



INDUSTRIAL TRUCK DIVISION



OPERATORS MAINTENANCE PARTS MANUAL

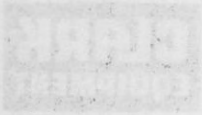
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C-60**

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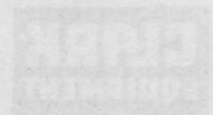
CLARK EQUIPMENT COMPANY

PUBLISHED BY

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



INDUSTRIAL TRUCK DIVISION



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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.



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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



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(continued)

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 definite maintenance program should be set up and followed. Haphazard maintenance will only lead to faulty performance and short life.



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<u>Page</u>	<u>Description</u>
A001	Instructions on use of manual
A002	Instructions on use of manual
A003	Table of contents
A004	Table of contents
1077-Z	Serial number location
B002	Specifications
B003	Specifications
B005	Specifications
B006	Specifications
B007	Specifications
B008	Specifications
B031	New machine 50 hour inspection

OPERATIONS

C002	Overall Controls
C003	Instrument indicators
C004	Instrument indicators
C103	Starting instructions
C303	Safety precautions

LUBRICATION AND PREVENTIVE MAINTENANCE

<u>Time Interval (H=Hours)</u>	<u>Page Number (0000)</u>	<u>Description</u>
H	001	Index
8H	000	<u>8 Hour Lubrication and Preventive Maintenance Illustration</u>
8H	001	Location of Fuses and Fuel Tank Check
8H	002	Engine crankcase check
8H	103	Engine cooling system check
8H	203	Instrument indicators check
8H	204	Instrument indicators check
8H	303	Brake pedal free travel, parking brake check
8H	403	Air Cleaner check
8H	503	Hydraulic sump and control levers check
8H	602	Tire and rim maintenance
8H	603	Tire and rim maintenance
8H	703	Power Steering pump
100H	000	<u>100 Hour Lubrication and Preventive Maintenance Illustration</u>
100H	001	Converter, Transmission and Axle Adapter
100H	002	Engine crankcase and oil filter check
100H	103	Cooling System check
100H	203	Fan and Generator drive belt check
100H	302	Brake System check, Brake pedal free travel check
100H	303	Master cylinder check
100H	403	Lifting mechanisms check
100H	503	Hydraulic sump tank breather
100H	603	Steering gear and battery check
100H	604	Battery check
100H	703	Lubrication check



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LUBRICATION AND PREVENTIVE MAINTENANCE

Time Interval (H=Hours)	Page Number (0000)	Description
500H	000	<u>Lubrication and preventive maintenance illustration</u>
500H	001	Fuel Pump Filter Check
500H	002	Transmission oil filter, screen, and level check
500H	004	Axle adapter & transmission drain plugs
500H	103	Hydraulic sump tank and filter check
500H	202	Steering gear adjust
500H	203	Steering gear adjust
500H	302	Steering axle and linkage adjustments
500H	303	Steering axle and linkage adjustments
500H	403	Manifolds check
1000H	000	<u>Lubrication and Preventive Maintenance Illustration</u>
1000H	001	Engine Tune up
1000H	002	Cylinder head, manifolds, crankcase, and valves adjustments
1000H	003	Valve adjustment
1000H	103	Compression test
1000H	203	Distributor Adjustments
1000H	204	Distributor adjustments
1000H	303	Distributor adjustments and timing
1000H	304	Timing
1000H	403	Vacuum Test
1000H	503	Governor adjustment
1000H	504	Governor adjustment
1000H	603	Starting motor
1000H	604	Starting motor
1000H	703	Generator adjustment
1000H	704	Generator adjustment
1000H	803	Steer wheel bearings lubrication
1000H	805	Axle ends lubrication
1000H	912	Brake bleeding procedure
1000H	913	Brake Bleeding procedure
1000H	1003	Brakes service
1000H	1103	Hand Brake adjustment
1000H	1202	Cooling System inspect and clean
1000H	1203	Cooling System inspect and clean
1000H	1503	Hydraulic system check
1000H	1504	Hydraulic system check
1000H	1505	Hydraulic system check
1000H	1507	Hydraulic system check
1000H	1703	Transmission stall and pressure checks
1000H	1704	Transmission stall and pressure checks
1000H	1705	Battery check
1000H	1793	Neutral starting switch
1000H	1803	Lift and upright adjustments
1000H	1806	Roller adjustments
1000H	1807	Upright roller adjustments
1000H	1808	Upright roller adjustments
1000H	1811	Lift carriage roller adjustments
1000H	1815	Upright roller lubrication

TROUBLE SHOOTING GUIDE

Page	Description	Page	Description
TS 001	Engine	TS 483	Drive Axle
TS 251	Fuel System	TS 251	Steering Axle
TS 321	Cooling System	TS 531	Steering
TS 341	Ignition System	TS 541	Brakes
TS 361	Starting Motor	TS 653	Hydraulic System
TS 381	Generator troubles	TS 963	Transmission, Converter and Axle Adapter (Hydratork Drive)
TS 401	Battery, Lights and Horn		

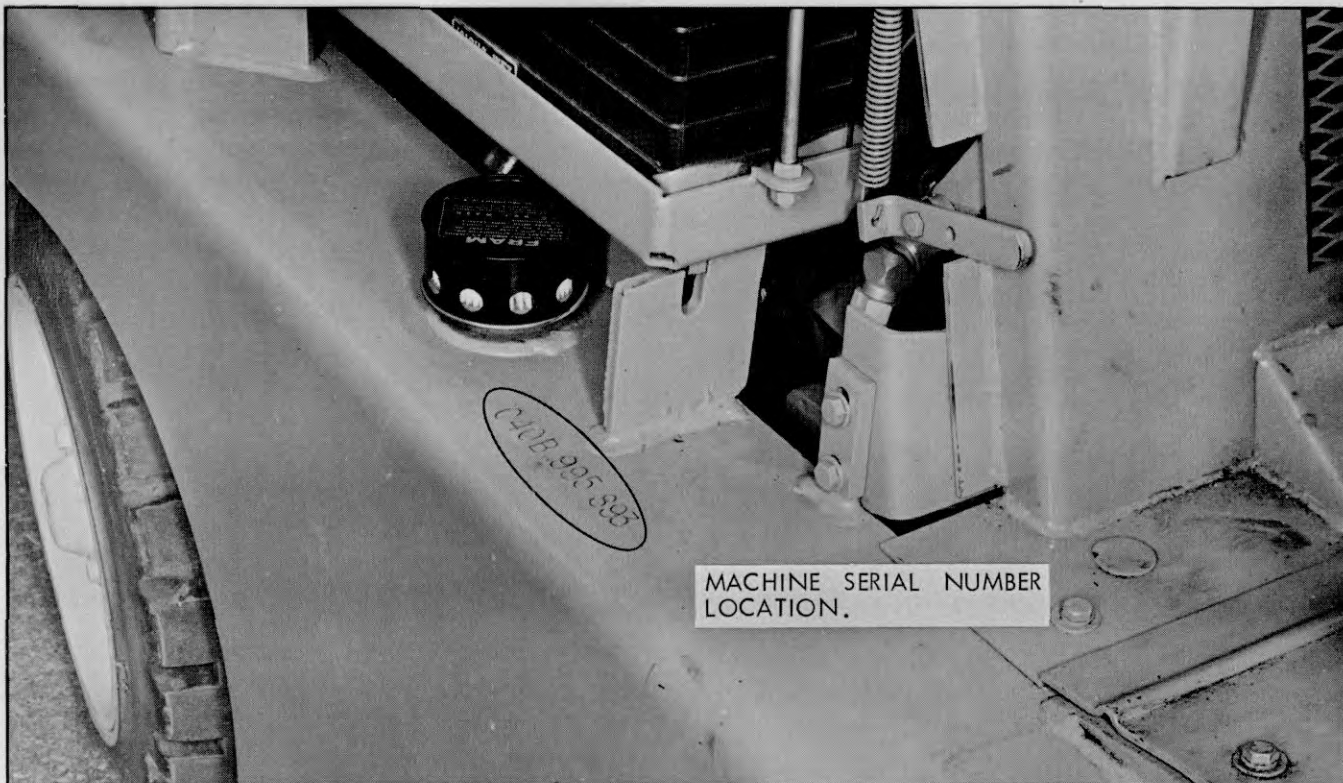
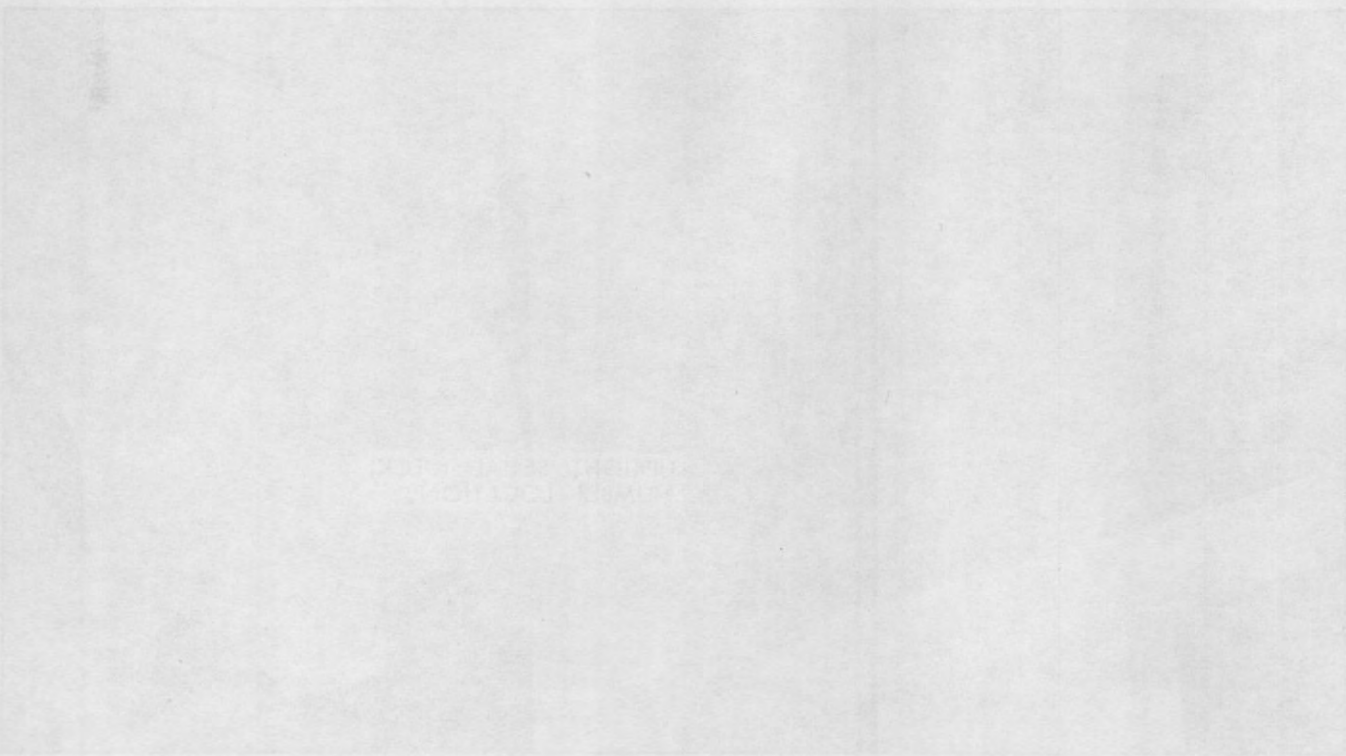
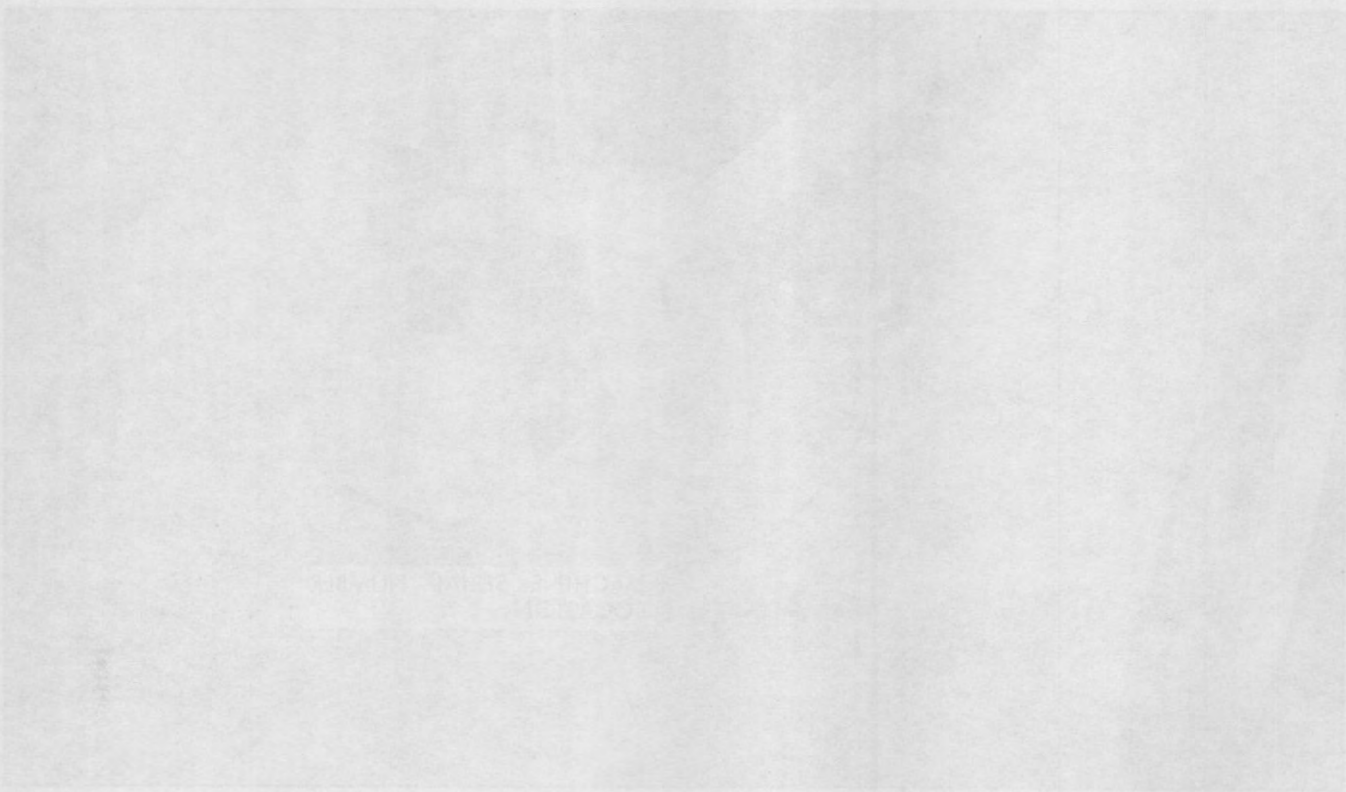
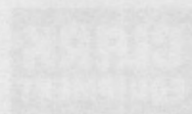
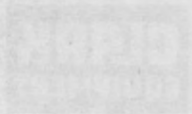


Plate 9474. Machine Serial No. Location



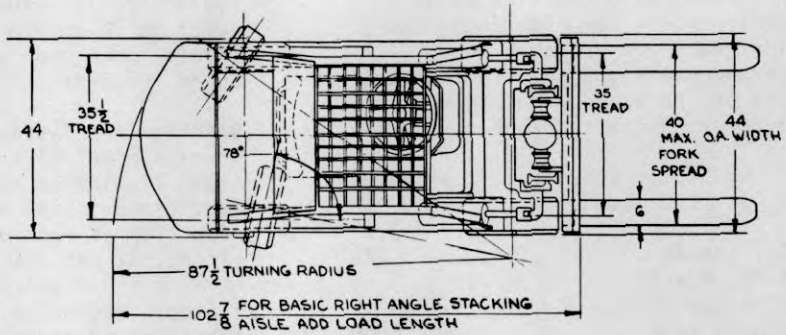
Plate 9475. Upright Serial (Deck) No. Location

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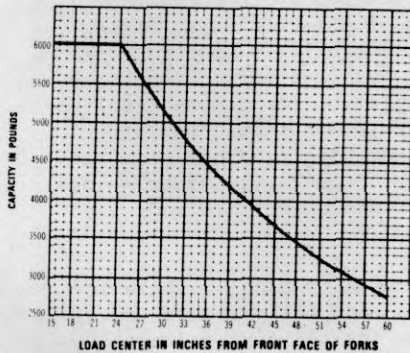


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C-60

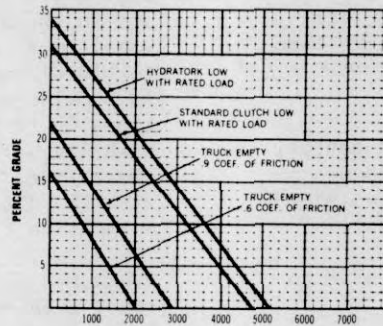


CAPACITY CHART

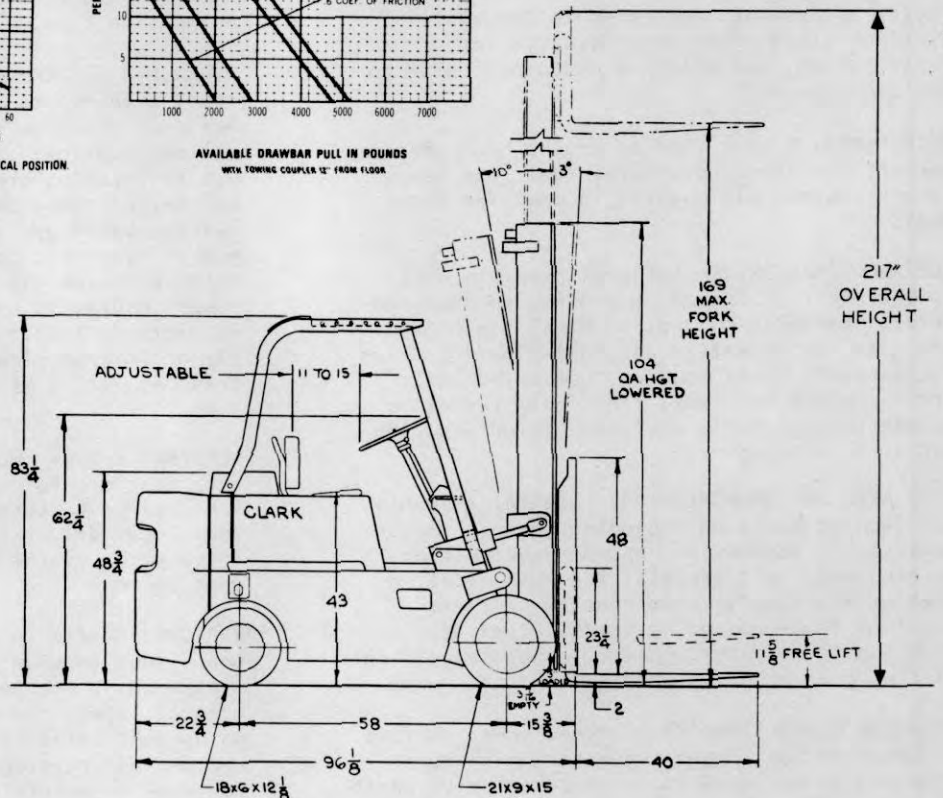


LOAD CENTER IN INCHES FROM FRONT FACE OF FORKS
RATED CAPACITIES SHOWN ABOVE ARE COMPUTED WITH UPRIGHTS IN VERTICAL POSITION

GRADE & DRAWBAR PULL CHART



AVAILABLE DRAWBAR PULL IN POUNDS
WITH TOWING COUPLER 12" FROM FLOOR





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D I M E N S I O N A L S P E C I F I C A T I O N S

MODEL: C60 Weight 10,480 Lbs.

WEIGHT DISTRIBUTION AND CAPACITY:

Percent on drive wheels, truck empty: 42%
Rated Capacity.... 6,000 Lbs. at 24" Load Center

ENGINE: Industrial Continental Red Seal, 6 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 submerged gear-type pump. Mechanical governor controls engine speed accurately without choking off power, Updraft carburetor.

Model F-227
Bore 3 5/16"
Stroke 4 3/8"
Displacement, Cu. Inches 226
Crankcase Capacity, quarts 5
Fuel Tank Capacity, gallons 12
Governed RPM with no load 2400
SAE rated horsepower at 2400 RPM 73
Max. SAE rated torque, Lb Foot at 1200 RPM ..176

ENGINE FILTERS: Three Types - (1) Fuel Filter in metallic bowl. (2) One-quart automotive type throw-away Oil Filter. (3) Dry type replaceable cartridge Air Cleaner.

ELECTRICAL SYSTEM: 12-volt, 60-amp-hour battery; 42 amp Alternator 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.

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 gear, 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 carries weight of truck not drive shaft. Final gear reduction is made through fully enclosed pinion and ring gear at drive wheels.

HYDRATORK DRIVE-STANDARD: 2-Speed 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 forward and reverse gears and high and low range gears are in constant mesh. Direction Selector lever for finger-tip control on steering column.

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

BRAKES: (Two system). Hydraulic spot disc brakes provide powerful braking without self-energization. Eliminates sudden "grabbing" of the brakes. Foot brake torque multiplied through final reduction at each drive wheel minimizes pedal effort. Brakes are enclosed within drive axle housing and require no adjustment for life of lining. Mechanical parking brake operates on transmission drive shaft.

STEERING: Power steering is standard. Steering control is maintained through mechanical linkage in the event of power failure. Strong vanadium steel steer axle is mounted on two torsional rubber bushings to cushion shock and to provide articulation for ground level variations up to 6". Position stops for lateral stability. Inclined king pins minimize road shocks. Recirculated ball type steering gear with 18" diameter handwheel. Tie rods are Automotive type.

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 and o-ring seals used throughout pressure system. Vane-type pump is driven by hardened gears. Hydraulic sump, built into frame of 3/8" thick plate has 12.5 gal. capacity. 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.

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"

****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



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D I M E N S I O N A L S P E C I F I C A T I O N S

rollers to prevent binding. Carriage has additional lateral thrust rollers to prevent upright spread, insuring maximum free-rolling movement.

****FORK CARRIAGE AND FORKS:** All-welded construction, 1045 steel fork carriage to withstand impacts. lateral fork adjustments from 0" to 40" with or without optional load rack. Convenient snap action latch assures positive fork positioning. Heat treated and upset forged forks to provide full section strength at heel.

MAINTENANCE: Split swing-out hood offers easy access for servicing. Check-points such as water and 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 and zinc or cadmium plated. Multi-pass muffler. All exposed surfaces are shot-blasted and prime painted with seather resistant paint.

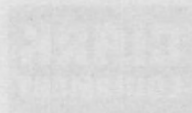
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X
X CLARK DOES NOT RECOMMEND WELDING ON MASTS X
X (UPRIGHTS), FORK CARRIAGE, OR FORKS. HOW- X
X EVER, IF IT BECOMES NECESSARY IN AN EMER- X
X GENCY TO WELD ABOVE ITEMS PROCEDURE MUST X
X BE AS FOLLOWS: X
X
X 1. WELDING MUST BE DONE BY COMPETENT AND X
X TRAINED PERSONNEL. X
X
X 2. MATERIAL MUST BE PREHEATED TO 300° TO X
X 400° BEFORE WELDING. THIS TEMPERATURE MUST X
X BE CHECKED WITH THE USE OF TEMPLE STICKS X
X OF PROPER HEAT RANGE OR SOME OTHER TYPE OF X
X TEMPERATURE CHECK. X
X
X 3. 100% PENETRATION MUST BE ASSURED BY X
X CHAMFERING FRACTURED EDGES. X
X
X 4. WELDED JOINTS MUST BE FREE OF RUST, X
X DIRT, OLD WELD, ETC., AND PROPERLY X
X PREPARED FOR MULTIPLE PASS WELDS. CLAMPS X
X MUST BE USED TO HOLD WORK AND PREVENT X
X DISTORTION. X
X
X 5. LOW HYDROGEN TYPE ROD OF APPROXIMATELY X
X 5/32 DIAMETER NUMBERS E-7015, E-7016, OR X
X E-7018 MUST BE USED. NOTE: LOW HYDROGEN X
X WELDING RODS BEGIN TO LOSE THEIR LOW X
X HYDROGEN QUALITY IN APPROXIMATELY 4 HOURS. X
X FRESH STOCK MUST BE USED TO ASSURE A X
X QUALITY WELDING JOB. X
X
X 6. MULTIPLE PASS WELDS ARE REQUIRED BOTH X
X INSIDE AND OUTSIDE OF THE JOINT AND THEY X
X MUST BE FREE OF CRATERS AND HOLES. X
X
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INDUSTRIAL TRUCK DIVISION



GENERAL INSTRUCTIONS

- X 1. WELDING MUST BE PERFORMED TO SPECIFICATIONS
- X 2. WELDING MUST BE PERFORMED TO SPECIFICATIONS
- X 3. WELDING MUST BE PERFORMED TO SPECIFICATIONS
- X 4. WELDING MUST BE PERFORMED TO SPECIFICATIONS
- X 5. WELDING MUST BE PERFORMED TO SPECIFICATIONS
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- X 48. WELDING MUST BE PERFORMED TO SPECIFICATIONS
- X 49. WELDING MUST BE PERFORMED TO SPECIFICATIONS
- X 50. WELDING MUST BE PERFORMED TO SPECIFICATIONS

Welding must be performed to specifications. The quality of the welds is critical to the safety and reliability of the equipment. All welding must be performed by qualified personnel using proper techniques and safety procedures. The use of proper shielding gas and electrode is essential for achieving the required mechanical properties. All welds must be inspected and tested according to the applicable standards and specifications. The welder must maintain proper posture and safety throughout the welding process. The use of personal protective equipment (PPE) is mandatory. The welding area must be properly ventilated and fire safety measures must be in place. The use of proper electrical safety procedures is also required. The welder must ensure that the equipment is properly grounded and that all electrical connections are secure. The use of proper electrical safety procedures is also required. The welder must ensure that the equipment is properly grounded and that all electrical connections are secure. The use of proper electrical safety procedures is also required. The welder must ensure that the equipment is properly grounded and that all electrical connections are secure.



INDUSTRIAL TRUCK DIVISION



SPECIFICATIONS

Air Cleaner Dry Type

Cooling System Capacity 15 quarts

Fan Belt Deflection (long span)..... 3/4"

Brake Pedal Free Travel..... 3/16 to 5/16 inch

Torque Converter diameter 11 inches
..... Torque multiplication 2 to 1

Transmission Hydratork
Speeds: 2
Capacity: 13 quarts

STEERING AXLE

Toe in 0 degrees
Camber 1 degree
Caster 0 degrees

Left hand turning radius angle:

Left wheel 78 degrees
Right wheel 55° 42'

Right hand turning radius angle:

Left wheel 55° 42'
Right wheel 78 degrees

DRIVE AXLE

Ratio-Bevel Gear 4.375 to 1
Wheel Reduction 4.09 to 1
Axle end (Grease)
Capacity 1 1/4 pounds

HYDRAULIC PUMP

Priority vane type pump delivers 13 GPM @ 1200 Pump RPM or 1460 engine RPM. For auxiliary hydraulic operations there are always available 2 GPM from the Priority outlet of the pump. This must be considered when checking pump output at main outlet port as delivery would be only 11 GPM at above specifications.

HYDRAULIC VALVE

Pressure Relief Valve Setting.....
2000 PSI @ 2250 engine RPM

ELECTRICAL SYSTEM

Starting Rotor

Brush tension (min)..... 35 Oz.
Rotation viewing D.E. C
Spec. No. 2441
No load test:
Volts 10.6
Min. Amps 49*
Max. Amps 76*
Min RPM 6200
Max. RPM 9400
Resistance Test:
Volts 4.3

Min amps 270
Max amps 310

Distributor

Rotation viewing D.E. C
Point Opening (in)..... 0.21
Cam angle (deg) 31-34
Spec. No. 70
Centrifugal advance:
Start
RPM 300
Deg 5-2.5
Intermediate
RPM 400
Deg 3-5
Intermediate
RPM 800
Deg 5.5-7-5
Maximum
RPM 1100
Deg 7.5-9.5

Alternator

Rotation C
Field Current
Amps 2.2-2.6
Volts 12
Cold output
Volts 14
Amps Min. 21
RPM Min. 2000
Amps Max. 30
RPM 5000
Rated Hot Output Amps 42

Voltage Regulator

Circuit A
Polarity N
Spec. No. 4237
Cutout Relay
Air gap (in) 0.20
Point opening 0.20
Closing voltage
..... Range..... 11.8-13.5
Voltage regulator
Air gap (in) 0.75
Volt Setting range
14.2-15.2 at 85 degrees
Current regulator
Air gap (in) 0.75
Current setting range
..... 24.5-29 at 85 degrees

Ignition Timing 2 degrees BTDC

SPARK PLUGS

..... Resistor .035

BATTERY (12 Volt)

20 hr. rate @ 61 amp. hr.
300 amp. @ 1.6 min. @ 0 deg F
300 amp. @ 10 sec. @ 7.7 volts
..... @ 0 DEG F
6 cell, 66 plates
group number SAE 25 MD.



INDUSTRIAL TRUCK DIVISION



SPECIFICATIONS

WHEEL NUT TORQUE

Steering wheels.... 275-300 lb. ft.
 Drive wheels..... 450-500 lb. ft.

* Includes solenoid.

ENGINE LIMITS AND CLEARANCE DATA

No. of Cylinders 6
 Bore & Stroke 3 5/16 X 4 3/8
 Displacement Cu. In. 226
 Compression Ratio 7.28
 Max. Oil Pressure 20-30
 Min. Oil Pressure 7
 Firing Order 1-5-3-6-2-4
 Main Brg. - Front..... 2 3.8 x 1 1/16
 Main Brg. - Int. (2) 2 3/8 X 1 5/16
 Main Brg. - Rear 2 3.8 X 1 23/64
 Conn. Rod Brg:
 Dia. & Length 2 1/16 X 1 1/8
 Oil Capacity
 Crankcase 5
 Filter 1/2
 Total 5 1/2
 Water Capacity (Given in quarts - add
 approximately 1 quart for hoses)
 Engine 6 1/2
 Radiator 10 1/2
 Total 17
 Weight - Bare Engine 555

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. Dia3447
 Distance, Cyl. Block Contact.....
 Face to Guide..... 1 13/32

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 Fit003-.005

Valves, Intake
 Stem Dia.3414/.3406
 Wear Limits, Min. Dia3386
 Seat Angle 30°
 Stem Clearance Limits..... .0026/.0008
 Wear Limits-Max. Clearance..... .0046
 Desired Stem Clearance0015

Valves, Exhaust
 Stem Dia3385/.3357
 Wear Limits - Min, Dia.3357
 Seat Angle 45°
 Stem Clearance-Limits..... .0055/.0037
 Wear Limits, Max. Clearance..... .0075
 Desired Stem Clearance0045

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



INDUSTRIAL TRUCK DIVISION



SPECIFICATIONS

ENGINE LIMITS AND CLEARANCE DATA

Tappets		Ring Groove Width #1 .....	.1290/.1270
O. D. Tappet .....	.9990	Max. Wear Limits .....	.1310
Bore in Block	1.0000	Ring Groove Width-#2-3.....	.1285/.1275
Total Max. Wear Limits .....	.005	Max Wear Limit .....	.1305
Camshaft		Ring Groove Width-#4 .....	.2535/.2520
Brg. Journal Dia. #1	1.8725/1.8715	Max. Wear Limit .....	.2555
#2	1.8095/1.8085	Ring Groove Width-#5	None
#3	1.7465/1.7457	Max. Wear Limit	—
#4	1.2475/1.2465	Piston Fit-Feeler Gauge .....	.003
Wear Limits-Min. Dia. (.001 UNDER MIN.....		Lbs. Pull	5-10#
(NEW SHAFT DIAMETER).....		Piston Rings	
Bushing-Inside Dia. #1	1.8755/1.8745	Ring Width-#1 .....	.124/.123
#2	1.8125/1.8115	Wear Limits-Min. Width .....	.121
#3	1.7502/1.7495	Ring Width-#2 & #3 .....	.124/.123
#4	1.2505/1.2495	Wear Limits-Min. Width .....	.121
Bushing-Clearance Limits .....	.004/.002	Ring Width-#4 .....	.249/.2485
End Play .....	.009/.005	Wear Limits-Min. Width.....	.2465
Connecting Rods		Ring Width-#5	None
Bush. Hose Dia .....	.914/913	Wear Limits-Min Width	—
Brg. Hole Dia.	1.870/2.1865	Ring Gap Clearance-#1.....	.020/.010
Brg. Thickness	16/.0613	Ring Gap Clearance-#2 & 3.....	.020/.010
Wear Limits-Min. Thk. ....	.0608	Ring Gap Clearance-#4 .....	.015/.055
Dia. - Crank Pin	2.0619/2.0627	Ring Gap Clearance-#5	None
Wear Limits-Min. Dia.	2.0609	Ring Side Clearance-#1 .....	.004/.0025
Clearance Limits .....	.0006/.0022	Ring Side Clearance-#2 & 3 .....	.0055/.0035
Desired Clearance .....	.0015	Ring Side Clearance-#4 .....	.005/.003
Wear Limits-Max Clearance .....	.0032	Ring Side Clearance-#5	None
Side Play .....	.010/.006		
Desired Side Play .....	.006		
Main Bearings			
Dia. of Brg. Bore			
in Block	2.5615-2.5622		
Brg. Shell Thickness .....	.09250/.0928		
Wear Limits Min. Thk. ....	.0920		
Dia. of Main Brg. Jr.	2.3744/2.3752		
Wear Limits-Min. Dia	2.3734		
Clearance Limits.....	.0007/.0028		
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 Ra ii 1/8" + or - 1/64" R on			
rear main.			
Piston Pin			
Length	2.868/2.878		
Diameter .....	.8593/.8591		
Wear Limits-Min Dia .....	.8588		
Desired Fit.....	Light Push		
Bush. Hole Dia. - Fin .....	.8597/.8595		
Wear Limits-Max. Dia .....	.8 07		
Pin Cl. in Bushing .....	.0006/.0002		
Desired Pin Fit .....	.0004		
Pistons			
Cylinder Dia.	3.3145/3.3125		
Wear Limits-Cyl. Bore .....	.008		
Piston Pin Hole Dia. ....	.8595/.8595		



INDUSTRIAL TRUCK DIVISION



SPECIFICATIONS

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.

INDUSTRIAL TRUCK DIVISION



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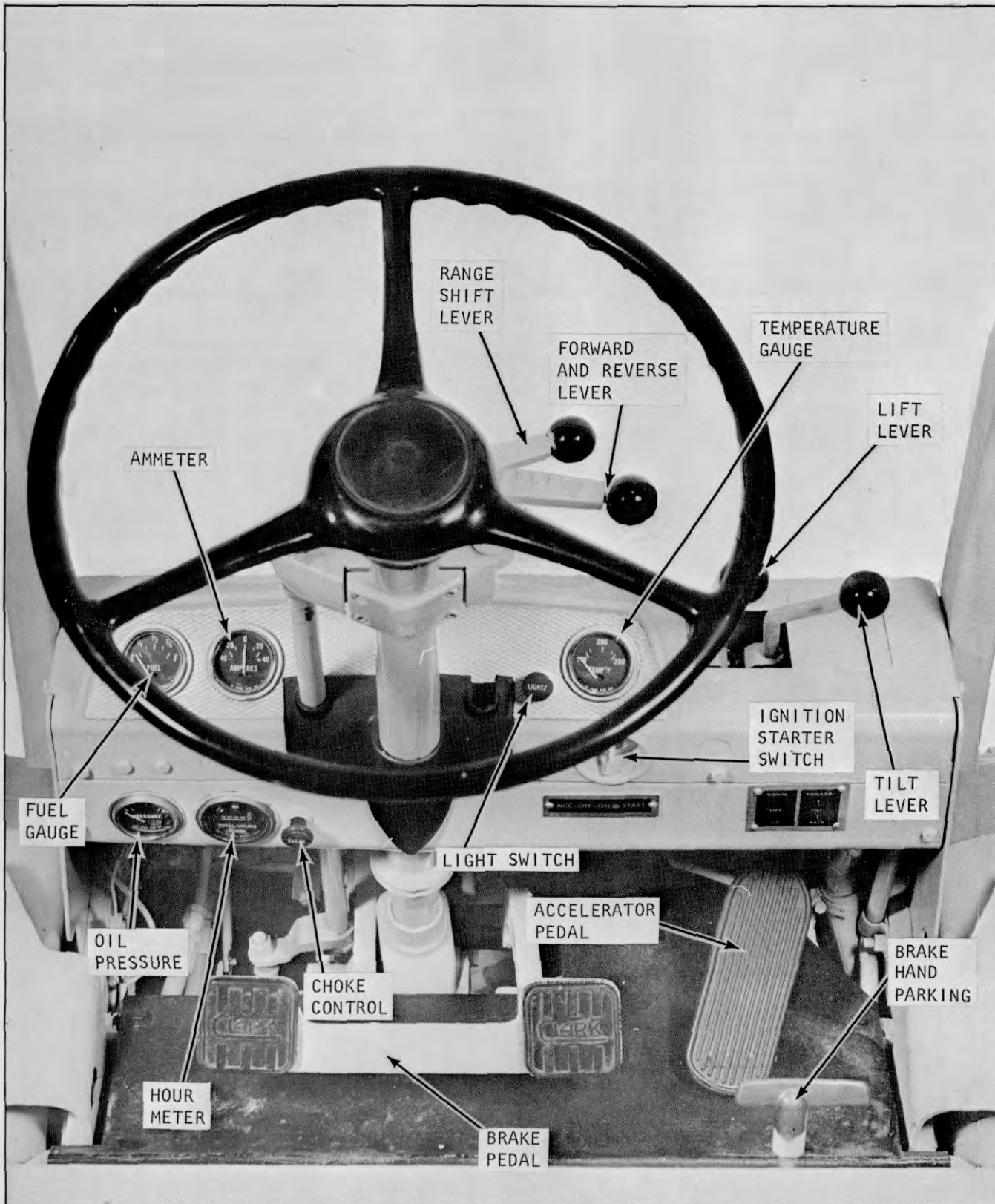


Plate 9478. Overall Controls

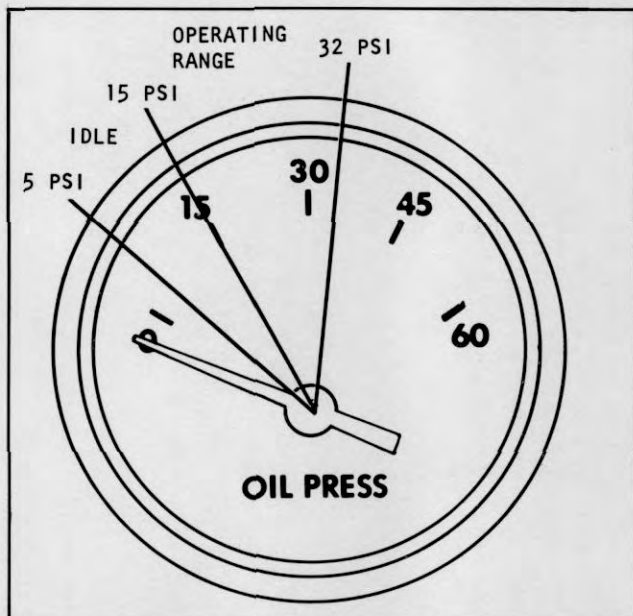


Plate 9615. Oil Pressure Indicator

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 conditions.

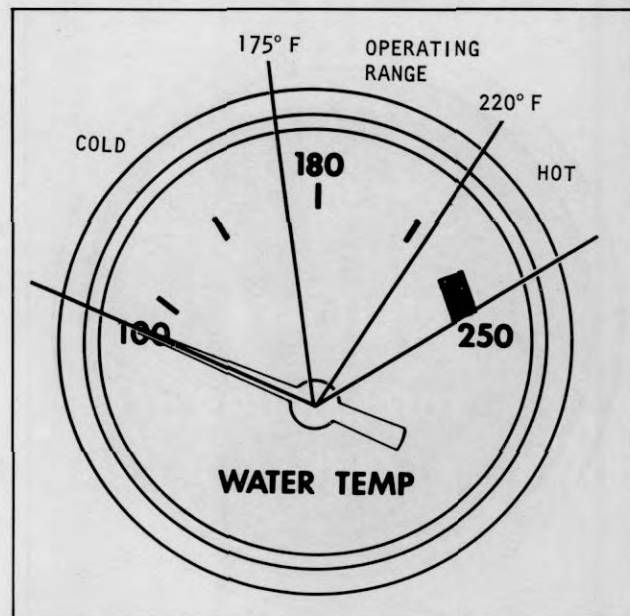


Plate 9614. Engine Coolant Temperature Indicator

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.

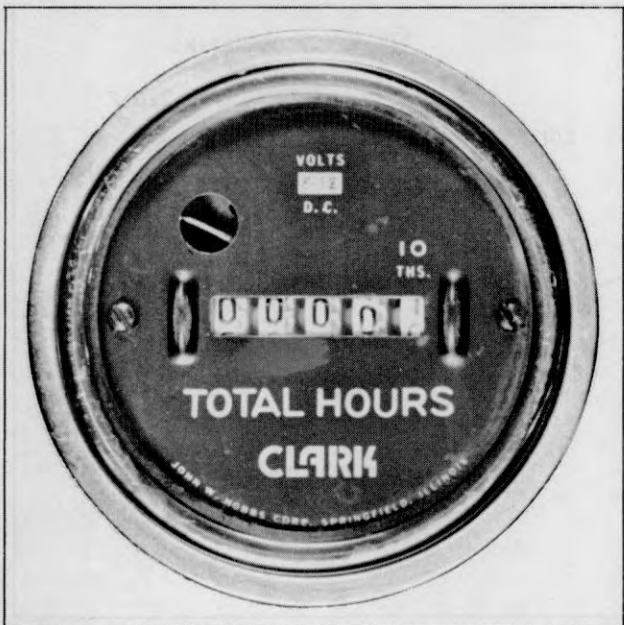


Plate 7162. Hour Meter

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.

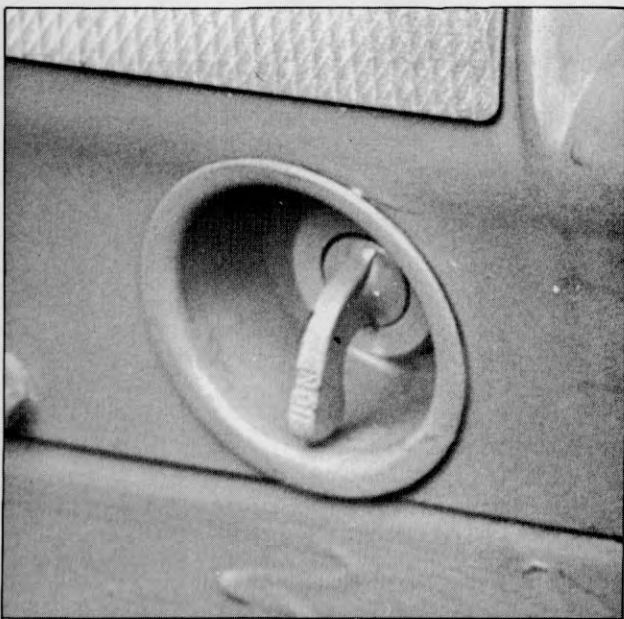


Plate 7018. Ignition Switch





INDUSTRIAL TRUCK DIVISION



OPERATIONS

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. Move Hi and Lo range lever for desired speed.
3. Now move forward and reverse lever out of neutral and into position for desired direction. Accelerate as required.
4. 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 brake become applied and all pressure by-passes the selector discs.

CAUTION

TO PROLONG MACHINE LIFE IT IS BEST 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.



INDUSTRIAL TRUCK DIVISION



OPERATIONS

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 backward 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 PORTION 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 path 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

(8 Hours)

	Time Interval & Number (H=Hours)	Page Number (0000)
Air cleaner check.....	8H.....	403
Brake Pedal free travel & parking brake check.....	8H.....	303
Engine crankcase check.....	8H.....	002
Engine cooling system check....	8H.....	103
Hydraulic sump and control levers check.....	8H.....	503
Instrument indicators check....	8H.....	203
Instrument indicators check....	8H.....	204
Power steering pump.....	8H.....	703
Tire and rim maintenance.....	8H.....	602
Tire and rim maintenance.....	8H.....	603

(100 Hours)

Brake pedal free travel check.....	100H.....	302
Brake system check.....	100H.....	303
Battery check.....	100H.....	603
Cooling system check.....	100H.....	103
Converter, Transmission and Axle Adapter.....	100H.....	001
Engine crankcase and oil filter check.....	100H.....	002
Fan and generator drive belt check.....	100H.....	203
Hydraulic sump tank breather...	100H.....	503
Lifting mechanisms check.....	100H.....	403
Lubrication chart.....	100H.....	703
Steering Gear Check.....	100H.....	603

(500 Hours)

Axle adapter and transmission drain plugs.....	500H.....	004
Fuel pump filter check.....	500H.....	001
Hydraulic sump tank and filter check.....	500H.....	103
Manifolds check.....	500H.....	403
Steering gear adjust.....	500H.....	202
Steering gear adjust.....	500H.....	203
Steering axle and linkage adjustments.....	500H.....	302
Steering axle and linkage adjustments.....	500H.....	303
Transmission oil filter, screen, and level check.....	500H.....	002

(1000H)

Axle ends lubrication.....	1000H.....	805
Brake bleeding procedure.....	1000H.....	912
Brake bleeding procedure.....	1000H.....	913
Brake service.....	1000H.....	1003
Battery check.....	1000H.....	1705
Cylinder head, manifolds, crankcase, and valves adjust, ..	1000H.....	002
Compression test.....	1000H.....	103
Cooling system inspect and clean.....	1000H.....	1202
Distributor adjustments.....	1000H.....	203

(1000 Hours)

	Time Interval & Number (H=Hours)	Page Number (0000)
Distributor adjustments.....	1000H.....	203
Distributor adjustments and timing.....	1000H.....	303
Engine Tune-up.....	1000H.....	001
Governor adjustment.....	1000H.....	503
Governor adjustment.....	1000H.....	504
Generator adjustment.....	1000H.....	703
Generator adjustment.....	1000H.....	704
Hand brake adjustment.....	1000H.....	1103
Hydraulic system check.....	1000H.....	1503
Hydraulic system check.....	1000H.....	1504
Hydraulic system check.....	1000H.....	1505
Hydraulic system check.....	1000H.....	1507
Lift and upright adjustments...	1000H.....	1803
Lift carriage roller adjust....	1000H.....	1811
Neutral starting switch.....	1000H.....	1793
Roller adjustments.....	1000H.....	1806
Starting motor.....	1000H.....	603
Starting motor.....	1000H.....	604
Steer wheel bearings Lubrication.....	1000H.....	803
Timing.....	1000H.....	304
Transmission stall and pressure chekcs.....	1000H.....	1703
Transmission stall and pressure checks.....	1000H.....	1705
Upright roller adjustments....	1000H.....	1807
Upright roller lubrication....	1000H.....	1815
Valve adjustments.....	1000H.....	002
Vacuum test.....	1000H.....	403

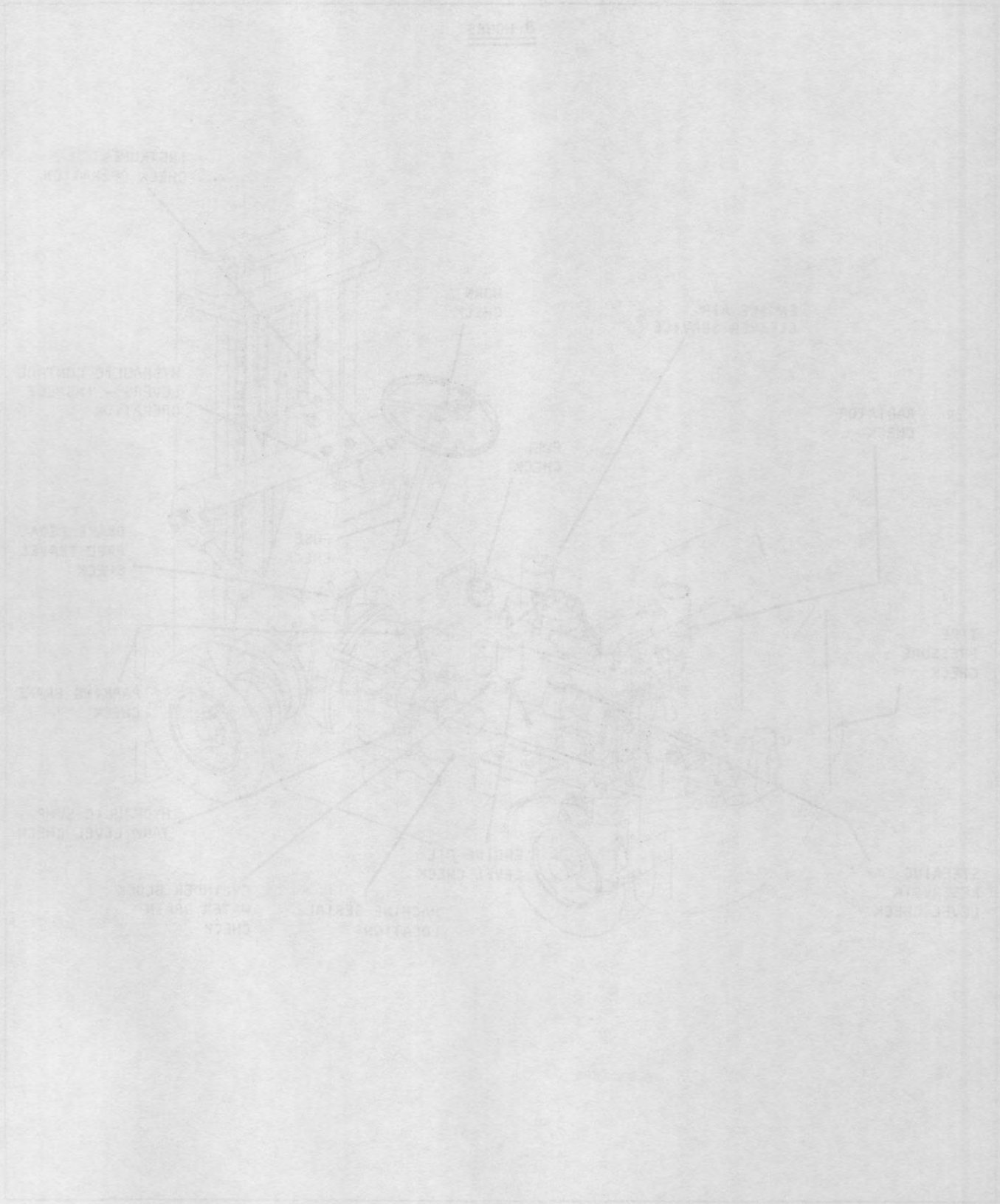
NOTE

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

INDUSTRIAL TRUCK DIVISION

INSPECTION AND PREVENTIVE MAINTENANCE

FIGURE 5



Page 500 - Publication on preventive maintenance inspection

8 HOURS

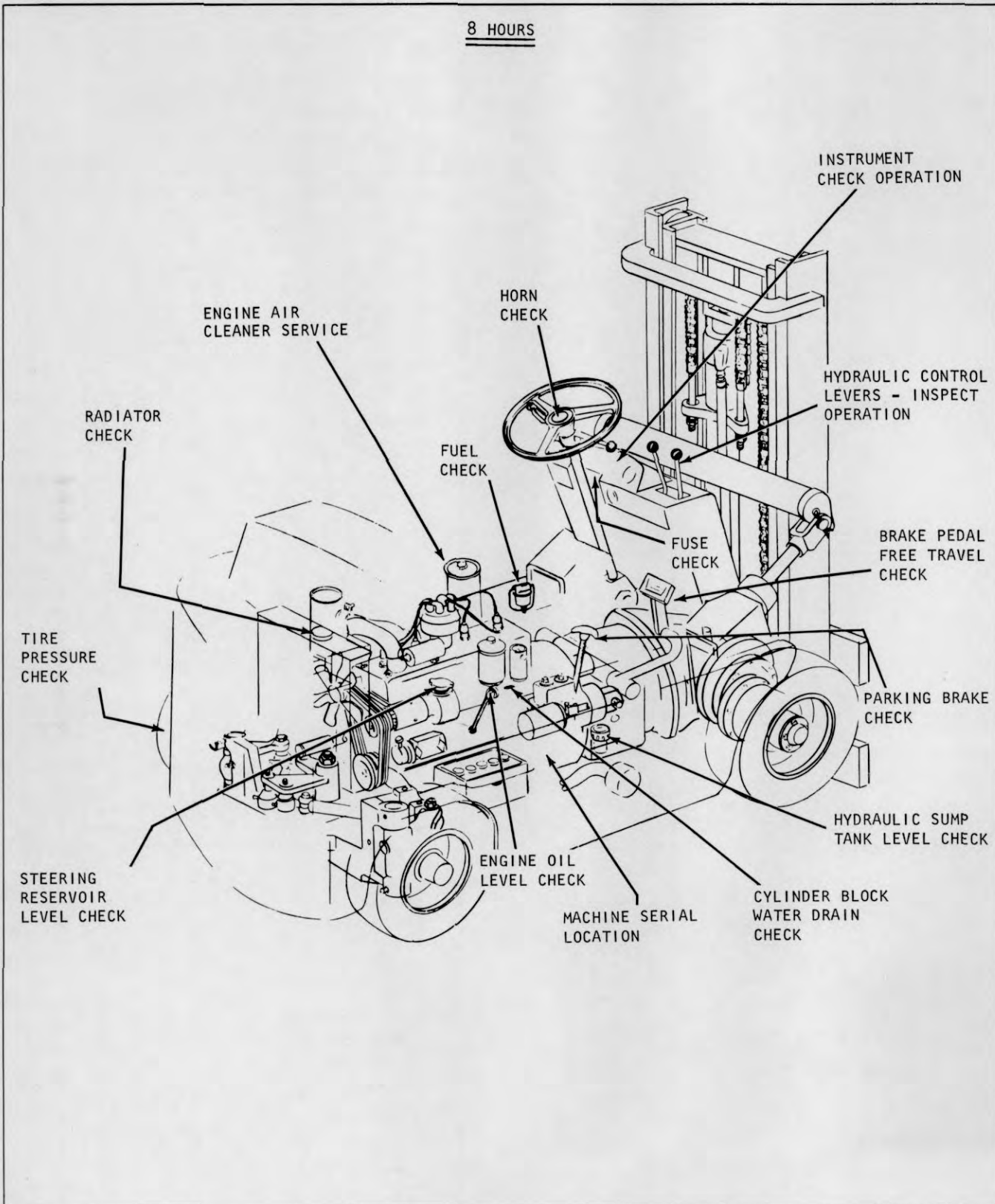


Plate 9480. Lubrication & Preventive Maintenance Illustration

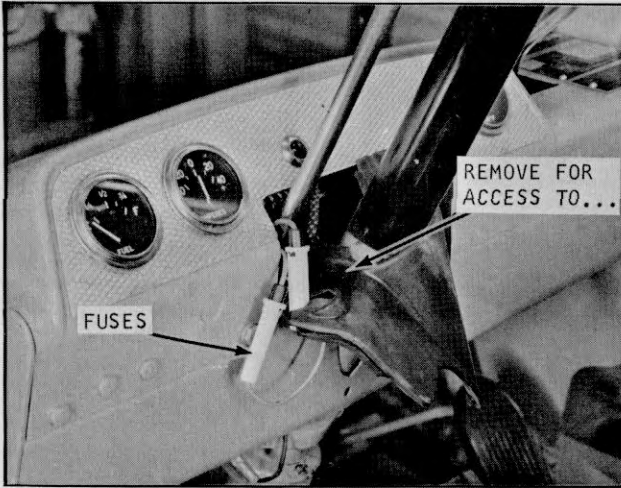


Plate 9473. Electrical System Fuse

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 supply and fill if necessary. Use a good grade of fuel.

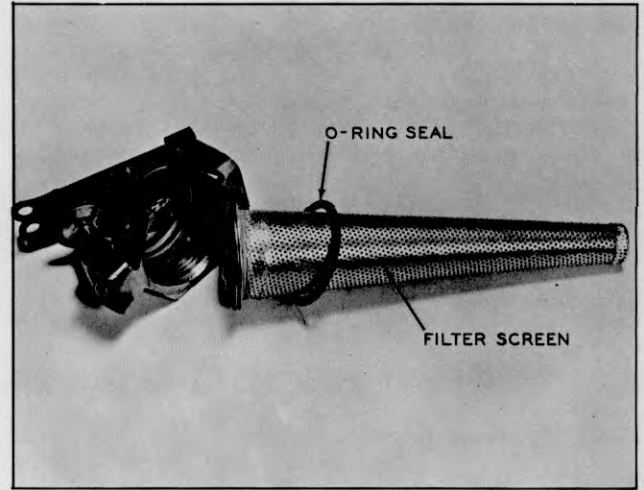


Plate 6627. Fuel Tank Filler Cap & Screen

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.

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X           W A R N I N G                               X
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X   CARE SHALL BE TAKEN NOT TO DAMAGE FILLER          X
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X   CAP SCREEN WITH FILLER HOSE NOZZLE WHILE          X
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X   FILLING FUEL TANK                                   X
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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 ENOUGH 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.

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

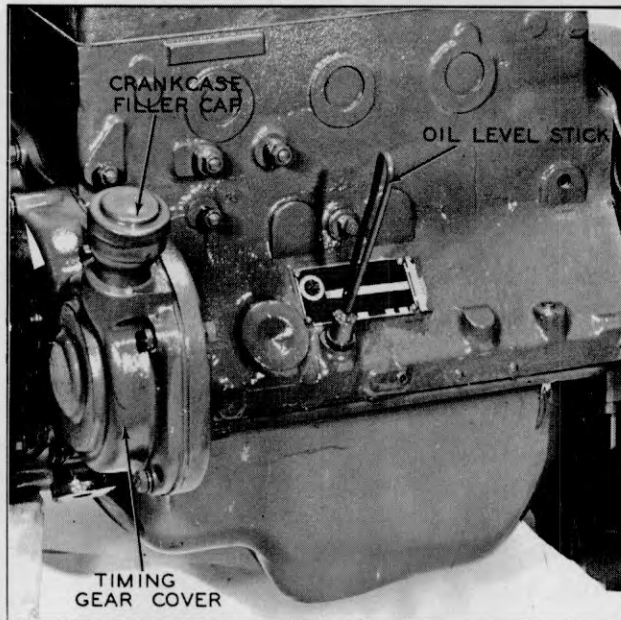


Plate 6629. Engine Crankcase Fill

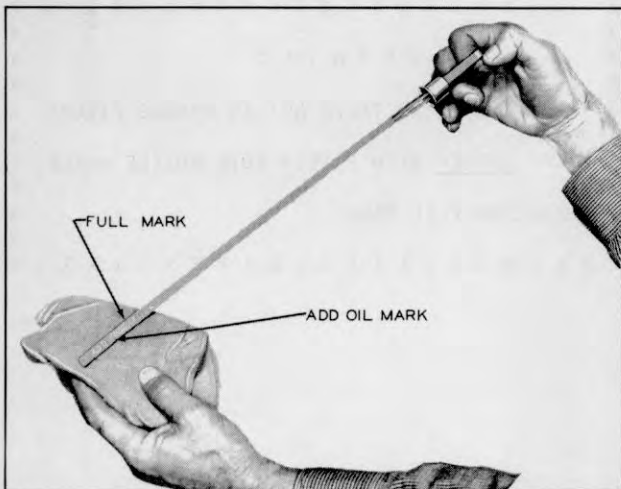


Plate 3145. Crankcase Oil Check

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.

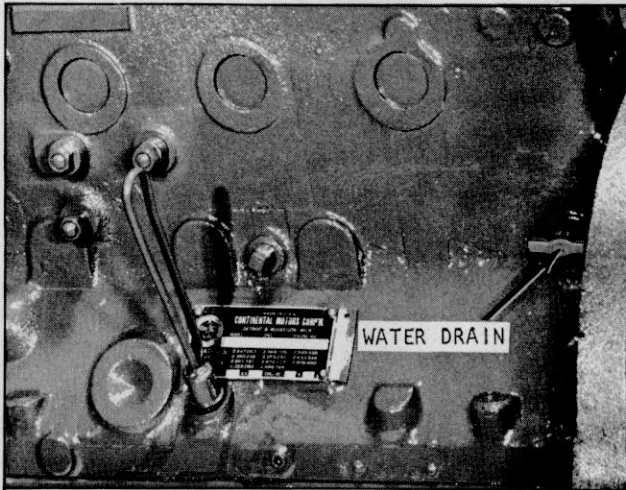


Plate 7008. Typical Cylinder Block Water Drain

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 ENGINE 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.

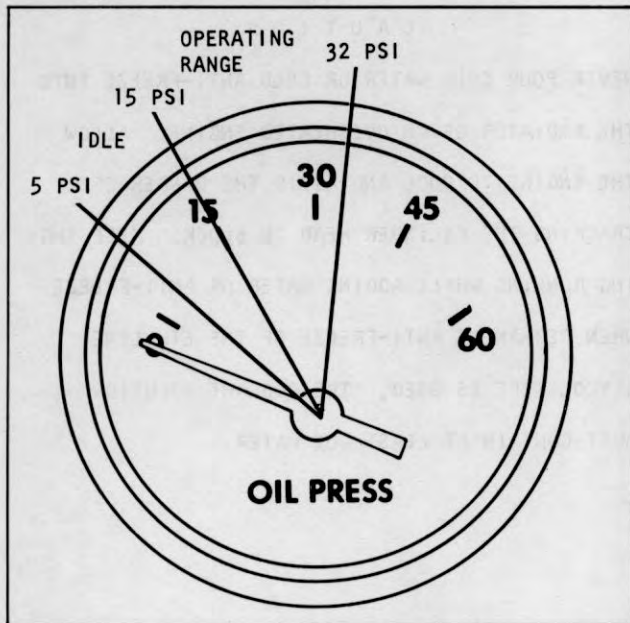


Plate 9615. Oil Pressure Indicator

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 conditions.

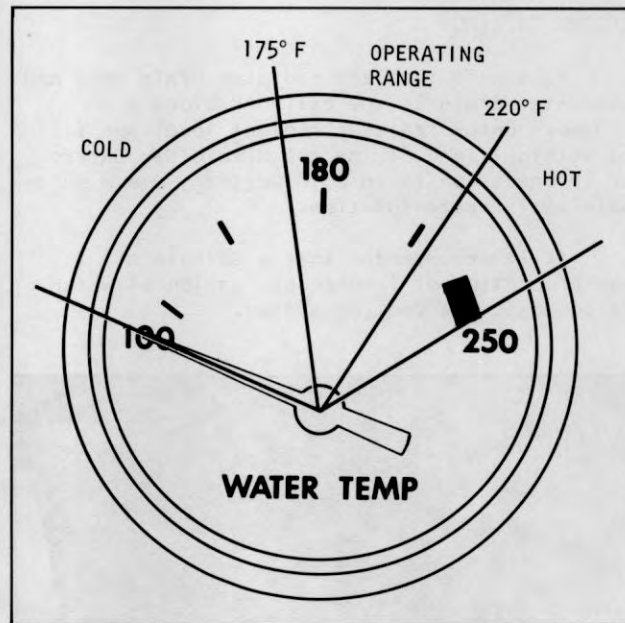


Plate 9614. Engine Coolant Temperature Indicator

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.

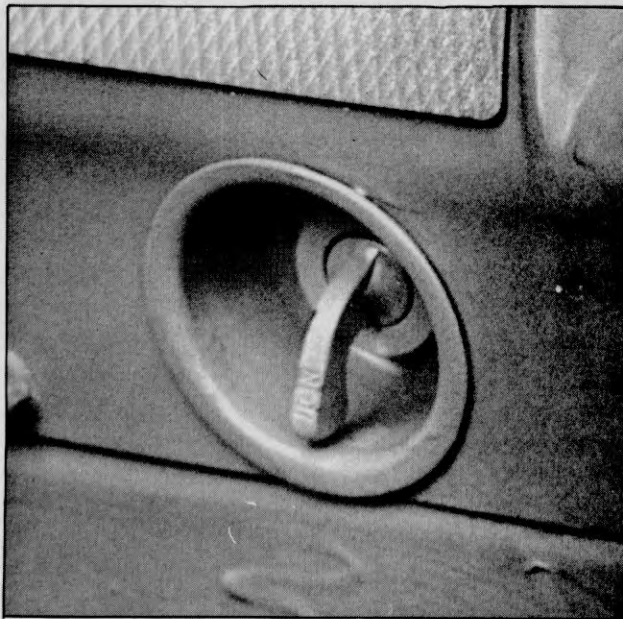


Plate 7018. Ignition Switch

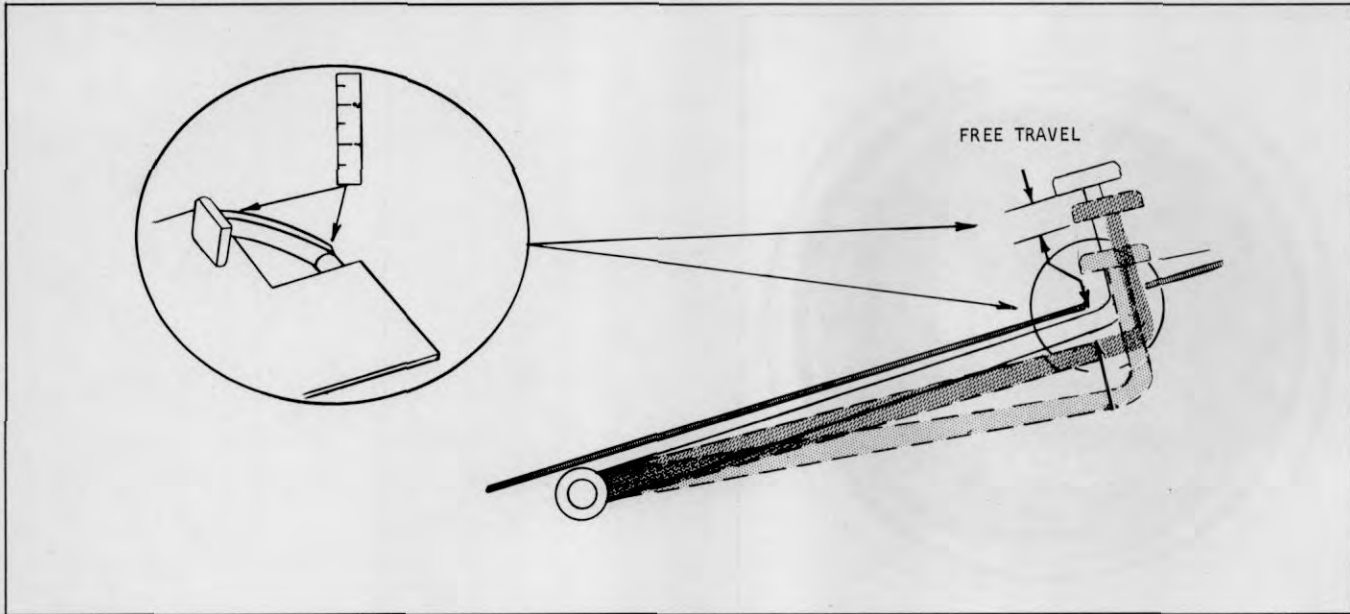


Plate 9592. Brake Pedal Free Travel

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

PARKING BRAKE

The parking brake linkage should be adjusted so that the brake handle will have 2 inches of upward free travel, before resistance is noticed and the brake becomes applied.

The parking brake must be capable of holding the truck, with full rated load, on a 15% grade. This should be tested while occupying the driver's seat with the parking brake applied and truck out of gear.

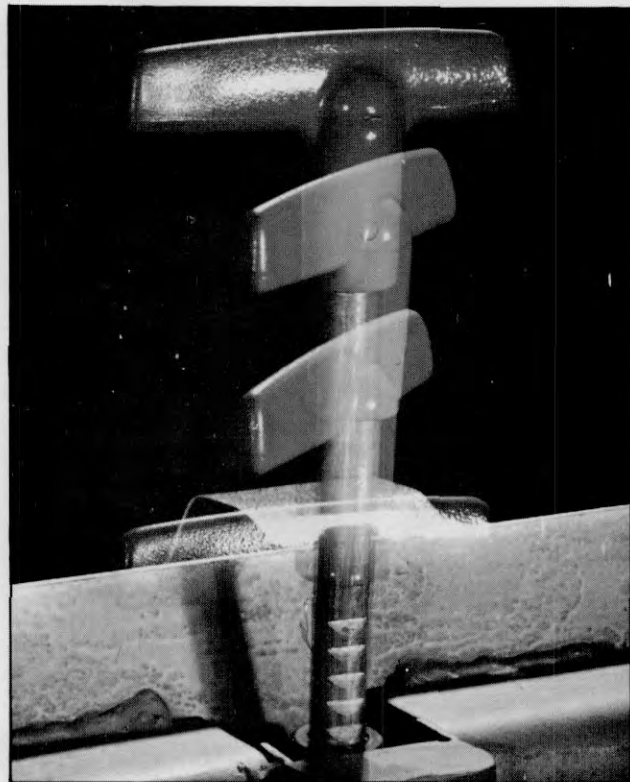


Plate 7482. Parking Brake

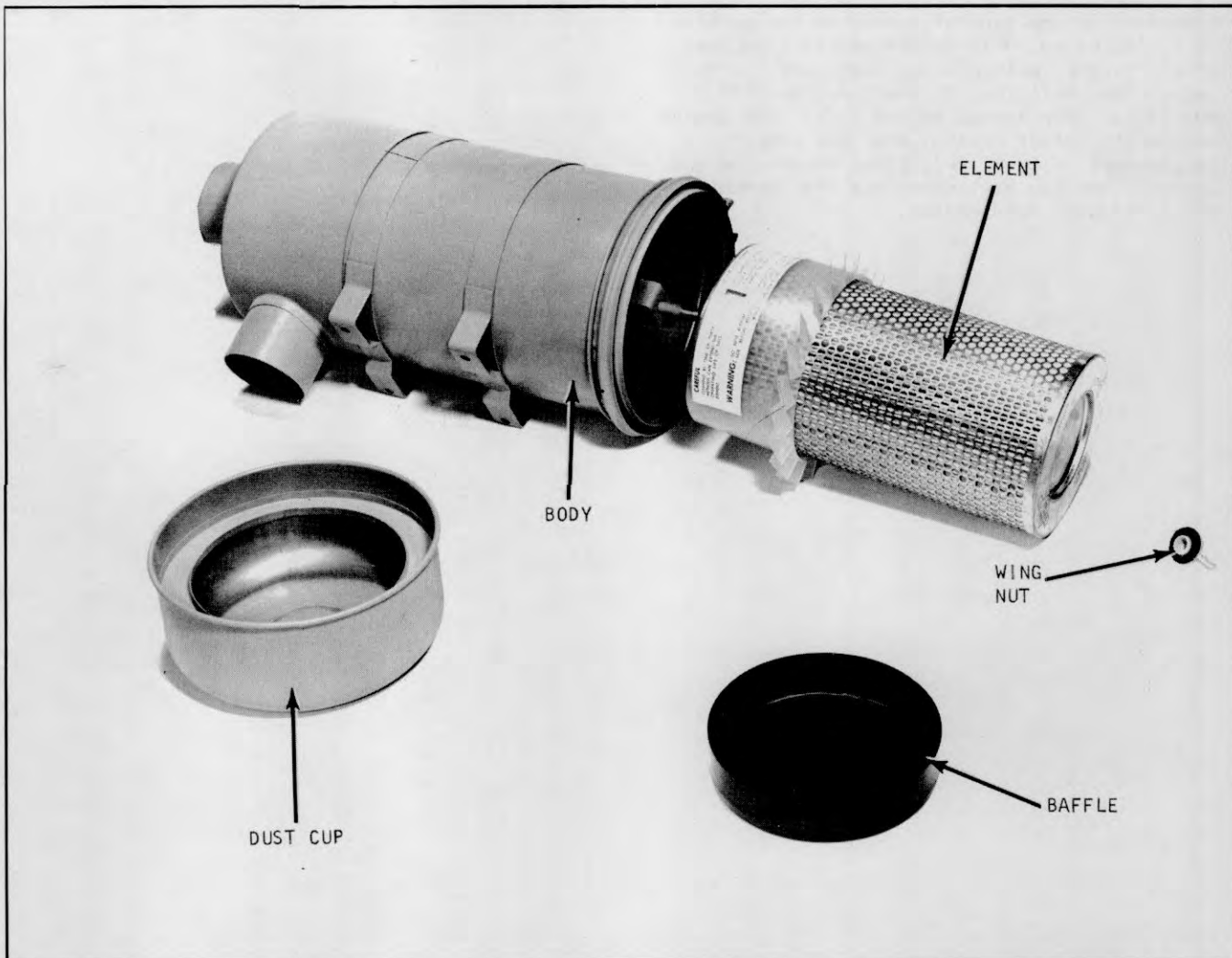


Plate 9154. Air Filter Assembly

ENGINE AIR CLEANER (DRY TYPE)

Proper servicing means cleaning unit thoroughly and maintaining air-tight connections between the air cleaner and intake manifold so that all air entering the engine is filtered.

1. Turn off wing nut, remove dust cup, pull out rubber seal and empty contents of dust, dirt, etc. (When replacing dust cup, position slot up.)
2. Remove air cleaner element and tap on a hard flat surface until all loose dirt is removed.

N O T E

If filter cartridge cannot be properly cleaned, replacement is necessary.

3. Check hose connections to be sure they are tight thus preventing any air and dirt from entering at these points. periodically remove air cleaner and check interior for any signs of dirt or dust. If found, this indicates that more frequent cleaning intervals are necessary as the interior should be free of all dirt and dust.
4. Check gasket for damages, replace if necessary.
5. Reassemble in reverse order.



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

Depending on the type of operation the machine is subjected to, will determine the frequency of air cleaner maintenance. Haphazard maintenance will lead to short engine life, but it can mean longer engine life, less engine upkeep and better economy provided proper maintenance is exercised. Close observance and common sense can best determine the frequency of air cleaner maintenance.

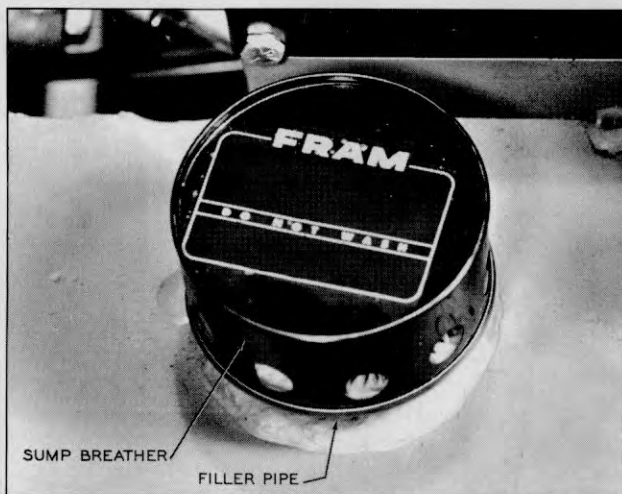


Plate 6626. Hydraulic Sump Tank and Sump Breather

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 required 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.

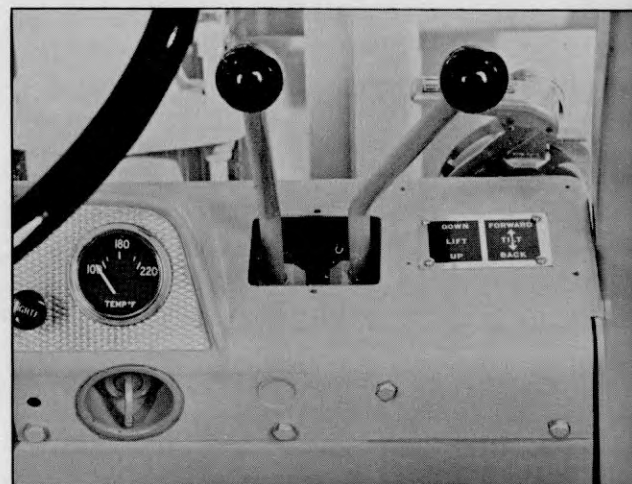


Plate 9535. Lift and Tilt Lever

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.

LUBRICATE MACHINE

100 HOURS

LIFT CHAINS

VISUALLY INSPECT AND LUBRICATE
USE CHAIN LUBE CLARK NUMBER
886399. CAUTION: WHEN OPERATING
IN ABRASIVE ATMOSPHERE KEEP
LIFT CHAINS FREE OF OIL. CHECK
LIFT CHAIN ADJUSTMENTS.

BRAKE PEDAL
FREE TRAVEL
CHECK - ADJUST

LIFT CYLINDER
INSPECT FOR
LEAKS

STEERING GEAR
CHECK LUBRICANT
LEVEL

HYDRAULIC VALVE
AND LINES INSPECT
FOR LEAKS

ENGINE CRANKCASE
VENT PIPE - INSPECT
CLEAN

TILT CYLINDERS
INSPECT FOR LEAKS
AND MOUNTINGS

FUEL TANK AND
LINES - INSPECT
FOR LEAKS AND
HOSE CONDITION

LIFT CARRIAGE
LUBRICATE AND
INSPECT FOR
DAMAGE

ENGINE OIL
FILTER CHANGE

COOLING SYSTEM
INSPECT FOR
LEAKS

TRANSMISSION
AXLE ADAPTER
LEVEL CHECK

WATER PUMP
INSPECT FOR
LEAKS AND
OPERATION

FAN AND GENERATOR
DRIVE BELTS
INSPECT - ADJUST

BRAKE SYSTEM
CHECK

HYDRAULIC SUMP TANK
BREATHER - SERVICE

ENGINE CRANKCASE
DRAIN AND REFILL

MACHINE SERIAL
LOCATION

BATTERY - INSPECT
FOR WATER LEVEL

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.

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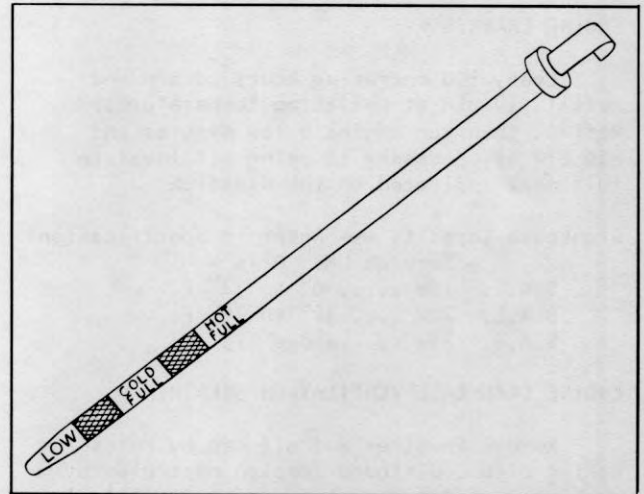


Plate 7303. Transmission Dipstick

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.

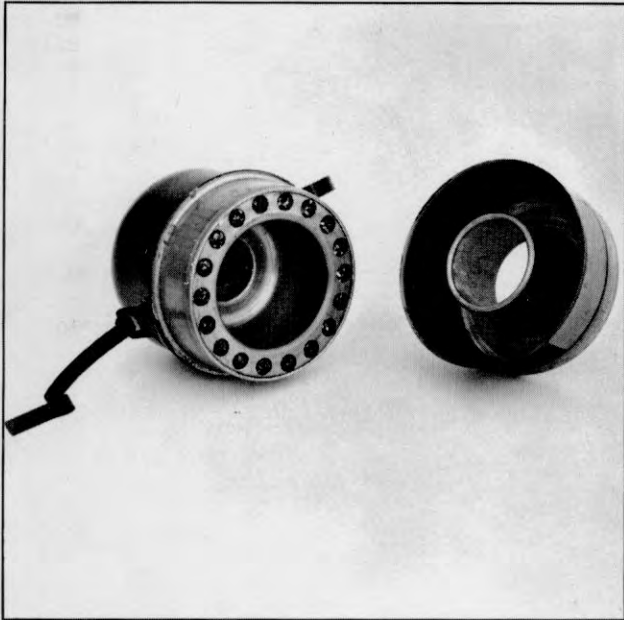


Plate 7033. Engine Breather

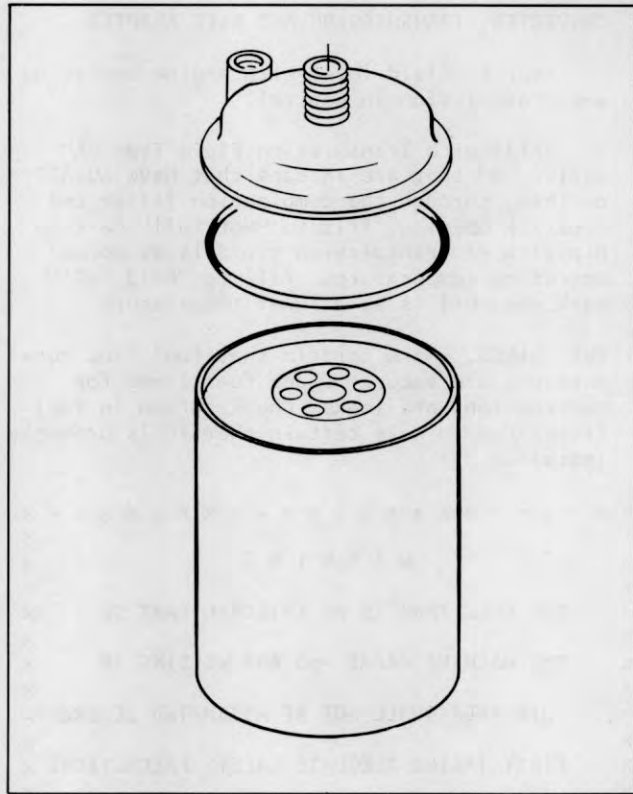


Plate 10444. Engine Oil Filter

C A U T I O N

DO NOT OVER TIGHTEN FILTER. STAET ENGINE, RUN AT IDLE FOR A FEW MINUTES, CHECK COVER AND COVER SCREW FOR LEAKS.

The oil filter is of the spin-on throw-away automotive type and should be replaced each time the engine oil is changed.

N O T E

Tighten filter until filter seal contacts filter cover. Then turn filter with hands 1/2 to 3/4 of a turn. Never use tools to tighten.



Plste 6458. Radiator Pressure Cap

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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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.

NOTE

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.

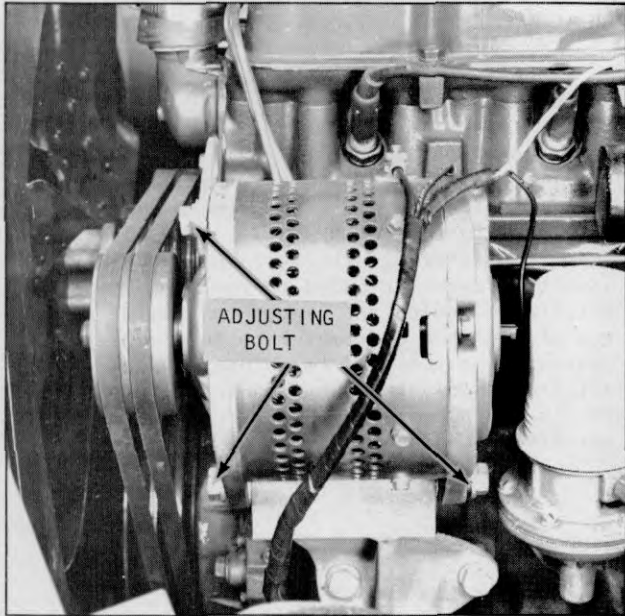


Plate 9160. Alternator Drive Belt Adjustment
FAN AND ALTERNATOR DRIVE BELTS

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 alternator brace adjusting bolt and lower mounting bolt. See Plate 9160.
2. Move alternator toward cylinder block to tighten alternator 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

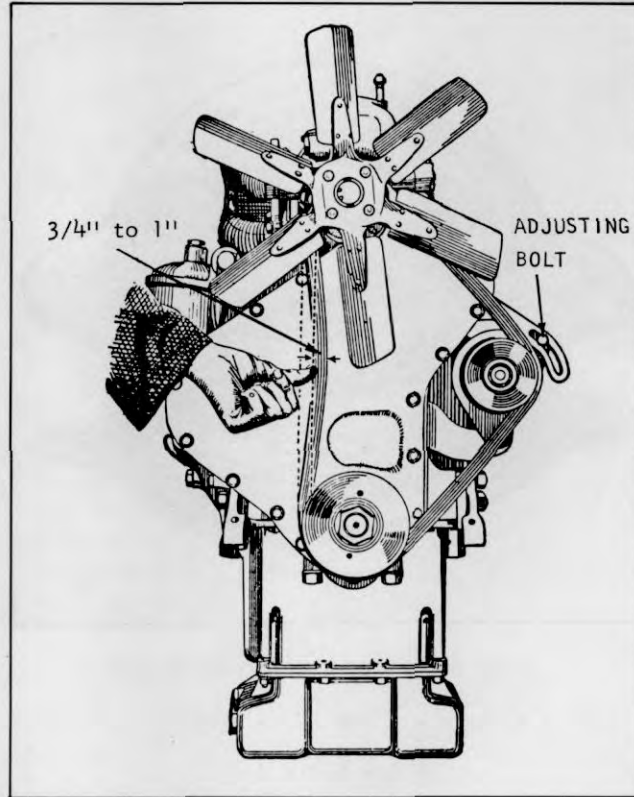


Plate 6632. Belt Deflection Check

TOO LOOSE WILL RESULT IN BELT WEAR AND HIGH ENGINE TEMPERATURE DUE TO BELT SLIPPAGE.

N O T E

REPLACEMENT OF DRIVE BELTS MUST BE MADE IN MATCHED PAIRS.

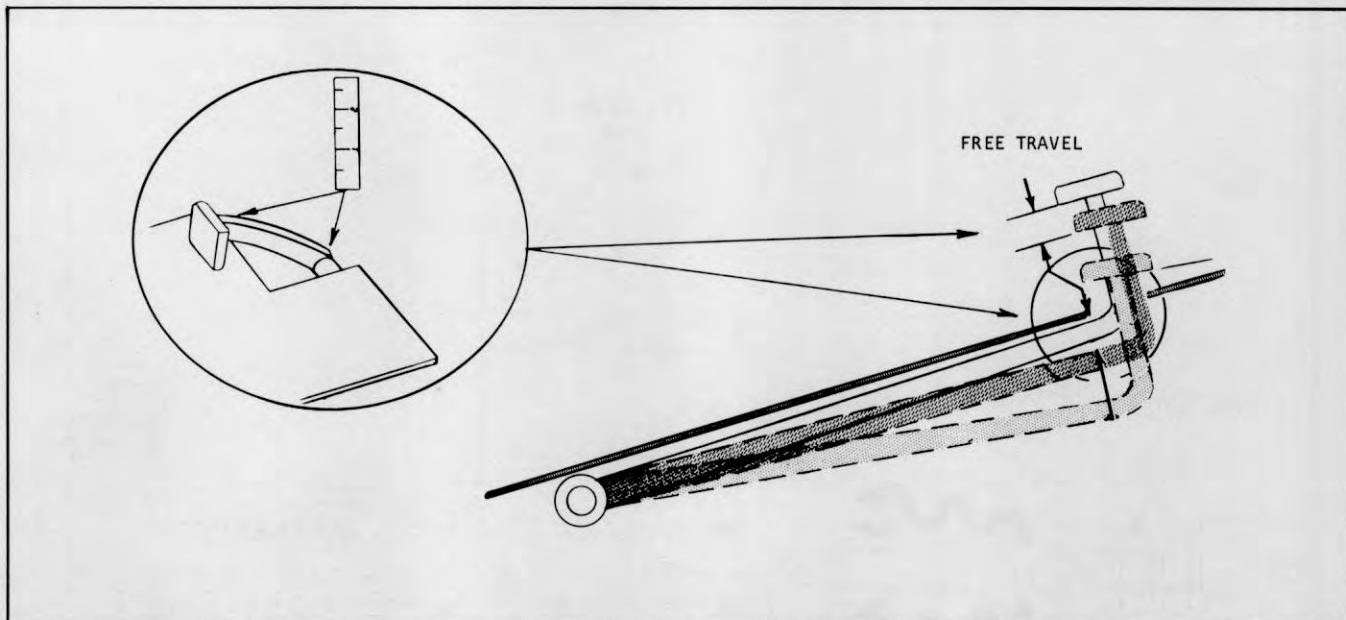


Plate 9592. Brake Pedal Free Travel

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.

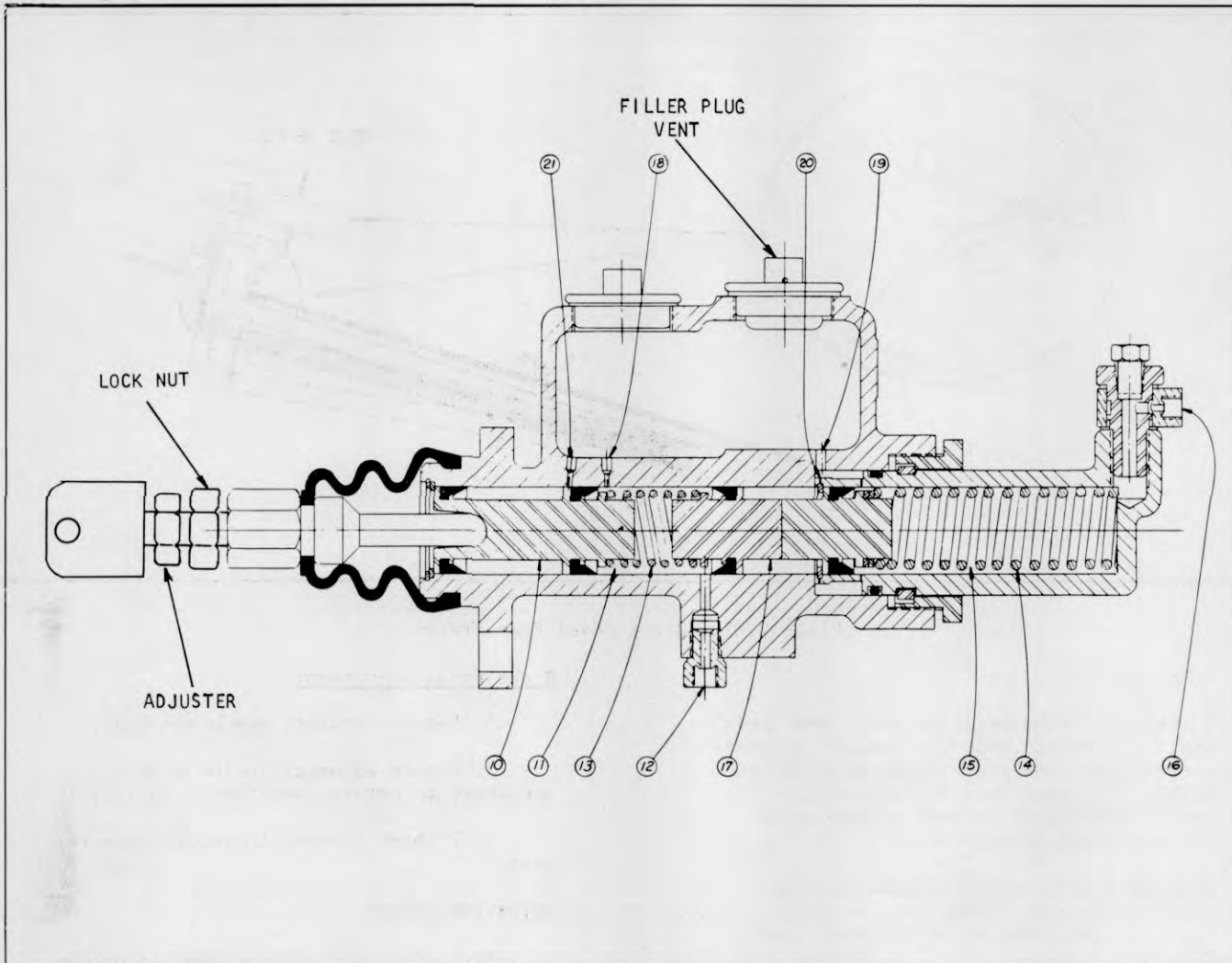


Plate 6987. Master Cylinder

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 greater 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).

LUBRICATION AND PREVENTIVE MAINTENANCE

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 place a capacity load on forks (or device if used) and adjust chains so center line of lower carriage roller is at least 1/2" above the bottom end of the innerslide channel. It is important that the chain adjustment be made with a capacity load. In this manner you will allow for chain stretch.

WARNING

KEEP CLEAR OF LOAD DURING ADJUSTMENT TO AVOID INJURY IF ANY MALFUNCTION SHOULD OCCUR AND CAUSE LOAD TO FALL.

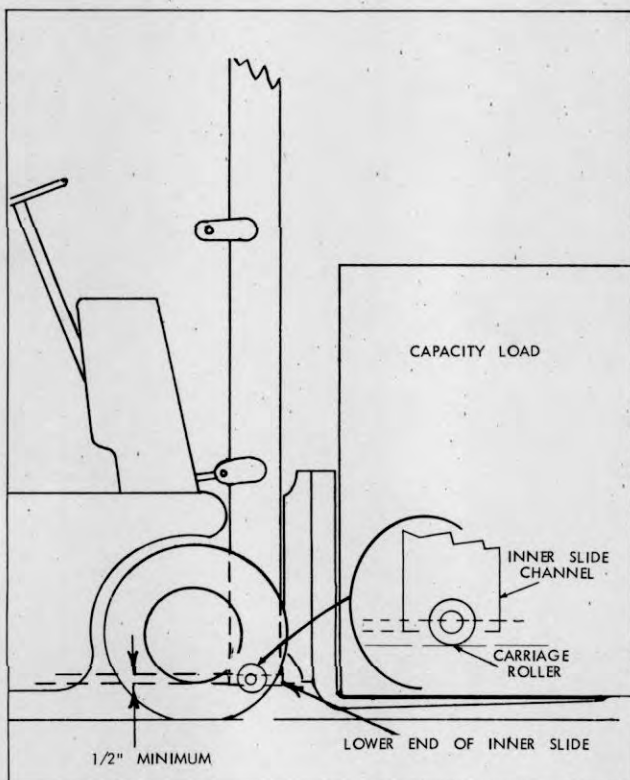


Plate 6884. Lift Chain Adjustment
(Place Maximum Load On Forks)

LUBRICATE MACHINE

CAUTION

WHEN LUBRICATING THE TRUCK, MAKE A VISUAL INSPECTION OF ALL HYDRAULIC LINES, FITTINGS AND ALL ELECTRICAL WIRING. LUBRICATE ALL MISCELLANEOUS LINKAGE WITH S.A.E. NUMBER 20 OIL.

HYDRAULIC CONTROL VALVE AND LINES

Inspect for damage, leakage and security of mounting.

LIFT BRACKET

Inspect for damage, bent forks etc.

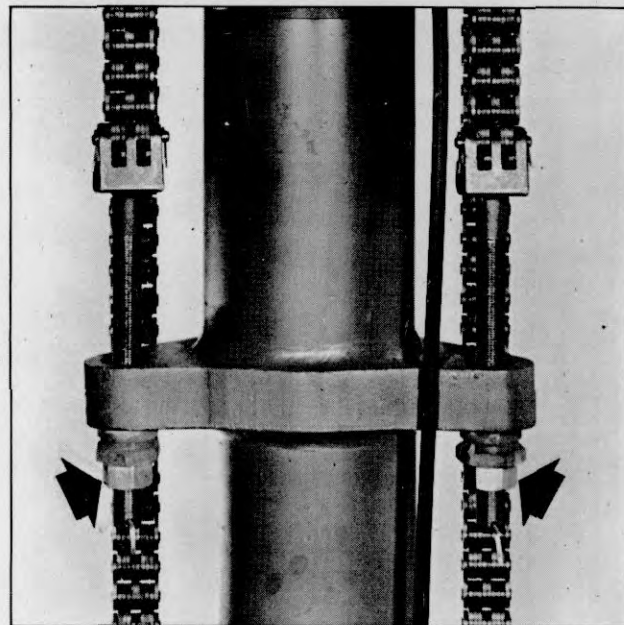


Plate 6634. Lift Chain Adjustment
(Chain Anchor Rods)

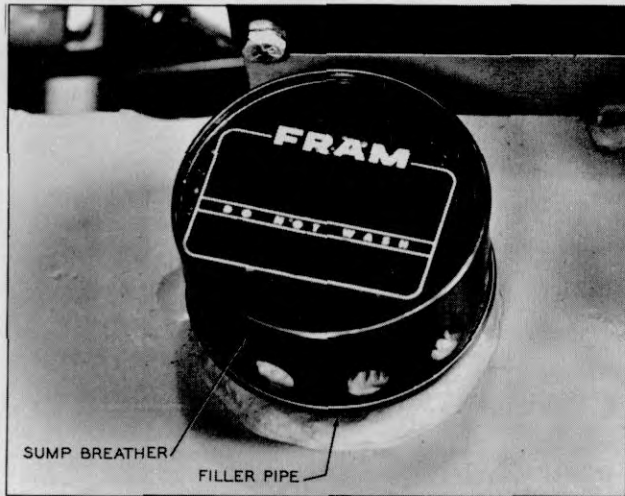


Plate 6626. Hydraulic Sump Tank

HYDRAULIC SUMP TANK BREATHER

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

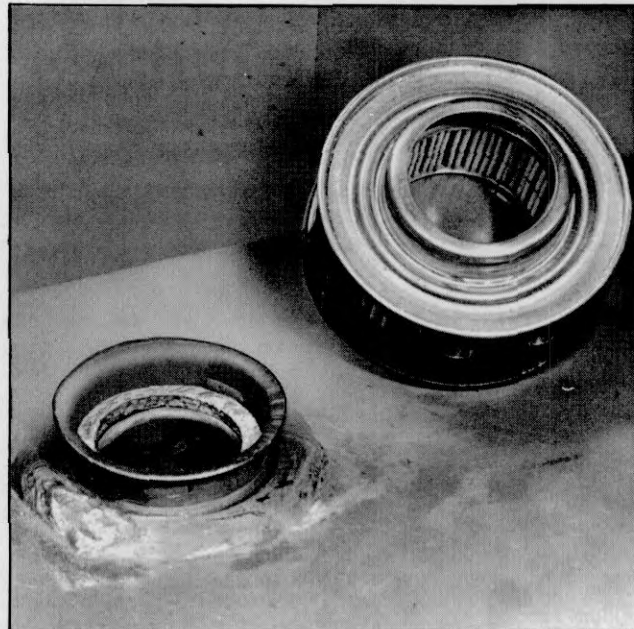


Plate 6682. Hydraulic Sump Tank & Sump Breather

STEERING GEAR

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

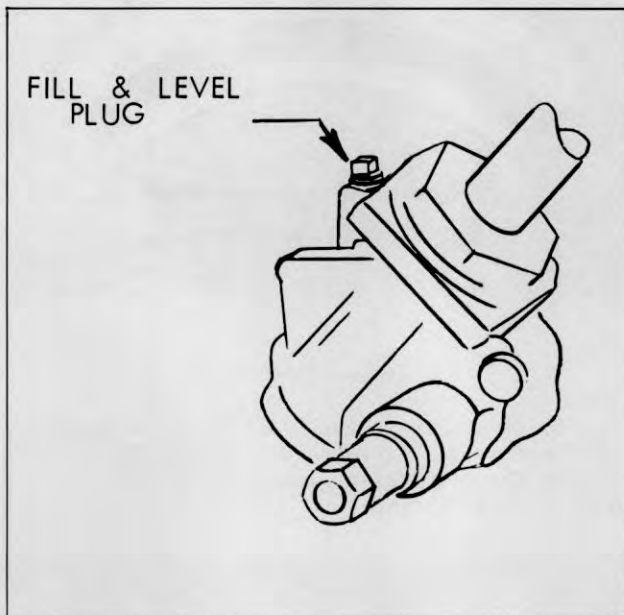


Plate 6429. Steering Gear

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
W A R N I N G	x
x	x
NEVER ALLOW FLAME OR SPARKS NEAR THE	x
x	x
BATTERY FILLER HOLES BECAUSE EXPLOSIVE	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

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.

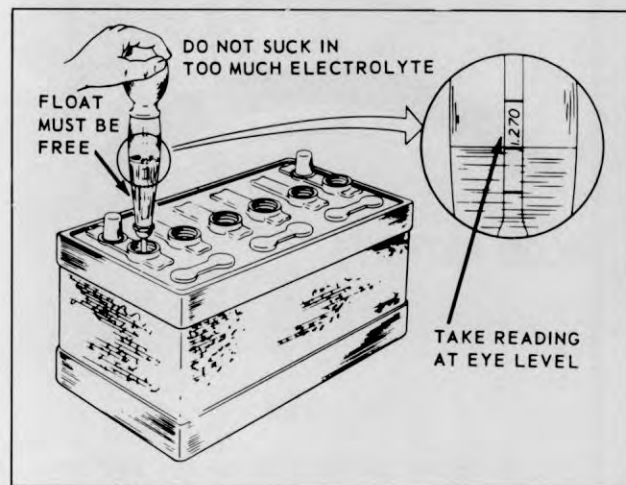


Plate 6271. Checking Specific Gravity of Battery

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.

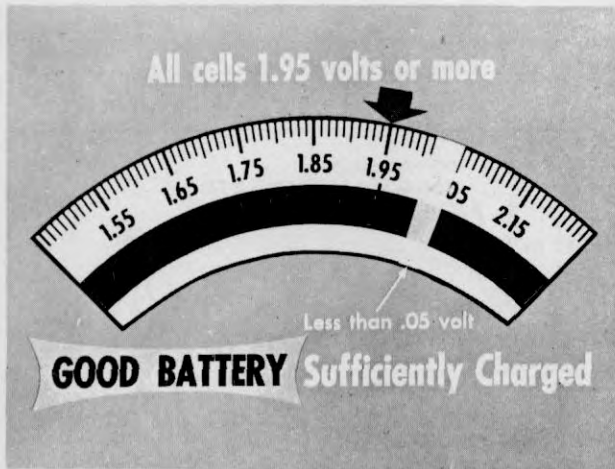


Plate 8306.

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 highest and lowest cell.

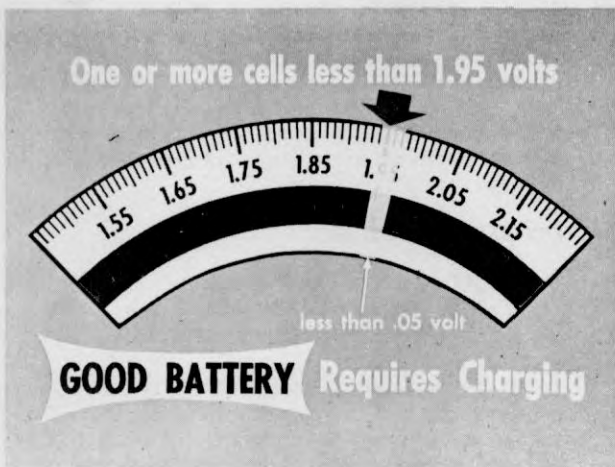


Plate 8307.

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.

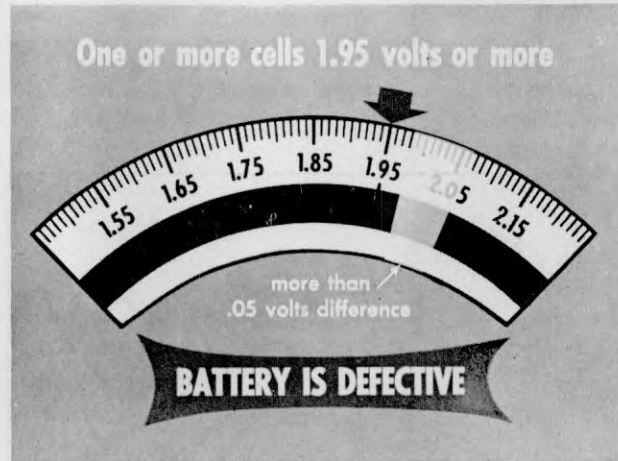


Plate 8308.

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.

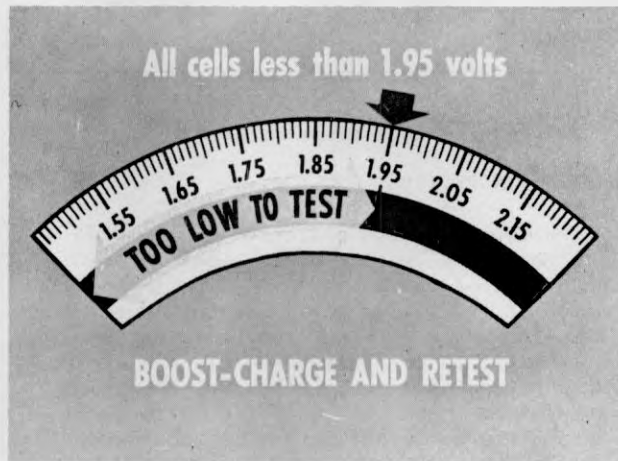
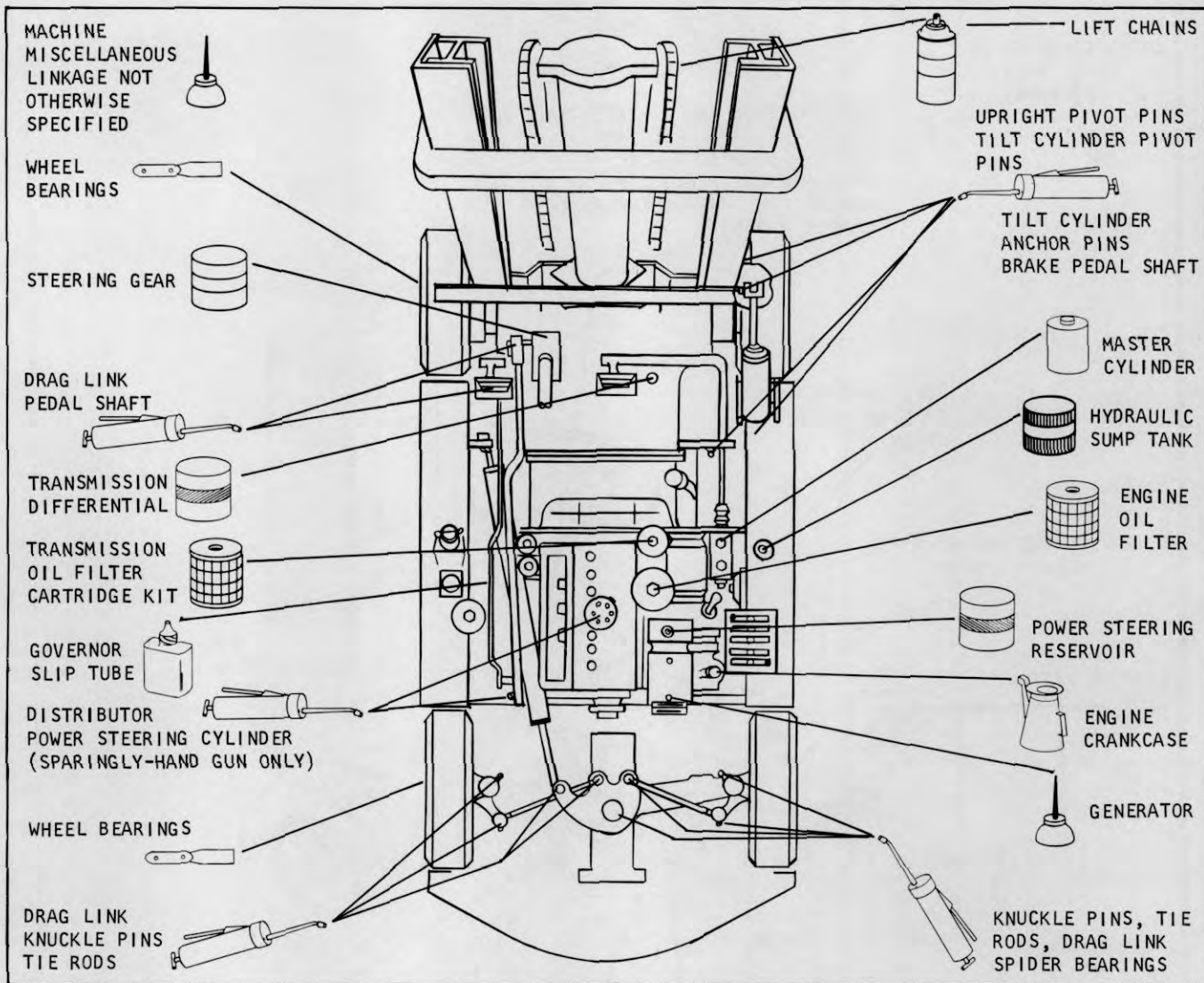
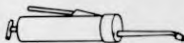


Plate 8309.

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





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

LUBRICATION AND PREVENTIVE MAINTENANCE

500 HOURS

CHECK SECURITY OF ALL NUTS, BOLTS, AND CAPSCREWS.

STEAM CLEAN MACHINE

TRANSMISSION AND DIFFERENTIAL DRAIN - CLEAN SCREEN AND REFILL - USE AUTOMATIC TRANSMISSION FLUID TYPE "A" SUFFIX "A" ----- CLARK PART NUMBER 879803

FUEL PUMP SEDIMENT BOWL AND SCREEN CLEAN

INTAKE AND EXHAUST MANIFOLD CHECK

EXHAUST SYSTEM CHECK

STEERING AXLE AND LINKAGE CHECK - ADJUST

STEERING GEAR ADJUST

HYDRAULIC SUMP TANK DRAIN - REFILL

MACHINE SERIAL LOCATION

TRANSMISSION OIL FILTER CHANGE

SUMP TANK FILTER CHANGE

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 lbs. 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 MINIMIZE ANY POSSIBLE FIRE HAZARD.

DO NOT SPILL GASOLINE.

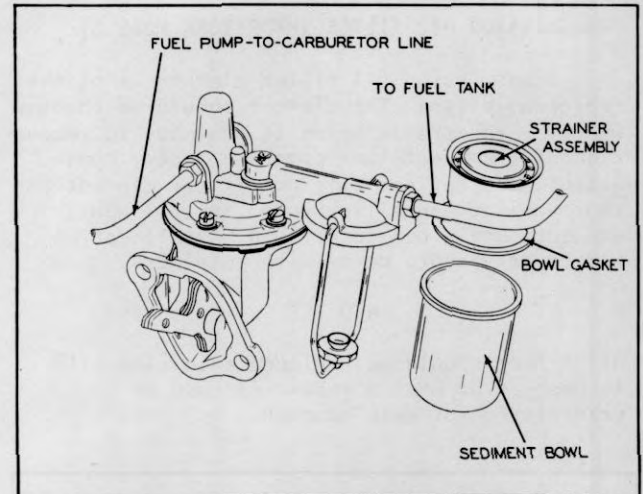


Plate 6432. Fuel Pump & Sediment Bowl

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.

NOTE

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

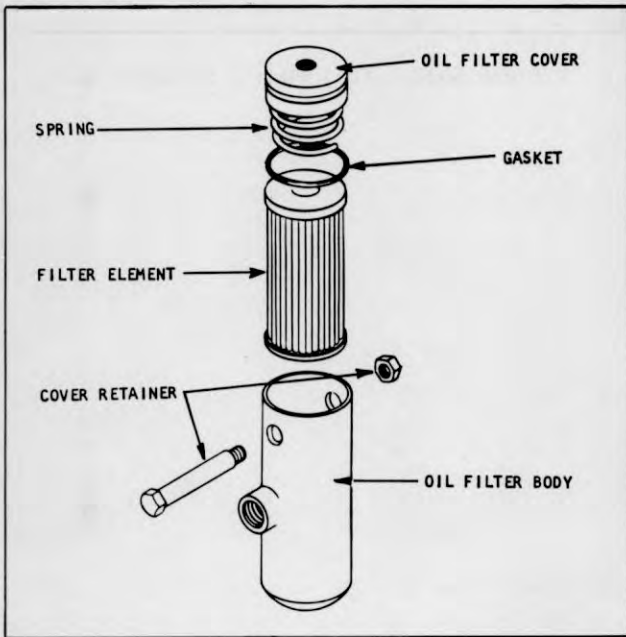


Plate 7234. Transmission Oil Filter

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.

CAUTION

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.

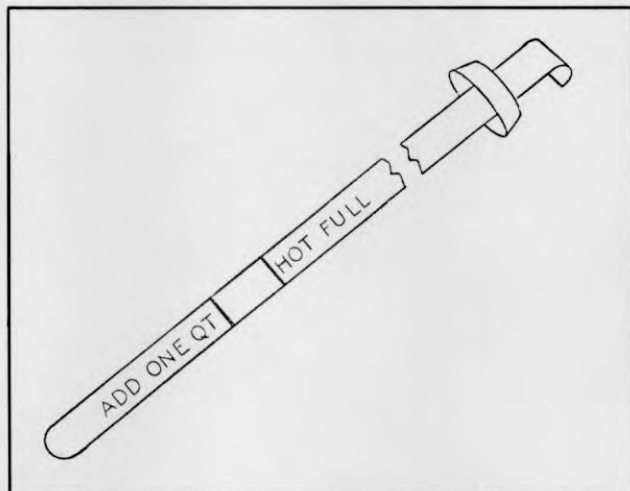


Plate 8281. Transmission Dipstick

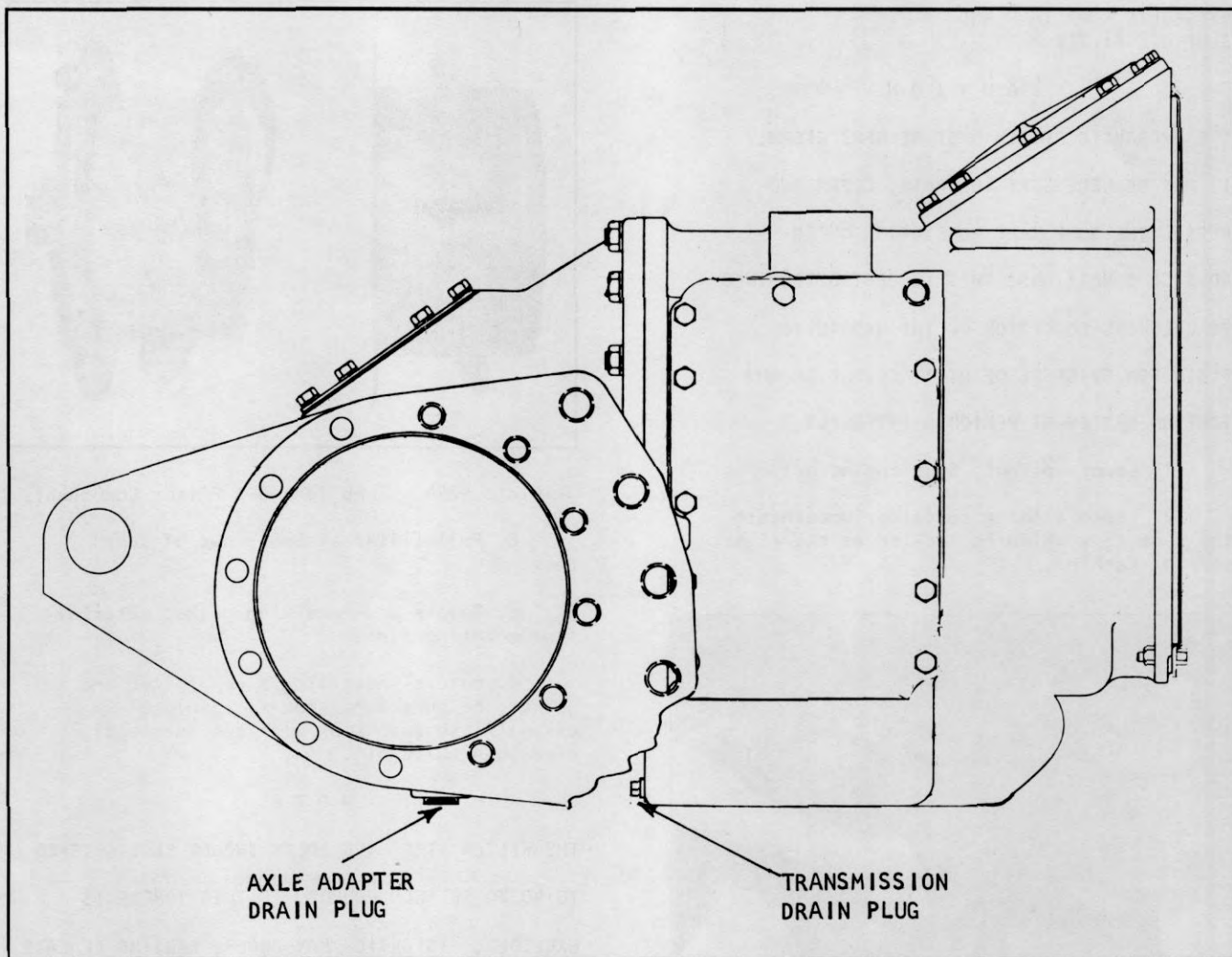


Plate 7301. Axle Adapter and Transmission Drain Plugs

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 EVIDENCE 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.

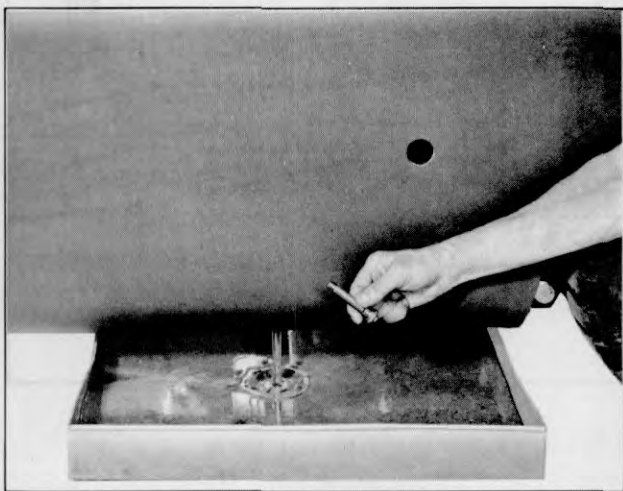


Plate 5359. Draining Sump Tank

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.

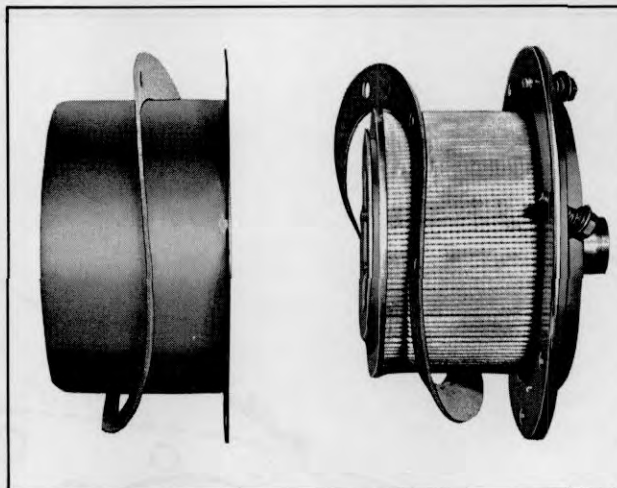


Plate 5274. Sump Tank Oil Filter Components

- 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.

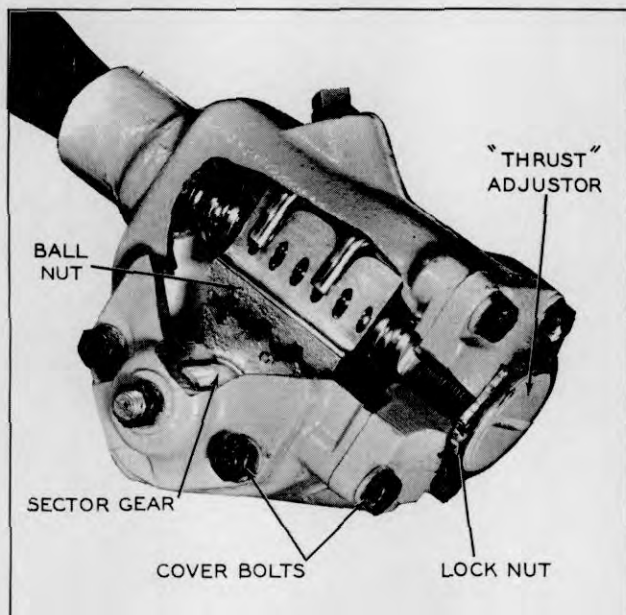


Plate 6636. Steering Gear Thrust Adjustment (Worm Bearings)

CAUTION

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) counter-clockwise a few turns to provide clearance between sector gear and worm ball nut.

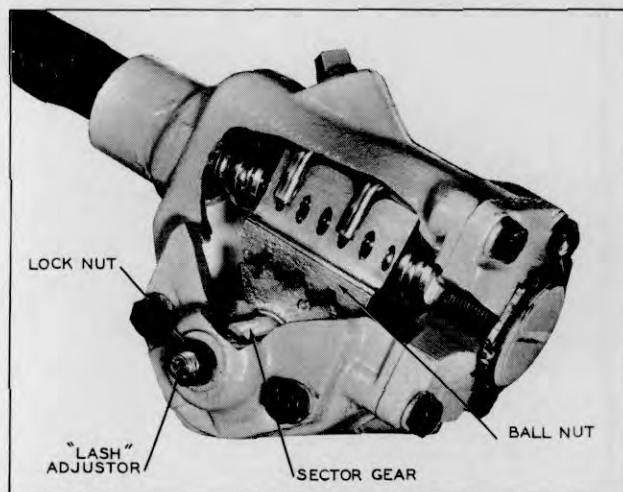


Plate 6637. Steering Gear Lash Adjustment (Sector Gear)

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.



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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.

NOTE

IF STEERING LINKAGE ADJUSTMENT IS NECESSARY DO NOT INSTALL DRAG LINK TO PITMAN ARM.



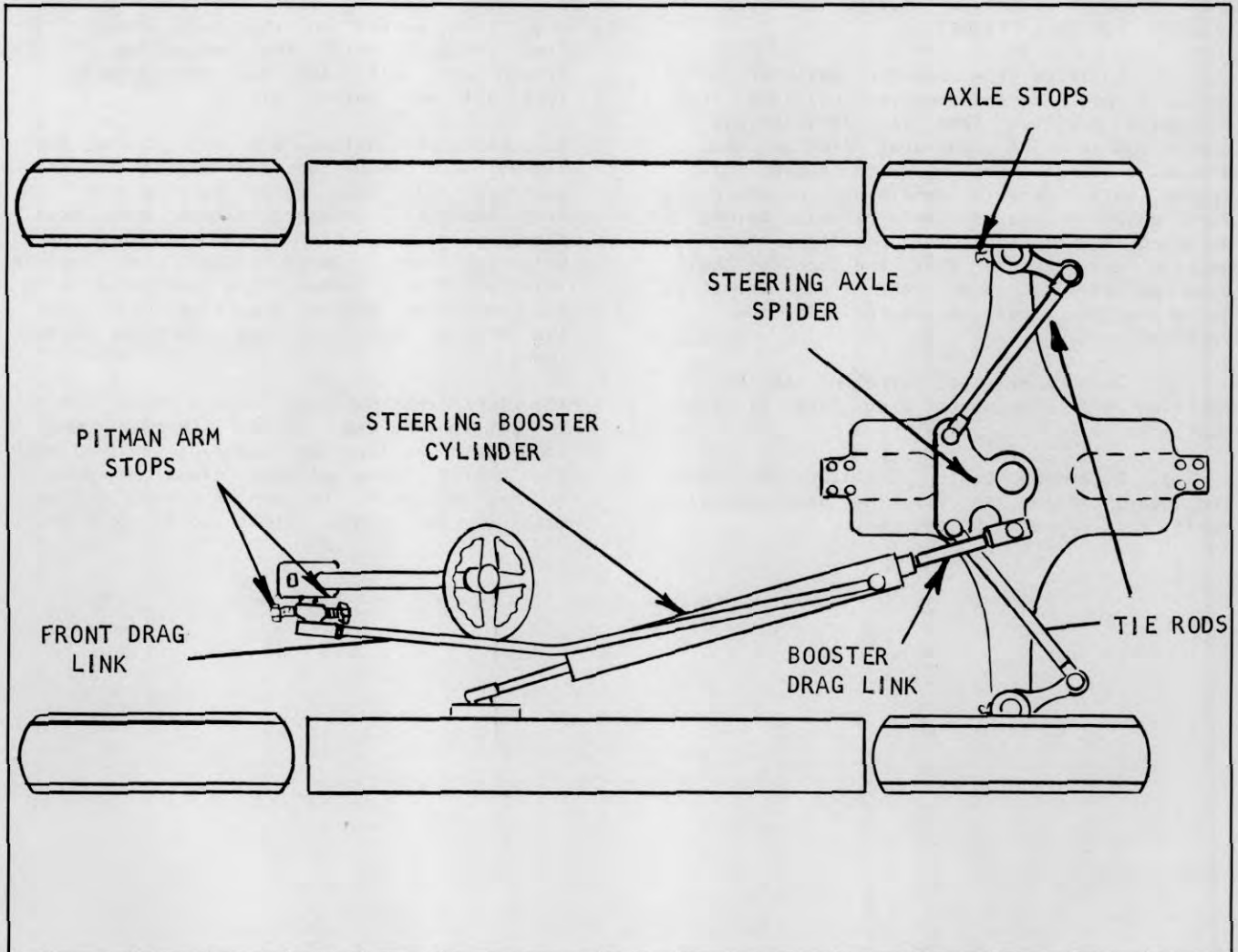


Plate 7340. Steering Linkage

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 achieve the correct angle. Repeat this procedure in a right turn with the opposite wheel and adjust the right axle stop as required.

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



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LUBRICATION AND PREVENTIVE MAINTENANCE

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.

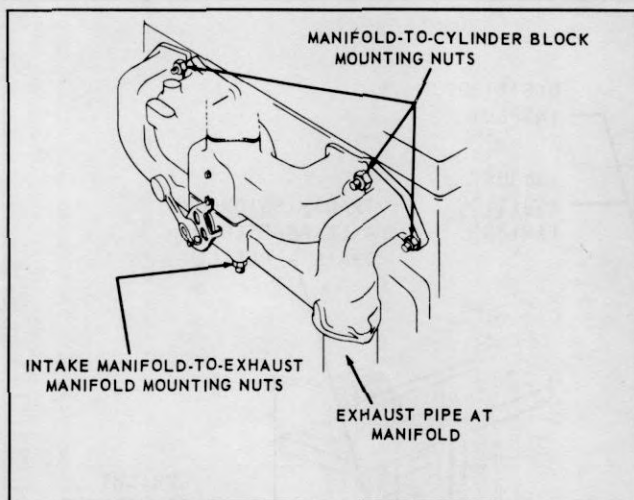
6. Turn wheels to straight ahead position and disconnect drag link at pitman arm.

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.

**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 6269. Intake and Exhaust Manifolds

LUBRICATION AND PREVENTIVE MAINTENANCE

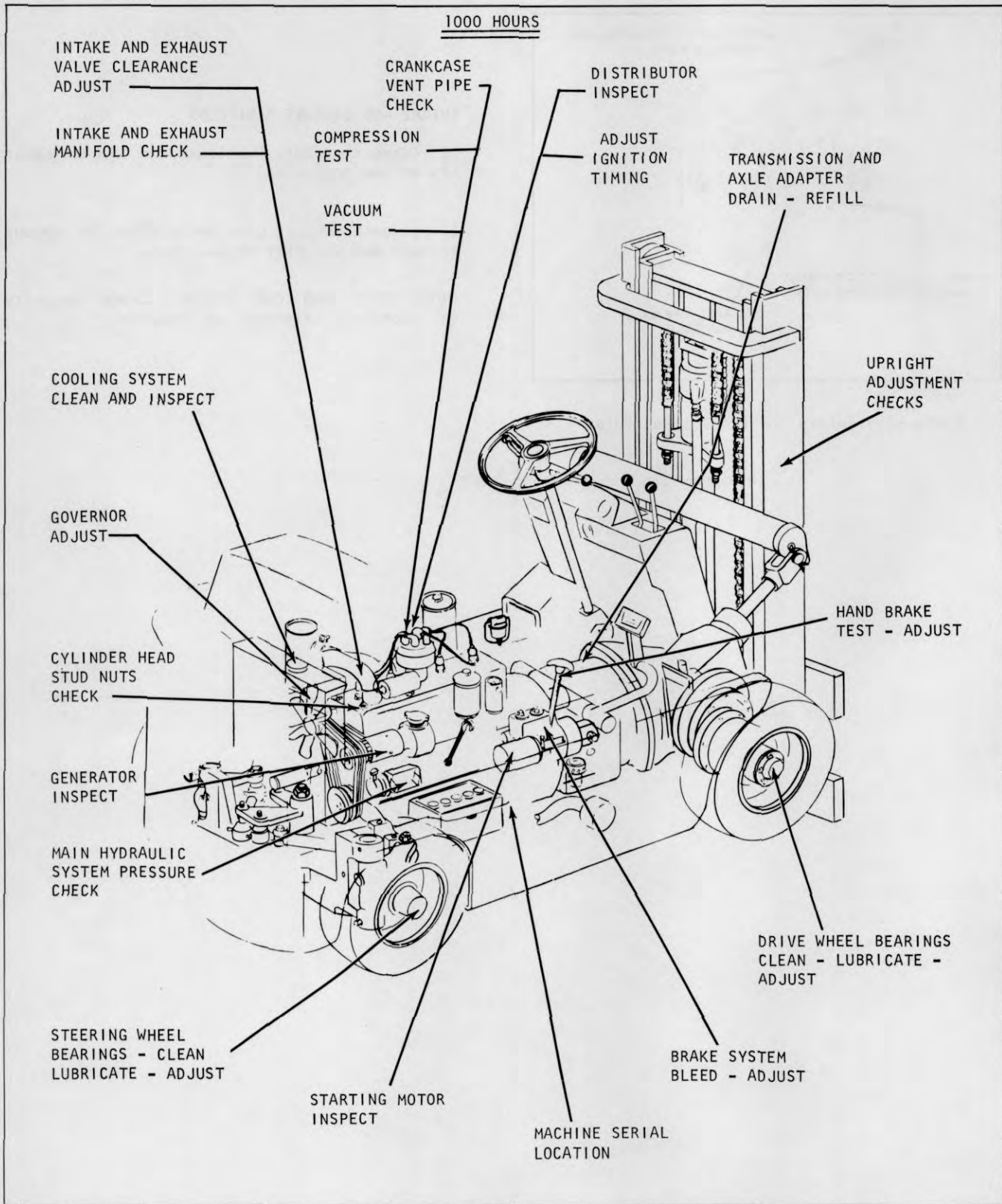


Plate 9484. Lubrication and Preventive Maintenance Illustration

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.

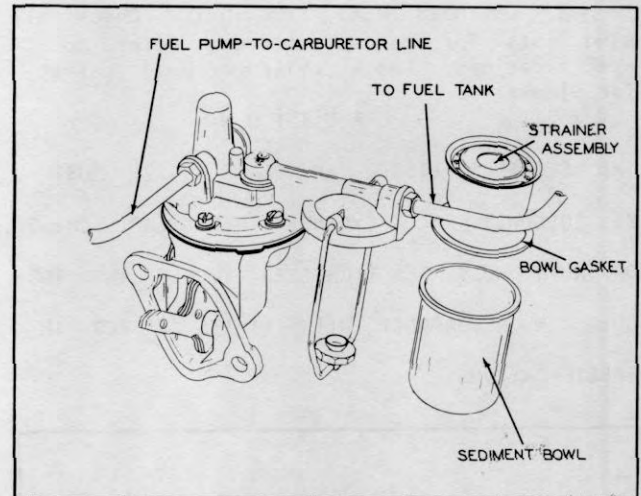


Plate -6432. Fuel Pump Strainer & Sediment Bowl

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.

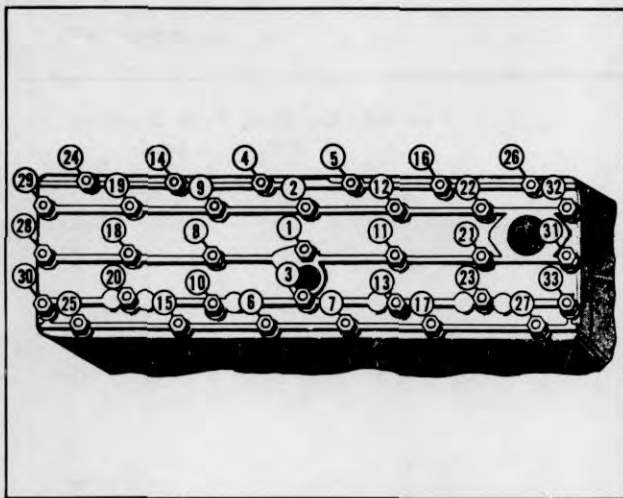


Plate 5927. Cylinder Head Stud Nut Tightening Sequence

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 quantity 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.

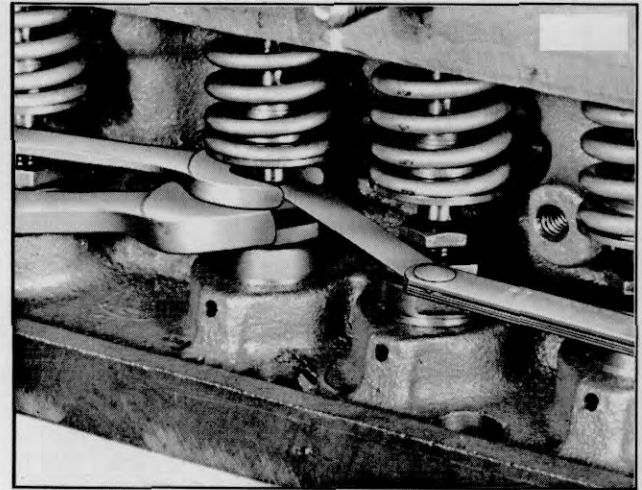


Plate 3223. Adjusting Valve Clearance

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.

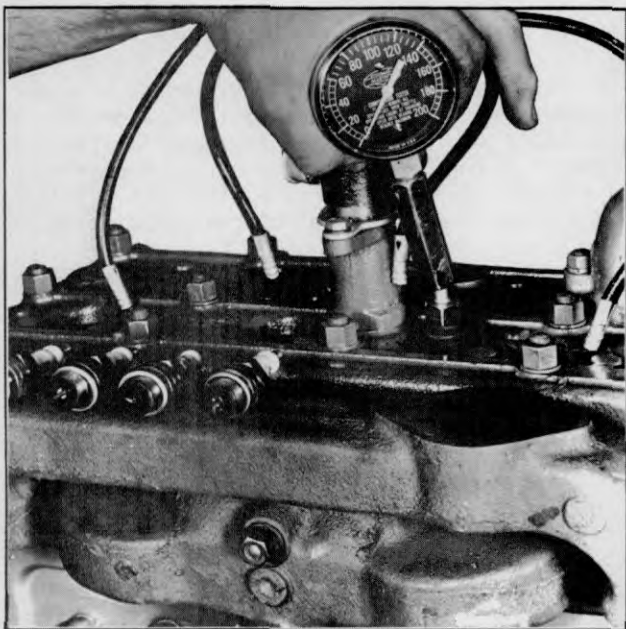


Plate 3486. Compression Test

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.

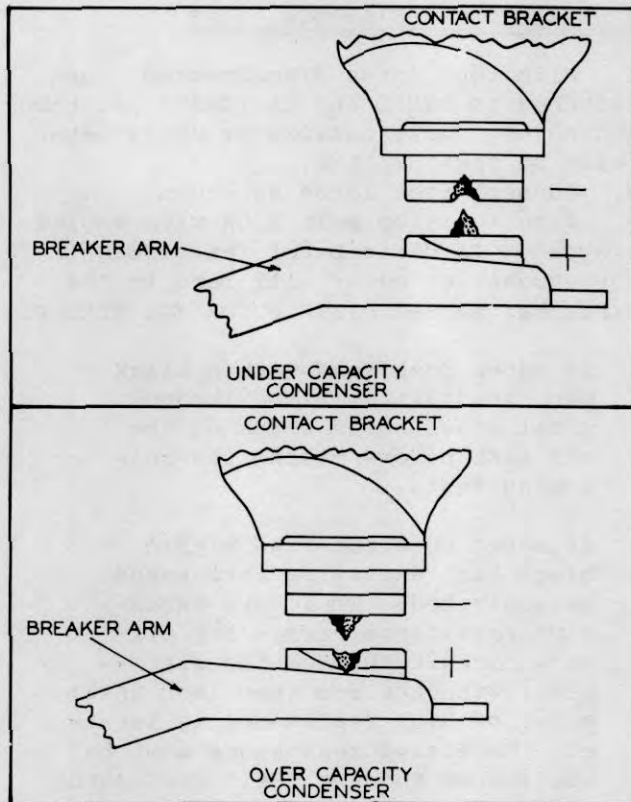


Plate 5933. Breaker Points

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.

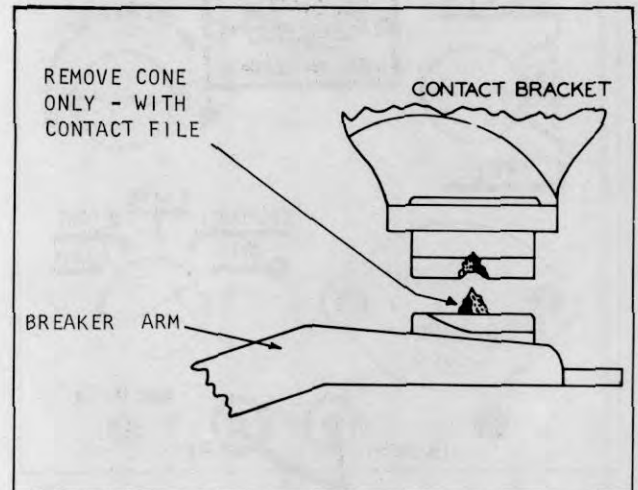
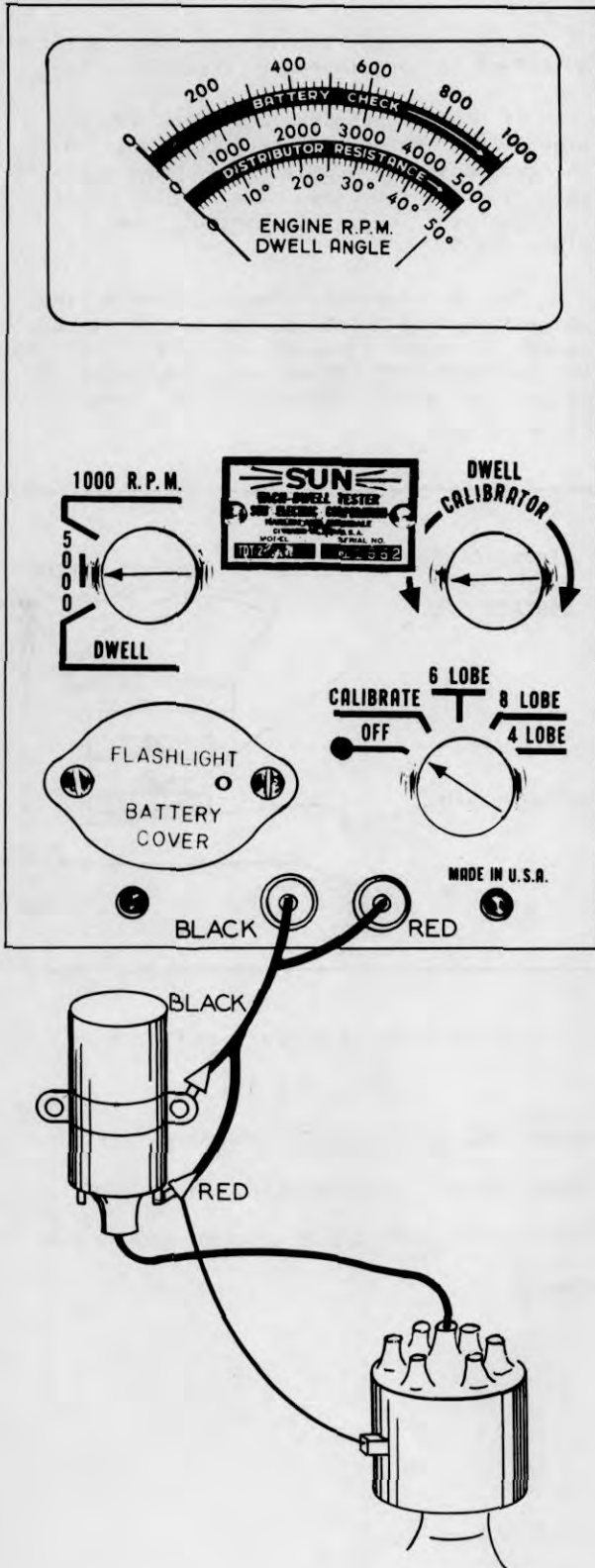


Plate 7475. File Contact Points

CAUTION

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



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.

Plate 6887 Tach Dwell Meter

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.

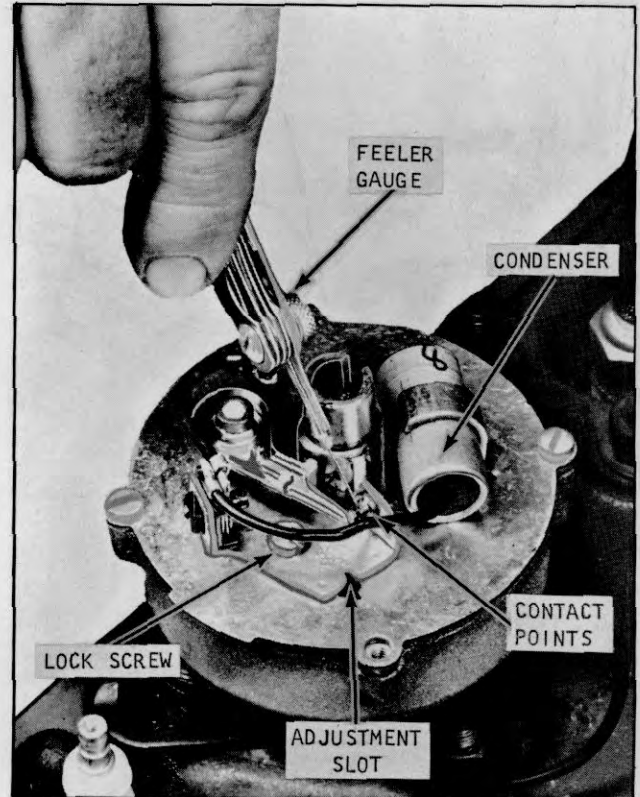


Plate 7457. Contact Point Adjustment

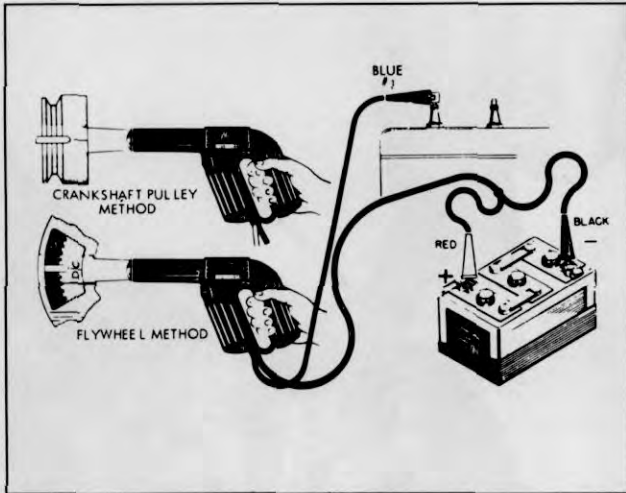


Plate 7818. Timing Light Hookup

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.**

NOTE

The initial advance RPM range is 430-580. Distributor advance at 600 engine RPM should be 1° to 5°.

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.

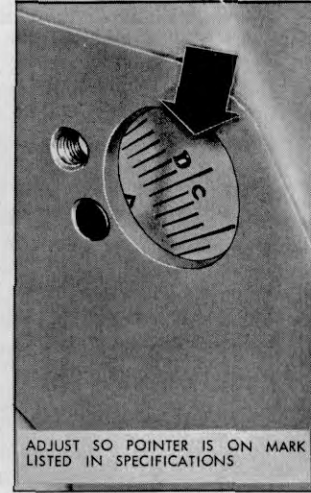
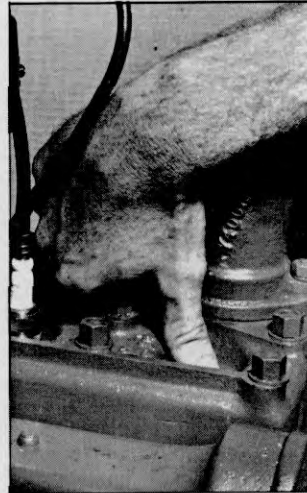


Plate 7861. Ignition Timing

- 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.

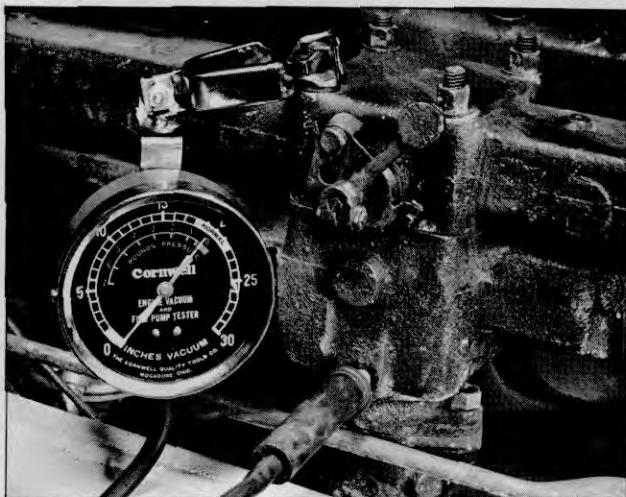


Plate 6643. Vacuum Test

(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.

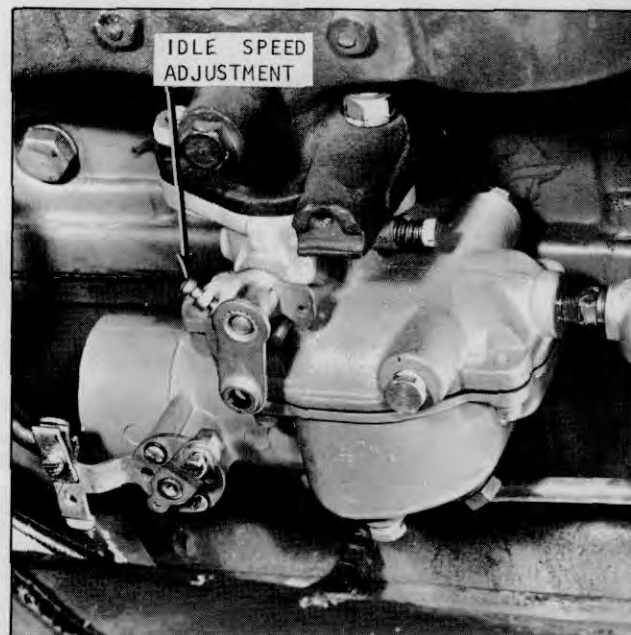


Plate 6889. Idle Speed Adjustment

(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.

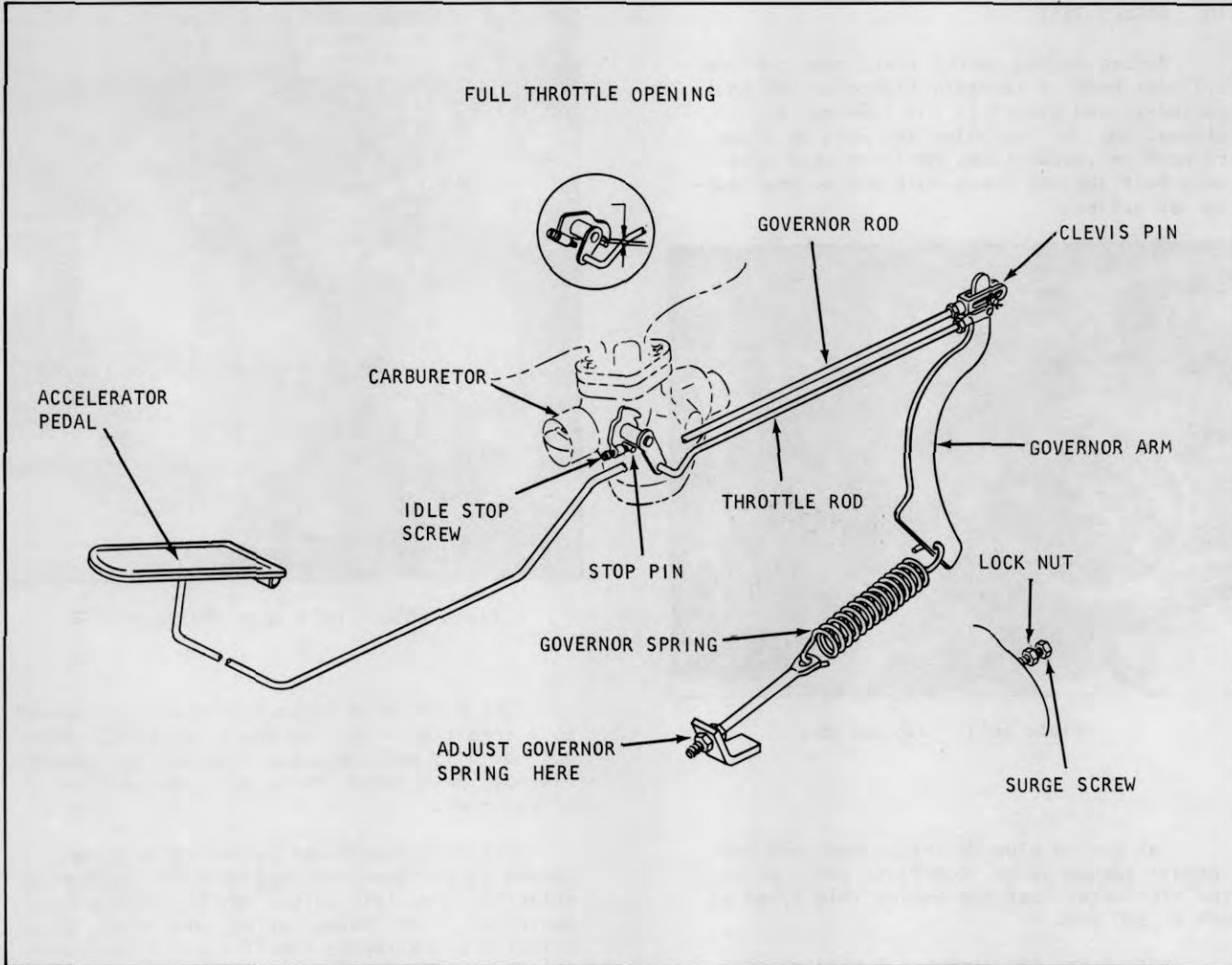


Plate 10443. Governor Adjustment

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 Governor Rod from Governor Arm by removing Clevis Pin.

N O T E

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

C. With the Governor Rod disconnected, the Governor Arm will move forward. Check the Carburetor Throttle Opening. There should be 2/32 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.

D. 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.



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E. 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 GOVERNOR ROD DISCONNECTED BETWEEN THE ACCELERATOR LINKAGE AND THE GOVERNOR ARM.

If adjustment is necessary, adjust the Governor Spring, See Plate 10443.

F. 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 GOVERNOR ROD CLEVIS, OR ACCELERATOR PEDAL LINKAGE TO OBTAIN THIS DIMENSION.

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

If specified R.P.M. is not obtained, check for binding linkage, 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.

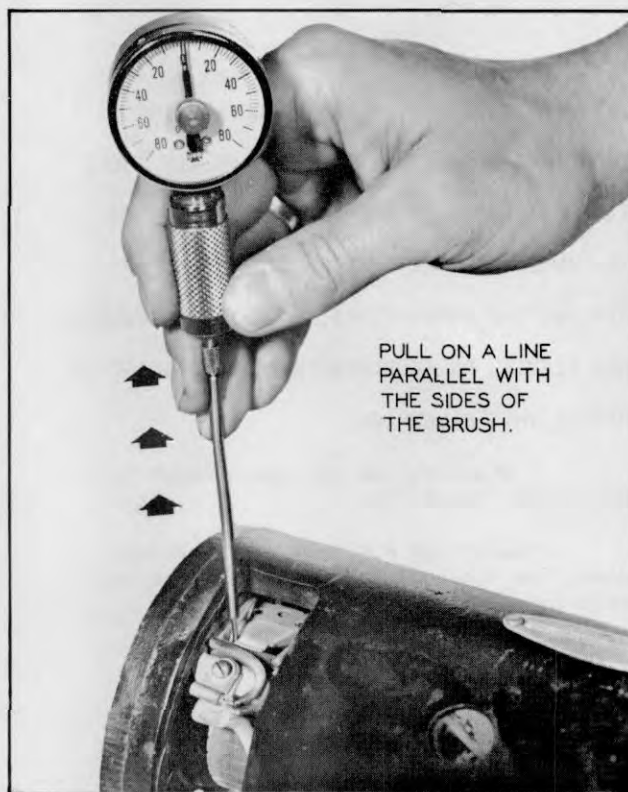


Plate 6450. Checking Brush Spring Tension

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.

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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.

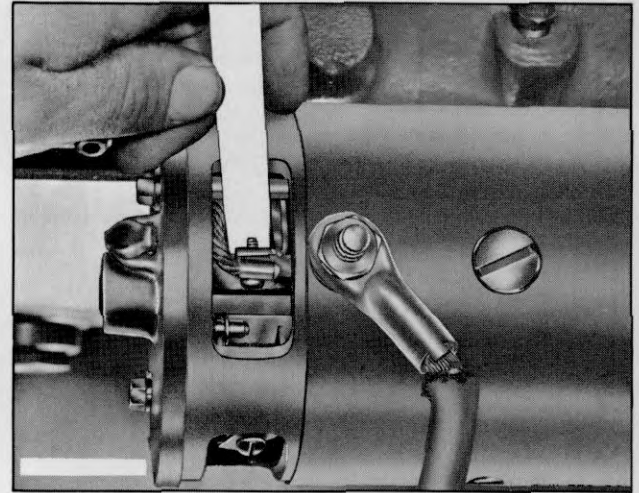


Plate 3436. Seating Brushes

NOTE

BLOW OUT ABRASIVE PARTICLES AFTER SEATING BRUSHES.



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ALTERNATOR

IMPORTANT ---- Since the alternator and regulator are designed for use on only one polarity system, the following precautions must be observed when working on the charging circuit. Failure to observe these precautions will result in serious damage to the electrical equipment.

1. When installing a battery, always make absolutely sure the ground polarity of the battery and the ground polarity of the alternator are the same.

2. When connecting a booster battery, make certain to connect the negative battery terminals together and the positive battery terminals together.

3. When connecting a charger to the battery, connect the charger positive lead to the battery positive terminal and the charger negative lead to the battery negative terminal.

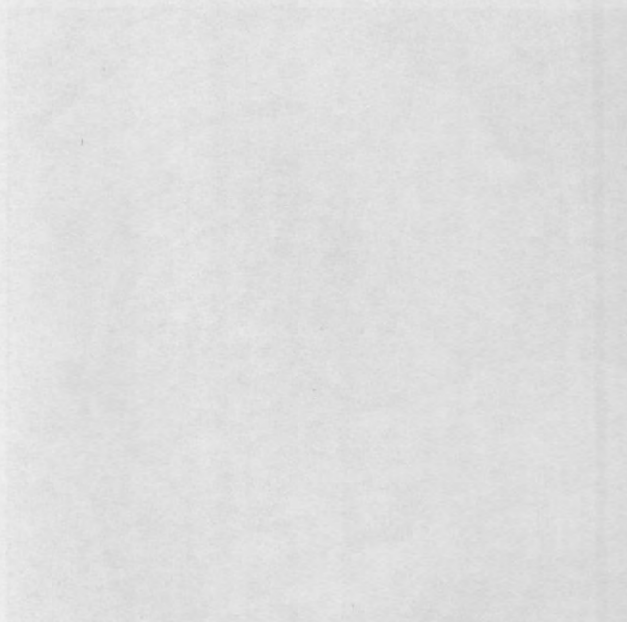
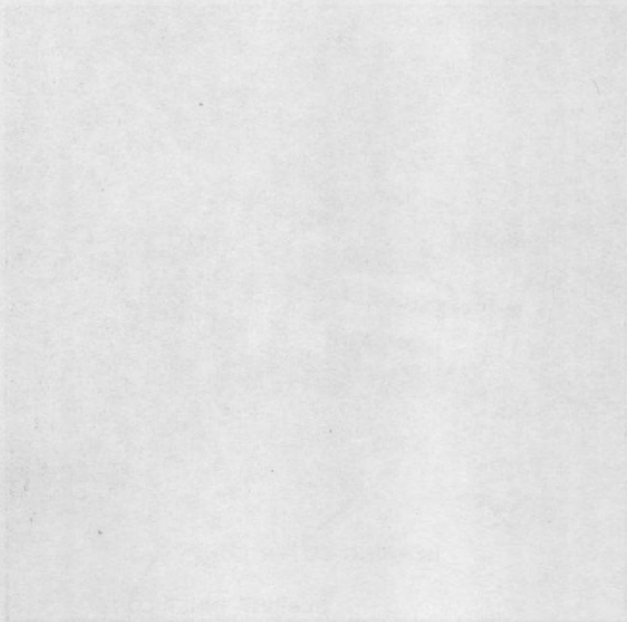
4. Never operate the alternator on open circuit. Make absolutely certain all connections in the circuit are secure.

5. Do not short across or ground any of the terminals on the alternator or regulator.

6. Do not attempt to polarize the alternator.

INSPECTION — The terminals should be inspected for corrosion and loose connections, and the wiring for frayed insulation. Check the mounting bolts for tightness, and the belt for alignment, proper tension and wear. Belt tension should be inspected and adjusted if necessary every 100 operating hours and adjusted per the procedures listed on page 100H 203.

After extended periods of operation, or at time of engine overhaul, the alternator may be removed from the vehicle for a thorough inspection and cleaning of all parts. The alternator requires no other service other than the previously mentioned inspection. When it becomes necessary to perform tests and internal inspection of the alternator, see your nearest authorized Clark Equipment Dealer.



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Plate 6640. Typical Wheel Bearings

STEERING WHEEL BEARINGS

Adjustment:

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

W A R N I N G

AFTER RAISING MACHINE AND BEFORE MAKING ANY ADJUSTMENTS OR ADJUSTMENT CHECKS, PLACE ADEQUATE (HEAVY) BLOCKING (SUFFICIENT TO SUPPORT THE WEIGHT OF THE MACHINE) UNDER THE FRAME TO PREVENT ACCIDENTAL LOWERING OR FALLING OF THE VEHICLE, THUS PREVENTING PERSONAL INJURY TO MECHANIC OR BYSTANDERS.

2. Inspect adjustment of bearings by gripping top and bottom of tire, chuck tire 'in' and 'out' to determine looseness or wobble.

N O T E

BEFORE MAKING WHEEL BEARING ADJUSTMENTS, BE SURE PLAY (LOOSENESS OR WOBBLE) IS IN THE WHEEL BEARINGS AND NOT IN THE KING PINS.

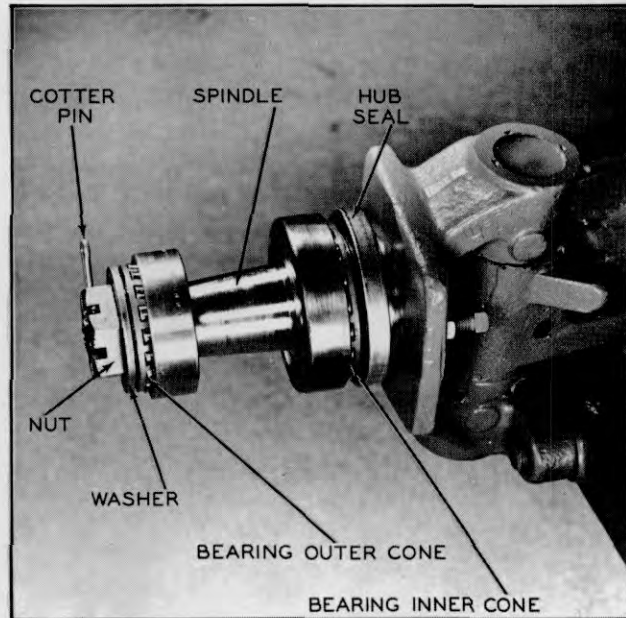


Plate 6703. Typical Wheel Bearings

N O T E

IF WHEEL BEARINGS NEED ADJUSTING, CLEAN AND REPACK BEARINGS BEFORE MAKING ADJUSTMENTS. REFER TO LUBRICATION PARAGRAPH. BEFORE REPACKING WHEEL BEARINGS, CHECK FOR ANY INDICATION OF LEAKAGE AROUND HUB SEALS. IF SUCH A CONDITION EXISTS, REPORT TO DESIGNATED PERSON IN AUTHORITY.

3. If loosens or wobble is in the wheel bearings, remove hub cap and spindle cotter pin, see (Plate 6640). 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 medium bodied high temperature wheel bearing grease, Clark Specification M59C.
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.

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.

WARNING

ON PNEUMATIC TIRE MACHINES DEFLATE TIRES BEFORE REMOVING WHEELS.

2. Remove hub cap, outer spindle nut, lockwasher, inner spindle nut and washer. Pull hub assembly from spindle.

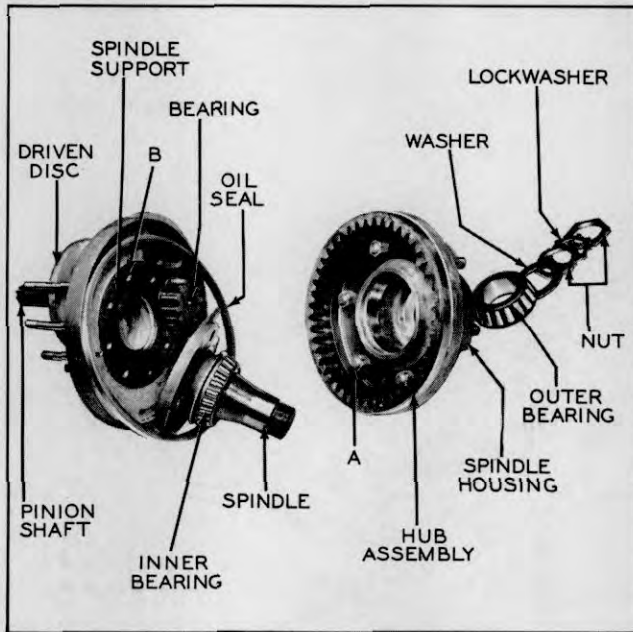


Plate 5694. Axle End Assembly

3. Remove bearings and clean in a Stoddard type cleaning solvent. Sloss 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. Pack all bearings with NLGI #1 (Amolith grease EP #1 or its equivalent) before final assembly. Also pack the hub cavity between the

bearings 1/2 full. (As an alternate grease No. 1 E.P. lithium soap grease may be used).

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

6. Inspect seals for cuts, scratches and nicks. It is necessary to replace seal if such a condition is found. Check the axle end vent for obstruction, vent must be open. See Plate 6893.

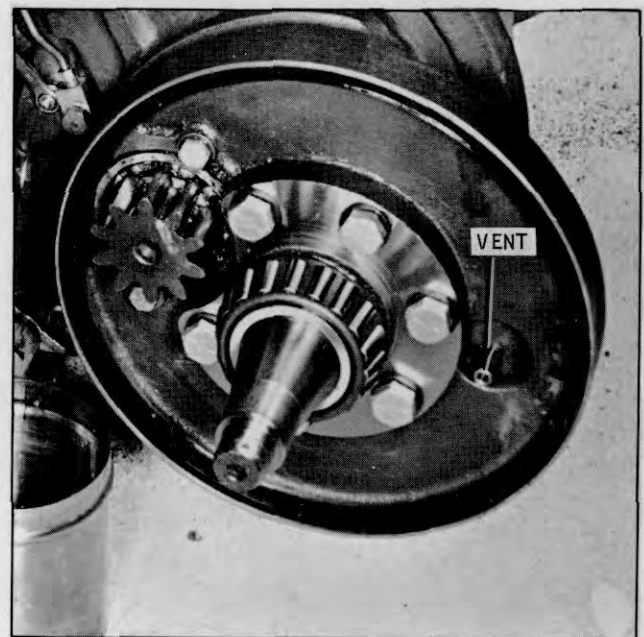


Plate 6893. Typical Axle End Vent

7. Pack the spaces between the teeth of the ring gear and pinion, level full for the entire circumference with NLGI #1 (Amolith grease EP #1 or its equivalent). The approximate amount of grease in this area is to be 1 1/4 pounds.

8. Install bearings, seal and hub assembly on spindle. Tighten inner bearing adjusting nut until bearings bind slightly during rotation. Back off adjusting nut approximately 1/8 turn and lock with outer nut. Secure this adjustment by bending the tangs on the lock washer. Install the hub cap.

9. Replace drive wheels and tires. Inflate tires if they are of the pneumatic type. Tilt upright back and remove blocking.

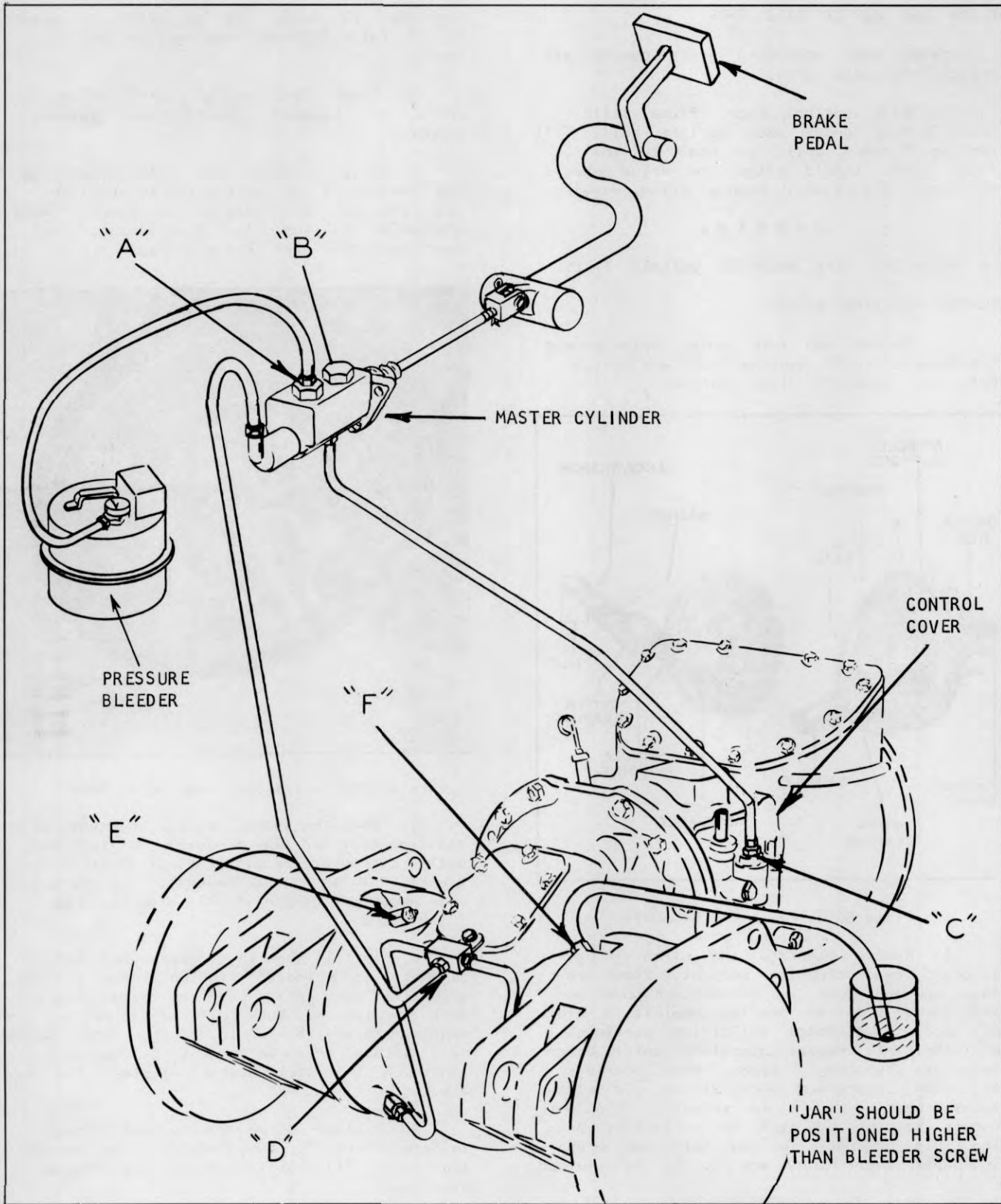


Plate 7302. Bleeding Brakes

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 or 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.

NOTE

IF DRIVE WHEELS ARE REMOVED FROM MACHINES EQUIPPED WITH PNEUMATIC TIRES, DEFLATE TIRES BEFORE REMOVING.

Step 2. Check the brake pedal free travel (see specifications). Clean dirt from around the filler cap of the master cylinder reservoir. Brake fluid should be within 1/4" of the top. With filler cap off the master cylinder, depress and release brake pedal. A small displacement of fluid should be noticed in the cylinder reservoir. If this happens, the brake pedal (upon being released) is returning the master cylinder piston to its normal position to open a master cylinder port. This port must be open. If fluid does not return to the reservoir (when releasing brake pedal), this indicates improper pedal free travel and a pedal adjustment is required.

NOTE

THE KEY LETTERS IN PARENTHESES ARE SHOWN ON OPPOSITE PAGE EXCEPT WHERE OTHERWISE INDICATED.

Step 3. To properly bleed the system it is recommended that a pressure bleeder filled with about two quarts of S.A.E. 70-R-3 heavy duty brake fluid be connected to the master cylinder reservoir. Pressure bleeder should then be pressurized to 10-20 P.S.I.

Step 4. Remove vented filler plug and attach pressure bleeder.

Step 5. Loosen plug (B) to permit air to escape from reservoir. Tighten plug after fluid appears around plug.

Step 6. Loosen tube nut (C) and allow all air to escape. Tighten tube nut.

Step 7. Loosen tube nut (D) and allow air to escape. Tighten tube nut.

Step 8. Install a bleeder hose on bleeder screw (E) and submerge the unattached end of the hose in a clean transparent jar containing several inches of brake fluid. NOTE: DURING BLEEDING THE JAR SHOULD BE ELEVATED TO A POSITION HIGHER THAN THE BLEEDER SCREWS MAKING SURE THAT THE END OF THE HOSE REMAINS SUBMERGED IN THE FLUID AT ALL TIMES. Allow fluid to flow until all traces of air are gone. Tighten bleeder screw. Repeat this operation on opposite bleeder screw (F).

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. If wheels were removed replace them. (Inflate tires if they are of the pneumatic type). Tilt upright back and remove blocking from under each upright rail.

If a pressure bleeder is unavailable the system may be bled manually by following steps six thru eight. It must be remembered that the brake pedal should be depressed slowly and held to the floor-board until the line connections or bleeder screws are securely 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 inch of the top as required.

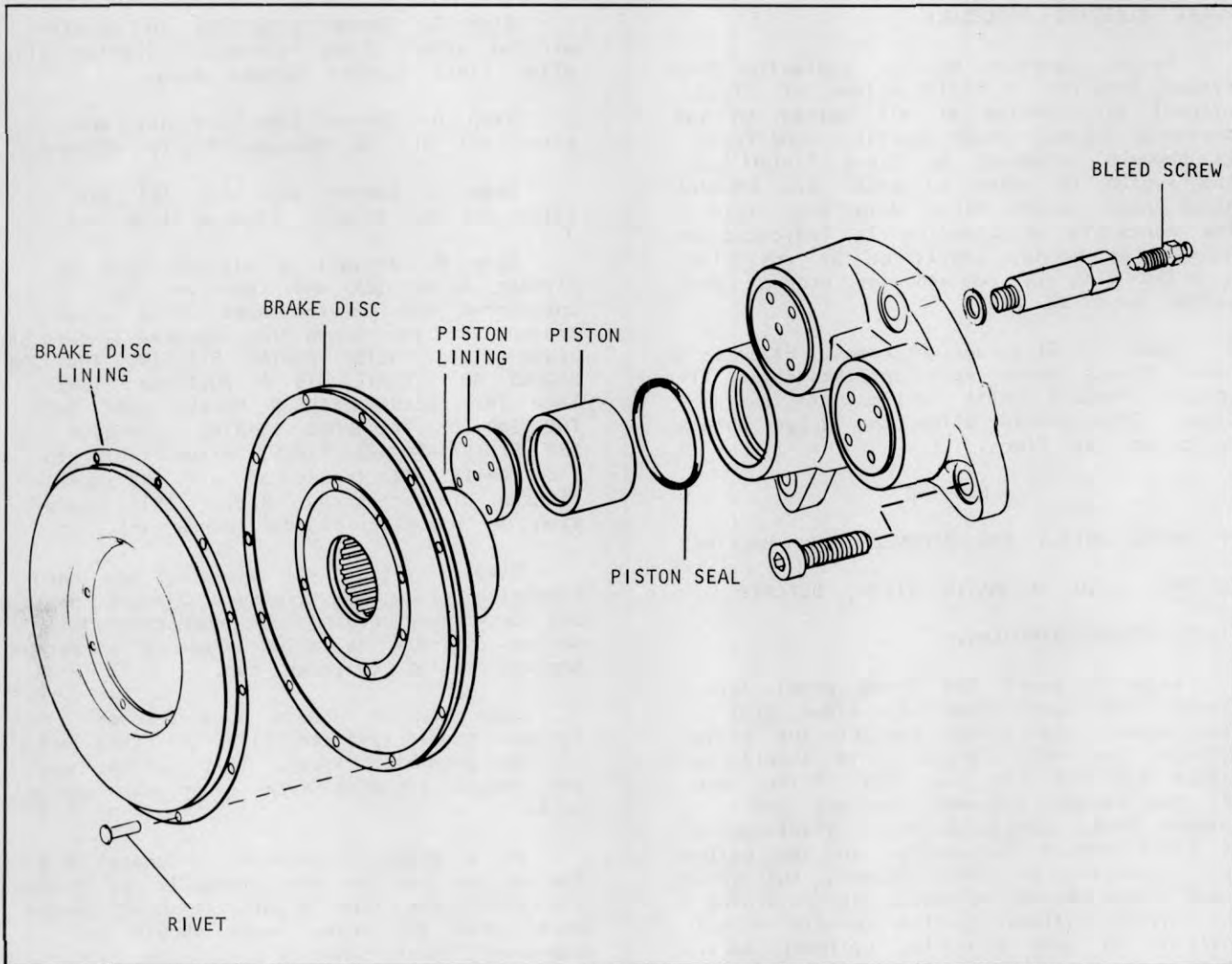


Plate 8261. Wheel Brake Assembly

DESCRIPTION

When depressing the brake pedal, hydraulic pressure is applied to the brakes, the pistons move out and their linings force the brake disc and its lining against a member of the axle end producing braking action by friction.

INSPECTION

Operating conditions determine the inspection and service periods for the brake linings. If it is found that the brake effectiveness has dropped to a noticeable degree (and the system has been properly bled and pedal free travel is correctly adjusted) the axle ends should be removed so that linings may be inspected to determine their further serviceability.

The original thickness of the brake disc lining is 0.221 inch. The disc lining is effective until it is worn to 1/16 inch thickness. If after inspection it is found that the lining is worn to the extent that it will not be effective until the next inspection period, it should be replaced. The brake piston lining when new is 0.649 inch thick to the step on the lining. This lining should also be replaced if it is determined that it will be worn to within 1/16 of step before the next inspection period.

Before replacing axle ends, check the cylinders for leakage. The actual presence of fluid, other than mere dampness, indicates a fluid leak. Correct leaks as necessary by replacing the piston seals after cleaning the pistons and seal grooves thoroughly.

PARKING BRAKE ADJUSTMENT

The mechanical "V" block type parking brake operates on the transmission drive shaft brake drum. The only adjustment necessary during the useful life of the brake lining is a periodic adjustment of the linkage.

To adjust the linkage, remove the floor plates, and adjust the clevis on the linkage, so that the brake handle has 2 inches of upward travel, before resistance is noticed and the brake becomes applied.

The parking brake must be capable of holding the truck, with full rated load, on a 15% grade. This should be tested with the drivers seat occupied, parking brake applied and the truck out of gear.

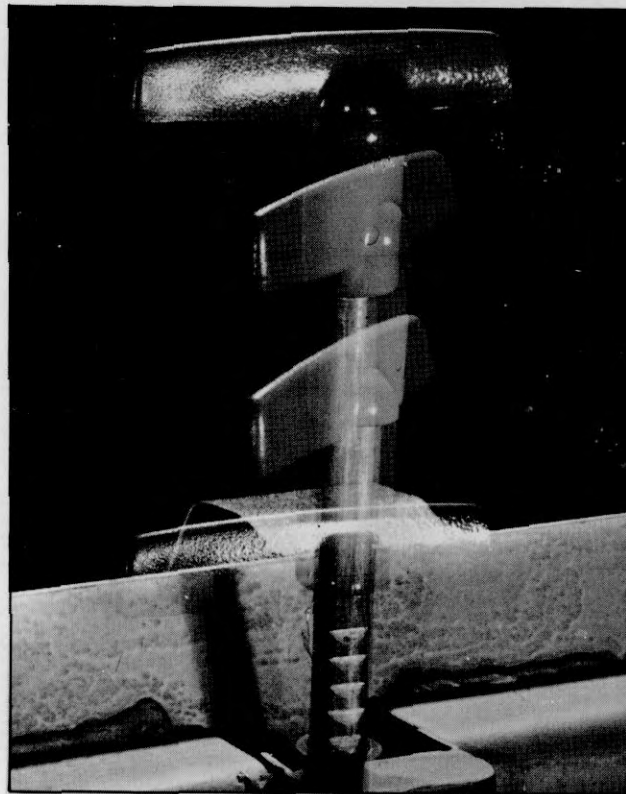


Plate 7482. Parking Brake

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.

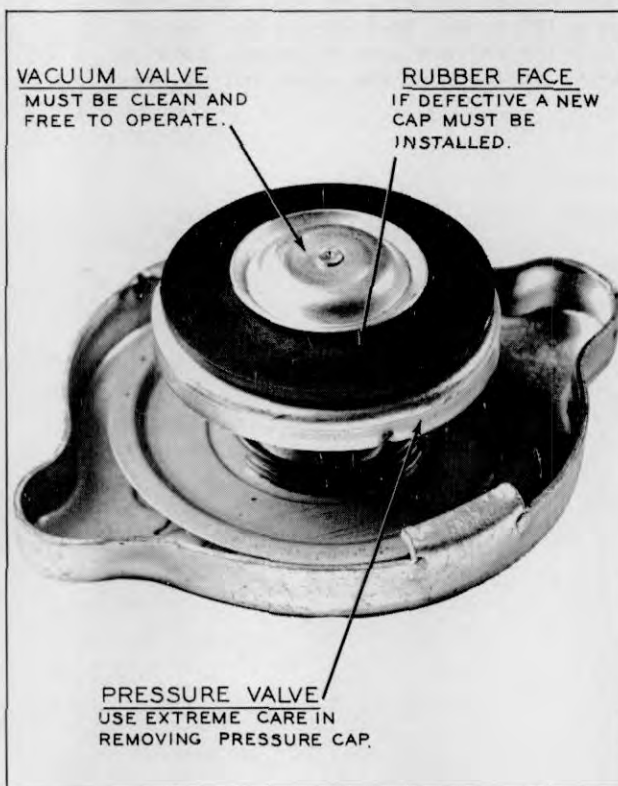


Plate 6459. Pressure Cap Gasket, Valve and Valve Gasket

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".

LUBRICATION AND PREVENTIVE MAINTENANCE

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 soluble 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.

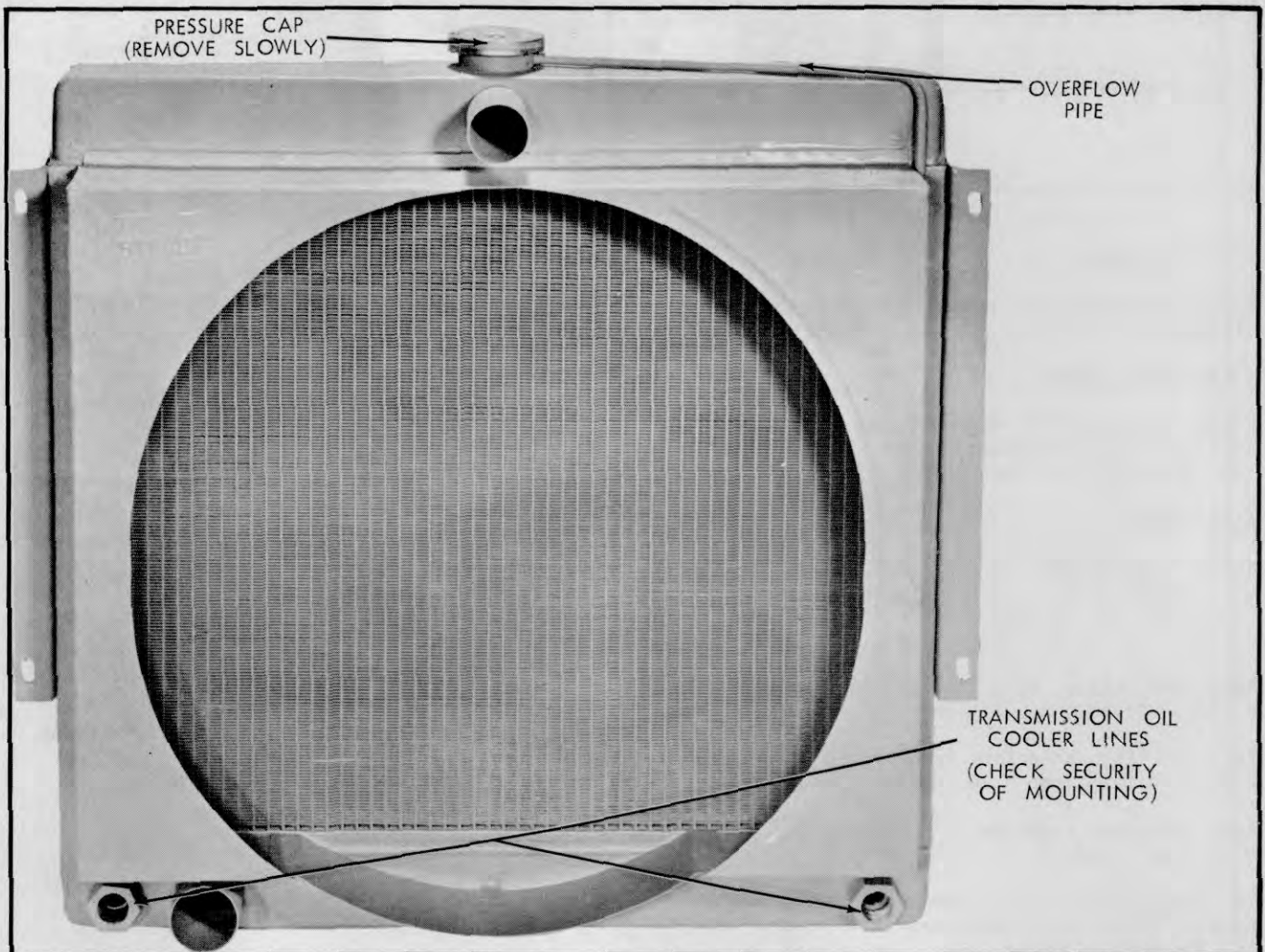


Plate 6460. Typical Radiator

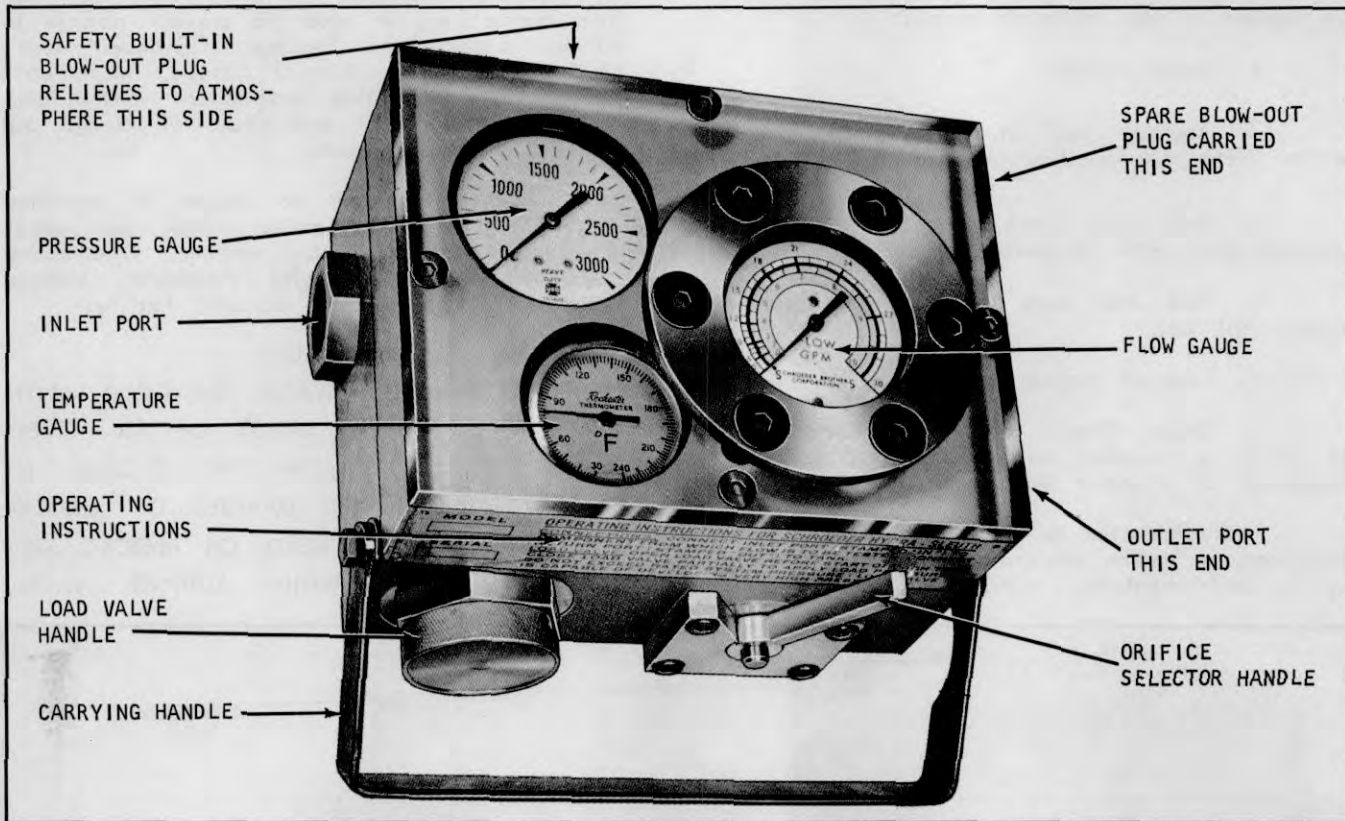


Plate 6747. Schroeder Hydraulic Circuit Tester CLARK PART NUMBER 1800060

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.

LUBRICATION AND PREVENTIVE MAINTENANCE

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.

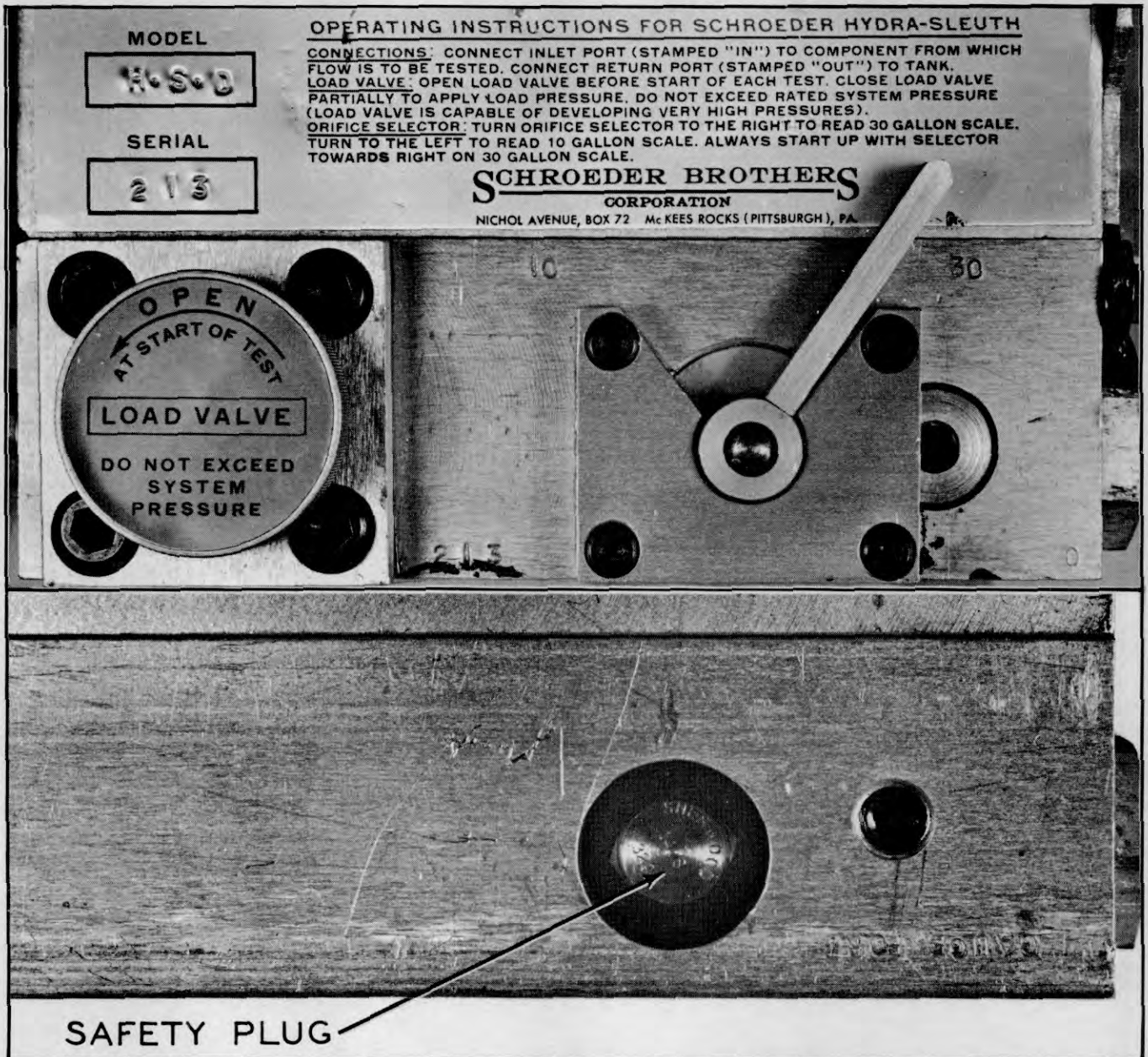


Plate 6748. Schroeder Hydraulic Circuit Tester



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

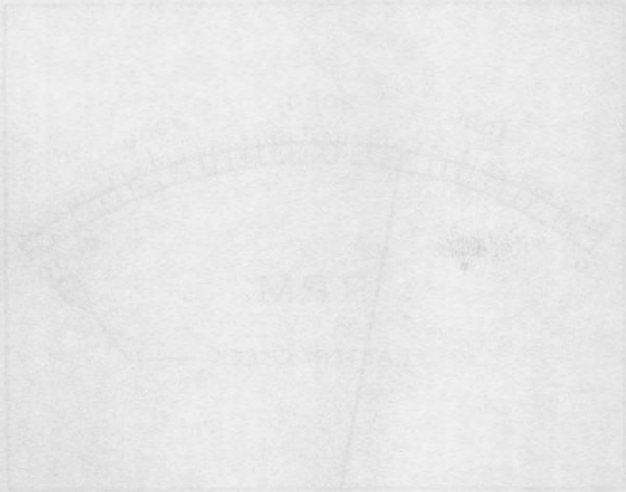


Diagram illustrating the front suspension and steering knuckle assembly. The upper control arm is shown with a ball joint, and the lower control arm is connected to the steering knuckle. The diagram is labeled with 'S.M.' and 'STEERING KNUCKLE'.



Diagram illustrating the rear suspension and axle housing assembly. The upper control arm is shown with a ball joint, and the lower control arm is connected to the axle housing. The diagram is labeled with 'S.M.' and 'AXLE HOUSING'.

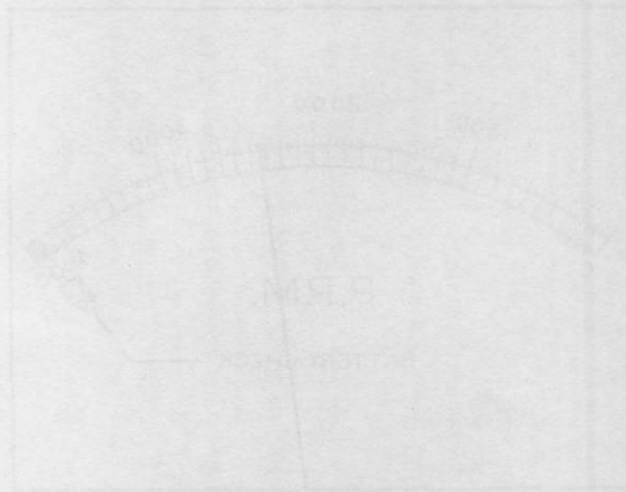


Diagram illustrating the front suspension and steering knuckle assembly. The upper control arm is shown with a ball joint, and the lower control arm is connected to the steering knuckle. The diagram is labeled with 'S.M.' and 'STEERING KNUCKLE'.

**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.

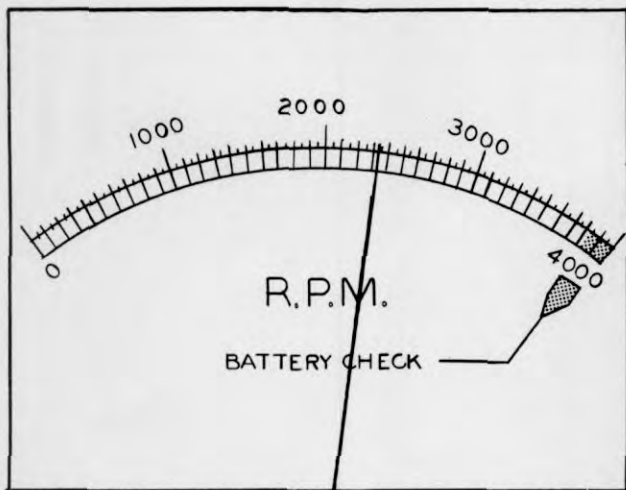


Figure 1703a. Check NO-LOAD R.P.M.

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.

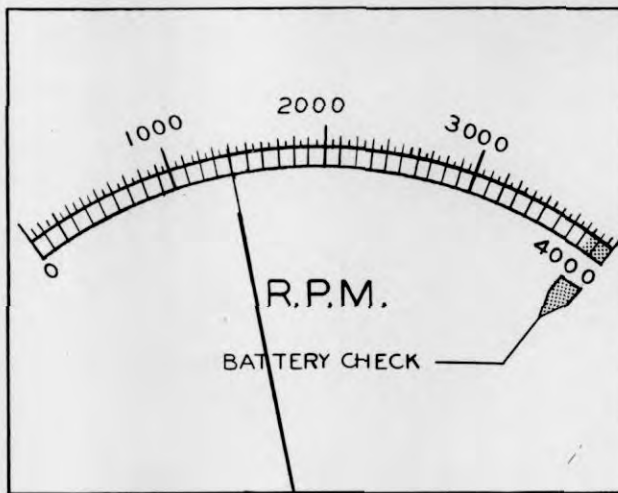


Figure 1703b. Normal Engine Stall

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.

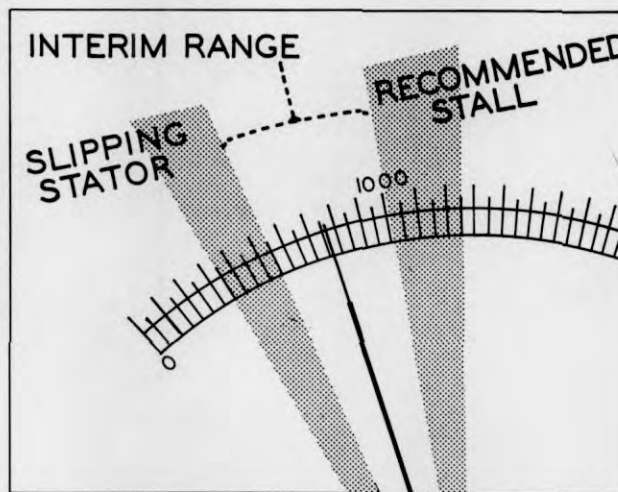


Figure 1703c. Low INTERIM stall

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

WHEN APPLYING BRAKE HYDRAULIC PRESSURE
92# ± 5 TO INCHING VALVE 'F' AND 'R'
CHECKED INDIVIDUALLY MUST DROP OFF TO
3# ± 2 P.S.I. MAX. WITH INCHING BREAK
OFF POINT OF 55# ± 5

IMMERSE IN UCON-1145 FLUID BEFORE ASSEM.

UNLESS OTHERWISE SPECIFIED

IMMERSE ALL OIL SEALS IN TYPE 'A'
TRANSMISSION FLUID BEFORE ASSEMBLY

OIL ALL 'O' RINGS BEFORE ASSEMBLY

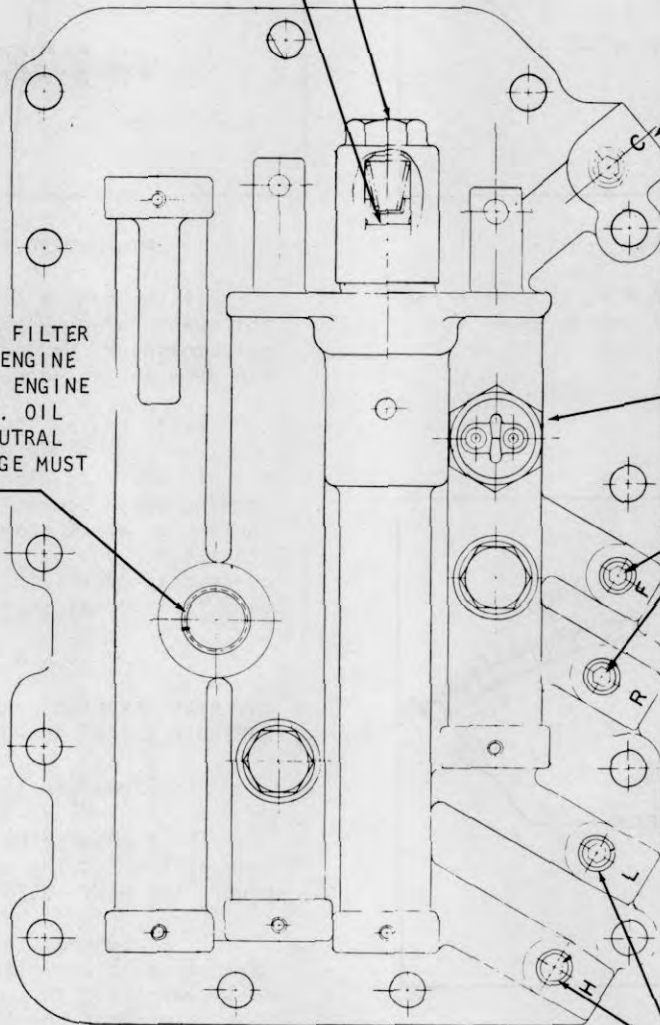
TIGHTEN ALL CAP SCREWS 20-25 FT. LBS. TORQUE

OIL FLOW TO CONTROL FROM FILTER
5-7 GALLONS AT 1300 RPM ENGINE
8-11 GALLONS AT 2000 RPM ENGINE
TO BE TESTED WITH 200° F. OIL
LEAKAGE-WITH F & R IN NEUTRAL
& H OR L ENGAGED. LEAKAGE MUST
NOT EXCEED .2 GAL..

CONV. PRESS. 60 PSI AT
1300 RPM. NOT TO EXCEED
75 PSI AT 2200 RPM
ENGINE.

NEUTRAL SWITCH (12 VOLTS)
NEUTRAL-SWITCH CLOSED
FOR. & REV.-SWITCH OPEN
NEUTRAL START SWITCH TEST
SEE NOTE

OIL PRESSURE CHECK
AT 1300 RPM ENGINE
120 LBS MIN-135 LBS MAX



NOTE

NEUTRAL START SWITCH TEST

- 1-WIRE SWITCH INTO TEST STAND LIGHT CIRCUIT
- 2-WITH ENGINE RUNNING & TRANSMISSION IN LOW
FOR., NUDGE CONTROL FOR. & REV. SPOOL
SLOWLY TOWARD NEUTRAL. IF SWITCH DOES NOT
MAKE CONTACT REPEAT STARTING IN LOW REV.
IF IN EITHER TEST CONTACT IS MADE WHEN NOT
IN DEAD NEUTRAL, SWITCH IS TO BE SHIMED,
TILL TEST SHOWS PROPER FUNCTION.

OIL PRESSURE CHECK

AT 1300 RPM ENGINE-150 LBS. MIN.
AT 2200 RPM ENGINE-165 LBS. MAX.

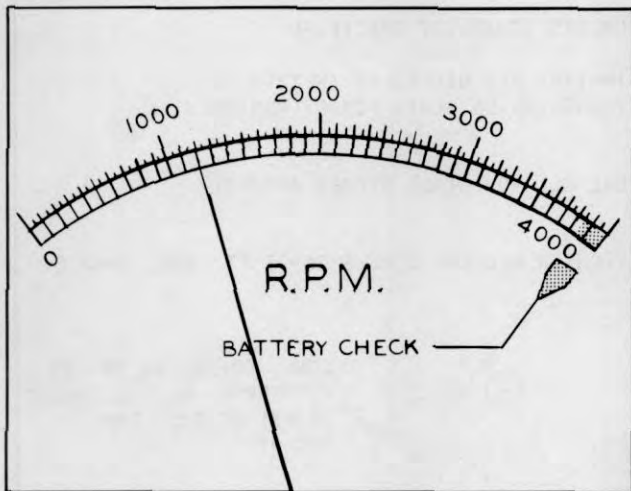


Plate 7327. Interim Stall

If the engine stall R.P.M. is within the following range -- loss of engine power is indicated.

F-227 Engine 1000 to 1300 R.P.M.

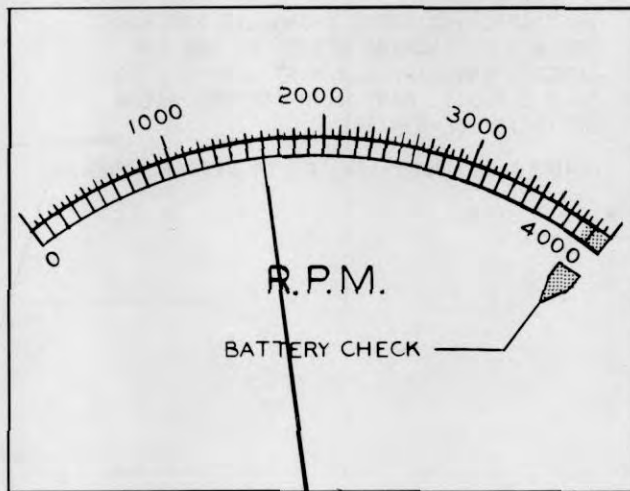


Plate 7328. High Engine Stall

If the engine stall R.P.M. is within the following range -- either slippage of the selector packs or low oil pressure (converter fin damage) is indicated.

F-227 Engine 1450 R.P.M. and above.

If stall readings are normal, check inching valve operation by operating the inching or brake pedal. This will vary stall R.P.M. by varying pressure on forward or reverse packs. This reading should vary from normal stall speed to high R.P.M.

N O T E

ANY STALL READING OTHER THAN NORMAL, MAKE PRESSURE CHECKS AS FOLLOWS.

Transmission Pressure Checks

The transmission pressure checks are made at the testing ports of the control cover. See plate 7326.

1. Place heavy blocking under the upright rails and tilt upright forward until vertical. This will allow the drive wheels to clear the floor.

2. Install a 250 P.S.I. pressure gauge at one of the testing ports (whichever direction or range of speed being tested.) With shift lever in related position the pressure should be within the range as specified on Plate 7326.

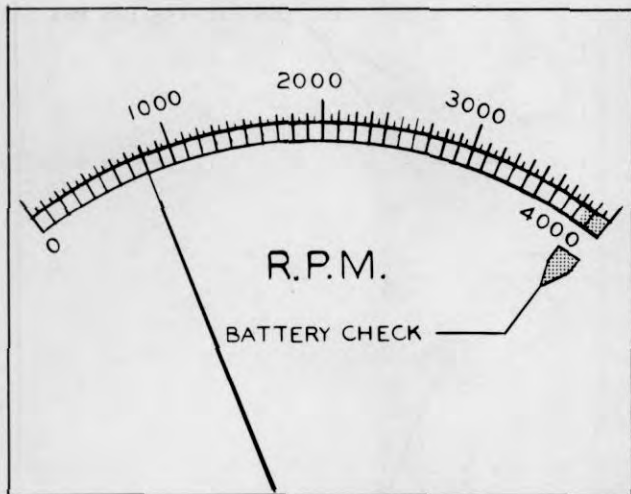


Plate 6686. Low Engine Stall

If the engine stall R.P.M. is within the following range -- converter malfunction or a faulty stator support shaft is indicated.

F-227 Engine 650 to 900 R.P.M.

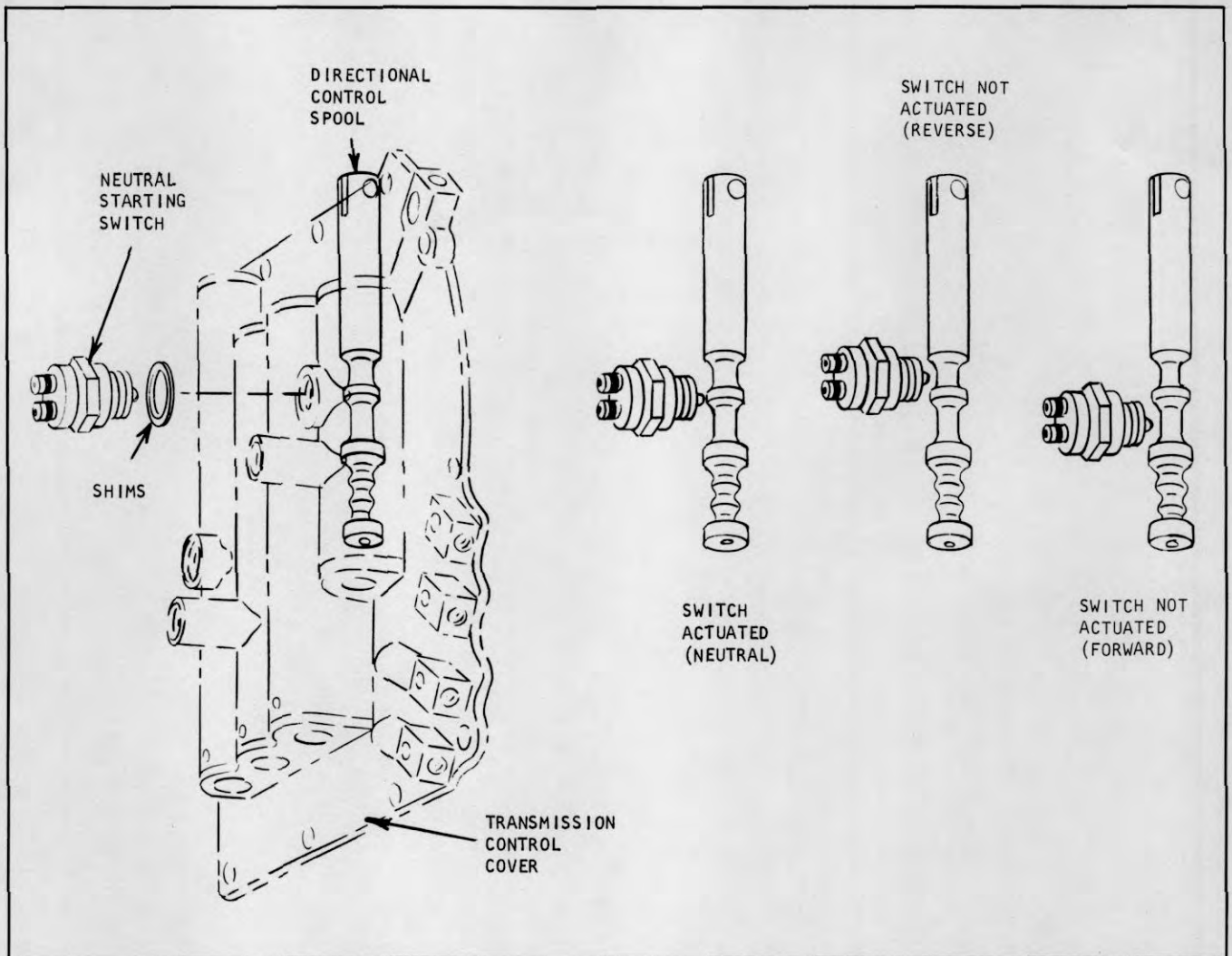


Plate 7300. Neutral Starting Switch

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 CHECK

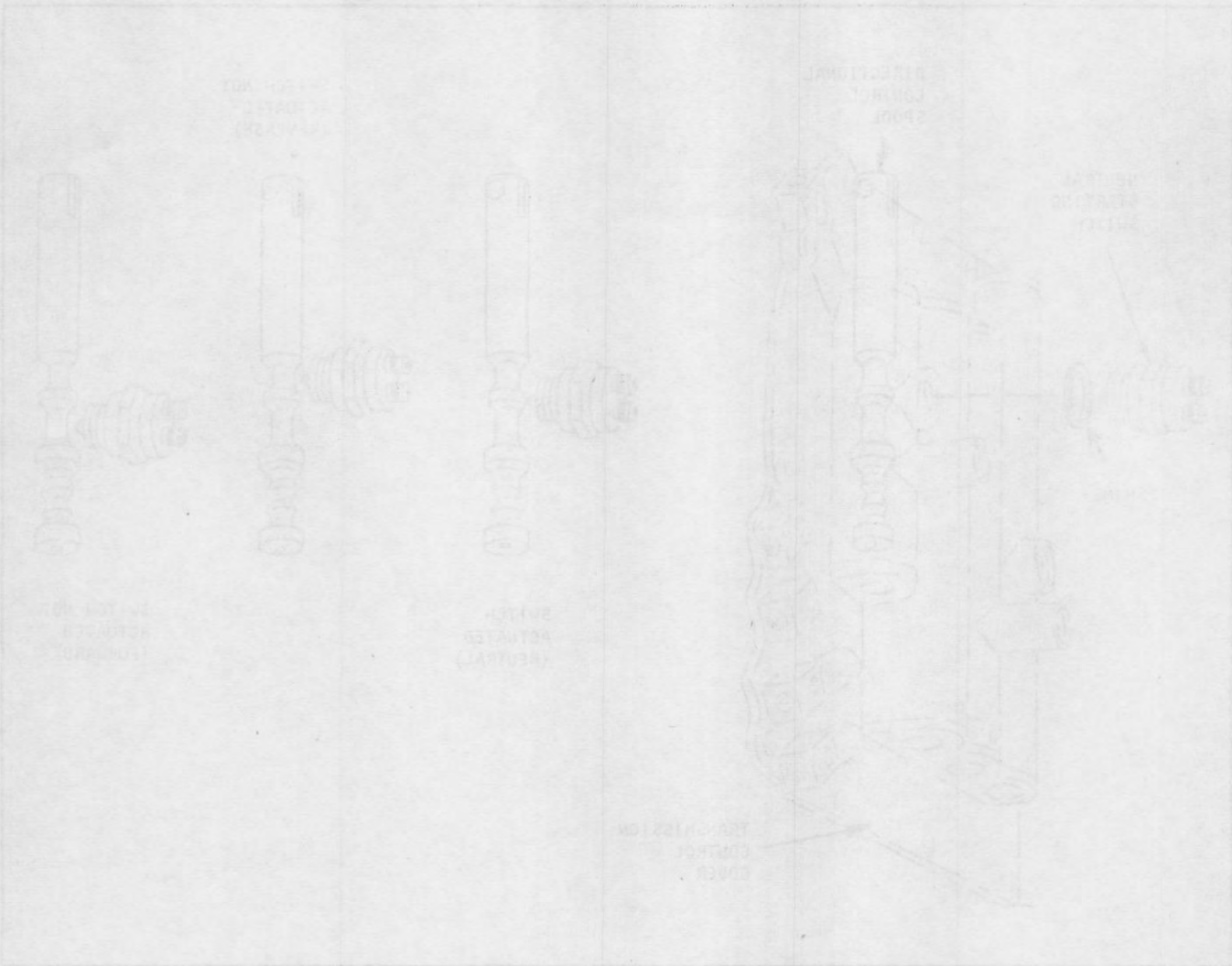
1. With driver's seat occupied and transmission in gear hold starting switch in actuated position and gently move shift lever towards neutral position.

2. If engine does not start, repeat adjustment 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.

INDUSTRIAL TRUCK DIVISION

LUBRICATION AND MAINTENANCE



1. If engine does not start, check the neutral starting switch position. If the engine starts in the forward direction, the neutral starting switch should be adjusted by turning the adjustment screw. If the engine starts in the reverse direction, the neutral starting switch should be adjusted by turning the adjustment screw. If the engine does not start, check the neutral starting switch position.

NEUTRAL STARTER SWITCH
 The neutral starting switch should be adjusted so that the engine will not start unless the transmission control is in the neutral position.
 REVERSE (REAR) SWITCH
 The reverse (rear) switch should be adjusted so that the engine will not start unless the transmission control is in the reverse position.
 TRANSMISSION ELECTRICAL SWITCH
 The transmission electrical switch should be adjusted so that the engine will not start unless the transmission control is in the forward position.