



INDUSTRIAL TRUCK DIVISION



OPERATORS MANUAL

FOR

CT-CTF-CTA6

20B-30B-40B-50B

(FOUR AND SIX CYLINDER -- FLUID COUPLING
FRICTION CLUTCH -- AUTOMATIC TRANSMISSION MODELS)

0-B144

CLARK EQUIPMENT COMPANY

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INDUSTRIAL TRUCK DIVISION



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 recommendations in this Manual and the following practices:

1. Only qualified and authorized personnel should be permitted to maintain, repair, adjust, and inspect industrial trucks, and a scheduled preventive maintenance, lubrication, and inspection system should be followed.
2. When truck is to be parked for maintenance: Turn off engine, lower lifting mechanism, place directional controls in neutral, (clutch type trucks may be left in gear) apply parking brake and chock wheels.
3. Before working on truck raise wheels free of floor or disconnect power source. Use chocks or other positive truck positioning devices and block carriage, innermast(s), or chassis before working under them. Before working on engine fuel system of: (a) Gasoline powered trucks with gravity feed fuel systems, be sure fuel shutoff is closed; (b) LP gas powered trucks, close LP-gas cylinder valve and run engine until fuel in system is depleted and engine dies.
4. When starting engine place shift levers in neutral and depress clutch (or brake pedal on automatic transmissions).
5. 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.
6. Properly ventilate work area, vent exhaust fumes and keep shop clean and floor dry.
7. Use hoisting equipment for heavy lifts.
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, safety 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.

(Continued)



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SAFETY INSTRUCTIONS FOR MAINTAINING INDUSTRIAL TRUCKS

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 practices. 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 rating, operation and maintenance instruction 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 practices. 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 rating and safe operation should not be performed by the user without manufacturer's approval.
18. Care should be taken to assure that all replacement parts are interchangeable with the original parts and of a quality equal to that provided in the original equipment.



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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: 8E 002-0; 8E 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.

NOTE

THIS MANUAL COVERS ALL CLARKTOR "B" MODELS (FRICTION CLUTCH, FLUID DRIVE AND AUTOMATIC TRANSMISSION MODELS).

TANGERINE PAGES PERTAIN TO THE AUTOMATIC TRANSMISSION MODELS ONLY.

WHITE PAGES PERTAIN TO BOTH FRICTION CLUTCH, FLUID DRIVE AND AUTOMATIC TRANSMISSION, AND FOUR AND SIX CYLINDER MODELS.

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

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



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TROUBLE SHOOTING GUIDE

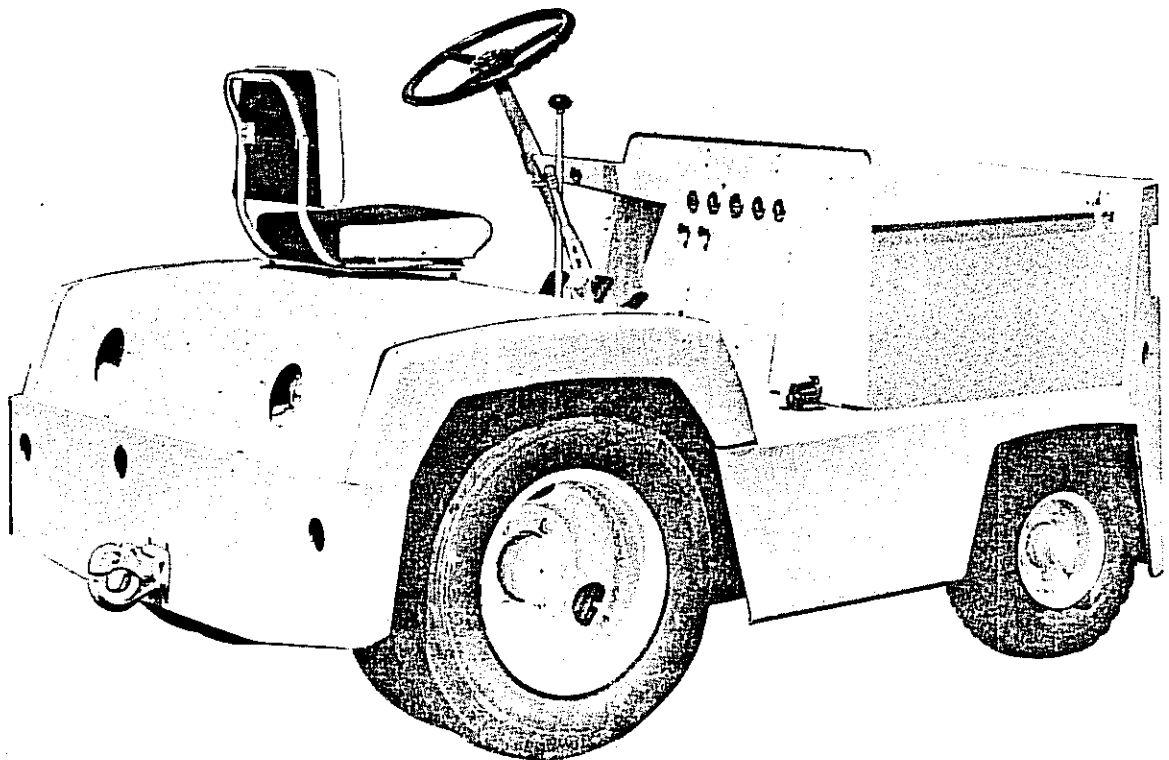
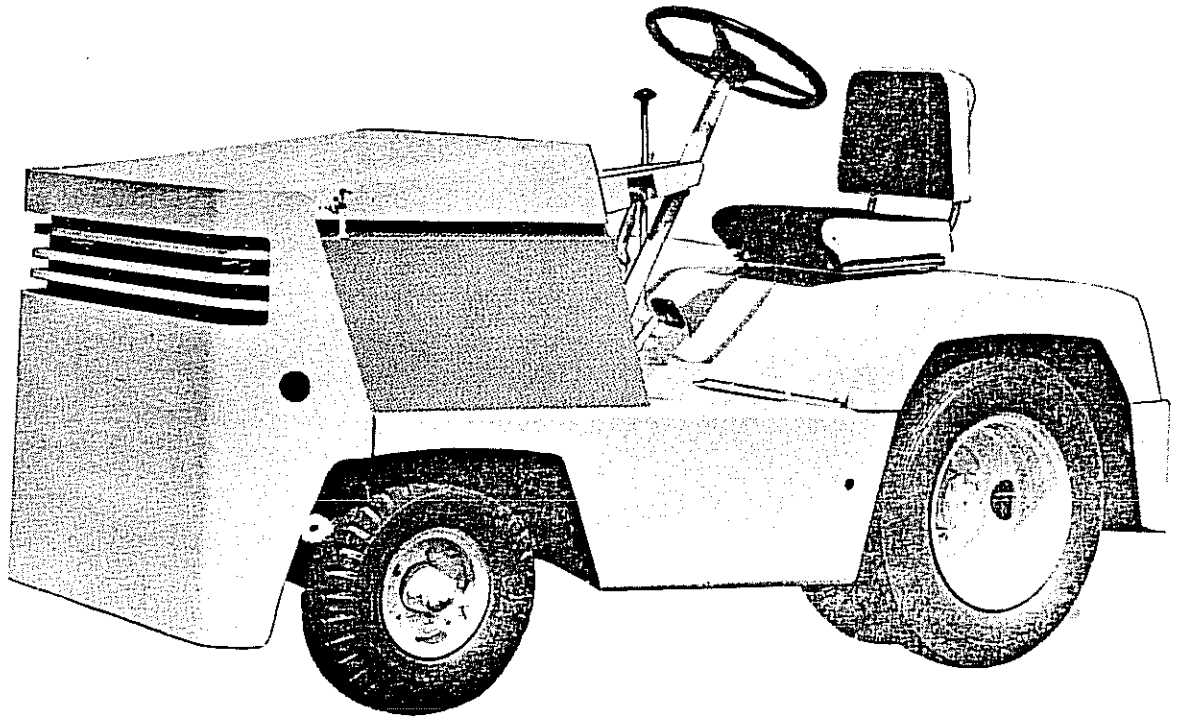
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CLARKTOR 20B, 30B, 40B, 50B

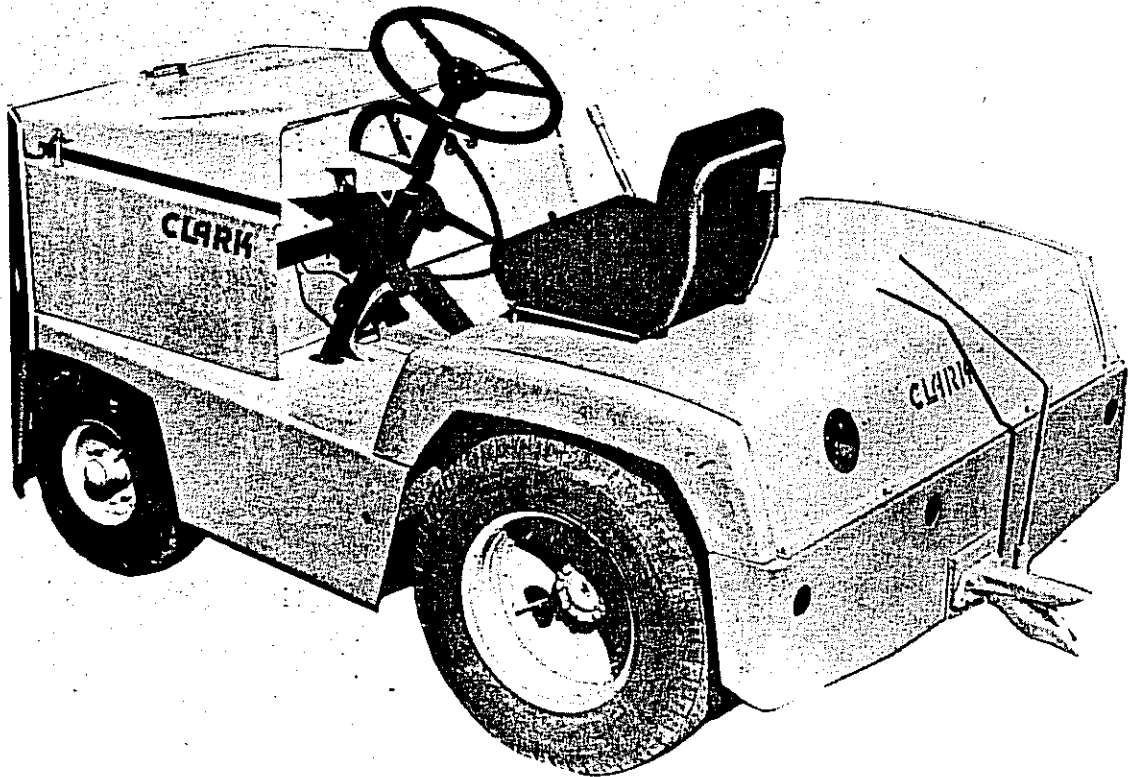
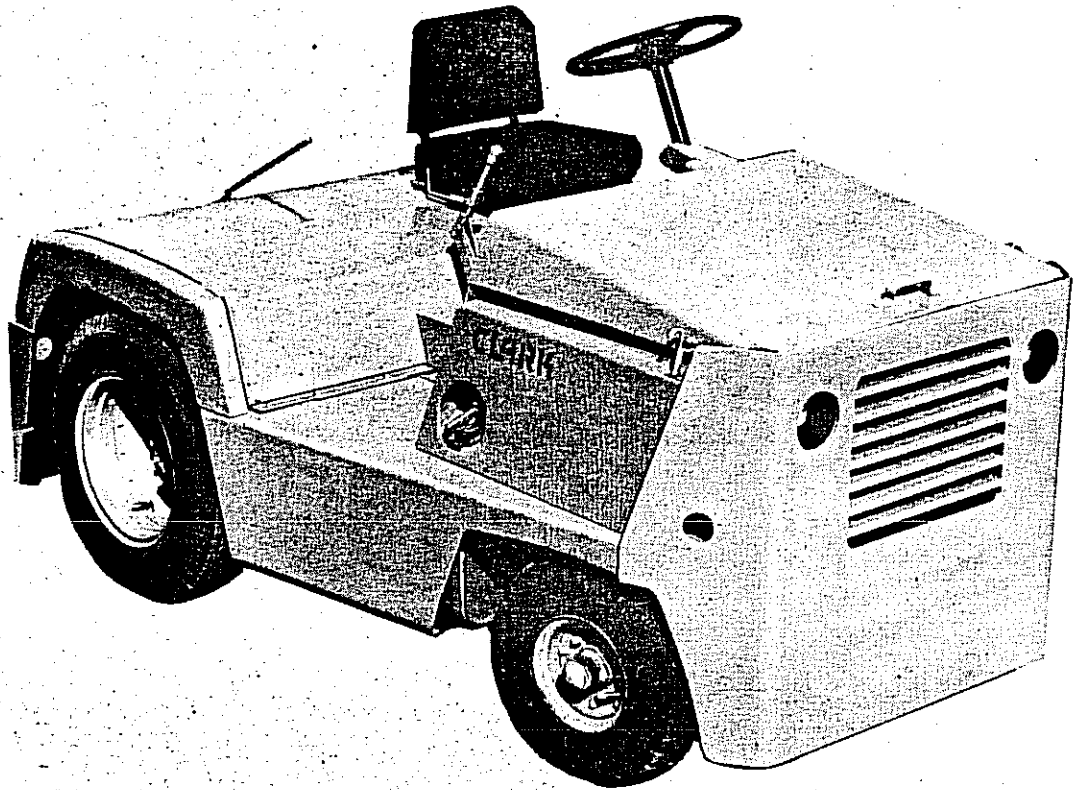


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CLARKTOR "C" AUTOMATIC WITH TORQUE CONVERTER

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SPECIFICATIONS

GENERAL

Type of vehicle Towing Tractor

Gross vehicle weight:

(CT-20B) Front Steer Axle 1547 lbs.
Rear Drive Axle 1990 lbs.

Total gross weight 3537 lbs.

(CT-30B) Front Steer Axle 1537 lbs.
Rear Drive Axle 2790 lbs.

Total gross weight 4327 lbs.

(CT-40B) Front Steer Axle 1550 lbs.
Rear Drive Axle 3600 lbs.

Total gross weight 5150 lbs.

(CT-50B) Front Steer Axle 1477 lbs.
Rear Drive Axle 4400 lbs.

Total gross weight 5877 lbs.

Draw bar pull (CT-20B) 2,000 lbs., at 12" coupler height

Draw bar pull (CT-30B) 3,000 lbs., at 12" coupler height

Draw bar pull (CT-40B) 4,000 lbs., at 12" coupler height

Draw bar pull (CT-50B) 5,000 lbs., at 12" coupler height

Overall length 97 inches

Overall width 65.5 inches

Overall height 59.5 inches

Ground clearance under rear axle 7 inches

Ground clearance between axles 9 inches

Ground clearance under front axle 5.25 inches

Grade clearance 34%

Top governed speed, no load 2750 R.P.M.

Inside tread between the front tires 37.5 inches

Inside tread between the rear tires 37.5 inches

Turning radius 108 inches

ENGINE

Type "L" head

Bore and stroke 3.4375 x 4.375

Number of cylinders 4

Maximum brake horsepower 50 at 2500 R.P.M.

Maximum torque, lbs., ft. 124 at 1200 R.P.M.

Displacement 162 cubic inches

Firing order 1-3-4-2

Oil Capacity 4.5 quarts

Lubrication system Submerged gear type oil pump
supplies oil pressure to all main,
connecting rod and camshaft bear-
ings, tappets and timing gears.

CLUTCH

Outside diameter 10 inches

Clutch pedal free travel approx. 1 inch

Clutch throwout bearing no lubrication required

GOVERNOR setting (loaded) 2650 R.P.M.

FUEL TANK capacity 17 gals.

COOLING SYSTEM capacity 10.5 quarts.

FAN BELT deflection 3/4 to 1 inch

OPTIONAL:

Split Rim Wheels torque wheel nuts to 240 lbs.
"Dry Thread"

ELECTRICAL SYSTEM 12 volt negative ground
Battery 12 volt

Generator

Brush spring tension 28 ounces

Rotation clockwise

Distributor

Contact point gap 0.022 inch

Rotation (View from cop end) counterclockwise

Dwell Angle 25°-34°

Spark Plug Gap (Resistor)035 inch

Starting Motor

Brush spring tension 35 ounces

TRANSMISSION

Speeds 3

Gear ratio:

First 3.714 to 1.000

Second 1.871 to 1.000

Third 1.000 to 1.000

Reverse 4.588 to 1.000

Capacity 6 1/4 pints.

FLUID COUPLING

Capacity 8 quarts

FRONT AXLE

Axle alignment

Toe-in 0 degrees

Camber angle 1 degree

Caster 0 degree

Left-hand turning radius angle;

left wheel 55 degrees

right wheel 38 degrees

Right-hand turning radius angle;

left wheel 38 degrees

right wheel 55 degrees

REAR AXLE

Ratio 17.311 to 1

Capacity 10 quarts

WHEELS AND TIRES

Clarktor 20B, 30B, 40B, 50B

Rear 7.00 x 17 1/2 - 6 Ply

Front 6.00 x 9 - 6 Ply

Air Pressures

Clarktor 20B, 30B, 40B, Front 30 pounds, Rear 40 pounds

Clarktor 50B Front 30 pounds, Rear 50 pounds



INDUSTRIAL TRUCK DIVISION



SPECIFICATIONS

GENERAL

Type of vehicle Towing Tractor

Gross vehicle weight:

(CT-20C) Front Steer Axle 1610 lbs.
Rear Drive Axle 2155 lbs.

Total gross weight 3765 lbs.

(CT-30C) Front Steer Axle 1600 lbs.
Rear Drive Axle 2855 lbs.

Total gross weight 4455 lbs.

(CT-40C) Front Steer Axle 1620 lbs.
Rear Drive Axle 3665 lbs.

Total gross weight 5285 lbs.

(CT-50C) Front Steer Axle 1650 lbs.
Rear Drive Axle 4465 lbs.

Total gross weight 6115 lbs.

Draw bar pull.....(CT-20C) 2,000 lbs.,
at 12" coupler height

Draw bar pull..... (CT-30C) 3,000 lbs.,
at 12" coupler height

Draw bar pull (CT-40C) 4,000 lbs.,
at 12" coupler height

Draw bar pull (CT-50C) 5,000 lbs.,
at 12" coupler height

Overall length 97 inches

Overall width 65.5 inches

Overall height 59.5 inches

Ground clearance under rear axle... 6.625 inches

Ground clearance between axles 9 inches

Ground clearance under front axle .. 5.25 inches

Grade clearance 34%

Top governed speed, no load 2600 R.P.M.

Center line of tread between the front tires
..... 43.25 inches

Center line of tread between the inside rear
tires..... 39.1875 inches

Center line of tread between the outside rear
tires..... 57.6875 inches

Turning radius..... 108 inches

ENGINE

Type "L" head

Bore and stroke 3.4375 x 4.375

Number of cylinders 6

Maximum brake horsepower..... 85 at 2600 R.P.M.

Maximum torque, lbs., ft. ... 196 at 1200 R.P.M.

Displacement 244 cubic inches

Firing order 1-3-5-6-4-2

Oil Capacity 5.5 quarts

Lubrication system - Submerged gear type oil pump
supplies oil pressure to all main,
connecting rod and camshaft bear-
ings, tappets and timing gears.

GOVERNOR setting (no load)..... 2600 R.P.M.

FUEL TANK capacity 17 gals.

COOLING SYSTEM capacity 10.5 quarts.

FAN BELT deflection 3/4 to 1 inch

Split Rim Wheels .. torque wheel nuts to 240 lbs.

"Dry Thread"

ELECTRICAL SYSTEM 12 volt negative ground

Battery 12 volt

Generator

Brush spring tension 28 ounces

Rotation clockwise

Distributor

Contact point gap 0.022 inch

Rotation (View from cap end) counterclockwise

Dwell Angle 25°-34°

Spark Plug Gap (Resistor)035 inch

Starting Motor

Brush spring tension 35 ounces

TRANSMISSION & CONVERTOR

Reverse 6.5

First 5.3

Second 8.6

Third 12.7

Speeds 3 Speed

Mounting Torque Converter Housing

Capacity (including convertor) 10 Qts.

CONVERTOR STALL RATIO

2.06:1

FRONT AXLE

Axle alignment

Toe-in 0 degrees

Camber angle 1 degree

Caster 0 degree

Left-hand turning radius angle;

left wheel 55 degrees

right wheel 38 degrees

Right-hand turning radius angle;

Left wheel 38 degrees

right wheel 55 degrees

OPERATIONS

EXCESSIVE HEAT AND CAUSE INTERNAL PRESSURE RESULTING IN DAMAGED SEALS AND LOSS OF EFFICIENCY.

TO OPERATE TOWING TRACTOR

When tractor is to be worked, depress clutch pedal with engine idling. Select gear in correct range to start intended load, apply sufficient brake pressure to overcome any clutch inertia, then release clutch pedal with the engine still idling. After full clutch release is obtained, release remaining brake pressure and depress accelerator, bringing engine up to power through the fluid coupling and gently setting tractor and load into motion. 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 in this unit is NEVER TO BE SLIPPED OR FEATHERED IN to start loads. If tractor will not move load, a lower gear should be selected. At no time should engine be allowed to run against a stalled fluid coupling as excessive heat will build up in the unit and cause internal pressures which may damage oil seals and result in a loss of fluid as well as loss of power and efficiency.

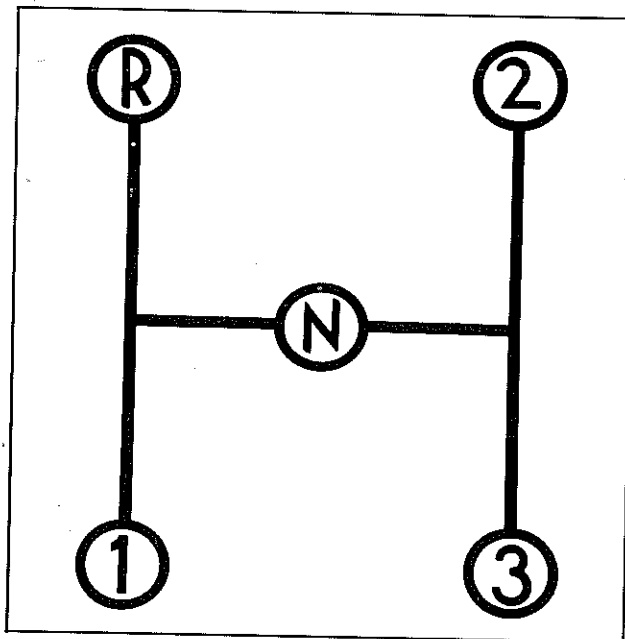


Figure 2. Gear Shift Diagram

TO OPERATE ACCESSORIES

LIGHTS. The lights are operated by two switches located on the instrument panel. The right hand switch operates the head lights and tail lights. The left hand switch operates the back up light.

TO STOP VEHICLE

- a. Remove foot from accelerator pedal.

- b. Depress foot brake pedal.
- c. As tractor comes to a halt, depress clutch pedal and place gear shift lever into neutral position.
- d. If tractor is to be parked, turn ignition switch to "OFF" position and apply hand brake.

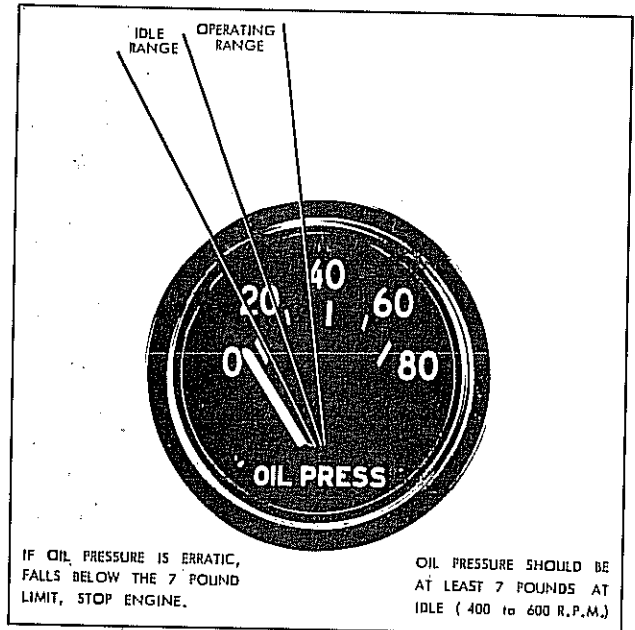


Figure 3. Oil Pressure Indicator

SAFETY PRECAUTIONS

- a. Only qualified drivers should be allowed to operate the tractor.

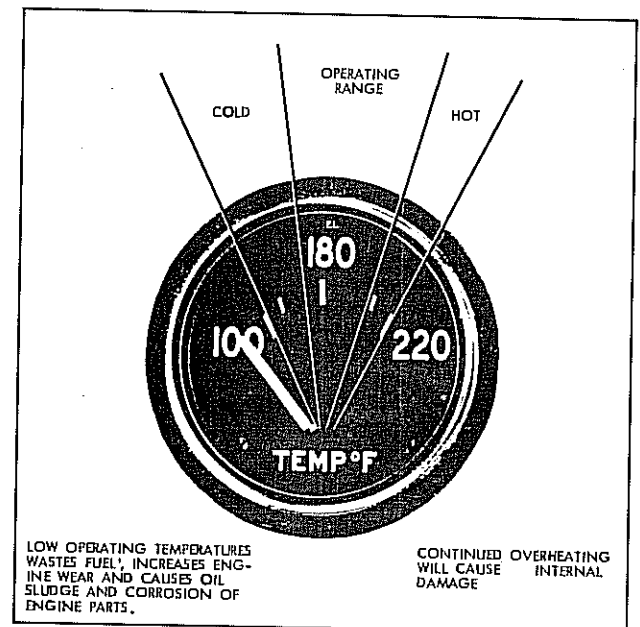


Figure 4. Temperature Indicator



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OPERATIONS

- b. Do not tow a train of more than eight trailers.
- c. Drive slowly in rough or congested areas.
- d. Do not drive with wet or greasy hands.
- e. Observe the Operating Rules and Preventive Maintenance Instructions A.S.A. B56.1 Safety Code

for Powered Industrial Trucks.

NOTE

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

NOTE:

PERFORM THE 100 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE AFTER THE FIRST 50 HOUR OF OPERATION ON NEW MACHINES

OPERATIONS

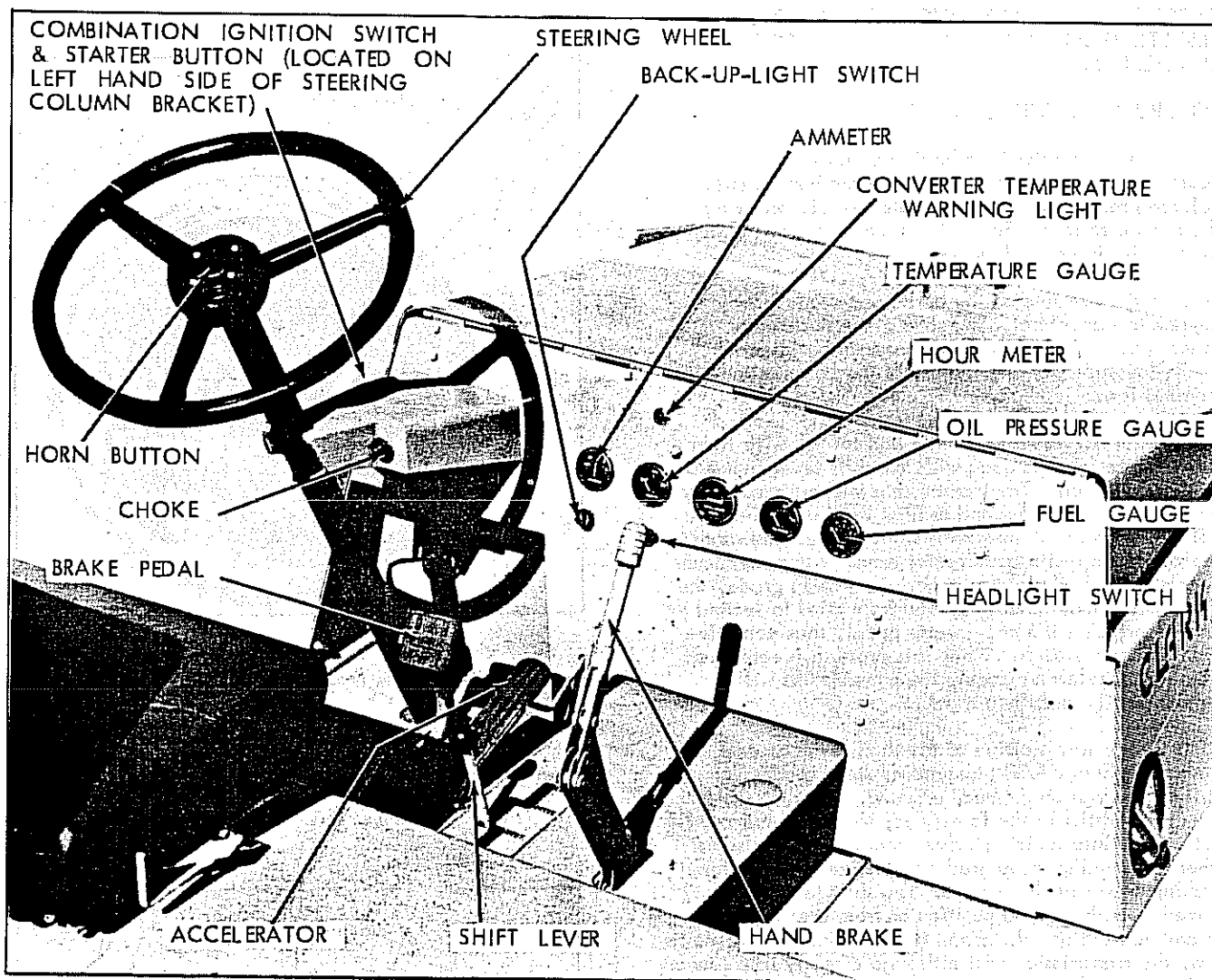


Figure 1. Location of Controls

PURPOSE AND USE OF OPERATING CONTROLS

SHIFT LEVER. It is used to direct the tractor transmission which supplies the vehicle with two 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, oil pressure, water temperature, fuel indicator and hour meter. The combination ignition and starter switch is mounted on the steering column support bracket.

TO START ENGINE

With accelerator 1/3 open, pull out on choke button. Disengage the clutch and place shift lever in neutral position. Turn ignition switch to start position and 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. 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. THE FLUID COUPLING MAY BUILD UP

OPERATIONS

EXCESSIVE HEAT AND CAUSE INTERNAL PRESSURE RESULTING IN DAMAGED SEALS AND LOSS OF EFFICIENCY.

TO OPERATE TOWING TRACTOR

When the tractor 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 tractor in motion. Particular attention should be given to the following regarding the use of the automatic transmission.

a. All normal forward driving and towing with light to moderate loads is done with the shift lever in the D or drive position. The transmission will automatically upshift from first to second to high or direct drive and will automatically downshift through the same ranges at speeds varying with accelerator feed. When maximum acceleration is desired to negotiate a steep grade, the transmission may be downshifted from third to second by fully depressing the accelerator pedal, thus actuating the kickdown switch. When this pressure is released from the accelerator pedal, the transmission will automatically upshift to third.

b. The L or low position of the shift lever is used for towing heavy loads, ascending steep grades, or pulling through sand, mud, or snow. When starting from a standstill in the low range, the transmission will not upshift into a higher drive range. Low is also used when descending steep grades to utilize the additional braking power of the engine. The shift lever may be moved from the L to D position or from D to L position at any vehicle speed. When downshifting from drive to low, the transmission will either go directly into low or go into second and then to low depending on the vehicle speed.

c. The tractor must be brought to a complete stop before placing the shift lever into the R or reverse position. To rock the tractor back and forth, maintain a steady but moderate pressure on the accelerator pedal and move the shift lever back and forth between the R and D positions.

TO OPERATE ACCESSORIES

LIGHTS. The lights are operated by two switches located on the instrument panel. The right hand switch operates the head lights and tail lights. The left hand switch operates the back up light.

TO STOP VEHICLE

- a. Remove foot from accelerator pedal.
- b. Depress foot brake pedal.
- c. As tractor comes to a halt, place gear shift lever into neutral position.
- d. If tractor is to be parked, turn ignition switch to "OFF" position and apply hand brake.

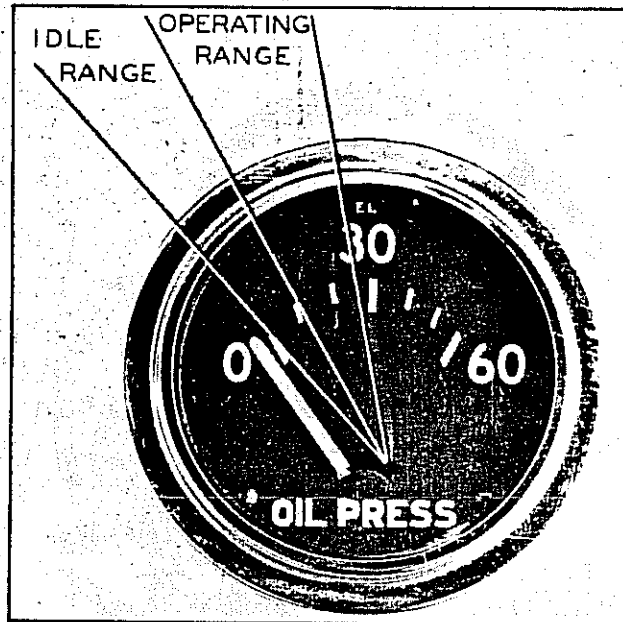


Figure 3. Oil Pressure Indicator

SAFETY PRECAUTIONS

- a. Only qualified drivers should be allowed to operate the tractor.

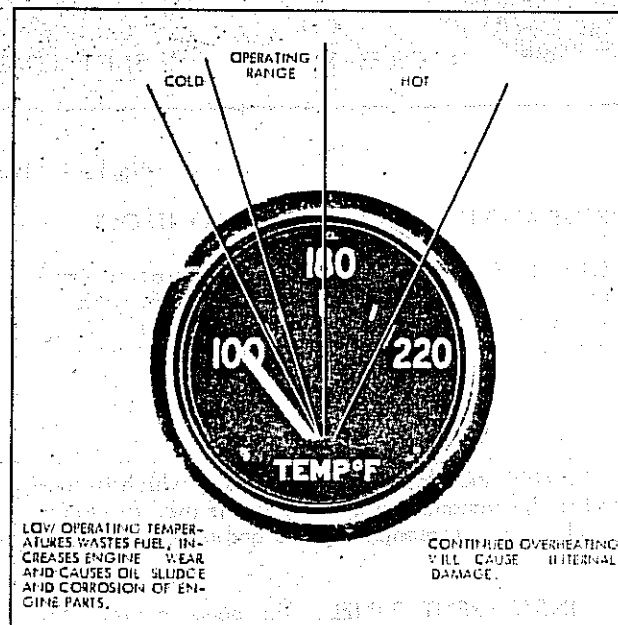


Figure 4. Temperature Indicator



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OPERATIONS

- b. Do not tow a train of more than eight trailers.
- c. Drive slowly in rough or congested areas.
- d. Do not drive with wet or greasy hands.
- e. Observe the Operating Rules and Preventive Maintenance Instructions A.S.A. B56.1 Safety Code

for Powered Industrial Trucks.

NOTE

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

NOTE:

PERFORM THE 100 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE AFTER THE FIRST 50 HOUR OF OPERATION ON NEW MACHINES



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NOTE

WHEN PERFORMING THE 100 OR 1000 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE, ALWAYS INCLUDE THE PREVIOUS LUBRICATION AND PREVENTIVE MAINTENANCE SCHEDULES.

NOTE: PERFORM THE 100 HOUR LUBRICATION AND PREVENTIVE MAINTENANCE AFTER THE FIRST 50 HOURS OF OPERATION ON NEW MACHINES.

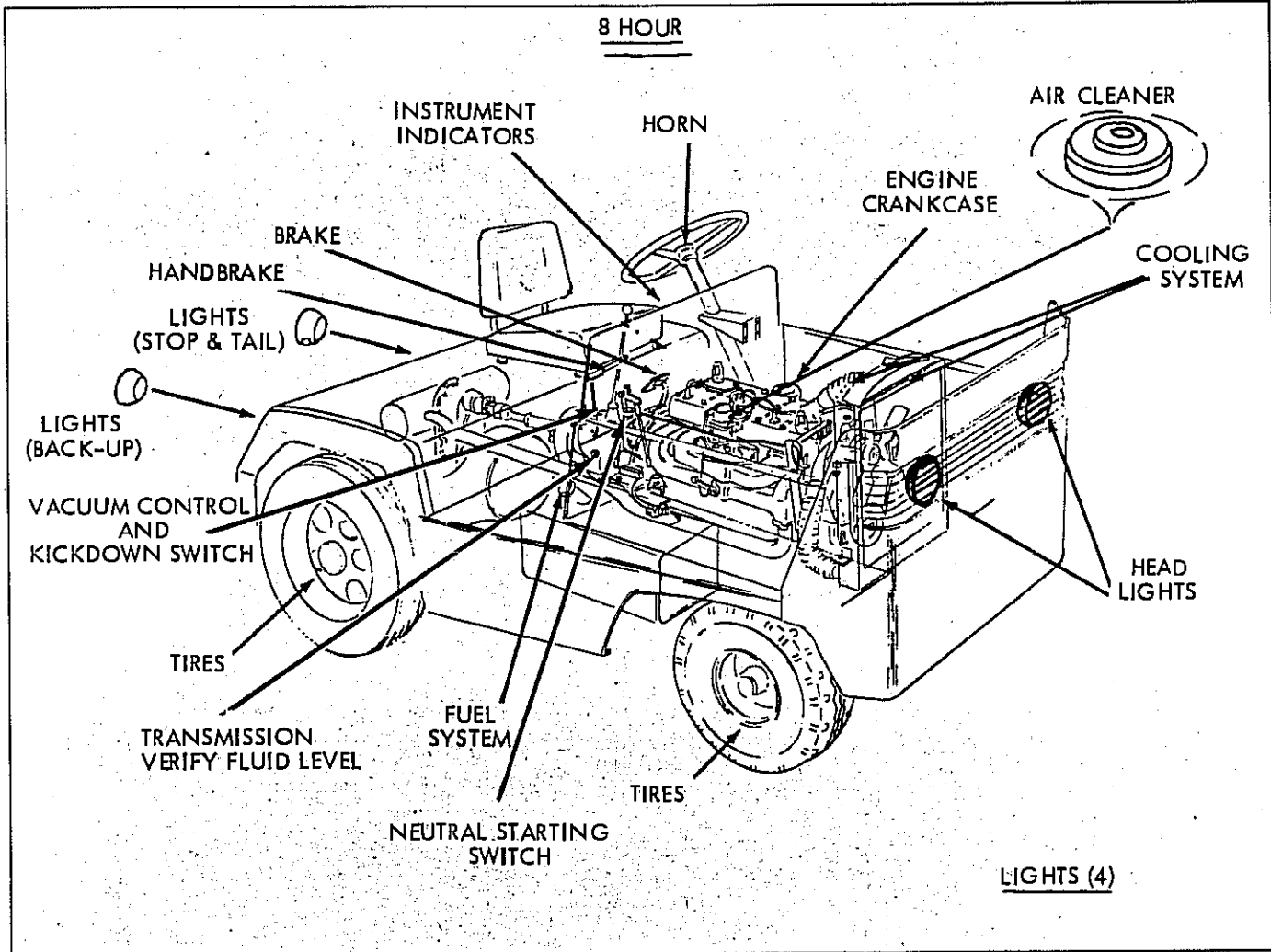


Figure 1. Lubrication & Preventive Maintenance Illustration

ENGINE CRANKCASE. Before attempting to start the tractor, first make sure that the engine has sufficient oil. The oil filler pipe is located on the right side of the engine. The oil level gauge is of the dipstick or bayonet type and is also located on the right side of the engine. Fill the crankcase reservoir through the filler pipe to the proper level as indicated on the dipstick, Figure 2. Never permit the oil level to fall below the "LOW" mark on the gauge.

CAUTION

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

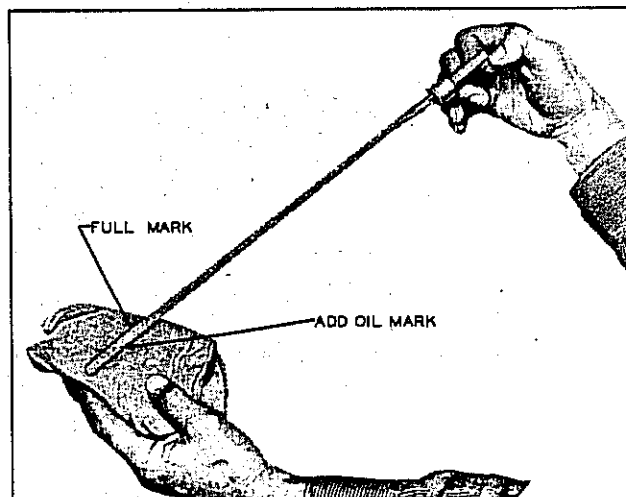


Figure 2. Crankcase Oil Check

LUBRICATION AND PREVENTIVE MAINTENANCE

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.

CAUTION

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

CAUTION

WHEN PERMANENT ANTI-FREEZE OF THE ETHYLENE GLYCOL TYPE IS USED, THE COOLANT SOLUTION MUST CONTAIN AT LEAST 40% WATER.

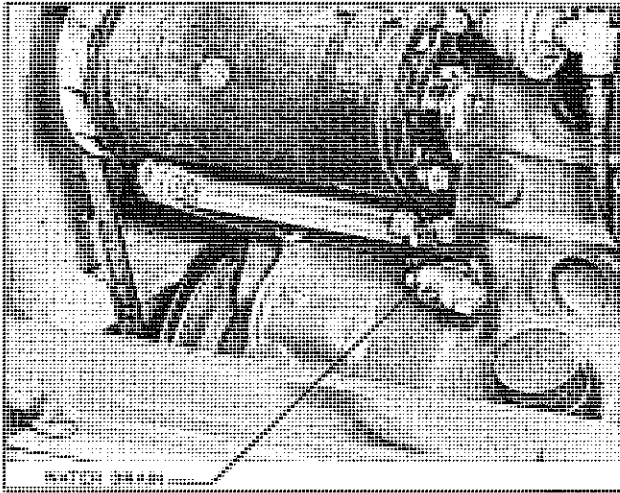


Figure 3. Cylinder Block Water Drain

ENGINE AIR CLEANER. Make sure that air cleaner has been properly serviced. The air cleaner is of the oil bath type and the oil level should be maintained at the oil level mark on the oil cup.

GAS TANK. Fill with clean regular grade gasoline.

LIGHTS. Check head lights, tail lights, brake lights and back up lights to be sure they are working properly.

HORN. Check to be sure the horn is working properly.

CLUTCH PEDAL. Depress clutch pedal from the top position to a point where it meets resistance. This free travel should be about 1 inch from top pedal position.

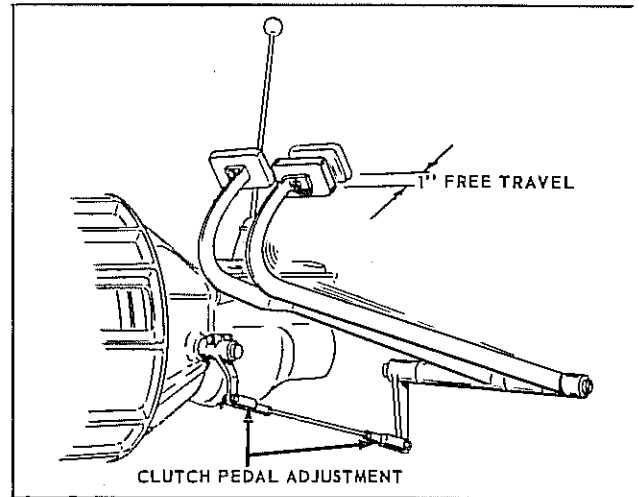


Figure 4. Clutch Pedal Free Travel

BRAKES. Depress brake pedal. Pedal **MUST** be solid, must not be spongy or drift. Pedal should have 1/4 to 1/2 inch free play.

Make certain that the Parking Brake is working properly and will hold truck on a reasonable grade.

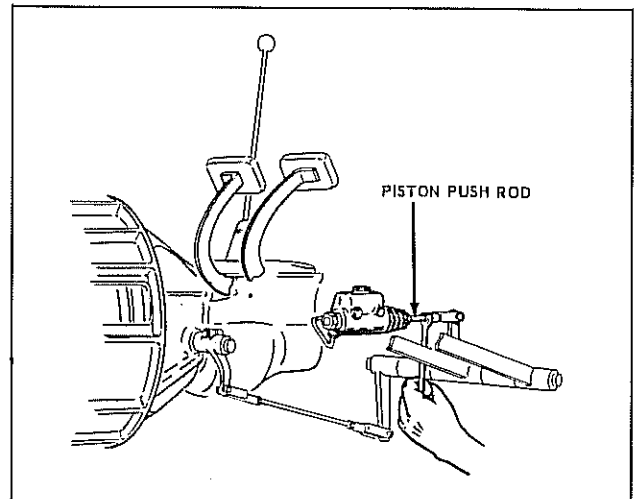


Figure 5. Brake Pedal Free Travel

TIRES. Inspect for proper inflation pressure.

Clarktor 20B, 30B, 40B

Front - 30 lbs.

Rear - 40 lbs.

Clarktor 50B

Front - 30 lbs.

Rear - 50 lbs.



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

TIRE AND RIM MAINTENANCE

Inspect tires and wheels regularly for cuts, breaks, alignment, security of wheel clamp bolts (on machines 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 wedging into it. Tires with cuts threated 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.

NOTE

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

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

On SPLIT RIM WHEELS, before inflating tires, make certain all wheel nuts are tightened to proper torque (See Specifications).

In all cases, when removing tires with SPLIT RIMS from the truck for repair or periodic rotation, COMPLETELY DEFLATE TIRES. This may be accomplished by removing the valve core.

In all cases, when removing tires equipped with the LOCK RING TYPE RIM from the truck for repair or periodic rotation, COMPLETELY DEFLATE TIRES. This may be accomplished by removing the valve core.

WARNING

WHEN REPAIRING TIRES USED ON TRUCKS 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) Inflat 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) Turn rim and wheel over once again so that lock ring is on the bottom and inflate tire to proper pressure.

NOTE

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 exists, 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.

CAUTION

BEFORE REMOVING TIRE FROM RIM, RELEASE ALL AIR FROM THE TIRE BY REMOVING VALVE STEM GORE.

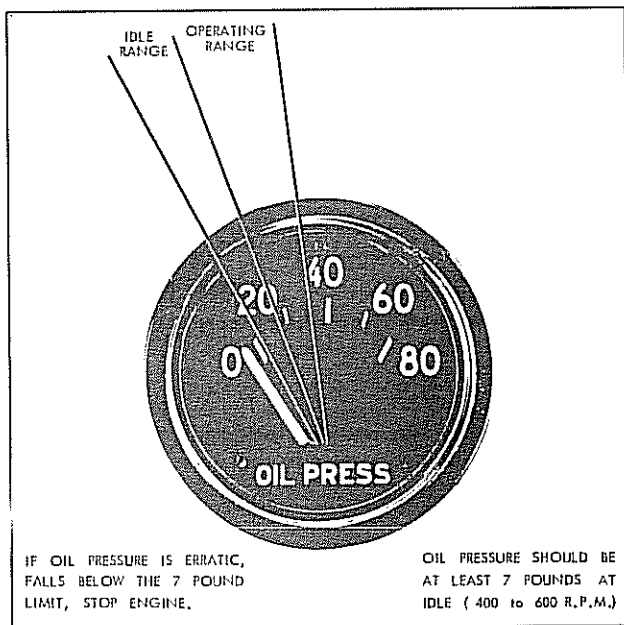


Plate 6288. Oil Pressure Indicator

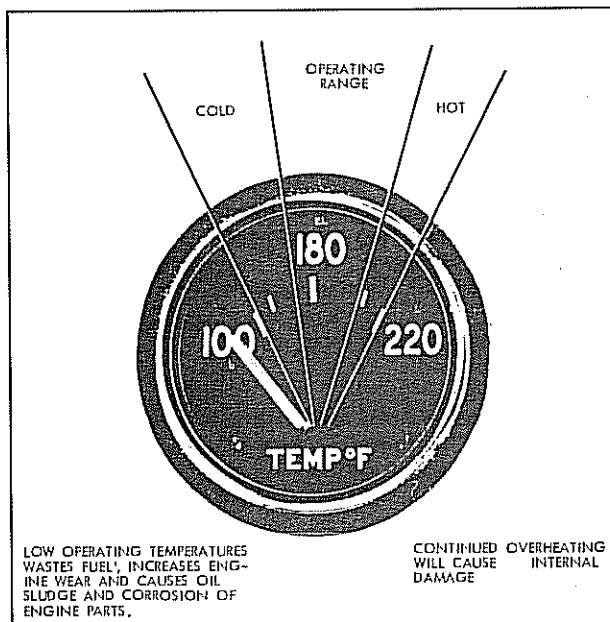


Plate 6287. Temperature Indicator

INSTRUMENT INDICATORS

a. Oil Pressure Indicator. Oil pressure should be at least 7 pounds at idle (400 to 600 R.P.M.) CAUTION: 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.

CAUTION

ON NEW MACHINES, AFTER STARTING ENGINE -- RUN IT AT IDLE FOR 5 MINUTES, THEN STOP ENGINE AND RECHECK OIL LEVEL IN CRANKCASE - BRING OIL LEVEL TO HIGH MARK, IF NECESSARY.

b. Temperature Indicator. The water temperature should register 185° to 205° F. after the first ten or fifteen minutes of operation.

c. 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.

NOTE

BEFORE PLACING MACHINE IN OPERATION RUN ENGINE A FEW MINUTES TO WARM OIL ESPECIALLY IN COLD OPERATING CONDITIONS.

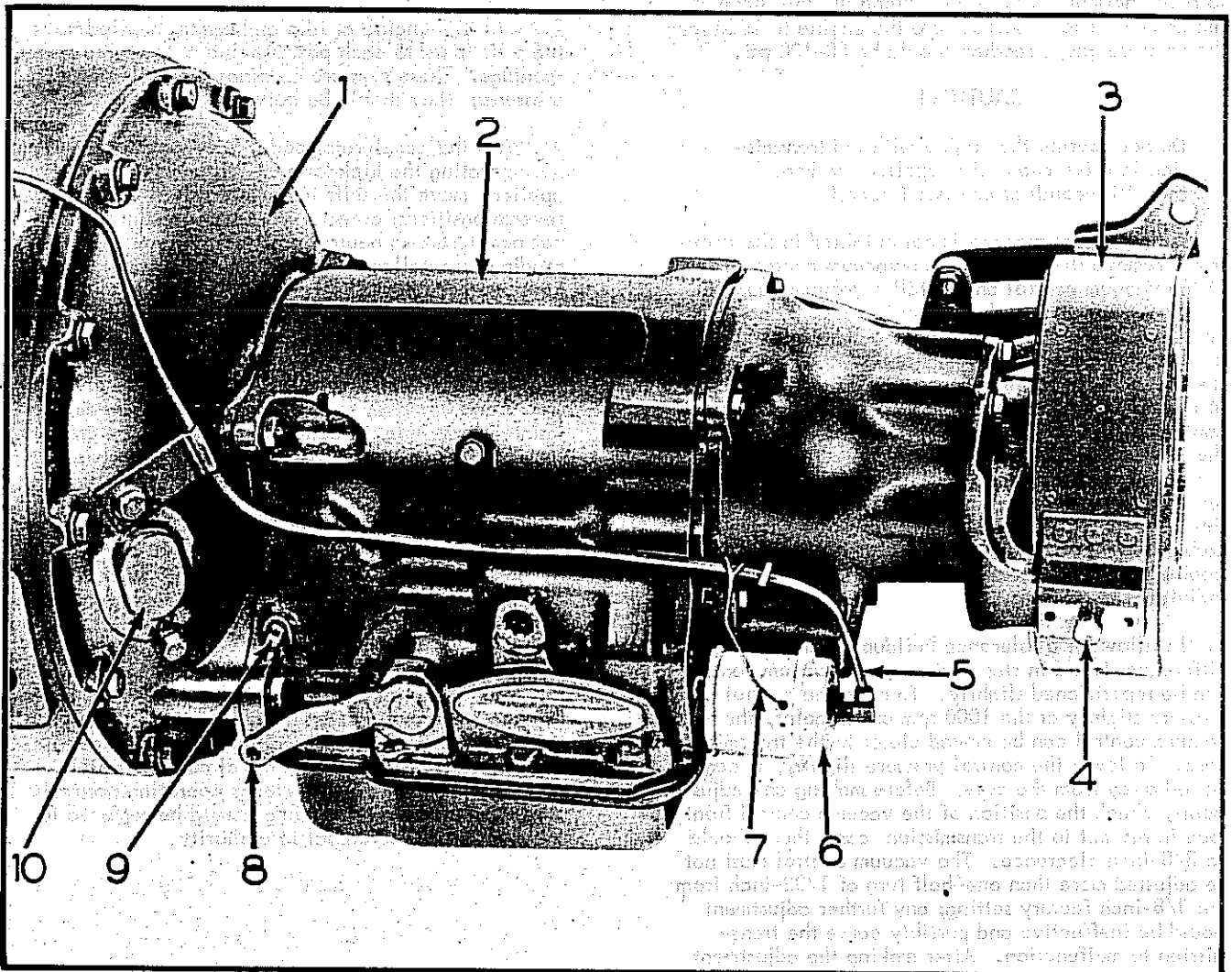
LOW OPERATING TEMPERATURES WASTES FUEL AND INCREASES ENGINE WEAR.

NEUTRAL STARTING SWITCH.

1. Check the operation of the neutral starting switch by trying to start the engine with the shift lever in all positions. The engine should start only when the shift lever is in the N (neutral) position.
2. If the engine starts in position other than neutral, the neutral starting switch must be repositioned on the shift linkage bracket, which is located immediately under the foot board plate but is accessible from the engine compartment. Loosen the two switch-to-shift linkage bracket bolts, flat washers, lock washers, and hexagon nuts that hold the switch to the bracket; reposition the switch and tighten. Repeat step 1 above.

KICKDOWN SWITCH.

1. Check the operation of the kickdown switch (1), actuated by the accelerator pedal. The kickdown switch is mounted on the engine side of the dash to the rear of the carburetor and is activated by the accelerator rod when in full open position.
2. To adjust the kickdown switch, loosen the two nuts that position the switch on the kickdown switch mounting bracket. Position the switch on the bracket so that it is activated in the last 1/4-inch travel of the accelerator rod; secure with the two nuts.



1. Torque Converter Housing
2. Transmission
3. Parking Brake
4. Anchor Clip Screw
5. Carburetor-to-vacuum control line

6. Vacuum Control and Solenoid Unit
7. Kickdown switch-to-vacuum control wire
8. Manual shift lever
9. Pressure gauge port pipe plug
10. Converter housing cover plate

Figure 1. Transmission, Left Side



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

VACUUM CONTROL.

1. Check the operation of the vacuum control and solenoid unit, located to the left rear of the transmission. The distance between its front face and the transmission case should be $3/8$ -inch. If necessary, loosen the locknut, adjust the clearance to $3/8$ -inch; tighten the locknut.

2. If shifts are delayed or soft, allowing the engine to "runup", the vacuum control should be checked. With a tachometer attached to the engine, remove the $1/8$ -inch pipe plug (9) and install a pressure gauge line in the pipe plug seat. Connect a 0-300 psi pressure gauge to the line. With the hand and service brakes applied, start the engine and allow the engine to reach normal temperature. Place the shift lever in the drive position. Accelerate the engine to 1000 rpm; the pressure gauge reading should be 80-100 psi.

CAUTION

Do not operate the engine with the transmission in drive and brakes applied for more than 10 seconds at any one interval.

3. If the correct pressure is not obtained in the above tests, remove the carburetor-to-vacuum control line at the vacuum control and install a vacuum gauge in the line. Repeat the check given in step 2 above; the vacuum gauge should read 5.8 to 6.8 inches of mercury at 1000 rpm. If minor differences build up, refer to step 4. A low vacuum reading would indicate a leak at the carburetor gasket, in the carburetor-to-vacuum control line, or in the vacuum control unit. Remove the line at the carburetor. Check to see if the trouble is in the line or the carburetor gasket by repeating the test with the vacuum gauge attached to the carburetor line fitting. A high reading indicates the line or carburetor adapter plate passages are plugged. If the trouble cannot be corrected, report it to the designated individual in authority.

4. To allow for a tolerance buildup of minor differences found in step 2 above, the vacuum control can be repositioned slightly. To raise the control pressure slightly at the 1000 rpm check point, the vacuum control can be moved closer to the transmission case. To lower the control pressure slightly, it can be moved away from the case. Before making any adjustments, check the position of the vacuum control front face in respect to the transmission case; there should be $3/8$ -inch clearance. The vacuum control must not be adjusted more than one-half turn of $1/32$ -inch from the $3/8$ -inch factory setting; any further adjustment would be ineffective and possibly cause the transmission to malfunction. After making the adjustment, make sure the locknut and the electrical control wire are tight. Remove the gauge from the pipe plug seat and install the $1/8$ -inch pipe plug, tighten to a torque 7 to 12 ft/lbs. If the adjustment of the control pressure cannot be made within the above limits, report the trouble to the designated individual in authority.

CONTROL PRESSURES. Control pressure varies with throttle opening and road speed. When the tractor is held stationary with the brakes, control pressure varies with throttle opening only.

1. Remove the $1/8$ -inch pipe plug and install a pressure gauge line in the opening. Connect a 0-300 psi pressure gauge to the line. With the hand and service brakes applied, start the engine and allow engine to reach normal operating temperature.

CAUTION

Do not operate the engine with the transmission in any gear when brakes are applied for more than 10 seconds at any one interval.

2. With the engine at idle and brakes applied move the shift lever to each position and observe the gauge readings. These pressure readings are called idle pressures; they should be between 50 and 70 psi.

3. With the accelerator pedal fully depressed but not operating the kickdown switch and the brakes applied, move the shift lever into drive, low, and reverse positions; observe the gauge readings. Do not accelerate in neutral position. These pressure readings are called stall pressures; they should be between 130 and 160 psi.

4. If the idle pressures are found to be above those specified in 2 and 3, repeat the vacuum control check. If idle or stall pressures are below the limits given in step 2 and 3 above, report the trouble to the designated individual in authority. Remove the pressure gauge and line. Install the $1/8$ -inch pipe plug, tighten to a torque of 7 to 12 ft/lbs.

TORQUE CONVERTER.

1. Install a tachometer on the engine. With the hand and service brakes applied, start the engine and allow it to reach normal operating temperature.

2. With the shift lever in drive or low range, depress the accelerator pedal fully and observe the tachometer reading. Normal converter stall speed is 1560 rpm. A stabilized tachometer reading, remaining steady for 5 to 10 seconds, at the normal converter stall speed, indicates the converter is operating normally. Any other tachometer reading should be reported to the designated individual in authority.

ENGINE CRANKCASE. Every 100 operating hours, drain and refill. Drain only when hot. Run engine a few minutes and add oil as necessary to bring oil level to full mark indicated on the dipstick.

Crankcase Capacity — Refer to Specifications

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

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

CAUTION

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

COOLING SYSTEM. Check radiator and hoses 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 radiator 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 amounts of anti-freeze solution required to protect the cooling system, refer to instructions on anti-freeze container.

Cooling System Capacity - Refer to Specifications.

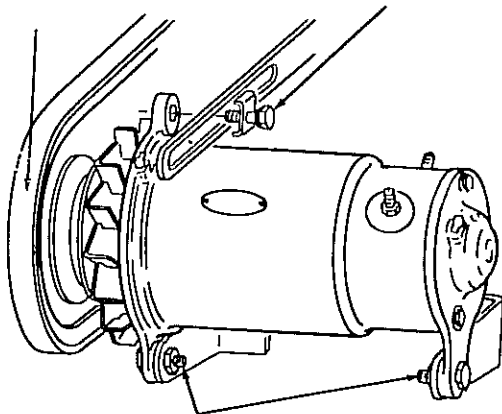


Figure 3. Fan Belt Adjustment

FAN AND GENERATOR DRIVE BELT

Adjustment: The drive belt should have finger pressure deflection of 3/4 inch midway on long span. If drive belt requires adjustment, loosen generator brace adjusting bolt and two lower mounting bolts. Move generator toward cylinder block to loosen belt and away from cylinder block to tighten belt. Tighten bolts when proper adjustment is reached.

Replacement: Loosen generator adjustment screws and mounting bolts. Move generator toward engine, slip belt off generator pulley, then crankshaft pulley and over fan. Install belt over fan and pulleys. Adjust to proper deflection.

INTAKE AND EXHAUST MANIFOLDS. Inspect gaskets for leaks and inspect security of manifold nuts.

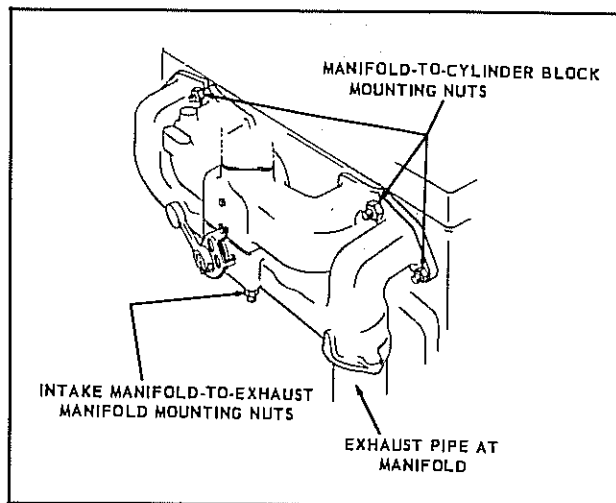


Figure 4. Intake and Exhaust Manifolds

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.

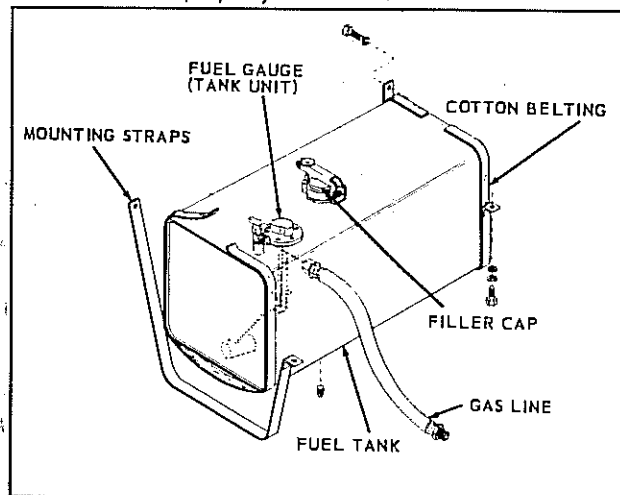


Figure 5. Fuel Tank and Lines

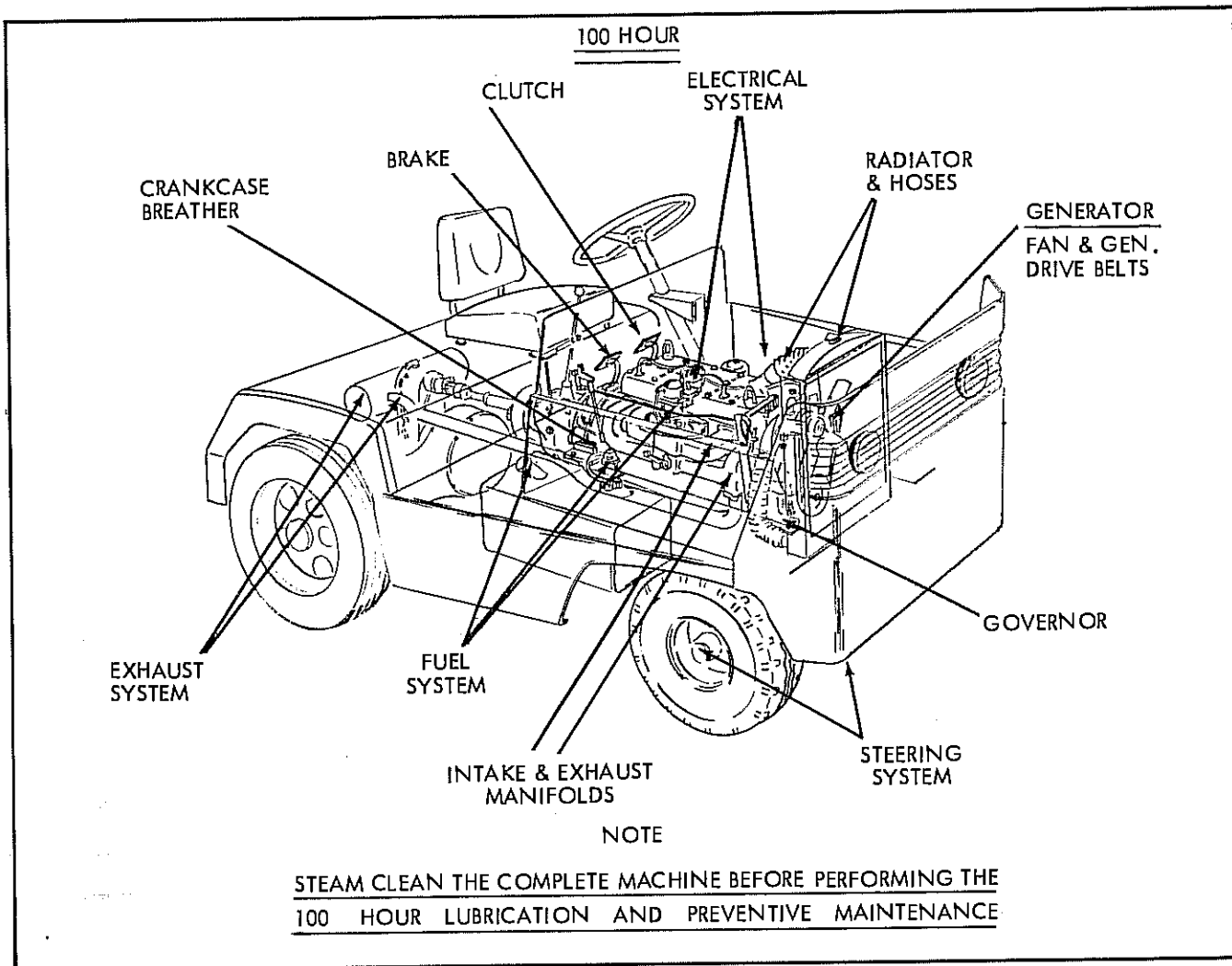


Figure 1. Lubrication & Preventive Maintenance Illustration

GOVERNOR. The purpose of the governor is to limit the top speed of the engine to a desired R.P.M. The governor is located on the camshaft gear behind the timing gear cover. It consists of a ball bearing assembly engaged to the governor cup and shaft assembly which acts on the governor arm. The function of the governor is based on action of two forces working against each other. One is the centrifugal force exerted on the ball bearing assembly when engine is running, tending to close the throttle. The other force consists of two adjustable springs, one located inside the timing gear cover, and the other attached to the external part of the governor arm. Both tend to open the throttle by counteracting the pressure of the cup against the governor arm. To set governor properly it is necessary to use an electric tachometer. Proceed with the governor adjustment in this manner:

a. Connect tachometer to engine, start engine and warm up to normal temperature.

b. To decrease engine speed, loosen speed con-

trol nut, as shown in figure 2, which decreases tension on spring. To increase speed, tighten speed control nut.

c. If engine should surge or not maintain steady top speed, then adjustment for the surge can be made at the governor spring bumper screw in the gear cover by loosening the lock nut and turning bumper screw, as shown in figure 2, to the right until surging ceases and engine runs steady at top speed. Tighten lock nut securely after adjustment. It may be necessary to readjust top speed after making surge adjustment.

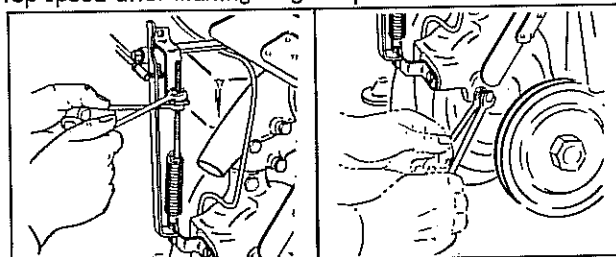


Figure 2. Governor Speed Control (left), Surge (right)

LUBRICATION AND PREVENTIVE MAINTENANCE

CARBURETOR. Make adjustments of the carburetor as follows:

a. Idle Fuel Adjustment: The carburetor is controlled by the idle adjustment screw that regulates the fuel-air mixture, see figure 6. Turn the screw clockwise for a richer mixture, or counterclockwise for a leaner mixture. If a vacuum gauge is used, turn screw until highest vacuum reading is obtained. If a gauge is not used, set screw to a range at which engine idles its smoothest.

b. Idle Speed Adjustment. See figure 6. A stop screw controls action of the throttle valve. Turn screw clockwise for faster idle speed, or counterclockwise for slower idle speed. This adjustment should be made with a tachometer. Idling speed should be set for 450 to 500 revolutions per minute. Reset idle mixture screw if necessary, after throttle adjustment has been made.

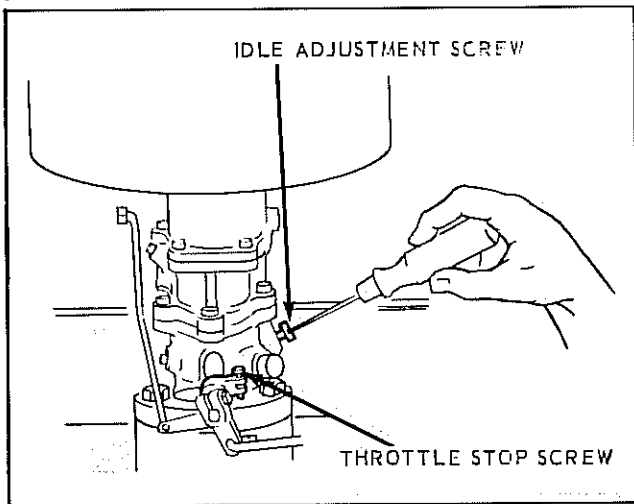


Figure 6. Adjusting Carburetor

CLUTCH PEDAL ADJUSTMENTS. The clutch pedal should be adjusted for 1 inch free travel.

The clutch pedal adjustment is to compensate for clutch facing wear. The adjustment is made beneath the floor plates at the release bearing shaft yoke, see figure 7.

- a. Loosen clutch control rod and adjusting yoke lock nut.
- b. Remove cotter pin and yoke pin.
- c. Adjust yoke to provide proper pedal free travel.
- d. Install yoke pin and cotter pin.
- e. Tighten lock nut.

CAUTION

ALWAYS KEEP CLUTCH FACINGS DRY AND FREE FROM OIL. NEVER PUT OIL OR KEROSENE IN

THE CLUTCH. CLUTCH RELEASE BEARING DOES NOT REQUIRE LUBRICATION.

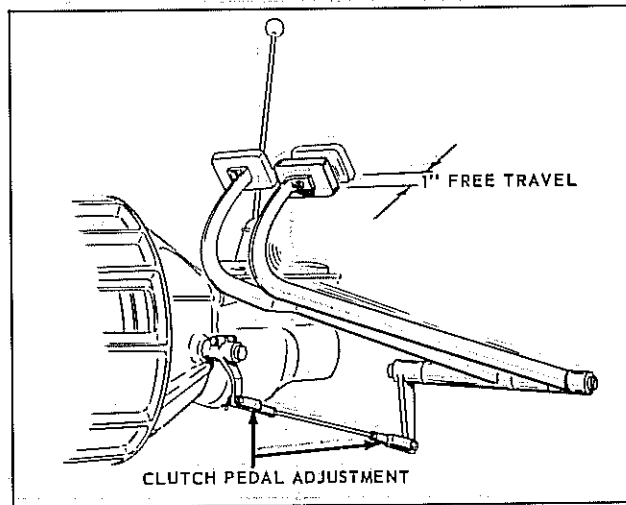


Figure 7. Clutch Pedal Adjustment

FLUID COUPLING. Verify fluid level. Rotate unit so that the filler plug is about 50° from top dead center, or until the words "TOP FOR FILLING," which are stamped on the outside diameter, appear on top dead center. Fill if necessary with Automatic Transmission Fluid Type "A" (Armour Qualified).

TRANSMISSION. Verify lubricant level, fill if necessary with S.A.E. 90 Gear Lube.

DROP GEAR CASE. Verify lubricant level, fill if necessary with S.A.E. 90 Gear Lube.

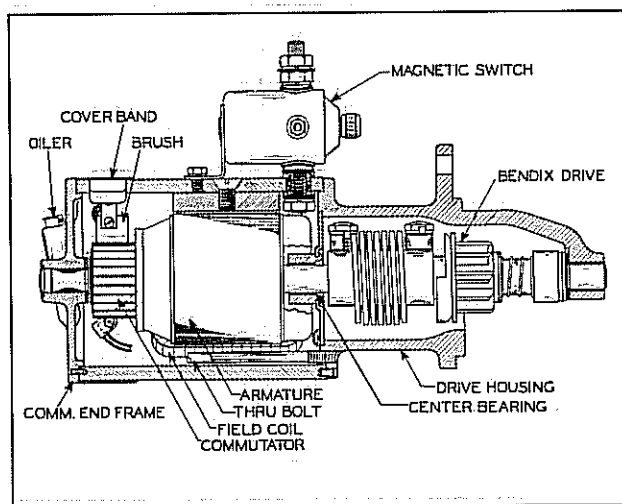


Figure 8. Starting Motor

STARTER. Bearings provided with hinge cap oilers should have from 8 to 10 drops of S.A.E. No. 20 engine oil every 100 operating hours.

CARBURETOR. Make adjustments of the carburetor as follows:

1. **Idle Fuel Adjustment:** The carburetor is controlled by the idle adjustment screw that regulates the fuel-air mixture. Turn the screw clockwise for a richer mixture, or counterclockwise for a leaner mixture. If a vacuum gauge is used, turn screw until highest vacuum reading is obtained. If a gauge is not used, set screw to a range at which engine idles its smoothest.

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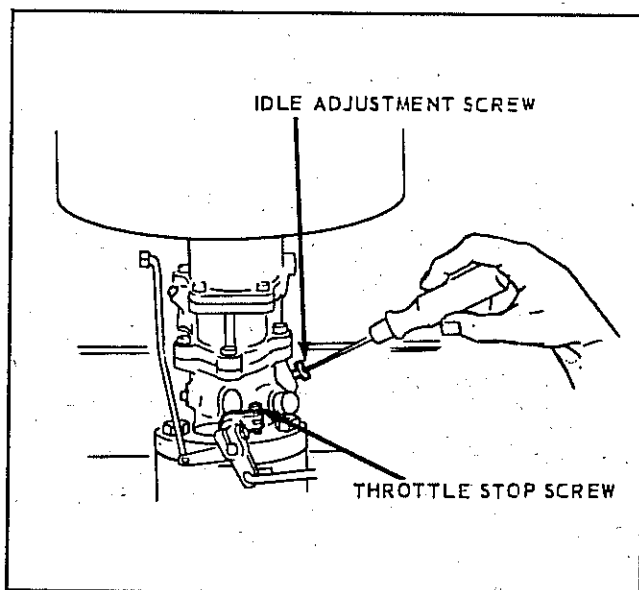


Figure 6. Adjusting Carburetor

DROP GEAR CASE. Verify lubricant level, fill if necessary with S.A.E. 90 Gear Lube.

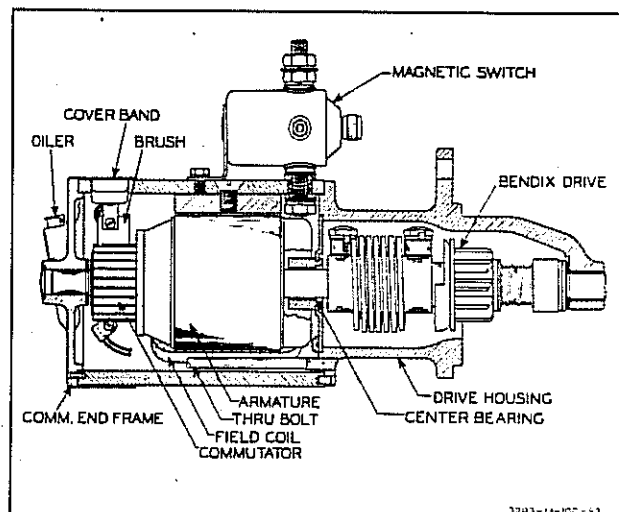


Figure 8. Starting Motor

STARTER. Bearings provided with hinge cap oilers should have from 8 to 10 drops of S.A.E. No. 20 engine oil every 100 operating hours.

LUBRICATION AND PREVENTIVE MAINTENANCE

DISTRIBUTOR

Inspection: Remove distributor cap (without removing wires). Wipe cap with a clean cloth. Examine rotor and cap for chips, cracks, corroded terminals,

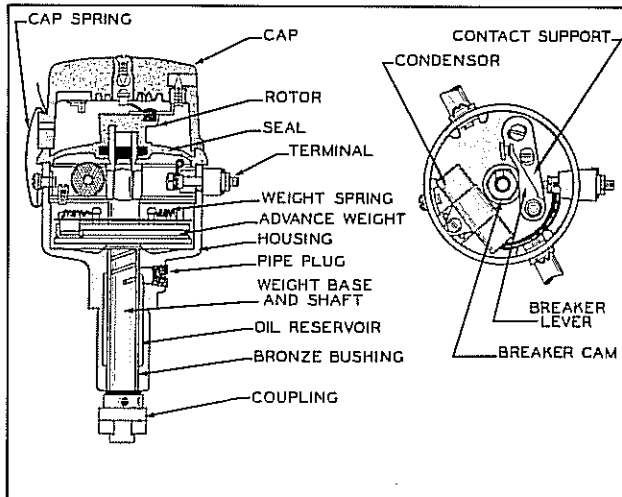


Figure 9. Distributor

carbon runners (paths) which will allow high-tension leakage to ground, or if the vertical faces of the inserts are burned -- install a new cap.

If the horizontal faces of the inserts are burned, replace the cap and rotor as this is due to the rotor being too short.

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

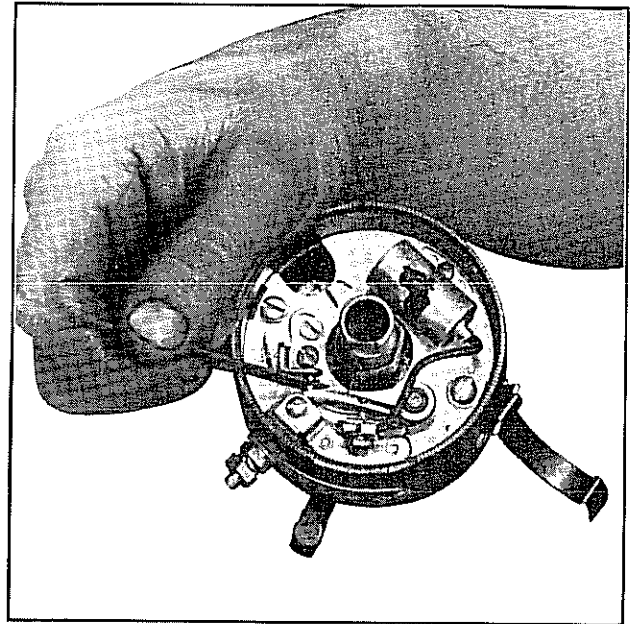


Figure 11. File Contact Points

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

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

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

If the condenser capacity is too high, the crater (depression) will form in the positive contact. If the condenser capacity is too low, the crater will form in the negative contact, see figure 10.

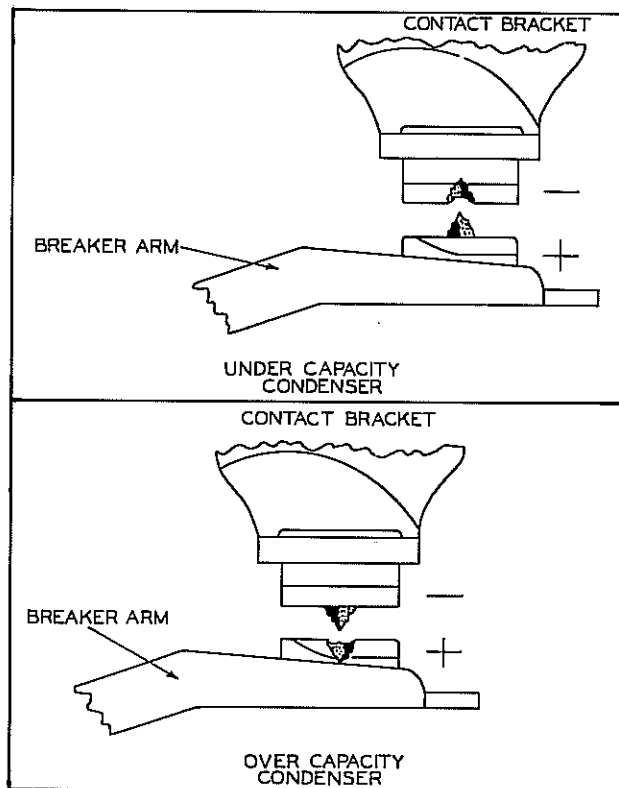


Figure 10. Breaker Points

If necessary, dress the contact points with a few **EVEN** strokes using a clean fine-cut contact file. **DO NOT ATTEMPT TO REMOVE ALL ROUGHNESS NOR DRESS THE POINT SURFACES DOWN SMOOTH.** See figure 11.

LUBRICATION AND PREVENTIVE MAINTENANCE

CAUTION

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

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

NOTE

REFER TO SPECIFICATIONS FOR DWELL ANGLE AND CONTACT POINT OPENING.

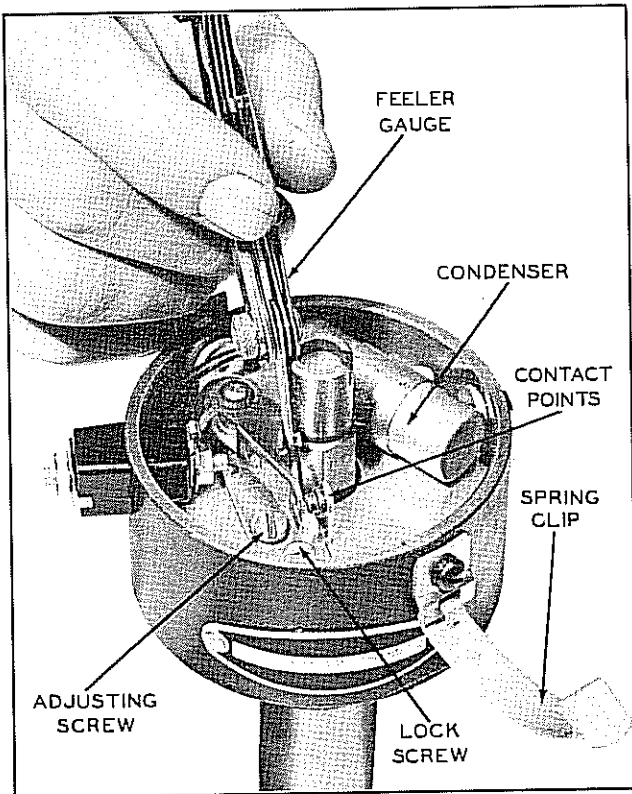


Figure 12. Contact Point Adjustment

To check point opening with a feeler gauge, insert a wire feeler gauge of proper size between the contact points. MAKE CERTAIN THAT THE BUMPER BLOCK ON THE MOVABLE CONTACT IS AT THE HIGH POINT ON THE CAM. If adjustment is neces-

sary, loosen the lock screw and turn the eccentric screw until the proper inch clearance is obtained. Retighten locking screw and recheck point gap, see figure 12.

IGNITION TIMING. If the engine is out of time, the following procedure should be followed:

- a. Remove No. 1 spark plug which is the one nearest the radiator.
- b. Press thumb over hole left vacant by removal of the spark plug.
- c. With thumb pressed over hole, figure 13, turn engine over slowly with the starter until air is being forced up around the thumb.
- d. Stop turning engine over at this point for it means that No. 1 piston is on the compression stroke and it is approaching top dead center.
- e. Flash a light into the timing hole and continue to turn engine over slowly until top dead center marking on flywheel appears in timing hole, figure 13.
- f. Center this mark with the pointer in the flywheel housing just inside the timing hole.
- g. With breaker points set at proper gap, remove distributor clamp plate screw and rotate distributor body until the contact points just start to open. This may be more accurately checked by means of a test lamp connected between the distributor primary lead and a ground. When points are closed the light will be "OFF" and as soon as the points break the light will go "ON".
- h. If engine seems sluggish, it may be caused by late timing. Loosen distributor clamp plate screw and turn distributor body slightly to the right or in a clockwise direction to advance spark.

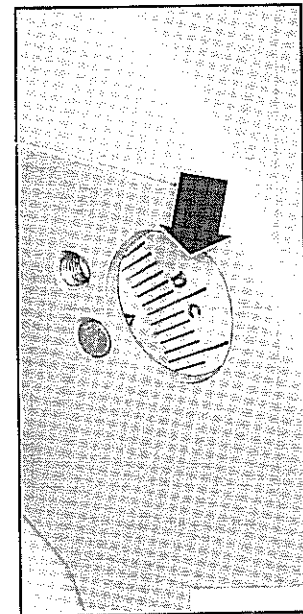
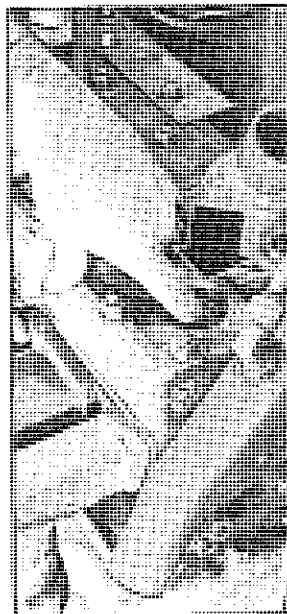


Figure 13. Ignition Timing

Tighten clamp plate screws before starting engine.

LUBRICATION AND PREVENTIVE MAINTENANCE

BATTERY: Check battery fluid level. Make sure that all connections are tight at battery, starter, generator, voltage regulator, distributor and spark plugs.

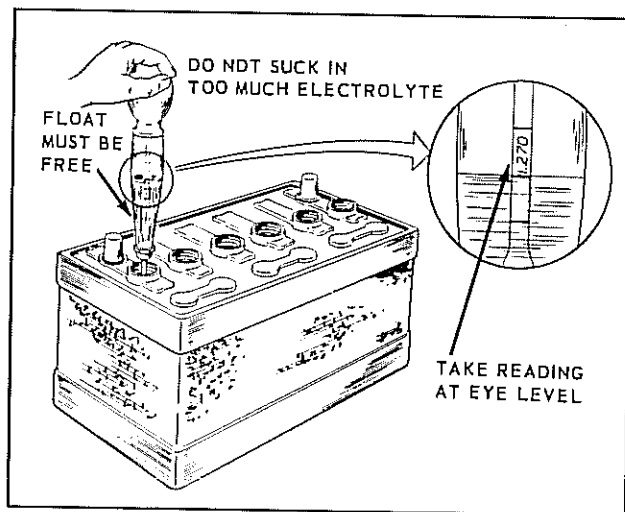


Figure 14. Checking Specific Gravity of Battery

Take hydrometer reading of electrolyte to determine state of charge. Charge battery if reading is below 1.225 at 24° C (75° F), or below 1.265, if tractor is operating in cold climates. If tractor 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. Make certain that specific gravity is adjusted to normal if tractor is shipped to areas where it will be exposed to freezing temperatures. Add distilled water immediately before charging. Do not add distilled water to a battery immediately after a charge.

To test battery, 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. Turn ignition switch to start position and check the voltmeter reading. Compare this reading with the previously recorded reading. If the voltage drop was more than 4 volts, or if the second reading registered below 8 volts, battery should be replaced.

GENERATOR. Every 100 operating hours the oil cups should be filled once with S.A.E. No. 20 oil. If the oil reserve in the commutator end frame should become exhausted through failure to add oil at regular lubrication periods, the oil cup should be filled three times consecutively allowing time between fillings for the oil to saturate the wick. **THE HINGE CAP OILER ON THE DRIVE END FRAME, HOWEVER, MUST**

NEVER BE FILLED MORE THAN ONCE AT EACH LUBRICATION PERIOD.

CAUTION

CARE SHOULD BE EXERCISED TO AVOID EXCESSIVE LUBRICATION, SINCE THIS MIGHT CAUSE LUBRICANT TO BE FORCED OUT ONTO THE COMMUTATOR WHERE IT WOULD GUM AND CAUSE POOR COMMUTATION. SUCH A CONDITION RESULTS IN REDUCED GENERATOR OUTPUT AND INCREASED COMMUTATOR AND BRUSH WEAR. NEVER LUBRICATE THE COMMUTATOR AND DO NOT LUBRICATE THE GENERATOR WHILE IT IS IN OPERATION. BE SURE TO KEEP ALL LUBRICANTS CLEAN AND IN CLOSED CONTAINERS.

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

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

DIFFERENTIAL. Verify lubricant level, fill if necessary with E.P.G.L. S.A.E. 90, Clark Specifications MS 8.

U JOINTS. Inspect U Joints for security of mounting and excessive bearing wear.

NOTE

REFER TO LUBRICATION CHART FOR LUBRICATION INSTRUCTIONS.

BRAKE SYSTEM: Check level of brake fluid in master cylinder. Brake fluid should be within 1/4 inch of the top. Fill with S.A.E. 70R1 Heavy Duty Hydraulic Brake Fluid. Make certain that the filler cap vent hole is free of obstruction.

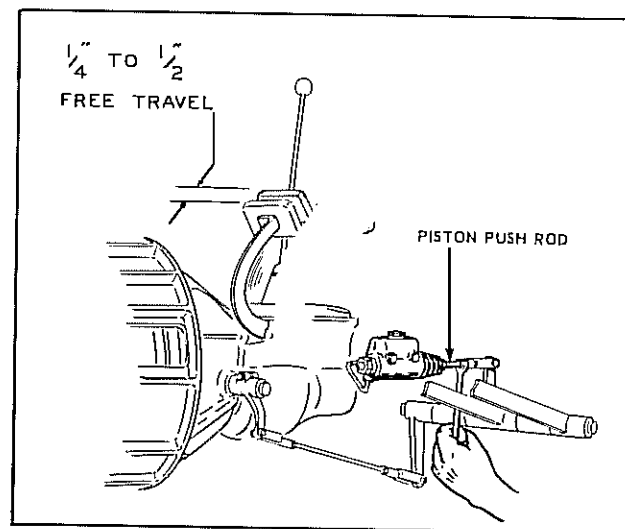


Figure 15. Brake Pedal Adjustment



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

BRAKE PEDAL: The brake pedal is properly adjusted if it has at least 1/4 to 1/2 inch free play before meeting resistance from master cylinder. If necessary, adjust per instructions given in the following paragraphs.

Brake Pedal Adjustment: Refer to figure 15, then make the following adjustment.

- a. Loosen lock nut at end of yoke and rotate piston push rod to obtain specified pedal free travel.
- b. Tighten lock nut to hold the adjustment.

STEERING AXLE ADJUSTMENTS

Wheel Alignment: Camber is the outward tilt of wheel at the top. Toe-in is the difference in distance between steering wheels at the front and rear. To correct toe-in, set left hand wheel so that it is straight ahead. Verify this distance as follows: Place a straight edge horizontally at about center of wheel, then measure from straight edge to frame rail of tractor. Adjust tie rod to right hand steer wheel so that distance between steer wheels front and rear are equal.

NOTE

TOE ROD ENDS THAT JOIN STEERING ARMS ARE RIGHT AND LEFT HAND THREAD. THEY ARE CLAMPED TIGHT TO TIE ROD BY TWO CLAMPING BOLTS TO EACH END. THESE CLAMPING BOLTS MAY BE LOOSENED AND TIE ROD ADJUSTED WITH A WRENCH. PROPER ALIGNMENT IS 0°.

STEERING GEAR. Verify lubricant level, fill if necessary with S.A.E. 140 Gear Lube (Summer), S.A.E. 90 Gear Lube (Winter).

Thrust Adjustment: Steering gear adjustments must be made in the following manner:

- a. Check mounting bolts for tightness.
- b. Disconnect drag link from pitman arm.
- c. Loosen U Bolt on Steering Column Bracket attached to dash.
- d. Check the End Cover Bolts for tightness.
- e. Loosen Lock Nut on Pitman Arm Shaft Lash Adjuster and turn adjuster counterclockwise several turns, see figure 16.
- f. Turn Steering Hand Wheel gently in one direction until stopped by gear, back away about one full turn.

h. Attach spring scale to rim of steering wheel. 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 bearing as follows:

1. Loosen lock nut at bottom of end cover and turn adjusting screw clockwise until all end play has been removed.

2. With spring scale attached to steering hand wheel, check wheel pull. If pull is not within 1 1/2 to 2 pounds, turn adjusting screw until proper reading

is obtained. Tighten lock nut and recheck pull.

If rough or improper action is noted during worm bearing adjustment, the steering gear will require replacement.

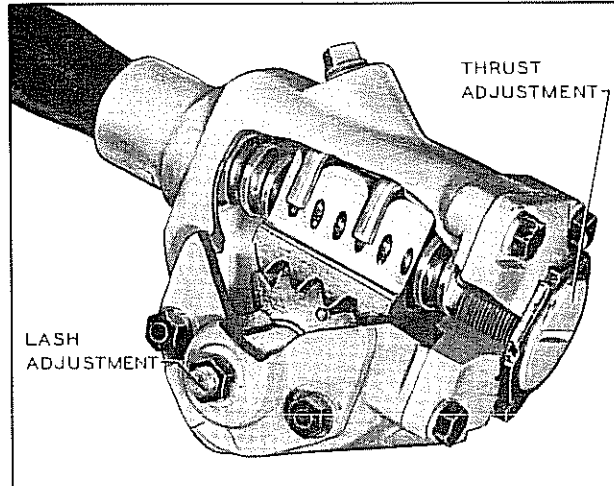


Figure 16. Steering Gear Adjustment

Lash Adjustment: Refer to Figure 16 and proceed as follows:

- a. Turn steering hand wheel all the way in one direction, then all the way in the other direction. Carefully count the number of turns and then bring steering hand wheel back to mid-position.
- b. Turn lash adjuster to remove all lash between gear teeth. All lash has been removed when it is not possible to feel any play while pushing forward or backward on lower end of pitman arm. Tighten lock nut when all lash has been removed.
- c. Check pull at steering hand wheel. If pull is not within 2 1/2 to 3 pounds, loosen lock nut and turn adjuster as necessary to obtain proper reading. Retighten lock nut and recheck pull. Continue until proper pull is obtained.
- d. Install drag link on pitman arm.

NOTE

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

e. Tighten U Bolt on steering column bracket.
STEERING LINKAGE ADJUSTMENT

Steer Wheels must be in straight ahead position before making the following adjustments.

Rotate Hand Wheel as far as it will go in one direction. Carefully counting the number of turns, turn wheel all the way in the opposite direction.

Now turn Hand Wheel back exactly half-way, noting position by a piece of tape placed on the hand wheel.

LUBRICATION AND PREVENTIVE MAINTENANCE

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.

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.

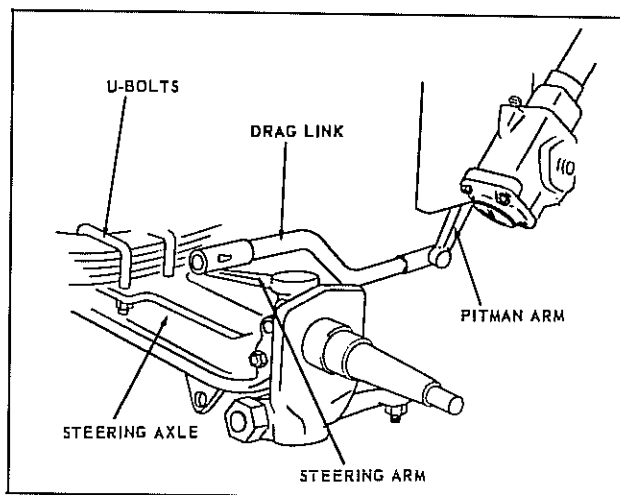


Figure 17. Steer Linkage Adjustment

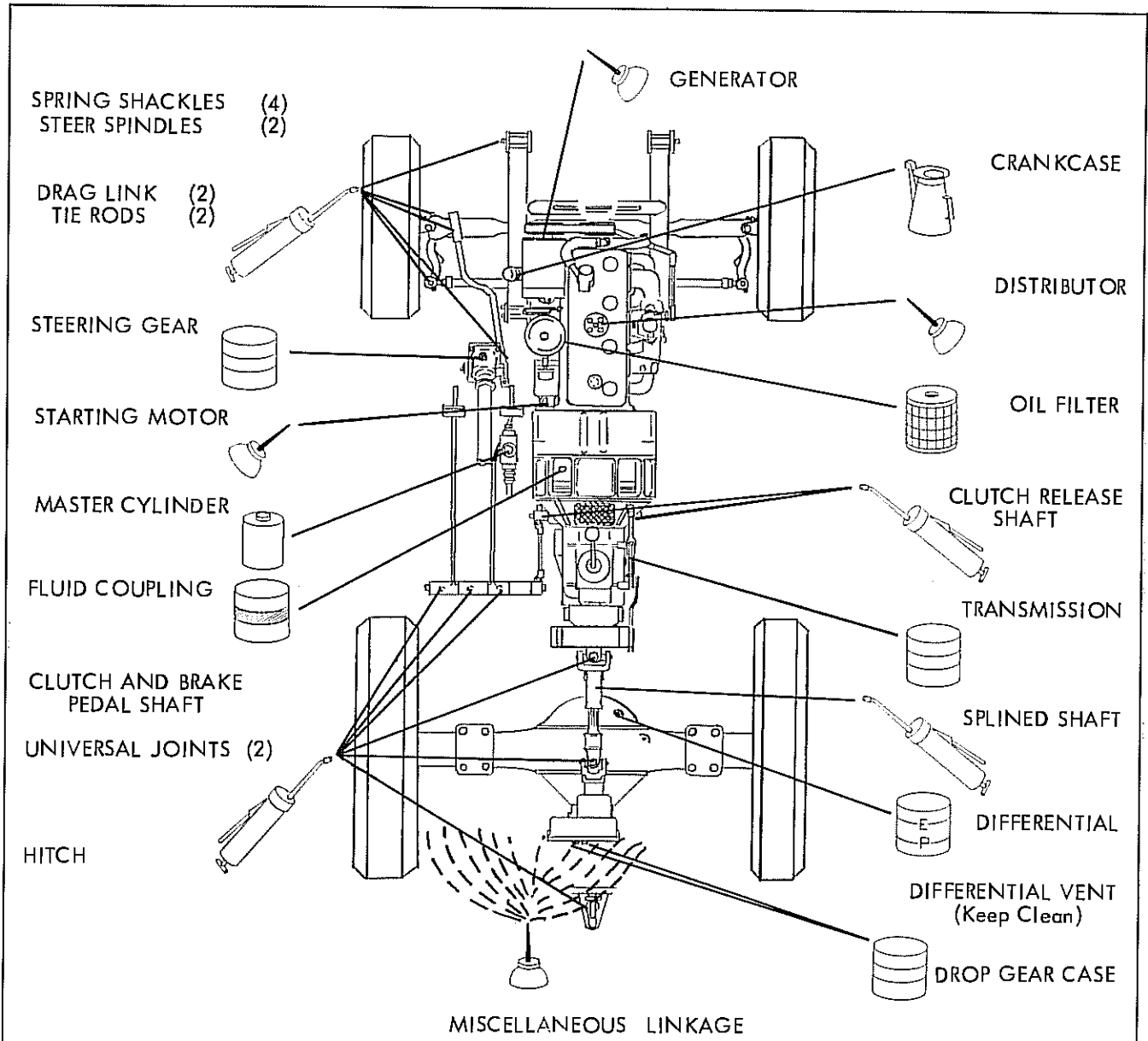
Tighten all nuts.

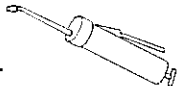







Adjust Turning Radius: The two stop screws, located on the front axle, are for adjusting the turning radius of the tractor. Adjustment is made by loosening the lock nuts and turning the stop screws IN to lengthen turning radius, or OUT to shorten turning radius. When the specified turning radius is obtained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

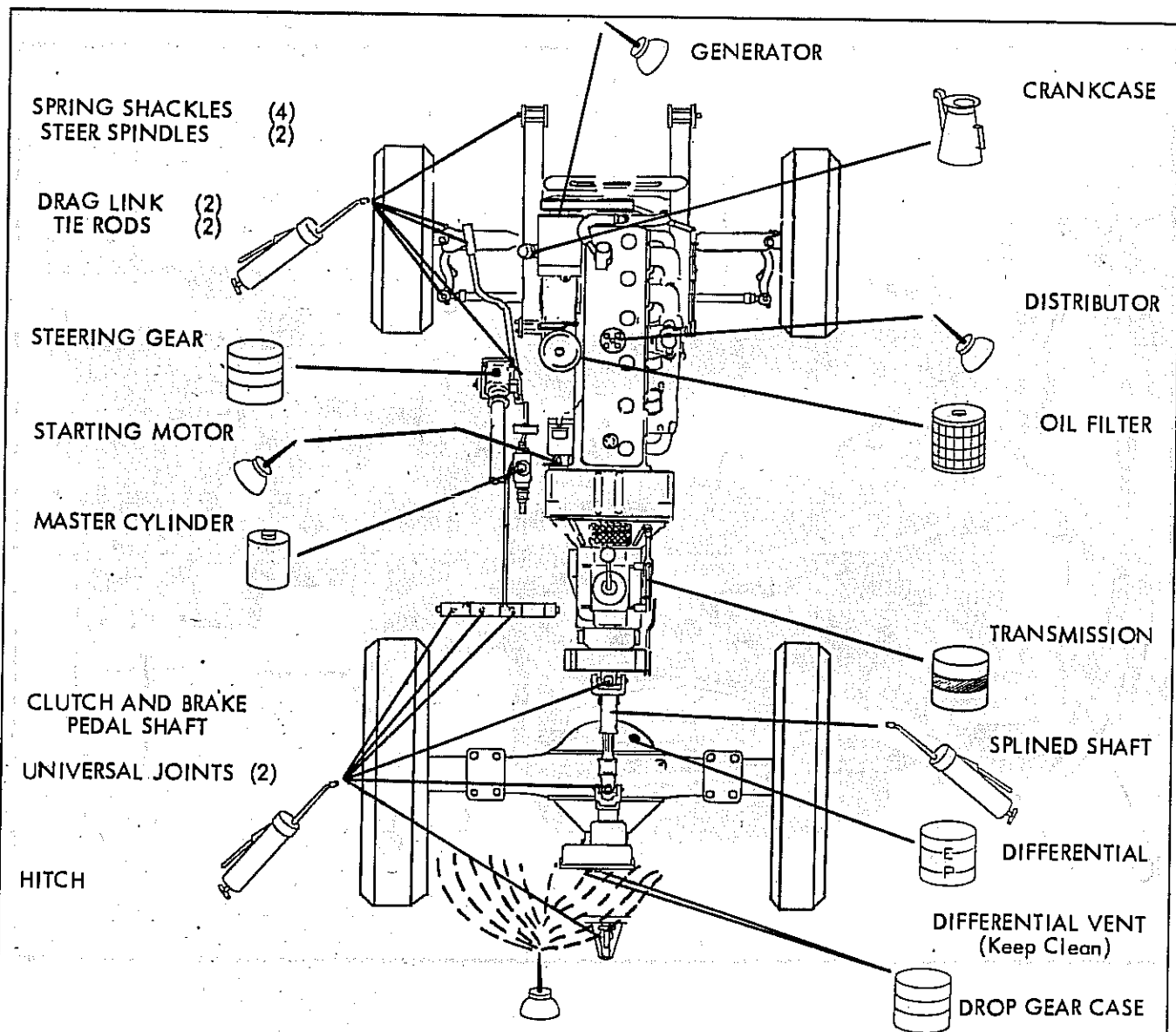
SUSPENSION. Inspect Spring Shackles, U Bolts and Clips for damage and security of mounting.

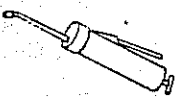







LINKAGE. Lubricate all miscellaneous linkage with S.A.E. No. 20 oil.

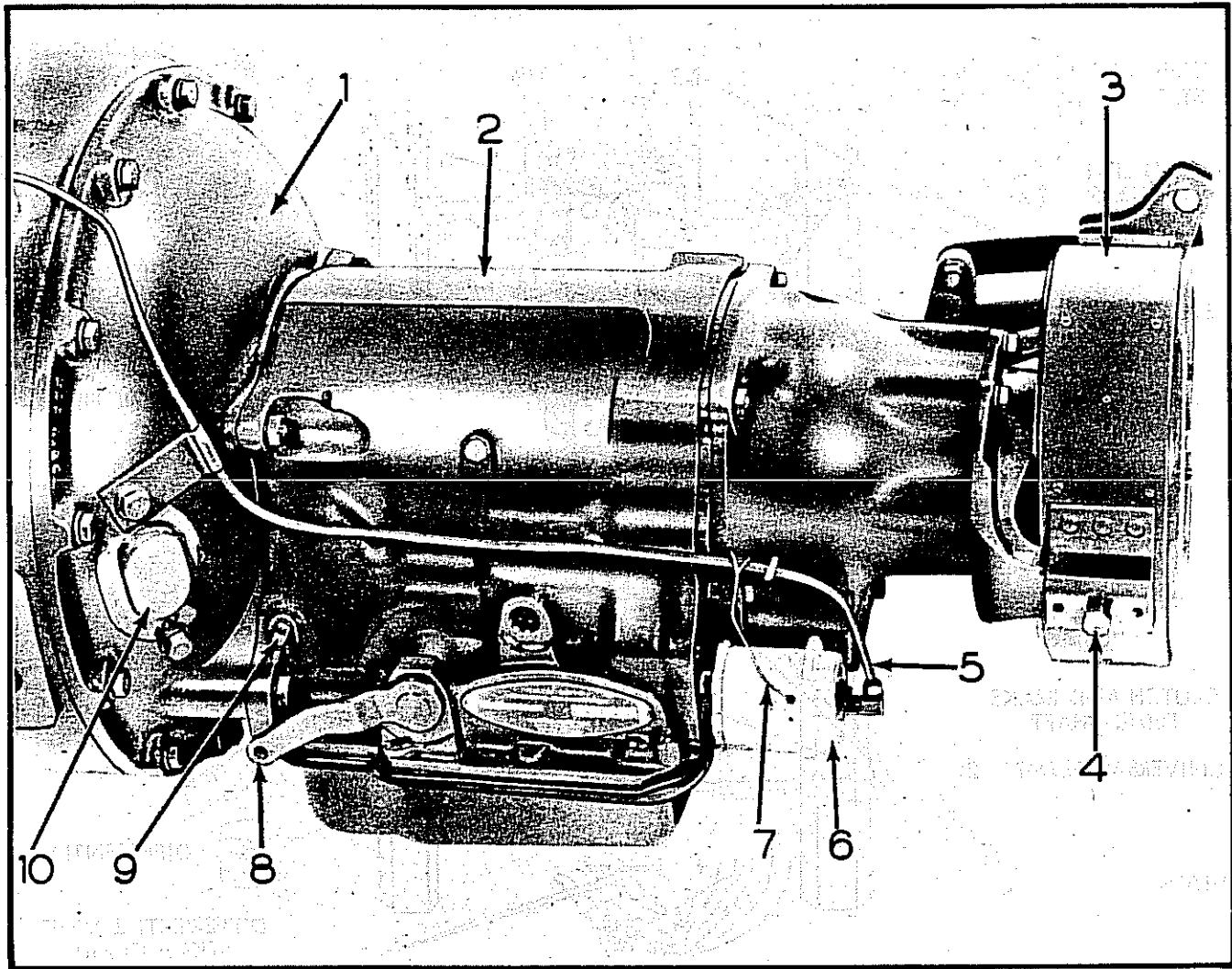
Tighten all Bolts, Nuts and Cap Screws.



- | | | | |
|---|---|--|--|
| CHASSIS GREASE |  |  | EXTREME PRESSURE
S.A.E. 90 GEAR LUBE |
| ENGINE OIL: S.A.E. 20 |  |  | 879803
AUTOMATIC TRANSMISSION FLUID
TYPE "A" ARMOUR QUALIFIED |
| GEAR LUBE: S.A.E. 90 |  |  | 884677 |
| ENGINE OIL: S.A.E. 10 W 0° - 32° F.
"Service MS" S.A.E. 20 W 32° - 75° F.
S.A.E. 30 above 75° F.
of use 10 W - 30 MULTI-GRADE oil. |  |  | ENGINE OIL FILTER
CARTRIDGE KIT |



- | | | | |
|---|---|--|---|
| CHASSIS GREASE |  |  | EXTREME PRESSURE
S.A.E. 90 GEAR LUBE |
| ENGINE OIL: S.A.E. 20 |  |  | AUTOMATIC TRANSMISSION FLUID
TYPE "A" ARMOUR QUALIFIED |
| GEAR LUBE: S.A.E. 90 |  |  | HYDRAULIC BRAKE FLUID
HD S.A.E. 70 R1 |
| ENGINE OIL: S.A.E. 10 W 0° - 32° F.
"Service MS" S.A.E. 20 W 32° - 75° F.
S.A.E. 30 above 75° F.
of use 10 W - 30 MULTI-GRADE oil. |  |  | ENGINE OIL FILTER
CARTRIDGE KIT |



- | | |
|--------------------------------------|---|
| 1. Torque converter housing | 6. Vacuum control and solenoid unit |
| 2. Transmission | 7. Kickdown switch-to-vacuum control wire |
| 3. Parking Brake | 8. Manual shift lever |
| 4. Anchor clip screw | 9. Pressure gauge port pipe plug |
| 5. Carburetor-to-vacuum control line | 10. Converter housing cover plate |

Figure 1. Transmission, Drain, & Refill

TRANSMISSION

Drain and refill to proper level with automatic Transmission Fluid Type "A" (Armour Qualified).

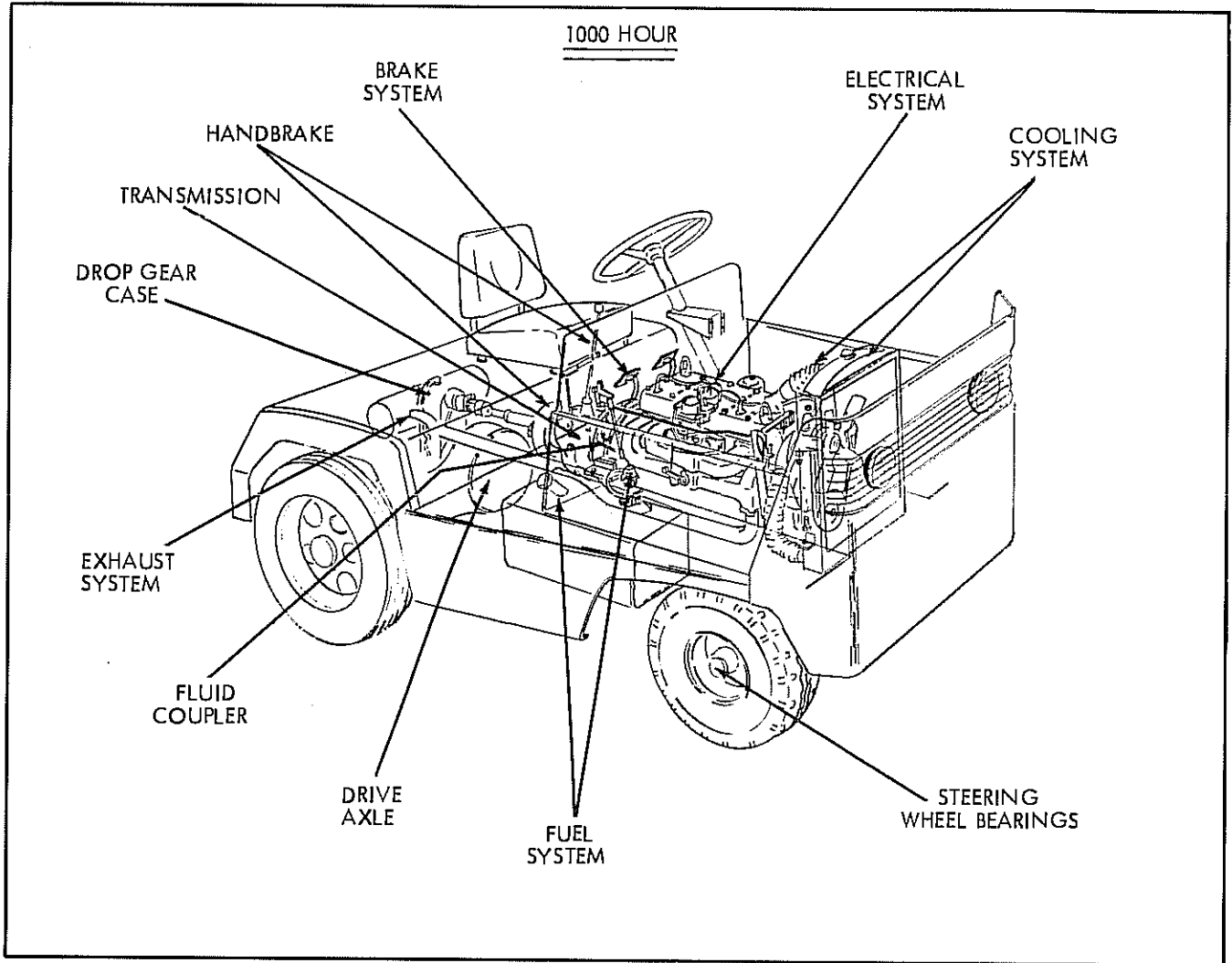


Figure 1. Lubrication and Preventive Maintenance Illustration

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

Check Cylinder Head for gasket leaks.

CYLINDER HEAD STUD NUTS. Check all stud nuts for correct torque of 65 to 70 pound feet "Dry Thread".

CAUTION

THE SEQUENCE LISTED IN FIGURE 2 MUST BE FOLLOWED.

ALL CYLINDER HEAD CAP SCREWS OR NUTS MUST BE TIGHTENED EVENLY AND TORQUED IN ACCORDANCE WITH LIMITS PREVIOUSLY DESCRIBED.

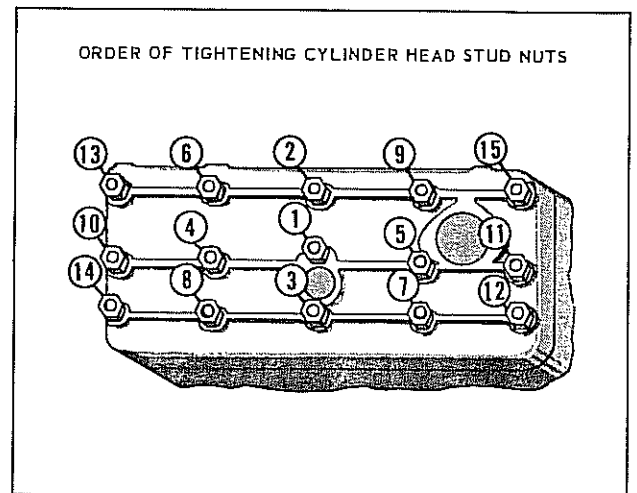


Figure 2. Cylinder Head Stud Nut Tighten Sequence

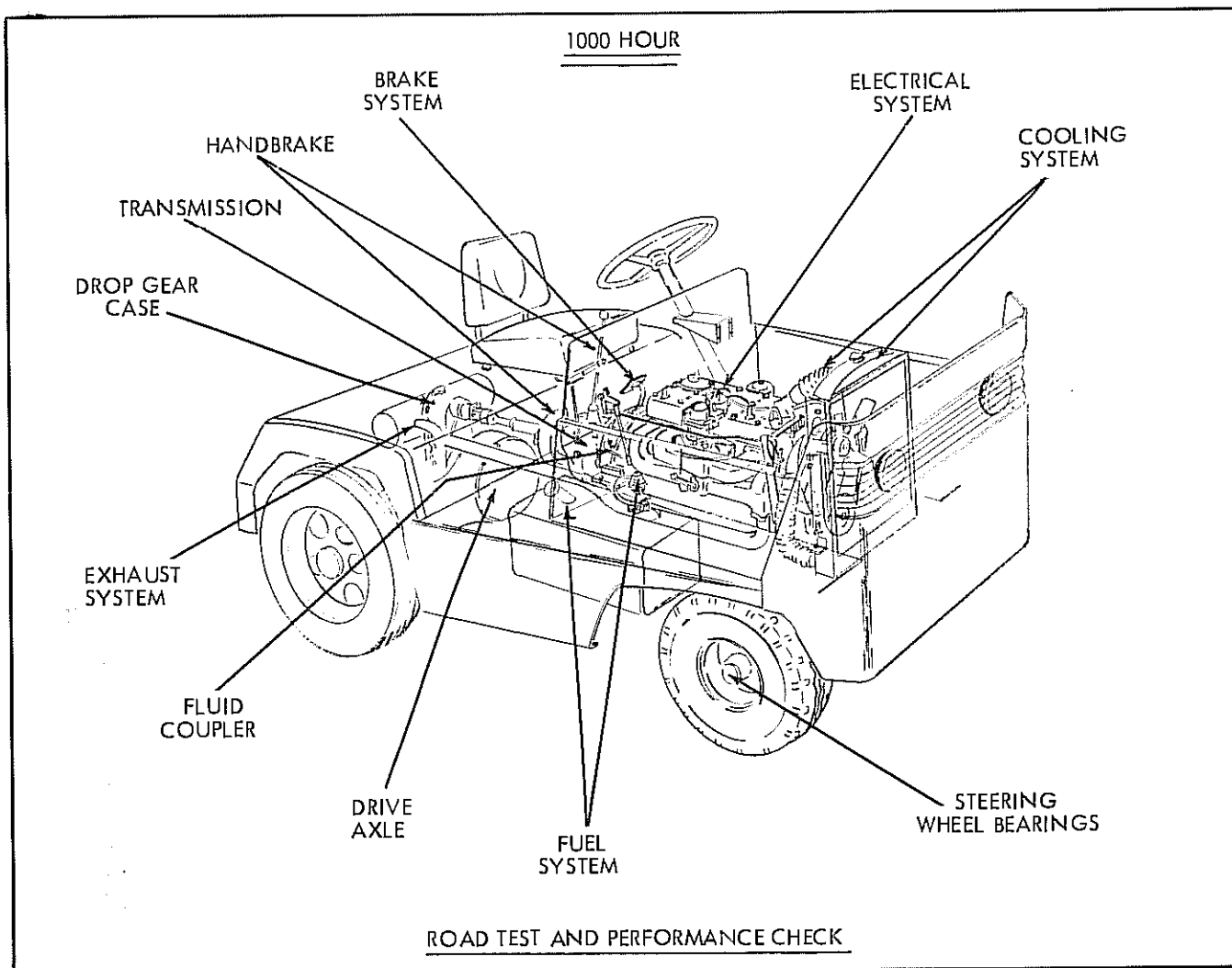


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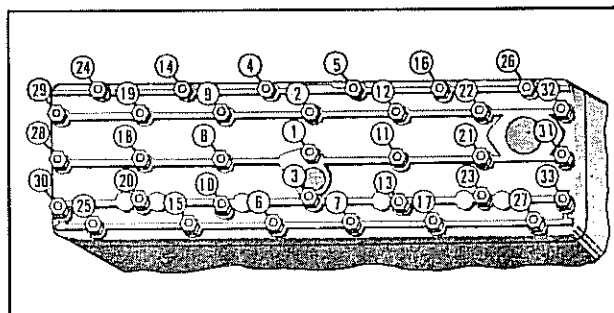


Figure 2. Cylinder Head Stud Nut Tighten Sequence



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

VALVE CLEARANCE ADJUSTMENT

- a. Remove two valve chamber cover mounting screws, and the valve chamber cover gasket.
- b. With engine running at idling speed and at normal operating temperature, adjust intake valves as follows:
- c. Check for proper 0.014 inch clearance by alternately passing a 0.013 inch and a 0.015 inch flat feeler gauge between head of adjusting screw and valve stem cap, see figure 3.

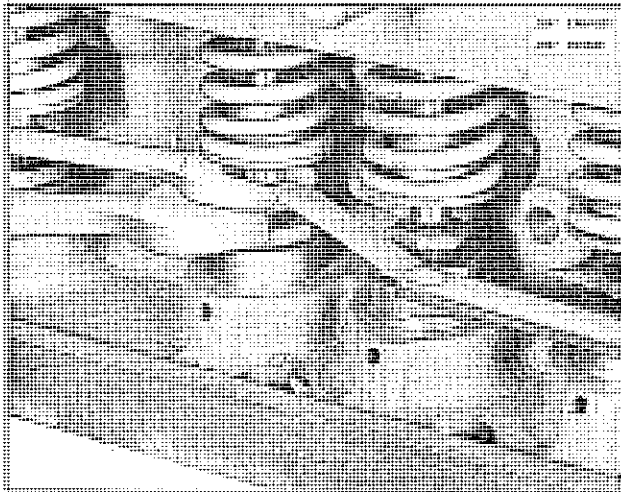


Figure 3. Adjusting Valve Clearance

- d. If a 0.013 inch feeler gauge moves freely back and forth in gap when valve is not being lifted and a 0.015 inch feeler gauge binds, at all times, clearance requires no adjustment.
- e. If a 0.013 inch feeler gauge is gripped at all times, the clearance is too little.
- f. Hold valve lifter with an open end wrench while using a second wrench to turn adjusting screw 1/4 to 1/2 turn clockwise. Repeat clearance check and adjustment, until proper clearance is obtained. The adjustable type valve lifters have self-lacking adjusting screws that require no lock nuts.
- g. If 0.015 inch feeler moves freely when valve is not being lifted, the clearance is too great. Hold valve lifter with an open end wrench while using a second wrench to turn valve lifter adjusting screw counterclockwise 1/4 to 1/2 turn. Repeat clearance check and adjustment until proper clearance is obtained.
- h. Repeat clearance check and adjustment on remaining intake valves.
- i. With engine running at idling speed and at normal operating temperature, adjust exhaust valve as follows:
- j. Check for proper 0.014 inch clearance by alternately passing a 0.013 inch and a 0.015 inch

flat feeler gauge between head of adjusting screw and valve stem cap, see figure 3.

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

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

NOTE

DO NOT REUSE OLD GASKETS. THEY DO NOT AFFORD A POSITIVE SEAL.

n. Check valve chamber cover gasket for leaks.

COMPRESSION TEST

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

a. Start engine and allow it to warm up until normal operating temperature is reached. Make idling speed adjustment.

b. Turn off ignition.

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

d. With all plugs removed, install compression gauge in front spark plug port. With choke and throttle fully open, operate starting motor until maximum reading on gauge is obtained, see figure 4. Record gauge reading. Repeat this operation on each remaining cylinder.

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

f. Set the spark plug gap as specified, by bending side electrode only.

g. Spark Plugs (Resistor Type... See Specifications.)

h. Replace Spark Plugs using new Gaskets. Always replace spark plug gasket whenever a spark plug is removed from the engine.

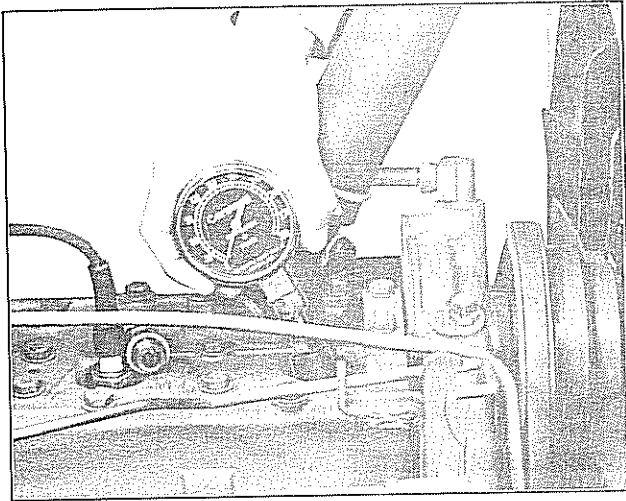


Figure 4. Compression Test

VACUUM TEST

Before making vacuum test, make certain cylinder head is securely tightened and that cylinder head gasket is not leaking. Air cleaner must be installed and must be clean to perform vacuum test.

- a. Tighten manifold stud nuts to prevent leakage at gasket, and remove pipe plug from intake manifold. Attach vacuum gauge in pipe plug opening, figure 5.

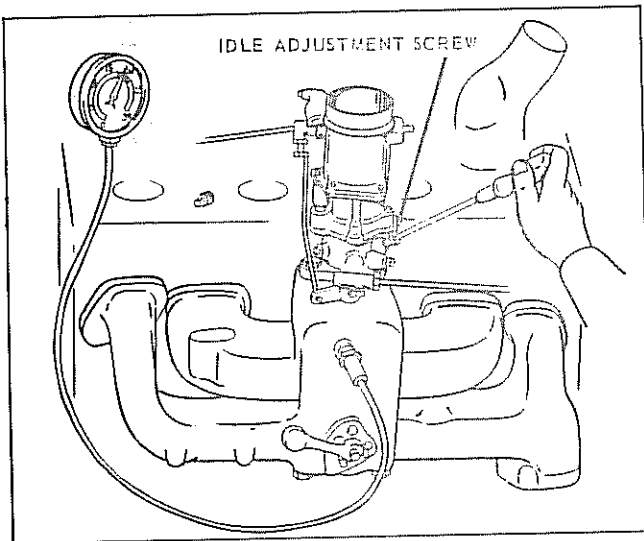


Figure 5. Vacuum Test

- b. Start engine and allow it to warm up to normal operating temperature.

- c. Check vacuum gauge. Reading should be 18 to 22 inches and needle should hold steady flutter. If needle does not indicate desired reading, adjust idle adjustment screw to obtain highest steady reading. If vacuum gauge needle cannot be held steady after these adjustments have been made, report condition to

designated person in authority.

WATER PUMP

The pump is a centrifugal impeller type and is located at the front end of the cylinder block. The bearings are sealed and do not require lubrication.

FUEL PUMP

Clean the fuel pump bowl and strainer. To determine whether the fuel pump is defective, disconnect fuel pump-to-carburetor fuel line at the fuel pump. With ignition switch OFF, crank engine with starting motor. If fuel spurts from the fuel pump, the fault is in other components of the fuel system. If fuel does not spurt from pump or flows only to a slight degree, the pump must be removed for inspection or replacement.

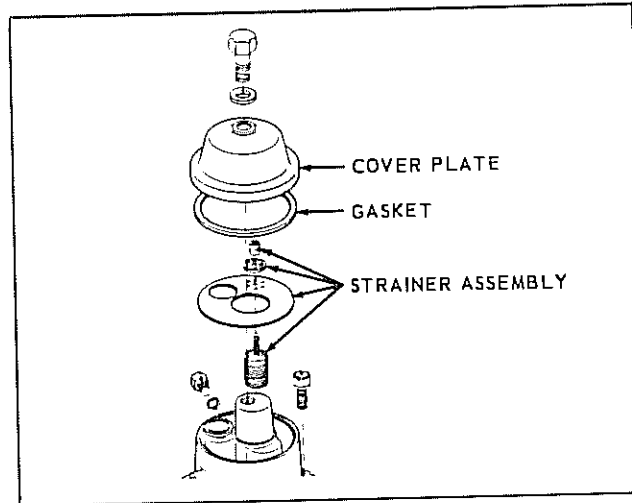


Figure 6. Cleaning Fuel Pump Strainer Assembly

FUEL PUMP STRAINER

The fuel strainer assembly incorporated in the pump body should be cleaned every 1000 operating hours. This may be accomplished by the following procedure:

- a. Shut off fuel supply valve at fuel tank outlet.
- b. Remove heat deflector.
- c. Loosen bolt in top of fuel pump cover plate and remove cover plate, gasket and strainer assembly from pump.
- d. Clean strainer assembly with compressed air, making sure that no dirt particles remain.
- e. Reinstall strainer assembly and gasket. Replace gasket, do not reuse old gasket.
- f. Replace cover plate on fuel pump and tighten bolt.
- g. Turn fuel supply valve on at fuel tank outlet.
- i. Replace heat deflector.

FLUID COUPLING

Drain and refill to proper level with Automatic Transmission Fluid Type "A" (Armour Qualified). Rotate unit so that the filler plug is about 50° from top dead center, or until the words "TOP FOR FILLING," which are stamped on the outside diameter, appear on top dead center.

TRANSMISSION

Drain old lubricant from unit and refill to proper level. Use S.A.E. 90 Gear Lube. Drain only when lubricant is warm.

DROP GEAR CASE

Drain and refill to proper level with S.A.E. 90 Gear Lube.

STARTING MOTOR

To determine whether the starting motor should be removed from the machine for servicing, the following checks can be made.

a. Rotate armature by hand to make certain that it is not binding, bent or contacting a field coil or shoe.

b. 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.

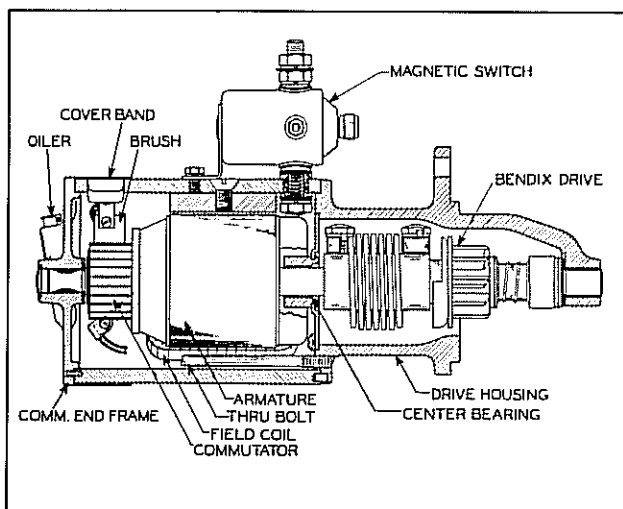


Figure 7. Starting Motor

c. Brush Spring Tension, 35 Ounces.

d. 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.

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.

a. **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.

b. 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.

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

d. **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 voltmeter to starter switch terminal. Turn ignition switch to start position and not 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.

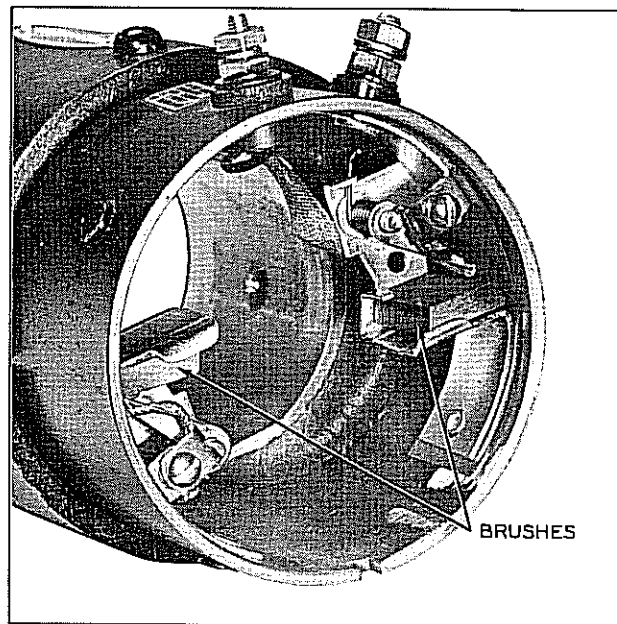


Figure 8. Generator

GENERATOR

The commutator should be inspected and cleaned if necessary. The commutator may be cleaned with

LUBRICATION AND PREVENTIVE MAINTENANCE

No. 00 sandpaper. Blow out all dirt, dust and grit with compressed air. NEVER USE EMERY CLOTH TO CLEAN COMMUTATOR.

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

Using a spring scale, check for proper brush spring tension of 28 ounces.

CAUTION

NEVER ALLOW SPRING TO SNAP DOWN ON BRUSHES.

DIFFERENTIAL

Drain and refill to proper level with E.P.G.L. S.A.E. 90, Clark Specifications MS 8.

BRAKE SYSTEM

TESTS. Because improper action of the brake pedal may indicate troubles other than faulty pedal adjustment, make the following preliminary tests and observations to determine whether a brake pedal adjustment will remedy the condition.

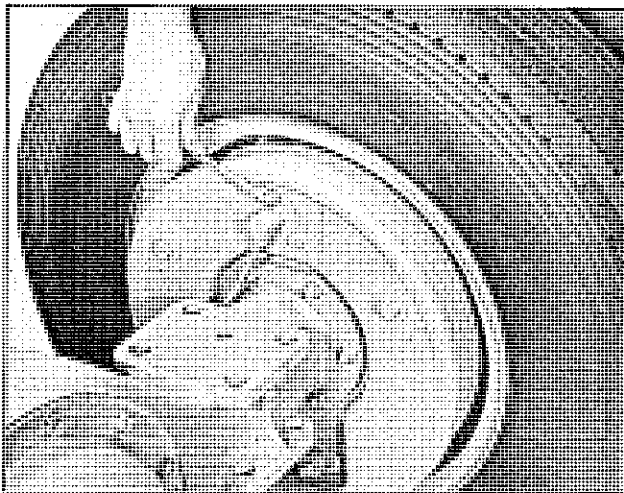


Figure 9. Bleeding Brakes

a. If pedal goes all the way to the floor plate when fully depressed and must be pumped to obtain brake action, check level of brake fluid in brake master cylinder. If level is low, fill to within 1/4 inch of the top. If fluid level is correct and pedal still requires pumping, make brake pedal adjustment.

b. If brake pedal momentarily stops at normal position above floor plate and then goes to floor plate under light foot pressure, inspect master cylinder for

external leakage and check all fluid lines, connections and backing plates for leakage.

c. If brake pedal reacts normally but feels spongy, bleed hydraulic brake system as described in the following paragraph. If brake pedal fails to return to normal release position, check brake pedal return spring, and replace if necessary.

BLEEDING BRAKE SYSTEM

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 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.

a. Install bleeder hose on first bleeding screw to be bled. Have loose end of bleeder hose submerged in brake fluid in glass jar. This prevents the possibility of air being sucked into lines during bleeding operation.

b. Loosen the bleeder screw one full turn and depress the brake pedal slowly, tighten screw and then allow pedal to return to the "off" position. Repeat this operation approximately ten times, providing a pumping action to force fluid through the line expelling all air.

NOTE

THIS OPERATION MUST BE REPEATED ON ALL WHEEL CYLINDERS BLEEDING THE LONGEST LINE FIRST.

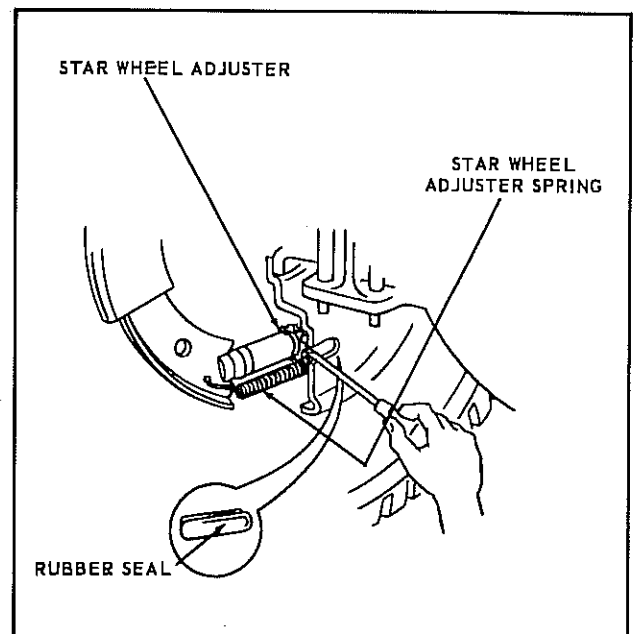


Figure 10. Minor Brake Adjustment

c. Watch flow from bleeder screw carefully. When bubbles cease to appear, or when the stream is a clean solid mass, close bleeder connections, then release brake pedal.

LUBRICATION AND PREVENTIVE MAINTENANCE

NOTE

FLUID WITHDRAWN FROM SYSTEM DURING BLEEDING OPERATION SHOULD NOT BE USED AGAIN. KEEP MASTER CYLINDER FILLED WITH CLEAN FLUID DURING BLEEDING OPERATION.

MINOR BRAKE ADJUSTMENTS

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

- a. Adjust brake pedal free play to 1/4 to 1/2 inch.
- b. Raise tractor until drive wheel tires clear floor. Be sure tractor is properly supported and blocked.

CAUTION

PLACE BLOCKING UNDERNEATH AXLE FOR SAFETY.

- c. Remove rubber seal from backing plate.
- d. Insert screw driver in backing plate slot, engaging the star wheel adjuster.

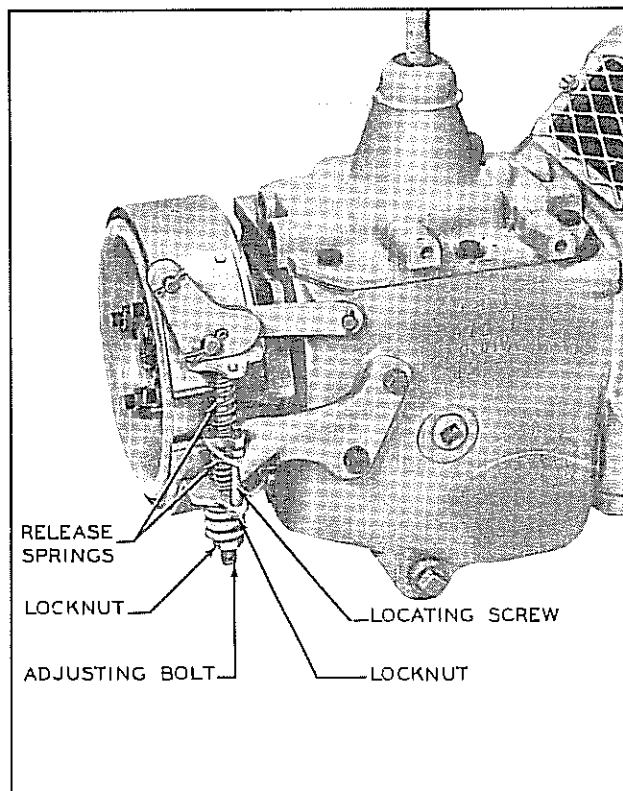


Figure 11. Hand Brake Lever Adjustment

e. Using slot edge as a fulcrum, move driver screw handle toward axle to rotate star wheel.

f. Rotate star wheel adjuster until brake lining drags on drum.

g. Back off star wheel adjustment fourteen notches. This setting should relieve drag and provide sufficient shoe working clearance.

h. Repeat this operation on the opposite drive wheel.

i. Remove blocking, lower tractor to floor. Test brakes.

HAND BRAKE ADJUSTMENT

If adjustment is necessary to provide proper hand brake lever release travel, proceed as follows:

- a. Set hand brake lever in fully released position and turn knob adjustment counterclockwise as far as possible. See figure 11.
- 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 figure 12.

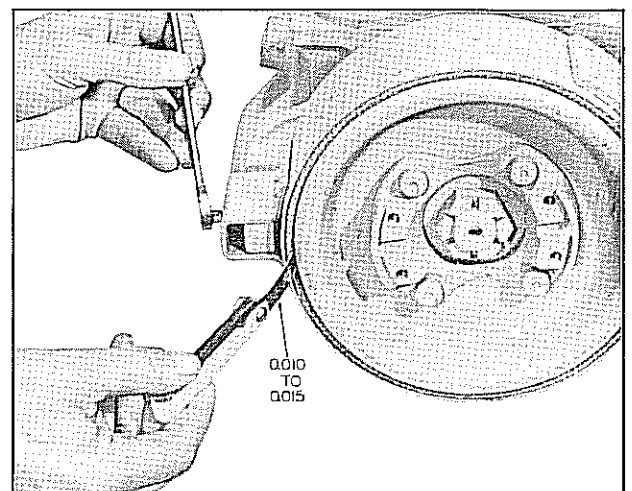


Figure 12. Brake Band Centering Adjustment

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 figure 13.



INDUSTRIAL TRUCK DIVISION



LUBRICATION AND PREVENTIVE MAINTENANCE

ROAD TEST AND PERFORMANCE CHECK. A driving test should be made with the shift lever in D or drive range to check shift speeds.

1. Light throttle upshift speed from second to third should be at 4 to 6 mph.
2. Kickdown upshift speed from first to second should be at 9 to 10 mph.
3. Kickdown upshift speed from second to third should be at 16 to 19 mph.
4. Maximum kickdown speed from third to second should be at 15 to 18 mph.
5. Maximum kickdown speed from second to first should be at 0 to 6 mph.
6. Closed throttle downshift speed from third to second should be at 2 to 4 mph.
7. At 10 mph move the shift lever to L or low range. Closed throttle downshift from second to first should be at 5 to 7 mph.
8. If any of the shift speeds are not within the tolerances listed above, report the condition to the designated individual in authority.



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

ENGINE

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

ENGINE (Continued)

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

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 an 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.



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

ENGINE (Continued)

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

ENGINE (Continued)

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

ENGINE (Continued)

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

ENGINE (Continued)

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

ENGINE (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Low oil pressure.	<p>Insufficient oil supply.</p> <p>Improper grade of oil, or diluted oil foaming at high speeds.</p> <p>Oil too heavy (funneling in cold weather).</p> <p>Oil pump screen clogged.</p> <p>Oil leaks.</p> <p>Faulty oil pump, pressure regulator valve stuck or improperly adjusted, or spring broken.</p>	<p>Fill crankcase to prescribed level.</p> <p>Change oil, inspect crankcase ventilator, inspect for water in oil.</p> <p>Change to proper grade oil. (Refer to Lubrication Instructions.)</p> <p>Remove oil pan and clean pump screen.</p> <p>Report to designated individual in authority.</p> <p>Report to designated individual in authority.</p>
Defective valves.	<p>Incorrect tappet adjustment.</p> <p>Other valve troubles.</p>	<p>Adjust tappets.</p> <p>Report to designated individual in authority.</p>
Abnormal engine noises.	<p>Loose fan, fan pulley or belt, heat control valve.</p> <p>Leaking intake or exhaust manifold or gaskets, cylinder head gasket, or spark plugs.</p> <p>Overheated engine, clogged exhaust system.</p> <p>Other abnormal engine noises.</p>	<p>Tighten or correct conditions as required.</p> <p>Tighten loose components or replace defective gaskets.</p> <p>Remove obstruction from exhaust system. Inspect for further serviceability.</p> <p>Report to designated individual in authority.</p>
Poor compression.	<p>Incorrect tappet adjustment.</p> <p>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.</p>	<p>Adjust tappets.</p> <p>Report to designated individual in authority.</p>



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

FUEL SYSTEM

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

CLUTCH

TROUBLE	PROBABLE CAUSE	REMEDY
Clutch slips.	<p>Improper pedal adjustment.</p> <p>Release linkage binding.</p> <p>Clutch facings burned or worn, torn loose from plate, or oil soaked.</p> <p>Weak pressure spring.</p> <p>Sticking pressure plate.</p> <p>Weak or broken retractor springs.</p> <p>Damaged pilot or clutch release bearing.</p>	<p>Adjust pedal free travel.</p> <p>Free-up and lubricate linkage.</p> <p>Report to designated individual in authority.</p> <p>Report to designated individual in authority.</p> <p>Report to designated individual in authority.</p> <p>Replace. Report to designated individual in authority.</p> <p>Replace. Report to designated individual in authority.</p>
Clutch grabs or chatters.	<p>Control linkage binding.</p> <p>Loose engine mounting.</p> <p>Facings burned, worn, or loose on driven plate; driven plate crimped, flattened out, worn, or binding on splined shaft.</p> <p>Pressure plate or clutch adaptor face scored or rough; pressure plate broken.</p> <p>Excessive looseness in power train.</p> <p>Oil on facings, or excessively worn disc surfaces.</p> <p>Sticking pressure plate.</p>	<p>Free-up and lubricate linkage.</p> <p>Tighten engine mounts.</p> <p>Report to designated individual in authority.</p> <p>Report to designated individual in authority.</p> <p>Report to designated individual in authority.</p> <p>Report to designated individual in authority.</p> <p>Report to designated individual in authority.</p>
Clutch drags.	<p>Excess pedal free play.</p> <p>Driven plate warped, facings torn or loose.</p> <p>Pressure plate warped or binds, improper clutch lever adjustment.</p>	<p>Adjust pedal free play.</p> <p>Report to designated individual in authority.</p> <p>Report to designated individual in authority.</p>
Clutch rattles.	<p>Clutch pedal return spring broken or disconnected.</p>	<p>Replace or connect spring.</p>



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

CLUTCH (Continued)

TROUBLE	PROBABLE CAUSE	REMEDY
Clutch rattles. (Continued)	Release fork loose on ball stud. Worn pressure plate, or broken return springs of driving lugs; worn driven plate hub on splined shaft, worn release bearings, pilot bushing worn.	Adjust clutch pedal free travel to one inch. Report to designated individual in authority.



INDUSTRIAL TRUCK DIVISION



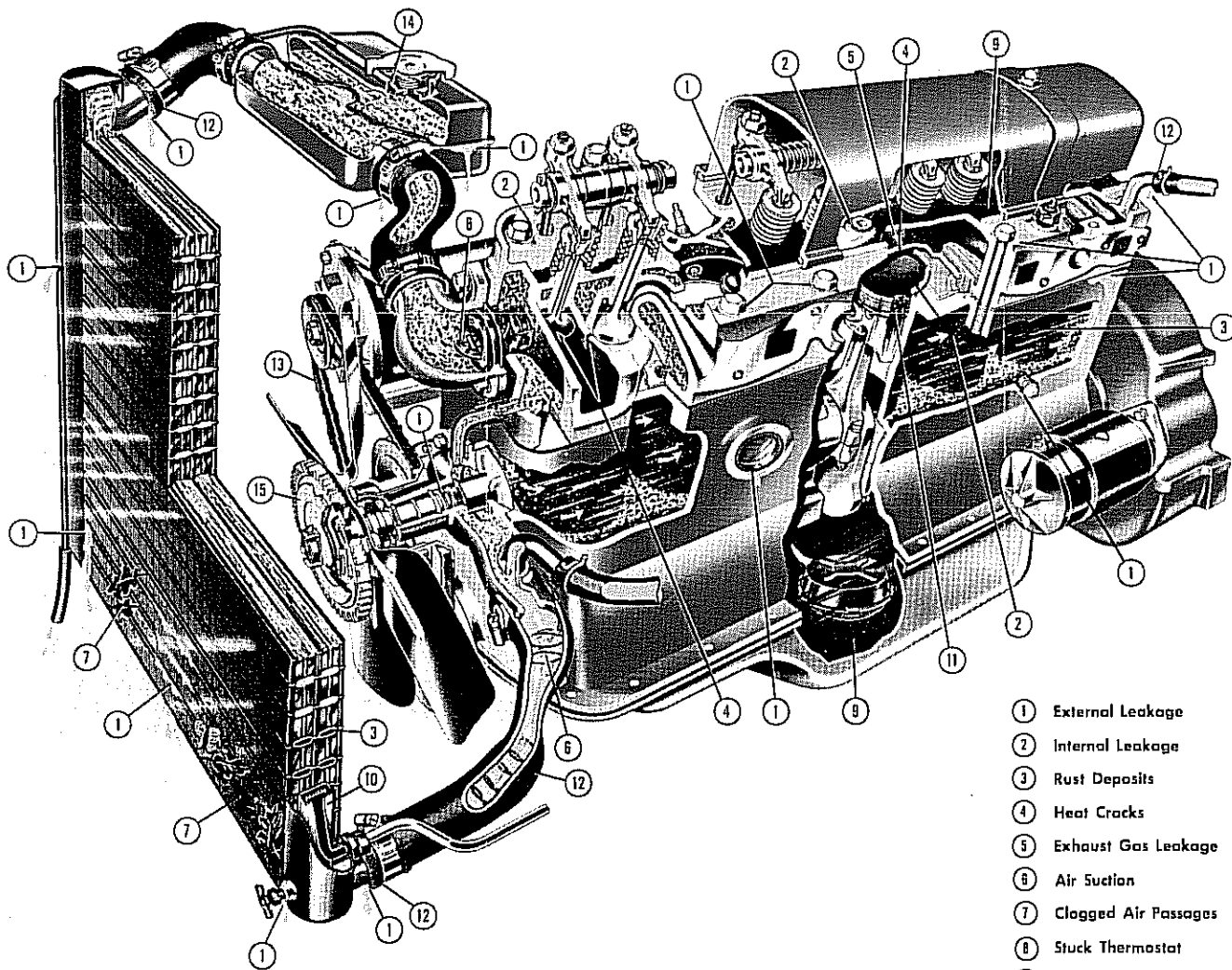
TROUBLE SHOOTING GUIDE

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. Damaged or deteriorated hose. Leaking radiator.	Tighten hose connections. Replace hoses. Repair or replace radiator.
Engine operates too cool.	Thermostat sticking. Low air temperature.	Replace thermostat and gasket. Cover radiator.
Noises.	Frayed or loose fan belt. Water pump defective.	Replace or adjust belt. Replace pump.

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.

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Cooling System Care Pays!

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INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

IGNITION SYSTEM

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

STARTING MOTOR

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

GENERATOR TROUBLES

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

BATTERY, LIGHTS AND HORN

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



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

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. Cover or bracket screws loose. Points adjusted improperly.	Clean and tighten connections. Tighten. Adjust points.
Horn will not operate.	Horn Fuse Blown. Open Circuit. Faulty Horn Relay.	Replace Fuse. Trace, repair or replace as required. Replace relay.



INDUSTRIAL TRUCK DIVISION



TROUBLE SHOOTING GUIDE

TRANSMISSION

TROUBLE	PROBABLE CAUSE	REMEDY
Excessive noise.	Incorrect driving practice. Insufficient lubricant. Gears or bearings broken or worn; shift fork bent, gears worn on splines. Overheated transmission.	Correct practice. Add lubricant. Replace transmission. Inspect lubricant grade and supply.
Hard shifting.	Clutch fails to release. Clutch driven plate binds, or pressure plate is defective. Gearshift binding in housing. Shift rods binding in case. Transmission loose on bell housing. Clutch shaft pilot bearing binding, or shift housing damaged.	Adjust clutch pedal free travel. Report to designated individual in authority. Lubricate and free-up. Report to designated individual in authority. Tighten transmission mounting bolts. Report to designated individual in authority.
Slips out of gear.	Weak or broken rail spring. Transmission gears or bearing worn. Shifting fork bent, causing partial gear engagement. Transmission loose on bell housing. Damaged bell housing. Damaged mainshaft pilot bearing.	Report to designated individual in authority. Replace transmission. Report to designated individual in authority. Tighten transmission mounting bolts. Report to designated individual in authority. Report to designated individual in authority.
Loss of lubricant.	Worn or damaged seals or gaskets.	Report to designated individual in authority.



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TROUBLE SHOOTING GUIDE

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.
Kickdown shift early or inoperative.	No electric current to solenoid.	Check and correct.
	Kickdown switch not actuated.	Reposition switch on mounting bracket.
	Defective kickdown switch.	Replace.
	Vacuum control out too far from transmission case.	Reposition as directed.
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.
	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.



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TROUBLE SHOOTING GUIDE

DRIVE AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble.	Noisy gears or backlash. Damaged axle. Abnormal tire wear. Lubrication leaks.	Report to designated individual in authority. Replace axle. Inflate tires properly. Drain excessive lubricant; clean housing vent; remove excessive grease in wheel hubs; replace leaking defective gaskets.



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TROUBLE SHOOTING GUIDE

STEERING AXLE

TROUBLE	PROBABLE CAUSE	REMEDY
Trouble.	Damaged axle. Lubrication leaks. Incorrect caster or camber. Uneven tire wear.	Replace axle. Replace oil seals. (Refer to Lubrication Section). Report to designated individual in authority. Report to designated individual in authority. Inflate tires properly. Check wheel alignment.



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TROUBLE SHOOTING GUIDE

BRAKES

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



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TROUBLE SHOOTING GUIDE

BRAKES (Continued)

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



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TROUBLE SHOOTING GUIDE

STEERING

TROUBLE	PROBABLE CAUSE	REMEDY
Steering difficult.	<p>Lack of lubrication.</p> <p>Tire pressure low.</p> <p>Tight steering system connections.</p> <p>Tight steering gear; misaligned front wheels; or bent frame.</p> <p>Bent steering connecting linkage or arm.</p> <p>Misaligned steering gear mounting.</p>	<p>Lubricate.</p> <p>Inflate properly.</p> <p>Lubricate and adjust linkage.</p> <p>Report to designated individual in authority.</p> <p>Straighten or replace linkage.</p> <p>Adjust mounting.</p>
Wonder or weaving.	<p>Improper camber or caster (axle twisted).</p> <p>Tire pressures uneven.</p> <p>Steering system connections or king pin bearings not properly adjusted.</p> <p>Loose wheel bearings.</p> <p>Steering gear worn or maladjusted.</p> <p>Steering gear mountings loose.</p>	<p>Report to designated individual in authority.</p> <p>Inflate properly.</p> <p>Lubricate and adjust.</p> <p>Adjust wheel bearings.</p> <p>Report to designated individual in authority.</p> <p>Tighten mounting bolts.</p>
Low speed shimmy or wobble.	<p>Loose steering connections.</p> <p>Steering gear worn, or adjustment too loose.</p> <p>Loose wheel bearings.</p>	<p>Adjust and tighten linkage.</p> <p>Report to designated individual in authority.</p> <p>Adjust wheel bearings.</p>
Vehicle pulls to one side.	<p>Odd size, or new and old tires on opposite front wheels.</p> <p>Tires not inflated evenly.</p> <p>Tight wheel bearings.</p> <p>Bent steering arm or connection.</p>	<p>Match tires.</p> <p>Inflate properly.</p> <p>Adjust. Lubricate wheel bearings.</p> <p>Straighten or replace bent linkage</p>



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TROUBLE SHOOTING GUIDE

FLUID COUPLING

TROUBLE	PROBABLE CAUSE	REMEDY
Output shaft does not turn.	No oil in coupling. Output shaft broken.	Fill coupling, check for leaks. (Refer to Lubrication Instruction. Report to designated individual in authority.
Transmission output shaft does not turn.	Clutch not engaged. Clutch slipping. Transmission shaft broken. Transmission gears stripped.	Check clutch linkage and throwout mechanism. Adjust clutch linkage. Report to designated individual in authority. Report to designated individual in authority.
Overheating.	Low oil level in coupling. Running unit in improper gear causing excessive slipping of coupling. Vent holes plugged. Excessive idling.	Fill coupling. Check for oil leaks after initial running. (Refer to Lubrication Instruction. Shift to lower gear. Clean vents. Shut engine off when not using machine.
Noise in coupling.	Bearings worn out. Dirt or foreign object in coupling. Worn transmission or bearings in transmission.	Report to designated individual in authority. Report to designated individual in authority. Report to designated individual in authority.
Fluid coupling leaks oil.	Coupling overheated resulting in burned seal. Rotary seal damaged. O-ring static seals damaged. Cover gasket damaged or improperly assembled.	Report to designated individual in authority. Report to designated individual in authority. Report to designated individual in authority. Report to designated individual in authority.

