CLARK EQUIPMENT INDUSTRIAL TRUCK DIVISION CLARK EQUIPMENT

OPERATORS MAINTENANCE PARTS MANUAL

FOR

CLARKLIFT 40 B

CODE GOV'T 0-213

CLARK EQUIPMENT COMPANY

PUBLISHED BY

TECHNICAL SERVICE DEPARTMENT,
BATTLE, CREEK, MICHIGAN, U.S.A.

OPERATORS
MAINTENANCE
PARTS
MANUAL

FOR

CY-60

CLARK EQUIPMENT COMPANY

SAFETY INSTRUCTIONS FOR MAINTAINING INDUSTRIAL TRUCKS

Powered industrial trucks may become hazardous if adequate maintenance is neglected. Therefore, adequate maintenance facilities, personnel and procedures should be provided.

Maintenance and inspection of all powered industrial trucks should be performed in conformance with the recommendation in this manual and the following practices.

1. A scheduled preventive maintenance, lubrication, and inspection system should be followed.

2. Only qualified and authorized personnel should be permitted to maintain, repair, adjust, and inspect industrial trucks.

3. Before Leaving The Truck:

   A. Stop truck.

   B. Fully lower the load engaging means.

   C. Place directional controls in neutral.

   D. Apply the parking brake.

   E. Stop the engine or turn off power.

   F. Lock the control or ignition circuit.

   G. Block the wheels if truck is on a ramp, or being worked on.

4. Before Working On Truck:

   A. Raise wheels free of floor or disconnect power source.

   B. Use chocks or other positive truck positioning devices.

   C. Block load engaging means, innermast(s), or chassis before working under them.

   Before working on engine fuel system of gasoline powered trucks with gravity feed fuel systems, be sure fuel shutoff valve is closed.

   Before working on engine fuel system of LP gas powered trucks, close LP gas cylinder valve and run engine until fuel in system is depleted and engine stops running.

   Operation to check performance of the truck or attachments should be conducted in an authorized, safe clearance area.

5. Before Starting To Operate The Truck:

   A. Be in operating position.

   B. Depress clutch (or brake pedal on automatic transmission and electric trucks).

   C. Place directional controls in neutral.

   D. Start engine or turn on power.

   E. Before operating truck, check functioning of lift and tilt systems, directional and speed controls, steering, warning devices, brakes, and any attachment. (If used)

   F. Release parking brake.

- continued -

SAFETY INSTRUCTIONS FOR MAINTAINING INDUSTRIAL TRUCKS

6. Avoid fire hazards and have fire protection equipment present. Do not use an open flame to check level, or for leakage, of fuel, electrolyte or coolant. Do not use open pans of fuel or flammable cleaning fluids for cleaning parts.

7. Properly ventilate work area, vent exhaust fumes and keep shop clean and floor dry.

8. Handle LP gas cylinders with care. Do not drop, dent, or damage in any way.

9. Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift overload devices, guards and safety devices should be inspected regularly and maintained in a safe operating condition.

10. All parts of lift and tilt mechanisms and frame members should be carefully and regularly inspected and maintained in a safe operating condition.

11. Special trucks or devices designed and approved for hazardous area operation should receive special attention to ensure that maintenance preserves the original, approved safe operating features.

12. Fuel systems should be checked for leaks and condition of parts. Extra special consideration should be given in the case of a leak in the fuel system. Action should be taken to prevent the use of the truck until the leak has been corrected.

13. All hydraulic systems should be regularly inspected and maintained in conformance with good practice. Tilt cylinders, valves, and other similar parts should be checked to assure that "drift" has not developed to the extent that it would create a hazard.

14. Capacity, operation and maintenance instructions plates, tags, or decals should be maintained in legible condition.

15. Batteries, motors, controllers, limit switches, protective devices, electrical conductors and connections should be inspected and maintained in conformance with good practice. Special attention should be paid to the condition of electrical insulation.

16. Industrial trucks should be kept in a clean condition to minimize fire hazards and facilitate detection of loose or defective parts.

17. Modifications and additions which affect capacity and safe truck operation should not be performed by the customer or user without manufacturers prior written approval. Capacity, operation and maintenance instruction plates, tags or decals should be changed accordingly.

18. Care should be taken to assure that all replacement parts are interchangeable with the original parts and of a quality equal to that provided in the original equipment.

PLEASE NOTE

INSTRUCTIONS ON USE OF MANUAL

This Operator's Manual is published as a service reference guide and includes Specifications, Operating Instructions, Lubrication and Preventive Maintenance Instructions, and Trouble Shooting Guide.

The TABLE OF CONTENTS for this manual is printed on green paper and is placed at the front for easy reference. A separate INDEX (also printed on green paper) is placed in front of the Lubrication and Preventive Maintenance Section.

Lubrication and Preventive Maintenance Instructions are listed under the TIME INTERVALS that they should be performed.

The TIME INTERVAL is part of the page number and code number.

Example: 8H 002-0; 8H is the TIME INTERVAL (8 operating hours), 002 is the PAGE NUMBER, and -0 is a CODE NUMBER that you as a customer should disregard. The dash number or code number is for the benefit of the publisher only.

The INDEX is set up under the TIME INTERVALS that the Lubrication and Preventive Maintenance should be performed.

Example: (8 Hours)	Time Interval (H=Hours)	&	Page Number (000-)
Hydraulic Sump Tank, level check...	8H		503
Brake Pedal Free Travel, check.....	8H		303

The above states to check the sump tank fluid level every 8 operating hours and refer to page 503 for fluid recommendations etc. Also, to check brake pedal free travel at this interval and turn to page 303 for instructions.

Turn to the eight (8) hour section (8H) and then to the page listed — 503 or 303 etc. The instructions covered therein will pertain only to the checks or adjustments that should be performed at this TIME INTERVAL.

If, for instance, the Brake Pedal Free Travel is incorrect, you would then refer to the INDEX for "Brake Pedal Free Travel, adjust" which would be listed in the TIME INTERVALS following the 8 hour section.

Example: (100 Hours)	Time Interval (H=Hours)	&	Page Number (000-)
Brake Pedal Free Travel, adjust....	100H		302

Turn to the one hundred hour section (100H) and then to

INSTRUCTIONS ON USE OF MANUAL

page 302. Complete instructions as to the importance of pedal free travel, the method to check and adjust for correct free travel with illustrations are included therein.

NOTE

YOU WILL NOTE THAT AT THE BEGINNING OF EVERY SECTION A LUBRICATION AND PREVENTIVE MAINTENANCE ILLUSTRATION IS SHOWN GIVING THE LOCATION OF THE COMPONENTS TO BE SERVICED.

It is impossible to cover all types of machine operations in one manual. Operating conditions should determine the lubrication and maintenance intervals. Common sense and a close observance can best determine the frequency with which you should service your machine.

The care you give your machine will greatly determine the satisfaction and service life that you will obtain from it. A difinite maintenance program should be set up and followed. Haphazard maintenance will only lead to faulty performance and short life.

INDUSTRIAL TRUCK DIVISION

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LUBRICATION AND PREVENTIVE MAINTENANCE

TROUBLE SHOOTING GUIDE

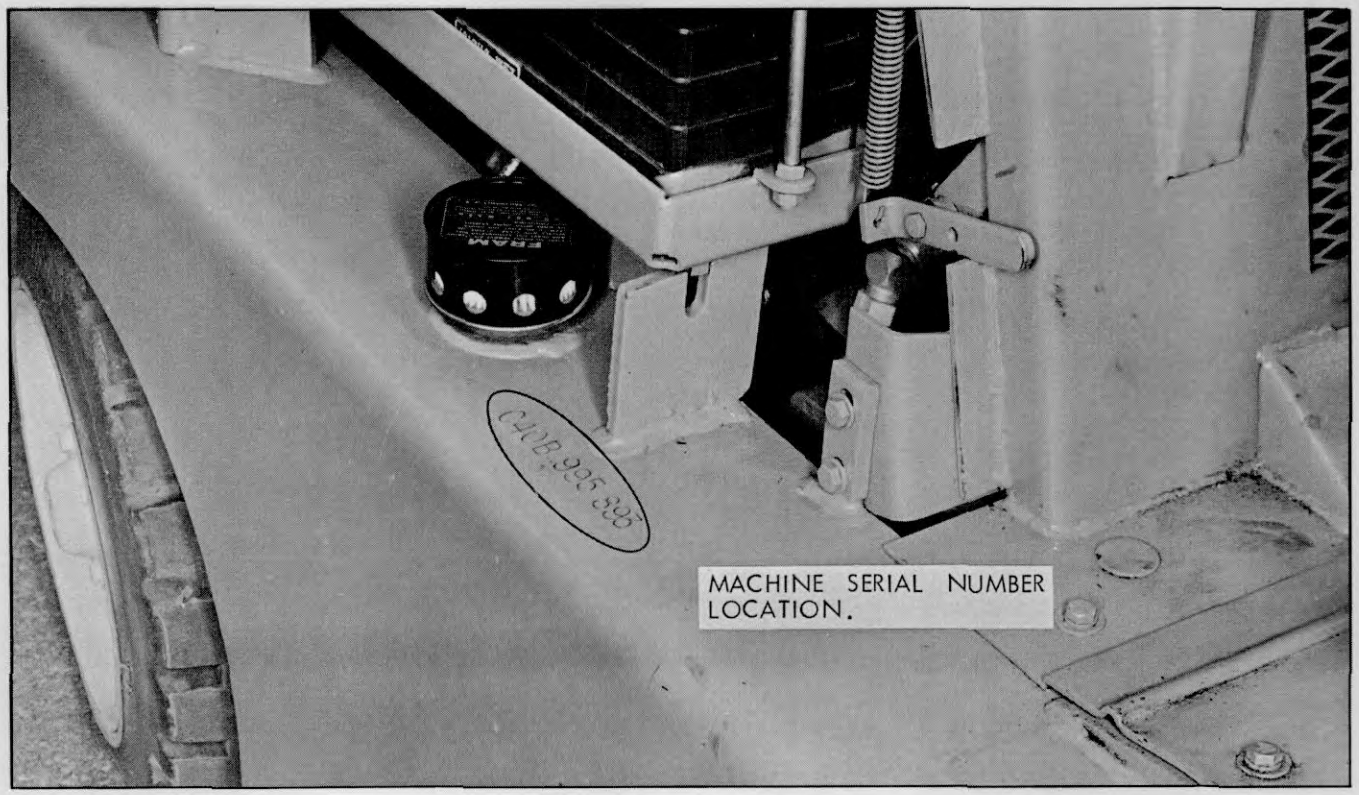


Plate 9474. Machine Serial No. Location

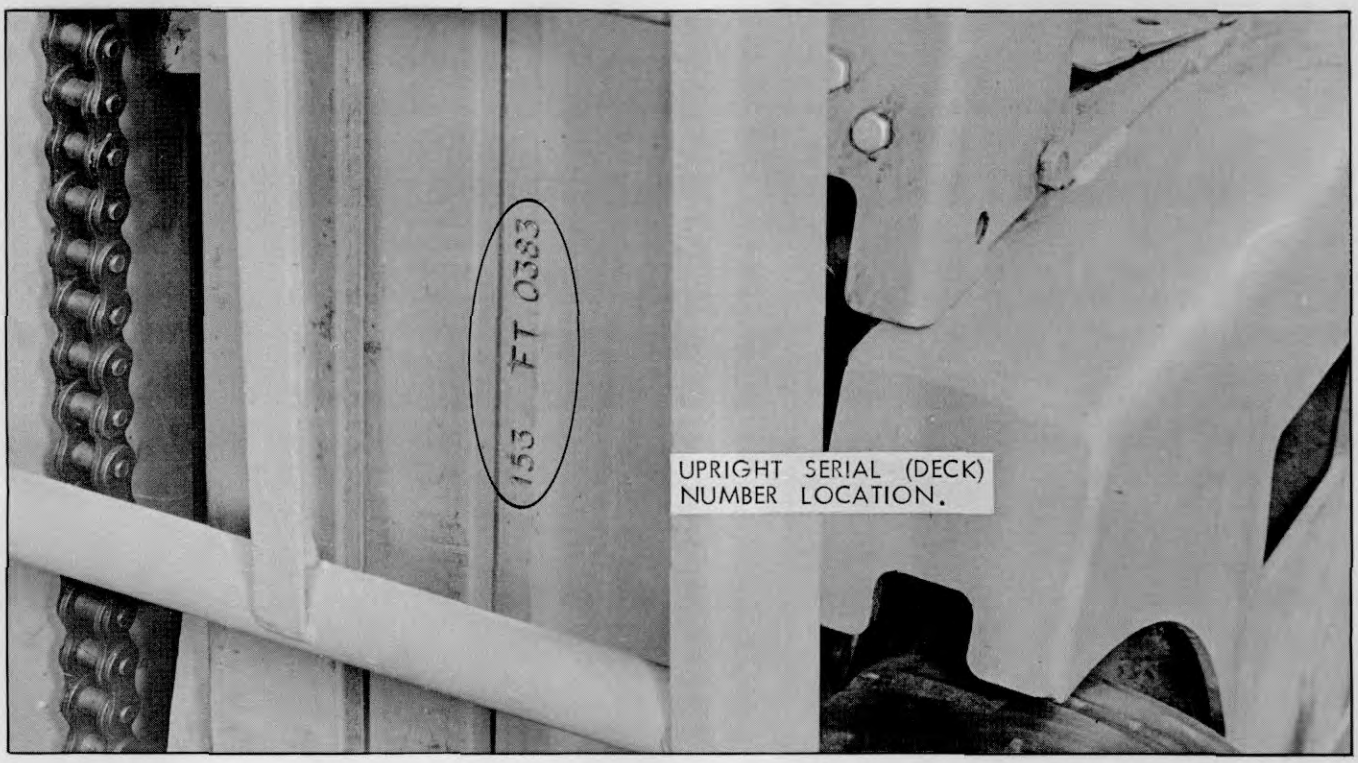


Plate 9475. Upright Serial (Deck) No. Location

ENGINE:
- MANUFACTURER..... CONTINENTAL
- MODEL..... 8041
- TYPE..... L-HEAD
- SERIES..... F163
- HORSE POWER ..... 52 @2350

CARBURETOR:
- MANUFACTURER..... ZENITH
- MODEL..... 26758

GENERATOR:
- MANUFACTURER ..... DELCO
- TYPE ..... 12 VOLTS MOISTURE & FUNGUS

STARTER:
- MANUFACTURER ..... DELCO-REMY
- TYPE..12 VOLTS-25 AMPERE-MOISTURE & FUNGUS

TRANSMISSION:
- MANUFACTURER..... CLARK
- MODEL H126A-8
- TYPE..... HYDRAULIC
- SERIES .....HYDRATORK
- RATED CAPACITY.....16 QUARTS

AXLE END ASSY. (FRONT)
- MANUFACTURER..... CLARK
- MODEL 108784
- TYPE..... PLANETARY

CLUTCH:..... NOT APPLICABLE

RADIATOR:
- MANUFACTURER ..... CLARK
- MODEL..... 317795
- PRESSURE.....7 LBS
- RATED CAPACITY .....10 QUARTS

MASTER CYLINDER:
- MANUFACTURER ..... WAGNER
- TYPE ..... SINGLE STAGE HORIZ.

WHEEL CYLINDER:
- MANUFACTURER..... WAGNER

POWER STEERING PUMP:
- MANUFACTURER..... VICKERS
- MODEL..... VTM40-20-30-12-EN-RI-12-S7
- TYPE..... VANE
- PRESSURE.....1250 PSI
- RATED CAPACITY .....2 QUARTS

POWER STEERING CYLINDER:
- MANUFACTURER..... CLARK
- MODEL.....180012

STEERING GEAR ASSY.:
- MANUFACTURER..... SAGINAW
- MODEL..... 530-D-274
- TYPE ..... RECIRCULATING BALL

BATTERY:
- MANUFACTURER ..... DELCO

BATTERY:
- MANUFACTURER ..... DELCO
- MODEL..... 3EMR70-D
- RATED CAPACITY..... 46 AMP HOUR

TIRES, FRONT DRIVE:
- MODEL.....18X7X12 1/8
- TYPE..... SOLID
- SERIES.....CUSHION

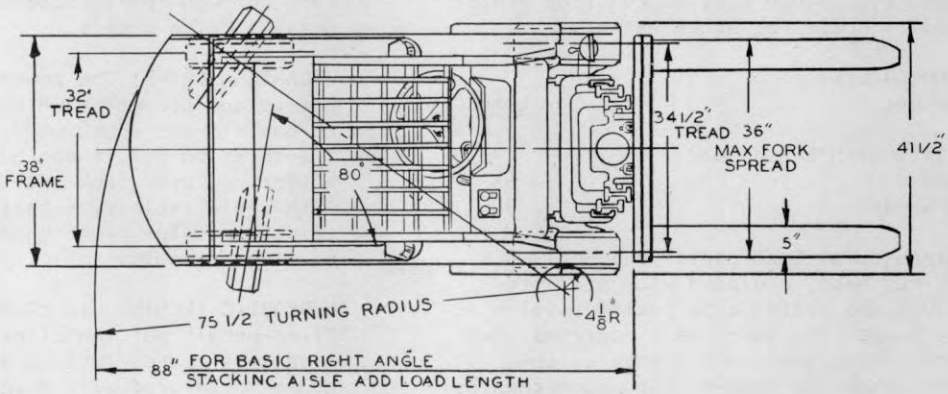
TIRES, REAR STEER:
- MODEL 18X5X12 1/8
- TYPE ..... SOLID
- SERIES ..... CUSHION

HYDRAULIC PUMP:
- MANUFACTURER ..... VICKERS
- MODEL..... V200-9-3C-12-S82
- TYPE ..... VANE
- PRESSURE.2000 P.S.I. 13 1/2 GPM @2350 RPM

CYLINDER, TILT:
- MANUFACTURER ..... CLARK
- MODEL 1700186
- TYPE..... DOUBLE ACTING
- PRESSURE.....2000 P.S.I.

POWER BRAKE ASSEMBLY:.....NOT APPLICABLE

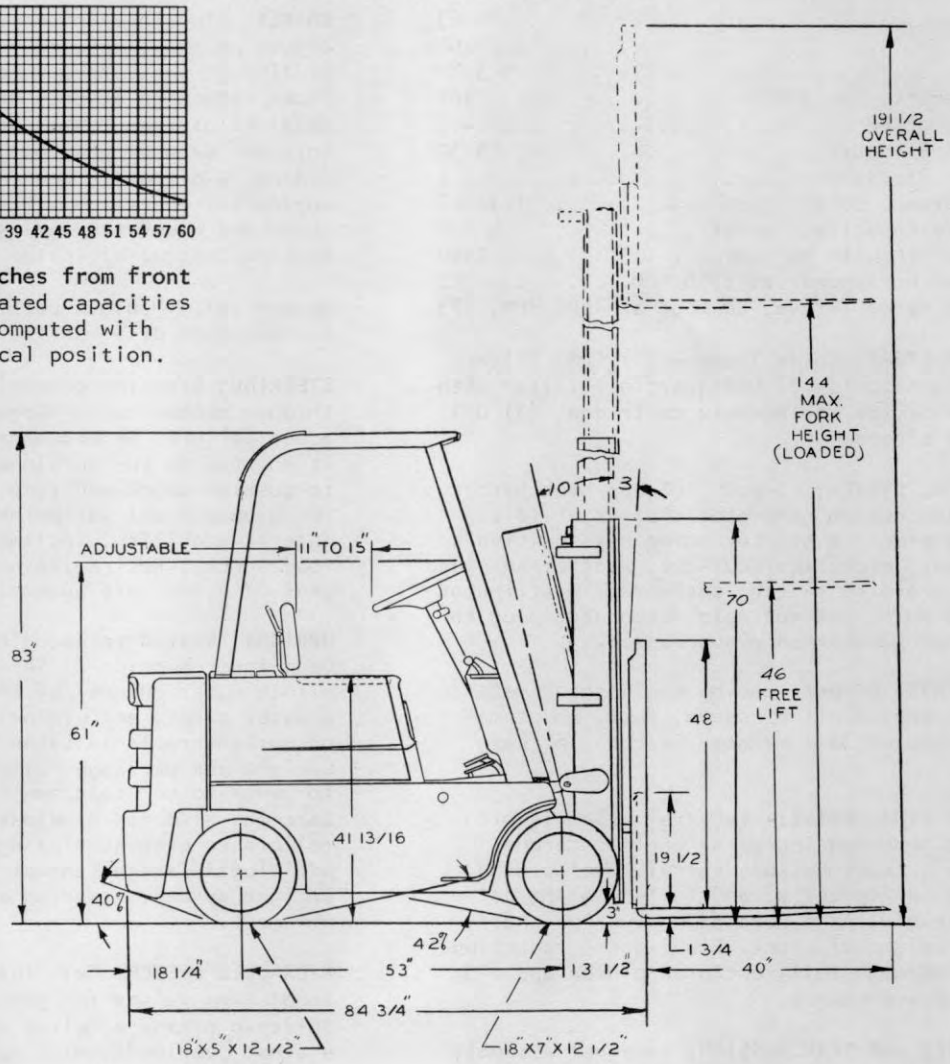
CLARKLIFT® C - 40



MINIMUM INTERSECTING AISLE 77.9"
CAPACITY-4000# AT 24" LOAD CENTER

CAPACITY CHART

Load center in inches from front face of forks - Rated capacities shown above are computed with uprights in vertical position.



INDUSTRIAL TRUCK DIVISION

DIMENSIONAL SPECIFICATIONS

MODEL: Clarklift 40 Weight..... 11,270 Lbs.

WEIGHT DISTRIBUTION AND CAPACITY:
Percent on drive wheels, truck empty: 43%
Rated Capacity...4,000 Lbs. at 24" load center
(See capacity chart for other ratings)

SPEEDS AND GRADES:

Travel Speeds:	LOADED
	8.3 MPH
Gradeability with rated load	27.7
Lift Speed	63
Lowering Speed	60

ENGINE: Industrial Continental Red Seal, 4 Cylinder, "L" head, equipped with stellite-faced valves and seats; also positive valve rotators. Connecting rods, main bearings, cam shaft, and timing gears are pressure lubricated by submerbed gear-type pump. Mechanical governor controls engine speed accurately without choking off power. Updraft carburetor.

Model	F-163
Bore	3 7/16"
Stroke	4 3/8"
Displacement, Cu. Inches	162
Compression Ratio	7.4:1
Max. Oil Pressure	20-30
Min. Oil Pressure	7
Firing Order	1-3-4-2
Crankcase Capacity, quarts	4 1/2
Governod RPM with no load	2350
SAE rated horsepower at 2350 RPM	52
Max. SAE Rated Torque, Lb Foot at 1600 RPM	123

ENGINE FILTERS: Three Types - (1) Fuel Filter in metallic bowl. (2) One-quart oil filter with automotive type replaceable cartridge. (3) Oil bath air cleaner.

ELECTRICAL SYSTEM: 12-volt, 46 amp-hour battery; 25 amp low cut-in generator charges at idle. Enclosed electric starter motor has positive engagement, electrical cut-out. Weather-shielded keyless starting switch; dust-proof distributor electric horn; and multiple disconnect plug to instrument panel. Radio suppressed.

INSTRUMENTS: Direct reading engine hour meter; ammeter, engine oil pressure, fuel, and temperature gauges, all mounted in cowl for easy reading.

AXLE AND FINAL DRIVE: Integral assembly with 3—point mounting including engine, torque, converter, transmission, spiral bevel pinion and ring, differential and full-floating drive axle assembly. Axle housing, not drive shaft, carries weight of truck. Final gear reduction is made through fully enclosed pinion and ring gear at drive wheels.

DRIVE AXLE AND TRANSMISSION: Integral assembly with 3-point mounting including engine, torque converter, transmission, spiral bevel pinion and ring gear, differential and full-floating drive axle assembly. Axle housing carriers weight of truck not drive shaft. Final gear reduction is made through fully enclosed pinion and ring gear at drive wheels.

HYDRATORK DRIVE: The power shifted transmission has torque converter which multiplies engine torque without shock on drive shaft and gears. Transmission oil is cooled thru cooler in bottom radiator tank and is a filtered system with replaceable type cartridge. the direction selector is for right hand finger-tip control on steering column.

HYDRAULIC INCHING: In close quarters, the "free-pedal" portion of brake pedal hydraulically actuates inching valve, permitting power to be gradually disengaged from drive wheels, even when the engine is running at top speed for fast lifting.

BRAKES: (Two independent systems). Self-adjusting shoes require no adjustment for lift of lining. Foot brake torque multiplied through final reduction at each drive wheel, reduces pedal effort, increases brake lift. Hydraulic internal expanding double shoe has bonded lining. Wide pedal, centrallv located, for convenient operation with either foot. Brake shoes and drums are enclosed within drive axle housing instead of inside drive wheels.

Mechanical "V" block parking brake operates on transmission drive shift.

STEERING: Steering control is maintained through mechanical linkage in the event of power failure. Strong vanadium steel axle is mounted on two torsional rubber bushings to cushion shock and to provide articulation for ground level variations. Positive stops for lateral stability. Inclined king pins minimize road shocks. Recirculating ball type steering gear. Tie rods are automotive type.

UPRIGHT: Nested telescopic roller types. "I" beam inner section of SAE 1045 Steel is nested within outer channel of SAE 1045 Steel for greater safety and visibility. Side loading on upright rails is taken on upright rollers. Upright and carriage rollers are adjustable for wear to maintain new truck tolerances. Carriage also has 4 adjustable side thrust rollers to prevent binding. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

HYDRAULIC SYSTEM: Full feathering balanced spool type valves for gentle starts and stops. Built-in pressure relief valve protects system against overloads; will open fully within 100 p.s.i. cracking pressure. SAE straight threads

HYDRAULIC SYSTEM: (CONTINUED)
and O-ring seals used throughout pressure system. Vane-type pump is driven by hardened gears. Hydraulic sump, built into frame. Flexible rubber hydraulic hose lines are steel braid reinforced. System is protected from dirt by (1) a 5 micron pleated replacement filler cap breather, (2) a 25-micron full flow filter in sump.

FORK CARRIAGE AND FORKS: All-welded construction, 1045 steel fork carriage to withstand impacts. Lateral fork adjustments from "0" to 60". Convenient snap action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

SEATING: Rubber mounted extra wide seat and back rest are Polyurethane Foam, covered with vinyl plastic. Curved back rest tilts to provide additional driver comfort. An automotive type latch releases the seat for horizontal adjustment up to 4".

MAINTENANCE: Split swing-out hood offers easy access for servicing. Check-points such as water, hydraulic sump filler caps, oil dipstick, and filler readily accessible. Battery swings out. Quickly detachable counterweight is hook mounted, secured with one large bolt.

GENERAL: Protectoseal gas tank filler cap. 12" height recessed pin-type coupler. Bolts and screws are zinc or cadmium plated. Multi-pass muffler. All exposed surfaces are shot-blasted and prime painted with weather resistant paint.

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS

Air Cleaner ..... 3/4 pints

Fuel Tank Capacity ..... 7.8 gallons

Cooling System Capacity ..... 11 1/2 quarts

Fan Belt Deflection ..... 3/4" to 1"

Torque Converter ..... diameter 11 inches
..... Torque multiplication 2.2 to 1

Transmission & Differential
Speeds: ..... 1 Forward & 1 Reverse
Capacity: .....15 quarts

STEERING AXLE

Toe-In..... 0 degrees
Camber Angle..... 1 degree
Caster..... 0 degrees

Lift-Hand turning radius angle:
Left wheel..... 80 degrees
Right wheel ..... 55 degrees

Right hand turning radius angle:
Left wheel ..... 55 degrees
Right wheel..... 80 degrees

DRIVE AXLE

Ratio ..... 4.4 to 1
Axle End Capacity ..... 1 Lb.
(each End)

ELECTRICAL SYSTEM .....
.....12 volt negative ground

Battery .....12 volts 46 amp hour

Distributor
Contact point gap ..... .022 inch
Rotation (viewed from cap end).....
..... clockwise
Dwell Angle ..... 25° - 34°

Spark Plugs
Gap Setting
Resistor ..... .035 inch
Standard ..... .025 inch

Starting motor
Brush spring tension .....
..... 35 ounces min.

Ignition Timing ..... 2° BTDC

HYDRAULIC SYSTEM

Sump Tank Capacity..... Approx. 5.5 gal
Sump Tank Filter (Replaceable).....
..... 25- micron
Sump Tank Breather (Replaceable) .....
..... 5- micron

Hydraulic Pumps
Main pump:
Type..... vane
Capacity .....
13 1/2 G.P.M. at 2350 R.P.M.

Hydraulic Valve
Pressure Relief Valve Setting.....
..... 2000 P.S.I.

Power Steering Pump
Controlled flow..... 3.0 GPM
Relief Valve Setting ..... 1250 PSI

BRAKE SYSTEM

Type ..... Hydraulic

Brake Pedal Free Travel
(as measured from top pedal position -to-
where pedal meets resistance from the
master cylinder)..... 3/16" to 5/16"

(as measured from bottom of floor board
-to- top of brake lever)..... 3/16" to 5/16"

GENERATOR

Armature Rotation (viewed from drive end).
..... Clockwise
Cold Output.....
..... 25 Amps at 14 volts at 1750 R.P.M.
Field Current.....
..... 1.69 - 1.79 Amps at 12 Volts (80° F)
Brush Spring Tension (ounces)..... 24-28

STARTERS

Rotation C
Brush Spring Tension 35
No Load Test
Max. Amps 76
Volts..... 10.6
Approx. RPM 6200-9400

WHEEL NUT TORQUE

Steering Wheel ..... 290-300 Lb Ft.
Drive Wheel .....490-500 Lb Ft.

ENGINE LIMITS AND CLEARANCE DATA

Weight - Bare Engine 415

Valve Clearance
- Intake (Hot) ..... .014
- Intake (Cold)..... .012
- Exhaust (Hot)..... .014
- Exhaust (Cold)..... .020

Valve Guide:
- Length 2 5/16
- Outside Diameter..... .6575/.6565
- Stem Hole Diameter ..... .3432/.3422
- Wear Limits - Max. Dia ..... .3447
- Distance, Cyl. Block Contact .... Face to Guide..... 1 15/32

Dimensions of Standard Inserts and Counterbores:
- Outside Dia. of Inserts (A)....1.442-1.441
- Inside Dia. of Counterbore (B).1.438-1.437
- Press Fit ..... .003-.005

Valves, Intake
- Stem Dia ..... .3414/.3406
- Wear Limits, Min. Dia ..... .3386
- Seat Angle ..... 30°
- Stem Clearance Limits ..... .0026/.0008
- Wear Limits-Max. Clearance..... .0046
- Desired Stem Clearance ..... .0015

Valves, Exhaust
- Stem Dia. ..... .3385/.3377
- Wear Limits - Min, Dia. ..... .3357
- Seat Angle ..... 45°
- Stem Clearance-Limits ..... .0055/.0037
- Wear Limits. Max. Clearance ..... .0075
- Desired Stem Clearance 45

Valve Springs
- Outside Dia. 31/32
- Length-Valve Closed 1 45/64
- Load Valve Closed..... 47-53#
- Wear Limits-Min. Wgt..... 42#
- Length-Valve Open 1 27/64
- Load-Valve Open ..... 961-104#
- Wear Limits-Min. Wgt. ..... 86#

Tappets
- O.D. Tappet ..... .9990
- Bore in Block 1.0000
- Total Max. Wear Limits ..... .005

Camshaft
- Brg. Journal Dia. #1 ..... 1.8725/1.8715
- #2 ..... 1.7465/1.2455
- #3 ..... 1.2475/1.2465
- #4 ..... None

Wear Limits-Min. Dia. (.001 UNDER MIN..... (NEW SHAFT DIAMETER).....
Bushing-Inside Dia. #1 ..... 1.8755/1.8745
#2 ..... 1.7502/1.7495
#3 ..... 1.2505/1.2495
#4 ..... None
Bushing-Clearance Limits ..... .004/.002
End Play ..... .009/.005

Connecting Rods
- Bush. Hole Dia. ..... .914/.913
- Brg. Hole Dia..... 2.1870/2.1865
- Brg. Thickness 06130/.06155
- Dia. of Rod Brg. Journal 2 1/16
- Dia. - Crank Pin.....2.0619/2/0627
- Clearance Limits ..... .0007/.0025
- Desired Clearance ..... .0015
- Side Play ..... .010/.006
- Desired Side Play ..... .006

Main Bearings
- Dia. of Brg. Bore in Block 2.5615-2.5622
- Brg. Shell Thickness ..... .09250/.09275
- Dia.of Main Brg. Journal .. 2.3744/2.3752
- Clearance Limits ..... .0028/.0008
- Desired Clearance 0015
- C/S End Play 002/.006

Crankshaft Fillet Radii
- C/S Fillet Radii -3/32" + or - 1/64" R on all crankpins and mains except rear.
- C/S Fillet Radii 1/8" + or - 1/64" R on Rear main.

Piston Pin
- Length 2.878/2.868
- Diameter ..... .8593/.8591
- Desired Fit ..... Light Push
- Bush. Hole Dia - Fin ..... .8597/.8595
- Pin Cl. in Bushing ..... .0006/.0002
- Desired Pin Fit ..... .0004

Pistons
- Cylinder Dia 3.4395/3.4375
- Wear Limit-Cyl. Bore ..... .008
- Piston Pin Hole Dia ..... .8597/.8595
- Ring Groove Width #1 ..... .097/.096
- Max. Wear Limits ..... .099
- Ring Groove Width-#2-3 ..... .1285/.1275
- Max Wear Limit ..... .1305
- Ring Groove Width-#4 ..... .2530/.2515
- Max. Wear Limit ..... .255
- Ring Groove Width-#5 ..... None
- Max. Wear Limit ..... —
- Piston Fit-Feeler Gauge ..... .003
- Lbs. Pull ..... 5-10#

Piston Rings
- Ring Width-#1 ..... .0935/.0930
- Wear Limits-Min. Width ..... .091
- Ring Width-#2 & #3 ..... .1240/.1235
- Wear Limits-Min. Width..... .1215
- Ring Width-#4 ..... .249/.2485
- Wear Limits-Min. Width ..... .2465
- Ring Width-#5 ..... None
- Wear Limits-Min Width ..... —
- Ring Gap Clearance-#1..... .010/.020

ENGINE LIMITS AND CLEARANCE (CONTINUED)

Ring Gap Clearance-#2 & 3	.010/.020
Ring Gap Clearance-#4	.015/.055
Ring Gap Clearance-#5	None
Ring Side Clearance-#1	.004/.0025
Ring Side Clearance-#2 & 3 ..	.0055/.0025
Ring Side Clearance-#4	.0045/.0025

ENGINE TORQUE SPECIFICATIONS

Engines have many studs, bolts, and cap screws of special material and sizes and it is very important that care be exercised to torque all studs and bolts correctly.

The torque specifications; foot pounds, listed below MUST be followed in order to have the engine conform to the original specifications.

Size - Diameter	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"
Cylinder Heads	------	35-40	70-85	100-110	130-140	145-155
Manifolds	15-20	25-30	40-50	50-60	50-50	60-70
Gear Covers, Water Pumps, Front and Rear End Plates	15-20	25-30	50-55	80-90	------	-----
Oil Pans	12-16	12-16	-----	------	------	-----

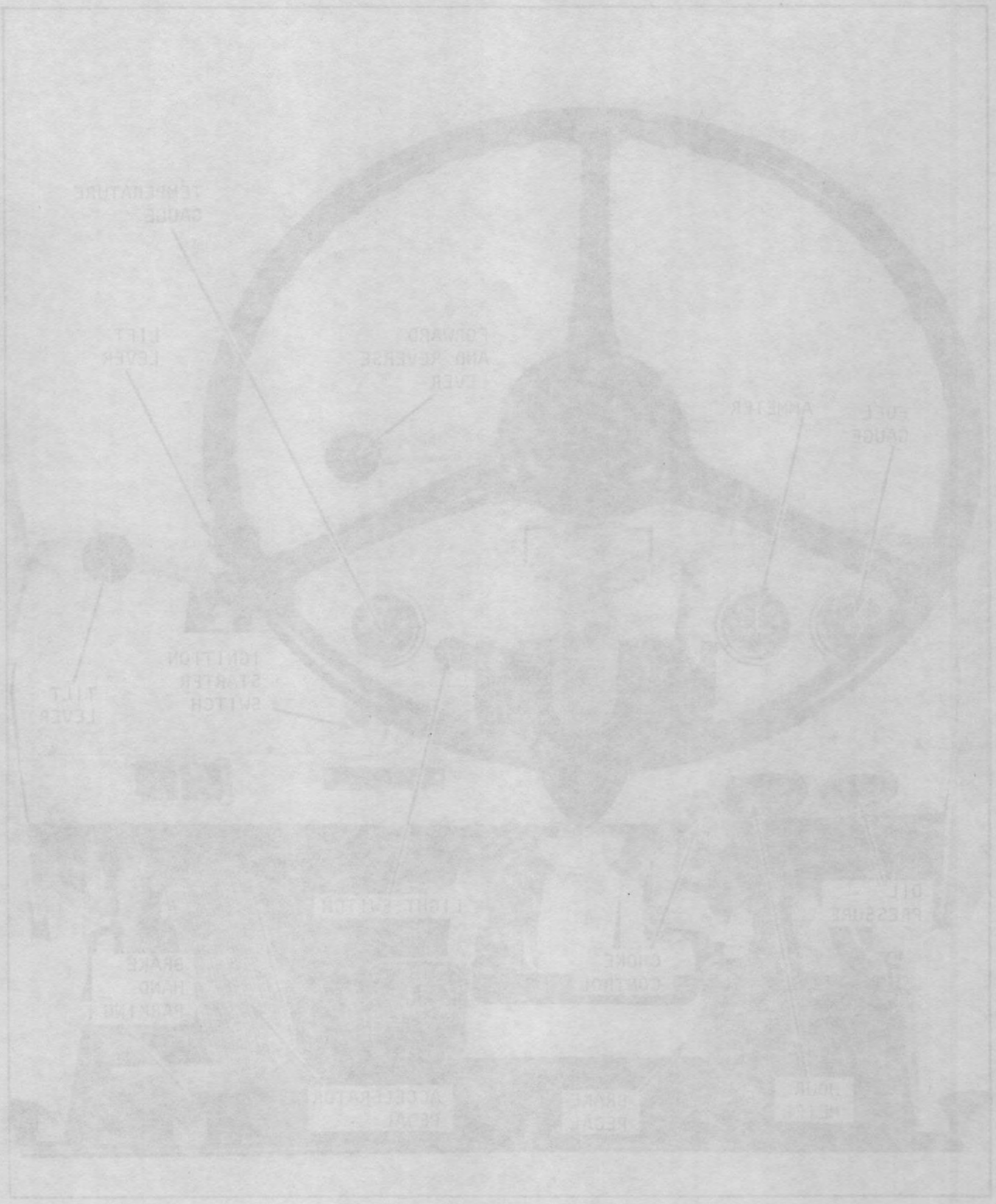
INDUSTRIAL TRUCK DIVISION

NEW MACHINE 50 HOUR SERVICE AND INSPECTION

Air Cleaner, Service	8H 403
Battery Test and Level Check	100H 603
Brake Master Cylinder Level Check	100H 303
Brake Pedal, Adjust	100H 302
Cooling System, Inspect	100H 103
Cylinder Head, Tighten	1000H 002
Engine Crankcase, Drain and Refill	100H 002
Engine Oil Filter, Change	100H 002
Fan Belt, Adjust	100H 203
Fuel Pump Strainer, Clean or Replace	500H 002
Hand Brake, Adjust	1000H 1103
Hydraulic Oil Filter, Change	500H 103
Intake and Exhaust Manifold, Tighten	500H 403
Lift Chains, Adjust	100H 403
Lubricate Machine	100H 703
Nuts, Bolts and Capscrews, Tighten	500H 403
Power Steering Reservoir Level Check	8H 703
Pressure Check Main Hydraulic System	1000H 1503
Steering Gear Level Check	100H 603
Transmission, Converter and Axle Adapter Level Check	100H 002
Transmission, Converter and Axle Adapter Change Filter	500H 002

N O T E

PERFORM THIS SERVICE AND INSPECTION AFTER THE FIRST 50 HOURS OF OPERATION ON NEW MACHINES.



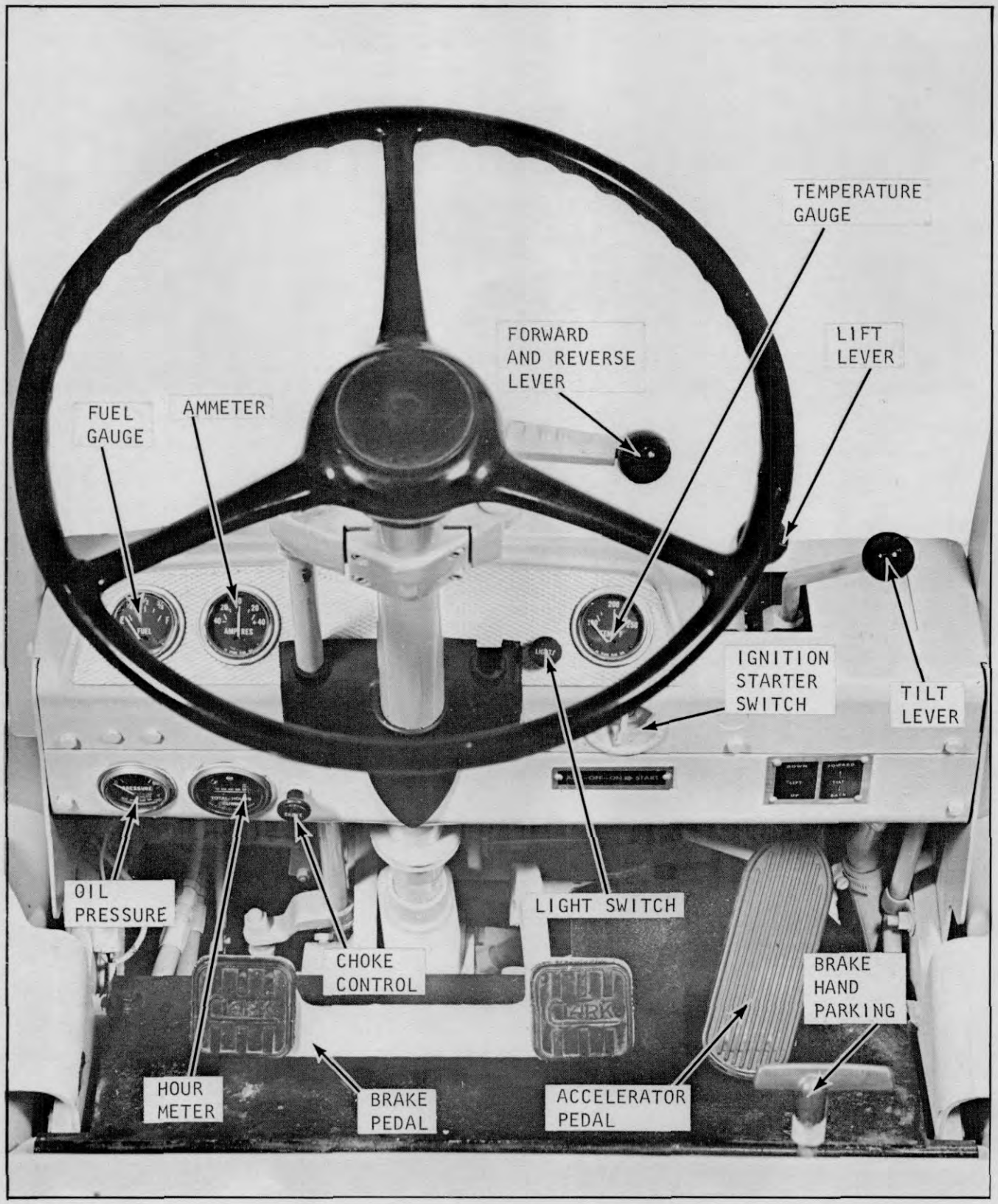


Plate 9957. Overall Controls

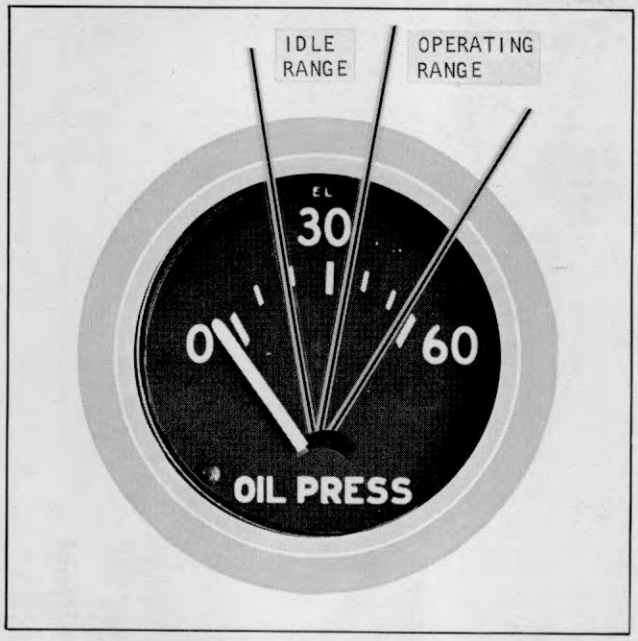


Plate 8606. Oil Pressure Indicator

If the oil pressure is erratic or falls below the above limit, stop the engine immediately and find the cause of the trouble. Refer to trouble shooting section for this information. On new machines, after starting machine, run it at idle for five minutes, then stop engine and recheck oil level in crankcase. Bring oil level to high mark, if necessary.

N O T E

Before placing machine in operation, run engine a few minutes to warm oil especially in cold operating condition.

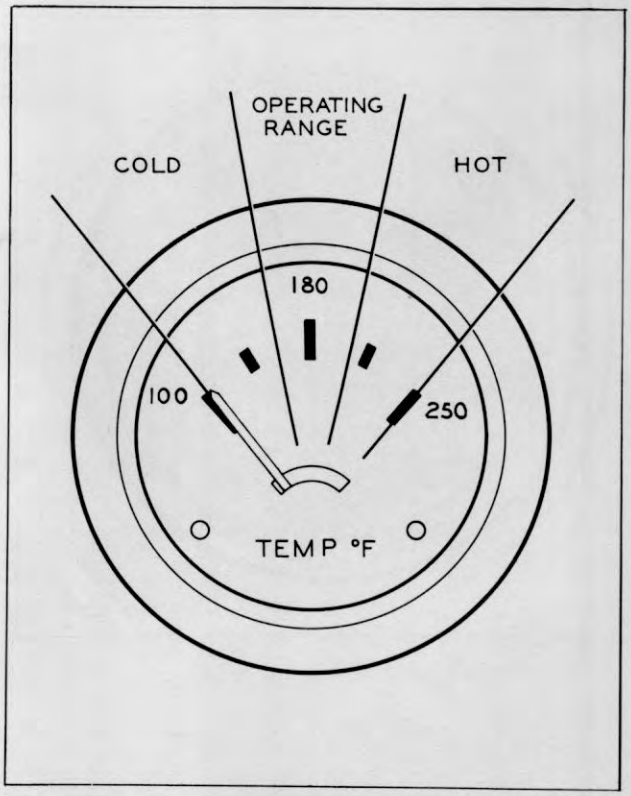


Plate 9955. Engine Coolant Temperature Indicator

N O T E

The coolant temperature should register in the operating range after the first few minutes of operation. Low operating temperatures wastes fuel and increases engine wear.

C A U T I O N

DO NOT IDLE THE ENGINE FOR LONG PERIODS AS IT IS NOT ONLY DETRIMENTAL TO THE ENGINE BUT ALSO INCREASES OPERATING COSTS AS YOU ARE USING FUEL WITHOUT BENEFIT.

Plate 7162. Hour Meter

The hour meter accurately records the actual hours of machine operation. This will serve as an aid in determining the time intervals for lubrication and preventive maintenance services.

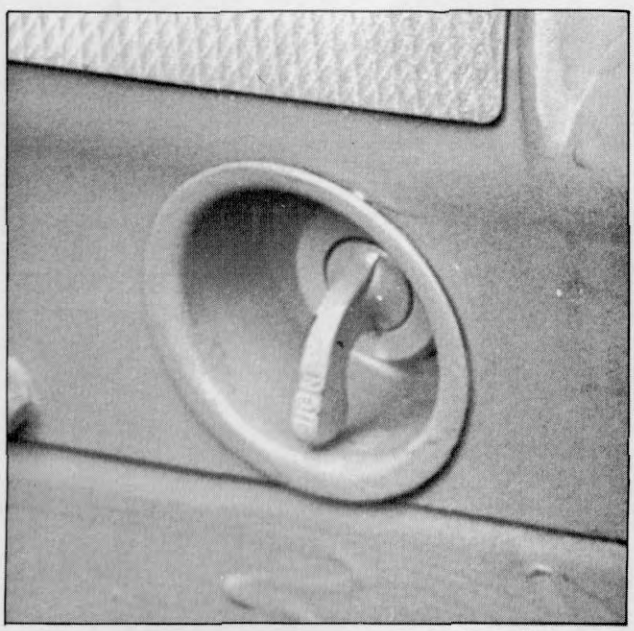


Plate 7018. Ignition Switch

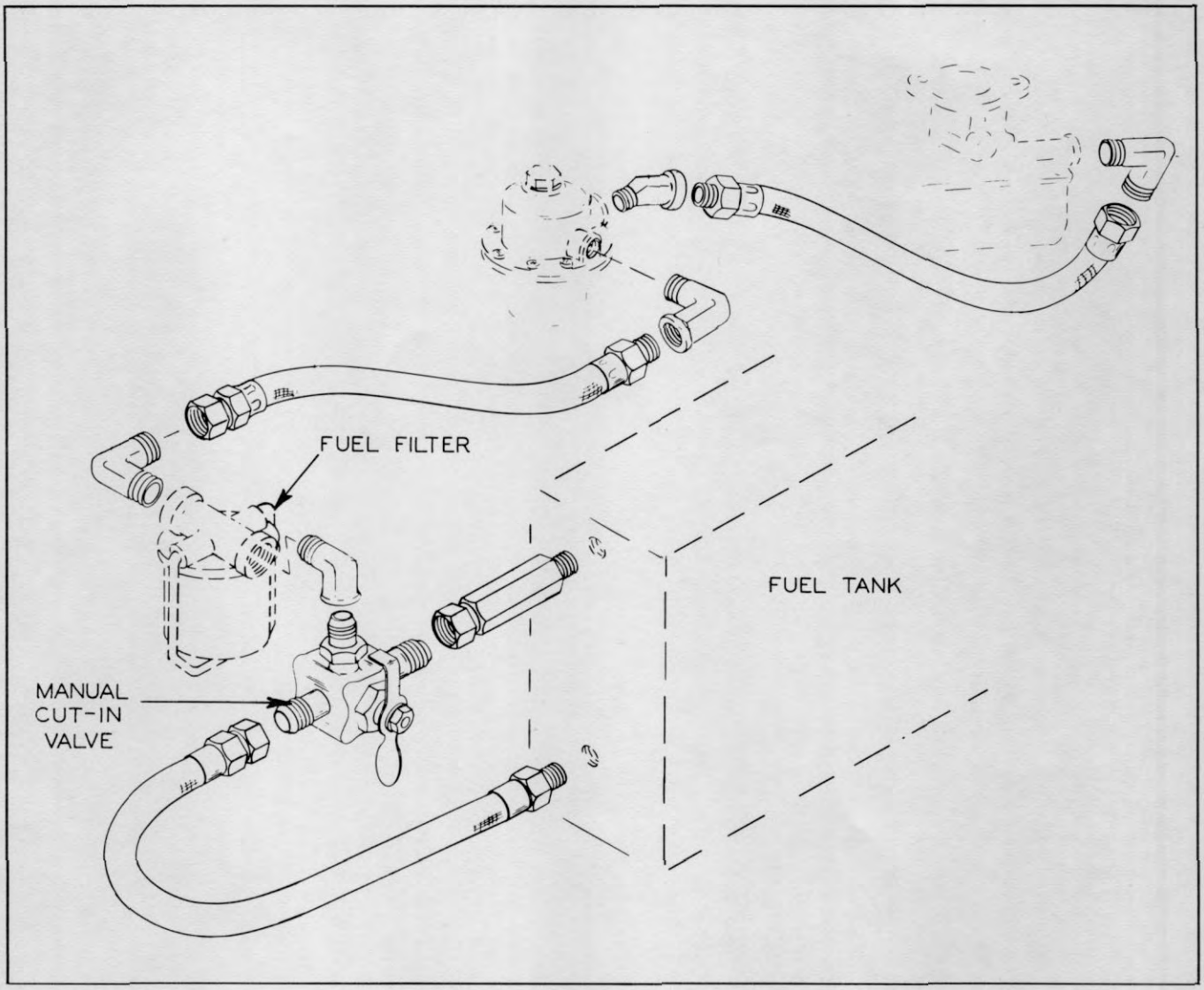
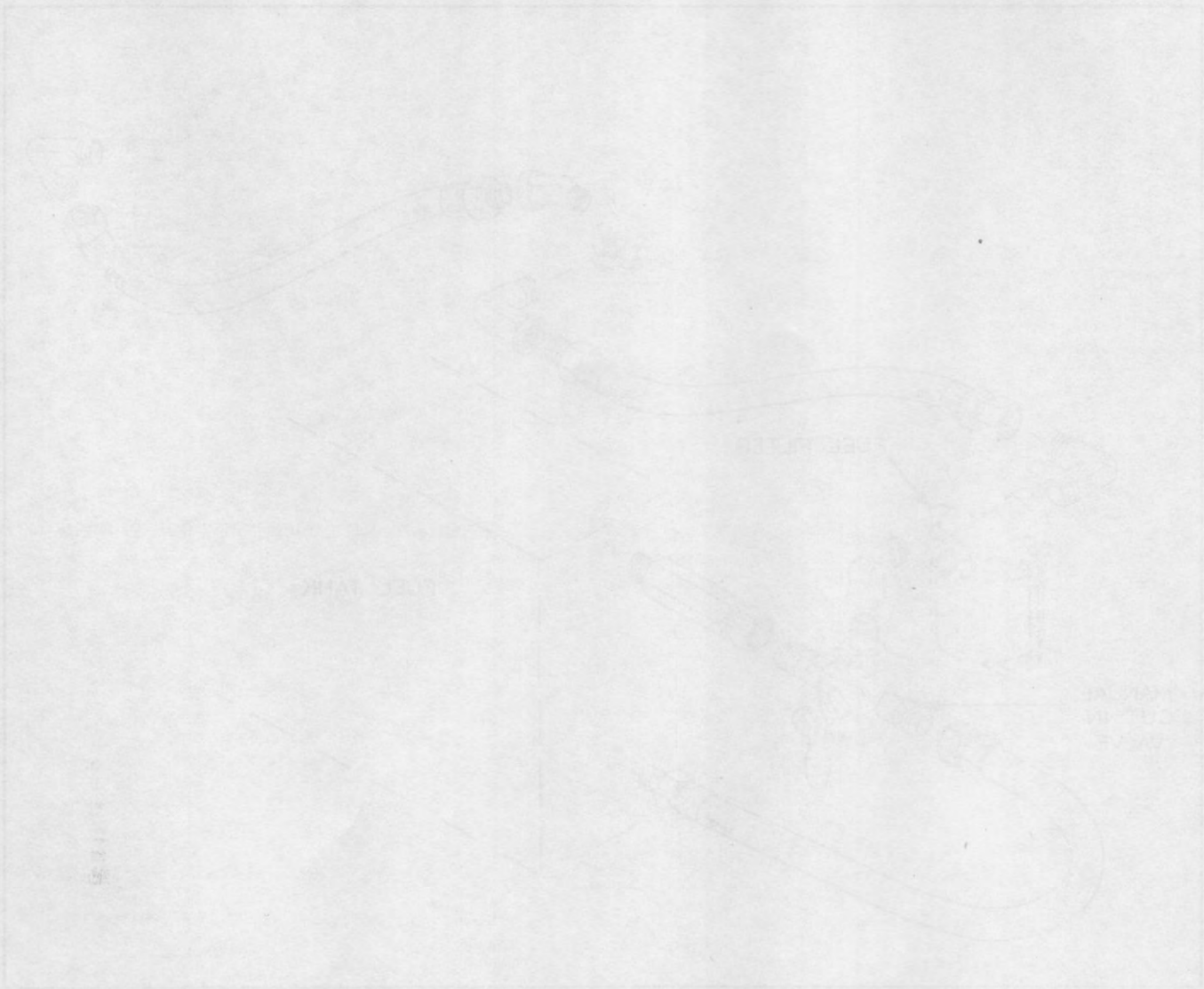


Plate 7019. Manual Cut-In Valve

The auxiliary fuel reserve manual cut-in valve located at the front of the fuel tank may be turned to the auxiliary position in the event that the main fuel tank supply becomes exhausted. The reserve fuel supply of approximately 1/2 gallon will in most cases be adequate to allow the machine to be driven to its refueling location. After the fuel supply has been replenished the manual cut-in lever should be turned to the normal position.



STARTING

Place all transmission control levers in neutral position. Pull out on choke and engage the starter by actuating the ignition switch in the start position.

CAUTION

DO NOT ENGAGE THE STARTER LONGER THAN 15 SECONDS WITHOUT A MINUTE OR SO INTERVAL BETWEEN TRIALS.

If the engine becomes overchoked or flooded; push choke button in, depress accelerator pedal fully and engage starter. If all necessary equipment is in correct working order, the engine will start.

After engine has started, check instrument panel making certain the engine oil pressure indicator shows adequate pressure. If no oil pressure is indicated, stop engine and correct the difficulty.

NOTE

RUN ENGINE A FEW MINUTES TO WARM OIL, BEFORE PUTTING MACHINE TO WORK ESPECIALLY IN COLD OPERATING CONDITIONS.

TO OPERATE MACHINE

1. Place transmission control levers in neutral position and start engine.

2. Now move forward and reverse lever out of neutral and into position for desired direction. Accelerate as required.

3. Inching Operation: To inch the machine into a load, the brake pedal should be depressed in its free travel range and the accelerator pedal actuated as required. The initial brake movement is used to regulate the inching control valve which allows a decrease in pressure on the transmission selector pack discs. This permits controlled slippage of the discs allowing the machine to inch----after the brake pedal travel has actuated the inching valve mechanism the brakes become applied and all pressure by-passes the selector discs.

CAUTION

TO PROLONG MACHINE LIFE IT IS BEST TO COME TO COME TO A COMPLETE STOP BEFORE SHIFTING TO THE OPPOSITE DIRECTION.

ALLOW FOOT TO REST ON BRAKE PEDAL ONLY WHEN INCHING IS DESIRED. DO NOT ALLOW FOOT TO REST ON BRAKE PEDAL WHILE DRIVING MACHINE FROM POINT TO POINT. RIDING THE BRAKE PEDAL WILL CAUSE CONTINUED SLIPPAGE OF THE TRANSMISSION SELECTOR PACKS RESULTING IN OVERHEATING AND UNNECESSARY WEAR OR DAMAGE TO TRANSMISSION COMPONENTS.

TO STOP MACHINE

Remove foot from accelerator pedal and depress brake pedal. If machine is to be parked, place transmission control levers in neutral position, apply hand brake and shut engine off.

CAUTION

IF THE ENGINE HAS BEEN OPERATING AT OR NEAR FULL LOAD, IT SHOULD BE ALLOWED TO RUN AT FAST IDLE (600 to 800 R. P. M.) FOR ONE OR TWO MINUTES AFTER LOAD IS REMOVED BEFORE BEING STOPPED. THIS ALLOWS INTERNAL ENGINE TEMPERATURES TO EQUALIZE.

TO MOVE A LOAD

The forks should be adjusted sideways on fork bars to obtain maximum balance in proportion to width of load. Raise or lower forks to proper level and center the load as nearly as possible on the forks. Tilt upright assembly slightly backwar to prevent the load from falling, accelerating engine slightly at the same time. Back away from stack.

Adjust the forks with load so they are close to the floor or ground but high enough to avoid hitting obstructions. The operator should have clear vision ahead when moving in a forward direction. When this is not possible, the operator should drive in reverse and sufficiently turn in his seat to obtain clear vision backward.

When the load is to be deposited, enter the area squarely, especially when placing one load on top of another, in order that all piles will be square and secure. Place load directly over desired area and slowly lower to the floor.

IMPORTANT

EVERY 8 OPERATING HOURS (OR EVERY SHIFT)

ELEVATE UPRIGHT TO THE UPPER LIMIT. THIS

WILL PROVIDE LUBRICATION TO THE TOP POR-

TION OF THE LIFT CYLINDER.

SAFETY AND OPERATION SUGGESTIONS

The use of industrial powered trucks is subject to certain hazards that cannot be overcome by purely mechanical means. The exercise of intelligence, care and common sense by the truck operator is necessary to eliminate the hazards of overloading, slipping and falling of the load; obstructions in the parth of travel, or the use of equipment for a purpose for which it is not intended or designed.

The following are a few suggestions that should be followed in the operation of this machine.

1. Operate machine with forks close to floor, loaded or empty, but high enough to avoid hitting obstructions.

2. If vision is obstructed by the load, operate machine in reverse and sufficiently turn in the seat to obtain clear vision.

3. Avoid sudden stops or starts. When backing, be sure to look for fellow workmen before moving machine.

4. Drive carefully at all times. Exercise caution at cross aisles. Sound horn for safety

5. Be sure loads are safe to move. Have loads properly centered on machine. Refer to the Capacity Chart in Specifications for various load center ratings.

6. An operator should be assigned to a specific machine.

7. The operator should be qualified and drive in accordance with established safety rules.

8. If the machine does not respond immediately, report to designated individual in charge. A minor adjustment now may save a major repair later.

9. Do not allow riders or hitchhikers.

10. Operate the machine at a safe distance behind other vehicles.

11. Do not operate machine with wet or greasy hands.

12. Observe highway traffic laws in the operation of the vehicle in the plant.

13. Drive carefully on wet or slippery floors.

14. Keep feet within running line of truck.

15. Avoid overloading the truck -- this is a safety measure against possible injury to the driver and fellow workmen. Overloading shortens the life of the truck and increases maintenance.

16. Do not operate machine for prolonged periods in an unventilated area. All engines produce poisonous carbon monoxide gas as a by-product of combustion and can be dangerous if allowed to accumulate in a closed area.

17. Be sure the brakes are in proper working condition. Be sure all mechanical and electrical components are working correctly.

INDUSTRIAL TRUCK DIVISION

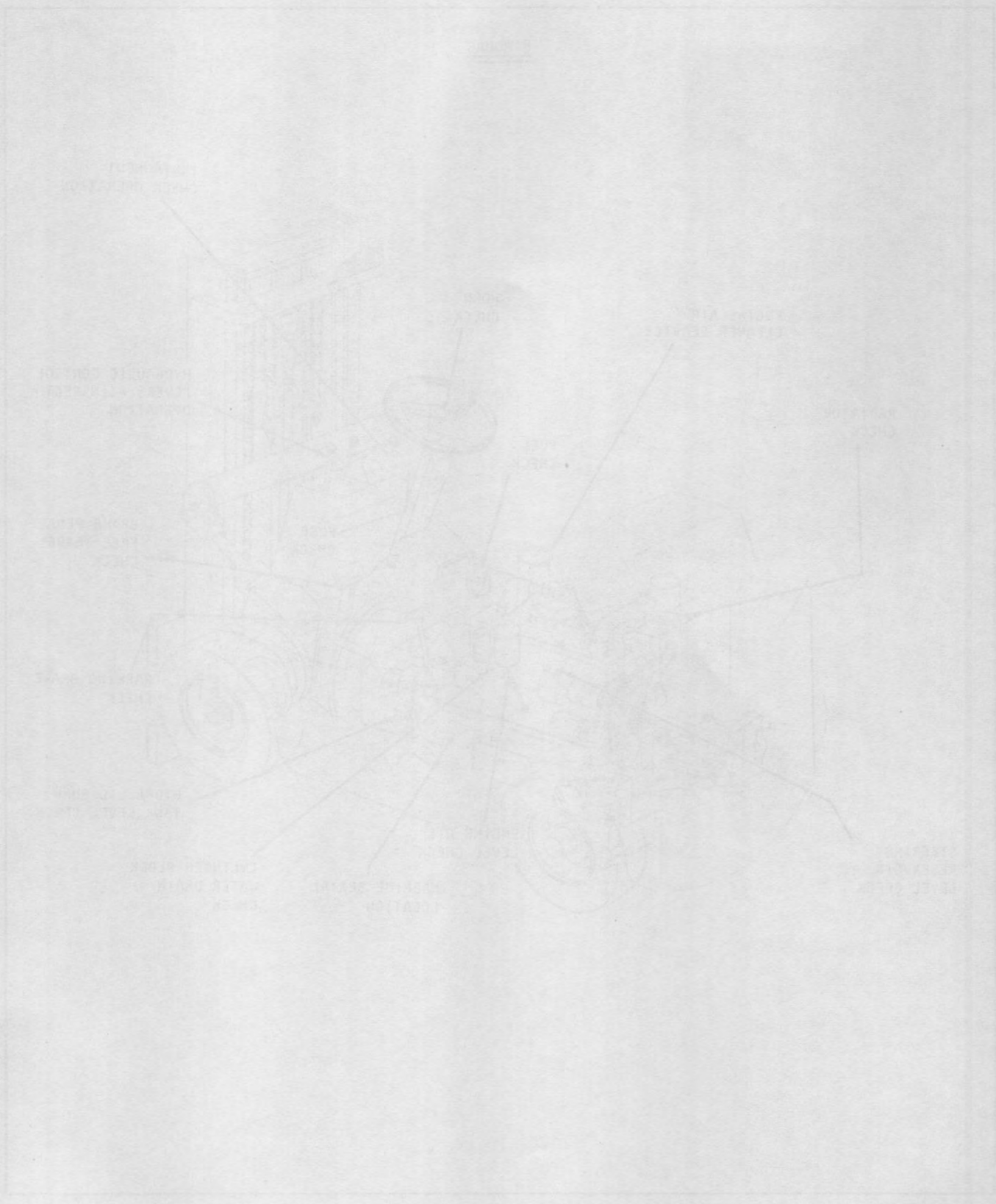
LUBRICATION AND PREVENTIVE MAINTENANCE INDEX

N O T E

Lubrication and Preventive Maintenance Illustrations at the beginning of each time interval section. When performing the 100, 500, 1000 hour lubrication and preventive maintenance, always include the previous lubrication and preventive maintenance schedules.

INDUSTRIAL TRUCK DIVISION

LUBRICATION AND PREVENTIVE MAINTENANCE INDEX



8 HOURS

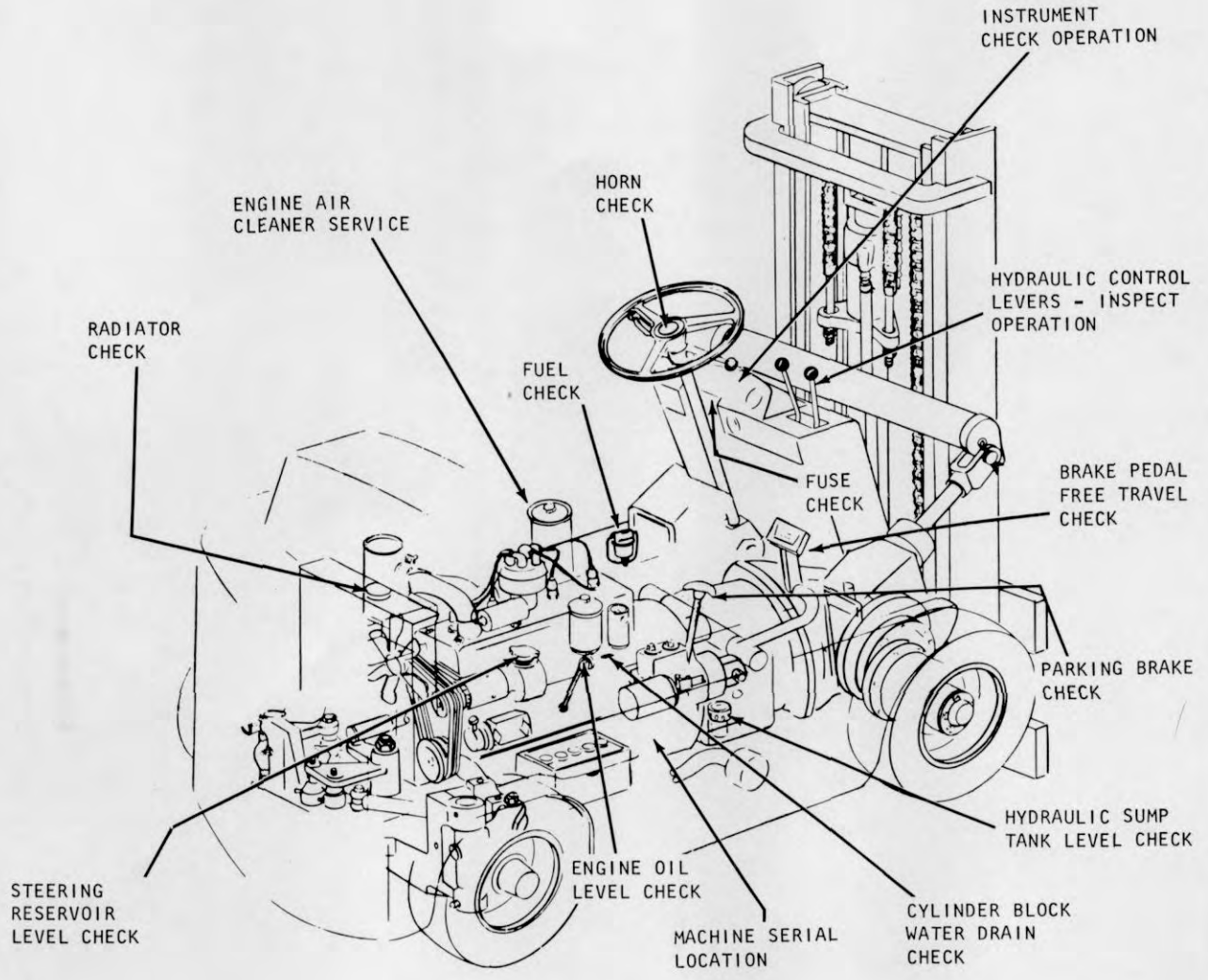


Plate 9956. Lubrication & Preventive Maintenance Illustration

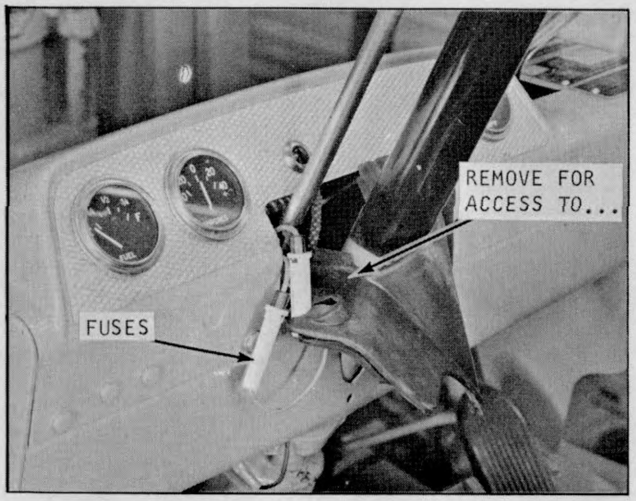


Plate 9473. Electrical System Fuse

HORN

Check to be sure the horn is working properly. The horn and ignition fuse is located beneath the dash near the steering column. Fuses are accessible by removing steering column grommet.

FUEL TANK

Check fuel sypply and fill if necessary. Use a good grade of fuel.

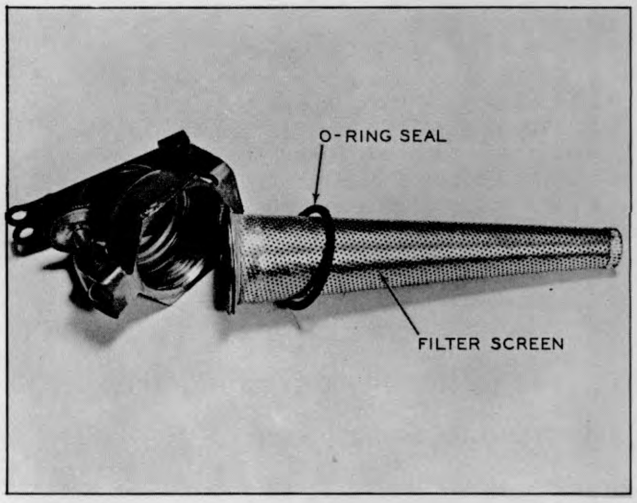


Plate 6627. Fuel Tank Filler Cap & Screen

Before filling fuel tank, make certain the filler cap screen and "O" ring is in place and not damaged.

C A U T I O N

DO NOT REMOVE THE SCREEN WHILE FILLING TANK.

W A R N I N G

CARE SHALL BE TAKEN NOT TO DAMAGE FILLER CAP SCREEN WITH FILLER HOSE NOZZLE WHILE FILLING FUEL TANK

ENGINE CRANKCASE

Before attempting to start the engine, first make sure that it has sufficient oil. The oil filler pipe is located on the right side of the machine. The oil level stick is of the dipstick or bayonet type and is also located on the right side of the machine. Fill the crankcase reservoir through the filler pipe to the proper level as indicated on the dipstick.

C A U T I O N

NEVER PERMIT THE OIL LEVEL TO FALL BELOW THE "ADD" MARK ON THE DIPSTICK.

DO NOT OVERFILL THE CRANKCASE, AS TOO MUCH OIL WILL BRING THE LEVEL HIGH ENOUCH FOR THE CONNECTING RODS TO DIP, THUS CAUSING EXCESSIVE QUANTITIES OF OIL TO BE THROWN TO THE CYLINDER WALLS RESULTING IN OIL CONSUMPTION, SMOKING, EXCESSIVE CARBON DEPOSITS AND FOULED SPARK PLUGS.

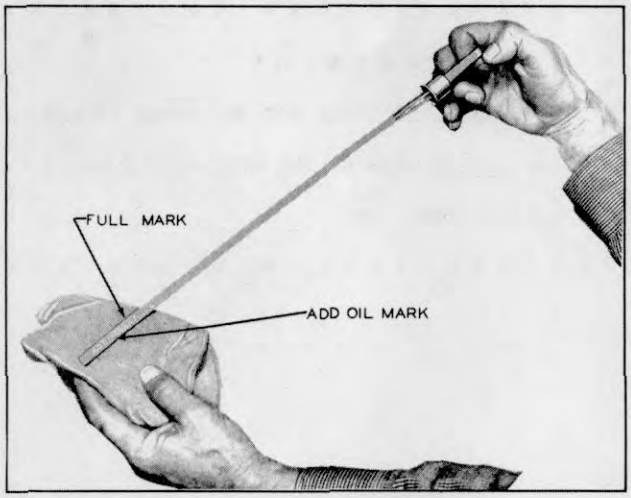


Plate 3145. Crankcase Oil Check

Crankcase Capacity — Refer to Specifications

Service "MS" Oils

S.A.E.	10W	0° to 32° F.
S.A.E.	20W	32° to 75° F.
S.A.E.	30W	above 75° F.
or use	10W	30 MULTI-GRADE OIL

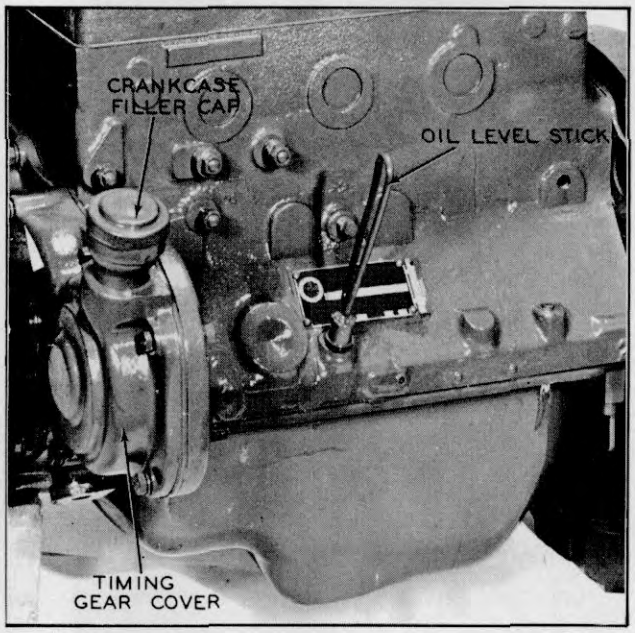


Plate 6629. Engine Crankcase Fill

ENGINE COOLING

Make sure that the radiator drain cock and the water drain in the cylinder block are closed. Check radiator coolant level and fill to within 1 inch of the top with clean water; or if operation is in cold weather, use a suitable anti-freeze solution.

It is recommended that a soluble oil in the proportion of 1 ounce per gallon of water be added to the Cooling System.

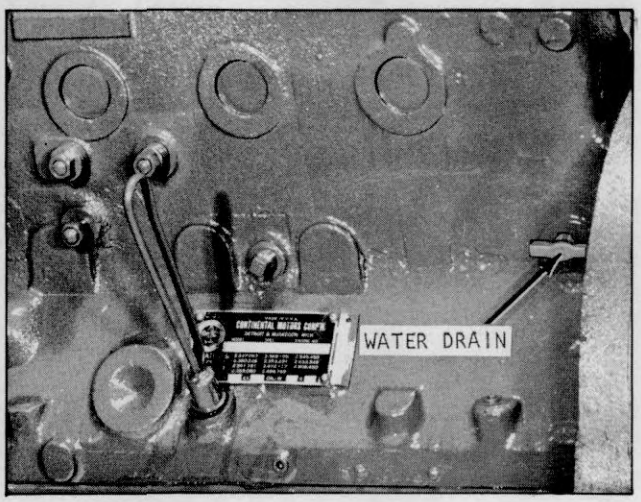


Plate 7008. Typical Cylinder Block Water Drain

C A U T I O N

NEVER POUR COLD WATER OR COLD ANTI-FREEZE INTO THE RADIATOR OF AN OVERHEATED ENGINE. ALLOW THE ENGINE TO COOL AND AVOID THE DANGER OF CRACKING THE CYLINDER HEAD OR BLOCK. KEEP ENGING RUNNING WHILE ADDING WATER OR ANTI-FREEZE. WHEN PERMANENT ANTI-FREEZE OF THE ETHYLENE GLYCOL TYPE IS USED, THE COOLANT SOLUTION MUST CONTAIN AT LEAST 40% WATER.

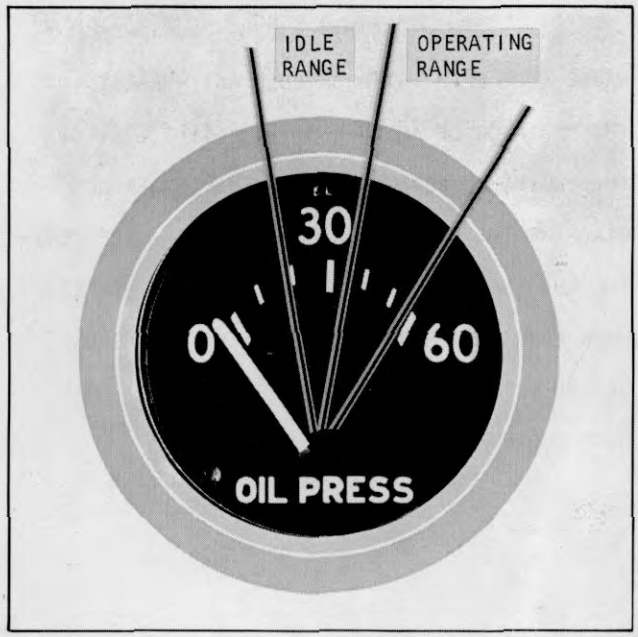


Plate 8606. Oil Pressure Indicator

If the oil pressure is erratic or falls below the above limit, stop the engine immediately and find the cause of the trouble. Refer to trouble shooting section for this information. On new machines, after starting machine, run it at idle for five minutes, then stop engine and recheck oil level in crankcase. Bring oil level to high mark, if necessary.

N O T E

Before placing machine in operation, run engine a few minutes to warm oil especially in cold operating condition.

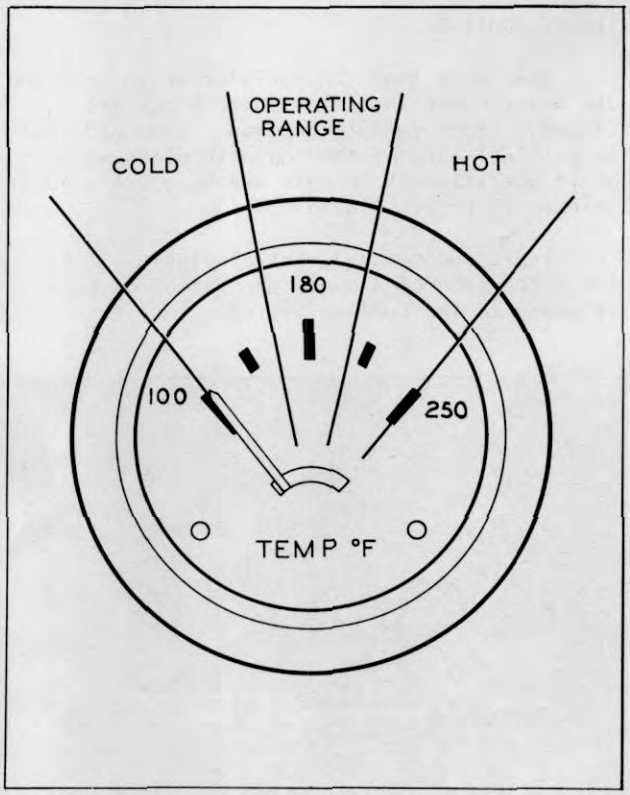


Plate 9955. Engine Coolant Temperature Indicator

N O T E

The coolant temperature should register in the operating range after the first few minutes of operation. Low operating temperatures wastes fuel and increases engine wear.

C A U T I O N

DO NOT IDLE THE ENGINE FOR LONG PERIODS AS IT IS NOT ONLY DETRIMENTAL TO THE ENGINE BUT ALSO INCREASES OPERATING COSTS AS YOU ARE USING FUEL WITHOUT BENEFIT.

Plate 7162. Hour Meter

The hour meter accurately records the actual hours of machine operation. This will serve as an aid in determining the time intervals for lubrication and preventive maintenance services.

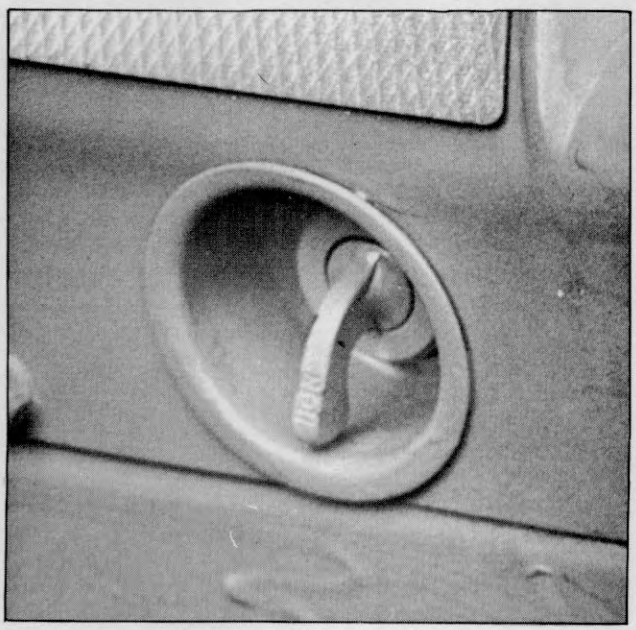


Plate 7018. Ignition Switch

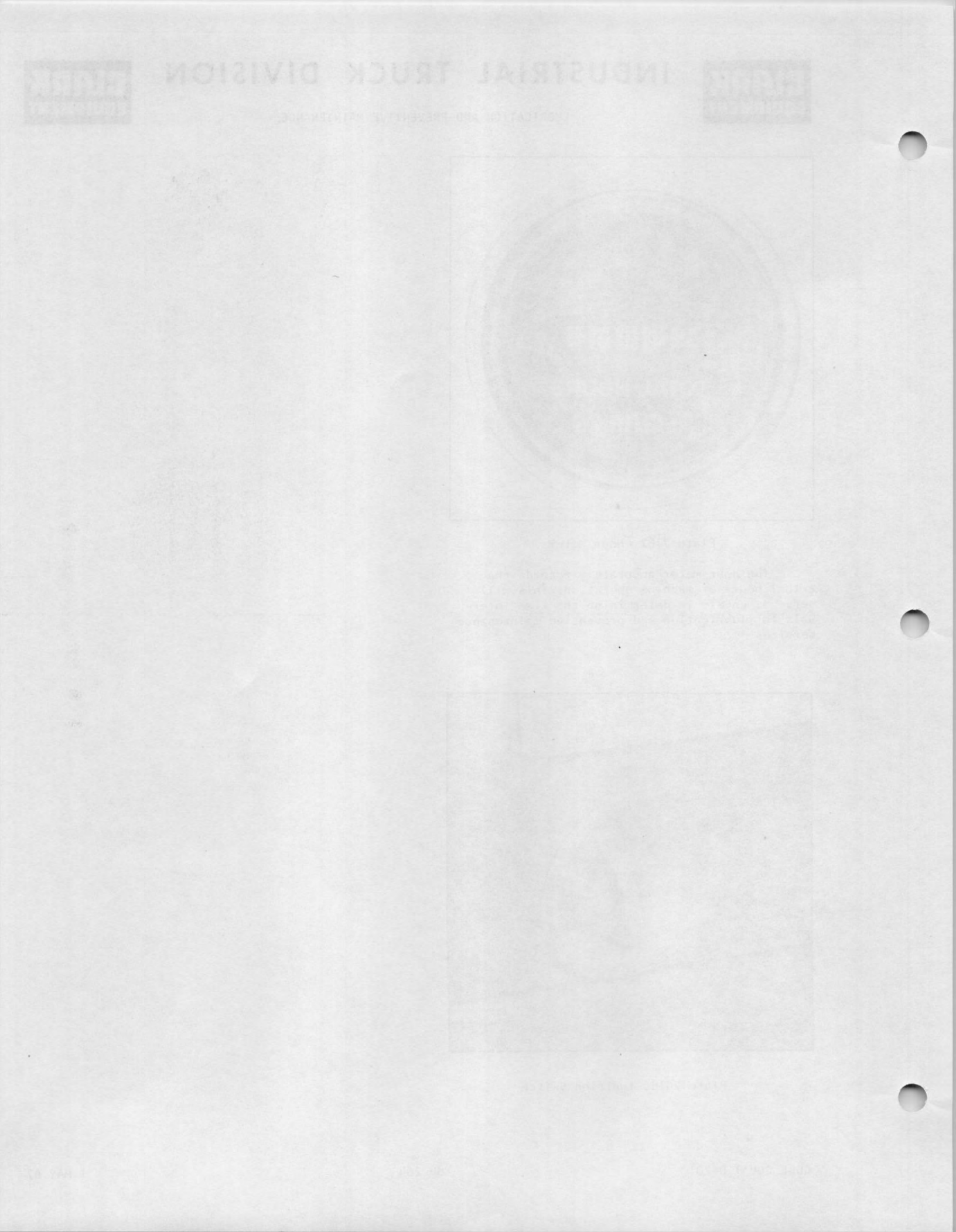


Plate 5985. Air Cleaner
Fill to oil level only.

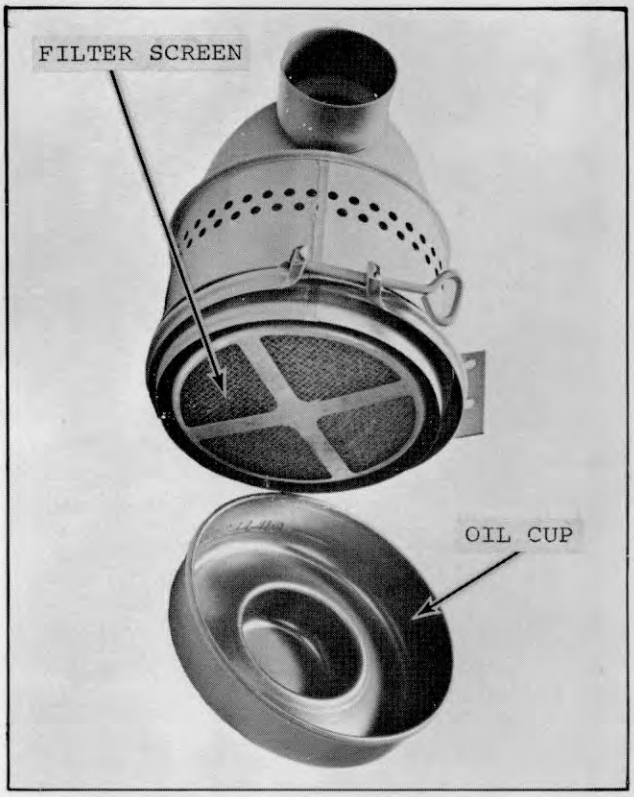


Plate 7663. Air Cleaner Screen and Oil Cup.

AIR CLEANER (OIL BATH TYPE)

The air cleaner is of the oil bath type. The main function of the air cleaner is to prevent dirt and grit from getting into the engine. All engines, when operating, consume several thousand cubic feet of air per hour. Since dusty air is full of abrasive matter, the engine will soon wear excessively if the air cleaner does not remove the dust before entering the cylinders.

Operating conditions determine the air cleaner service periods. As the dirt is strained from the air flowing through the cleaner, it thickens the oil in the cup and raises the level. If the level is to high, agitation of the oil on the screen is affected and gritty oil is carried over into the air stream, through the carburetor and into the engine cylinders. This would actually introduce a grinding compound with resulting very rapid wear.

Air cleaner maintenance may seem trivial, but it can mean longer engine lift, less engine up keep and better economy providing proper maintenance is exercised. Common sense with a close observance can best determine the frequency of air cleaner maintenance.

RECOMMENDED MAINTENANCE

The air cleaner should be checked every 8 operating hours and cleaned if needed. This may be necessary twice daily under extreme dirty conditions.

Remove air cleaner oil cup and wash in a Stoddard type cleaning solvent. Wipe dry and refill with new engine oil. Replace oil cup on air cleaner being sure it is properly positioned.

Check all hose connections to be sure they are tight. Periodically remove hose connections and check interior of hose for dirty or dust. If found, this indicates that additional cleaning intervals are necessary.

C A U T I O N

ALWAYS CHECK AIR CLEANER ASSEMBLY WITH THE ENGINE TURNED OFF. NEVER CHECK OR REFILL THE OIL CUP WITH THE ENGINE IN OPERATION.

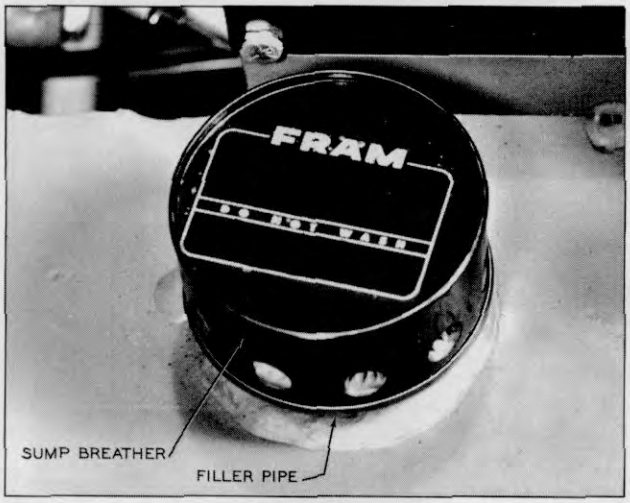


Plate 6626. Hydraulic Sump Tank and Sump Breather

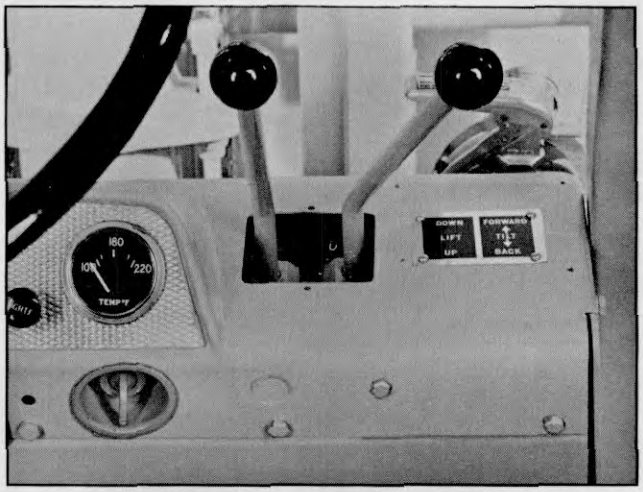


Plate 9535. Lift and Tilt Lever

HYDRAULIC SUMP TANK

Check hydraulic sump tank fluid level in the following manner:

1. Lower upright.

2. Turn switch key to off position

3. Remove sump breather. Fluid level should be up to bottom of filler pipe.

If necessary, fill sump tank using MS 68 Hydraulic fluid. Move valve control levers with hydraulic pump operating to allow any air in the lines to escape, then recheck sump tank fluid level and fill as requred before putting machine in operation.

HYDRAULIC CONTROL LEVERS

I M P O R T A N T

EVERY 8 OPERATING HOURS (OR EVERY SHIFT)

ELEVATE UPRIGHT TO THE UPPER LIMIT. THIS WILL PROVIDE LUBRICATION TO THE TOP PORTION OF THE LIFT CYLINDER.

Check lift and tilt operation. The lift and tilt cylinders should actuate when lift or tilt levers are moved either way from neutral position.

When load is elevated and control lever returned to neutral position, load should remain in elevated position, with no noticeable downward drift. If load drifts downward excessively, this may indicate lift cylinder U-Cup or seal damage.

With tilt lever in neutral position, upright should remain steady with no noticeable backward or forward drift. If upright drifts excessively either way, this may indicate tilt cylinder seal or U-Cup damage.

C A U T I O N

NEVER ALLOW LOADED OR UNLOADED LIFT CARRIAGE TO REMAIN IN AN ELEVATED POSITION FOR ANY PROLONGED PERIODS. LIFT CARRIAGE SHOULD BE LOWERED WHEN NOT IN USE.

DO NOT HOLD CONTROL LEVERS IN EXTREME POSITIONS AFTER A LOAD HAS REACHED ITS LIMITS. TO DO SO WILL RESULT IN HIGH OIL PRESSURE THAT MAY RESULT IN OVERHEATING OF THE HYDRAULIC OIL.

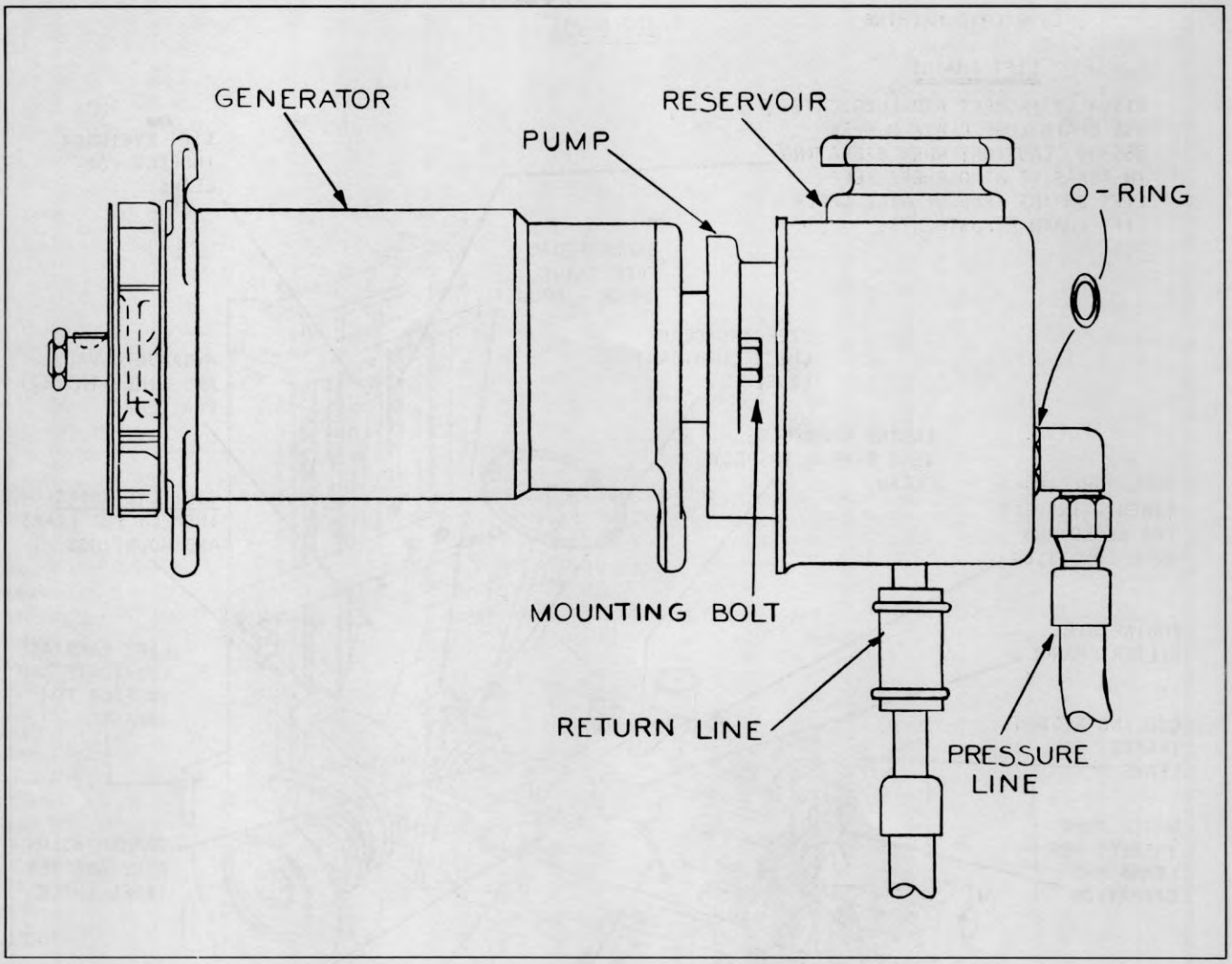


Plate 5940. Power Steering Pump

POWER STEERING PUMP

Check reservoir fluid level each 8 operating hours. Fill (if necessary) with type "A" suffix "A" automatic transmission fluid, CLARK part number 879803. (Fluid containers must display a qualification number prefixed by AQ-ATF.) When fluid in reservoir becomes contaminated it should be drained by removing the return line hose at the bottom of the reservoir. After draining refill to the proper level with the above mentioned fluid. Operate engine for a few minutes and recheck fluid level. Fill to the proper level if necessary.

C A U T I O N

DO NOT OPERATE ENGINE WHILE RESERVOIR IS EMPTY AS THE STEERING PUMP WILL NOT BE LUBRICATED AND SERIOUS DAMAGE WILL OCCUR.

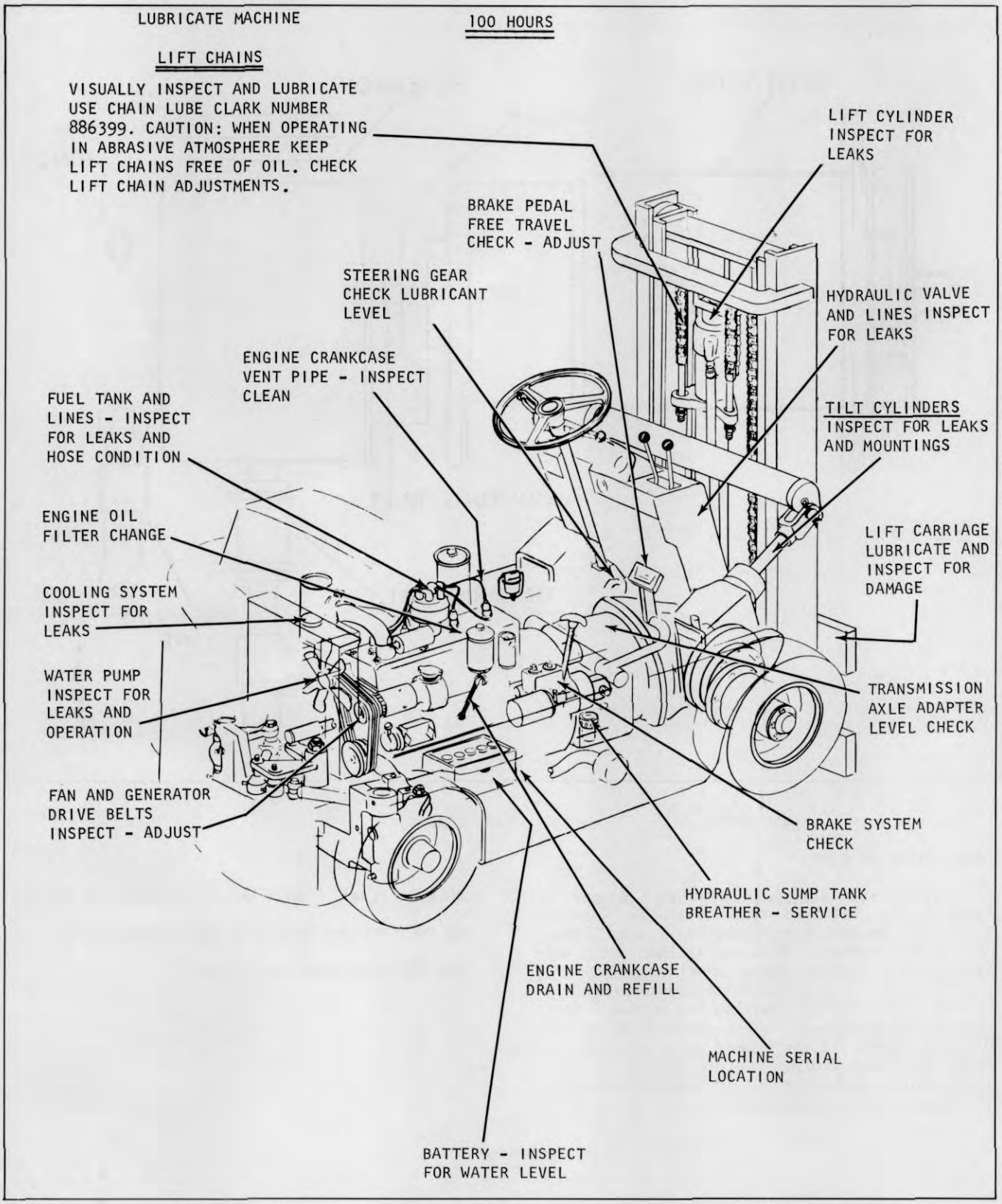


Plate 9481. 100 Hour Lubrication & Preventive Maintenance Illustration Index

CONVERTER, TRANSMISSION AND AXLE ADAPTER

Verify fluid level with engine operating and transmission in neutral.

Fill with Transmission Fluid Type "A" Suffix "A" that are in cans that have AQ-ATF on them, through the combination filler and dipstick opening. Fill to "Hot Full" mark on dipstick if transmission fluid is at normal operating temperatures. Fill to "Cold Full" mark when oil is at a lower temperature.

FUEL LINES. Make certain that fuel line connections are secure. Check fuel lines for obstructions and leaks. Check screen in fuel filler cap to make certain that it is properly installed.

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x x x x x x x x x x x x x x x x x x x x x x x x x x x
x                                                     x
x                    W A R N I N G                    x
x                                                     x
x     THE FUEL TANK IS AN INTEGRAL PART OF            x
x                                                     x
x     THE MACHINE FRAME AND ANY WELDING IN            x
x                                                     x
x     THIS AREA SHALL NOT BE ATTEMPTED BEFORE         x
x                                                     x
x     FIRST TAKING ADEQUATE SAFETY PRECAUTIONS        x
x                                                     x
x     REPORT TO DESIGINATED PERSON IN AUTHOR-         x
x                                                     x
x     ITY                                             x
x x x x x x x x x x x x x x x x x x x x x x x x x x x
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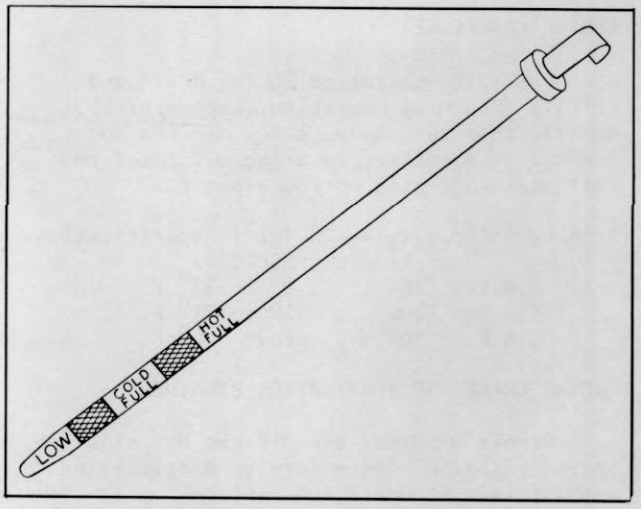


Plate 7303. Transmission Dipstick

ENGINE CRANKCASE

Every 100 operating hours, drain and refill. (Drain at operating temperatures). Refill, then run engine a few minutes and add oil as necessary to bring oil level to full mark indicated on the dipstick.

Crankcase Capacity — Refer to Specifications

Service "MS" Oils

S.A.E.	10W	0° to 32° F.
S.A.E.	20W	32° to 75° F.
S.A.E.	30W	above 75° F.

ENGINE CRANKCASE VENTILATION BREATHER

Remove breather and oil cup by releasing spring clips. Dislodge foreign particles by washing in a Stoddard type solvent until clean. Allow to air dry. Fill oil cup to level mark with oil of same viscosity as used in engine. Replace breather after it is completely air dried.

Plate 7033. Engine Breather

ENGINE OIL FILTER

The oil filter element is of the replaceable type. The element should be changed whenever the crankcase is drained. To remove the element, remove oil filter cover screw and gasket, oil filter cover, cover spring and cover gasket. Lift out oil filter element. Install new element after draining and thoroughly cleaning filter case. Install new gaskets and replace cover spring, oil filter cover and secure with oil filter cover screw.

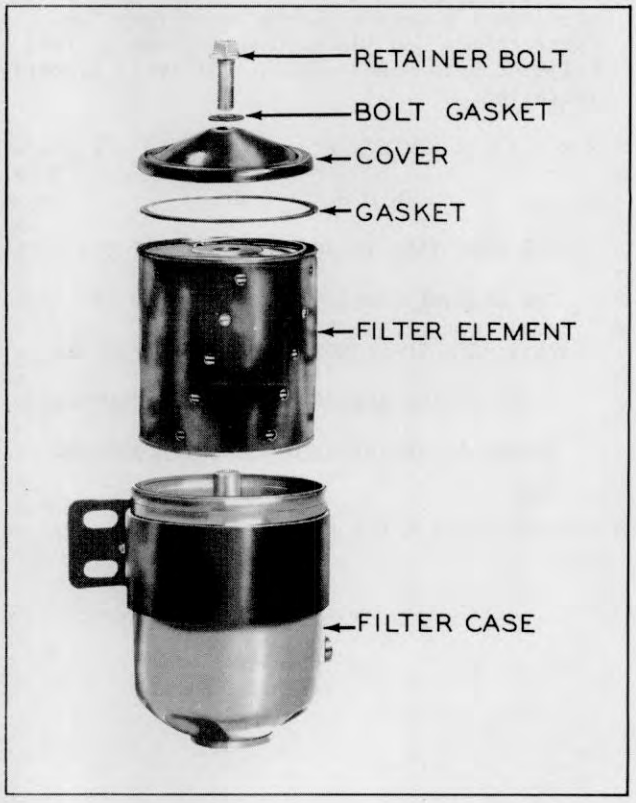


Plate 6332. Engine Oil Filter

C A U T I O N

START ENGINE, RUN AT IDLE FOR A FEW MINUTES, CHECK COVER AND COVER SCREW FOR LEAKS.

Plste 6458. Radiator Pressure Cap

WARNING

USE EXTREME CARE IN REMOVING THE RADIATOR PRESSURE CAP. IN PRESSURE SYSTEM, THE SUDDEN RELEASE OF PRESSURE CAN CAUSE A STEAM FLASH AND THE FLASH, OR THE LOOSENED CAP CAN CAUSE SERIOUS PERSONAL INJURY. LOOSEN CAP SLOWLY AND ALLOW STEAM TO ESCAPE. THIS MACHINE IS EQUIPPED WITH A 7 LB. PRESSURE CAP.

COOLING SYSTEM

Check radiator, hoses and water pump for leaks.

Add proper amount of water or antifreeze solution to cooling system. If antifreeze is not available and machine is to be at rest for an appreciable length of time; drain system when temperature is likely to be 32^{o} F, or lower, If water is added to radiator containing antifreeze solution, always test solution in radiator with a hydrometer to determine the degree of protection. For proper amount of antifreeze solution required to protect the cooling system, refer to instructions on antifreeze container.

N O T E

COOLING SYSTEM CAPACITY - REFER TO SPECIFICATIONS.

Accumulated foreign material should be blown from radiator fins with compressed air. Direct air stream through radiator fins towards engine to make this process effective.

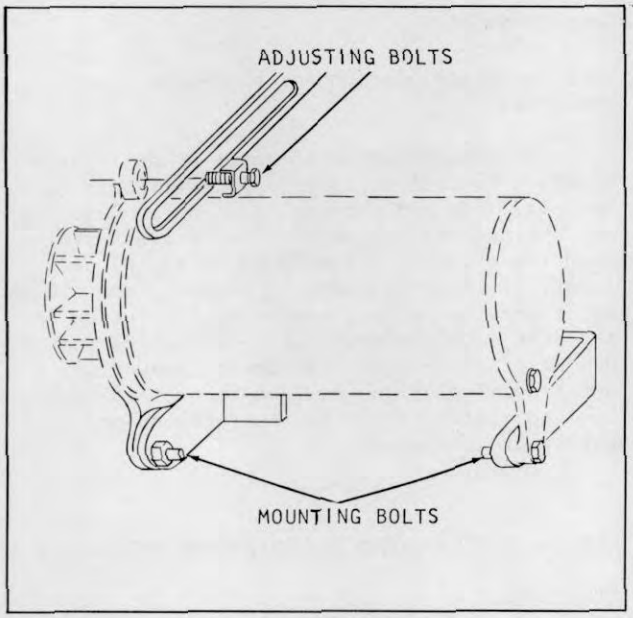


Plate 6631. Generator Drive Belt Adjustment

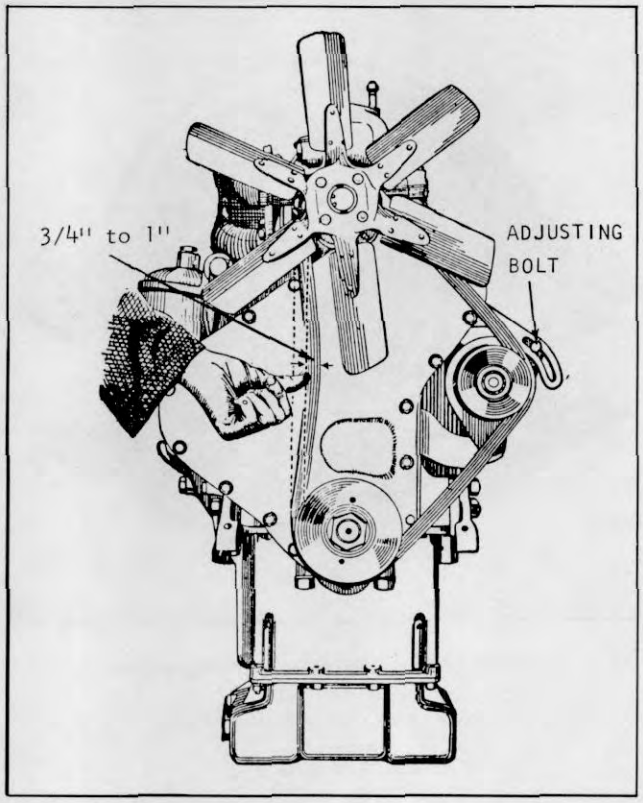


Plate 6632. Belt Deflection Check

FAN AND GENERATOR DRIVE BELTS

The drive belts should have finger pressure deflection of 3/4 to 1 inch midway on long span. If belts require adjustment, use following procedure.

1. Loosen generator brace adjusting bolt and two lower mounting bolts, See Plate 6631.

2. Move generator toward cylinder block to loosen Generator Drive Belts and away from cylinder block to tighten belts. Tighten bolts when correct finger deflection is obtained.

C A U T I O N

EXERCISE CAUTION WHEN ADJUSTING BELTS. BELTS ADJUSTED TOO TIGHT WILL VERY LIKELY CAUSE BEARING DAMAGE. CONVERSELY, BELTS ADJUSTED TOO LOOSE WILL RESULT IN BELT WEAR AND HIGH ENGINE TEMPERATURE DUE TO BELT SLIPPAGE.

N O T E

UPON REPLACEMENT OF DRIVE BELTS, IT WILL BE NECESSARY TO USE A MATCHED SET OF BELTS.

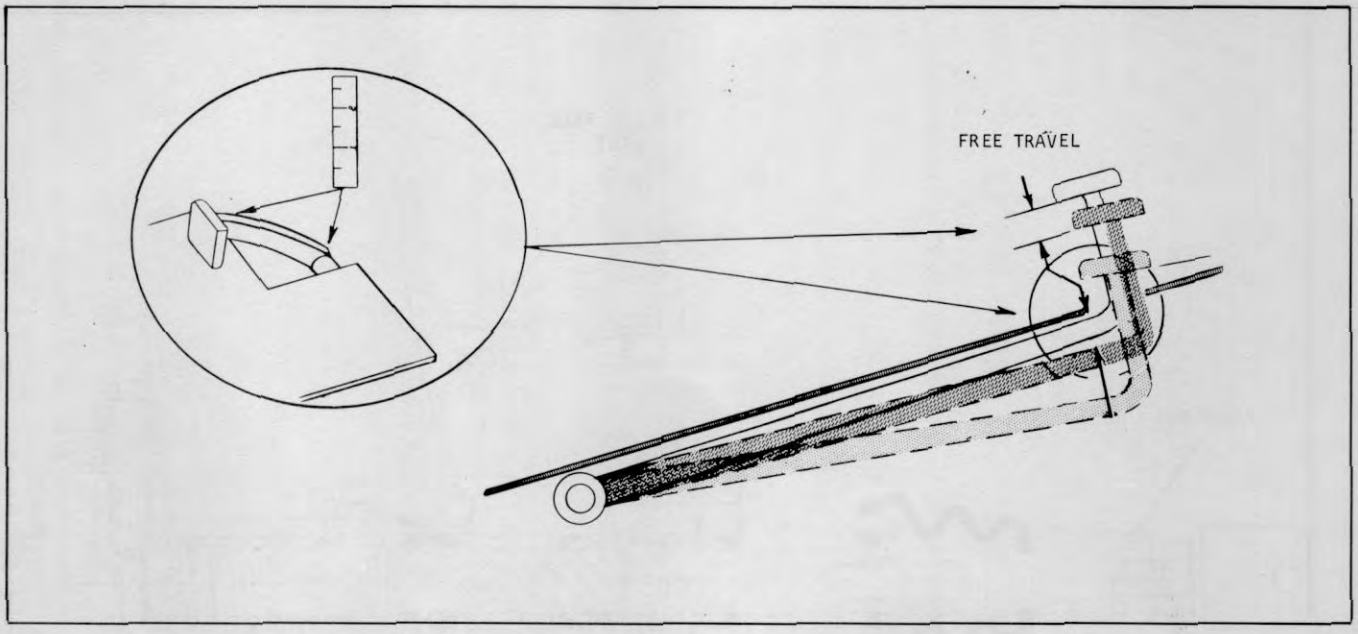


Plate 9592. Brake Pedal Free Travel

BRAKE PEDAL

1. Depress brake pedal by hand. When pedal meets resistance from the master cylinder, the distance traveled should be 3/16" to 5/16". If free travel is incorrect an adjustment should be made at the master cylinder linkage adjuster.

2. Depress foot pedal and hold for at least 10 seconds. Pedal must be solid, must not be spongy or drift under foot pressure.

BRAKE SYSTEM

Check brake fluid level in the master cylinder. Brake fluid should be within 1/4 inch of the top. Fill with SAE 70 R3 Heavy Duty Brake Fluid. Clark Part Number 1800200.

Master Cylinder Filler Cap Vent Hole:
Check cap vent hole for obstruction. Vent hole must be open at all times. Clean if necessary, see Plate 6987.

Brake Pedal Adjustment

1. Loosen locknut, See plate 6987.

2. Rotate adjuster in the direction necessary to obtain specified free travel.

3. Tighten locknut to secure adjustment.

ACTUATION STROKE

If nearly full pedal travel is necessary to apply the brakes, there is an indication of either lack of fluid in the master cylinder; air in system, leakage at the cylinders, or the brake linings require adjustment or replacement.

W A R N I N G

CORRECT BRAKE PEDAL FREE TRAVEL IS IMPORTANT FOR SAFE OPERATING BRAKES.

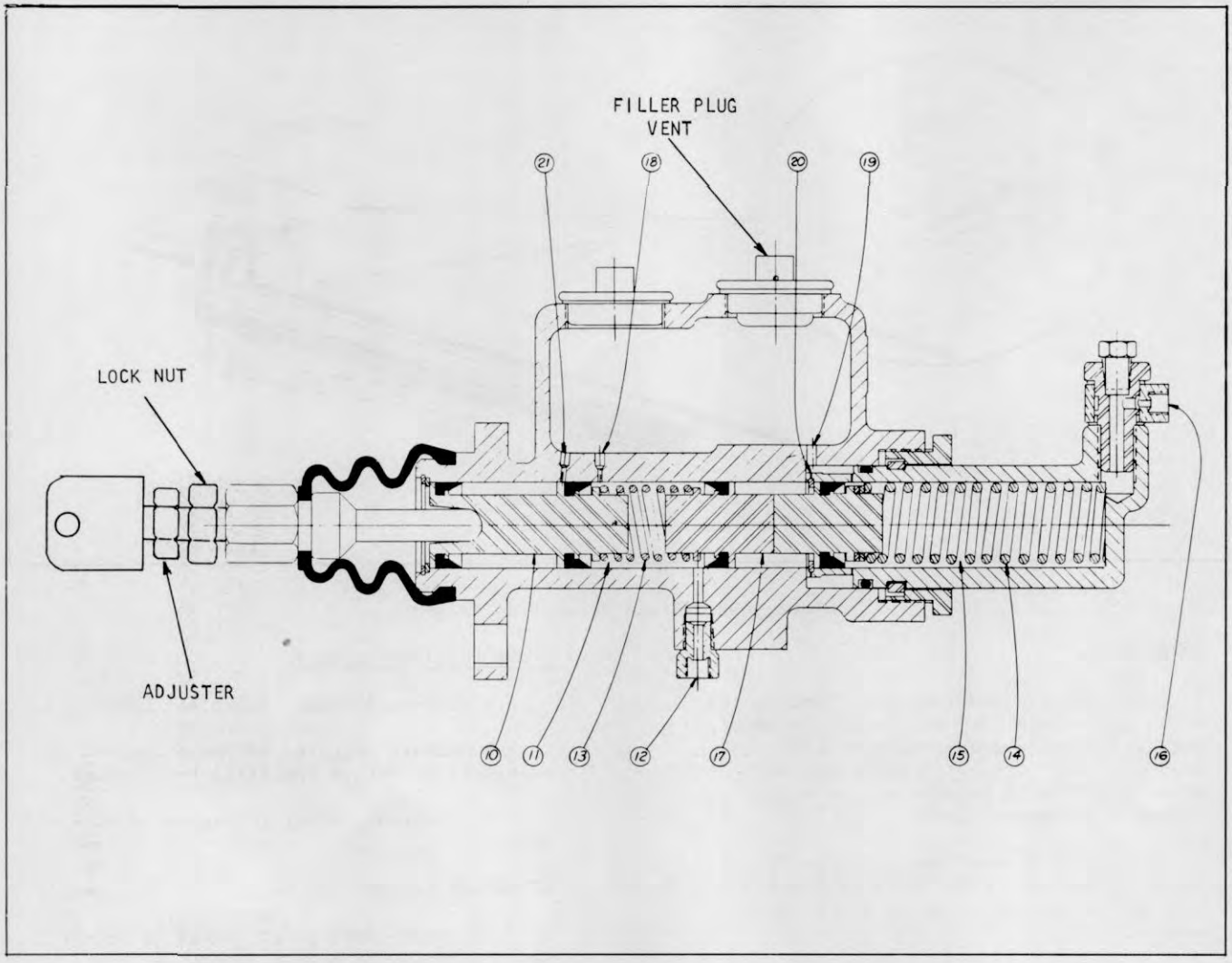


Plate 6987. Master Cylinder

The piston (10) is moved in conventional manner by linkage from the brake pedal. As this is done, oil from the cavity (11) is moved out thru port (12) to the inching control. Since spring (13) is lighter and more readily compressed than spring (14) the oil from cavity (11) will flow thru port (12) more readily and in greather volume than oil from cavity (15) thru port (16) the latter supplying the brake system.

As further motion is imparted to piston (10) from the brake pedal the pressure in (11) builds up to the pressure required for positive brake application. At this time piston (17) is caused to move further into cavity (15) thus forcing high pressure oil out of port (16) and into the brake system.

Thus it is seen that this unit provides initially, low pressure oil to actuate the inching mechanism and to partially actuate the brake mechanism, making brakes ready for immediate application, and finally, high pressure oil for complete brake actuation. In the reverse operation when brake pedal effort is released, the braking effort is removed first, and the inching effort second upon return of the brake to its normal position.

Hydraulic oil is provided to the system thru ports (18) and (19) from a conventional reservoir. Port (20) serves to vent any build up of oil pressure between the two sections of the piston (17). Port (21) serves to vent any build up of oil pressure between the two seals on piston (10).

LIFT AND TILT CYLINDERS

Check for drift, leakage at packings, damage and security of mountings. (Anchor pivot pins, flanges and mounting rings).

LIFT CHAINS

The lift chains are mounted to the chain anchors on the lift carriage and at the chain anchor rods near the lift cylinder piston head.

If it becomes necessary to adjust the lift chains, proceed as follows:

W A R N I N G

KEEP CLEAR OF LOAD AND CARRIAGE WHEN MAKING ADJUSTMENTS TO AVOID INJURY IF ANY MALFUNCTION SHOULD OCCUR AND CAUSE LOAD OR CARRIAGE TO FALL.

1. Elevate carriage to about 4 feet.

2. Smear grease on the innerslide channel as shown in Plate 8622.

3. Pick up a capacity load.

N O T E

It is important that the chain adjustment be made with a capacity load. In this manner you will allow for chain stretch.

4. Making sure uprights are either vertical or aft of vertical, lower load to the bottom.

5. Remove capacity load.

6. Raise carriage and measure the distance from where the center of the <u>bottom carriage roller</u> stopped, to the bottom edge of the inner slide. Distance must not be less than ½".

LUBRICATE MACHINE

Lubricate all miscellaneous linkage with SAE 20 oil and all grease fittings with chassis grease. (Refer to Lubrication Chart).

C A U T I O N

WHEN LUBRICATING MACHINE, INSPECT FOR LEAKING HYDRAULIC LINES, FITTINGS, AND DAMAGED ELECTRICAL WIRING.

HYDRAULIC CONTROL VALVE AND LINES

Inspection for damage, leakage and security of mounting.

LIFT BRACKET

Inspect for damage, bent forks, etc.

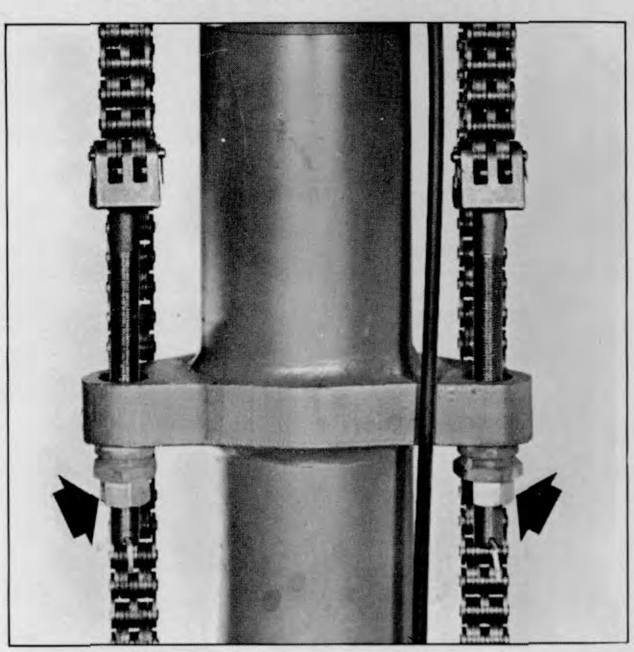


Plate 6634. Lift Chain Adjustment (Chain Anchor Rods)

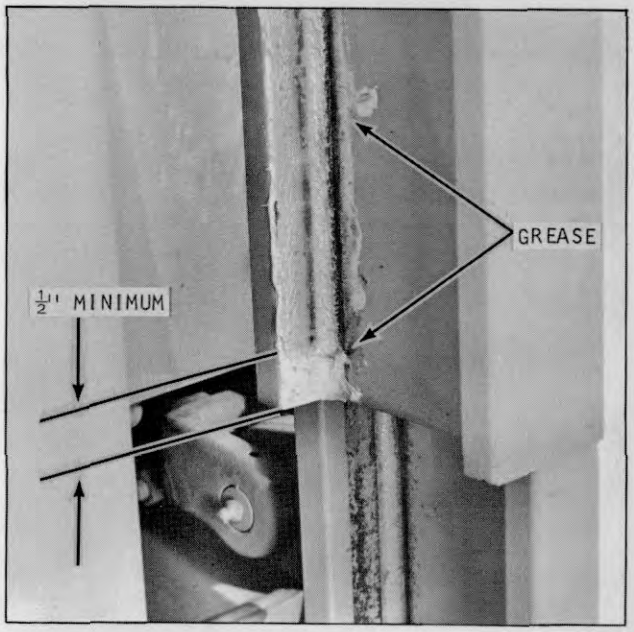


Plate 8622. Lift Chain Adjustment

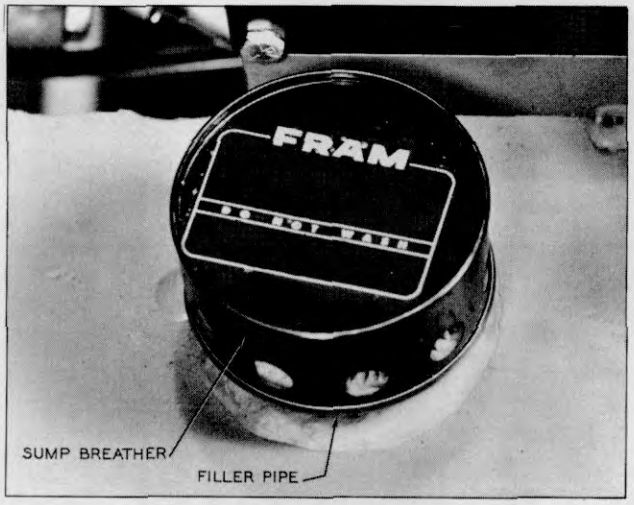


Plate 6626. Hydraulic Sump Tank

HYDRAULIC SUMP TANK BREATHER

Check breather to be sure it is not dirty or clogged with foreign matter. Replace breather if dirty.

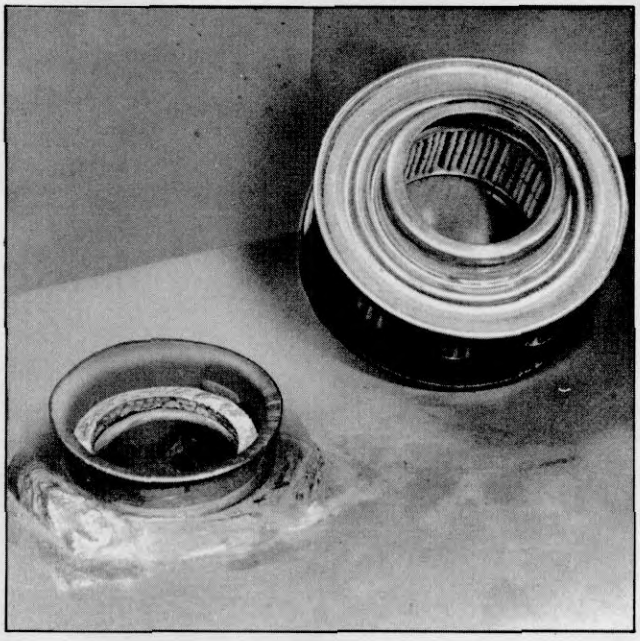


Plate 6682. Hydraulic Sump Tank & Sump Breather

STEERING GEAR

Verify lubricant level, fill if necessary with AMOCO Lithium Multipurpose Grease or its equivalent.

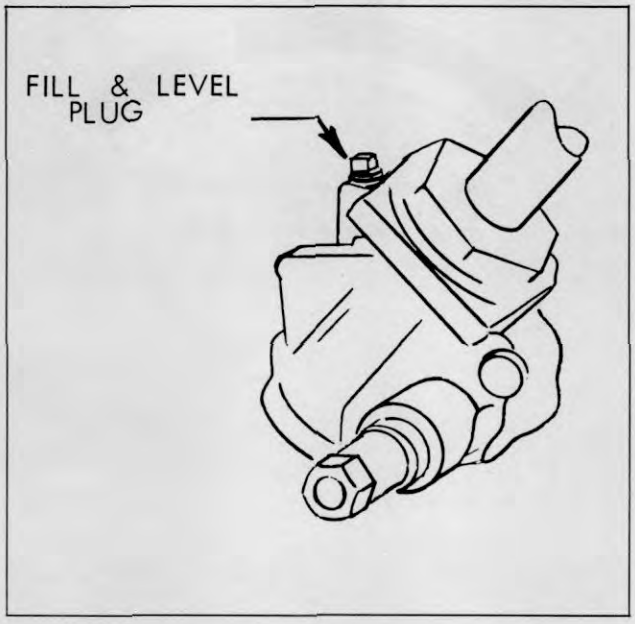


Plate 6429. Steering Gear

BATTERY INSPECTION

Remove all caps and check fluid level. Keep the fluid in each battery cell above the plates or up to the level ring in the bottom of the filler well. Use only pure distilled water. If the machine is exposed to freezing temperatures, operate the engine for a period of time to make sure the added water mixes thoroughly with the battery electrolyte solution. Otherwise, the water may freeze and damage the battery.

```
x x x x x x x x x x x x x x x x x x x x x x x x x
x                                               x
x                  W A R N I N G                x
x                                               x
x  NEVER ALLOW FLAME OR SPARKS NEAR THE         x
x                                               x
x  BATTERY FILLER HOLES BECAUSE EXPLOSIVE       x
x                                               x
x  HYDROGEN GAS MAY BE PRESENT                  x
x                                               x
x x x x x x x x x x x x x x x x x x x x x x x x x
```

Take hydrometer reading of electrolyte to determine state of charge. Charge battery if reading is below 1.225 at 24° C (75° F), or below 1.265, if machine is exposed to freezing temperatures. If machine is operating in tropical areas in which freezing weather is not encountered, the full charge specific gravity reading may be lowered from 1.375 to 1.225 by diluting the electrolyte with distilled water.

N O T E

Add distilled water before charging. Do not add distilled water immediately after a charge.

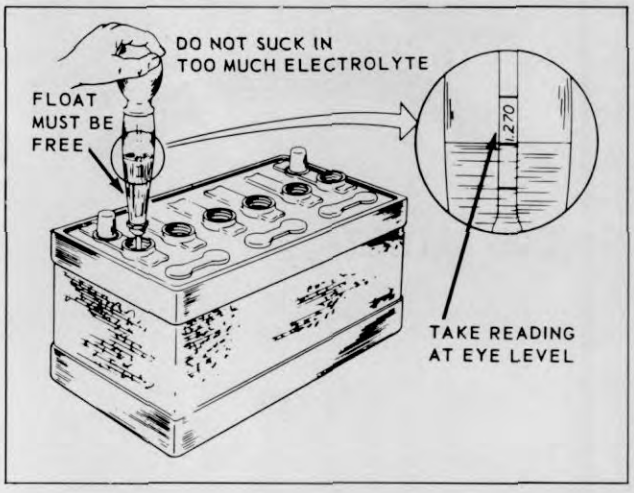


Plate 6271. Checking Specific Gravity of Battery

Make sure that all connections are tight at battery, starter, generator voltage regulator, distributor and spark plugs. Corrosion can be removed from the battery cables and terminals with a solution of baking soda or ammonia and water. After cleaning, flush the top of the battery with clean water, and coat the parts with grease to retard further corrosion.

BATTERY TEST PROCEDURE

A defective battery or a discharged battery may be found by performing the following "Light Load Test"

1. Place an electrical load on the battery by cranking the engine for three seconds. If it starts, turn the ignition off immediately.

2. Place a 10 ampere load across the battery terminals for one minute. This will condition the battery so an accurate voltage comparison test can be made between cells. (Turning two headlights on low beam will equal the 10 ampere load - this method may be used in place of the load placed across the terminals)

3. After one minute, and with the 10 ampere load still on the battery, check the individual cells with an expanded scale voltmeter.

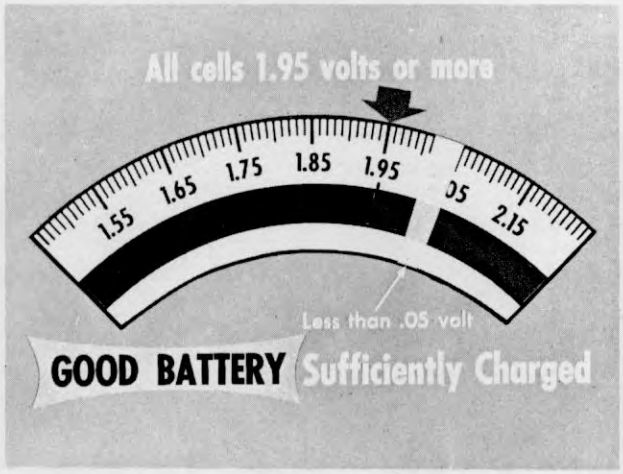


Plate 8306.

4. Place the positive voltmeter prod on the positive side of the cell and the other prod on the negative side. A good battery, sufficiently charged will read 1.95 volts or more on each cell with a difference of less than .05 volt between hightst and lowest cell.

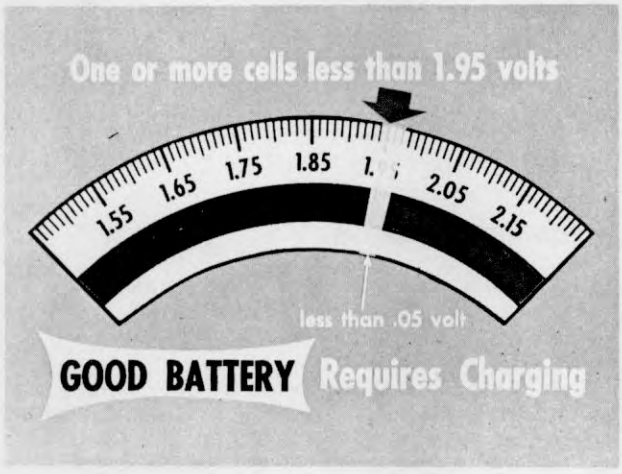


Plate 8307.

5. If cells read both above and below 1.95 volts and the difference between highest and lowest cell is less than .05 volt, battery is good but requires charging.

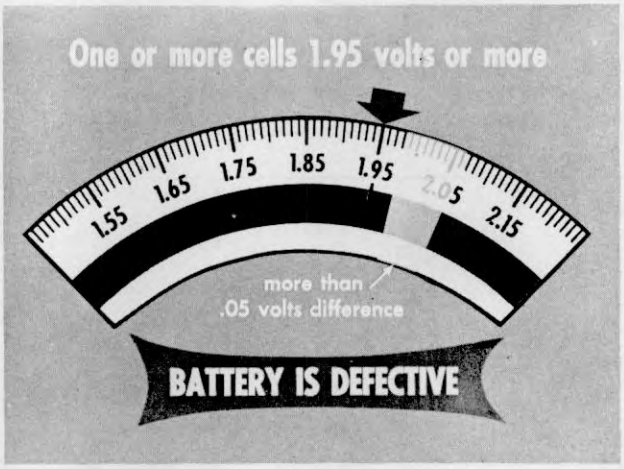


Plate 8308.

6. If any cell reads 1.95 volts or more and there is a difference of .05 volt or more between the highest and lowest cell, the battery is defective.

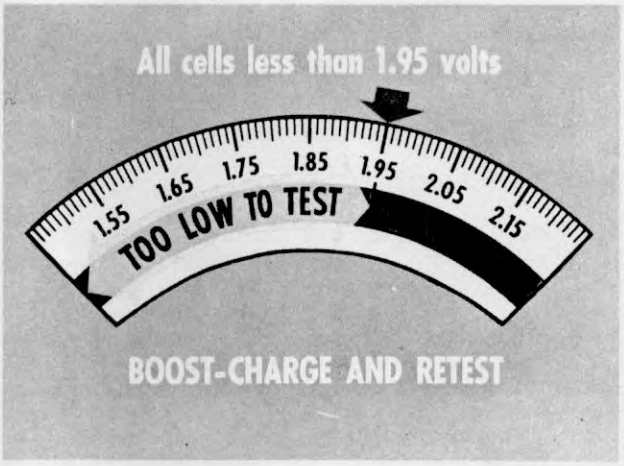


Plate 8309.

7. If all cells read less than 1.95 volts, battery is too low to test accurately. Boost-charge and repeat light load test.

INDUSTRIAL TRUCK DIVISION

LUBRICATION CHART KEY

ENGINE OIL.....
SAE 10W ---- 0 deg. to 32 deg. F.
SAE 20W ---- 33 deg. to 75 deg. F.
SAE 30 ---- above 75 deg F.
Low Temperature Operation.....Multi-Grade Oil

Multi-viscosity oil should be used ONLY where cold starting conditions make it necessary. The oil supplier should assume full responsibility for satisfactory performance of the engine operating temperatures.

Shell X-100 or Rotella T Motor Oil
Sunfleet MIL-B Motor Oil
Sinclair Extra Duty Motor Oil or Tenol Motor Oil
Gulflube Motor Oil X.H.D.
AMOCO 200
Citgo C300 LP Gas Engine Oil & Preminum Motor Oil
Havoline or URSA Extra Duty Motor Oil
Purol HD Motor Oil
or the equivalent to the above.....

TRANSMISSION FLUID.....
Automatic Transmission Fluid, Type "A", Suffix "A". Fluid Containers must display a qualification number prefixed by AQ-ATF. Clark Part Number 879803.
Automatic Transmissions and Hydracool Clutch ....Standard Transmissions.
Transmission/Axle Adaptor/Power Steering System have a common sump.

Shell Automatic Transmission Fluid Donax T-6
Sunoco Automatic Trans. Fluid Type "A", Suffix "A"
Sinclair Automatic Trans. Fluid Type "A", Suffix "A"
Gulf Automatic Trans. Fluid Type "A", Suffix "A"
AMOCO Automatic Trans. Fluid Type "A", Suffix "A"
Citgo Automatic Trans. Fluid Type "A", Suffix "A"
Texamatic Automatic Trans. Fluid Type "A" 1826-3528
Purelube Automatic Trans. Fluid Type "A", Suffix "A"
or the equivalent to the above.....

BRAKE MASTER CYLINDERS.....
SAE 70R3 (Heavy Duty Brake Fluid), Clark Part Number 1800200.
R.H. Brake Master Cylinder....and, Inching/Brake Master Cylinder.

Shell Super Heavy Duty Hydraulic Brake Fluid
Gulf Heavy Duty Hydraulic Brake Fluid
Atlas Heavy Duty Hydraulic Brake Fluid
Texaco Super Heavy Duty Hydraulic Brake Fluid
Pure Super Heavy Duty Hydraulic Brake Fluid
or the equivalent to the above.....

HYDRAULIC SUMP TANK.....
Hydraulic Fluid per Clark Specifications MS-68.
Clark Part Number 885385.

Shell LO Hydrax 127
Sunvis Industrial Oil #816 WRP
Gulf Harmony 43 AW
AMOCO Industrial Oil RL #14A
Citgo Pacemaker XD-15 MS-68 Hydraulic Oil
Texaco 729 Rando Oil HD-A
Puropale RX Hydraulic Oil #150
Molub-Alloy Industrial Hydraulic Oil #601
or the equivalent to the above.....

AXLE END/STEER WHEEL BEARINGS...
NLGI #1 or NLGI #2....A smooth multi-purpose grease or refined mineral oil blended with a lithium soap thickner containing anti-wear, anti-rust and anti-oxidants with "EP" additives. To meet or exceed Clark Specifications MS-107 and Timken Test 40# minimum.

Shell Aluania "EP" Grease #1 or #2
Sun Prestige 741 "EP" #1 or 742 "EP" #2
Gulfcrown Grease "EP" #1 or #2
Amolith Grease "EP" #1 or #2
Citgo HEP Grease #1 or #2
Texaco Multifak "EP" #1 or Marfak All Purpose #2
Poco HT Grease "EP" #1 or #2
Molub-Alloy General Purpose Grease #1 or #2
or the equivalent to the above.....

CHASSIS LUBRICANT.....
NLGI #2 (same as stated above)

NLGI #2 (refer to the above)

CHAIN LUBE.....
Lift Chain Lube, Clark Part Number 886399.

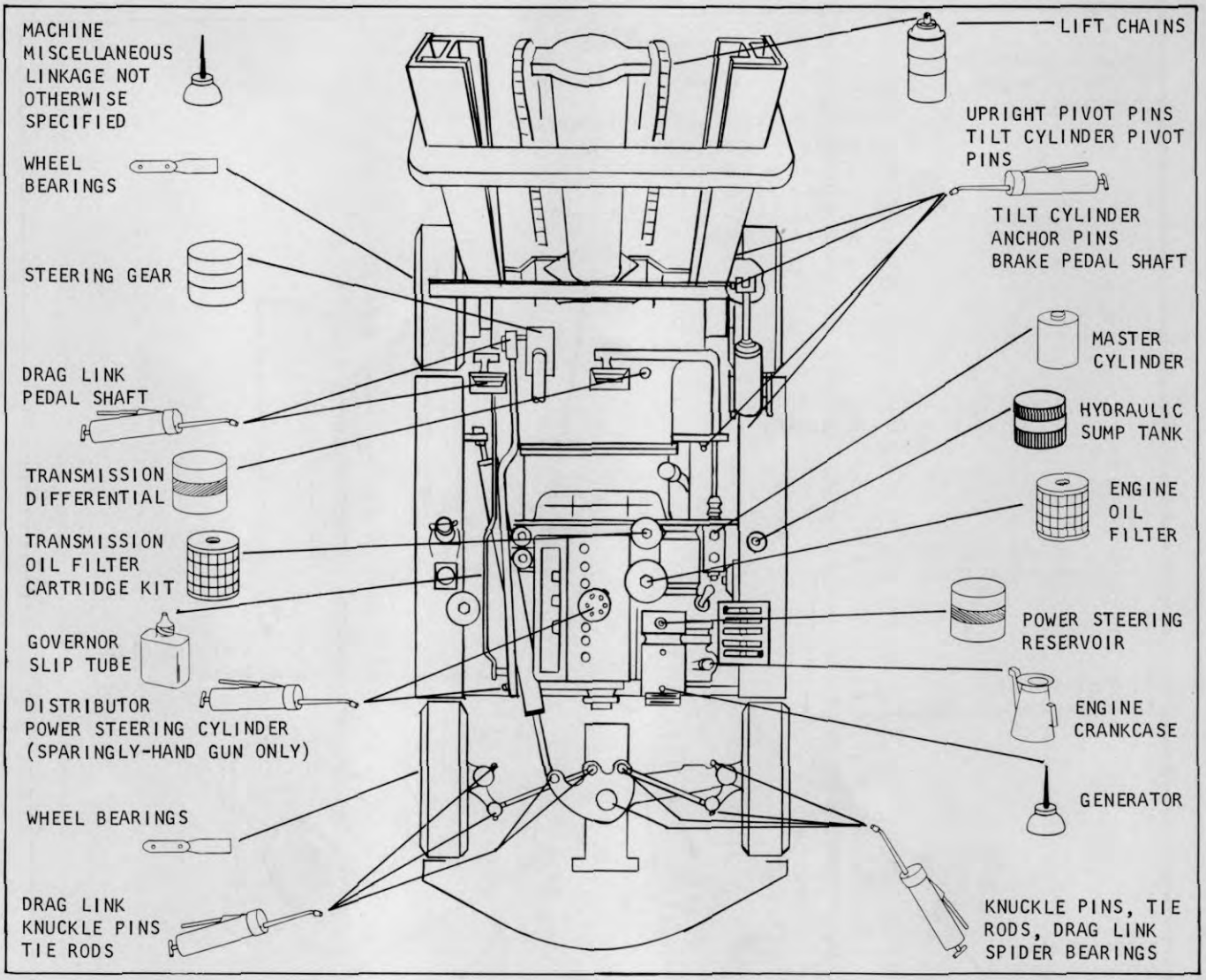
Technical Societies in Reference

AGMA..American Gear Manufacturers Association
API.....American Petroleum Institute
ASTM...American Society for Testing Materials
ICEI.... Internal Combustion Engine Institute
MIL.... Military Specification
NGPA.. Natural Gas Processors Association
NLGI...National Lubricating Grease Institute
SAE.....Society of Automotive Engineers

OIL FILTERS.....
Oil Filter Cartridge Kit.
Engine Oil Filter/Hydraulic Sump Tank Fluid Filter/Transmission Fluid Filter.

INDUSTRIAL TRUCK DIVISION

LUBRICATION AND PREVENTIVE MAINTENANCE



CHASSIS GREASE

ENGINE OIL: S.A.E. 20

GEAR LUBE: S.A.E. 90

OIL FILTER CARTRIDGE KIT

1800200 HYDRAULIC BRAKE FLUID HEAVY DUTY S.A.E. 70R3

879803 AUTOMATIC TRANSMISSION FLUID TYPE "A", SUFFIX "A" (CAN MUST HAVE NUMBER PREFIXED BY "AQ-ATF".

HYDRAULIC FLUID - CLARK SPECIFICATION MS-68 885385

ENGINE OIL--S.A.E. 10W 0 deg-32 deg F
S.A.E. 20W 32 deg-75 d F.
"Service MS"S.A.E. 30 above 75 deg F.
Or use 10W-30 MULTI-GRADE OIL.

GRAPHITE GREASE

886399 CHAIN LUBE

WHEEL BEARING GREASE SPEC. MS 9C GREASE
AXLE ENDS-#1 EP LITHIUM SOAP GREASE

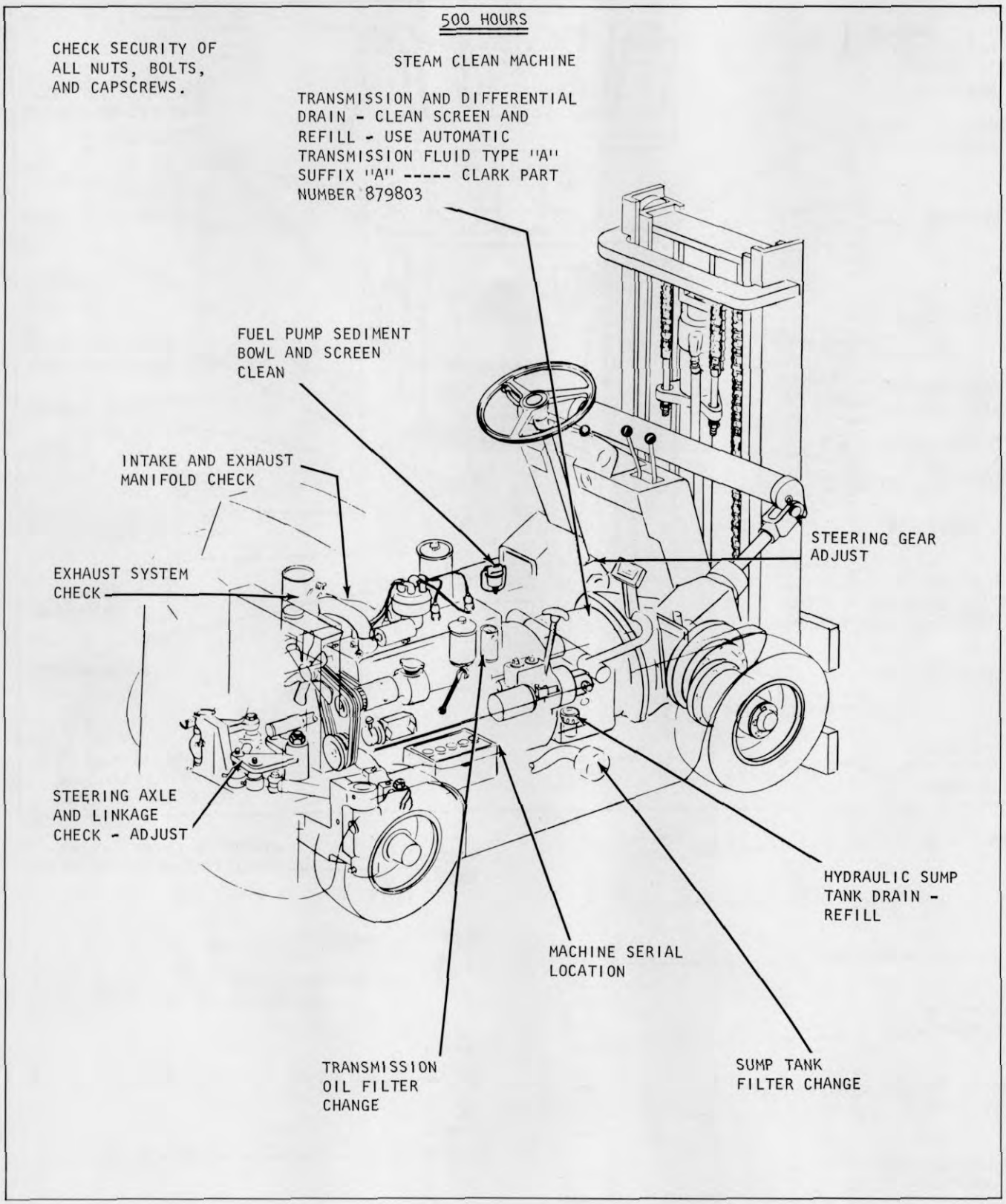


Plate 9482. Lubrication and Preventive Maintenance Illustration

FUEL PUMP STRAINER

The fuel filter and sediment bowl should be cleaned every 500 operating hours. Remove and clean sediment bowl. If fuel strainer is dirty, install a new strainer assembly and gasket. Do not reuse old gasket.

FUEL PUMP

To determine if the fuel pump is defective, remove the fuel tank supply line at the pump and blow out line with compressed air to remove any possible obstructions. Reconnect fuel tank line and disconnect pump to carburetor line. Install a fuel pressure gauge, by placing a "T" in the line, and run engine at 1800 R. P. M. with all lines connected. Fuel pump pressure should be between 1 1/2 and 2 1/4 pounds. If the fuel pump pressure is not within this range the pump should be removed for repair or replacement.

C A U T I O N

TO AVOID CREATING A FIRE HAZARD CARE SHOULD BE TAKEN SO THAT GASOLINE IS NOT SPILLED DURING THESE OPERATIONS.

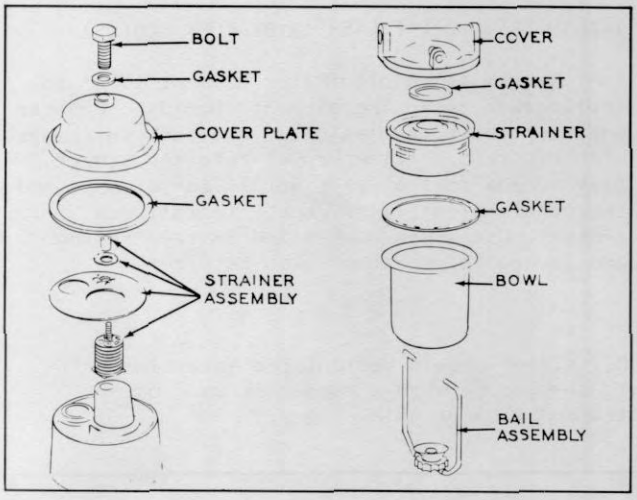


Plate 6638. Fuel Pump & Sediment Bowl

TRANSMISSION OIL FILTER (HYDRATORK MODELS)

Transmission oil filter element is of the replaceable type. The element should be changed whenever the transmission is drained. To remove element, remove filter cover retainer, cover, gasket, and spring. Lift out filter element and thoroughly clean filter body. Install new element. Use a new gasket and install spring and cover. Secure cover with retainer.

N O T E

Oil filter should be replaced each time oil is changed or when a repair is made on transmission or axle adapter.

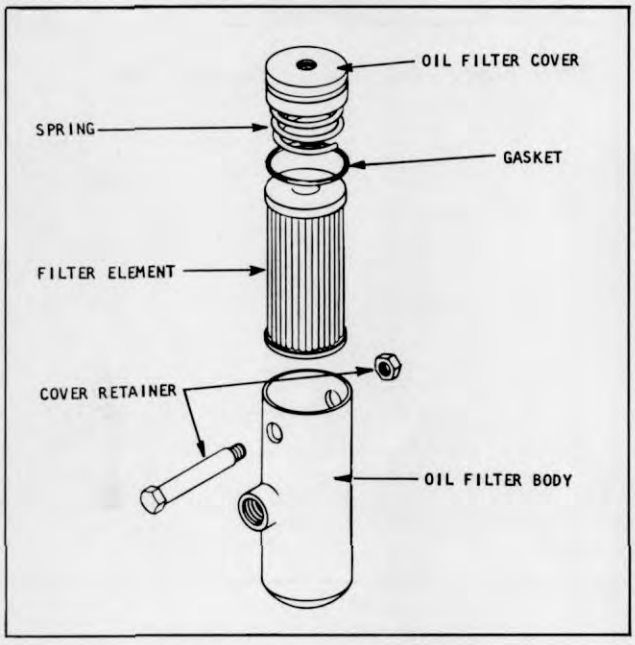


Plate 7234. Transmission Oil Filter

CONVERTER, AXLE ADAPTER AND TRANSMISSION SUMP SCREEN.

1. Drain transmission and axle adapter at operating temperatures. See Plate 7301 on following page for location of drain plugs.

C A U T I O N

DO NOT USE FLUSHING OIL OR COMPOUND TO FLUSH SYSTEM.

2. Remove and clean transmission sump screen in a Stoddard type solvent. Dry with filtered compressed air - directing air thru neck of screen.

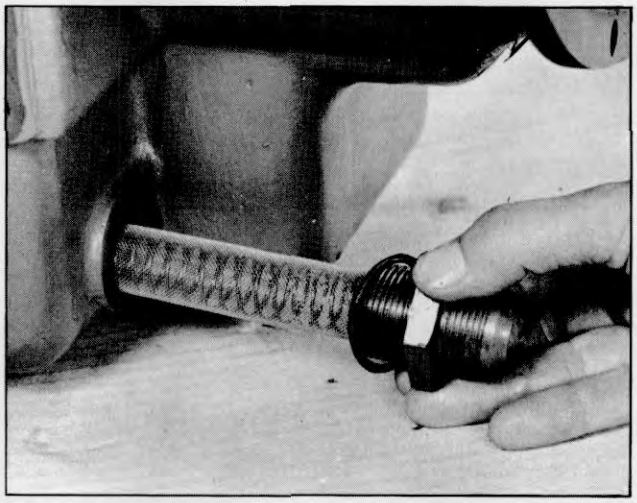


Plate 7235. Transmission Sump Screen

3. It is recommended that a new "O" ring be used when installing the sump screen.

4. Refill transmission and axle adapter to the full mark as indicated on the dipstick. Use Automatic Transmission Fluid Type "A", Suffix "A". Clark part number 879803. Fluid containers must display a qualification number prefixed by "AQ-ATF".

5. Operate engine for a short period of time to completely charge the converter and plumbing with fluid; then recheck fluid level. To accurately check the fluid level the transmission should be at normal operating temperature, engine running at low idle, and transmission in neutral.

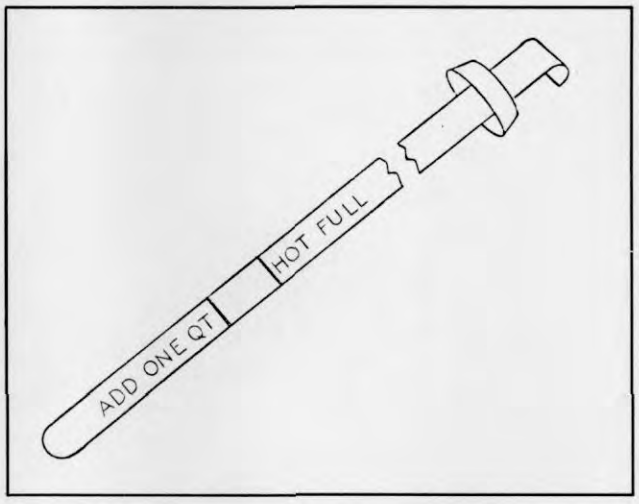


Plate 8281. Transmission Dipstick

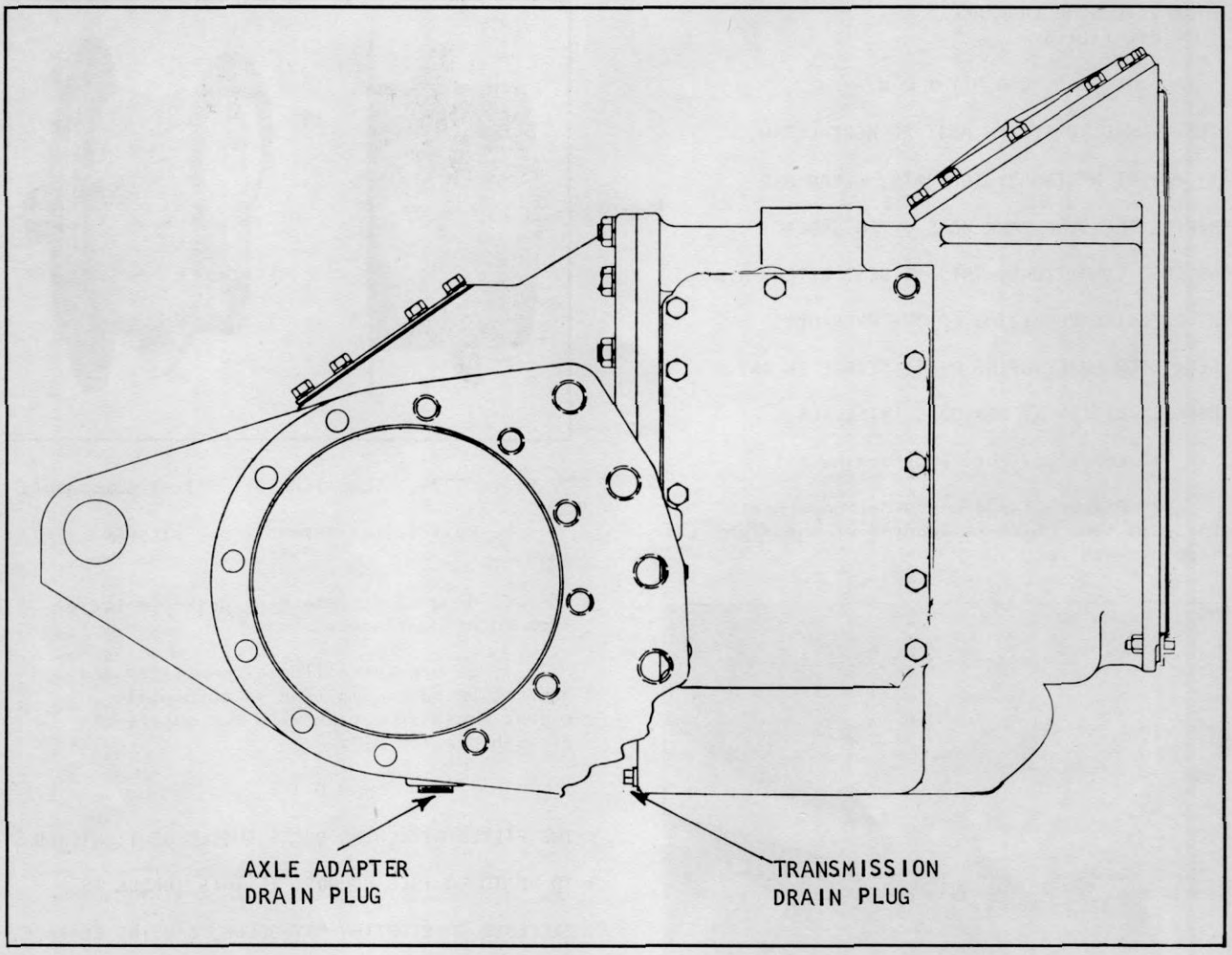


Plate 7301. Axle Adapter and Transmission Drain Plugs

HYDRAULIC SUMP TANK AND SUMP OIL FILTER

C A U T I O N

THE HYDRAULIC SYSTEM MUST BE KEPT CLEAN. IT MAY BE NECESSARY TO DRAIN, CLEAN AND REFILL THE SUMP TANK MORE OFTEN UNDER ADVERSE CONDITIONS. THIS IS BEST DETERMINED BY CHECKING CONDITION OF THE HYDRAULIC FLUID FOR EVICENCE OF DIRT, SLUDGE OR ANY FOREIGN MATTER AT PERIODIC INTERVALS.

1. Lower upright. Shut engine off.

2. Place a large container underneath the sump tank which is located at the right side of machine.

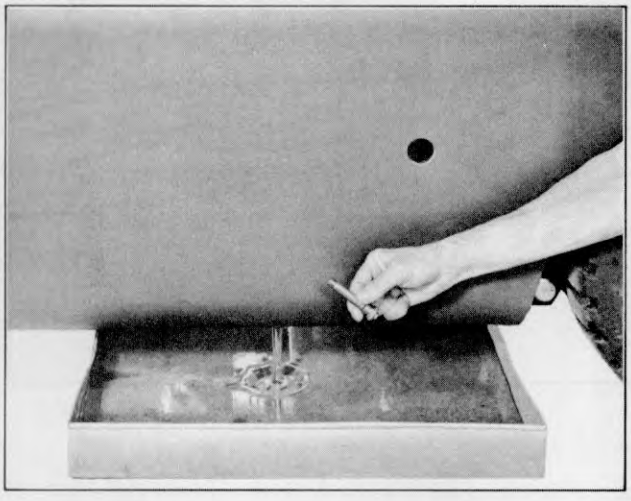


Plate 5359. Draining Sump Tank

3. Remove sump tank drain plug, located at bottom of tank, and allow the fluid to drain. Replace drain plug.

C A U T I O N

DO NOT START ENGINE WHILE SUMP TANK IS EMPTY AS DAMAGE TO THE HYDRAULIC PUMP WILL RESULT.

4. Remove Filter and Clean Sump Tank:

a. Disconnect hose and remove filter retainer bolts.

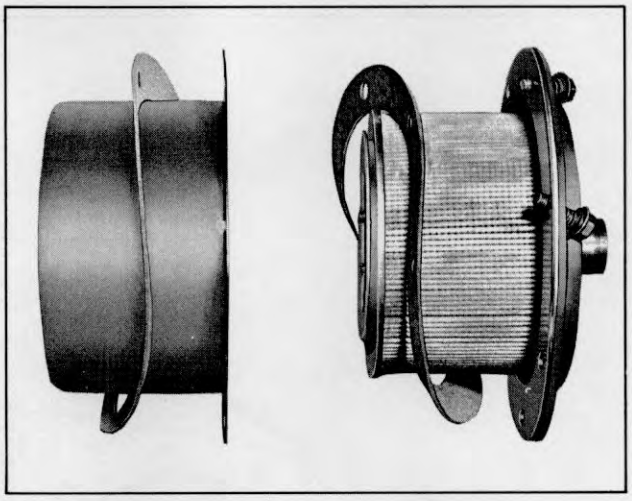


Plate 5274. Sump Tank Oil Filter Components

b. Pull filter assembly out of sump tank.

c. Remove any remaining gasket material from mounting flange.

d. Before installing a new filter and gasket, be sure sump tank is absolutely clean. Flush sump tank with two quarts of clean hydraulic oil.

N O T E

THE FILTER ATTACHING BOLTS SHOULD BE TIGHTENED TO 40 TO 50 INCH POUNDS. IF THIS TORQUE IS EXCEEDED, DISTORTION MAY OCCUR, CAUSING LEAKAGE.

e. Install hose and tighten hose connections.

5. Fill sump tank with MS 68 Hydraulic fluid until level reaches the bottom of the fill pipe.

C A U T I O N

START ENGINE AND OPERATE HYDRAULIC CONTROL LEVERS SEVERAL TIMES. CHECK OIL FILTER FOR LEAKS, RECHECK OIL LEVEL AND FILL TO BOTTOM OF FILL PIPE IF NECESSARY.

STEERING GEAR

Steering gear adjustments must be made in the following manner (see Plates 6636 and 6637).

Always check worm bearing thrust adjustment, and adjust if necessary, before making sector gear lash adjustment.

Before making above adjustments, the following preliminary operations are necessary.

1. Disconnect steering drag link from pitman arm. Note relative position of drag link parts when disconnecting link so the parts may be re-assembled correctly.

2. Check lubricant level in steering gear housing. If low, add enough lubricant to bring level up to filler plug hole. (Use AMOCO Lithium Multipurpose Grease or its equivalent.)

3. Tighten steering gear housing to frame side member bolts, see Plate 6636.

4. Determine straight-ahead position of steering mechanism by turning steering wheel to extreme right.

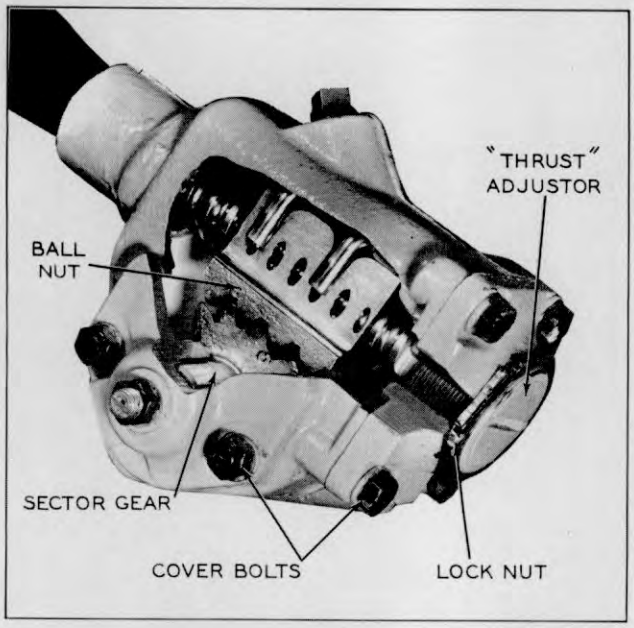


Plate 6636. Steering Gear Thrust Adjustment (Worm Bearings)

C A U T I O N

APPROACH EXTREME ENDS CAUTIOUSLY; WORM BALL NUT MUST NOT STRIKE ENDS WITH ANY DEGREE OF FORCE.

Then turn to extreme left, counting the exact number of turns from right to left end. Turn wheel back one-half number of wheel turns. Mark wheel with respect to steering column so center position may readily be found during adjustment procedures.

Worm Bearing THRUST Adjustment: Refer to Plate 6636 and proceed as follows:

1. Check tightness of cover bolts, see Plate 6636. Loosen lock nut and turn lash adjuster screw (Plate 6637) counterclockwise a few turns to provide clearance between sector gear and worm ball nut.

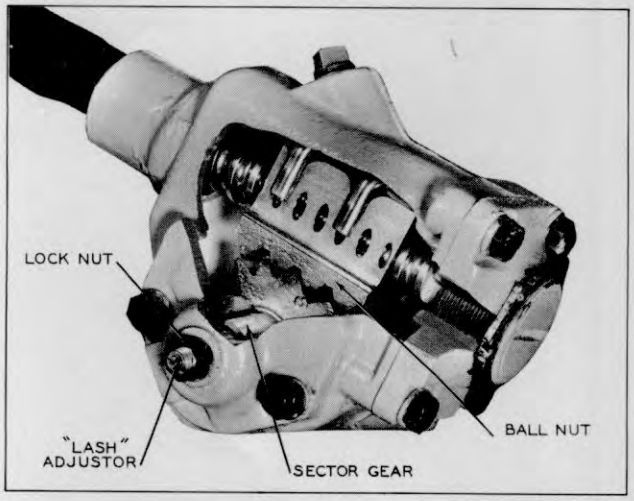


Plate 6637. Steering Gear Lash Adjustment (Sector Gear)

2. Turn steering wheel GENTLY to one extreme end. Turn wheel back one full turn. With spring scale on spoke of wheel, measure pull required to KEEP WHEEL MOVING. Pull on scale should be made at right angles to wheel spoke. If pull is within 1 1/2 to 2 pounds, proceed to lash adjustment in the following paragraphs. If pull is not within 1 1/2 to 2 pounds, adjust worm bearings. The pitman shaft adjustment must be made if worm bearing check is accomplished, or if the worm bearings are adjusted.

3. If it is necessary to adjust the worm bearings, loosen lock nut and then turn worm bearing adjuster nut clockwise until all end play is removed, see Plate 6636. Using spring scale, as directed in Step 2, check pull and readjust as necessary; then tighten lock nut securely.

Sector Gear Lash Adjustment: Refer to Plate 6637. and proceed as follows:

1. Steering Gear Mechanism must be in straight ahead position as previously explained.

2. Turn lash adjuster screw clockwise to remove all lash between gear teeth. Tighten adjuster screw lock nut. Position spring scale on steering wheel so pull may be made at right angles to wheel spoke.

3. Measure pull while wheel is TURNED THROUGH CENTER POSITION. Readjust if reading is not within 2 1/2 to 3 pounds.

4. Tighten adjuster screw lock nut, check pull again.

5. After adjustments are made, install drag link on pitman arm.

N O T E

IF STEERING LINKAGE ADJUSTMENT IS NECESSARY

DO NOT INSTALL DRAG LINK TO PITMAN ARM.

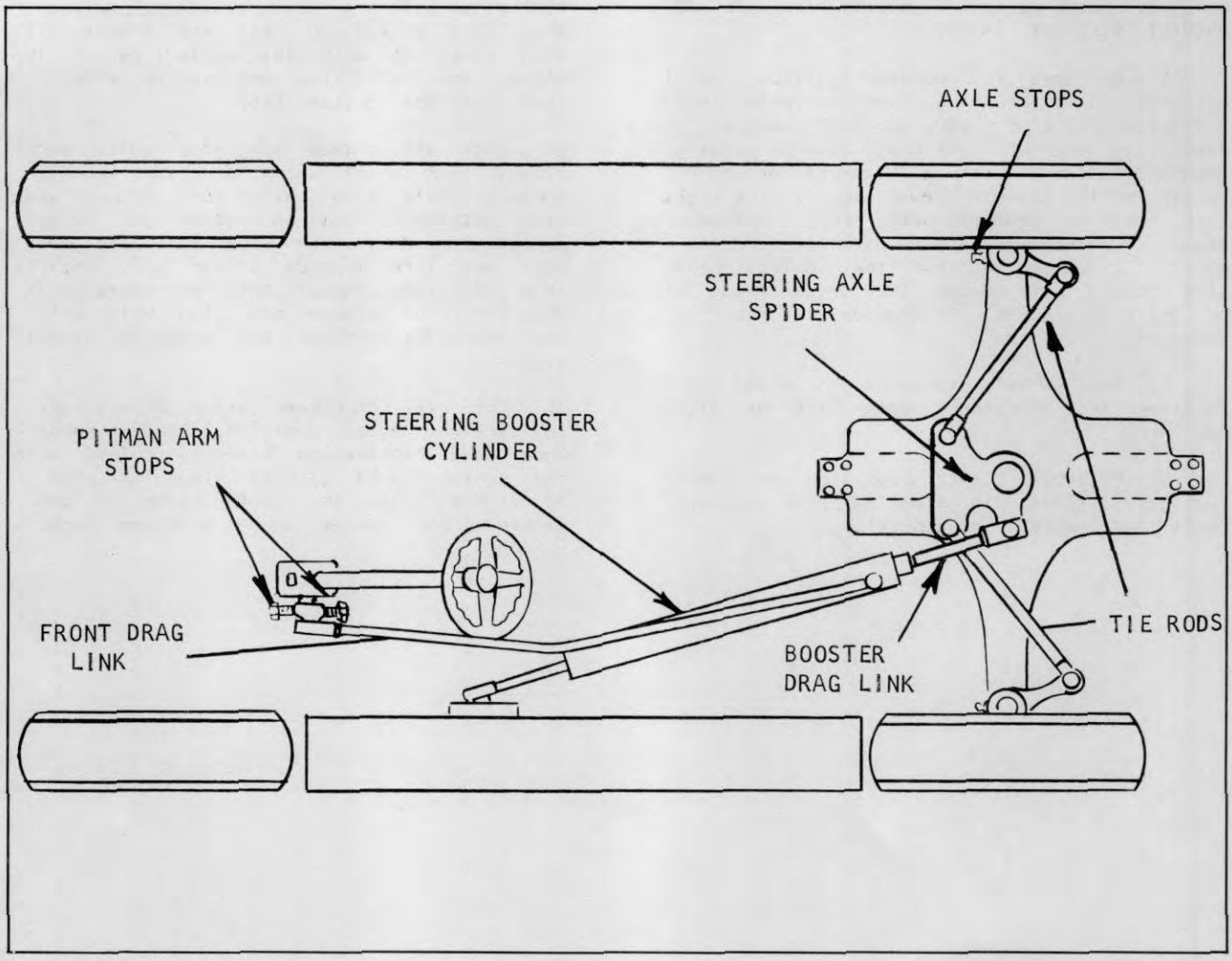


Plate 7340. Steering Linkage

STEERING AXLE AND LINKAGE ADJUSTMENTS

1. Raise the steering wheels far enough to clear the floor and place heavy blocking under the machine frame so it cannot accidentally become lowered during adjustments.

2. The steering wheels should track square with the drive wheels with no toe-in or toe-out. If adjustment is necessary loosen the lock nuts at the tie rod ends and turn each tie rod in a manner so they will be the same length when the correct adjustment is obtained. Tighten tie rod lock nuts to secure this adjustment.

3. Disconnect the steering booster socket from the steering axle spider noting the relative position of the socket parts so they may be re-installed correctly after checking wheels for correct turning geometry.

4. Check wheels for correct turning geometry by turning the wheels all the way for a left turn - this should allow the left wheel to attain an angle of 75 degrees to the frame on pneumatic tire machines and 78 degrees on solid tire machines. If an adjustment is necessary, the axle stop on the left side should be turned in or out whichever is necessary to acheive the correct angle. Repeat this procedure in a right turn with the opposite wheel and adjust the right axle stop as required.

W A R N I N G

IF THE STEERING BOOSTER CYLINDER IS TO BE ACTUATED UNDER POWER DO SO ONLY WITH THE ENGINE RUNNING AT IDLE SPEED, USING EXTREME

CARE TO KEEP CLEAR OF MOVING LINKAGES TO PREVENT PERSONAL INJURY.

5. Collapse the booster cylinder until bottomed out. Extend booster cylinder from collapsed position 1/4" to 1/2". Adjust socket on end of rear drag link so that grease fitting lines up with center of spider ball. (Wheels remaining in the right turn position against axle stop). Before securing socket lock nut position the booster cylinder so that the control ball stud points out toward the truck frame at an angle of about 45 degrees to the vertical.

6. Turn wheels to straight ahead position and disconnect drag link at pitman arm.

7. Determine center position of steering gear. (Refer to Steering Gear adjustments for correct procedure).

8. With Steering Gear centered; adjust drag link socket so that the grease fitting lines up with the centerline of the pitman arm ball stud and secure with lock nut and cotter pin.

9. Back off pitman arm stop bolts and slowly turn wheel until steering knuckle contacts axle stop bolt. Turn pitman arm stop until it contacts pitman arm. Move pitman arm away from stop bolt and turn bolt one turn towards pitman arm. Lock in this position. Repeat this procedure with the remaining pitman arm stop bolt with the wheels turned in the opposite direction.

10. Turn the handwheel until wheels are in straight ahead position. Remove handwheel and replace on steering column with the center spoke aligned minus or plus 10 degrees with the center line of the machine, the center spoke pointing back.

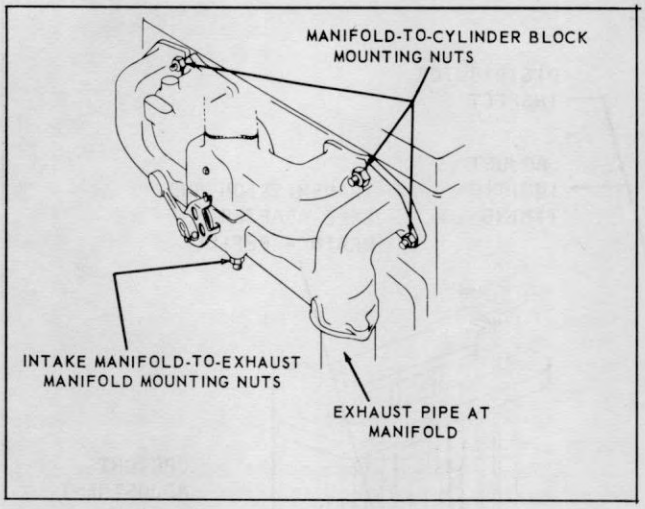


Plate 6269. Intake and Exhaust Manifolds

INTAKE AND EXHAUST MANIFOLDS

1. Inspect gaskets for leaks and inspect security of manifold nuts.

2. Inspect exhaust pipe and muffler for damage, leakage and security of mountings.

NUTS, BOLTS AND CAP SCREWS. Check security of mounting, tighten as required.

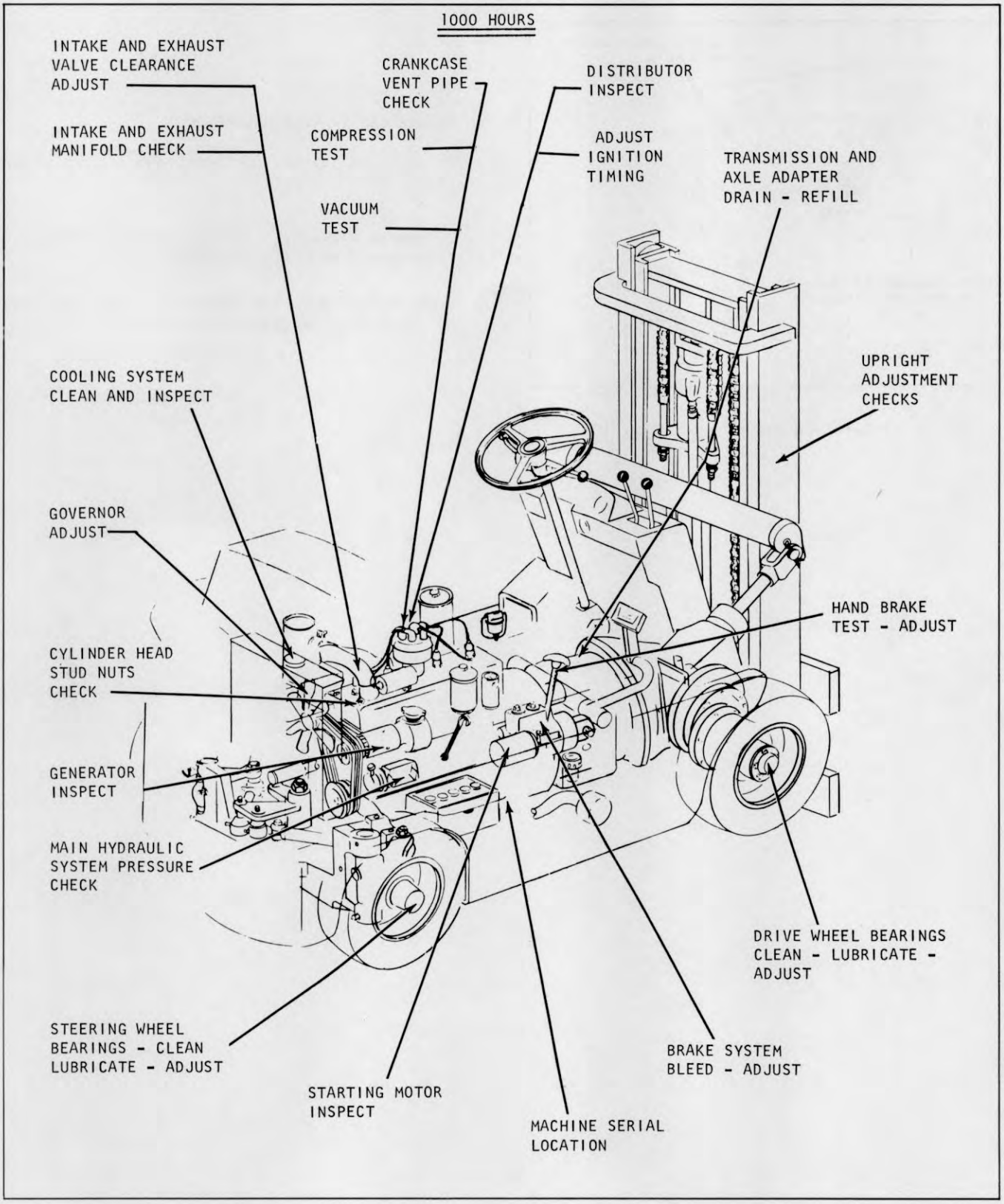


Plate 9484. Lubrication and Preventive Maintenance Illustration

ENGINE TUNE-UP

Engine tune-up is the orderly and systematic process of checking the engine and accessory equipment to maintain or restore satisfactory engine performance. Engine tune-up must be accomplished semi-annually and more frequently if engine performance indicates the need for these services. Perform engine tune-up as follows:

1. AIR CLEANER. Be sure air cleaner has received proper service. Air Cleaner must be installed before making engine tune-up.

2. FUEL PUMP. Be sure the fuel pump bowl and strainer has been properly serviced and the fuel pump is operating satisfactorily.

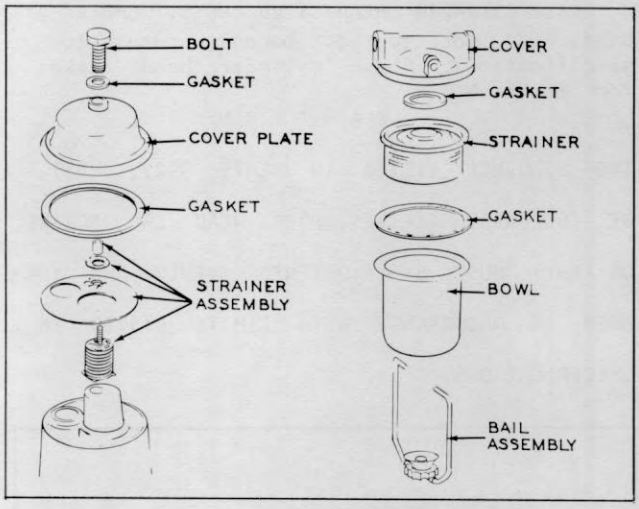


Plate 6638. Fuel Pump Strainer & Sediment Bowl

3. CYLINDER HEAD STUD NUTS. Check all stud nuts for correct torque, refer to specifications. Check cylinder head gasket for leaks.

C A U T I O N

THE SEQUENCE LISTED IN PLATE 5927. MUST BE FOLLOWED. ALL CYLINDER HEAD CAP SCREWS OR NUTS MUST BE TIGHTENED EVENLY AND TORQUED IN ACCORDANCE WITH LIMITS LISTED IN SPECIFICATIONS.

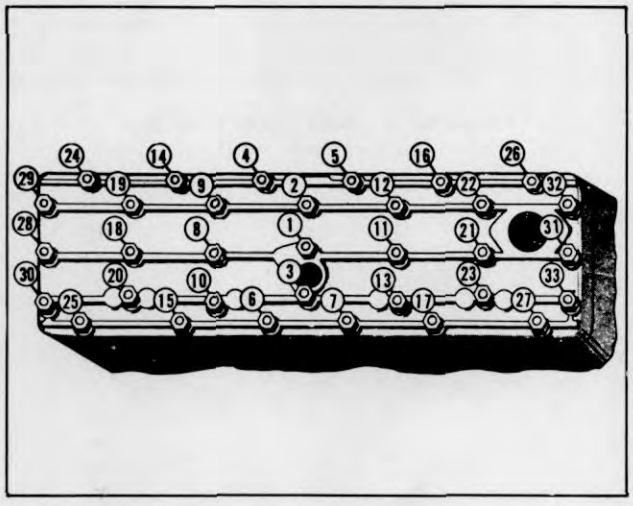


Plate 5927. Cylinder Head Stud Nut Tightening Sequence

4. INTAKE AND EXHAUST MANIFOLDS. Inspect for gasket leaks and security of mounting.

5. CRANKCASE VENTILATION METERING VALVE. The metering valve connected between the intake manifold and valve cover regulates the amount of air which will flow through the crankcase and is controlled by the engine vacuum.

Remove metering valve and disassemble and wash in a Stoddard type cleaning solvent. Before assembling, put a small quanity of very light oil on the metering pin to prevent sticking until its own lubrication is established. The ventilation tube and valve cover should also be cleaned at the same time, particularly if any noticeable amount of sludge accumulation is found.

After installing the metering valve on the engine be sure hose is in good condition and all connections are properly sealed to prevent unfiltered air from entering the engine.

Plate 7034. Crankcase Ventilation Metering Valve

6. INTAKE AND EXHAUST VALVE CLEARANCE ADJUSTMENTS.

a. Remove valve chamber cover mounting screws, and the valve chamber cover gasket.

b. With engine running at idling speed and at normal operating temperature, adjust intake valves as follows:

c. Check for proper 0.014 inch clearance by alternately passing a 0.013 inch and a 0.015 inch flat feeler gauge between head of adjusting screw and valve stem, see Plate 3223 on following page.

d. If a 0.013 inch feeler gauge moves freely back and forth in gap when valve is not being lifted and a 0.015 inch feeler gauge binds, at all times, clearance requires no adjustment.

e. If a 0.013 inch feeler gauge is gripped at all times, the clearance is insufficient.

f. Hold valve lifter with an open end wrench while using a second wrench to turn adjusting screw 1/4 to 1/2 turn clockwise. Repeat clearance check and adjustment, until proper clearance is obtained. The adjustable type valve lifters

have self-locking adjusting screws that require no lock nuts.

g. If 0.015 inch feeler moves freely when valve is not being lifted, the clearance is too great. Hold valve lifter with an open end wrench while using a second wrench to turn valve lifter adjusting screw counterclockwise 1/4 to 1/2 turn. Repeat clearance check and adjustment until proper clearance is obtained.

h. Repeat clearance check and adjustment on remaining intake valves.

i. With engine running at idling speed and at normal operating temperature, adjust exhaust valve as follows:

j. Check for proper 0.014 inch clearance by alternately passing a 0.013 inch and a 0.015 inch flat feeler gauge between head of adjusting screw and valve stem cap, See Plate 3223.

k. Follow procedure outlined in paragraphs (d) thru (h).

m. Install valve chamber cover using new valve chamber cover gasket and replace cover mounting screws.

N O T E

DO NOT REUSE OLD GASKETS. THEY DO NOT

AFFORD A POSITIVE SEAL.

n. Check valve chamber cover gasket for leaks.

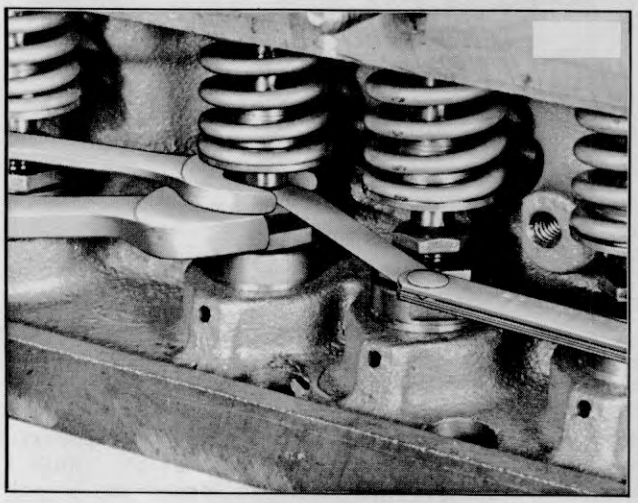


Plate 3223. Adjusting Valve Clearance

6A. COLD SETTING. (ALTERNATE METHOD)
To adjust valve clearance when engine is at room temperature and not running, proceed in the following manner:

a. Remove distributor cap.

b. Crank engine until distributor rotor points to No. 1 cylinder position with the breaker points open. In this position the No. 1 piston is at the top of its compression stroke with both lifters on the base circle of the cam and both valves can be adjusted.

c. Adjust the valve clearance to 0.012 inch on the intake and 0.020 inch on the exhaust. The exhaust (e) and intake (I) valve arrangement on the six cylinder engine is: E-I-I-E-E-I-I-E-E-I-I-E.

d. The other valves may be adjusted by setting the engine with the distributor rotor pointing to the rest of the cylinder positions in the sequence of the firing order which is 1-5-3-6-2-4.

7. COMPRESSION TEST

a. Test battery for full charge (specific gravity 1.280 temperature of 24°C (75° F). If battery is not fully charged, replace with fully charged battery.

b. Start engine and allow it to warm up until normal operating temperature is reached.

c. Turn off ignition.

d. Remove spark plug cables from spark plugs and remove spark plugs from cylinder head. Examine spark plugs for carbon deposits, defective insulation and general serviceability. All carbon or lead deposits must be removed from the insulation shell and electrodes. This can be done on a sand blast cleaner. Carbon deposits should be removed from the plug threads with a stiff brush. After cleaning, inspect plugs carefully for cracked or broken insulator, badly pitted electrodes or other signs of failure.

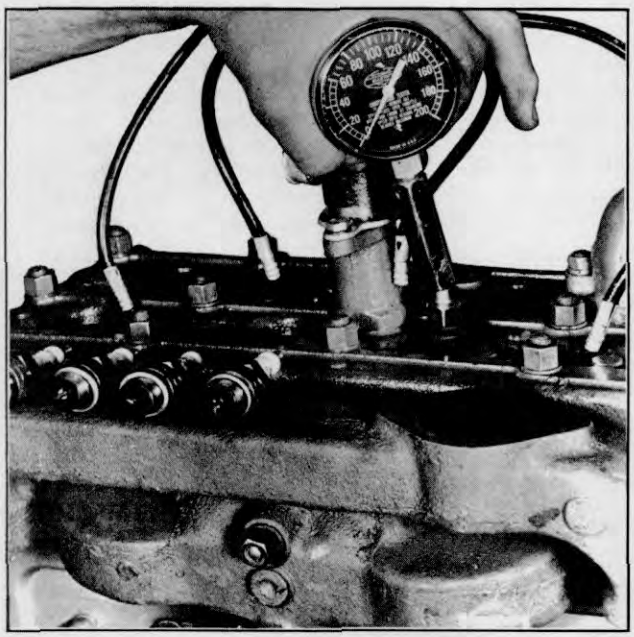


Plate 3486. Compression Test

e. With all plugs removed, install compression gauge in front spark plug port. Operate starting motor until maximum reading on gauge is obtained, see Plate 3486., Record gauge reading. Repeat this operation on each remaining cylinder.

f. If readings are reasonably high (110 to 120) pounds and the readings do not vary more than about 10 pounds between cylinders, compression may be considered normal. Excessively low readings or readings that vary more than 10 pounds between cylinders indicate internal trouble to be corrected after further examination and testing.

g. Set the spark plug gap as specified, by bending side electrode only. The gap should be checked with a wire feeler gauge rather than a flat type gauge as it is better suited for this purpose.

h. Spark Plug Specifications:

Resistor Type - .035" Gap

i. Replace spark plugs using new gaskets. Always replace spark plug gasket whenever a spark plug is removed from the engine. Before installing plugs, be sure that the spark plug seat in the cylinder head is clean and free from obstructions. The spark plug should be screwed into cylinder head (using a socket of proper size) sufficiently tight to fully compress the gasket. This is most important as a large percentage of troubles due to overheated spark plugs are caused by plugs being too loose in the cylinder head. Conversely, excessive tightening may change the gap between the electrodes or crack the insulator.

Plate 3278. Check Spark Plug Gap

8. DISTRIBUTOR

Inspection: Remove distributor cap (without removing wires). Wipe cap with a clean cloth. Examine rotor and cap for chips, cracks, corroded terminals, carbon runners (paths which will allow high-tension leakage to ground) or if the vertical faces of the inserts are burned -- install a new cap and rotor, as this is due to the rotor being too short.

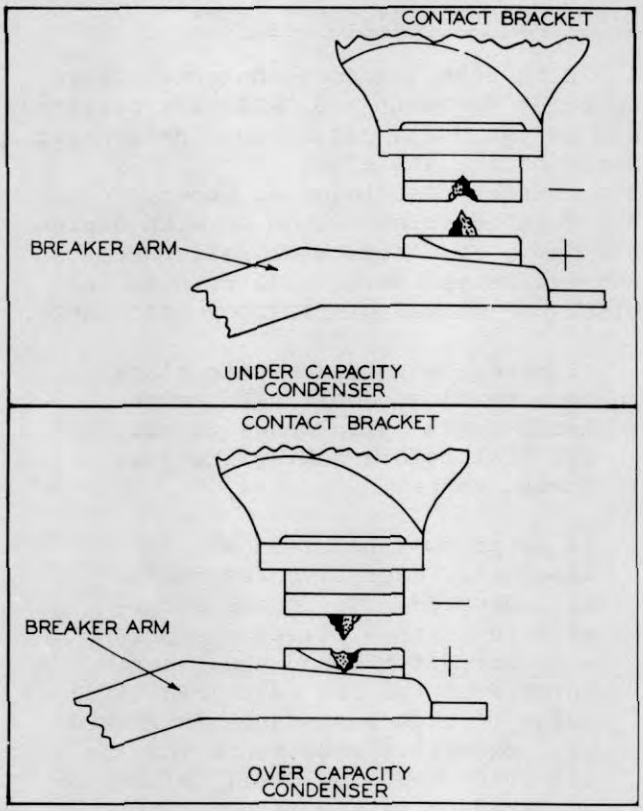


Plate 5933. Breaker Points

Check the centrifugal advance mechanism for "freeness" by turning the breaker cam in the direction of rotation and then releasing it. The advance springs should return the cam to its original position without sticking.

Inspect breaker points. If points are pitted, burned or worn to an unserviceable condition, install a new set of points.

The normal color of contact points should be a light gray. If the contact point surfaces are black, it is usually caused by oil vapor, or grease from the cam. If they are blue, the cause is usually excessive heating due to improper alignment, high resistance or open condenser circuit.

Badly pitted points may be caused by a defective or improper condenser capacity.

If the condenser capacity is too high, the crater (depression) will form in the positive contact. If the condenser capacity is too low, the crater will form in the negative contact, see Plate 5933.

For a temporary repair, dress the contact points with a few EVEN strokes using a clean fine-cut contact file. DO NOT ATTEMPT TO REMOVE ALL ROUGHNESS OR DRESS THE POINT SURFACES DOWN SMOOTH. See Plate 7475.

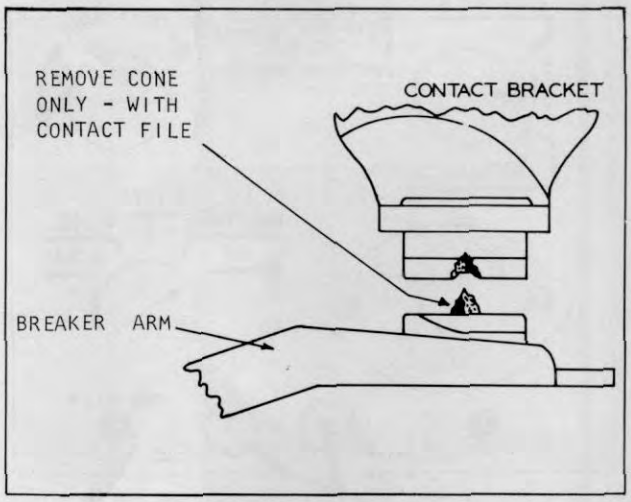


Plate 7475. File Contact Points

C A U T I O N

NEVER USE EMERY CLOTH OR SANDPAPER TO CLEAN POINTS AS PARTICLES WILL EMBED IN THE POINTS AND CAUSE ARCING AND RAPID BURNING.

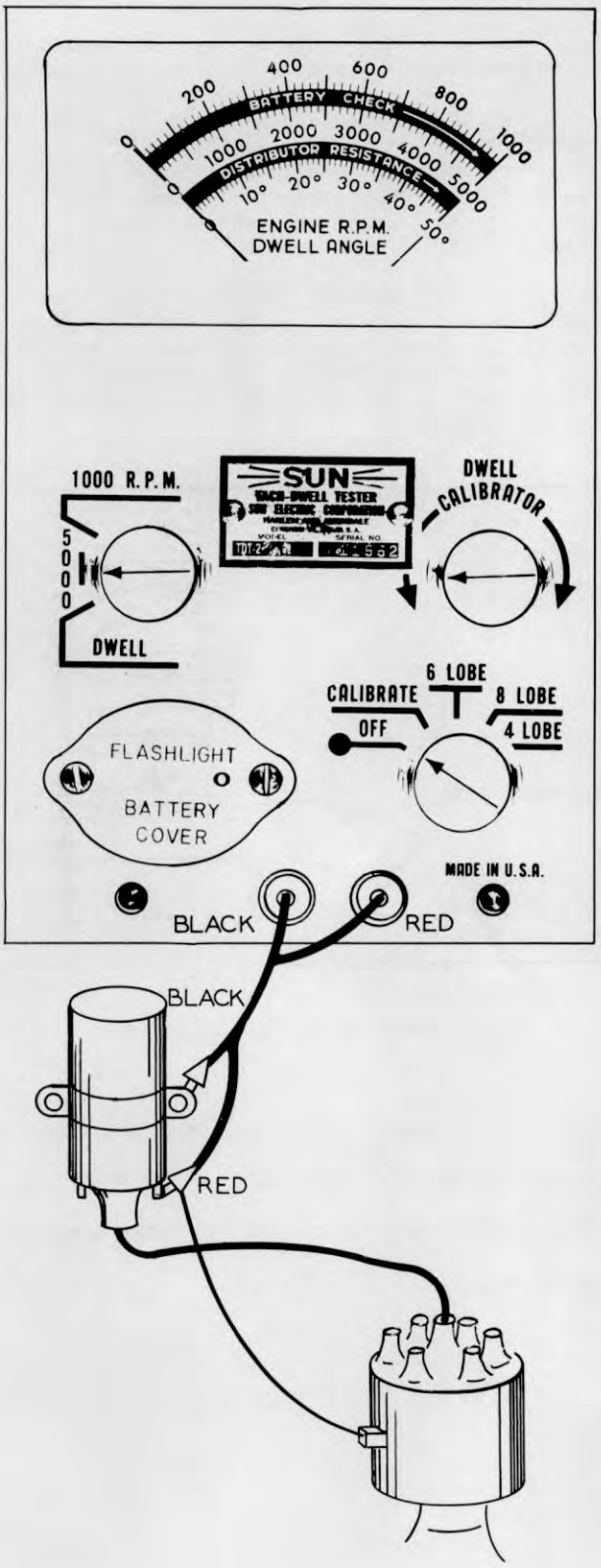


Plate 6887 Tach Dwell Meter

MEASURING ENGINE SPEED

1. Connect the test leads as shown.
2. Turn switch to the LOBE position corresponding to the number of cylinders.
3. Turn the other switch to the 1000 rpm position for all idle and low speed testing. Use the 5000 rpm position for all speeds over 1000 rpm.

DISTRIBUTOR RESISTANCE TEST

1. With test leads disconnected, turn switches to DWELL and CALIBRATE positions and adjust dwell calibrator until meter reads on the SET LINE.
2. Connect test leads as shown.
3. Turn ignition switch ON with engine stopped. If distributor resistance is not excessive, meter will read in the black bar marked DISTRIBUTOR RESISTANCE.

   If meter does read within black bar, readjust dwell calibrator until meter again reads on the SET LINE before making the following tests.

   If meter does not read within black bar, excessive resistance is indicated. To locate excessive resistance, trace the primary circuit through the distributor with the red test lead until point of high resistance is located. Excessive resistance must be eliminated and the dwell calibrator adjusted until the meter again reads on the SET LINE before proceeding with the following tests.

DWELL AND DWELL VARIATION TESTS

1. Turn switch to the proper LOBE position.
2. Operate engine at idle speed and note reading on dwell scale of meter. Refer to specifications for proper dwell.
3. Turn tachometer switch to the 5000 rpm position and increase speed to 1500 rpm.
4. Turn switch back to the DWELL position and again note dwell reading. Slowly reduce speed to idle while watching meter. Dwell should not change more than 3 degrees in either case.

Contact Point Adjustment: The point opening of new points can be checked with a wire feeler gauge, but the use of a feeler gauge on older, rough points is not recommended, since accurate gauging cannot be done on such points. The gauge measures between high spots on the points instead of the true point opening. Point opening of used points can be checked with a Dwell Angle Meter. A meter of this type indicates the cam or contact angle. This angle is the number of degrees that the breaker cam rotates from the time the points close until they open again. The cam angle increases as the point opening decreases and it is reduced as the point opening is increased. Manufacturers of this type equipment furnish complete instructions as to their use.

N O T E

REFER TO SPECIFICATIONS FOR DWELL ANGLE

AND CONTACT POINT OPENING.

To check point opening with a feeler gauge, insert a wire feeler gauge of proper size between the contact points. MAKE CERTAIN THAT THE BUMPER BLOCK ON THE MOVABLE CONTACT IS AT THE HIGH POINT ON THE CAM. If adjustment is necessary, loosen the lock screw, and insert a screwdriver of the proper size in the adjustment slot and move the stationary arm until the correct clearance is obtained. Tighten locking screw and recheck point gap. See Plate 7457.

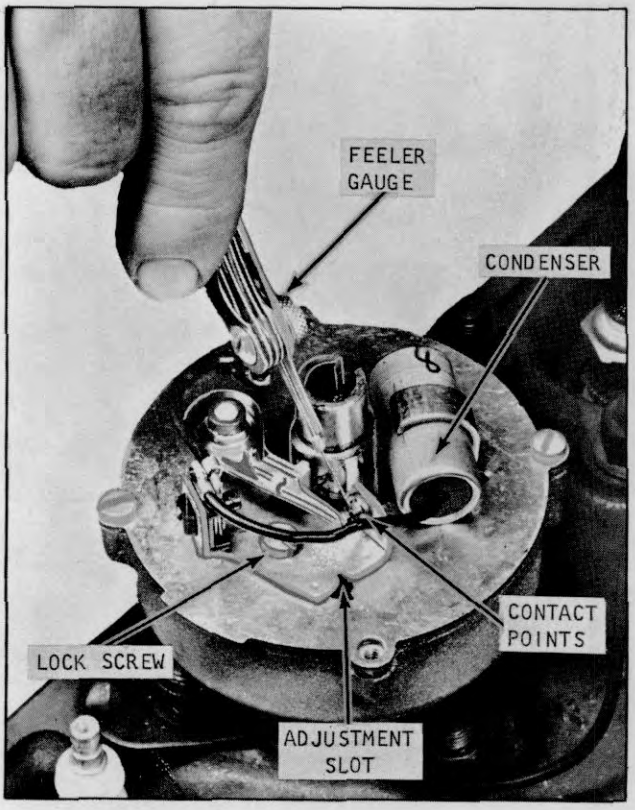


Plate 7457. Contact Point Adjustment

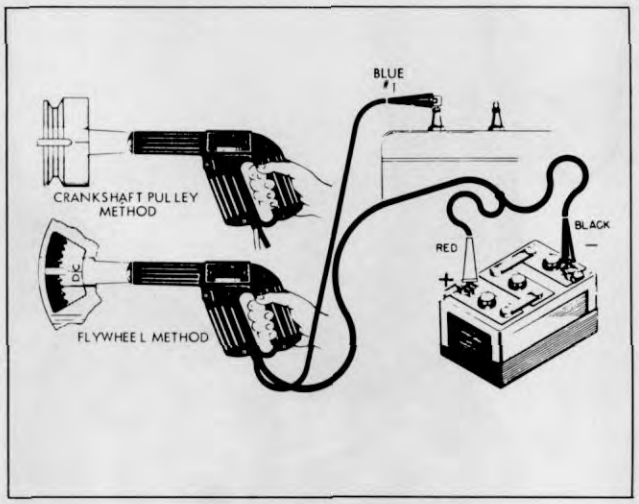


Plate 7818. Timing Light Hookup

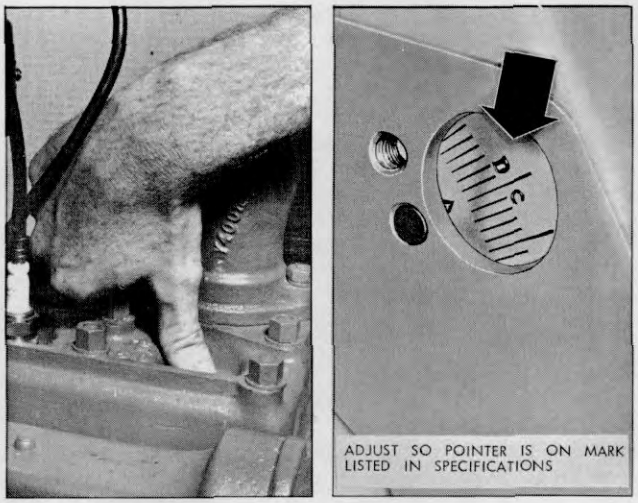


Plate 7861. Ignition Timing

9. IGNITION TIMING

There are two methods of checking ignition timing --- with or without a timing light. The PREFERRED METHOD is to use a timing light in following sequence:

Paint a line on the flywheel (or in some cases, on the front pulley) so the correct timing mark will be more legible under the timing light.

a. Clip blue secondary lead of light to the #1 spark plug -- leave spark plug wire on plug.

b. Connect primary positive lead (red) to positive terminal of battery.

c. Connect primary negative lead (black) to negative battery terminal.

d. Start engine and run at 400 RPM or below so the automatic advance of the distributor is completely retarded. THIS IS VERY IMPORTANT TO OBTAIN CORRECT TIMING.

N O T E

The initial advance RPM range is 430-580. Distributor advance at 600 engine RPM should be 1^{o} to 5^{o}.

e. Direct timing light on the pulley (or flywheel through opening in bell housing) and note timing marks as light flashes. The light should flash on the timing mark that is listed in specifications.

f. To advance timing, turn distributor body clockwise. To retard timing, turn distributor body counterclockwise.

g. When timing is correct, tighten distributor clamp screw securely. Then recheck timing again with light.

ALTERNATE TIMING METHOD

a. Remove #1 Spark Plug -- put your thumb over the spark plug hole and crank engine by hand until air is exhausting.

b. Continue to slowly crank engine until the mark listed in specifications lines up with the pointer in bell housing.

c. Loosen the distributor clamp bolt and rotate the distributor body until the contact points just start to open. (This may be more accurately checked by means of a test lamp connected between the distributor primary lead and the negative terminal of the battery -- when the points are closed the light will be ON and as soon as the points break the light will go OFF.)

d. Tighten distributor mounting bolts.

10. VACUUM TEST

Before making vacuum test, make certain cylinder head is securely tightened and that cylinder head gasket is not leaking. Air cleaner must be installed and must be clean to perform vacuum test. Manifold stud nuts must be tight and there must not be any leakage at gasket.

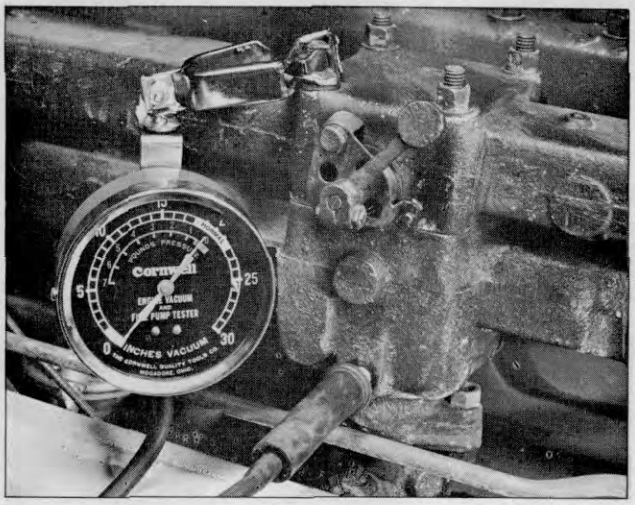


Plate 6643. Vacuum Test

(a) Remove plug at intake manifold and install vacuum gauge, see Plate 6443. Using the tachometer, set the engine idle speed at 450 to 500 RPM.

Idle Speed Adjustment: A stop screw controls action of the throttle valve. Turn screw clockwise for faster idle speed, or counterclockwise for slower idle speed. This adjustment should be made with a tachometer. Idling speed should be set for 450 to 500 revolutions per minute. Reset idle mixture screw if necessary, after throttle adjustment has been made, see Plate 6889.

(b) Check the vacuum gauge. A steady reading from 18" to 22" of mercury is a normal reading, indicating that valve and spark timing, valve seating, and piston ring sealing are all satisfactory.

(c) A steady but below normal reading indicates a condition common to all cylinders such as a leak at the carburetor gasket, late ignition or valve timing, or uniform piston ring and bore wear.

(d) A slowly fluctuating or drifting reading indicates that the fuel idle mixture is incorrect. Look for the cause in the fuel system.

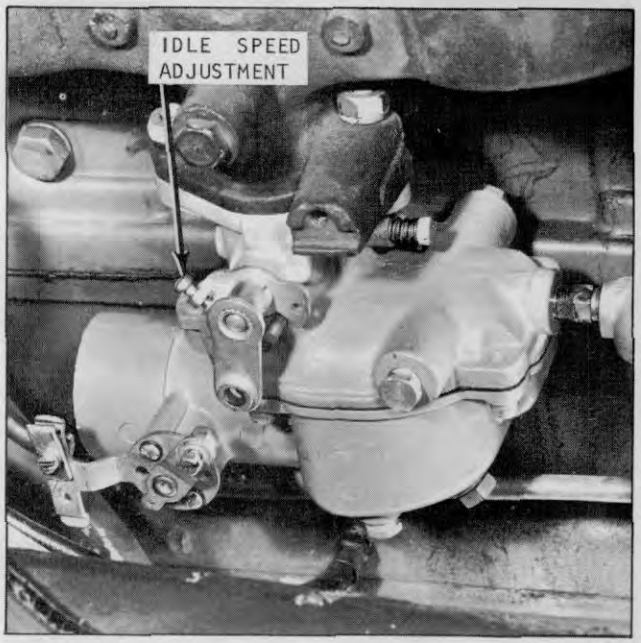


Plate 6889. Idle Speed Adjustment

(e) A rhythmic pulsating reading is caused by a condition affecting one or more cylinders, but not all, and indicates leaky valve, gasket blow-by, restricted intake port, or an electrical miss.

(f) An intermittent pulsating reading is caused by an occasional malfunction, such as a sticking valve (all valves may be erratic in operation if the valve springs are weak), electrical miss caused by insufficient distributor point tension or low coil voltage coupled with inconsistent spark plug gaps or fouled plugs, or dirt in the fuel system finding its way into passages of critical size or valve seats in the carburetor.

(g) A normal reading that quickly falls off (with engine running at approx. 1860 RPM) indicates exhaust back pressure caused by a restriction in the exhaust system.

(h) Make indicated corrections to bring vacuum to 18" to 22" of mercury normal reading.

Idle Fuel Adjustment: The carburetor is controlled by the idle adjustment screw that regulates the fuel-air mixture, see Plate 6889. Turning the screw clockwise, towards the seat, cuts off air increasing the suction on the idle jet and making the mixture richer. Turning the idle adjusting screw counterclockwise, or away from seat, allows more air to be mixed with the fuel making a leaner mixture for idling.

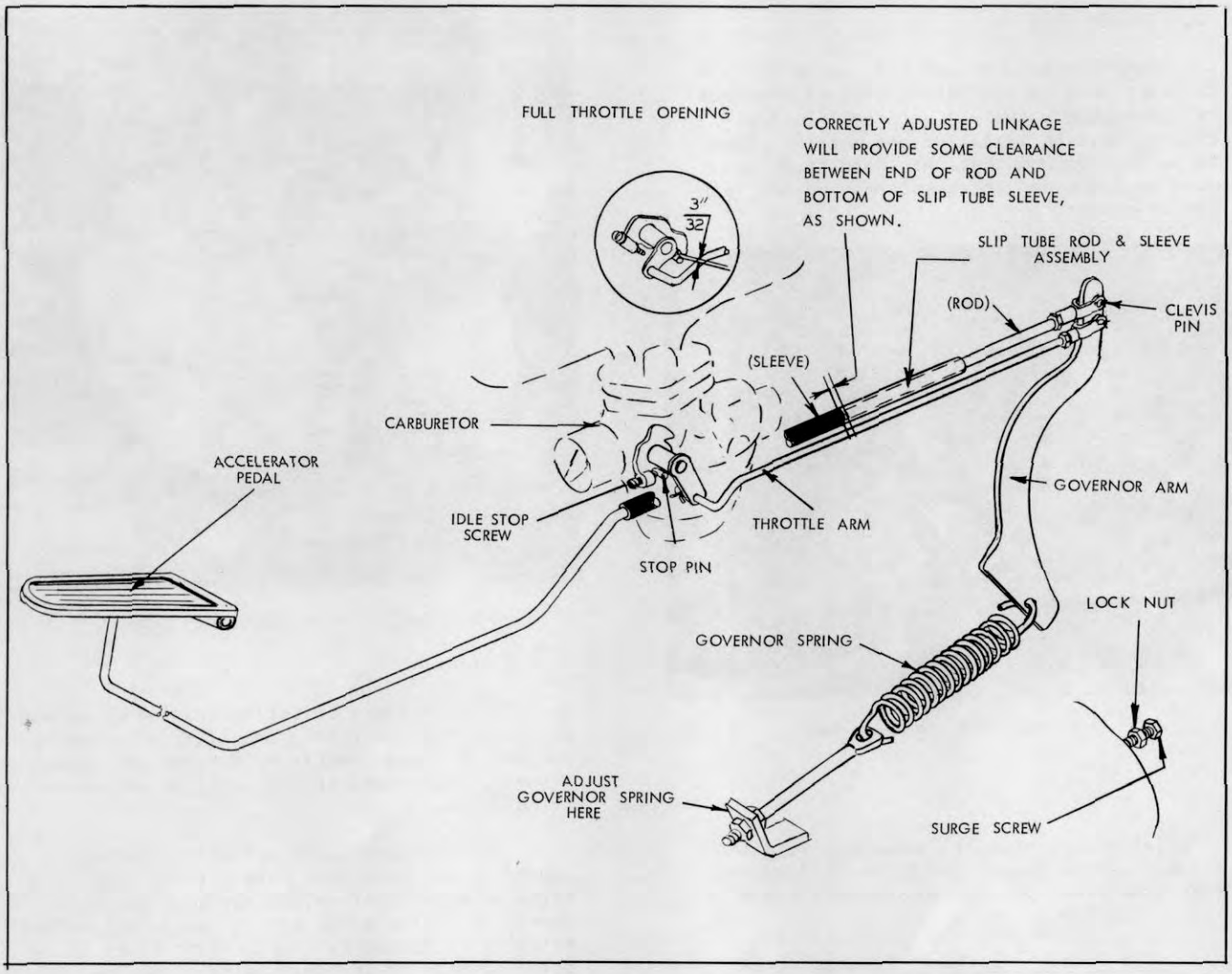


Plate 6660. Governor Adjustment

11. GOVERNOR ADJUSTMENT

With timing set on top dead center, and the carburetor properly adjusted to idle at 500 R.P.M., proceed with the following:

A. Loosen Governor Surge Screw Jam Nut and back Surge Screw out.

B. Disconnect Slip Tube Rod from Governor Arm by removing Clevis Pin.

N O T E

REMOVE CLEVIS PIN --- DO NOT LOOSEN CLEVIS JAM NUT.

C. Pull rod from Slip Tube Sleeve and thoroughly clean rod and sleeve. Lubricate rod with Graphite Grease after cleaning.

N O T E

THE SLIP TUBE ROD AND SLEEVE ASSEMBLY CANNOT FUNCTION PROPERLY IF IT IS BINDING, THEREFORE, THE ASSEMBLY MUST BE CLEAN AND PROPERLY LUBRICATED TO CORRECTLY ADJUST THE GOVERNOR.

D. With the Slip Tube and Sleeve Assembly disconnected, the Governor Arm will move forward. Check the Carburetor Throttle Opening. There should be 3/32 inch clearance between the Full Throttle Opening Stop and Stop Pin on the carburetor.

If adjustment is necessary, adjust the Throttle Rod between carburetor and

governor arm until the specified clearance (3/32 inch between STOP and STOP PIN) is obtained.

E. Push the Governor Arm toward rear of machine until the Idle Stop Screw contacts Stop Pin on the carburetor. Rotate the Governor Surge Screw inwards until screw comes in contact with the Governor Shaft Lever (when holding the Governor Arm rearward) ---- Do Not Rotate Screw So Far That The Idle Stop Screw Moves Away From Stop Pin. When correct surge screw adjustment is obtained, tighten jam nut.

F. With the use of an Electric Tachometer, start engine (Warm up to normal temperature) and check for NO -- LOAD 2350 R.P.M.

N O T E

GOVERNED R.P.M. SHOULD BE CHECKED WITH THE SLIP TUBE ROD DISCONNECTED BETWEEN THE ACCELERATOR LINKAGE AND THE GOVERNOR ARM.

If adjustment is necessary, adjust the Governor Spring, see Plate 6660.

G. Install Slip Tube over rod. Attach Rod Clevis to Governor Arm with Clevis Pin.

I M P O R T A N T

WITH IGNITION OFF, DEPRESS ACCELERATOR PEDAL AND CHECK THROTTLE OPENING. IF THERE IS MORE THAN 3/32 INCH CLEARANCE BETWEEN THE FULL THROTTLE OPENING STOP AND STOP PIN (ON THE CARBURETOR), ADJUST THE SLIP TUBE CLEVIS, OR ACCELERATOR PEDAL LINKAGE TO OBTAIN THIS DIMENSION.

H. Start engine and again check for NO - LOAD 2350 R.P.M.

If specified R.P.M. is not obtained, check for binding linkage, bent Slip Tube, etc., free up, straighten or repair as required.

STARTING MOTOR

1. Remove end plate (or Brush Cover) from starter. Use a wire hook to lift a brush spring and remove brush from holder. Compare brush size with that of a new brush. If brush is worn beyond half the original size, or if brushes are jammed, chipped, or broken they must be replaced.

CAUTION

NEVER ALLOW SPRING TO SNAP DOWN ON BRUSHES.

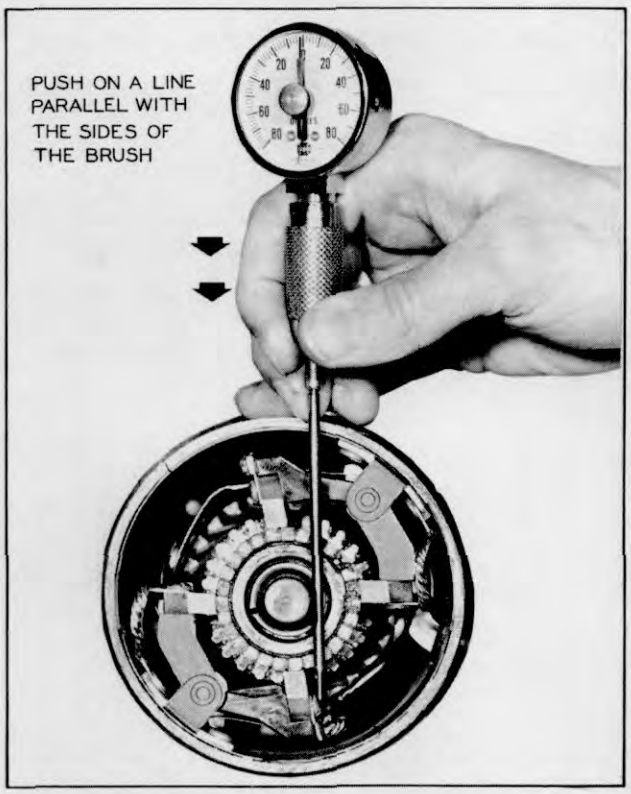


Plate 6449 Checking Brush Spring Tension

2. Check for Brush Spring Tension, refer to Specifications. Refer to the following procedures for checking spring tension.

Measuring Brush Spring Tension - Reaction Type Brushes. Hook the scale under the brush spring near the end and push or pull on a line parallel to the sides of the brush. To assist in telling the exact instant that the pressure is relieved, a small strip of paper can be placed under the brush. Pull slightly on the paper and the paper will slip out at the correct instant for reading the spring scale.

Measuring Spring Tension - Swinging Type Brushes: Hook the spring scale under the brush screw tight against the brush and push or pull on a line parallel to the sides of the brush. Take the reading just as the brush leaves the commutator. Pulling slightly on a strip of paper which has been placed under the brush will indicate when the brush leaves the commutator and the correct instant for reading the spring scale.

3. If commutator is glazed or dirty, clean with a strip of No. 00 sandpaper. Blow out all dirt and grit with compressed air.

CAUTION

DO NOT USE EMERY CLOTH TO CLEAN COMMUTATOR.

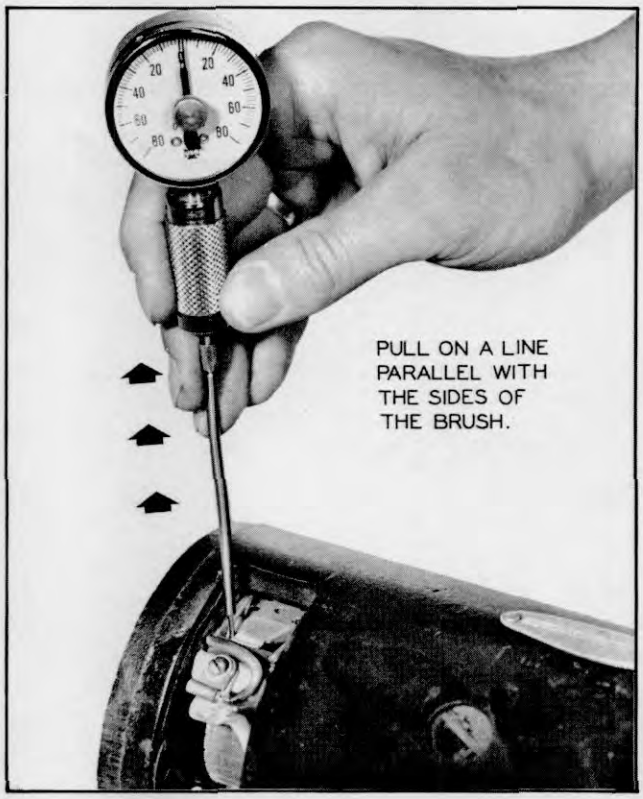


Plate 6450. Checking Brush Spring Tension

Condition Test: Use one of the two following methods to determine whether the starting motor should be removed from the engine for inspection, service or replacement.

1. First Method: Operate the starting motor by disconnecting the battery cable from the solenoid switch and holding the cable terminal firmly against the starting motor terminal, using a battery known to be fully charged and in good condition. To do this it will be necessary to remove the solenoid switch.

2. If the motor reacts correctly, and the drive mechanism engages and disengages each time the starting motor is operated, the starting motor is in good condition.

3. If motor does not react properly, it must be removed for inspection or replacement.

4. Second Method: Using a voltmeter and a battery (fully charged) that is in good condition, connect positive lead of test voltmeter to positive terminal of battery and negative lead of voltmeter to negative (grounded) terminal of battery. Record voltmeter reading. Now pull high-tension wire from ignition coil so engine will not start when starter is engaged. Connect positive lead of test voltmeter to ground and negative lead of test voltmeter to starter switch terminal. Turn ignition switch to start position and note voltmeter reading. Compare this reading with the previously recorded reading. If the voltage drop is more than 4 volts, or if the second reading is below 8 volts, the starting motor should be removed from the engine for further testing and repair, or replacement.

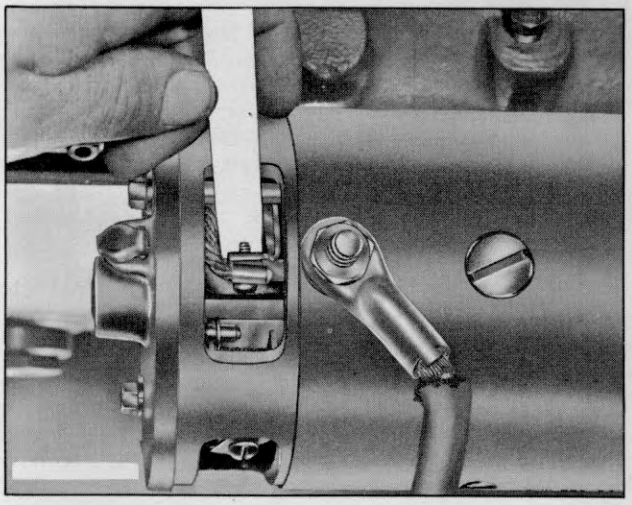


Plate 3436. Seating Brushes

NOTE

BLOW OUT ABRASIVE PARTICLES AFTER SEATING BRUSHES.

GENERATOR

1. Remove end plate (or Brush Cover) from generator. Use a wire hook to lift a brush spring and remove brush from holder. Compare brush size with that of a new brush. If brush is worn beyond half the original size, or if brushes are jammed, chipped, or broken they must be replaced.

CAUTION

NEVER ALLOW SPRING TO SNAP DOWN ON BRUSHES.

New brushes can be seated with a brush seating stone. When held against the revolving commutator, the abrasive material carries under the brushes, seating them in a few seconds. Blow out abrasive particles after seating brushes. See Plate 3436.

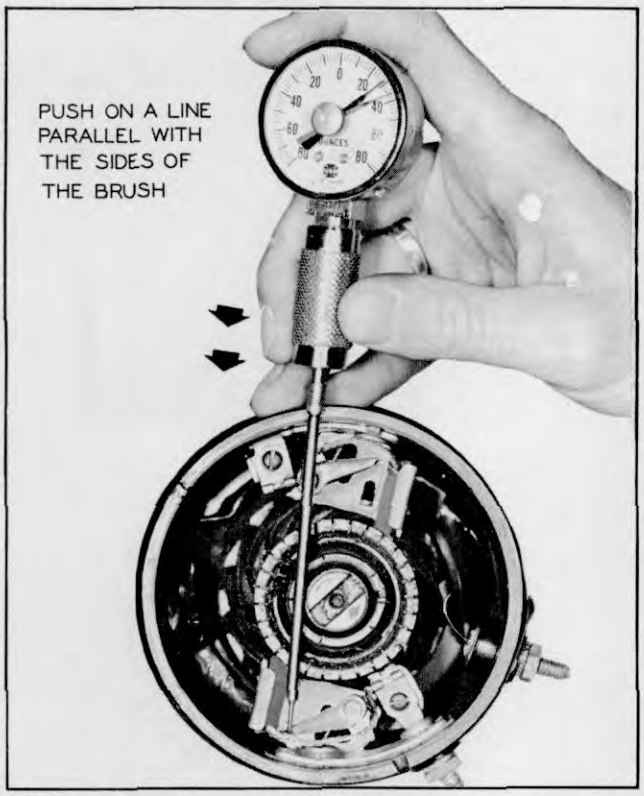


Plate 6451. Checking Brush Spring Tension

Using a spring scale, check for proper brush spring tension. Refer to Specifications. Refer to the following procedures for checking spring tension.

Measuring Brush Spring Tension - Reaction Type Brushes. Hook the scale under the brush spring near the end and push or pull on a line parallel to the sides of the brush. To assist in telling the exact instant that the pressure is relieved, a small strip of paper can be placed under the brush. Pull slightly on the paper and the paper will slip out at the correct instant for reading the spring scale.

Measuring Spring Tension - Swinging Type Brushes: Hook the spring scale under the brush screw tight against the brush and push or pull on a line parallel to the sides of the brush. Take the reading just as the brush leaves the commutator. Pulling slightly on a strip of paper which has been placed under the brush will indicate when the brush leaves the commutator and the correct instant for reading the spring scale.

3. If commutator is glazed or dirty, clean with a strip of No. 00 sandpaper. Blow out all dirt and grit with compressed air.

CAUTION

DO NOT USE EMERY CLOTH TO CLEAN COMMUTATOR.

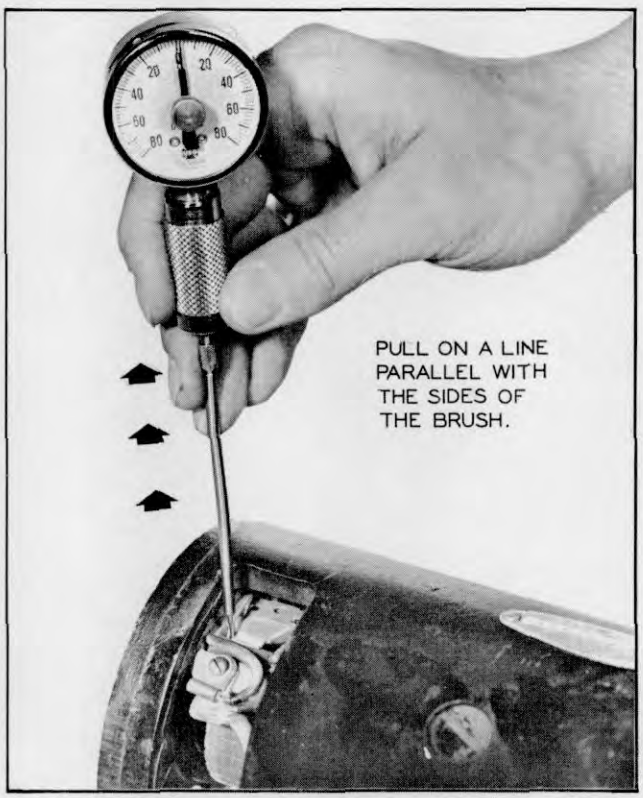


Plate 6450. Checking Brush Spring Tension

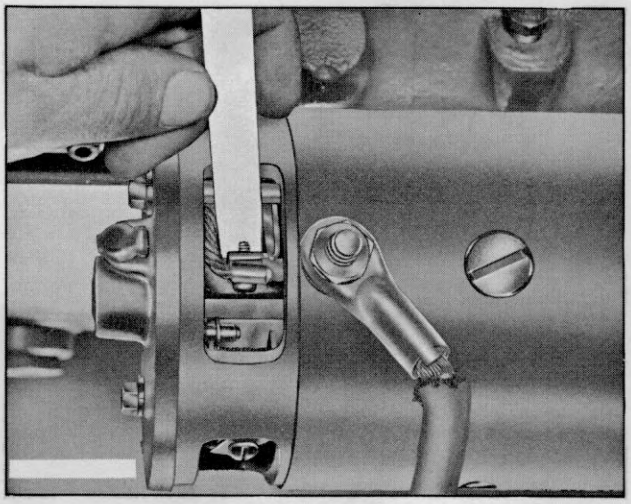


Plate 3436. Seating Brushes

NOTE

BLOW OUT ABRASIVE PARTICLES AFTER SEATING BRUSHES.

REGULATOR

Inspect regulator leads for frayed or worn condition. Check to make certain that leads are tight and securely mounted.

WIRING

Check all wires for loose or corroded connections and for fraying. Replace defective wires.

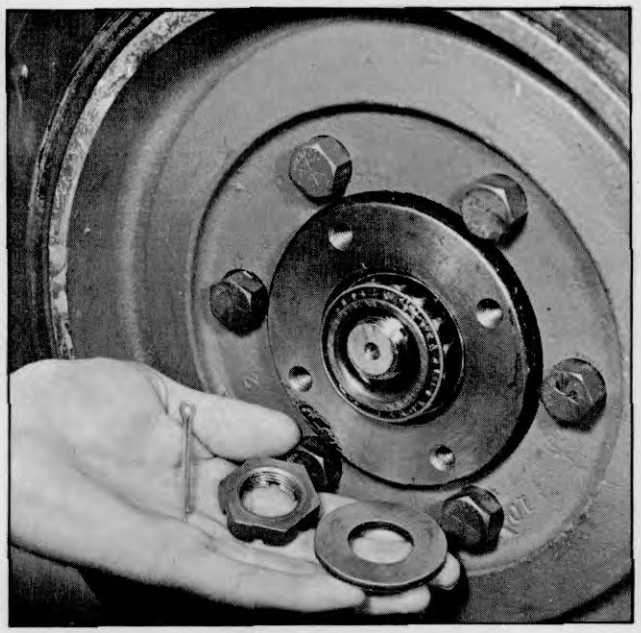


Plate 6640. Wheel Bearings

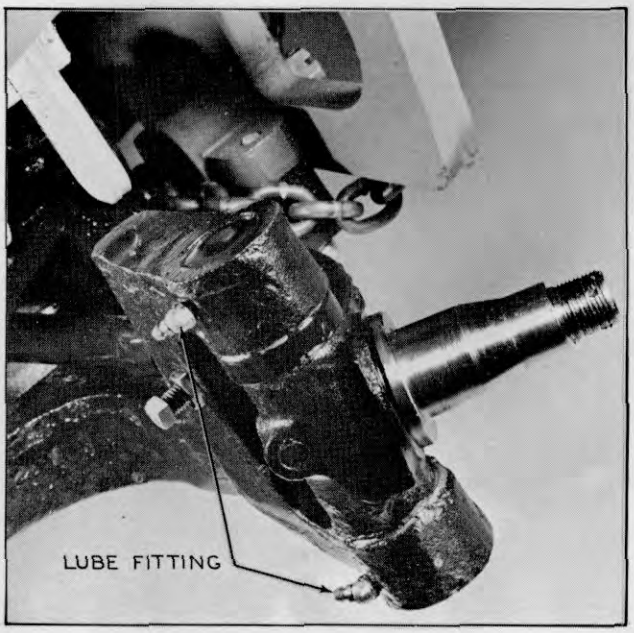


Plate 6641. Spindle

STEERING WHEEL BEARINGS

Adjustment

1. Raise rear of machine so that tires clear floor.

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⊕                                                 ⊕
⊕                    W A R N I N G                ⊕
⊕                                                 ⊕
⊕  AFTER RAISING MACHINE AND BEFORE DOING         ⊕
⊕                                                 ⊕
⊕  ANY MAINTENANCE OR MAINTENANCE CHECKS,         ⊕
⊕                                                 ⊕
⊕  MAKE SURE SUPPORTS OF ADEQUATE STRENGTH        ⊕
⊕                                                 ⊕
⊕  ARE PLACED SECURELY UNDER THE MACHINE (IN      ⊕
⊕                                                 ⊕
⊕  A POSITION SO AS NOT TO CAUSE TEETERING)       ⊕
⊕                                                 ⊕
⊕  TO PREVENT THE POSSIBILITY OF ACCIDENTAL       ⊕
⊕                                                 ⊕
⊕  LOWERING OR FALLING OF THE MACHINE AND         ⊕
⊕                                                 ⊕
⊕  CAUSING INJURY TO PERSONNEL.                   ⊕
⊕                                                 ⊕
⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕
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2. Inspect adjustment of bearings by gripping top and bottom then front and rear, chucking in and out to determine wobble.

N O T E

Before making wheel bearing adjustments, be sure play is in the wheel bearing and not in the king pins. If wheel bearings need adjusting, clean and repack bearings before making adjustments. Refer to lubrication paragraph.

3. If looseness or wobble is in the wheel bearings, remove hub cap and spindle cotter pin. Tighten nut with a 12" wrench and at the same time rotate the wheel in one direction and then in the other until there is a slight bind to be sure all bearing surfaces are in contact. Then back off the nut 1/6 to 1/4 turn allowing the wheel to rotate freely. Secure nut at this position with a new cotter pin and replace hub cap.

Lubrication

1. Remove wheels after 1000 hours or every six months of operation. Clean bearings and repack with NLGI #1 (Amolith grease EP #1 or its equivalent).

2. Install wheels and adjust wheel bearings as previously described.

CLEAN AND REPACK AXLE ENDS

Every 1000 operating hours remove and repack the axle ends with EP #1 Lithium Soap Base Grease.

1. Tilt upright back. Place solid heavy blocks under each upright rail. Tilt upright forward until vertical to the floor. This should allow the drive wheels to clean the floor. Remove drive wheels.

2. Remove hub cap, cotter pin, washer, spindle nut and pull hub assembly from spindle.

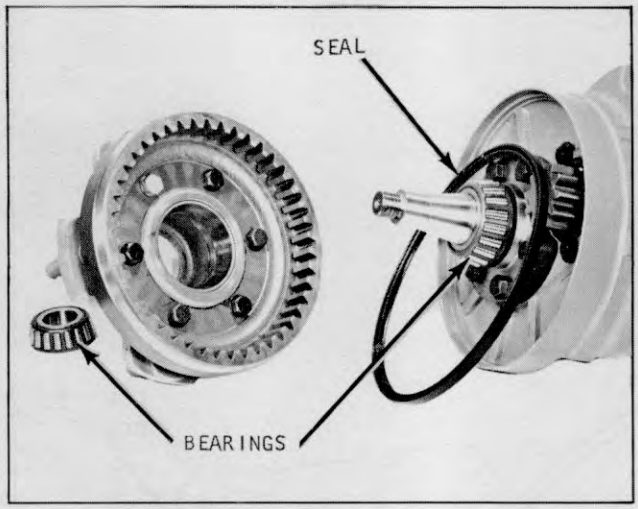


Plate 6892. Axle End Assembly

3. Remove bearings and clean in a Stoddard type cleaning solvent. Slosh bearings up and down in solvent. Remove and tap large side of bearing against a block of wood to dislodge solidified particles of lubricant. Repeat operation until bearings are thoroughly clean. Blow bearings dry with compressed air. Direct air stream across bearing to avoid spinning. Slowly rotate bearing by hand to facilitate drying. Dip bearings in gear oil and wrap in paper until they are to be reinstalled.

4. Clean ring gear, pinion drive shaft, hub assembly, spindle and spindle support.

5. Inspect seal for cuts, scratches and nicks. If is necessary to replace seal if such a condition is found.

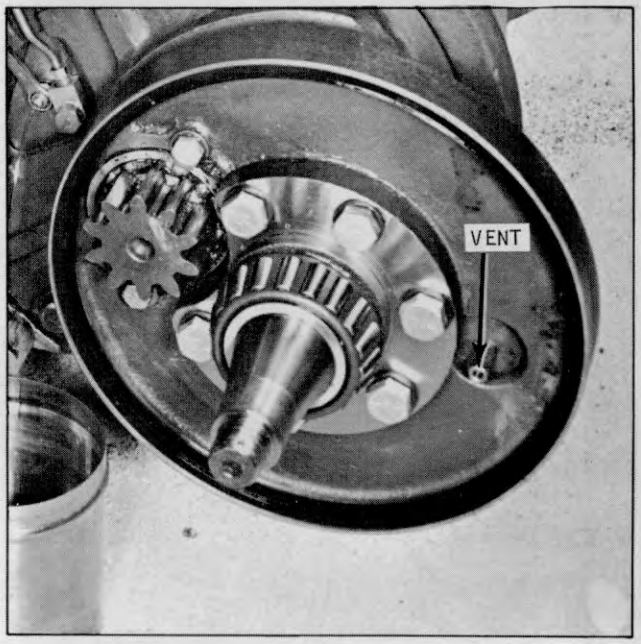


Plate 6893. Axle End Vent

6. Repack each axle end (bearings, spindle ring gear and pinion) with one pound of EP #1 Lithium Soap Base Grease previously listed. Check the axle end vent for obstruction, vent must be open.

7. Install bearings, seal and hub assembly.

8. Install washer, spindle nut and hub cap.

9. Tilt upright back and remove blocking.

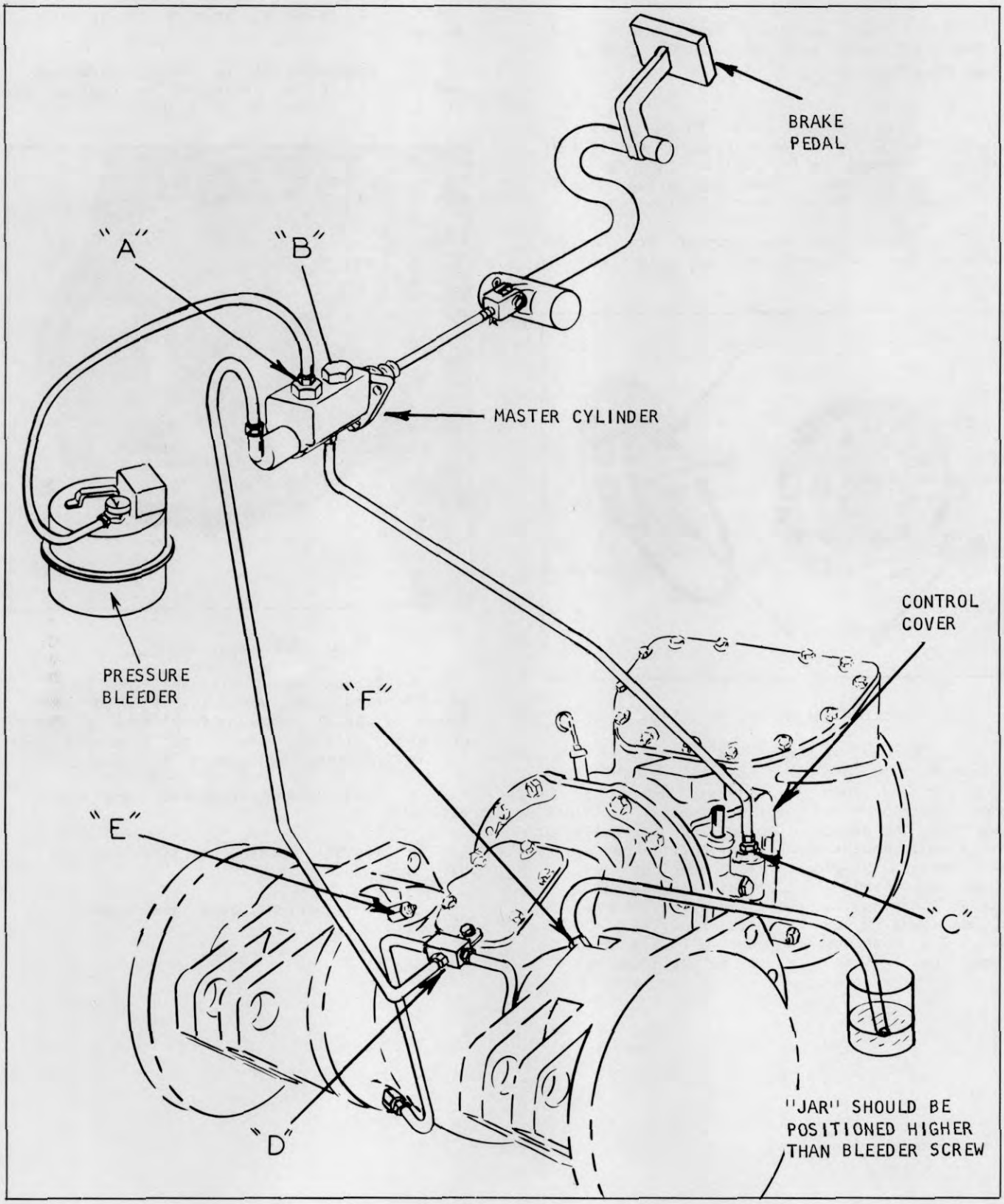


Plate 7302. Bleeding Brakes

BRAKE BLEEDING PROCEDURE

Proper operation of the hydraulic brake system requires a solid column of fluid without air bubbles at all points in the pressure system. Under certain conditions it becomes necessary to bleed fluid from the system in order to expel air bubbles which have become mixed with the fluid. The necessity of bleeding is indicated by a soft spongy pedal, or at any time a brake line is removed (or broken) the system must be bled.

Step 1. Tilt upright back, Place solid heavy blocks under each upright rail. Tilt upright forward until vertical to the floor. This should allow the drive wheels to clear the floor. Remove drive wheels.

Step w. Check the brake pedal free travel (Refer to Specifications). Clean dirt from around the filler cap of the master cylinder reservoir. Brake fluid should be within 1/4 of an inch from the top. With filler cap removed from the master cylinder, depress and release brake pedal. A small displacement of fluid should be noticed in the reservoir each time the pedal is actuated. If this happens, the brake pedal (upon being released) is returning the master cylinder piston to its normal position to open a cylinder port. This port must be open. If a noticeable displacement of fluid is not observed in the reservoir, during depression of the brake pedal, improper pedal free travel is indicated, and an adjustment is required.

Step 3. To properly bleed the system it is recommended that a pressure bleeder filled with about two quarts of S.A.E. 70R-3 heavy duty brake fluid be connected to the master cylinder reservoir. Pressure bleeder should then be pressurized to approximately 30 P.S.I.

Step 4. Loosen the brake line fitting at Point "A" (Plate 6881) enough to allow fluid and air to escape. Tighten fitting when escaping fluid is free of air bubbles.

Step 5. Loosen inching valve-check-ball stop bolt at Point "B" (Plate 6881) and depress brake pedal to the floorboard and hold in this position until connection is retightened. This operation should be repeated until escaping fluid is free of air bubbles.

Step 6. Loosen line connection at highest position on "T" block (See Point "C", Plate 6881) and Bleed in the same manner as described in Step 5.

Step 7. Install a bleeder hose on one of the wheel cylinder bleeder screws and submerge the unattached end of the hose in a clean transparent jar containing several inches of brake fluid.

N O T E

During bleeding of the wheel cylinders, the jar should be elevated to a position higher than the bleeder screw making sure that the end of the hose remains submerged in the fluid at all times.

Loosen bleeder screw and slowly push brake pedal to the floorboard and hold pedal in this position until bleeder screw is retightened. Repeat this operation until all air bubbles disappear and clear fluid is being pumped into the jar.

Step 8. Install bleeder hose on the remaining bleeder screw and proceed as in step seven.

Step 9. After all bleeding has been completed close the pressure bleeder shut-off cock and loosen hose connection at master cylinder to allow pressure to escape. Replace master cylinder cap.

Step 10. Replace drive wheels. Tilt upright back and remove blocking from under each upright rail.

If a pressure bleeder is unavilable, the system may be bled manually by following Steps 2, 4, 5, 6, 7, 8 and 10. It must be remembered that the brake pedal should be depressed slowly and held to the floorboard until the line connections or bleeder screws are securely tighten tightened. This prevents the possibility of air being drawn into the system during the bleeding operation. Check master cylinder reservoir level periodically during manual bleeding and fill to within 1/4 of an inch of the top as required.

BRAKE ADJUSTERS

When the brake system is operating properly, the cam like action of the reaction arm allows self-adjustment for the total thickness of the brake linings, without any noticeable increase in brake pedal free travel. The self-adjustment feature eliminates the need for manual adjustment of the brakes.

When brakes become noisy during brake application, this may indicate the linings are worn enough to allow brake shoes to contact brake drum. If such a condition exists, the axle ends shall be removed and a brake lining inspection shall be made to determine further serviceability.

N O T E

When installing new shoe and lining assemblies, be sure to install new assemblies at each wheel. Refer to following instructions covering mounting bolt torque specifications and procedures.

Before installing new brake linings the adjuster mounting bolt torque should be checked with a torque wrench. This should be torqued to 23 to 26 ft. lbs. The brake adjuster with nut and washer assembly has been preassembled and properly torqued and should never need to be changed.

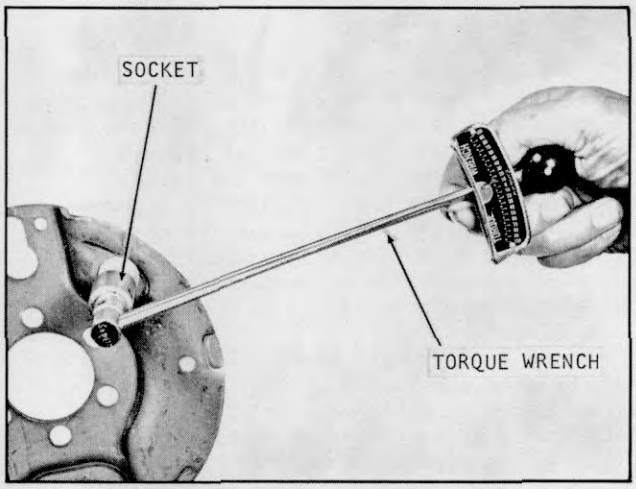


Plate 9958. Checking Adjuster Arm Torque

The backing plate and adjuster arm components must be clean, dry and free from rust when this torque test is made.

HAND BRAKE ADJUSTMENT

The brake on this model is a "V" pulley type drum mounted on the end of the transmission pinion shaft with a "V" shaped brake shoe that fits into the drum groove. When lifting hand brake lever, pressure is applied to the brake shoe which presses the shoe against (into) the drum.

To adjust the hand brake, refer to Plate 5270 and proceed as follows:

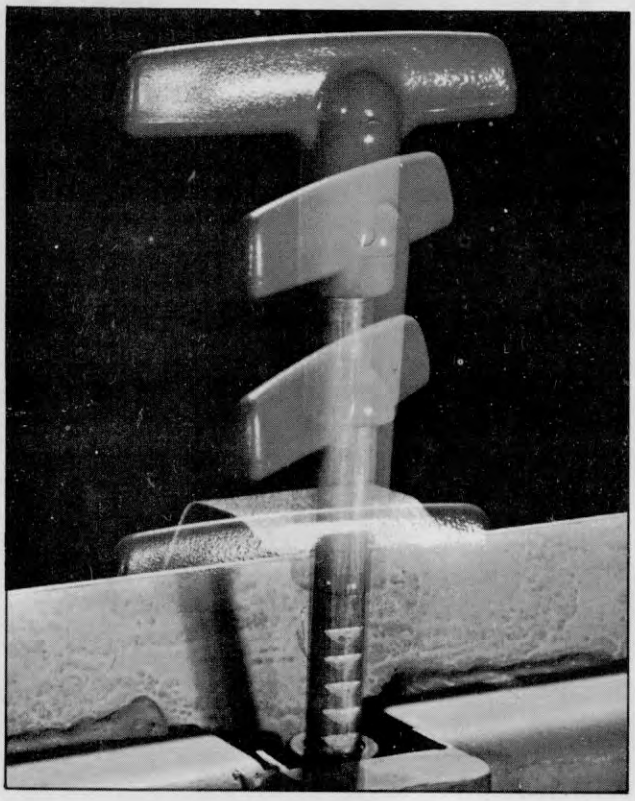


Plate 7482. Hand Brake (Actuating) Lever

Adjustment is made at the Parking Brake Draw Rod LOCK SLEEVE and LOCK NUT, Plate 5270.

These items protrude downward through the bottom-side of the Converter Housing.

1. Loosen the Lock Nut several turns.

2. Rotate the Lock Sleeve counterclockwise to close gap between brake shoe and brake drum.

3. Hold the Lock Sleeve and tighten the Lock Nut until snug against Cam Lever, then back off lock nut one half to three quarters of a turn.

4. Test Adjustment: Test adjustment while occupying the driver's seat.

Fully apply the hand brake. Full application of hand brake should require 1 1/2 to 2 inches of travel. If the lever travel exceeds this amount the linkage should be adjusted.

Test Parking Brake Effectiveness - must be capable of holding the truck, with full rated load, on a 15% grade.

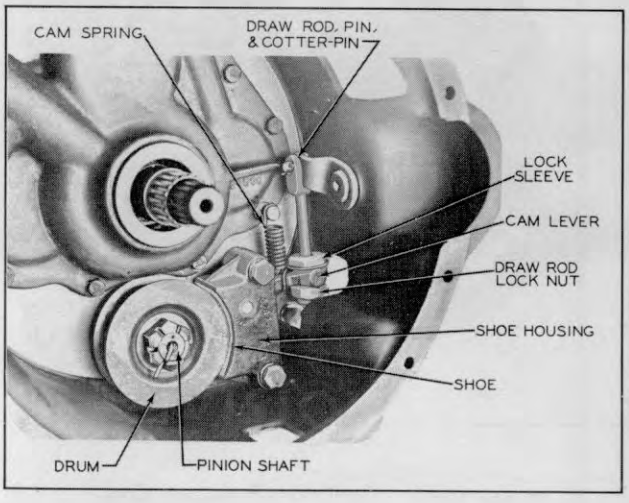


Plate 5270. Adjusting Brake

COOLING SYSTEM

Radiator Pressure Caps:

WARNING

USE EXTREME CARE IN REMOVING THE RADIATOR PRESSURE CAP. IN PRESSURE SYSTEMS, THE SUDDEN RELEASE OF PRESSURE CAN CAUSE A STEAM FLASH AND THE FLASH, OR THE LOOSENED CAP CAN CAUSE SERIOUS PERSONAL INJURY. LOOSEN CAP SLOWLY AND ALLOW STEAM TO ESCAPE.

1. Inspect pressure cap gasket and radiator filler neck to be sure they are providing a proper seal. If the rubber face of the valve is defective, a new cap should be installed.

Plate 6458. Radiator Pressure Cap

2. Inspect pressure cap for freedom of operation.

Pressure caps employ a spring loaded, rubber-faced valve which presses against a seat in the radiator top tank. Pressure caps employ either a vacuum valve held against its seat under spring pressure, or a weighted vacuum valve which hangs open until forced closed by a surge of vapor or coolant. Check to be sure components are free to operate.

NOTE

IF A NEW CAP IS REQUIRED, ALWAYS INSTALL A CAP OF THE SAME TYPE AND PRESSURE RATING. PRESSURE RATING 7 LB.

3. Inspect for dented or clogged overflow pipe. To remove clogged material, run a flexible wire through pipe until obstruction is removed.

When a pressure cap opens the sudden surge of vapor or liquid must pass thru the overflow pipe. If the pipe is dented or clogged, the pressure developed by the obstruction may cause damage to radiator or hoses.

Inspect and Clean Cooling System:

Check hose connections for coolant leaks as well as air leakage. Air leakage around hose connections allows oxygen into the system which is a major factor in corrosion.

Plate 6459. Pressure Cap Gasket, Valve and Valve Gasket

NOTE

EXHAUST GAS LEAKAGE BETWEEN CYLINDER HEAD AND GASKET ALSO RESULTS IN CORROSION. IF EXHAUST GAS DISCHARGES INTO COOLANT, THE COOLANT AND THE GAS COMBINE TO FORM A VARIETY OF ACIDS. IT IS THEREFORE IMPORTANT THAT CYLINDER HEAD STUD NUTS BE DRAWN DOWN TO SPECIFICATIONS AS INSTRUCTED IN "ENGINE TUNE-UP".

Using a washing soda solution, flush cooling system in the following manner:

1. Drain system.

2. Replace half of volume with fresh water. Refer to Specifications for capacity.

3. Boil other half of volume and add washing soda until no more will dissolve.

4. Add hot soda solution to cooling system (fill up).

5. Operate engine normally for 24 hours.

6. Drain, flush, refill with clean water to which a soluable oil has been added in a proportion of 1 ounce per gallon of water.

Maintaining the cooling system efficiency is important, as engine temperatures must be brought up to and maintained within satisfactory range for efficient operation; however, must be kept from overheating, in order to prevent damage to valves, pistons and bearings. Continued overheating may cause internal damage, while continuously low operating temperature wastes fuel, increases engine wear and causes oil sludge and corrosion of engine parts.

Overcooling may be caused by operating conditions such as excessive idling, low speeds and light loads during cold weather. Overheating may be caused by faulty thermostat, clogged radiator or an improperly adjusted fan belt.

CAUTION

NEVER POUR COLD WATER OR COLD ANTI-FREEZE INTO THE RADIATOR OF AN OVERHEATED ENGINE. ALLOW THE ENGINE TO COOL AND AVOID THE DANGER OF CRACKING THE CYLINDER HEAD OR BLOCK. KEEP ENGINE RUNNING WHILE ADDING WATER.

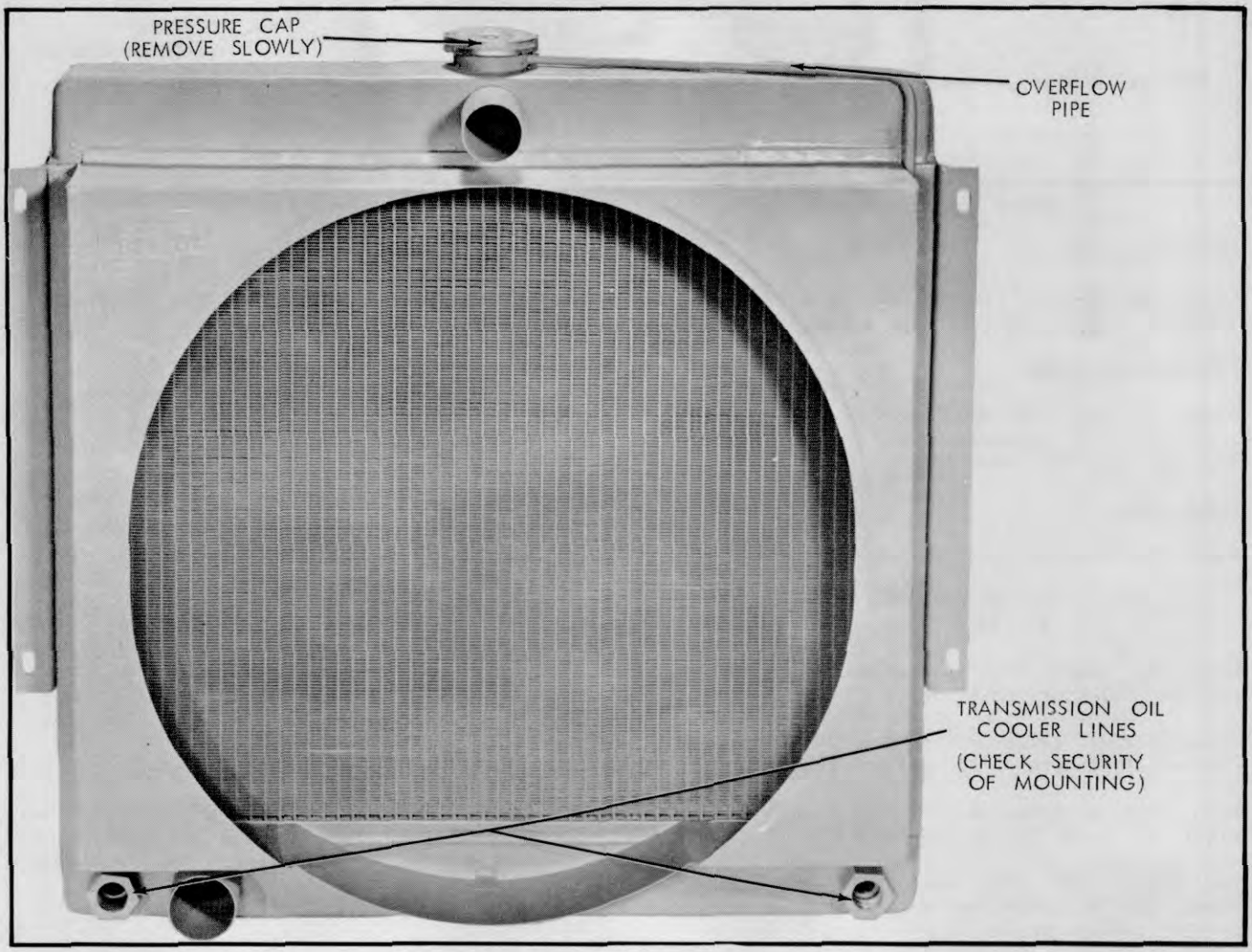


Plate 6460. Typical Radiator

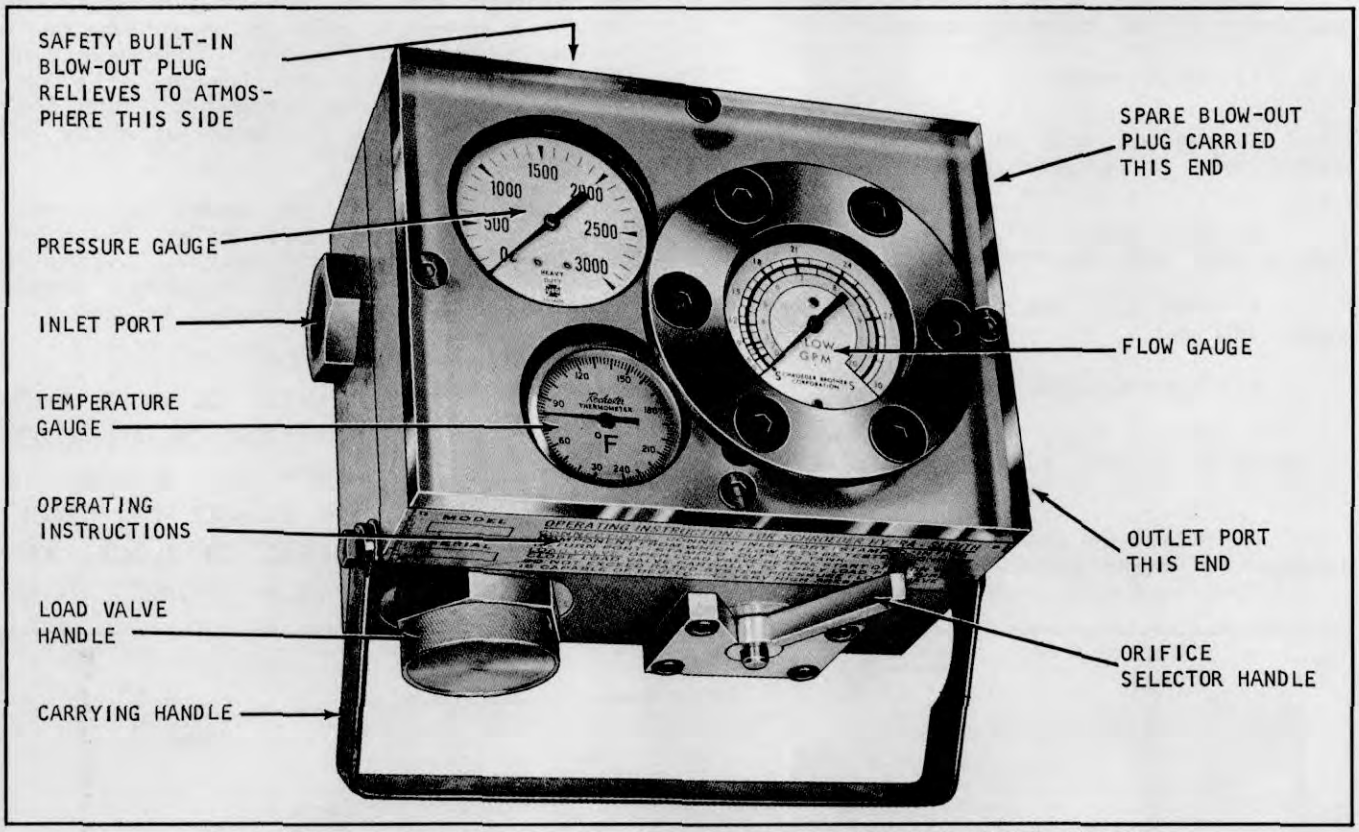


Plate 6747. Schroeder Hydraulic Circuit Tester CLARK PART NUMBER 1800060

PRESSURE GAUGE

Reads directly in pounds per square inch (PSI).

TEMPERATURE GAUGE

Reads directly in degrees Fahrenheit and indicates the temperature of the oil passing through the instrument.

FLOW GAUGE

Reads two scales in gallons per minute.

0 - 30 gallons
9 - 30 gallons

Read the scale that corresponds with the orifice selector position.

Turn orifice selector to the left (counter-clockwise) to read 10 gallon scale.

Turn orifice selector to the right (clockwise) to read 30 gallon scale.

You may switch from one scale to the other, while operating machine. Always start on 30 gallon scale.

LOAD VALVE

The load valve is a flow restrictor or shut off valve. Turning the valve to the right throttles flow through the Hydra-Sleuth, thus the operator may load a hydraulic pump or circuit to the desired test pressure, simulating work.

SAFETY PLUG

Located opposite the load valve this plug protects the Hydra-Sleuth and the tested system from pressures in excess of 3200 PSI. When pressure becomes higher the plug will rupture and dump oil to atmosphere.

HYDRAULIC FLUID

Unless marked to the contrary, the unit is for use with petroleum, hydraulic fluids.

HOW TO CONNECT THE PORTABLE TESTER

Using a 1/2" hose or larger, connect tester INLET PORT to the flow to be tested. Connect the tester outlet port to reservoir fill port, or system return line.

HYDRA-SLEUTH ADJUSTMENTS BEFORE OPERATION

A. Depending on flow (GPM) to be checked choose proper orifice. (It is good practice to start always on 30 gallon scale.)

B. Fully open load valve by turning all the way to the left.

HYDRA-SLEUTH ADJUSTMENTS DURING OPERATION

1. Turn load valve to right to develop test pressures.

CAUTION

LOAD VALVE IS CAPABLE OF VERY HIGH PRESSURES.

A. Always start test with load valve fully open.

B. Do not exceed design pressure of system under test.

C. Keep load pressures within range of the Hydra-Sleuth pressure gauge.

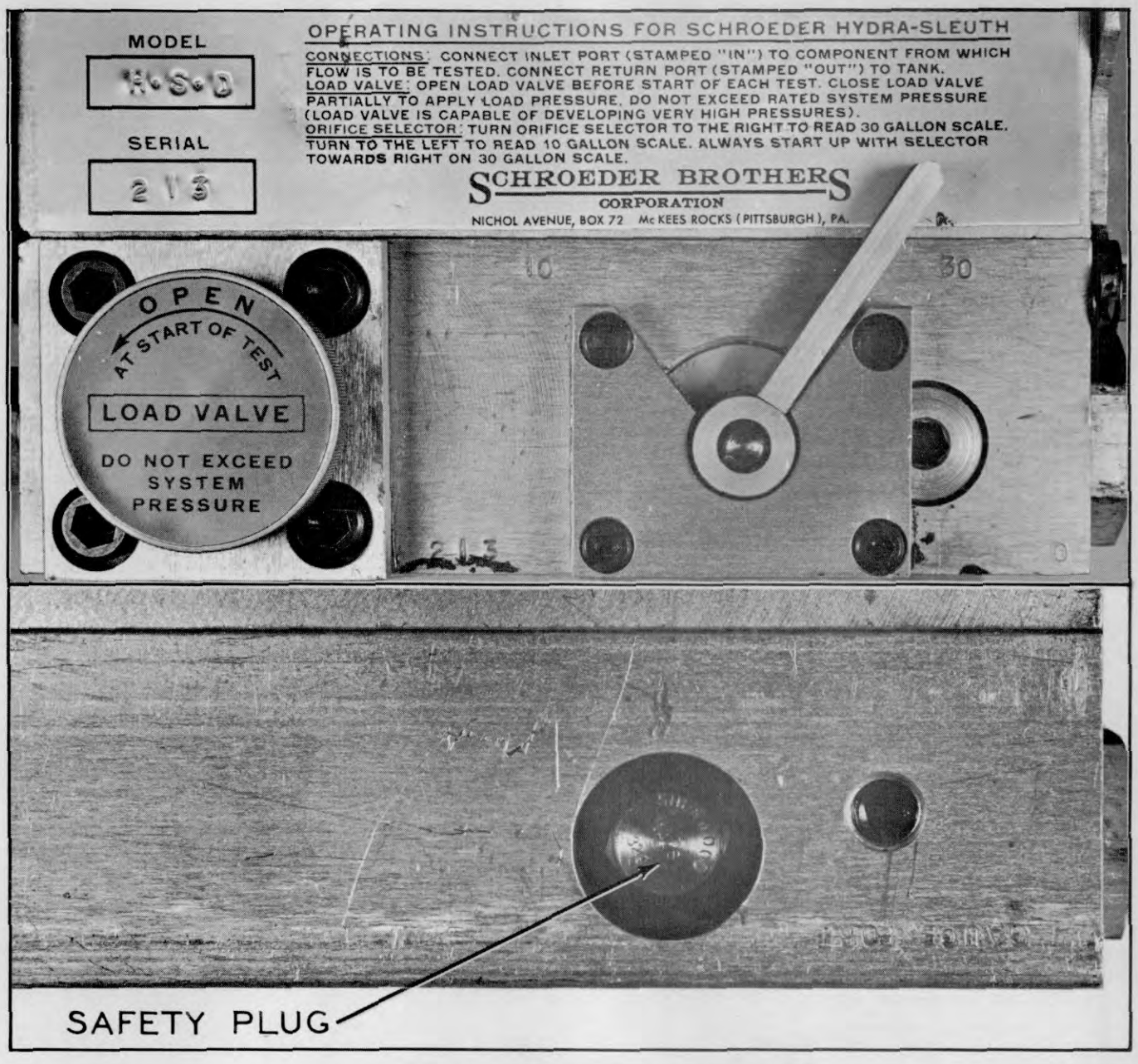


Plate 6748. Schroeder Hydraulic Circuit Tester

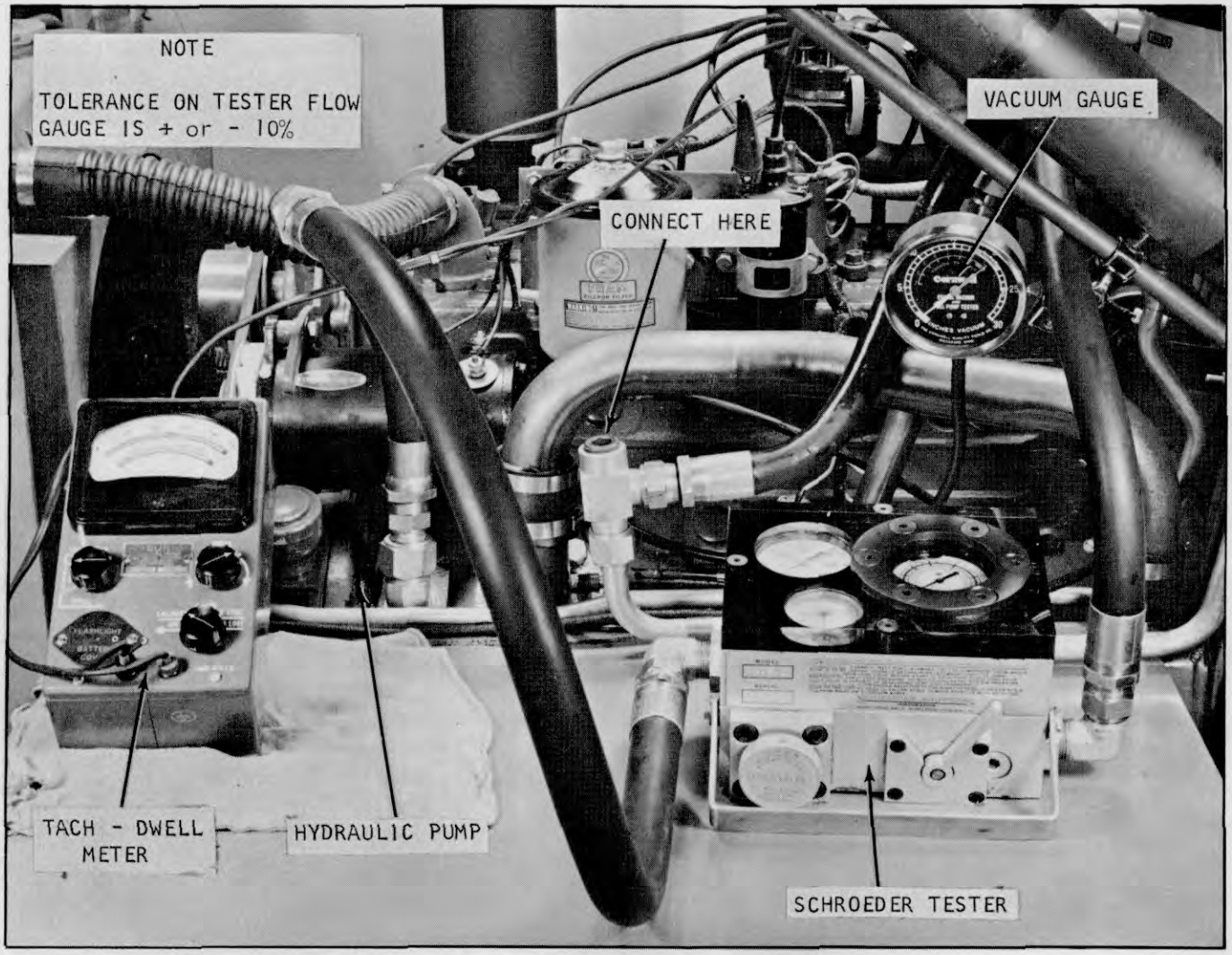


Plate 6749. Flowmeter Hookup

HOOK UP FLOWMETER

Install the high pressure hose onto the pump as shown, see Plate 6749. Attach the return line hose as shown in Plate 6749.

TESTING PUMP OUTPUT

1. Start the Tractor engine, and set speed to the exact R.P.M. stated in the chart below.

2. To heat up oil, apply the load valve until pressure reaches 1000 P.S.I. CAUTION: APPLY PRESSURE GRADUALLY. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN "BLOWING-OUT" THE FLOWMETER RELIEF PLUG.

3. After the oil has come up to test temperature (120°F.) and the flow gauge needle is stabilized, apply the load valve GRADUALLY until desired pressure is achieved. Then stabilize the pressure needle. NOTE: IT WILL BE NECESSARY TO INCREASE TRACTOR SPEED SLIGHTLY AS PUMP MUST BE TESTED UNDER LOAD (AT SPECIFIED R.P.M.)

CAUTION: LIMIT TIME THE LOAD VALVE IS SET FOR A READING OF 2000 P.S.I. TO 30 SECONDS EXTENDED PERIOD OF TIME WITH MAXIMUM READING COULD CAUSE DAMAGE.

4. Read the flow gauge. It should read reasonably close to the specifications for a new pump as listed below.

ENGINE R.P.M.	P.S.I.	G.P.M.
2250	2000	17

PRESSURE CHECKS
HYDRATORK TRANSMISSION

MINIMUM TOOLS REQUIRED
1 - Pressure Gauge 0 -to- 250 P.S.I.
1 - Tachometer

1. Completely clean the truck and hydratork before making pressure checks. This should include cleaning the complete machine with steam. Making sure the radiator and its tubes are clean externally and internally.

2. Check Transmission Fluid Level.

Run machine in Forward and Reverse for about one to three minutes total. Stop engine and check fluid level. Fill if necessary to the "FULL" mark on the Transmission Dip Stick.

3. Check Brake Pedal Free Travel.

The hydraulic inching (brake) pedal should contact the floor board with the pedal in the released (up) position.

Pedal free travel should be measured from bottom of floor board to top of pedal arm, or from top pedal position to where pedal meets resistance from the master cylinder when depressing pedal by hand. Refer to page 100H 302 for Pedal Free Travel and illustrations.

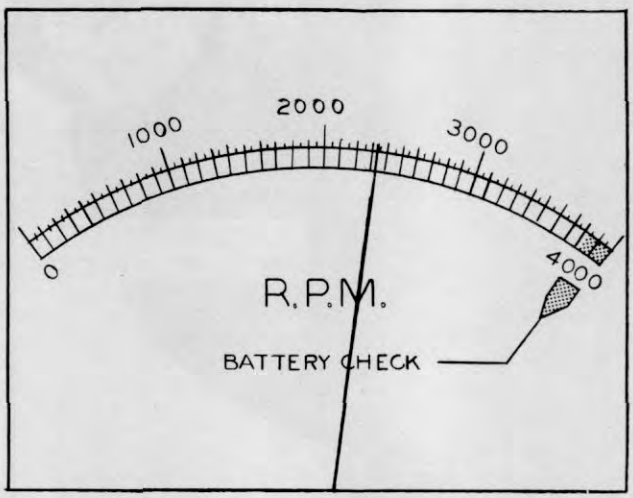


Figure 1703a. Check NO-LOAD R.P.M.

4. Check engine for prescribed NO-LOAD 2350 R.P.M.

5. Check engine for prescribed 2200 R.P.M. with rated load. This may be done by holding the tilt lever in the back position.
Engine must be properly tuned before making transmission pressure checks.

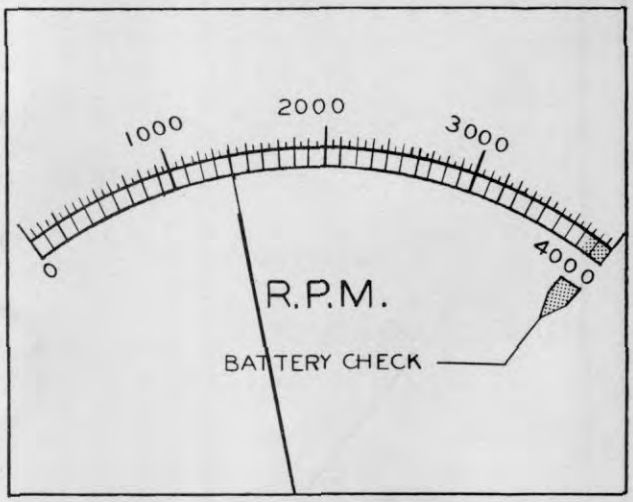


Figure 1703b. Normal Engine Stall

6. Check for normal engine stall by positioning machine against an immovable object. With machine in gear, accelerate to full throttle position. The normal engine stall R.P.M. is 1350 to 1500.

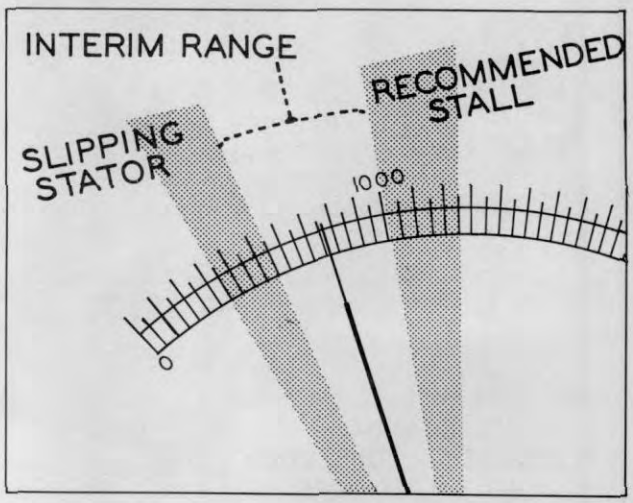
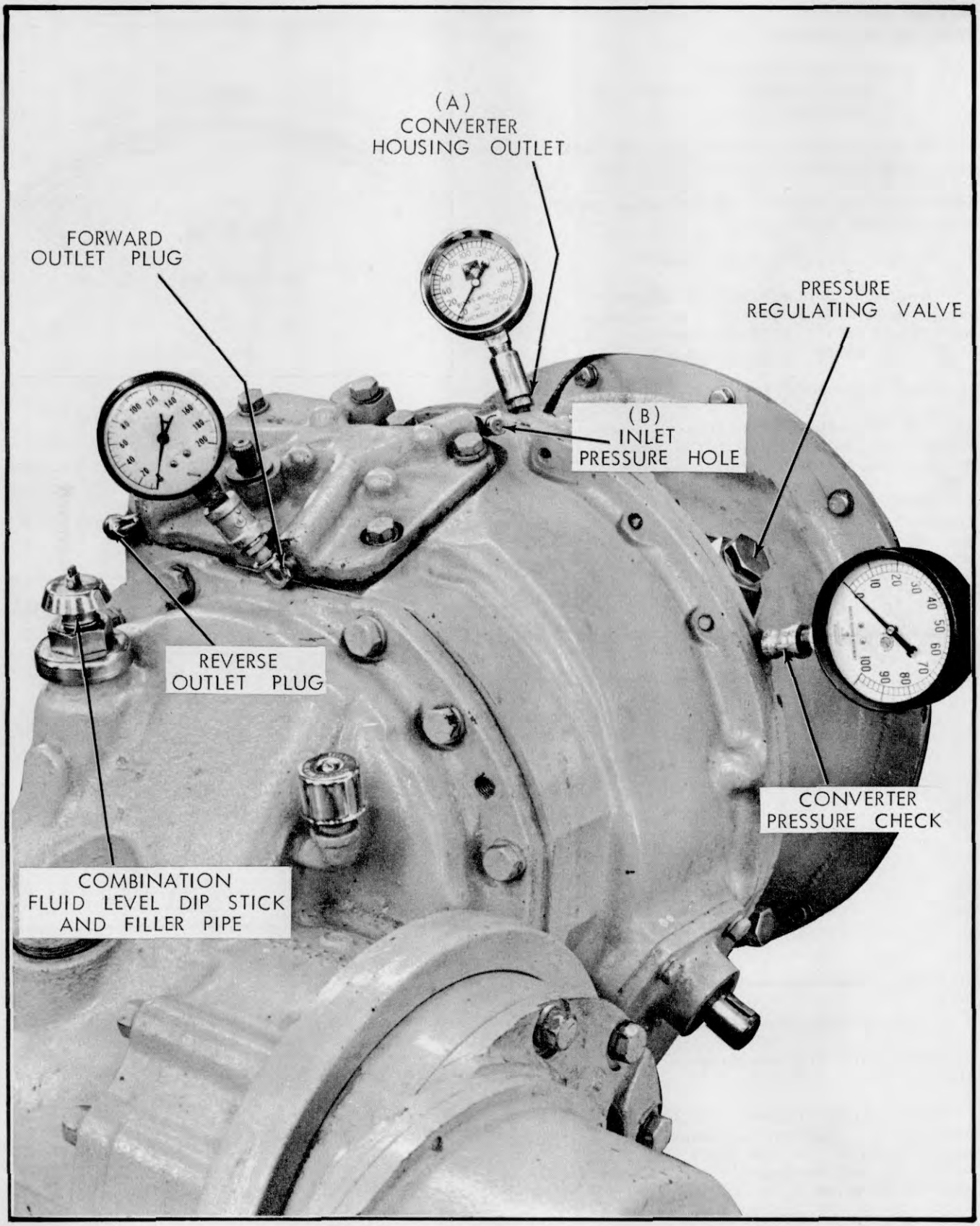


Figure 1703c. Low INTERIM stall

Low Interim Range Engine Stall (1000 -to- 1350 R.P.M.) indicates a loss of engine power. Report to designated person in authority.



(Figure 1704a.) Plate 6658. Transmission Pressure Checks

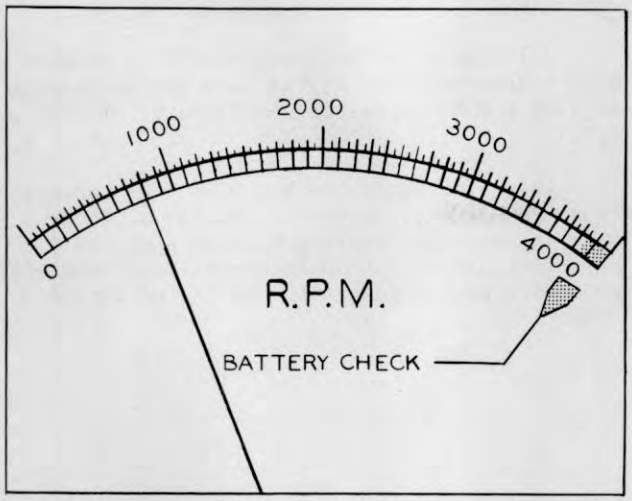


Figure 1705a. Low Engine Stall

Low — Low Engine Stall (650 -to- 900 R.P.M.) indicates Converter Stator slipping. Converter must be replaced. Report to designated person in authority.

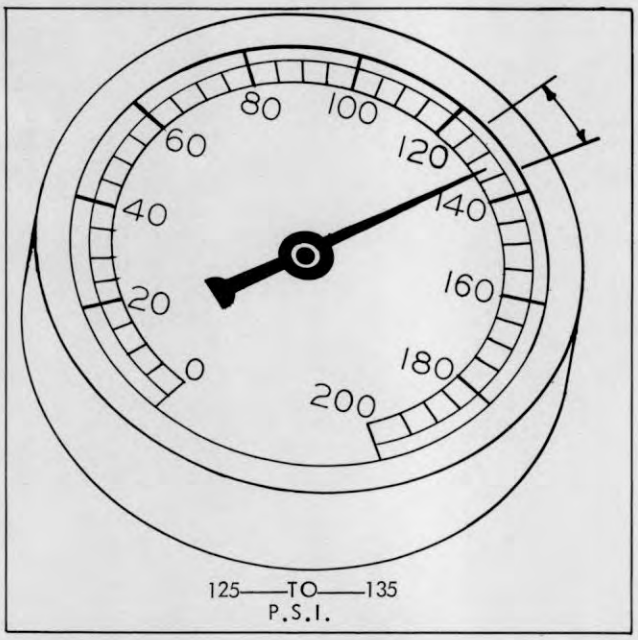


Figure 1705b. Pump Pressure Check

7. Pump Pressure Check, see Figures 1704a and 1705b.

(A) Remove pipe plug and install pressure gauge at the Converter Housing Outlet (A), see Fig. 1704a. Check pressure with transmission in NEUTRAL and engine running at 1400 R.P.M. Pressure should be 125 -to- 135 P.S.I. (Figure 1705b.)

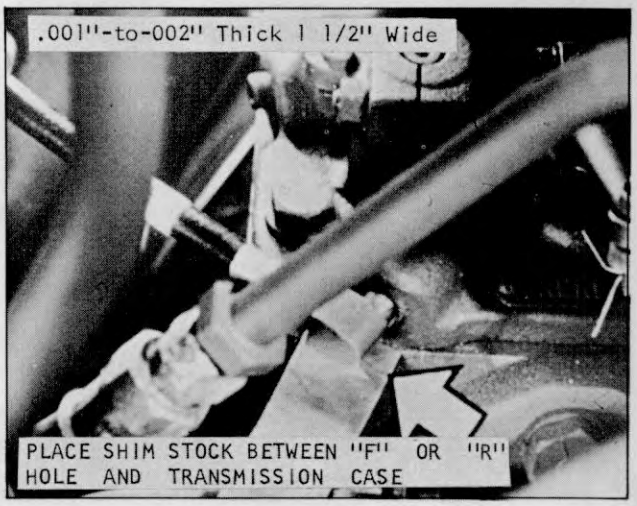


Figure 1705c. Install Shim Stock

(B) If pressure is low, place shim stock (.001" -to- .002" thick -x- 1 1/2" wide) between the Inlet Pressure Hole (B) of the Transmission Control Cover and Transmission Case, see Figure 1705c.

(C) Check pressure again. Pressure should be 125 -to- 135 P.S.I.

(D) If pressure is still low, the Transmission Pump or Pressure Regulating Valve may be defective. Report to designated person in authority.

8. Control Cover - Selector Check.

(A) Check control cover or selectors at either Forward or Reverse Outlet Plugs, see Figure 1704a.

Securely block machine so it cannot move. Install pressure gauge at either the Forward or Reverse Outlet Plugs. Start engine and place Directional Control Lever in either Forward or Reverse (depending upon which selector is being checked). Run engine at 1400 R.P.M. Pressure should be 125 -to- 135 P.S.I. (Figure 1705d.)

(B) If pressure is low, insert shim stock (.001" -to- .002" thick -x- 1 1/2" wide) between either the Forward or Reverse Hole (whichever one was used) and the Transmission Case. Check pressure again. Pressure should be 125 -to- 135 P.S.I. If pressure is low, trouble is in the control cover. If pressure is 125 -to- 135 P.S.I., the trouble is inside of the transmission. Report to designated person in authority.

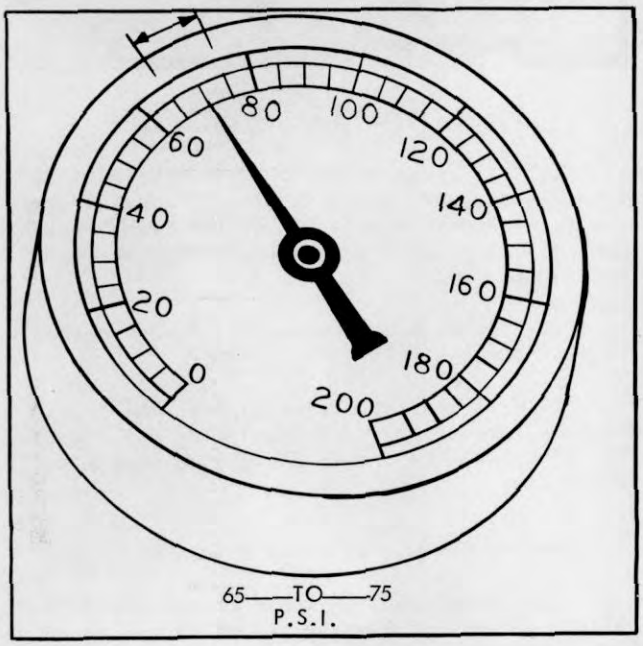


Figure 1707a. Converter Pressure Check

9. Converter Pressure Check, see Figures 1704a and 1707a.

(A) Converter Pressure should be checked with transmission in NEUTRAL and engine running at 1400 R.P.M. Pressure should be 65 -to- 75 P.S.I.

(B) If pressure is too high, the Convertor Pressure Regulator may be at fault; or if pressure is low, the Pressure Regulator may be defective, there may be internal leaks, bad seals, or a worn pump. Report to designated person in authority.

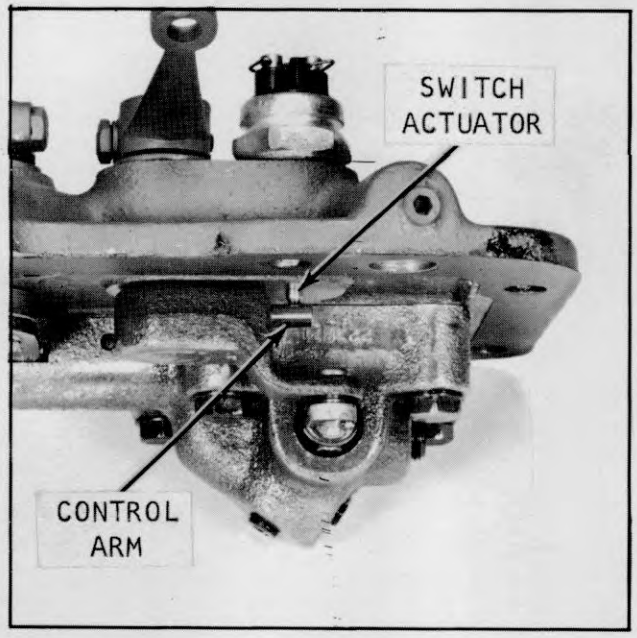


Figure 1793a. Starting Switch Actuated (NEUTRAL)

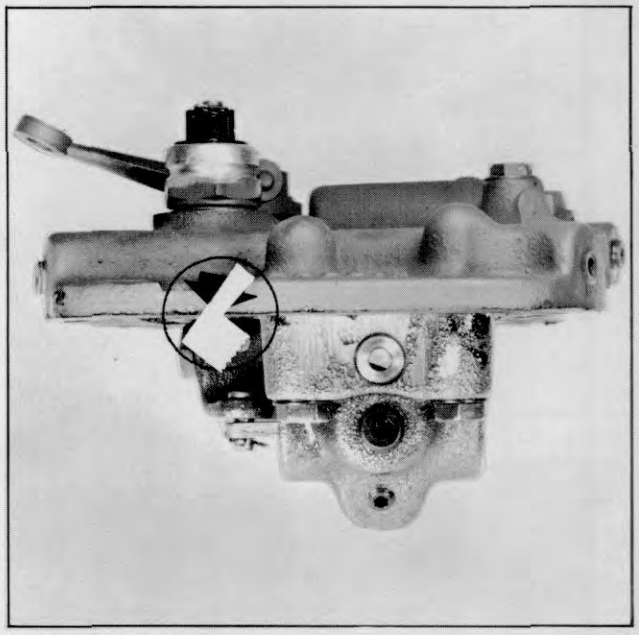


Figure 1793b. Starting Switch Unactuated (F or R)

NEUTRAL STARTING SWITCH

The neutral starting switch should be adjusted so that machine will not start except when the transmission control is in the (dead) neutral position.

ADJUSTMENT

1. With driver's seat occupied and transmission in gear hold starting switch in actuated position and gently move shift lever towards neutral position.

2. If engine does not start, repeat operation in opposite direction.

3. If engine starts, coming from either direction on the shift lever prior to reaching neutral, switch should be adjusted by means of shims underneath the switch until engine will not start unless it is in (dead) neutral; that is, vehicle will not move regardless of shift lever position during the starting cycle.

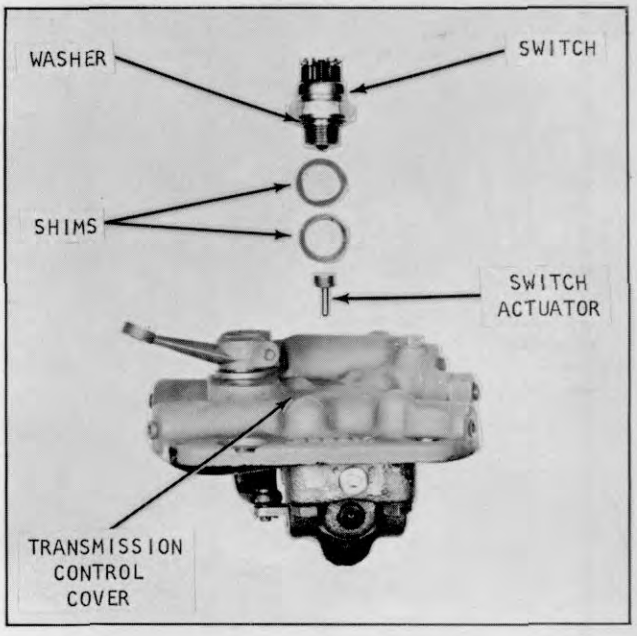


Figure 1793c. Neutral Starting Switch Adjustment

ENGINE

TROUBLE	PROBABLE CAUSE	REMEDY
Starting motor will not crank engine.	Battery discharged	Recharge or replace battery.
	Battery cable terminals loose or corroded. Ignition Fuse blown.	Remove and clean, reinstall and tighten cables. Replace fuse.
	Starting motor drive gear jammed in flywheel teeth.	Loosen starting motor and free-up gear.
	Improper oil.	Change oil to proper grade.
	Battery cable terminal broken.	Replace cable.
	Poor starting switch contacts.	Replace switch.
	Faulty Neutral Starting Switch.	Replace Switch
Starting motor operates, but fails to crank engine when switch is engaged.	Starting motor gear does not engage flywheel.	Remove starting motor, and clean drive mechanism.
	Starting motor or drive gear defective.	Replace starting motor.
Engine will not start. No spark. Ammeter shows no discharge (Zero reading) with ignition switch "on".	Ignition switch partly "on".	Turn switch "on" fully.
	Ignition switch defective.	Replace switch.
	Ignition primary wires or starting motor cables broken or connections loose.	Repair, or replace and tighten.
	Ignition coil primary winding open.	Replace coil.
	Distributor points dirty.	Clean and adjust points.
	Distributor points not closing.	Adjust or replace points.
	Loose or corroded ground, or battery cable connections.	Remove and clean, reinstall and tighten cables.
Engine will not start.	Defective condenser.	Replace condenser
Ammeter showing abnormal discharge with ignition switch "on".	Short-circuited or burned distributor cap or rotor.	Replace parts.
	Short-circuited wire between ammeter and ignition switch.	Repair or replace wire.
	Short-circuited primary winding in ignition coil.	Replace coil.
	Distributor points not opening.	Clean or replace, and adjust points.
	Distributor points pitted or burned.	Clean or replace, and adjust points.
	Distributor condenser weak.	Replace condenser.
	Ignition coil weak.	Replace coil.

ENGINE (CONTINUED)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine will not start. Weak spark (continued)	Primary wire connections loose.	Tighten.
	High-tension, spark plug wires, or distributor cap wet.	Dry thoroughly.
	High-tension, spark plug wires, or distributor cap damaged.	Replace defective parts.
	Distributor cap or rotor burned or broken.	Replace defective parts.
	Spark plug gap incorrect.	Reset Gaps.
	Short-circuited secondary circuit in coil.	Replace coil.
Good spark.	Fuel tank empty.	Refill tank.
	Dirt or water in carburetor, or float stuck.	Drain and clean carburetor
	Carburetor and engine flooded by excessive use of choke.	Depress accelerator pedal fully, crank engine with starting motor when engine starts, reset throttle and leave choke control "in".
	Fuel does not reach carburetor.	Inspect for damaged or leaky lines or air leak into line between tank and fuel pump.
	Dirt in fuel lines or tank.	Disconnect lines, drain tank, and blow out lines.
	Fuel line pinched.	Repair or replace line.
	Ignition wires incorrectly installed in distrubutor cap.	Install wires correctly.
	Ignition timing incorrect.	Reset timing.
	Fuel Strainer Clogged.	Remove and clean strainer.
	Fuel pump does not pump.	Clean screen, replace pump if defective.
	Lack of engine compression.	Replace head gasket, Grind valves, replace valve spring, replace bad valve.
Backfiring.	Ignition out of time.	Reset timing.
	Spark plug wires incorrectly installed distributor cap or at spark plugs.	Install wires correctly.
	Distributor cap cracked or shorted	Replace cap.
	Valve holding open.	Reset timing. replace valve springs. Adjust tappets.

ENGINE (CONTINUED)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine operates, but backfires and spits.	Improper ignition timing.	Reset timing.
	Spark plug wires incorrectly installed in distributor cap.	Install wires correctly.
	Dirt or water in carburetor.	Drain and clean carburetor.
	Carburetor improperly adjusted.	Clean and adjust carburetor.
	Carburetor float level low.	Reset Float Level
	Valve sticking or not seating properly, burned or pitted.	Regrind Valves
	Excessive carbon in cylinders.	Remove carbon from cylinders.
	Valve springs weak.	Replace Valve Springs
	Heat control valve not operating.	Free-up, and adjust valve.
	Fuel pump pressure low.	Clean screen; replace pump, if defective.
	Fuel strainer clogged.	Remove and clean strainer.
	Partly clogged or pinched fuel lines.	Clean and repair lines.
	Intake manifold leak.	Inspect gaskets and tighten manifold stud nuts.
	Distributor cap cracked or shorted.	Replace cap.
Engine stalls on idle.	Carburetor throttle valve closes too far, or idle mixture incorrect.	Adjust carburetor.
	Carburetor choke valve remains closed.	Free-up and lubricate valve.
	Dirt or water in idler passages of Carburetor.	Clean or replace carburetor.
	Air leak at intake manifold.	Inspect gaskets and tighten manifold stud nut.
	Heat control valve defective.	Free-up and adjust valve.
	Spark plugs defective, gaps incorrect.	Clean or replace spark plugs, set gap clearance.
	Ignition timing early.	Reset timing.
	Low compression.	Tighten intake manifold. Adjust valve.
	Water leak in cylinder head or head gasket.	Replace gasket.

ENGINE (CONTINUED)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine misfires on one or more cylinders.	Dirty spark plugs.	Clean, adjust, or replace plugs.
	Spark plug gap incorrect.	Reset gap.
	Cracked spark plug porcelain.	Replace spark plug.
	Spark plug wires grounded.	Replace wires.
	Spark plug wires incorrectly installed in cap or at spark plugs.	Install wires incorrectly.
	Distributor cap or rotor burned or broken.	Replace defective parts.
	Valve tappet holding valve open.	Adjust tappets
	Low engine compression.	Adjust tappets, Retime engine, Replace rings.
	Leaky cylinder head gasket.	Replace gasket.
	Cracked cylinder block, broken valve tappet or tappet screw.	Replace defective or broken parts.
Engine does not idle properly.	Ignition timing.	Reset timing.
	Dirty spark plugs, or gaps too close.	Clean and adjust spark plugs.
Engine misses at high speeds.	Ignition coil or condenser weak.	Replace defective parts.
	Distributor points sticking, dirty or improperly adjusted.	Clean, adjust, or replace points.
	Distributor rotor or cap cracked or burned.	Replace defective parts.
	Leaky cylinder head gaskets.	Replace gaskets.
	Uneven cylinder compression.	Adjust tappets or timing.
	High-tension or spark plug wires leaky, cracked insulation.	Replace defective parts.
	Carburetor choke not adjusted.	Adjust choke.
	Carburetor accelerating pump system defective, dirt in metering jets or float level incorrect.	Replace defective parts, Clean carburetor, reset float level.
	Fuel pump defective, causing lack of fuel.	Clean screen, replace defective pump.
	Air cleaner dirty.	Clean complete air cleaner and refill oil cup.
	Heat control valve defective	Free-up and adjust.

ENGINE (CONTINUED)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine misses at high speeds. (Continued)	Valves sticking, weak or broken valve springs.	Free up valves, replace valve springs.
	Fuel strainer clogged.	Remove and clean strainer.
	Weak distributor bracket arm spring.	Replace point set.
	Excessive play in distributor shaft bearing.	Replace distributor.
	Spark plugs defective, dirty or gap incorrectly set.	Clean, adjust or replace spark plugs.
Engine pings (Spark Knock.)	Ignition timing early.	Reset timing.
	Distributor automatic spark advance stuck in advance position, or spring broken.	Replace distributor.
	Excessive carbon deposits in cylinders.	Remove cylinder head and clean.
	Incorrect fuel.	Drain, use correct fuel.
Engine lacks power.	Ignition timing late.	Reset timing.
	Incorrect fuel.	Use correct fuel.
	Leaky cylinder head gasket.	Replace gasket.
	Excessive carbon formation.	Remove cylinder head, and clean cylinder head, piston heads, cylinder block, and valves.
	Engine runs cold.	Test thermostat; in cold weather, cover radiator.
	Insufficient oil, or improper grade oil.	Lubricate in accordance with lubrication section.
	Oil system failure.	Fill crankcase to prescribed level, check oil pressure.
	Air Cleaner dirty.	Clean complete air cleaner, change oil in cup.
	Spark plug gaps to wide.	Reset gaps.
	Choke valve partially closed, or throttie does not open fully.	Adjust valve or throttle,
	Manifold heat control inoperative.	Free-up and adjust control.
	Exhaust pipe, muffler or tail pipe obstructed.	Service or replace obstructed parts.
	Low compression, broken valve spring, sticking valves.	Replace valves or springs, Free up valves.

ENGINE (CONTINUED)

TROUBLE	PROBABLE CAUSE	REMEDY
Engine lacks power. (Continued)	Improper tappet adjustment.	Adjust Tappets.
	Lack of fuel.	Clean filter, inspect fuel pump, inspect carburetor for water or dirt and clean if necessary.
Engine overheats.	Cooling system deficient. Water low, air flow through radiator core restricted.	Clean radiator core from engine side with compressed air or water, or fill radiator to proper level.
	Clogged radiator core (Clogged internally).	Clean by flushing radiator.
	Cylinder head gasket leaking.	Tighten cylinder head stud nuts and/or replace gasket.
	Radiator or water pump leaking.	Repair or replace defective parts.
	Damaged or deteriorated hose or fan belt.	Replace defective parts.
	Loose fan belt.	Adjust fan tension.
	Cylinder block or head leaking.	Replace block or head.
	Ignition timing incorrect.	Reset timing.
	Damaged muffler, bent or clogged exhaust pipe.	Service or replace defective parts.
	Excessive carbon in cylinders.	Remove cylinder head, and clean cylinder head, piston heads cylinder block, and valves.
	Insufficient oil, or improper grade.	Refer to lubrication Instructions.
	Air Cleaner restricted.	Clean complete change oil in cup.
	Inoperative thermostat.	Replace thermostat and gasket
	Water pump impeller broken.	Replace pump.
	Poor compression.	Check ignition timing.
	Valve timing incorrect.	Reset timing.
High fuel consumption.	High engine speeds (Excessive driving in lower gear range).	Correct driving practice.
	Air cleaner clogged.	Clean complete air cleaner and change oil in cup.
	Carburetor float level too high, accelerating pump not properly adjusted.	Reset float level, overhaul carburetor pump.
	Fuel line leaks.	Correct leaks, replace lines.

ENGINE (CONTINUED)

TROUBLE	PROBABLE CAUSE	REMEDY
High fuel consumption. (Continued)	Overheated engine.	See "Engine overheats".
	Carburetor parts worn or broken.	Replace fuel carburetor.
	Fuel pump pressure too high, or leaky diaphragm.	Replace fuel pump.
	Engine running cold.	Inspect thermostat, cover radiator in winter.
	Ignition incorrectly timed.	Reset timing.
	Spark advance stuck.	Replace distributor.
	Leaking fuel pump bowl gasket.	Replace gasket.
	Low compression.	Check timing, Rebuild Engine.
	Carburetor controls sticking.	Free-up and lubricate controls.
	Engine idles too fast.	Adjust carburetor throttle stop screw.
	Spark plugs dirty.	Clean or replace spark plugs.
	Weak coil or condenser.	Replace coil or condenser.
	Clogged muffler, or bent exhaust pipe.	Service or replace defective parts.
	Loose engine mounts, permitting engine to shake and raise fuel level in carburetor.	Tighten; if damaged, replace defective mounts.
High oil consumption	High engine speeds, or excessive driving in low gear range.	Correct driving practice.
	Oil leaks.	Replace leaking gaskets.
	Improper grade oil, or diluted oil.	Use new oil of proper grade.
	Overheating of engine causing thinning of oil.	See "Engine overheats".
	Oil filter clogged.	Clean filter case thoroughly and replace element.
	Defective piston or rings, excessive side clearance of intake valves in guides, cylinder bores worn (scored, out-of-round, tapered); excessive bearing clearance, misaligned connecting rods.	Replace worn parts.

ENGINE (CONTINUED)

TROUBLE	PROBABLE CAUSE	REMEDY
Low oil pressure.	Insufficient oil supply.	Fill crankcase to prescribed level.
	Improper grade of oil, or diluted oil foaming at high speed.	Change oil, inspect crankcase ventilator inspect for water in oil.
	Oil too heavy (Funneling in cold weather).	Change to proper grade oil. (Refer to Lubrication Instructions.
	Oil pump screen clogged.	Remove oil pan and clean pump screen.
	Oil leaks.	Replace gaskets or seals.
	Faulty oil pump, pressure regulator valve stuck or improperly adjusted, or spring broken.	Replace worn parts.
Defective valves.	Incorrect tappet adjustment.	Adjust tappets.
Abnormal engine noises.	Loose fan, fan pulley or belt, heat control valve.	Tighten or correct conditions as required.
	Leaking intake or exhaust manifold or gaskets, cylinder head gasket, or spark plugs.	Tighten loose components or replace defective gaskets.
	Overheated engine, clogged exhaust system	Remove obstruction from exhaust system. Inspect for further serviceability.
Poor compression.	Incorrect tappet adjustment.	Adjust tappets.
	Leaking, sticking, or burned valves; sticking tappets; valve spring weak or broken; valve stems and guides worn; piston ring grooves worn or rings worn, broken, or stuck; cylinder bores scored or worn.	Replace worn, Broken, or Defective parts.

FUEL SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
Fuel does not reach carburetor	No fuel in Fuel tank.	Fill fuel tank.
	Fuel pump inoperative.	Replace pump.
	Fuel line air leak between tank and fuel pump.	Repair or replace line.
	Fuel line clogged.	Disconnect and blow out lines.
	Fuel tank cap vent clogged.	Clean vent.
Fuel reaches carburetor, but does not reach cylinders.	Choke does not close.	Free-up and lubricate, inspect for proper operation.
	Fuel passage in carburetor clogged.	Clean or replace carburetor.
	Carburetor float valve stuck closed.	Clean or replace carburetor.
High fuel consumption	Lubricant in power train too heavy.	Use correct lubricant.
	Incorrect adjustment of carburetor.	Adjust carburetor.
	Vehicle overloaded.	Reduce loads to specified maximum capacity.
	Tires improperly inflated.	Inflate tires properly.
	Tight brakes.	Adjust brakes.
Low Fuel Pressure.	Air leak in fuel lines.	Tighten connections, repair lines if damaged.
	Fuel pump defective, diaphragm broken; valve leaking, linkage worn.	Replace fuel pump
	Fuel lines clogged.	Clean or replace lines.
Engine idles too fast.	Improper carburetor throttle stop adjustment.	Adjust throttle stop screw.
	Carburetor control sticking.	Free-up and lubricate control.
	Control return spring weak.	Replace spring.
Fuel gauge does not register.	Loose wire connection at instrmment panel or tank unit.	Tighten connections.
	Instrument panel unit or tank unit inoperative.	Replace unit.

COOLING SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
Overheating.	Unusual operating conditions of high temperature.	Inspect. (Refer to "Engine overheats".)
Loss of cooling solution.	Loose hose connections.	Tighten hose connections.
	Damaged or deteriorated hose.	Replace hoses.
	Leaking radiator.	Repair or replace radiator.
Engine operates too cool.	Thermostat sticking.	Replace thermostat and gasket.
	Low air temperature.	Cover radiator.
Noises.	Frayed or loose fan belt.	Replace or adjust belt.
	Water pump defective.	Replace pump.

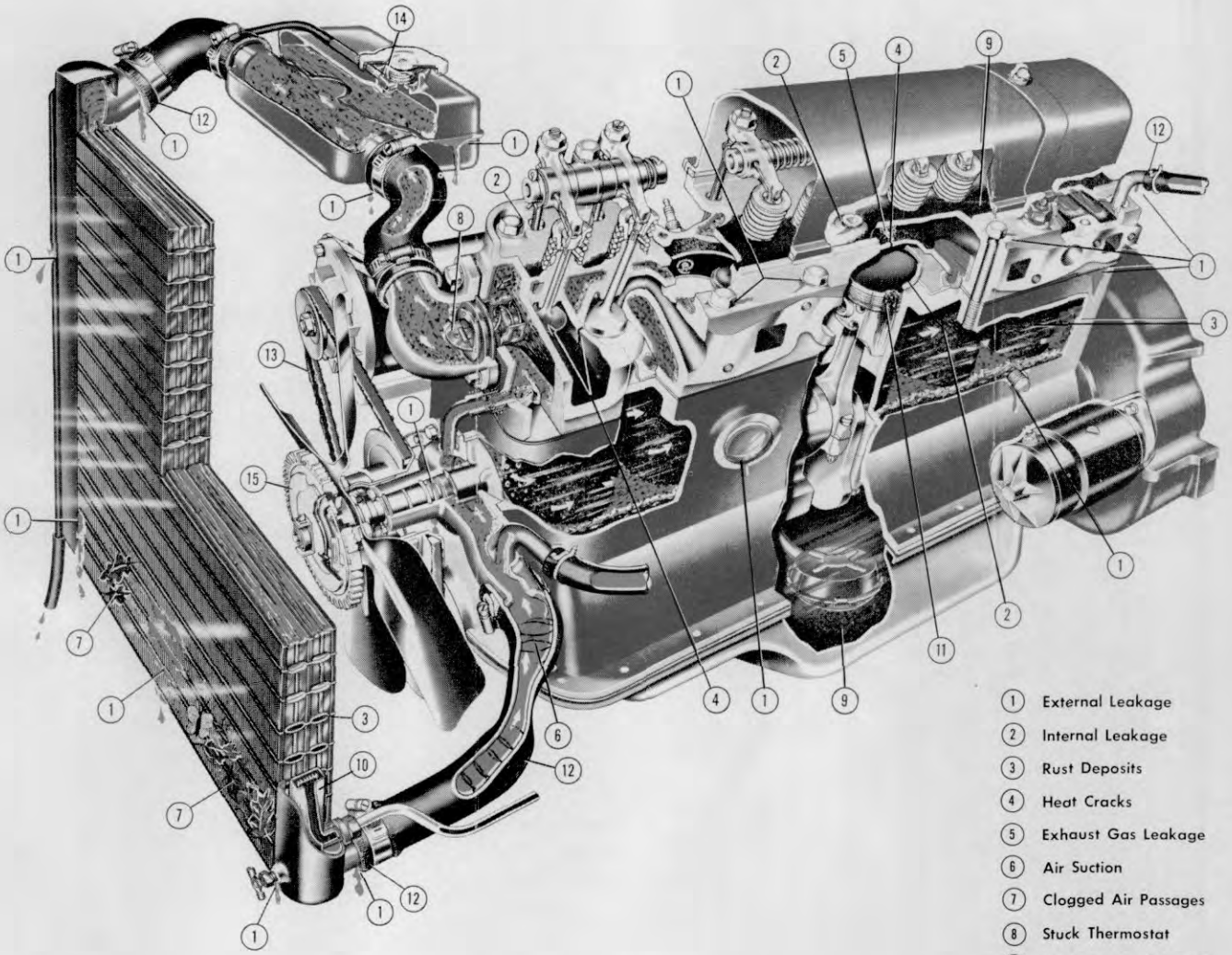
CLARK® EQUIPMENT

INDUSTRIAL TRUCK DIVISION

CLARK® EQUIPMENT

THE ENGINE COOLING SYSTEM

Trouble spots resulting from service neglect



(1) External Leakage
(2) Internal Leakage
(3) Rust Deposits
(4) Heat Cracks
(5) Exhaust Gas Leakage
(6) Air Suction
(7) Clogged Air Passages
(8) Stuck Thermostat
(9) Sludge Formation in Oil
(10) Transmission Oil Cooler
(11) Heat Damage
(12) Hose Failure
(13) Worn Fan Belt
(14) Pressure Cap Leakage
(15) Temperature Control Fan Drive

The cooling system depicted here does not represent that of any particular make of car, it incorporates features used by many different manufacturers.

Cooling System Care Pays!

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IGNITION SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
Ignition System troubles.	Weak spark.	Refer to "Engine will not Start."
	Timing incorrect.	Retime ignition.
	Moisture on distributor wires, coil, or spark plugs.	Clean and dry thoroughly
	Ignition switch inoperative	Replace switch
	Primary or secondary wiring loose, broken, or grounded.	Service.
	Coil defective	Refer to "Ignition coil troubles," below.
	Distributor defective.	Refer to "Distributor troubles", below.
	Spark plug defective.	Refer to spark plug troubles below.
Ignition coil.	Connections loose; dirty or broken external wire, wet.	Clean and tighten, or repair, dry thoroughly.
	Coil defective.	Replace coil.
Distributor troubles.	Distributor breaker points dirty or pitted, point gaps incorrect.	Clean, adjust or replace breaker points.
	Distributor breaker point arm spring weak.	Replace breaker point arm.
	Distributor breaker points sticking.	Free-up breaker points.
	Distributor automatic advance defective.	Lubricate and free-up. If seized, replace distributor.
	Distributor cap or rotor shorted, cracked or broken.	Replace defective parts.
	Distributor rotor does not turn.	Replace broken shaft, rotor, or gear.
	Condenser defective.	Replace condenser.
Spark plug troubles.	Cracked, broken, leaking, or improper type.	Replace spark plug.
	Spark plug wires incorrectly installed on plugs or in distributor cap.	Install wires correctly.
	Spark plugs dirty; gap incorrect.	Clean, set gaps, or replace plugs.
	Spark plug porcelain cracked or broken.	Replace plug.

STARTING MOTOR

TROUBLE	PROBABLE CAUSE	REMEDY
Starting motor cranks engine slowly.	Engine oil too heavy.	Change to proper grade oil.
	Battery charge low.	Recharge or replace battery.
	Battery cell shorted.	Replace battery.
	Battery connections corroded, broken, or loose.	Clean and tighten, or replace cables.
	Dirty commutator.	Clean commutator.
	Insufficient brush surface contact.	Free-up or replace brush.
	Defective starting motor.	Replace starting motor.
	Starting switch defective.	Replace switch.
Starting motor does not crank engine.	Engine oil too heavy.	Change to proper grade oil.
	Starting motor, Solenoid, or cables defective; loose connections.	Replace or tighten loose connections.
	Starting motor pinion gear jammed in flywheel drive gear.	Remove starting motor and reinstall. Replace defective driving gear.
	Dirty drive mechanism.	Clean and lubricate drive mechanism.
	Faulty Relay Switch.	Replace Relay Switch.
	Ignition Fuse Blown.	Replace Fuse.
	Faulty Ignition Switch.	Replace Switch.
	Faulty Neutral Starting Switch.	Replace Switch. NOTE: The INDEX of this manual will list an ADJUSTABLE Neutral Starting Switch if your machine is so equipped.

GENERATOR TROUBLES

TROUBLE	PROBABLE CAUSE	REMEDY
No output.	Regulator defective.	Replace regulator.
Low or fluctuating output.	Loose fan belt.	Adjust belt.
	Insufficient brush surface contact.	Free-up or replace brush.
	Weak brush springs.	Replace spring.
	Worn commutator.	Turn commutator and undercut.
	Broken or loose connections.	Repair, tighten or replace
	Dirty commutator.	Clean commutator.
	Regulator defective.	Replace regulator.
	Loose or dirty connections in charging circuit.	Clean and tighten connections.
Excessive output.	Short circuit between field coil and armature leads.	Replace generator
	Regulator defective.	Replace regulator.
Noisy.	Loose pulley or generator mounting.	Tighten.
	Defective bearings, or armature rubbing on field poles.	Replace generator.
	Improperly seated brushes.	Seat Brushes.
Generator regulator trouble.	Loose connections or mountings.	Clean and tighten.
	Defective regulator.	Replace regulator.

INDUSTRIAL TRUCK DIVISION

TROUBLE SHOOTING GUIDE

BATTERY, LIGHTS AND HORN

TROUBLE	PROBABLE CAUSE	REMEDY
Battery discharged.	Battery solution level low.	Add distilled water to bring level above plates; inspect for cracked case.
	Short in battery cell.	Replace battery.
	Generator not charging.	Inspect generator, fan belt, and regulator.
	Loose or dirty connections; broken cables.	Clean and tighten connections; replace cables.
	Excessive use of starting motor.	Tune up engine; charge battery.
	Idle battery, or excessive use of lights with engine at idle.	Recharge or replace battery. Use lights sparingly.
	Short circuits.	Replace defective wiring.
Battery (other troubles)	Overheated battery.	Inspect for short circuit or excessive generator charge.
	Case bulged (or out of shape).	Inspect for overcharging and overtightening of hold-down screws.
Light switch.	Loose or dirty connections; broken wire.	Clean and tighten; replace broken wire.
	Defective switch.	Replace switch.
Wiring.	Loose or dirty connections; broken wire or terminal.	Clean, tighten, repair or replace. Wire or terminal.
Lights do not light.	Switch not fully "on".	Turn switch "on" fully.
	Loose or dirty connections; broken wire.	Clean and tighten; replace or repair wire or terminal.
	Wiring circuit short-circuited, or open.	Correct short circuit or replace defective parts.
	Light burned out.	Replace light.
Lights dim.	Loose or dirty connection.	Clean and tighten connections.
	Wiring short-circuited.	Correct short circuit or replace defective parts.
	Defective switch.	Replace switch.

BATTERY, LIGHTS AND HORN (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Horn troubles.	Loose or dirty wiring connections.	Clean and tighten connections.
Horn sounds continuously.	Short-circuit in wiring between horn and horn button.	Replace wire.
Improper tone.	Loose or dirty wiring connections.	Clean and tighten connections.
	Cover or bracket screws loose.	Tighten.
	Points adjusted improperly.	Adjust points.
Horn will not operate.	Horn Fuse Blown.	Replace Fuse.
	Open Circuit.	Trace, repair or replace as required.
	Faulty Horn Relay.	Replace relay.

INDUSTRIAL TRUCK DIVISION

TROUBLE SHOOTING GUIDE

DRIVE AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Continuous Axle Noise.	Badly worn parts.	Replace worn parts with new.
	Unevenly worn tires.	Replace tires.
	Improperly adjusted wheel bearing.	Adjust correctly.
	Lack of lubricant.	Add sufficient lubricant of correct grade.
Axle Noise on Drive or on Coast Only.	Differential pinion gear and ring gear out of adjustment or worn excessively.	Adjust, repair or replace entire unit if conditions warrants.
Excessive Backlash in Axle Driving.	Loose axle shaft drive flange cap screws.	Tighten cap screws.
	Flange loose on axle shaft.	Reweld flange to shaft.
	Worn splines on axle shaft at differential end.	Replace drive flange and shaft assembly.
	Differential drive pinion gear and ring gear out of adjustment or worn excessively.	Adjust or replace as condition warrants.
Complete Failure to Function.	Broken axle shaft.	Replace axle shaft.
	Broken teeth on ring gear or pinion gear.	Replace ring gear and pinion and other parts of differential necessary. Adjust ring gear and pinion gear correctly.

STEERING AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble.	Damaged axle.	Replace axle.
	Lubrication leaks.	Replace oil seals.
	Incorrect caster or camber.	Adjust and Replace worn parts.
	Uneven tire wear.	Inflate tires properly. Check wheel alignment.

STEERING

TROUBLE	PROBABLE CAUSE	REMEDY
Steering difficult.	Lack of lubrication	Lubricate.
	Tight steering system connections.	Lubricate and adjust linkage.
	Tight steering gear; misaligned wheels.	Adjust steering gear bearings, realign wheels.
	Bent steering connecting linkage or arm.	Straighten or replace linkage.
	Misaligned steering gear mounting.	Adjust mounting.
Wander or weaving	Improper toe in camber or caster (axle twisted).	Replace worn parts. Adjust for proper camber and caster.
	Steering system connections or king pin bearings not properly lubricated.	Lubricate.
	Loose wheel bearings.	Adjust wheel bearings.
	Steering gear worn or maladjusted.	Replace worn parts and adjust bearings.
	Steering gear mountings loose.	Tighten mounting bolts.
Low speed shimmy or wobble.	Loose steering connections.	Adjust and tighten linkage.
	Steering gear worn, or adjustment too loose.	Tighten mounting bolts.
Low speed shimmy or wobble.	Loose steering connections.	Adjust and tighten linkage.
	Steering gear worn, or adjustment too loose.	Replace worn parts; adjust worn thrust bearings and lash adjustment.
	Loose wheel bearings.	Adjust wheel bearings.
Vehicle pulls to one side.	Odd size, or new and old tires on opposite wheels.	Match tires.
	Bent steering arm or connection.	Straighten or replace bent linkage.

BRAKES

TROUBLE	PROBABLE CAUSE	REMEDY
Brakes drag.	Improper pedal adjustment.	Adjust brake pedal free travel.
	Brake pedal return spring broken or weak.	Replace spring.
	Brakes improperly adjusted.	Adjust brakes.
	Brake shoe anchor pin tight in shoe.	Free-up pin and lubricate lightly.
	Brake shoe return spring broken or weak.	Replace spring.
	Loose or damaged wheel bearings.	Adjust or replace wheel bearings.
	Insufficient brake shoe clearance, or improper brake anchor pin adjustment.	Adjust brakes.
	Brake backing plate loose.	Tighten plate.
	Grease on linings.	Correct grease leakage; clean or install new shoes and lining assemblies.
	Dirt imbedded in lining.	Clean lining with wire brush.
	Drums scored or rough.	Replace drum and brake shoe and lining assemblies.
Severe brake action on light pedal pressure.	Brake shoes improperly adjusted.	Adjust brakes.
	Grease on linings.	Correct grease leakage; clean or install new shoes and lining assemblies.
	Loose brake shoe anchor.	Adjust and tighten.
Brake locked.	Brake pedal lacks free travel.	Adjust pedal free travel.
	Brakes frozen to drums (cold weather).	Break loose by driving vehicle.
Brake noisy or chatters.	Brake lining worn.	Replace shoe and lining assemblies.
	Grease on linings.	Correct leakage; clean or replace shoe and lining assemblies.
	Dirt embedded in linings.	Clean lining with wire brush.
	Improper or loose linings.	Replace shoe and lining assemblies.
	Brake shoe or drum distorted.	Straighten or replace.

BRAKES (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive pedal travel.	Lining worn.	Adjust or replace shoe and lining assemblies.
	Brake improperly adjusted.	Adjust brake.
	Scored brake drums.	Repair or replace drums.
Excessive pedal pressure.	Grease on linings; worn or glazed lining.	Correct grease leakage; clean up and replace shoe and lining assemblies.
	Warped brake shoes, or defective brake linings.	Replace shoe and lining assemblies.
	Shoes improperly adjusted.	Adjust brakes.
	Brake drum scored or distorted.	Repair or replace drums.
	Shoes improperly adjusted.	Adjust brakes.
	Insufficient fluid in master cylinder.	Fill master cylinder to within 1/4 inch of the top.
Wheel troubles.	Wheel wobbles; bent.	Inspect mounting on hub, spindles, and drive axle; replace defective wheel or mounting.
	Wheel loose on hub.	Tighten.
	Wheel out of balance.	Balance wheel.
	Wheel bearings run hot.	Adjust, lubricate wheel bearings.

HYDRAULIC SYSTEM

TROUBLE	PROBABLE CAUSE	REMEDY
Pump not delivering oil.	Wrong direction of rotation.	Must be reversed immediately to prevent seizure and breakage of parts due to lack of oil.
	Tank oil level low.	Add recommended oil.
	Oil intake pipe or suction filter plugged.	Replace filter cartridge, clean strainer if so equipped.
	Air leak in suction line.	Will prevent priming, or cause noise and irregular action of control circuit.
	Oil viscosity too heavy to pick up prime.	Thinner oil should be used, per recommendations for given temperature and service.
	Broken pump shaft or gear.	Replace broken, worn or defective parts.
Pump not developing pressure.	Pump not delivering oil for any of the above reasons.	Check oil circulation by watching oil in tank.
	Relief valve spring broken	Replace relief valve
	Relief valve sticking open.	Dirt under pressure adjustment valve. Clean valve
	Leak in hydraulic control system (cylinders or valves).	Find leak and correct.
	Partially clogged intake line, intake filter or restricted intake pipe.	Pump must receive intake oil freely or cavitation will take place.
Pump making noise.	Small air leak at pump intake piping joints.	Test by pouring oil on joints while listening for change in operation. Tighten as required.
	Air leak at pump shaft packing.	Repair or replace.
	Tank air vent plugged.	*Must be open thru breather opening or air filter.*
	Too high oil viscosity.	Use recommended oils.
	Shaft packing worn.	Replace shaft packing per preceding instructions.
	Oil filter dirty.	Replace filter element.
Forks do not lift to maximum height.	Hydraulic Oil level low.	Fill sump tank.

HYDRAULIC SYSTEM CONTINUED

TROUBLE	PROBABLE CAUSE	REMEDY
Lift or tilt action fails.	Loss of oil pressure.	See "pump not delivering oil
Oil leak at top of lift cylinder assembly.	Worn or damaged lift piston seal.	Replace seal.
	Scored cylinder wall.	Replace Cylinder
	Plugged vent line.	Clean out vent line. Replace if collapsed.
Oil leak around piston rod at tilt cylinder	Worn seal.	Replace seal.
	Scored piston rod.	Replace rod and eliminate cause of scoring which myy be caused by misalignment, worn bearing or foreign matter.
With load centered on lift forks load is lifted unevenly.	Lift chains out of adjustment.	Adjust chains.

TRANSMISSION, CONVERTER AND AXLE ADAPTER

TROUBLE	PROBABLE CAUSE	REMEDY
Machine will not move in either direction	Parking brake not released.	Release brake.
	Control linkage not properly adjusted.	Readjust linkage.
	Oil level low.	Determine cause and correct. Fill to proper level with Type "A" Automatic Transmission Fluid Armour Qualified.
	No oil pressure.	Replace Pump.
Machine will move in one direction only.	Control linkage not adjusted.	Adjust linkage.
	No oil pressure to Directional Selector. Seals and "O" Rings in Directional Selector may be defective.	Replace seals and "O" Rings.
	Directional Selector Discs not releasing. Discs defective. Relief hole in D.S. Drum clogged.	Replace Discs and clean all orifices.
Machine moves slowly in both directions at wide open throttle.	Oil level low.	Fill to correct level and determine cause for loss of oil.
	Low oil pressure. Faulty Inching Valve, Faulty Relief Valve, Faulty Pump.	Replace defective parts.
	Brakes dragging.	Adjust brakes.
	Clogged Sump screen.	Clean Screen.
Transmission overheating.	Low oil.	Check and fill to correct level.
	Low Directional Selector pressure (check with gauge). Inching valve not functioning properly.	Replace worn parts as necessary and clean.
	Seals in selector defective.	Replace seals
	Regulating valve sticking open.	Clean valve; replace worn or defective parts.
	Brakes Dragging.	Adjust brakes.
	Clogged Sump Screen.	Clean Screen.

TRANSMISSION, CONVERTER AND AXLE ADAPTER

TROUBLE	PROBABLE CAUSE	REMEDY
Transmission Overheating (continued)	Insufficient oil to Torque Converter and Cooler.	Add oil to proper level; check for plugged lines; replace defective parts.
	Cooler clogged internally stopping flow of oil.	Clean Cooler.
	Bushing in Torque Converter Impeller Hub worn, allowing oil to leak out.	Replace worn or defective parts.
	Slipping Stator.	Refer to Transmission Pressure Checks.
Machine has full power and overheats.	Overloading machine.	Check Capacity loads. Never overload.
	Radiator core clogged externally.	Clean Core.
	Pressure Regulator Valve sticking, giving low pressure.	Clean Valve; replace worn or defective parts.