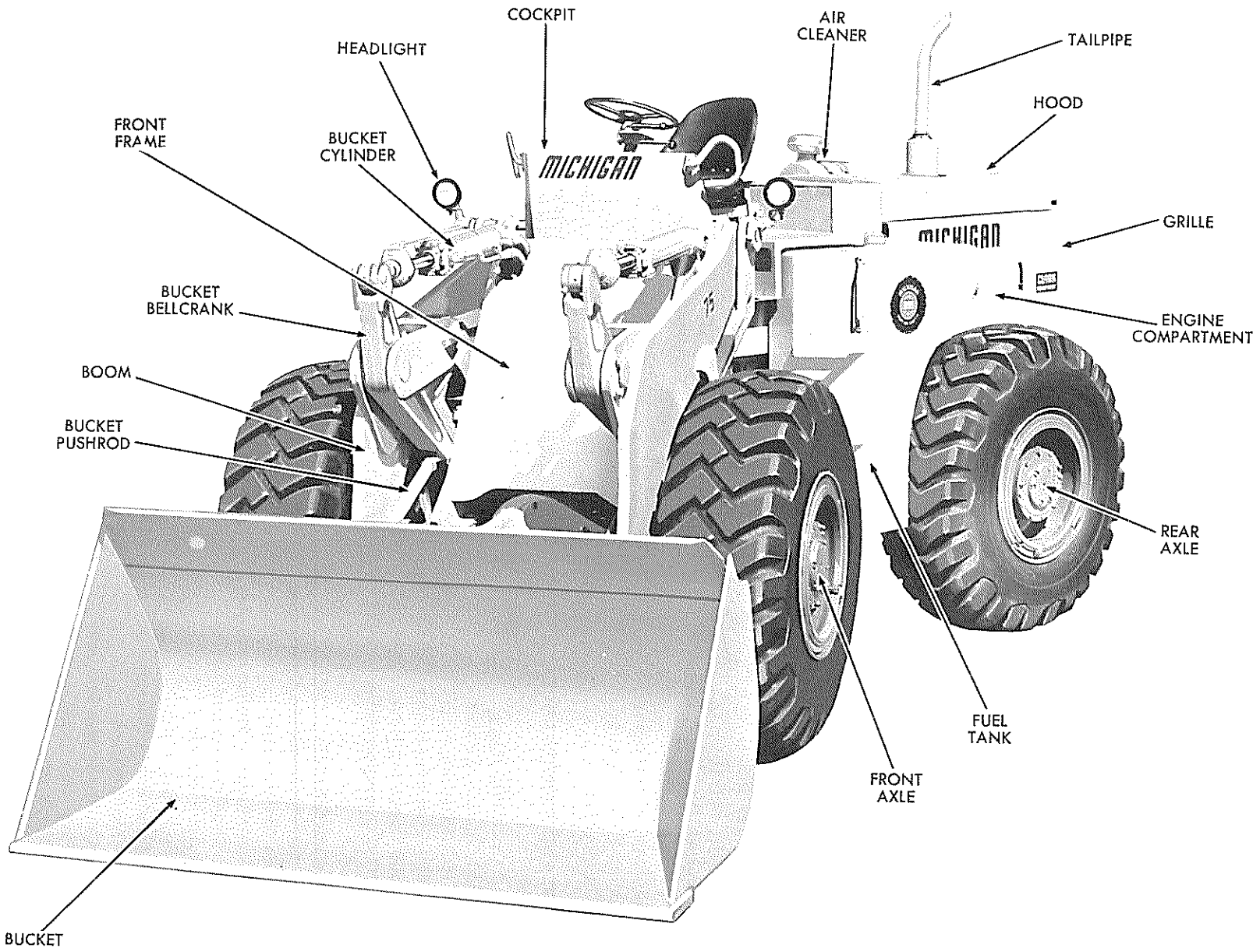

MODEL 75 ARTICULATED TRACTOR SHOVEL

TS-8427

GENERAL DESCRIPTION

MICHIGAN Articulated Tractor Shovels are constructed for rugged, heavy-duty industrial and commercial applications. They are specifically engineered for maximum ease of operation to move the greatest amount of material in the shortest possible time.

Drive power is from the engine through a Clark torque converter having 3.0-1 torque multiplication factor, to a Clark power shifted, full reversing type transmission, to the axle assemblies. Universal slip-joint drive shaft assemblies are used between power transfer units.

Axle assemblies are Clark all wheel drive, spiral bevel ring gear and pinion, with further reduction provided by planetary gear sets within the wheel hubs.

Constant four-wheel drive provides additional tractive effort and power for any operating condition. Effortless hydraulic power steering is provided, utilizing two double acting steering cylinders, one at each side between front and rear frames.

Service brakes at each wheel are air over hydraulic, with a cable controlled mechanical parking brake mounted on the drive line.

Numerous quick-change attachments are available as optional accessory equipment, enabling one to increase the usefulness and productivity of the machine for a variety of different operations.

For more complete specifications refer to Specifications and Service Data at rear of this manual.

DATA PLATES

Data plates and decals used throughout the machine aid in its safe and efficient operation; others give service instructions. Read all instruction plates before starting and operating the machine.

AREA WARNING DECAL

The warning decal as shown in Figure 1 is located on the surfaces of hydraulic reservoir and fuel tank behind steps. Both safety links should be attached between Front and Rear frames when servicing the machine. Service personnel must stay out of these areas when the engine is running or the machine is in motion as there is not enough space for a man in the area when the machine is turned.

Fig. 1. Area Warning Decal

MACHINE SERIAL NUMBER PLATE

The machine serial number plate is mounted in the operator's compartment, giving model number and serial number of machine. See Figure 2. Serial number of machine also is stamped in one-half inch numerals beneath right-hand upper pivot assembly, and on the rear beneath the wrap around.

IMPORTANT: ALWAYS GIVE SERIAL NUMBER OF MACHINE WHEN ORDERING PARTS.

LUBRICATION INSTRUCTION PLATE

The lubrication instruction plate as shown in

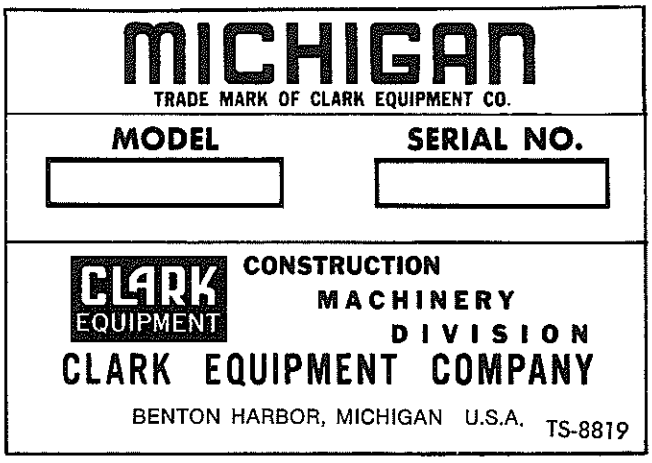

Fig. 2. Machine Serial Number Plate

LUBRICATION INSTRUCTIONS

ITEM	SHOVEL	DOZER	SCRAPER	CHECK	LUBRICATION OR CHANGE PERIOD	LUBRICANT KEY
AIR CLEANER(S)	X	X	X	SEE OPERATORS MANUAL FOR DETAILED INSTRUCTIONS.		
HYDRAULIC RESERVOIR	X	X	X	8 HRS.	1000 HRS.	HF
TORQUE CONVERTER & TRANSMISSION	X	X	X	8 HRS.	500 HRS.	HF
ALL GREASE FITTINGS EXCEPT:	X	X	X	—	8 HRS.	LBG
BRAKE CAMSHAFT FITTINGS	X	X	X	—	50 HRS.	LBG
PROPELLER SHAFT FITTINGS	X	X	X	—	100 HRS.	LBG
ELEVATOR MOTOR CIRCUIT SWIVEL JOINTS	—	—	X	—	250 HRS.	LBG
FRONT AXLE DIFFERENTIAL	X	X	X	50 HRS.	1000 HRS. - 6 MO.	SAE 90 EPGL-1
REAR AXLE DIFFERENTIAL	X	X	—	50 HRS.	1000 HRS. - 6 MO.	SAE 90 EPGL-1
FRONT AXLE PLANETARY HUBS	X	X	X	50 HRS.	1000 HRS. - 6 MO.	SAE 90 EPGL-1
REAR AXLE PLANETARY HUBS	X	X	—	50 HRS.	1000 HRS. - 6 MO.	SAE 90 EPGL-1
REAR AXLE WHEEL BEARINGS	—	—	X	—	1000 HRS. - 6 MO.	WB
REAR AXLE WHEEL BEARINGS & CENTER STEER ARM BEARINGS (Non-Driving Axles)	X	—	—	—	1000 HRS. - 6 MO.	WB
STEERING GEAR	X	X	X	50 HRS.	—	SAE 90 GL
FAN DRIVE GEAR BOX (Where Applicable)	—	X	—	50 HRS.	1000 HRS. - 6 MO.	SAE 90 GL
ELEVATOR GEARBOX	—	—	X	50 HRS.	1000 HRS. - 6 MO.	SAE 90 EPGL-2
MIDMOUNT BEARING ASSEMBLY:						
A — Equipped with level & drain plug	X	X	—	50 HRS.	1000 HRS. - 6 MO.	HF
B — Equipped with grease fittings (2)	X	X	—	—	100 HRS.	LBG
BRAKE MASTER CYLINDER (Hydraulic & Air Over Hydraulic Brakes)	X	—	X	50 HRS.	—	BF
BRAKE POWER CLUSTER AIR CHAMBER (Air Over Hydraulic Brakes)	X	—	X	—	1000 HRS.	HF
HYDRAULIC SYSTEM BREATHER	X	X	X	REMOVE, CLEAN & REPLACE EVERY 50 HRS.		
CONVERTER BREATHER	X	X	X	REMOVE, CLEAN & REPLACE EVERY 50 HRS.		
TRANSMISSION BREATHER	X	X	X	REMOVE, CLEAN & REPLACE EVERY 50 HRS.		
CONVERTER & TRANSMISSION OIL FILTERS	X	X	X	—	250 HRS.	—
STEERING SYSTEM OIL FILTERS	X	X	X	—	250 HRS.	—
HYDRAULIC RESERVOIR SUCTION & RETURN FILTERS	X	X	X	CLEAN OR REPLACE EVERY 500 HRS.		
AXLE BREATHERS	X	X	X	REMOVE, CLEAN & REPLACE EVERY 500 HRS.		
ENGINE, FUEL & OIL FILTERS & ACCESSORIES				SEE ENGINE OPERATORS MANUAL FOR INSTRUCTIONS.		

LUBRICANT KEY

LBG	LITHIUM BASE MULTI-PURPOSE GREASE 0°F & ABOVE — GRADE 2 BELOW 0°F — GRADE 0
EPGL-1	EXTREME PRESSURE GEAR LUBE — SCL TYPE
EPGL-2	EXTREME PRESSURE GEAR LUBE — API CLASS GL4 (Military Spec. MIL-L-2105B)
GL	STRAIGHT MINERAL OIL GEAR LUBE — API CLASS GL1
BF	SAE 70 R-3 BRAKE FLUID
WB	WHEEL BEARING GREASE — EP GRADE 1 (Lithium Soap or Lithium Lead Type — 40 lbs. Min. Lever Load, Timken Test)

HF

AMBIENT TEMP. RANGE	LUBRICANT TO BE USED
ABOVE 0°F 1)	SAE 10W Engine Oil, API Class §MS, DM, or MIL-L-2104B.
2)	Automatic Transmission Fluids: Type A, Suffix A, or DEXRON.
3)	Hydraulic Transmission Fluid Type C-2 — See Note Below.
0°F & BELOW	Automatic Transmission Fluids: Type A, Suffix A, or DEXRON.

§ — Sequence Tested

NOTE: C-2 Fluids must contain type and content of anti-wear compound found in API MS engine oils and meet viscosity requirements of MS engine oils — GRADE 10W.

SEE APPLICABLE OPERATORS MANUAL FOR DETAILED INSTRUCTIONS.

CLARK EQUIPMENT MICHIGAN

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Fig. 3. Lubrication Instruction Plate

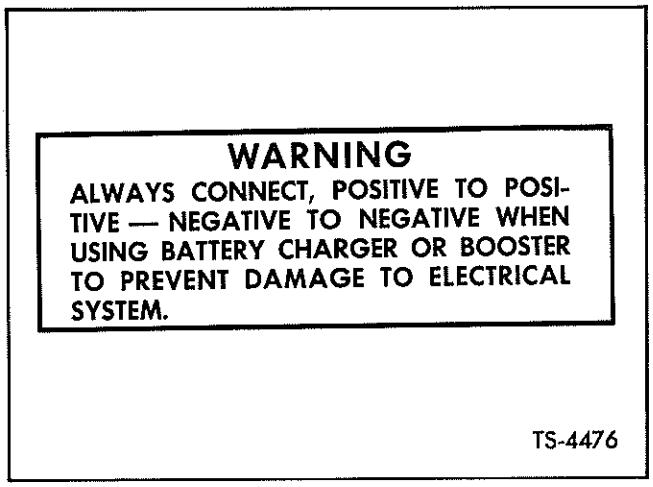


Fig. 4. Safety Wiring Decal

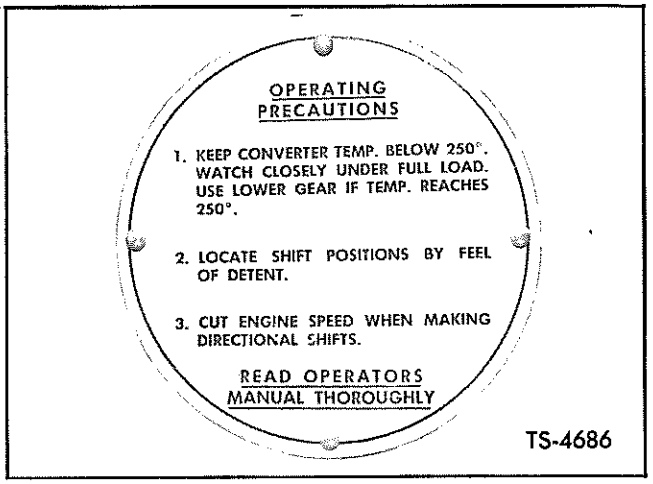


Fig. 5. Operating Precaution Plate

Figure 3 is located in operator's compartment. This plate provides a list of items to be lubricated on specific models, intervals of lubrication, and types of lubricant to be used. However, in addition to the lubrication instruction plate, it will be necessary to refer to the Lubrication Section in applicable Operator's Manual for location of lubricating points, capacities and detailed instructions pertaining to lubrication.

SAFETY WIRING DECAL

The safety wiring decal as shown in Figure 4 is located on right hand dash panel. This indicates that machine is equipped with an alternator having a negative grounded electrical system.

The alternator is a continuous output diode rectified alternating current (a.c.) generator that develops a continuous output of electrical energy at all engine operating speeds (high, low and idle). The trade name for this unit manufactured by Delco-Remy is "Delcotron". The output of the alternator is controlled by a transistorized voltage regulator.

Note: *To prevent serious injury to personnel or extreme damage to electrical system components, it should be noted that information contained in this manual pertaining to electrical system components will emphasize certain precautions that must be followed when servicing the "Delcotron" charging system.*

OPERATING PRECAUTION PLATE

The operating precaution plate as shown in Figure 5 is located in the center of the steering wheel. This plate provides a few precautions to follow during machine operation, and also reminds the operator to refer to the Operator's Manual for additional information that is necessary for proper operation of the machine.

TRANSMISSION OR TORQUE CONVERTER SERIAL NUMBER PLATE

The transmission serial number plate is located on the transmission case. The torque converter serial number plate is located on the converter housing. Both plates are identical except for model number and serial number stamped on each plate to properly identify the units. Plate is shown in Figure 6.

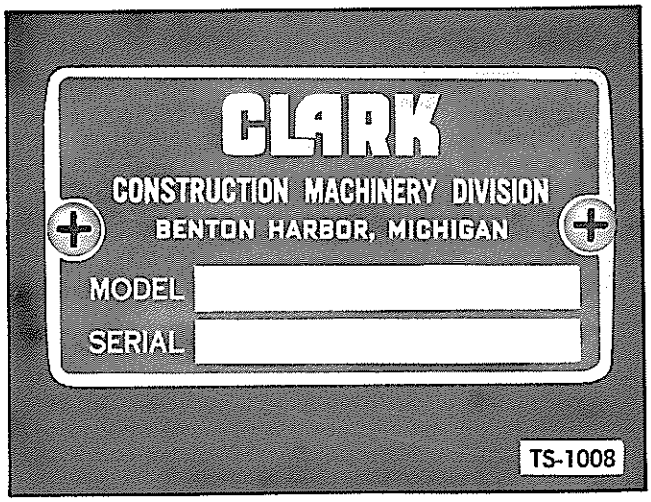


Fig. 6. Torque Converter or Transmission Serial Number Plate

PREPARATION FOR OPERATION

It is essential that the following points be checked with machine in level position before operating this MICHIGAN Tractor Shovel.

Refer to the Lubrication Charts to locate items referred to below.

1. Check entire machine for damage in transit or storage.
2. Check oil level in the following to specifications outlined in Lubrication Section.
   a. Engine crankcase
   b. Transmission case (with engine idling)
   c. Front drive axle differential
   d. Front drive axle planetary hubs
   e. Rear drive axle differential
   f. Rear drive axle planetary hubs
   g. Hydraulic system reservoir
   h. Steering gear
3. Check cooling system to make sure radiator is filled and that radiator drain cock and engine block drain cock are closed. When there is danger of water freezing in the cooling system, use a reliable brand of permanent type anti-freeze according to manufacturer's instructions. For further information please refer to Operation and Maintenance Manual of engine manufacturer.
4. Check batteries that plates are covered with water. Add only clean distilled water.
5. Check fuel level in tank. Handle fuel in clean containers. Use No. 2 Diesel fuel oil, Cetane 40 minimum.
6. Check that all drain plugs, drain cocks, filler openings, fuel lines, oil lines, hydraulic lines, cooling system and air cleaner connections are tight, and do not leak.
7. Check tire pressures and hydroinflation. See Specifications Section for proper air pressure and hydroinflation data. Be sure valve caps are in place to prevent dirt, moisture and foreign material from damaging valve core.
8. Grease all lubrication points of the entire unit. Refer to Lubrication Section as a guide for location, type and quantity of lubricant.

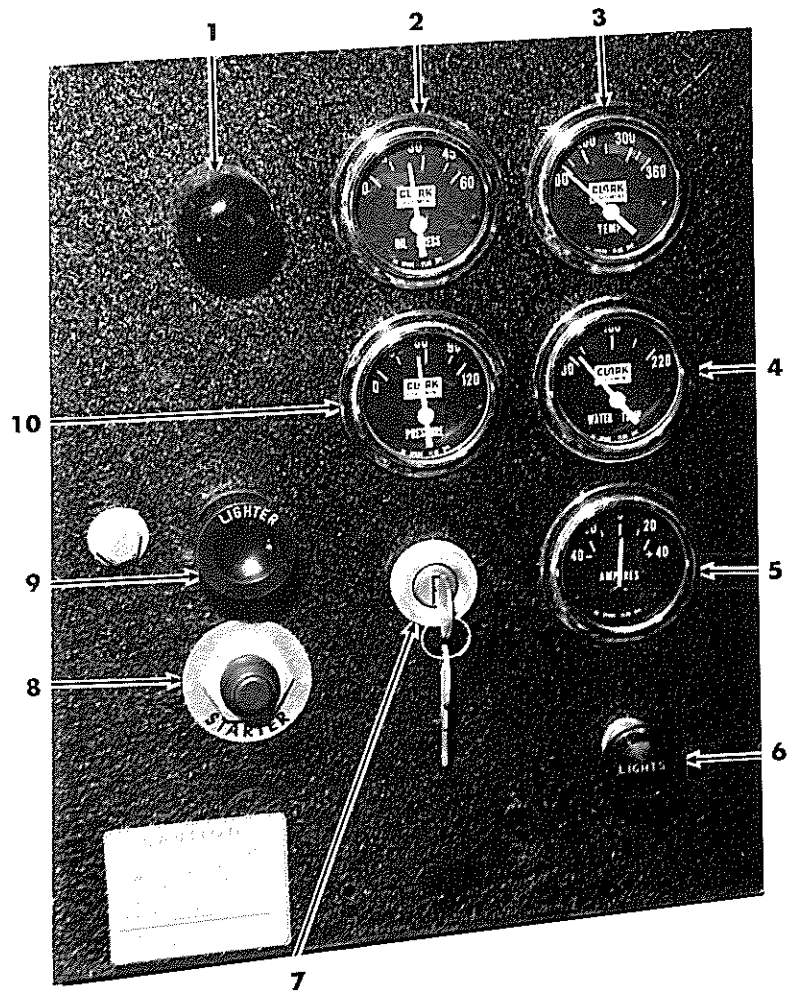
NOTES

INSTRUMENTS AND OPERATING CONTROLS

Before operating a machine of this type it is essential that the operator become thoroughly familiar with the location and function of the various controls and instruments. Reference to, and study of the illustrations of the operator's compartment, controls, and instruments, together with the following paragraphs will aid in acquiring this information.

The operator should work slowly and carefully until he has become thoroughly accustomed to the machine. Speed and skill will be attained much easier if the necessary time is spent to acquire complete familiarity with the machine and its operation.

The terms "right-hand" and "left-hand" referred to below are determined by sitting in the operator's seat and facing toward front of machine.



1. Dash Lamp
2. Engine Oil Pressure Gauge
3. Torque Converter Temperature Gauge
4. Engine Temperature Gauge
5. Ammeter
6. Light Switch
7. Ignition Switch
8. Starter Switch
9. Lighter
10. Air Pressure Gauge

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Fig. 7. Instrument Panel

INSTRUMENTS AND SWITCHES

All instruments and switches with the exception of the hour meter and foot operated horn switch are conveniently located on instrument panel at left front side of operator's compartment. The hour meter is mounted at rear of the operator's compartment. The foot operated horn switch is located at left side of front floorboard.

It is good practice to observe gauges frequently while working the machine. Each gauge serves as an important check point for operating conditions of torque converter and transmission, and of the engine and accessories. Do not operate machine if gauges are not functioning properly.

Figures 7 and 8 give identification of instruments and switches.

INSTRUMENT PANEL

Engine Temperature Gauge indicates temperature of engine coolant. Under normal operating conditions gauge should register between 165° F. and 185° F. If gauge indicates temperature to be at boiling point, idle engine, and add water to the cooling system. When temperature lowers, shut down engine and trouble shoot cooling system for cause of overheating.

Engine Oil Pressure Gauge indicates oil pressure in engine lubricating system. Under normal operation, at idle and governed rpm, gauge pressure is as follows:

	Idle	Governed RPM
Cummins Diesel	10 psi min.	Approx. 30 psi
G.M. Diesel	11 psi min.	30 psi min.

If gauge fails to register within 10 to 15 seconds, stop engine immediately and determine cause.

Dash Lamp lights when light switch is pulled out to the first position.

Air Pressure Gauge indicates pressure in air reservoir for operating brakes. Gauge should read between 80 and 105 psi. Never operate machine with less than 60 psi pressure.

Torque Converter Temperature Gauge indicates temperature of fluid in torque converter and transmission lubricating system. When temperature approaches 250° F., or red portion of gauge, shift to a lower operating speed range.

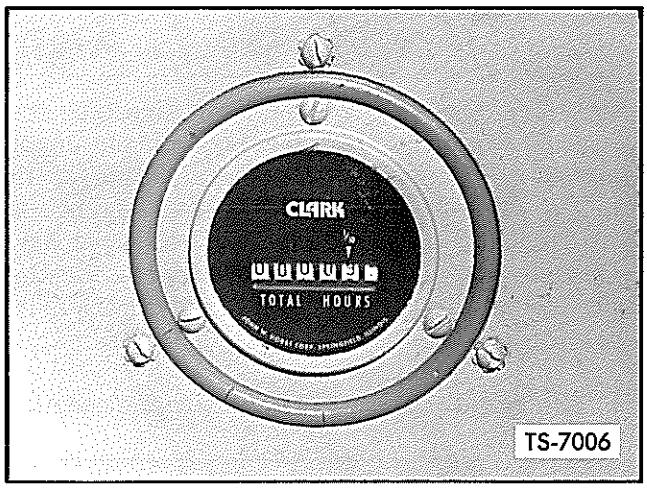


Fig. 8. Hour Meter

Ammeter shows current flow to and from batteries. Electrical current going from alternator to batteries registers on the charge (+) side. Gauge will show discharge (—) when more electrical energy is being consumed than received from alternator.

Ignition Switch energizes all gauges and switches on instrument panel, and starting motor circuit. Turn switch to right for ON position.

Light Switch operates dash lamp, head lights and tail lights in first position, with addition of back-up lights in second position. Pull switch to operate.

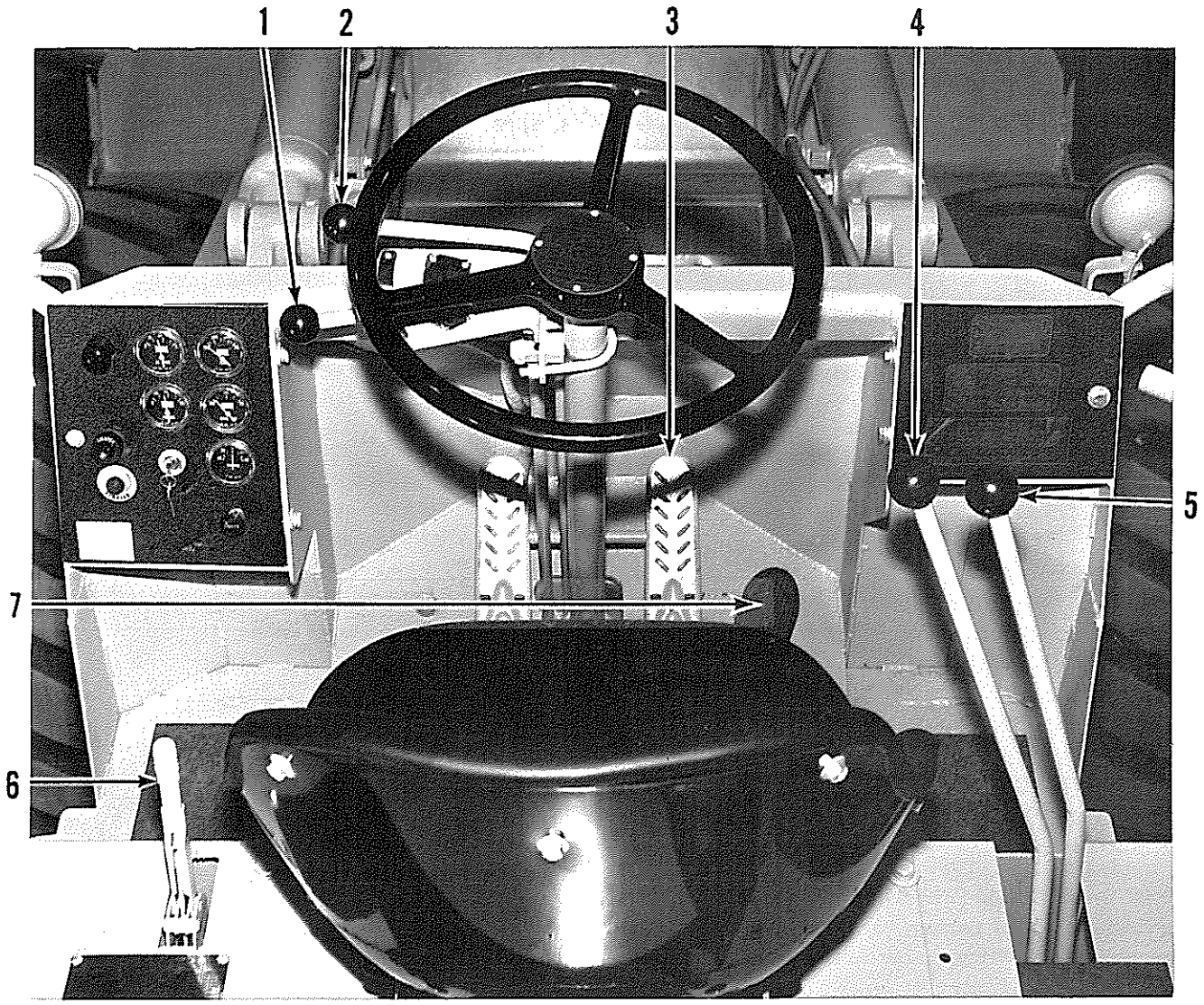
Starter Switch energizes cranking motor to start engine. Press to operate; release when engine starts. Do not crank engine continuously for more than 30 seconds to avoid damage to cranking motor. Pause a few minutes between cranking cycles, if difficulty is encountered, to let windings cool. See Starting Procedure.

Cigarette Lighter is a push button type conveniently located on instrument panel. With ignition turned to the ON position, push lighter in to operate.

OPERATING CONTROLS

All controls are conveniently located to provide maximum ease of operation of the machine.

The operator's seat can be shifted forward or rearward to suit the individual by moving the lever on left side of seat forward and shifting the seat to desired position. The height and angle of the seat can also be adjusted by repositioning the seat in the adjusting holes in seat mounting brackets.



1. Speed Range Lever
2. Directional Shift Lever
3. Brake Pedal
4. Bucket Control Lever
5. Boom Control Lever
6. Parking Brake Lever
7. Accelerator Pedal
8. Work and Travel Range Selector (Below Seat)

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Fig. 9. Operating Controls

If enclosed parking is not available when shutting down machine at end of shift, tilt seat forward over steering wheel and spread tarpaulin over operator's compartment to give protection from inclement weather. A cab enclosure kit is available as accessory equipment.

Refer to Figure 9 for location and identification of operating controls.

Directional Shift Lever is top lever on steering column. This lever provides three positions, FORWARD, NEUTRAL and REVERSE to control direction of machine travel. Pushing lever into forward position engages FORWARD travel. Pulling lever into rear position engages REVERSE travel. Lever is in NEUTRAL when in its central position. When starting engine, lever must be in NEUTRAL position.

When shifting from FORWARD *into* REVERSE *or vice versa, always decrease engine rpm and stop machine momentarily while making the shift.*

Speed Range Lever is bottom lever on steering column. This lever provides three positions, LO, NEUTRAL and HI to control travel speed of the machine. Pushing lever into forward position engages LO speed range; pulling lever into the rear position engages HI speed range. Lever is in NEUTRAL when in its central position.

Speed range lever and range shift lever make available to the operator a choice of four speed ranges, providing selective power requirements for any operating condition. First and second speed ranges are obtained by shifting speed range lever into LO and HI when range shift lever is in WORKING RANGE; third and fourth are obtained by shifting into LO and HI with range shift lever in TRAVEL RANGE. See chart below.

Speed Range	Speed Range Lever	Range Shift Lever
1st	LO	WORKING RANGE
2nd	HI	WORKING RANGE
3rd	LO	TRAVEL RANGE
4th	HI	TRAVEL RANGE

Speed range and directional shift levers are so arranged that it is convenient to load in LO range FORWARD, and back away from pile in HI range REVERSE by gripping both levers at the same time. HI range should always be used when traveling machine for comparatively long distances without a load.

Observe torque converter temperature gauge when working machine. If gauge approaches 250° F., shift to a lower operating speed range.

Shifting from one speed range to another can be made at any time during the working cycle. Momentarily let up on accelerator when shifting into HI speed range, and accelerate slightly when shifting into LO speed range.

Range Shift Lever is located on front floorboard. See Figure 9. This lever provides two positions, WORKING RANGE and TRAVEL RANGE to control high and low range of the transmission. Pushing lever to DOWN position engages WORKING RANGE (transmission low range). Pulling lever to UP position engages TRAVEL RANGE (transmission high range).

In the WORKING RANGE position, this lever actuates a lockout control valve to automatically establish a NEUTRAL position in the transmission when the service brakes are applied. When in TRAVEL RANGE, the lockout control valve is disengaged; a transmission NEUTRAL can be obtained only by shifting the directional and speed range levers at the steering column.

Range shift lever and speed range lever make available to the operator a choice of four speed ranges providing tractive power requirements for any operating condition. HI or LO speed can be selected in both WORKING RANGE and TRAVEL RANGE.

WORKING RANGE should always be used when loading and dumping bucket. TRAVEL RANGE should always be used when driving machine from job site to job site; or from one portion of the job to another without a load.

Shifting from WORKING RANGE to TRAVEL RANGE or vice versa should be performed when machine is stationary, and with speed range and directional levers in NEUTRAL.

Boom Control Lever is the outer lever on right hand side of operator. This lever has four positions: RAISE, HOLD, DOWN PRESSURE and FLOAT to control boom operation. Each position can be distinctly felt by the operator as lever is moved.

To raise boom and bucket, pull boom lever backward to last detent position. Boom and bucket will raise in direct proportion to engine speed.

Push lever forward, one notch ahead of RAISE position, to HOLD (neutral) position. Placing boom lever in this position will stop and hold bucket at any height desired.

To lower boom and bucket, push lever forward one notch ahead of HOLD position, to DOWN PRESSURE position. Placing boom lever in this position will lower boom and bucket and provide penetration to dig below grade level.

Pushing lever all the way forward into detent located FLOAT position permits hydraulic oil to pass from the bottom of boom cylinders, through the control valve and into the top of the cylinders, keeping them free of air, and allowing the bucket to move freely following variations in grade level for back-dragging.

Always place boom control lever in HOLD (neutral) position before starting or shutting down engine. This lever will lower boom and bucket even though the engine has been shut down.

Bucket Control Lever is inner lever on right hand side of operator. This lever has three positions: HOLD, CLOSE and DUMP to control bucket operation.

To DUMP bucket, push lever forward. Release lever and it will return to HOLD (neutral) position, allowing bucket to remain in DUMP position.

To CLOSE bucket, pull lever backward into a detent position. Release lever and it will return to HOLD position, allowing bucket to remain in closed position.

Bucket may be stopped and held in any position of its dumping arc by releasing lever for return to HOLD (neutral) position.

Engine Fuel Shut-Off Control – G.M. Diesel is forward T-handle located at right side of operator. This control is used for normal engine shut down. After turning ignition switch off, pulling T-handle will manually position the injector racks in the no fuel position to shut down the engine.

Engine Emergency (Air) Shut-Off Control – G.M. Diesel is rear T-handle located at right side of operator. This control should be used only in an emergency or if normal shut down procedure fails to shut down the engine. Pulling T-handle will immediately cut off engine air supply at the air intake housing thus stopping the engine.

Note: *Replace engine emergency (air) shut-off control in its original position and manually reset the latch assembly after each use at the air intake housing before attempting to restart the engine.*

Parking Brake Lever applies brake on forward drive line. To set brake pull up and back on lever. To release brake push lever forward and down.

Accelerator Pedal increases fuel supply to engine thus increasing its rpm.

Brake Pedal design permits brake application with either left or right foot of operator. Pedal actuates an air valve for applying brakes at all wheels. As pedal pressure increases, air valve opens wider, and brake application becomes more severe.

Brake pedal also operates a de-clutch valve and shut-off valve in the transmission control cover which blocks off hydraulic oil pressure to the forward clutch in all speed ranges, this disengaging the transmission and establishing a transmission neutral when the service brakes are applied. The reverse clutch is not affected.

This feature prevents the machine from creeping forward when loading or dumping the bucket; yet permits backing away if operating on a sloping grade. It also increases boom and bucket hydraulic system working power by blocking the power to the wheels.

NOTES

OPERATING INSTRUCTIONS

After the machine has been properly checked, and the operator has familiarized himself with location and function of the various controls, the machine should be operated according to instructions in the following paragraphs.

SAFETY PRECAUTIONS

A careful and efficient operator of heavy equipment must be guided by simple and fundamental rules of safety. He must take the necessary precautions to insure the safety of others as well as himself, and must avoid careless operating habits which cause damaging accidents to machinery and equipment.

The use of this machine is subject to certain hazards that cannot be met by mechanical means, but only by the exercise of intelligence, care, and common sense.

Warning: *Use safety links when servicing machine. Do not stand or work in step area(s) when machine is running – There is no room in this area for a man when machine is turned.*

The following are a few of the primary sources of injury to operators and other workmen.

1. Repairing and servicing equipment in dangerous positions.
2. Striking other persons or vehicles with the machine.
3. Unexpected violent tipping of the equipment.
4. Unexpected violent shocks or jars to the machine.
5. Uncontrolled traffic involving other vehicles.
6. Hazards from limbs of trees or overhead obstructions.
7. Leaving earth-moving or other equipment in dangerous positions, unattended.

In order to help prevent accidents the following safety rules should be observed at all times.

Do Not Leave Machine Unattended: Do not leave machine unattended with engine running. Always place directional and speed range shift levers in neutral, lower bucket, set parking brake, and shut down engine before leaving operator's seat.

Never Leave Machine with Bucket in Air: Never leave machine without first lowering bucket so that it rests on the ground. Make sure all control levers are in neutral position and engine shut down.

Watch Bucket and Direction at All Times: Keep your eye on the load and always face or look in direction machine is traveling.

Avoid Greasy Hands and Floors: Keep hands, floors, and controls free from water, grease, and mud to insure non-slip control.

Never Get On or Off a Machine in Motion: Never get off or on a machine that is in motion. Positively in no case should anyone ride in the bucket, or on the outside of the machine.

Stop Machine to Lubricate or Adjust: Stop all operation and shut down engine when cleaning, adjusting, or lubricating the machine. Tie red WARNING tag on steering wheel and turn off ignition switch.

Never Lift Bucket Over Ground Crew: Watch for ground crew and other workers on foot while machine is in motion. Never swing bucket over a truck cab. Sound horn as a warning when approaching ground crew, and before setting machine into motion.

Keep Brakes Properly Adjusted: At first signs of brake slippage, stop machine and adjust them promptly.

Never Transport Load with Bucket Fully Raised: The nearer the ground that the bucket is held, the better the stability, especially on slopes or when turning machine. Approximately 15 inches from the ground is best.

Bucket Position for Travel: Raise bucket approximately 15 inches off the ground and tip back to afford maximum visibility.

Always Set Brake to Hold Machine When

Parked: Set parking brake lever when parking machine. If on a grade, block wheels.

Maintain Proper Tire Inflation: Check tire inflation pressure daily to provide best operation and longest tire life. Particular attention must be emphasized when checking hydro-inflated tires as there is less volume of air to provide cusioning.

Select Proper Speed Range: Operate machine at speeds consistent with conditions on the particular job. Extra caution should be used if wet or icy conditions exist.

Maintain Shovel Balance: Keep bucket close to the ground for balance when tractor shovel is traveling up a steep grade.

Do Not Use Bucket as a Brake: When going down a steep slope, do not use bucket as a brake.

Check Before Moving Shovel: Walk around machine to make certain that no one is in "danger area" before entering operator's compartment. Sound horn before moving machine.

Do Not Operate Machine Without Instruments: Each gauge on the instrument panel serves as an important check point for operating conditions of the machine. Do not operate machine if gauges are not functioning properly.

Be Courteous: Always give loaded equipment the right of way.

Portions of above safety precautions taken from Data Sheet D-256 by permission of National Safety Council.

STARTING PROCEDURE

PRE-STARTING CHECKS

Before starting engine at beginning of the work shift, or at any time machine has been shut down for adjustment or time-off period, perform the following checks.

1. Engine oil level
2. Engine air cleaner
3. Hydraulic system oil level
4. Cooling system
5. Fuel supply
6. Transmission fluid level (maintain level between check plugs)
7. Tire pressures

Service units at this time if inspection indicates the necessity.

Caution: *Disconnect safety links before moving machine.*

NORMAL STARTING

Caution: *Walk around machine. Make certain that no one is in "danger area" before entering operator's compartment.*

Cummins Diesel (Above 50°F.)

1. Set directional shift quadrant lever in NEUTRAL.
2. Turn ignition switch ON; and press starter switch firmly. Very lightly depress accelerator to feed additional fuel. Operate cranking motor no more than 30 seconds at a time to avoid overheating motor.

   Caution: *If engine fails to start within the first 30 seconds, wait two to five minutes before re-cranking.*

   If engine fails to start after four periods of cranking, refer to Operation and Maintenance Manual of engine manufacturer.
3. After engine starts, check oil pressure gauge. If no pressure is indicated within 15 seconds, shut off engine and determine cause.
4. Allow engine to reach operating temperature before driving machine.

G.M. Diesel (Above 40°F.)

1. Set shift quadrant levers (directional and speed range) in NEUTRAL.
2. Depress and release accelerator to reset governor throttle control lever in IDLE position.
3. Turn ignition switch ON; press starter switch firmly, and very lightly depress accelerator to feed additional fuel. Operate cranking motor no more than 30 seconds at a time to avoid overheating motor.

   Caution: *If engine fails to start, wait until cranking motor stops rotating before repressing starter switch. Serious damage to the*

cranking motor may result if this precaution is not complied with.

If the engine fails to start after four periods of cranking, refer to Operation and Maintenance Manual of engine manufacturer.

4. After engine starts, check oil pressure gauge. If no pressure is indicated within 15 seconds, shut off engine and determine cause.

5. Allow engine to reach operating temperature before driving machine.

COLD WEATHER STARTING

MICHIGAN machines do not require extensive preparation for cold weather operation beyond addition of a permanent type anti-freeze to the cooling system, and a change of engine oil to a viscosity suitable for anticipated temperatures in which the machine is to operate. At temperatures below 0° F. a change of oil in the boom and bucket system to Type "A", Suffix A, Automatic Transmission Fluid will aid starting by reduction of resistance in the boom and bucket pump. Probably the most important item to insure prompt starting is proper maintenance of the electrical system, especially the batteries.

Batteries must be kept fully charged at all times, since in cold weather the capacity of a battery to deliver full power is greatly reduced. A fully charged battery at 15° F. is capable of delivering only 70% of its rated amperage, and at lower temperatures becomes even more inefficient. Service batteries weekly as follows:

1. Add distilled water to cover plates and separators but do not overfill. Overfilling causes dilution of the electrolyte, and sputtering during the charging cycle. This may result in battery freezing and corroded terminals.

2. Keep terminals clean and tight. Dirty or loose connections offer high resistance.

3. Keep vent plugs in place, and tight, to prevent entrance of foreign material into cells.

4. Check specific gravity regularly with a hydrometer, and recharge or replace batteries that continually show low reading.

Service other electrical components as follows:

1. Visually check all wiring for worn or cracked insulation and loose terminal connections.

2. Clean and tighten external ground straps, and replace if badly frayed or corroded.

To avoid unnecessary cranking because of air locks in cold fuel oil, change fuel filters only when engine is hot; then start and run engine after filter change, and check that there is no fuel restriction nor leakage.

When not in use, machine should be parked or stored in a closed garage or building during cold weather to reduce cranking effort when starting a cold engine. It is particularly important in starting the engine, that it is not accelerated to governed speed, or a load applied until the oil has become warm enough to circulate to all bearing surfaces.

Cold starting procedure for Cummins Diesel engines is as follows, after first placing all control levers in their NEUTRAL position.

If difficulty is experienced in starting engine, please refer to Operator's Manual of engine manufacturer for further trouble shooting procedures.

Cummins Diesel (When Colder Than 50° F.)

(a) **Use of Ether without Metering Equipment**

Cummins Diesels are not equipped with cold weather starting aids. However, two men can use the following method as a cold weather starting aid.

Caution: *Ether is highly flammable. Do not use with preheater or near open flame. Do not breathe ether fumes.*

1. Pour three tablespoonfuls of ether on a cloth; hold cloth close to air cleaner intake while second man cranks the engine.

2. As an alternate method, spray ether into air cleaner intake while second man cranks the engine.

3. Ether fumes will be drawn into the intake air manifold and the cold engine should start without difficulty.

Caution: *Do not use excessive amounts of ether. Excessive amount of ether will cause excessively high pressure and detonation.*

(b) Use of Preheater Arrangement (Optional Equipment)

An intake air preheater arrangement can be obtained as optional equipment to aid in cold weather starting. This equipment consists of a single glow plug mounted in the intake manifold, and a hand priming pump to force atomized fuel into the manifold. Depressing glow plug switch heats glow plug, igniting the fuel in the manifold and heating the intake air entering the combustion chamber.

Since primary ignition takes place within the manifold, serious damage may result if starting fluid (pressurized can type) is used with glow plug hot. Do not use starting fluid in any form.

1. Set throttle in idle position. *Do not accelerate during the starting procedure.*
2. Turn ignition switch ON, and press glow plug switch. When indicator light has been on 20 seconds, engage starter switch.
3. As engine rotates, operate preheater priming pump to maintain 80 to 100 psi fuel pressure.

   Use of primer before 20 second interval will wet glow plug and prevent heating. *Do not use starting fluid in any form.*
4. If engine does not start within 30 seconds, stop cranking and repeat steps 2 and 3. This will aid in battery conservation, and provide maximum cranking time. If no start is obtained after two trials, check intake manifold for heat.
5. After engine starts, release starter switch, but hold glow plug switch. Pump primer slowly to keep engine idling smoothly. In cold weather this may require 4 to 5 minutes or longer. *Do not accelerate engine.*
6. When engine does not falter between primer strokes, stop pumping, close primer and lock; then release glow plug switch.
7. Allow engine to reach operating temperature before driving machine.

G.M. Diesel (When Colder Than 40°F.)

G.M. Diesels are not equipped with cold weather starting aids. However, starting fluid (pressurized can type) sprayed into air cleaner intake is recommended as engine is being started.

Ether starting fluid is available in 16 ounce pressurized can from your authorized MICHIGAN Distributor under part number 945152.

A fluid starting aid (capsule form) can be installed by any authorized G.M. Diesel Distributor.

1. Set all control levers in NEUTRAL position and turn ignition switch ON.
2. Depress accelerator to full throttle position.
3. Press starter switch firmly and simultaneously use starting fluid directed into air cleaner intake.

   Do not operate cranking motor for more than 30 seconds at a time to avoid overheating motor.

   Caution: *If engine fails to start, do not repress starter until cranking motor stops rotating. Serious damage to cranking motor may result if above procedure is not complied with.*
4. After engine starts, check oil pressure gauge. If no pressure is indicated within 15 seconds, shut off engine and determine cause.
5. Allow engine to warm up for a few minutes before driving or operating machine.

WARM-UP CHECKS

Hold engine at idle speed for approximately two minutes after starting; then while engine continues to warm up for the next few minutes perform the following checks:

1. Engine oil pressure gauge
2. Ammeter
3. Air pressure gauge
4. Engine temperature gauge
5. Torque converter temperature gauge
6. Horn
7. Lights
8. Hydraulic system – boom and bucket control levers.

Visually check for leaks at drain and fill plugs in axle assemblies, torque converter and transmission, and at hose couplings and fittings in hydraulic, fuel, air intake, brake and cooling systems.

Correct all leaking conditions, and repair or replace gauges that are not functioning before continuing the operation of the machine.

PARKING AREA CHECKS

As a final check before leaving the parking area, set machine into motion and test the following:

1. Steering gear
2. Service brakes
3. Parking brake

Remember, the safety of the operator and other workmen, and the efficient operation of the machine depend upon the performance of all items in the check lists above. Service units at this time if inspection indicates the necessity.

SHUTTING DOWN ENGINE

It is important to idle an engine 3 to 5 minutes before shutting it down. This will allow lubricating oil and water to carry heat away from combustion chambers, cylinder head, bearings, and shafts.

Residual heat can damage many parts, ranging from valves to fuel pumps. The latter suffer from gums and deposits remaining after evaporation of the lighter ends. In addition, the physical stresses from expansion and contraction can cause distortion, permanent warping, and gasket failures. In some cases, oil seals and cylinder sleeve seals suffer badly, although the results may not appear until much later.

IT IS GOOD PRACTICE TO IDLE ANY ENGINE LONG ENOUGH TO REDUCE EXTREME TEMPERATURES.

To shut down a Cummins Diesel, turn ignition switch OFF.

G.M. Diesel

To shut down a G.M. Diesel, turn ignition switch OFF; then pull engine fuel shut-off control (forward T-handle) up and hold until engine stops rotating. After engine stops running, replace T-handle in its original position.

If after pulling the forward T-handle engine continues to operate, the engine emergency air shut-off control (rear T-handle) must be pulled to the up position. This control handle will trip the latch assembly securing air shut-off valve in air intake housing, thus starving off air to the engine and preventing further combustion of fuel to shut down engine. Replace emergency control handle in its original position and manually reset latch assembly before restarting engine.

OPERATING TRACTOR SHOVEL

The steps below give proper procedure for setting machine into motion. Refer to Operating Controls Diagram, Figure 10.

1. Raise boom and bucket approximately 15 inches above ground by pulling backward on boom control lever.
2. Place directional shift lever in position for direction of travel desired. When shifting from forward into reverse, or vice versa, always decrease engine rpm, and stop machine momentarily while making the shift.
3. Select high or low speed range for operating machine. Speed range and directional shift levers are so positioned that it is convenient to load in low range forward, and back away from pile in high range reverse by gripping both levers at the same time.

   High range should be used when traveling machine for comparatively long distances without a load.

   A shift from low range to high range can be made when machine is in motion, by momentarily letting up on accelerator, making the shift, and again depressing accelerator.

   When making a downshift, accelerate engine to synchronize engine and drive shaft speeds when transmission clutch re-engages.
4. Select by use of range shift lever the speed range desired – working range for all normal work operations; travel range for moving relatively long distances without load.

   The range shift lever should be shifted only when machine is stationary, and with speed range and directional levers in neutral.

   There are available to the operator a selection of four speeds in both forward and reverse directions. This is accomplished by use of range shift lever and speed range lever. In

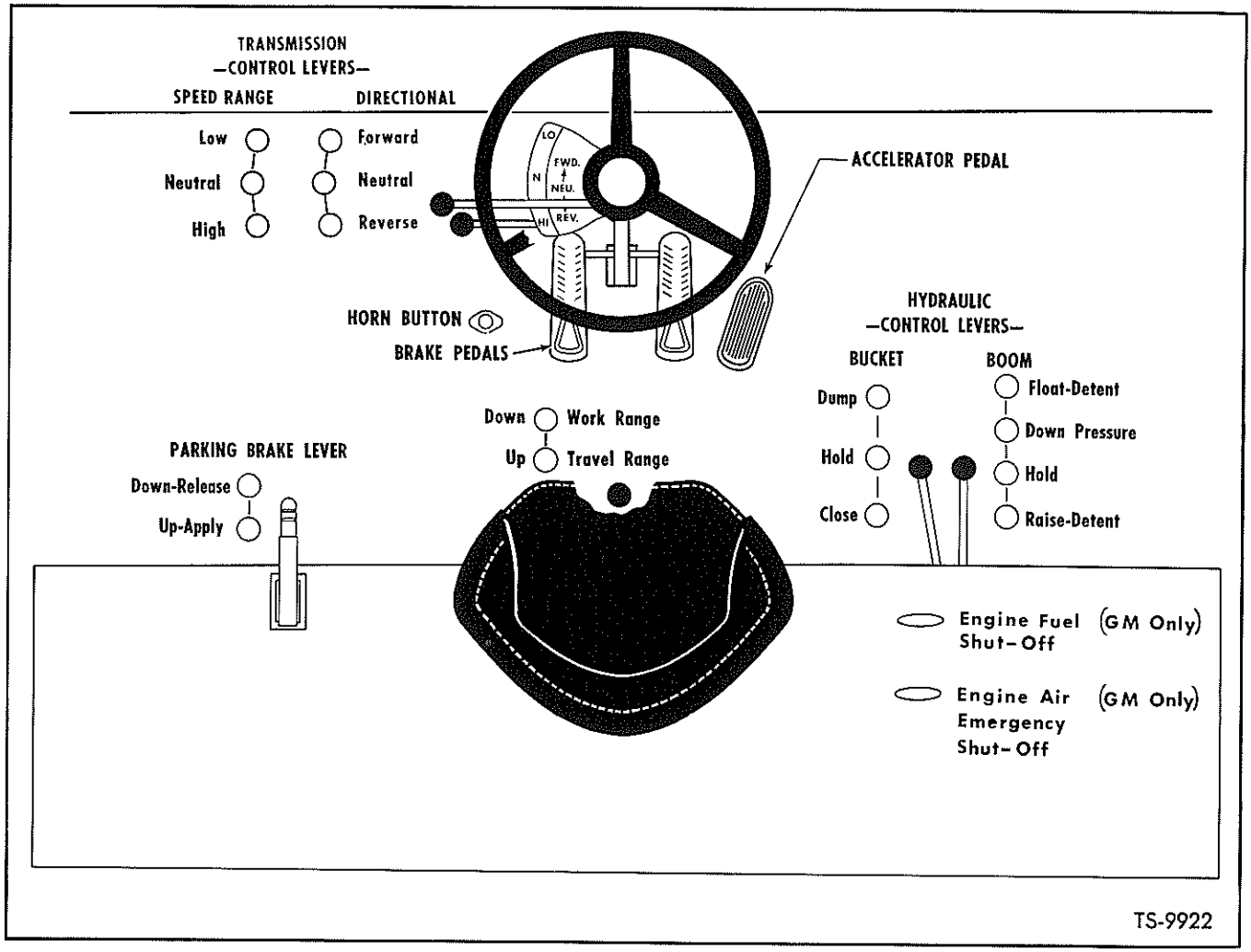


Fig. 10. Operating Controls Diagram

other words a choice of low or high speed is possible in both working range and in travel range.

5. Release parking brake.

6. Gradually apply pressure on accelerator pedal until desired travel speed is reached.

LOADING THE BUCKET

Place speed range lever in low, directional lever in forward, and range shift lever in working range. With bucket control lever, adjust bucket until indicator on right hand bucket cylinder indicates it is in level position.

When loading from a stockpile, drive into pile with cutting edge parallel to the ground, and push cutting edge into pile until bucket is nearly full. Then pull boom control lever back to raise bucket. As bucket raises, pull bucket lever back to tip bucket back against stops. Continue to raise bucket with boom lever until it breaks out of pile. Back out of pile, keeping load low, and deliver load to desired dumping position.

When grading or excavating, bucket should also be adjusted so that indicator shows it is in level position. Place boom control lever in DOWN PRESSURE position to force bucket cutting edge down against the ground as machine moves forward.

If cutting edge does not penetrate the ground immediately, use bucket control lever to incline the angle of the cutting edge slightly to give better penetration. When cutting edge penetrates, use bucket control lever to adjust bucket to level position to prevent excessive penetration. The operator may manipulate boom and bucket control levers slightly to maintain a good grade as machine moves forward.

When maintaining a grade, machine should be driven in low gear at about half throttle to

make an accurate cut. When bucket is full, or the end of the cut is reached, pull backward on bucket control lever to tip bucket back against the stops, then raise boom so that bucket is approximately 15 inches off the ground for carrying to dumping position.

TRANSPORTING THE LOAD

When transporting the load, travel speed of machine will depend upon the length of haul, and the kind of surface over which the machine must pass. Rough terrain calls for a fairly slow speed. When bucket is full, it should be carried approximately 15 inches off the ground. Never transport load with bucket fully raised. The nearer the ground that bucket is held, the better the stability, especially on slopes or when turning machine.

DUMPING THE BUCKET

Approach truck, railroad car or hopper raising boom until bucket safely clears top edge of the unit. At proper clearance height, place boom control lever in HOLD (neutral) position. Move machine up to place bucket inside the dumping area, positioning Tractor Shovel perpendicular to side of unit to avoid spillage and to distribute material evenly. Apply service brakes which will automatically disengage transmission FORWARD clutch. This not only prevents machine from creeping forward when engine is accelerated, but also provides maximum hydraulic working pressure for bucket cylinders.

Push bucket control lever forward slowly to dump bucket. Control rate of material discharge with accelerator, and by manipulating control lever between DUMP and HOLD positions. Bucket can be maintained in full dump or partial dump position by releasing control lever at any time for spring return to HOLD position. Dumping load slowly will minimize shock loading of a truck body, or other transporting vehicle.

When bucket is empty, pull backward on bucket control lever into detent located CLOSE position, and back away from loaded unit. Place boom control lever in DOWN PRESSURE position while returning for another load. Stop bucket at carrying height by placing boom control lever in HOLD position. The bucket control lever automatically returns to HOLD (neutral) position.

BACKFILLING AND SPREADING

The bucket is used for backfilling and spreading operations. Lower the bucket in an attitude parallel to the surface of the ground and proceed forward in one of the lower speed ranges allowing the bucket to fill. The material will form its own dozer blade. Best results are obtained when a shallow bite is used. Caution must be used in controlling the depth of the bite as too deep a bite will cause wheel-spin and an uneven working surface.

The above procedure may be used to spread material, strip, level, or backfill ditches and foundations.

TRAVELING WITHOUT A LOAD IN BUCKET

When driving machine from job to job, shift into high speed range. The bucket should be raised approximately 15 inches off the ground and tipped back to afford maximum visibility.

TOWING THE MACHINE

If at any time it is necessary to tow the machine any appreciable distance, observe the following precautions:

1. Set all control levers in NEUTRAL.
2. Remove the propeller shaft from the transmission to the rear axle assembly, and one of the propeller shafts from between the transmission and front axle assembly.

   Important: *Note correct assembly of propeller shafts before removing them. Reassemble them in the same position. The tubular end is always the driving end. Do not separate the two ends of the assembly due to wear pattern and balancing characteristics. Wire the spider and bearing assemblies to the prop shaft flanges and wrap the assemblies in lint free cloths.*

When the machine is being towed, the torque converter charging pump is not operating. There is danger of bearing or gear damage in the torque converter and transmission if propeller shafts are not removed.

When replacing propeller shaft assemblies use only the special heat treated nuts and bolts provided. Tighten attaching bolts to the torque specified in Bolt Torque Chart, at rear of this manual.

LUBRICATION AND MAINTENANCE

This section of the manual is divided into two major categories — LUBRICATION and MAINTENANCE.

The LUBRICATION portion contains the Chassis Lube Chart, the Drive Line Lube Chart, and the recommended intervals at which the machine should be serviced such as Daily or Shift, Weekly or 50 Operating Hours, up through a 1000 Operating Hour schedule.

Lubrication is maintenance, but the items described in the Lubrication portion are only those that pertain to the actual greasing or oiling of the machine, including the level checks and the drain and refill procedures.

The MAINTENANCE portion contains recommended mechanical checks and adjustments over and above those listed in the Lubrication portion.

The maintenance schedule is based on hours of normal operation recorded on the hour meter. A more practical schedule should be developed for each job application. Make changes in the basic schedule as required based on the type of work the machine is doing, the rate at which it is worked, and how it is being worked.

LUBRICATION

The importance of proper lubrication cannot be overemphasized. It is the most essential single factor in a well planned preventive maintenance program. Refer to lubrication diagrams to locate the various points to be serviced, and recommended lubricant. Before servicing machine, always wipe dirt and foreign material from grease fittings, clips, plugs, or covers to prevent dirt, grit or foreign material from entering.

When checking various lubricant levels, machine must be level and areas around all fill, level and plug openings cleaned. Systems requiring draining at specific intervals should always be drained after working machine when fluid is at operating temperature. Hot oil flows more freely and carries more foreign material with it.

SERVICE DAILY

(Every 8 Operating Hours)

Grease Fittings: Lubricate all points indicated on Chassis Lubrication chart for 8 hour intervals. Use grade of lubricant specified on lubrication charts according to ambient temperature.

Engine and Accessories: Refer to Operation and Maintenance Manual of engine manufacturer for lubrication instructions of engine and accessories.

Fuel Tank: Fill fuel tank with clean fuel handled in clean containers. Use a good brand procured from a reliable company.

Diesel Engine: For most operating conditions, a No. 2 Diesel Fuel Oil Cetane 40 minimum is recommended. For unusual operating conditions with regard to load, speed, idling time or ambient air temperature, refer to fuel oil specifications recommended by engine manufacturer.

Radiator: Check daily and refill as required with clean, soft water. See "Every 1000 Operating Hours" for Drain and Refill.

Torque Converter and Transmission: Check fluid level at dipstick located on left side of operator's seat daily as follows:

1. Machine must be level.
2. Fluid must be hot (Normal operating temperature).
3. Engine must be IDLING.
4. Area around dipstick must be clean.
5. Maintain fluid level between add and full mark on dipstick.

Refill as necessary adding fluid through the torque converter fill plug.

See Drive Line Lube Chart for proper fluid according to ambient temperature.

Hydraulic Reservoir: Check oil level daily observing the following conditions:

MICHIGAN

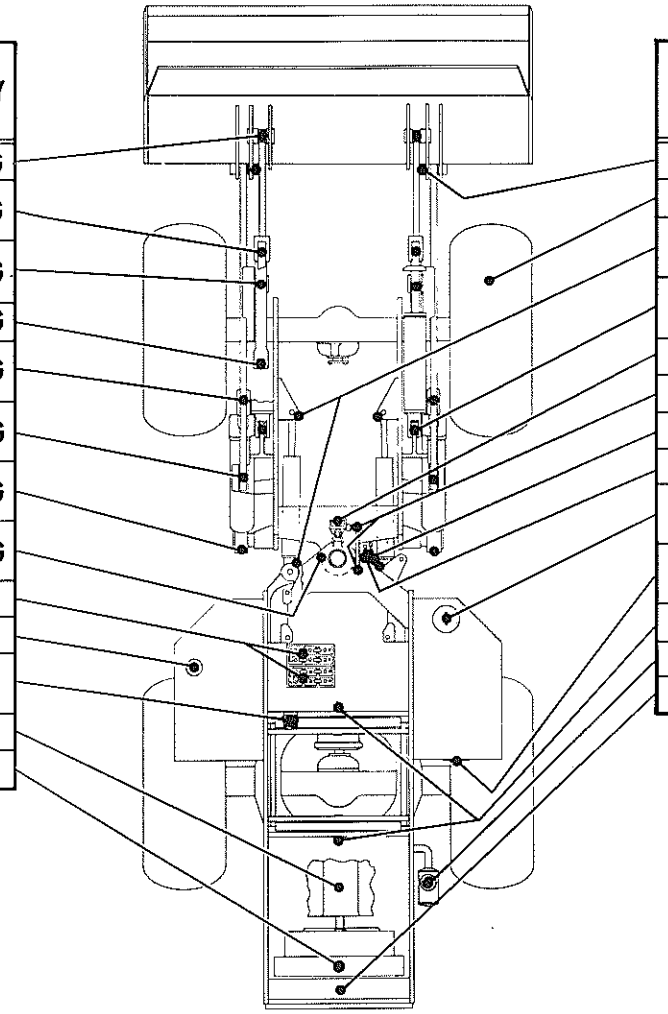
CHASSIS LUBRICATION

DESCRIPTION	HOURS 1000	250	100	50	8	KEY
1 Fitting Each Side PUSH ROD TO BUCKET					X	LBG
BUCKET CYLINDER TO BELL CRANK 1 Fitting Each Side					X	LBG
BELL CRANK TO BELL CRANK PIVOT CASTING 1 Fitting Each Side					X	LBG
1 Fitting Each Side PUSH ROD TO BELL CRANK					X	LBG
BOOM CYLINDER TO BOOM 1 Fitting Each Side					X	LBG
BOOM TO UPPER PIVOT SHAFT 1 Fitting Each Side					X	LBG
BOOM CYLINDER TO LOWER PIVOT SHAFT 1 Fitting Each Side					X	LBG
PIVOT HINGE PINS 1 Fitting Each Pin — Top & Bottom					X	LBG
(See Text) BATTERIES				X		
(See Text) *(CAP. 75 GAL.) FUEL TANK	X			X	X	
TRANSMISSION & TORQUE CONVERTER SYSTEM FILTER (See Text)		X				
(See Text) ENGINE & ACCESSORIES					X	
(See Text) *(CAP. 10 GAL. RADIATOR					X	

KEY		
LBG	LITHIUM BASE MULTI-PURPOSE GREASE	0°F. & Above Grade 2; Below 0°F. Grade 0
GL	STRAIGHT MINERAL OIL GEAR LUBE — API CLASS GL1	
WB	WHEEL BEARING GREASE — EP GRADE 1 (Lithium Soap or Lithium Lead Type — 40 lbs. Min. Lever Load, Timken Test)	
HF	AMBIENT TEMP RANGE	LUBRICANT TO BE USED
	ABOVE 0°F 1)	SAE 10 W Engine Oil, API Class §MS, DM, or MIL-L-2104 B.
	2)	Automatic Transmission Fluids: Type A, Suffix A, or DEXRON.
	3)	Hydraulic Transmission Fluid: Type C — See Note Below.
	0°F & BELOW	Automatic Transmission Fluids: Type A, Suffix A, or DEXRON.

§ — Sequence Tested.

NOTE: C-2 Fluids must contain type and content of anti-wear compound found in API MS engine oils and meet viscosity requirements of MS engine oils — GRADE 10 W.



KEY	HOURS 8	50	100	250	1000	DESCRIPTION	
LBG	X					BOOM TO BUCKET	1 Fitting Each Side
	X					TIRES — FRONT & REAR	(See Text)
LBG	X					STEERING CYLINDERS 2 Fittings Each Cylinder	
LBG	X					BUCKET CYLINDER TO FRAME 1 Fitting Each Side	
GL		X				STEERING GEAR	(See Text)
LBG	X					STEERING DRAG LINK	2 Fittings
LBG	X					BOOM CONTROL LEVER	1 Fitting
LBG	X					BUCKET CONTROL LEVER	1 Fitting
HF	X				X	HYDRAULIC SYSTEM RESERVOIR *(CAP. 60 GAL.)	(See Text)
				X		HYDRAULIC SYSTEM RETURN FILTER	(See Text)
LBG	X					AXLE CRADLE BUSHINGS	2 Fittings
	X	X			X	AIR CLEANER	(See Text)
	X					AIR RESERVOIR	(See Text)

*NOTE: Capacities listed are approximate U.S. measures. Refer to specifications and service data for Metric and Imperial measures.

MODEL - 75IIIA TRACTOR SHOVEL

TS-9923

CLARK EQUIPMENT

CONSTRUCTION MACHINERY DIVISION

MICHIGAN

OM 2592

MICHIGAN
DRIVE LINE LUBRICATION

KEY		
LBG	LITHIUM BASE MULTI-PURPOSE GREASE	0°F. & Above Grade 2; Below 0°F. Grade 0
EPGL-1	EXTREME PRESSURE GEAR LUBE — SCL TYPE	
HF	AMBIENT TEMP. RANGE	LUBRICANT TO BE USED
	ABOVE 0°F 1)	SAE 10 W Engine Oil, API Class §MS, DM, or MIL-L-2104 B.
	2)	Automatic Transmission Fluids: Type A, Suffix A, or DEXRON.
	3)	Hydraulic Transmission Fluid: Type C — See Note Below.
	0°F & BELOW	Automatic Transmission Fluids: Type A, Suffix A, or DEXRON.

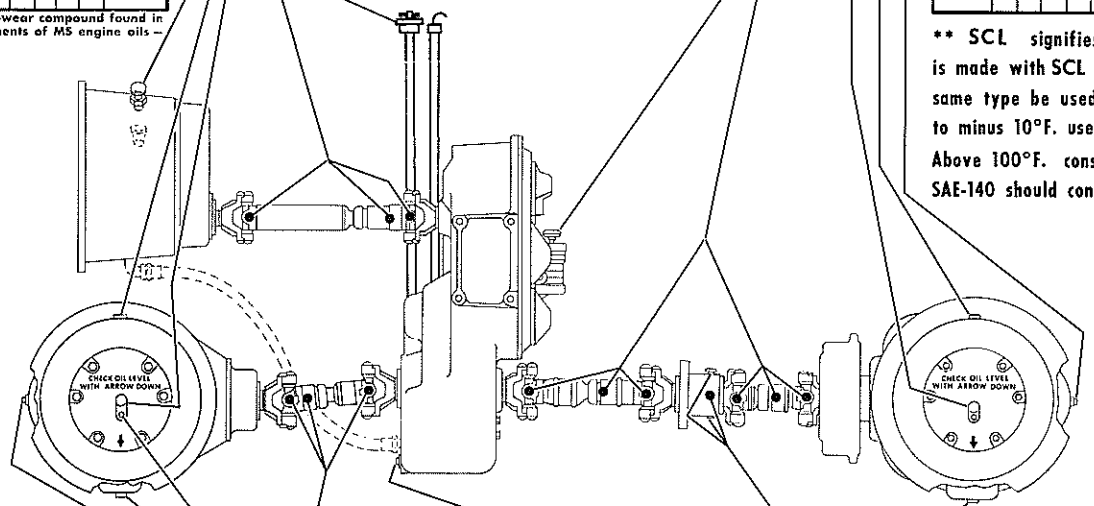
§ — Sequence Tested.

DESCRIPTION	HOURS 1000	500	100	50	8	KEY
TRANSMISSION & TORQUE CONVERTER FILL (See Text)		X			X	HF
PROP SHAFT 3 Fittings (See Text)			X			LBG
AXLE BREATHER (See Text)		X				
PLANETARY DRAIN PLUG (See Text)	X					
TORQUE CONVERTER BREATHER (See Text)				X		

NOTE: C-2 Fluids must contain type and content of anti-wear compound found in API MS engine oils and meet viscosity requirements of MS engine oils — GRADE 10 W.

KEY	HOURS 8	50	100	500	1000	DESCRIPTION
		X		X		TRANSMISSION BREATHER (See Text)
LBG			X			PROP SHAFTS 3 Fittings Ea. (See Text)
EPGL-1		X			X	PLANETARY FILL & LEVEL PLUG (See Text) *(CAP. 5 Qts. EA.)
					X	PLANETARY DRAIN PLUG (See Text)
EPGL-1		X			X	DIFFERENTIAL FILL & LEVEL PLUG (See Text) *(CAP. 3 Gal.)

** SCL signifies sulfo-chloro-lead type. Factory fill is made with SCL type lube and it is recommended that same type be used when adding or refilling. Below 0°F. to minus 10°F. use SAE-80. Up to 100°F. use SAE-90. Above 100°F. consistently, use SAE-140. SAE-80 and SAE-140 should contain additives similar to SAE-90.



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DIFFERENTIAL FILL & LEVEL PLUG *(CAP. 3 Gal.) (See Text)	X			X		EPGL-1
DIFFERENTIAL DRAIN PLUG (See Text)	X					
PLANETARY FILL & LEVEL PLUG *(CAP. 5 Qts. EA.) (See Text)	X			X		EPGL-1
PROP SHAFT 3 Fittings (See Text)			X			LBG

					X	DIFFERENTIAL DRAIN PLUG (See Text)
HF		X			X	MIDMOUNT BEARING (See Text) * (Cap. 2 Qts.)
				X		TRANSMISSION & TORQUE CONVERTER DRAIN PLUG (See Text)

MODEL 75 III A
TRACTOR SHOVEL

*NOTE: Capacities listed are approximate U.S. measures. Refer to specifications and service data for Metric and Imperial measures.

1. Machine must be LEVEL.
2. Bucket must be on GROUND.
3. Engine must be SHUT DOWN.
4. Area around reservoir cap must be CLEAN.

Loosen reservoir cap at right side of machine slowly to relieve pressure in reservoir tank; then remove cap. Remove reservoir dipstick located inside reservoir and wipe with clean, lint-free cloth. Reinsert to check oil level. Maintain oil level to FULL mark on dipstick.

Refill as necessary adding only premium quality hydraulic oil. Refer to lubrication charts for recommended hydraulic fluid.

See "Every 250 Operating Hours" for Filter Change.

SERVICE WEEKLY

(Every 50 Operating Hours)

Grease Fittings: Lubricate all points indicated on Chassis Lubrication chart for 50 hour intervals. Use grade of lubricant specified on lubrication charts according to ambient temperature.

Engine and Accessories: Refer to Operation and Maintenance Manual of engine manufacturer for lubrication instructions of engine and accessories.

Brake Master Cylinder: Master cylinder is located at left side of steering gear assembly. Check and maintain fluid level to within ¼ inch from top of reservoir each 50 operating hours.

Battery: Keep terminals clean and tight, and be sure that distilled water is added to cover plates and separators in each cell. Do not overfill.

Front Axle Differential: Check lubricant level each 50 operating hours at the differential level plug. Add lubricant until level with plug opening. See "Every 1000 Operating Hours" for Drain and Refill.

Front Axle Planetary Hubs: Check lubricant level each 50 operating hours at level plug located slightly off center of thrust cap. Fill plug is located on external diameter of hub and drum assembly. Rotate wheel until fill plug is at top center; this will position level plug slightly below center of wheel.

Remove fill plug and add lubricant until level with opening in thrust cap. See "Every 1000 Operating Hours" for Drain and Refill.

Rear Steer Axle Differential: Check lubricant level each 50 operating hours at the differential level plug. Add lubricant until level with plug opening. See "Every 1000 Operating Hours" for Drain and Refill.

Rear Steer Axle Planetary Hubs: Check lubricant level each 50 operating hours at level plug located slightly off center of thrust cap. Fill plug is located on external diameter of hub and drum assembly. Rotate wheel until fill plug is at top center; this will position level plug slightly below center of wheel. The breather in the thrust cap will be on top.

Remove fill plug and add lubricant until level with opening in thrust cap. See "Every 1000 Operating Hours" for Drain and Refill.

Steering Gear: Check oil level each 50 operating hours. Keep reservoir filled. When adding lubricant, use of hand pump or gun is recommended to force lubricant into housing and up through bearing, since weight of lubricant alone in filler extension is insufficient to raise level above bearing.

Midmount Bearing: Check every 50 operating hours in the following manner. With machine on a level surface, remove check plug located in side of Midmount Bearing. Fluid level should reach bottom of check plug hole. If fluid level is low, remove breather-fill cap located on top of Midmount Bearing and add fluid until level reaches bottom of check plug hole. Replace breather cap and check plug.

See Drive Line Lube Chart for proper fluid.

(Every 100 Operating Hours)

Propeller Shafts: There are four propeller shafts – one from torque converter to transmission, one from transmission to rear drive axle, one from transmission to midmount bearing assembly, and one from midmount bearing assembly to front drive axle. Each shaft has 3 points of lubrication – one on each spider and bearing assembly, and one on each slip yoke assembly. Total 12 points. Use a hand gun and apply Lithium Soap Multi-Purpose Grease (LBG) until grease is visible at all 4 bearing caps on each spider and bearing assembly. Use grade of lubricant specified below according to ambient temperature.

Temperature Range	Grease Consistency
0°F and Above	Heavy Oil Base – Grade 2
Below 0°F	Light Oil Base – Grade 0

(Every 250 Operating Hours)

Engine and Accessories: Refer to Operation and Maintenance Manual of engine manufacturer for lubrication instructions of engine and accessories.

Torque Converter and Transmission Filter: The torque converter and transmission hydraulic system is protected by a full flow replaceable element type filter assembly. Filter is mounted on bracket located on inner left hand side of hood, behind operator's compartment.

All fluid leaving the converter pump first passes through the filters providing clean fluid to the torque converter and transmission.

Replace filter element every 250 operating hours and whenever converter pump, transmission or torque converter is repaired or overhauled for any reason. Thoroughly clean filter case and base casting before inserting new element. Using new gasket in base casting, tighten center bolt to specified torque. See Bolt Torque Chart.

Run engine 5 minutes at approximately 1500 rpm checking filter assembly, hoses and connections for leaks. Recheck transmission fluid level when it is at operating temperature (180° F. to 200° F.) as described under "Service Daily."

Note: *Filter element is especially designed to withstand pressure and flow rate requirements. Use only replacement filter element called for in applicable parts manual. Use of "will-fit" or substitute element will endanger proper operation of transmission and torque converter and cause costly repairs and down time.*

(Every 500 Operating Hours)

Grease Fittings: Lubricate all points indicated on Chassis and Drive Line Lubrication charts for 500 hour intervals. Use grade of lubricant specified on lubrication charts according to ambient temperature.

Engine and Accessories: Refer to Operation and Maintenance Manual of engine manufacturer for lubrication instructions of engine and accessories.

Torque Converter and Transmission: Drain and refill torque converter and transmission every 500 operating hours and whenever converter pump, transmission or torque converter is repaired or overhauled for any reason.

1. Always drain system while fluid is at operating temperature (180° F. to 200° F.) Hot oil flows more freely and carries more foreign material with it.
2. Remove drain plug from transmission housing and drain thoroughly.
3. Clean magnetic drain plugs and reinstall.
4. Replace element in transmission and torque converter filter assembly. Thoroughly clean filter case and base casting before inserting new element. Using new gasket in base casting, tighten center bolt to specified torque.
5. Remove breather caps and elements from rear of transmission and top of torque converter housing. Clean parts in solvent, blow dry with compressed air and reassemble.
6. Refill torque converter and transmission with fluid through filler extension in left side of torque converter. Refer to lubrication charts for correct fluid. Refer to Specifications and Service Data Section for system capacity.
7. Disconnect return oil cooler hose from cooler line (located forward of radiator on right-hand side of machine) and direct open end into waste drum or on the ground. Securely block wheels of machine and apply parking brake. With range shift lever in TRAVEL RANGE, position speed range selector lever in HI speed range and directional shift lever in NEUTRAL.
8. Start engine, place directional shift lever in FORWARD and maintain idle speed to force trapped oil in torque converter and oil cooler out through open end of return oil cooler hose. Drain sufficient fluid to insure clean fluid flow; then shut down engine and reconnect return oil cooler hose.
9. Restart and run engine for 5 minutes at approximately 1500 rpm checking filter assembly, drain plugs, hoses and connections for leaks. Recheck transmission fluid level when it is at operating temperature (180°F. to 200° F.).
10. Add transmission fluid as necessary to main-

tain level between the check plugs on front of transmission housing.
This check is to be performed with engine idling.

NEVER UNDER ANY CIRCUMSTANCES USE ANY FLUSHING OIL OR COMPOUNDS FOR CLEANING THE SYSTEM.

(Every 1000 Operating Hours)

Radiator: Twice a year, drain, flush and refill cooling system. Add permanent type anti-freeze according to manufacturer's instructions when air temperature is 32° F. or lower, or when there is danger of water freezing in the system. Always use a hydrometer to check freezing point of solution when it is at operating temperature.

Check for evidence of foreign material plugging external core of radiator and blow out with compressed air.

Refer to Specifications and Service Data Section for system capacity.

Hydraulic Reservoir: Drain, clean, and refill hydraulic oil system every 1000 hours of operation, or oftener if required. When operating under severe dusty and dirty conditions, clean the system more often to prevent excessive wear or premature failure of valve, pump, or cylinder parts.

1. Always drain system after working machine, and while oil is at operating temperature. Hot oil flows more freely and carries more foreign material with it.
2. To thoroughly drain cylinders and hoses, raise boom and bucket to full height and actuate bucket to full dump position. **Securely block or chain boom and bucket in raised position.** Then shut down engine.
3. Loosen reservoir cap slowly to relieve pressure in hydraulic reservoir.
4. Remove drain plug in hand hole cover in bottom of reservoir and drain reservoir.
5. Disconnect boom and bucket cylinder hoses at lowest points to drain cylinders.
6. Remove hand hole cover from bottom of reservoir and clean all foreign material from bottom of tank. Remove magnet and clean thoroughly. Replace magnet; then reinstall hand hole cover and drain plug securely.
7. Reconnect all hoses and unions.
8. Refill reservoir to indicated FULL mark on dipstick. Reinsert dipstick and secure reservoir cap. Refer to lubrication charts for recommended fluids.

   Refer to Specifications and Service Data Section for system capacity.
9. Be sure all control levers are in NEUTRAL position. Start engine and run it at idle speed for a few minutes.
10. Place boom lever in RAISE position to pump oil into boom cylinders. Then remove blocks or chains securing boom and bucket. **Do not stand or work under boom and bucket after removing blocks or chains.**
11. Operate unit by raising, lowering, dumping, and closing bucket until oil ceases to foam. This will "bleed" the system, forcing trapped air to escape through the reservoir drain hose.
12. After oil has ceased to aerate, add oil to reservoir to bring level to indicated FULL mark on dipstick. This will replace oil drawn into the cylinders and hoses.
13. Check all connections for leaks and make certain reservoir cap is properly secured.

NEVER UNDER ANY CIRCUMSTANCES USE ANY FLUSHING OIL OR COMPOUNDS FOR CLEANING THE SYSTEM.

Transmission Sump and Screen: When servicing transmission at every 1000 operating hours, remove transmission sump and screen. Wash in solvent, dry, and reinstall, using new gaskets.

Front Axle Differential: Drain differential every 1000 operating hours. Refill with lubricant recommended on lubrication chart until level with plug opening at center of axle assembly.

Refer to Specifications and Service Data Section for capacity.

Front Axle Planetary Hubs: Drain planetary hubs every 1000 operating hours through fill and drain plug opening in external diameter of hub and drum assembly.

Rotate wheel until fill and drain plug is at top

center; this will position level plug in thrust cap slightly below center of wheel.

Add lubricant recommended on lubrication chart until level with plug opening in thrust cap.

Refer to Specifications and Service Data Section for capacity.

Rear Axle Differential: Drain differential every 1000 operating hours. Refill with lubricant recommended on lubrication chart until level with plug opening at center of axle assembly.

Refer to Specifications and Service Data Section for capacity.

Rear Axle Planetary Hubs: Drain planetary hubs every 1000 operating hours through fill and drain plug opening in external diameter of hub and drum assembly.

Rotate wheel until fill and drain plug is at top center; this will position level plug in thrust cap slightly below center of wheel. The breather in the thrust cap will be on top.

Add lubricant recommended on lubrication chart until level with opening in thrust cap.

Refer to Specifications and Service Data Section for capacity.

Midmount Bearing: Drain and refill every 1000 operating hours. Remove drain plug located in bottom of Midmount Bearing and allow all fluid to drain out. Replace drain plug. Remove check plug from side and breather-fill cap from top of Midmount Bearing. Wash breather-fill cap in solvent and blow dry with compressed air. Fill with fluid recommended on drive line lube chart until level with bottom of check plug opening. Reinstall check plug and breather-fill cap.

Refer to Specifications and Service Data Section for capacity.

NOTES

MAINTENANCE SCHEDULE

SYSTEM	OPERATION	DAILY or SHIFT	TIME INTERVAL (HOURS) 50	100	250	500	1000
Engine, Controls, Cooling System and Accessories	Engine Maintenance	See Engine Manufacturer's Manual					
	Check Cooling System for Leaks		●	●	●	●	●
	Check Air Cleaner Service Indicator	●	●	●	●	●	●
	Drain Fuel Tank Sediment		●	●	●	●	●
	Check Anti-freeze Protection		●	●	●	●	●
	Tighten Air Cleaner Connections		●	●	●	●	●
	Check and Adjust Belt Tension		●	●	●	●	●
	Check Engine RPM				●	●	●
	Clean Radiator Core					●	●
	Service Air Cleaner Element and Body					●	●
Torque Converter and Transmission System	Check Hydraulic System for Leaks		●	●	●	●	●
	Clean Torque Converter and Transmission Breathers		●	●	●	●	●
	Check and Adjust Transmission Shift Lever Linkage					●	●
	Check Transmission De-Clutch Valve					●	●
	Check Transmission Clutch, Transmission and Oil Cooler Pressures					●	●
Boom and Bucket System	Check Hydraulic System for Leaks		●	●	●	●	●
	Adjust Bucket Leveler				●	●	●
	Check Boom and Bucket					●	●
	Adjust Boom and Bucket Control Levers					●	●
	Check and Repair Bucket Cutting Edge						●
	Check Boom to Bucket Linkage						●
Electrical System	Check Lights and Fuses		●	●	●	●	●
	Service Batteries		●	●	●	●	●
	Clean and Tighten Electrical Connections					●	●
	Inspect, Test and Lubricate Electrical Units						●
Axles, Prop Shafts, Wheels and Tires	Check Tire Pressure and Casings	●	●	●	●	●	●
	Tighten Wheel Nuts and Inspect Rims		●	●	●	●	●
	Clean Axle Breathers					●	●
Steering System	Check Hydraulic System for Leaks		●	●	●	●	●
	Check Steering Pressure					●	●
	Adjust Drag Link Ball Joints					●	●
	Adjust Steering Gear						●
Brake System	Bleed Air Reservoir	●	●	●	●	●	●
	Inspect Brakes	●	●	●	●	●	●
	Check Air Chambers and Lines for Leaks		●	●	●	●	●
	Lubricate Brake Pedal and Roller			●	●	●	●
	Adjust Service (Wheel) Brakes				●	●	●
	Adjust Parking Brake				●	●	●
General Maintenance	Visually Inspect Machine	●	●	●	●	●	●
	Clean Cylinder Rods		●	●	●	●	●
	Adjust Cylinder Packing Glands				●	●	●
	Adjust and Lubricate Operator's Seat				●	●	●
	Replace Reservoir Return Filter Assembly					●	●
	Tighten Mounting Bolts					●	●
	Steam Clean Machine					●	●
	Inspect Frame						●

MAINTENANCE

The Maintenance Schedule lists checks or adjustments within machine systems or related components.

Procedures from each system listed at a specified interval are described in sequence. They should be performed at the same time as the lubrication intervals.

DAILY OR SHIFT MAINTENANCE OPERATIONS

- **ENGINE MAINTENANCE**
- **CHECK AIR CLEANER SERVICE INDICATOR**
- **CHECK TIRE PRESSURE AND CASING**
- **BLEED AIR RESERVOIR**
- **INSPECT BRAKES**
- **VISUALLY INSPECT MACHINE**

Engine Maintenance: Refer to Operation and Maintenance Manual of engine manufacturer for maintenance instructions of engine and accessories.

Check Air Cleaner Service Indicator: Mounted on the air cleaner outlet to the engine, the service indicator is factory set to signal when replacement of the filter element is required. Refer to Figure 11.

Dirt trapped by the air cleaner gradually increases the pressure drop across the cleaner. As the resistance increases the Red Flag of the indicator gradually rises in the window. When the flag reaches the top position it will lock in position regardless of whether or not the engine is running. Replace the filter element at this time.

Check Tire Pressure and Casings: Check air pressure in all tires. See Specifications and Service Data for proper air pressure. Particular attention must be emphasized when checking hydro-inflated tires as there is less volume of air to provide cushioning. Be sure valve caps are in place to prevent dirt, moisture, and foreign material from damaging valve core.

Keep tires free from oil and grease, and repair cuts immediately to prolong tire life. Check tire pressure in the morning when the tires are cold. Do not remove increased pressure caused by operation.

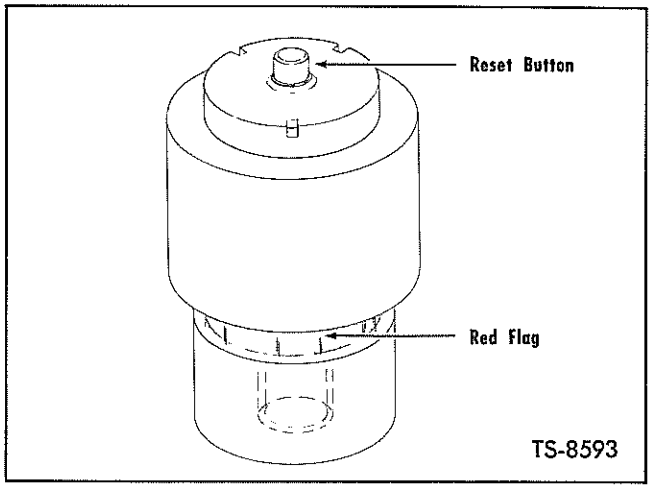


Fig. 11. Air Cleaner Service Indicator

Bleed Air Reservoir: Each day open drain cock at bottom of reservoir and bleed accumulated condensation. Reservoir is located below radiator.

Inspect Brakes: Visually inspect disc brakes to insure that all bolts are tight and that boot deterioration or excessive lining wear has not occured. Linings worn to ⅛" thickness should be replaced. Discs worn to less than 0.450 inch should be replaced. Inspect brake hydraulic system to be certain that no leakage is evident.

Visually Inspect Machine: Visually inspect general condition of the machine, operating controls, instruments and switches, control rods, cable controls and linkage, fuel pump, filters and the radiator for any noticeable damage.

Special attention must be emphasized when inspecting components of the oil system, fuel system and cooling system. If unusual or unexplained traces of oil, fuel and water are found on or below components of the respective systems locate and correct such leaks immediately.

Unexplained oil streaks on or below the engine, transmission, torque converter and axle assemblies must be carefully investigated. Such indications may be evidence of cracks, loose mounting bolts, damaged seals or gaskets, which (if neglected) may result in complete failure and major damage to the engine and drive line.

50 HOUR MAINTENANCE OPERATIONS

- **ENGINE MAINTENANCE**

- **CHECK COOLING SYSTEM FOR LEAKS**
- **DRAIN FUEL TANK SEDIMENT**
- **CHECK ANTI-FREEZE PROTECTION**
- **TIGHTEN AIR CLEANER CONNECTIONS**
- **CHECK AND ADJUST BELT TENSION**
- **CHECK HYDRAULIC SYSTEM FOR LEAKS**
- **CLEAN TORQUE CONVERTER AND TRANSMISSION BREATHERS**
- **CHECK LIGHTS AND FUSES**
- **SERVICE BATTERIES**
- **TIGHTEN WHEEL NUTS AND INSPECT RIMS**
- **CHECK AIR CHAMBERS AND LINES FOR LEAKS**
- **CLEAN CYLINDER RODS**

Engine Maintenance: Refer to Operation and Maintenance Manual of engine manufacturer for maintenance instructions of engine and accessories.

Check Cooling System for Leaks: Check radiator, hoses, oil cooler, water pump and drain cocks for leaks and correct where necessary. Loss of coolant due to ruptured hoses, loose clamps, leaking pump or drain cocks can and will result in expensive repairs or replacement of engine components.

Drain Fuel Tank Sediment: Every 50 operating hours loosen drain plug in hand hole cover on bottom of fuel tank and drain off any accumulated water.

Check all fuel lines, fuel pump, filters and shut-off cocks for leaks and correct where necessary. Open drain cock at bottom of filters, when provided, and drain off accumulated water and sediment.

Check Anti-Freeze Protection: At specified intervals, or whenever anticipating extremely cold weather, use a hydrometer to check freezing point of solution (permanent type anti-freeze) when it is at operating temperature. If necessary add additional anti-freeze according to manufacturer's instructions to maintain a safe level beyond the freezing point.

Tighten Air Cleaner Connections: Tighten all hose clamps and air cleaner mounting bracket bolts. Check all hoses and pipes between air cleaner and engine for cracks or leaks, which will permit dust laden air to by-pass air cleaner entering directly into engine. Serious and costly damage to the engine will result. See "1000 Hour Maintenance Operations" for servicing air cleaner filter element.

Check and Adjust Belt Tension: Each 50 operating hours inspect all drive belts for serviceable condition and proper tension. Neglect and improper tension often leads to inadequate cooling, bearing failure of the driven part and short belt life. Belts should be just tight enough to drive the moving parts without slipping.

Note: *Due to older belts having been stretched, through use, beyond their original length and preventing newer belts from carrying most of the load, it will be necessary to replace all belts as a matched set when one or two belts in the set are worn or damaged beyond serviceable condition.*

All new belts will loosen after operating for a day or two and must be rechecked and retensioned if necessary. At specified intervals check and retension fan belts as follows:

Cummins

1. Loosen locknut securing the fan drive pulley bracket.
2. Turn fan drive pulley adjusting bolt clockwise to raise fan drive pulley (increasing belt tention) or counterclockwise to lower fan drive pulley (decreasing belt tension) depending on the existing condition.
3. Turn the adjusting bolt so that maximum deflection is obtained on the belts midway between the pulleys as shown in Figure 12. Maximum deflection is $1\frac{3}{32}$ inch for Cummins Diesels.
4. When belts are properly adjusted, retighten locknut to 400 ft. lbs. torque to prevent fan drive pulley and belts from working loose.

Periodically belts should be cleaned to remove grease and glaze by wiping with a cloth saturated with brake fluid. This in most instances will eliminate squeak and extend the service life of the belts.

G.M. Diesel

At specified intervals check and retension

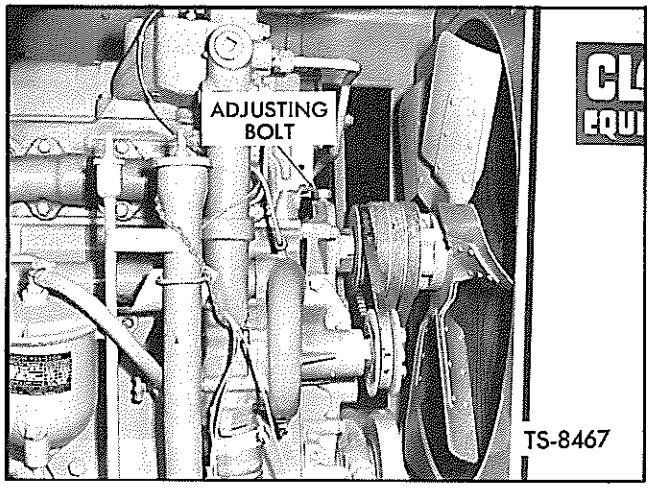


Fig. 12. Check Fan Belt Tension — Cummins Diesel

belts as follows:

1. Measure the span length.
2. At the center of the span, apply force with a spring scale (at right angles to the span) large enough to deflect the belt 1/64 inch per inch of span. Refer to Figure 13.
3. For a properly tensioned drive, the force should be within the listed range. New belts should initially be tensioned to the upper limit of the range. All new belts will loosen after operating for a day or two and must be re-checked and retensioned if necessary.

Outside Diameter of Small Sheave	Deflection Force
7" to 11"	8 to 12 lbs.
11½" to 16"	10 to 15 lbs.

Periodically belts should be cleaned to remove grease and glaze by wiping with a cloth saturated with brake fluid. This in most instances will eliminate squeak and extend the service life of the belts.

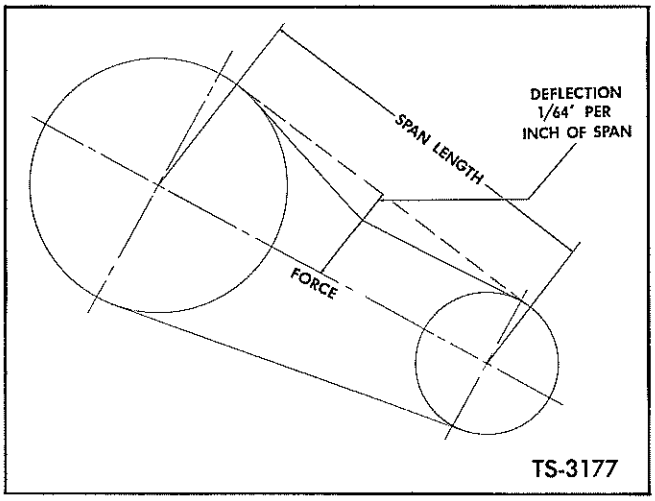


Fig. 13. Check Belt Tension — G.M. Diesel

Check Hydraulic System for Leaks: Check oil reservoir, valve, pumps, cylinders, all hydraulic hose lines and connections for leaks, correcting where necessary. Particular attention should be paid to hoses employed on the intake or suction side of the pumps. Hose clamps and connections employed must be securely tightened to prevent entrance of foreign material or air into the system. Air drawn into the system at this point will cause cavitation of the pump with resultant malfunctioning and early failure. All hoses should be checked for abrasions which could result in ruptures of same. Replace hoses found in this condition.

Clean Torque Converter and Transmission Breathers: The torque converter and transmission hydraulic system is equipped with breathers at two points. Breathers are located on top of torque converter and front face of transmission

Each 50 operating hours unscrew breathers, wash in solvent, blow dry with compressed air and reinstall.

Check Lights and Fuses: Two fuses provide protection for the electrical system, one in gauge circuit and one in light circuit. An additional self contained fuse which is part of the lighter base and cord assembly provides protection for the lighter element. All fuses are located behind the instrument panel as shown in the Cockpit Wiring Diagram at rear of manual.

The light circuit fuse and gauge circuit fuse are contained in plastic connectors. Push and twist to open and lock plastic connectors for fuse replacement. The self contained lighter fuse is a screw on type fuse secured between the lighter base and cord assembly.

To replace fuses remove instrument panel mounting bolts and swing panel outward.

The circuits and fuse protection are:

Gauge Circuit .....AGC ¾ Amp
Light Circuit .....SFE 20 Amp
Lighter Circuit (self contained) ..20 Amp

(a) **Headlamps and Back-Up Lamps:** The ma-

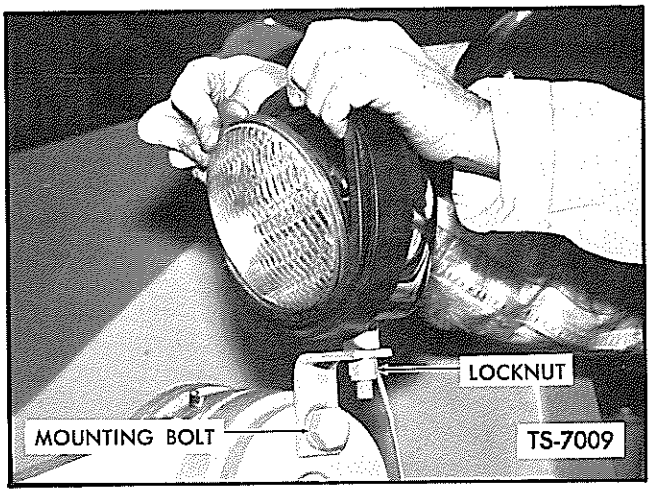


Fig. 14. Replace Headlamps or Back-Up Lamps

chine is equipped with four lamps mounted in shock resistant rubber retainers. The headlamps and back-up lamps are floodlamps that disperse light in a horizontal pattern.

Headlamps are factory adjusted but may be re-adjusted at the headlamp mounting nuts or bolts to obtain a desired light pattern.

If necessary to replace floodlamps, depress lamp and spread lip of rubber retainer outward forcing lamp out as shown in Figure 14 and disconnect terminals. Reconnect terminals on new lamp and reinstall in retainer.

(b) **Dash, Tail and Stop Lamps:** These lights are easily replaced by a push and a twist. To remove dash lamp reflector from dash lamp assembly pull out to remove and push on to retain. Reflectors for the shock mounted tail and stop lights must be removed by spreading the lip of the rubber retainer outward as shown in Figure 15 and carefully forcing the reflectors out. To reinstall reflectors carefully depress reflectors into retainers.

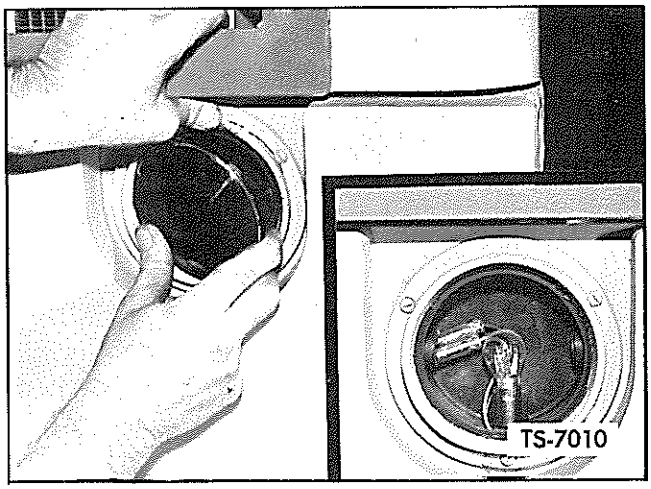


Fig. 15. Remove Reflectors and Replace Tail and Stop Lamps

Service Batteries: Batteries are located in battery compartment at the rear of the operator's seat. Keep terminals clean and tight, and be sure that distilled water is added to cover plates and separators in each cell. Do not overfill.

To prevent serious damage to electrical system components when recharging or replacing batteries in the "Delcotron" charging system.

. . . REMEMBER . . .

1. When installing batteries, **make sure** batteries and "Delcotron" polarities are the same.
2. Booster batteries must be paralleled.
3. Battery-charger and battery polarities must **agree.**
4. Before doing any welding, **disconnect ground cable from batteries and electrical lead from battery terminal on alternator.**

Tighten Wheel Nuts and Inspect Rims: Wheel nuts should be checked regularly and kept tight. Loose wheel nuts will cause undue tire wear, strain axle assemblies, and effect steering and load distribution. Apply lubricant on threads of wheel studs only and tighten wheel nuts to specified torque. Do not lubricate the spherical seat or threaded portion of the wheel nuts.

Check rims for bent or damaged flanges and repair or replace as needed.

Check Air Chambers and Lines for Leaks: Periodically check connecting lines and fittings to be sure they are air tight. Air chambers occasionally should be painted with soap solution to detect leakage. Tighten clamping ring bolts uniformly until leakage is eliminated, as no leakage is permissible.

Check and securely tighten air chamber to mounting bracket bolts and mounting bracket to axle bolts.

Clean Cylinder Rods: Wipe boom, bucket and steering rods with clean cloth saturated in hydraulic oil. Check the rods for nicks or burrs which would damage packings or seals. Remove such nicks or burrs with a fine grained hand stone or crocus cloth.

100 HOUR MAINTENANCE OPERATIONS

- **ENGINE MAINTENANCE**
- **LUBRICATE BRAKE PEDAL AND ROLLER**

Engine Maintenance: Refer to Operation and Maintenance Manual of engine manufacturer for maintenance instructions of engine and accessories.

Lubricate Brake Pedal and Roller: Remove dirt and foreign material from around brake pedals and top of brake valve assembly.

Use engine oil and lubricate pedal pivot pins and brake roller to keep them operating freely. Lift rubber boot away from plunger of mounting plate and put a few drops of oil around plunger. Avoid using too much oil to prevent deterioration of the boot.

250 HOUR MAINTENANCE OPERATIONS

- **ENGINE MAINTENANCE**
- **CHECK ENGINE RPM**
- **ADJUST BUCKET LEVELER**
- **ADJUST SERVICE (WHEEL) BRAKES**
- **ADJUST PARKING BRAKE**
- **ADJUST CYLINDER PACKING GLANDS**
- **ADJUST AND LUBRICATE OPERATOR'S SEAT**

Engine Maintenance: Refer to Operation and Maintenance Manual of engine manufacturer for maintenance instructions of engine and accessories.

Check Engine RPM: Engine speeds should be checked regularly against specifications to determine engine efficiency and machine performance. Proper speeds insure safe operating limits for the engine and maintain correct operating speeds for torque converter and transmission.

(a) **Low Idle and High Idle RPM:** These speeds are the free operating limits of the engine under no load conditions. They are determined by the amount of fuel delivered to the engine. See Specifications and Service Data at rear of manual.

Caution: *Do not accelerate to maximum rpm until engine is at operating temperature.*

Check throttle linkage to insure wide open throttle when accelerator is fully depressed, also closed throttle when accelerator is fully released. Accelerator and linkage should operate freely in all positions.

Occasionally control rods, control levers or bell cranks loosen or become damaged, impairing the operating efficiency of the engine. Insufficient power is frequently caused by throttle linkage being out of adjustment.

Fuel controls are accurately calibrated at the factory to insure correct idle and high idle speeds.

DO NOT ADJUST G.M. GOVERNOR ASSEMBLY OR CUMMINS FUEL PUMP WITHOUT CONSULTING OPERATION AND MAINTENANCE MANUAL OF RESPECTIVE ENGINE MANUFACTURER.

Cummins Diesel

Fuel controls are accurately calibrated at the factory to insure correct idle, and high idle speeds. The adjustment that follows is for control rod between accelerator and throttle control lever on fuel pump.

1. Unhook spring and disconnect balljoint securing accelerator control rod to throttle control lever on fuel pump.
2. Depress accelerator until it contacts stop on floorboard.
3. Rotate throttle control lever to extreme forward (full throttle) position and adjust balljoint to obtain a slip fit on throttle control lever just before accelerator pedal bottoms.
4. Reinstall and secure balljoint and spring to throttle control lever.
5. Depress and release accelerator, and check that accelerator control rod will properly rotate throttle control lever from the idle position to the full throttle position without interference.
6. Additional adjustment can be made by adjusting eye under accelerator pedal.

Pressure required to depress accelerator is controlled by the spring on the throttle control lever as shown in Figure 16. This spring also insures that engine will return to idle speed when accelerator pedal is released.

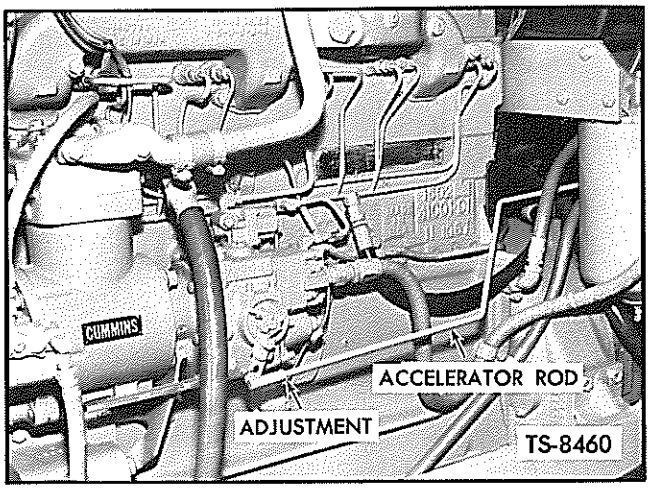


Fig. 16. Adjust Throttle Linkage — Cummins

G.M. Diesel

1. Unhook spring from accelerator linkage and disconnect clevis from governor throttle control lever. This will enable governor throttle lever to return to spring loaded idle position.

2. Depress accelerator until it contacts stop on floorboard.

3. Rotate governor throttle control lever to extreme forward (full throttle) position and adjust clevis to obtain a slip fit in governor throttle lever just before accelerator bottoms. If a slip fit cannot be obtained adjust clevis at lower bell crank arm. See Figures 17 and 18.

4. Reinstall and secure clevis to governor throttle lever and reconnect accelerator spring.

5. Release and depress accelerator, and check that linkage will properly rotate throttle control lever from idle to full throttle position without interference.

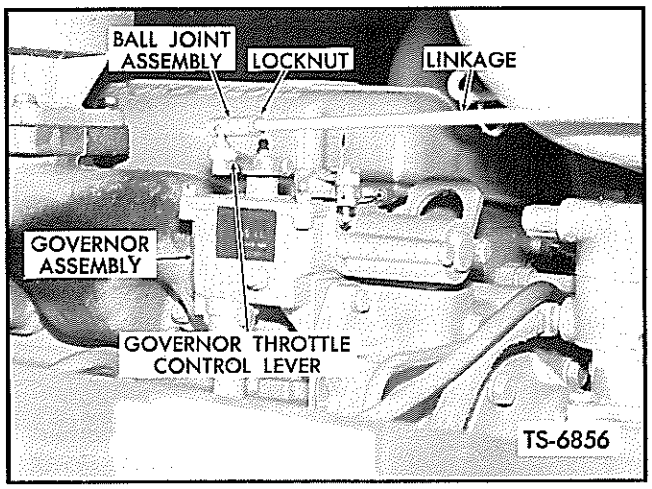


Fig. 17. Adjust Throttle Linkage at Governor Housing — G.M.

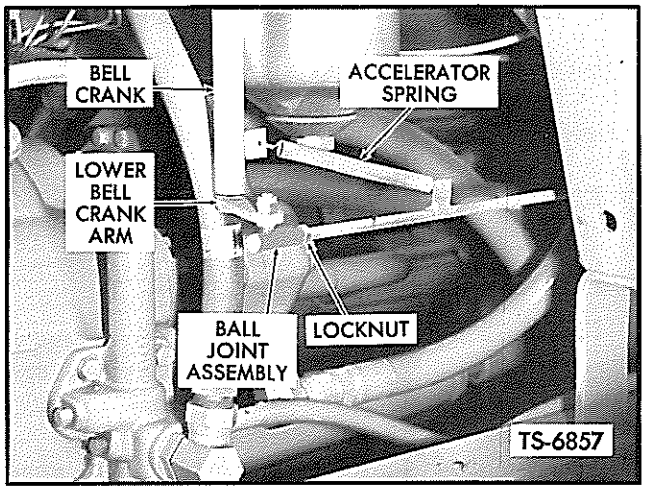


Fig. 18. Adjust Throttle Linkage at Bell Crank — G.M.

6. Additional adjustment can be made by adjusting clevis under accelerator pedal.

Pressure required to depress accelerator is controlled by a spring attached from bell crank to front accelerator linkage. This spring also insures that engine will return to idle speed when accelerator pedal is released.

(b) **Stall RPM:** The engine and torque converter act as a unit to deliver power to the transmission. A stall check should be performed to insure that engine is developing rated power and that the torque converter is operating efficiently.

Caution: *Check stall rpm only when torque converter fluid is hot (180° F. to 200° F.) engine is at operating temperature, and boom and bucket relief valve setting is at proper specification.*

1. Install tachometer on engine.

2. Apply parking brake, block wheels, attach safety link on each side, and place directional lever in NEUTRAL.

3. Start engine and raise bucket a few inches above the ground.

4. Shift levers into FORWARD — HI and TRAVEL RANGE and accelerate engine. When engine reaches maximum rpm pull back on bucket control lever to rotate bucket to full close position. When engine rpm drops to its lowest point — read tachometer.

DO NOT STALL CONVERTER MORE THAN 30 SECONDS AT ANY ONE TIME.

If stall rpm is not within specifications, trouble shooting of engine or torque converter by a qualified mechanic is required. See Specifications and Service Data at rear of manual.

Note: *Stall rpm, as specified in Specifications and Service Data, is applicable to altitude of 600 ft. and ambient temperature of 70° F. Due to the many combinations of altitude and temperature possible in the field, space does not permit publishing here all the corrections necessary to the stall rpm indicated to accommodate such variations. It is suggested the engine manufacturer's distributor be contacted to determine the correction necessary for altitude and temperature in your application.*

Adjust Bucket Leveler: The bucket leveler mechanism mounted on the right hand bucket cylinder consists of a leveler cam and leveler valve with connecting piping from the air reservoir to the main control valve.

The cam arm of the leveler valve contacts the leveler cam as the bucket rotates back from the DUMP position. Air tapped from the air reservoir is directed to the bucket spool on the main control valve, releasing the bucket lever from the detent located CLOSE position to the HOLD (neutral) position. This action returns bucket to a level position automatically.

Elongated holes in the leveler cam mounting bracket provide the adjustment necessary to maintain alignment between cam arm on leveler valve and leveler cam. Make sure machine is on level surface with bucket in level position on ground. Loosen mounting bolts securing leveler cam bracket and readjust leveler cam until cam arm on leveler valve is aligned with leveler cam (⅛ inch stroke required to actuate leveler valve). Resecure cam bracket. See Figure 19.

Start engine and cycle bucket several times, each time bucket reaches a level position relative to the ground the bucket lever should automatically return to the HOLD position.

SHOE AND DRUM TYPE BRAKES

Adjust Service (Wheel) Brakes: Inadequate braking may indicate a need to replenish fluid in master cylinder or to adjust the shoes.

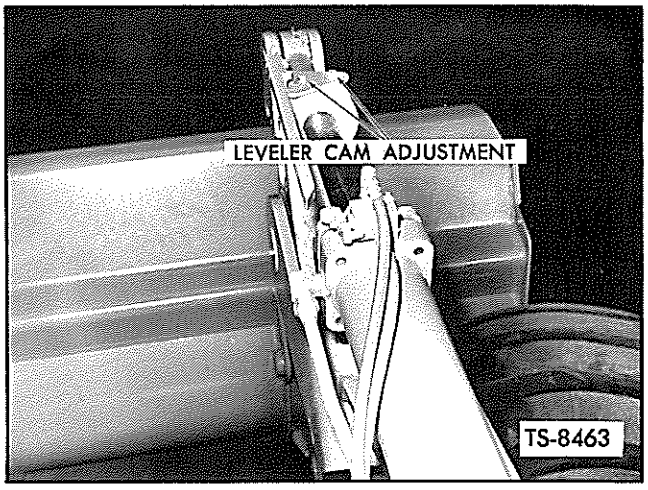


Fig. 19. Adjust Bucket Leveler

Determine the need for lining clearance adjustment by fully applying brakes and measuring travel of piston stroke indicator located on the power cluster. See Figure 20.

Adjustment is required when indicator travel reaches 1–1¼ inches. After adjustment, indicator travel should be at least ⅜–¾ inches.

(a) Shoe Adjustment – Minor: When brake lining becomes worn it is necessary to adjust brake lining in closer relation with brake drums. This adjustment changes the toe adjustment only. The anchor adjustments are not moved.

A brake adjustment also should be made after a wheel cylinder is removed for reconditioning as previous adjustment is lost when shoes are moved out for wheel cylinder removal.

It will also be necessary to bleed brakes, by

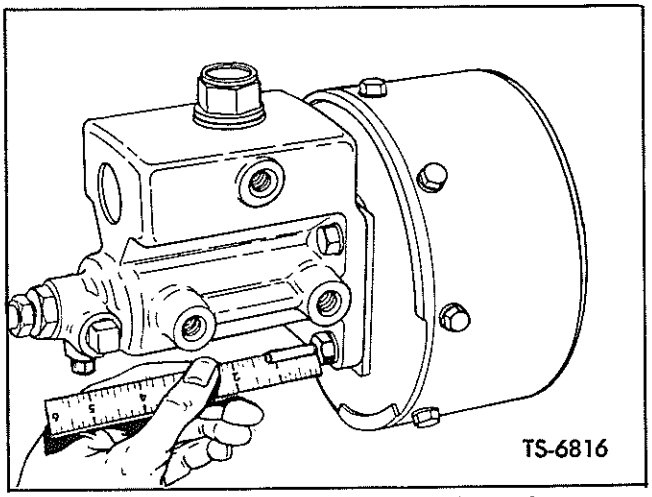


Fig. 20. Measure Indicator Rod Travel

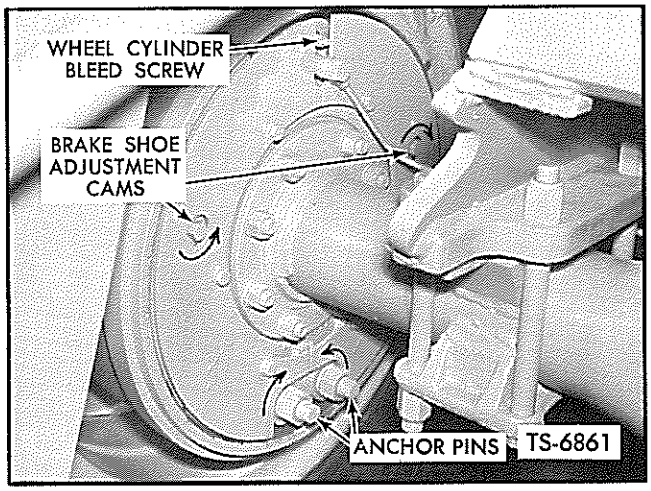


Fig. 21. Adjust Brake Shoes

referring to that paragraph of this section, as air will have entered the system with the wheel cylinder removed.

Adjustment is made at the outside of the brake backing plate. See Figure 21.

1. Raise wheels off the ground.
2. Rotate shoe adjusting cam in direction of arrow until lining drags on drum.
3. Back off cam until drum runs free.
4. Adjust both cams at all wheels in same manner.
5. Test brakes for proper application and release.

(b) **Shoe Adjustment – Major:** A major shoe adjustment must be performed whenever new brake linings are installed.

1. Raise wheels off the ground.
2. Rotate shoe adjusting cam in direction of arrow until lining drags on drum.
3. Rotate eccentric shoe anchor in direction of arrow until drag is relieved.
4. Repeat Steps 2 and 3 in sequence until drag cannot be relieved.
5. Back off shoe adjusting cam and then anchor adjustment just enough to relieve drag. (Lining to drum clearance as indicated by feeler gauge should be .010 at toe of shoe and .005 at heel.)
6. Adjust both shoes at all wheels in same manner.
7. Tighten anchor pin nuts to 150 foot pounds torque making sure no pin rotation occurs during tightening.
8. Complete the minor adjustment as outlined in preceding paragraph. Check the operation of wheels and brakes to see if brakes will set but that there is no bind when brakes are released.

If new linings have been installed, complete a major and minor adjustment at the time of installation. *After machine has been operated for 50 hours, recheck brake adjustment.*

(c) **Bleed Brake Lines:** Proper operation of hydraulic brakes require a solid column of fluid without air bubbles at all points in the pressure system. Because of loose fittings, leaking cylinders or low fluid level in master cylinder it is necessary to "bleed" the system in order to expel air bubbles which have become mixed with the fluid. The necessity of bleeding is indicated by a soft or spongy pedal.

Two methods of bleeding brakes are commonly used: manual bleeding and pressure bleeding. Pressure bleeding introduces fluid under pressure into the master cylinder and does not require depressing pedal during the bleeding operation. Manual bleeding is as follows:

1. Fill master cylinder with fluid.
2. Open bleed screw and depress brake pedal to expel air and fluid from lines.
3. When pedal is fully depressed, close bleed screw before releasing pedal.
4. Repeat this procedure at each wheel until solid fluid, free from bubbles, comes from bleed screws, checking master cylinder frequently to insure ample supply of fluid.

DISC BRAKES

Bleed Brake System: Occasionally it may be necessary to bleed brake system to remove air trapped in the system due to a leak in the line or the installation of new parts in the system. Air trapped in the system will be indicated by a soft spongy brake pedal.

Note: *It is recommended to use a bleeder hose on bleeder valves whenever possible to keep fluid away from linings. Keep master cylinder filled during bleeding process.*

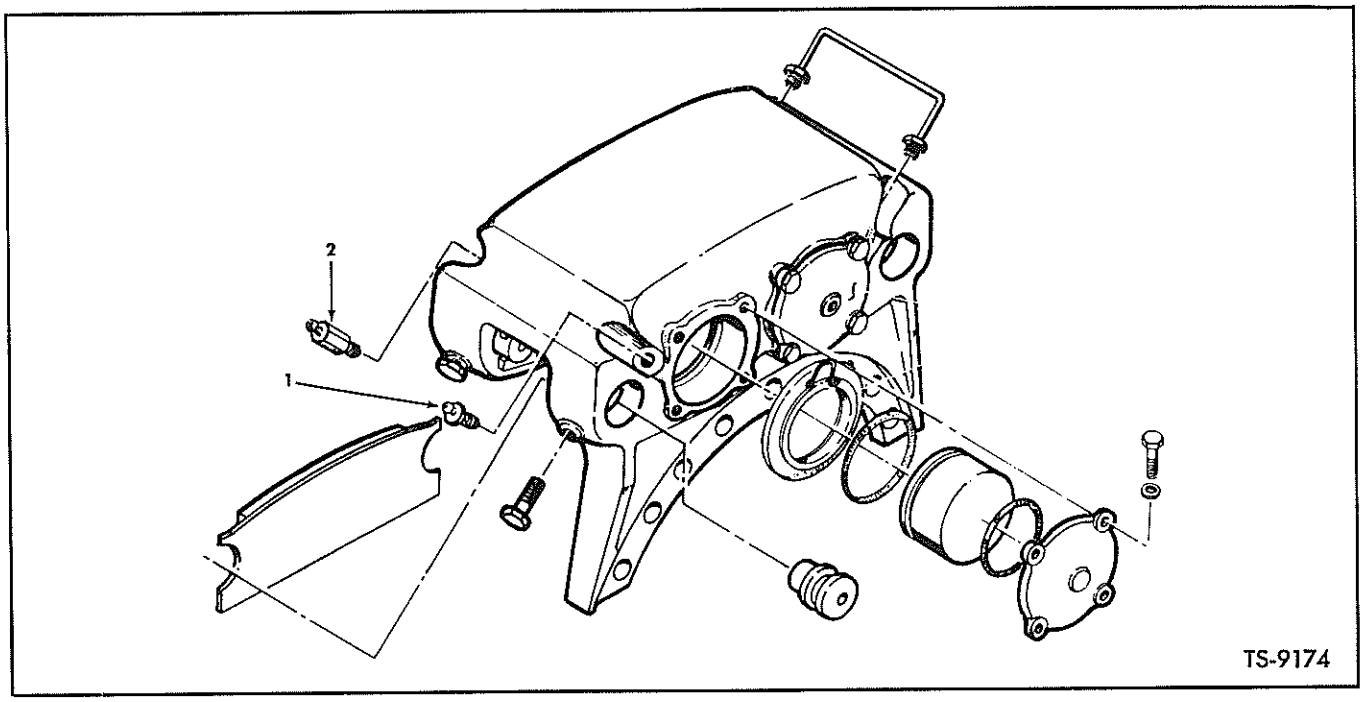


Fig. 22. Brake Head Exploded View

1. Open bleeder valve, (see Item 1 Figure 22), and actuate brakes several times until fluid coming from bleeder valve is free of bubbles. Depress brake pedal and close bleeder valve, then release brake pedal.

2. Open second bleeder valve (see Item 2 Figure 22). Depress brake pedal several times until brake fluid coming from bleeder valve is free of bubbles. Depress brake pedal and close bleeder valve, then release brake pedal.

3. Actuate brakes several times.

4. Repeat steps 1 and 2, until no bubbles are observed in fluid from bleeder valves.

5. Repeat entire process at each brake head to finish bleeding system.

   Note: *Master cylinder must be kept full at all times.*

Recommended brake fluid .....SAE 70R3, Clark 850487.

Adjust Parking Brake: When slack develops in the parking brake cable, perform the following adjustments.

1. With lever in released position, turn acorn on end of handle clockwise as shown in Figure 23.

2. Test for good resistance over center as handle is pulled up to applied position.

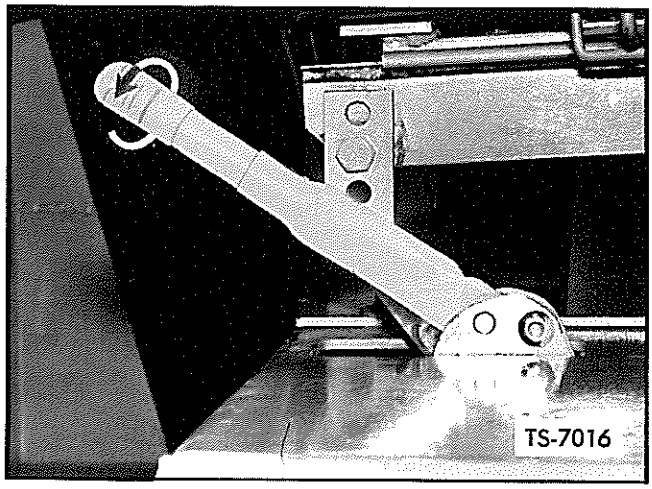


Fig. 23. Adjust Parking Brake at Handle

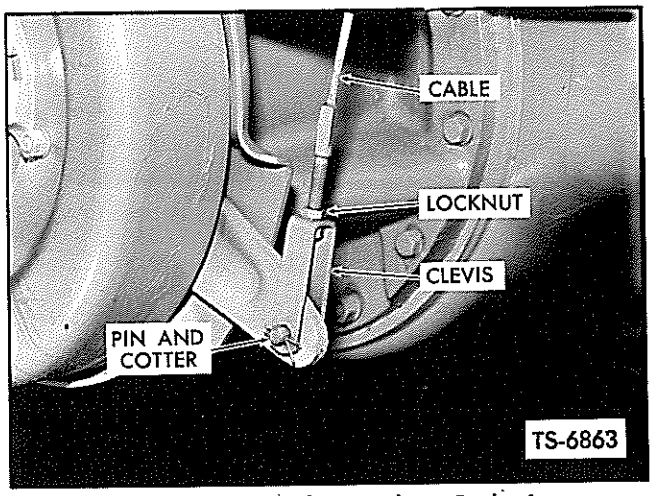


Fig. 24. Adjust Parking Brake at Brake Arm

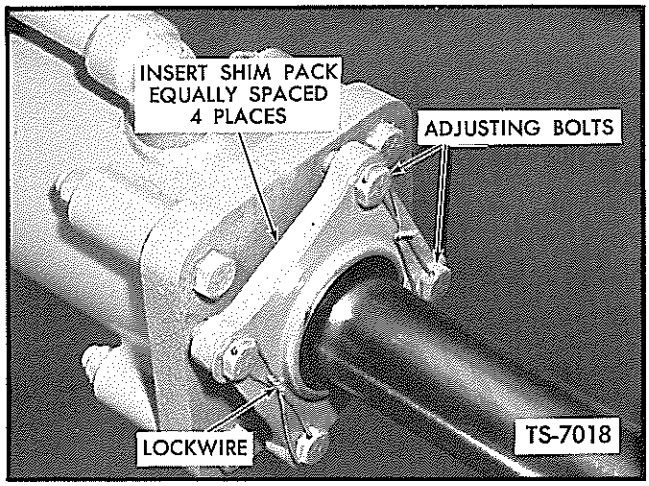


Fig. 25. Adjust Packing Gland (Steering Cylinder Shown)

Further adjustment is provided by a clevis at the brake arm. See Figure 24. First be sure that acorn on lever is backed off, so that all slack can be taken up at the clevis. Brake lever should be in released position.

1. Loosen locknut on brake cable.
2. Remove cotter and clevis pin.
3. Turn clevis clockwise to tighten brake.
4. Reassemble and tighten locknut.
5. Test brake for proper application and release.

Adjust Cylinder Packing Glands: The packing gland on boom, bucket or steering cylinders occasionally may require adjustment to prevent excessive leakage past the wiper seal. A certain amount of leakage is desirable to keep the rod and seal lightly lubricated and clean. See Figure 25.

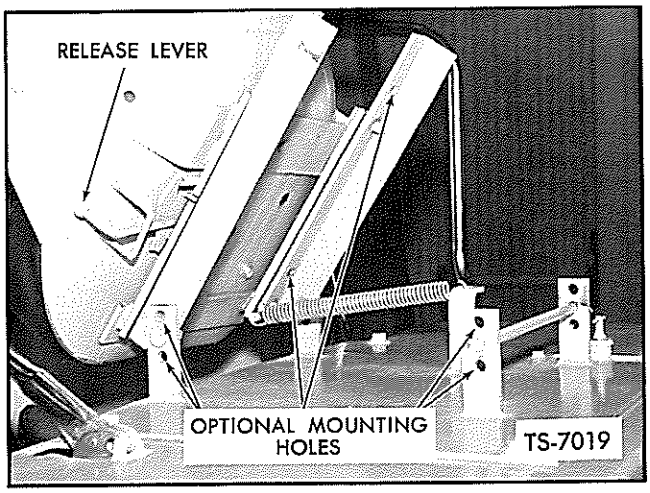


Fig. 26. Adjust Operator's Seat

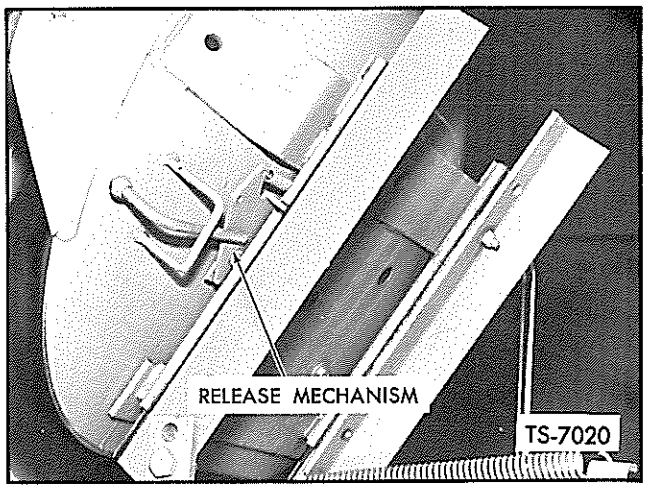


Fig. 27. Lubricate Operator's Seat

1. Clip lockwire and tighten down bolts until packing is snug.
2. Check with feeler gauge shim pack in at least four places that all bolts are tightened evenly.
3. Lockwire bolts in pairs.

Adjust and Lubricate Operator's Seat: The operator's seat can be shifted forward or rearward to suit the individual by moving the lever on left-hand side of seat forward and shifting seat to desired position. The seat can also be adjusted up and down by relocating the seat assembly in the adjusting holes in the seat mounting brackets. Another set of holes in the rails is provided for optional mounting if desired. See Figures 26 and 27.

Oiling of release mechanism, track assemblies and pivot points will keep them operating freely.

Tilt seat over steering wheel when shutting down machine at end of work shift.

500 HOUR MAINTENANCE OPERATIONS

- **ENGINE MAINTENANCE**
- **CHECK ENGINE SHUT-OFF CONTROLS**
- **SERVICE AIR CLEANER ELEMENT AND BODY**
- **CLEAN RADIATOR CORE**
- **CHECK AND ADJUST TRANSMISSION SHIFT LEVER LINKAGE**
- **CHECK TRANSMISSION DE-CLUTCH VALVE**

- **CHECK TRANSMISSION CLUTCH AND OIL COOLER PRESSURES**
- **CHECK BOOM AND BUCKET PRESSURE**
- **ADJUST BOOM AND BUCKET CONTROL LEVERS**
- **CLEAN AND TIGHTEN ELECTRICAL CONNECTIONS**
- **CLEAN AXLE BREATHERS**
- **CHECK STEERING PRESSURE**
- **ADJUST DRAG LINK BALL JOINTS**
- **TIGHTEN MOUNTING BOLTS**
- **STEAM CLEAN MACHINE**
- **REPLACE RESERVOIR RETURN FILTER**

Engine Maintenance: Refer to Operation and Maintenance Manual of engine manufacturer for maintenance instructions of engine and accessories.

Check Engine Shut-Off Controls: G.M. Diesels are equipped with two shut-off controls; a fuel shut-off for normal shut down, and an air shut-off for emergency purposes. Both of these controls must operate freely to shut down the engine.

Check and adjust shut-off controls as follows:

(a) **Fuel Shut-Off Control**

1. Start engine; then pull engine fuel shut-off control (forward T-handle) located at right side of operator to the UP position and hold to shut down engine.
2. If cable binds or sticks, eliminate kinks or free with penetrating oil. Remove excess oil to prevent dirt accumulation.
3. Check that cable operation rotates engine fuel shut-off lever on governor assembly sufficiently to shut down engine.
4. Adjust cable tension if necessary at engine fuel shut-off lever on governor assembly by loosening set screw from cable connector, and increasing cable tension as necessary. Resecure cable in cable connector by retightening set screw. See Figure 28.
5. Recheck operation of engine fuel shut-off control to insure proper engine shut down.

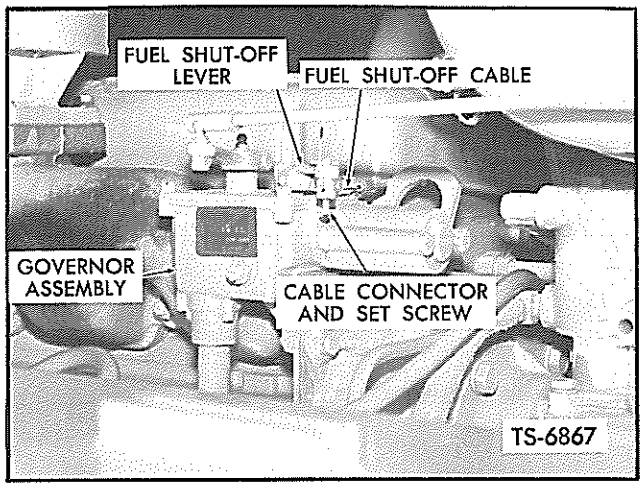


Fig. 28. Adjust Engine Fuel Shut-off Control — G.M.

(b) **Emergency (Air) Shut-Off Control**

Perform this check with engine shut down as frequent usage may damage seals in blower assembly.

1. Pull engine emergency (air) shut-off control (rear T-handle) located at right side of operator and check that cable operation releases shut down latch assembly enabling engine air shut-off valve to completely close inside air intake housing.
2. If cable binds or sticks, eliminate kinks or free with penetrating oil. Remove excess oil to prevent dirt accumulation.
3. Adjust cable tension if necessary at engine air shut down latch assembly by loosening set screw from cable connector, and increasing cable tension as necessary. Resecure cable in cable connector by retightening set screw. See Figure 29.

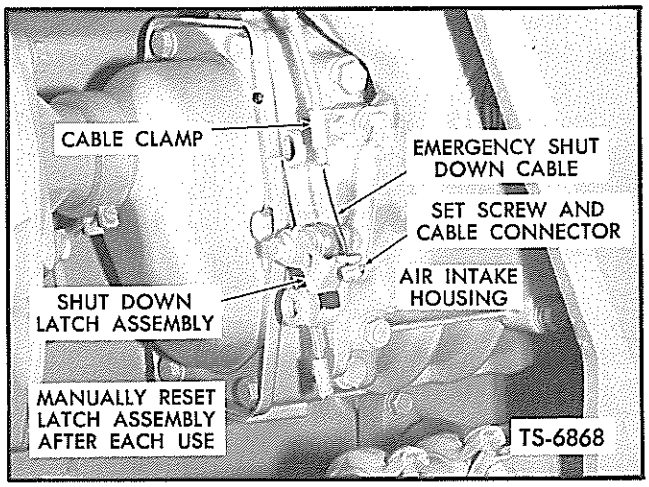


Fig. 29. Adjust Engine Air (Emergency) Shut-Off Control — G.M.

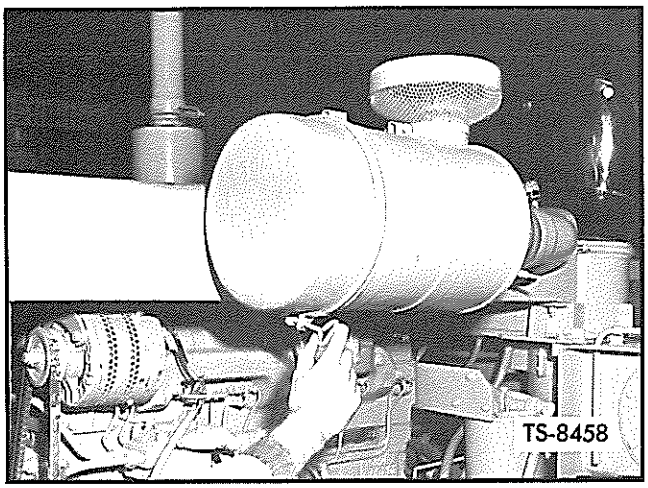


Fig. 30. Remove Dust Cup

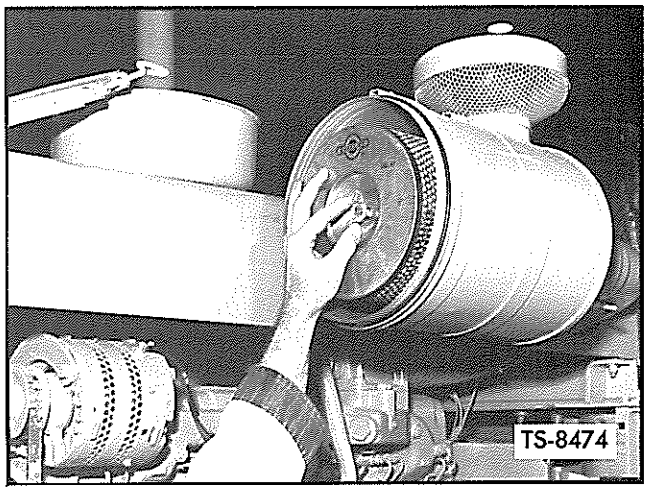


Fig. 31. Remove Wing Nut

4. Reset engine emergency (air) shut-off control in its original position and manually reset the latch assembly after each use before attempting to restart the engine.

5. Recheck operation of engine emergency (air) shut-off control to insure proper release of the shut down latch assembly and valve inside air intake housing.

Service Air Cleaner Element and Body: Recommended servicing procedures and intervals for replacing the air cleaner filter element are described below, but it should be understood that no set rule can be established for replacing the filter element because the replacement interval is automatically established by a service indicator installed on the air cleaner outlet to the engine. The service indicator insures maximum engine efficiency by providing the operator with a fast, safe and efficient method of determining when the filter element should be replaced. This is accomplished by a WARNING SIGNAL (red band) which is actuated by the pressure drop across the air cleaner.

Note: *Extended operation of the machine without replacing the filter element when indicated by the service indicator will create excessive restriction resulting in high fuel consumption, excessive smoke, lower horsepower and poor acceleration.*

Figures 30 through 33 illustrate in sequence the removal and cleaning procedure of air cleaner components.

Loosen clamp assembly and remove dust cup as shown in Figure 30. Unscrew wing nut and remove baffle. Clean dust cup and baffle as specified under "Daily or Shift Maintenance Operations." Remove wing nut and remove filter element as shown in Figures 31 and 32. Do not separate fins and sealing gasket from element as they are designed as a single replaceable assembly. Pat sides of element with palm of hand, rotating element to remove dust trapped in the pleats.

Tapping element against hard surfaces or with hard objects may create dents or break element end cap seals. This would affect proper sealing when reassembled, resulting in rapid engine wear. Using low air pressure (not over 100 psi) blow out remaining dust from inside out, opposite normal operating air flow through the element. See Figure 33.

Caution: *Be careful not to rupture filter element. Maintain a reasonable distance between air nozzle and filter element when directing air up and down the clean air side of element pleats.*

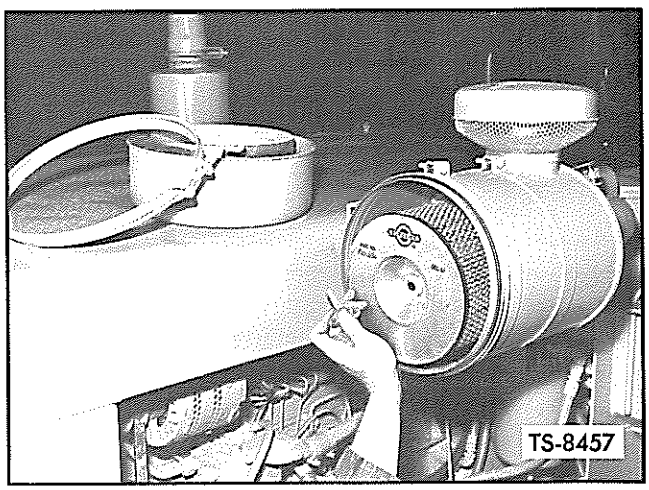


Fig. 32. Remove Filter Element

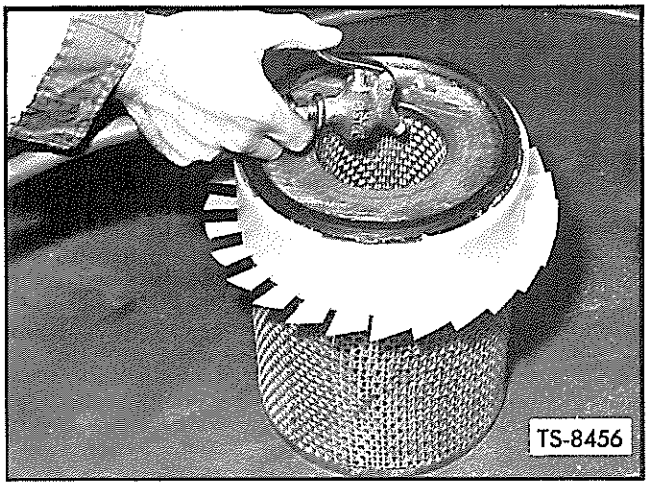


Fig. 33. Remove Dust and Clean

If element appears clogged, oily or soot laden, further cleaning is indicated.

To keep machine in operation, it is suggested that a new element be installed. When dirty element is cleaned, it can be used as a replacement element.

An extremely dirty element can be cleaned in warm water (120° F. to 140° F.) using a non-sudsing detergent such as SOILAX. Soak element until dirt particles are softened (approximately 15 minutes); then lightly brush with a soft bristled non-metallic brush or agitate element in cleaning solution until dirt particles are loosened. Flush element until drain water is clear. Maximum water line pressure should not exceed 40 psi.

Air dry element thoroughly before further use. Check cemented sealing gasket on top of filter element for looseness or damage. A loose gasket can be recemented. Inspect element for holes or ruptures by placing a bright light inside element and viewing from outer side. Thin spots, pin holes or the slightest rupture will render the element unfit for use. Replace damaged element.

Clean fins, inside of air cleaner body, intake stack and outlet tube with a dry lint-free cloth, and reassemble air cleaner. The thumb screw retaining the element must always have the gasket washer around its shank.

Re-set the service indicator by depressing reset button on top of indicator.

Clean Radiator Core: External surfaces of radiator core must be kept clean, straight and unobstructed to prevent blocking the air flow and causing overheating.

Flying objects such as sand, dust, leaves, twigs, bugs or other debris that plug the core or adhere to water or oil streaks impair the cooling efficiency.

Use compressed air, steam or a high pressure water stream and remove such objects opposite the air flow through the core assembly. Oil streaks should be removed using a solvent non-harmful to hoses and wiring insulation. Straighten bent fins being careful not to puncture or enlarge the openings.

Check and Adjust Transmission Shift Linkage: Inspect all mechanical control linkages to make sure all rods, cross shafts, bell cranks, ball joints and operating arms are in serviceable condition and properly adjusted. Correct any questionable condition such as loose or bent linkage, worn pins or evidence of binding or rubbing of any of the linkage components.

Adjustments for the various shift linkages are as follows:

(a) **Directional and Speed Range Shift Levers**

Check and adjust directional and speed range shift levers to insure full engagement into all detent positions without its interference.

Levers should be positioned at approximately right angles to steering column, and in line with one another so that it is convenient to shift by gripping both levers at the same time. Levers line up with markings or shift quadrant only when in neutral position.

1. Check and tighten shift quadrant mounting bolts.
2. Check and tighten U-bolts securing shift levers and mounting supports to steering column so that bolts are snug.
3. Place speed range and directional shift levers in NEUTRAL position.
4. Adjust lever positions at the ball joint assemblies at each end of the lever control rods. See Figure 34.
5. Resecure ball joint assemblies.
6. Check that levers will shift into all detent positions without interference.

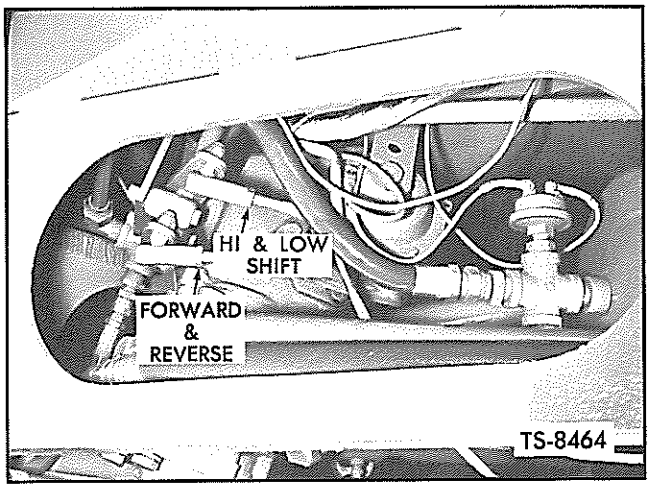


Fig. 34. Adjust Directional and Speed Range Shift Levers

(b) **Range Shift Lever**

Range shift lever engages transmission working range or travel range. Lever position may be changed at the clevis on the shift lever arm or at the clevis at transmission end of the shift lever cable.

Reassemble and tighten the applicable clevis locknut securely.

Check shift lever operation to insure positive engagement in both work and travel range positions without interference.

Check Transmission De-Clutch Valve: The transmission de-clutch valve is an air operated valve consisting of a piston, piston stop plug and the necessary "O" rings to provide an air tight body. This valve is installed in a housing bore containing a shut-off valve spool located in the transmission control cover and connected to the brake valve by a hose line.

The function of the de-clutch valve is to automatically establish a transmission neutral using air pressure from the brake system when the service brakes are applied.

When the service brakes are applied, the brake valve releases air pressure from the brake system into the de-clutch valve forcing the de-clutch valve piston to contact the shut-off valve spool inside the transmission control cover. This forces the shut-off valve spool to shift into a position that prevents oil flow to the forward clutch, disengaging the clutch and establishing a transmission neutral. The reverse clutch is not affected.

This arrangement prevents the machine from creeping forward when loading or dumping the bucket; yet permits backing away if operating on a sloping grade. It also increases the boom and bucket hydraulic system working power by utilizing the power contained at the transmission, which is normally used for engaging the forward clutch to drive the wheels.

Maintenance consists of periodically checking the de-clutch valve for proper operation as described below:

1. Place directional shift lever in NEUTRAL position and start engine.
2. Accelerate engine to approximately 1200 rpm (half throttle), lightly apply service brakes and shift directional shift lever in FORWARD position. There should be no clutch engagement (causing the machine to move forward) or drop in engine rpm as would be noticed when shifting lever into REVERSE position. A steady rpm will give a more pronounced indication.

   However, if forward movement of the machine does occur, this is an indication that the de-clutch valve is not functioning properly and must be replaced.
3. Shut down engine and remove and replace the de-clutch valve.
4. Recheck valve operation as described in Steps 1 and 2.

Transmission Clutch and Oil Cooler Pressures: Check transmission clutch, and oil cooler pressures at specified intervals, or whenever machine evidences overheating or no power in any one of the four speeds in forward or reverse direction.

Pressure checks must be taken with fluid hot (180° F. to 200° F.).

(a) **Transmission Clutch Pressure**

Pressure check should be made in all speed ranges in both forward and reverse directions. Wheels of machine should be securely blocked and parking brake applied.

1. Install an accurate gauge (0 to 400 psi capacity) in the pressure regulator valve port on transmission control cover as shown in Figure 35.
2. Check pressure with engine at IDLE.

NOTES

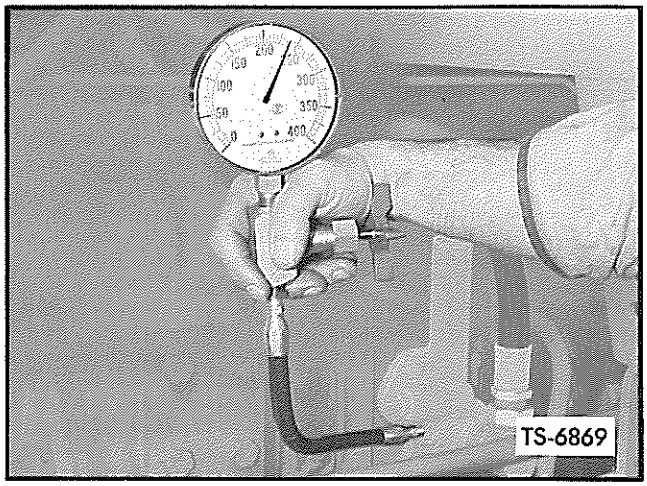


Fig. 35. Check Pressure — Transmission Clutches

3. Read gauge in NEUTRAL; then engage clutches one at a time. Minimum pressure reading should be 240 psi. With no more than 5 psi variation between clutches.

If pressure is not as specified, further trouble shooting of the transmission, torque converter and allied hydraulic system by a qualified mechanic is required.

(b) **Oil Cooler Pressure Drop – Check These Pressures**

The drop in pressure across the oil cooler at bottom of radiator will indicate whether oil cooler has or is becoming plugged with foreign material causing overheating.

Pressure check must be made with fluid hot (180° F. to 200° F.) using accurate gauges (0 to 100 psi capacity) at 2000 rpm.

1. Install tachometer on engine. Install gauges in cooler IN and cooler OUT pressure ports as shown in Figures 36 and 37.

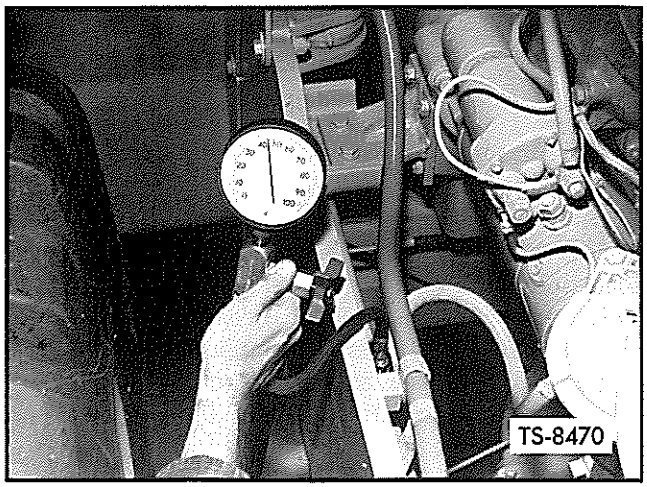


Fig. 36. Check Pressure — Oil Cooler IN

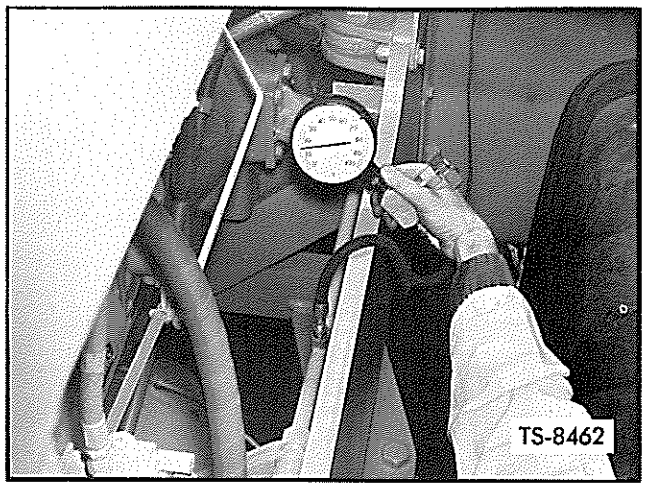


Fig. 37. Check Pressure — Oil Cooler OUT

2. Attach safety links, apply parking brake and shift directional lever into NEUTRAL position.

3. With the aid of a helper, read gauges at steady 2000 rpm, and subtract oil cooler OUT pressure from oil cooler IN pressure to get pressure drop. Pressure drop should be between 25 psi and 55 psi.

If the pressure equals or exceeds 55 psi it will be necessary to thoroughly clean or replace the oil cooler and/or the radiator assembly.

Check Boom and Bucket Pressure: The boom and bucket hydraulic pump is coupled to the drive line and operates as soon as the engine is started. The pump draws fluid from the reservoir and forces it under pressure into the boom and bucket control valve.

Maintenance consists of periodically checking the pressure in the system.

1. Remove four mounting bolts securing access plate to check and adjust boom and bucket pressure.

2. Use a hydraulic pressure gauge of at least 3000 psi capacity. With engine shut down, move boom control lever into RAISE position and hold to prevent hydraulic oil draining while attaching gauge.

3. Remove pipe plug and attach gauge as shown in Figure 38. Attach safety links, apply parking brake and block wheels.

4. Start engine, place speed range selector lever

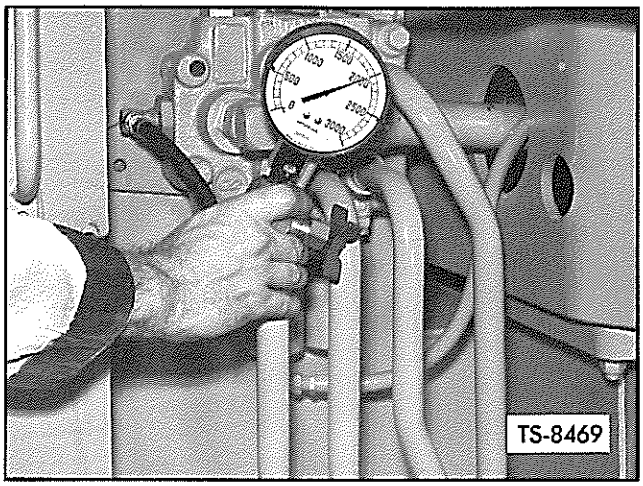


Fig. 38. Check Pressure — Boom and Bucket Control Valve

in fourth (HI) speed range and directional shift lever in FORWARD, and accelerate engine to maximum rpm to stall converter. Rotate bucket into full close position to engage hydraulic system. When engine rpm drops to its lowest point — gauge should read 2100 psi. If reading is not as specified, shut down engine and adjust valve.

DO NOT STALL CONVERTER MORE THAN 30 SECONDS AT ANY ONE TIME.

5. Remove acorn nut on end of adjusting screw, and loosen locknut. Insert screwdriver and turn screw clockwise to increase pressure, counterclockwise to decrease pressure. See Figure 39. Turn screw in increments of approximately one revolution or less, set locknut, and retake reading. Repeat until gauge reads 2100 psi.

6. Shut down engine, set locknut, and replace acorn nut; then move boom control lever into RAISE position and hold to prevent hydraulic oil draining while removing gauge. Remove gauge line from valve, and reinstall plug.

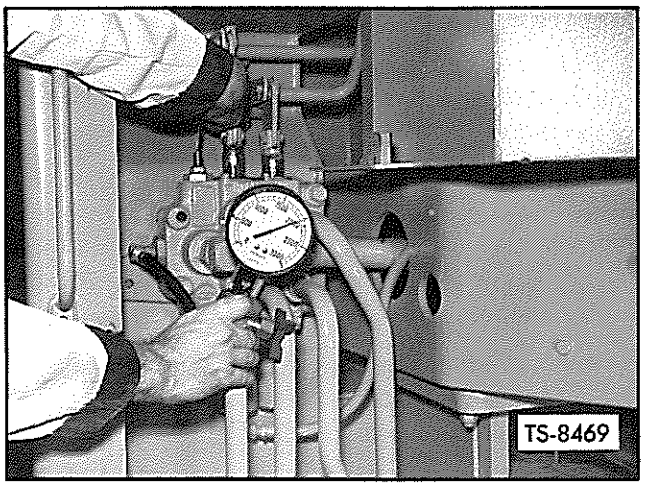


Fig. 39. Adjust Pressure — Boom and Bucket Control Valve

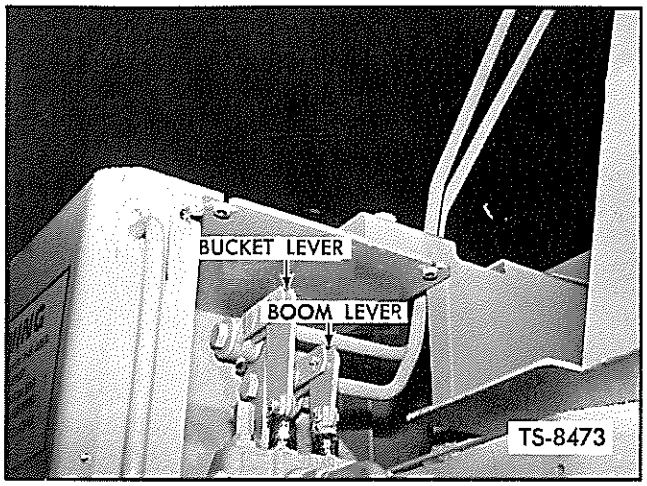


Fig. 40. Adjust Boom and Bucket Control Levers

Adjust Boom and Bucket Control Levers: The control levers are properly set at the factory. An adjustment is provided by clevises connected directly to the levers to permit changing angle of levers if desired and to insure that spools shift into all positions.

With engine shut down, and bucket on the ground, place levers in HOLD (neutral) position. The adjustment can be made as follows: See Figure 40.

1. Loosen locknut on control rod.
2. Remove cotter and clevis pin.
3. Turn clevis clockwise to move lever forward: counterclockwise to move lever toward the rear.
4. When lever is set where desired, attach clevis with pin and cotter and tighten locknut securely.
5. Check that levers shift into all positions without interference.

Clean and Tighten Electrical Connections: Periodically inspect and check all wiring and connections on electrical components such as the batteries, cranking motor, voltage regulator, alternator, solenoid switch, relays, instruments and switches for worn, cracked, broken or frayed insulation and loose terminal connections. Check for frayed or corroded external ground straps and corrosion on battery terminal posts.

Where inspection reveals dirt, looseness or damage, clean, tighten and adjust or replace as

necessary depending on existing conditions.

Note: *Maintenance personnel must observe the following precautions to prevent the possibility of serious injury or excessive damage to electrical system components when servicing the "Delcotron" charging system.*

1. WHEN INSTALLING BATTERIES, MAKE SURE BATTERIES AND "DELCOTRON" POLARITIES ARE THE SAME —

When installing a battery, always make absolutely sure the ground polarity of the battery and the ground polarity of the "Delcotron" are the same. If a battery of the wrong polarity is connected into the charging system or if a battery is reversed when installing it, the battery is directly shorted through the diodes. Consequently the diodes and machine wiring are endangered by high current flow. Burned wiring harness and burned "open" diodes probably will result.

2. BOOSTER BATTERIES MUST BE PARALLELED —

When connecting a booster or "slave" battery, make certain to connect the negative battery terminals together and the positive battery terminals together. Failure to observe this precaution will result in the same damage as described in the caution above.

3. BATTERY CHARGER AND BATTERY POLARITIES MUST AGREE —

When connecting a charger to the battery, connect the charger positive lead to the battery positive terminal and the charger negative lead to the battery negative terminal. Failure to follow this procedure will result in the same damage as described in the first caution.

4. NEVER OPERATE "DELCOTRON" ON OPEN CIRCUIT —

Never operate the "Delcotron" on open circuit. With no battery or electric load in the circuit (open circuit), the "Delcotron" can build up high voltages which could be extremely dangerous to anyone who might accidentally touch the "Delcotron" battery terminal. Before making tests or "on the machine" checks, it is prudent to make sure that all connections in the circuit are tight and secure.

5. DO NOT SHORT ACROSS OR GROUND ANY TERMINALS OF THE "DELCOTRON" OR REGULATOR —

Do not short across or ground any of the terminals on the "Delcotron" or regulator. Any artificial circuit set up by purposely grounding or shorting any of the "Delcotron" or regulator terminals can cause serious electrical malfunctions that might endanger components of the electrical system.

6. DO NOT POLARIZE THE "DELCOTRON" —

Do not attempt to polarize the "Delcotron". Polarizing the d. c. type of generator is necessary to insure that generator and battery polarity are the same. "Delcotron" polarizing however is not necessary since the voltage developed within the "Delcotron" is of both polarities and the diode rectifier automatically controls the direction of current flow. It is of vital importance as discussed in the first precaution that the battery ground and the "Delcotron" ground be of the same polarity for diode protection.

7. BEFORE DOING ANY WELDING, DISCONNECT GROUND CABLE FROM BATTERY AND ELECTRICAL LEAD FROM BATTERY TERMINAL ON ALTERNATOR —

Before doing any welding on machines equipped with an alternator, disconnect the ground cable from the battery and the electrical lead from the battery terminal on the alternator.

Clean Axle Breathers: Each 500 operating hours inspect breathers on front and rear axle housings.

Housing breathers have a loose fitting cap that should be rotated.

Oil leakage past breathers, thrust caps, carrier housing or pinion cap seals indicates that breathers may be clogged. Unscrew breathers, wash in solvent, dry and reinstall.

Check Steering Pressure: The steering hydraulic pump is coupled to the drive line and operates as soon as the engine is started. The pump draws fluid from the reservoir and forces it under pressure into the control valve mounted at the base of the steering gear.

Maintenance consists of periodically checking the pressure in the system.

Note: *Remove safety links, if attached between tractors.*

Warning: *Do not stand or work in step area(s) when machine is running — No room for a man in this area when machine is turned.*

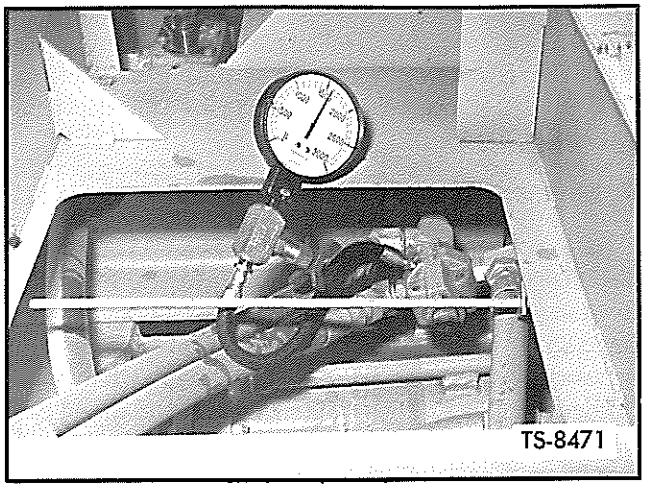


Fig. 41. Check Pressure — Steering Relief Valve

1. Use a hydraulic pressure gauge of at least 3000 psi capacity. With engine shut down, remove pipe plug on side of relief valve and connect gauge as shown in Figure 41.
2. Start engine and accelerate to maximum rpm.
3. Turn tractor right or left and hold against the stops. Take a pressure gauge reading which should be 1500 psi.
4. If reading is not as specified, remove acorn nut on valve, and loosen locknut. Insert screwdriver and turn clockwise to increase pressure, counterclockwise to decrease pressure. See Figure 42. Turn screw in increments of approximately one revolution or less, set locknut, and retake reading. Repeat until gauge reads 1500 psi.
5. Shut down engine, set locknut, and replace acorn nut. Remove gauge from valve, and reinstall pipe plug.

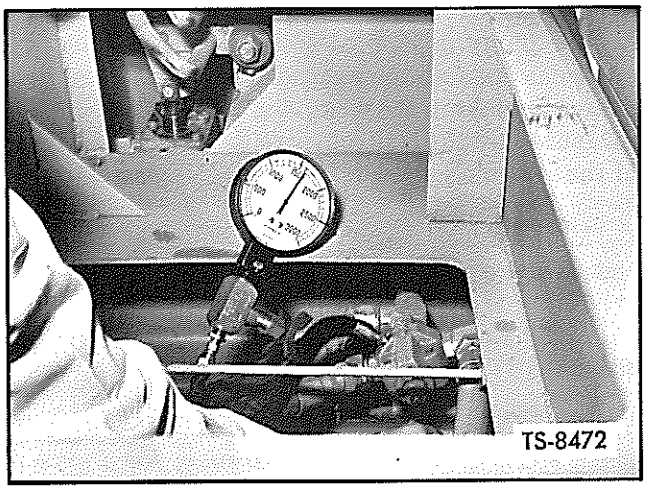


Fig. 42. Adjust Pressure — Steering Relief Valve

Adjust Drag Link Ball Joints: Adjust front and rear ball joints on drag link whenever excess looseness develops. This condition will be indicated by an increase of free play at the steering wheel before tractor responds to turning action.

Remove cotter and turn slotted adjusting plug to remove all slack in ball joints at each end of drag link as shown in Figure 43.

Tighten Mounting Bolts: Mounting bolts on such components as engine, torque converter, transmission, steering gear, axles and prop shafts will occasionally work loose and cause supports and brackets to wear rapidly. Alignment difficulty may also develop.

Inspect all mounting bolts for evidence of looseness, stripped threads, cracked or broken heads or any other signs of damage.

Remove and replace damaged or missing mounting bolts and tighten all loose mounting bolts as necessary. Refer to Bolt Torque Chart at rear of manual.

Steam Clean Machine: Periodically or whenever working machine in muddy or swampy areas or when machine begins to cake up with excessive dirt, the entire machine should be steam cleaned. If allowed to accumulate, dirt will find its way into the various systems when plugs, covers or caps are removed or during unit replacement, eventually causing serious damage and downtime.

Dirt packed on or around the axle, transmission, torque converter and engine breathers will cause oil losses.

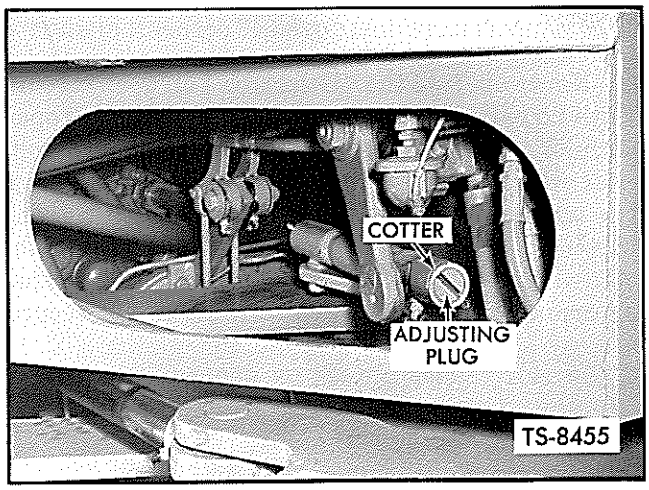


Fig. 43. Adjust Drag Link Ball Joints

Steam is the most effective and recommended method of cleaning a dirty machine. If unavailable use a spray of mineral spirits or a similar solvent non-harmful to exposed hoses, lines and electrical wiring.

Note: *Prior to steam cleaning cover all alternator and cranking motor openings to protect them from the force of the steam jet.*

Service Reservoir Return Filter Assembly: The hydraulic reservoir return filter assembly installed inside the hydraulic reservoir consists of a gasket, spring retainer assembly and spring. The reservoir return filter assembly is designed and installed in a manner that permits the filter assembly to act as a relief valve so that oil can be by-passed if the filter element becomes excessively plugged with foreign material. This filter should be replaced every 500 hours. See Figure 44.

1. Remove filter assembly from hydraulic reservoir by removing 6 mounting bolts and lockwashers.

2. Remove attaching hardware securing the spring retainer assembly and filter element. Inspect condition of cover plate "O" Ring at this time and replace if not in a good serviceable condition.

3. Remove filter element from hydraulic reservoir. Discard the filter element.

   Note: *Do not attempt to clean or re-use the dirty filter element.*

4. Resecure the element using new gasket and spring retainer assembly.

5. Resecure the return filter assembly in the hydraulic reservoir with mounting bolts and lockwashers.

1000 HOUR MAINTENANCE OPERATIONS

- **ENGINE MAINTENANCE**
- **CHECK AND REPAIR BUCKET CUTTING EDGE**
- **CHECK BOOM TO BUCKET LINKAGE**
- **INSPECT, TEST AND LUBRICATE ELECTRICAL UNITS**
- **ADJUST STEERING GEAR**
- **INSPECT FRAME**

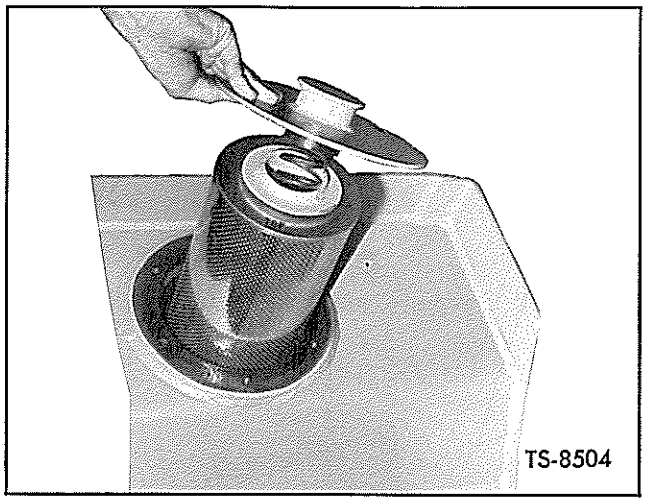


Fig. 44. Reservoir Return Filter Assembly

Engine Maintenance: Refer to Operation and Maintenance Manual of engine manufacturer for maintenance instructions of engine and accessories.

Check and Repair Bucket Cutting Edge: The bucket should be periodically inspected for badly ripped, cracked, chipped or worn-out cutting edges (bottom and sides).

If at any time it becomes necessary to replace the bucket cutting edge (bottom and/or sides), replacement parts can be ordered separately. Refer to Parts Manual for applicable part numbers.

To replace bucket cutting edges, follow the procedure outlined below and as shown in Figure 45.

1. Align and clamp straight edge so that back edge will line up with front edge of bucket sheets as shown in View 2.

2. Measure segment length dimension up on each side cutting edge from bottom cutting edge and scribe lines A as shown in View 1.

3. Guide cutting torch through scribe lines A and down rear edge of side cutting edges to bottom cutting edge as shown in View 1; then continue cutting along back edge of straight edge as shown in View 2. Remove and discard cut-out section from bucket. Grind all rough edges on bucket smooth.

4. Equally space three flat plates on bucket sheet and tack weld in three places as shown in View 3.

5. Position and align new cutting edge flush against bucket sheet and flat plates and secure

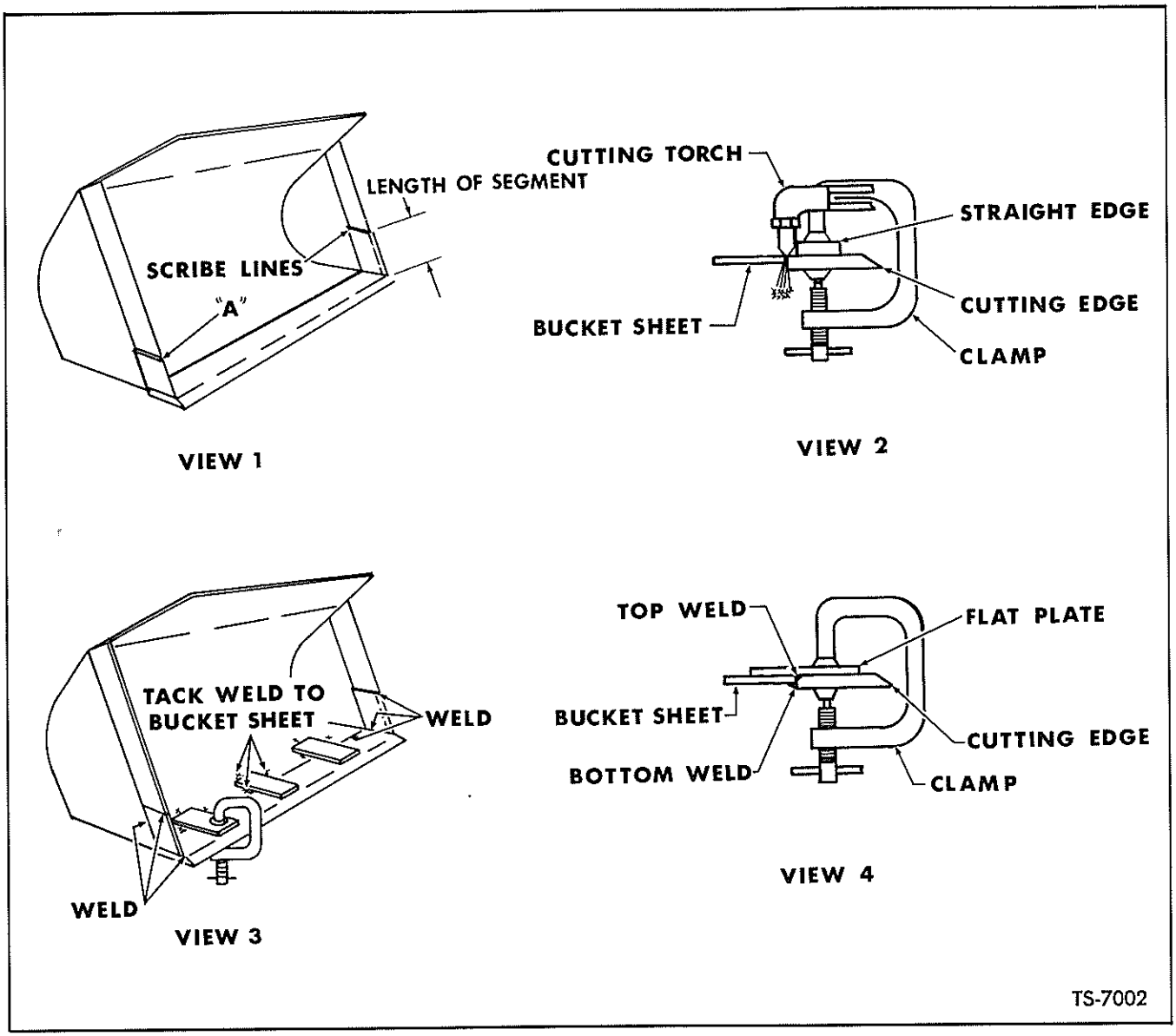


Fig. 45. Repair Bucket Cutting Edge

in place with clamps as shown in View 3.

6. Alternately tack weld cutting edge to bucket sheet on top and bottom.

7. Remove flat plates and continuously weld cutting edge to bucket sheet on both top and bottom sides as shown in Views 3 and 4.

8. Clamp side cutting edge flush against bucket sheet and bottom cutting edge and weld securely.

9. Grind all welds inside bucket to present a smooth surface for entry of material; grind the residue of the tack welds from bucket sheet.

Note: *Using a 5/16 inch diameter low hydrogen electrode equivalent to AWS-E-10016.*

Check Boom to Bucket Linkage: All Model 75 articulated machines are equipped with non-adjustable pushrods. The only boom to bucket linkage adjustment to be made on machines equipped with non adjustable pushrods consists of either adding or removing material on bucket stops. Proceed with boom to bucket checkout as follows:

1. Start engine and raise boom to full up position.

2. Shut off engine and free fall bucket until bucket stops or contacts boom.

3. Adjust bucket stops to no more than 1/16 inch space, one stop to the other by grinding or welding on bucket stops.

Inspect, Test and Lubricate Electrical Units:

Maintenance performed on the various electrical components usually consists of cleaning, lubricating, minor testing and adjusting, and replacing defective or worn-out parts.

At specified intervals lubricate alternator and cranking motor sparingly. Excessive lubrication can result in premature failure.

Check cranking motor operation with a substitute battery source known to be fully charged and in good condition.

In general, proper functioning of the alternator and voltage regulator can usually be determined by the following battery conditions: (1) if batteries are kept fully charged, except when under unusually severe loads and (2) if no more than the usual amount of water is required to keep them filled.

When testing alternator for charging rate use accurate test meters.

Inspect wires, cables and terminals for tight connections, cleanliness and evidence of deterioration or corrosion.

Blow out accumulated dust and dirt, and clean exterior surfaces of all electrical units.

Complete service facilities for electrical system components are available at any authorized Delco-Remy or United Motors sales and service outlet.

Adjust Steering Gear: The steering gear assembly consists of a manual gear of the recirculating ball type with a hydraulic control valve mounted at the base.

The manual gear requires two adjustments to maintain proper operation: (1) worm bearing adjustment, (2) overcenter or pitman shaft adjustment. The worm bearing adjustment is performed only at the time the control valve is assembled to the gear. The adjusting nut is securely staked in place and does not require further attention.

The overcenter or pitman shaft adjustment, however, should be periodically checked and adjusted to remove lash between pitman shaft gear and the worm gear ball nut. Adjustment is indicated by too much free play at steering wheel before wheels respond to turning action. Adjustment is as follows with engine shut off.

1. Disconnect steering drag link from pitman arm.

2. Turn steering wheel gently from one stop all the way to the other stop, carefully counting the total number of turns. Then turn wheel back exactly half way to center position. Mark wheel at top or bottom center with piece of tape.

3. Measure the pull at the rim of the steering wheel required to keep the wheel in motion. Take the highest reading of the spring scale as the wheel is pulled through the center position. This pull can be measured by attaching a spring scale to the rim of the wheel with a piece of cord, then pulling on the spring scale to turn the wheel. The line of the scale should be kept tangent to the rim of the wheel.

   The proper pull at the wheel rim under these conditions should be 1⅛ to 2 lbs.

4. Loosen locknut and turn adjusting screw clockwise to increase pull at wheel, counterclockwise to decrease the pull. See Figure 46. Reset locknut and recheck pull, as it must be within the specified limits after the locknut is tightened.

5. Reassemble drag link to pitman arm and adjust drag link ball joints.

Inspect Frame: The frame is the basic backbone of the entire machine that provides structural support directly or indirectly for completely mounting all assemblies, sub-assemblies and in-

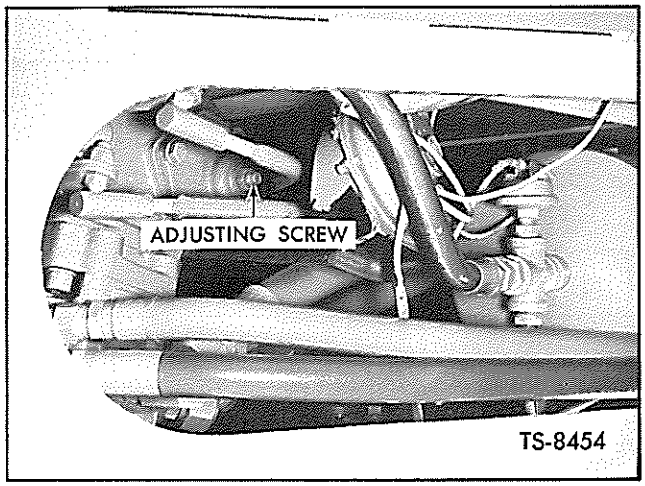


Fig. 46. Adjust Steering Gear

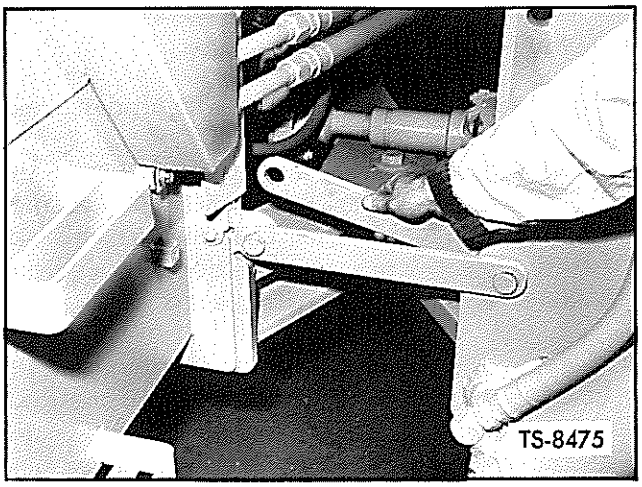


Fig. 47. Check Safety Links

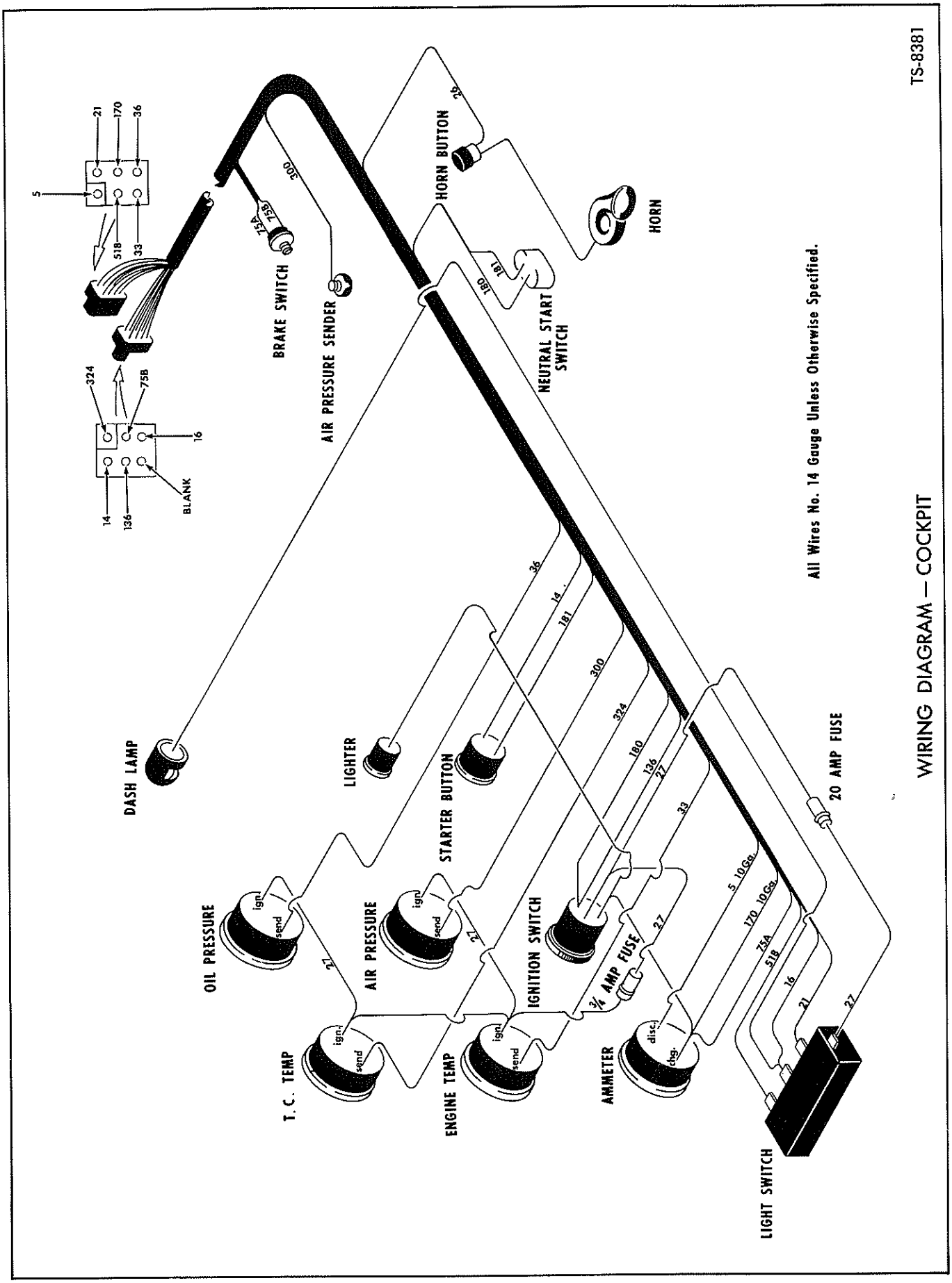
dividual components necessary for machine construction and operation.

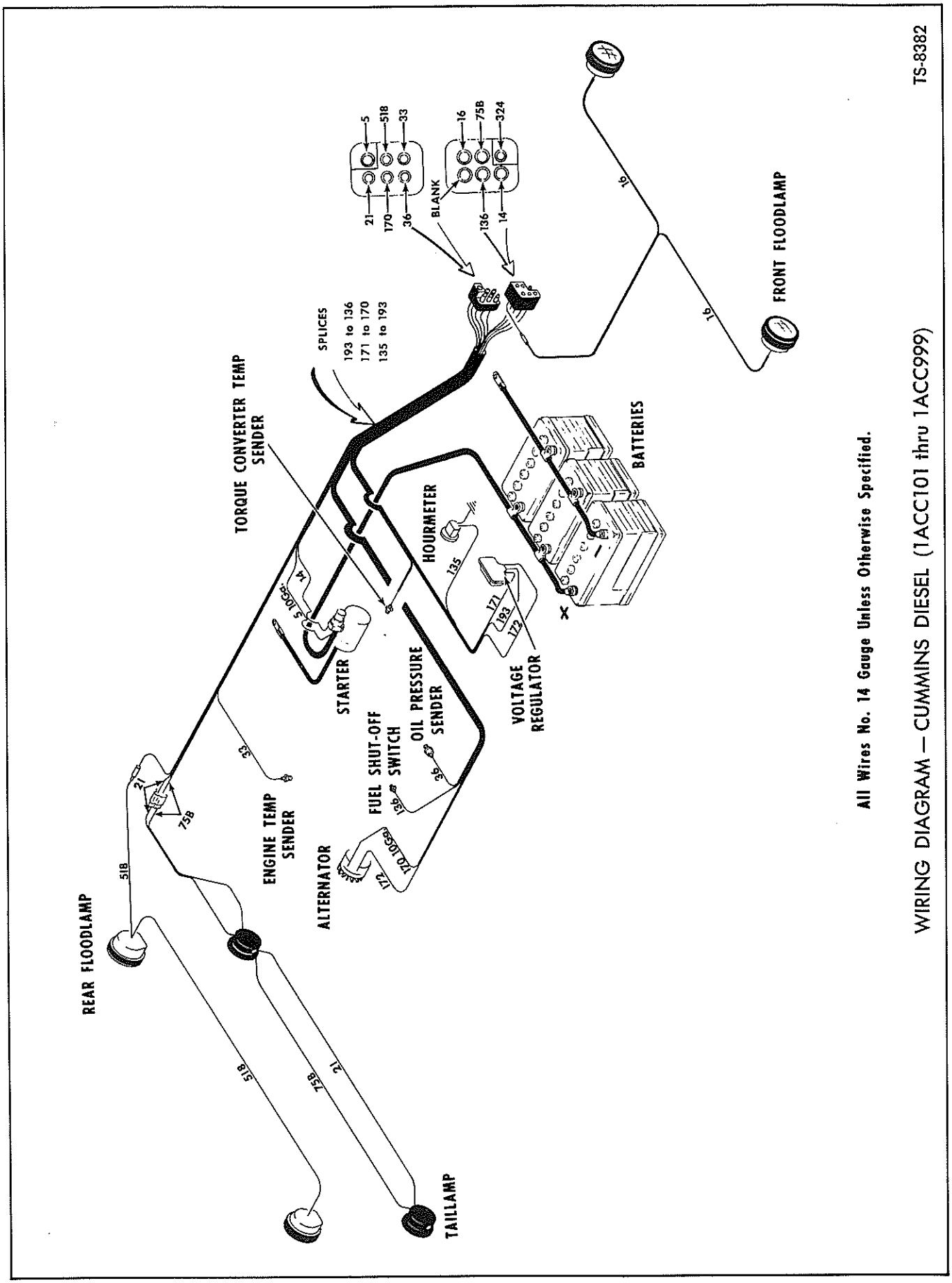
The frame structure and all supporting assemblies such as cradle, boom and bucket, bell cranks, pushrods, upper and lower pivot tubes, crossmembers, reinforcing gussets and brackets should be periodically inspected for cracks, bends, broken welds, warping or any other signs of damage that would endanger proper operation.

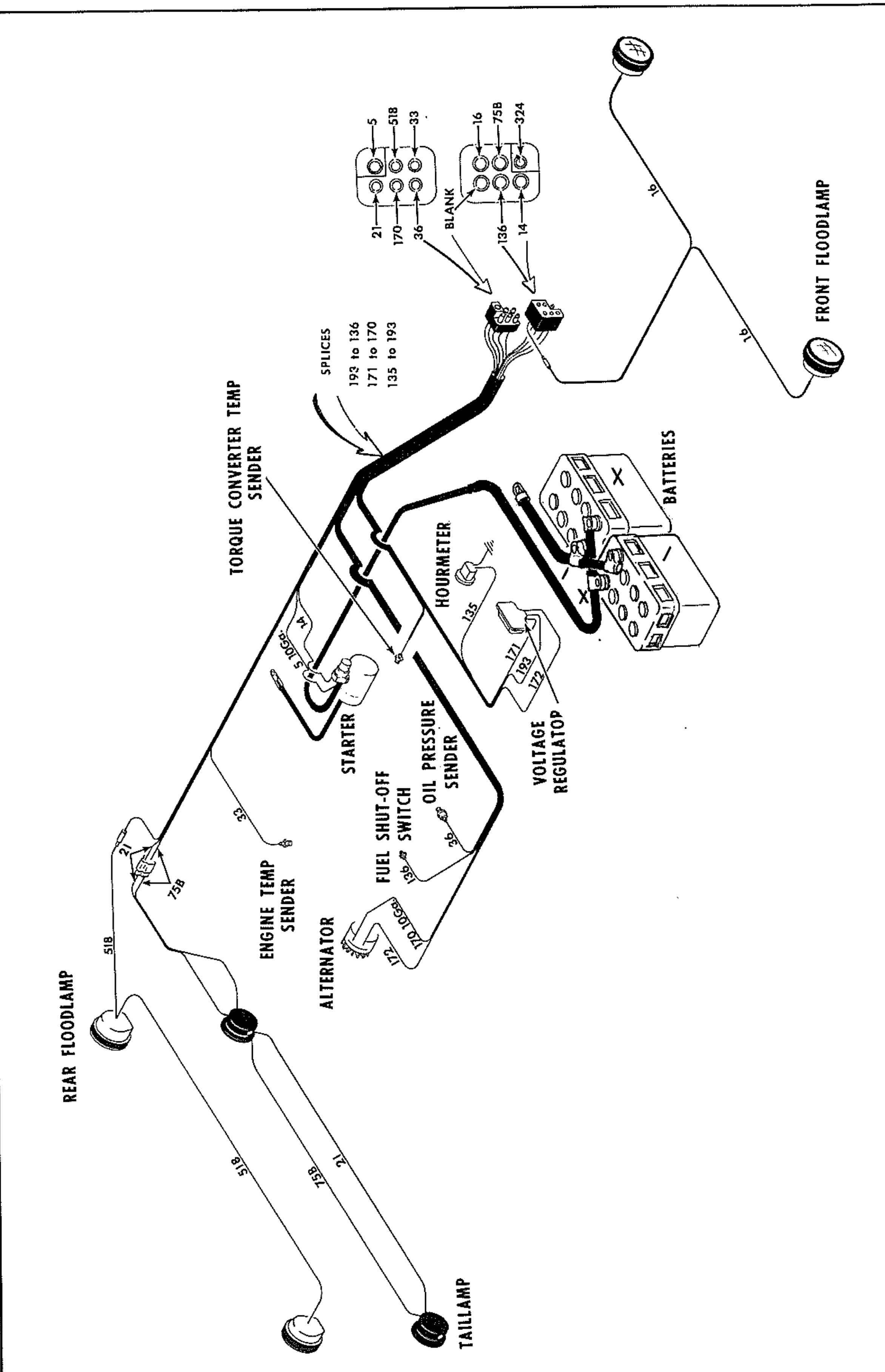
Frame damage should be immediately repaired or corrected as necessary to maintain the frame assembly in good serviceable condition.

Note: *Adjust, repair or replace safety links that do not connect properly or have been damaged. See Figure 47.*

NOTES


TS-8381
WIRING DIAGRAM — COCKPIT
All Wires No. 14 Gauge Unless Otherwise Specified.
DASH LAMP
LIGHTER
STARTER BUTTON
OIL PRESSURE
AIR PRESSURE
IGNITION SWITCH
T. C. TEMP
ENGINE TEMP
AMMETER
LIGHT SWITCH
20 AMP FUSE
¾ AMP FUSE
BRAKE SWITCH
AIR PRESSURE SENDER
HORN BUTTON
HORN
NEUTRAL START SWITCH
BLANK
ign.
send
disc.
chg.
5
21
170
36
518
33
324
75B
16
14
136
75S
75A
300
181
180
27
33
5 10Ga.
170 10Ga.
75A
518
16
21
27

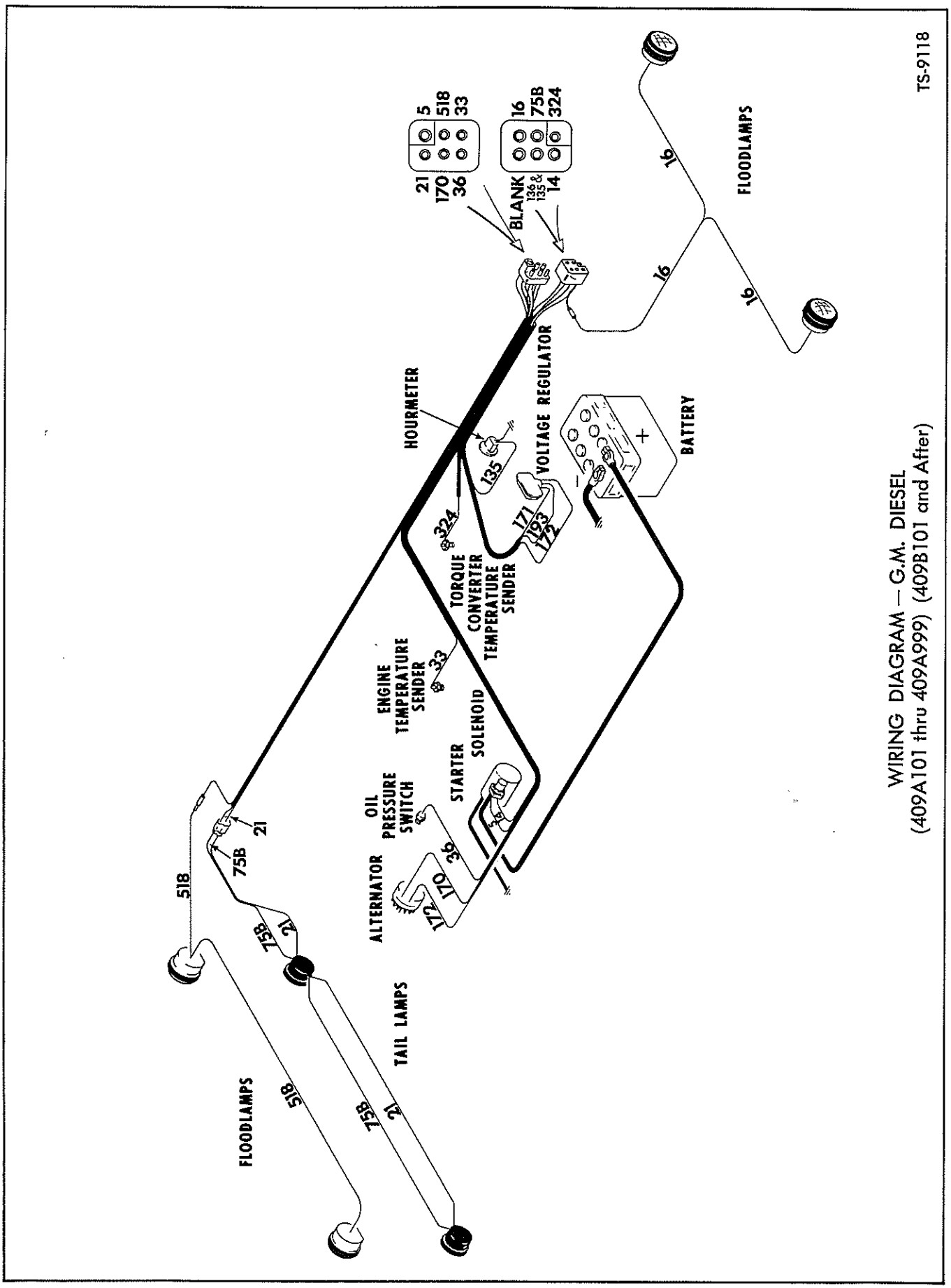

TS-8382
WIRING DIAGRAM — CUMMINS DIESEL (1ACC101 thru 1ACC999)
All Wires No. 14 Gauge Unless Otherwise Specified.
REAR FLOODLAMP
TAILLAMP
FRONT FLOODLAMP
BATTERIES
ALTERNATOR
STARTER
ENGINE TEMP SENDER
FUEL SHUT-OFF SWITCH
OIL PRESSURE SENDER
VOLTAGE REGULATOR
HOURMETER
TORQUE CONVERTER TEMP SENDER
SPLICES
193 to 136
171 to 170
135 to 193
BLANK
5
518
33
21
170
36
16
75B
324
136
14
16
518
21
75B
14
5
135
171
193
172
X



TS-8799

All Wires No. 14 Gauge Unless Otherwise Specified.

WIRING DIAGRAM — CUMMINS DIESEL
(408A101 thru 408A999) (408B101 and After)


TS-9118
WIRING DIAGRAM — G.M. DIESEL
(409A101 thru 409A999) (409B101 and After)
FLOODLAMPS
16
16
16
FLOODLAMPS
5
518
33
21
170
36
16
75B
324
BLANK
136 & 135
14
HOURMETER
VOLTAGE REGULATOR
BATTERY
135
324
171
193
172
TORQUE CONVERTER TEMPERATURE SENDER
ENGINE TEMPERATURE SENDER
33
STARTER SOLENOID
OIL PRESSURE SWITCH
36
ALTERNATOR
170
172
518
75B
21
21
75B
518
TAIL LAMPS
FLOODLAMPS
518
75B
21

BOLT TORQUE CHART

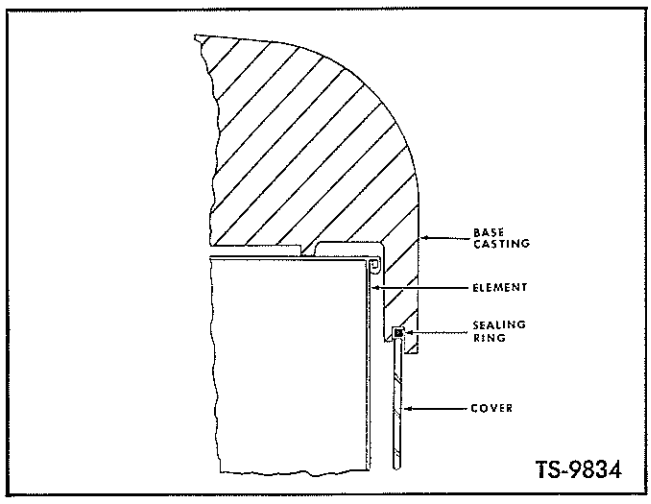
FT.-LBS.

Location	Thread	Torque
Axle Mounting Bolts	1"–14	790
Bucket Cylinder Cap	½"–20	90
**Converter Filter Center Bolt – A.C. Filters	–	50±5
Fleetguard Filters	–	30±5
Converter, Housing Mounting	⅜"–16	23
Engine Support to Flywheel Housing	½"–13	33
Engine Support to Frame	½"–20	90
Engine Trunnion Mounting	⅝"–18	185
Prop Shaft – Upper	⅝"–24	25
Prop Shaft – Upper	⅜"–24	50
Prop Shaft – Lower	⅜"–24	50
Prop Shaft – Lower	7/16"–20	75
Tractor Pivot (Nut End Only)	1"–14	790
Transmission Bracket to Frame	½"–20	90
Transmission to Bracket	¾"–16	153
*Wheel Nuts	¾"–16	475

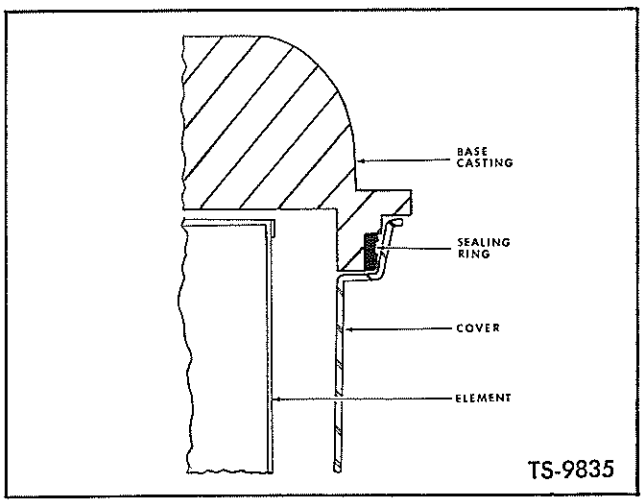
BOLTS NOT LISTED ARE TO BE DRAWN UP TIGHT IN MANNER CONSISTENT WITH GOOD WORKMANSHIP.

*Wheel nut spherical seat in disc must be concentric with stud — ream if necessary.

**A.C. Filters and Fleetguard Filters may be identified by the characteristics of the sealing area between cover and base casting. See below.



A.C. Spark Plug Div. Filters



Fleetguard Div. Filters

Materials and Specifications Subject to Change Without Notice or Obligation

SPECIFICATIONS AND SERVICE DATA

ENGINE

	Diesel	Diesel	Diesel
Make	Cummins	Cummins	G.M.
Model	C-464-C	CT-464-C	4-71N
Number of cylinders	6	6	4
Bore and stroke	4 7/16" x 5"	4 7/16" x 5"	4 1/4" x 5"
Displacement, cu. inches	464	464	284
Maximum torque, ft. lbs.	377 @ 1400	403 @ 1750	432 @ 1400
Governed horsepower	146	163	163
Governed rpm	2300	2300	2300
Low idle rpm	550-600	550-600	450-500
High idle rpm	2400-2500	2400-2500	2400-2500
*Stall rpm	1650-1750	1900-2000	1800-1900

*Note: Stall rpm is the maximum obtainable rpm with oil at operating temperature (180° F. to 200° F.), parking brake applied, wheels blocked, directional and speed range levers in FORWARD — 4th (HI), and bucket held in full close position.
Stall rpm is applicable to altitude of 600 ft. and ambient temperature of 70° F. Due to the many combinations of altitude and temperature possible in the field, space does not permit publishing here all the corrections to the stall rpm indicated to accommodate such variations. It is suggested the engine manufacturer's distributor be contacted to determine the correction necessary for altitude and temperature in your application.

ELECTRICAL SYSTEM

Fuses:
- Gauge circuit ..... AGC ¾ amp
- Light circuit ..... SFE 20 amp
- Lighter circuit ..... Self contained 20 amp

Instruments:
- Panel gauges ..... 12 volt
- Sender units ..... 12 volt

Lamps:
- Back-up ..... 12 volt, 35 watt
- Dash ..... 12 volt, 4 C.P.
- Tail and stop ..... 12 volt, 32/4 C.P.
- Head ..... 12 volt, 35 watt

Alternator ..... 12 volt
Starting motor ..... 12 volt
Voltage regulator ..... 12 volt

FUEL SPECS

Fuel Oil ..... No. 2 Cetane 40 min.

BRAKE FLUID

SAE 70R3, Clark No. 850487

BATTERIES

	1ACC101 thru 1ACC999	408A101 and after	409A101 and after
Make and Part No.	Clark 1800613	Clark 1310120	Clark 1671369
Number	3-12 volt	2-12 volt	1-12 volt
Electrical system	12 volt	12 volt	12 volt
Grounded terminal	Negative	Negative	Negative
Specific gravity	1.230-1.260	1.230-1.260	1.230-1.260

(Not over 0.050 variance between adjacent cells)

PRESSURES

Engine oil	Idle rpm	Governed rpm
Cummins	10 psi min.	Approx. 30 psi.
G.M.	11 psi min.	30 psi min.

Air compressor range ..... 80-105 psi

Boom and bucket hydraulic system ..... 2100 psi at engine stall rpm and one set of cylinders against stops

Steering hydraulic system ..... 1500 psi at maximum engine rpm and tractor halves turned against stops

Transmission clutches ..... 240 psi minimum: (No more than 5 psi variation between clutches) at idle in all speed ranges in both forward and reverse direction and oil temperature 180°F.-200°F.

TRAVEL SPEEDS

Forward & Reverse MPH	1st	2nd	3rd	4th
	4.5	8.4	16.3	31.0
(km/hr)	(7,2)	(13,5)	(26,2)	(49,2)

Materials and Specifications Subject to Change Without Notice or Obligation

CAPACITIES

(Approximate Quantities)

	U.S. MEASURE	METRIC MEASURE LITERS	IMPERIAL MEASURE
Engine crankcase and system – Cummins	8 gal.	30.32	6.46 gal.
G.M.	5 gal.	19.25	4.2 gal.
Cooling system	10 gal.	38.5	8.4 gal.
Frnt drive axle differential	3 gal.	11.4	2.5 gal.
Front drive axle planetary hubs (each)	5 qts.	4.7	4.2 qts.
Fuel tank	75 gal.	283.9	62.4 gal.
Hydraulic system	60 gal.	227.2	50.0 gal.
Rear drive axle differential	3 gal.	11.4	2.5 gal.
Rear drive axle planetary hubs (each)	5 qts.	4.7	4.2 qts.
Torque converter and transmission	6.5 gal.	24.6	54 gal.
Midmount bearing	2 qts.	1.9	1.7 gal.

TIRE OPTIONS

SIZE	PLY RATING	INFLATION PSI FRONT	INFLATION PSI REAR	TYPE
14.00-24	12	45	45	Traction
16.00-24	12	35	35	Traction
17.5 -25	12	35	35	Traction
20.5 -25	12	30	30	Rock

NOTE: Other Options Available

The following table indicates the amount of calcium chloride and water which may be added to tires where increased weight and tractive ability are desired.

TIRE SIZE	USE $CACL_2$ (POUNDS)	DISSOLVE IN WATER (GALLONS)	TOTAL GALLONS SOLUTION	WEIGHT INCREASE EACH TIRE (POUNDS)
14.00-24	151	43	50	510
16.00-24	192	54	63	640
17.5 -25	231	55	67	680
20.5 -25	278	80	93	944

The solution indicated above, when using a commercial calcium chloride flake of 77-80%, should protect the tire against freezing down to 30° F. below zero. Solution strength can be tested with a battery hydrometer. Reading at 60° F. should be 1218.

It is recommended that the rear tires be hydro-inflated to the above table if optional counterweight is not used. It is not permissible to use both hydro-inflation and optional counterweight.

NOTES