CLARK

Industrial Truck Division

OPERATORS MANUAL

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MODELS 20/30/40/50

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OPERATORS MANUAL

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.

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. Such as: 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.

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.

N O T I C E

MACHINES EQUIPPED WITH DIESEL ENGINES:

REFER TO THE SPECIAL SECTION (PRINTED ON FAWN PAPER) LOCATED IN THE REAR OF THIS MANUAL.

N O T E

This section has its own index (printed on green paper) for easy reference.

INDUSTRIAL TRUCK DIVISION

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INDUSTRIAL TRUCK DIVISION

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LUBRICATION AND PREVENTIVE MAINTENANCE

TROUBLE SHOOTING GUIDE

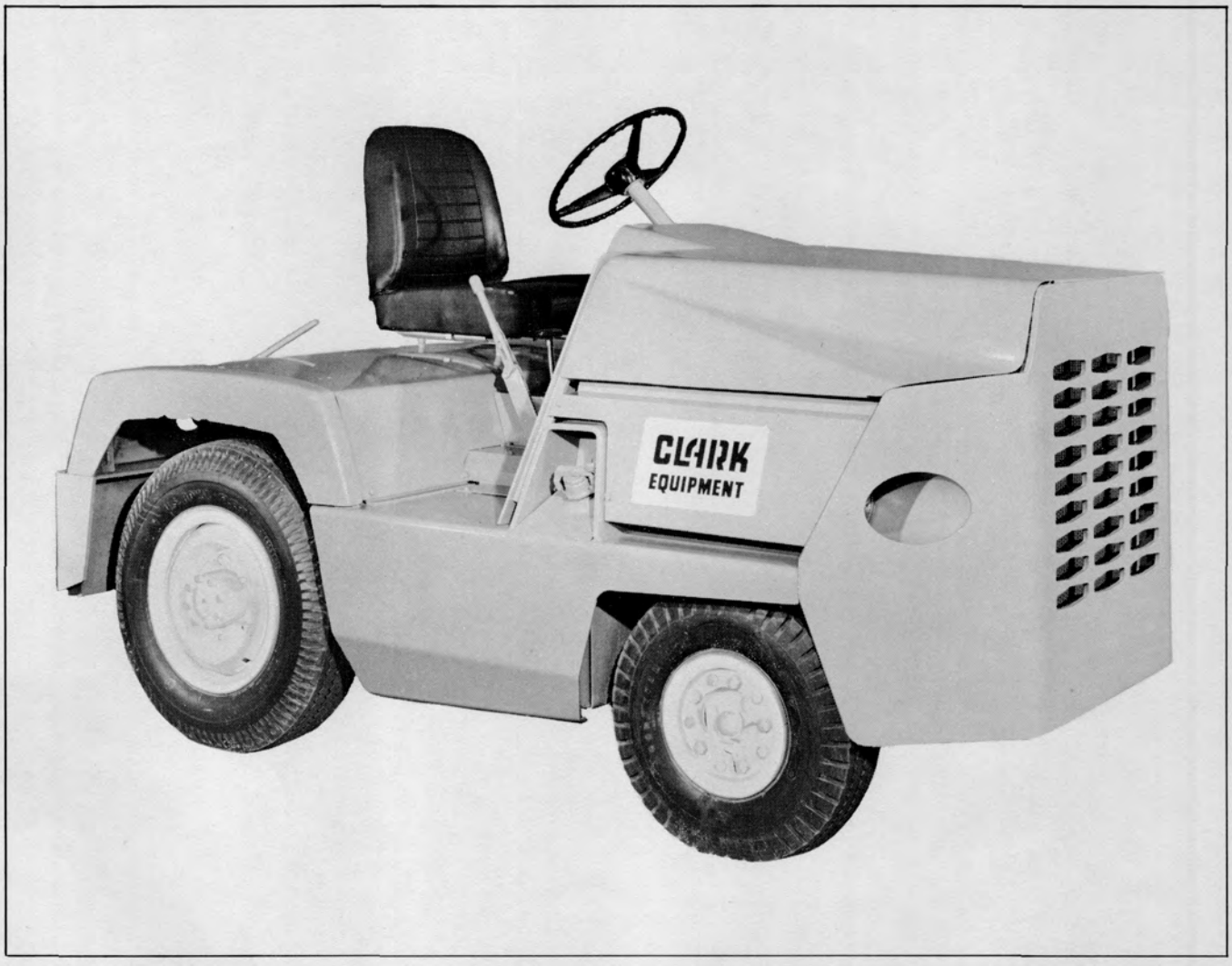
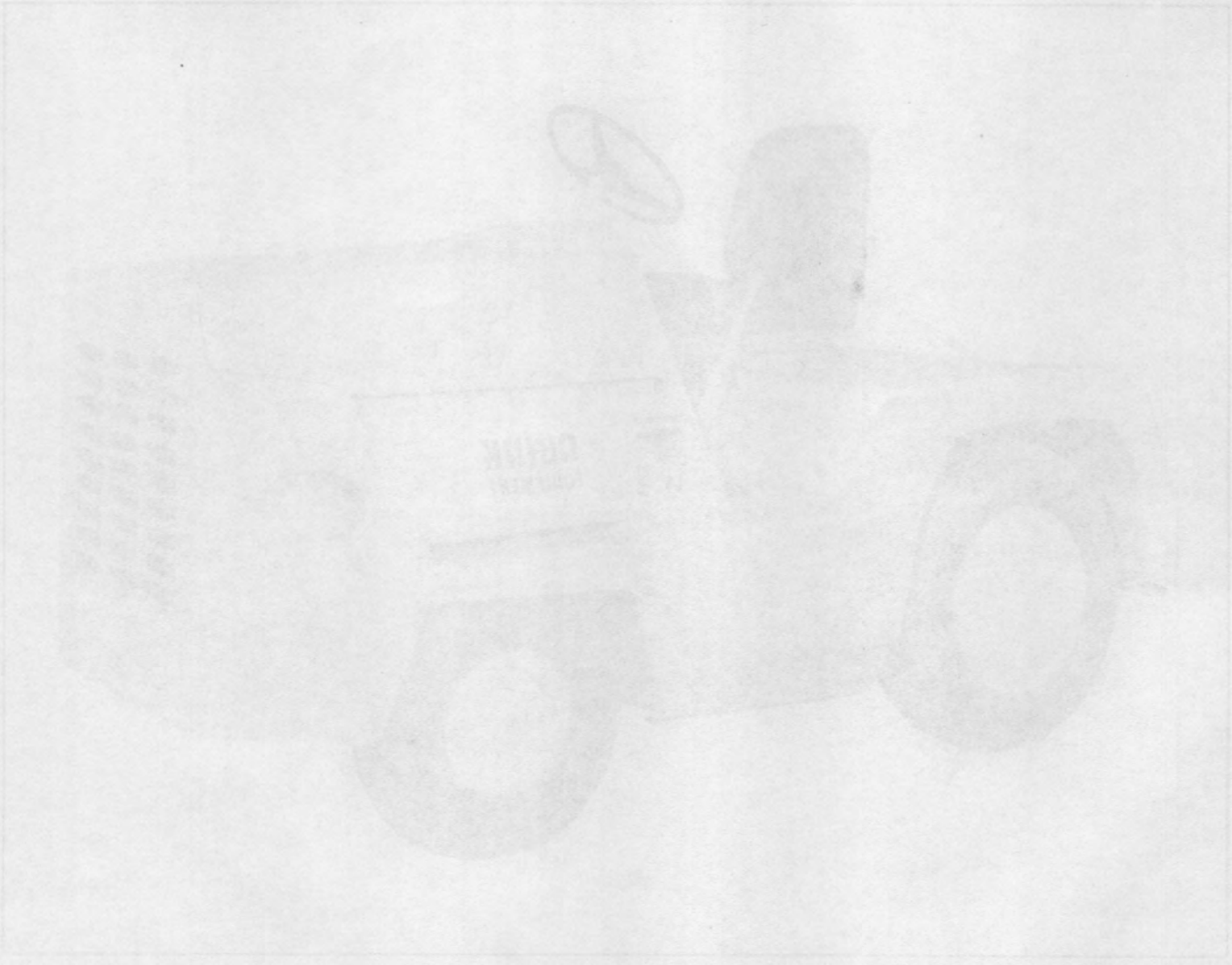


Plate 9284. Towing Tractor



INDUSTRIAL TRUCK DIVISION

S P E C I F I C A T I O N S (*NOTE)

GENERAL

Type of vehicle.....Tow Tractor

Single drive:
  Tread.....46 15/16"
Dual drive:
  Tread outside tires.....57 11/16"
  Tread inside tires.....39 3/16"

Turning radius, outside.....108"
Turning radius, inside:
  Single drive.....29"
  Dual drive.....25"

Ground clearance (under counterweight tow hitch or mounting).....11"
Ground clearance (under rear axle).....7"
Ground clearance (under front axle).....6 1/2"
Ground clearance between axles.....8"
Grade clearance.....34%

Draw bar pull.....
.....2000 to 5000 lbs., at 12" coupler height
Draw bar pull (empty).....1st gear at 3.2 MPH

Travel speeds:
  Empty: 1st.....5.5 MPH
  2nd.....8.9 MPH
  3rd.....13.1 MPH
  Rev.....6.5 MPH

*N O T E

Refer to DIESEL ENGINE MANUAL for machines so equipped.

ENGINE

Model.....EGW 240 IV-Six
Type.....(In-Line) O.H.V.
Number of cylinders.....6
Bore.....4.000
Stroke.....3.180
Displacement.....240 cu. in.
Governed speed (no-load).....2750 R.P.M.
Governed speed (loaded).....2600 R.P.M.
Maximum gross horse power @ 2750 RPM...94
Maximum torque @ 2400 RPM.....192 lb. ft.
Taxable horse power.....38.40
Firing order.....1-5-3-6-2-4
Engine idle.....500-550 RPM
Engine idle manifold vacuum.....17

N O T E

Minimum inches of mercury @ specified engine RPM (sea level). This includes automatic transmission in neutral.

Ignition timing (either transmission): 6° BTDC @ 500-550 RPM with distributor vacuum line disconnected.

N O T E

If the individual requirements of the vehicle and/or the use of sub-standard fuels dictate, the initial timing may have to be retarded from the recommended setting to eliminate detonation (spark knock). If retarding is necessary, it should be done progressively and not to exceed 2° BTDC.
For altitude operation, and/or to obtain optimum engine performance and fuel economy, the initial ignition timing may be advanced to a maximum of 5% in excess of the "normal" setting. No further improvement in engine performance or fuel economy will be achieved by advancing beyond this point. Advance the timing progressively until detonation (spark knock) is evident under actual road test acceleration. Retard the timing until the detonation (spark knock) is eliminated.

  Oil pressure.....35-60 PSI
  Valve lash (hot and cold).....0
  Crankcase capacity with filter...6 quarts
    Without filter.....5 quarts
  Lubrication system is pressure lubricated by submerged rotor-type oil pump.
Cooling system capacity.....16 quarts
Fuel tank capacity.....17 gallons
Fan belt (finger) deflection, short span..$\frac{1}{4}$-$\frac{1}{2}$"

CLUTCH

  Outside diameter.....12 inches
  Clutch pedal free travel approx..1/2-3/4"
  Clutch throw-out bearing greased for life.

TRANSMISSION (Standard)

  Speeds.....Fwd 3, Rev 1
  Gear ratio:
    First.....3.714 to 1
    Second.....1.871 to 1
    Third.....1.000 to 1
    Reverse.....4.588 to 1
  Capacity (lubricant) approx.....6$\frac{1}{4}$ pts

TORQUE CONVERTER

  Diameter.....12 inch
  Torque multiplication.....2.1 to 1.0

TRANSMISSION (Automatic)

  Speeds.....3 Fwd, 1 Rev
  Gear ratio:
    Low.....2.40 to 1.0
    Intermediate.....1.47 to 1.0
    High.....1.0 to 1.0
    Reverse.....2.0 to 1.0

Capacity.....22 Pints

STEER AXLE

Axle alignment:
Toe-in.....0°
Camber angle.....1°
Caster.....0°
Left-hand turning radius angle:
Left wheel.....56°
Right wheel.....36½°
Right-hand turning radius angle:
Left wheel.....36½°
Right wheel.....56°

DRIVE AXLE

Ratio.....17.311 to 1
Capacity.....10 Quarts

WHEELS AND TIRES (Dual and single drive)

Size: Front (steer).....6:50X10-6 ply
Rear (drive).....6:50X16-6 ply
Air pressure: Front (single drive)-40 lbs.
Rear (single & dual drive).....40 lbs.

SPLIT RIM WHEELS (standard or optional)

Drive wheels: Torque wheel nuts,
Single.....125-140 ft. lbs.
Dual.....200-225 ft. lbs.

Steer wheels: torque wheel nuts,
At.....60-75 ft. lbs.

N O T E

All torque specifications listed above are for dry thread only.

STEERING GEAR (torques all dry thread)

Pitman arm lock nut.....120-130 ft. lbs.
Mounting bolts & Clamp bolt-40-45 ft. lbs.

BRAKE SYSTEM

Type: Vacuum suspended tandem diaphragm power unit with dual system (split system) master cylinder.

Brake pedal free travel.....½"

DISTRIBUTOR

Cam angle range.....35-38°
Brush spring tension (ounces).....17-21
Contact spacing (inches)..... .024-.026
Shaft end play clearance..... .003-.010
Condenser:
Capacity (microfarads)..... .21-.25
Maximum leakage (megohms).....5
Maximum series resistance (ohms)...1

Coil:
Primary resistance wire (ohms).....
.....1.40-1.54 (75° F.)
Secondary resistance (ohms).....
.....8,000-8,800 (75° F.)
Amperage draw:
Engine stopped.....4.5
Engine idling.....2.5
Primary circuit resistor (ohms)
.....1.30-1.40 (75° F.)

DISTRIBUTOR ADVANCE CHARACTERISTICS

Distributor RPM 550 Maximum idle.

Ignition timing is advanced by counterclockwise rotation of the distributor body, while clockwise rotation retards timing.

When proper timing is obtained (refer to ignition timing, 1000H 001), tighten the distributor body clamp and connect the distributor vacuum line, then accelerate the engine while watching the timing mark with the timing light to determine if the advance mechanism is functioning. The pointer should advance as engine rpm increases. This check will confirm whether or not the advance mechanism is functioning, but it does not indicate proper distributor calibration.

In order to properly adjust the distributor advance, the distributor must be removed from the engine and checked on a distributor testing machine. If you do not have the proper equipment, and calibration is necessary, see your local Clark Equipment Industrial Truck Dealer. The distributor advance specifications are given in the following chart.

VACUUM ADVANCE

Test Stand Set to 0°@ 1,000 RPM & 0" of Mercury

Distributor RPM	Advance (Degrees)	Vacuum (") of Mercury	Maximum Advance
1000	1-4	8	8 1/2
1000	4-7	10	8 1/2
1000	5½-8½	17	8 1/2
600	0-1	0	11°
900	4-5¼	0	11°
1200	6-7¼	0	11°
1500	7-8¼	0	11°
2000	8½-10	0	11°

SPARK PLUGS

Gap (inches).....0.032-0.036
Torque.....15-20 Ft. Lbs.

BATTERY (Negative Ground)

Volts.....12
Number of cells.....6
Number of plates.....11
20 hour rate A.H.....70 ampere hours
300 amps., 0° F. (10 sec.)
2.0 minutes to one volt per cell.

STARTING MOTOR

Cranking speed (normal engine) RPM.....
.....250-290
Brush tension(Oz.).....40
Brushes (wear limit, inches).....0.25
Draw Current (amps) under normal load....
.....150-180
Volts (minimum stall torque @ volts)....5
Torque (ft lbs) min. stall torque @ 5
volts).....15.5
Maximum starting circuit voltage drop
(battery plus terminal to starter terminal)
@ normal engine temperature.....0.5 volts
Maximum load amperes.....670
No-load (amperes).....70
Mfg. length (inches).....0.5
Mounting bolt, 3-hole (5/16") bolt torque
Ft-lbs.....12-15
Mounting bolt, 2-hole (3/8") bolt torque
Ft-lbs.....15-20

ALTERNATOR

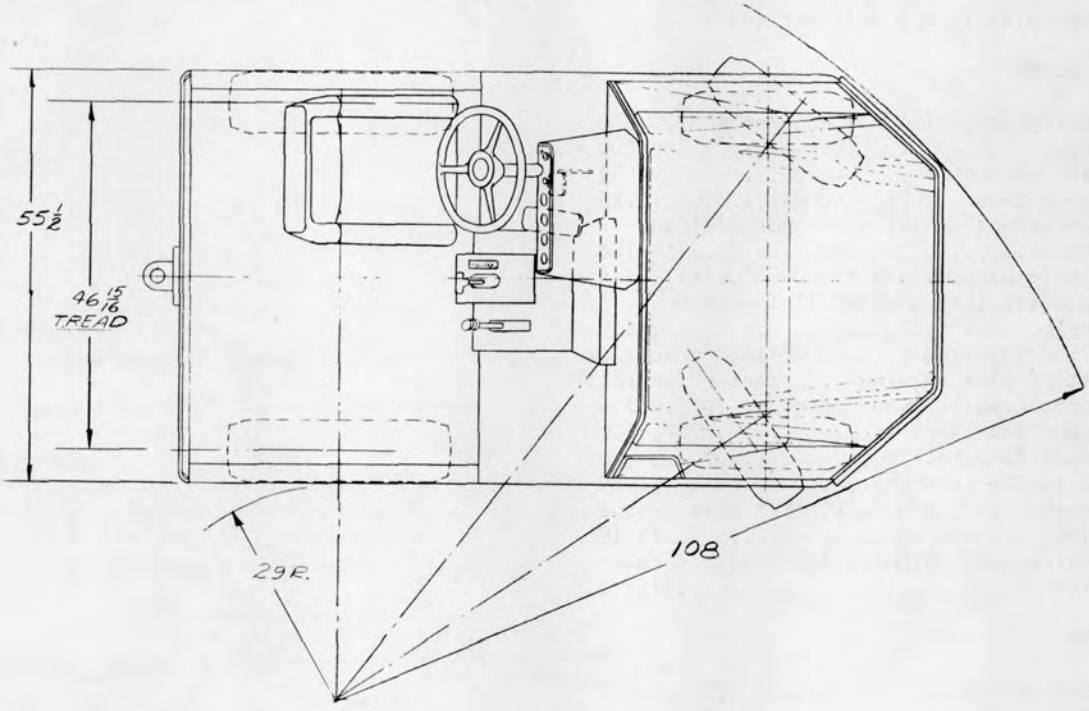
System voltage.....12
System ground.....negative
Amperes.....32
Maximum ambient temperature.....200° F
Rotation.....CW
Pulley nut torque.....40-60 lb.-ft.
Battery terminal nut.....20-25 in.-lb.
Ground terminal nut.....15-20 in.-lb.
Field coil draw.....
.....@ 80 F. 2.2-2.6 Amps @ 12 Volts
Rated Hot Output.....32 Amps
Output test @ 80° F:
14 Volts, 21 Amps @ 2000 RPM (Approx)
and 30 Amps @ 5000 RPM (Approx)
Chargine Starts Cold.....1000 RPM (Alternator)
Charging Starts Hot.....1050 RPM (Alternator)

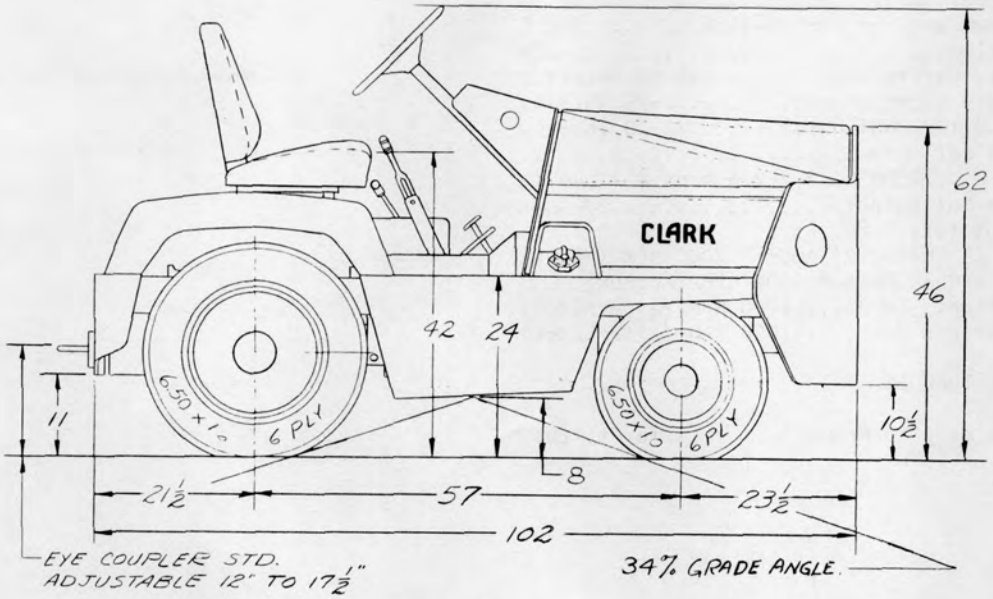
ADDITIONAL TORQUES

Drive axle to Frame.....218 Ft. Lbs.

DRAWBAR PULL. 2000, 3000, 4000, 5000

TIRES: DRIVE 6.50 x 16 - 6 PLY, STEER 6:50 x 10 - 6 PLY.





SINGLE DRIVE

ALTERNATOR

C A U T I O N

WELDING ON VEHICLES EQUIPPED WITH ALTERNATORS:

DISCONNECT ALTERNATOR BEFORE WELDING

ON VEHICLE FRAME OR DAMAGE WILL OCCUR

TO THE ALTERNATOR ASSEMBLY.

Specifications (Leece-Neville Alternator)

Ground	Circuit	Brush Spring Tension Ounces		Field Current (80°F.) Amps.		Volts.
		New	Used	Cold	Hot	
N/P*	B	10 - oz	- 7	3	2	12

Cold Output

At Specified Voltage

Specified Volts	Approx. Amps.	Approx. RPM	Amps.	RPM	Hot Output (Amps.)
14	22	1000			60

N/P ... Negative or Positive Ground

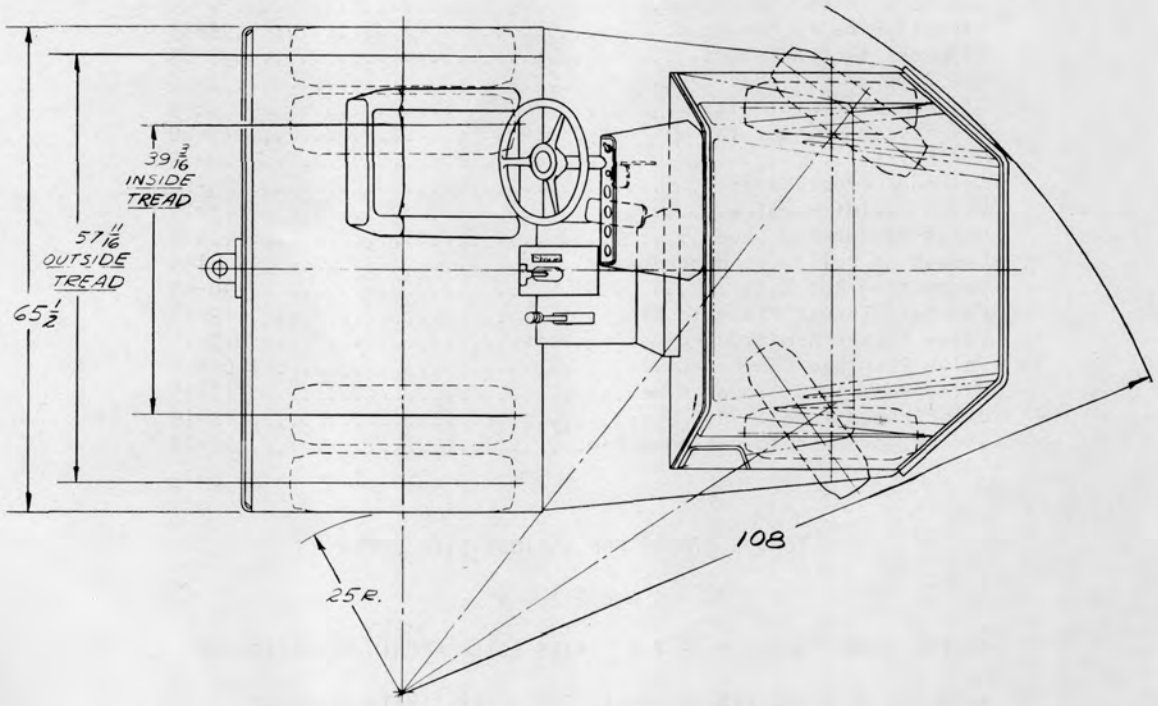
* ... Ground being Negative or Positive depends on whether the regulator is a Negative or Positive ground regulator.

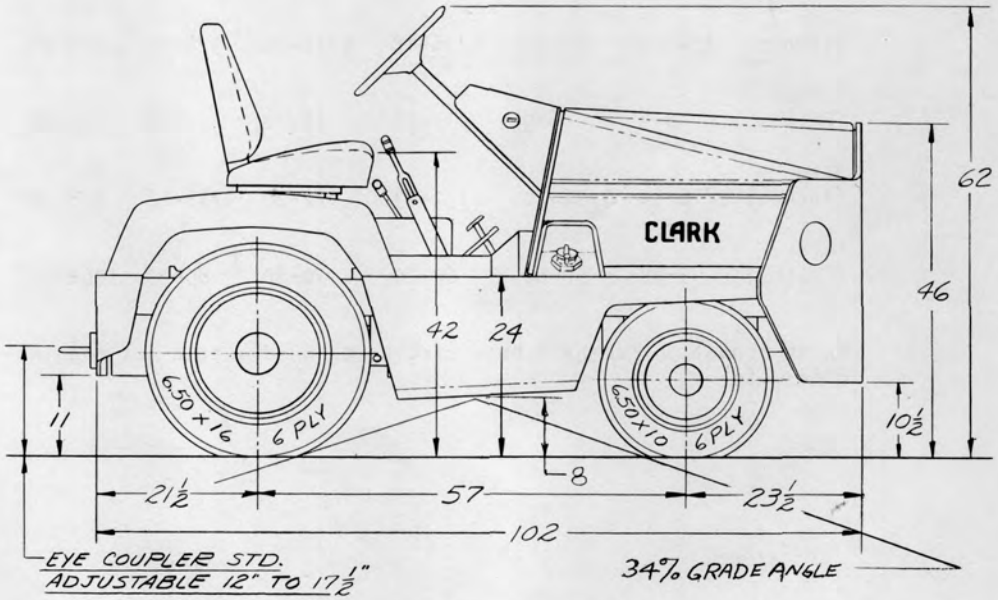
"A" circuit: Those alternators which have their field winding grounded in the regulator.

"B" circuit: Those alternators which have their field winding grounded at the alternator.

DRAWBAR PULL: 2000, 3000, 4000, 5000

TIRES: DRIVE 6.50 x 16 - 6 PLY, STEER 6.50 x 10 - 6 PLY.





DUAL DRIVE

TORQUE LIMITS....FOOT-POUNDS

Main Bearing Cap Bolts (Oiled Threads)	60-70
Cylinder Head Bolts (Oiled Threads)	70-75
Oil Pan to Cylinder Block	10-12
Manifold to Cylinder Head	20-25
Exhaust Pipe to Manifold	25-35
Flywheel to Crankshaft	75-85
Oil Pump to Cylinder Block	12-15
Oil Pump to Cover Plate	6-9
Oil Filter Adapter to Cylinder Block	15-20
Oil Filter	20-25
Cylinder Front Cover	15-20
Water Outlet Housing	12-15
Valve Rocker Arm Cover	4-7
Damper or Pulley to Crankshaft	130-145
Connecting Rod Nuts	40-45
Camshaft Thrust Plate to Block	19-21
Valve Rocker Arm Stud Adjusting Nut*	4.5-15
Valve Push Rod Chamber Cover	1.0-1.5
Water Pump to Cylinder Block	12-15
Oil Pick-up Tube to Oil Pump	12-15
Engine Governor to Cylinder Block	23-28

TORQUE LIMITS FOR VARIOUS SIZE BOLTS

CAUTION

IN THE EVENT THAT ANY OF THE LIMITS BELOW ARE IN DISAGREEMENT WITH ANY OF THOSE LISTED ABOVE, THE ABOVE LIMITS PREVAIL.

Size (Inches)	1/4-20	1/4-28	5/16-18	5/16-24	3/8-16	3/8-24
Torque (Ft.Lbs.)	6-9	6-9	12-15	15-18	23-28	30-35

Size (Inches)	7/16-14	7/16-20	1/2-13	1/2-20	9/16-18	5/8-18
Torque (Ft.Lbs.)	45-50	50-60	60-70	70-80	85-95	130-145

*With tappet on camshaft base circle, turn adjusting nut counter-clockwise.

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 003
Engine Crankcase, Drain and Refill	100H 003
Engine Oil Filter, Change	100H 003
Fan Belt, Adjust	100H 203
Hand Brake, Adjust	1000H 1103
Intake and Exhaust Manifold, Tighten	500H 403
Lubricate Machine	100H 703
Nuts, Bolts and Capscrews, Tighten	500H 403
Steering Gear Level Check	100H 603
Transmission and Converter Level Check	100H 001
Differential and Drop Gear Case	1000H 1303

N O T E

Perform this service and inspection after the first 50 hours of operation on new machines.

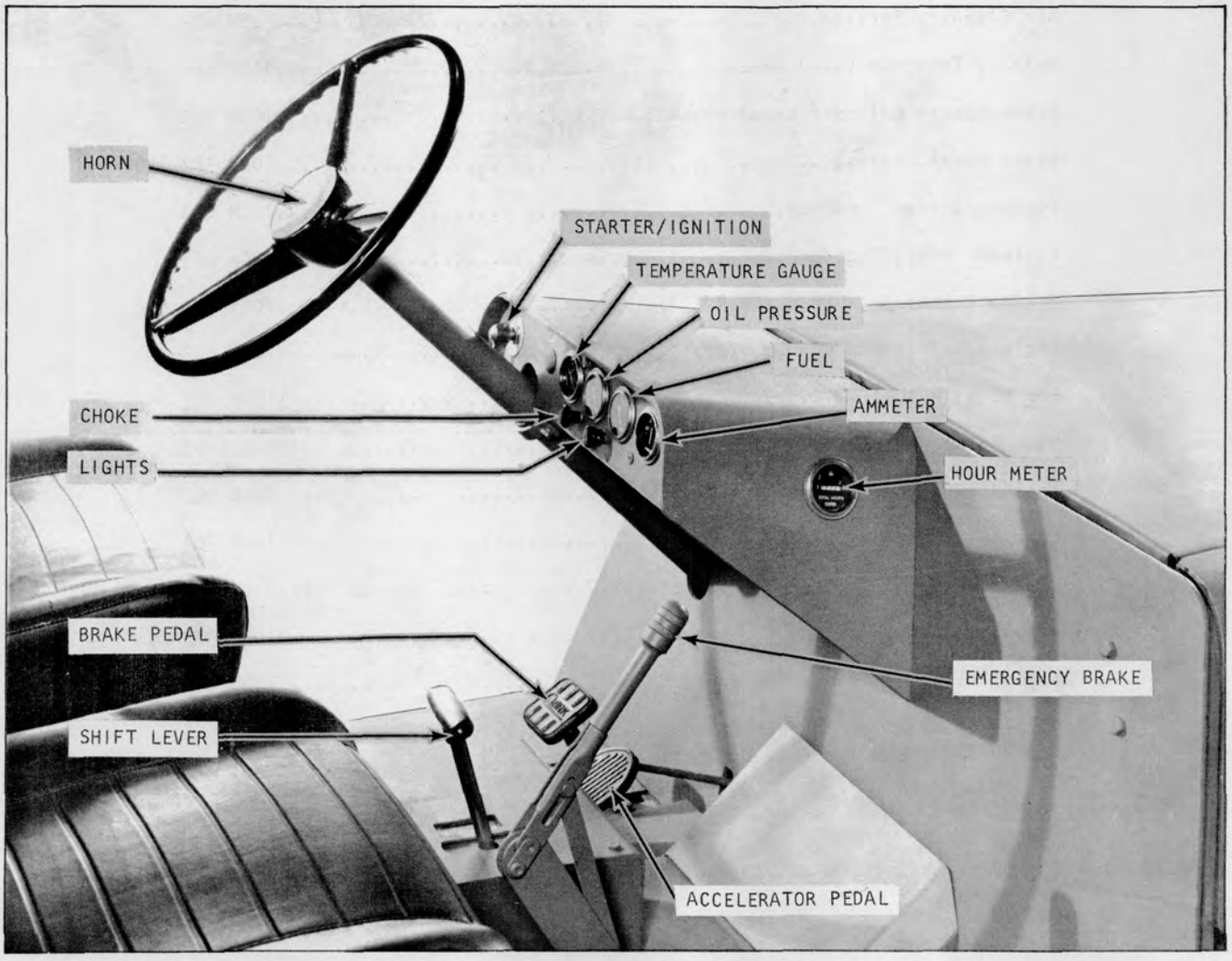


Plate 9281. Location of Controls

MACHINE CONTROLS

Shift Lever The shift lever is used to direct the tractor transmission which supplies the vehicle with three forward speeds and one reverse. A shifting diagram aids the operator in selecting correct gear.

Hand Brake The hand brake, which is connected to the transmission drive shaft, is used for securing machine on a reasonable grade and parking.

Instrument Panel The panel contains the following engine instruments: Ammeter, hour meter, oil pressure, water temperature and fuel indicator. It also contains a light switch, choke button and a combination ignition and starter switch.

Plate 8606. Oil Pressure Indicator

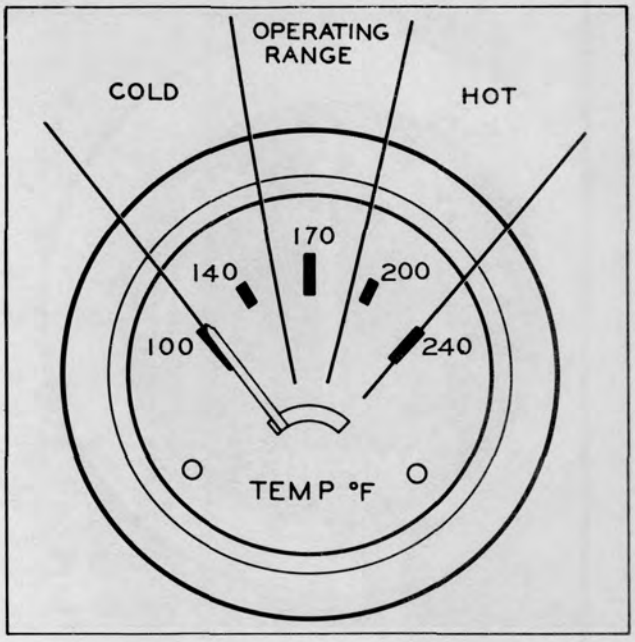


Plate 9283. Engine Temperature Indicator

MACHINE INSTRUMENTS

Oil Pressure Indicator Your machine engine oil pressure should read as marked in the illustration soon after starting the engine depending on the temperature of the engine. Before placing machine in operation, run engine a few minutes to warm oil especially in cold operating conditions.

C A U T I O N

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 ENGINE, RUN IT AT IDLE FOR FIVE MINUTES, THEN STOP ENGINE AND RECHECK OIL LEVEL IN CRANKCASE. BRING OIL LEVEL TO HIGH MARK, IF NECESSARY.

Engine Temperature Indicator The coolant temperature should register around 170 degrees Fahrenheit after the first ten or fifteen minutes of operation.

N O T E

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.

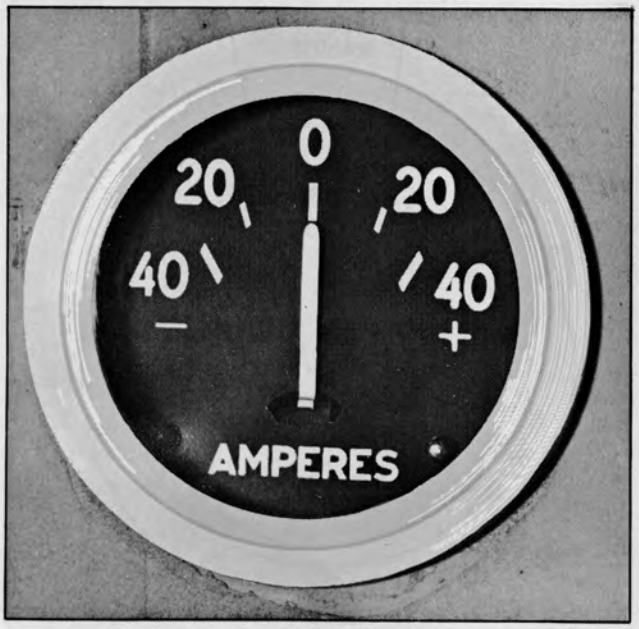


Plate 7647. Ammeter

Plate 7162. Hour Meter

AMMETER

The ammeter is connected in the generator (or alternator if used) and battery circuit in such a manner as to indicate rate of charge or discharge. If the generator (or alternator) is functioning properly the ammeter should show a small amount of charge at engine idle. As engine R.P.M. increases the rate of charge also increases. When the battery becomes fully charged the circuit is regulated to reduce the rate of charge and cause the ammeter needle to return to near neutral position, showing only a small amount of charge.

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 preventative maintenance services.

N O T E

Refer to DIESEL ENGINE MANUAL for machines so equipped.

Plate 9282. Ignition/Starter Switch

ENGINE OPERATION

Starting With accelerator about 1/3 open, pull out on choke button. Place shift lever in neutral position. Turn ignition switch to start position and engage starter. If all necessary equipment is in correct working order, the engine will start. Starter should not be engaged longer than 15 second periods at a time. If the engine does not start at first attempt, allow 10 to 15 seconds time to elapse, then repeat. If the engine becomes over-choked or flooded, depress the accelerator pedal to full depressed position and engage the starter. After the engine starts, let up on the accelerator pedal to obtain desired engine speed and watch oil pressure indicator. Run engine a few minutes to warm oil before putting machine to work...especially in cold operating conditions. If oil pressure does not build up immediately stop the engine and investigate the cause.

C A U T I O N

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

Driving The Vehicle When the vehicle is to be placed into motion, depress the brake pedal and release the hand brake. Release pressure on the accelerator pedal, allowing the engine to idle. Select the proper driving range to start the intended load.

Release the pressure on the brake pedal and slowly depress the accelerator pedal to place the vehicle in motion. Particular attention should be given to the following regarding the use of the automatic transmission:

When shifting from any forward gear selector position to reverse, the machine must be brought to a complete stop to safe guard the internal parts of the transmission. Anytime the machine is stopped longer than a minute or so with the engine running, the transmission should be placed in neutral for the same reason.

TO STOP VEHICLE

N O T E

This machine is equipped with a dual (power brake) brake system. A hydraulic failure in one of the systems does not affect the other.. If one system should fail, this will be indicated by greater pedal travel and braking effort to stop in the vehicle's normal stopping distance.

1. Remove foot from accelerator pedal.
2. Depress foot brake pedal.
3. As vehicle comes to a halt, place gear shift lever into neutral position.
4. If vehicle is to be parked, turn ignition switch to the off position and apply the hand brake.

Brake Warning Light (Optional Equipment) This machine is equipped with a dual master cylinder to which is attached a brake warning light switch. Whenever either brake system fails, a difference of hydraulic pressure within the switch causes a circuit to close and turns on the brake warning light which is located on the instrument panel.

C A U T I O N

DO NOT RIDE THE BRAKE PEDAL. THIS CAUSES SLIPPAGE OF THE TRANSMISSION SELECTOR PACKS. OVERHEATING, UNNECESSARY WEAR AND DAMAGE WILL OCCUR. ALSO, IF THE ENGINE HAS BEEN OPERATING AT CAPACITY, THE ENGINE SHOULD BE IDLED FOR 2 MINUTES BEFORE SHUT DOWN TO EQUALIZE INTERNAL ENGINE TEMPERATURES.

CAUTION

AUTOMATIC TRANSMISSION FLUID.....TYPE "F"

FORD AUTOMATIC TRANSMISSION IN CLARKTOR E MODELS. USE TYPE "F" AUTOMATIC TRANSMISSION FLUID ONLY! FORD MOTOR COMPANY SPECIFICATION M2C-33D OR M2C-33E. TYPE "A" AUTOMATIC TRANSMISSION FLUID SHOULD NOT BE USED IN THESE MACHINES. FORD MOTOR COMPANY HAS ADVISED US THAT THEIR AUTOMATIC TRANSMISSIONS MUST BE FILLED WITH TYPE "F" AUTOMATIC TRANSMISSION FLUID AND NOT WITH TYPE "A" FLUID.

TYPE "A" AND TYPE "F" FLUIDS ARE NOT COMPATIBLE AND SHOULD NOT BE MIXED. FURTHER, CLUTCH DISC FACINGS USED IN THE FORD AUTOMATIC TRANSMISSION WERE DESIGNED FOR TYPE "F" FLUID ONLY. THE USE OF ANY OTHER TYPE FLUIDS WILL PERMANENTLY DAMAGE TRANSMISSION AND VOID WARRANTY.

SAFETY PRECAUTIONS

1. Only qualified drivers should be allowed to operate the vehicle.

2. Do not tow a train of more than three trailers.

3. Drive slowly in rough or congested areas.

4. Do not drive with wet or greasy hands.

5. Observe the Operating Rules and Preventive Maintenance Instructions A.S.A. B56.1 Safety Code for Powered Industrial Trucks.

6. Avoid making sudden stops or starts.

7. When backing, be sure to look for fellow workers before moving machine.

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

9. Do not allow anyone to ride on this machine unless a standard seat is provided.

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

11. Observe highway safety rules in operation of vehicle in buildings as well as out.

12. Drive carefully on wet or slippery driving areas.

13. Keep hands, elbows and feet within running line of truck.

14. Do not operate machine for prolonged periods in an unventilated area.

15. Be sure brakes, tires and steering are in proper condition at all times.

N O T E

A 1,000 POUND TRACTOR DRAWBAR PULL WILL EQUAL A 10,000 POUND LOAD ON A FOUR WHEEL TRAILER (INCLUDING THE WEIGHT OF THE TRAILER.)

INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS

DISTRIBUTOR (All FOUR and SIX Cylinder Engines)

N O T E

Distributors are equipped with either Standard or Heavy Duty Points. Heavy Duty Points are thicker (have more contact material) than Standard Points.

Heavy Duty Points - All FOUR Cylinder Engines
Set Dwell Angle at.....31° - 34°

Heavy Duty Points - All SIX Cylinder Engines
Set Dwell Angle at.....22° - 26°

Heavy Duty Points

When connecting leads, terminals must be back to back (flat sides together). Push into slot between insulator and spring. (DO NOT push lever spring.) Then push other terminal in place between first terminal and insulator. See following illustration.

WHEN CONNECTING LEADS, THE TERMINALS MUST BE BACK TO BACK (flat sides together).....

- FOUR (4) CYLINDER ENGINES, ONLY -

Point Opening (in.)	Dwell Angle (deg.)	Centrifugal Advance							
		START		INTERMEDIATE		INTERMEDIATE		MAXIMUM	
		Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.
.022*	31-34	600	1-5	800	6-10	1600	11-15	2200	15-19
.021**	31-34	600	1-5	800	6-10	1600	11-15	2200	15-19

- SIX (6) CYLINDER ENGINES, ONLY -

Point Opening (in.)	Dwell Angle (deg.)	Centrifugal Advance							
		START		INTERMEDIATE		INTERMEDIATE		MAXIMUM	
		Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.	Eng.rpm.	Eng.adv.
.020*	28-32	600	1-5	800	6-10	1600	11-15	2200	15-19
.021**	22-26	600	1-5	800	6-10	1600	11-15	2200	15-19

N O T E

Time engine with timing light and tachometer at 400 engine RPM or below to the above specifications. The initial advance RPM range is 430 - 580. Distributor advance at 600 engine RPM should be 1° to 5°. Distributor rotation (as viewed from cap end) is counterclockwise.

When checking Distributor on a test stand, the above specifications are 1/2 that shown.

*..... Four (4) or Six (6) Cylinder Engine STANDARD Points.
**..... Four (4) or Six (6) Cylinder Engine HEAVY DUTY Points.

START ENGINE, WARM IT UP ... SHUT IT OFF

ADJUST TAPPETS TO THE STATIC WARM SETTINGS LISTED BELOW:

Engine Model	Intake Valves	Exhaust Valves	
Y-112	.012 inch	.020 inch	STATIC WARM SETTING

NOTE: The above is effective with Engine Specifications No. *8054 and above. Refer to the Engine Name Plate on the engine.

*For tappet settings on units built prior to this specification number, refer to "Static Cold Setting Adjustments" listed below.

F-135 F-163 F-227 F-245	.012 inch	.020 inch	STATIC WARM SETTING

ADJUST TAPPETS TO THE STATIC COLD SETTINGS LISTED BELOW:

Engine Model	Intake Valves	Exhaust Valves	
Y-112	.014 inch	.014 inch	STATIC COLD SETTING

NOTE: *The Static Cold Settings are effective with all Y-112 engines built prior to Engine Specification No. 8054. Refer to the Engine Name Plate located on the side of the engine.

Y-69 Y-91	.014 inch	.014 inch	STATIC COLD SETTING
F-124 F-140 F-162 F-186 F-209 F-226	.016 inch	.018 inch	STATIC COLD SETTING

NOTE: ENGINE "NAMEPLATE" SPECIFY TAPPET SETTINGS AT "HOT IDLE" ONLY.

VEHICLES EQUIPPED WITH CONTINENTAL ENGINES.

FUEL HANDLING AND STORAGE SAFETY

Liquefied Petroleum Gas Fuel (LPG Powered Trucks)

1. The storage and handling of liquefied petroleum gas (LP-Gas) should be in accordance with the Standard for Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58, USA Standard Z106.1-1965).

2. Trucks using LP-Gas should be refueled only at locations designated for that purpose. Safe outdoor locations are preferable to indoor. Trucks should be refueled as provided in the Standard for the Storage and Handling of Liquefied Petroleum Gases (NFPA No. 58, USA Standard Z106.1-1965.)

3. Reasonable care should be exercised in handling of LP-Gas containers to avoid damage. Do not drop, throw, roll, or drag LP-Gas containers or any associated parts of the containers or fuel systems.

4. Do not over-fill LP-Gas containers.

5. Engine should be stopped and operator off the truck during refueling.

6. Trained and designated personnel should recharge or exchange LP-Gas containers.

7. Personnel engaged in recharging of LP-Gas containers should wear protective clothing such as face shield, long sleeves, and gauntlet gloves.

8. Never use a match or flame to check for leaks, use a soap solution.

9. LP-Gas powered trucks should not be refueled nor stored near underground entrances, elevator shafts nor any other place where LP-Gas could collect in a pocket causing a potentially dangerous condition.

10. Trucks equipped with permanently mounted LP-Gas containers should be refueled outdoors.

11. Exchange of removable LP-Gas containers preferably should be done outdoors, but may be done indoors. Means should be provided in the fuel system to minimize the escape of fuel when the containers are exchanged. This should be accomplished by either of the following methods:

A. Using an automatic quick closing coupling (a type closing in both directions when uncoupled) in the fuel line, or.....

B. Closing the valve at the LP-Gas container and allowing the engine to run until the fuel in the line is consumed.

12. When installing removable LP-Gas containers they should be so located on the truck that the safety pressure relief valve opening is always in contact with the vapor space (top) of the cylinder. This is accomplished by an indexing pin which, when the tank is properly installed, positions the container.

13. All reserve LP-Gas containers should be stored and transported with the service valve closed. Safety relief valves should have direct communication with the vapor space of the container at all times.

14. The careless handling of LP-Gas containers can result in a serious accident. Extreme care should be exercised when transporting containers so that they are not accidentally dropped or physically damaged. When it is necessary to move more than one container at one time, a proper carrying device should be provided.

15. Physical damage such as dents, scrapes, or gouges, may materially weaken the structure of the LP-Gas container and render it unsafe for use. All LP-Gas containers should be examined before recharging and again before reuse, for the following defects or damage:

A. Dents, scrapes, and gouges of the pressure vessel.

B. Damage to the various valves and liquid level gage.

C. Debris in the relief valve.

D. Indications of leakage at valves or threaded connections.

E. Deterioration damage or loss of flexible seals in the fill or servicing connections.

All defective or damaged LP-Gas containers should be removed from service.

16. Smoking should be prohibited in the refueling area.

17. Whenever vehicles using LP-Gas as a fuel are parked overnight or stored for protracted periods of time indoors, with the fuel container in place, the service valve on the fuel container should be closed.

When checking or adjusting L.P. Gas equipment be sure to:

1. Properly ventilate work area.

2. Eliminate ignition sources (sparks, pilot lights etc.).

3. Prohibit smoking.

4. Have fire fighting equipment present.

5. Check all equipment, lines, connections with soapy water. NEVER USE A MATCH OR FLAME WHEN CHECKING FOR LEAKS.

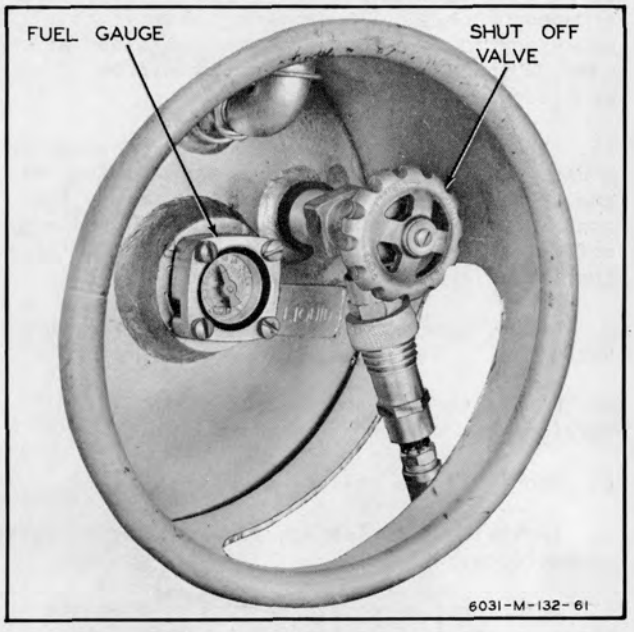


Plate 6031. Typical L.P. Gas Container

6. Check cylinder (container) for security of mounting.

7. Inspect hoses, grommets or whatever means is used to protect hoses from damage where they run through sheet metal etc. Replace any component that is unfit for further service.

8. Check all equipment for security of mounting.

9. Check the Solenoid Lock-Off Valve to be sure it is working. Upon turning off the ignition switch there should be an audible click indicating the valve has actuated shutting off the fuel flow at the valve. The valve should not open again until the ignition switch is turned on and the engine cranked. Cranking the engine provides oil pressure to the engine oil pressure sending unit which actuates completing an electrical circuit to the solenoid lock-off valve. The valve then opens allowing the L.P. Gas to pass through.

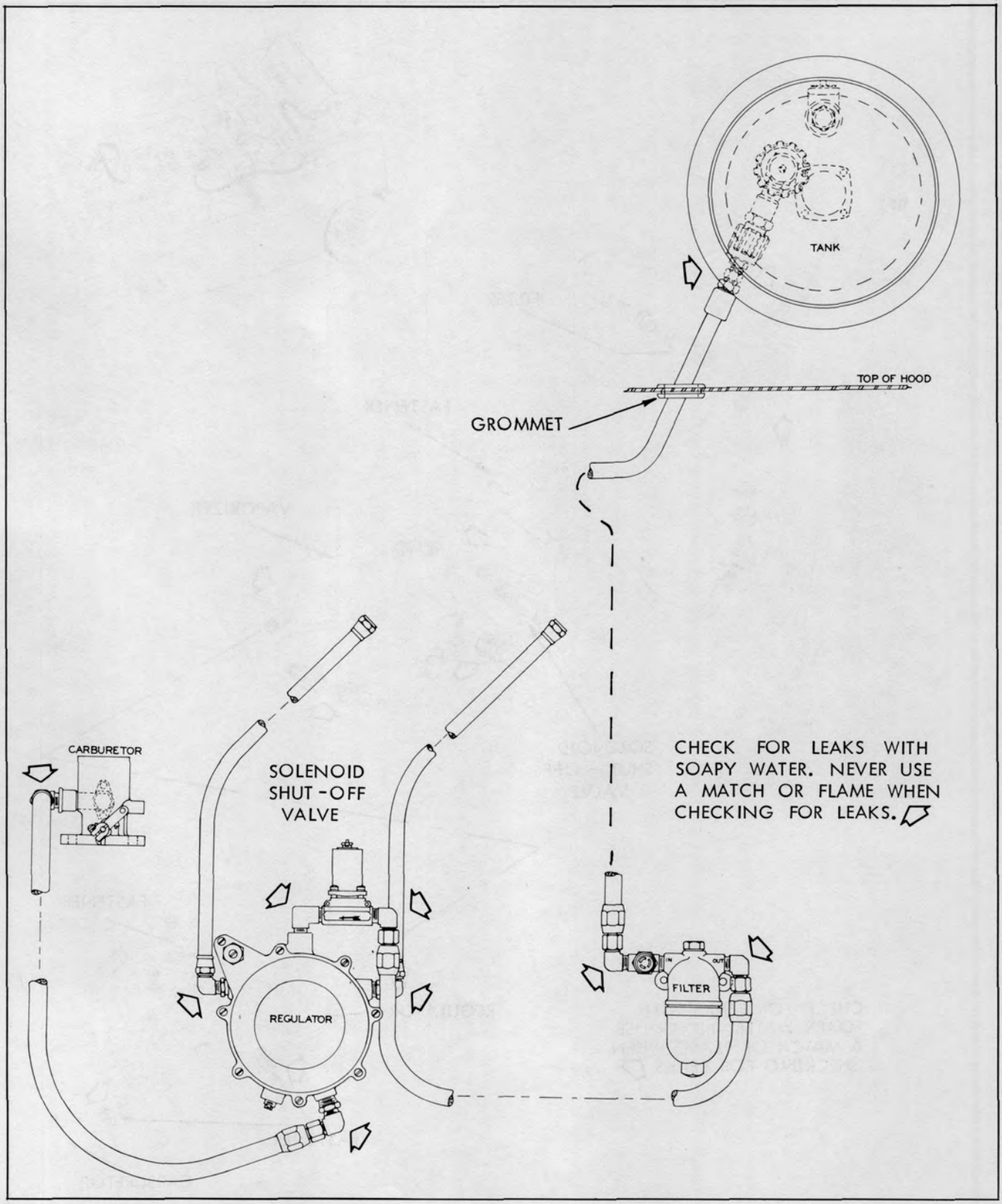


Plate 7405. Typical L.P. GAS Installation

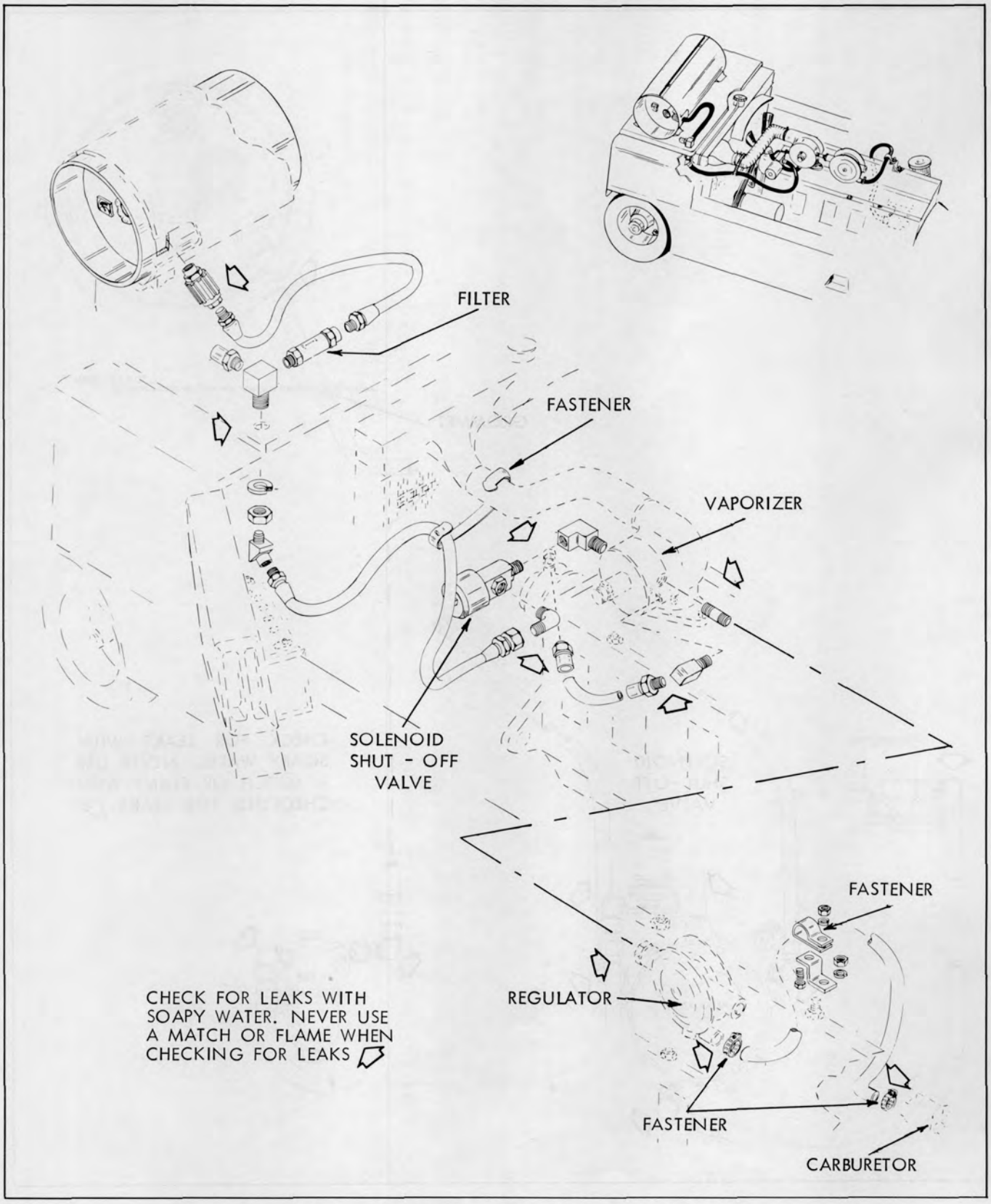


Plate 7406. Typical L.P. GAS Installation

FUEL HANDLING AND STORAGE SAFETY

(Gasoline Powered Trucks)

Liquid Fuels. (Such as Gasoline and Diesel Fuel).

1. The storage and handling of liquid fuels should be in accordance with the Flammable and Combustible Liquids Code. (NFPA No. 30).

2. Trucks using liquid fuels should be refueled only at locations designated for that purpose. Safe outdoor locations are preferable to those indoors. The Flammable and Combustible Liquids Code (NFPA No. 30), Paragraph 7211, outlines recommendations for arranging safe indoor fueling facilities.

3. Engines should be stopped and operator off the truck during refueling.

4. Liquid fuels not handled in approved dispensing pumps should be transported in safety cans. Safety cans should be inspected regularly for damage to closures and for leaks; faulty cans repaired or replaced. Care should be exercised in handling of safety cans to avoid damage.

5. Reasonable care should be exercised to prevent the spillage of fuel or overfilling either the vehicle fuel tanks or safety cans. Filler cap should be replaced and any spilled fuel disposed of by using a noncombustible adsorbent before the engine is restarted.

6. Smoking should be prohibited in the refueling area.

SERVICE RECORDER:

The service recorder records number of productive lifts in addition to busy and idle time of each truck. The records are made on a 6-inch diameter chart, revolving once. This model records the raising or lowering of a predetermined load. The limits generally are between 5% of the truck's capacity and a full load. Minimums may be established, and the chart will show only those lifts of the minimum weight or greater. Selective load records are made by using an adjustable pressure switch. This switch fits into the hydraulic system between the lift control and the cylinder. It is sensitive to system pressure changes but insensitive to surges or vibration. Switch setting can be adjusted externally and then sealed. The load recording stylus is always in contact with the chart. When the predetermined load or more is lifted, an electrical circuit is closed and this stylus is lifted up, making a record. A surge dampener is recommended particularly when lift trucks are in service where rough or uneven floors occur.

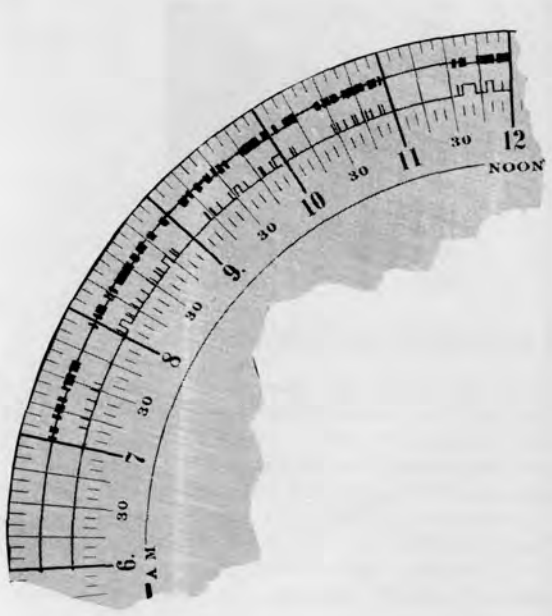


Plate 10161. Service Recorder Chart

HOW TO OPERATE SERVICE RECORDERS

Wind the Clock Movement: No key is needed. Turn the star-shaped winding disc clockwise until the movement is wound fairly tight. Do not overwind. It is a good practice to wind the clock each time a chart is changed even if it is not run down.

Plate 10164

Place Chart in the Recorder: Snap up the two finger-like clamps. Slip the chart down over the now vertical clamps to the face of the winding disc.

Plate 10165

To Set the Chart: Before clamping it down, turn the chart so that the place on it that corresponds to the present time of the day is at the little white spot on rim of Recorder case. If this is not done correctly, the recorder will be "that much off" all day.

Plate 10166

Fasten the Chart in Place By snapping down the two clamping fingers. Now close and lock the Recorder and it is ready to operate for its full cycle, the length of time depending on the model and clock speed.

Plate 10167

HOW TO READ THE CHART:

This section of chart shows a typical record. The wide marks in the outer record band show when the truck was in motion. The fine line shows down time.

Inner record band shows lifts. Load recording stylus normally rests at lower or inner position. When activated by pressure switch, it is moved outward to record each lift.

Plate 10162. Service Recorder Chart

When the key is turned to lock or unlock the Recorder, the stylus makes a round dot at the exact time of locking or unlocking. The mark appears on the face of the chart, and it is also embossed on the back. It is unmistakable.

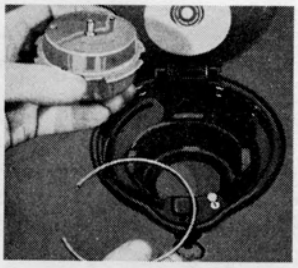


Plate 10163. Clock Exchange

HOW TO EXCHANGE CLOCK MOVEMENTS:

A clock movement is inherently a delicate mechanism that should receive reasonably good care. We have tried to make the clocks in Servis Recorders as rugged as possible to withstand the rough use they sometimes get. If the clock should fail, it can be easily lifted out and mailed in for repair or replacement. Merely unscrew the winding disc by turning it counter-clockwise and pry out wire retaining ring.

To replace the clock movement, first notice that one of the four retaining lugs in the Recorder case is wider than the rest. Match this wide space in movement top and settle movement into place. Then force wire retaining ring into place securely under lugs.

It is a good policy to have a spare clock movement in stock to insure uninterrupted service. Extra clocks are inexpensive.

INDUSTRIAL TRUCK DIVISION

LU RICATION AND PREVENTIVE MAINTENANCE INDEX

CLARK EQUIPMENT

INDUSTRIAL TRUCK DIVISION

SERVICE ENGINEERING DEPARTMENT, BATTLE CREEK

CLARK EQUIPMENT

WORK SAFELY

DRIVE SAFELY

BE CAREFUL

ALWAYS

GIVE MACHINE SERIAL NUMBER

WHEN ORDERING PARTS

Rev OCT 73 1127-Z

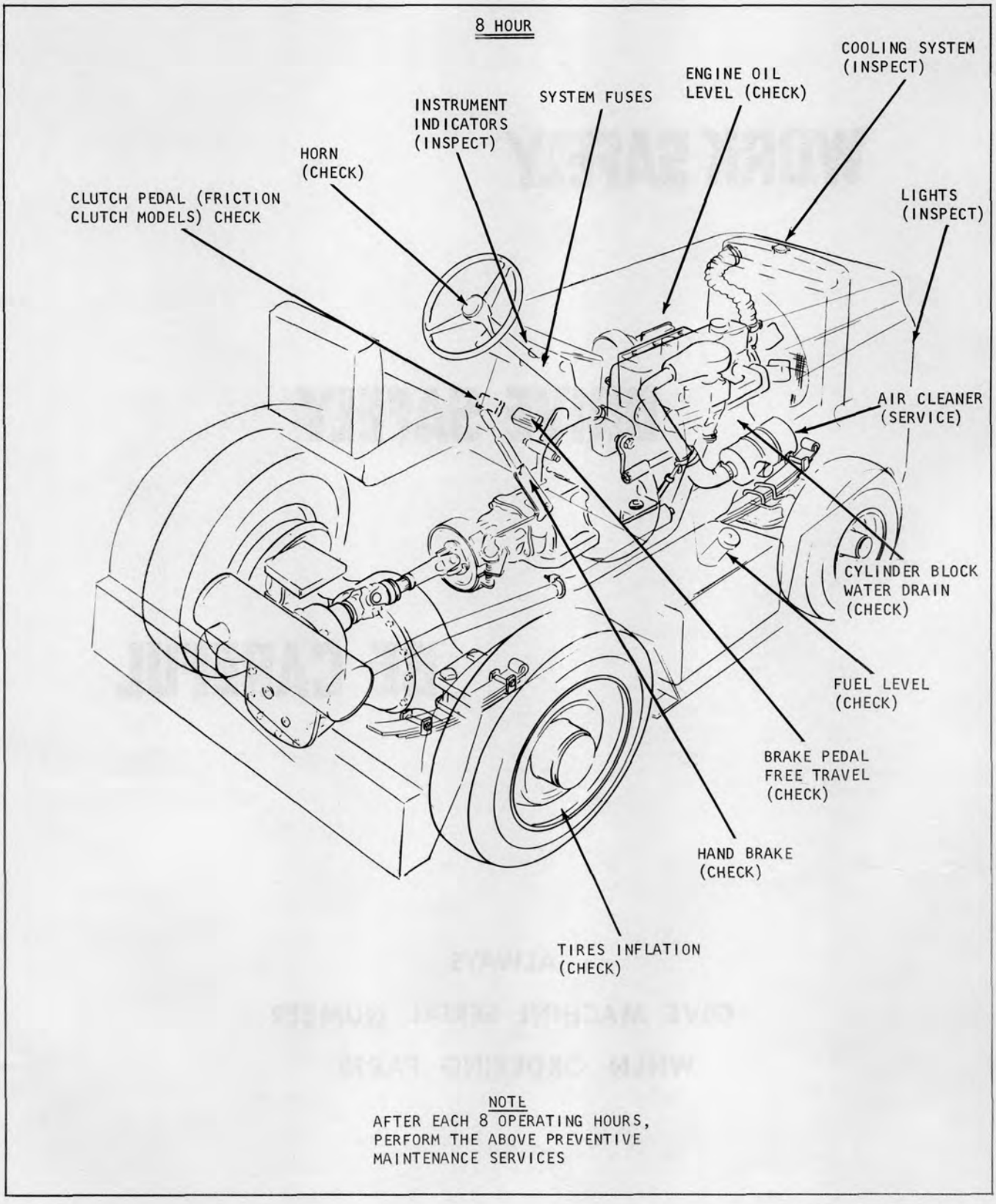


Plate 9155. Lubrication and Preventive Maintenance Illustration

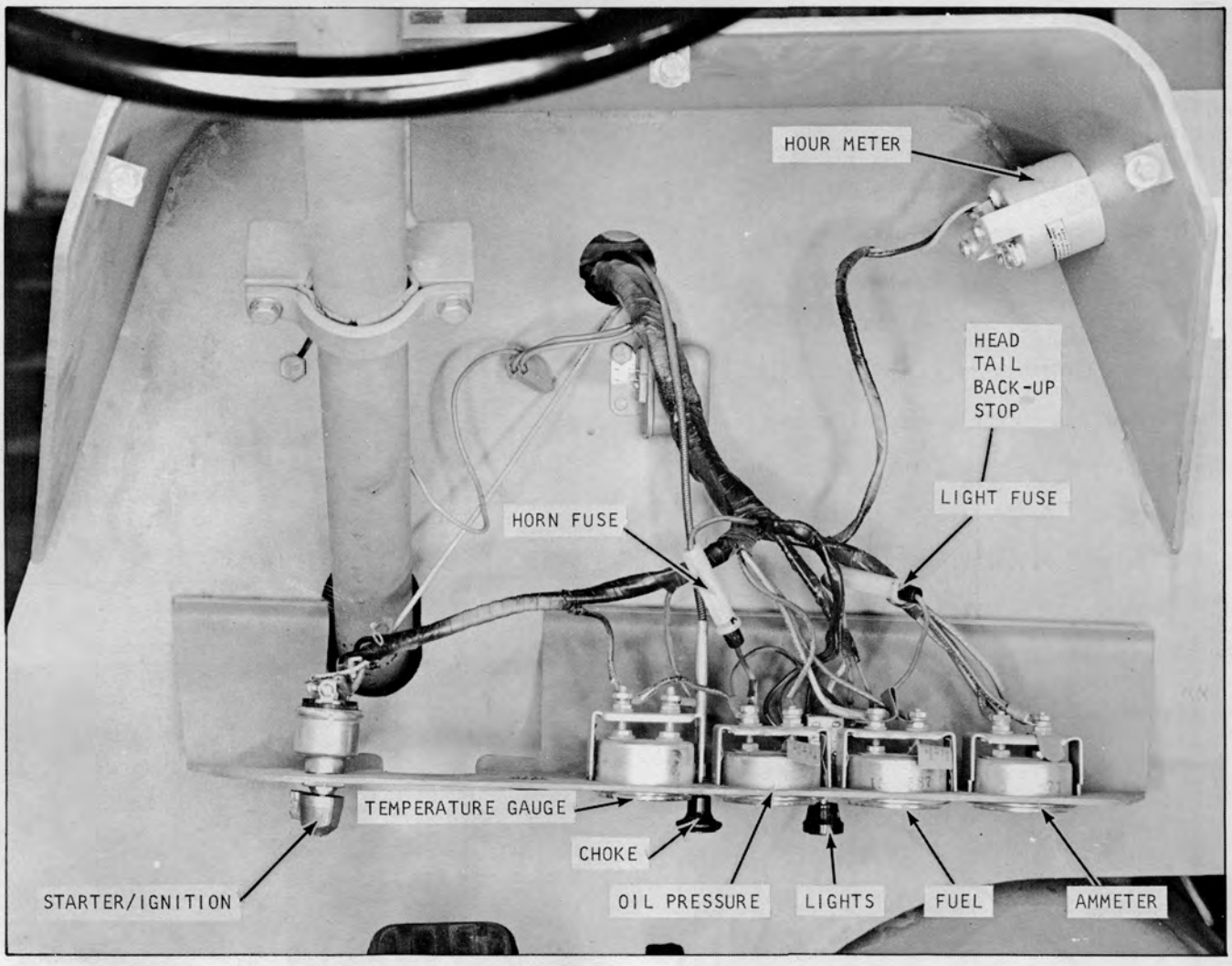


Plate 9162. Electrical System Fuses

HORN

Check to be sure the horn is working properly.

FUEL TANK

Check fuel supply and fill if necessary. Use a good grade of gasoline, 90-94 octane (regular). Before filling the tank, make certain the filler cap screen is in place and not damaged. (Machines so equipped).

Diesel Engines: Refer to the diesel Operator/Maintenance manual for fuel recommendations.

TIRE INFLATION

Check tires for proper inflation.

Front.....40 lbs.

Rear.....40 lbs.

ENGINE CRANKCASE

Before attempting to start the engine, first make sure that it has sufficient oil. The oil filler opening is located on the top of the rocker arm cover. The oil level stick is of the dipstick type and is located on the left side of the engine. Fill the crankcase reservoir through the oil filler opening 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 AND CAUSE EXCESSIVE QUANTITIES OF OIL TO BE THROWN TO THE CYLINDER WALLS RESULTING IN OIL CONSUMPTION, SMOKING, EXCESSIVE CARBON DEPOSITS AND FOULED SPARK PLUGS.

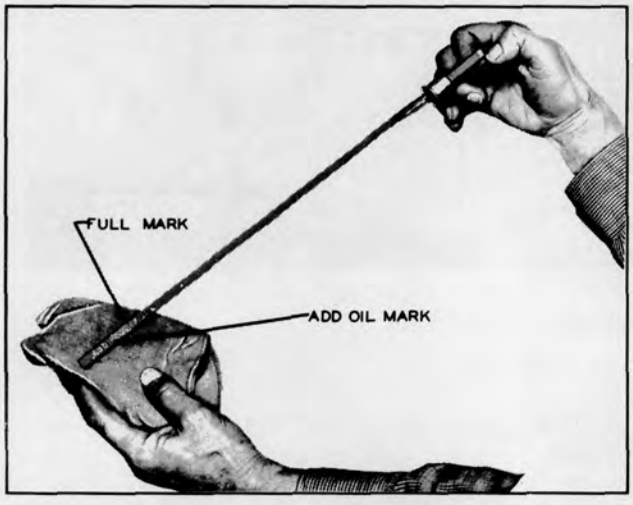


Plate 3145. Crankcase Oil Check

N O T E

On L.P. gas engines, use a non-detergent oil during break-in periods.

Crankcase Capacity (Refer to Specifications)

Viscosity to Use	At Atmospheric Temperature "SERVICE MS TESTS"
SAE 40 Only	Above +100 deg F
SAE 30 or 20W-40	+32 deg F to +100 deg F
SAE 20 or 10W-30	-10 deg F to + 32 deg F
SAE 10W or 5W-20	-10 deg F and below

Plate 9163. Oil Filler Opening

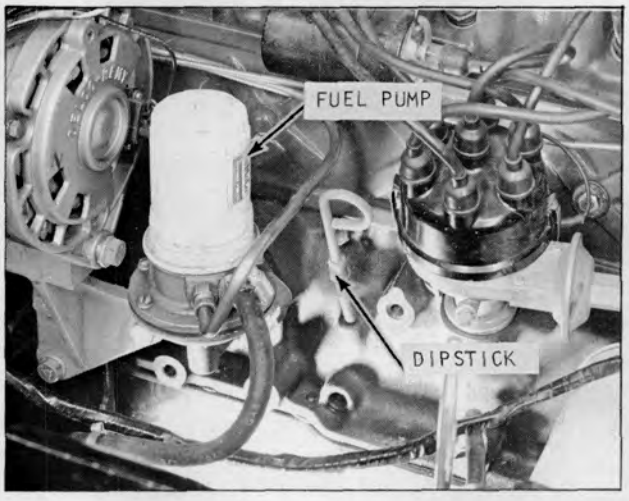


Plate 9164. Crankcase Dipstick

ENGINE COOLING

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

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

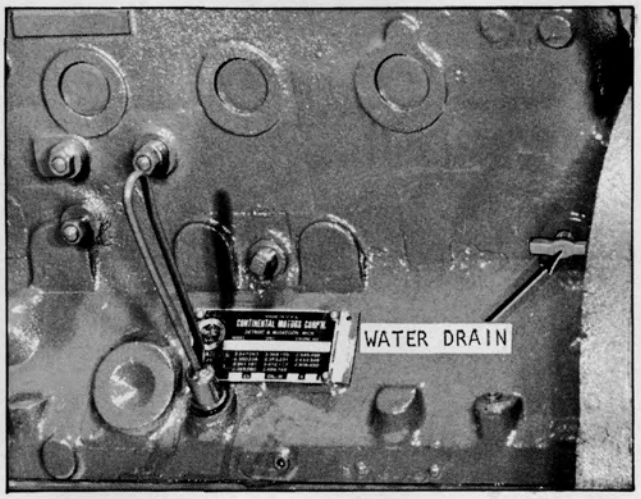


Plate 7008. Typical Cylinder Block Water Drain

C A U T I O N

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

N O T E

REFER TO DIESEL ENGINE MANUAL FOR MACHINES SO EQUIPPED.

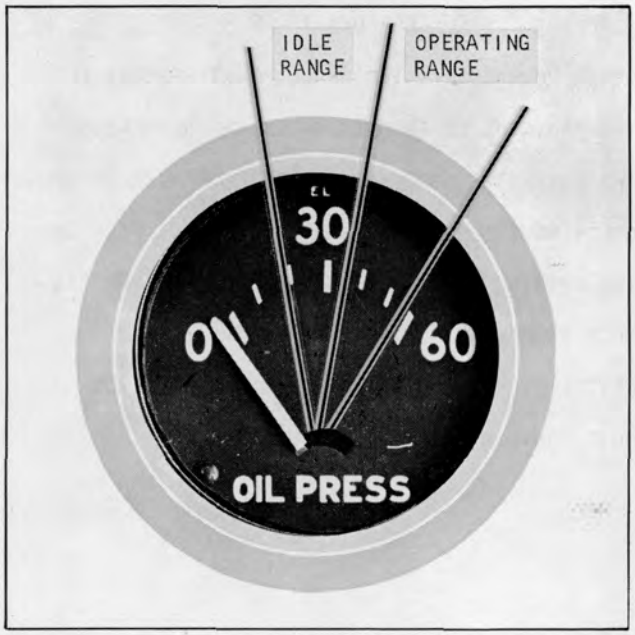


Plate 8606. Oil Pressure Indicator

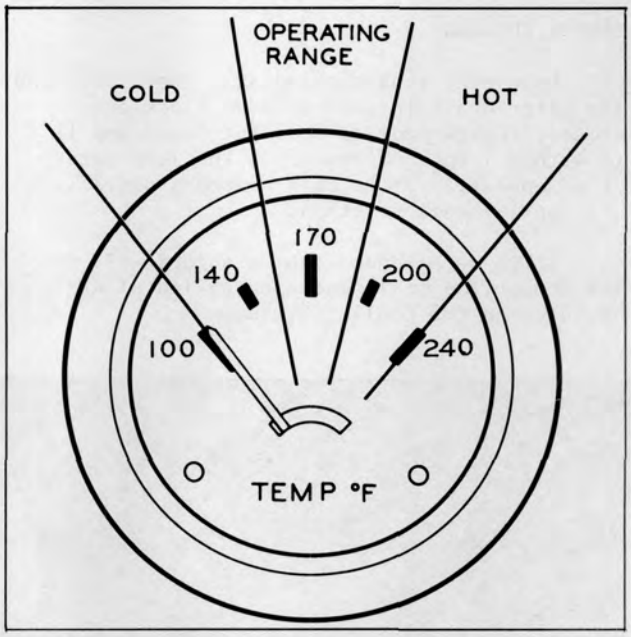


Plate 9283. Temperature Indicator

INSTRUMENT INDICATORS

1. Oil Pressure Indicator The oil pressure should be approx. 20 pounds at idle (500-550 rpm).

C A U T I O N

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 ENGINE, RUN IT AT IDLE FOR 5 MINUTES, THEN STOP ENGINE AND RE-CHECK OIL LEVEL IN CRANKCASE. BRING OIL LEVEL TO HIGH MARK, IF NECESSARY.

2. Temperature Indicator The thermostate installed in this machine begins to open between 157-164 deg F. and is fully open between 184-186 deg F. This should occur in a few minutes of engine operation.

3. Ammeter The ammeter is connected in the alternator and battery circuit in such a manner as to indicate rate of alternator charge or battery discharge with engine at fast idle (approximately 550 rpm).

N O T E

BEFORE PLACING MACHINE IN OPERATION RUN ENGINE A FEW MINUTES TO WARM OIL ESPECIALLY IN COLD OPERATING CONDITIONS. LOW OPERATING TEMPERATURES WASTES FUEL AND INCREASES ENGINE WEAR.

Brake Pedal Freel Travel...Performance Check

N O T E

Pedal free travel check must be made with the engine shut down.

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

2. Check pedal free travel...1/4 to 1/2 of an inch downward movement should be had as resistance is felt from the cylinder.

Power Brake System...Performance Check

1. Loss of Vacuum Power: in the event of engine failure...the vacuum chambers within the power brake provide adequate vacuum reserve for two or three brake applications. If the vacuum check valve is defective or after the braking has depleted the vacuum reserve...the driver can still operate the brakes by pushing straight through the power cylinder...but pedal effort is noticeably greater.

2. System Test: as a check...apply brakes several times with the engine shut down and vehicle standing still. Hold the pedal applied firmly...and start the engine. The brake pedal should drop or "fall away" slightly under steady pressure but then should remain firm without further travel or sponginess.

(a) If pedal fails to "fall away"...check vacuum hose connections.

(b) If pedal continues to fall...check and tighten all hydraulic connections and bleed screws. Apply pedal again and if pedal still falls away to the floor...there is a hydraulic leak in the system... locate and repair the leak...do not drive vehicle.

(c) If pedal is spongy...bleed remaining air out of the hydraulic system.

Parking Brake

1. Make certain that the parking brake is capable of holding the truck on a 3% grade. This should be tested with the parking brake applied...truck out of gear...and driver occupying the driver's seat.

2. If brake operation is not satisfactory...report to designated person in authority.

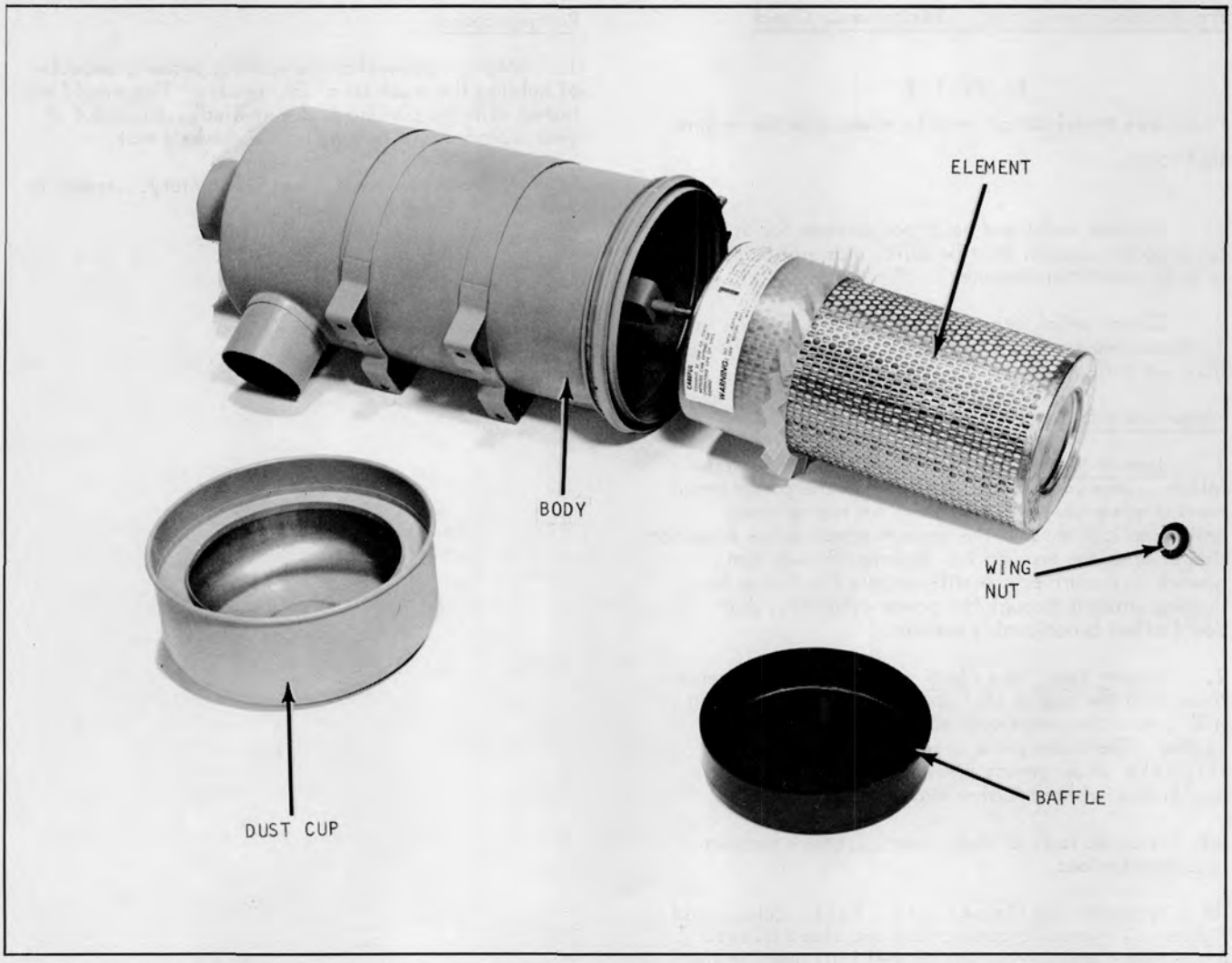


Plate 9154. Air Cleaner Assembly

AIR CLEANER ASSEMBLY

Dust Cup: Empty and clean dust cup every 8 operating hours or more often under extremely dusty conditions. Dust should not be allowed to build up in cup. Remove foreign material such as leaves from around filter and tighten wing nut if necessary. Replace baffle and securely replace cup on air cleaner body.

Filter Element: Operating conditions determine the air cleaner service periods. The air cleaner should be checked every 8 operating hours and cleaned. This may be necessary more often under dusty operating conditions.

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.

When cleaning the filter element, procede as follows:

1. Remove cover.

2. Lift out baffle.

3. Empty dust from cup.

4. Remove filter element. Clean thoroughly by using one of the following methods:

(a) Dry Dusty Element: Use compressed, dry, clean air directing this up and down pleats on the clean side of the element.

C A U T I O N

AIR PRESSURE MUST NOT EXCEED 100 P.S.I. MAINTAIN A REASONABLE DISTANCE BETWEEN NOZZLE AND

Plate 7173. Cleaning Dusty Element

ELEMENT. DIRECT AIR THROUGH ELEMENT (OPPOSITE TO DIRECTION OF ARROWS CAST ON END OF ELEMENT). DO NOT DAMAGE FINS OR SEALING SURFACES OR RUPTURE ELEMENT NOR ALLOW DUST TO DEPOSIT ON CLEAN AIR SIDE.

(b) Oily or Sooty Element: For best results, use small amount of cool tap water with non-sudsing household detergent then add to warm (70 deg - 100 deg F) water. The warmer the solution the better the cleaning. Soak for approximately 15 minutes. Rinse element thoroughly with clean water from hose (maximum pressure 40 P.S.I.). Air dry completely before installing.

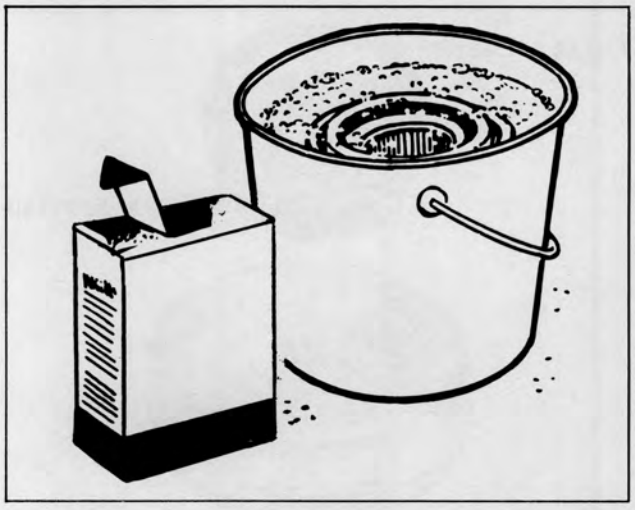


Plate 7174. Cleaning Oily Sooty Element

5. Clean cover, baffle and inside of filter body with a clean lint free cloth.

6. Check air cleaner hose connections for an air tight fit.

7. After air cleaner has dried, (a fan or air draft may be used, but do not heat element to hasten drying), inspect element for damage by placing a bright light inside element. Thin spots, pin holes or the slightest rupture will render the element unfit for further use.

8. Install filter element making sure wing nut is tight.

9. Replace baffle.

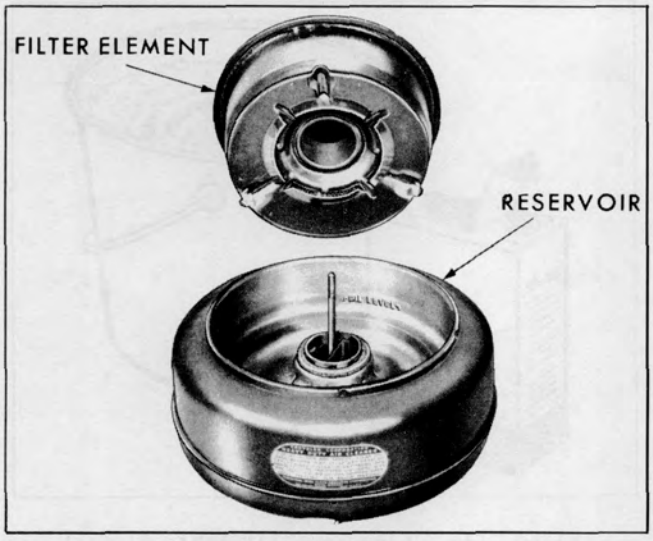


Plate 9322. Oil Bath Carburetor Air Cleaner

AIR CLEANER ASSEMBLY

Operating conditions determine the air cleaner service periods. The air cleaner should be checked every 8 operating hours and cleaned. This may be necessary more often under dusty operating conditions.

If the quantity of dirt in the sump is sufficient to reach the lower offset in the reservoir, the air cleaner should be removed and thoroughly cleaned.

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.

When cleaning the filter element, proceed as follows:

1. Remove cover and filter element assembly.

2. Drain the oil reservoir.

3. Wash the components in a Stoddard type cleaning solvent.

4. Saturate the maze screen with oil.

5. Clean out the reservoir and refill to indicated level with the following engine oils:

Above plus 32° F	SAE 30W
Below plus 32° F	SAE 10W

#11500. Clip-on Air Chuck & Nitrogen Cylinder

PRESSURIZING TIRES WITH NITROGEN:

The primary object in using nitrogen to pressurize tires is to gain the pressure desired in case shop pressure is inadequate.

Most shops have air pressure somewhere around 90-100 PSI, so if you have pneumatic tires on a machine that require more pressure than this, nitrogen cylinders can be used to finish the pressurization.

When using nitrogen:

1. Make sure the cylinder, gauges, regulator, hoses, etc. are all in good condition and U.L. approved. The regulator should be adequate for the pressure desired.

2. Set the regulator at the pressure required.

#11501. Shows Set-up Using Nitrogen Cylinder

3. Using a clip-on air chuck, attach this to the tire valve (#11500).

4. Then stand behind the truck as shown in #11501.

5. When other people are clear of the area, the tire can then be pressurized.

W A R N I N G

TIRES REQUIRING PRESSURIZATION IN

THIS MANNER MUST FIRST BE MOUNTED

PROPERLY ON THE TRUCK.

N O T E

The tank and regulator with gauges need a carrying device or a stand to protect them from falling over.

INDUSTRIAL TRUCK DIVISION

SAFETY TIPS

RIMS AND WHEELS

1. NEVER ATTEMPT TO WELD ON AN INFLATED TIRE/RIM ASSEMBLY.

2. ALWAYS EXHAUST ALL AIR FROM A SINGLE TIRE AND FROM BOTH TIRES OF A DUAL ASSEMBLY PRIOR TO REMOVING ANY RIM COMPONENTS, OR ANY WHEEL COMPONENTS, SUCH AS NUTS AND RIM CLAMPS.

   MAKE SURE TO REMOVE THE VALVE CORE AND EXHAUST ALL AIR FROM THE TIRE.

   REMOVE THE VALVE CORES FROM BOTH TIRES OF A DUAL ASSEMBLY.

   CHECK THE VALVE STEM BY RUNNING A PIECE OF WIRE THROUGH THE STEM TO MAKE SURE IT IS NOT PLUGGED.

3. CHECK RIM COMPONENTS PERIODICALLY FOR FATIGUE CRACKS. REPLACE ALL CRACKED, BADLY WORN, DAMAGED AND SEVEREL RUSTED COMPONENTS.

4. CLEAN RIMS AND REPAINT TO STOP DETRIMENTAL EFFECTS OF CORROSION. BE VERY CAREFUL TO CLEAN ALL DIRT AND RUST FROM THE LOCK RING GUTTER.

   THIS IS IMPORTANT TO SECURE THE LOCK RING IN ITS PROPER POSITION.

   A FILTER ON THE AIR INFLATION EQUIPMENT TO REMOVE THE MOISTURE FROM THE AIR LINE PREVENTS A LOT OF CORROSION. THE FILTER SHOULD BE CHECKED PERIODICALLY TO SEE THAT IT IS WORKING PROPERLY.

5. MAKE SURE CORRECT PARTS ARE BEING ASSEMBLED. CHECK YOUR DISTRIBUTOR OR THE MANUFACTURER IF YOU HAVE ANY DOUBTS.

6. DOUBLE CHECK TO MAKE SURE ALL COMPONENTS ARE PROPERLY SEATED PRIOR TO INFLATION.

7. MIXING PARTS OF ONE MANUFACTURER'S RIMS WITH THOSE OF ANOTHER IS POTENTIALLY DANGEROUS. ALWAYS CHECK MANUFACTURER FOR APPROVAL.

8. DON'T OVERLOAD OR OVER-INFLATE RIMS. CHECK YOUR RIM MANUFACTURER IF SPECIAL OPERATING CONDITIONS ARE REQUIRED.

9. DON'T REINFLATE A TIRE THAT HAS BEEN RUN FLAT WITHOUT FIRST INSPECTING THE TIRE, RIM, AND WHEEL ASSEMBLY.

   DOUBLE CHECK THE LOCK RING FOR DAMAGE...MAKE SURE THAT IT IS SECURE IN THE GUTTER BEFORE INFLATION.

10. NEVER RUN A VEHICLE ON ONE TIRE OF A DUAL ASSEMBLY. THE CARRYING CAPACITY OF THE SINGLE TIRE AND RIM IS DANAGEROUSLY EXCEEDED, AND OPERATING A VEHICLE IN THIS MANNER CAN RESULT IN DAMAGE TO THE RIM.

11. DON'T BE CARELESS OR TAKE CHANCES. IF YOU ARE NOT SURE ABOUT THE PROPER MATING OF RIM AND WHEEL PARTS, CONSULT A WHEEL AND RIM EXPERT. THIS MAY BE THE TIRE MAN WHO IS SERVICING YOUR FLEET, THE RIM AND WHEEL DISTRIBUTOR IN YOUR AREA, OR THE CLARK DEALER.

12. DON'T USE UNDERSIZED RIMS. USE THE RIGHT RIMS FOR THE JOB.

13. DON'T SEAT RINGS BY HAMMERING WHILE THE TIRE IS INFLATED.

    DON'T HAMMER ON AN INFLATED OR PARTIALLY INFLATED TIRE/RIM ASSEMBLY.

14. DON'T LET ANYONE MOUNT OR DEMOUNT TIRES WITHOUT PROPER TRAINING.

15. NEVER SIT ON OR STAND IN FRONT OF A TIRE AND RIM ASSEMBLY THAT IS BEING INFLATED. USE A CLIP-ON CHUCK AND MAKE SURE INFLATION HOSE IS LONG ENOUGH TO PERMIT THE PERSON INFLATING THE TIRE TO STAND TO THE SIDE OF THE TIRE, NOT IN FRONT OR IN BACK OF THE TIRE ASSEMBLY.

16. DO NOT, UNDER ANY CIRCUMSTANCES, ATTEMPT TO REWORK, WELD HEAT, OR BRAZE ANY RIM COMPONENTS THAT ARE CRACKED, BROKEN OR DAMAGED. REPLACE WITH NEW PARTS OR PARTS THAT ARE NOT CRACKED, BROKEN, OR DAMAGED, WHICH ARE OF THE SAME SIZE, TYPE AND MAKE.

17. INFLATE IN A SAFETY CAGE OR USE SAFETY CHAINS DURING INFLATION.

18. REGARDLESS OF HOW HARD OR FIRM THE GROUND APPEARS, PUT HARDWOOD BLOCKS UNDER THE JACK.

19. BLOCK THE TIRE AND WHEEL ON THE OTHER SIDE OF THE VEHICLE, BEFORE YOU PLACE THE JACK IN POSITION...ALWAYS CRIB UP WITH BLOCKS JUST IN CASE THE JACK MAY SLIP.

20. REMOVE THE BEAD SEAT BAND SLOWLY TO PREVENT IT FROM DROPPING OFF AND CRUSHING YOUR TOES. SUPPORT THE BAND ON YOUR THIGH AND ROLL IT SLOWLY TO THE GROUND THIS WILL PROTECT YOUR BACK AND TOES.

21. BEAD BREAKERS AND RAMS APPLY PRESSURE TO BEAD FLANGES. KEEP YOUR FINGERS CLEAR. SLANT BEAD BREAKER ABOUT 10 DEGREES TO KEEP IT FIRMLY IN PLACE. IF... ...IT SLIPS OFF, IT CAN FLY WITH ENOUGH FORCE TO KILL. ALWAYS STAND TO ONE SIDE WHEN YOU APPLY HYDRAULIC PRESSURE.

21. WHEN USING A CABLE OR CHAIN SLING, STAND CLEAR...IT MIGHT SNAP AND LASH OUT.

RIM AND WHEEL MAINTENANCE:

N O T E

"In order to maintain and insure maximum service, a continuous maintenance program is advisable... maintenance procedures should be carried out both during tire inspections and during tire changes."

x x x x x x x x x x x x x x x x x x x x x x x x x x
x x
x W A R N I N G x
x x
x PULL DAMAGED RIMS OR WHEELS. DEFLATE x
x x
x TIRES PRIOR TO THE REMOVAL OF RIMS OR x
x x
x WHEELS FROM THE VEHICLE. 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

Check all metal surfaces thoroughly while making tire inspections...watch for...

1. Fatigue cracks in metal.

2. Bent flanges, resulting from road obstructions.

3. Deep rim tool marks.

4. Loose, missing or damaged nuts.

5. Bent or stripped studs.

6. Excessive rust or corrosion.

Mark damaged or hazardous areas with chalk so that part will be removed from service...replace damaged parts.

Insure that replacements are made with the proper sizes and types...refer to your machine serial number when ordering replacement parts. 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.

Check all metal surfaces, as listed above, and check for cracks. These are caused by deep rim tool marks, overloading and overinflating tires and using larger than recommended tire sizes.

Cracks in wheel between stud holes are caused by loose wheel nuts...improper installation procedures and use of incorrect sizes or types of attaching parts. Insufficient mounting torque can cause wheel shimmy, resulting in damage to parts and extreme tire tread wear. Excessive mounting torque can cause studs to break and disc to crack in the stud hole area.

Thoroughly clean wheels...remove rust, dirt and other foreign materials from all surfaces. Hand or electric wire brushes, and blasting or chemical baths may be used.

Bead seat areas of the rim should be free of rust and rubber deposits. This is especially important for drop-center tubless rims...because of the air-sealing element.

Paint rim by brush or spray with a fast-drying metal primer. Surfaces should be clean and dry prior to painting. Insure that bare metal areas on outside or tire side of rim are covered. This is especially important on drop-center tubless rims, because warm and somethimes moist air is in constant contact with the metal surface on the tire side of the rim.

Lubricate tire side of rim base just prior to mounting tire...avoid the use of any lubricant which contains water or solvent that is injurious to rubber...a combination lubricant and rust-preventive compound is preferable. This protective measure is of particular importance with drop-center tubless rims as the air in the tire is contained by the tire-side rim surface.

N O T E

Rim Distributors can supply the proper compound that serves as a lubricant and rust preventive.

TIRE MAINTENANCE:

Inspect for proper inflation. Refer to Specifications for correct tire pressure.

Inspect tires and wheels regularly for cuts, breaks, alignment, security of wheel clamp bolts (on machine using split rims), and lug nuts or bolts.

Even with the best of maintenance practices, cuts will still be a source of tire trouble. The correct procedure for handling and repairing tires should be given careful attention. Close inspection of all tires should be made at the time of inflation check, and all tires having cuts that penetrate into the cord body should be taken off for proper repair.

Failure to make regular inspections and repairs, when needed, will result in further deterioration of the cord body and eventually a blowout. Small rocks and dirt will get into shallow cuts in the tread and if neglected will gradually be pounded through the cord body.

One simple method to forestall this action is to clean out the cut with an awl or similar tool to remove any stones or other matter which may be lodged in the cut. Use a sharp, narrow-bladed knife and cut away the rubber around the cut to form a cone-shaped cavity extending to the bottom of the injury. The sides of the cavity should be slanted enough to prevent stones from

TIRE MAINTENANCE (CONTINUED):

wedging into it. Tires with cuts treated in this manner may be continued in service without danger of further growth of these injuries. If a tire has at least one deep cut that requires a repair, then all smaller cuts may be quickly and economically repaired and vulcanized by the steam kettle method.

WARNING

IT IS NOT RECOMMENDED THAT TIRES WITH BREAKS BE USED AGAIN.

If uneven tire wear is evident, wheel alignment should be checked.

TIRE INFLATION:

Before inflating tires, make certain all wheel nuts are tightened to proper torque (see Specifications).

WARNING

IN ALL CASES, WHEN REMOVING TIRES WITH SPLIT RIMS FROM THE MACHINE FOR REPAIR OR PERIODIC ROTATION, COMPLETELY DEFLATE TIRES. THIS IS ACCOMPLISHED BY REMOVING THE VALVE CORE.

WARNING

IN ALL CASES, WHEN REMOVING TIRES EQUIPPED WITH THE LOCK RING TYPE RIM FROM THE MACHINE FOR REPAIR OR PERIODIC ROTATION, COMPLETELY DEFLATE TIRES. THIS IS ACCOMPLISHED BY REMOVING THE VALVE CORE.

WARNING

WHEN REPAIRING TIRES USED ON MACHINES THAT EMPLOY THE LOCK RING TYPE RIM, USE CAUTION WHEN INFLATING TIRE, PROCEED AS FOLLOWS:

1. After positioning lock ring on rim, turn wheel and rim assembly over so that lock ring is on side toward ground.

2. Inflate tire to 5 to 10 pounds.

3. Turn rim over and tap lock ring carefully with a mallet to be sure it is properly seated.

4. If you have access to a steel cage...use it, (see next page)...otherwise turn rim and wheel over once again so that lock ring is on the bottom and inflate tire to proper pressure.

WARNING

IF LOCK RING IS NOT LOCATED PROPERLY, IT IS POSSIBLE FOR IT TO POP OFF RIM WITH GREAT FORCE WHEN TIRE IS INFLATED AND COULD RESULT IN SERIOUS INJURY TO ANYONE STRUCK BY IT.

On machines using split rims, make periodic checks for noises in the wheel, as it is possible for damage to occur to the wheel bolts if they are not securely tightened when tires are changed. If the wheel bolts are loose or have been sheared off as a result of being loose, a grinding or scraping noise will be present when wheels are turned. Should this condition exist, it will be necessary to immediately remove the rim and tire from the machine and determine the cause of noise and repair or replace defective parts.

NOTE

Refer to WARNING on deflation of tires before removing wheels from machine.

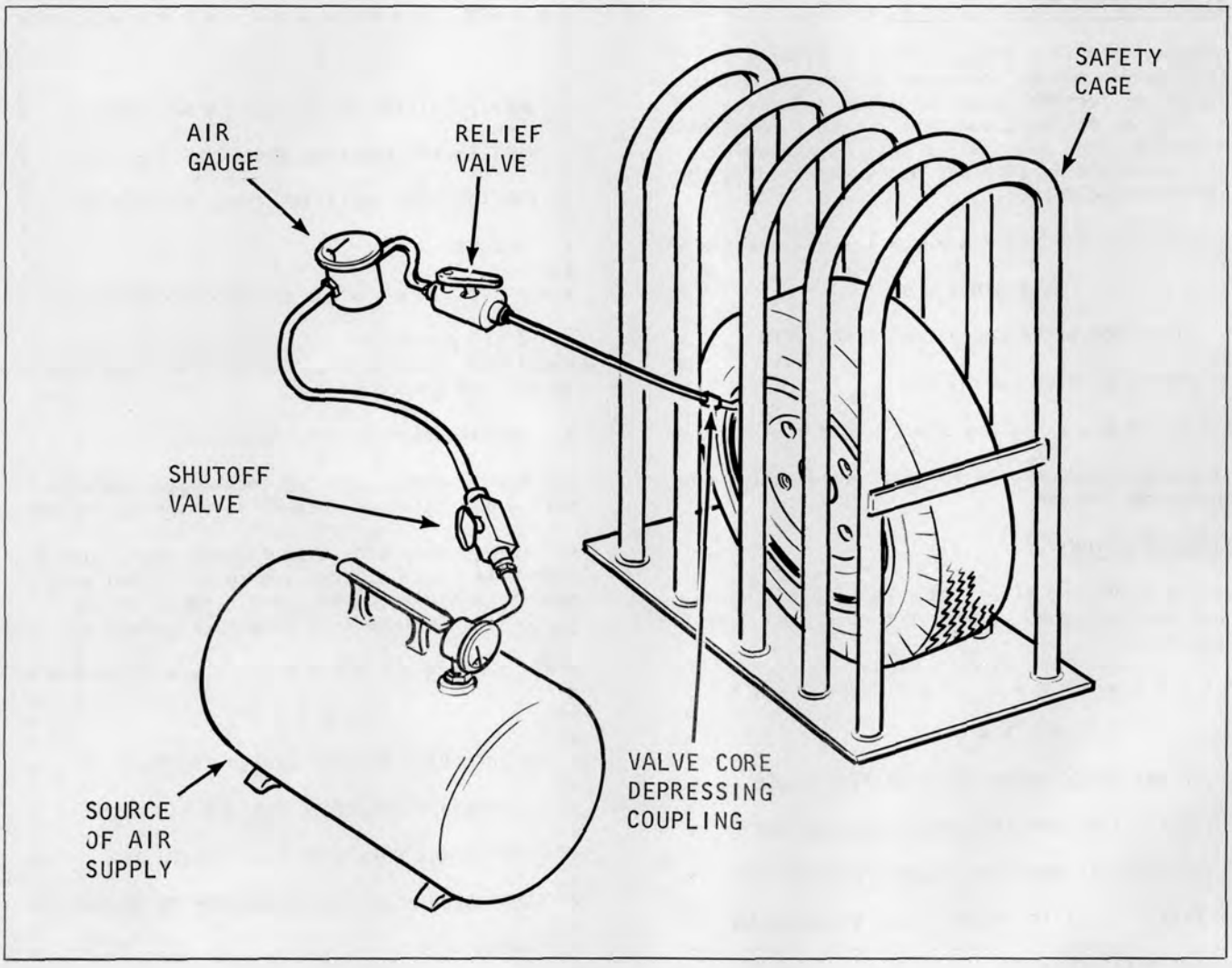


Plate 9702. Typical Tire Inflation Procedure

Torque wheel stud nuts or wheel bolts to the values listed in specifications. Excessive torque of wheel nuts can cause stud and rim damage.

Any replacement parts used should be of a quality equal to that provided in the original manufacture.

Inflation

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 CAUTION x
x x
x ALL FASTENERS SHOULD BE PROPERLY INSTALLED x
x x
x BEFORE INFLATING WHEEL/TIRE ASSEMBLY. 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

Tires with split wheels should be inflated in a safety cage or when properly installed on the vehicle. In either case, make sure all nuts and bolts are properly installed and torqued according to specifications.

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 CAUTION x
x x
x USE ONLY AN APPROVED SAFETY CAGE DESIGNED x
x x
x FOR THIS PURPOSE. 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

Tires used on lock-ring type wheels should be inflated in a safety cage (see previous caution) or use a clip-on type air chuck and stand aside (in-line with the tire tread) during inflation. Insure that rings are properly

Plate 7613. Typical Split Wheel

seated prior to inflation. An inflated tire contains potentially explosive energy that can blow rings loose.

All wheel/tire assemblies should be inflated in a safety cage. The air hose should have a special set-up as shown in Plate 9702. The hose should have an adapter so that it can be securely fastened to the valve stem. Using this set-up you would:

1. Attach air hose to valve stem.

2. Open shut-off valve allowing compressed air to enter tube.

3. Shut off air supply occasionally to check pressure in tube at air gauge.

4. Inflate to proper capacity. If pressure exceeds proper inflation capacity, depress the relief valve to release excess air pressure.

5. This alternating procedure is followed until proper inflation is reached. See specifications.

I M P O R T A N T

MAINTAIN UNIFORM INFLATION IN BOTH TIRES OF A

DUAL ASSEMBLY SO THAT WEIGHT IS EQUALLY SUSTAINED.

NEVER RE-INFLATE A TIRE THAT HAS GONE FLAT WITH-

OUT FIRST INSPECTING IT AND THE WHEEL ASSEMBLY.

The tire inflation arrangement as shown in Plate 9702 can be made up from local suppliers.

Parts can be ordered from the following suppliers:

Relief Valve - Model 250V-1/4"

Humphrey Products
P.O. Box 2008
Kilgore at Sprinkle Rd.
Kalamazoo, Mich.

Shut-Off Valve - Imperial #77E(1/4 to 1/4 1 PT)

Kendall Industrial Supplies, Inc.
702 N. 20th St.
Battle Creek, Mich. 49016

Air Gauge - Marshaltown #23 (160 lb, 1/4 1 PT, 2 1/2" diameter gauge)

Kendall Industrial Supplies, Inc.
702 N. 20th St.
Battle Creek, Mich. 49016

Safety Cage

Meyers Tire Supplies
6400 Epworth Blvd.
Detroit, Mich.

DIRECTIONAL TREAD TIRES

All directional tread tires are to be mounted in the correct position with respect to the arrow cast on the side of the tire as explained and illustrated below.

Directional Tread Dual Tires:

1. Inside dual tire arrow to point in the direction of foward rotation, see Plate 6422.

   (Rotate wheel to bring arrow on tire above the wheel. Arrow must point toward front of truck.)

2. Outside dual tire arrow to point in the direction of rearward rotation, see Plate 6423.

   (Rotate wheel to bring arrow on tire above the wheel. Arrow must point toward rear of truck.)

Directional Tread Single Drive Tires:

1. Tire arrow to point in the direction of forward rotation, see Plate 6422.

   (Rotate wheel to bring arrow on tire above the wheel. Arrow must point toward front of truck, see Plate 6422.

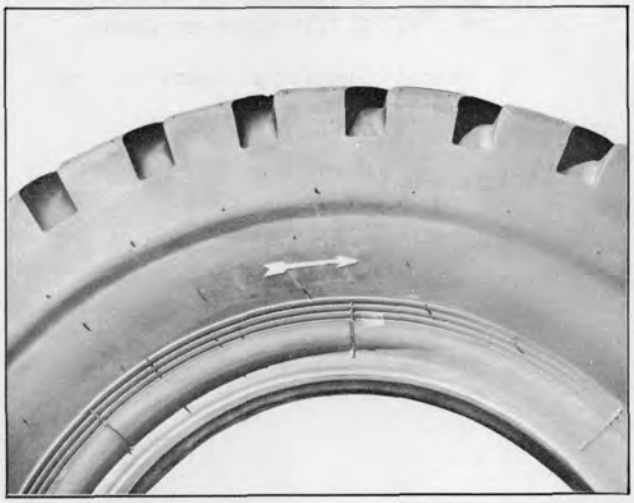


Plate 6422. Inside Dual Tire
(or Single Drive Tire)
(Arrow to point toward front of truck)

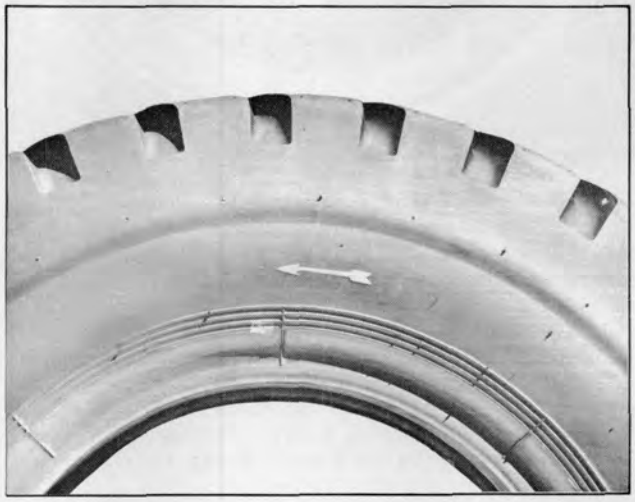


Plate 6423. Outside Dual Tire
(Arrow to point toward
rear of truck)

SOLID OR CUSHION TIRE AND RIM MAINTENANCE

1. Inspect tires regularly - remove all sharp objects picked up by treads before they have a chance to cut further into the rubber and cause chipping or possible separation of the rubber from the base metal.

2. Avoid overloading and do not allow vehicle to stand under heavy loads for prolonged periods as this will cause a "flat" spot on the tires.

3. Check steering axle alignment regularly to protect against fast, irregular tread wear and separation.

4. If rubber tires come in contact with oils, grease, and gasoline they should be wiped off without delay.

5. Regular lubrication of all wheel bearings will assure free-rolling and elimination of tire drag when stopping or starting.

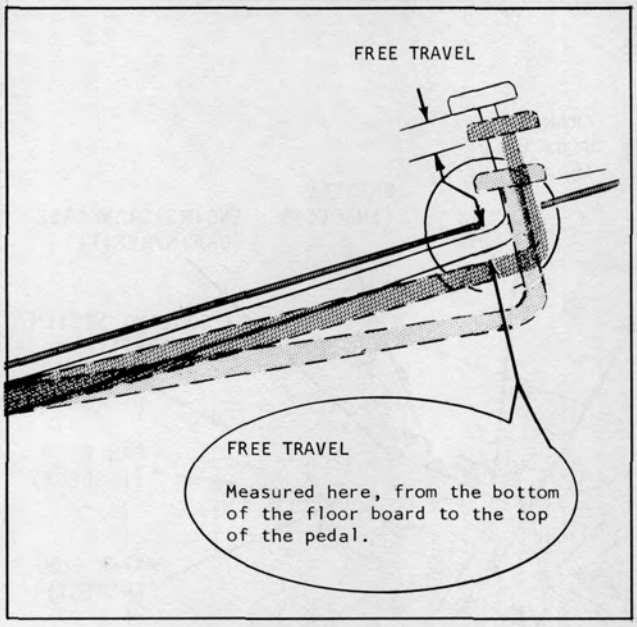
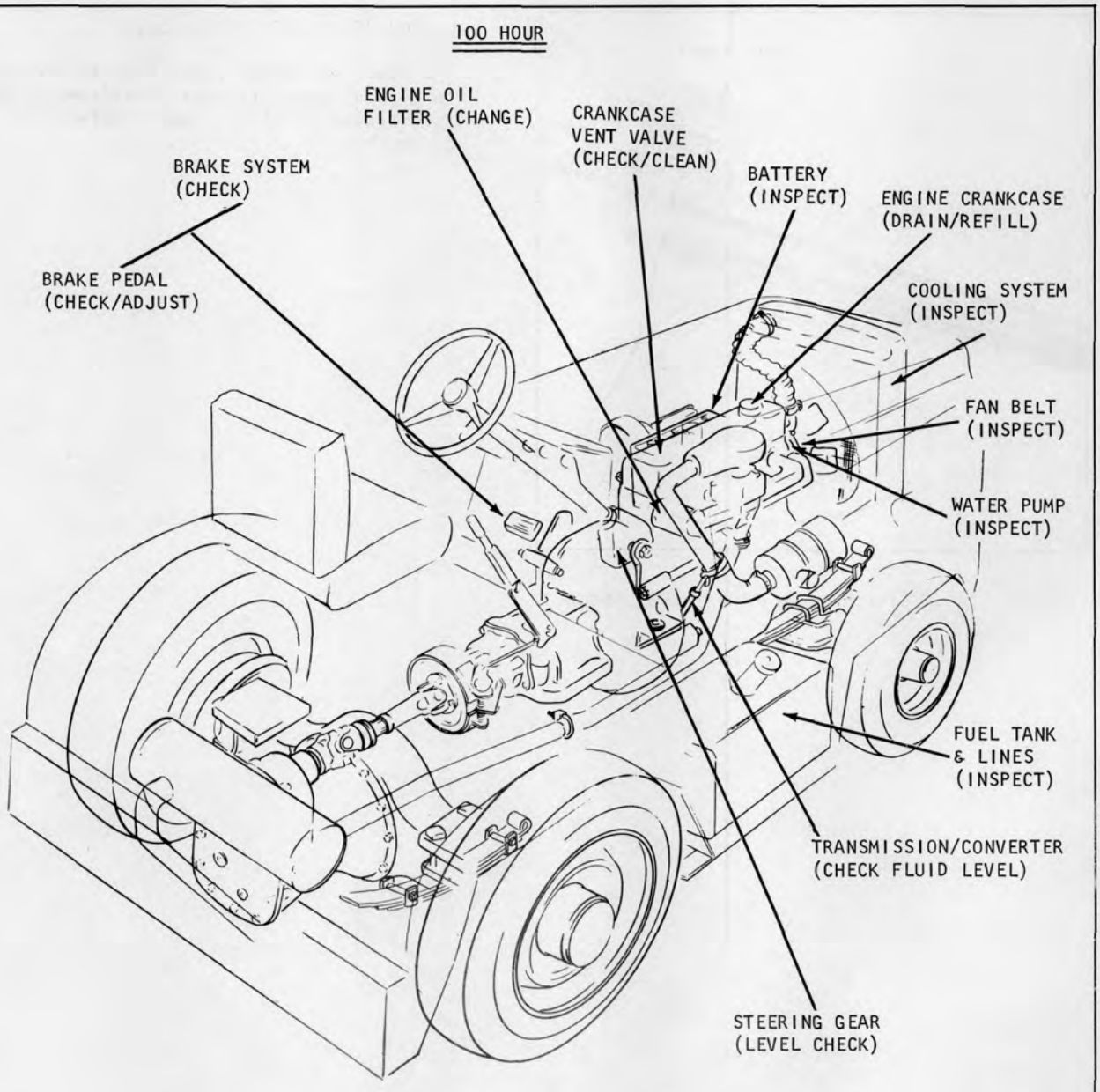


Plate 7042. Clutch Pedal Free Travel Check

CLUTCH PEDAL FREE TRAVEL CHECK

Depress clutch pedal from the top position to a point where it meets resistance. This free travel should be approximately 1/2 to 3/4 of an inch.



LUBRICATE ALL GREASE FITTINGS (100H-703)

NOTE

IN ADDITION TO THE ABOVE, PERFORM THE 8 HOUR PREVENTIVE MAINTENANCE SERVICES.

Plate 9156. Lubrication and Preventive Maintenance Illustration

CLARK EQUIPMENT

INDUSTRIAL TRUCK DIVISION

SERVICE ENGINEERING DEPARTMENT, BATTLE CREEK

CLARK EQUIPMENT

WORK SAFELY

DRIVE SAFELY

BE CAREFUL

ALWAYS

GIVE MACHINE SERIAL NUMBER

WHEN ORDERING PARTS

Rev OCT 73 1127-Z

CAUTION

AUTOMATIC TRANSMISSION FLUID.....TYPE "F"

FORD AUTOMATIC TRANSMISSION IN CLARKTOR E MODELS. USE TYPE "F" AUTOMATIC TRANSMISSION FLUID ONLY! FORD MOTOR COMPANY SPECIFICATION M2C-33D OR M2C-33E. TYPE "A" AUTOMATIC TRANSMISSION FLUID SHOULD NOT BE USED IN THESE MACHINES. FORD MOTOR COMPANY HAS ADVISED US THAT THEIR AUTOMATIC TRANSMISSIONS MUST BE FILLED WITH TYPE "F" AUTOMATIC TRANSMISSION FLUID AND NOT WITH TYPE "A" FLUID.

TYPE "A" AND TYPE "F" FLUIDS ARE NOT COMPATIBLE AND SHOULD NOT BE MIXED. FURTHER, CLUTCH DISC FACINGS USED IN THE FORD AUTOMATIC TRANSMISSION WERE DESIGNED FOR TYPE "F" FLUID ONLY. THE USE OF ANY OTHER TYPE FLUIDS WILL PERMANENTLY DAMAGE TRANSMISSION AND VOID WARRANTY.

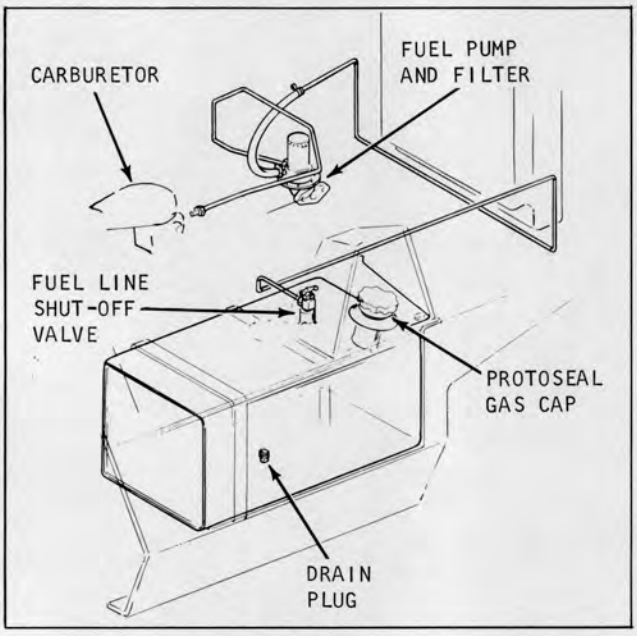


Plate 9299. Fuel System Accessories

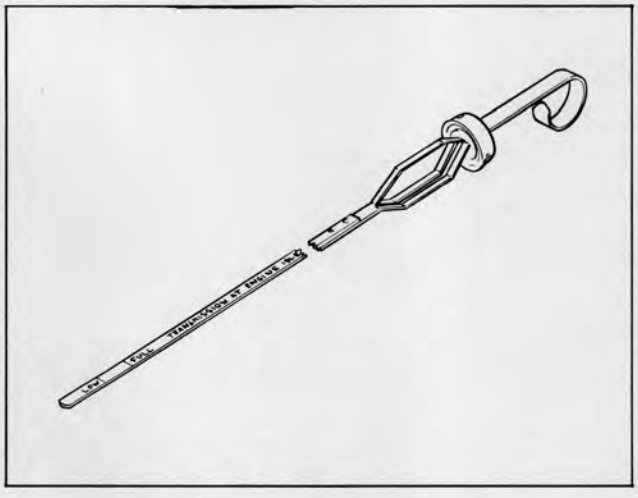


Plate 9300. Typical Dipstick

TRANSMISSION/CONVERTER FLUID LEVEL CHECK

1. Make sure that the vehicle is standing level. Then firmly apply the parking brake.

2. Run the engine at normal idle speed. If the transmission fluid is cold, run the engine at fast idle speed (about 1200 rpm) until the fluid reaches its normal operating temperature. When the fluid is warm, slow the engine down to normal idle speed.

3. Shift the selector lever through all positions and place the lever at N (neutral). Do not turn off the engine during the fluid level checks.

4. Clean all dirt from the transmission fluid dip stick cap before removing the dipstick from the filler tube.

5. Pull the dipstick out of the tube, wipe it clean and push it all the way back into the tube.

6. Pull the dipstick out of the tube again and check the fluid level. If necessary, add enough fluid to the transmission through the filler tube to raise the fluid level to the F (full) mark on the dipstick. Do not overfill the transmission. (Fluid specs on pg. 100H-002).

FLUID AERATION CHECK

A fluid level that is too high will cause the fluid to became aerated. Aerated fluid will cause low control pressure and the aerated fluid may be forced out the vent.

Check the transmission fluid level. Low fluid level can affect the operation of the transmission and may indicate fluid leaks that could cause transmission damage.

TRANSMISSION FLUID LEAKAGE CHECKS

Inspect the governor inspection plate for leakage. Install a new gasket if needed.

Leakage at the oil pan gasket often can be stopped by tightening the attaching bolts to the proper torque. If necessary, replace the gasket.

Check the fluid filler tube connection at the transmission. If leakage is found here, tighten the fitting.

Check the fluid lines and fittings between the transmission and the cooler in the radiator tank or on the transmission for looseness, wear, or damage. If leakage cannot be stopped by tightening a fitting, replace the defective parts.

The cooler can be further checked for leaks by disconnecting the lines from the cooler fittings and applying 5 psi air pressure to the fittings. If the cooler is leaking and will not hold this pressure, the radiator must be replaced. The cooler cannot be replaced separately.

Inspect the pipe plug on the left side of the transmission case at the front. If the plug shows leakage, torque the plug to specification. If tightening does not stop the leaks, replace the plug.

When converter drain plugs leak, remove drain plugs with a six-point wrench. Coat the threads with a sealing compound and install the plugs.

Coat the threads with sealing compound and install the plugs. Torque the drain plugs to specification.

N O T E

Fluid leakage from the converter housing may be caused by engine oil leakage past the rear main bearing or oil from oil gallery plugs. Report to designated person in authority.

I M P O R T A N T

THIS TRANSMISSION USES ONLY TYPE "F" AUTOMATIC

TRANSMISSION FLUID. REFER TO SPECIFICATIONS.

Fuel Lines

Make certain that fuel line connections are secure. Check fuel lines for obstructions and leaks.

ENGINE CRANKCASE

Every 100 operating hours, drain and refill.

N O T E

Always drain the crankcase at engine operating temperatures.

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)

SAE 40 Only	Above	+100 deg F
SAE 30 or 20W-40	+32 deg F to	+100 deg F
SAE 20 or 10W-30	-10 deg F to	32 deg F
SAE 10W or 5W-20	-10 deg F and below.	

Plate 9246. Typical Disposable-Type Oil Filter

DISPOSABLE-TYPE OIL FILTER ASSEMBLY

Oil Filter Replacement

1. Place a drip pan under the oil filter. Unscrew the filter from the cylinder block with a filter wrench.

2. Coat the gasket on the filter with oil. Place the filter in position on the cylinder block. Hand tighten the filter until the gasket contacts the adapter face; then advance it 1/2 turn.

3. Operate the engine at fast idle, and check for oil leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage. Check the oil level and fill the crankcase if necessary.

C A U T I O N

DO NOT OVERTIGHTEN THE FILTER ASSEMBLY.

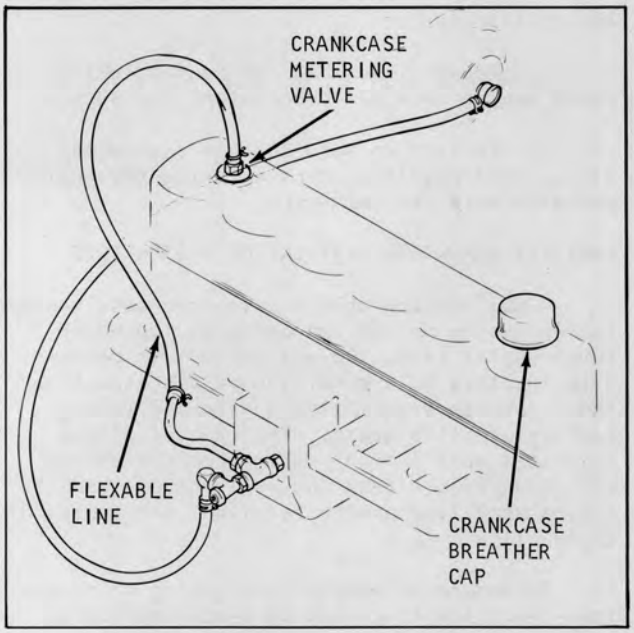


Plate 9248. Positive Crankcase Ventilation

POSITIVE CRANKCASE VENTILATION

1. Remove breather cap (located on top of valve lifter cover) and dislodge foreign particles by washing in a Stoddard type cleaning solvent until clean. Replace after it has been completely air dried.

2. Remove the flexable line running from the intake manifold to the metering valve and clean in the same manner as the breather cap.

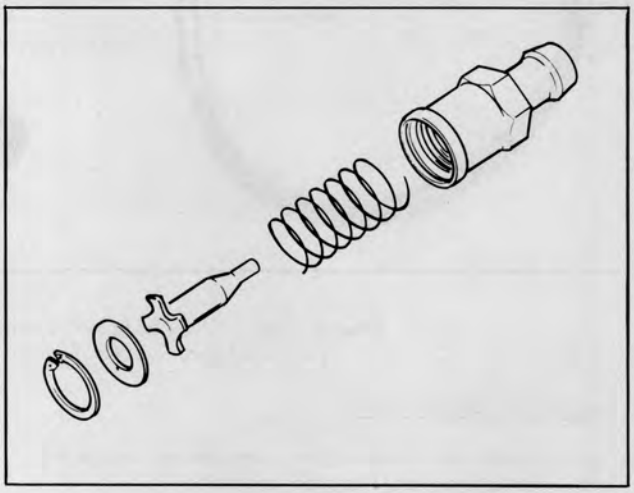


Plate 9247. Crankcase Metering Valve

3. Remove the positive crankcase metering valve from the top of the valve lifter cover, disassemble, clean as directed above, air dry

and reassemble.

4. Replace flexable line and metering valve making sure all connections are secure.

5. Failure to service this system as stated will result in dirt entering the engine and will void the warranty.

POSITIVE CRANKCASE VENTILATION SYSTEM TEST

A malfunctioning positive crankcase ventilation system may be indicated by loping or rough engine idle. Do not attempt to compensate for this idle condition by disconnecting the crankcase ventilation system and making carburetor adjustments. The removal of the crankcase ventilation system from the engine will adversely affect the fuel economy and engine ventilation with resultant shortening of engine life.

To determine whether the loping or rough idle condition is caused by a malfunctioning crankcase ventilation system, perform either of the following tests.

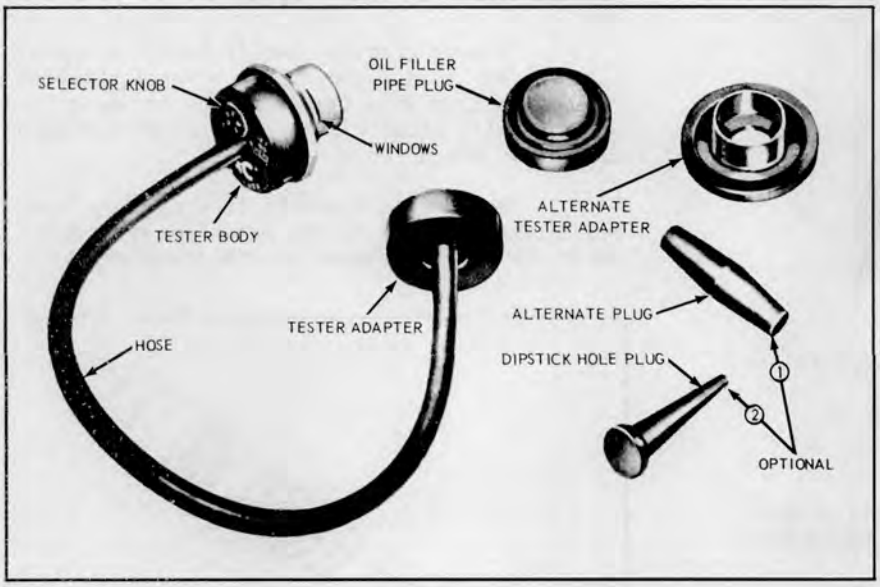


Plate 9249. Positive Crankcase Ventilation System Tester

Regulator Valve Test

Install a known good regulator valve in the crankcase ventilation system.

Start the engine and compare the engine idle condition to the prior idle condition.

If the loping or rough idle condition remains when the good regulator valve is installed, the crankcase ventilation regulator valve is not at fault. Check the crankcase ventilation system for restriction at the intake manifold or carburetor spacer. If the system is not restricted, further engine component diagnosis will have to be conducted to find the malfunction.

If the idle condition is found to be satisfactory, replace the regulator valve and clean the hoses, fittings, etc.

Air Intake Test

This test uses the positive crankcase ventilation tester which is operated by the engine vacuum through the oil fill opening. Follow the procedures described below to install the tester and check the crankcase ventilation system for faulty operation.

1. With the engine at normal operating temperature, remove the oil filler cap and the dipstick.

2. Connect one end of the hose to the tester body and connect the other end of the hose to the tester adapter.

3. Use the dipstick hole plug to plug the opening in the dipstick tube.

4. Insert the tester adapter in the filler cap opening and turn the selector knob to number 2.

5. If the vehicle has a closed crankcase ventilation system with the tube from the air cleaner going into the filler cap, disconnect tube at the oil filler cap and plug the tube and hose openings.

6. Start the engine and let it idle.

7. With the plugs secure, and the tube free of kinks, hold the tester body upright and note the color in the tester windows. Below is listed the various colors and the probable cause or related condition of the crankcase ventilation system.

8. Clean or replace the malfunctioning or defective components and repeat the test to ensure that the crankcase ventilation system is operating satisfactory.

-Continued-

COLOR	CAUSE
Green	System operating properly.
Green & Yellow	Regulator valve or system partially plugged. Slight kink in tester hose. Slight engine blow by. Plugs from the kit or the engine vacuum lines are not properly sealed. Tester knob improperly set.
Yellow	Regulator valve or system partially plugged. Tester hose kinked or blocked. Blow-by at maximum capacity of regulator valve. Plugs from the kit or the engine vacuum lines are not properly sealed. Tester knob improperly set.
Yellow & Red	Regulator valve or system partallly or fully plugged. More engine blow-by than regulator valve can handle. Vent hose plugged or collapsed.
Red	Regulator valve or system fully plugged or stuck. Vent hose plugged or collapsed. Extreme blow-by.

Plate 6458. Radiator Pressure Cap

W A R N I N G

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. THIS MACHINE IS EQUIPPED WITH A 7 LB PRESSURE CAP.

COOLING SYSTEM

Check radiator, hoses and water pump for leaks.

Add proper amount of water or anti-freeze solution to cooling system. If anti-freeze 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° F, or lower. If water is added to radiator containing anti-freeze solution, always test solution in radiator with a hydrometer to determine the degree of protection. For proper amount of anti-freeze solution required to protect the cooling system, refer to instructions on anti-freeze container.

N O T E

COOLING SYSTEM CAPACITY - REFER TO SPECIFICATIONS.

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

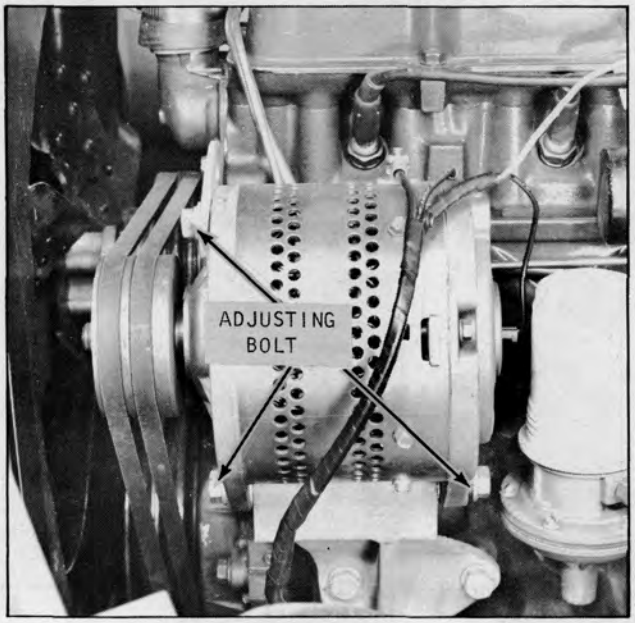


Plate 9160. Typical
Drive Belt Adjustment

FAN AND DRIVE BELT ADJUSTMENT

The drive belt should have a specific finger pressure deflection midway on the long span. (See specifications.)

W A R N I N G

CHECK FAN BELT DEFLECTION WITH ENGINE OFF.

C A U T I O N

IF THE FAN CAN BE ROTATED EASILY WITH A FINGER PULLING ON THE FAN BLADES, THE BELT IS TOO LOOSE AND MUST BE ADJUSTED.

If the belt requires adjustment, use the following procedure:

1. Loosen the alternator brace adjusting bolt and the two lower mounting bolts.

2. Move alternator toward cylinder block to loosen drive belt and away from cylinder block to tighten belt. Tighten bolts when correct finger deflection is obtained.

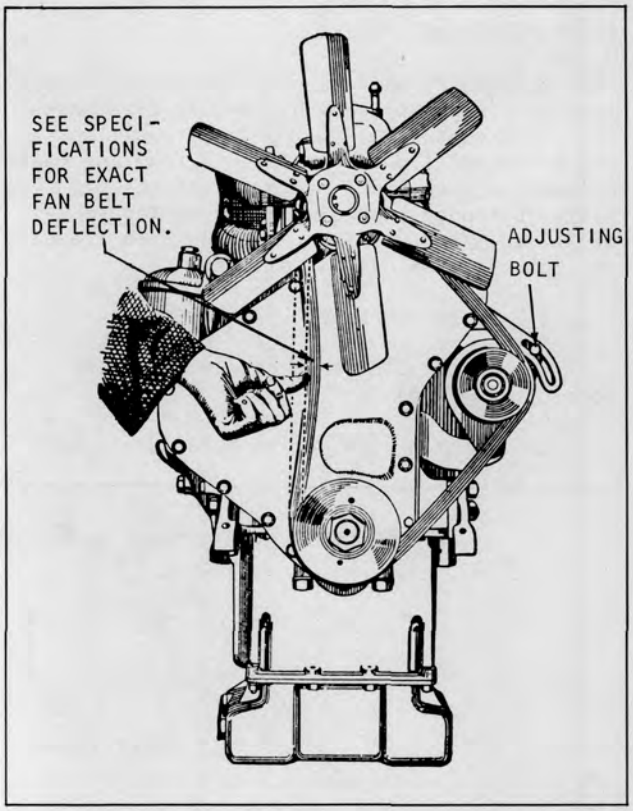


Plate 6632. Typical
Belt Deflection Check

C A U T I O N

WHEN TIGHTENING BELT TENSION, APPLY PRESSURE AGAINST THE STATOR LAMINATIONS BETWEEN THE END FRAMES AND NOT AGAINST EITHER END FRAME. WHEN ADJUSTING FOR DEFLECTION, PULL ALTERNATOR BY HAND. DO NOT USE A PRY BAR. EXERCISE CAUTION WHEN ADJUSTING BELTS. BELTS ADJUSTED TOO TIGHT WILL VERY LIKELY CAUSE BEARING DAMAGE. CONVERSELY, BELTS ADJUSTED TOO LOOSE WILL RESULT IN BELT WEAR AND HIGH ENGINE TEMPERATURE DUE TO BELT SLIPPAGE.

BRAKE PEDAL FREE TRAVEL

Using a ruler, measure brake pedal free travel. (Depress pedal by hand.) Clearance should be measured from top pedal position to where the pedal meets resistance from the master cylinder. When pedal meets resistance from the master cylinder, the distance traveled should be 1/2 to 3/4 of an inch. If the free travel is incorrect, adjust as follows:

1. Loosen lock nut.

2. Rotate clevis to obtain specified pedal free travel.

3. Tighten lock nut to hold adjustment.

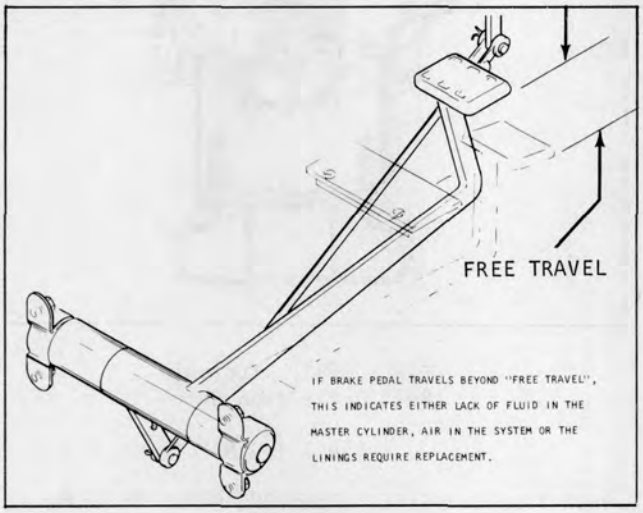


Plate 9285. Typical Brake Pedal Linkage

ACTUATION STROKE

If the brake pedal travels beyond the free travel distance, this could indicate either of the following conditions:

1. Lack of fluid in the reservoir.

2. Air in the brake system lines.

3. Brake linings need adjustment or replacement.

PUSH ROD ADJUSTMENT PROCEDURE (Power Brakes)

The self-locking adjustment screw on the outer end of the hydraulic push rod is set to the correct dimension "A" (Plate 9286) at the time of manufacture and no further adjustment should be needed. However, if the adjustment has been changed or a new push rod is installed, then adjustment may be required. Check push rod length, as shown, with gauges made as detailed in Plate 9287. To adjust, turn nut in or out - but do NOT scratch machined shaft of push rod.

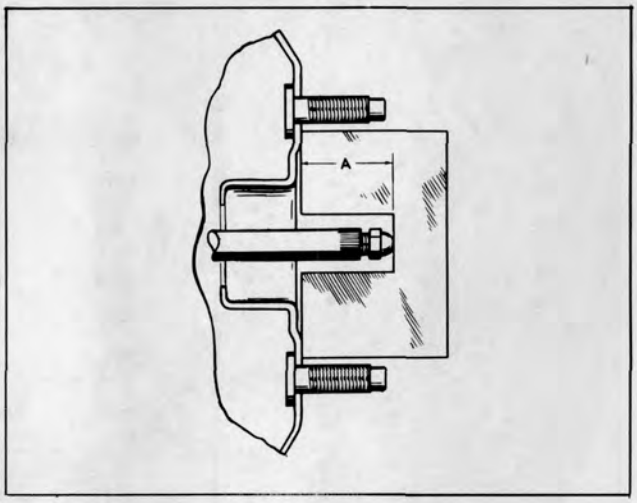


Plate 9286. Gauging Hydraulic Push Rod

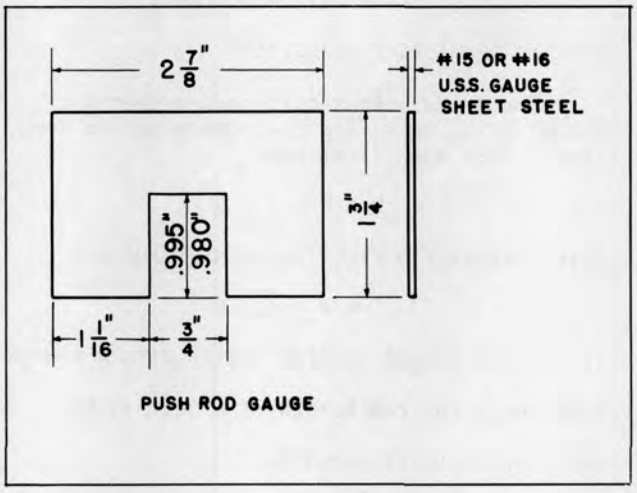


Plate 9287. Making Push Rod Gauge

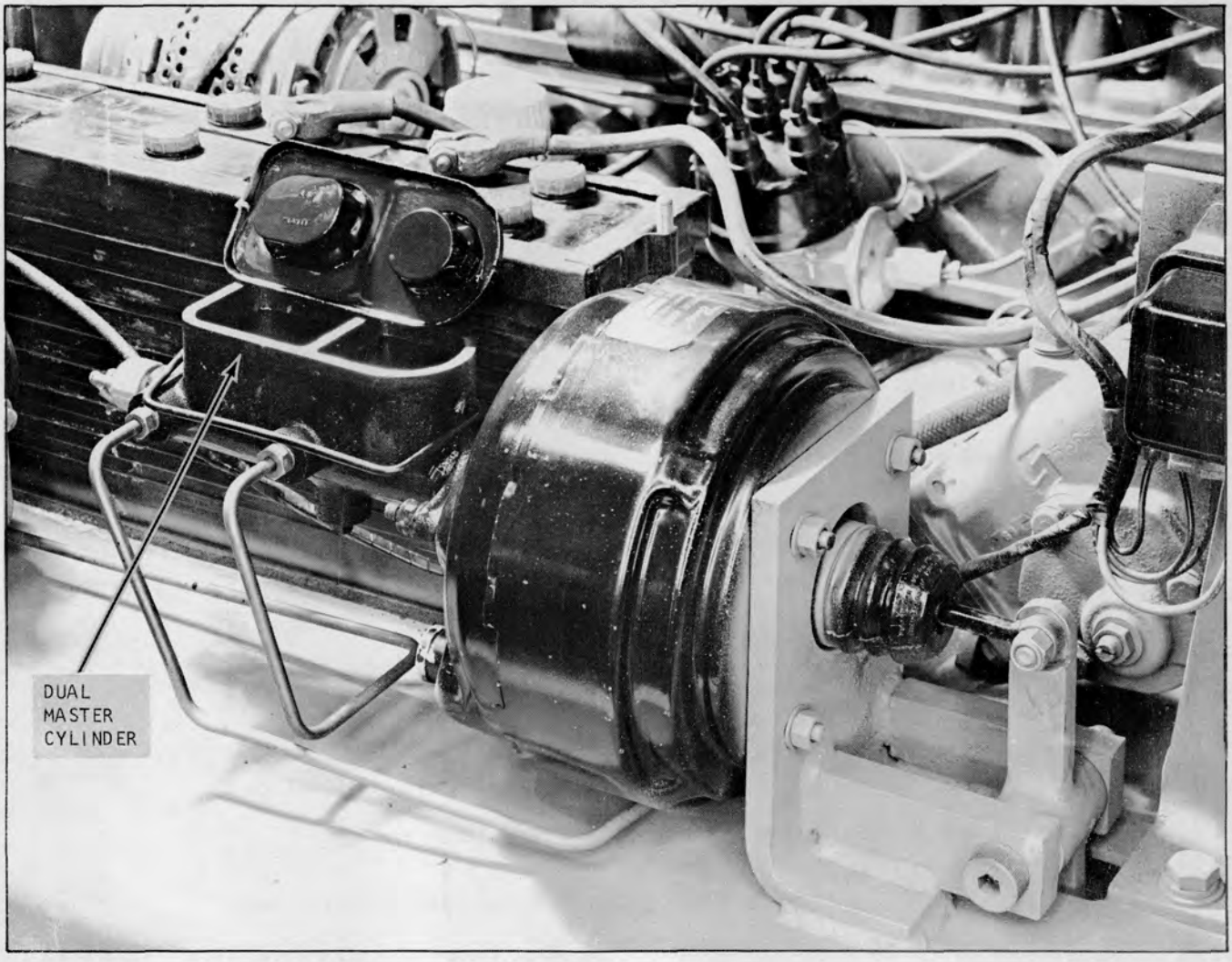


Plate 9161. Master Cylinder

MASTER CYLINDER

Check the brake fluid level in the master cylinder. The brake fluid should be within 1/4 inch of the top. Fill with S.A.E. 70 R3 Heavy Duty Hydraulic Brake Fluid. (CLARK part number 1800200.)

Check the master cylinder filler cap vent hole for obstructions. Vent must me open at all times. Clean if necessary.

BRAKE PEDAL

W A R N I N G

CORRECT BRAKE PEDAL FREE TRAVEL IS IMPORTANT

FOR SAFE OPERATING BRAKES.

A correctly adjusted brake pedal is important so that the internal ports in the master cylinder are not blocked by the cylinder piston. Below is listed two important reasons for proper brake pedal free travel.

An improperly adjusted pedal will block the internal ports so that upon releasing the brake pedal, fluid will be trapped in the lines and hold the brake linings in contact with the brake drums. This will cause lining wear and excessive fuel consumption.

ALTERNATOR - BATTERY - ELECTRICAL SYSTEM

C A U T I O N

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 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.

LUBRICATE MACHINE

N O T E

WHEN LUBRICATING THE VEHICLE, MAKE A VISUAL INSPECTION OF ALL ELECTRICAL WIRING. LUBRICATE ALL MISCELLANEOUS LINKAGE WITH S.A.E. NUMBER 20 OIL.

BATTERY INSPECTION

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

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

Take hydrometer reading of electrolyte to determine state of charge. Charge battery if reading is below 1.225 at 24 deg. C (75 deg. 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.

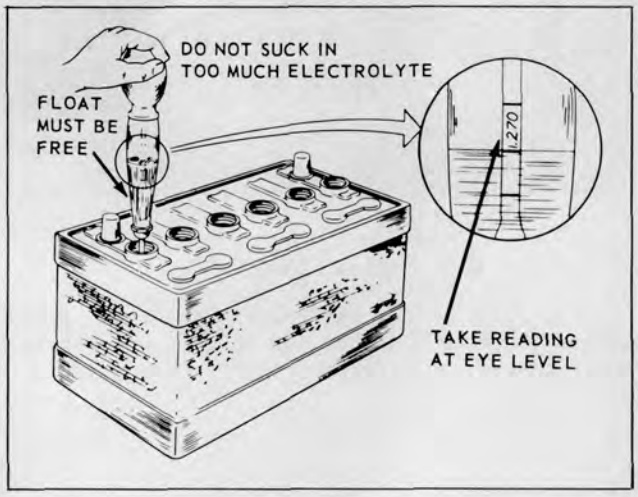


Plate 6271. Checking Specific Gravity of Battery

Make sure that all connections are tight at battery, starter, generator/alternator 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. (Connecting two headlights turned on low beam will equal the 10 ampere load - this method may be used in place of the load placed across the terminals.)

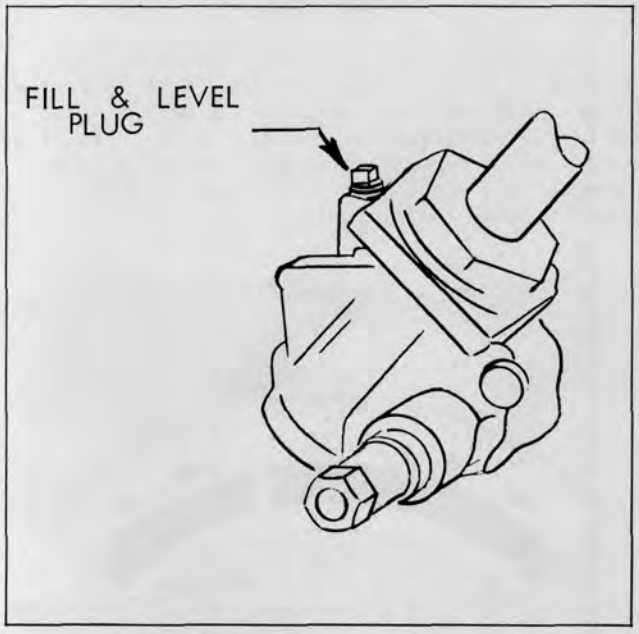


Plate 6429. Typical Steering Gear

STEERING GEAR

The steering gear is prepacked with grease at the factory and should not require lubrication until disassembled for repair. However, it is recommended that periodically the gear be checked for proper lubricant level, and filled if necessary with NLGI #1 (amolith grease EP #1 or its equivalent).

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

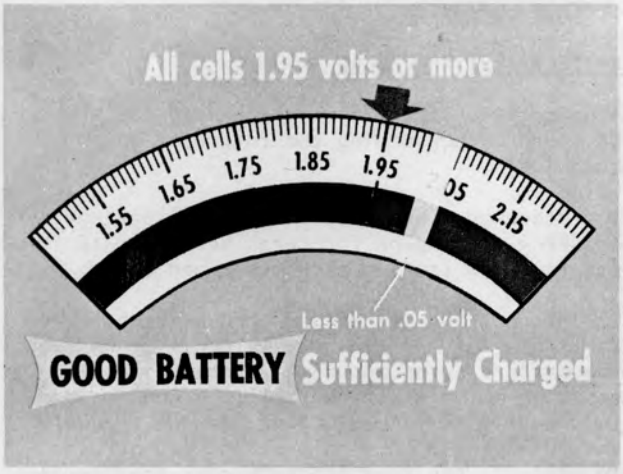


Plate 8306.

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.

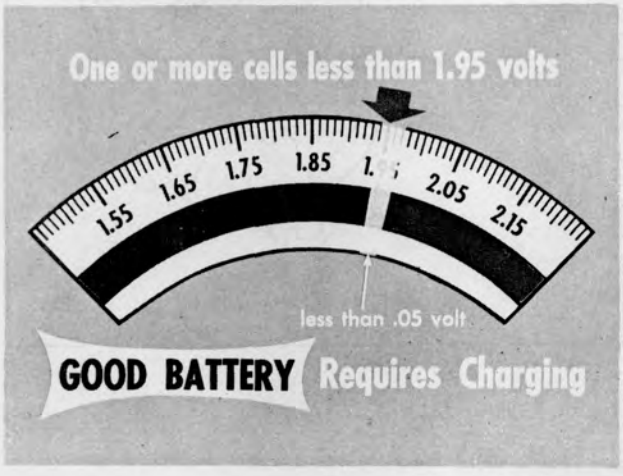


Plate 8307.

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.

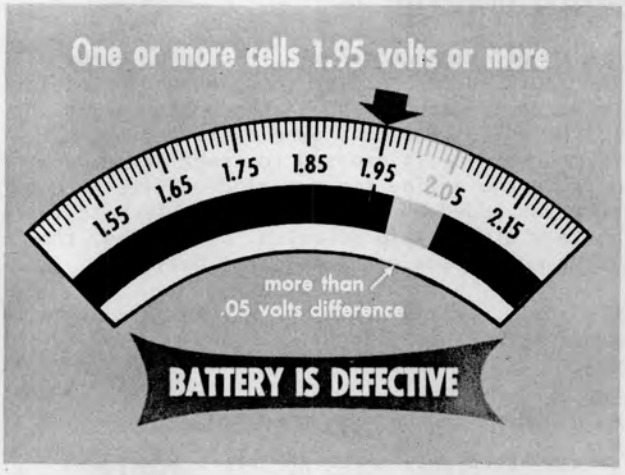


Plate 8308.

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.

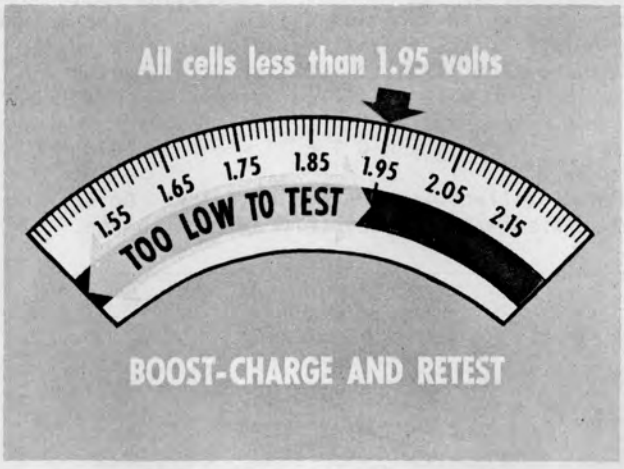
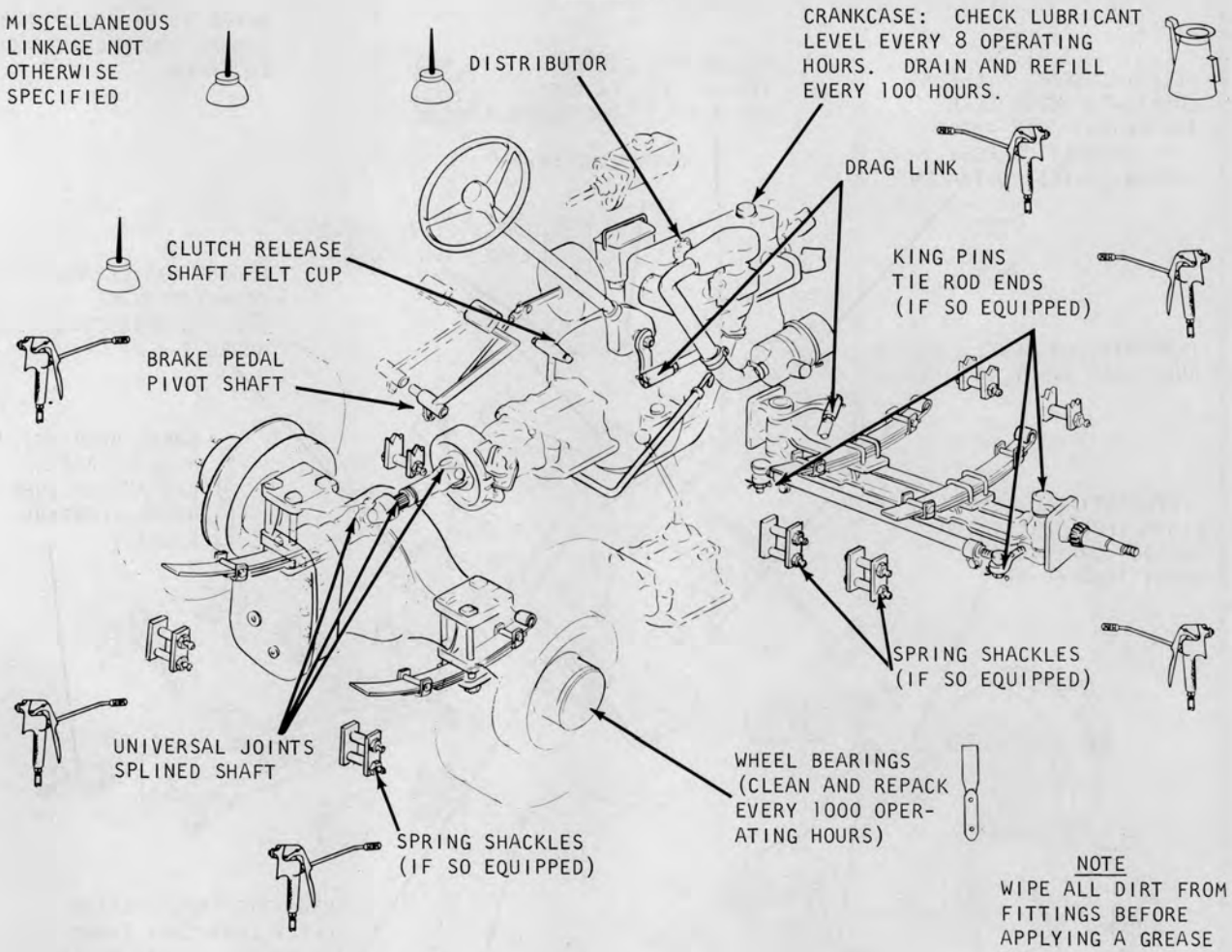


Plate 8309.

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

100 HOUR



NOTE

WIPE ALL DIRT FROM FITTINGS BEFORE APPLYING A GREASE GUN

AUTOMATIC TRANSMISSION FLUID TYPE "F" (SEE SPECIFICATIONS)

STANDARD TRANSMISSION SAE 90 GEAR LUBE

HEAVY DUTY BRAKE FLUID SAE 70 R3 CLARK #1800200

EXTREME PRESSURE SAE 90 GEAR LUBE, CLARK SPEC. MS-8 879803

ENGINE OIL: SAE 10W.....0-32 deg F
SAE 20W.....32-75 deg F
SAE 30W.....75 deg F +
Can must display the qualification of "MS" service.

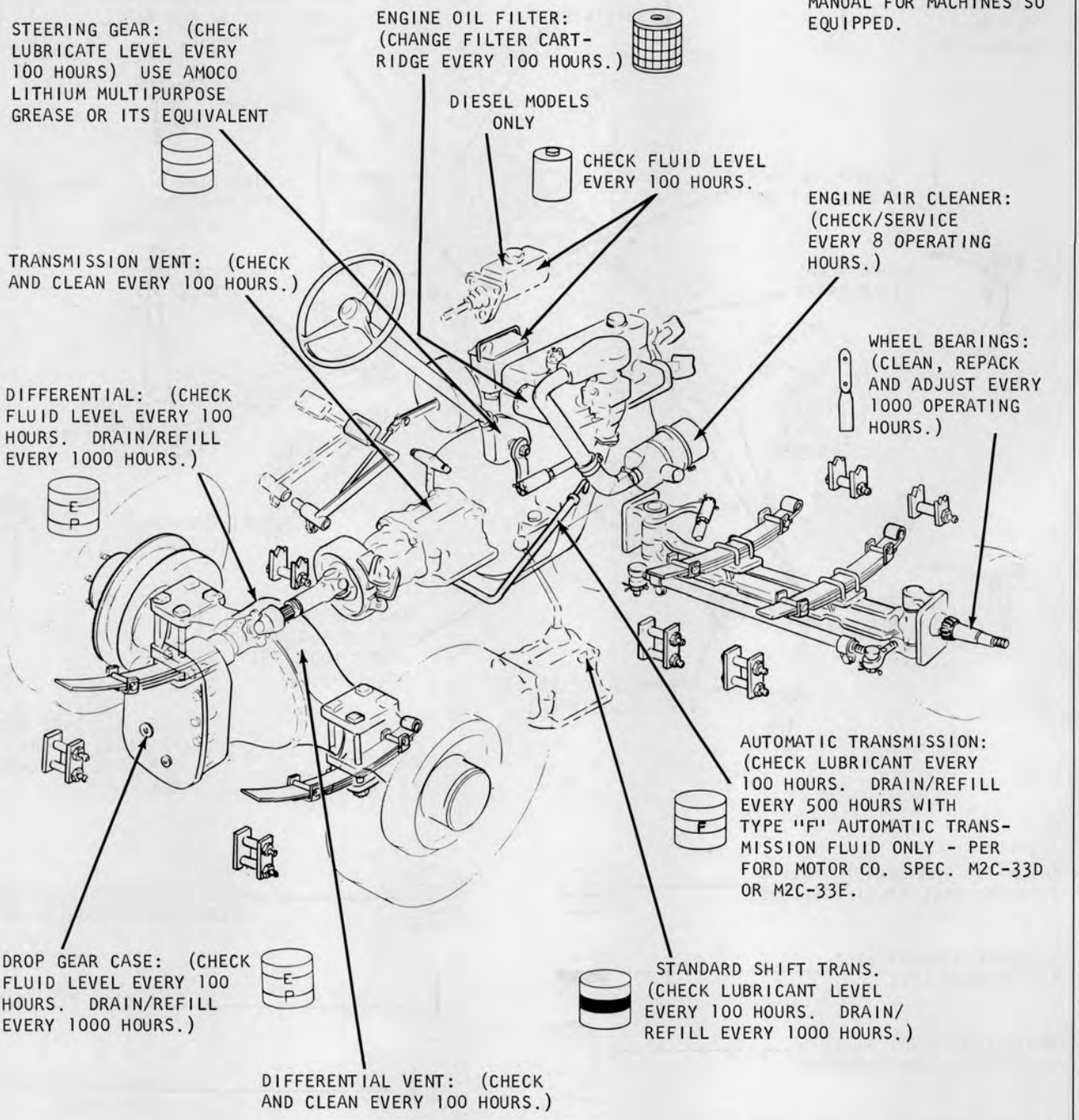
AMOCO LITHIUM MULTI-PURPOSE GREASE OR ITS EQUIVALANT

ENGINE OIL: SAE 20

ENGINE OIL FILTER CARTRIDGE

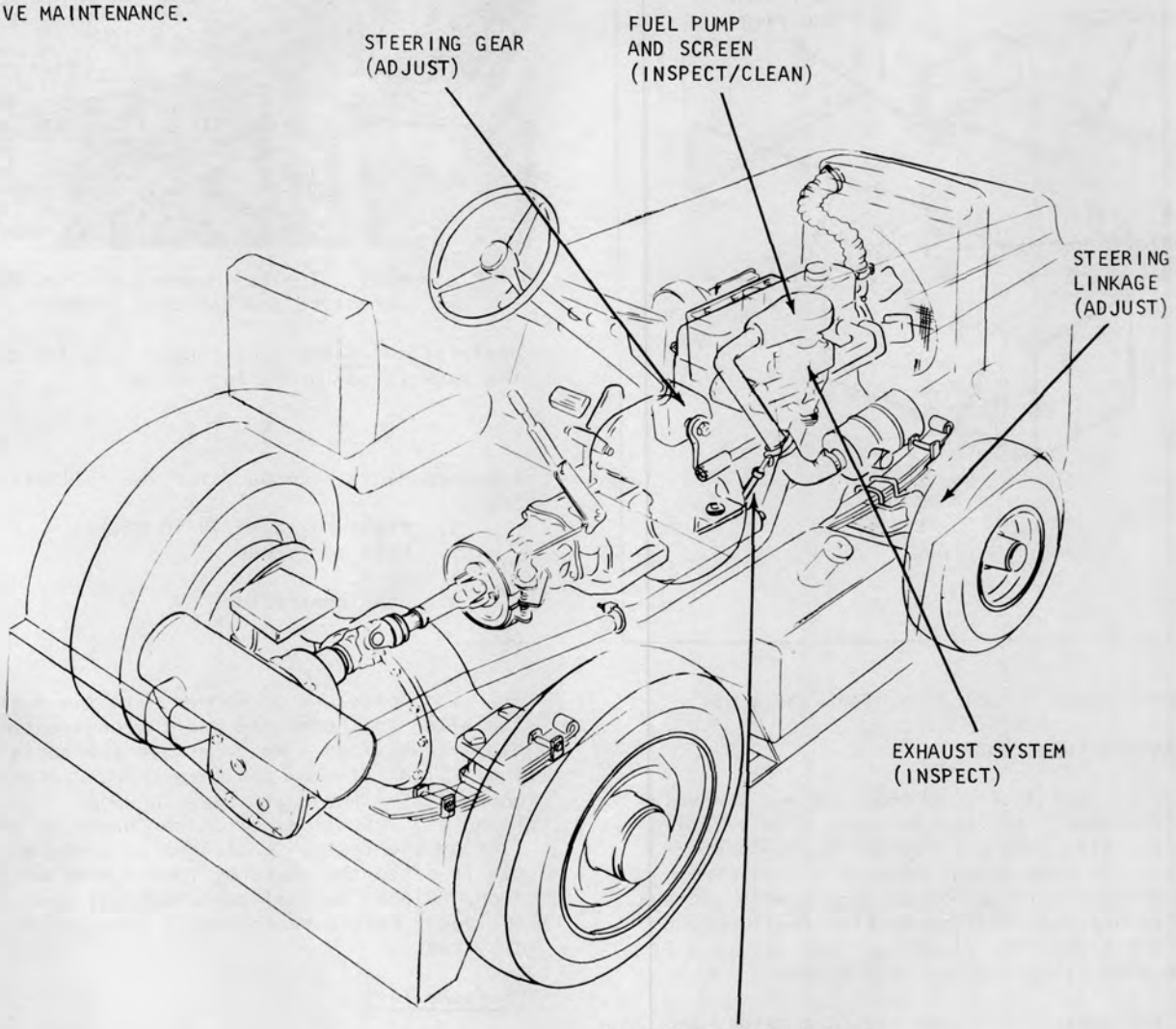
AMOCO LITHIUM MULTI-PURPOSE GREASE OR ITS EQUIVALENT

WHEEL BEARING GREASE SPEC. MS 9C


NOTE
REFER TO DIESEL ENGINE MANUAL FOR MACHINES SO EQUIPPED.
STEERING GEAR: (CHECK LUBRICATE LEVEL EVERY 100 HOURS) USE AMOCO LITHIUM MULTIPURPOSE GREASE OR ITS EQUIVALENT
ENGINE OIL FILTER: (CHANGE FILTER CARTRIDGE EVERY 100 HOURS.)
DIESEL MODELS ONLY
CHECK FLUID LEVEL EVERY 100 HOURS.
ENGINE AIR CLEANER: (CHECK/SERVICE EVERY 8 OPERATING HOURS.)
TRANSMISSION VENT: (CHECK AND CLEAN EVERY 100 HOURS.)
WHEEL BEARINGS: (CLEAN, REPACK AND ADJUST EVERY 1000 OPERATING HOURS.)
DIFFERENTIAL: (CHECK FLUID LEVEL EVERY 100 HOURS. DRAIN/REFILL EVERY 1000 HOURS.)
E P
AUTOMATIC TRANSMISSION: (CHECK LUBRICANT EVERY 100 HOURS. DRAIN/REFILL EVERY 500 HOURS WITH TYPE "F" AUTOMATIC TRANSMISSION FLUID ONLY - PER FORD MOTOR CO. SPEC. M2C-33D OR M2C-33E.
DROP GEAR CASE: (CHECK FLUID LEVEL EVERY 100 HOURS. DRAIN/REFILL EVERY 1000 HOURS.)
STANDARD SHIFT TRANS. (CHECK LUBRICANT LEVEL EVERY 100 HOURS. DRAIN/REFILL EVERY 1000 HOURS.)
DIFFERENTIAL VENT: (CHECK AND CLEAN EVERY 100 HOURS.)

500 HOURS

STEAM CLEAN ENTIRE MACHINE BEFORE PERFORMING THE 500 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE.



(WARNING: USE TYPE "F" AUTOMATIC TRANSMISSION FLUID ONLY PER FORD MOTOR CO. SPEC: M2C-33D OR M2C-33E)

CHECK SECURITY OF ALL NUTS, BOLTS AND CAPSCREWS.

NOTE

IN ADDITION TO THE ABOVE, PERFORM THE 8 HOUR AND 100 HOUR PREVENTIVE MAINTENANCE SERVICES.

Plate 9157. Lubrication and Preventive Maintenance Illustration

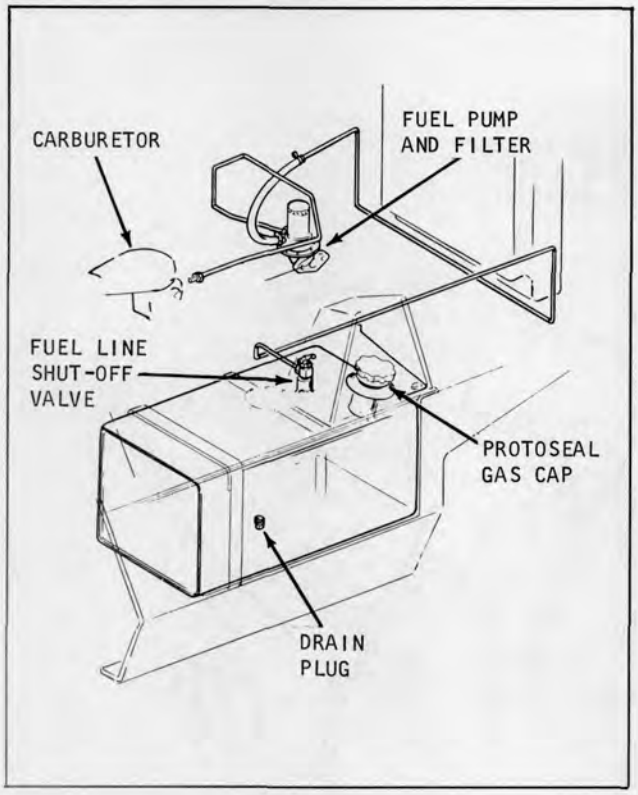


Plate 9299. Fuel Pump, Tank and Lines

MECHANICAL FUEL PUMP

Incorrect fuel pump pressure and low volume (flow rate) are the two most likely fuel pump troubles that will affect engine performance. Low pressure will cause a lean mixture and fuel starvation at high speeds and excessive pressure will cause high fuel consumption and carburetor flooding. Low volume will cause fuel starvation at high speeds.

Two tests (fuel pump static pressure and fuel volume) are necessary to determine that the fuel pump is in satisfactory condition.

If both the fuel pump volume and pressure are with in specifications and the pump and lines are in satisfactory condition, a vacuum test is not required.

If the pump volume is low but the pressure is within specifications, a fuel pump capacity test must be made with the fuel filter element removed. If the pump volume meets specifications, with the filter element removed, the element was clogged. If the pump volume is still below specifications, repeat the test, using an auxiliary fuel supply. If the pump still does not meet specifications, replace the pump. If the pump does meet specifications, there is a restriction in the fuel supply from the tank or

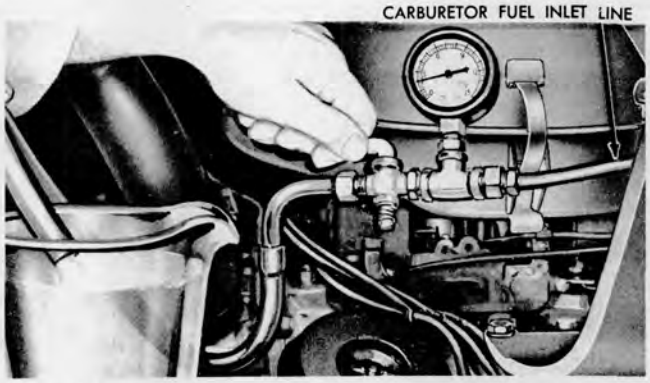


Plate 9251. Typical Mechanical Fuel Pump Pressure and Capacity Tests

restriction in the fuel supply from the tank or the tank is not properly vented.

N O T E

The components necessary for the following tests are:

1. Pressure gauge (0-10 PSI).
2. Fuel container.
3. Hose.
4. Hose restrictor.

TESTS

The tests are performed with the fuel pump installed on the engine and the engine temperature stabilized. Make certain the replaceable fuel filter element has been changed within the correct time interval. (See 500H-002 .) When in doubt, install a new filter prior to performing the tests. A clogged or restricted filter is often the cause of fuel system malfunction. Clean the fuel pump sediment bowl (if so equipped) before performing a pressure or capacity test.

Pressure Test

1. Remove the air cleaner. Disconnect the fuel inlet line from the carburetor. Use care to prevent combustion due to fuel spillage.

2. Connect a pressure gauge and flexible hose between the carburetor inlet connector and the fuel inlet line connector.

3. Position the flexible hose so that the fuel can be expelled into a suitable container for the capacity (volume) test.

4. Start the engine. Vent the system into the container by opening the hose restrictor momentarily before taking a pressure reading.

5. Operate the engine a 500 RPM. After the fuel pump pressure has stabilized, it should be 4.0 - 6.0 PSI.

Capacity (Volume) Test

Perform this test only when the fuel pump pressure is within specifications.

1. Operate the engine at 500 RPM.

2. Open the hose restrictor and expel the fuel into the container while observing the time required to expel one pint; then close the hose restrictor. At least one pint of fuel should be expelled within 30 seconds.

3. Remove the test equipment, and connect the fuel inlet line to the carburetor.

4. Install the air cleaner.

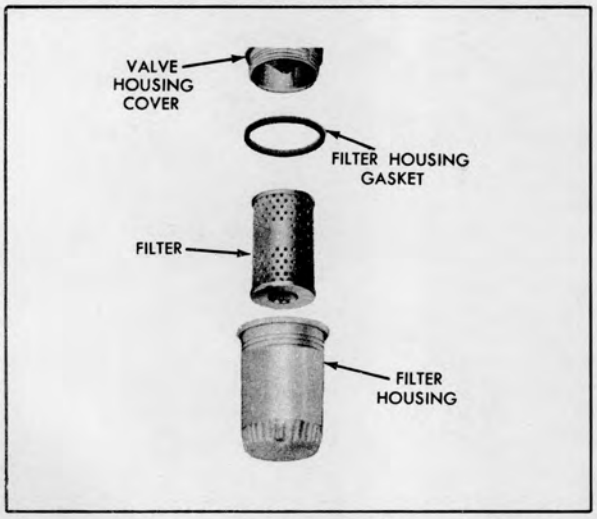


Plate 9273. Typical Fuel Filter Assembly

Fuel Filter Assembly

The fuel filters for mechanical fuel pumps are integrally mounted on the fuel pump except for electrical fuel pump systems.

Replace the filter element if it becomes clogged and also at the recommended time interval.

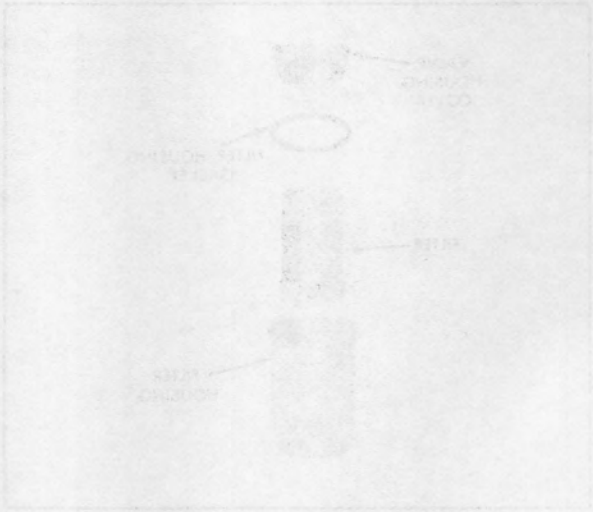
Replacement

W A R N I N G

A CERTAIN AMOUNT OF FUEL WILL ESCAPE WHEN THE FILTER HOUSING IS REMOVED. A PRECAUTION SHOULD BE TAKEN TO CATCH AND CONTAIN THIS FUEL. ALSO, THE ENGINE SHOULD BE COLD AND THERE SHOULD NOT BE PRESENT IN THE AREA ANY FORM OF OPEN FLAME OR SPARK WHICH COULD POSSIBLY IGNITE THE GASOLINE FUMES.

1. Unscrew the filter housing from the fuel pump and remove the filter element and gasket. Discard the element and gasket. Clean the filter housing in cleaning solvent.

2. Place a new filter element over the spout in the fuel pump valve housing cover. Be sure to use the proper type element for the installation. Do not install the hang-down type filter in the upright position. Coat a new gasket with light engine oil and position the gasket on the filter housing. Screw the filter housing onto the fuel pump. Hand tighten the filter housing until the gasket contacts the pump and then advance it 1/8 of a turn.



CLARK EQUIPMENT

INDUSTRIAL TRUCK DIVISION

SERVICE ENGINEERING DEPARTMENT, BATTLE CREEK

CLARK EQUIPMENT

WORK SAFELY

DRIVE SAFELY

BE CAREFUL

ALWAYS

GIVE MACHINE SERIAL NUMBER

WHEN ORDERING PARTS

Rev OCT 73 1127-Z

CAUTION

AUTOMATIC TRANSMISSION FLUID.....TYPE "F"

FORD AUTOMATIC TRANSMISSION IN CLARKTOR E MODELS. USE TYPE "F" AUTOMATIC TRANSMISSION FLUID ONLY! FORD MOTOR COMPANY SPECIFICATION M2C-33D OR M2C-33E. TYPE "A" AUTOMATIC TRANSMISSION FLUID SHOULD NOT BE USED IN THESE MACHINES. FORD MOTOR COMPANY HAS ADVISED US THAT THEIR AUTOMATIC TRANSMISSIONS MUST BE FILLED WITH TYPE "F" AUTOMATIC TRANSMISSION FLUID AND NOT WITH TYPE "A" FLUID.

TYPE "A" AND TYPE "F" FLUIDS ARE NOT COMPATIBLE AND SHOULD NOT BE MIXED. FURTHER, CLUTCH DISC FACINGS USED IN THE FORD AUTOMATIC TRANSMISSION WERE DESIGNED FOR TYPE "F" FLUID ONLY. THE USE OF ANY OTHER TYPE FLUIDS WILL PERMANENTLY DAMAGE TRANSMISSION AND VOID WARRANTY.

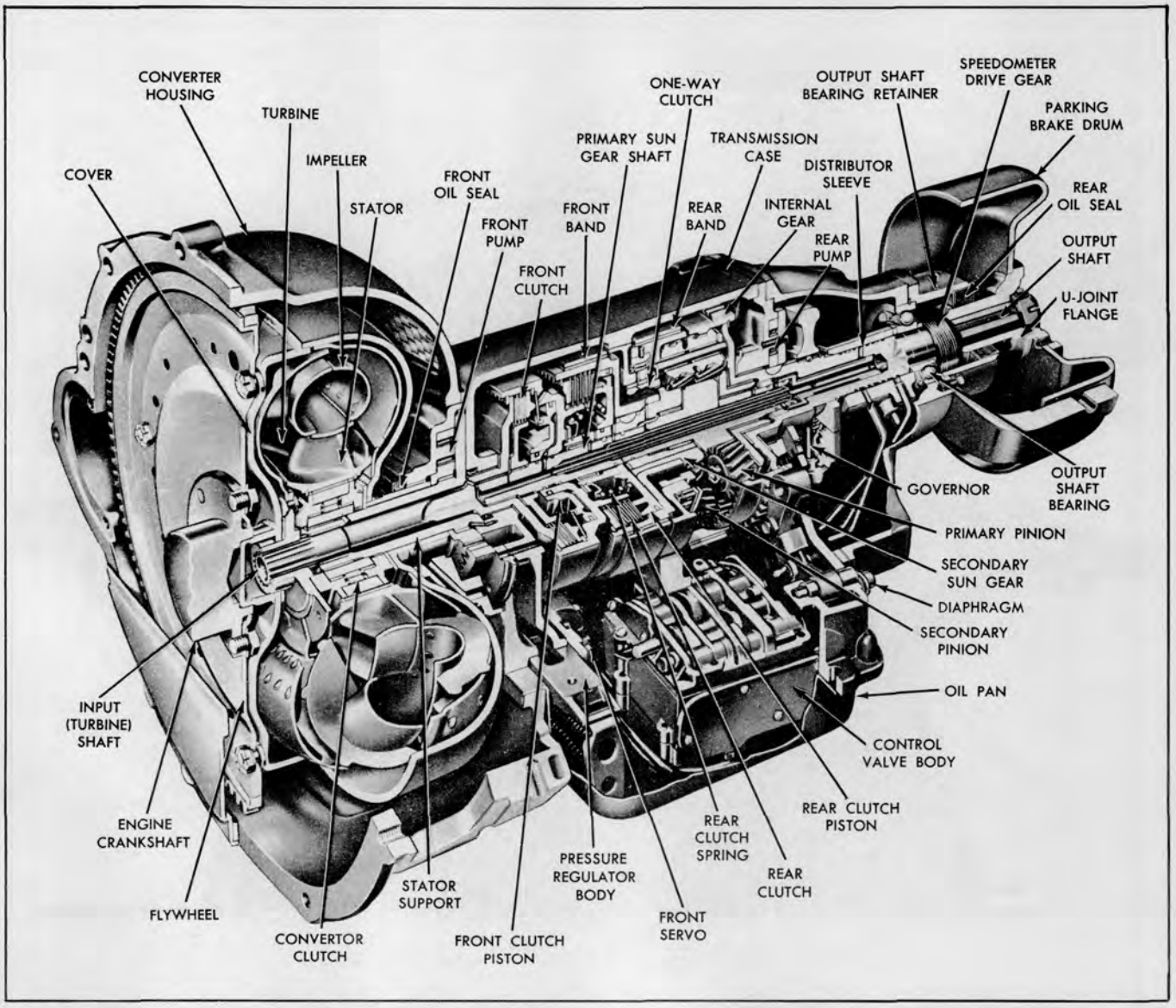


Plate 9297. HD Cruise-O-Matic Transmission

TRANSMISSION - CONVERTER DRAIN AND BAND ADJUSTMENT

Every 500 operating hours the transmission and converter should be drained of old fluid, front and rear bands adjusted and transmission and converter refilled with new fluid.

Use only automatic transmission fluid type "F", Ford Motor Company specification numbers M2C-33D or M2C-33E. Refer to Specifications in this manual.

N O T E

The draining procedure is included with the band adjustment because the transmission oil pan has to be removed to accomplish both operations.

Normal maintenance and lubrication requirements necessitate periodic automatic transmission fluid changes.

Also, if a major failure, such as a clutch, band, bearing, etc., has occurred in the transmission, it will have to be removed for service. At this time the converter must be thoroughly flushed to remove any dirt.

Converter Drain

1. Drive the vehicle onto a hoist but do not raise it at this time.

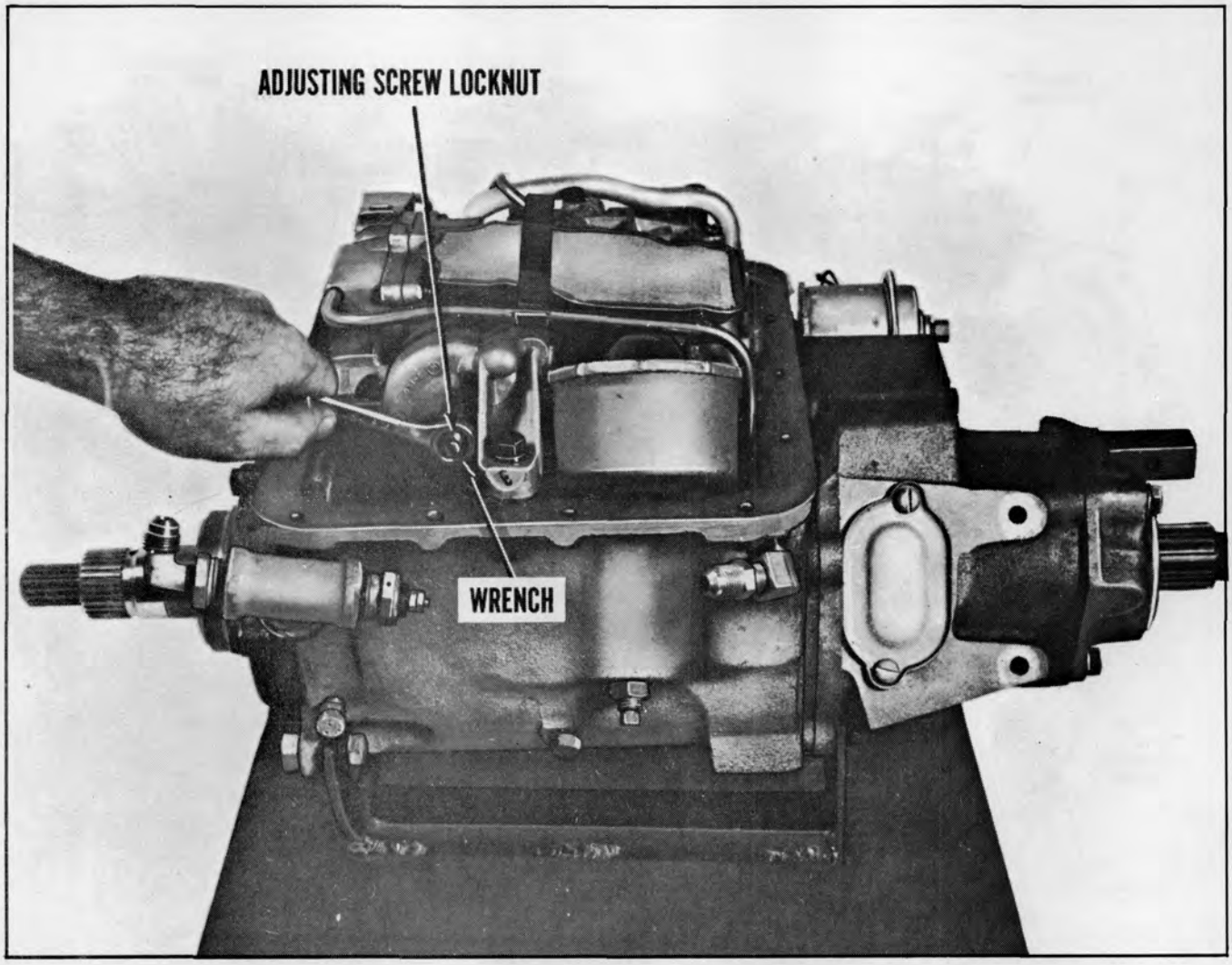


Plate 8542. Loosen Front Servo Adjustment Screw

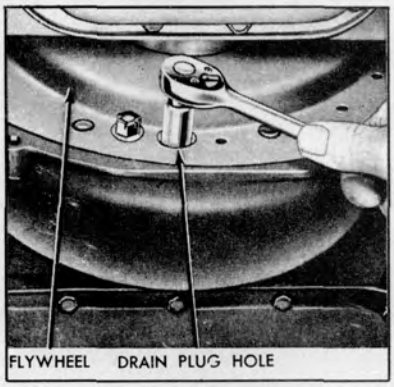


Plate 9298. Converter Drain Plug Location

2. After removing the converter access hole cover, remove the two upper bolts and lock washers which attach the converter housing to the engine.

3. Raise the vehicle and remove the cover from the lower front side of the converter housing.

4. Remove one of the converter drain plugs (Plate 9298). Then rotate the converter 180° and remove the other plug. Do not attempt to turn the converter with a wrench on the converter stud nuts.

Transmission Drain

1. Disconnect the fluid filler tube from the transmission.

2. When the fluid has stopped draining from the transmission, remove and thoroughly clean the oil pan. Discard the oil pan gasket.

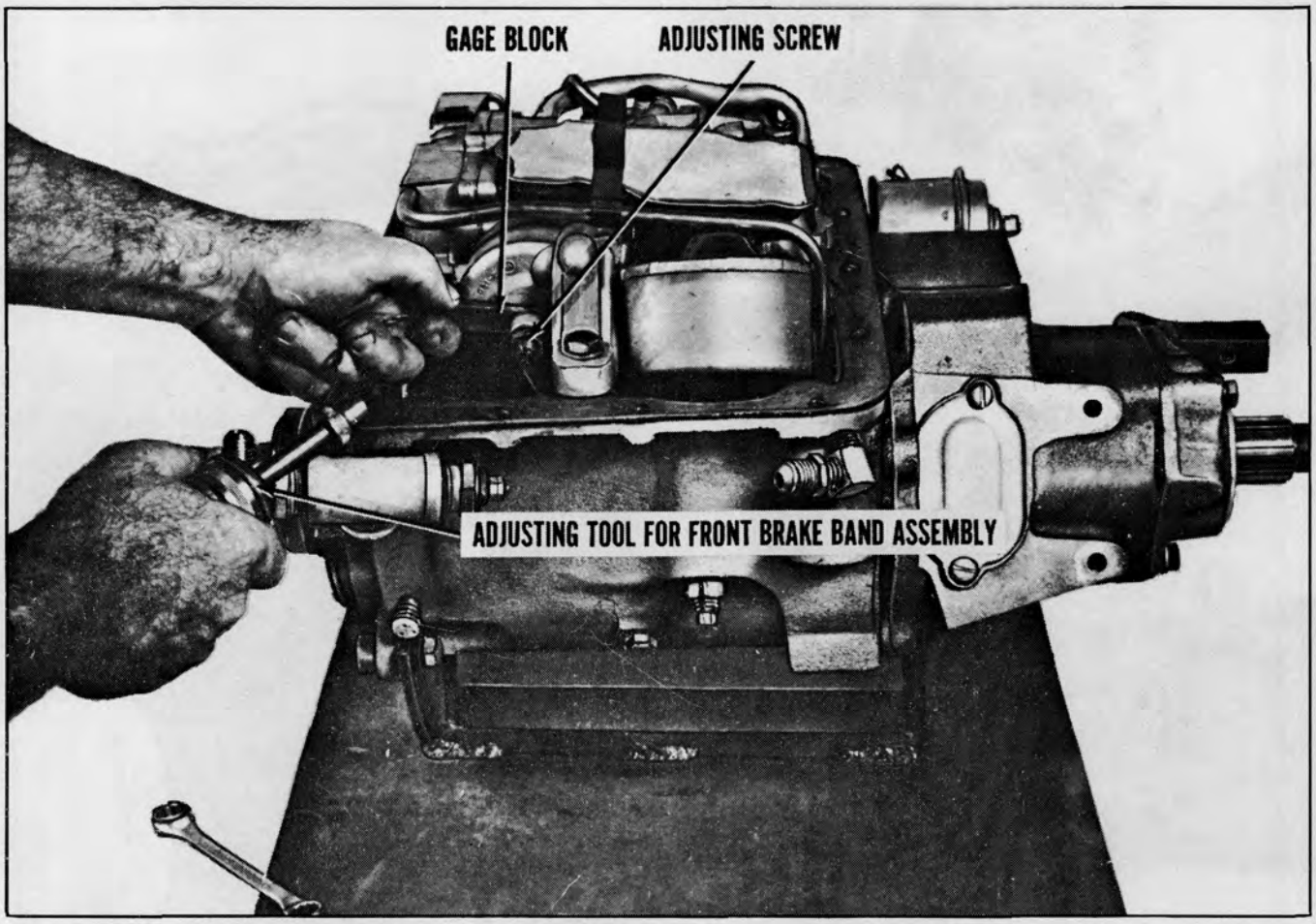


Plate 8543. Pull Back On Adjusting Rod and Insert Gauge Block

Front Band Adjustment

1. Disconnect the fluid filler tube from the oil pan and drain the fluid from the transmission.

2. Remove and thoroughly clean the oil pan and screen. Discard the oil pan gasket.

3. Loosen the front servo adjusting screw lock nut (Plate 8542) two full turns. Check the adjusting screw for free rotation in the servo actuating lever. Free the screw if necessary.

4. Pull back on the actuating rod and insert the gauge block (of the front band adjusting wrench) between the servo piston and adjusting screw. (See above.)

N O T E

The adjusting tool shown above is typical in design and may be purchased from most reputable auto parts store.

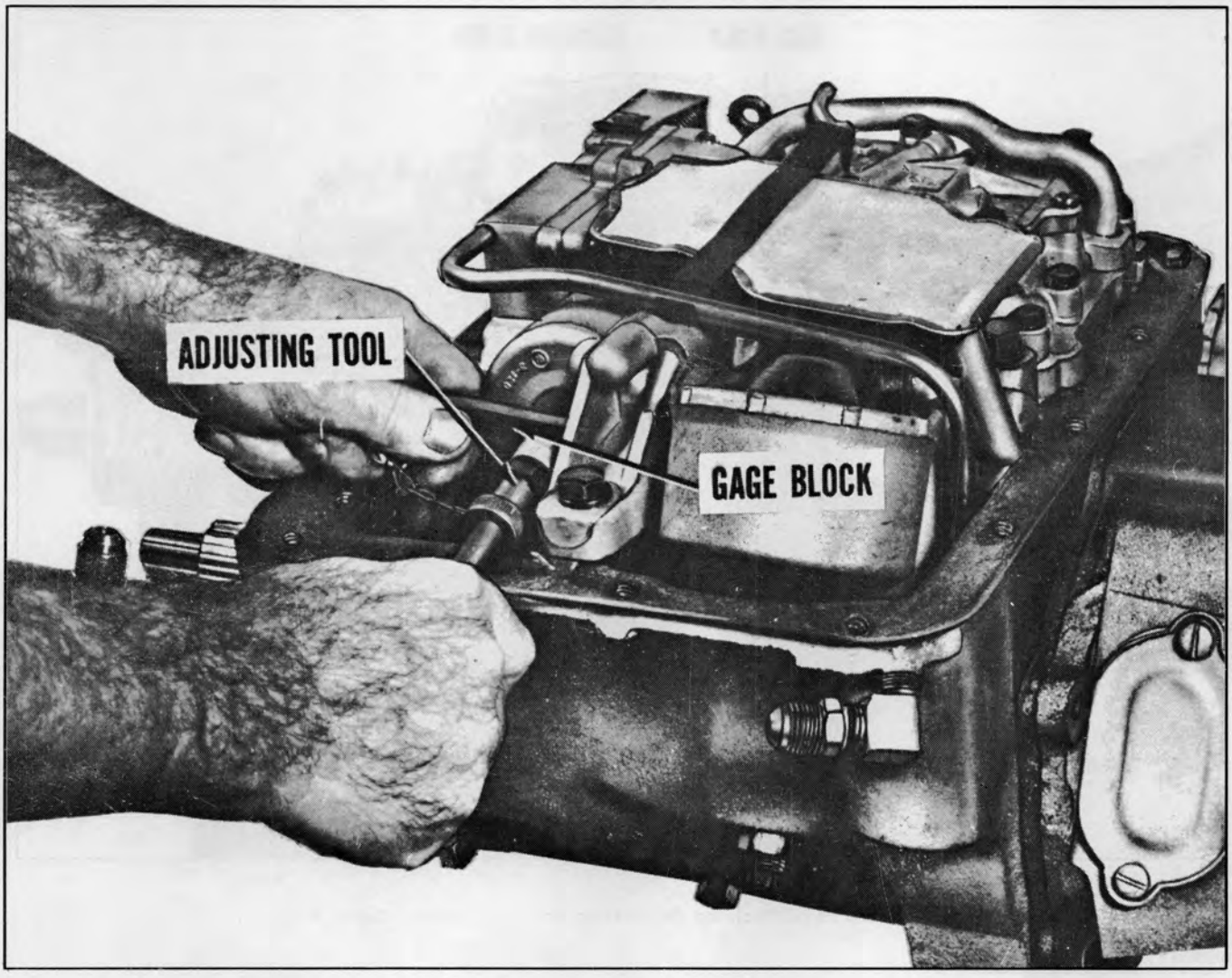


Plate 8544. Torque Adjusting Screw

5. Torque the adjusting screw with the adjusting tool (wrench) until the wrench over-runs 10 in. lbs. (See above illustration). Then back off the screw exactly one full turn.

CAUTION

SEVERE DAMAGE MAY RESULT TO THE TRANSMISSION IF THE ADJUSTING SCREW IS NOT BACKED OFF EXACTLY ONE FULL TURN.

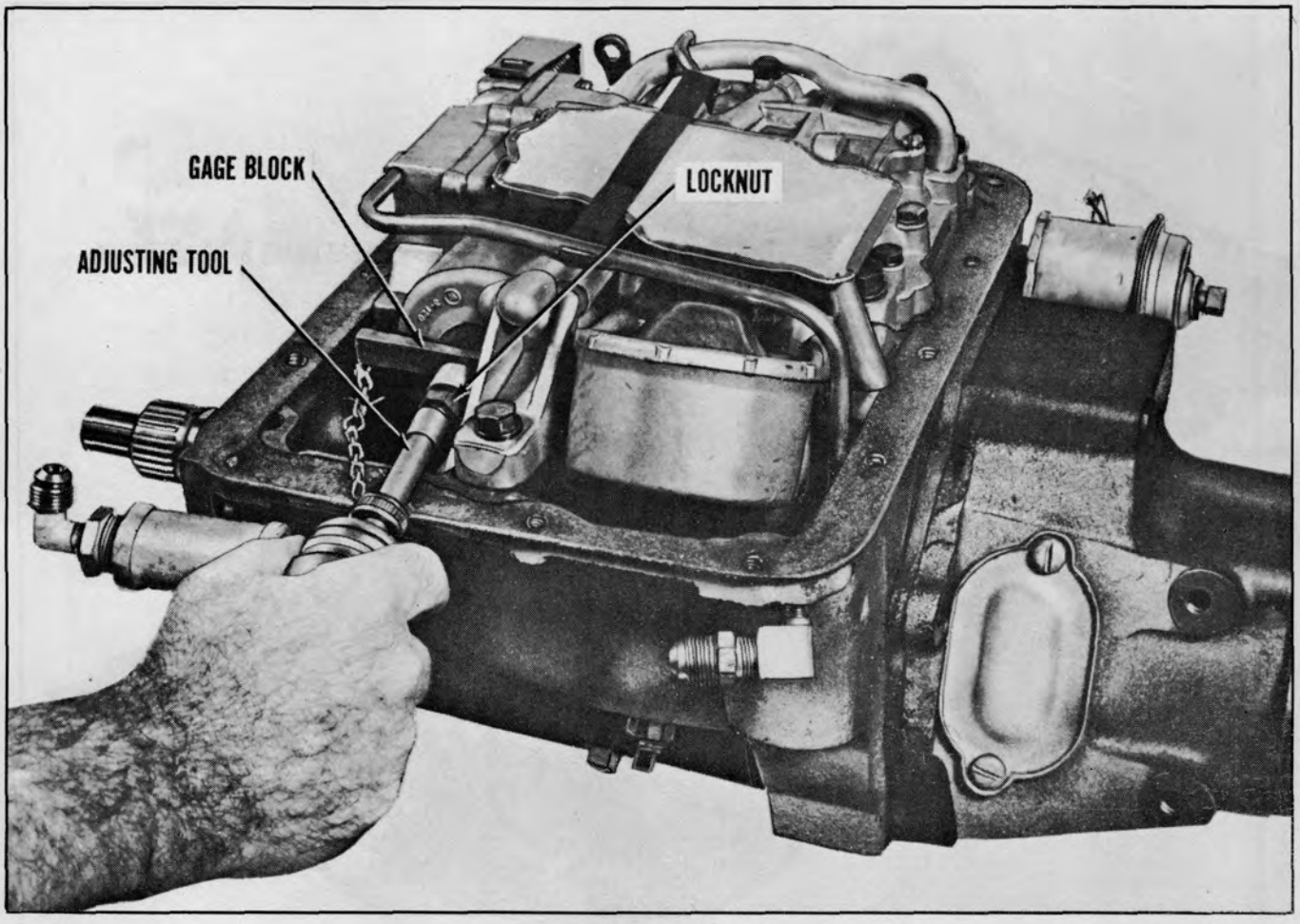


Plate 8545. Pull Gauge Block Out And Torque Nut

6. Pull gauge block out, hold adjusting screw stationary and torque the lock nut clockwise to 20 - 25 ft. lbs.

The front band should now be in proper adjustment. Refer to the following pages for rear band adjustment.

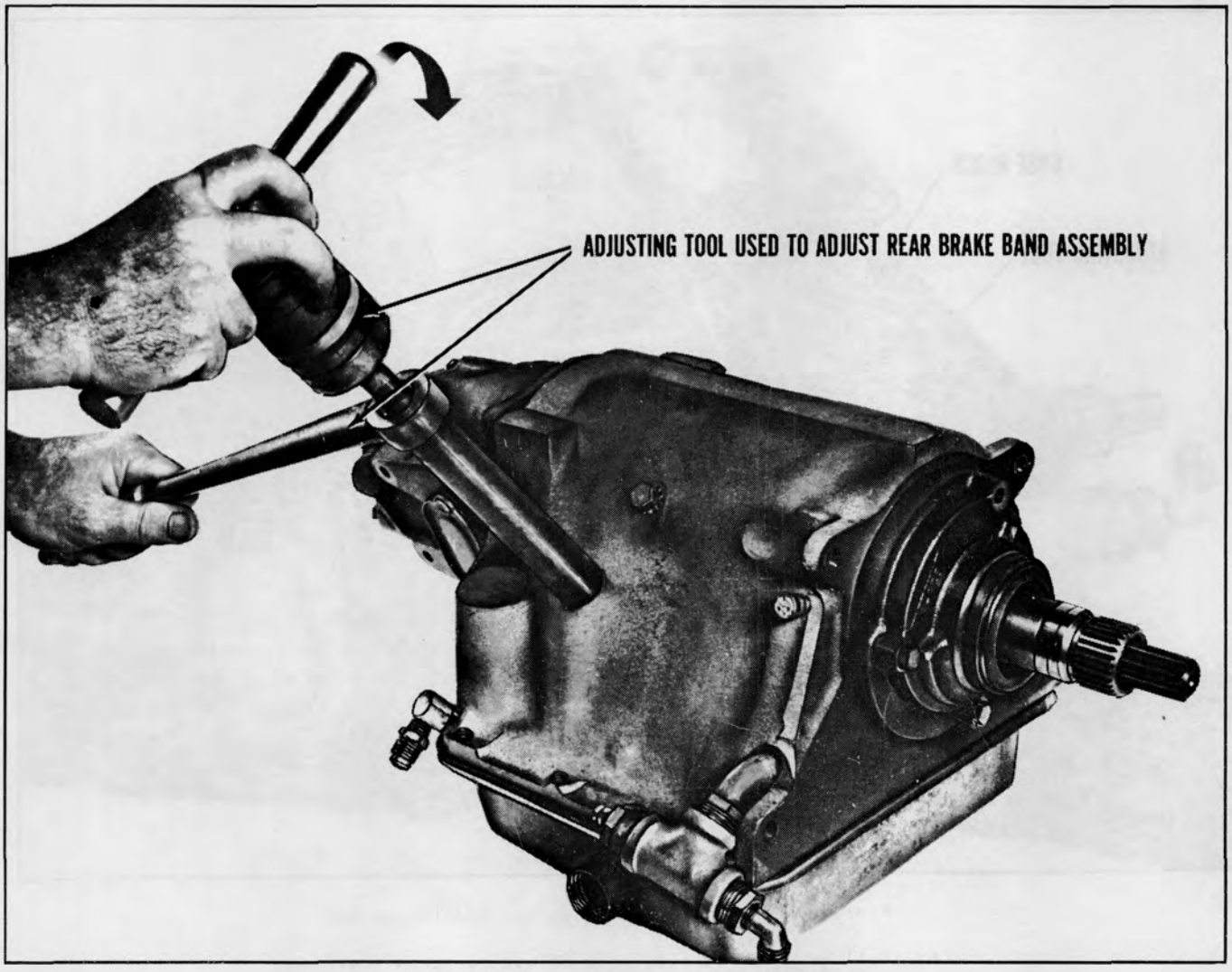


Plate 8546. Loosen Rear Band Screw Nut

REAR BAND ADJUSTMENTS

N O T E

Be sure all dirt is removed from around the rear band adjusting screw. Oil the threads.

7. Loosen the rear band adjusting screw lock nut. Torque the adjusting screw until the wrench over-runs 10 lb. ft.

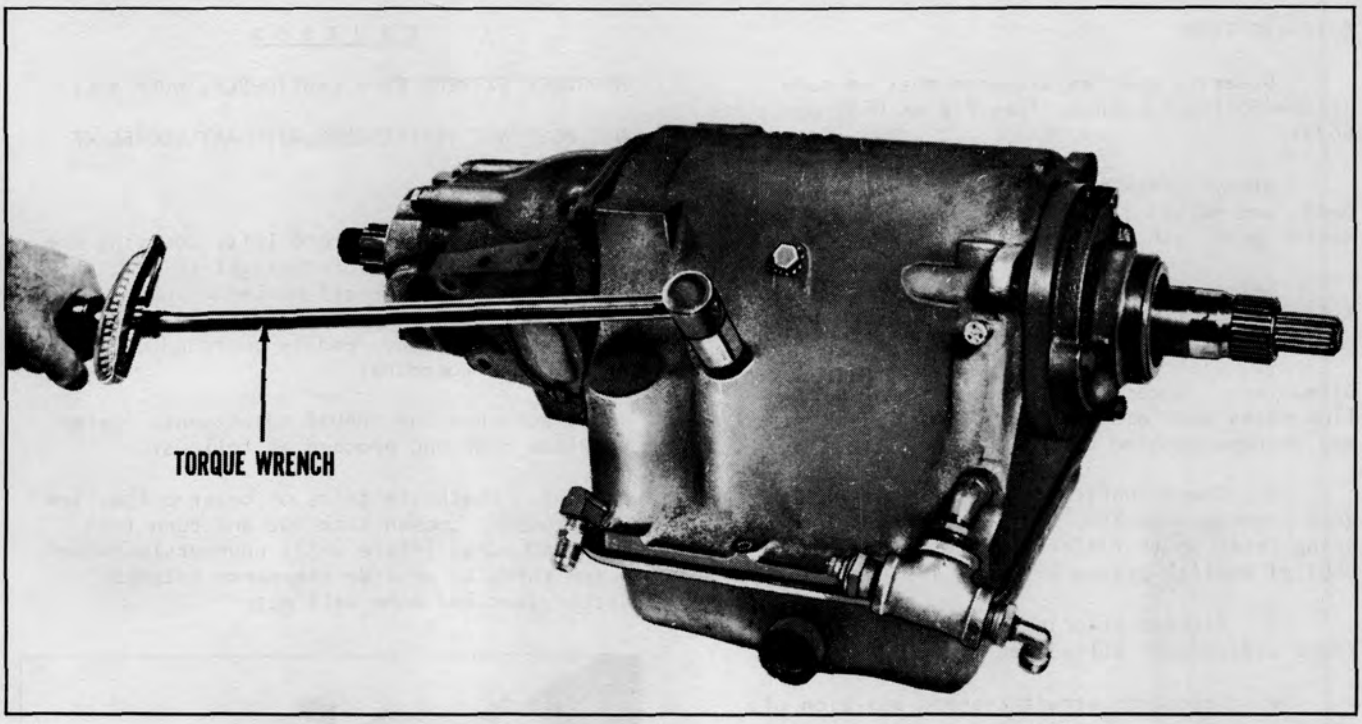


Plate 8547. Torque Lock Nut

8. Back off the adjusting screw exactly (1½) one and a half turns. Hold the adjusting screw stationary and torque the screw lock nut to 35 to 45 lb. ft.

9. Replace the transmission oil pan and screen in reverse order of removal. Torque the pan bolts to 12 to 15 lb. ft.

10. Connect the fluid filler tube to the transmission oil pan. Tighten the connection securely.

11. Replace the converter plugs, converter housing cover, converter housing and access hole cover.

12. When filling a dry transmission and converter, install five quarts of fluid.

13. Run the engine at idle speed for about two minutes and then run it at fast idle speed (about 1200 rpm) until it reaches its normal operating temperature. **Do not race the engine.**

14. Shift the selector lever through all the positions, place it a N (neutral) and check the fluid level. If necessary, add enough fluid to the transmission to raise the level to the F (full) mark on the dipstick. **Do not overfill the transmission.**

N O T E

Use only automatic transmission fluid type "F" in Ford Cruise-O-Matic transmission. Refer to specifications.

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 NLGI #1 Amolith grease EP #1 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.

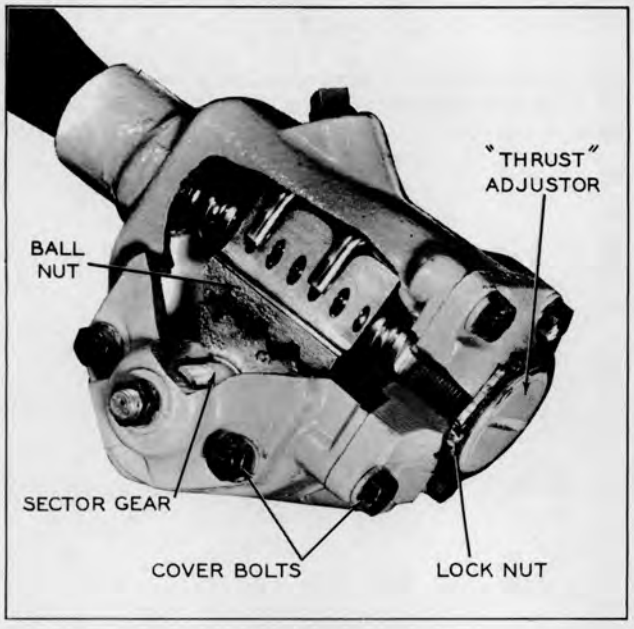


Plate 6636. Steering Gear Thrust Adjustment (Worm Bearings)

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) counterclockwise a few turns to provide clearance between sector gear and worm ball nut.

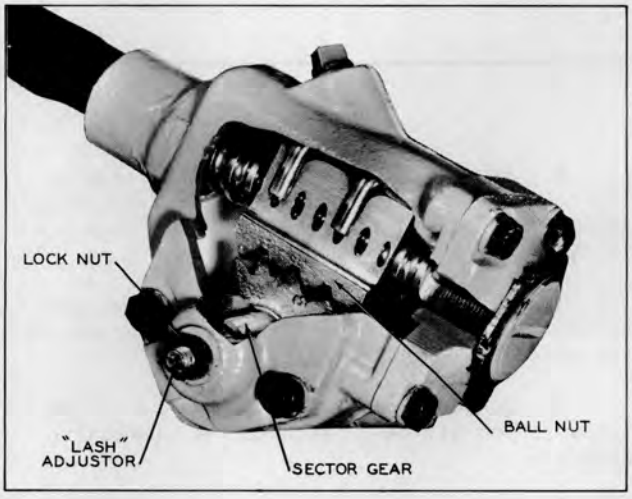


Plate 6637. Steering Gear Lash Adjustment (Sector Gear)

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

3. If it is necessary to adjust the worm bearings, loosen lock nut and then turn worm bearing adjuster nut clockwise until all end play is removed, see Plate 6636. Using

spring scale, as directed in Step 2, check pull and readjust as necessary; then tighten lock nut securely.

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

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

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

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

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

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

N O T E

If steering linkage adjustment is necessary do not install drag link to pitman arm.

STEERING LINKAGE ADJUSTMENT

Steering mechanism must be in straight ahead position (refer to Steering gear adjustments for correct procedure) before making the following adjustments.

Pitman Arm should now be in a vertical position. If not, remove pitman arm and reinstall it without moving hand wheel from its centered position.

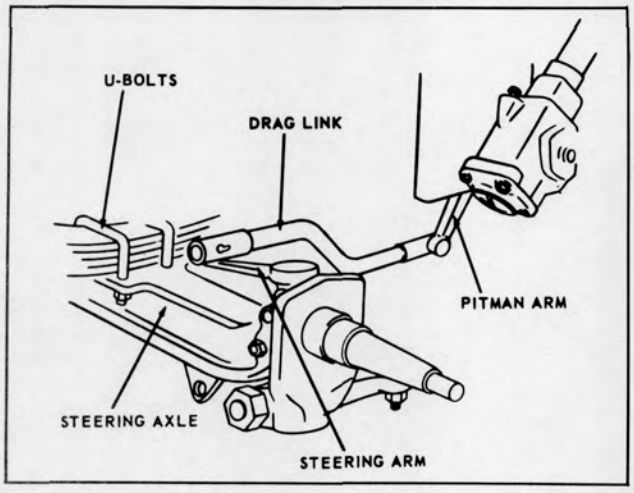


Plate 6274. Steer Linkage Adjustment

Shorten or lengthen Drag Link until it connects with Pitman Arm without moving centered position of Hand Wheel and without moving straight ahead position of Steer Wheels.

Tighten all nuts.

Adjust Turning Radius: The two stop screws, located on the front axle, are for adjusting the turning radius of the tractor. Adjustment is made by loosening the lock nuts and turning the stop screws IN to lengthen turning radius, or OUT to shorten turning radius. When the specified turning radius is obtained, tighten lock nut. Refer to Specifications for specified turning radius.

SUSPENSION. Inspect Spring Shackles, U Bolts and Clips for damage and security of mounting.

LINKAGE. Lubricate all miscellaneous linkage with S.A.E. No. 20 oil.

Tighten all Bolts, Nuts and Cap Screws.

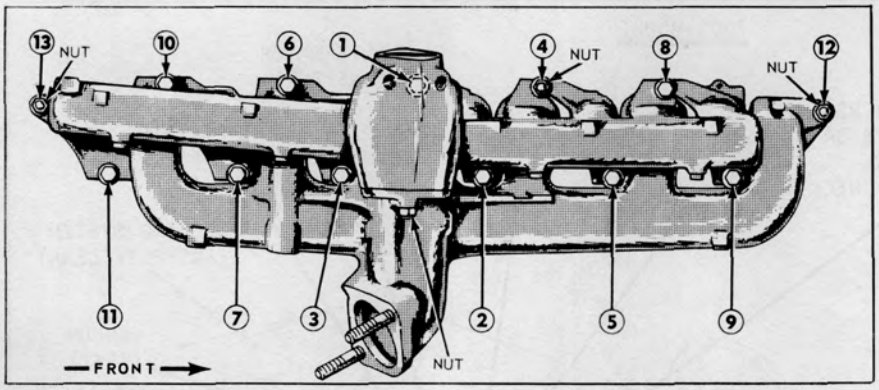


Plate 9252. Manifolds Torque Sequence

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

1. Check security of mounting. Tighten as required.

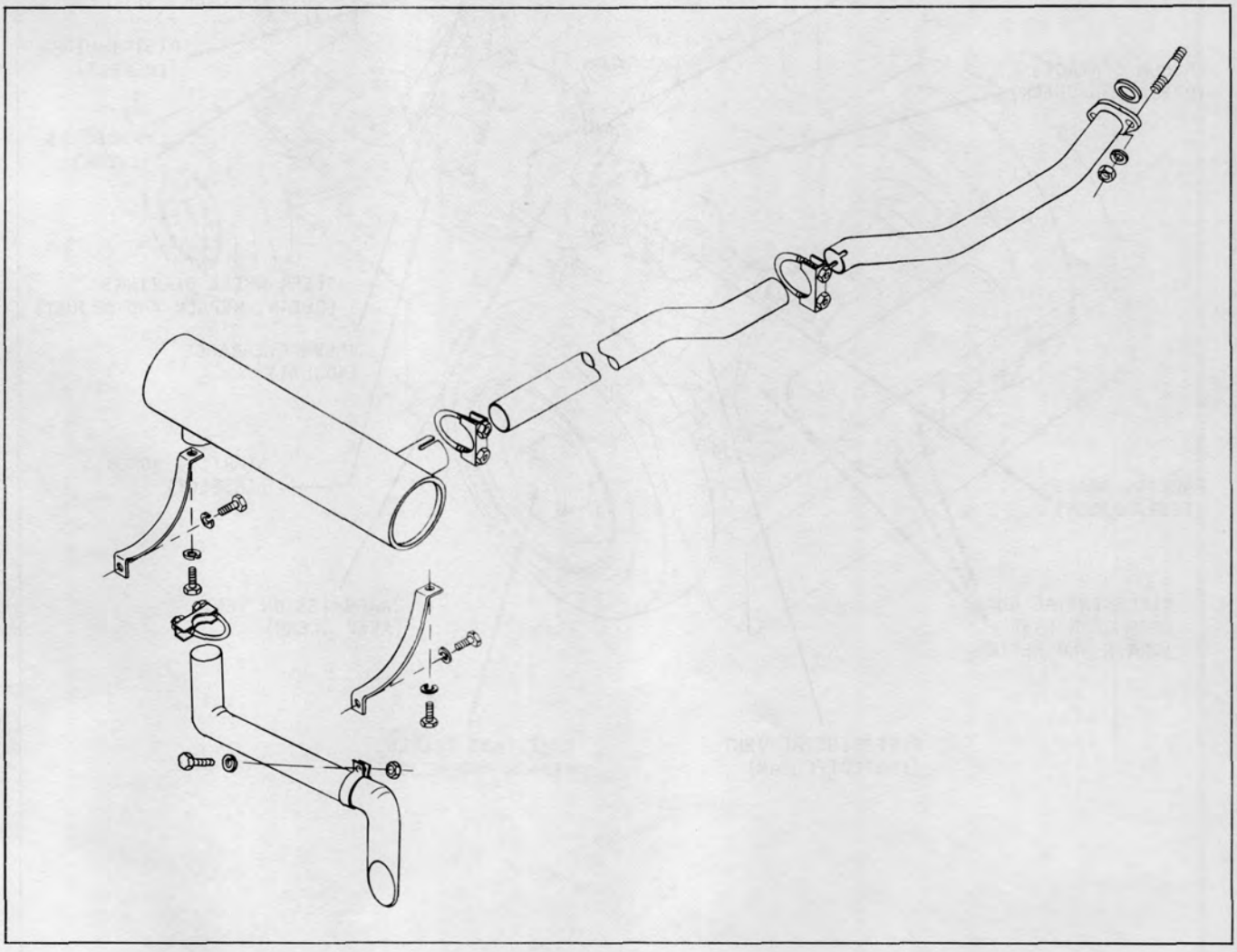


Plate 9253. Typical Muffler and Mounting

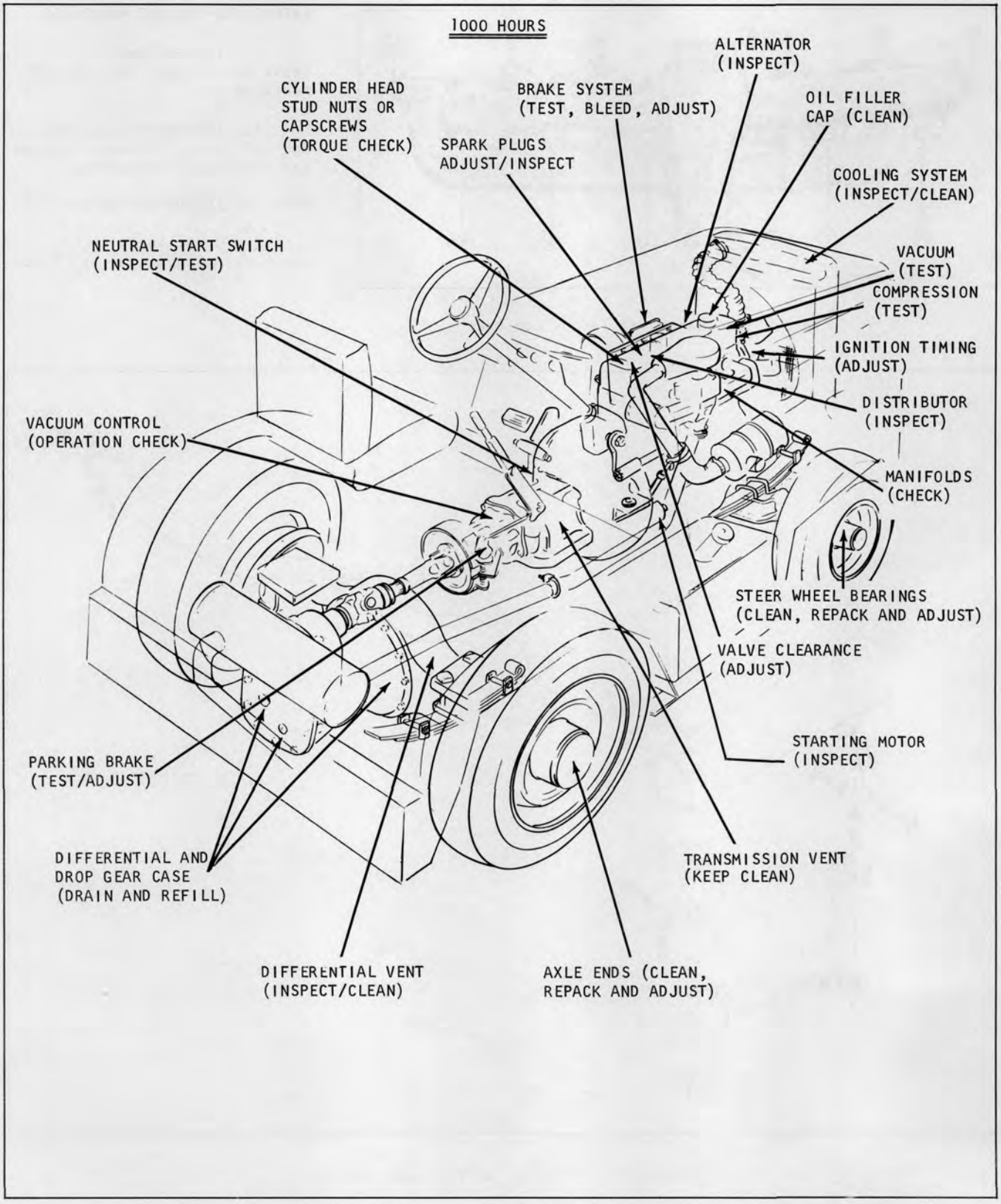


Plate 9158. Lubrication and Preventive Maintenance Illustration

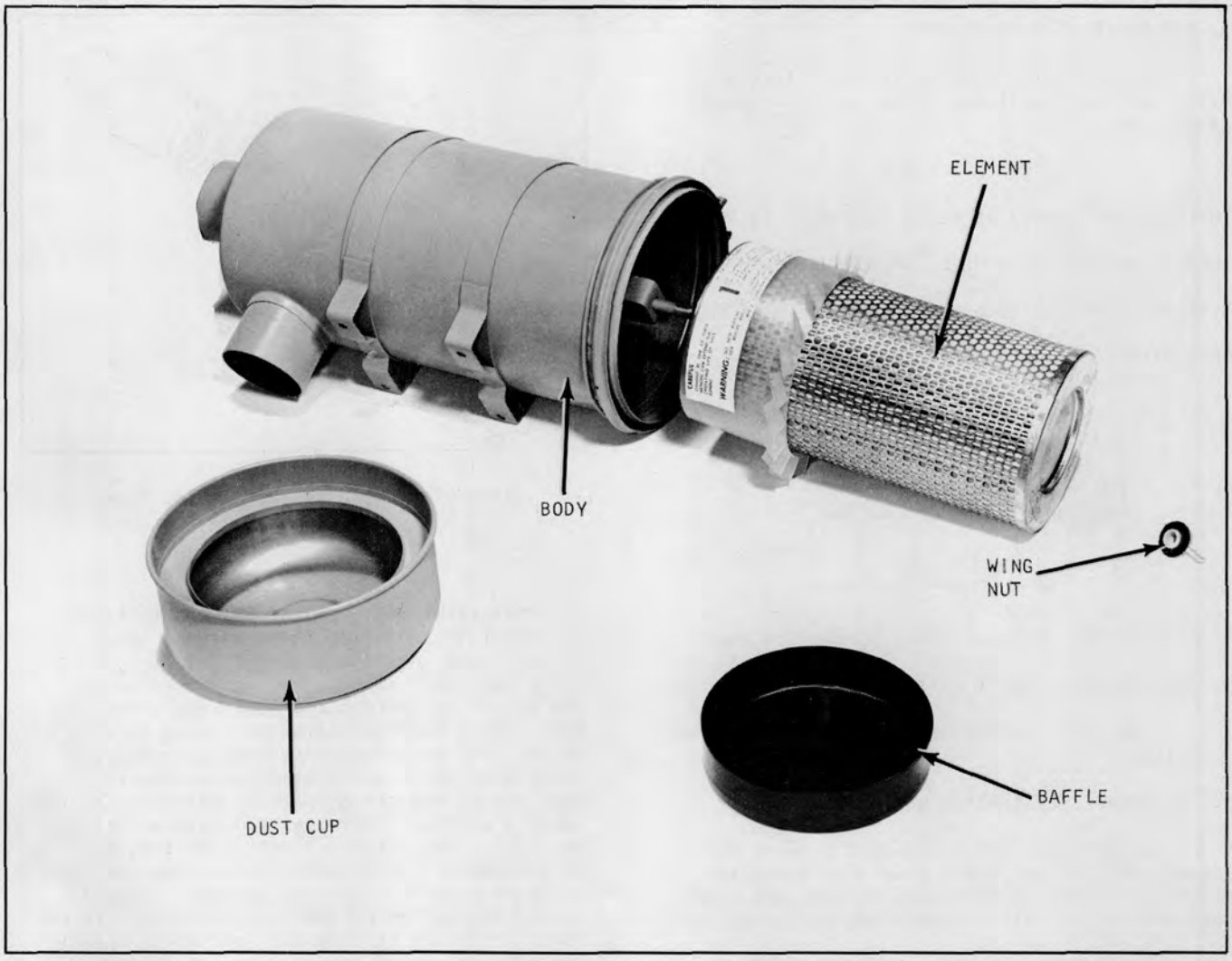


Plate 9154. Air Cleaner Assembly

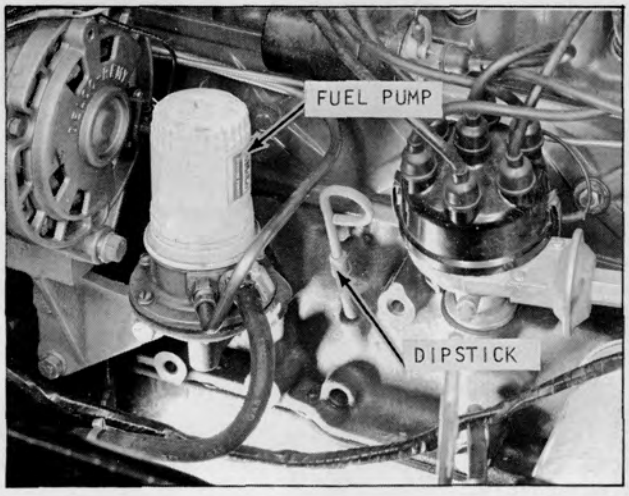


Plate 9164. Fuel Pump Assembly

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.

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 9254 MUST BE FOLLOWED. ALL CYLINDER HEAD CAP SCREWS OR NUTS MUST BE TIGHTENED EVENLY AND TORQUED IN ACCORDANCE WITH LIMITS LISTED IN SPECIFICATIONS.

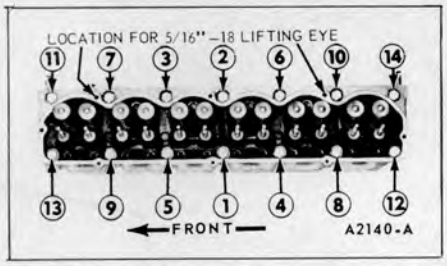


Plate 9254. Cylinder Head Torque Sequence

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.

6. VALVE LASH

The engine installed in your machine is equipped with hydraulic valve lifters. Although a preliminary valve adjustment is performed at the factory, it is recommended that this setting be checked before full-time operation of the unit.

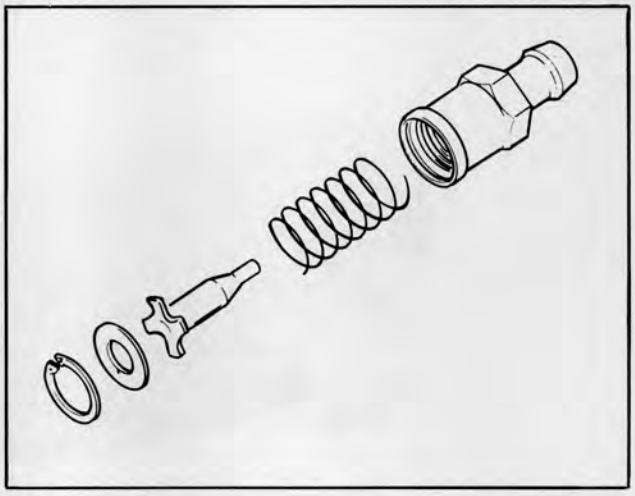


Plate 9247. Crankcase Metering Valve

Maintaining the proper valve lash setting is one of the most important factors relating to excellent engine performance and long life. Valve lash that is adjusted too tight causes the valves to operate too early and close too late. This does not allow the valve to remain on the seat long enough to cool properly and results in early valve warping and burning. When the valves are allowed to operate with too loose a setting, they open too late and close too early. When this condition exists, the ramp on the camshaft lobe which slows down the closing of the valve before it contacts the seat is not allowed to perform its function. Therefore, the valve strikes the seat while traveling at a very high speed, resulting in increased valve and camshaft wear and possible breakage of the valve due to the high impact force.

Before adjusting the valve clearance, run the engine at approximately 1200 rpm, for a minimum of 30 minutes in order to stabilize engine temperatures. Then proceed as follows:

1. Reduce the engine speed as much as possible, still maintaining a smooth idle.

2. Remove the rocker arm cover hold down nuts.

3. Jar the rocker arm cover with the heel of your hand or a soft leather hammer to loosen the gasket from the cylinder head.

4. Remove the rocker arm cover.

5. Loosen the adjusting nut on the first rocker arm stud until the lifter just begins to click audibly.

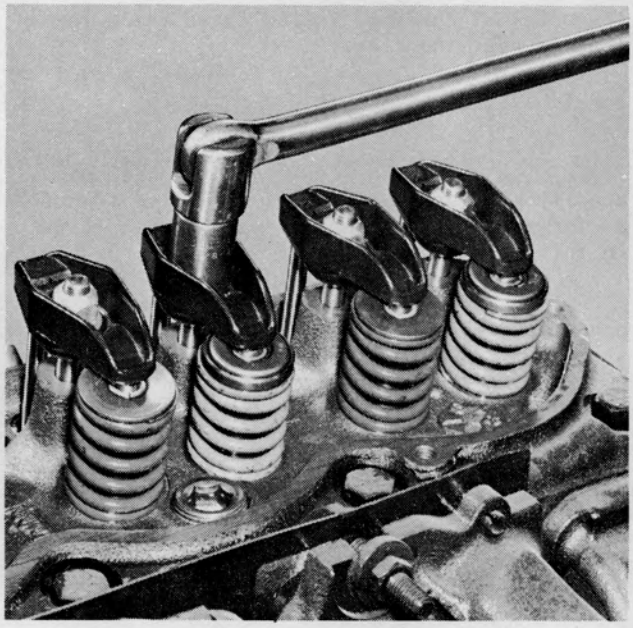


Plate 9255. Setting Valve Lash

6. Now tighten the nut until the click just disappears.

7. Tighten the nut 3/4 turn past this point and proceed to the next rocker.

8. The nuts used are self-locking, and require no further attention after they are properly adjusted.

9. After all adjustments are made, clean the gasket surfaces, install a new valve cover gasket, and replace the valve cover.

7. COMPRESSION TEST

A cylinder compression test aids in determining the condition of the valves, rings and head gasket. This test should always be performed at the recommended intervals to help determine if any major engine repairs are necessary.

Be sure the battery is good. Operate the engine until normal operating temperature is reached. Turn the ignition switch off. Loosen the spark plugs, blow out any dirt in the spark plug wells, then remove the plugs.

Set the throttle in the wide open position and be sure the choke is wide open. Remove the coil high tension lead at the distributor, and ground it securely to the engine. Install a compression gauge in number 1 cylinder. Crank the engine until the gauge registers a maximum reading and record the reading. Note the number of compression stroker required to obtain this reading. Repeat the test on each cylinder, cranking the same number of times that were needed to obtain the maximum reading on number 1 cylinder.

During the compression test, the indicated pressure should rise evenly on each succeeding stroke until the maximum reading is obtained. If the pressure rise is erratic, or fails to rise on any stroke, a sticky or stuck valve is indicated.

The pressure should be 150-200 pounds. However, the compression of all cylinders should be uniform within 20 pounds.

A reading of more than 10 pounds above normal indicates carbon or lead deposits in the cylinder.

A reading of more than 10 pounds below normal indicates leakage at the head gasket, rings, or valves.

A low, even compression in two adjacent cylinders indicates a head gasket leak. This should be checked before condemning the rings or valves.

To determine whether the rings or the valves are at fault, squirt the equivalent of a tablespoon of heavy oil into the combustion chamber and repeat the compression test. The oil will temproarily seal leakage past the rings. If the same reading is obtained, the rings are satisfactory, but the valves are leaking. If the compression has increased 10 pounds or more over the original reading, it indicates there is leakage past the rings.

Spark Plug Check

Under normal conditions these spark plugs will give long life performance with the normal maintenance listed in this manual.

The spark plugs should be cleaned, tested and gapped at the recommended intervals.

Loosen the spark plugs one full turn, then blow any accumulation of dirt out of the spark plug wells before completing the removal.

Remove carbon and other deposits from the threads with a stiff wire brush. Any deposits will retard the heat-flow from the plug to the cylinder head, causing spark plug overheating and pre-ignition.

Clean any heavy carbon deposits from the inside of the plugs with a thin bladed knife, then finish cleaning them with an abrasive-type cleaner. Use the cleaner sparingly, as excessive abravive blasting may damage the porcelain around the center electrode. If the porcelain is badly glazed or eroded, replace the spark plugs.

After cleaning, examine the plug carefully for cracked or broken insulator, badly eroded electrodes and other signs of failure. Replace as required.

Clean the electrode surfaces with a small file. Dress the electrodes to secure flat parallel surfaces on both the center and side electrode.

Examine the firing ends of the spark plug noting the type of deposits and the degree of

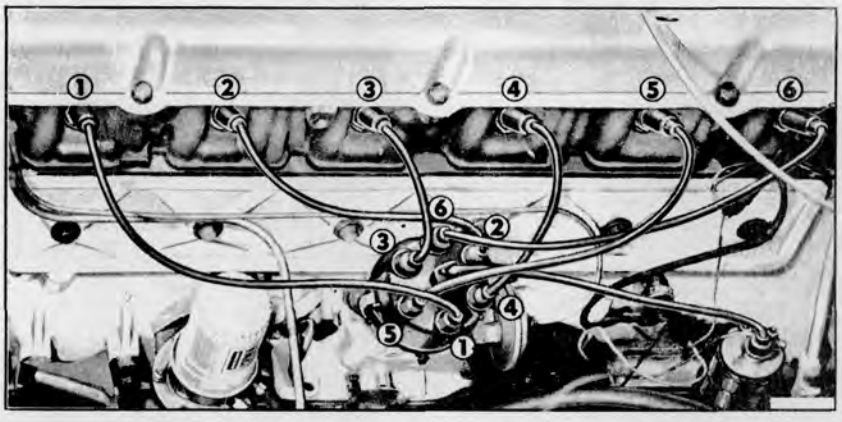


Plate 9271. Engine Ignition Wiring

CARBON FOULED	OIL FOULED	GAP BRIDGED
		
IDENTIFIED BY BLACK, DRY FLUFFY CARBON DEPOSITS ON INSULATOR TIPS, EXPOSED SHELL SURFACES AND ELECTRODES. CAUSED BY TOO COLD A PLUG, WEAK IGNITION, DIRTY AIR CLEANER, DEFECTIVE FUEL PUMP, TOO RICH A FUEL MIXTURE, IMPROPERLY OPERATING HEAT RISER OR EXCESSIVE IDLING. CAN BE CLEANED.	IDENTIFIED BY WET, BLACK DEPOSITS ON THE INSULATOR, SHELL BORE AND ELECTRODES. CAUSED BY EXCESSIVE OIL ENTERING COMBUSTION CHAMBER THROUGH WORN RINGS AND PISTONS, EXCESSIVE CLEARANCE BETWEEN VALVE GUIDES AND STEMS, OR WORN OR LOOSE BEARINGS. CAN BE CLEANED.	IDENTIFIED BY DEPOSIT BUILD-UP CLOSING GAP BETWEEN ELECTRODES. CAUSED BY OIL OR CARBON FOULING. IF DEPOSITS ARE NOT EXCESSIVE, THE PLUG CAN BE CLEANED.
LEAD FOULED	**NORMAL**	**WORN**
		
IDENTIFIED BY DARK GRAY, BLACK, YELLOW OR TAN DEPOSITS OR A FUSED GLAZED COATING ON THE INSULATOR TIP. CAUSED BY HIGHLY LEADED GASOLINE. CAN BE CLEANED.	IDENTIFIED BY LIGHT TAN OR GRAY DEPOSITS ON THE FIRING TIP CAN BE CLEANED.	IDENTIFIED BY SEVERELY ERODED OR WORN ELECTRODES. CAUSED BY NORMAL WEAR. SHOULD BE REPLACED.
FUSED SPOT DEPOSIT	**OVERHEATING**	**PRE-IGNITION**
		
IDENTIFIED BY MELTED OR SPOTTY DEPOSITS RESEMBLING BUBBLES OR BLISTERS. CAUSED BY SUDDEN ACCELERATION. CAN BE CLEANED.	IDENTIFIED BY A WHITE OR OR LIGHT GRAY INSULATOR WITH SMALL BLACK OR GRAY BROWN SPOTS AND WITH BLUISH-BURNT APPEARANCE OF ELECTRODES. CAUSED BY ENGINE OVERHEATING, WRONG TYPE OF FUEL, LOOSE SPARK PLUGS, TOO HOT A PLUG, LOW FUEL PUMP PRESSURE OR INCORRECT IGNITION TIMING.	IDENTIFIED BY MELTED ELECTRODES AND POSSIBLY BLISTERED INSULATOR. METALLIC DEPOSITS ON INSULATOR INDICATE ENGINE DAMAGE. CAUSED BY WRONG TYPE OF FUEL, INCORRECT IGNITION TIMING OR ADVANCE, TOO HOT A PLUG, BURNT VALVES OR ENGINE OVERHEATING. REPLACE THE PLUG.

Plate 9272. Spark Plug Inspection

electrode erosion.

Adjust the spark plug gap to .032 by bending only the outside electrode. Use a round wire-type gauge to check the gap. If old spark plugs are reused, install with new gaskets. Torque to 15-20 ft. lbs.

N O T E

Do not overtighten spark plugs. The gap may change considerably due to distortion of the plug outer shell.

Spark Plug Wire Replacement

When removing the wires from the spark plugs, grasp, twist and pull the moulded cap only. Do not pull on the wire because the wire connections inside the cap may become separated or the weather seal may be damaged.

Removal

1. Disconnect the wires at the spark plug and at the distributor cap.

2. Remove the coil high tension lead.

Installation

1. Connect the wires to the proper spark plugs.

2. Insert the ends of the wires in the correct sockets in the distributor cap. Be sure the wires are forced all the way down into their sockets and that they are held firmly in position. The No. 1 socket is identified on the cap. Install the wires in a clockwise direction in the firing order (1-5-3-6-2-4) starting at the No. 1 socket.

3. Install the coil high tension lead. Push all weather seals into position.

8. DISTRIBUTOR

Distributor Cap: Clean the distributor cap with a soft bristle brush and mild cleaning solvent or mineral spirits. Dry the cap with compressed air. Inspect the cap for cracks, burned contacts, permanent carbon tracks or dirt or corrosion in the sockets. Replace the cap if it is defective.

Rotor: Clean the rotor with a soft bristle brush and a Stoddard type cleaning solvent. The rotor should be dried with compressed air. Inspect the rotor for cracks or burning. Replace the rotor if it is defective.

Coil: Wipe the coil with a damp cloth and check for any cracks or other defects.

Distributor Spark Advance

The spark advance is checked to determine if the ignition timing advances in proper relation to engine speed and load.

Dual Advance Distributor

1. Check the contact dwell. If the contact dwell is not within specifications, adjust the breaker points.

2. Check the breaker arm spring tension and adjust it if necessary.

The dual advance distributor has two independently operated spark advance systems. Each system is adjusted separately. Adjust the centrifugal advance before adjusting the vacuum advance.

Centrifugal Advance

1. Do not connect the test set vacuum line to the diaphragm. Set the test set to 0 deg advance and the initial rpm setting listed in the specifications.

2. Operate the distributor in the direction of rotation and slowly increase the rpm to the setting specified for the first advance reading listed in the specifications.

If the correct advance is not indicated at this rpm, stop the distributor and bend one spring adjustment bracket to change its tension (Plate 9258). Bend the adjustment bracket away from the distributor shaft to decrease advance (increase spring tension) and toward the shaft to increase advance (decrease spring tension). After the adjustment is made, identify the bracket.

3. After an adjustment has been made to one spring, check the minimum advance point again.

Plate 9258. Centrifugal Advance Adjustment

4. Operate the distributor at the specified rpm to give an advance just below the maximum. If this advance is not to specifications, stop the distributor and bend the other spring bracket to give the correct advance.

5. Check the advance at all rpm settings listed in the specification. Operate the distributor both up and down the rpm range.

Vacuum Advance

1. Connect the test set vacuum line to the fitting on the diaphragm and turn the vacuum supply switch on.

2. Set the test set to 0 deg advance, 0 vacuum, and at 1000 rpm.

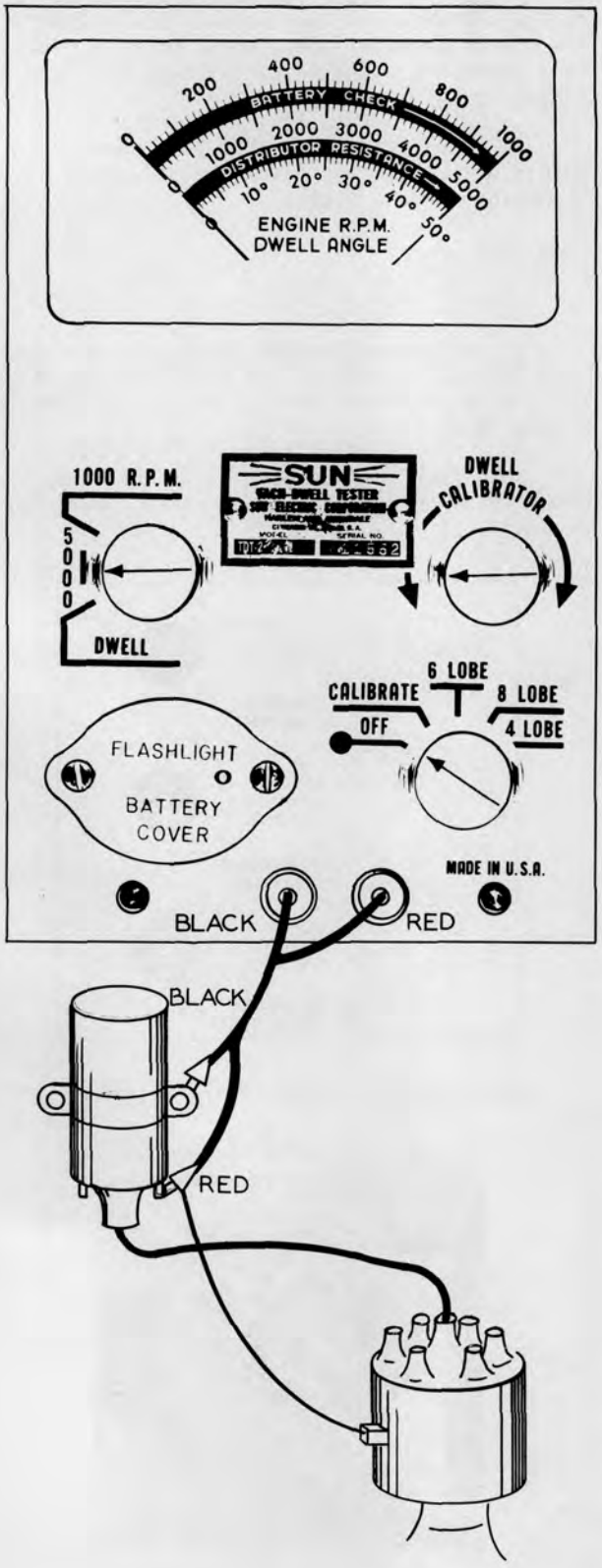
3. Check the advance at the first vacuum setting given in the specifications.

4. If the advance is incorrect, change the calibration washers between the vacuum chamber spring and nut (Plate 9259). After installing or removing the washers, position the gasket in place and tighten the nut. The addition of a washer will decrease advance and the removal of a washer will increase advance.

5. After one vacuum setting has been adjusted, the others should be checked. Do not change the original rpm setting when going to a different vacuum setting. If the other settings are not within limits, it indicates incorrect spring tension, leakage in the vacuum chamber and/or line, or the wrong fiber stop has been in installed in the vacuum chamber of the diaphragm housing.

To check the diaphragm for leakage:
Remove the vacuum line from the distributor. Adjust the vacuum pressure of a distributor tester to its maximum position. Hold your

(Cont. to page 1000H-205-0)



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

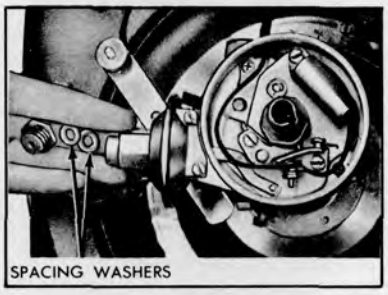


Plate 9259. Vacuum Advance Adjustment

hand over the end of the tester's vacuum hose and note the maximum reading obtained. Do not exceed 25 inches Hg.

If the maximum reading is 25 inches Hg or less, connect the tester's vacuum line to the vacuum fitting on the diaphragm without changing any of the adjustments. The maximum gauge reading should not be less than it was above. If it is less, the diaphragm is leaking and should be replaced.

Dual Advance Distributors - Conventional Ignition System

Removal (Breaker Point Assembly)

1. Remove the distrubutor cap and rotor.

2. Disconnect the primary and the condenser wires from the breaker point assembly.

3. Remove the breaker point assembly and condenser retaining screws. Lift the breaker point assembly and condenser out of the distributor.

Installation

1. Place the breaker point assembly and the condenser in position and install the retaining screws. Be sure to place the ground wire under the breaker point assembly screw farthest from the breaker point contacts on an eight cylinder engine distrubutor or under the condenser retaining screw on a six cylinder engine distributor.

2. Align and adjust the breaker point assembly.

3. Connect the primary and condenser wires to the breaker point assembly.

4. Install the rotor and the distributor cap.

Breaker Point Alignment

The vented-type breaker points must be accurately aligned and strike squarely in order to realize the full advantages provided by this design and assure normal breaker point life. Any misalignment of the breaker point surfaces will cause premature wear, overheating and pitting.

1. Turn the cam so that the breaker points are closed and check the alignment of the points (Plate 9260).

2. Align the breaker points to make full face contact by bending the stationary breaker point bracket (Plate 9261). Do not bend the breaker arm.

3. After the breaker points have been properly aligned, adjust the breaker point gap or dwell.

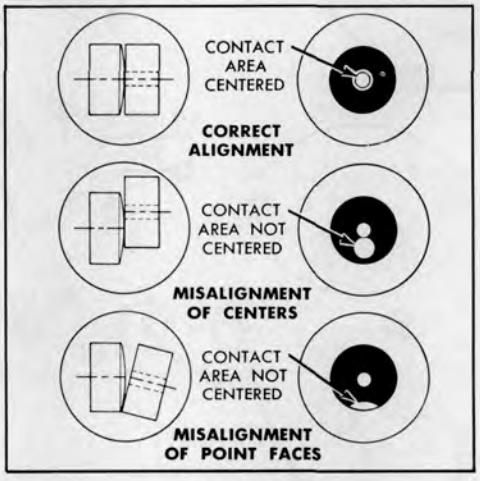


Plate 9260. Breaker Point Alignment

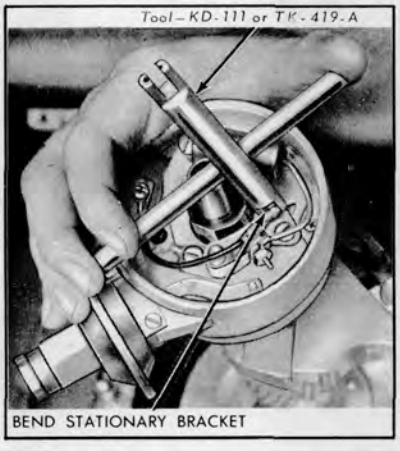


Plate 9261. Aligning Breaker Points

Tool Numbers listed above are Ford Part Numbers

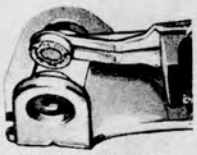
CONDITION	CAUSED BY
 BURNED	Any discoloration other than a frosted slate grey shall be considered as burned points.
 EXCESSIVE METAL TRANSFER OR PITTING	Incorrect alignment. Incorrect voltage regulator setting. Radio condenser installed to the distributor side of the coil. Ignition condenser of improper capacity. Extended operation of the engine at speeds other than normal. B1443-B

Plate 9262. Breaker Point Inspection

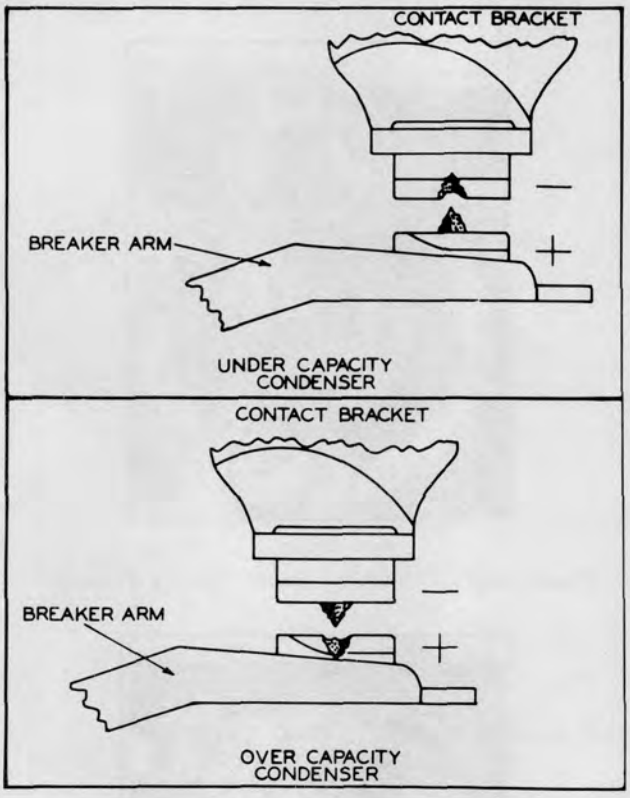


Plate 5933. Breaker Points

Breaker Point Inspection

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. (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. (Plate 7475).

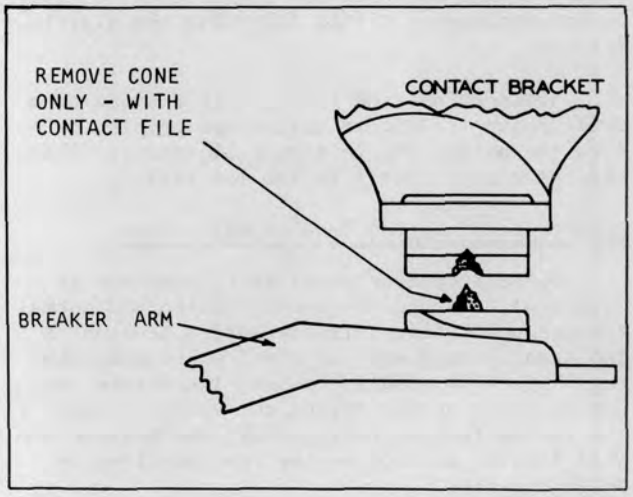


Plate 7475. File Contact Points

C A U T I O N

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

Breaker Point Gap Adjustment

A scope, a dwell meter, or a feeler gauge can be used to check the gap of new breaker points.

A scope or a dwell meter can be used to check the gap of used breaker points. Due to the roughness of used points, it is not advisable to use a feeler gauge to check the gap.

To check and adjust the breaker points with a feeler gauge:

1. Check and adjust the breaker point alignment.

2. Rotate the distributor until the rubbing block rests on the peak of a cam lobe.

If the distributor is in the engine, place the rubbing block on the peak of the cam by proceeding as follows:

With the ignition switch off, crank the engine by using an auxiliary starter switch between the S and battery terminals of the starter relay.

Insert the correct blade of a clean feeler gauge between the breaker points. (Plate 9266).

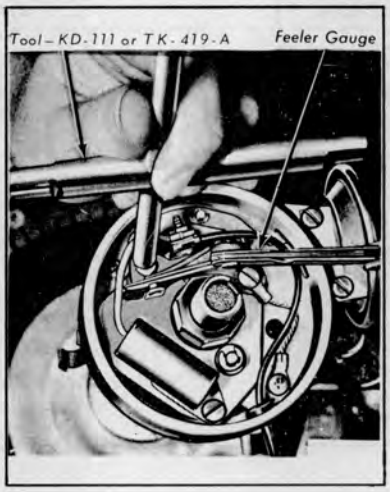


Plate 9266. Adjusting New Breaker Point

Apply a light film of distributor cam lubricant to the cam when new points are installed. Do not use engine oil to lubricate the distributor cam.

Set the ignition timing. If a scope or a dwell meter is used to adjust new points, be sure the points are in proper alignment. Also, set the contact dwell to the low setting.

Breaker Point Spring Tension Adjustment

Correct breaker point spring tension is essential to proper engine operation and normal breaker point life. If the spring tension is too great, rapid wear of the breaker arm rubbing block will result, causing the breaker point gap to close up and retard the spark timing. If the spring tension is too weak, the breaker arm will flutter at high engine rpm resulting in an engine miss.

To check the spring tension, place the hooked end of the spring tension gauge over the movable breaker point. Pull the gauge at a right angle (90 deg) to the movable arm until the breaker points just start to open. (Plate 9267). If the tension is not within specifications, adjust the spring tension.

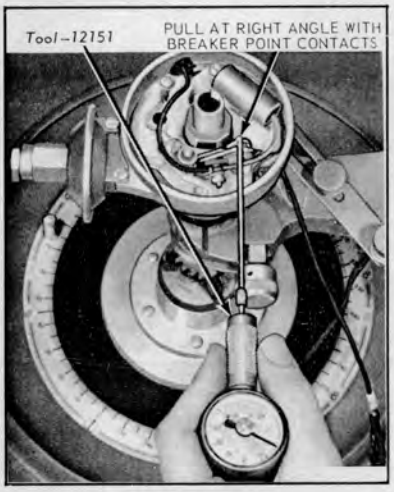


Plate 9267. Checking Point Spring Tension

To adjust the spring tension (Plate 9263)

1. Disconnect the primary or distributor-transistor lead wire and the condenser lead (if so equipped) at the breaker point assembly primary terminal.

2. Loosen the nut holding the spring in position. Move the spring toward the breaker arm pivot to decrease tension and in the opposite direction to increase tension.

3. Tighten the lock nut, then check spring

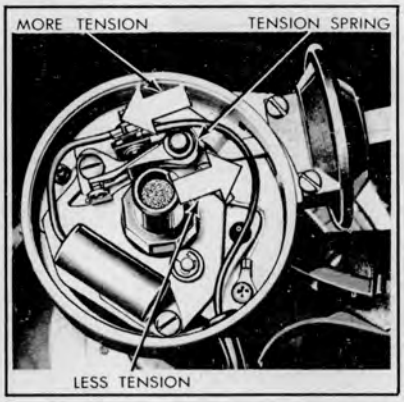


Plate 9263. Adjusting Point Spring Tension

Tool Numbers listed above are Ford Part Numbers....

tension. Repeat the adjustment until the specified spring tension is obtained.

4. Install the primary or distributor-transistor lead wire, and the condenser lead (if so equipped) with the lock-washer and tighten the nut securely.

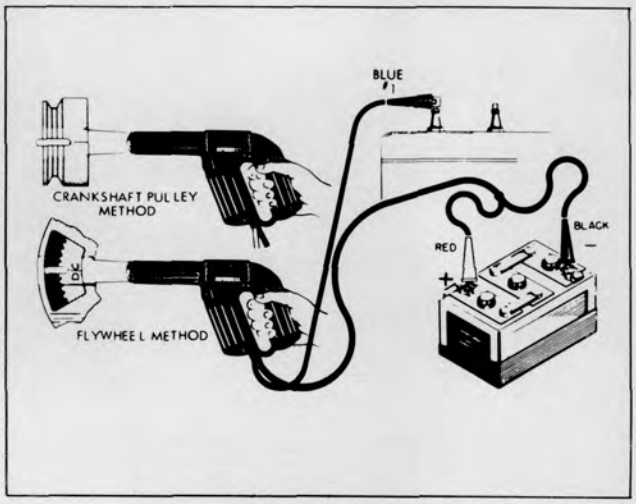


Plate 7818. Typical Timing Light Hookup

9. IGNITION TIMING

Timing Mark Locations

There are two methods of showing the timing position. Both methods use the crankshaft damper and a timing pointer.

One method uses degree marks on the crankshaft pulley (Plate 9265). These degree marks range from 0 deg or top dead center (TDC) to some value before top dead center (BTDC). When checking the timing, the correct degree mark should be in line with the timing mark on the crankshaft pulley when the timing light flashes.

Adjustment

To check and adjust the timing with a timing light, proceed as follows:

1. Remove the plug wire from the number 1 spark plug.

2. Install the spark plug adaptor on the spark plug.

3. Connect the plug wire to the spark plug adapter.

4. Clamp the timing light spark plug lead to the spark plug adapter.

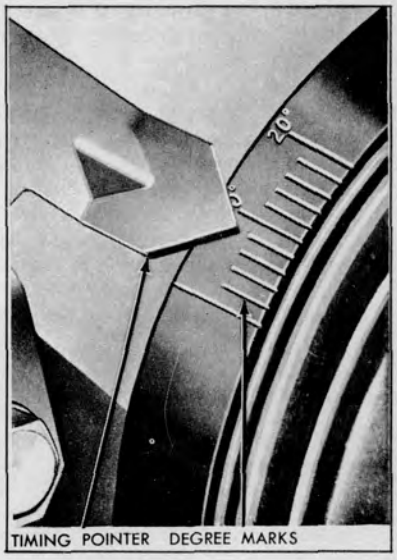


Plate 9265. Typical Pulley Mounted Degree Marks

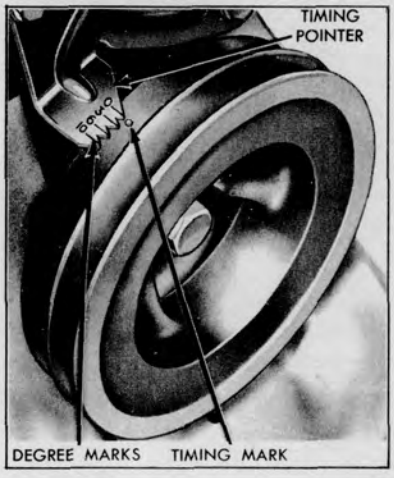


Plate 9264. Typical Pointer Mounted Degree Marks

5. Connect the timing light battery leads to the battery terminals.

6. Disconnect the distributor vacuum line (if so equipped).

7. If necessary, clean and mark the timing marks.

8. Operate the engine at the specified idle rpm and point the timing light at the timing pointer.

9. If the timing is incorrect, loosen the distributor hold down bolt and rotate the distributor until the desired initial advance is obtained.

10. Tighten the distributor hold down bolt and check the timing again.

11. Turn off the engine.

12. Remove the timing light and connect the vacuum line.

10. INTAKE MANIFOLD VACUUM TEST

A manifold vacuum test aids in determining the condition of an engine and also in helping to locate the cause of poor engine performance. To test manifold vacuum:

1. Operate the engine at 1200 rpm until normal operating temperature is reached.

2. Install an accurate, sensitive vacuum gauge on the manifold vacuum line or on the fitting in the intake manifold.

3. Operate the engine at idle rpm with the load disengaged (transmission in neutral in vehicles).

4. Check the vacuum reading on the gauge and refer to the chart below for interpretation.

Manifold vacuum is affected by carburetor adjustment, valve timing, the condition of the valves, cylinder compression, and leakage at the intake maniflod, carburetor, or cylinder head gasket.

Because abnormal gauge readings may indicate that more than one of the above factors is at fault, use caution in analyzing an abnormal reading. For example, if the vacuum is low, the correction of one item may not increase the vacuum enough to indicate that the trouble has been corrected. It is important, therefore, that each cause of an abnormal reading be investigated and further tests conducted where necessary in order to arrive at the corrected diagnosis of the trouble.

Allowance should be made for the affect of altitude on the gauge reading. The engine vacuum will decrease with an increase in altitude.

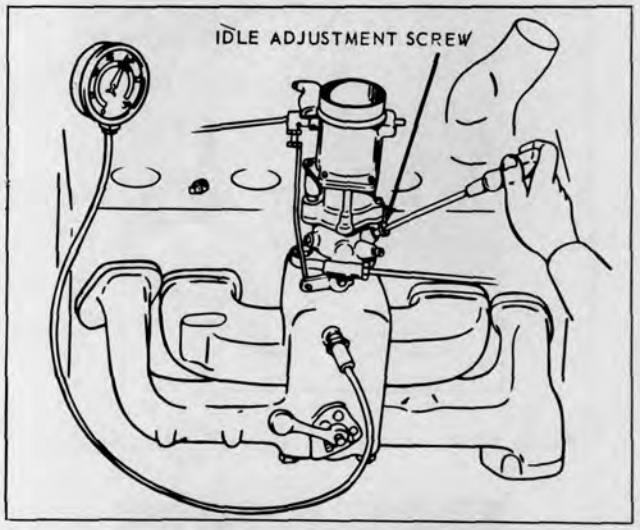


Plate 6283. Typical Vacuum Test

MANIFOLD VACUUM GAUGE READINGS

Gauge Reading (Inches Hg)	Engine Condition
17	Normal
Low and steady.	Loss of power in all cylinders caused possibly by late ignition or valve timing, or loss of compression due to leakage around the piston rings.
Very low.	Manifold, carburetor, or cylinder head gasket leak.
Needle fluctuates steadily as speed increases.	A partial or complete loss of power in one or more cylinders caused by: a leaking valve, cylinder head or intake manifold gasket leak, a defect in the ignition system or a weak valve spring.
Gradual drop in reading at engine idle.	Excessive back pressure in the exhaust system.
Intermittent fluctuation.	An occasional loss of power possibly caused by a defect in the ignition system or a sticking valve.
Slow fluctuation or drifting of the needle.	Improper idle mixture adjustment, carburetor or intake manifold gasket leak.

IDLE FUEL MIXTURE AND IDLE SPEED ADJUSTMENTS

The engine idle speed is adjusted to settings for a hot engine. Make the idle speed and fuel mixture adjustments in the following sequence.

Initial Idle Mixture Adjustments

Set the preliminary idle mixture by turning the idle mixture screw inward (clockwise) until it is lightly seated, then turn the screw outward (counterclockwise) 1 to 1 1/2 turns. Do not turn the screw needle tightly against its seat as this may groove the end. If the needle is damaged, it must be replaced before a satisfactory fuel mixture can be obtained.

Initial Idle Speed Adjustment

A stop screw at the throttle lever flange of the carburetor (Plate 9274) controls the engine idle speed. Turn the screw outward (counterclockwise) to

increase the engine idle speed and inward (clockwise) to decrease the engine idle speed.

Initial idle adjustment will automatically set the preliminary fast idle (hot engine) rpm required.

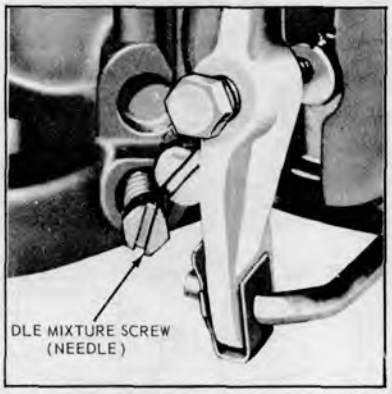


Plate 9275. Idle Fuel Mixture Adjustment

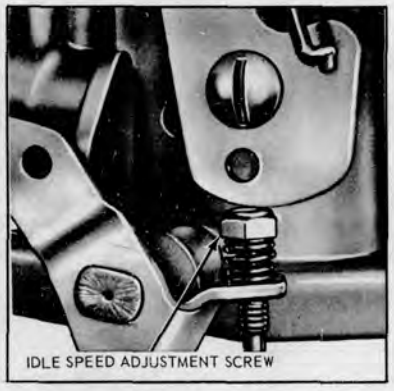


Plate 9274. Idle (Hot Engine) Speed Adjustment

1. Position the choke control lever so that the choke plate is fully open.

2. Seat the throttle plate in the throttle bore. It may be necessary to back off on the dashpot (if so equipped) adjustment screw to seat the throttle plate in the throttle bore. Set the idle adjusting screw (Plate 9274) to just make contact with the cam contour; then turn the screw outward (counterclockwise) 1 1/2 turns.

Final Idle (Hot Engine) Speed and Mixture Adjustments

The final idle fuel mixture and engine idle speed is adjusted to settings for a hot engine.

1. Operate the engine until the engine temperatures are stabilized at a hot, normal operating temperature. On a vehicle with an air conditioner, the engine idle speed is adjusted with the air conditioner operating at maximum system pressure.

2. Place the transmission selector lever in neutral position and set the parking brake.

3. Turn on the headlamps. It is necessary to place the alternator under a load condition in this manner in order to obtain the specified idle speed during the adjustment procedure.

4. Attach a tachometer to the engine.

5. Make sure the choke plate is fully opened. With the transmission selector lever in neutral position, turn the idle speed adjustment screw (Plate 9274) in a direction to obtain the specified engine idle rpm*. Open the throttle by hand and allow it to close normally.

6. On a vehicle with an automatic transmission, place the transmission selector lever in DRIVE range and adjust the idle speed to specification*. On a vehicle with automatic transmission, the engine idle speed is adjusted first with the automatic transmission selector lever in neutral. The final idle speed and fuel mixture adjustments are made with the transmission selector lever in DRIVE range.

7. Turn the idle fuel mixture adjustment screw inward until the engine rpm begins to drop, due to the lean mixture.

On a vehicle equipped with a Thermactor exhaust emission system, turn the idle fuel mixture screw outward 1/4 turn. The outward adjustment is the final adjustment required.

On a vehicle without the Thermactor system, turn the idle fuel mixture screw outward until the engine rpm increases and begins to drop; then, turn the idle mixture screw inward for maximum engine rpm and smoothness. Always favor a slightly rich fuel mixture.

8. Check the engine idle (hot engine) speed and adjust it to specifications, if necessary. The final engine idle speed may be vaired to suit the conditions under which the vehicle is to be operated.

9. Place the transmission selector lever in neutral. Shut off the engine and switch off the headlamps. Remove the tachometer.

10. On vehicles equipped with an automatic transmission, check the anti-stall dashpot for proper adjustment. Check the accelerator pump for proper adjustment.

* (500-550 rpm)

ANTI-STALL DASHPOT ADJUSTMENT (AUTOMATIC TRANSMISSION)

The anti-stall dashpot adjustment is performed with the air cleaner removed from the vehicle.

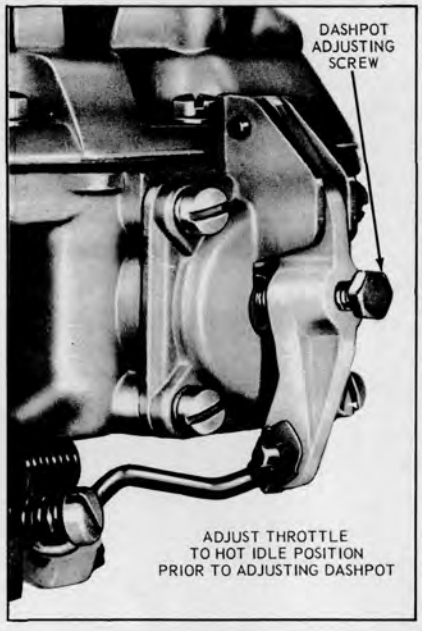


Plate 9277. Anti-Stall Dashpot Adjustment

1. Adjust the throttle position to the hot idle setting. Turn the dashpot adjusting screw outward until it is clear of the dashpot plunger assembly.

2. Turn the dashpot adjusting screw (Plate 9277) inward until it initially contacts the dashpot plunger assembly; then turn the adjusting screw inward (clockwise) the specified number of turns against the dashpot diaphragm plunger assembly.

ACCELERATING PUMP ADJUSTMENTS

Acceleration requirements in various climates are satisfied by controlling the amount of fuel discharged by the accelerating pump. This is accomplished by adjusting the accelerating pump clearance to specification, then adjusting the pump stroke to suit the ambient temperature at which the car is to be operated.

The accelerating pump adjustments are performed with the carburetor air cleaner removed from the vehicle.

Accelerating Pump Clearance Adjustment

1. Insert the roll pin in the lower hole (HI) position in the lever stop hole.

2. Position the throttle and choke linkage so that the throttle plate will seat in the throttle bore. Hold the throttle plates in the closed position. Position a gauge or drill of the specified thickness (0.23) between the roll pin and the cover surface.

N O T E

Accelerator pump lever clearance - inches. Pin in HI position, throttle plate seated. Accelerator pump lever adjustment pin placement:
50 deg F or below.....HI
Above 50 deg F and/or above 5,000 ft....LO

Bend the accelerating pump actuating rod to obtain the specified gauge or drill clearance between the pump cover and the roll pin in the pump lever. (Plate 9278)

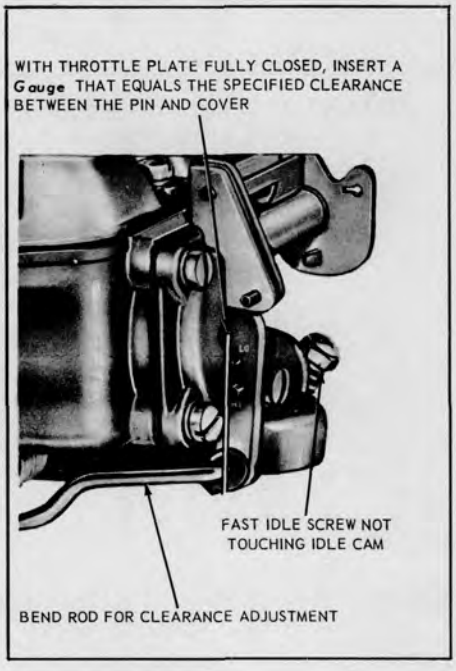


Plate 9278. Accelerating Pump Clearance Adjustment

Accelerating Pump Stroke Adjustments

Acceleration requirements in various climates are satisfied by controlling the amount of fuel discharged by the accelerating pump. The pump stroke is controlled by changing the location of the roll pin in the lever stop hole. (Plate 9279)

For operation in ambient temperatures 50 deg F. and below, place the roll pin in the hole of the pump operating lever marked HI (lower hole). For best performance and economy at normal ambient temperatures and high altitude

(above 50 deg F and/or above 5,000 feet altitude), place the roll pin in the LO (upper hole) of the lever.

Check the vent valve (if the carburetor is so equipped) for proper adjustment.

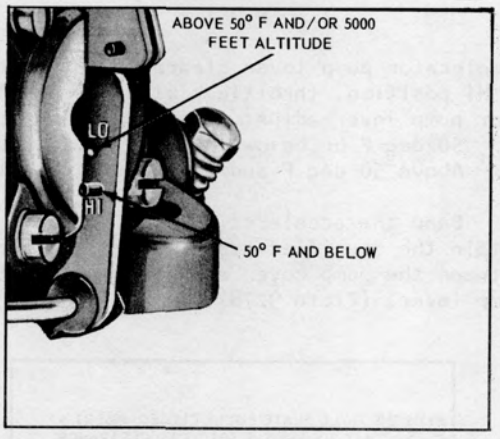


Plate 9279. Accelerating Pump Stroke Adjustment

ANTI-STALL DASHPOT ADJUSTMENT (AUTOMATIC TRANSMISSION)

The anti-stall dashpot adjustment is performed with the air cleaner removed from the vehicle.

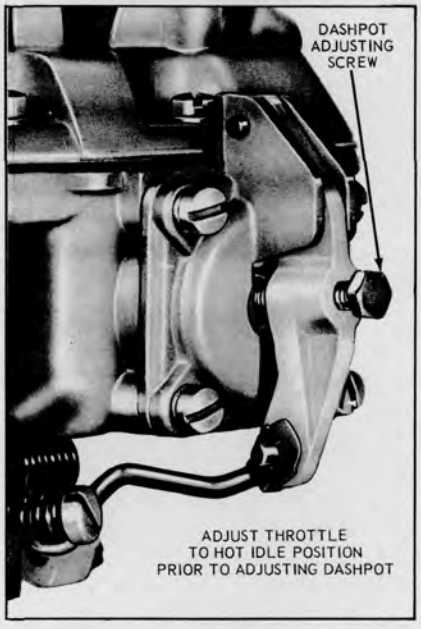


Plate 9277. Anti-Stall Dashpot Adjustment

1. Adjust the throttle position to the hot idle setting. Turn the dashpot adjusting screw outward until it is clear of the dashpot plunger assembly.

2. Turn the dashpot adjusting screw (Plate 9277) inward until it initially contacts the dashpot plunger assembly; then turn the adjusting screw inward (clockwise) the specified number of turns against the dashpot diaphragm plunger assembly.

ACCELERATING PUMP ADJUSTMENTS

Acceleration requirements in various climates are satisfied by controlling the amount of fuel discharged by the accelerating pump. This is accomplished by adjusting the accelerating pump clearance to specification, then adjusting the pump stroke to suit the ambient temperature at which the car is to be operated.

The accelerating pump adjustments are performed with the carburetor air cleaner removed from the vehicle.

Accelerating Pump Clearance Adjustment

1. Insert the roll pin in the lower hole (HI) position in the lever stop hole.

2. Position the throttle and choke linkage so that the throttle plate will seat in the throttle bore. Hold the throttle plates in the closed position. Position a gauge or drill of the specified thickness (0.23) between the roll pin and the cover surface.

N O T E

Accelerator pump lever clearance - inches. Pin in HI position, throttle plate seated. Accelerator pump lever adjustment pin placement:
50 deg F or below.....HI
Above 50 deg F and/or above 5,000 ft....LO

Bend the accelerating pump actuating rod to obtain the specified gauge or drill clearance between the pump cover and the roll pin in the pump lever. (Plate 9278)

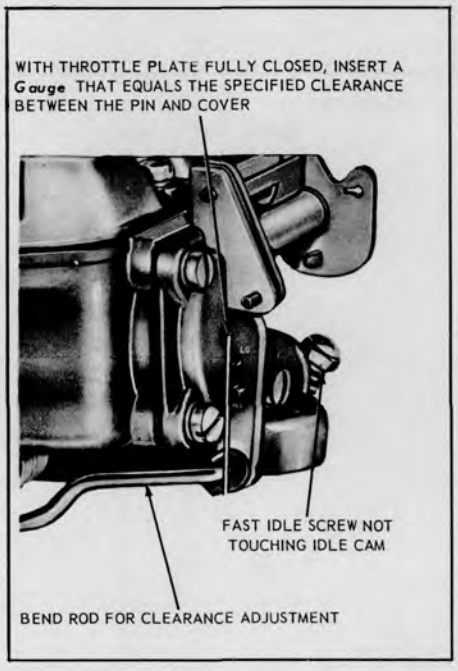


Plate 9278. Accelerating Pump Clearance Adjustment

Accelerating Pump Stroke Adjustments

Acceleration requirements in various climates are satisfied by controlling the amount of fuel discharged by the accelerating pump. The pump stroke is controlled by changing the location of the roll pin in the lever stop hole. (Plate 9279)

For operation in ambient temperatures 50 deg F. and below, place the roll pin in the hole of the pump operating lever marked HI (lower hole). For best performance and economy at normal ambient temperatures and high altitude

(above 50 deg F and/or above 5,000 feet altitude), place the roll pin in the LO (upper hole) of the lever.

Check the vent valve (if the carburetor is so equipped) for proper adjustment.

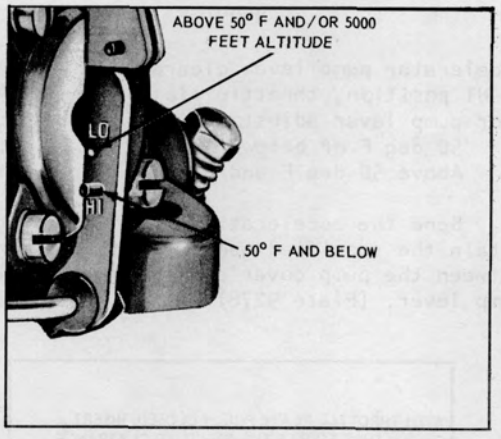


Plate 9279. Accelerating Pump Stroke Adjustment

VELOCITY GOVERNOR

Connect a tachometer to the engine. With the engine at normal operating temperature, operate the engine at wide open throttle and compare the rpm with the operating range of the governor. The operating range is stamped on the governor plate.

If governed speed is within range, stop the engine and remove the tachometer.

If adjustment is required or desired, remove the governor seal. To increase rpm, turn the cap counterclockwise. To decrease rpm, turn the cap clockwise. When adjustment is complete, stop the engine, seal the cap and remove the tachometer.

If the truck is going to be operated at consistent altitude, adjust the bovernor by following the Constant Altitude Adjustment Procedure.

If the truck is going to be operated at varying altitudes, adjust the governor by following the Varying Altitude Adjustment Procedure.

Constant Altitude Adjustment

1. Cut the governor seal wire and remove the adjusting cap. Do not rotate the adjusting cap during removal.

2. Use a mirror and a light to observe the position of the slots in the adjusting bushing.

3. Hold tool T64T-12450-A in the proper position to engage the adjusting bushing slots and carefully insert the hex-shaped center post of the tool in the hex-head of the adjusting screw. Push the tool inward until the tangs on the tool engage the slots in the adjusting bushing. If the tool will not engage in the adjusting bushing slots, note the position of the tool and rotate the tool slightly in either direction until engagement is achieved. If it is necessary to rotate the tool more than 1/6 turn (1 flat of the hex head) to accomplish engagement, rotate the tool back to its insertion position and pull the tool out. Rotate the tool 1/6 turn in the direction required to achieve engagement and re-insert it.

4. The altitude adjustment table specifies the amount from the factory setting that Tool T64T-12450-A should be rotated to adjust the velocity governor for altitude operation. For an increase in the average altitude of operation, rotate the tool the specified amount in the counterclockwise direction.

5. Remove the tool and install the adjusting cap. Do not turn the adjusting cap.

6. Install a tachometer and check and adjust the no-load setting of the governor. The no-load setting should be 2750 rpm at the trucks operating altitude. If the altitude adjustment was done properly, the load setting at the trucks operating altitude should be 2600 rpm.

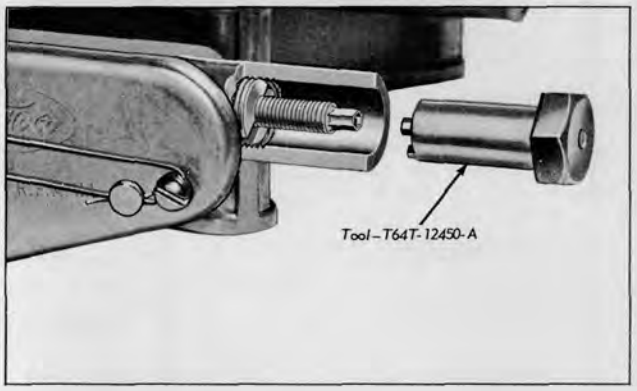


Plate 9276. Velocity Governor Adjusting Method

** If the governor is being adjusted at an altitude above the truck anticipated operating altitude, the load and no-load speeds should be slightly above 2600 and 2750 rpm respectively. If the governor is being adjusted at an altitude below the truck anticipated operating altitude, the load and no-load should be slightly below 2600 and 2750 rpm respectively.

** If the load rpm is below the specified rpm (2500 at sea level and 2600 at operating altitudes above 2000 feet), insert the tool by following step 3 and turn it counterclockwise. Remove the tool, insert the adjusting cap and adjust the no-load setting. Check the load setting and adjust again if necessary.

** If the load rpm is above the specified rpm (2500 at sea level and 2600 at operating altitudes above 2000 feet), insert the tool by following step 3 and turn it clockwise. Remove the tool, insert the adjusting cap and adjust the no-load setting. Check the load setting and adjust again if necessary.

7, Remove the tool and install the adjusting cap.

8. Seal the adjusting cap to the governor body using the service governor seal wire and lead seal.

Tool Numbers listed above are Ford Part Numbers....

Varying Altitude Adjustment

This adjustment is made on trucks that are operating at varying altitudes.

** 1. Adjust the governor to 2750 rpm (no-load) for sea-level operation (this is only necessary if the governor has been adjusted after the truck has left the factory).

** 2. Using the adjusting cap only, adjust the no-load speed for 2800 rpm at the anticipated altitude by turning the adjustment cap 1/4 turn in the clockwise direction for each 1000 foot difference between the adjusting and maximim anticipated operating altitudes.

** If the maximum operating altitude of the truck is lower than the altitude at which the adjustment is being made, adjust the no-load speed to 2800 rpm with the adjustment cap.

Altitude Adjustment Table

Average Operating Altitude in Feet	Amount of Tool Rotation*
2000	1/3 turn (120 deg)
3000	1/2 turn (180 deg)
4000	2/3 turn (240 deg)
5000	5/6 turn (300 deg)
6000	1 turn (360 deg)

* 60 deg or 1/6 turn rotation is equivalent to one flat of the tool hex head.

** Do not vary more than 100 RPM.

STARTING MOTOR

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

CAUTION

NEVER ALLOW SPRING TO SNAP DOWN ON BRUSHES.

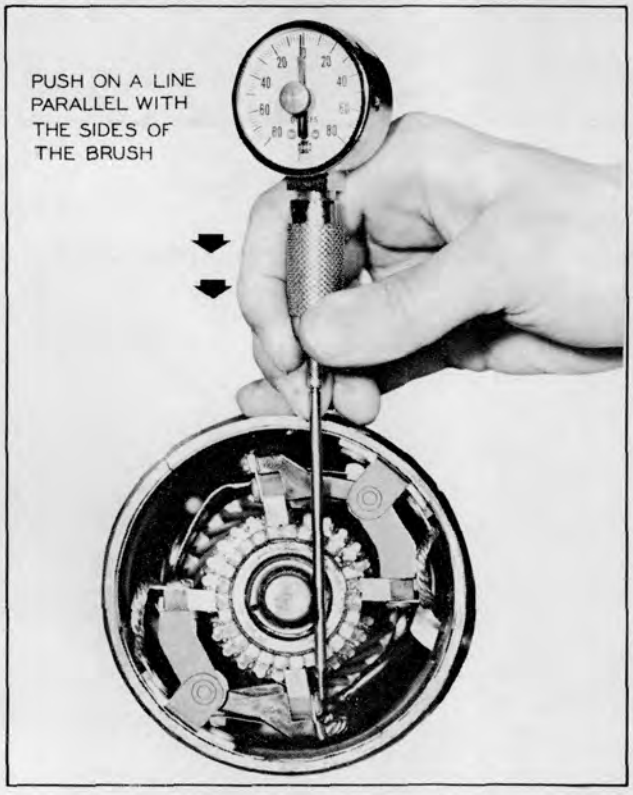


Plate 6449 Checking Brush Spring Tension

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

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

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

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

CAUTION

DO NOT USE EMERY CLOTH TO CLEAN COMMUTATOR.

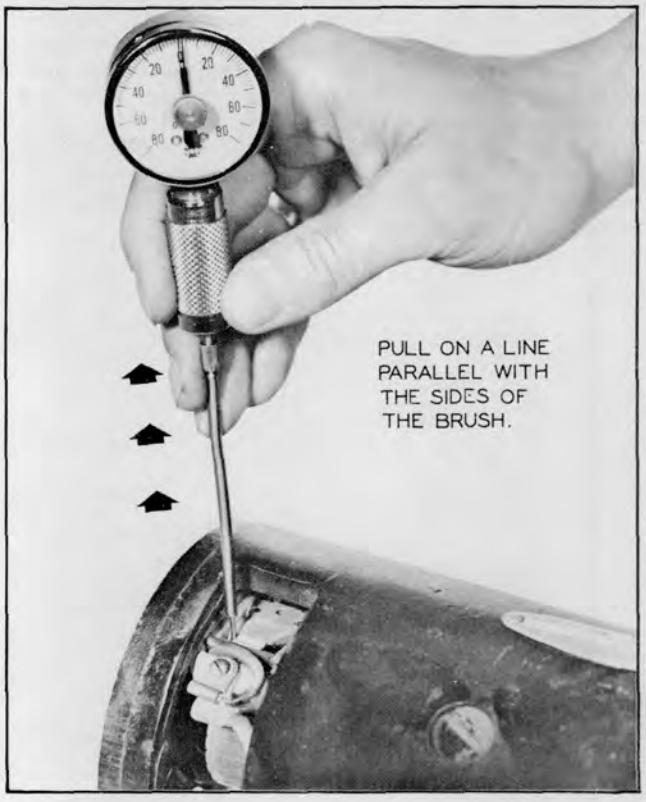


Plate 6450. Checking Brush Spring Tension

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

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

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

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

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

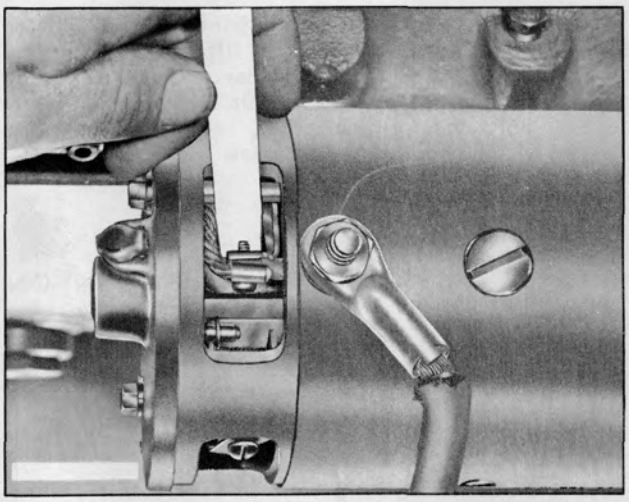


Plate 3436. Seating Brushes

NOTE

BLOW OUT ABRASIVE PARTICLES AFTER SEATING BRUSHES.

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.

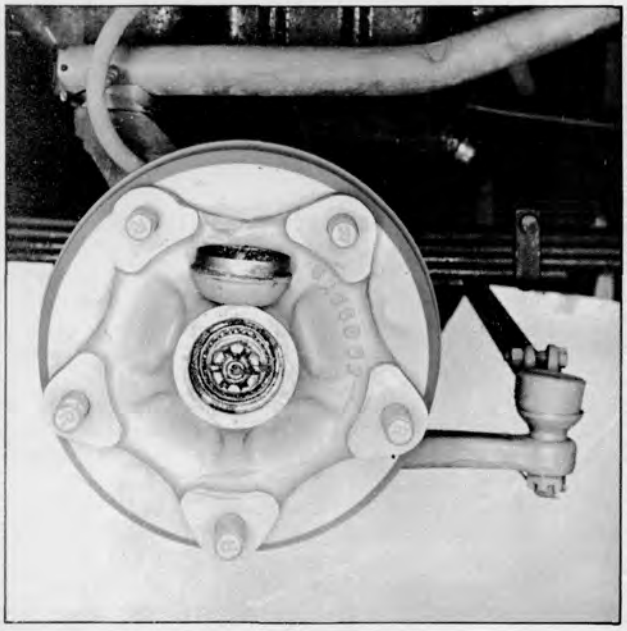


Plate 9256. Wheel Bearings

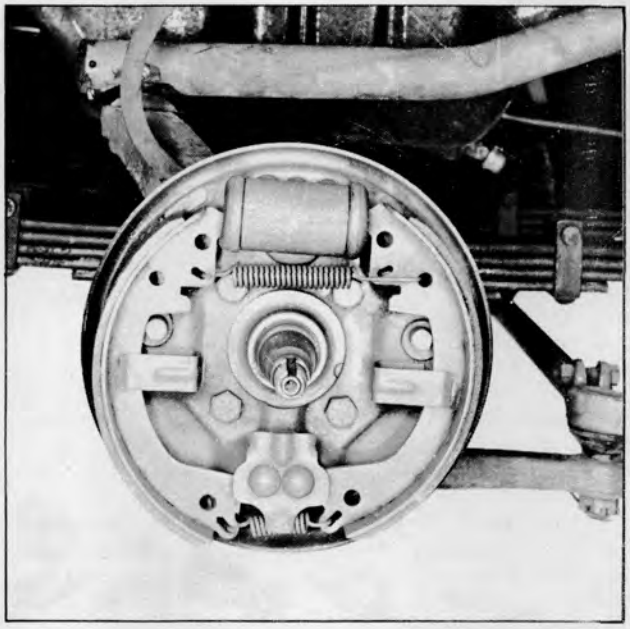


Plate 9257. Spindle

STEERING WHEEL BEARINGS

Adjustment

1. Raise rear of machine so that the tires clear the ground.

WARNING

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 griping top and bottom of tire, chuck tire in and out to determine looseness or wobble. Now grip front and rear side of tire, chuck tire in and out to determine looseness or wobble.

N O T E

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

3. If looseness or wobble is in the wheel bearings, remove hub cap and spindle cotter pin. See Plate 9256. 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 1/16 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 that has a melting point of 250° F or higher. The following types of grease are acceptable according to Clark spec. MS 9C.

1 - Gulfex "A"
2 - Retinax "A"
3 - Sincolube #2 or Litholine MP grease
4 - Mobile grease #5
5 - Amoco lithium multipurpose grease
6 - Marfax #2 heavy duty
and...7 - Pennzoil lubricant #705 or the equivalent of the above listed lubricants.

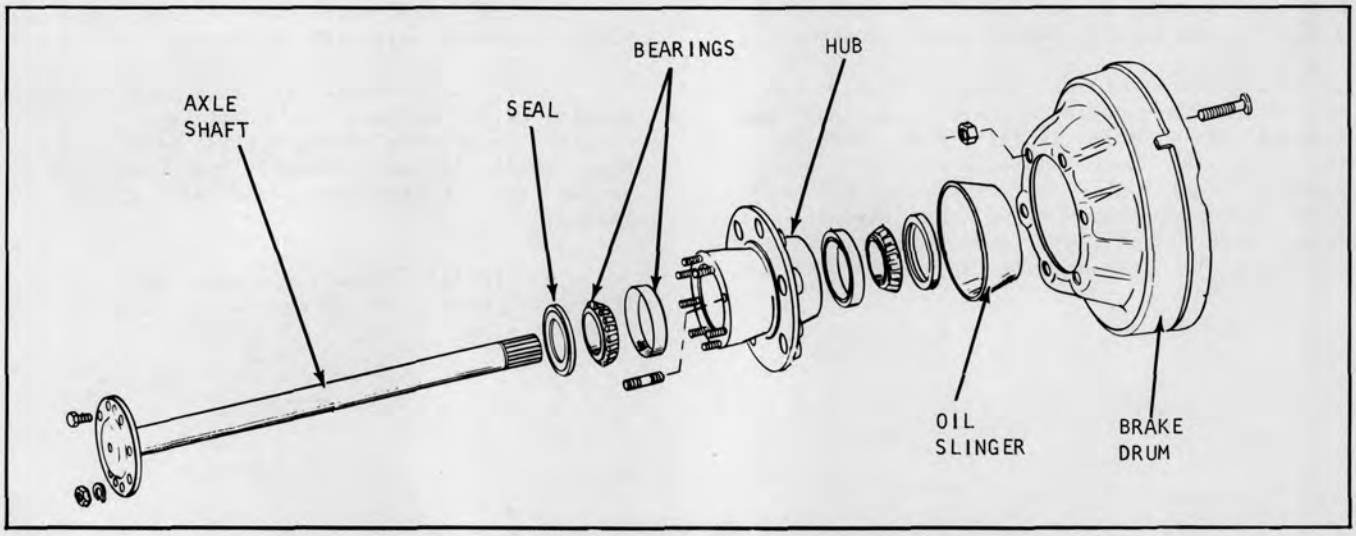


Plate 7102. Axle Shaft and Hub Assembly

CLEAN AND REPACK DRIVE WHEEL BEARINGS

Every 1000 operating hours remove and repack the drive wheel bearings with AMOCO Lithuim multipurpose grease, Shell Alvania EP #1 or equivalent.

1. Raise the drive wheels far enough to clear the floor and place heavy blocking under the machine frame so it cannot accidentally become lowered. Deflate the tires and remove the wheels from the hub assembly.

2. Remove the screws that retain the axle shaft to the hub. By using jack screws in the holes provided in the axle flange, the axle may be pulled.

3. Unclinch the tube nut lock and remove the outer tube nut, nut lock and inner tube nut.

4. The hub and drum assembly may now be removed from the axle tube.

5. Remove the brake drum oil slinger, inner and outer seals from the hub and lift out the bearing cones.

6. Clean the hub assembly and bearings in separate containers using a Stoddard type cleaning solvent. After all solidified particles of lubricant are removed from the bearings blow dry with compressed air. Direct air stream across bearings to prevent spinning. Slowly rotate bearing by hand to facilitate drying. Inspect bearings and races carefully to determine if they are in good condition and suitable for further service. Dry the hub assembly with compressed air.

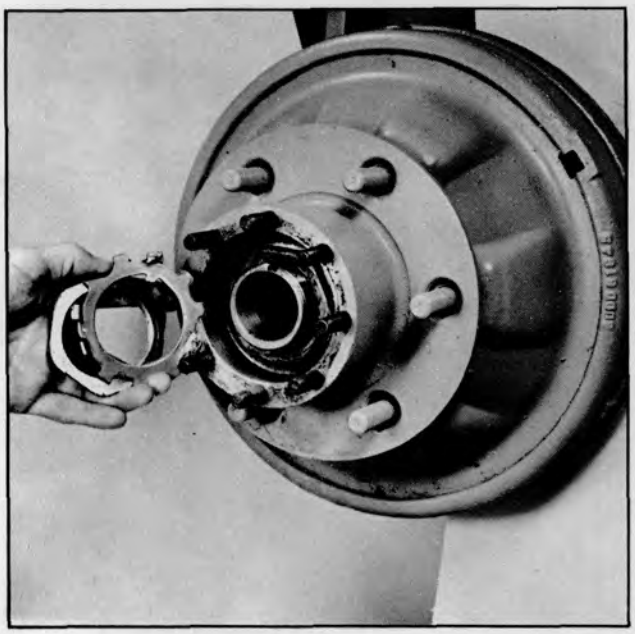


Plate 7103. Axle Tube Nuts and Nut Lock

7. Repack bearing cones with the type grease previously described and install in hub assembly. If there is any doubt about the serviceability of the bearing seals it is more economical to install new ones to prevent a premature overhaul to replace these parts at a furture time. Care should be taken when installing the hub over the axle tube to prevent damage to the seals.

Cutting, scratching or curling under the seal lip seriously impairs efficiency.

8. After hub has been installed on the axle tube replace inner tube nut and tighten until drag is felt when turning the hub. (Be sure brake shoes are not causing drag). Back off the nut slightly until the hub turns free and install nut lock, outer tube nut and tighten. Clinch nut lock to retain nuts in this position.

9. Coat the axle shaft flange to hub mating surface with #2 Permatex.

Insert axle shaft in tube and rotate slowly until splines on shaft are in registry with the differential side gears. Push shaft in and install the retaining screws and tighten to 52-57 ft. pounds torque.

10. Install wheels on hub and inflate tires to proper pressure. Lower machine to floor.

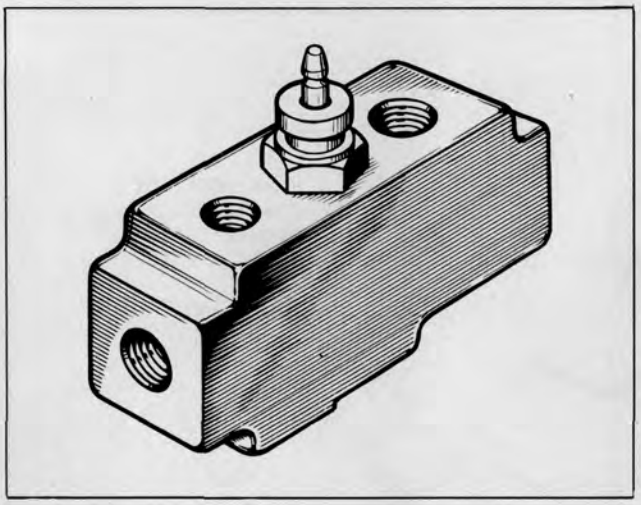


Plate 9305. Brake Warning Light Switch

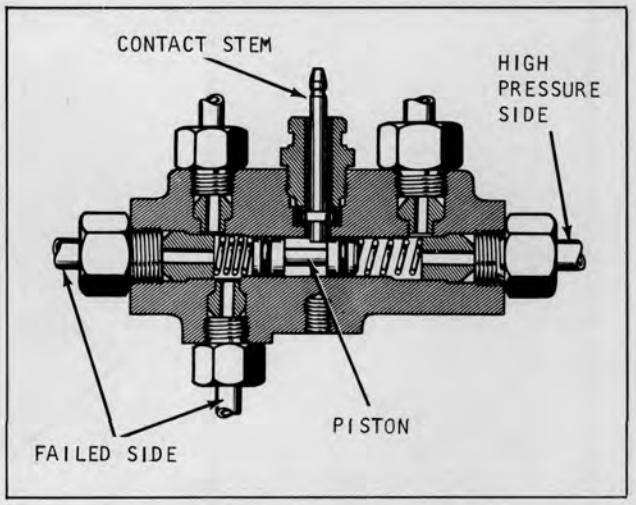


Plate 9306. Cross Sectional View of Switch

POWER BRAKE SYSTEM

Power Brake Unit The power brake unit is a self-contained vacuum-hydraulic unit for power braking that uses engine manifold vacuum and atmospheric pressure. It permits the use of a low brake pedal and reduces pedal effort. The separate hydraulic systems provided by this master cylinder prevent a hydraulic failure in either system from affecting the other system. If one of the systems fail, the driver will be aware of this because of greater pedal travel and more effort will be needed to achieve the expected braking results.

Brake Warning Light/Switch Check The brake warning light switch is used with a dual system master cylinder. The switch is a pressure differential type, designed to light a warning lamp on the instrument panel if a failure occurs in one of the two brake systems. (Plate 9305.)

Operation The brake tubes from the master cylinder output ports are connected to the brake warning light switch. When hydraulic pressure is equal in both systems, the switch piston remains centered and does not contact the terminal in the switch cylinder bore. If the pressure fails in one of the systems, hydraulic pressure moves the piston toward the inoperative side. The shoulder of the piston then contacts the contact stem to provide a ground for the warning lamp circuit and light the warning lamp. (9306)

Testing 1. Attach a bleeder hose to a rear brake bleed screw and immerse other end of hose in a container partially filled with clean brake fluid. Be sure master cylinder reservoirs are full.

2. Turn ignition switch to ON. Open bleed screw while a helper applies heavy pressure to brake pedal. Up to 250 psi is required to operate switch. Warning lamp should light. Close bleed screw before helper releases pedal. Warning lamp should go out when pedal is released.

3. Attach bleeder hose to a front brake bleed screw and repeat above test. Again, warning lamp should light and then go off when pedal is released. Turn ignition switch to OFF.

4. If warning lamp does not light during steps 2 and 3 above, disconnect wire from contact stem. Short wire to ground and turn ignition switch to ON. If lamp lights when wire is shorted to ground but did not light during steps 2 and 3 above, switch is defective. Do not attempt to repair. A defective switch should be replaced with a new one.

5. If warning lamp does not light when wire is shorted to ground, lamp bulb is burned out or electric circuit is defective.

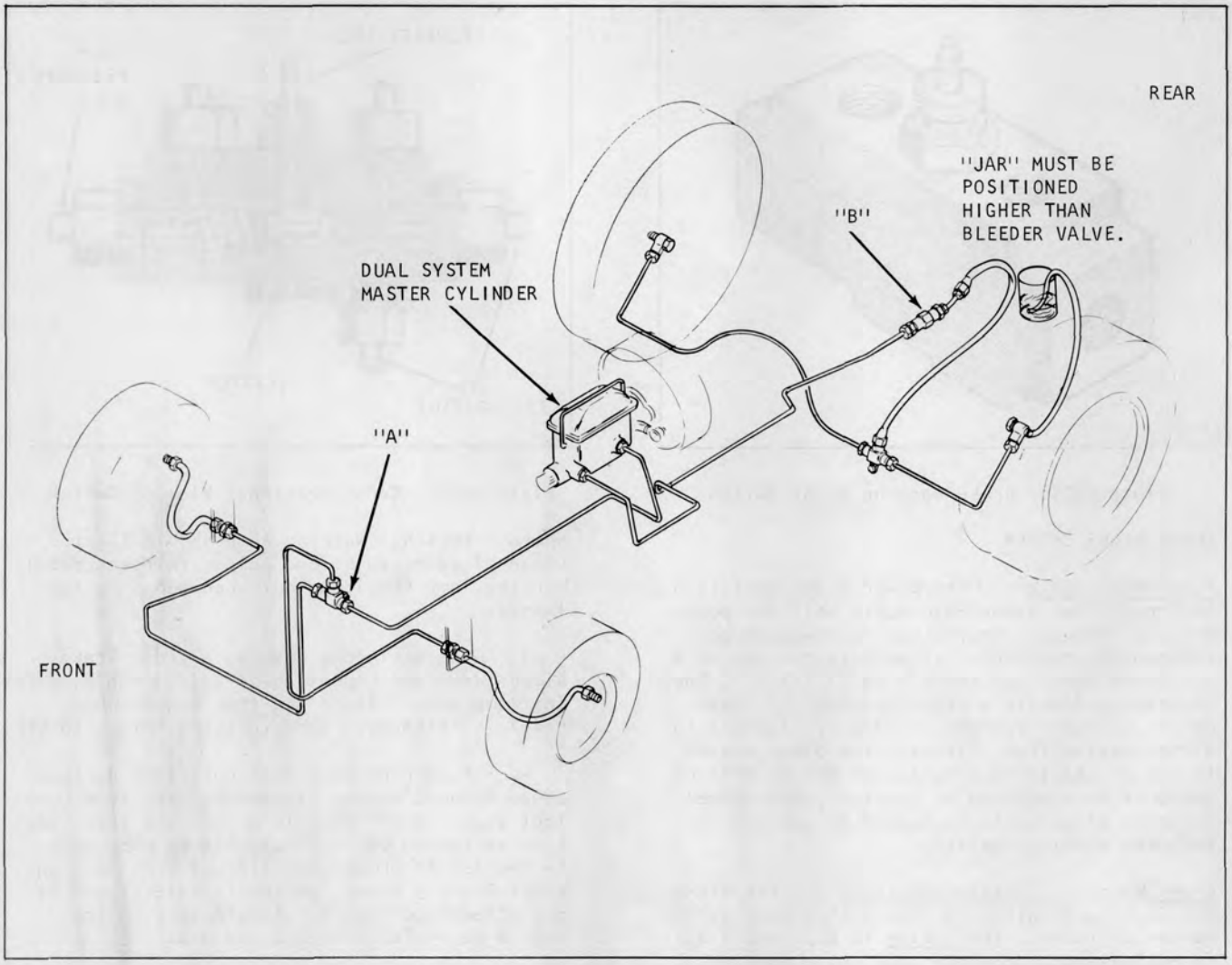


Plate 9280. Typical Dual System Brake Lines

BRAKE BLEEDING PROCEDURE

System Test

As a system check, apply brakes several times with the engine off and car standing still. Hold the brake pedal applied firmly and start the engine. The brake pedal should drop or "fall away" slightly under steady pressure but then should remain firm without further travel or sponginess.

1. If pedal fails to "fall away", check vacuum hose connection.

2. If pedal continues to fall, check and tighten all hydraulic connections and bleed screws. Apply pedal again and if pedal again falls away to floor, there is a hydraulic leak in the system. Locate and repair leak.

3. If pedal is spongy, bleed remaining air out of hydraulic system.

Bleeding Dual System Brake Lines

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

1. Raise the drive wheels far enough to clear the floor and place heavy blocking under the machine frame so it cannot accidentally become lowered. Deflate the tires and remove the wheels from the hub assembly.

WARNING

DEFLATE TIRES BEFORE REMOVING

DRIVE WHEELS FROM MACHINE.

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.

3. Be sure the master cylinder reservoir is filled.

4. Bleed front and rear brake lines at their highest points first; "A" and "B" respectively. Loosen each one separately and bleed as follows: Depress brake pedal slowly and hold, allowing fluid and air to eacape. Tighten fitting, then release brake pedal. Repeat procedure until fluid is free of air bubbles.

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

NOTE

During bleeding of the wheel cylinders 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.

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

7. Install bleeder hose on the remaining bleeder screw and proceed as in step five. After all bleeding has been completed, recheck fluid level in master cylinder. Fill to within 1/4 inch of the top with SAE 70 R3 brake fluid, Clark part #1800200. Replace cylinder cap.

8. Replace drive wheels. Inflate tires. Remove blocking and lower machine to floor.

NOTE

Remember that the brake pedal should be depressed slowly and held to the floorboard 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.

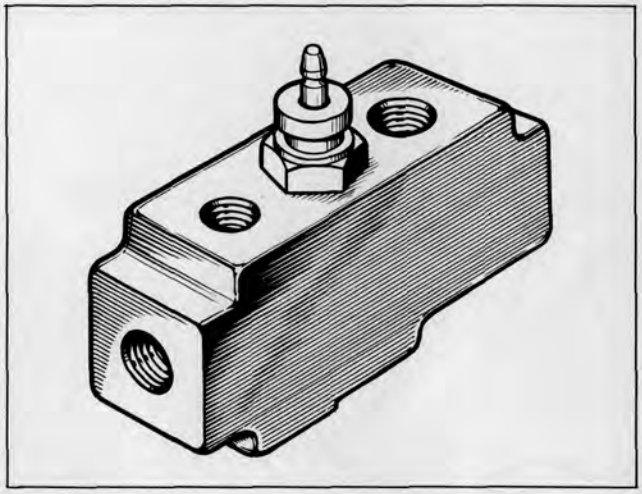


Plate 9305. Typical Brake Warning Light Switch

DUAL HYDRAULIC BRAKE SYSTEM

The system consists of a power unit, a dual-master cylinder, pressure differential valve assembly and a switch on the valve that triggers a warning light on the instrument panel.

The new dual-master cylinder brake system is similar to previous design single brake master cylinder system, except that the dual system has two master cylinders combined in a single, dual-cylinder body casting. Each master cylinder has its own separate piston and fluid reservoir. The primary chamber (at the rear of the cylinder) actuates the front brake system. The secondary chamber (at the front of the cylinder) actuates the rear brake system. Leakage or failure of either half of the system does not impair operation of the other half. In other words, should the front brakes develop a leak, the rear brakes will still function to stop the vehicle, or vice versa. A warning light on the instrument panel signals a failure of either primary (front) or secondary (rear) brake system. This is accomplished by a pressure differential valve and a mechanically operated switch that triggers the warning light.

Operation

When the brake pedal is pressed down, both the front primary and rear secondary master cylinder pistons move forward and exert hydraulic pressure to their respective hydraulic brake sub-systems. Should the rear-secondary system leak or fail, the unrestricted secondary piston bottons out in the master cylinder bore. At the same time, the primary piston displaces the hydraulic fluid in the primary section dual-master cylinder to actuate the front brake system. Should the primary system fail, pressing the brake pedal down causes the primary piston to bottom out against the secondary piston while the forward movement of the pedal displaces the hydraulic fluid in the secondary section of the master cylinder to actuate the rear brakes.

The increased pedal travel and effort needed to compensate for the loss in the failed section triggers a warning light and signals the driver that a partial brake system failure has occurred. In the event of failure of either the front or rear brake sub-systems, a pressure differential valve senses the pressure loss of the failed brake system and forces the valve toward the low pressure area. This causes the plunger in the mechanically operated electrical switch to locate and move up onto the valve ramp or shoulder. The switch contacts close and light the warning light on the instrument panel. Normally, when both brake sub-systems are operating satisfactorily, the spring-loaded plunger of the switch remains centered when the hydraulic pressure is equalized.

Brake Warning Light Diagnosis

For operational checkout purposes, the warning light goes on momentarily each time the ignition switch is turned to the on or accessory position. But if the brake warning light stays on, the differential pressure valve is not centered indicating the possibility of a failure in either the primary-front or secondary-rear brake systems. Look for leaks at each wheel, at hose connections, junction fittings and on the frame or body and make the needed repairs. Next, bleed the system and re-center the pressure differential valve (instructions for bleeding and centering to follow).

If the warning light remains on after centering the pressure differential valve, check the switch connector and wire for a grounded condition. If not grounded, replace entire warning light switch.

If the warning light does not come on, the light bulb may be burned out, the light switch may not be working, or the switch-to-lamp wiring may have an open circuit. First replace the bulb; check the switch-to-lamp wiring for an open circuit and repair or replace them. If still no light, replace the switch.

DIAGNOSIS GUIDE

Problem	Condition
One section of dual brake system is inoperative.	Brakes chatter. Brakes for the respective system do not apply. Warning lamp stays lit. Pedal gradually moves toward floor or dash panel.

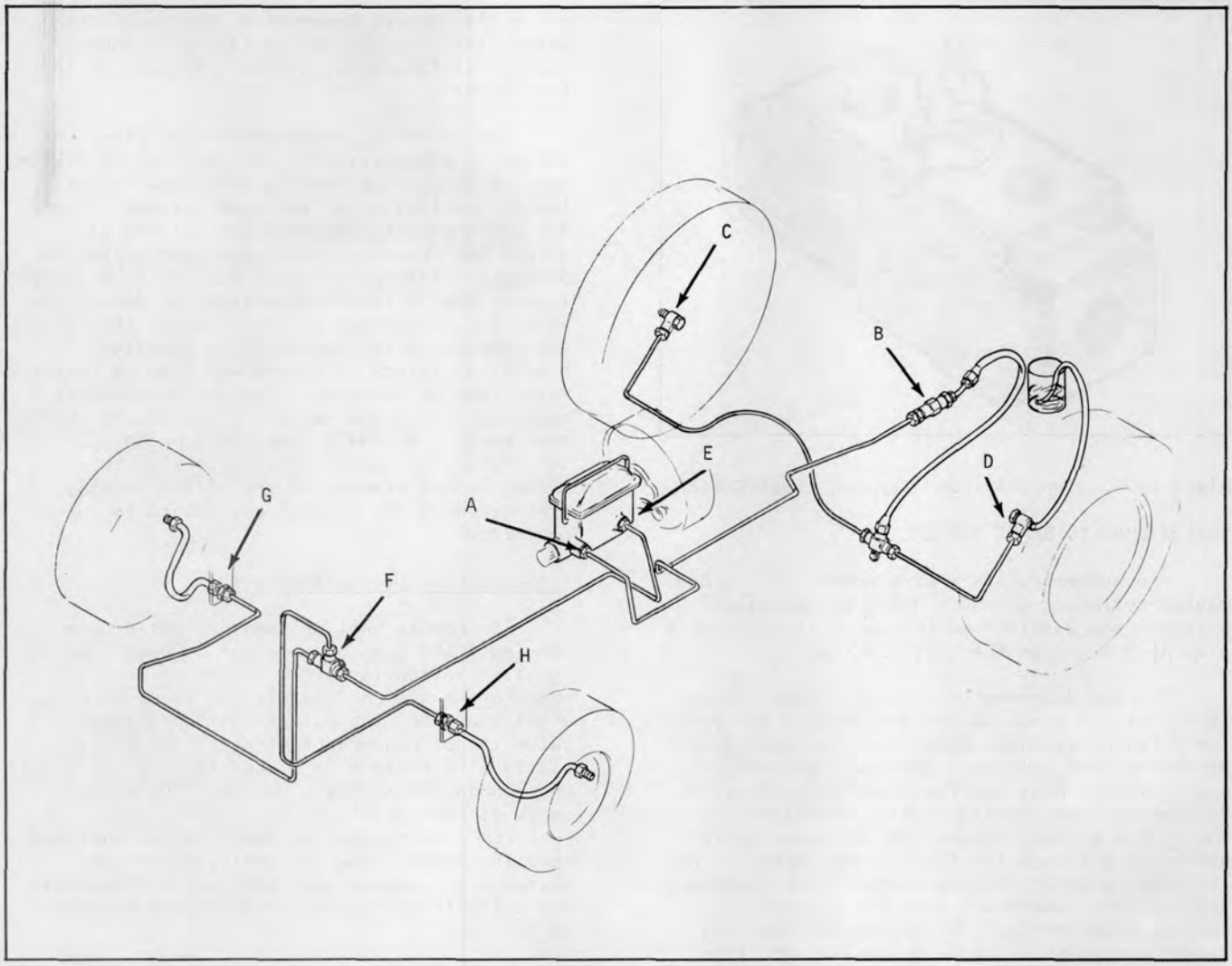


Plate 9321. Typical Dual System Brake Lines

DIAGNOSIS GUIDE CONT.	
Problem	Condition
Differential pressure valve is not centered.	Warning lamp stays lit.
Wiring to warning lamp or switch is grounded.	Warning lamp stays lit.
Warning lamp switch is grounded.	Warning lamp stays lit.
Warning lamp is burned out.	Warning lamp does not light.
Warning lamp or switch has an open circuit	Warning lamp does not light.
Warning lamp switch is inoperative.	Warning lamp does not light.

Manual Bleeding Proceedure

Bleeding the new dual-master hydraulic brake system is not too different from bleeding the previous design single system.

Since each sub-system is complete in itself, each is bled separately. Bleed the longest line first of the sub-system being bled. DO NOT ALLOW THE RESERVOIR TO RUN DRY. Also do not intermix brake fluids, such as adding extra-heavy duty brake fluid with heavy duty brake fluid or vice versa, or use low temperature brake fluid with the specified fluid.

1. Loosen the outlet port tube nut (A). Operate the brake pedal slowly until fluid is free of bubbles, then tighten the tube nut.

2. Next, loosen fitting at point (B) and follow the same proceedure as above.

3. Next, position a wrench on the bleeder fitting on the brake wheel cylinder at point C then D and connect a drain tube to fitting.

4. Submerge drain tube in container partly

filled with clean fluid.

5. Push brake pedal down slowly through its full travel. Close bleeder fitting, then let pedal return to its released position. Repeat this until all air bubbles disappear in bleeder-container. Close fitting and remove bleeder tube.

6. Be sure not to let the pedal return till the screw is closed.

7. Repeat bleeding procedures 1 through 6 for the other brake sub-system.

8. Centralize the pressure differential valve as previously outlined.

Pressure Bleeding Procedure

As recommended in manual bleeding, bleed the longest lines first. Make sure the bleeder tank contains enough of the right type of brake fluid to do the job. Do not intermix types of brake fluids. Never reuse brake fluid drained from any brake system.

1. Clean the master cylinder reservoir cover.

2. Remove the master cylinder cover and gasket and fill reservoir with specified fluid.

3. Install pressure bleeder adapter tool master cylinder outlet port and attach bleeder tank hose to adapter fitting.

4. Position a wrench on bleeder fitting (C) on right, rear brake wheel cylinder. Attach bleeder hose securely to bleeder fitting on wheel cylinder.

5. Open valve on bleeder tank to pressurize brake fluid to master cylinder reservoir.

6. Submerge bleeder hose in a container partially filled with clean fluid and loosen bleeder fitting at wheel cylinder.

7. When air bubbles stop coming into the container, close the bleeder fitting and remove the tube.

8. Repeat steps 4 through 7 at points D. G, and H respectively.

9. When bleeding operation is completed, close bleeder tank valve and remove tank hose from the adapter fitting.

10. Remove the pressure bleeder adapter tool. Fill the master cylinder reservoir to within $\frac{1}{4}$ to $\frac{1}{2}$ inch from the top and install gasket and cover.

N O T E

Brake Warning Light After bleeding the brake system, the warning light will usually stay on when the ignition switch is turned to ON. This is due to a pressure differential created during the bleeding operation that causes the differential valve to move off-center and to activate the light switch. To centralize the differential valve, a pressure differential must again be created in the other sub-system to force the valve back to its center position.

1. Loosen the valve inlet tube nut of the system that has not failed (or the side opposite the system that was bled last).

2. Operate the brake pedal slowly and gradually to help return the differential valve to its central position and to turn the warning light off.

3. When the light goes out, tighten the tube nut.

4. Check fluid level in the master cylinder reservoirs and refill to $\frac{1}{4}$ to $\frac{1}{2}$ inch from the top.

And should the warning light stay on when neither system has failed and the system has not been bled, it may be necessary to loosen both system inlet tube nuts on the pressure differential valve, one at a time, to center the differential valve.

BRAKE ADJUSTMENT (FRONT WHEELS):

When the brake drums are hot, allow to cool, then proceed as follows:

1. Adjust brake pedal free play 1/2 to 3/4 of an inch.

2. Raise tractor until steer wheel tires clear floor. Be sure tractor is properly supported and blocked.

```
x x x x x x x x x x x x x x x x x x x x x x x x x x x
x                                                     x
x                     W A R N I N G                   x
x                                                     x
x  AFTER RAISING MACHINE AND BEFORE MAKING            x
x                                                     x
x  ANY ADJUSTMENTS, ADJUSTMENT CHECKS OR              x
x                                                     x
x  BEFORE PERFORMING ANY MAINTENANCE, PLACE           x
x                                                     x
x  ADEQUATE BLOCKING (SUFFICIENT TO SUPPORT           x
x                                                     x
x  THE MACHINE) UNDER THE FRAME TO PREVENT            x
x                                                     x
x  ACCIDENTAL LOWERING OR FALLING OF THE              x
x                                                     x
x  VEHICLE, THUS PREVENTING PERSONAL INJURY           x
x                                                     x
x  TO MECHANIC OR BYSTANDERS.                         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
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3. Bleed hydraulic system as required to remove entrapped air.

4. At each wheel, adjust each brake shoe in turn, taking a forward acting shoe first.

(a) Rotate the shoe (toe) adjusting cam until the shoe drags. A forward acting shoe cam rotates forward: a reverse acting shoe cam rotates in reverse. (Plate 8743).

(b) Back off the shoe (toe) adjusting cam, while rotating the drum forward, until the shoe is just free of drag. Operate the pedal several times to center the shoes, then provide a running clearance by again backing off the cam 1/8 to 1/4 of a turn.

5. Remove blocking, lower vehicle to the floor and test the brakes.

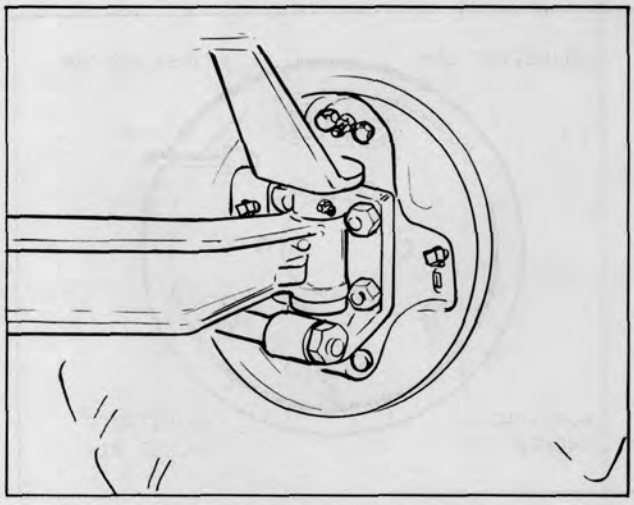


Plate 9288. Typical Cam Type Brake Adjustment

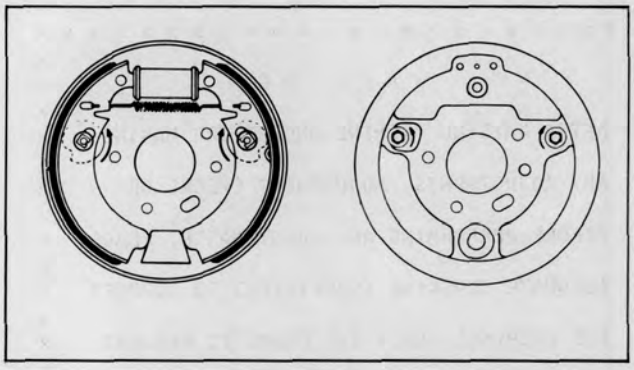


Plate 8743. Typical Cam Movement

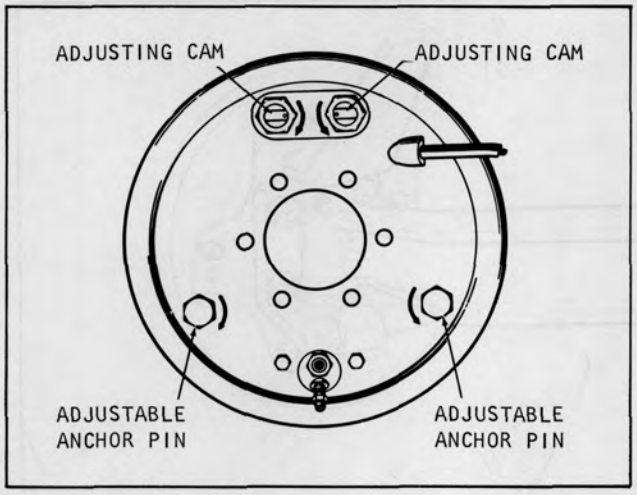


Plate 10158. Typical Brake Assembly

BRAKE ADJUSTMENT:

```
x x x x x x x x x x x x x x x x x x x x x x x x x x x
x                                                     x
x                    W A R N I N G                    x
x                                                     x
x  AFTER RAISING MACHINE AND BEFORE MAKING            x
x                                                     x
x  ANY ADJUSTMENTS, ADJUSTMENT CHECKS OR              x
x                                                     x
x  BEFORE PERFORMING ANY MAINTENANCE, PLACE           x
x                                                     x
x  ADEQUATE BLOCKING (SUFFICIENT TO SUPPORT           x
x                                                     x
x  THE MACHINE) UNDER THE FRAME TO PREVENT            x
x                                                     x
x  ACCIDENTAL LOWERING OR FALLING OF THE              x
x                                                     x
x  VEHICLE, THUS PREVENTING PERSONAL INJURY           x
x                                                     x
x  TO MECHANIC OR BYSTANDERS.                         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
```

To decrease clearance at anchor end of forward shoe;

1. Turn forward shoe anchor pin in direction illustrated by arrow.

To increase clearance at anchor end of forward shoe;

1. Turn forward shoe anchor pin in opposite direction indicated by arrow.

Alternate between the anchor pin and the adjusting cam until brake shoe feeler gauge (.010") just fits between the drum and linning at both "heel" and "toe". Then tighten the anchor pin locknut.

Repeat this same procedure at the opposite shoe and on the other drive wheel brake assembly.

HAND BRAKE ADJUSTMENT

The brake is located on the drive shaft between the front drive axle and transmission see Plate 4963. The brake has two adjustments. A minor adjustment may be made at the Actuating Lever located in the driver's compartment. If necessary, a major adjustment may be made at the brake assembly. Brake adjustments are made as follows:

1. Minor Adjustment: Rotate knob on top of the hand brake lever clockwise to increase tension, or counterclockwise to loosen tension. Adjustment should be made with hand lever in fully released position, then test adjustment by applying (pivoting) lever to set brake. See Plate 6505.

Plate 6505. Hand Brake (Actuating) Lever

2. Major Adjustment: If a major adjustment is necessary to provide proper brake lever release travel and also to provide brake tension, proceed as follows:

a. Set hand brake lever in fully released position and turn knob adjustment counterclockwise as far as possible. See Plate 6505.

b. Turn brake band anchor clip bolt until feeler gauge placed between lining and drum indicates a 0.010 to 0.015 inch clearance. See Plate 6291.

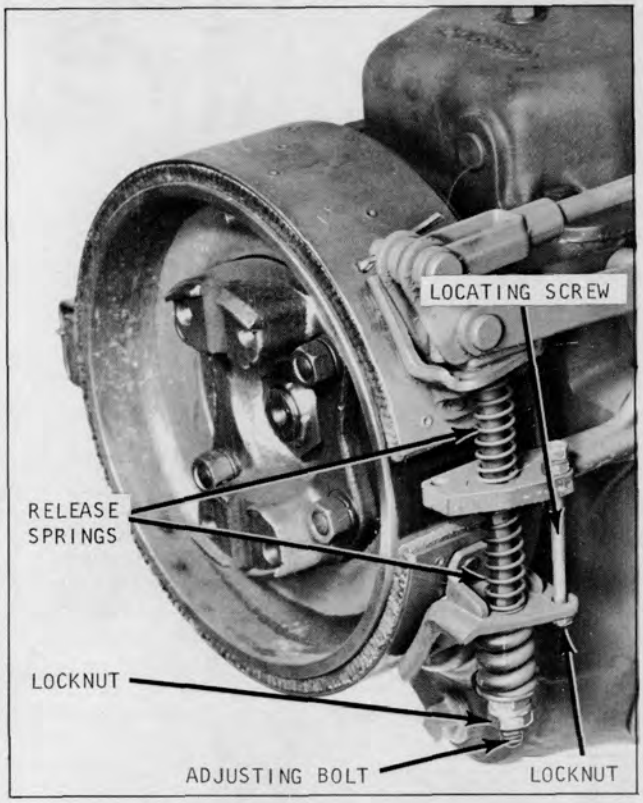


Plate 7447. Hand Brake Adjustments

c. Loosen lock nut and tighten screw until feeler gauge placed between lower end of lining and brake drum indicates a 0.020 inch clearance. Tighten lock nut when this clearance is obtained. See Plate 6290.

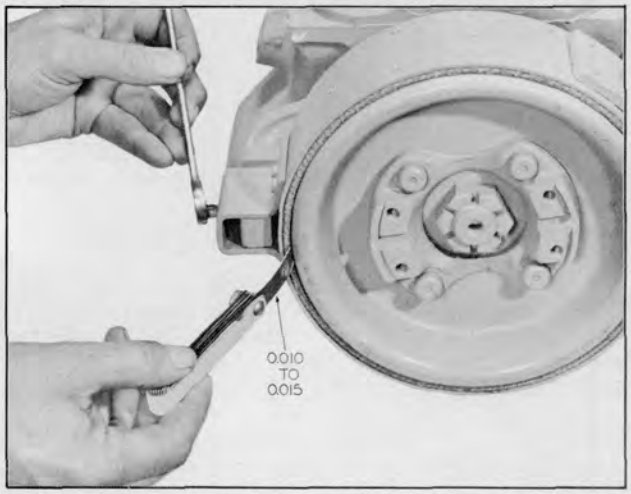


Plate 6291. Brake Band Centering Adjustment

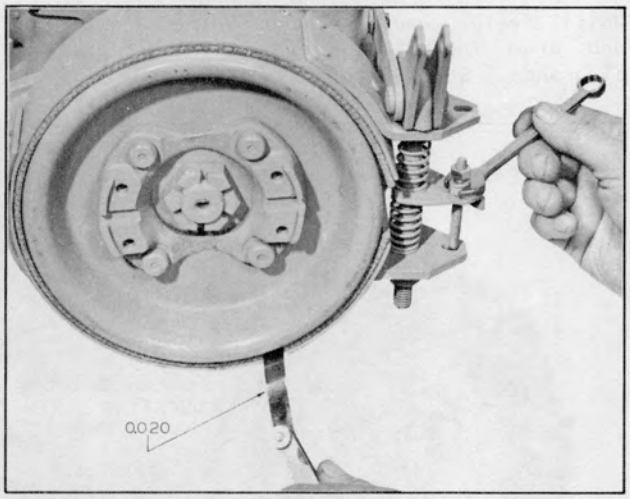


Plate 6290. Brake Band Lower Adjustment

d. Loosen lock nut from end of adjusting bolt and tighten adjusting bolt until feeler gauge placed between upper end of lining and brake drum indicates a 0.020 inch clearance. Tighten lock nut when this clearance is obtained. See Plate 6289.

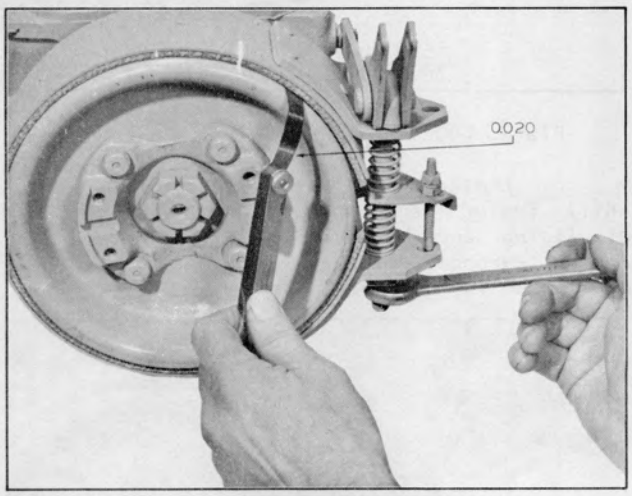


Plate 6289. Brake Band Upper Adjustment

e. Rotate adjusting knob, located at upper end of brake lever, clockwise until sufficient tension is obtained to properly apply parking brake when lever is actuated. See Plate 6505.

COOLING SYSTEM

Radiator Pressure Caps:

WARNING

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

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

Plate 6458. Radiator Pressure Cap

2. Inspect pressure cap for freedom of operation.

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

NOTE

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

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

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

Inspect and Clean Cooling System:

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

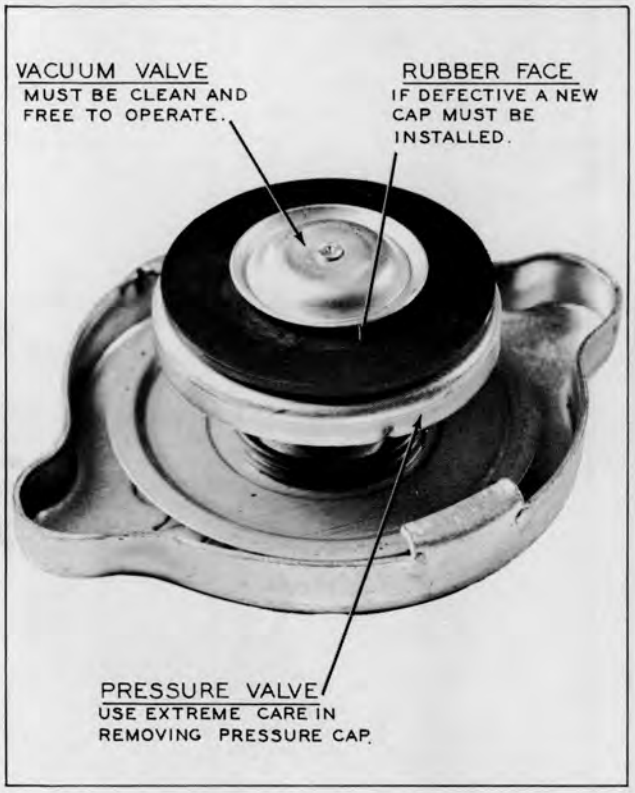


Plate 6459. Pressure Cap Gasket, Valve and Valve Gasket

NOTE

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

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

1. Drain system.

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

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

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

5. Operate engine normally for 24 hours.

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

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

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

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.

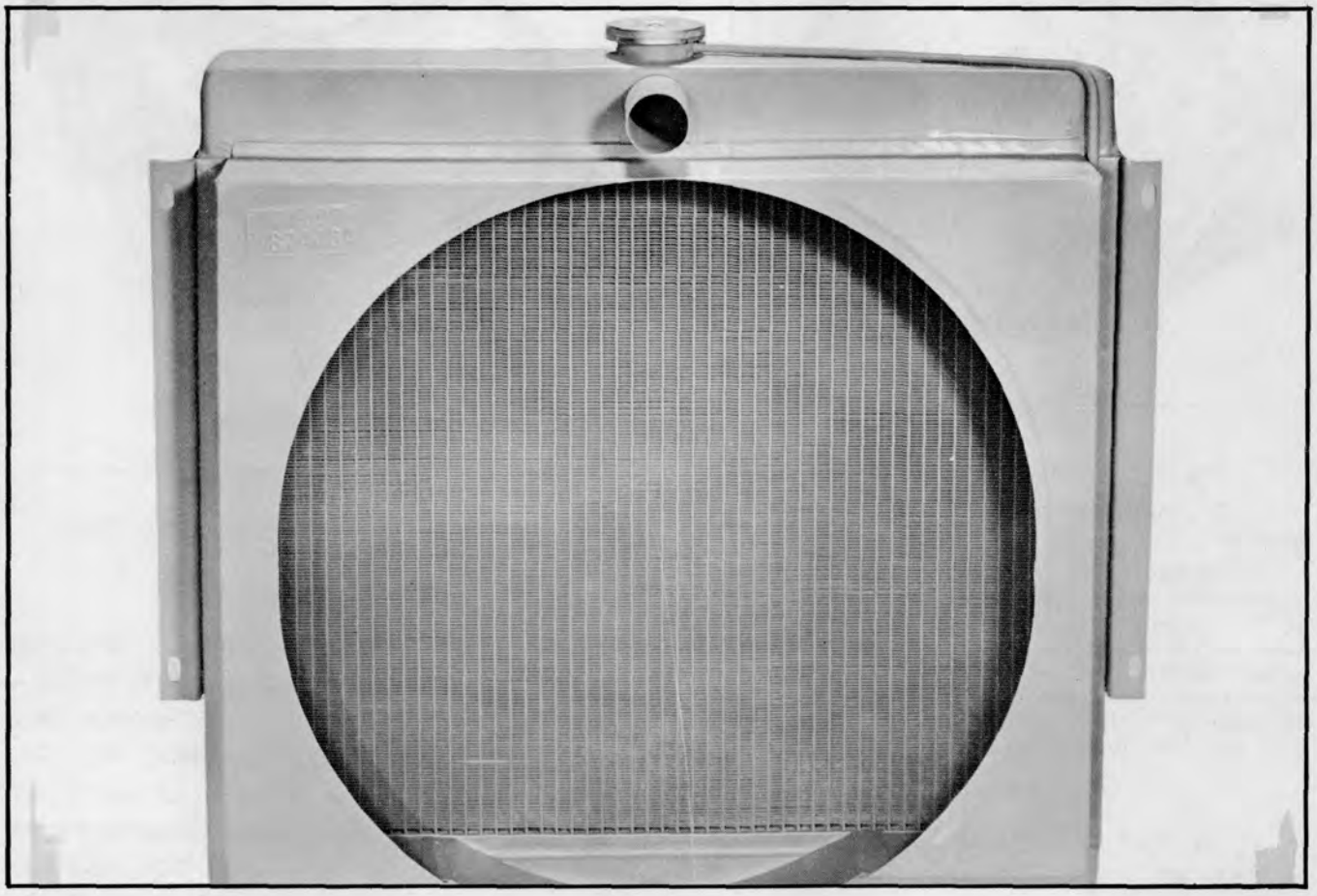


Plate 6461 Typical Radiator

TRANSMISSION OIL COOLER

Flushing Cooler When Cleaning Equipment is Not Available

When necessary to clean or flush a cooler when a converter and cooler cleaning equipment is not available, the following procedure should be used:

1. Disconnect the oil cooler return line from the transmission.
Place the transmission selector lever in the N (neutral) position and connect the cooler inlet (converter out) line to the transmission. Place a pan under the end of the cooler return line that will hold automatic transmission fluid. Do not start the engine.

2. Install 5 quarts of automatic transmission fluid type "F". (See next column CAUTION)

3. Now, start the engine and allow it to run at normal idle speed for 3 minutes with the selector lever in the N (neutral) position. Stop the engine, add additional transmission fluid required to complete total fill. Start the engine and allow it to run at normal idle speed.

4. Allow approximately two quarts of transmission fluid to drain into the pan placed under the end of the cooler return line.

5. If the fluid does not run clean after draining two quarts of transmission fluid through the cooler, shut off the engine and add two additional quarts of automatic transmission fluid.

6. Repeat steps 3-5 until the transmission fluid flowing out of the cooler return line is clean.

7. If there is no fluid flow or the fluid does not flow freely, shut off the engine and disconnect both cooler lines from the transmission and cooler.

8. Use an air hose with not more than 100 psi air pressure to reverse flush the cooler lines and the cooler. After flushing, connect both lines at the cooler and the cooler inlet line (converter out) to the transmission.

9. Start the engine and check the fluid flow. If the transmission fluid flows freely, proceed with steps 3-6. If there is no fluid flow, check for pinched cooler lines. If the flow is restricted, replace cooler lines and/or the radiator.

10. Shut off engine, remove the temporary plug from the cooler return line fitting on the transmission case and connect the cooler return line to the transmission. Check the transmission fluid level. Add or remove transmission fluid as required until the proper fluid level is obtained on the dipstick. Do not overfill the transmission.

12. Do not attempt to correct cooler or cooler line leaks by closing off the lines.

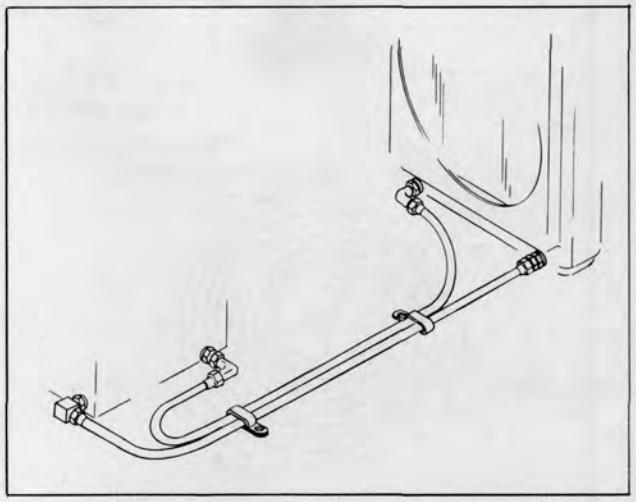


Plate 9269. Transmission Oil Cooler Lines

C A U T I O N

USE TYPE "F" AUTOMATIC TRANSMISSION FLUID PER FORD MOTOR COMPANY, SPECIFICATION NUMBER M2C-33D OR M2C-33E. DO NOT USE TYPE "A" FLUID. REFER TO SPECIFICATIONS IN THIS MANUAL.

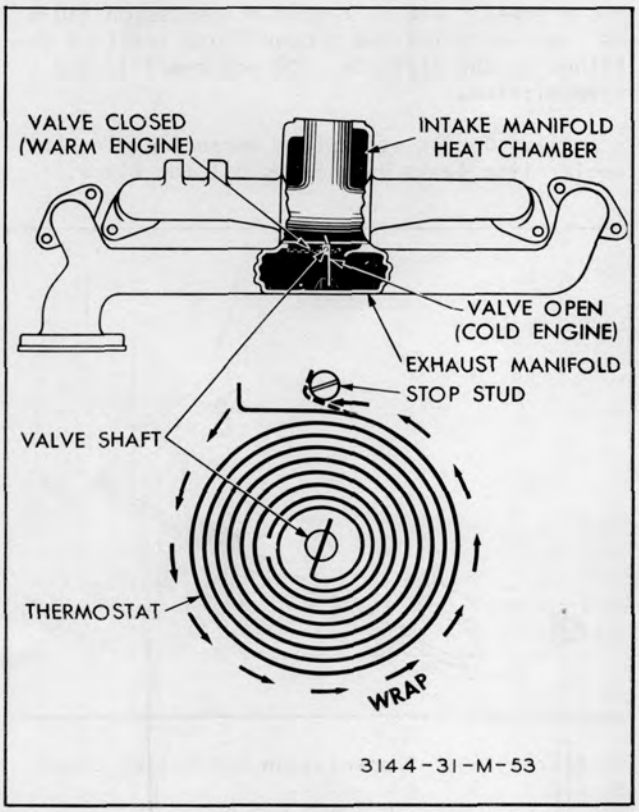


Plate 3144. Manifold Heat Control Valve

AUTOMATIC HEAT CONTROL VALVE

Exhaust from the combustion chamber passes through the exhaust valve ports into the exhaust manifold and out through the exhaust pipe. The manifold heat control valve permits faster warmup of the engine by diverting exhaust from the engine through a by-pass port and out through the exhaust manifold.

An automatic heat control valve is used on engines equipped with a universal type manifold. (The universal type manifold makes possible up-front or down-rear exhaust. In addition, updraft and downdraft carburetion is available.)

This valve regulates the amount of heat that by-passes around the inlet manifold heater body. An occasional check should be made to insure that the valve and shaft are free and not restricted in their operation. If the shaft is frozen or bushing is damaged, the assembly should be repaired or replaced.

The thermostat spring attached to the valve shaft in the manifold should be replaced when it becomes weak.

The manifold heat control valve counterweight employed with universal type manifolds can be positioned to meet manufacturers' specifications.

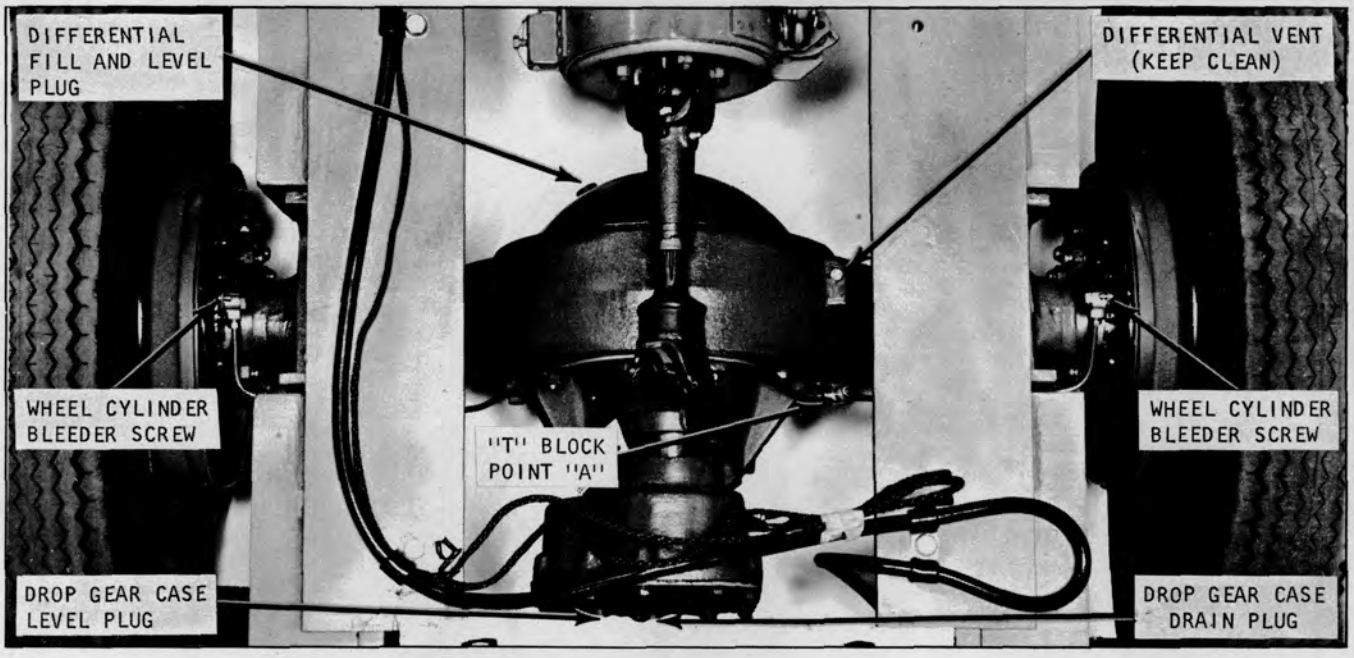


Plate 7435. Drop Gear Case and Differential - Drain and Refill

DIFFERENTIAL AND DROP GEAR CASE

1. Drain differential by removing the lower capscrew on the front cover of the differential bowl. Drain differential at operating temperatures. Removal of the filler/plug will allow full atmospheric pressure to enter the differential bowl and speed up the draining process.

N O T E

BEFORE REMOVING PLUGS FROM EITHER DIFFERENTIAL OR DROP GEAR CASE, CLEAN BOTH ASSEMBLIES SO THAT THE AREA AROUND THE DRAIN, FILL/LEVEL PLUGS IS ABSOLUTELY CLEAN.

2. Remove drain plug from the drop gear case and drain lubricant at operating temperature.

3. Replace drain plugs after both units are completely drained and tighten plugs securely.

4. Remove fill/level plug and fill differential with E.P.G.L. S.A.E. 90 Clark Specifications MS8. Do not fill above the level of the plug hole. Replace plug and securely tighten.

5. Remove fill/level plug of drop gear case and add one quart of E.P.G.L. S.A.E. 90. Then replace fill/level plug and securely tighten.

Refer to Specifications for combined capacity of differential and drop gear case.

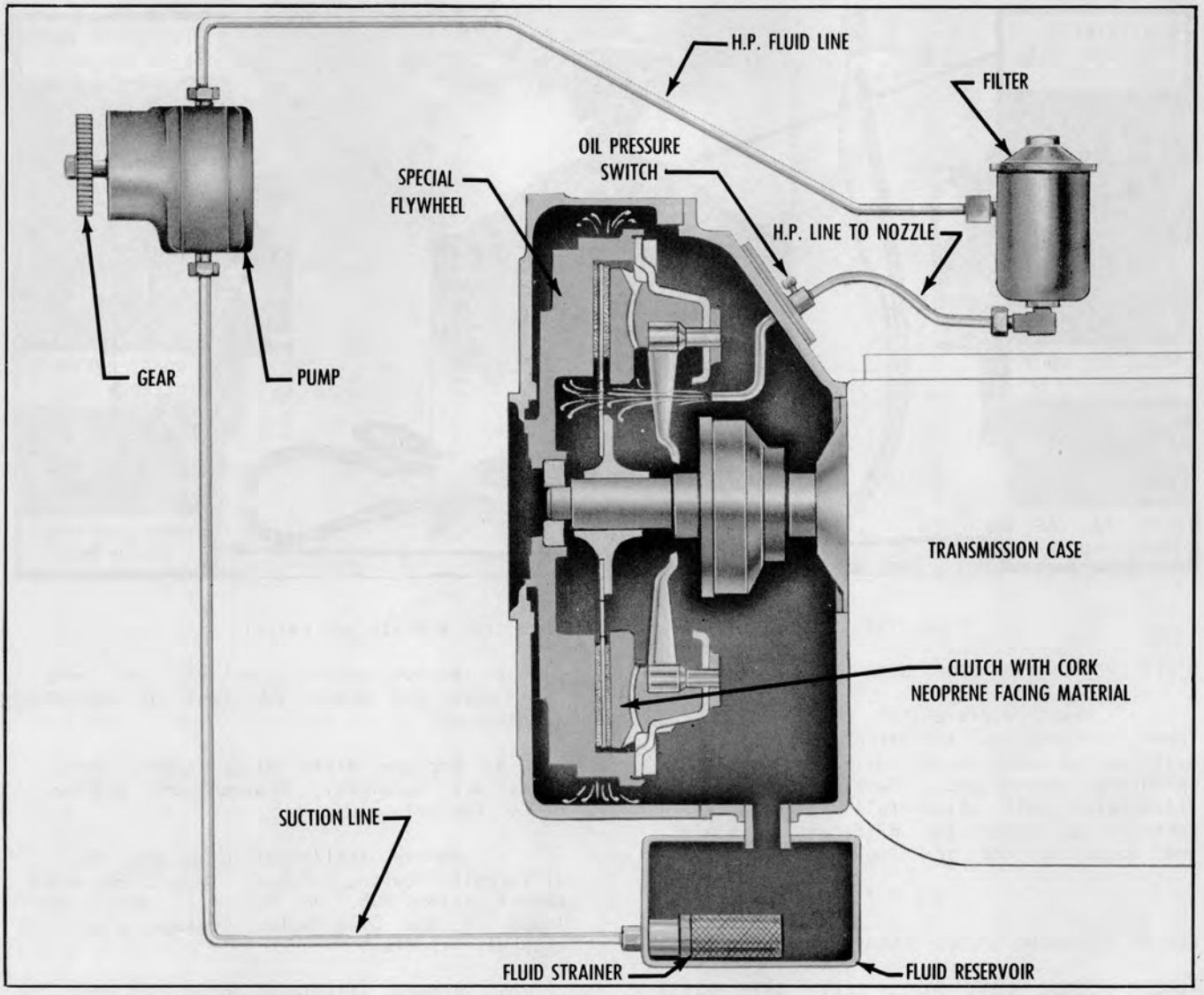


Plate 7182. Typical Hydracool Clutch

HYDRACOOL CLUTCH

1. Drain clutch reservoir at drain plug.

2. Remove fluid strainer screen from clutch reservoir. Thoroughly clean screen in a Stoddard type solvent.

3. Install screen into reservoir. Refill clutch reservoir through dipstick opening to proper level indicated on the dipstick (capacity 6 quarts). Use Automatic Transmission Fluid Type "A", Suffix "A", Clark Part number 879803. Fluid containers must display a qualification number prefixed by AQ-ATF.

HYDRACOOL CLUTCH FILTER

The filter element is of the replacable type and should be changed every time the fluid reservoir is drained.

1. Remove filter cover retainer, cover, gasket and spring.

2. Remove old element and thoroughly clean case with a lint free cloth.

3. Install new filter element.

4. Install spring and cover using a new gasket. Secure cover with retainer.

TRANSMISSION CHECKS AND ADJUSTMENTS

The transmission control linkage adjustments should be performed in the order in which they appear at this section of the manual.

Engine-Idle Speed Adjustment

1. Apply the parking brake and place the selector lever at N.

2. Run the engine at normal idle speed. If the transmission fluid is cold, run the engine at fast idle speed (about 1200 rpm) until the engine reaches its normal operating temperature. When the engine is warm, slow the engine down to normal idle speed.

3. Connect a tachometer to the engine.

4. Adjust the engine idle speed to required specifications. It may be necessary to readjust the idle speed at N position of the selector lever to obtain the correct rpm in Drive (2nd gear 'little dot' or 2nd & 3rd 'big dot'). If the anti-stall dashpot holds the throttle open and prevents the idle speed from being correctly adjusted, adjust the dashpot clearance before adjusting the idle speed.

N O T E

If the idle speed is too low, the engine will run roughly. An idle speed that is too high will cause the vehicle to creep when the transmission is shifted into gear and will cause rough transmission engagement.

Anti-stall Dashpot Adjustment

After the engine idle speed has been properly adjusted, stop the engine and adjust the anti-stall dashpot clearance.

1. Loosen the dashpot locknut.

2. With the throttle in the hot-idle position, bottom the dashpot plunger and measure the clearance between the bottomed plunger and the throttle shaft lever. The clearance should be 0.060-0.090 inch.

3. To adjust the clearance, turn the dashpot or dashpot adjusting nut and tighten the locknut after the correct clearance is obtained.

Manual Linkage Adjustment

N O T E

Correct manual linkage adjustment is necessary to position the manual valve for proper fluid pressure direction to the different transmission components. Improperly adjusted manual linkage may cause cross-leakage and subsequent transmission failure.

Position the selector lever so that the pointer is opposite R on quadrant plate and with transmission lever in forward position. Adjust linkage until ball joint stud fits into hole with out lever movement.

THROTTLE LINKAGE

The throttle linkage should be adjusted when:

1. The engine idle speed is changed.

2. The main control valve body assembly or the pressure regulator is disturbed.

3. Diagnosis indicates linkage problems.

4. Linkage parts have been disassembled.

Adjustment -6 and 8 Cylinder Engines

1. Loosen clamp screw. Disconnect the throttle lever return spring.

2. Depress the accelerator pedal to the floor.

3. Slide cable conduit in clamp bracket until the throttle lever is in the wide open position.

4. Tighten the clamp screw. Connect the throttle lever return spring.

Control Pressure And Vacuum Diaphragm Unit Check

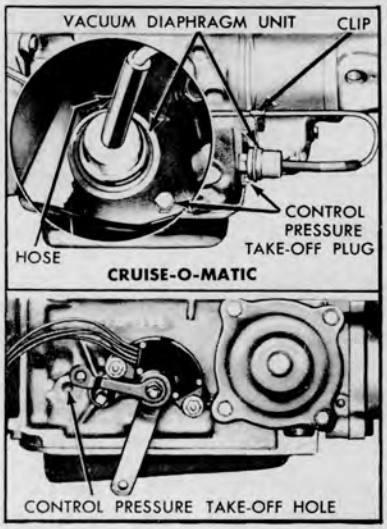


Plate 9301. Vacuum Diaphragm and Control Pressure Checking Point

If the automatic shifts do not occur within limits or the transmission slips during shift points, the following procedure is suggested to determine engine, transmission, linkage, diaphragm unit or valve body problems:

1. Attach a tachometer to the engine and a vacuum gauge to the transmission vacuum line at the vacuum unit. (Plate 9302).

2. Attach a pressure gauge to the control pressure outlet at the transmission.

3. Firmly apply the parking brake and start the engine.

4. Adjust the engine idle speed to the specified rpm. If the engine idle speed cannot be brought within limits by adjustment at the carburetor idle adjustment screw, check the throttle linkage for a binding condition. If the linkage is satisfactory, check for vacuum leaks in the transmission diaphragm unit and its connecting tubes and hoses. Check all other vacuum operated units (such as the power brake) for vacuum leaks.

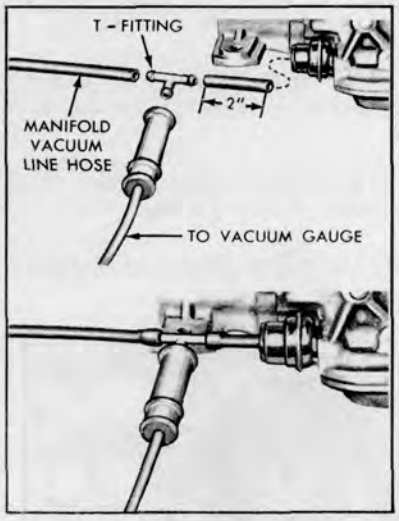


Plate 9302. Vacuum Test Line Connections

VACUUM UNIT CHECK

To check the vacuum unit for diaphragm leakage, remove the unit from the transmission. Using a vacuum pump, set the regulator knob so that the vacuum gauge reads 18 inches with the end of the vacuum hose blocked off.

Then connect the vacuum hose to the transmission vacuum unit. If the gauge still reads 18 inches, the vacuum unit diaphragm is not leaking. As the hose is removed from the transmission vacuum unit, hold a finger over the end of the control rod. When the hose is removed, the internal spring of the vacuum unit should push the control rod outward.

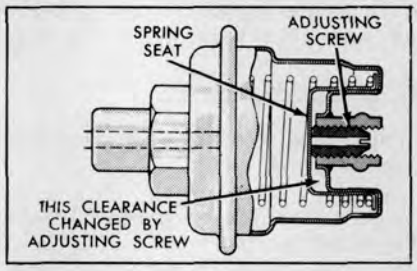


Plate 9303. Automatic Transmission Adjustable Vacuum Unit

N O T E

Tool numbers shown in this section are Ford part numbers.

Testing - HD Cruise-O-Matic

The test results of the following checks should agree with the specifications given in chart on the following page.

Test Number 1 - Control Pressure Check - At Engine Idle

1. With the transmission in neutral and the engine at the correct idle speed, the vacuum gauge should show a minimum of 16.7 inches. If the vacuum reading is lower than 16.7 inches, an engine problem is indicated or there is leakage in the vacuum line. Make necessary repairs to obtain a minimum vacuum reading of 16.7 inches.

2. At engine idle, depress and release the accelerator pedal quickly and observe the vacuum gauge. The amount of vacuum should decrease and increase with the changes in throttle openings. If the vacuum response to changes in throttle opening is too slow, the vacuum line to the diaphragm unit could be restricted. Make the necessary repairs before completing the test.

3. At engine idle, check the transmission control pressure gauge at all selector lever positions. The transmission control pressure test should agree with the chart on the next page, for control pressure at engine idle.

Test Number 2 - Control Pressure Increase Check

Control pressure increase should be checked in all ranges except neutral.

Shift the transmission into positions: little dot (2nd), big dot (2nd-3rd), L, and R and check control pressure rise in each range.

Test No.	Engine Speed or Manifold Vacuum	Throttle Position	Selector Lever Position	(1)Control Line Pressure All Except Police Interceptor
1	Engine Idle - Vacuum above 16.7"	Closed	All except R	57-77
		Closed	R	64-106
2	Engine rpm as required for 16.7-13.7" of manifold vacuum	As Required	L, Little dot, Big dot. (3)	Line Pressure Increase
3	Engine rpm as required for 10 " of manifold vacuum	As Required	Little Dot, big dot, L (3)	(2) 97-113
4	Engine rpm - STALL Vacuum below 1.5 inches	To and thru Detent	Little dot, big dot, L	145-176
			R	196-213

(1) Transmission fluid a normal operating temperature.
(2) Initial pressure specification. Adjustment to provide pressures as low as 92 psi may be made if necessary, to provide acceptable shift feel.
(3) Little dot=2nd gear, big dot=2nd and 3rd gear on the gear shift lever console.

Advance the throttle until the engine vacuum reading falls between 16.7-13.7 inches. As the vacuum gauge reading decreases into these specifications, the control pressure should start to rise as outlined in the above chart.

Test Number 3 - Control Pressure Check at 10 Inches of Vacuum

A control pressure check should be made at 10 inches of vacuum in the forward gear positions. Advance the throttle until the engine vacuum reading is 10 inches and check the control pressure regulation. Control pressure should be as shown in the above chart.

Test number 4 - Control Pressure Check At 3 Inches of Vacuum

Check control pressure at stall speed (throttle advanced to and through detent) in R, 2nd, 2nd-3rd, and L. Pressures at stall in the various ranges should agree with the control pressures as outlined in Table 4. If the engine speed exceeds the maximum limits, release the accelerator immediately because band or clutch slippage is indicated. While making the stall pressure test, do not hold the throttle open for more than five seconds in each detent position. Between each test move the selector lever to neutral and run engine at 1000 rpm for fifteen seconds, to cool the converter.

If the vacuum and pressure gauge readings are within specifications, the diaphragm unit and transmission control pressure regulating system are operating properly.

If transmission control pressure is too low, too high, fails to rise with throttle opening, or is extremely erratic, use the procedure given under the following appropriate heading to resolve the problem.

Control Pressure is Low at Engine Idle

(Test No. 1) If control pressure at engine idle is low in all selector lever positions, trouble other than the diaphragm unit is indicated. When control pressure at engine idle is low in all ranges, check for excessive leakage in the front oil pump, case and control valve body, or a sticking control pressure regulator valve.

Control Pressure is High at Engine Idle

(Test No. 1) If transmission control pressure at engine idle is too high in all ranges, the trouble may be in the diaphragm unit or its connecting vacuum tubes and hoses, throttle valve, or control rod.

With the engine idling, disconnect the hose from the diaphragm unit and check the engine manifold vacuum. Hold a thumb over the end of the hose and check for vacuum. If the engine speeds up when the hose is disconnected and slows down as the thumb is held against the end of the hose, the vacuum source is satisfactory.

Stop the engine and remove the diaphragm unit and the diaphragm unit push rod. Inspect the control rod for a bent condition and for corrosion. Install the diaphragm unit in the case to prevent fluid loss, but leave the push rod out. With the push rod removed, the diaphragm unit cannot affect transmission control pressure.

Start the engine and check control pressure at engine idle in all selector lever positions. If control pressure is still too high, the trouble is in the transmission pressure regulating control system. If the pressure is now within limits, the diaparagm unit

Selector Lever Position	Clutch Applied	Band Applied	Engine Speed (rpm) 240-Six
2nd only (Small dot)	Front	Front	1300-1350
D = 2-3rd Drive range (Large dot)	Front	One-way Clutch	
L	Front	Rear	
R	Rear	Rear	

was not operating properly and should be checked as previously described.

Control Pressure Does Not Increase With Throttle Opening

(Test No. 2). When the control pressure is within specification at engine idle, but does not rise, as the vacuum is decreased to the specified limits, first check the control rod between the vacuum unit and throttle valve for proper engagement. If the control rod is not assembled into the end of the throttle valve or vacuum unit, the valve cannot regulate throttle pressure to increase control pressure. Next check for a stuck throttle valve, compensator valve or control pressure regulator valve.

If control pressure increases before or after vacuum is decreased to the specified limits check for the proper operation of the diaphragm assembly, bent diaphragm cam, or worn or bent control rod.

Control Pressure Not Within Limits at 10 Inches of Vacuum (Test Number 3)

If idle pressure and pressure increase point are within specifications, but pressures at 10 inches of vacuum are not within specifications in all ranges, excessive leakage, low pump capacity, or a restricted oil pan screen is indicated.

If pressures are not within specifications for specific selector lever positions only, this indicates excessive leakage in the clutch or servo circuits used in those ranges.

When the control pressure is within specifications at engine idle, but not within specifications at the pressure rise point of approximately 16.7-13.7 inches of vacuum, the vacuum diaphragm unit may need adjustment.

Control Pressure Not Within Limits - Stall Test

(Test No. 4) If idle pressure and pressure point increase are within specifications but stall pressures are not within specifications in all ranges, excessive leakage, low pump capacity or restricted oil pan screen is indicated.

If stall pressures are not within specifications for specific ranges only, this indicates excessive leakage in the clutch or servo circuits used in those ranges. The chart to the left gives the clutch or band application for each selector lever position.

Adjusting Control Pressure

An adjustable diaphragm is available for service to correct transmission problems causing a soft or harsh automatic shift condition. The diaphragm is preset and no attempt should be made to adjust it until a pressure and vacuum check has been made to insure that pressures are within specification and that the cause of the problem is not due to other items within the transmission or vacuum connecting lines. The adjustable diaphragm should not be used for any other purpose, such as attempting to correct erratic shifts, harsh engagments and no-drive conditions.

The adjustment screw is located in the vacuum connecting tube (Plate 9303). By turning the screw the control pressure can be increased or decreased to correct the shift condition.

Checking Control Pressure

1. With the engine idling (throttle closed), manifold vacuum should be above 16 inches at sea level. Select each range and note pressure gauge reading. Pressure should be within specifications as outlined in the above chart.

2. Position selector lever in Drive range with engine idling. Open throttle gradually while observing pressure gauge. Pressure should remain within idle limits until vacuum drops to between 16.7 and 13.7 inches and then the pressure should start to increase.

3. Place selector in L, 2nd, 3rd ranges, then open throttle until vacuum reading is below 1.5 inches and note pressure gauge reading.

4. Shift transmission to reverse and open throttle until vacuum reading is below 1.5 inches and note pressure gauge reading.

If shifts are harsh, an adjustment should be made to reduce line pressure. If shifts are soft, an adjustment should be made to increase line pressure.

To increase control pressure, turn the adjusting screw in clockwise. To reduce control pressure, back the adjusting screw out by turning it counterclockwise. One complete turn of the adjusting screw (360°) will change idle line control pressure approximately 2-3

psi. After the adjustment is made, install the vacuum line and make all the pressure checks as outlined in the chart on page.

Stall Test (See WARNING next column)-----

Raise drive wheels, allow machine to reach its normal operating temperature, then apply the service brakes.

The stall test is made in 2nd (small dot) 2nd-3rd (large dot), L, or R at full throttle to check engine performance, converter clutch operation or installation, and front clutch, rear clutch and rear band operation.

While making this test, do not hold the throttle open for more than five seconds at a time. Then move the selector lever to Neutral and run the engine at 1000 rpm for about 15 seconds to cool the converter before making the next test. If the engine speed, as recorded by the tachometer, exceeds the maximum limits specified in the chart on the previous page, release the accelerator immediately because clutch or band slippage is indicated.

Stall Speed Too Low

When the stall test speeds are low and the engine is properly tuned, convertor stator clutch problems are indicated. A road test must be performed to determine the exact cause of the trouble.

If the stall test speeds are 300 to 400 rpm below the specifications shown in the chart on the previous page, and the vehicle cruises properly but has very poor acceleration, the converter stator clutch is slipping. Report to the designated person in authority.

If the stall test speeds are 300 to 400 rpm below the specified values and the vehicle drags at cruising speeds and acceleration is poor, the stator clutch is installed backwards.

When the stall test shows normal speeds, the acceleration is good, but the vehicle drags at cruising speeds, the difficulty is due to a seized stator assembly. If the stator is defective, replace the converter.

Initial Engagement Checks

Initial engagement checks are made to determine if initial band and clutch engagements are smooth.

Run the engine until its normal operating temperature is reached. With the engine at the correct idle speed, shift the selector lever from N to 2nd, 2nd-3rd, L and R. Observe the initial band and clutch engagements. Band and clutch engagements should be smooth in all positions. Rough initial engagements in 3rd, 2nd, L or R are caused by high engine idle speed or high control pressures.

---------- W A R N I N G ----------

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

Diagnosis Guides

The Diagnosis Guides list the most common trouble symptoms that may be found and gives the items that should be checked to find the cause of the trouble.

The items to check are arranged in a logical sequence which should be followed for quickest results. The letter symbols for each item are explained in the key. If items A, B, C, K, and the stall tests have already been checked during preliminary checks and adjustments, they need not be repeated.

CRUISE-O-MATIC TRANSMISSION DIAGNOSIS GUIDE

Shift Conditions And Operating Characteristics

N O T E

Under "Components to Check" (see chart on next page) for Pressure Check and Valve Body and Position of valves, the transmission pressure gauge, and the tachometer and engine vacuum gauge will have to be used before and during road test. By driving in all possible ranges and through all shift points it will be possible to determine if the control valves are able to move and can be placed in their correct position for each gear ratio.

After road test you should know the following items:

1. Control Pressure: Does the transmission have the correct control pressure?

2. Control Valves: Beyond the manual valve are all the Control Valves Functioning?

3. Hydraulic Circuits: If the first two items check out good, then check the transmission's internal hydraulic circuits that are beyond the valve body. These circuits must be checked during transmission disassembly. Report discrepancies to the designated person assigned.

PERFORMANCE CHART

OPERATING CONDITIONS	COMPONENTS TO CHECK (In the order shown) See possible causes below.
Rough initial engagement in Drive (large dot) or 2nd (small dot).	K B W F E G
2-3 shift points incorrect or erratic	A B C D W E
Rough 2-3 shifts	B W F E
Engine overspeeds on 2-3 shift	A B W E F G b r
No 2-3 shift	C B D W E G J b c f
Rough 3-2 shift at closed throttle	K B E F
Creeps excessively in Drive (large dot) 2nd (small dot).	K
Slips or chatters in first gear, drive (large dot)	A B W F E a c f
Slips or chatters in second gear (small or large dot)	A B W G F E J a c
Slips or chatters in R	A H B W I F E b c f
No drive in drive (large dot) ONLY	C W E
No drive in 2nd (small dot) ONLY	C W J E R c f
No drive in L only	C W E I R c f
No drive in R only	C H W I E R b c f
No drive in any selector lever position	A C W F E R c
Lockup in drive (large dot) ONLY	H I b c
Lockup in 2nd (small dot) ONLY	H I b c
Lockup in L only	G J b c
Lockup in R only	G J a c
Transmission overheats	O F n
Poor acceleration	n
Transmission noisy in N	A F d h
Transmission noisy in first, second, third, or reverse gear.	A F h a d
Fluid leak	A M N O P Q S T U V B j m p
Machine moves forward in N	C a

DETAILED POSSIBLE CAUSES

A. Fluid level	U. Extension housing rear oil seal
B. Vacuum diaphragm unit or tubes restricted - leaking	V. Governor inspection cover gasket
C. Manual linkage	W. Perform control pressure check
D. Governor	
E. Valve body	a. Front clutch
F. Pressure regulator	b. Rear clutch
G. Front band	c. Leakage in hydraulic system
H. Rear band	d. Front pump
I. Rear servo	e. Rear pump
J. Front servo	f. Fluid distributor sleeve in output shaft
K. Engine idle speed	h. Planetary assembly
M. Converter drain plugs	j. Engine rear oil seal
N. Oil pan gasket or filler tube	m. Front pump oil seal
O. Oil cooler and connections	n. Converter one-way clutch
P. Manual or throttle lever shaft seal	p. Front pump to case gasket
Q. 1/8 inch pipe plug in side of case	r. Rear clutch piston air bleed valve
R. Perform air-pressure check	
S. Extension housing to case gaskets and lockwashers	
T. Center support bolt lockwashers	

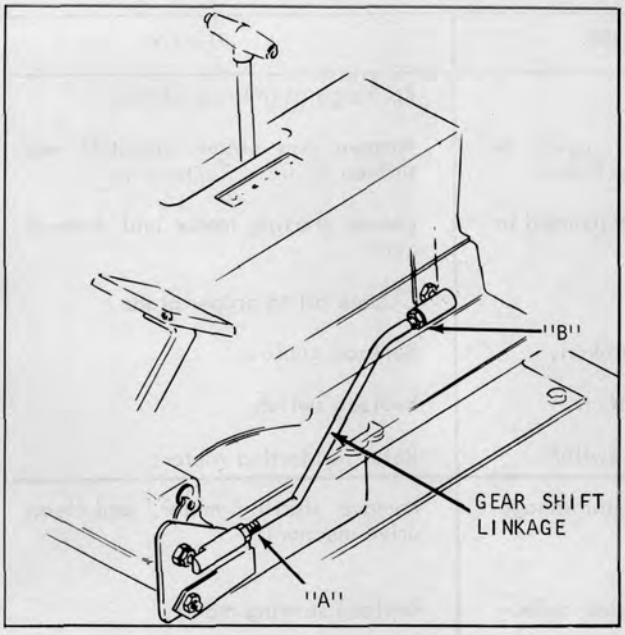


Plate 9312. Typical Gear Shift Linkage

NEUTRAL START SWITCH TEST AND ADJUSTMENT:

```
x x x x x x x x x x x x x x x x x x x x x x x x x x x
x                                                     x
x                    W A R N I N G                    x
x                                                     x
x  THE NEUTRAL START SWITCH MUST BE TESTED            x
x                                                     x
x  AND ADJUSTED WHENEVER THE NEUTRAL START            x
x                                                     x
x  SWITCH AND OR THE TRANSMISSION SHIFT               x
x                                                     x
x  LINKAGE IS DISCONNECTED, REPAIRED OR RE-           x
x                                                     x
x  PLACED.                                            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
```

Before testing of the neutral start switch, disconnect the high tension lead wire from the coil assembly to the distributor cap. Ground the lead wire. This will prevent accidental starting of the engine.

The engine must start in the neutral "N" position only.

Place the shift lever in the neutral position and crank the engine. While the engine is cranking, slowly move the shift lever out of neutral "N" position. The engine must not crank in any other selected position. If the engine continues to crank after shift lever is moved out of neutral "N" the switch is defective or or mis-adjusted.

If the switch is out of adjustment, disconnect the shift linkage at the transmission, place the transmission shift lever in neutral position against forward stop, lengthen or shorten the linkage until exact neutral is obtained at both the transmission and shift lever. (Plate 9312).

Loosen the two mounting screws on the switch housing. Move the switch forward or backward while holding the starter switch in the crank position. When the engine cranks and the shift lever is in the neutral position tighten the two mounting screws and re-test the start switch.

A cranking in all positions will indicate a defective switch and must be replaced.

A no cranking in any position will indicate defective wiring. Check the wiring, if found NOT to be defective then the switch is defective and must be replaced.

INDUSTRIAL TRUCK DIVISION

TROUBLE SHOOTING GUIDE

ENGINE

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

ENGINE (Continued)

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

ENGINE (Continued)

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

ENGINE (Continued)

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

ENGINE (Continued)

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

ENGINE (Continued)

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

ENGINE (Continued)

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

ENGINE (Continued)

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

FUEL SYSTEM

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

MECHANICAL FUEL PUMP, TANK
AND LINES DIAGNOSIS GUIDE

Low Fuel Pump Pressure Or Volume

Diaphragm stretched or leaking.
Fuel pump diaphragm spring is weak.
Rocker arm or eccentric worn or undersize.
Excessive clearance between rocker arm and fuel pump link.
Fittings loose or cracked.
Fuel filter clogged (low volume).
Fuel line cracked or broken.
Fuel pump valves improperly seated.
Dirt in fuel tank and/or lines.
Fuel tank vent restricted.
Diaphragm ruptured.
Main body retaining screws loose.

High Fuel Pump Pressure Or Volume

Diaphagm spring too strong or improper spring.
Diaphragm surface too tight (over-tensioned).
Diaphragm vent (breather hole) plugged or omitted.
Pump link has no free play (frozen).

Low Fuel Pump Vacuum

Diaphragm stretched or leaking.
Fuel pump springs weak.
Fuel pump valves improperly seated.
Diaphragm ruptured.
Rocker arm or eccentric worn.
Excessive clearance between rocker arm and fuel pump link.
Main body retaining screws loose.

Low Fuel Pump Volume With Normal Pressure

Fuel filter clogged.
Fuel pump to carburetor inlet line obstructed, crimped or leaks.
Restriction in fuel supply line to fuel pump.

Fuel Pump Leaks Fuel

Diaphragm defective.
Fittings loose.
Threads on fittings stripped.
Body cracked.

Fuel Pump Leaks Oil

Fuel pump retaining bolts loose.
Diaphragm pull rod oil seal is defective.
Mounting gasket defective.

Fuel Pump Noise

Rocker arm or eccentric worn.
Mounting bolts loose.
Rocker arm spring weak or broker.
Diaphragm pull rod bumper pad is defective.

Fuel Tank And/Or Inlet Line Hoses Collapsed

Fuel tank vent restricted.

COOLING SYSTEM

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

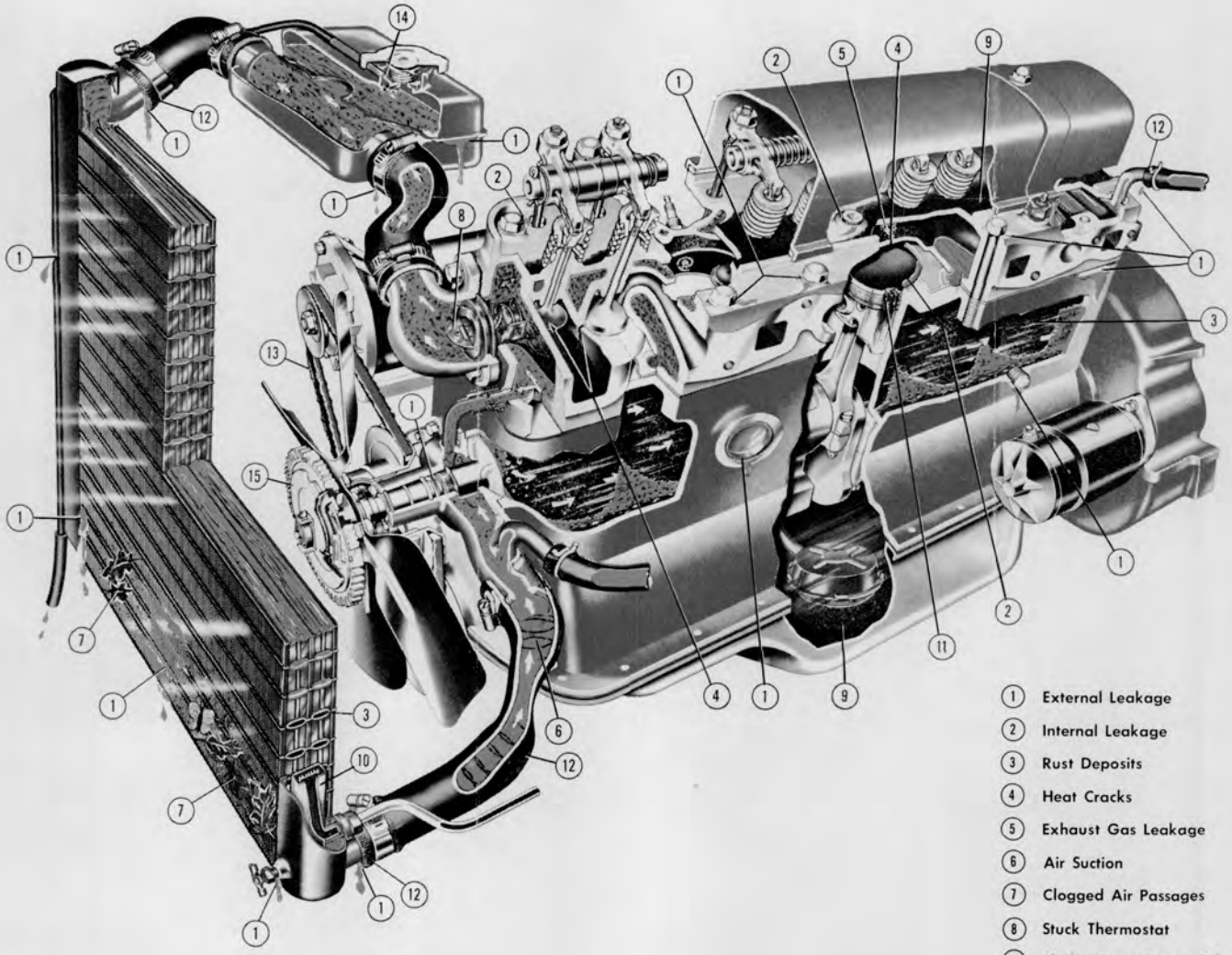
CLARK EQUIPMENT

INDUSTRIAL TRUCK DIVISION

CLARK EQUIPMENT

THE ENGINE COOLING SYSTEM

Trouble spots resulting from service neglect



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

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

Cooling System Care Pays!

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Division of Union Carbide Corporation

IGNITION SYSTEM

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

D I A G N O S I S A N D T E S T I N G

GENERAL INFORMATION

Conventional Ignition System

The ignition system consists of a primary (low voltage) and a secondary (high voltage) circuit. (Plate 9289)

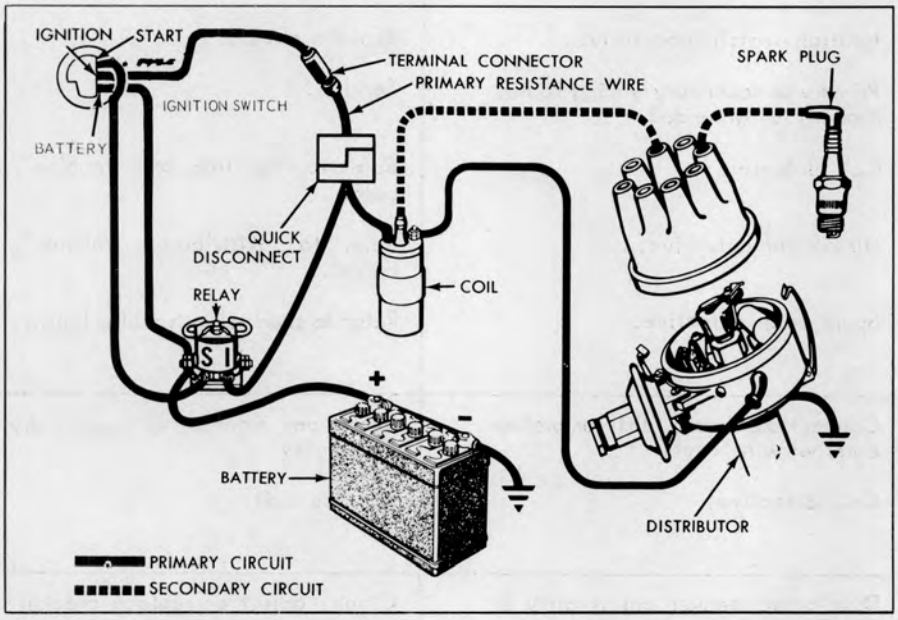


Plate 9289. Typical Conventional Ignition System Circuit

The primary circuit consists of the:

1. Battery.
3. Ignition switch.
3. Primary circuit resistance wire.
4. Primary windings of the ignition coil.
5. Breaker points.
6. Condenser.
7. Circuit wiring.

The secondary circuit consists of the:

1. Secondary windings of the ignition coil.
2. Distributor rotor.
3. Distributor cap.
4. High tension wires.
5. Spark plugs.

When the breaker points are closed, the primary or low voltage current flows from the battery through the ignition switch to the primary windings in the coil, then to ground through the closed breaker points. When the breaker points open, the magnetic field built up in the primary windings of the coil moves through the secondary windings of the coil producing high voltage current. High voltage current is produced each time the breaker points open. The high voltage flows through the coil high tension lead to the distributor cap where the rotor distributes it to one of the spark plug terminals in the distributor cap. This process is repeated for every power stroke of the engine.

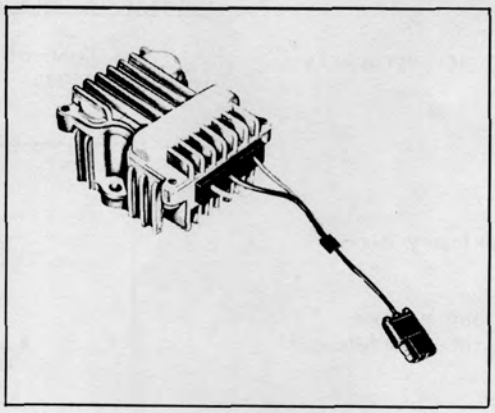


Plate 9291. Amplifier Assembly

IGNITION SYSTEM TESTS - CONVENTIONAL TEST EQUIPMENT

Conventional Ignition System

Trouble Isolation

Ignition system troubles are caused by a failure in the primary and/or the secondary circuit or incorrect ignition timing. If an engine trouble has been traced to the ignition system from the engine trouble diagnosis guide, the trouble can be found by performing an ignition system test on a scope or by further isolating the trouble to the primary or secondary circuit as follows:

1. Disconnect the wire from the starter relay I terminal and the wire from the starter relay S terminal.

2. Remove the coil high tension lead from the distributor cap.

3. Turn on the ignition switch.

4. While holding the high tension lead approximately 3/16 inch from the cylinder head or any other good ground, crank the engine by using an auxiliary starter switch between the starter relay battery and S terminals.

If the spark is good, the trouble lies in the secondary circuit.

If there is no spark or a weak spark, the trouble is in the primary circuit, coil to distributor high tension lead or the coil.

Primary Circuit

A breakdown or energy loss in the primary circuit can be caused by:

1. Defective primary wiring or loose or

corroded terminals.

2. Burned, shorted, sticking or improperly adjusted breaker points.

3. A defective coil.

4. A defective condenser.

To isolate a trouble in the primary circuit, proceed as follows:

Turn the ignition switch off and remove the auxiliary starter switch from the starter relay.

Install the coil high tension lead in the distributor cap, the red and blue wire on the starter relay S terminal and the brown wire on the starter relay I terminal.

Now perform a primary circuit test.

Secondary Circuit

A breakdown or energy loss in the secondary circuit can be caused by:

1. Fouled or improperly adjusted spark plugs.

2. Defective high tension wiring.

3. High tension leakage across the coil, distributor cap or rotor resulting from an accumulation of dirt.

To isolate a trouble in the secondary circuit, proceed as follows:

Turn the ignition switch off and remove the auxiliary starter switch from the starter relay.

Install the coil high tension lead in the distributor cap, the wire on the starter relay S terminal and the wire on the starter relay I terminal.

Now perform a secondary circuit test.

Primary Circuit Tests

A complete test of the primary circuit consists of checking the circuit from the battery to the coil, the circuit from the coil to ground, and the starting ignition circuit.

Excessive voltage drop in the primary circuit will reduce the secondary output of the ignition coil, resulting in hard starting and poor performance.

Tool Numbers listed above are Ford Part Numbers

Battery To Coil Test

1. Connect the voltmeter leads as shown in Plate 9292.

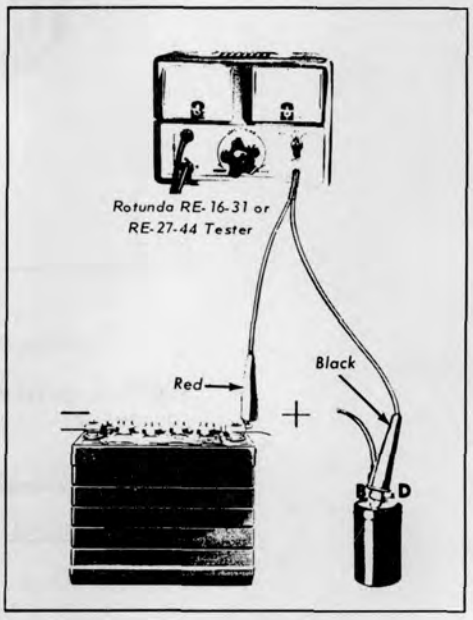


Plate 9292. Battery to Coil Test and Starting Ignition Circuit Test

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor housing.

3. Turn the lights and accessories off.

4. Turn the ignition switch on.

5. If the voltmeter reading is 6.9 volts or less, the primary circuit from the battery to the coil is satisfactory.

6. If the voltmeter reading is greater than 6.9 volts, check the following:

The battery and cables for loose connection or corrosion.

The primary wiring for worn insulation, broken strands, and loose or corroded terminals.

The resistance wire for defects.

The relay to ignition switch for defects.

Starting Ignition Circuit Test

1. Connect the voltmeter leads as shown in Plate 9292.

2. Disconnect and ground the coil to dis-

tributor high tension lead at the distributor.

3. With the ignition switch off, crank the engine by installing a jumper wire between the battery and the S terminals of the starter relay while observing the voltage drop.

4. If the voltage drop is 0.1 volt or less, the starting ignition circuit is satisfactory.

5. If the voltage drop is greater than 0.1 volt, clean and tighten the terminals in the circuit or replace the wiring as necessary.

Ignition Switch Test

1. Connect the voltmeter leads as shown in Plate 9293.

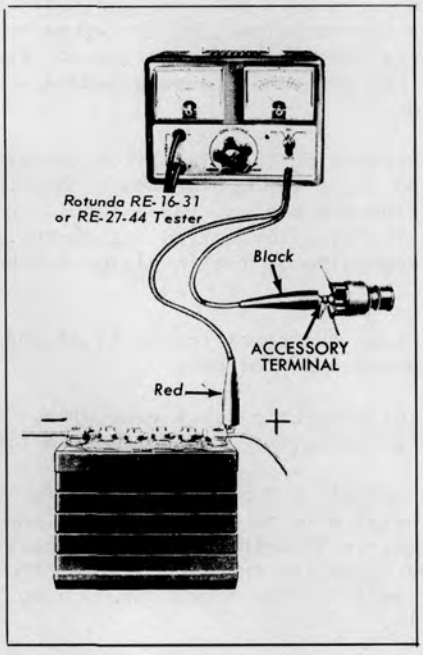


Plate 9293. Ignition Switch Test

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor body.

3. Turn all of the accessories and lights off.

4. Turn the ignition switch on.

5. If the voltmeter reading is 0.3 volt or less, the ignition switch and the relay to switch wire are satisfactory.

6. If the voltmeter reading is greater than 0.3 volt, either the ignition switch and/or the wire are defective.

Resistance Wire Test

1. Connect the voltmeter leads as shown in Plate 9294.

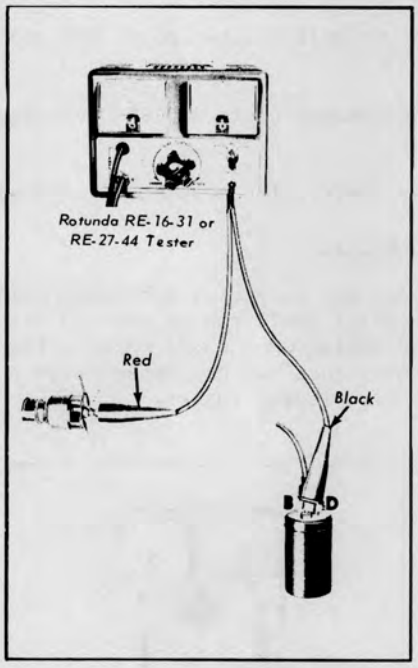


Plate 9294. Resistance Wire Test

2. Install a jumper wire from the distributor terminal of the coil to a good ground on the distributor housing.

3. Turn all of the accessories and lights off.

4. Turn the ignition switch on.

5. If the voltmeter reading is 6.6 volts or less, the resistance wire is satisfactory.

6. If the voltmeter reading is greater than 6.6 volts, replace the resistance wire.

Coil To Ground Test

1. Connect the voltmeter leads as shown in Plate 9295.

2. Close the breaker points.

3. Turn all lights and accessories off.

4. Turn the ignition switch on.

5. If the voltmeter reading is 0.1 volt or less, the primary circuit from coil to ground

is satisfactory.

6. If the voltmeter reading is greater than 0.1 volt, test the voltage drop of each of the following:

The coil and the breaker point terminals of the coil to distributor primary wire.

The movable breaker point and the breaker plate.

The breaker plate and the distributor housing.

The distributor housing and engine ground.

Breaker Points

Clean and inspect the breaker points. The breaker point dwell can be checked with a distributor tester or a dwell meter. The breaker point resistance can be checked with a Rotunda RE-1416 distributor tester.

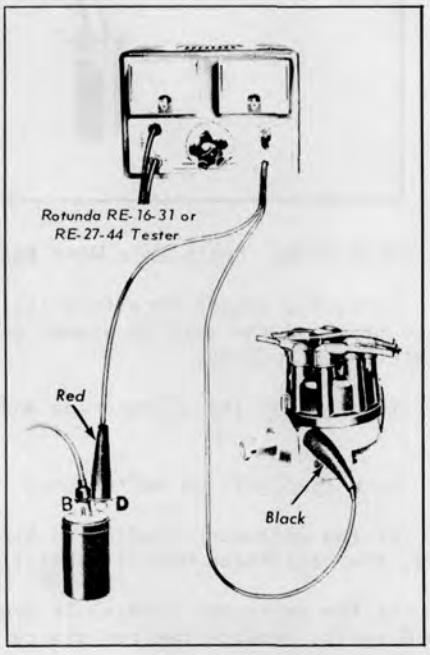


Plate 9295. Coil To Ground Test

Coil

Clean and inspect the coil. Check the coil on a coil tester by following the manufacturers instructions.

Tool Numbers listed above are Ford Part Numbers

Secondary Circuit Tests

Distributor Cap And Rotor

Clean and inspect the distributor cap and the rotor.

Secondary (High Tension) Wires

The secondary wires include the wires connecting the distributor cap to the spark plugs and the wire connecting the center terminal on the distributor cap to the center terminal of the ignition coil.

Clean and inspect the secondary wiring.

These wires are the radio resistance-type which filter out the high frequency electrical impluses that are the source of ignition noise interference. The resistance of each wire should not exceed 7,000 ohms per foot. When checking the resistance of the wires or setting ignition timing, do not puncture the wires with probe. The probe may cause a separation in the conductor.

When removing the wires from the spark plugs grasp and twist the moulded cap, then pull the cap off the spark plug. Do not pull on the wire because the wire connection inside the cap may become separated or the insulator may be damaged.

To check the spark intensity at the spark plugs, proceed as follows:

1. Disconnect a spark plug wire. Check the spark intensity of one wire at a time.

2. Install a terminal adapter in the terminal of the wire to be checked. Hold the adapter approximately 3/16-inch from the exhaust manifold and crank the engine, using a remote starter switch. The spark should jump the gap regularly.

3. If the spark intensity of all the wires is satisfactory, the coil, condenser, rotor, distributor cap and the secondary wires are probably satisfactory.

If the spark is good at only some wires, check the resistance of the faulty leads.

If the spark is equal at all wires, but weak or intermittent, check the coil, distributor cap and the coil to distributor high tension wire.

Spark Plugs

Inspect, clean and gap the plugs. After the proper gap is obtained, check the plugs on a testing machine. Compare the sparking

efficiency of the cleaned and gapped plug with a new plug. Replace the plug if it fails to meet 70% of the new plug performance.

Test the plugs for compression leakage at the insulator seal. Apply a coating of oil to the shoulder of the plug where the insulator projects through the shell, and to the top of the plug, where the center electrode and terminal project from the insulator. Place the spark plug under pressure with the tester's high tension wire removed from the spark plug. Leakage is indicated by air bubbling through the oil. If the test indicates compression leakage, replace the plug. If the plug is satisfactory, wipe it clean.

Ignition Timing

Incorrect ignition timing can be caused by:

1. Timing incorrectly adjusted.

2. Distributor bushing and/or shaft worn or a bent distributor shaft.

3. Defective vacuum advance system.

4. Defective centrifugal advance system.

STARTING MOTOR

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

ALTERNATOR TROUBLES

TROUBLE	PROBABLE CAUSE	REMEDY
Noisy alternator.	Worn or dirty bearings	Report to designated person in authority.
	Loose mounting bolts.	Tighten as required.
	Loose drive pulley.	Tighten shaft nut.
	Defective diode.	Report to designated person in authority.
	Defective stator.	Report to designated person in authority.

BATTERY, LIGHTS AND HORN

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

BATTERY, LIGHTS AND HORN (Continued)

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

TRANSMISSION

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive noise.	Incorrect driving practice.	Correct practice.
	Insufficient lubricant.	Add lubricant.
	Gears or bearings broken or worn; gears worn on splines.	Replace transmission
	Overheated transmission.	Inspect lubricant grade and supply.
Inoperative in all ranges.	Shift lever linkage slipping or broken.	Check linkage and repair.
	Inoperative vacuum control.	Check operation of vacuum control and solenoid unit.
	Internal trouble.	Report to designated individual in authority.
Engine starts in ranges other than neutral.	Neutral starting switch out of position.	Reposition switch.
Shifting delayed or soft.	Low vacuum to vacuum control.	Check vacuum from carburetor.
Loss of lubricant.	Worn or damaged seals or gaskets.	Report to designated individual in authority.
Downshift rough with closed throttle.	Vacuum control not positioned correctly.	Reposition as directed.
	Internal trouble.	Report to designated individual in authority.
High torque converter oil temperatures.	Improper driving practices.	Correct driving practice.
	Low transmission fluid level.	Check and fill.
	Internal trouble.	Report to designated individual in authority.

DRIVE AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble.	Noisy gears or backlash.	Report to designated individual in authority.
	Damaged axle.	Replace axle.
	Abnormal tire wear.	Inflate tires properly.
	Lubrication leaks.	Drain excessive lubricant; clean housing vent; remove excessive grease in wheel hubs; replace leaking defective gaskets.

STEERING AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble.	Damaged axle.	Replace axle.
	Lubrication leaks.	Replace oil seals. (Refer to Lubrication Section). Report to designated individual in authority.
	Incorrect caster or camber.	Report to designated individual in authority.
	Uneven tire wear.	Inflate tires properly. Check wheel alignment.

STEERING

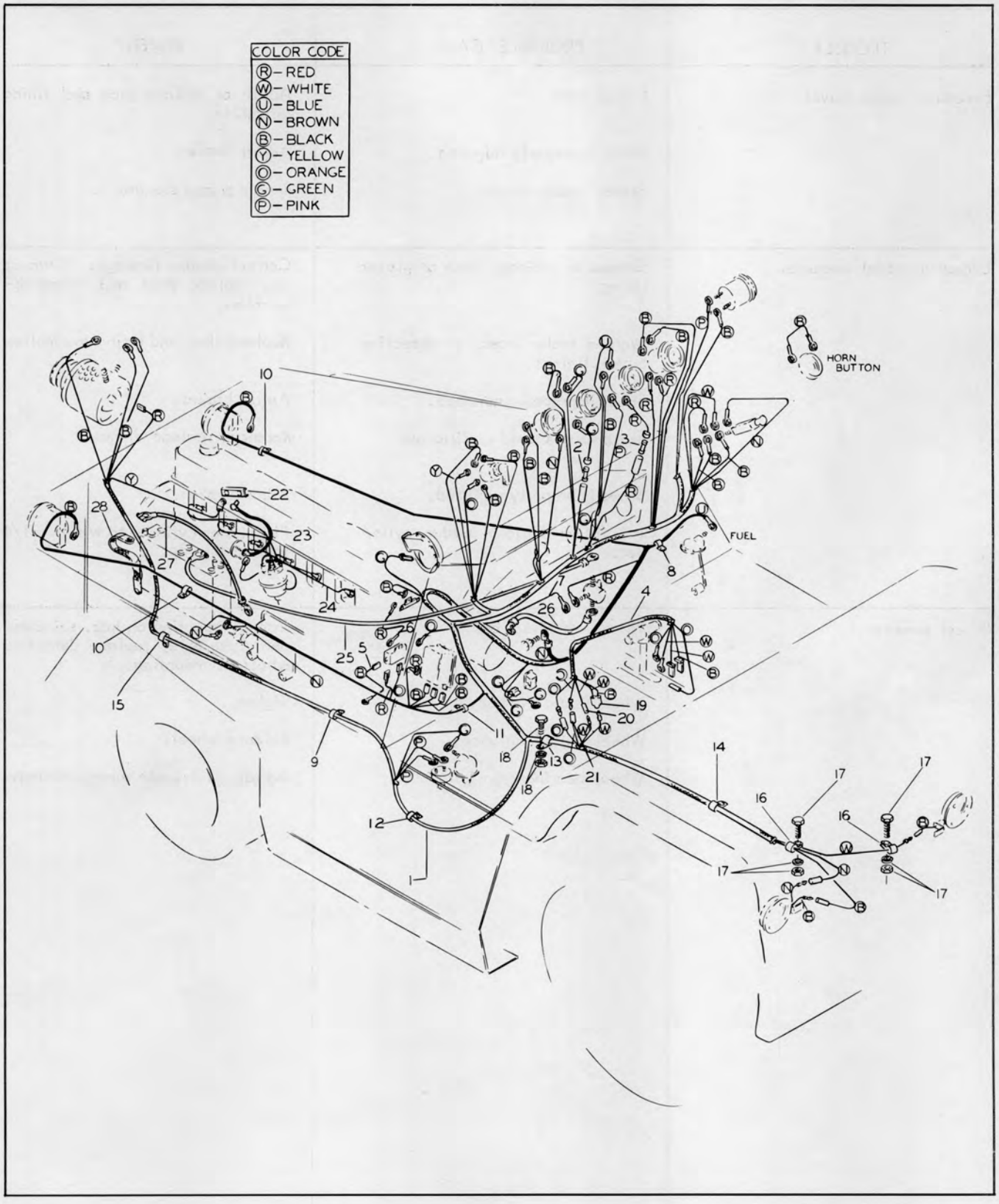
TROUBLE	PROBABLE CAUSE	REMEDY
Steering difficult.	Lack of lubrication	Lubricate.
	Tight steering system connections.	Lubricate and adjust linkage.
	Tight steering gear; misaligned wheels.	Report to designated individual in authority.
	Bent steering connecting linkage or arm.	Straighten or replace linkage.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

BRAKES

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

BRAKES (Continued)

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


COLOR CODE
Ⓡ – RED
Ⓦ – WHITE
Ⓤ – BLUE
Ⓝ – BROWN
Ⓑ – BLACK
Ⓨ – YELLOW
Ⓞ – ORANGE
Ⓖ – GREEN
Ⓟ – PINK
HORN BUTTON
FUEL
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2
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INDUSTRIAL TRUCK DIVISION

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LUBRICATION AND PREVENTIVE MAINTENANCE

NOTE: REFER TO DIESEL ENGINE MANUAL FOR ENGINE AND ACCESSORY SERVICE INSTRUCTIONS

TROUBLE SHOOTING GUIDE

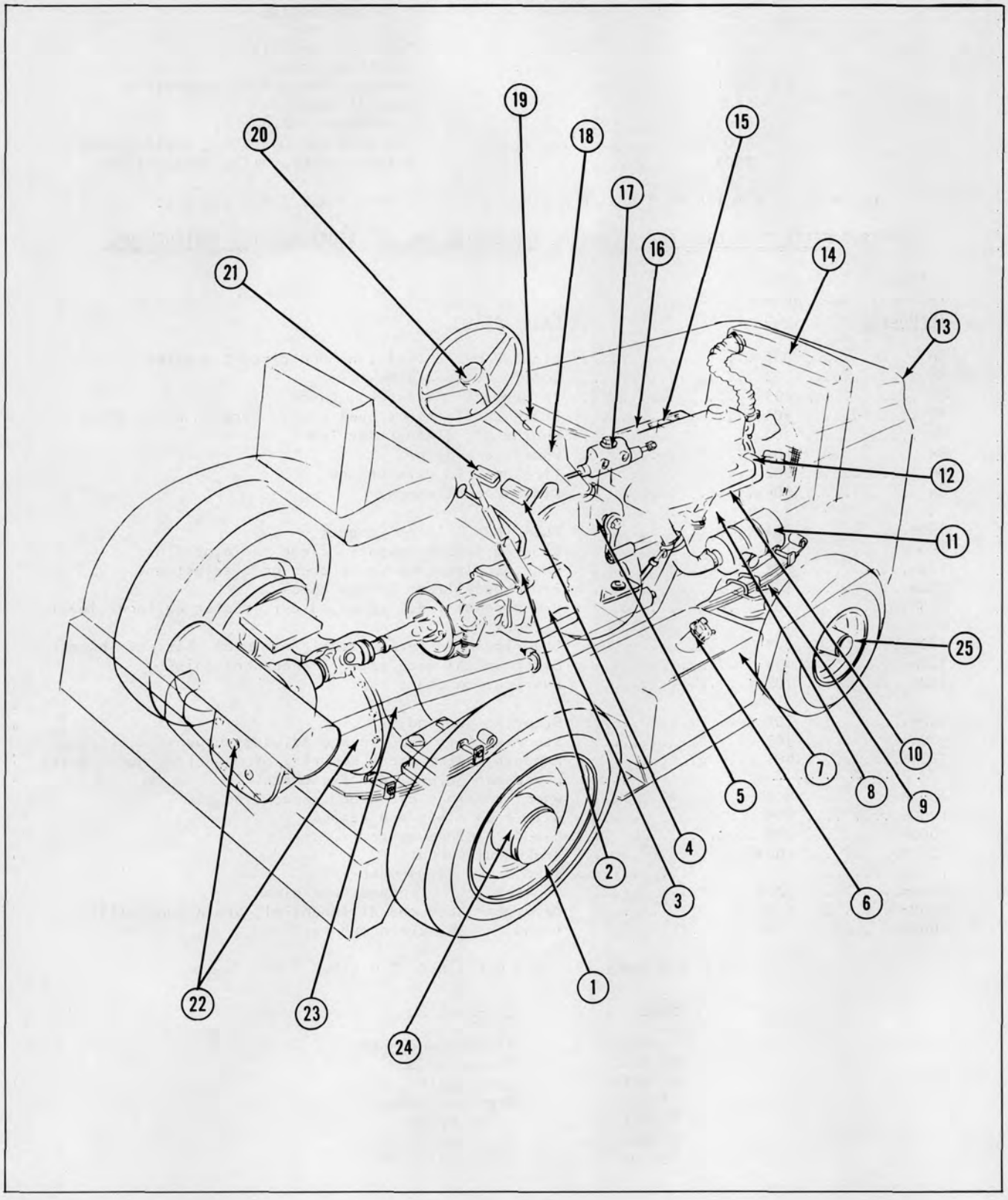

Plate 9442. Typical Lubrication and Preventive Maintenance Illustration

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INDUSTRIAL TRUCK DIVISION

SPECIFICATIONS

GENERAL

Type of vehicle: Diesel Model Tow Tractor

Single drive:
Tread ..... 46 15/16"
Dual drive:
Tread outside tires ..... 57 11/16"
Tread inside tires ..... 39 3/16"

Turning radius, outside ..... 108"
Turning radius, inside:
Single drive ..... 29"
Dual drive..... 25"

Ground clearance (under counterweight tow hitch or mounting)..... 11"
Ground clearange (under rear axle) ..... 7"
Ground clearance (under front axle)..... 6 1/2"
Ground clearance between axles ..... 8"
Grade clearance 34%

Draw bar pull .....
.....2000 to 5000 lbs., at 12" coupler height
Draw bar pull (empty)..... 1st gear at 3.2 MPH

Travel speeds:
Empty: 1st ..... 3.3 MPH
2nd ..... 6.8 MPH
3rd .....12.8 MPH
Rev ..... 2.8 MPH
ENGINE (Diesel Models)
Refer to Diesel Engine Manual.

Clutch

Outside diameter..... 12"
Clutch pedal free travel approx...1/2-3/4"
Clutch throw-out bearing greased for life.

TRANSMISSION (Standard) Diesel Models

Speeds:..... Fwd 3, Rev 1
Gear ratio:
First..... 3.714 to 1
Second ..... 1.871 to 1
Third..... 1.000 to 1
Reverse..... 4.588 to 1
Lubricant Capacity (approx.)...6 1/4 pints

STEER AXLE

Axle alignment:
Toe-in ..... 0°
Camber angle ..... 1°
Caster ..... 0°
Left-hand turning radius angle:
Left wheel..... 56°
Right wheel ..... 36½°
Right-hand turning radius angle:
Left wheel ..... 36½°
Right wheet..... 56°

DRIVE AXLE

Ratio ..... 17.311 to 1
Capacity..... 10 Quarts

WHEELS AND TIRES (Dual and Single Drive)

Size: Front (steer)..... 6:50x10-6 Ply
Rear (drive)..... 6:50x10-6 Ply
Air pressure: Front (single drive)-40 lbs.
Rear (single & dual drive)..... 40 lbs.

SPLIT WHEELS (Standard or Optional)

Drive wheels: Torque wheel nuts,
Single ..... 125-140 ft. lbs.
Dual..... 200-225 ft. lbs.

Steer wheels: Torque wheel nuts,
At ..... 60-75 ft. lbs.

Torque Split Wheel (Inner & Outer Halves) retainer bolts/nuts ..... 55-60 ft lbs

N O T E

All torque specifications listed above are for dry thread only.

STEERING GEAR (torques all dry thread)

Pitman arm lock nut..... 120-130 ft. lbs.
Mounting bolts & Clamp bolt-40-45 ft. lbs.
Drive axle to Frame ..... 218 ft. lbs.

BRAKE SYSTEM (Diesel Models)

Type: .....
....Hydraulic two wheel rear brake system.
Brake Pedal Free Travel..... 1/4 to 1/2"
(as measured from top pedal position, to where pedal meets resistance from the master cylinder.)

BATTERY (Negative Ground)

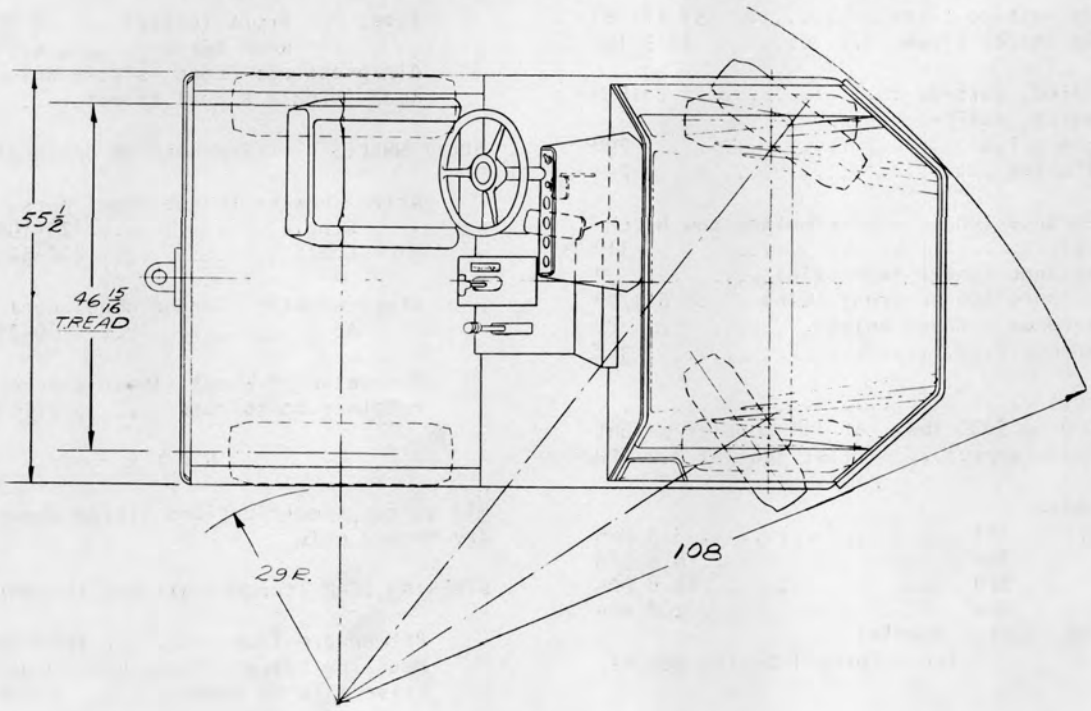
Volts 12
Number of cells..... 6
Number of plates..... 11
20 hour rate A.H. ..... 70 ampere hours
300 amps. 0°F. (10 sec.)
2.0 minutes to one volt per cell.

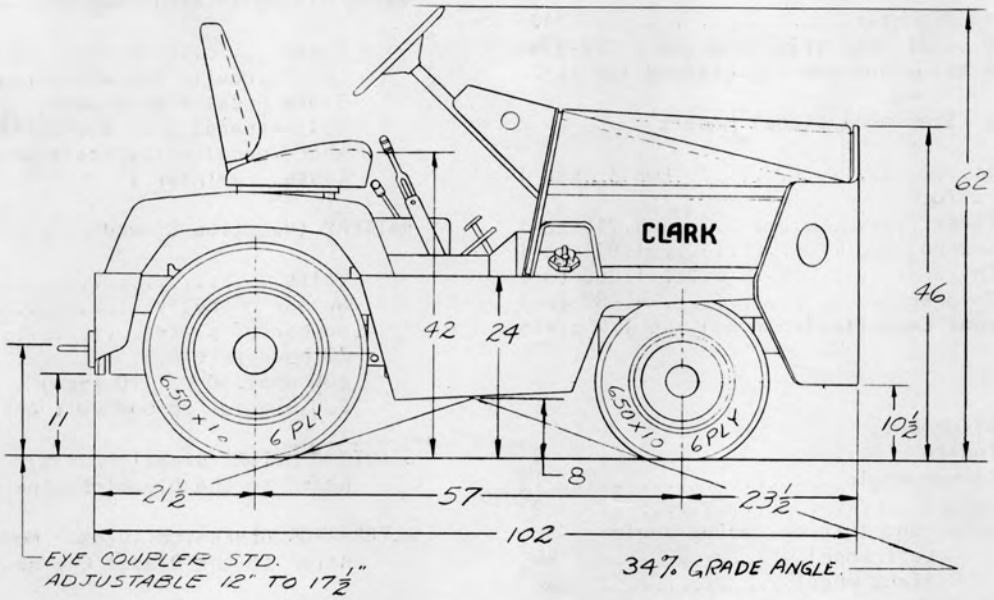
STARTING MOTOR (Diesel Models)
Refer to the Diesel Engine Manual.

ALTERNATOR/GENERATOR (Diesel Model)
Refer to the Diesel Engine Manaul.

DRAWBAR PULL. 2000, 3000, 4000, 5000

TIRES: DRIVE 6.50 x 16 - 6 PLY, STEER 6.50 x 10 - 6 PLY.

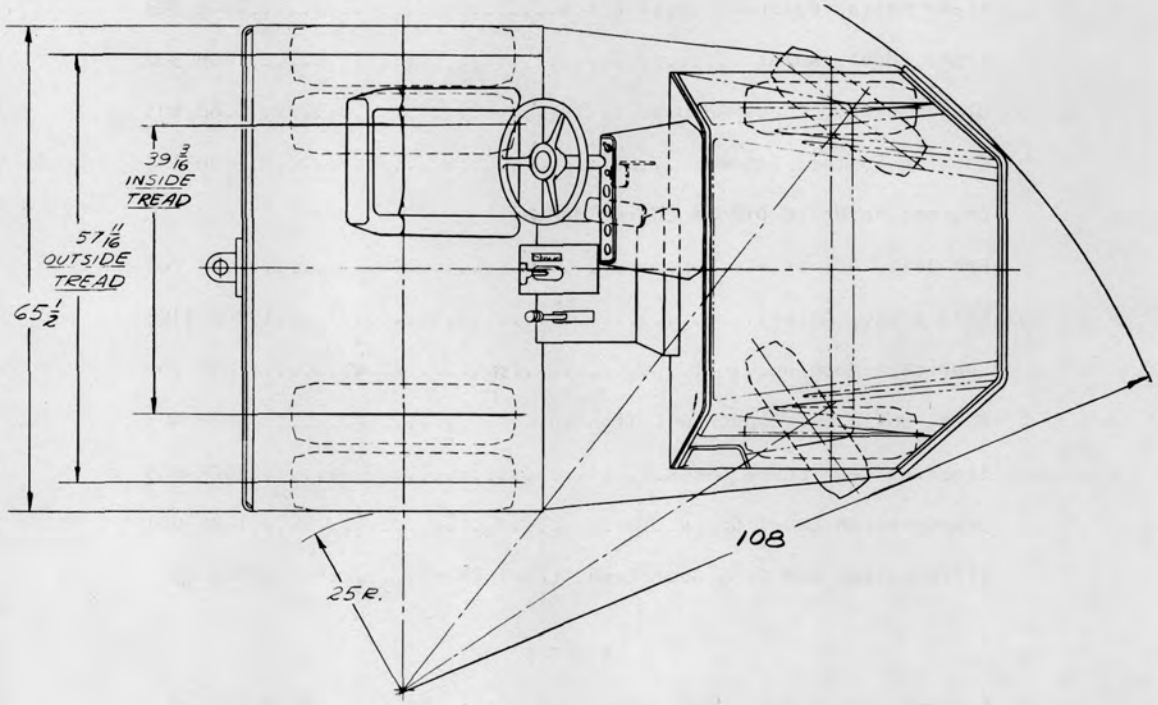


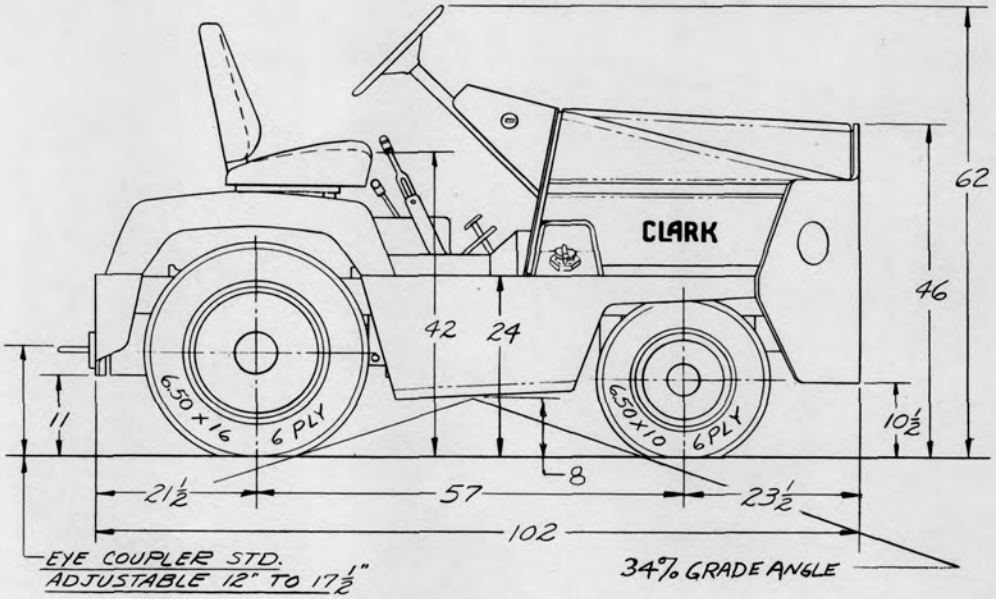


SINGLE DRIVE

DRAWBAR PULL: 2000, 3000, 4000, 5000

TIRES: DRIVE 6.50 x 16 - 6 PLY, STEER 6.50 x 10 - 6 PLY.





DUAL DRIVE

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

Clutch Pedal, Check/Adjust.....8H 605

Cooling System, Inspect.....100H 103

Engine; Refer to Diesel Engine Manual

Fan Belt, Adjust.....100H 203

Hand Brake, Adjust.....1000H 1103

Lubricate Machine.....100H 703

Nuts, Bolts and Capscrews, Tighten.....500H 403

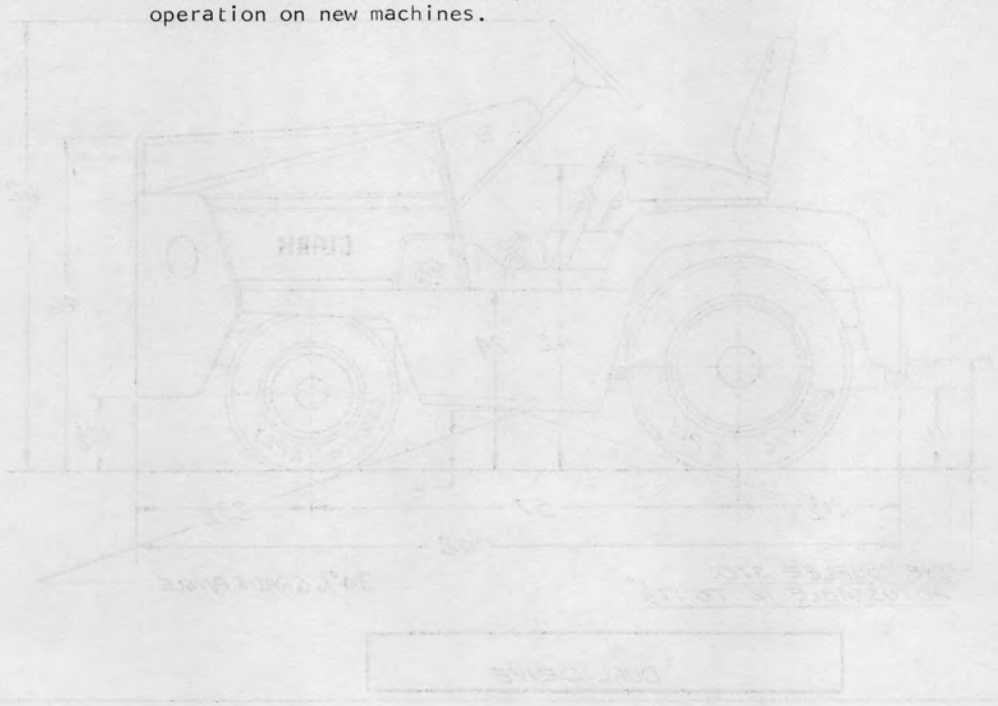
Steering Gear Level Check.....100H 603

Transmission Level Check.....100H 001

Differential and Drop Gear Case, Level Check.....1000H 1303

N O T E

Perform this service and inspection after the first 50 hours of operation on new machines.



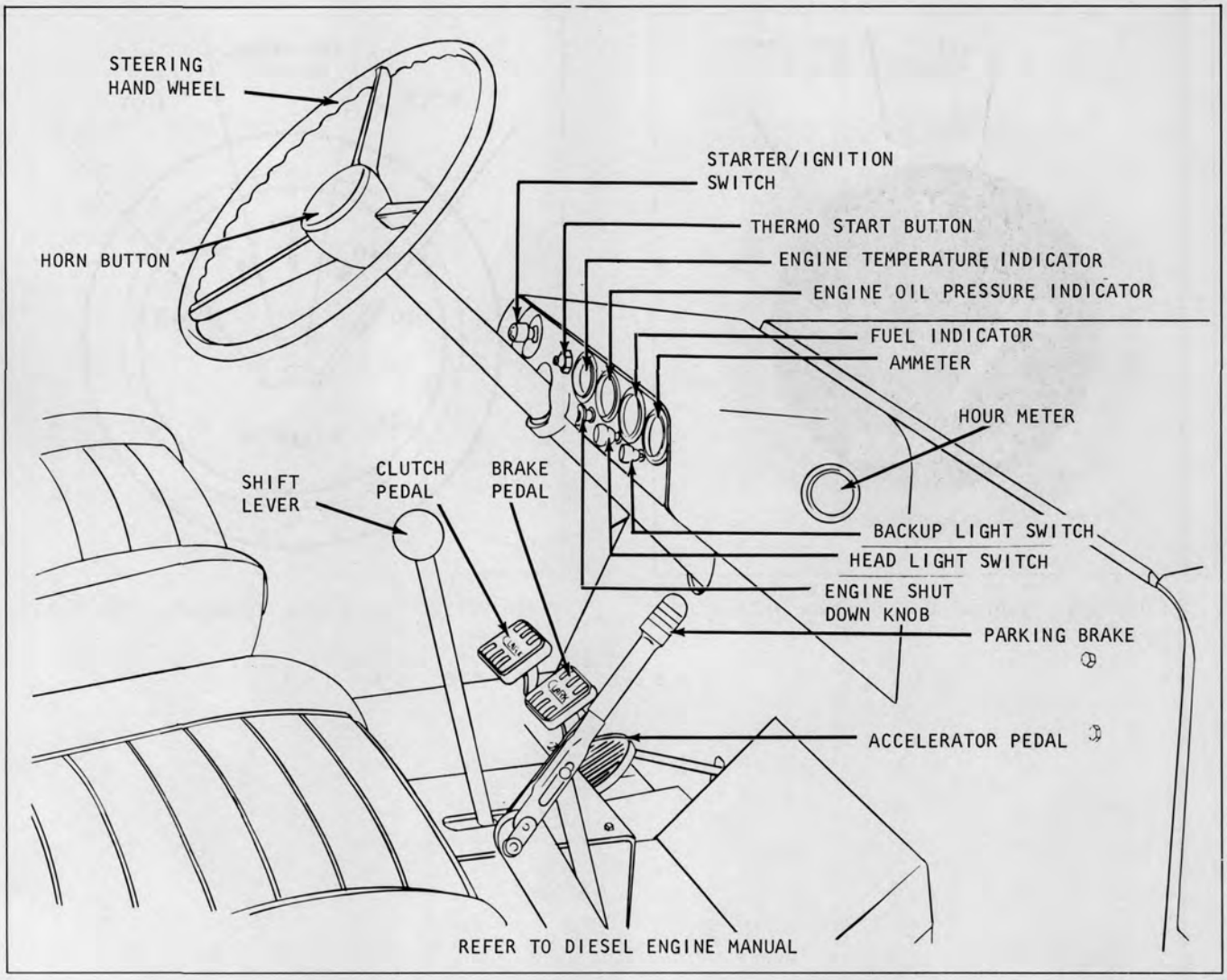


Plate 9437. Typical Location of Controls (Diesel)

MACHINE CONTROLS

Shift Lever The shift lever is used to direct the tractor transmission which supplies the vehicle with three forward speeds and one reverse. A shifting diagram aids the operator in selecting correct gear.

Hand Brake The hand brake, which is connected to the transmission drive shaft, is used for securing machine on a reasonable grade and parking. Refer to page 8H 303.

Instrument Panel The panel contains the following engine instruments: Ammeter, hour meter, oil pressure, water temperature and fuel indicator. It also contains a light switch back up light switch, engine stop button, engine thermo start button, and a combination ignition and starter switch.

Refer to Diesel Engine Manual for machines so equipped.

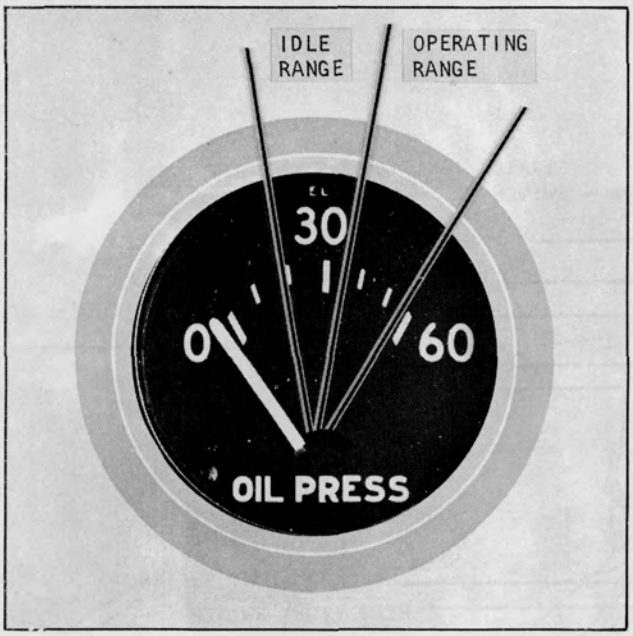


Plate 8606. Typical Oil Pressure Indicator

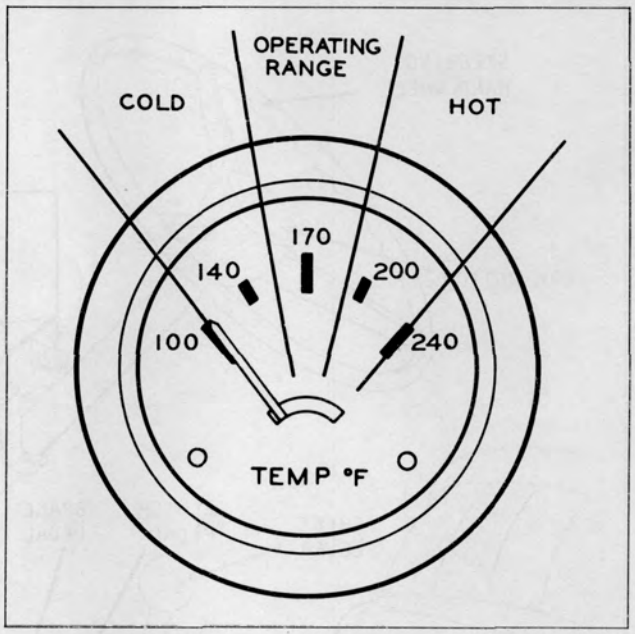


Plate 9283. Typ. Engine Temperature Indicator

REFER TO DIESEL ENGINE MANUAL

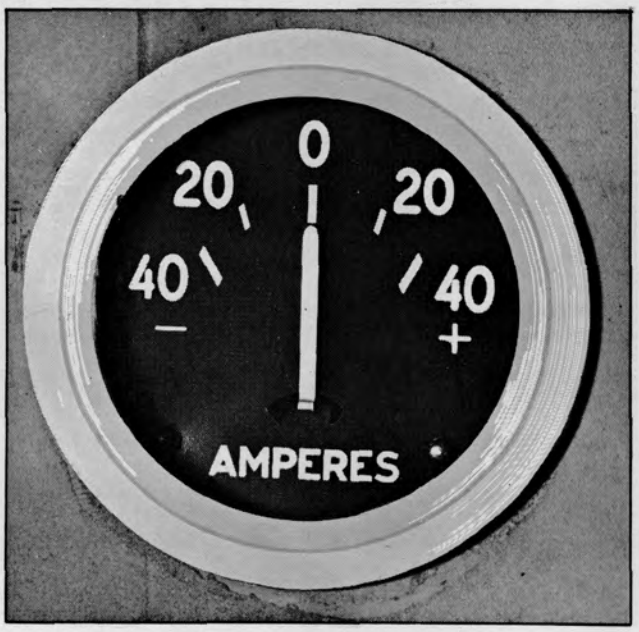


Plate 7647. Ammeter

Plate 7162. Hour Meter

AMMETER

The ammeter is connected in the generator (or alternator if used) and battery circuit in such a manner as to indicate rate of charge or discharge. If the generator (or alternator) is functioning properly the ammeter should show a small amount of charge at engine idle. As engine R.P.M. increases the rate of charge also increases. When the battery becomes fully charged the circuit is regulated to reduce the rate of charge and cause the ammeter needle to return to near neutral position, showing only a small amount of charge.

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 preventative maintenance services.

N O T E

Refer to DIESEL ENGINE MANUAL for machines so equipped.

Plate 9282. Typical Ignition/Starter Switch

ENGINE OPERATION (Refer to Diesel Engine Manual)

Starting

Place shift lever in neutral position. Turn ignition switch to start position and engage starter. Starter should not be engaged longer than 15 second periods at a time. After the engine starts, let up on the accelerator pedal to obtain desired engine speed and watch oil pressure indicator. Run engine a few minutes to warm oil before putting machine to work-especially in cold operating conditions. If oil pressure does not build up immediately stop the engine and investigate the cause.

CAUTION

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

Driving The Vehicle

When the vehicle is to be placed into motion, depress the clutch pedal and release the hand brake. Release pressure on the accelerator pedal, allowing the engine to idle. Select the proper driving range to start the intended load.

Release the pressure on the clutch pedal and slowly depress the accelerator pedal to gently place the vehicle and load in motion. Particular attention should be given to the following regarding the use of the transmission.

When up shifting is required with tractor in motion, clutch pedal is used as in conventional trucks. The same applies to double clutching for down shifts but it must be understood that the clutch is NEVER TO BE SLIPPED OR FEATHERED IN to start loads. If tractor will not move load, a lower gear should be selected.

When shifting from any forward gear position to reverse, the machine must be brought to a complete stop to safe guard the internal parts of the transmission. Anytime the machine is stopped longer than a minute or so with the engine running, the transmission should be placed in neutral and the hand brake applied.

TO STOP VEHICLE

1. Remove foot from accelerator pedal.
2. Depress foot brake pedal.
3. As vehicle slows to a halt, depress clutch pedal and place gear shift lever into neutral position.
4. If vehicle is to be parked, turn ignition switch to the off position and apply the hand brake.

CAUTION

DO NOT RIDE OR SLIP THE CLUTCH PEDAL. THIS CAUSES SLIPPAGE OF THE CLUTCH ASSEMBLY. OVERHEATING, UNNECESSARY WEAR AND DAMAGE WILL OCCUR.

SAFETY PRECAUTIONS

1. Only qualified drivers should be allowed to operate the vehicle.

2. Do not tow a train of more than three trailers.

3. Drive slowly in rough or congested areas.

4. Do not drive with wet or greasy hands.

5. Observe the Operating Rules and Preventive Maintenance Instructions A.S.A. B56.1 Safety Code for Powered Industrial Trucks.

6. Avoid making sudden stops or starts.

7. When backing, be sure to look for fellow workers before moving machine.

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

9. Do not allow anyone to ride on this machine unless a standard seat is provided.

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

11. Observe highway safety rules in operation of vehicle in buildings as well as out.

12. Drive carefully on wet or slippery driving areas.

13. Keep hands, elbows and feet within running line of truck.

14. Do not operate machine for prolonged periods in an unventilated area.

15. Be sure brakes, tires and steering are in proper condition at all times.

N O T E

A 1,000 POUND TRACTOR DRAWBAR PULL WILL EQUAL A 10,000 POUND LOAD ON A FOUR WHEEL TRAILER (INCLUDING THE WEIGHT OF THE TRAILER.)

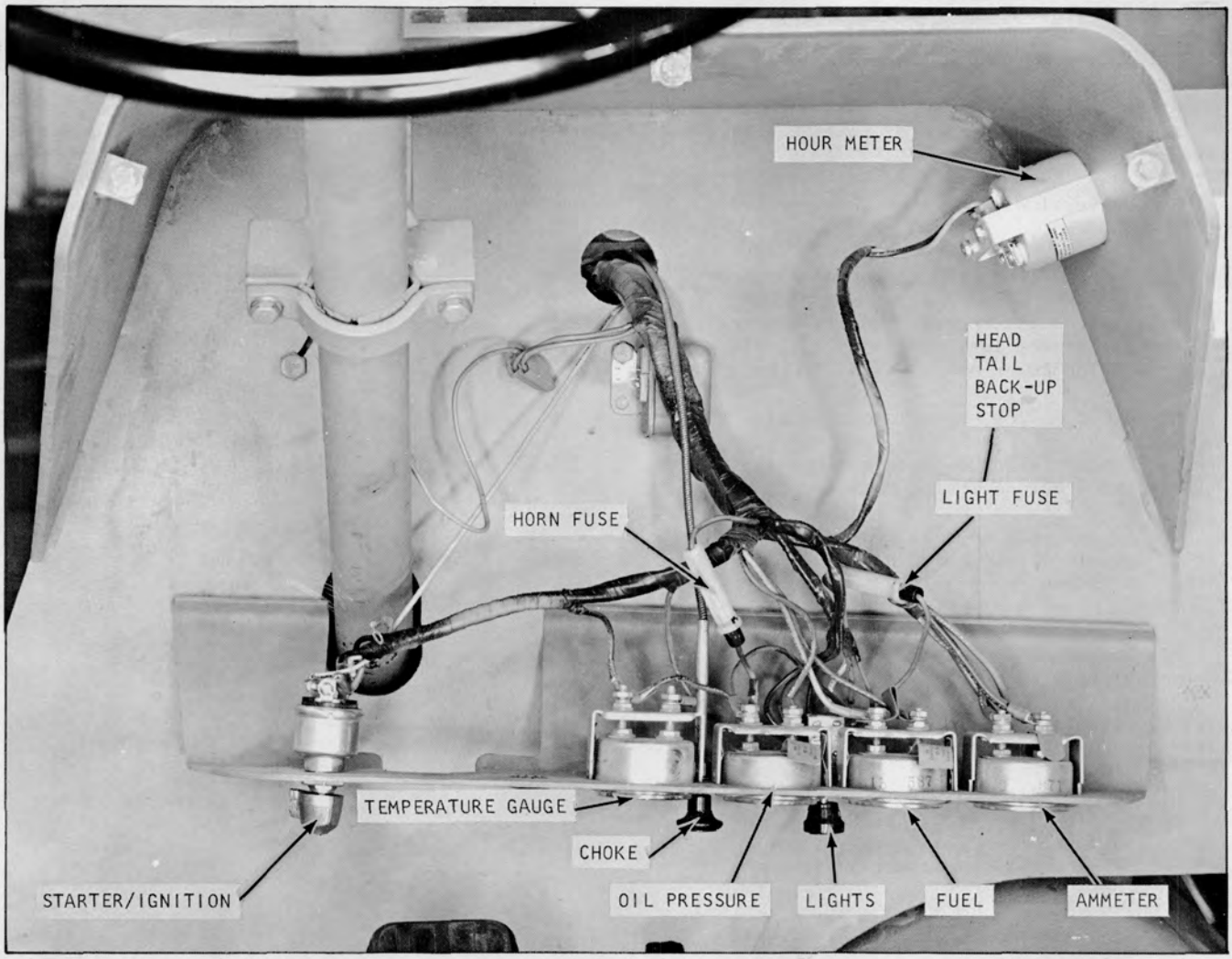


Plate 9162. Electrical System Fuses

HORN

Check to be sure the horn is working properly.

FUEL TANK

Check fuel supply and fill if necessary. Use a good grade of gasoline, 90-94 octane (regular). Before filling the tank, make certain the filler cap screen is in place and not damaged. (Machines so equipped).

Diesel Engines: Refer to the diesel Operator/Maintenance manual for fuel recommendations.

TIRE INFLATION

Check tires for proper inflation.

Front.....40 lbs.

Rear.....40 lbs.

ENGINE COOLING

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

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

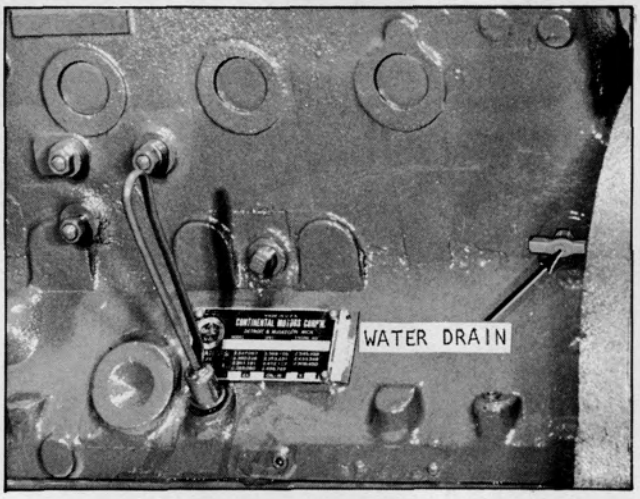


Plate 7008. Typical Cylinder Block Water Drain

C A U T I O N

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

N O T E

REFER TO DIESEL ENGINE MANUAL FOR MACHINES SO EQUIPPED.

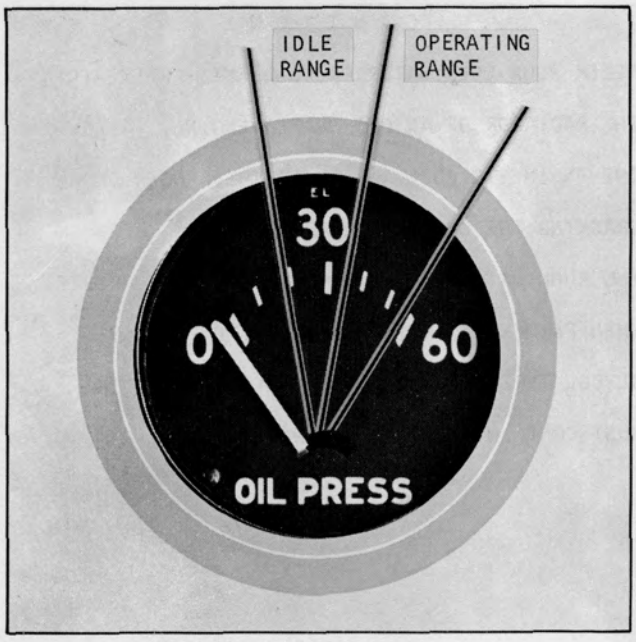


Plate 8606. Typical Oil Pressure Indicator

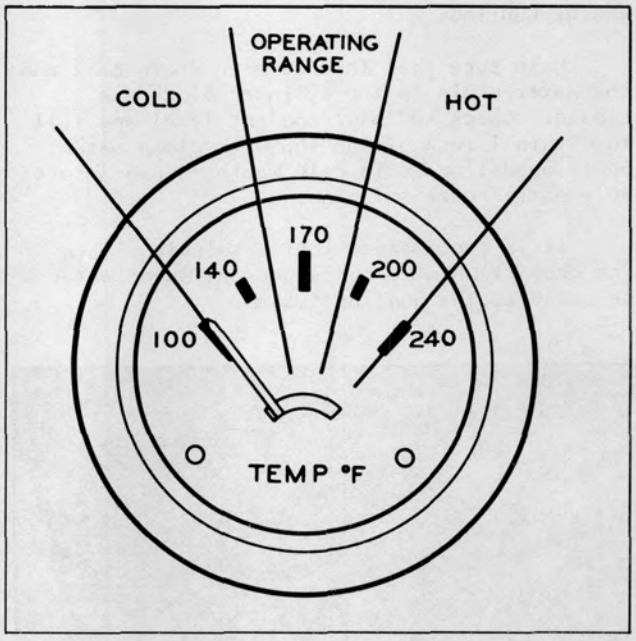


Plate 9283. Typical Temperature Indicator

REFER TO DIESEL ENGINE MANUAL

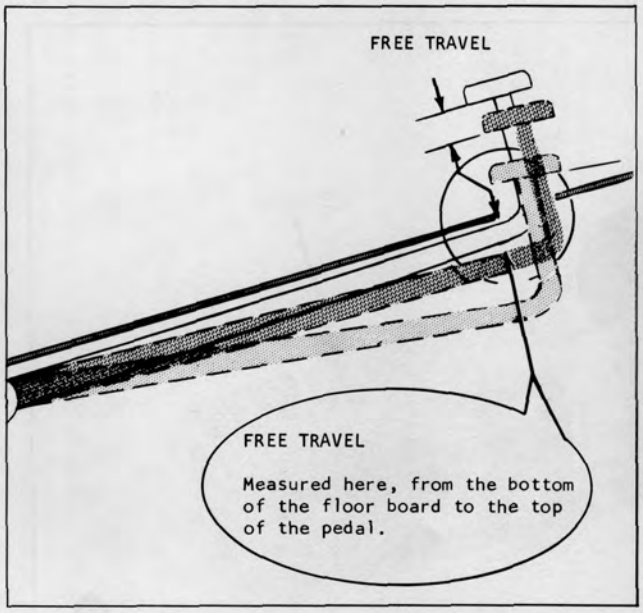


Plate 7042. Typical Brake Pedal Free Travel

BRAKE PEDAL CHECK

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

Correct pedal free travel is 1/2 to 3/4 of an inch when resistance is felt from the master cylinder. See 100H-302 for adjustment procedure.

Plate 6505. Typical Parking Brake

PARKING BRAKE CHECK

Make certain that the parking brake is capable of holding the truck on a 3% grade. This should be tested with the parking brake applied and truck out of gear and driver occupying the drivers seat.

If brake operation is not satisfactory, report to designated person in authority.

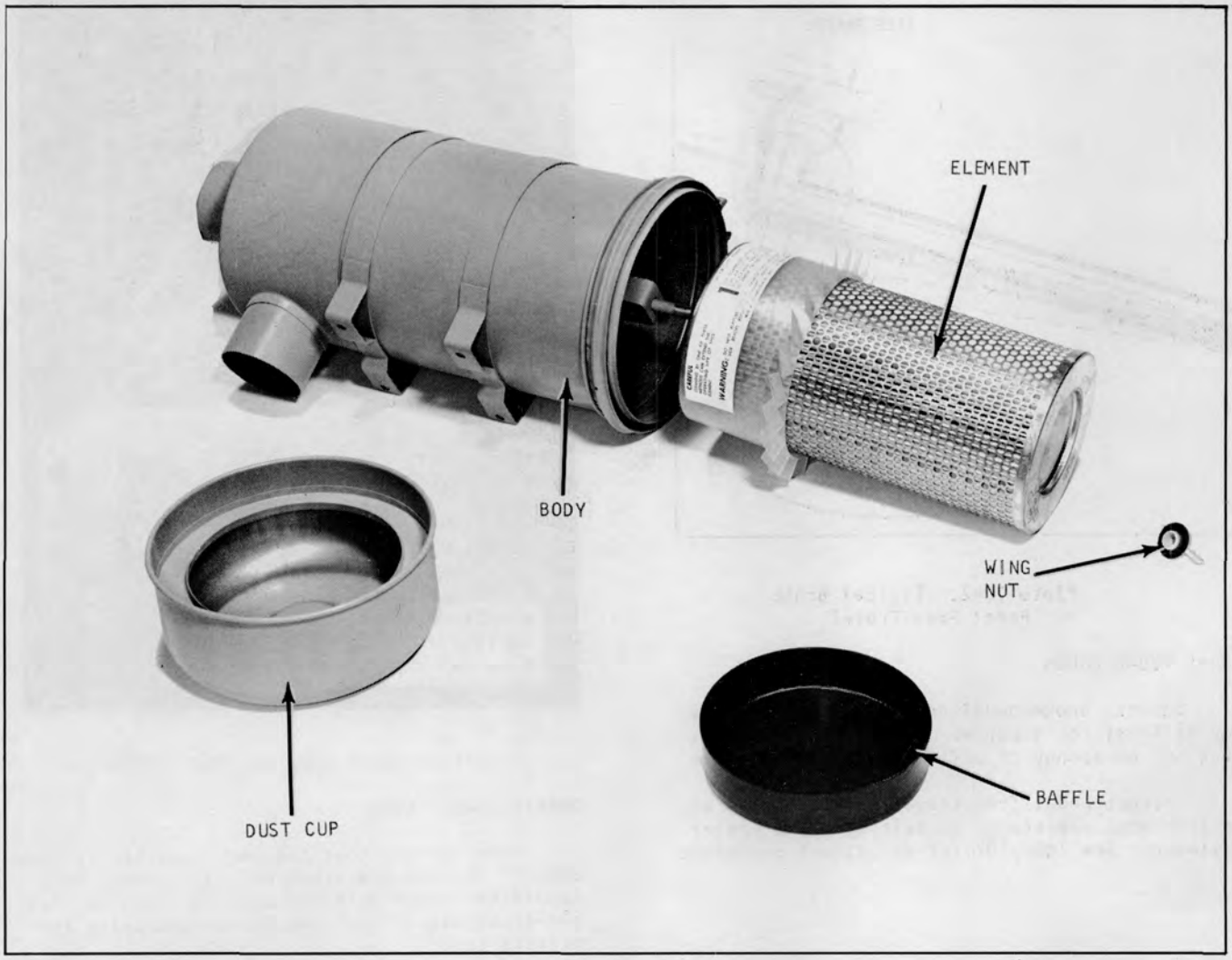


Plate 9154. Air Cleaner Assembly

AIR CLEANER ASSEMBLY

Dust Cup: Empty and clean dust cup every 8 operating hours or more often under extremely dusty conditions. Dust should not be allowed to build up in cup. Remove foreign material such as leaves from around filter and tighten wing nut if necessary. Replace baffle and securely replace cup on air cleaner body.

Filter Element: Operating conditions determine the air cleaner service periods. The air cleaner should be checked every 8 operating hours and cleaned. This may be necessary more often under dusty operating conditions.

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.

When cleaning the filter element, procede as follows:

1. Remove cover.

2. Lift out baffle.

3. Empty dust from cup.

4. Remove filter element. Clean thoroughly by using one of the following methods:

(a) Dry Dusty Element: Use compressed, dry, clean air directing this up and down pleats on the clean side of the element.

C A U T I O N

AIR PRESSURE MUST NOT EXCEED 100 P.S.I. MAINTAIN A REASONABLE DISTANCE BETWEEN NOZZLE AND

Plate 7173. Cleaning Dusty Element

ELEMENT. DIRECT AIR THROUGH ELEMENT (OPPOSITE TO DIRECTION OF ARROWS CAST ON END OF ELEMENT). DO NOT DAMAGE FINS OR SEALING SURFACES OR RUPTURE ELEMENT NOR ALLOW DUST TO DEPOSIT ON CLEAN AIR SIDE.

(b) Oily or Sooty Element: For best results, use small amount of cool tap water with non-sudsing household detergent then add to warm (70 deg - 100 deg F) water. The warmer the solution the better the cleaning. Soak for approximately 15 minutes. Rinse element thoroughly with clean water from hose (maximum pressure 40 P.S.I.). Air dry completely before installing.

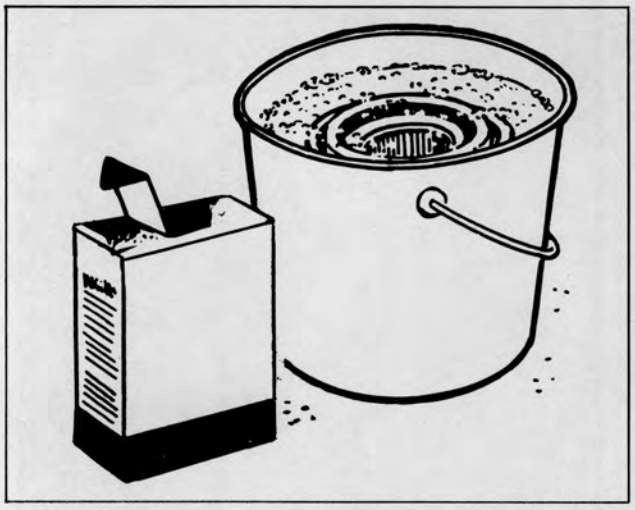


Plate 7174. Cleaning Oily Sooty Element

5. Clean cover, baffle and inside of filter body with a clean lint free cloth.

6. Check air cleaner hose connections for an air tight fit.

7. After air cleaner has dried, (a fan or air draft may be used, but do not heat element to hasten drying), inspect element for damage by placing a bright light inside element. Thin spots, pin holes or the slightest rupture will render the element unfit for further use.

8. Install filter element making sure wing nut is tight.

9. Replace baffle.

Plate 9159. Front (Steer) Wheels
Split Rims

Plate 7716. Rear (Drive) Wheels
Lock Ring

W A R N I N G

BEFORE REMOVING WHEELS (FRONT WHEELS, SPLIT RIM TYPE) FROM MACHINE, ALWAYS DEFLATE TIRES BY REMOVING THE VALVE STEM CORE WITH A TOOL DESIGNED FOR THIS PURPOSE. ALWAYS WEAR SAFETY GLASSES WHEN DOING THIS. IF THE AIR IS NOT RELEASED FROM A TIRE WITH SPLIT RIMS AND THE RIM RETAINER NUTS HAVE BEEN REMOVED OR ARE LOOSE, IT IS POSSIBLE FOR THE SPLIT RIMS TO BLOW APART WITH GREAT FORCE CAUSING POSSIBLE FATAL INJURY TO PERSONNEL.

UPON REASSEMBLING SPLIT RIM WHEELS, BE SURE ALL THE RIM RETAINER BOLTS ARE INSTALLED AND SECURELY TIGHTENED BEFORE APPLYING AIR PRESSURE. (REFER TO SPECIFICATIONS FOR PROPER TORQUE REQUIREMENTS.)

N O T E

REFER TO THE FOLLOWING PAGES.

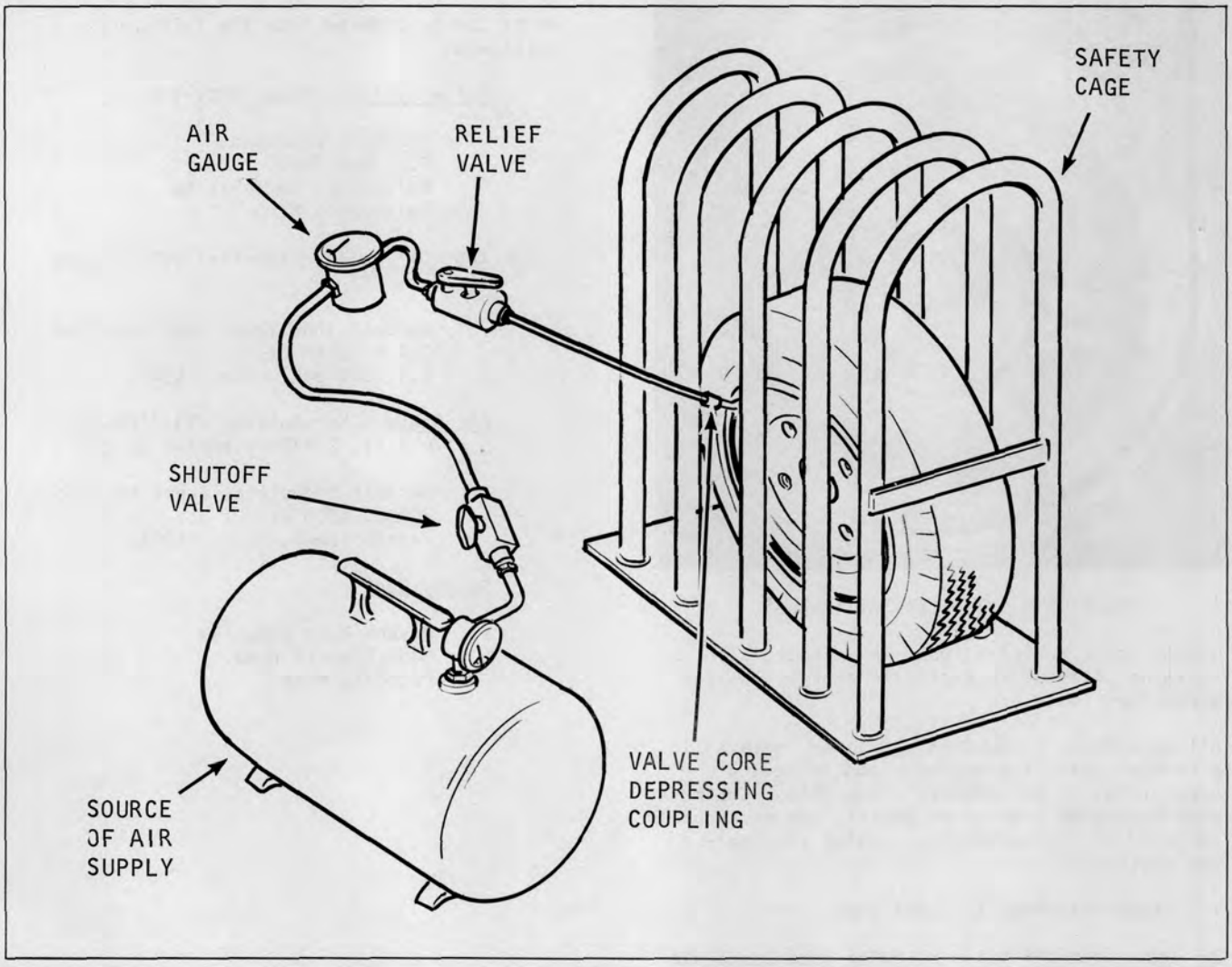


Plate 9702. Typical Tire Inflation Procedure

Torque wheel stud nuts or wheel bolts to the values listed in specifications. Excessive torque of wheel nuts can cause stud and rim damage.

Any replacement parts used should be of a quality equal to that provided in the original manufacture.

Inflation

```
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                    C A U T I O N                  x
x                                                   x
x  ALL FASTENERS SHOULD BE PROPERLY INSTALLED       x
x                                                   x
x  BEFORE INFLATING WHEEL/TIRE ASSEMBLY.            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
```

Tires with split wheels should be inflated in a safety cage or when properly installed on the vehicle. In either case, make sure all nuts and bolts are properly installed and torqued according to specifications.

```
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                    C A U T I O N                  x
x                                                   x
x  USE ONLY AN APPROVED SAFETY CAGE DESIGNED        x
x                                                   x
x  FOR THIS PURPOSE.                                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
```

Tires used on lock-ring type wheels should be inflated in a safety cage (see previous caution) or use a clip-on type air chuck and stand aside (in-line with the tire tread) during inflation. Insure that rings are properly

Plate 7613. Typical Split Wheel

seated prior to inflation. An inflated tire contains potentially explosive energy that can blow rings loose.

All wheel/tire assemblies should be inflated in a safety cage. The air hose should have a special set-up as shown in Plate 9702. The hose should have an adapter so that it can be securely fastened to the valve stem. Using this set-up you would:

1. Attach air hose to valve stem.

2. Open shut-off valve allowing compressed air to enter tube.

3. Shut off air supply occasionally to check pressure in tube at air gauge.

4. Inflate to proper capacity. If pressure exceeds proper inflation capacity, depress the relief valve to release excess air pressure.

5. This alternating procedure is followed until proper inflation is reached. See specifications.

I M P O R T A N T

MAINTAIN UNIFORM INFLATION IN BOTH TIRES OF A DUAL ASSEMBLY SO THAT WEIGHT IS EQUALLY SUSTAINED.

NEVER RE-INFLATE A TIRE THAT HAS GONE FLAT WITHOUT FIRST INSPECTING IT AND THE WHEEL ASSEMBLY.

The tire inflation arrangement as shown in Plate 9702 can be made up from local suppliers.

Parts can be ordered from the following suppliers:

Relief Valve - Model 250V-1/4"

Humphrey Products
P.O. Box 2008
Kilgore at Sprinkle Rd.
Kalamazoo, Mich.

Shut-Off Valve - Imperial #77E(1/4 to 1/4 1 PT)

Kendall Industrial Supplies, Inc.
702 N. 20th St.
Battle Creek, Mich. 49016

Air Gauge - Marshaltown #23 (160 lb, 1/4 1 PT, 2 1/2" diameter gauge)

Kendall Industrial Supplies, Inc.
702 N. 20th St.
Battle Creek, Mich. 49016

Safety Cage

Meyers Tire Supplies
6400 Epworth Blvd.
Detroit, Mich.

DIRECTIONAL TREAD TIRES

All directional tread tires are to be mounted in the correct position with respect to the arrow cast on the side of the tire as explained and illustrated below.

Directional Tread Dual Tires:

1. Inside dual tire arrow to point in the direction of foward rotation, see Plate 6422.

   (Rotate wheel to bring arrow on tire above the wheel. Arrow must point toward front of truck.)

2. Outside dual tire arrow to point in the direction of rearward rotation, see Plate 6423.

   (Rotate wheel to bring arrow on tire above the wheel. Arrow must point toward rear of truck.)

Directional Tread Single Drive Tires:

1. Tire arrow to point in the direction of forward rotation, see Plate 6422.

   (Rotate wheel to bring arrow on tire above the wheel. Arrow must point toward front of truck, see Plate 6422.

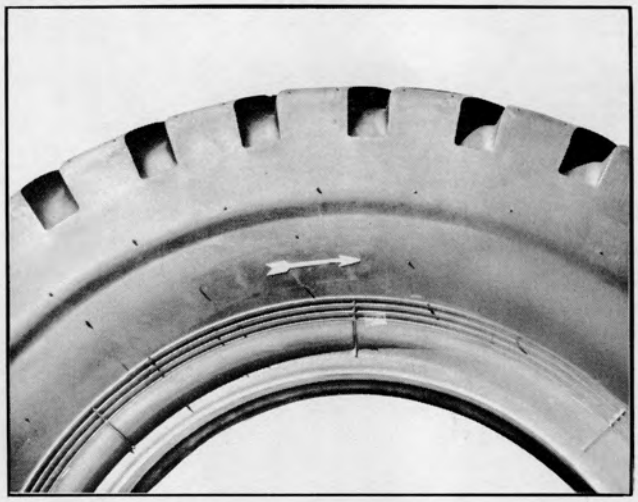


Plate 6422. Inside Dual Tire
(or Single Drive Tire)
(Arrow to point toward front of truck)

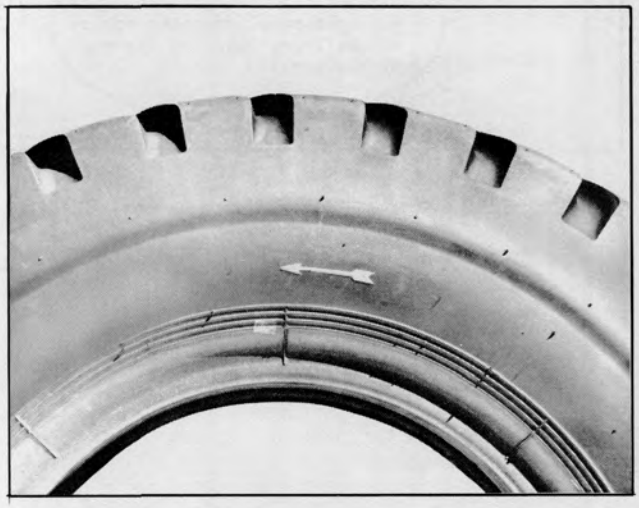


Plate 6423. Outside Dual Tire
(Arrow to point toward
rear of truck)

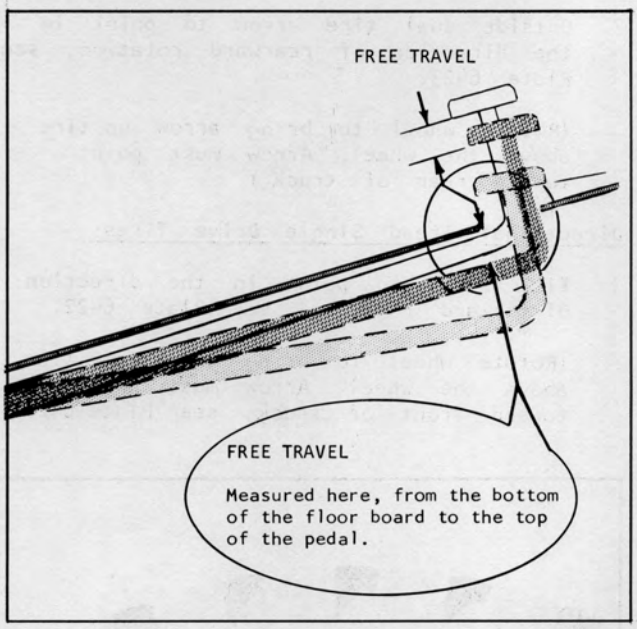


Plate 7042. Clutch Pedal Free Travel Check

CLUTCH PEDAL FREE TRAVEL CHECK

Depress clutch pedal from the top position to a point where it meets resistance. This free travel should be approximately 1/2 to 3/4 of an inch.

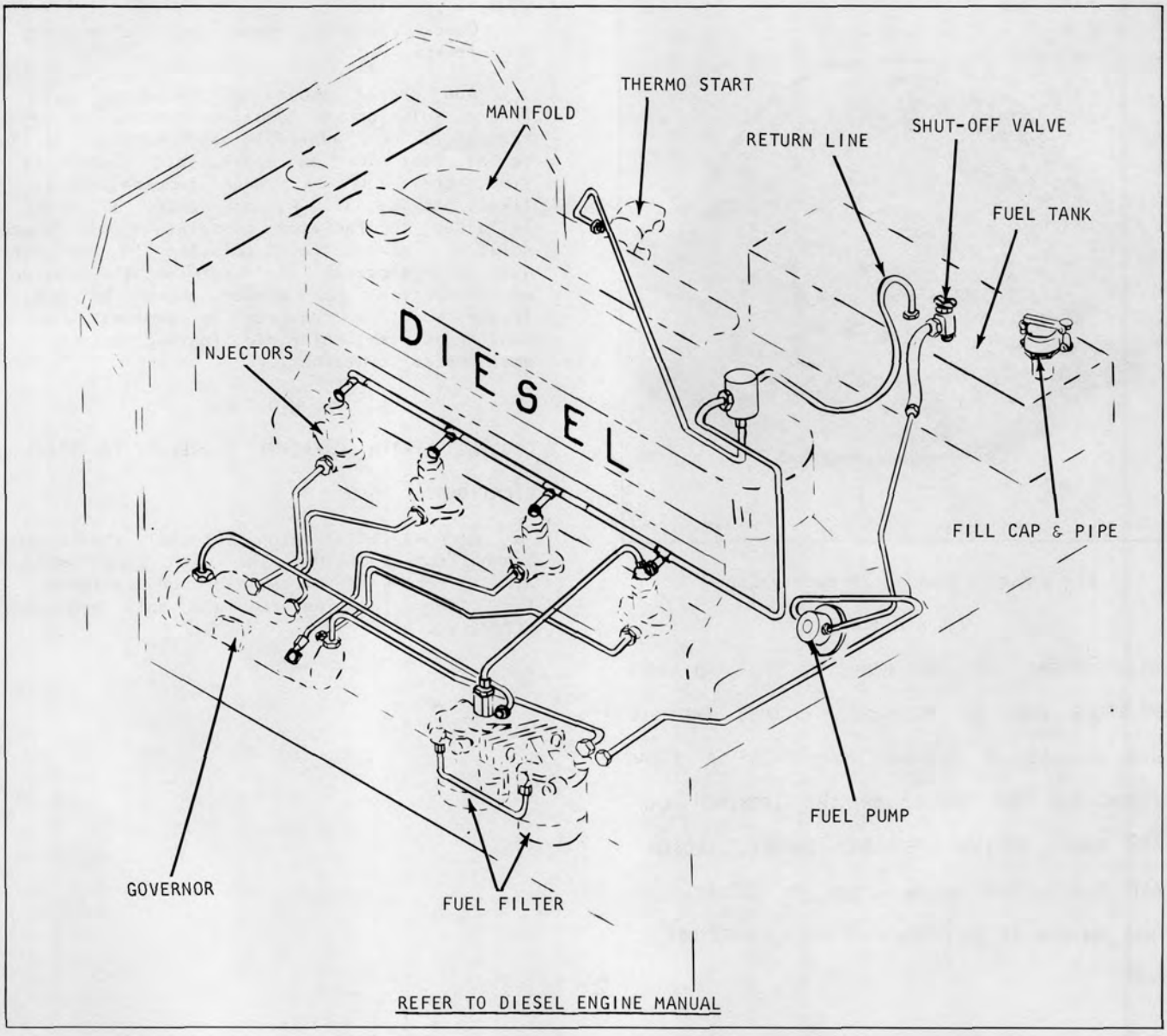


Plate 9441. Typical Fuel Lines (Diesel)

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 and not damaged.

FUEL

Use automotive quality diesel fuel, ASTM #1 or #2, 45-centane minimum.

Plate 6458. Radiator Pressure Cap

W A R N I N G

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. THIS MACHINE IS EQUIPPED WITH A 7 LB PRESSURE CAP.

COOLING SYSTEM

Check radiator, hoses and water pump for leaks.

Add proper amount of water or anti-freeze solution to cooling system. If anti-freeze 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 anti-freeze solution, always test solution in radiator with a hydrometer to determine the degree of protection. For proper amount of anti-freeze solution required to protect the cooling system, refer to instructions on anti-freeze container.

N O T E

COOLING SYSTEM CAPACITY - REFER TO SPECIFICATIONS.

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

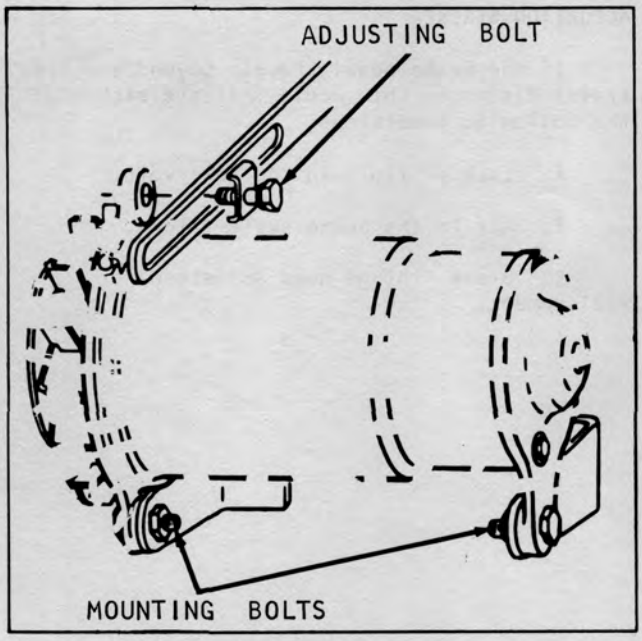


Plate 6631. Generator Drive Belt Adjustment

FAN AND GENERATOR DRIVE BELTS

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

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

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

C A U T I O N

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

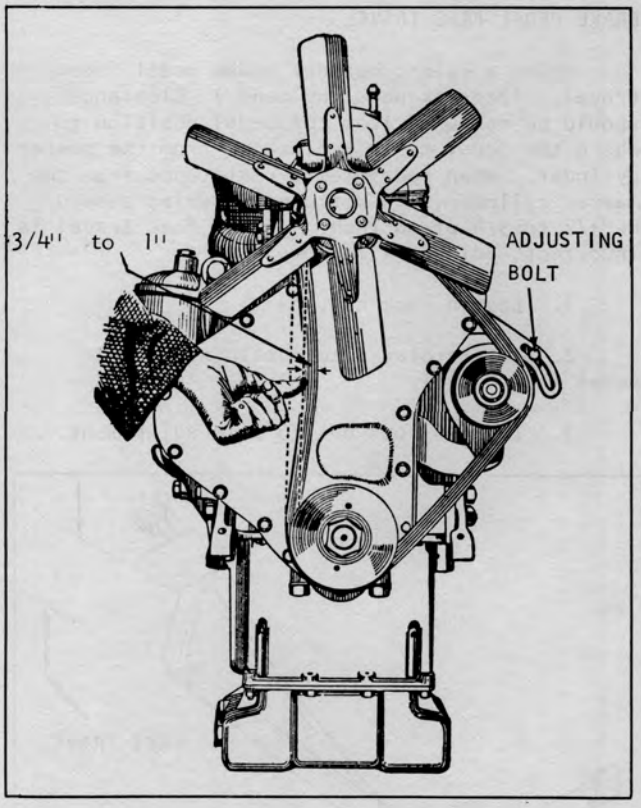


Plate 6632. Belt Deflection Check

N O T E

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

BRAKE PEDAL FREE TRAVEL

Using a ruler, measure brake pedal free travel. (Depress pedal by hand.) Clearance should be measured from top pedal position to where the pedal meets resistance from the master cylinder. When pedal meets resistance from the master cylinder, the distance traveled should be 1/2 to 3/4 of an inch. If the free travel is incorrect, adjust as follows:

1. Loosen lock nut.

2. Rotate clevis to obtain specified pedal free travel.

3. Tighten lock nut to hold adjustment.

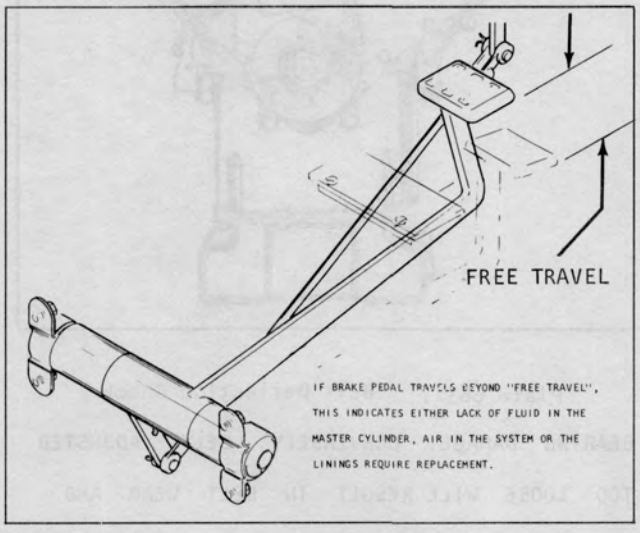


Plate 9285. Typical Brake Pedal Linkage

ACTUATION STROKE

If the brake pedal travels beyond the free travel distance, this could indicate either of the following conditions:

1. Lack of fluid in the reservoir.

2. Air in the brake system lines.

3. Brake linings need adjustment or replacement.

BRAKE SYSTEM

Check brake fluid level in the master cylinder. Brake fluid should be within 1/4 inch of the top. Fill with S.A.E. 70 R3 Heavy Duty Hydraulic Brake Fluid, CLARK part #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 6633.

A correctly adjusted brake pedal is important so that the internal ports in the master cylinder are not blocked by the cylinder piston. The following lists two important reasons for proper brake pedal free travel.

X X X X X X X X X X X X X X X X X X X X X X X X X X
X X
X W A R N I N G X
X X
X CORRECT BRAKE PEDAL FREE TRAVEL IS X
X X
X IMPORTANT FOR SAFE OPERATING BRAKES. 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

Inadequate pedal free travel will block the internal ports so that upon releasing the brake pedal fluid will be trapped in the lines and hold the brake linings in contact with the brake drums. Resulting in lining wear and excessive fuel consumption.

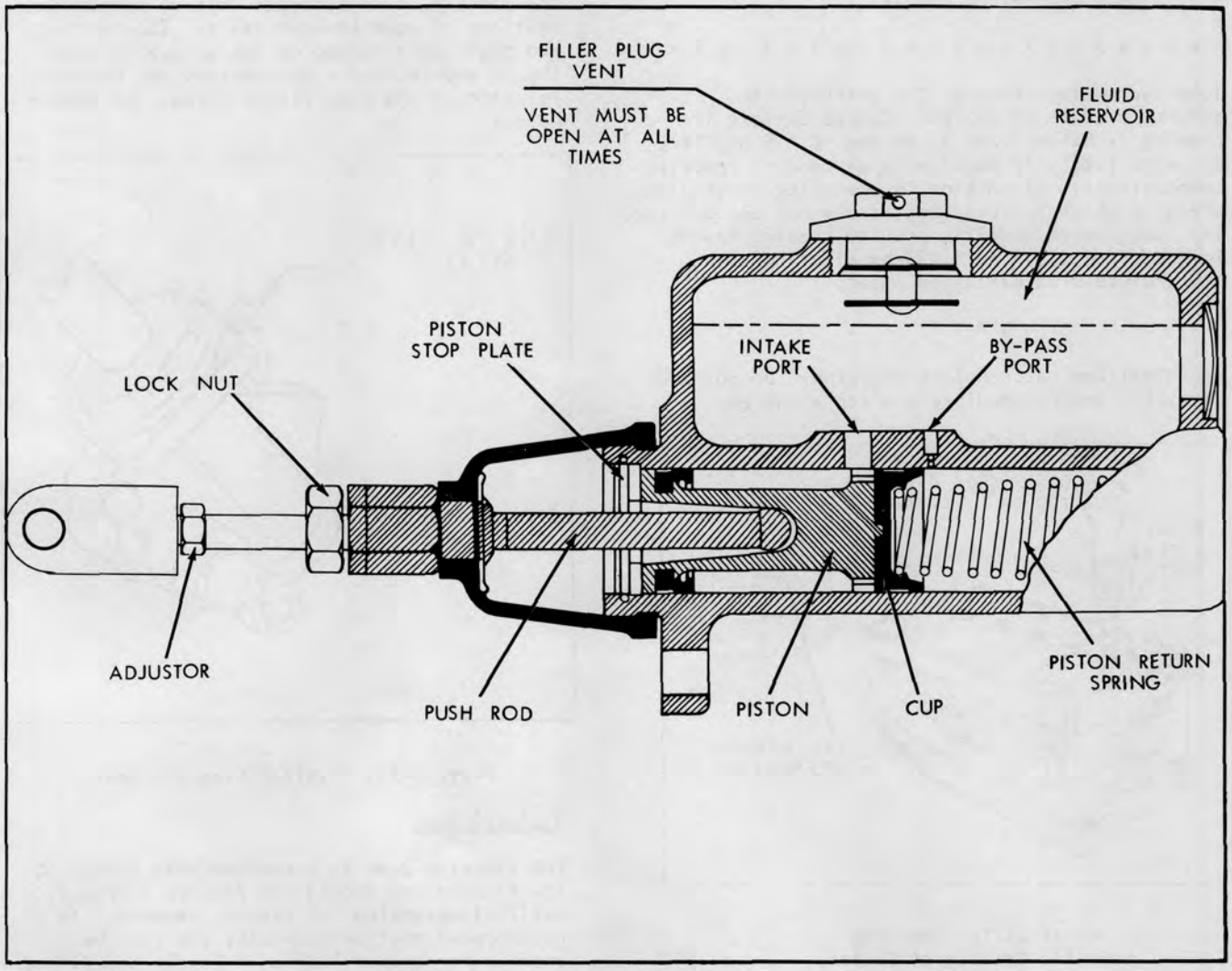


Plate 6633. Brake Pedal Adjustment

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.

WARNING

NEVER ALLOW FLAME OR SPARKS NEAR THE BATTERY FILLER HOLES BECAUSE EXPLOSIVE HYDROGEN GAS MAY BE PRESENT.

Take hydrometer reading of electrolyte to determine state of charge. Charge battery if reading is below 1.225 at 24 deg. C (75 deg. 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.

NOTE

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

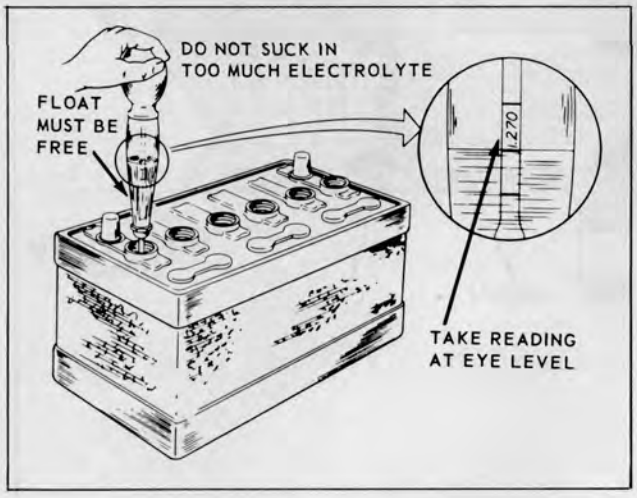


Plate 6271. Checking Specific Gravity of Battery

Make sure that all connections are tight at battery, starter, generator/alternator 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. (Connecting two headlights turned on low beam will equal the 10 ampere load - this method may be used in place of the load placed across the terminals.)

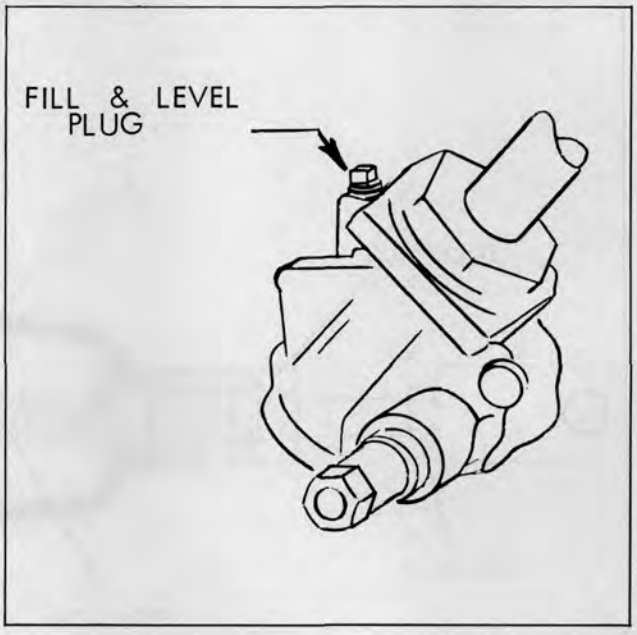


Plate 6429. Typical Steering Gear

STEERING GEAR

The steering gear is prepacked with grease at the factory and should not require lubrication until disassembled for repair. However, it is recommended that periodically the gear be checked for proper lubricant level, and filled if necessary with NLGI #1 (amolith grease EP #1 or its equivalent).

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

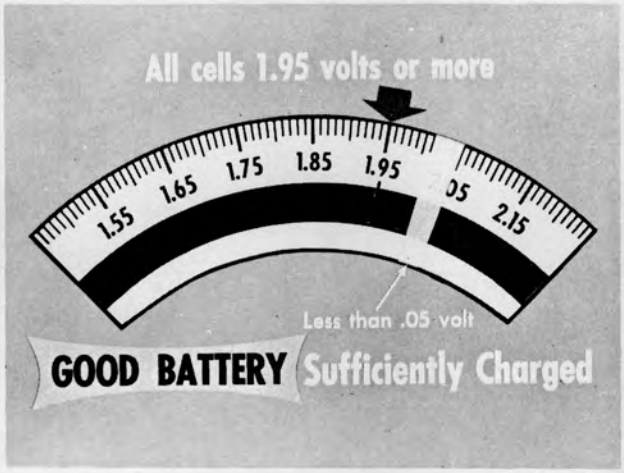


Plate 8306.

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.

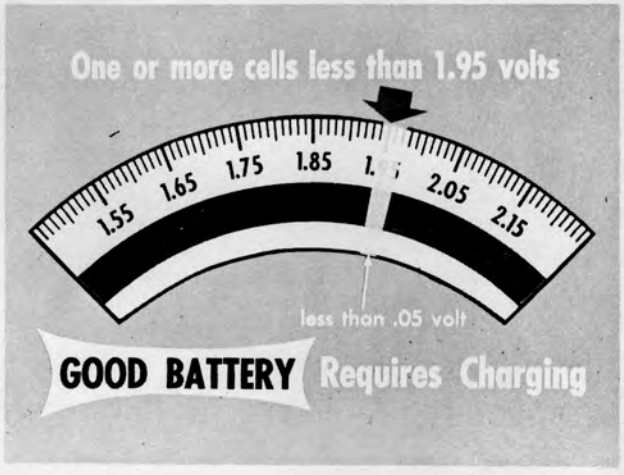


Plate 8307.

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.

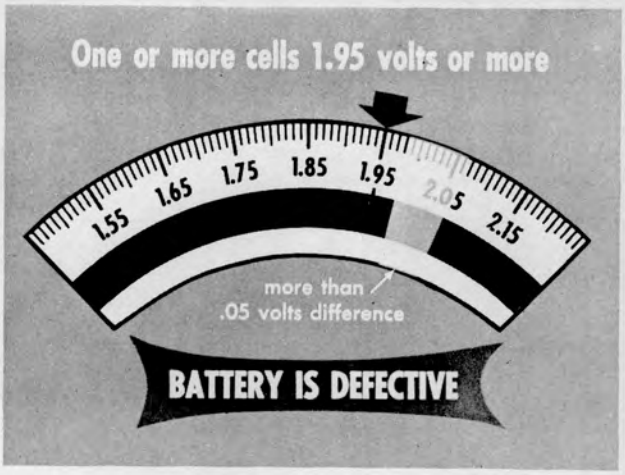


Plate 8308.

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.

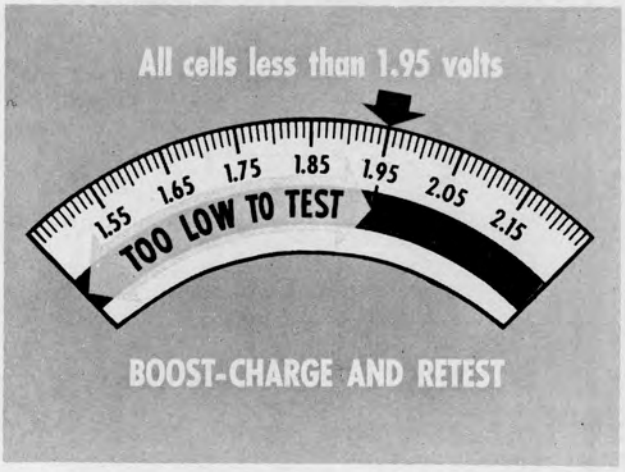


Plate 8309.

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

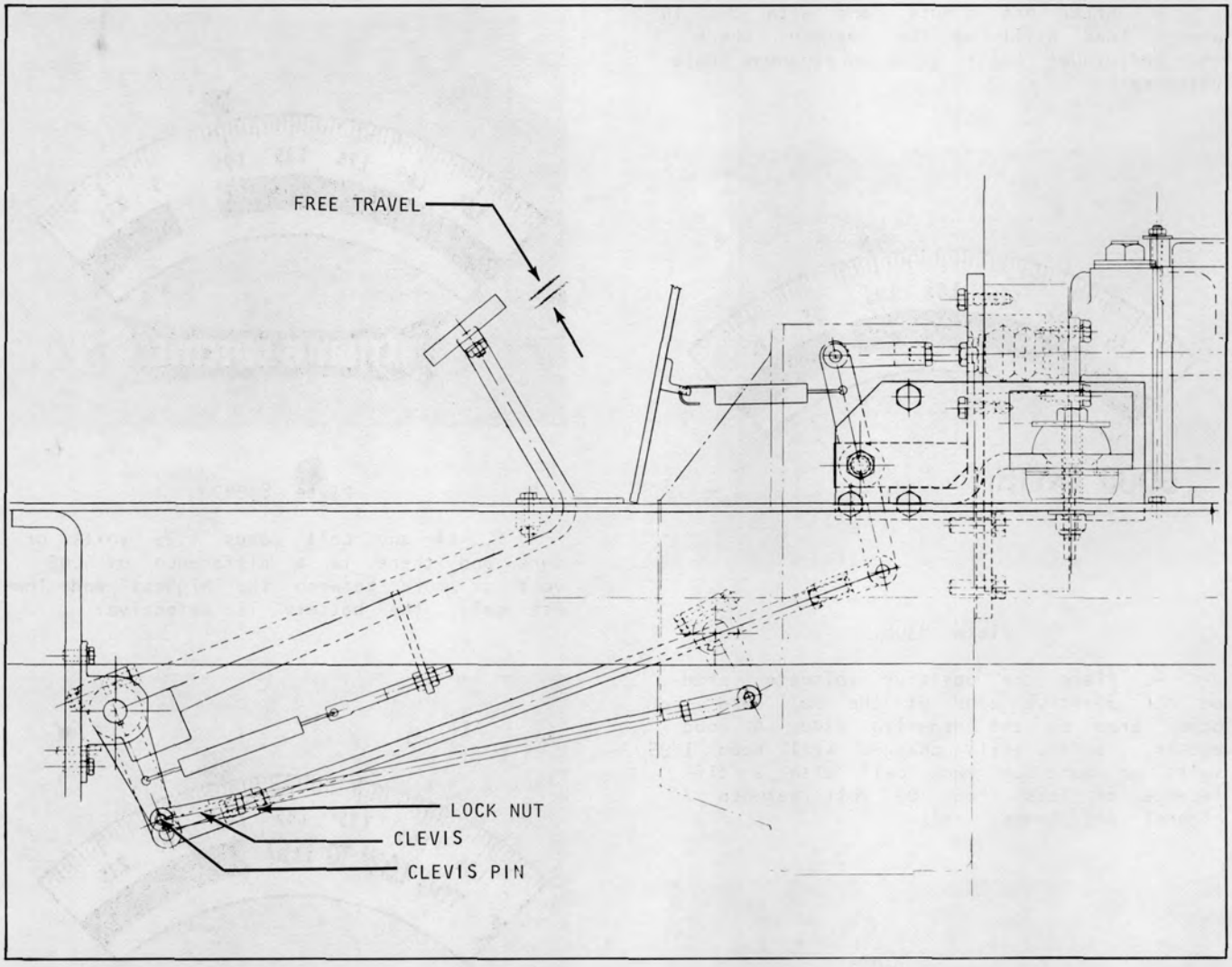


Plate 9438. Typical Clutch Pedal Adjust

CLUTCH PEDAL ADJUSTMENT

Clutch pedal adjustment is necessary to compensate for clutch facing wear and provide clearance between the release bearing and pressure plate fingers. The adjustment is made beneath the floor plate.

Loosen lock nut, remove clevis pin and turn clevis in the direction necessary to make clutch pedal free travel 1/2-3/4 of an inch. When this is accomplished, replace clevis pin and tighten lock nut.

CLARK EQUIPMENT

INDUSTRIAL TRUCK DIVISION

SERVICE ENGINEERING DEPARTMENT, BATTLE CREEK

CLARK EQUIPMENT

WORK SAFELY

DRIVE SAFELY

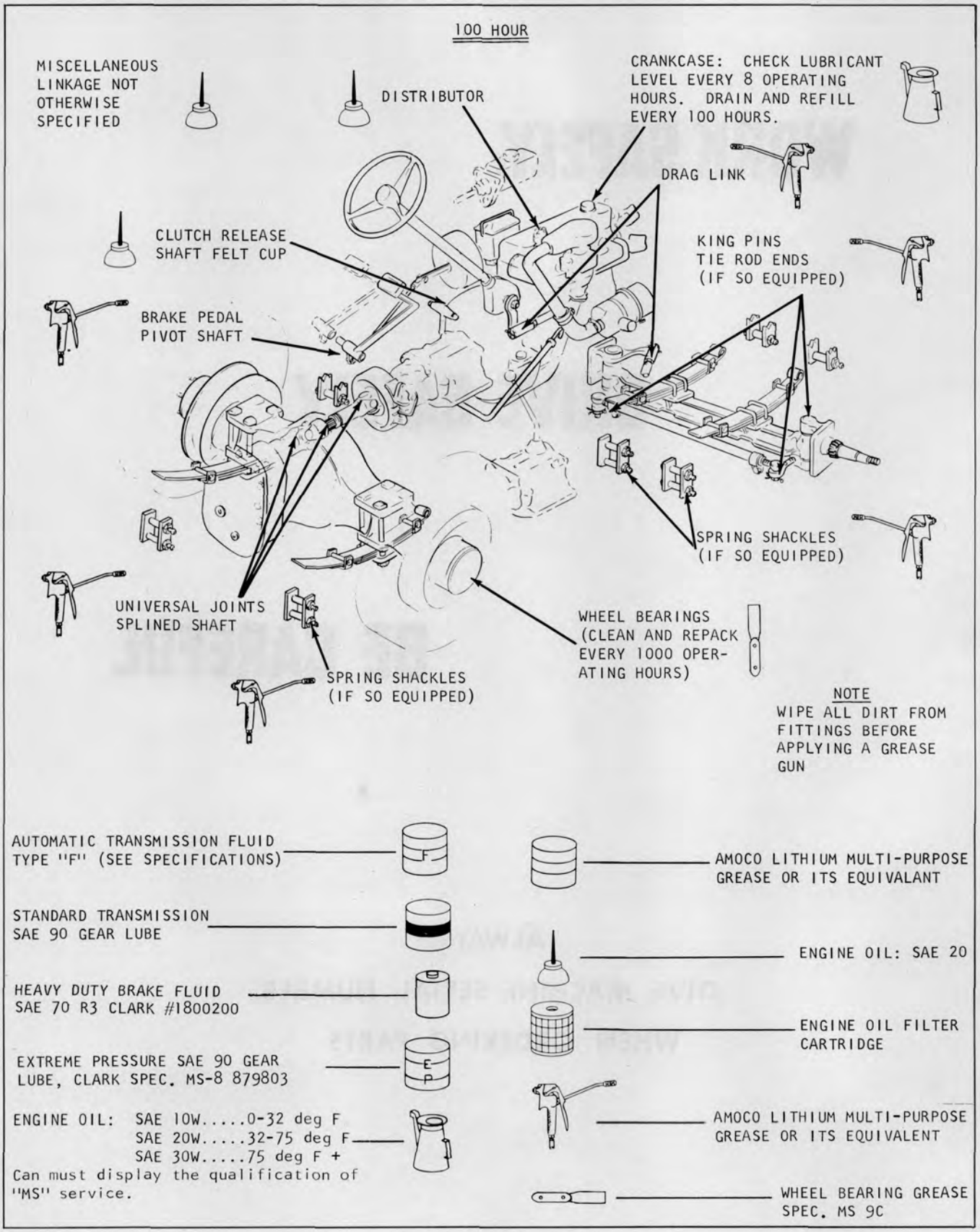
BE CAREFUL

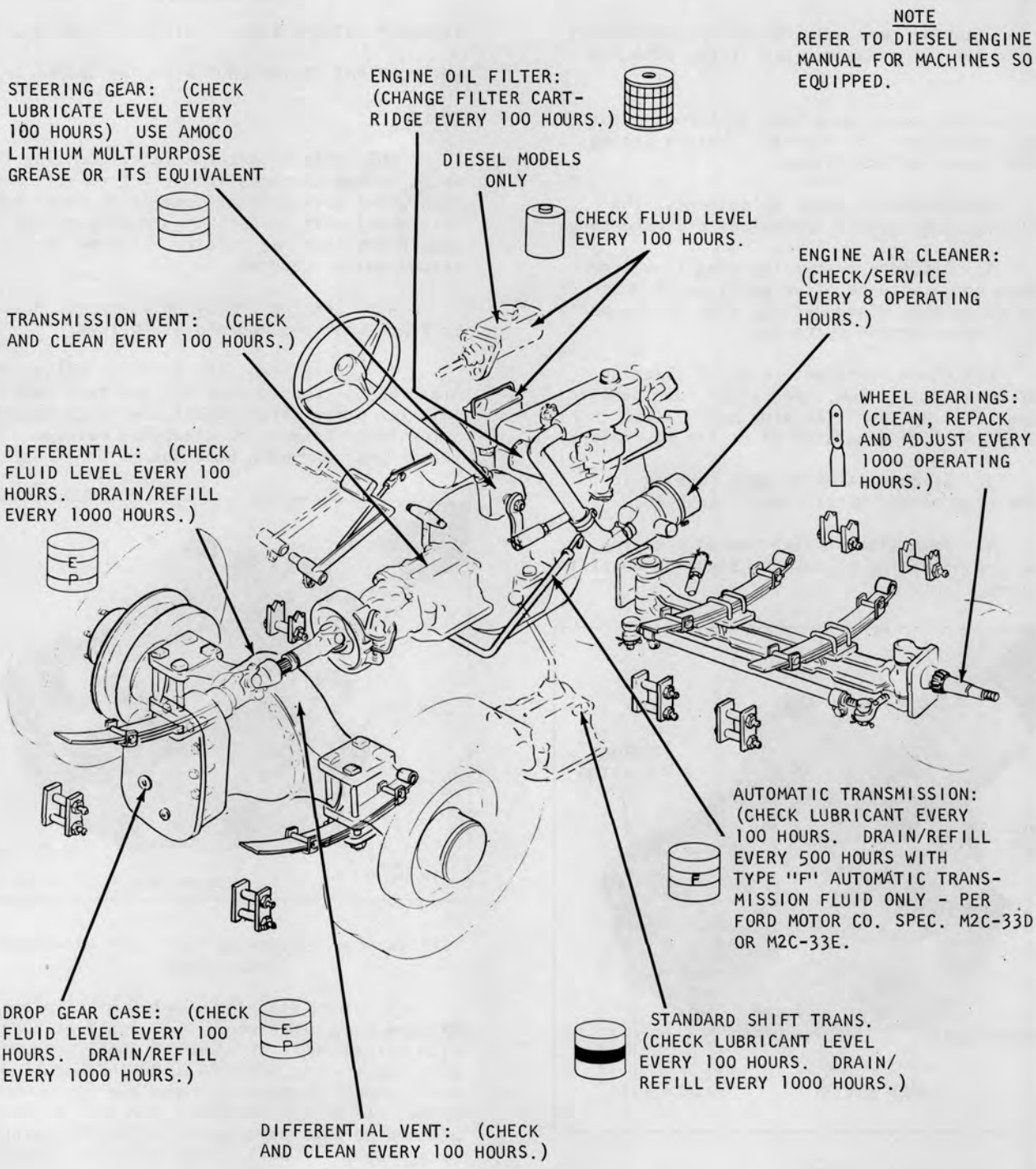
ALWAYS

GIVE MACHINE SERIAL NUMBER

WHEN ORDERING PARTS

Rev OCT 73 1127-Z


100 HOUR
MISCELLANEOUS LINKAGE NOT OTHERWISE SPECIFIED
DISTRIBUTOR
CRANKCASE: CHECK LUBRICANT LEVEL EVERY 8 OPERATING HOURS. DRAIN AND REFILL EVERY 100 HOURS.
DRAG LINK
CLUTCH RELEASE SHAFT FELT CUP
KING PINS TIE ROD ENDS (IF SO EQUIPPED)
BRAKE PEDAL PIVOT SHAFT
SPRING SHACKLES (IF SO EQUIPPED)
UNIVERSAL JOINTS SPLINED SHAFT
WHEEL BEARINGS (CLEAN AND REPACK EVERY 1000 OPERATING HOURS)
SPRING SHACKLES (IF SO EQUIPPED)
NOTE
WIPE ALL DIRT FROM FITTINGS BEFORE APPLYING A GREASE GUN
AUTOMATIC TRANSMISSION FLUID TYPE "F" (SEE SPECIFICATIONS)
STANDARD TRANSMISSION SAE 90 GEAR LUBE
HEAVY DUTY BRAKE FLUID SAE 70 R3 CLARK #1800200
EXTREME PRESSURE SAE 90 GEAR LUBE, CLARK SPEC. MS-8 879803
ENGINE OIL: SAE 10W.....0-32 deg F
SAE 20W.....32-75 deg F
SAE 30W.....75 deg F +
Can must display the qualification of "MS" service.
AMOCO LITHIUM MULTI-PURPOSE GREASE OR ITS EQUIVALANT
ENGINE OIL: SAE 20
ENGINE OIL FILTER CARTRIDGE
AMOCO LITHIUM MULTI-PURPOSE GREASE OR ITS EQUIVALENT
WHEEL BEARING GREASE SPEC. MS 9C


NOTE
REFER TO DIESEL ENGINE MANUAL FOR MACHINES SO EQUIPPED.
STEERING GEAR: (CHECK LUBRICATE LEVEL EVERY 100 HOURS) USE AMOCO LITHIUM MULTIPURPOSE GREASE OR ITS EQUIVALENT
ENGINE OIL FILTER: (CHANGE FILTER CARTRIDGE EVERY 100 HOURS.)
DIESEL MODELS ONLY
CHECK FLUID LEVEL EVERY 100 HOURS.
ENGINE AIR CLEANER: (CHECK/SERVICE EVERY 8 OPERATING HOURS.)
TRANSMISSION VENT: (CHECK AND CLEAN EVERY 100 HOURS.)
WHEEL BEARINGS: (CLEAN, REPACK AND ADJUST EVERY 1000 OPERATING HOURS.)
DIFFERENTIAL: (CHECK FLUID LEVEL EVERY 100 HOURS. DRAIN/REFILL EVERY 1000 HOURS.)
E P
AUTOMATIC TRANSMISSION: (CHECK LUBRICANT EVERY 100 HOURS. DRAIN/REFILL EVERY 500 HOURS WITH TYPE "F" AUTOMATIC TRANSMISSION FLUID ONLY - PER FORD MOTOR CO. SPEC. M2C-33D OR M2C-33E.
F
DROP GEAR CASE: (CHECK FLUID LEVEL EVERY 100 HOURS. DRAIN/REFILL EVERY 1000 HOURS.)
E P
STANDARD SHIFT TRANS. (CHECK LUBRICANT LEVEL EVERY 100 HOURS. DRAIN/REFILL EVERY 1000 HOURS.)
DIFFERENTIAL VENT: (CHECK AND CLEAN EVERY 100 HOURS.)

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 NLGI #1 Amolith grease EP #1 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.

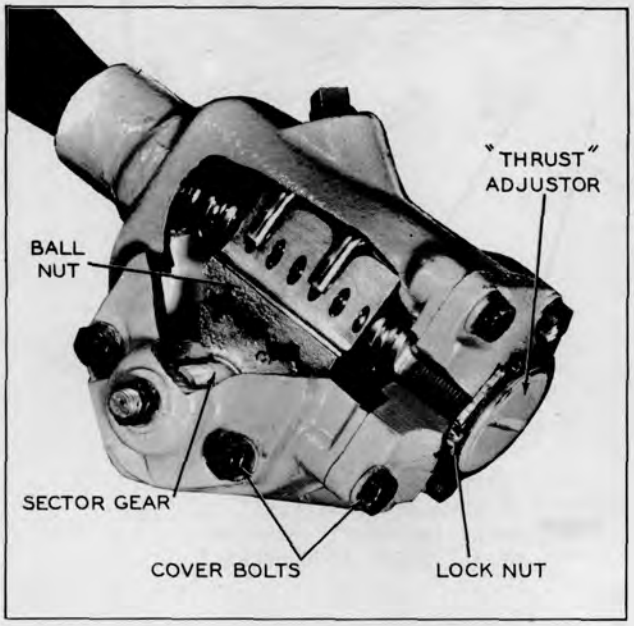


Plate 6636. Steering Gear Thrust Adjustment (Worm Bearings)

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) counterclockwise a few turns to provide clearance between sector gear and worm ball nut.

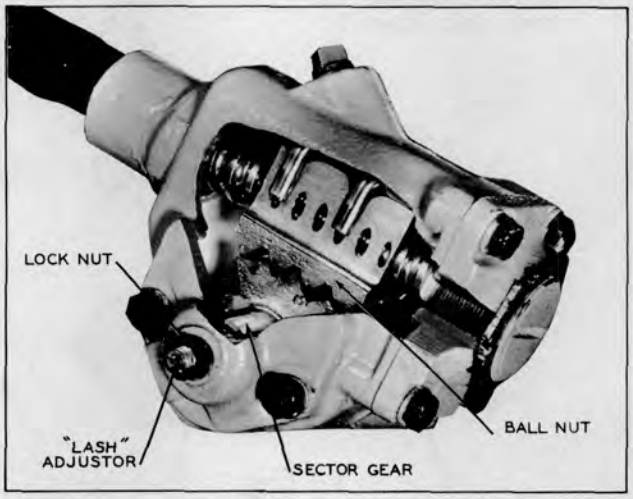


Plate 6637. Steering Gear Lash Adjustment (Sector Gear)

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

3. If it is necessary to adjust the worm bearings, loosen lock nut and then turn worm bearing adjuster nut clockwise until all end play is removed, see Plate 6636. Using

spring scale, as directed in Step 2, check pull and readjust as necessary; then tighten lock nut securely.

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

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

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

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

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

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

N O T E

If steering linkage adjustment is necessary do not install drag link to pitman arm.

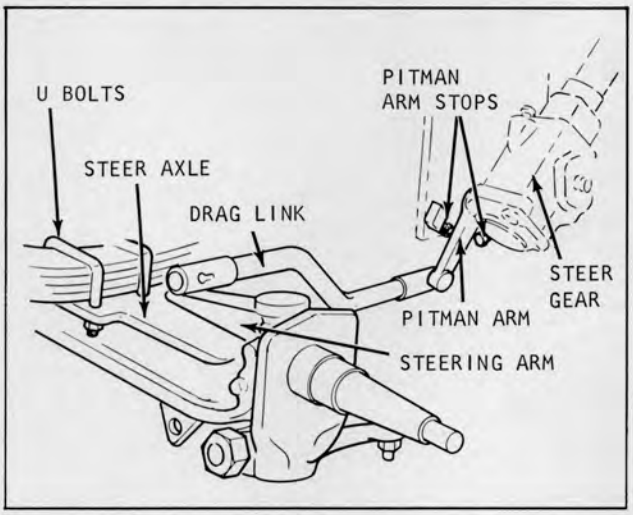


Plate 9439. Typical Steer Linkage Adjustment

1. Raise front of machine until steering wheels clear ground.

```
X X X X X X X X X X X X X X X X X X X X X X X X X X X
X                                                     X
X                     W A R N I N G                   X
X                                                     X
X      AFTER RAISING MACHINE AND BEFORE               X
X                                                     X
X      MAKING ANY ADJUSTMENTS, ADJUSTMENT             X
X                                                     X
X      CHECKS OR BEFORE PERFORMING ANY MAIN-          X
X                                                     X
X      TENANCE, PLACE ADEQUATE BLOCKING               X
X                                                     X
X      (SUFFICIENT TO SUPPORT THE MACHINE)            X
X                                                     X
X      UNDER THE FRAME TO PREVENT ACCIDENT-           X
X                                                     X
X      AL LOWERING OR FALLING OF THE VEHICLE,         X
X                                                     X
X      THUS PREVENTING PERSONAL INJURY TO             X
X                                                     X
X      MECHANIC OR BYSTANDERS.                        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
```

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 nut/s at the tie rod end/s and turn tie rod until correct adjustment is obtained. Tighten tie rod lock nut/s to secure this adjustment.

3. 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 56° to the frame. If an adjustment is necessary, the axle stop on the left side should be turned in or out which ever is necessary to achieve the correct angle. Repeat this procedure in a right turn with the opposite wheel.

3. 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 56° to the frame. 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.

4. Turn wheels to straight ahead position and disconnect drag link at pitman arm if not already disconnected.

5. Determine center position of steering gear. (Refer to steering gear adjustments for correct procedure, page 500H 202 and 203.)

6. With steering gear centered; adjust drag link socket so that the grease fitting lines up with the centerline of the pitman arm ball stud, install drag link and secure with lock nut and cotter pin.

7. Back off the front Pitman arm stop bolt several turns. Slowly turn wheel for a left turn until steering knuckle comes to within 1/16" of the axle stop bolt. (A 1/16" piece of shim stock may be used to measure for this clearance.) Now screw Pitman arm stop bolt inward until it contacts the Pitman arm, secure with jam nut. Adjust the rear Pitman arm stop bolt for a right turn using the same procedure.

8. 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° with the center line of the vehicle, the center spoke pointing back.

9. Carefully removing blocking and lower vehicle to floor.

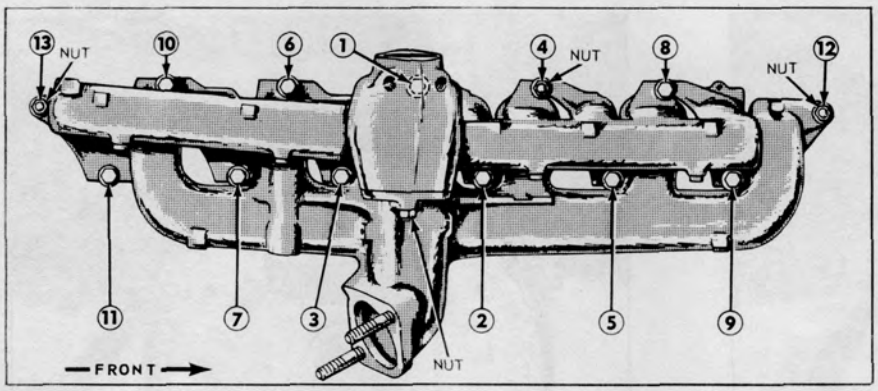


Plate 9252. Manifolds Torque Sequence

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

1. Check security of mounting. Tighten as required.

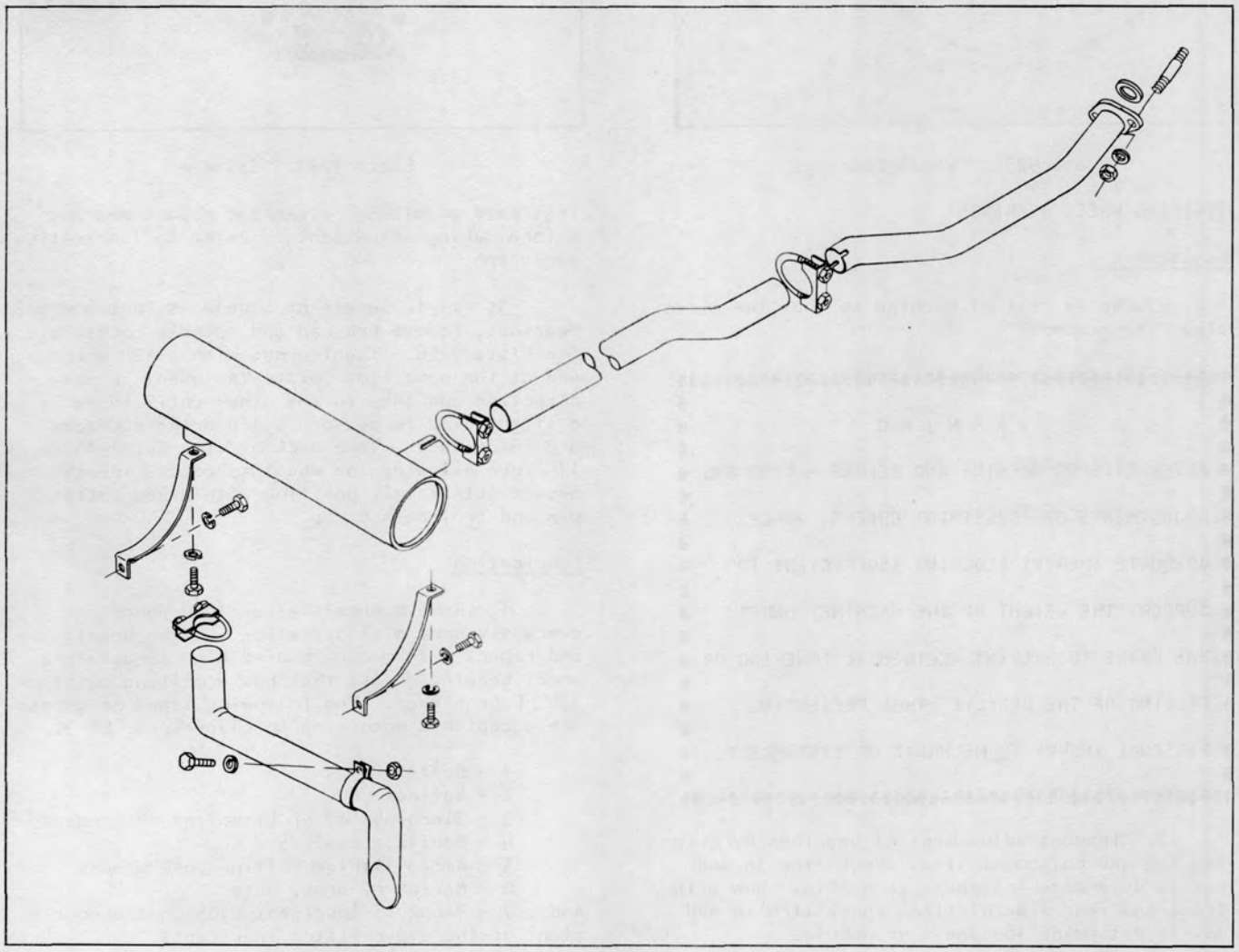


Plate 9253. Typical Muffler and Mounting

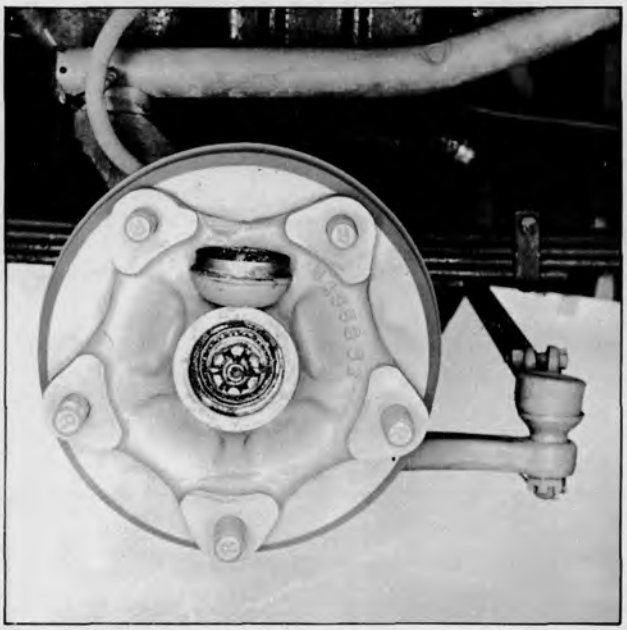


Plate 9256. Wheel Bearings

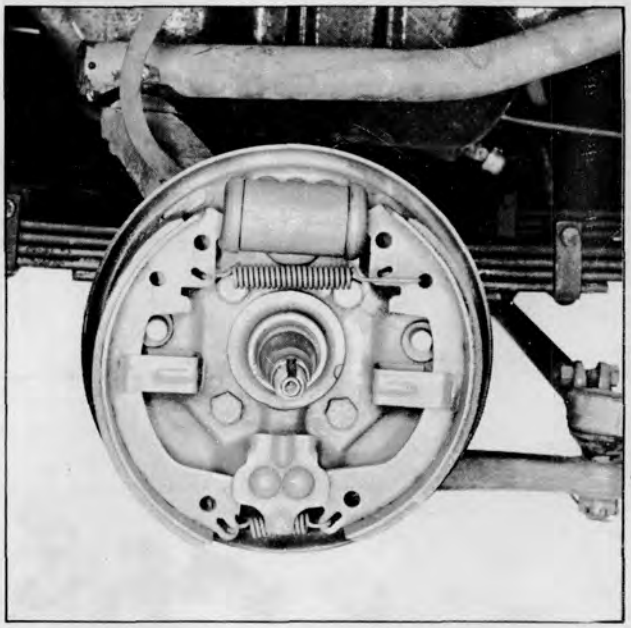


Plate 9257. Spindle

STEERING WHEEL BEARINGS

Adjustment

1. Raise rear of machine so that the tires clear the ground.

WARNING

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 griping top and bottom of tire, chuck tire in and out to determine looseness or wobble. Now grip front and rear side of tire, chuck tire in and out to determine looseness or wobble.

NOTE

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

3. If looseness or wobble is in the wheel bearings, remove hub cap and spindle cotter pin. See Plate 9256. 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 1/16 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 that has a melting point of 250° F or higher. The following types of grease are acceptable according to Clark spec. MS 9C.

1 - Gulfex "A"
2 - Retinax "A"
3 - Sincolube #2 or Litholine MP grease
4 - Mobile grease #5
5 - Amoco lithium multipurpose grease
6 - Marfax #2 heavy duty
and...7 - Pennzoil lubricant #705 or the equivalent of the above listed lubricants.

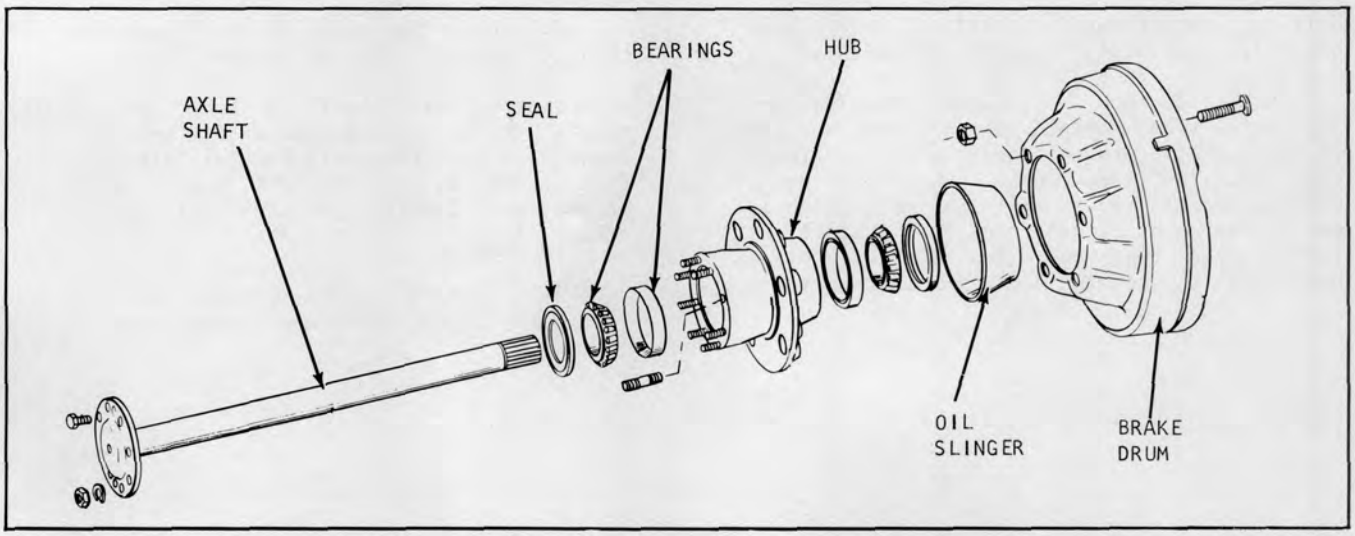


Plate 7102. Axle Shaft and Hub Assembly

CLEAN AND REPACK DRIVE WHEEL BEARINGS

Every 1000 operating hours remove and repack the drive wheel bearings with AMOCO Lithuim multipurpose grease, Shell Alvania EP #1 or equivalent.

1. Raise the drive wheels far enough to clear the floor and place heavy blocking under the machine frame so it cannot accidentally become lowered. Deflate the tires and remove the wheels from the hub assembly.

2. Remove the screws that retain the axle shaft to the hub. By using jack screws in the holes provided in the axle flange, the axle may be pulled.

3. Unclinch the tube nut lock and remove the outer tube nut, nut lock and inner tube nut.

4. The hub and drum assembly may now be removed from the axle tube.

5. Remove the brake drum oil slinger, inner and outer seals from the hub and lift out the bearing cones.

6. Clean the hub assembly and bearings in separate containers using a Stoddard type cleaning solvent. After all solidified particles of lubricant are removed from the bearings blow dry with compressed air. Direct air stream across bearings to prevent spinning. Slowly rotate bearing by hand to facilitate drying. Inspect bearings and races carefully to determine if they are in good condition and suitable for further service. Dry the hub assembly with compressed air.

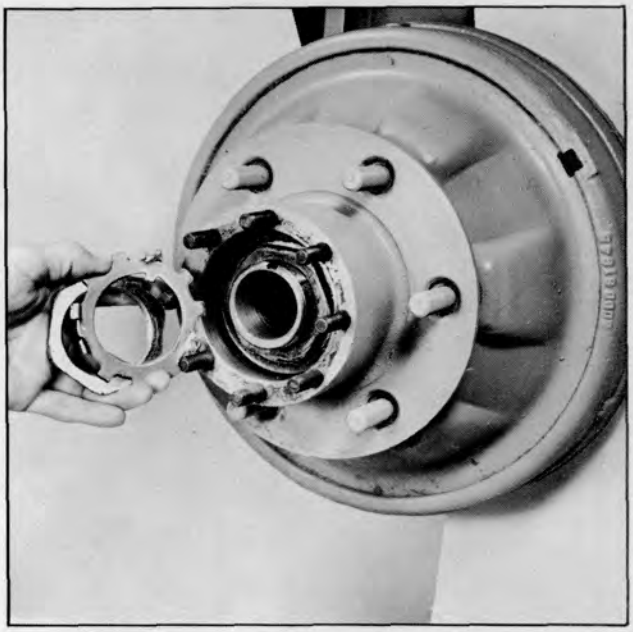


Plate 7103. Axle Tube Nuts and Nut Lock

7. Repack bearing cones with the type grease previously described and install in hub assembly. If there is any doubt about the serviceability of the bearing seals it is more economical to install new ones to prevent a premature overhaul to replace these parts at a furture time. Care should be taken when installing the hub over the axle tube to prevent damage to the seals.

Cutting, scratching or curling under the seal lip seriously impairs efficiency.

8. After hub has been installed on the axle tube replace inner tube nut and tighten until drag is felt when turning the hub. (Be sure brake shoes are not causing drag). Back off the nut slightly until the hub turns free and install nut lock, outer tube nut and tighten. Clinch nut lock to retain nuts in this position.

9. Coat the axle shaft flange to hub mating surface with #2 Permatex.

Insert axle shaft in tube and rotate slowly until splines on shaft are in registry with the differential side gears. Push shaft in and install the retaining screws and tighten to 52-57 ft. pounds torque.

10. Install wheels on hub and inflate tires to proper pressure. Lower machine to floor.

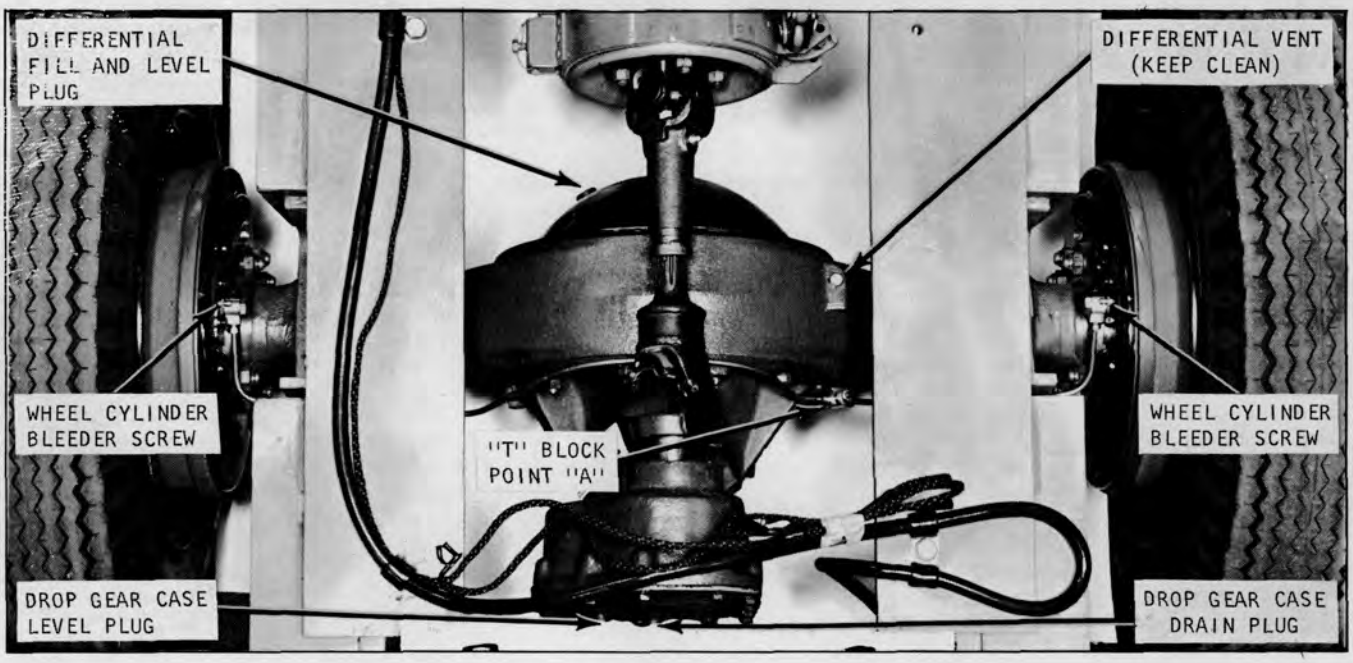


Plate 7435. Typical Bleeding Brake System

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).

Step 1. Raise the drive wheels far enough to clear the floor and place heavy blocking under the machine frame so it cannot accidentally become lowered. Deflate the tires and remove the wheels from the hub assembly.

```
X X X X X X X X X X X X X X X X X X X X X X X X X
X                                                 X
X                    W A R N I N G                X
X                                                 X
X      AFTER RAISING MACHINE AND BEFORE MAK-      X
X                                                 X
X      ING ANY ADJUSTMENTS, ADJUSTMENT CHECKS     X
X                                                 X
X      OR BEFORE PERFORMING ANY MAINTENANCE,      X
X                                                 X
X      PLACE ADEQUATE BLOCKING (SUFFICIENT        X
X                                                 X
X      TO SUPPORT THE MACHINE) UNDER THE          X
X                                                 X
X      FRAME TO PREVENT ACCIDENTAL LOWERING       X
X                                                 X
X      OR FALLING OF THE VEHICLE, THUS            X
X      PREVENTING PERSONAL INJURY TO MECHANIC     X
X                                                 X
X      OR BYSTANDERS.                             X
X                                                 X
X      DEFLATE TIRES BEFORE REMOVING DRIVE        X
X                                                 X
X      WHEELS FROM MACHINE.  REFER TO PAGES       X
X                                                 X
X      8H 601 THRU 8H 603 FOR PROPER DEFLATION    X
X                                                 X
X      OF TIRES.                                  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
```

Step 2. Check the brake pedal free travel (see page 8H 303). Clean dirt from around the filter cap of the master cylinder reservoir.

Brake fluid should be within 1/4" of the top. With filler cap of 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.

Step 3. Be sure the master cylinder reservoir is filled.

Step 4. Loosen line connection at highest

position on "T" block point "A" depress brake pedal slowly and hold allowing fluid and air to escape. Tighten fitting at this point, then release brake pedal. Repeat procedure until fluid is free of air bubbles.

Step 5. Install a bleeder hose on one of the wheel cylinder bleeder screws and submerge the unattached end of the hose in a clean transparent jar containing several inches of brake fluid.

N O T E

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

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

Step 6. Install bleeder hose on remaining bleeder screw and proceed as in step five. After all bleeding has been completed, recheck fluid level in master cylinder. Fill to within 1/4" of top with SAE 70 R3 brake fluid, CLARK part #1800200. Replace master cylinder cap.

Step 7. Replace drive wheels. Inflate tires. Remove blocking and lower machine to floor.

N O T E

Remember that the brake pedal should be depressed slowly and held to the floorboard 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.

BRAKE ADJUSTMENT (FRONT WHEELS):

When the brake drums are hot, allow to cool, then proceed as follows:

1. Adjust brake pedal free play 1/2 to 3/4 of an inch.

2. Raise tractor until steer wheel tires clear floor. Be sure tractor is properly supported and blocked.

```
x x x x x x x x x x x x x x x x x x x x x x x x x x x
x                                                     x
x                       W A R N I N G                 x
x                                                     x
x  AFTER RAISING MACHINE AND BEFORE MAKING            x
x                                                     x
x  ANY ADJUSTMENTS, ADJUSTMENT CHECKS OR              x
x                                                     x
x  BEFORE PERFORMING ANY MAINTENANCE, PLACE           x
x                                                     x
x  ADEQUATE BLOCKING (SUFFICIENT TO SUPPORT           x
x                                                     x
x  THE MACHINE) UNDER THE FRAME TO PREVENT            x
x                                                     x
x  ACCIDENTAL LOWERING OR FALLING OF THE              x
x                                                     x
x  VEHICLE, THUS PREVENTING PERSONAL INJURY           x
x                                                     x
x  TO MECHANIC OR BYSTANDERS.                         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
```

3. Bleed hydraulic system as required to remove entrapped air.

4. At each wheel, adjust each brake shoe in turn, taking a forward acting shoe first.

(a) Rotate the shoe (toe) adjusting cam until the shoe drags. A forward acting shoe cam rotates forward: a reverse acting shoe cam rotates in reverse. (Plate 8743).

(b) Back off the shoe (toe) adjusting cam, while rotating the drum forward, until the shoe is just free of drag. Operate the pedal several times to center the shoes, then provide a running clearance by again backing off the cam 1/8 to 1/4 of a turn.

5. Remove blocking, lower vehicle to the floor and test the brakes.

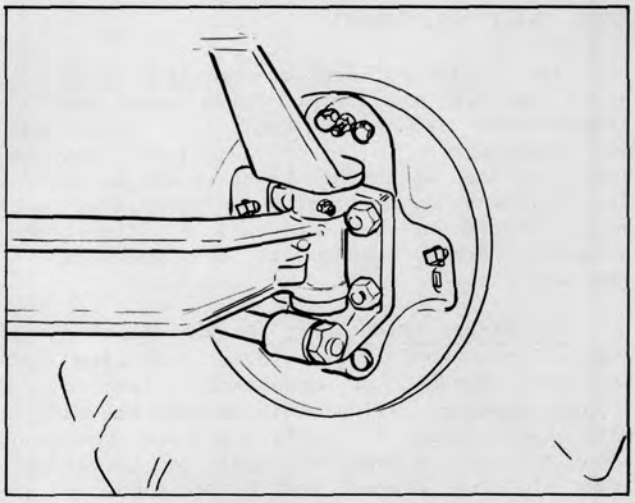


Plate 9288. Typical Cam Type Brake Adjustment

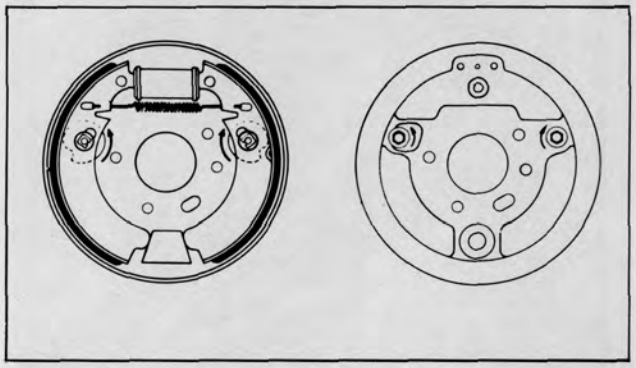


Plate 8743. Typical Cam Movement

HAND BRAKE ADJUSTMENT

The brake is located on the drive shaft between the front drive axle and transmission see Plate 4963. The brake has two adjustments. A minor adjustment may be made at the Actuating Lever located in the driver's compartment. If necessary, a major adjustment may be made at the brake assembly. Brake adjustments are made as follows:

1. Minor Adjustment: Rotate knob on top of the hand brake lever clockwise to increase tension, or counterclockwise to loosen tension. Adjustment should be made with hand lever in fully released position, then test adjustment by applying (pivoting) lever to set brake. See Plate 6505.

Plate 6505. Hand Brake (Actuating) Lever

2. Major Adjustment: If a major adjustment is necessary to provide proper brake lever release travel and also to provide brake tension, proceed as follows:

a. Set hand brake lever in fully released position and turn knob adjustment counterclockwise as far as possible. See Plate 6505.

b. Turn brake band anchor clip bolt until feeler gauge placed between lining and drum indicates a 0.010 to 0.015 inch clearance. See Plate 6291.

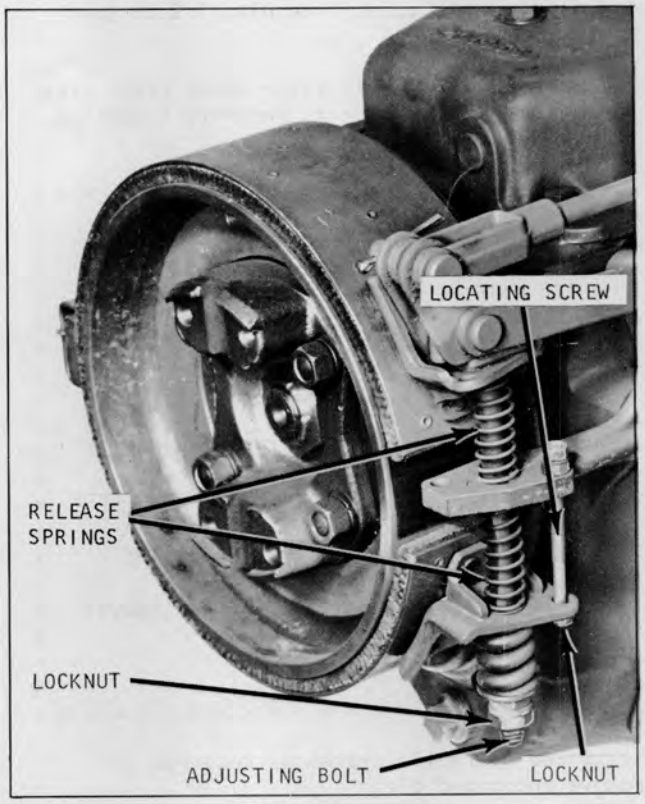


Plate 7447. Hand Brake Adjustments

c. Loosen lock nut and tighten screw until feeler gauge placed between lower end of lining and brake drum indicates a 0.020 inch clearance. Tighten lock nut when this clearance is obtained. See Plate 6290.

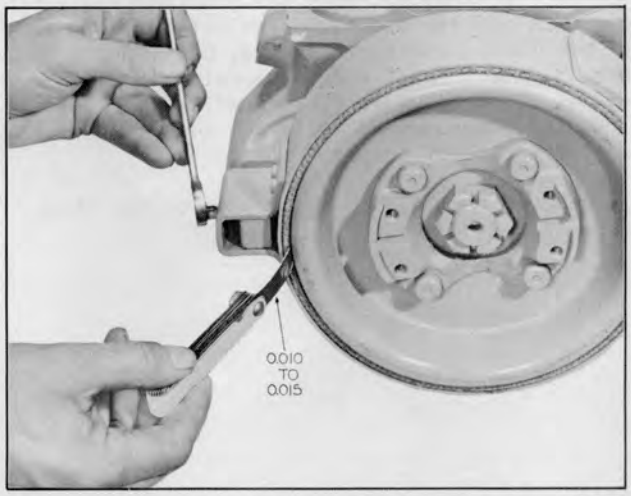


Plate 6291. Brake Band Centering Adjustment

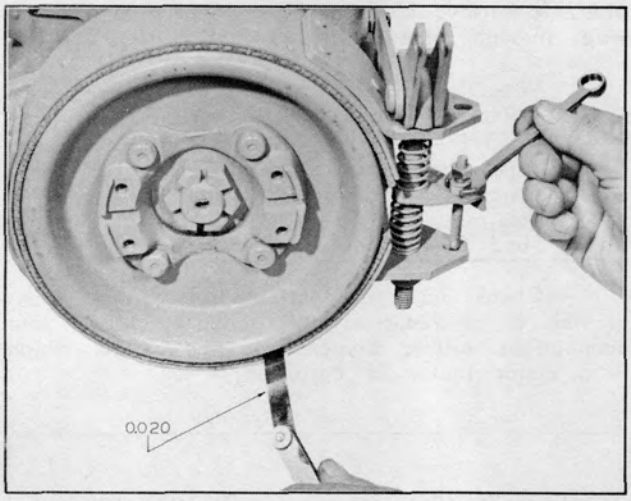


Plate 6290. Brake Band Lower Adjustment

d. Loosen lock nut from end of adjusting bolt and tighten adjusting bolt until feeler gauge placed between upper end of lining and brake drum indicates a 0.020 inch clearance. Tighten lock nut when this clearance is obtained. See Plate 6289.

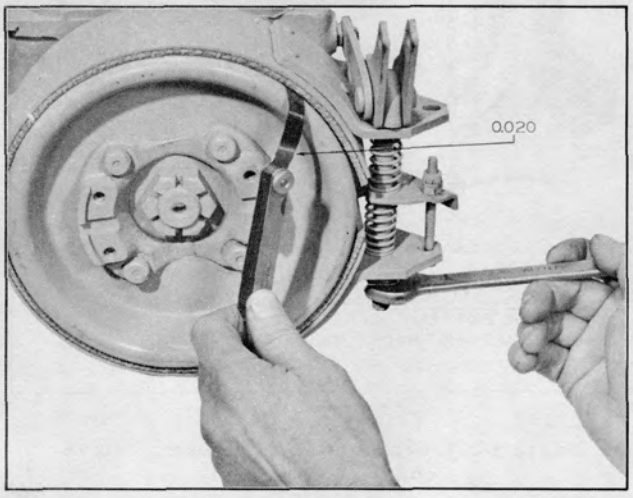


Plate 6289. Brake Band Upper Adjustment

e. Rotate adjusting knob, located at upper end of brake lever, clockwise until sufficient tension is obtained to properly apply parking brake when lever is actuated. See Plate 6505.

COOLING SYSTEM

Radiator Pressure Caps:

WARNING

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

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

Plate 6458. Radiator Pressure Cap

2. Inspect pressure cap for freedom of operation.

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

NOTE

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

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

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

Inspect and Clean Cooling System:

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

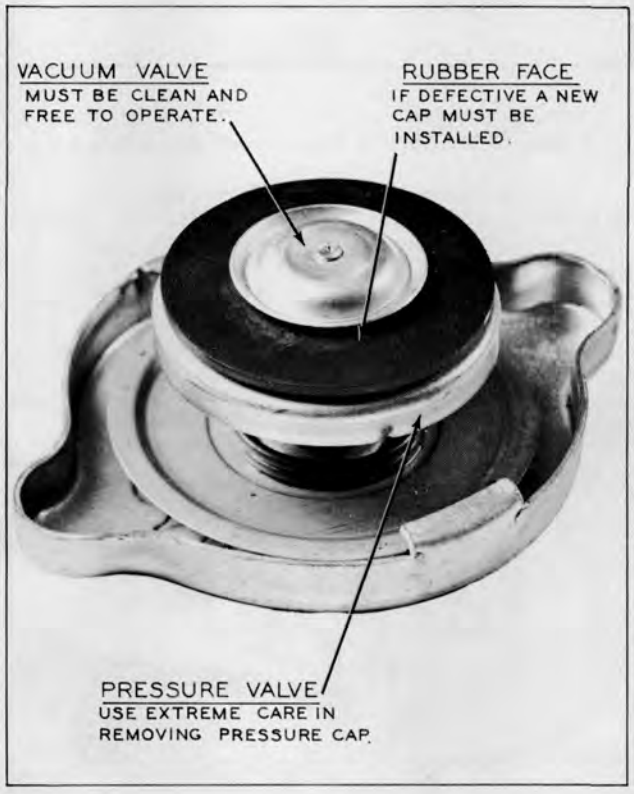


Plate 6459. Pressure Cap Gasket, Valve and Valve Gasket

NOTE

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

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

1. Drain system.

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

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

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

5. Operate engine normally for 24 hours.

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

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

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

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.

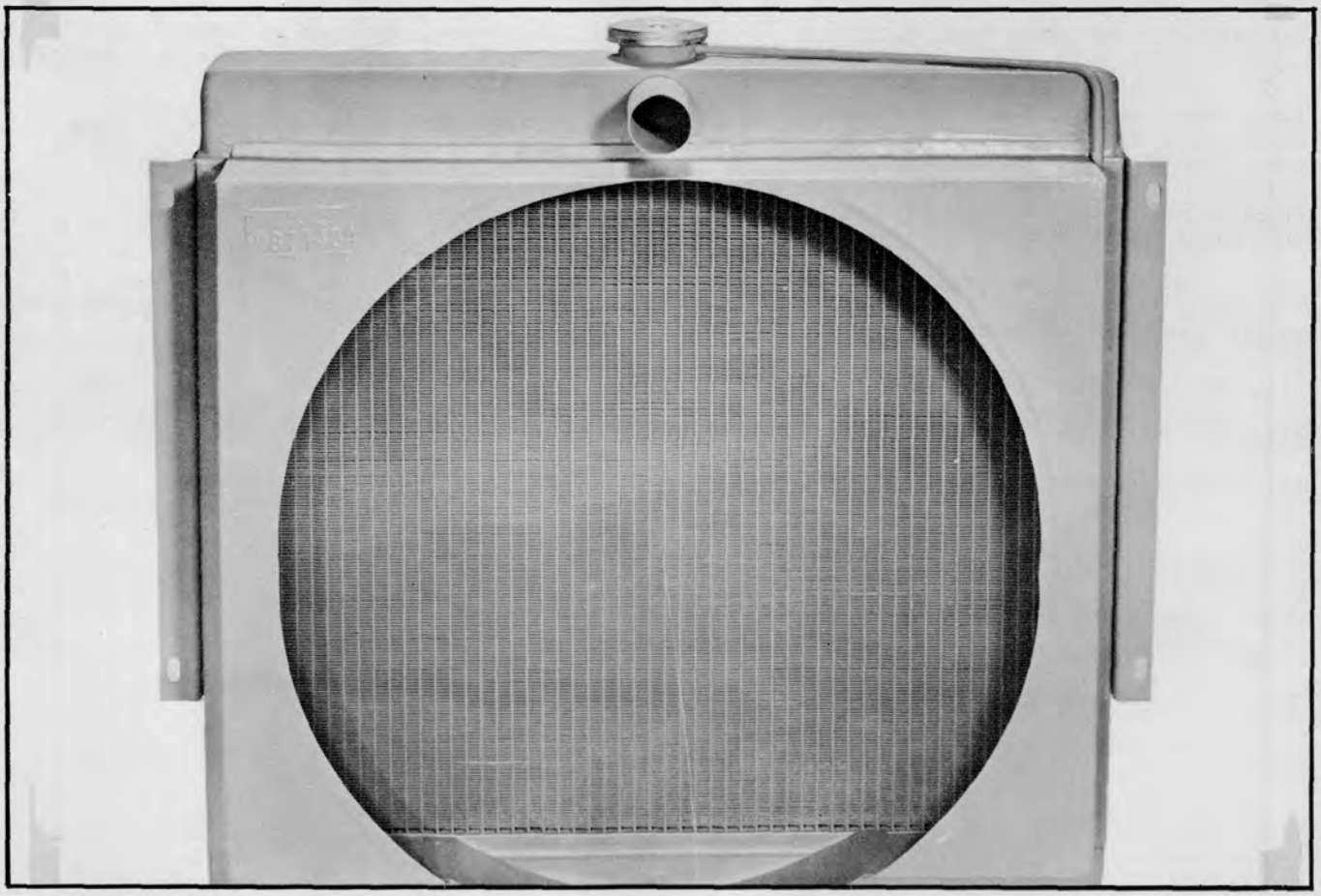


Plate 6461 Typical Radiator

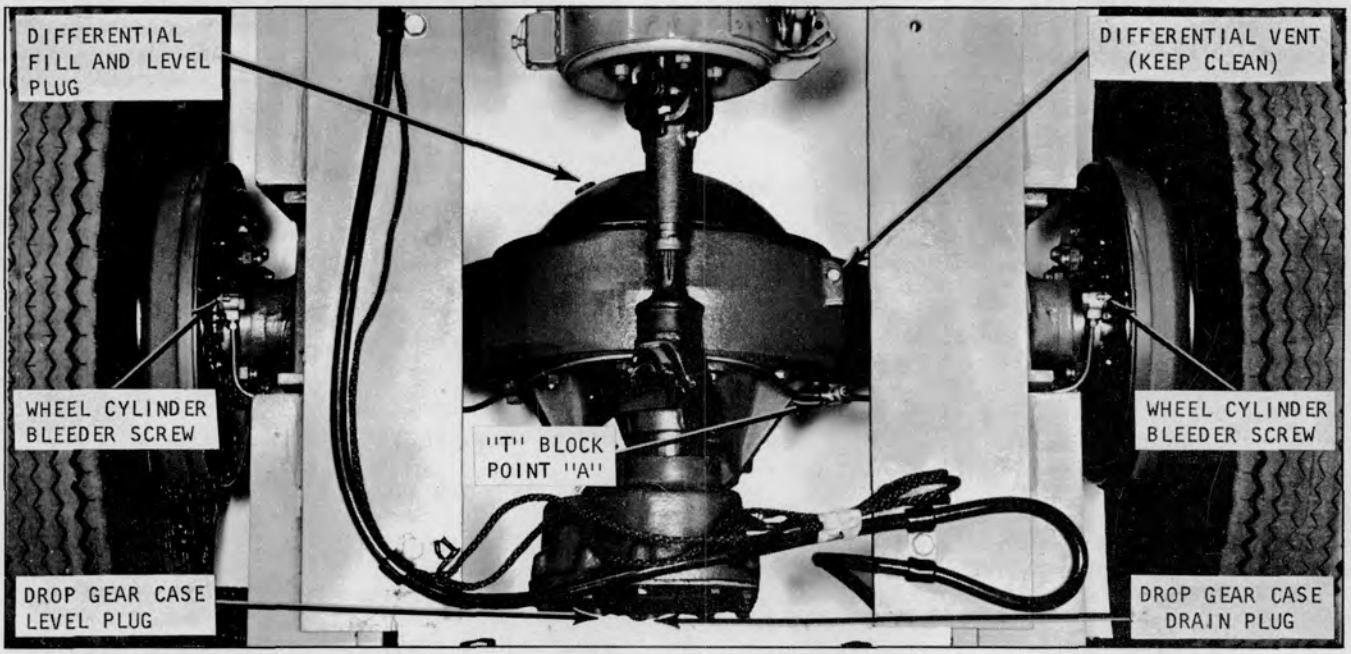


Plate 7435. Drop Gear Case and Differential - Drain and Refill

DIFFERENTIAL AND DROP GEAR CASE

1. Drain differential by removing the lower capscrew on the front cover of the differential bowl. Drain differential at operating temperatures. Removal of the filler/plug will allow full atmospheric pressure to enter the differential bowl and speed up the draining process.

N O T E

BEFORE REMOVING PLUGS FROM EITHER DIFFERENTIAL OR DROP GEAR CASE, CLEAN BOTH ASSEMBLIES SO THAT THE AREA AROUND THE DRAIN, FILL/LEVEL PLUGS IS ABSOLUTELY CLEAN.

2. Remove drain plug from the drop gear case and drain lubricant at operating temperature.

3. Replace drain plugs after both units are completely drained and tighten plugs securely.

4. Remove fill/level plug and fill differential with E.P.G.L. S.A.E. 90 Clark Specifications MS8. Do not fill above the level of the plug hole. Replace plug and securely tighten.

5. Remove fill/level plug of drop gear case and add one quart of E.P.G.L. S.A.E. 90. Then replace fill/level plug and securely tighten.

Refer to Specifications for combined capacity of differential and drop gear case.

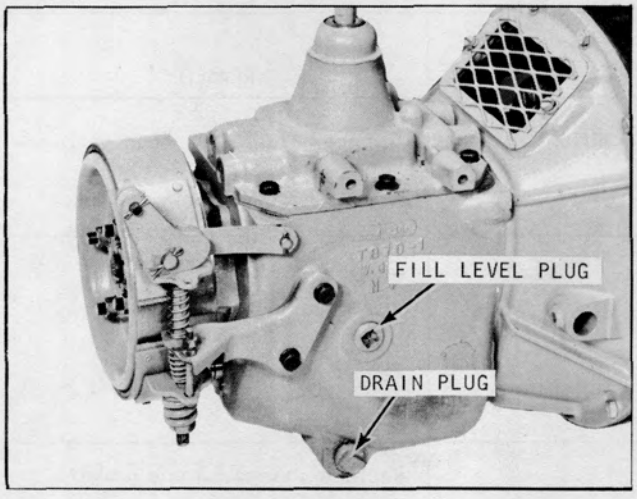


Plate 9435. Typical Standard Transmission

TRANSMISSION OIL CHANGE

Draining

Remove the drain plug from the transmission and drain the oil at operating temperature.

Refill

After draining, replace the drain plug, clean all dirt from around the filler plug and remove filler plug. Refill to the level of the filler plug with straight mineral lubricant, grade SAE #90. Do not over fill, as the excess quantity will serve no useful purpose. If the oil level is too high, it will cause excessive oil churning, high oil temperature and possible leakage.

COOLING SYSTEM

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

BATTERY, LIGHTS AND HORN

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

BATTERY, LIGHTS AND HORN (Continued)

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

DRIVE AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble.	Noisy gears or backlash.	Report to designated individual in authority.
	Damaged axle.	Replace axle.
	Abnormal tire wear.	Inflate tires properly.
	Lubrication leaks.	Drain excessive lubricant; clean housing vent; remove excessive grease in wheel hubs; replace leaking defective gaskets.

STEERING AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble.	Damaged axle.	Replace axle.
	Lubrication leaks.	Replace oil seals. (Refer to Lubrication Section). Report to designated individual in authority.
	Incorrect caster or camber.	Report to designated individual in authority.
	Uneven tire wear.	Inflate tires properly. Check wheel alignment.

STEERING

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

INDUSTRIAL TRUCK DIVISION

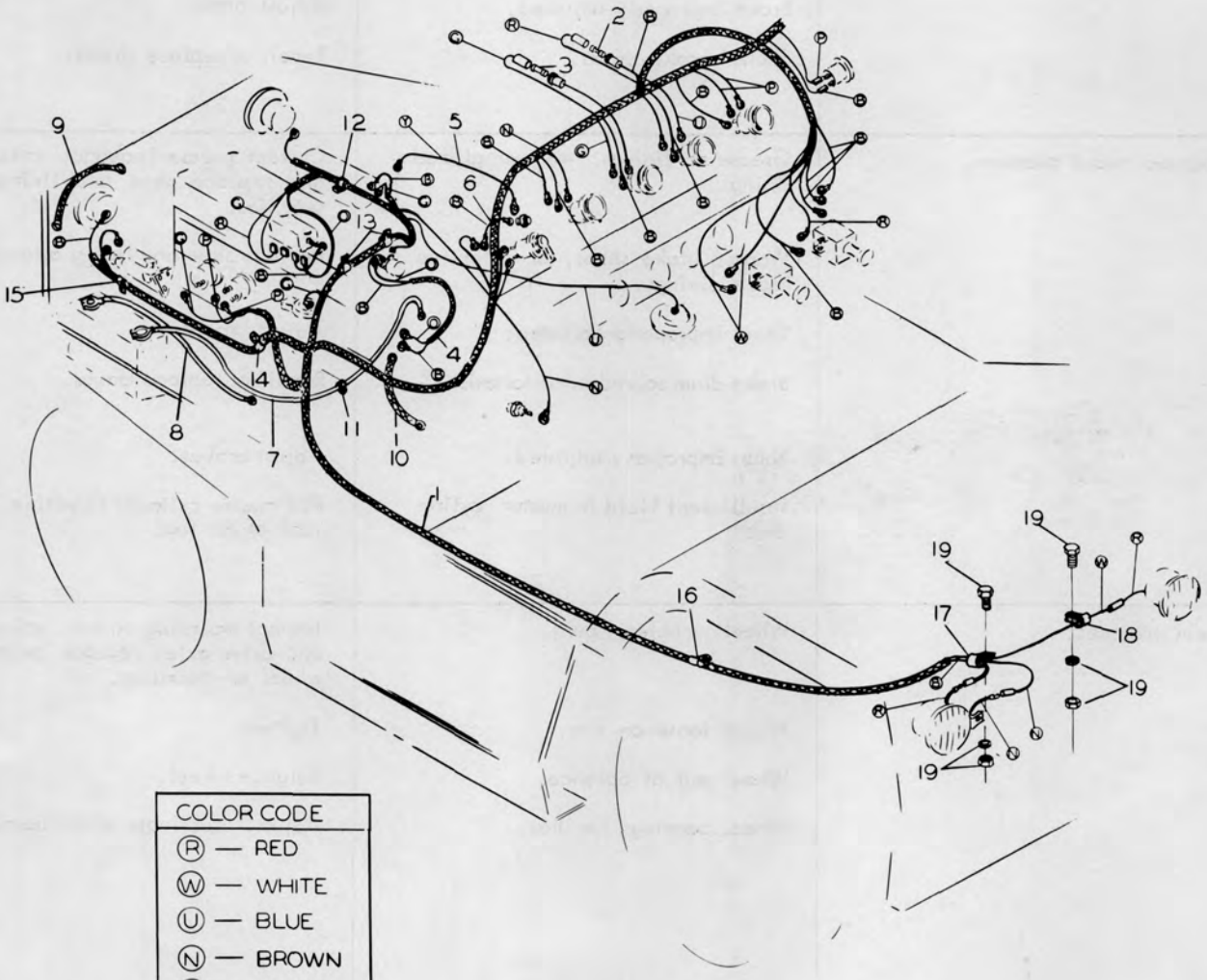
TROUBLE SHOOTING GUIDE

BRAKES

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

BRAKES (Continued)

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



COLOR CODE
(R) — RED
(W) — WHITE
(U) — BLUE
(N) — BROWN
(B) — BLACK
(Y) — YELLOW
(O) — ORANGE
(G) — GREEN
(P) — PINK
(A) — GRAY

INDUSTRIAL TRUCK DIVISION

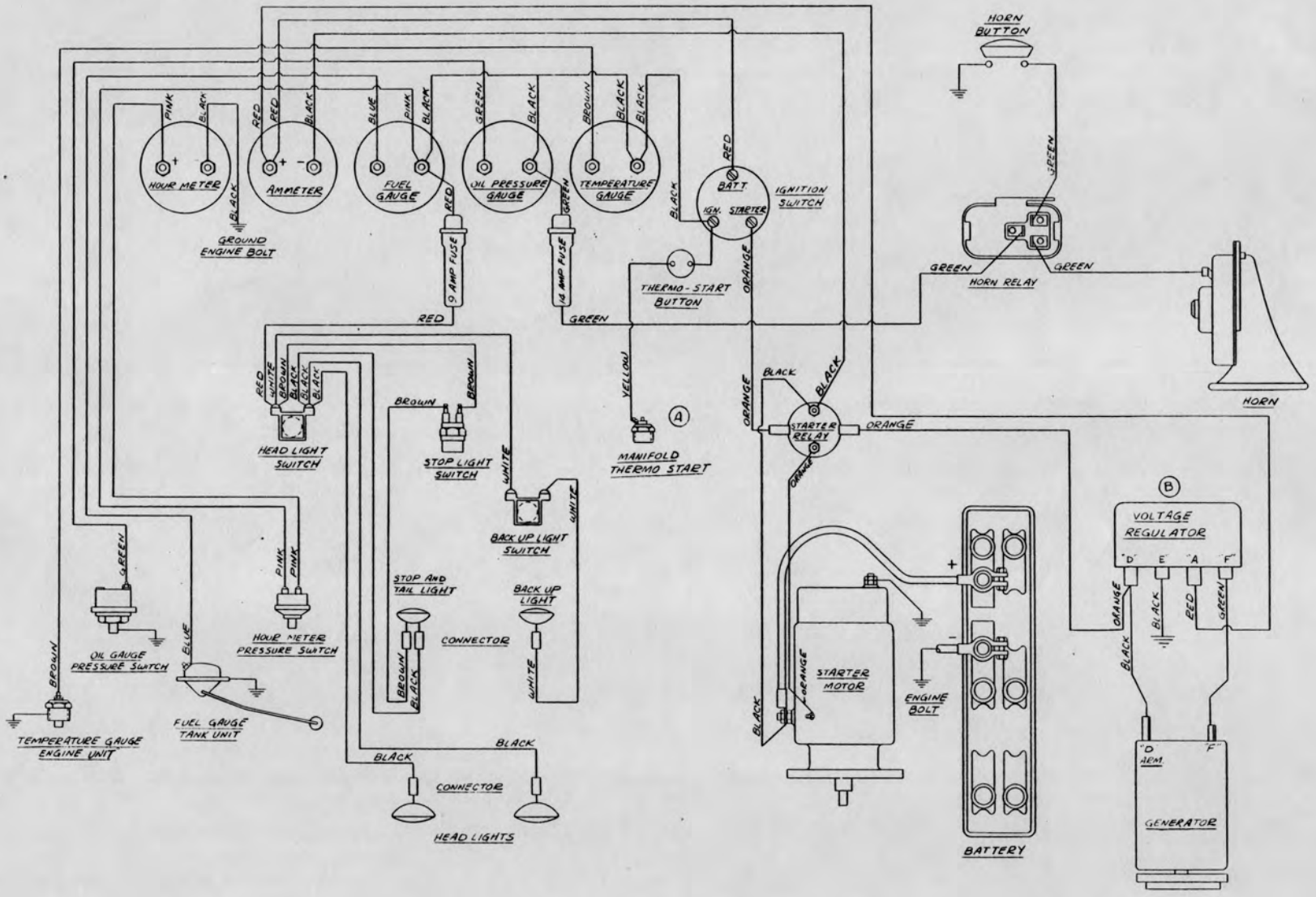
N O T I C E

THE WIRING DIAGRAM IN THIS MANUAL IS FOR A STANDARD TRUCK, WITHOUT SPECIAL CUSTOM FEATURES.

THE PARTS BOOK FOR THIS SERIAL NUMBER INCLUDES WIRING DIAGRAM/S COVERING SPECIAL CUSTOM OPTIONS INCORPORATED AT TIME OF SHIPMENT.

C

MATERIAL
HT. TREATMENT
HARDNESS



IN-14483

	CHANGES	DATE	BY	CHANGE NO.	MICRO FILM		CHANGES	DATE	BY	CHANGE NO.	MICRO FILM
B	CORRECTED TERM. LOC.	14 AUG. 67	RM	67309							
A	ADD THERMO-START	14 AUG. 67	RM								

UNLESS OTHERWISE SPECIFIED MAX. TOLERANCE ON FINISHED DIMENSIONS ± .010
ALL OTHER DIMENSIONS ± .0
DO NOT SCALE

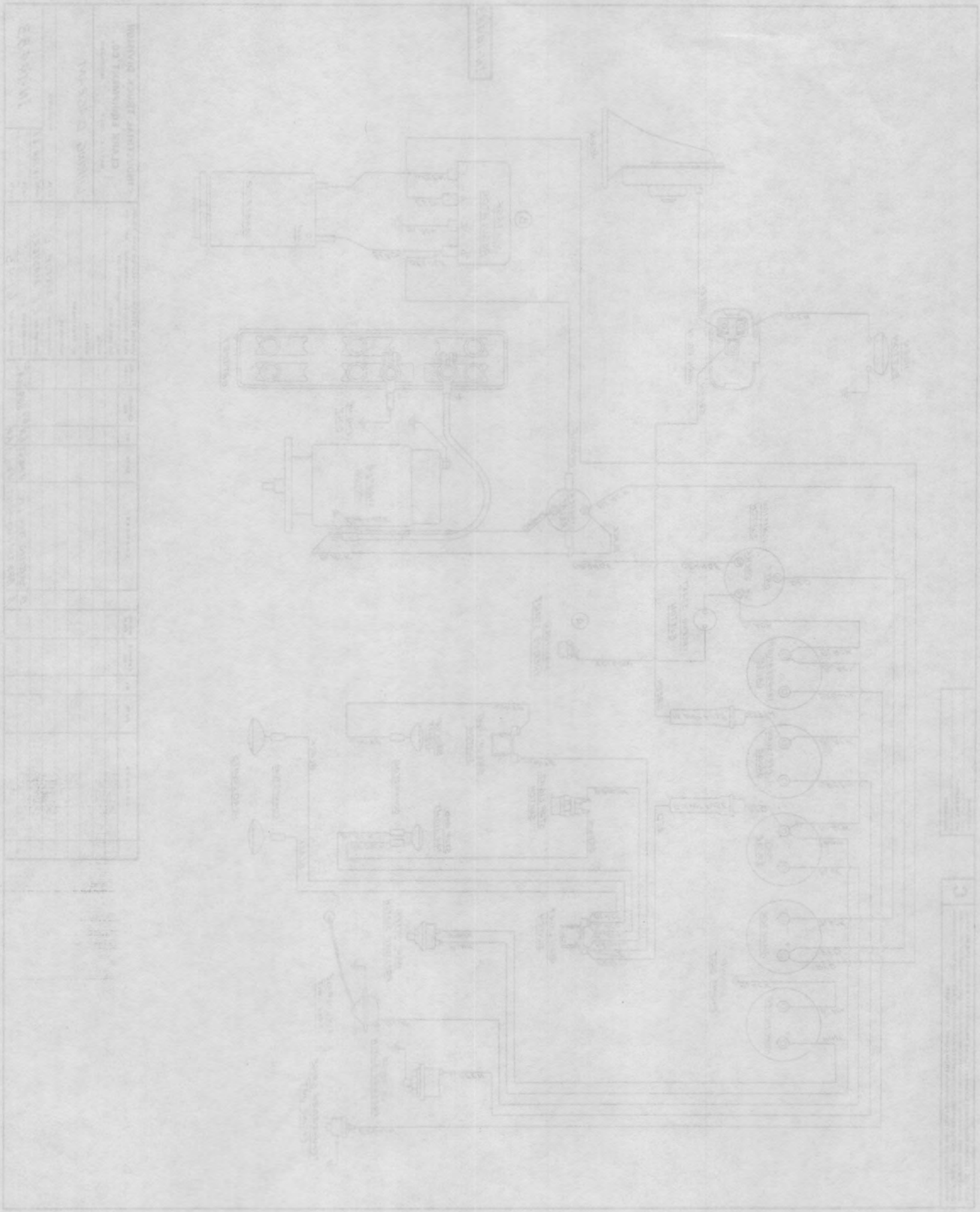
SCALE —
MATERIAL —
HT. TREATMENT
HARDNESS
DRAWN FOR CLARKTOR "D"
DRAWN BY P.E. MASTER'S
CHECKED BY
RELEASED BY 67-43

DATE WITNESSED
DATE 19 JAN. 67
DATE
DATE

INDUSTRIAL TRUCK DIVISION
CLARK EQUIPMENT CO.
BATTLE CREEK. MICHIGAN

WIRING DIAGRAM

IN-14483



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MATERIAL
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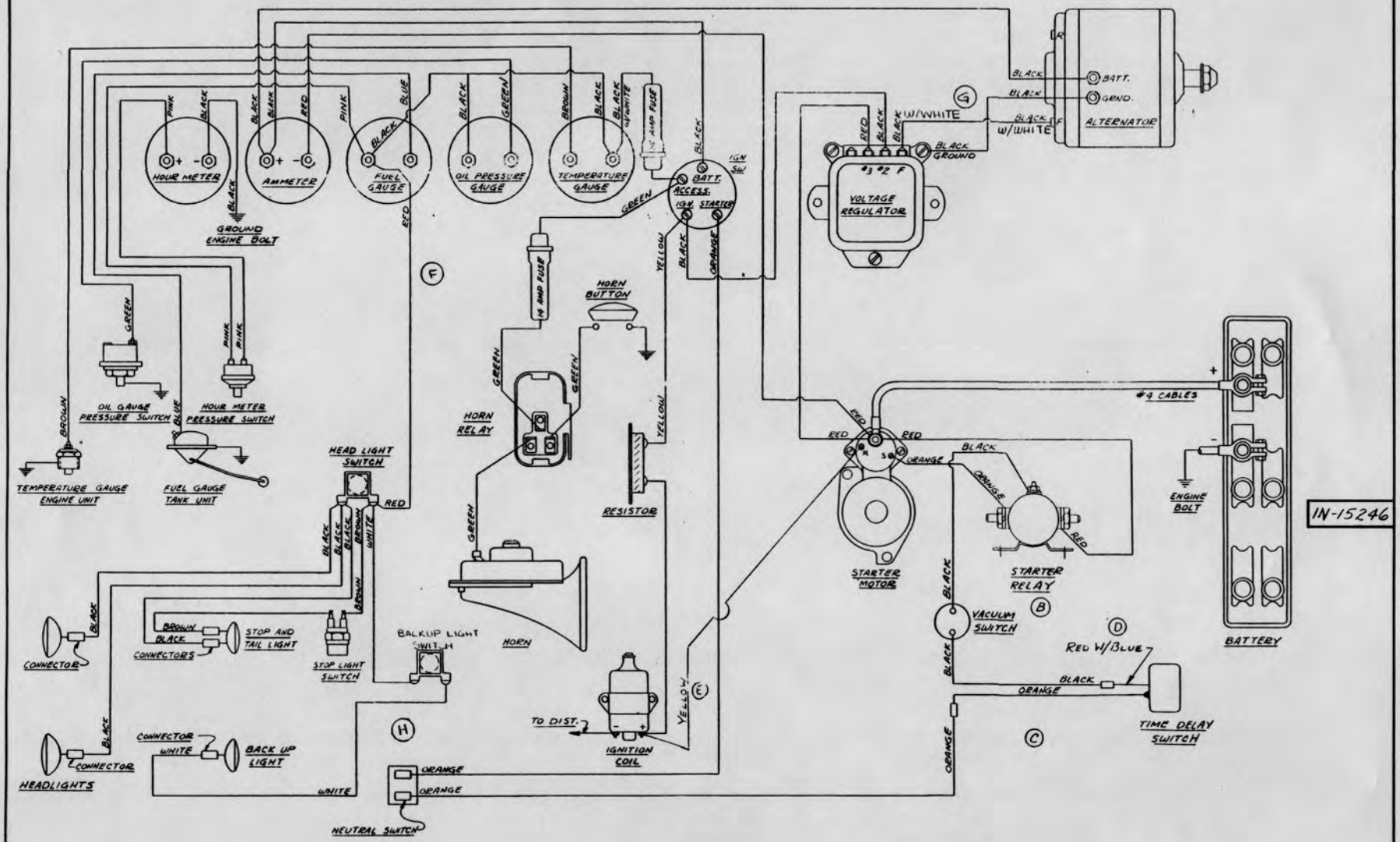

	CHANGES	DATE	BY	CHANGE NO.	MICRO FILM
H	NEUT. & BACK UP SW WERE SHOWN INTEGRAL	6 DEC 71	LG	71-397F	
G	WAS BLACK	10 DEC 71	LG	71-413	
F	9 AMP FUSE REMOVED	1 DEC 71	LG	"	
E	WIRE ADDED	15 NOV 71	LG	71-378	
D	WIRE COLOR ADDED	6 AUG 71	RO	68-761	
C	REVISE ADDING T.O. # VAC SW.	20 FEB. 68	RM	68-122-71	
B	REVISED RELAY & WIRES	12 FEB. 68	RM	68-122-71	
A	REVISED AND REDRAWN	29 JAN. 68	RM	68-122	

UNLESS OTHERWISE SPECIFIED MAX. TOLERANCE ON FINISHED DIMENSIONS + OR — .010. ALL OTHER DIMENSIONS + OR — DO NOT SCALE.

SCALE

MATERIAL

HT. TREATMENT

HARDNESS

DRAWN FOR CLARKTOR "E"

DRAWN BY R.E. MASTERS

CHECKED BY

RELEASED BY RW 67-701 5/3

DATE 29 JAN 68

DATE

DATE

WITNESSED

INDUSTRIAL TRUCK DIVISION
CLARK EQUIPMENT CO.
BATTLE CREEK MICHIGAN

WIRING DIAGRAM -AUTOMATIC TRANSMISSION-

IN-15246