NATURAL GAS FUEL SYSTEM AND OPERATING PROCEDURE

1.0 SCOPE

1.1 THE FOLLOWING IS A DESCRIPTION OF THE COMPRESSED NATURAL GAS (CNG) FUEL SYSTEM USED ON THE TRAM TRACTOR-WDW. ALSO INCLUDED ARE OPERATION AND MAINTENANCE PROCEDURES.

2.0 DESCRIPTION

2.1 THE SYSTEM INCLUDES PRESSURE VESSELS FOR STORING GAS--ELECTRICAL AND PNEUMATIC CONTROLS--SAFETY DEVICES--CONNECTING TUBING AND HOSES--FITTINGS--AND A PRESSURE CONTROL UNIT (PCU) FOR REGULATING CARBURETOR PRESSURE AND FILLING THE SYSTEM.
UNLESS OTHERWISE SPECIFIED, ITEM NUMBERS REFERED TO IN THIS DOCUMENT ARE FOR THOSE ITEMS THAT APPEAR ON DRAWING NUMBER 3835-415602 (SEE PAGE A15). SEE DRAWING NUMBER 2590-415563 (PAGE A8) FOR THE ELECTRICAL WIRING DIAGRAM.

3.0 OPERATING PRESSURES

3.1 THE SYSTEM RATING IS 3000 PSIG WITH A PROOF TEST OF 4500 PSIG.

3.2 OVER PRESSURIZATION IS LIMITED TO 4000-4500 PSIG BY A SAFETY DEVICE ON EACH PRESSURE VESSEL--SEE ITEM 6.

3.3 THE NOMINAL OPERATING RANGE OF THE SYSTEM IS 300 TO 3000 PSIG. THE PCU REDUCES THIS PRESSURE TO 3.5 INCHES WATER COLUMN (2 OUNCES) PRESSURE FOR CARBURETOR INDUCTION.

3.3.1 SEE PARA. 10.3 FOR LOW PRESSURE OPERATION.

4.0 ENGINE ADJUSTMENTS

4.1 THE FOLLOWING SETTINGS HAVE BEEN DETERMINED TO BE OPTIMUM. FOR ADDITIONAL INFORMATION SEE DIVISION "C" - PAGES C1 THRU C85.

a. THE HOSE IS DISCONNECTED FROM THE DISTRIBUTOR VACUUM ADVANCE CONNECTION, AND PLUGGED.
b. DISTRIBUTOR POINT GAP IS SET AT .017.
c. SPARK PLUG GAP IS SET AT .018--.022.
d. ADJUST CAM ANGLE TO 26° - 31° AT ENGINE IDLE SPEED.
e. IDLE TIMING IS SET AT 14½° BTDC AT 550 RPM.

5.0 IMPCO CAG 425-6 CARBURETOR ADJUSTMENTS

5.1 FOR A DETAIL BREAKDOWN ON THE IMPCO CARBURETOR SEE PAGE C93.

5.2 WITH ALL OTHER ENGINE ADJUSTMENTS SET PER PARA. 4.1 ABOVE, USE AN EXHAUST ANALYZER TO AID IN ADJUSTING THE CARBUREATOR LOAD AND IDLE SETTINGS.

5.3 THE LOAD AND IDLE ADJUSTMENTS ARE LOCATED IN THE BASE OF THE CARBURETOR ON THE REAR SIDE. THE LOAD ADJUSTMENT IS A 9/16" HEX HEAD SCREW WHILE THE IDLE ADJUSTMENT IS A 9/16" SLOTTED HEAD SCREW. CLOCKWISE ADJUSTMENT OF THESE SCREWS "LEANS" THE FUEL MIXTURE.

5.4 ADJUSTMENTS WILL BE MADE WITH SYSTEM PRESSURE AT 1000-2000 PSI. THE IDLE & LOAD SETTINGS SHALL BE SUCH THAT THE CARBON MONOXIDE CONTENT OF THE EXHAUST GAS IS 0.5% WITH 550 TO 3200 RPM AND NO LOAD OR MAX RPM AND FULL LOAD.

5.4.1 FOR OPTIMUM PERFORMANCE, IT MAY BE NECESSARY TO MAKE A SLIGHT ADJUSTMENT IN THE PCU OUTPUT PRESSURE. (3.5 INCHES W.C. NOMINAL). SEE PARA. 7.0. REDUCING THE PCU OUTLET PRESSURE WILL "LEAN" THE MIXTURE AND LOWER THE CARBON MONOXIDE READING.

6.0 SAFETY DEVICES

6.1 THE PRESSURE RELIEF SAFETY DEVICE, ITEM 6, IS INSTALLED AT THE FORWARD END OF EACH VESSEL. THIS IS A DISC WHICH WILL BURST AT 4000-4400 PSIG, DISCHARGING THE COMPRESSED GAS TO ATMOSPHERE THRU THE VENT TUBE, ITEM 5.

6.1.1 DRIVERS AND OTHERS CONCERNED WITH TRACTOR OPERATION SHOULD BE ALERTED TO EXPECT A LOUD BLAST IF THE BURST DISC RUPTURES.

6.2 A BALL VALVE, ITEM 16, IS INSTALLED AT THE REAR END OF EACH VESSEL. THESE ARE NORMALLY OPEN, PRIMARY SHUTOFF DEVICES FOR THE SYSTEM. THE VALVES ARE OPERATED MANUALLY BY TEE HANDLES, ITEM 3, WHICH PROJECT THRU THE FIREWALL INTO THE ENGINE COMPARTMENT. PUSHING ON THE HANDLES CLOSES THE VALVES.

6.2.1 BALL VALVES SHOULD BE CLOSED ONLY FOR EMERGENCIES OR WHEN SERVICING THE CNG SYSTEM.

6.2.2 OPEN BALL VALVES CAREFULLY TO AVOID CLOSING THE FLOW FUSES - ITEM 11.

6.3 THE FLOW FUSES WILL CLOSE AUTOMATICALLY IN THE EVENT OF A HIGH PRESSURE LINE BREAK. THEY ARE INSTALLED DOWNSTREAM OF THE BALL VALVE.

6.3.1 IF A FLOW FUSE CLOSES INADVERTENTLY, OR AFTER REPAIRING A LINE BREAK, IT CAN BE RESET TO OPEN BY CLOSING THE UPSTREAM BALL VALVE AND REPRESSURIZING THE SYSTEM TO EQUAL OR EXCEED THE PRESSURE ON THE GAUGE, ITEM 13.

6.4 A SECONDARY SHUTOFF BALL VALVE IS LOCATED ON THE PCU, ITEM 12, AT THE POINT OF ATTACHMENT OF THE PCU TUBE ASSEMBLY, ITEM 17. THIS VALVE ISOLATES THE PCU AND LOW PRESSURE AREA AND SHOULD BE USED WHEN POSSIBLE INSTEAD OF THE PRIMARY VALVES. THIS VALVE SHOULD REMAIN OPEN EXCEPT FOR EMERGENCY USE.

7.0 PRESSURE CONTROL UNIT (SEE ITEM 12)

7.1 THIS COMPONENT HAS SEVERAL FUNCTIONS IN ADDITION TO REDUCTION OF HIGH PRESSURE GAS.

a. IT SERVES AS A FILTER.
b. SERVES AS A FUELING HOSE CONNECTION.
c. SERVES AS A SOLENOID VALVE.
d. SERVES AS A PRESSURE RELIEF VALVE.

REGULATION OCCURS IN TWO STAGES. THE FIRST STAGE REDUCES HIGH PRESSURE SYSTEM TO APPROXIMATELY 17 PSIG WHILE THE SECOND STAGE FURTHER REDUCES PRESSURE TO 3.5 INCHES WATER COLUMN TO THE CARBURETOR.

7.2 THE ONLY ADJUSTMENT TO BE MADE ON THE PCU IS IN THE SECOND STAGE REGULATOR OUTLET PRESSURE. TO ADJUST THIS PRESSURE REMOVE THE CAP FROM THE DIAPHRAM SPRING HOUSING AND TIGHTEN OR LOOSEN THE ADJUSTING SCREW ON THE SPRING FOLLOWER AS REQUIRED. CLOCKWISE ROTATION OF THE ADJUSTING SCREW INCREASES OUTPUT PRESSURE. BACK OFF 1/8 TURN AFTER EACH ADJUSTMENT TO RELIEVE TORSONIAL STRESS IN THE SPRING. READJUST AND REPLACE CAP.

7.2.1 DO NOT DISTURB THE RELIEF VALVE SETTING WHICH IS CONTROLLED BY THE ADJUSTING SCREW INSIDE THE SPRING NEAR THE DIAPHRAM.

7.3 A NORMALLY CLOSED SOLENOID VALVE IS LOCATED UPSTREAM OF THE FIRST STAGE PRESSURE REGULATOR AND DOWNSTREAM OF THE FILL PORT. THE SOLENOID VALVE IS NORMALLY CLOSED AND IS ENERGIZED TO OPEN WITH THE IGNITION SWITCH IN START OR RUNNING POSITION.

7.3.1 THE SOLENOID VALVE IS A RELIABLE SHUTOFF DEVICE. IT ISN'T NECESSARY TO CLOSE ANY OTHER VALVES WHEN THE TRACTOR IS OUT OF SERVICE BECAUSE OF NORMAL NON-USE.

8.0 SYSTEM INSPECTION

8.1 IT IS RECOMMENDED THAT PERIODIC INSPECTIONS BE PERFORMED ON A MONTHLY BASIS TO CHECK FOR LEAKS IN THE SYSTEM. A SERIOUS LEAK MY BE DETECTED BY THE GAS ODORIZER, BUT A LEAK DETECTING SOLUTION SUCH AS "SNOOP" WILL SPOT MINUTE LEAKS.

8.2 THE PRESSURE VESSEL HOSE ASSEMBLY, ITEM 20, SHALL BE REPLACED AT SIX MONTH INTERVALS. HOSE ASSEMBLIES THAT HAVE BEEN REPLACED WILL BE TESTED FOR POSSIBLE RE-USE. TEST PRESSURE WILL BE 4300-4500 PSI HYDROSTATIC TEST @ 2 MINUTES DURATION.

9.0 VEHICLE FUELING

9.1 GOOD SAFETY PRACTICES WILL BE OBSERVED AT ALL TIMES. THE IGNITION SWITCH WILL BE "OFF". NO SMOKING OR OPEN FLAME WILL BE PERMITTED WITHIN 50 FEET OF THE VEHICLE DURING FUELING.

9.2 THE "DISCONNECT" COUPLING ATTACHED TO THE FUELING HOSE ASSEMBLY MATES WITH THE COUPLING LOCATED ON THE PCU FILL PORT (NEXT TO THE PRESSURE GAGE). INSERT THE HOSE COUPLING INTO THE CUP AND ROTATE THE HANDWHEEL CLOCKWISE TO CONNECT.

9.2.1 THE COUPLING MAY BE CONNECTED OR DISCONNECTED WHILE PRESSURIZED SINCE EACH HALF IS AUTOMATICALLY CLOSED WHEN SEPARATED. THE COUPLING IS FULLY ENGAGED WITH 4 1/2 TURNS. THE LAST FULL TURN OPENS THE VALVES. AFTER THE VALVES CLOSE DURING DISCONNECT, RESIDUAL PRESSURE IN THE COUPLING IS VENTED PRIOR TO COMPLETE DISCONNECT.

9.3 GAS FLOWING INTO THE HOSE ASSEMBLY PASSES THRU A FLOW LIMITER VALVE AND A BALL VALVE. IF THE HOSE BREAKS, THE FLOW LIMITER WILL CLOSE AUTOMATICALLY, AND A CHECK VALVE IN THE PCU WILL PREVENT REVERSE FLOW FROM THE VEHICLE. FACILITIES WITH GAS STORAGE HAVE A HIGH FLOW TRANSFER RATE. TO PREVENT THE FLOW LIMITER FROM CLOSING, IT MAY BE NECESSARY TO THROTTLE FLOW SLIGHTLY WITH THE BALL VALVE.

9.3.1 IF THE FLOW LIMITER CLOSES INADVERTENTLY, CLOSE THE BALL VALVE AND LISTEN FOR A CLICK INDICATING THE LIMITER IS RESET. A SMALL ORIFICE IN THE FLOW LIMITER POPPET PERMITS PRESSURE TO EQUALIZE ACROSS THE POPPET WITH THE BALL VALVE CLOSED.

9.4 THERMODYNAMIC EFFECTS WILL CAUSE THE SYSTEM PRESSURE TO RISE AND FALL WITH TEMPERATURE. THEREFORE IT IS NECESSARY TO BE AWARE OF THE GAS TEMPERATURE IN THE PRESSURE VESSELS AFTER FUELING. IF THE TRACTOR IS REFUELED SHORTLY AFTER USAGE, THE PRESSURE VESSELS WILL BE WARM AND THE GAS PRESSURE WILL DROP AS THE SYSTEM COOLS. IF, HOWEVER, REFUELING TAKES PLACE WHEN THE PRESSURE VESSELS ARE COLD, THE PRESSURE MAY APPROACH THE BURSTING PRESSURE OF THE RELIEF DEVICE. (SEE PARA. 6.1.1).

10.0 VEHICLE OPERATION

10.1 STARTING - TURN THE IGNITION SWITCH TO START, THEN RETURN TO THE RUNNING POSITION. ALLOW AIR PRESSURE TO BUILD UP BEFORE MOVING THE VEHICLE, THEN DRIVE SLOWLY FOR THE FIRST FEW MINUTES TO PERMIT THE OIL TEMPERATURE TO STABILIZE.

10.2 STOPPING - PRESS THE "PRE SHUTDOWN" SWITCH LOCATED NEXT TO THE "LOW GAS" WARNING LIGHT. WHEN THE ENGINE STOPS, TURN THE IGNITION SWITCH TO THE "OFF" POSITION THEN RELEASE THE "PRE SHUTDOWN" SWITCH. THIS "PURGES" THE GAS FROM THE CARBURETOR AND THE SYSTEM DOWNSTREAM OF THE PCU SOLENOID VALVE.

10.3 LOW PRESSURE OPERATION

10.3.1 TWO PRESSURE SWITCHES CONTROL THE LOW PRESSURE SYSTEM. SWITCH #1, ITEM 52 [10] , ON THE LEFT SIDE OF THE VEHICLE IS SET TO ACTUATE WHEN PRESSURE DROPS TO 500 PSIG. THIS ENERGIZES THE "LOW GAS" WARNING LIGHT, INDICATING TIME TO REFUEL. IF THE WARNING IS IGNORED, SWITCH #2, ITEM 52 [9] WILL ACTUATE AT 300 PSIG. AS THE SYSTEM PRESSURE DROPS BELOW 300 PSIG, THE ENGINE MAY BECOME SLUGGISH AT FULL POWER BUT CAN BE OPERATED AT REDUCED POWER FOR APPROXIMATELY TWENTY (20) MINUTES RUNNING TIME BEFORE THE ENGINE STOPS.

10.3.2 THE IGNITION SYSTEM CAN BE REACTIVATED BY MANUALLY ACTUATING THE BYPASS SWITCH. THE SWITCH IS COVERED WITH A RED CAP AND IS LOCATED UNDER THE HOOD NEAR THE PCU. CLOSING THE CAP RESETS THE SWITCH TO "OPEN" FOR NORMAL OPERATION.

11.0 TROUBLE SHOOTING

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TROUBLE	PROBABLE CAUSE	REMEDY
11A NO GAS SUPPLY TO ENGINE WITH IGNITION ON	1. PRESSURE VESSEL BALL VALVES, ITEM 16, ARE CLOSED.	1. OPEN BALL VALVES
	2. FLOW FUSES, ITEM 11 ARE CLOSED	2. RESET FLOW FUSES (SEE PARA. 6.3.1)
	3. PCU BALL VALVE IS CLOSED(SEE PARA 6.4)	3. OPEN VALVE(MANUALLY).

TROUBLE	PROBABLE CAUSE	REMEDY
11A (CONT.) NO GAS SUPPLY TO ENGINE WITH IGNITION ON	4. PCU SOLENOID VALVE IS CLOSED	4.a. LOW PRESSURE SWITCH #2 IS OPEN. CHECK BY ACTUATING BYPASS SWITCH (SEE PARA. 10.3.2).
		4.b. DISCONNECT PCU ELECTRICAL POWER CABLE AND CHECK FOR 12VDC ACROSS TERMINALS "A" & "B". IF ENERGIZED REPLACE PCU WITH A NEW UNIT*. IF NOT ENERGIZED LOOK FOR PROBLEM IN ELECTRICAL SYSTEM.
11B FUEL CONSUMPTION RATE IS EXCESSIVE	1. IMPROPER IGNITION AND/OR CARBURETOR ADJUSTMENT	1. READJUST ENGINE (SEE PARA. 4.0 & 5.0)
	2. ONE PRESSURE VESSEL IS ISOLATED	2.a. RESET FLOW FUSE (SEE PARA. 6.3.1)
		2.b. OPEN VALVE
11C ENGINE IS SLUGGISH AT HIGH LOAD DEMAND, BUT RUNS WELL AT LOWER RPM AND LOAD.	1. IMPROPER IGNITION OR CARBURETOR ADJUSTMENT	1. READJUST ENGINE (SEE PARA. 4.0 & 5.0)
	2. RESTRICTION OR COMPONENT MALFUNCTION WITHIN PCU	2. REPLACE PCU*
11D EXCESSIVE INTERMITTENT OR CONTINUOUS VENTING OF GAS FROM PCU THRU VENT HOSE, ITEM 39.	1. PCU REGULATOR(S) MALFUNCTIONING	1. REPLACE PCU*
	2. PCU RELIEF VALVE(S) MALFUNCTIONING	2. REPLACE PCU*

* PCU SHALL BE RETURNED TO AUTHORIZED REPAIR SHOP FOR REPAIR

800-900 and 8000-9000 SERIES TRUCKS PRE-DELIVERY SCHEDULE

Perform The Following Operations (Checks, Alignments, Replenishments, Adjustments, Corrections, Etc.)

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800-900 and 8000-9000 SERIES TRUCKS PRE-DELIVERY SCHEDULE—(Continued)

Perform The Following Operations (Checks, Alignments, Replenishments, Adjustments, Corrections, Etc.)

ON HOIST—OR UNDERSIDE—(Cont'd.)	Page
Check Spring Seat Bushing Lube Level—Timken Light Weight Tandem Axle	—
Check Front and Rear Spring U-Bolt, Shackles and Shock Absorber Brackets Torque	03-54
Steering Mounting Linkage and Connections	03-54
Front Bumper Bolt Torque—W-Series	03-54
Check Front and Rear Spring and U-Bolt Torque	03-55
Retarder Linkage—Operation (Transmatic)	—
Transmission Air Filter (Roadranger, RT910)	03-09
Air Brake Reservoir	03-54
Check Brake Push Rod Adjustments (Cam-Type)	—
Adjust Rear Brakes on Saddle-Mount Deliveries	03-54
Lube Front and Rear Spring Shackles and Pins	03-81
Check Mounting Bolt Torque, Torque Arm to Frame Bracket at Axle Bracket (Tandem Axle) and Spring Brackets to Frame	03-54
Lube Brake and Clutch Pedal Pivot and Linkage	03-64
ALIGNMENT STALL	
Front Wheel Toe-in	03-09
ROAD TEST	
Neutral Switch—Operation (Transmatic)	03-06
Parking Brake—Operation	03-63
Horn, W/S-Wipers and Washers—Operation	03-06

ROAD TEST—(Cont'd.)	Page
All Instruments. Lights and Turn Signals—Operation	03-06
Heater, Air Vents and Air Conditioner—Operation	03-06
Radio and Other Optional Equipment—Check for Proper Operation	03-07 03-01
Brake Clutch and Accelerator Pedal—Operation	03-06
Transmission Shift Lever—Operation	03-06
Transmatic Transmission Shift Timing and Quality, and Retarder Operation	03-06 03-06
Fluid Temperature Light—Operation (Transmatic)	03-06
2-3 Speed Axle Control—Operation	03-06
Engine Performance	03-07
Drive Belts for Noise	03-07
Steering Control	03-07
Squeaks and Rattles	—
AFTER ROAD TEST	
Remove Seat Protectors, Windshield Markings and Tapes	03-07
Wash Truck and Check for Leaks	03-08
Inspect for Interior and Exterior Metal and Paint Damage	03-08
Check for Soft Trim Soilage and Excess Sealer	03-08
Check Ownercard and Owner Publications in Glove Compartment	—

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600-900 and 8000-9000 SERIES TRUCKS SCHEDULED MAINTENANCE SERVICES

Thousands of Miles ①	6000	12000	18000	24000	30000	36000	42000	48000	See Manual Page
INSIDE Lube all door and ignition lock cylinders & storage compartment lock cylinders.	X	X	X	X	X	X	X	X	03-64 03-65
Lube clutch & brake pedal pivots.		X		X		X		X	03-64
Lube treadle hinge & roller.	X	X	X	X	X	X	X	X	03-64
Lube speedometer & tachometer cables		X		X		X			03-64
OUTSIDE Lube hood hinges, (except L-Series) door locks, striker plates, hinges, check links & rotors.	X	X	X	X	X	X	X	X	03-73
Torque check fuel tank mountings	Every 3 Months								03-08
Check tilt pump fluid level (W-Series)	X	X	X	X	X	X	X		–
Clean frame mounted booster air cleaner (initially at 2000 miles)		X		X		X		X	03-09
Torque check–air stack support mounting bolts	X	X	X	X	X	X	X	X	–
UNDER HOOD or TILT CAB Lube power steering control valve sliding sleeve C & CT-Series.	X	X	X	X	X	X	X	X	–
Check steering gear lube level.	X	X	X	X	X	X	X	X	03-72
Lube clutch & brake linkage & clutch release bearing.		X		X		X		X	03-64
Check power steering reservoir fluid level.	X	X	X	X	X	X	X	X	03-20
Lube shutter control shaft bushings & shutter blade.				X				X	03-72
Lube rod-type accelerator linkage	X	X	X	X	X	X	X	X	–
Lube air brake foot control valve.	X	X	X	X	X	X	X	X	03-64
Lube steering column "U" joints & steering shaft slip spline.	X	X	X	X	X	X	X	X	03-73
Replace power steering pump filter.	Each 50,000 miles or 12 Months								03-28
Check brake master cylinder fluid level.	X	X	X	X	X	X	X	X	03-20
Torque check steering gear bolts & power steering pump bracket bolts.		X		X		X		X	–
Change or clean water filter element plates.	X	X	X	X	X	X	X	X	03-48
Torque check air compressor mounting bolts.	Every 48,000 Miles or Yearly								–
Check air compressor filter–clean if necessary.	X	X	X	X	X	X	X	X	03-28

① More frequent intervals may be required under adverse operating conditions.

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800-900 and 8000-9000 SERIES TRUCKS SCHEDULED MAINTENANCE SERVICES—(Continued)

Gasoline Engines Thousands of Miles ①	4000	6000	12000	16000	20000	24000	28000	32000	36000	40000	44000	48000	See Manual Page
UNDER HOOD or TILT CAB—(Cont'd) Change oil & filter ⑤	X	X	X	X	X	X	X	X	X	X	X	X	
Clean & refill oil bath air cleaner ⑤	X	X	X	X	X	X	X	X	X	X	X	X	03-74
Replace fuel filter (each 500 Miles off Hwy)						X						X	03-72
Check drive belts for excessive wear or defects—adjust as required			X			X			X			X	03-40
Clean complete crankcase emission system, replace any parts required and replace valve			X			X			X			X	03-29
Inspect fuel lines and filter for leaks			X			X			X			X	03-42
Check and adjust distributor points—replace as required			X			X			X			X	03-20
Lube distributor bushing (oil cup)						X						X	03-30
Check & adjust carburetor—idle speed, fuel-mixture			X			X			X			X	03-73
Check and clean choke external linkage			X			X			X			X	03-31
Check and adjust ignition timing—initial timing, mechanical and vacuum advances, and vacuum retard (if so equipped)			X			X			X			X	03-42
Inspect ignition wiring (Secondary) for proper installation and good condition			X			X			X			X	03-31
Inspect clean, adjust and test spark plugs—replace as required			X			X			X			X	03-40
Torque intake manifold bolts to specifications—all V-8 engines			X			X			X			X	03-41
Adjust valve lash—super duty			X			X			X			X	03-41
Inspect cooling system hoses for deterioration, leaks, and loose hose clamps. Repair as required ④	Twice Annually												–
Drain, flush and refill cooling system	Twice Annually												03-39
Clean engine oil cooler—super duty												X	03-38
Drain fuel filter bowl (super duty) and check fuel lines for leaks			X			X			X			X	03-40
Replace crankcase emission filter element in air cleaner						X						X	03-20

UNDER HOOD OR TILT CAB (Cont'd) Truck Engines Thousands of Miles ①	6000	12000	18000	24000	30000	36000	42000	48000	See Manual Page
CUMMINS DIESEL									
Change engine oil	X	X	X	X	X	X	X	X	03-20
Change full-flow oil filter element	X	X	X	X	X	X	X	X	03-20
Record oil pressure	X	X	X	X	X	X	X	X	03-75
Change crankcase breather (NH,NKJ)③	X	X	X	X	X	X	X	X	03-75

① More frequent intervals may be required under adverse operating conditions.
② Replace inner rear wheel seal whenever rear hub is removed.
③ Change oil every 4000 miles if not equipped with by-pass filter.
④ If coolant is dirty or rusty in appearance, the system should be drained and flushed. The radiator cap should be cleaned and the system refilled with the specified solution of coolant and water.
⑤ Or each 4 months, whichever comes first.

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7000-9000 and 8000-9000 SERIES TRUCKS SCHEDULED MAINTENANCE SERVICES—(Continued)

Detroit Engines Thousands of Miles 1	6000	12000	18000	24000	30000	36000	42000	48000	See Manual Page
Inspect exhaust system	X	X	X	X	X	X	X	X	–
Lubricate starting motor	Every 100,000 Miles or Each Year								03-73
Change by-pass oil filter element		X		X		X		X	03-75
Change fuel filter element		X		X		X		X	03-52
Check and adjust belt tension		X		X		X		X	03-27
Check cooling system corrosion resistor and condition of coolant		X		X		X		X	03-49
Check air inlet piping ①		X		X		X		X	03-27
Check thermostat				X				X	03-52
Check fan hub and drive pulley				X				X	–
Check inlet air restrictions–clean or change air cleaner				X				X	03-50
Clean and tighten electrical connections				X				X	–
Steam clean engine ①				X				X	03-49
Clean starter motor and alternator	Every 100,000 Miles or Each Year								03-53
Check engine mounting bolt torque	Every 100,000 Miles or Each Year								03-49
Clean fuel pump screen and magnet								X	03-52
Tighten manifold nuts or cap screws								X	03-53
Check crankshaft end clearance								X	03-53
Clean injector inlet screen (NH-NHE)								X	03-52
Check engine blow-by								X	03-52
Change turbo charger oil filter and oil in aneroid control (NTC)	X	X	X	X	X	X	X	X	–
Check super charger/turbo charger for oil leaks (NHCT-CT)				X				X	–
Tighten turbo charger MTG bolts (NHCT-CT)				X				X	–
Check fuel manifold pressure								X	03-51
Clean cooling system, replace coolant ④	Twice Annually								03-49
Torque vibration damper								X	–
Clean turbo charger compressor wheel diffuser (NTC)								X	–
Check turbo charger bearing clearance (NTC)								X	–
DETROIT DIESEL									
Change engine oil & record pressure ③	X	X	X	X	X	X	X	X	03-77
Change full-flow oil filter element	X	X	X	X	X	X	X	X	03-77
Lubricate starting motor	Every 100,000 Miles or Each Year								03-73
Inspect exhaust system				X				X	03-55
Change by-pass oil filter element	X	X	X	X	X	X	X	X	03-77
Change fuel filter element (primary & secondary)		X		X		X		X	03-47
Check and adjust belt tension		X		X		X		X	–

① More frequent intervals may be required under adverse operating conditions.
② Replace inner rear wheel seal whenever rear hub is removed.
③ Change oil every 4000 miles if not equipped with by-pass filter.
④ If coolant is dirty or rusty in appearance, the system should be drained and flushed. The radiator cap should be cleaned and the system refilled with the specified solution of coolant and water.

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800-900 and 8000-9000 SERIES TRUCKS SCHEDULED MAINTENANCE SERVICES--(Continued)

UNDER HOOD OR TILT CAB (Cont'd)	6000	12000	18000	24000	30000	36000	42000	48000	See Manual Page
Check air inlet piping ①		X		X		X		X	03-27
Check inlet air restrictions				X				X	03-50
Clean and tighten electrical connections				X				X	–
Tighten exhaust manifold nuts or capscrews				X				X	–
Check crankshaft end clearance								X	–
Clean crankcase breather ①	Every 32,000 miles								–
Check thermostat				X				X	–
Check condition of coolant, clean, and refill system ③	Twice Annually								03-48
Check air flow from air box drain tubes				X				X	03-51
Check lubricating oil lines--(wear & chafing)	X	X	X	X	X	X	X	X	–
Check blower screen, seals and emergency shut-down system	100,000 miles or 1 year								–
Check cooling system hoses				X				X	03-47
Check engine mounting bolt, fan hub and drive pulley torque	Each 100,000 miles or annually								–
Check engine blow-by								X	–
Steam clean engine ①				X				X	03-49
FORD V-8 DIESEL Change engine oil ①	X	X	X	X	X	X	X	X	03-74
Record oil pressure and change full-flow oil filter. element ①	X	X	X	X	X	X	X	X	–
Clean crankcase breather ①	X	X	X	X	X	X	X	X	03-44
Change fuel filter element (secondary)	X	X	X	X	X	X	X	X	03-47
Lubricate tachometer drive adapter		X		X		X		X	03-64
Adjust valve clearance	X		X		X		X		03-26
Inspect exhaust system	X	X	X	X	X	X	X	X	03-08
Check and adjust belt tension		X		X		X		X	03-29
Check air inlet piping ①		X		X		X		X	03-23
Check condition of coolant, clean and refill system ③	Twice annually or 24,000 miles								03-43
Check inlet air restrictions ②				X				X	03-44
Clean and tighten electrical connections				X				X	–
Steam clean engine ①				X				X	–
Check engine mounting bolt torques and tighten manifold nuts or cap screws	Every 100,000 miles or yearly								03-23
Check engine blow-by								X	–
Lubricate starting motor	Every 12,000								03-73
Check crankshaft end clearance								X	–
UNDER VEHICLE ④ Lube front axle spindle pin & steering tie rods & linkage	X	X	X	X	X	X	X	X	03-81

① More frequent intervals may be required under adverse operating conditions.
② Replace dry air cleaner element after four cleanings. Two years of service, or if damaged.
③ Use water and rust inhibitor (unless equipped with water conditioner) in summer. Use specified solution of permanent anti-freeze and water in winter.
④ 500 mile interval for off-road operation.

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800-900 and 8000-9000 SERIES TRUCKS SCHEDULED MAINTENANCE SERVICES–(Continued)

UNDER VEHICLE Thousands of Miles ①	6000	12000	18000	24000	30000	36000	42000	48000	See Manual Page
Repack & adjust front wheel bearings (do not pre-load bearings)				X				X	03-65
Lube parking brake linkage, pivots & clevises	X	X	X	X	X	X	X	X	03-81
Check wheel nut torque twice within first 500 miles of delivery or any removal of tire & wheel, and at first 1,000 miles.									–
Inspect brake lining ① ②				X				X	03-10
Lube clutch linkage & release bearing		X		X		X		X	03-80
Lube front & rear spring shackles & pins (every 500 miles–off highway)	X	X	X	X	X	X	X	X	03-81
Lube Hendrickson RT441 & RT444 suspension bushings–Daily if operated in severe service (off highway)	X	X	X	X	X	X	X	X	–
Disassemble, check & clean R6 & R7 relay valves	Each 50,000 Miles or 12 months								–
Remove, clean & lube power divider air lockout control	As required but at least every 6 months								03-55
Torque reyco suspension, equalizer bolts, U bolts & leaf bolts at eccentric bushing	Every 3 months								–
Inspect springs and tighten U bolts twice within first 500 miles and at first 1,000 miles. In severe service each 4,000 miles thereafter.									03-55
Disassemble, check, clean and lube air system automatic moisture ejector valve								X	–
Disassemble, check & clean brake system quick release valve								X	–
Torque check all crossmember bolts (L&W Series) ①	Every 50,000 Miles or Yearly								–
Torque check front spring bracket to frame bolts (L&W Series) ①	Every 100,000 Miles or Yearly								03-104
Check trans. fluid level & clean breather (every 500 miles–off Highway)	X	X	X	X	X	X	X	X	03-54
Change lubricant in manual shift main or auxiliary trans. ③		X		X		X		X	03-79
Lube Trans. Remote Gear Shift Linkage and air cylinder shift lever	X	X	X	X	X	X	X	X	03-80
Change transmatic drive fluid & replace filter element (initial)	X		X		X		X		03-80
Replace flat type brake chamber diaphragm	Every 50,000 Miles or Yearly								–
Replace roto-chamber brake chamber diaphragm	Every 100,000 Miles or Yearly								–
Clean or replace filter–MGM short-stop brake chamber	On Hwy–24,000 Miles/Off Hwy–12,000 Miles								–
Clean or replace filter–MGM low-profile brake chamber	On Hwy–50,000 Miles/Off Hwy–24,000 Miles								–
Lubricate Transmatic Drive trans. detent stop assembly	X	X	X	X	X	X	X	X	03-80

① More frequent intervals may be required under adverse operating conditions.

② Replace inner rear wheel seal whenever rear hub is removed.

③ Every 8000 Miles–Off Highway.

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800-900 and 8000-9000 SERIES TRUCKS SCHEDULED MAINTENANCE SERVICES—(Continued)

UNDER VEHICLE (Cont'd) Thousands of Miles ①	6000	12000	18000	24000	30000	36000	42000	48000	See Manual Page
Change Transmatic Drive trans. fluid & replace filter element (severe service) ②		X		X		X		X	03-80
Lube clutch linkage, pivots and equalizer universal joints & slip yoke	X	X	X	X	X	X	X	X	03-80
Check rear axle lube level, clean breather and Eaton magnetic filler plug	X	X	X	X	X	X	X	X	03-54
Drain & refill rear axle. (Initial change—6000 Miles) Replace Eaton filter	Thereafter Each 6 Months or 36,000 Miles								03-81
Check 2 & 3 speed axle shift unit lube level & clean vent hole		X		X		X		X	03-55
Power divider control vent filter—Remove and clean filter (Eaton tandem forward rear axle) before and after winter season	Each 6 Months								03-55
Drain, flush & refill 5, 10, 13 & 15 speed transmission		X		X		X		X	03-79
Replace air filter—Fuller transmissions		X		X		X		X	03-54
Check & clean 2 & 3 speed tandem axle air shift motor vent ①	X	X	X	X	X	X	X	X	–
Torque check—rear suspension & shackle bracket-to-frame bolts (W-Series)				X				X	03-104

① More frequent intervals may be required under adverse operating conditions. ② Initial change—2000 Miles

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800-900/8000-9000 SERIES GASOLINE AND DIESEL NON-SCHEDULED MAINTENANCE

The following maintenance operations are not required at definite mileage or time intervals, but should be performed on a required basis.

MAINTENANCE OPERATION	WHEN PERFORMED
INSIDE VEHICLE Check operation of brakes, clutch and steering.	Vehicle handling qualities not up to par.
OUTSIDE VEHICLE Clean body/door drain holes.	Improper water drainage is suspected.
Replace windshield wiper blades.	Blades do not clean glass.
Check headlight alignment.	Light beams in wrong position when operating loaded.
Inspect tires and check air pressure.	Varies with operation.
Check Roadranger air filter for dirt or plugging.	Sluggish transmission shift action.
UNDER HOOD OR TILT CAB—ALL ENGINES Check windshield washer fluid.	Governed by weather conditions.
Check clutch and hydraulic brake master cylinders fluid level and brake pedal travel. ①	Excessive pedal travel or spongy feel.
Check clutch fluid level.	Excessive pedal movement or sluggish action.
Torque check engine mounting bolts.	Excessive engine vibration.
Check and adjust clutch pedal travel.	Insufficient free travel or hard shifting.

① During maintenance and repair, protect nylon tube fuel and air brake lines from external heat, acids and abrasions that could damage the lines.

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800-900/8000-9000 SERIES GASOLINE AND DIESEL NON-SCHEDULED MAINTENANCE

MAINTENANCE OPERATION	WHEN PERFORMED
GASOLINE ENGINES Check fuel pump pressure and flow-electric pump.	Insufficient full-throttle power or backfiring.
DIESEL ENGINES Adjust injectors and valve lash (Cummins and Detroit).	Insufficient power.
Adjust valve clearance—Ford V-8 Diesel.	Insufficient power.
Clean injectors or Adjust injectors (Ford V-8 Diesel).	Engine missing or smoking.
Clean injector inlet screen (Detroit).	Erratic fuel injector operation.
Clean positive crankcase ventilation valve—Ford V-8 Diesel.	Low intake manifold vacuum.
Remove and clean radiator coolant level sight glass.	When coolant level is difficult to see.
Clean or replace air cleaner element (dry type).	When inlet air restriction exceeds 25 in. water pressure
Lubricate accelerator linkage EXCEPT BALL JOINTS AND PLASTIC BUSHINGS.	Accelerator does not operate freely.
UNDER VEHICLE Adjust brakes—All	Insufficient power shown in loaded practice stop.
Check steering stop adjustment.	Front wheels rub on undercarriage or sheet metal when turning.
Adjusting steering gear preload. ②	When operating at sustained extreme low ambient temperatures.
Check front and alignment.	Poor steering, wandering or excessive tire wear.
Check parking brake adjustment.	Will not hold on a reasonable grade.
Check exhaust system for leaks and looseness—correct as necessary.	When system becomes noisy, is damaged or shows evidence of leaks.
Check transmission and engine mountings.	Hard shifting or excessive vibration.
Check wedge brake running clearance.	Excessive pedal travel or slow brake action.
Clean internal shoe parking brake (without dust shields)-Transmatic.	Excessively dusty or muddy operation of vehicle.
Balance wheels and tires.	Vibration indicates unbalance.
Rotate wheels and tires and torque lug nuts.	Periodically to prevent uneven tire wear and to prevent loose wheel lug nuts.
Check and adjust transmission controls.	Too much effort to shift transmission.
Drain water from transmission air filter.	Governed by climate conditions and transmission action.
Check torque-tandem axle torque arm to brackets.	Vibration indicates looseness.

② Adjust center mesh preload to 2-1/4—2-1/2 in-lbs. above the minimum specified worm bearing preload.

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PART 50-03 Lubrication and Maintenance Operations

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1 INSIDE VEHICLE MAINTENANCE

CHECK OPERATION OF ALL LIGHTS, GAUGES AND INSTRUMENTS

Check for proper operation of switches and brightness of lights, including operation of oil pressure and alternator warning lights. Check detent action and return of turn signal lever by making full left and right turns during road test. Check all other lights and switches for proper operation.

CHECK AIR PRESSURE BUZZER AND GAUGE OPERATION

Check operation. Operate brakes to drop pressure below 40 psi for test. With engine running, buzzer should sound and continue sounding until pressure builds up to 58-65 psi.

CHECK AIR COMPRESSOR GOVERNOR OPERATION

With engine running, the dash panel gauge should show governor cut-out at 118-125 psi, and cut-in at 98-104 psi. Adjust if required.

CHECK SEAT CONTROL

Check lever for ease of operation, test freeness of seat movement on track, and test for solid engagement with lever released. If equipped with a Bostrom or Unison seat, check for proper operation of all controls.

CHECK ALTERNATOR AND VOLTAGE REGULATOR OPERATION

Turn the headlights ON and check the charge indicator gauge or light to be sure the charging system is not discharging. If the system is discharging, check the charging system and repair as necessary.

INSTALL AND CHECK CIGAR LIGHTER

Install the lighter and check the operation of the lighter. If the lighter is inoperative, check to be sure the wire is connected to the light socket.

INSIDE LOCKS AND DOOR HANDLES

Check operation of the glove compartment and/or

Check the door inside lock and handle operation. Correct as necessary.

WINDOWS AND VENTS

Check for ease of operation, like position of both right and left interior handles, and tight fit against weatherstrip when closed. Check for alignment to opening. Refer to 1971 Truck Shop Manual, Group 42, for detailed instructions.

ROAD TEST

Neutral Switch—Automatic Transmissions

Check, and adjust the switch if necessary, to start engine with shift lever in Neutral and Park position. If equipped with Transmatic transmission, adjust switch to start engine with the shift lever in Neutral position.

Horn, Windshield Wipers and Washers

Check for proper operation, including sweep and park. Adjust if required.

All Instruments

Check operation of all instruments. Correct as necessary.

Radio

Check for proper operation of radio, if so equipped. Set push-buttons for local stations.

Heater, Air Vents and Air Conditioners

Check for the following items: leaks, sufficient heat (approximately 40 degrees at 32 degrees outside temperature and 50 percent relative humidity), blower operation, water control valve operation, operation of heat and air duct(s), operation of air vents, operation of air conditioner controls, and air conditioning temperatures. Adjust and correct as necessary.

Clutch Operation

Check free travel, full return and disengagement. Check for chatter, slipping, excess pedal efforts or noise. **The clutch pedal free travel must be at least 3/4 inch to prevent clutch slippage and excessive clutch disc wear.** Refer to the specifications (Section 9) for free travel measurements. Adjust as required.

Brake Operation

Check and correct, as required, the following conditions: pull in either direction, harshness or noise, excess pedal effort, or spongy feel. Avoid sudden hard stops—make slow, gradual stops. Check pedal height. On Econoline, F-100 and also F-250 when equipped with optional heavy duty brakes, it may be necessary to make a few reverse stops to fully adjust brakes.

Transmission Shift Lever

Check and adjust manual transmission, if necessary, for smooth crossover action.

Check and adjust automatic transmission, if necessary, to match transmission range and lever position.

Transfer Case Shift Operation

Check to be sure the transfer case shifts properly from one range to another and with a change in gear ratio.

Shift Timing and Quality

Check for smooth, acceptable and correctly timed up and down shifts, and correct if necessary.

Retarder Operation—Transmatic

Operate retarder pedal and check for proper function. Correct as necessary.

Fluid Temperature Light— Transmatic

Check for proper operation of fluid temperature warning light. Correct as necessary.

2-3-Speed Axle Control

Operate axle control switch and check for correct axle shift and engagement.

Accelerator Pedal Operation

Check for full return, and sufficient height to open throttle fully. (Remove air cleaner, hold choke plate open, depress accelerator pedal fully and observe position of throttle plate. Plate should be in vertical position.) Check for binding or looseness, and adjust if necessary.

Engine Performance

Check for smoothness of operation and performance consistent with weight, engine size, and transmission-axle ratio combination.

Drive Belts

Check noise level and belt tension and correct as necessary. Refer to Section 9 for gasoline engine belt tension specifications. Refer to the applicable manufacturer's service manual for diesel engine belt tension specifications.

Steering Control and Power Steering

Check steering wheel return from both directions. Test for steering effort required and inconsistent effort in different directions. Check for harshness noise, wander or free play. Correct as required.

Check Operation of Optional Equipment

Check operation of all additional optional equipment such as tractor package, power take-off, I.C.C. emergency flasher units, etc.

Check Speedometer and Odometer

Check the speedometer and odometer for proper operation. Lubricate and tighten cable connections if needle bounce is found.

AFTER ROAD TEST

Remove the seat protector and tapes. Inspect for interior paint condition, and touch up chips and scratches. Check for soft trim soilage and excess sealer.

Verify information on ownercard with warranty plate and check Owner's Manual in glove compartment.

BRAKE PEDAL FREE TRAVEL—HYDRAULIC BRAKES

On dual-brake master cylinder or dash-mounted vacuum booster equipped vehicles, the brake systems are designed to permit full stroke of the master cylinder when the brake pedal is fully depressed. A brake pedal clearance adjustment is not required.

In order to release the brakes, fluid in a hydraulic brake system must flow back to the master cylinder when pedal pressure is released. A port is provided in the master cylinder to allow this flow, but the piston must move back far enough to expose the return port. To be sure that this will always happen, free-travel is built into the pedal linkage on single master cylinders with non-power brakes or frame-mounted booster systems. This free-travel prevents the piston from becoming trapped in a partially released position. Pedal free travel is not always perceptible in dash-mounted booster systems, however, because the operating clearance for the piston is adjusted at the booster push rod, rather than the pedal linkage. (Refer to Parts 12-50, 12-52, and 12-58 of the 1971 Truck Shop Manual for instructions on dash-mounted booster push rod adjustments).

Pedal free travel is not adjustable on 500-1000 Series trucks with a dash-mounted booster and a single or dual system or units with a dual system and a frame-mounted booster.

If the pedal free travel in a standard hydraulic brake system or frame mounted hydraulic booster system is less than 3/16 inch or more than 3/8 inch, the pedal should be adjusted.

To adjust free travel:

1. Push the brake pedal down by hand pressure, and check the free travel.
2. Loosen the lock nut on the eccentric bolt, and rotate the eccentric bolt until the free travel is within 3/16-3/8 inch.

On a P-Series truck turn the hex head of the push rod to obtain the required free travel.

3. Hold the bolt securely, and torque the lock nut to 30-35 ft-lbs.
4. Recheck the pedal free travel to make sure that the adjustment did not change when the lock nut was tightened.

Check the total pedal travel by pushing the brake pedal down as far as it will go. If the pedal travels more than half way between the released position and the floor, adjust the brake shoes.

CUMMINS AND FORD V-8 DIESEL ENGINES—RECORD OIL PRESSURE

Start the engine and operate at 800 to 1000 rpm until the oil temperature gauge reads 140 degrees F. Reduce engine speed to idle and record the oil pressure. A comparison of pressure at idling speed with previous readings will give an indication of progressive wear of lubricating oil pump, bearings, shafts, etc. These readings are more accurate and reliable when taken immediately after an oil change.

DETROIT DIESEL ENGINES—RECORD OIL PRESSURE

Check and record the engine oil pressure at maximum no-load rpm. The table lists the specified engine oil pressures and temperatures. These readings are more accurate and reliable when taken immediately after an oil change.

ENGINE OIL PRESSURE AND TEMPERATURE TABLE–DETROIT DIESEL

	Engine Speed (rpm)		
	1200	1800	2100
Normal (psi)	40-55	50-70	
Minimum for Safe Operation (psi)	25	28	30
Oil Temperature-°F	20-235		

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2 OUTSIDE VEHICLE MAINTENANCE

TORQUE WHEEL NUTS

It is important that the wheel stud nuts and clamps be tightened alternately and evenly so that the lateral or side run-out of the wheel does not exceed one-eighth inch on front wheels or one-quarter inch on dual rear wheels.

On dual wheels, be sure to back off the outer nut before tightening the inner stud. Then tighten the outer nut. Since dual wheels are alternately offset inward and outward. These surfaces must be mated when the wheels are mounted.

Tighten all the stud nuts to the recommended torque for the vehicle and wheel type (Refer to the Specifications, Section 9).

WHEEL COVERS

Check for correct type of cover and install. Center the tire stem carefully in opening provided. Caution should be exercised when installing not to distort cover. Use rubber mallet on outer perimeter.

CHECK FUEL TANK MOUNTING

Inspect the fuel tank mounting brackets and straps to be sure the fuel tanks are securely attached to the vehicle. Inspect the fuel line(s) at the tank(s) to be sure they do not leak. On Bronco, Econoline and F-100 4 x 2 and 4 x 4, be sure the sealed gas cap is not leaking. Make corrections as required.

LATCHES, KEYS AND LOCKS

Check for ease of operation of latches, keys and locks on doors. Adjust and lubricate as required.

HOOD AND DOOR PANELS

Check fit and alignment. Adjust as required. Refer to the 1971 Truck Shop Manual, Group 44, for detailed instructions.

CHECK TAILGATE OPERATION

Check the tailgate for ease of operation and lubricate as required. Check the latch alignment and adjust if necessary. Refer to the 1971 Truck Shop Manual, Group 44, for detailed adjustment procedures.

BUMPERS AND MOULDINGS

Check condition, fit and alignment. Adjust as required. Refer to the 1971 Truck Shop Manual, Group 47, for detailed instructions.

FRONT BUMPER BOLT TORQUE—W-SERIES

Check and correct as required, to specifications given in Section 9.

WEATHERSTRIPS

Check fit and retention and correct as required. Refer to the 1971 Truck Shop Manual, Group 44, for detailed instructions.

INSTALL RADIO ANTENNA

Check type and location specified, and install using installation instructions and template supplied with antenna kit. Do not break plastic adapter when tightening nut.

CLEAN AND INSPECT VEHICLE

Remove the windshield markings and tapes. Wash the vehicle and check for leaks. Inspect for exterior metal damage. Inspect exterior paint condition, and touch up chips and scratches. Check for excess sealer.

REPLACE WINDSHIELD WIPER BLADES

Wiper blade replacement intervals will vary with the amount of use, type of weather, chemical reaction from road tars or salts and the age of the blades. Be sure that the windshield glass surface is not contaminated with oil, tree sap or other foreign substance which cannot be easily rubbed off.

Generally, if the wiper pattern across the glass is still uneven and streaked after these tests, the blades should be replaced.

CLEAN BODY DOOR DRAIN HOLES

Drain holes, located along the bottom surface of the door panels, should be inspected periodically for plugged or obstructed condition. A practical time for inspection is whenever the vehicle is washed. Use a small screwdriver or similar tool to

CHECK BATTERY FLUID LEVEL

Keep the fluid in each battery cell up to the level of the ring in the bottom of the filler well.

Ordinary tap water can be used except in areas where the water is known to be hard or to have a high mineral or alkali content—use distilled water in these areas.

Hydrogen and oxygen gases are produced during normal battery operation. This combustible gas mixture can explode if flames or sparks are brought near the vent openings of the battery. The sulphuric acid in the battery electrolyte can cause a serious burn if spilled on the skin or spattered in the eyes. It should be flushed away with large quantities of clear water.

CHECK BATTERY CABLES

Battery cables must be tight in terminals and terminals tight to posts. A light coating of non-metallic grease can be applied to terminals and posts to retard corrosion and oxidation.

INSPECT EXHAUST SYSTEM

The exhaust system must be free of leakage, binds, groundings, excessive vibration and restrictions. Check the exhaust manifold and pipe connections to be sure they are securely attached.

Leaks can usually be detected visually, or in some cases, a whistling noise may be heard at the pipe connections. Check the various sections of the exhaust system for signs of leaking or burning through.

Muffler inlet and outlet pipes and the various pipe connectors must overlap sufficiently to prevent leakage, and provide enough overlap to support proper tightening of the retaining clamp(s). Replace all sections that show signs of burning through.

Exhaust system vibration, grounding or binds are usually caused by: loose, broken or improperly aligned clamps or brackets; improper installation of the inlet pipe flange on the exhaust manifold, or improper pipe connections. Any of the aforementioned conditions may cause changes to the clearances of the exhaust system components. If any of these conditions exist, the exhaust system components must be checked and adjusted to make certain clearances are maintained.

CHECK FRONT WHEEL TOE-IN

Check the toe-in with the front wheels in the straight-ahead position. Measure the distance between the extreme front and also between the extreme rear of both front wheels. Both of these measurements (front and rear of wheels) should be taken at an equal distance from the floor and at the approximate center line of the spindle. The difference between these two distances is the amount that the wheels toe in or toe out. The wheels should always be adjusted to toe in according to specifications.

If the toe in is incorrect, loosen the clamp bolts at each end of the spindle connecting rod tube. Rotate the tube until the correct toe in is obtained, and torque the clamp bolts to specifications at the end of this part. Recheck the toe in to make sure that no changes occurred when the bolts were tightened.

INSPECT FULLER TRANSMISSION AIR FILTER

If the shifts between high and low range are sluggish, even though the transmission air filter is drained of water, the filter should be removed and cleaned.

1. Loosen the center bolt and remove the filter body from its cover (Fig. 1).
2. Remove the filter element from the body and clean both element and body of all dirt and/or obstruction.
3. Install the element in the body, assemble the body to its cover, and secure with the center attaching bolt.

DRAIN WATER FROM FULLER TRANSMISSION AIR FILTER

If the shifts between high and low range are sluggish, drain the water from the transmission air filter by removing the drain plug (Fig. 1).

REPLACE AIR FILTER ELEMENT—FULLER TRANSMISSION

1. Loosen the center bolt and remove the filter body from its cover (Fig. 1).
2. Remove the filter element from the body, and discard the element.
3. Clean the filter body, and install a new filter element in the body.
4. Assemble the filter body to its cover, and secure with the center attaching bolts.

CLEAN FRAME MOUNTED VACUUM BOOSTER AIR CLEANER—DIAPHRAGM AND PISTON TYPES (P-SERIES EXCEPT P-350)

The air cleaner is mounted on the radiator support and connected to the booster by a hose. Disconnect the hose and remove the cleaner assembly. Wash the cleaner in a suitable solvent and saturate the filter element with SAE 10W engine oil. Mount the air cleaner on the radiator support and connect the hose.

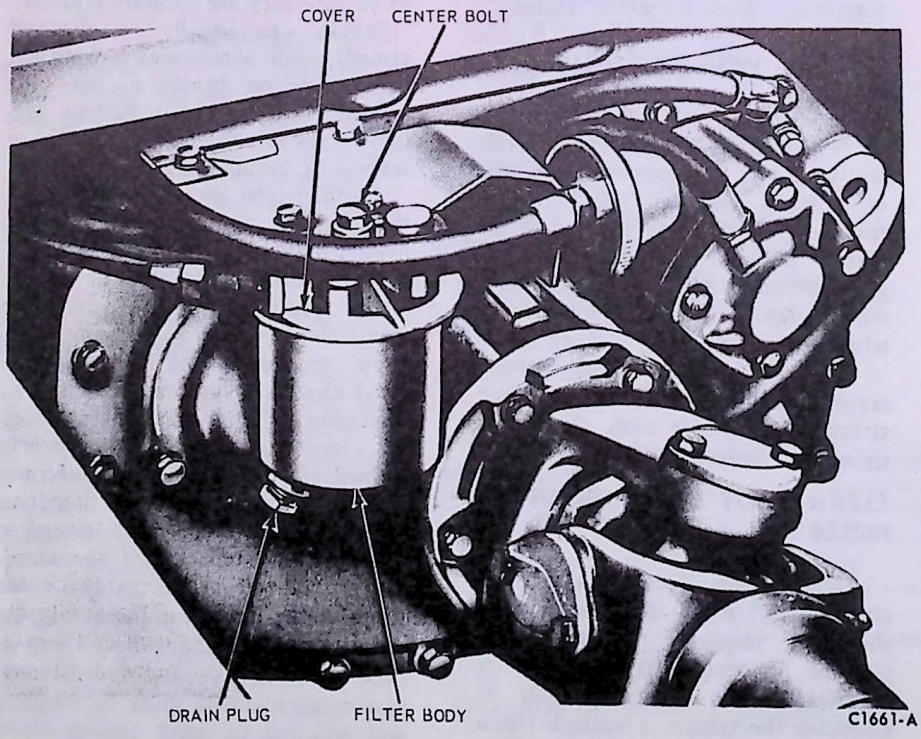


FIG. 1 Transmission Air Filter

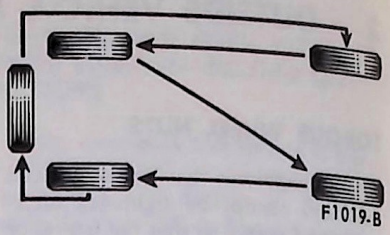


FIG. 2 Tire Cross Switching Diagram

REPLACE FRAME MOUNTED VACUUM BOOSTER AIR CLEANER— 500 THROUGH 900, EXCEPT C-SERIES

The air cleaner is mounted on the forward side of the dash panel on F- and B-600 through 750 cowl model trucks. On all other 500 through 900 except C- and P-Series trucks, the air cleaner is located in the cab behind the driver's seat. When the air cleaner becomes clogged and dirty, replace it with a new one.

ROTATE WHEELS AND TIRES

If wheels and tires are rotated, the spare tire should be included as shown in Fig. 2. On a vehicle with dual rear wheels, tire cross-switching is desirable but may not be possible when different size tires are used on the front and rear wheels.

Dual tires should be matched so that the tire diameters are within 1/4 inch of each other with the small diameter on the inner wheel to conform to the road. Tighten wheel stud nuts to specifications.

WHEEL BEARING ADJUSTMENT

F-100, 250, 350 and Econoline

1. Remove the hub cap and remove the grease cap from the hub.
2. Wipe any excess grease from the end of the spindle and remove the cotter pin and nut lock.
3. While rotating the wheel, torque the adjusting nut (Fig. 3) to 17-25 ft-lb to seat the bearings.
4. Install the nut lock so that the cotter pin hole in the spindle is aligned with a slot in the nut lock.

5. Back off the adjusting nut and next lock two slots of the nut lock and install the cotter pin.

6. Check the front wheel rotation. If the wheel rotates freely with no noticeable end play, install the grease cap. If the wheel is still loose, or it rotates roughly or noisily, the bearing cones and rollers and the cups are dirty or worn and should be cleaned or replaced.

7. Install the hub cap.

4-Wheel Drive Vehicles

1. Raise the vehicle and install safety stands.

2. Back off the brake adjusting screw, if necessary. Remove the wheel cover, if installed.

3. Remove the front hub grease cap. Remove the driving hub retaining snap ring and slide the splined driving hub from between the axle shaft and the wheel hub (Fig. 4). Remove the driving hub spacer. (If equipped with free-running lock-out hubs, refer to Front Wheel Drive Lock-Out Hub Removal in 1971 Truck Shop Manual, Group 15.

4. With Tool T59T-1197-B, remove the lock nut and lock ring from the spindle.

5. Using Tool T59T-1197-B and a torque wrench, tighten the bearing adjusting nut (Fig. 4) to 50 ft-lb, while rotating the wheel back and forth to seat the bearings.

6. Continue rotating the wheel and then loosen and re-torque the adjusting nut to 30-40 ft-lb.

7. Back the adjusting nut off approximately 1/2 turn (135-150 degrees). Assemble the lock ring by turning the nut to the nearest hole where the dowel pin will enter.

8. Install the outer lock nut and torque to 50 ft-lb. Final end-play of the wheel on the spindle should be 0.001 to 0.010 inch.

9. Install the driving hub, spacer, snap ring and hub grease cap. Apply a thin coat of non-hardening sealer to the seating edge of the grease cap, before installation. (If equipped with free-running lock-out hubs, refer to Front Wheel Drive Lock-Out Hub Installation in the 1971 Truck Shop Manual, Group 15.

10. Adjust the brake, if backed off to permit drum removal.

P-350 thru 500

1. Remove the hub cap, if so equipped, and remove the grease cap from the hub.

2. Remove any excess grease from the end of the spindle and remove the adjusting nut cotter pin.

3. While rotating the wheel, torque the adjusting nut (Fig. 3) to 40-55 ft-lbs to seat the bearings.

4. Back off the adjusting nut to the next castellation if necessary to align the nut with the cotter pin hole. Then, back off the adjusting nut two castellations and install the cotter pin.

5. Check the front wheel rotation. If the wheel rotates freely with no noticeable end play, install the grease cap. If the wheel is still loose, or it rotates roughly or noisily, the bearing cones and rollers and the cups are dirty or worn and should be cleaned or replaced.

6. Install the hub cap, if used.

F- and B-500-600

1. Remove the grease cap from the hub.

2. Remove any excess grease from the end of the spindle and remove the adjusting nut cotter pin.

3. While rotating the wheel, torque the adjusting nut (Fig. 4) to 40-55 ft-lb to seat the bearings.

4. Back the adjusting nut to the next castellation if necessary to align the nut with the cotter pin hole. Then, back off the adjusting nut one castellation and install the cotter pin.

5. Check the front wheel rotation. If the wheel rotates freely with no noticeable end play, install the grease cap. If the wheel is still loose, or it rotates roughly or noisily, the bearing cones and rollers and the cups are dirty or worn and should be cleaned or replaced.

F- and LT-700 thru 9000 B-700-750 C- and CT-500 thru 900, 6000-7000 LN- and LNT-500 thru 9000 W- and WT-9000

Single Nut with Cotter Pin

1. Remove the grease cap from the hub.

2. Remove any excess grease from the end of the spindle and remove the adjusting nut cotter pin.

3. While rotating the wheel, torque the adjusting nut (Fig. 3) to 50-80 ft-lb to seat the bearings.

4. Back off the adjusting nut to obtain 0.001 to 0.010 inch end play between the wheel hub and the spindle.

5. Install the cotter pin.

6. Check the front wheel rotation. If the wheel rotates freely with no noticeable end play, install the grease cap. If the wheel is still loose, or it rotates roughly or noisily, the bearing cones and rollers and the cups are dirty or worn and should be cleaned or replaced.

Double Nut with Lock Ring

1. Remove the front hub grease cap.

2. Remove the lock nut, washer, and locking ring (Fig. 3).

3. While rotating the wheel, torque the adjusting nut to 50-80 ft-lbs. This will assure the proper seating of the wheel bearings.

4. Back off the adjusting nut to obtain 0.001 to 0.010 inch end play between the wheel hub and the spindle. Then, install the lock ring.

5. Install the washer with the dimple indexed in one of the holes in the locking ring. Install the lock nut. Torque the lock nut to 100-150 ft-lbs.

6. Check the front wheel rotation. If the wheel rotates freely with no noticeable end play, install the grease cap. If the wheel is still loose, or it rotates roughly or noisily, the bearing cones and rollers and the cups are dirty or worn and should be cleaned or replaced.

Double Nut with Double Washer

1. Remove the front hub grease cap.

2. Remove the lock nut and washer (Fig. 3).

3. While rotating the wheel, torque the adjusting nut to 50-80 ft-lbs. This will assure the proper seating of the wheel bearings.

4. Back off the adjusting nut to obtain 0.001 to 0.010 inch end play between the wheel hub and the spindle.

5. Install the washer and lock nut. Torque the lock nut to 100-150 ft-lb.

6. Check the front wheel rotation. If the wheel rotates freely with no noticeable end play, install the grease cap. If the wheel is still loose, or it rotates roughly or noisily, the bearing cones and rollers and the cups are dirty or worn and should be cleaned or replaced.

INSPECT BRAKE LININGS

1. Raise all four wheels. Remove one of the front brake drums, and inspect the drum and the linings (the wheel bearings should be inspected at this time and repacked if necessary). **Do not let oil or grease touch the drum or the linings.** If the linings are worn to within 1/32 inch of the rivet heads, replace or reline both sets (primary and secondary) on the front or rear wheels. **Under no circumstances replace one lining only, or one**

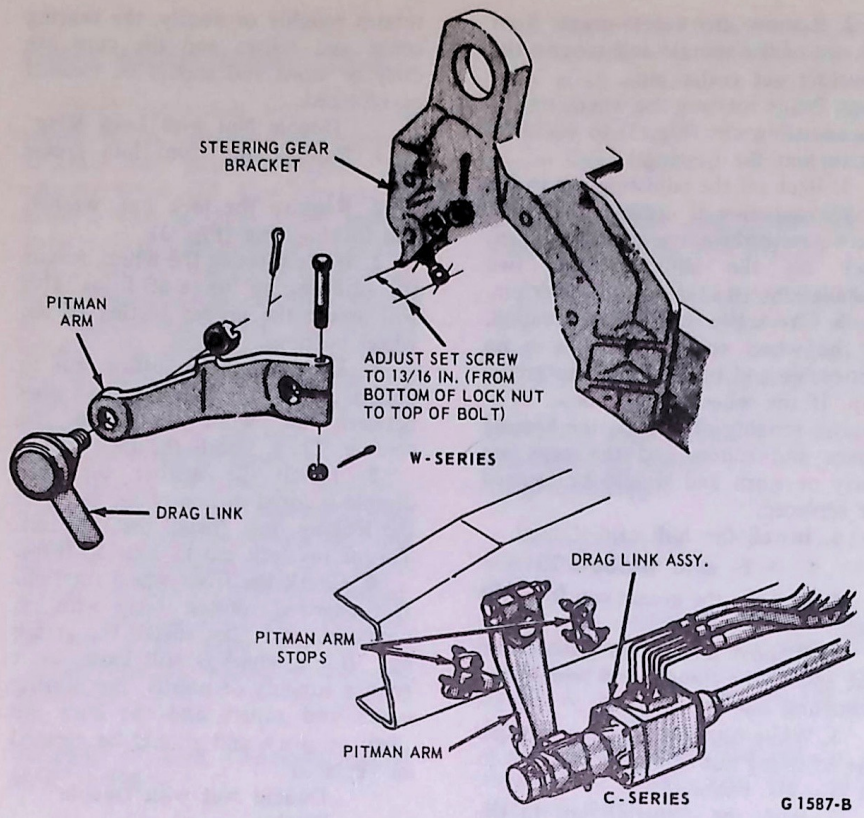


FIG. 19 Pitman Arm Stops

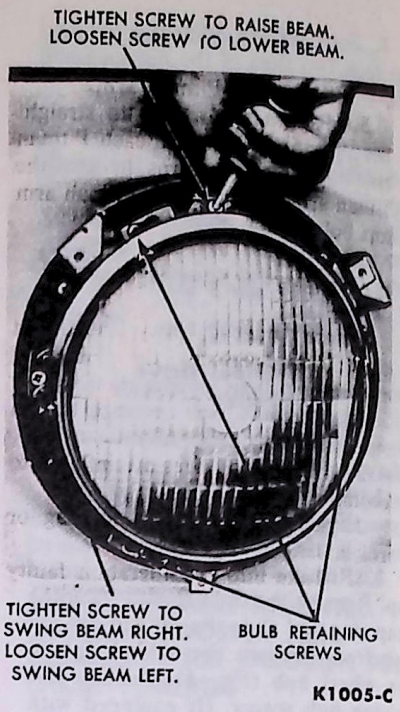


FIG. 20 Headlight Alignment—Typical

3 UNDER HOOD MAINTENANCE

CHECK RADIATOR COOLANT LEVEL (ENGINE AT NORMAL OPERATING TEMPERATURE)

CAUTION: Avoid injury when checking a hot engine. Muffle the radiator cap in a thick cloth and turn it slowly counterclockwise only until the pressure starts to escape. After the pressure has completely dissipated, finish removing the cap.

On conventional radiators, the coolant level should be approximately 1 inch below the bottom of the radiator filler neck. On vehicles with an expansion tank, fill the tank 2/3 full.

On L-Series gasoline and Ford V-8 Diesel engines, with crossflow radiators, fill until the coolant is visible through the sightglass—engine cold. (Caution—Do not operate engine if coolant level is below sightglass.)

On L-Series Cummins and Detroit Diesel engines, fill until the coolant is visible through the bottom of the upper sightglass with engine cold. (Caution—Do not operate engine if coolant level is below the lower sightglass.)

When adding coolant, a mixture of Ford Permanent AntiFreeze and water is recommended. To avoid possible chemical damage to the cooling system, do not mix different brands of

anti-freeze nor use other than a permanent anti-freeze meeting Ford specification M97B18-C.

Keep the freeze protection at an adequate level for the temperatures which may occur in the area in which the vehicle will be operated. It should be maintained at least to 0 degrees F to provide adequate corrosion and boiling protection. Ford Permanent Anti-freeze may be added undiluted if anti-freeze protection below -35 degrees F is required. Refer to the coolant mixture charts on the container.

Tap water may be used in the mixture except where it is known to be very hard or to have a high alkaline content.

RADIATOR SIGHT GLASS—L-SERIES

Sight glass should be cleaned when coolant level is difficult to see. Unscrew sight glass from radiator. Wipe the glass with a clean damp cloth to remove any residue. Replace the sight glass in the radiator and torque to 9-13 in-lbs.

Coolant Recovery System

F-100-250 Truck, Econoline E-100-300 W/240 CID Engine Manual Transmission, Standard Cooling

The engine coolant recovery system incorporates a new radiator pressure cap and a new radiator coolant recovery reservoir assembly (Fig. 21).

When the cooling system has been drained for replacement of hoses, thermostat, engine repair, etc.; the following radiator coolant refilling instructions are recommended:

1. Fill the radiator, through the filler cap opening of the radiator upper tank, completely full. The locking type radiator cap may be removed by turning to the stop and, pressing down on the cap, force the cap past the stop tangs on the filler neck. When filling radiator, the engine should be running at idle speed to circulate the coolant and eliminate any trapped air in the system.
2. Install the radiator cap.
3. Fill the coolant reservoir with one quart of coolant.
4. Operate the engine until it reaches normal temperature. Check the coolant reservoir to see if the coolant level is at the Engine Hot level. If necessary, add coolant to bring it to this level.

Note: The new design locking type radiator cap assembly should not be removed to check the coolant level. The filler neck of the radiator upper tank incorporates a built-in stop that prevents complete removal of the radiator cap under normal conditions. If necessary, add coolant to the reservoir only.

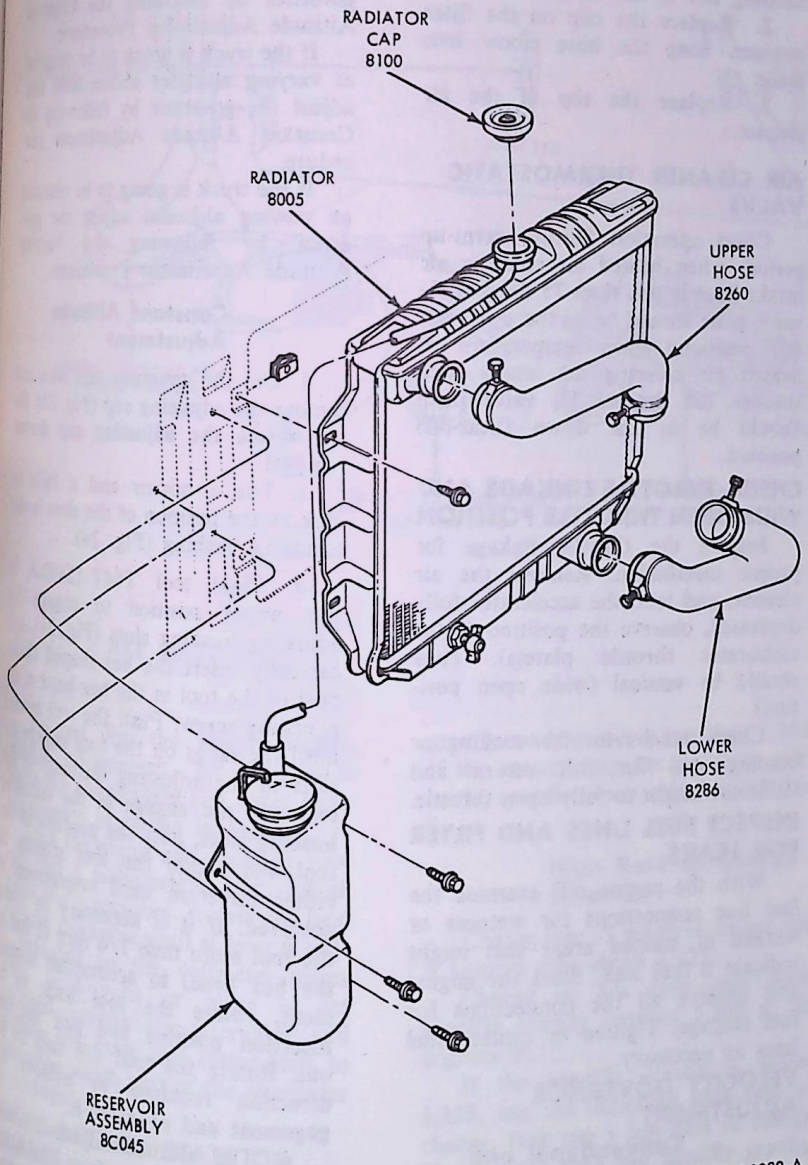


FIG. 21 Coolant Recovery System

CHECK WINDSHIELD WASHER FLUID LEVEL

In warm weather, fill the reservoir with water and enough Rotunda windshield washer solvent to act as a detergent.

In winter, be sure to keep the bag filled with a solution of 2 parts water to 1 part Ford windshield washer solvent. This solution is necessary to prevent freezing and damaging the plastic container.

CHECK BATTERY FLUID LEVEL

Keep the fluid in each battery cell up to the level of the ring in the bottom of the filler well.

Ordinary tap water can be used except in areas where the water is known to be hard or to have a high mineral or alkali content—use distilled water in these areas.

Hydrogen and oxygen gases are produced during normal battery operation. This combustible gas mixture can explode if flames or sparks are brought near the vent openings of the battery. The sulphuric acid in the

battery electrolyte can cause a serious burn if spilled on the skid or spattered in the eyes. It should be flushed away with large quantities of clear water.

CHECK BATTERY CABLES

Battery cables must be tight in terminals and terminals tight to posts. A light coating of non-metallic grease can be applied to terminals and posts to retard corrosion and oxidation.

CHECK HYDRAULIC BRAKE MASTER CYLINDER FLUID LEVEL

The level should be maintained 1/4 to 1/2 inch below the top of the reservoir on both single and dual master cylinders. Use only the specified brake fluid. Refer to the Lubricant Chart in Section 9.

CHECK HYDRAULIC CLUTCH MASTER CYLINDER FLUID LEVEL

The clutch master cylinder reservoir should be filled to 1/2 inch from the top. Use only the specified fluid.

CHECK POWER STEERING RESERVOIR FLUID LEVEL

Run the engine until the fluid is at normal operating temperature. Then turn the steering wheel all the way to the left and right several times. Make sure that the wheels are in the straight ahead position, then shut off the engine.

Check the fluid level in the power steering reservoir on Ford-Thompson pumps. The level must show on the cross hatching between the bottom of the dipstick and the full mark. If the level is low, add automatic transmission fluid. Refer to the Lubricants Chart in Section 9 for au tomatic transmission fluid specification number. **Do not overfill the reservoir.** Remove excess fluid with a suction device.

CHECK AIR STARTER AIR RESERVOIR

Check the air reservoir to be sure it is securely attached. Check the air lines and fittings to be sure they do not leak. Make corrections as necessary.

INSPECT RADIATOR SHUTTERS

Check for smooth closing of shutters when engine is started, and for smooth opening as engine reaches operating temperature. Check blades for proper sealing. Adjust as required.

CRANKCASE VENTILATION FILTER

Refer to Part 50-02, Maintenance Schedule, for recommended frequency of replacement.

Removal

1. Remove the clip from the crankcase ventilation filter retainer and hose elbow (Fig. 22). Remove the hose elbow.
2. Remove the top of the air cleaner.
3. Remove the filter pack from the air cleaner tray. Remove the filter.

Installation

1. Replace the filter in the filter retainer. Index the filter pack to the locating slot in the air cleaner.
2. Replace the clip on the filter retainer. Snap the hose elbow into place.
3. Replace the top of the air cleaner.

AIR CLEANER THERMOSTATIC VALVE

Check operation. During warm-up period: when heated air entering air intake duct is less than 75 degrees F., valve plate should be in the up (heat-on) position; when temperature of heated air entering air intake duct reaches 105 degrees F., valve plate should be in the down (heat-off) position.

CHECK THROTTLE LINKAGE AND WIDE OPEN THROTTLE POSITION

Inspect the throttle linkage for proper installation. Remove the air cleaner, and with the accelerator fully depressed, observe the position of the carburetor throttle plate(s). They should be vertical (wide open position).

Check accelerator for sticking or binding and for full return and sufficient height to fully open throttle.

INSPECT FUEL LINES AND FILTER FOR LEAKS

With the engine off, examine the fuel line connections for wetness or washed or stained areas that might indicate a fuel leak. Start the engine and observe all the connections for fuel seepage. Tighten or replace fuel lines as necessary.

VELOCITY GOVERNOR ADJUSTMENT

Conventional and Coolant Heated Velocity Governors

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

If governed speed is within rang stop the engine and remove th tachometer.

If adjustment is required d desired, remove the governor seal (Fig 23). To increase rpm, turn the ca counterclockwise. To decrease rpm turn the cap clockwise. When ad justment is complete, stop the engine seal the cap, and remove th tachometer.

Compensating Governor

If the truck is going to be operated at a consistent altitude, adjust the governor by following the Constan Altitude Adjustment Procedure.

If the truck is going to be operated at varying altitudes above 2000 feet adjust the governor by following the Constant Altitude Adjustment procedure.

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

Constant Altitude Adjustment

1. Cut the governor seal wire and remove the adjusting cap (Fig. 23). **Do not rotate the adjusting cap during removal.**
2. Use a mirror and a light to observe the position of the slots in the adjusting bushing (Fig. 24).
3. Hold tool T64T-12450-A in the proper position to engage the adjusting bushing slots (Fig. 24), and carefully insert the hex-shaped center post of the tool in the hex-head of the adjusting screw. Push the tool inward until the tangs on the tool engage the slots in the adjusting bushing. **If the tool will not engage in the adjusting bushing slots, note the position of the tool and rotate the tool slightly in either direction until engagement is achieved. If it is necessary to rotate the tool more than 1/6 turn (1 flat of the hex head) to accomplish engagement, rotate the tool back to its insertion position and pull the tool out. Rotate the tool 1/6 turn in the direction required to achieve engagement and re-insert it.**
4. The altitude adjustment table specifies the amount from the factory setting that Tool T64T-12450-A should be rotated to adjust the velocity

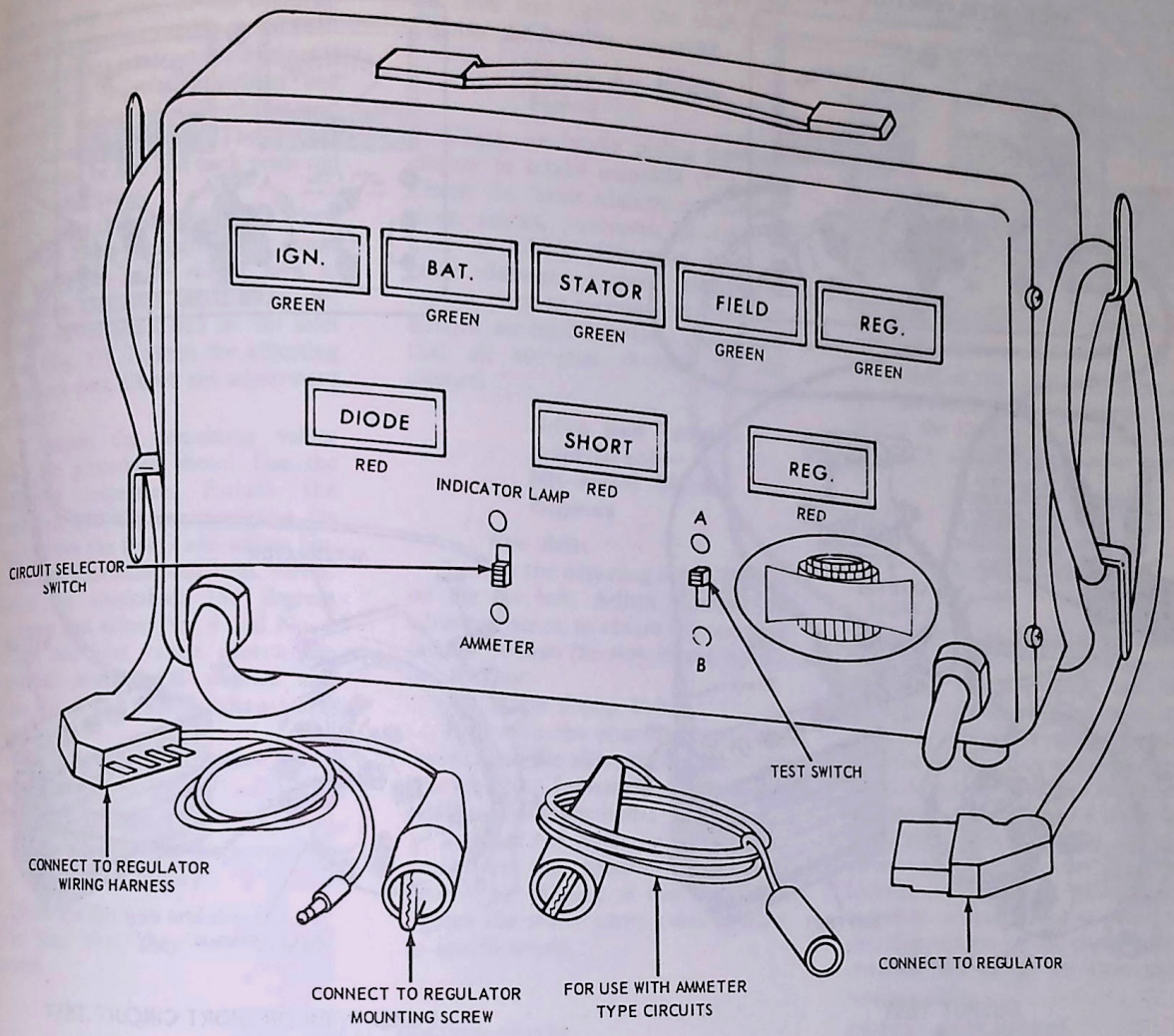


FIG. 27 ARE 20-22 Tester

To test for the stator neutral voltage, disconnect the regulator. Make the connections and tester knob adjustments as shown in Fig. 31.

Start the engine and run it at 1000 rpm (use a tachometer). Turn off all lights and accessories. Rotate the field rheostat clockwise until at least 6 volts is indicated on the voltmeter upper scale. If 6 volts or more is not obtained, remove the alternator and perform the diode and stator tests to determine which part of the alternator is damaged.

CHECK BATTERY STATE OF CHARGE

When corrected to 80 degrees F. the battery should have a specific gravity reading of not less than 1.250. If the battery requires charging, refer to the specific gravity chart in Section 9.

High Rate of Charge Schedule

Charge rate 35 amperes, except use 5 ampere rate above 1.225.

Charge at low rate only until specific gravity reaches 1.250 at 80 degrees F.

If the specific gravity is below 1.125, use the indicated high rate of charge, then use a low rate of charge (5 amperes) until the specific gravity reaches 1.250 at 80 degrees F.

FORD V-8 DIESEL ENGINES

Check Torque of Engine Mounting Bolts

Use a ft-lb torque wrench and check the torque effort against the specifications for this engine. Refer to Group 22 of the 1971 Truck Shop Manual for procedures and specifications.

Check Air Inlet Piping

Check air intake piping from air cleaner to intake manifold. Check for loose clamps or connections, cracks, punctures, or tears in hose or tubing, collapsing hose, or other damage.

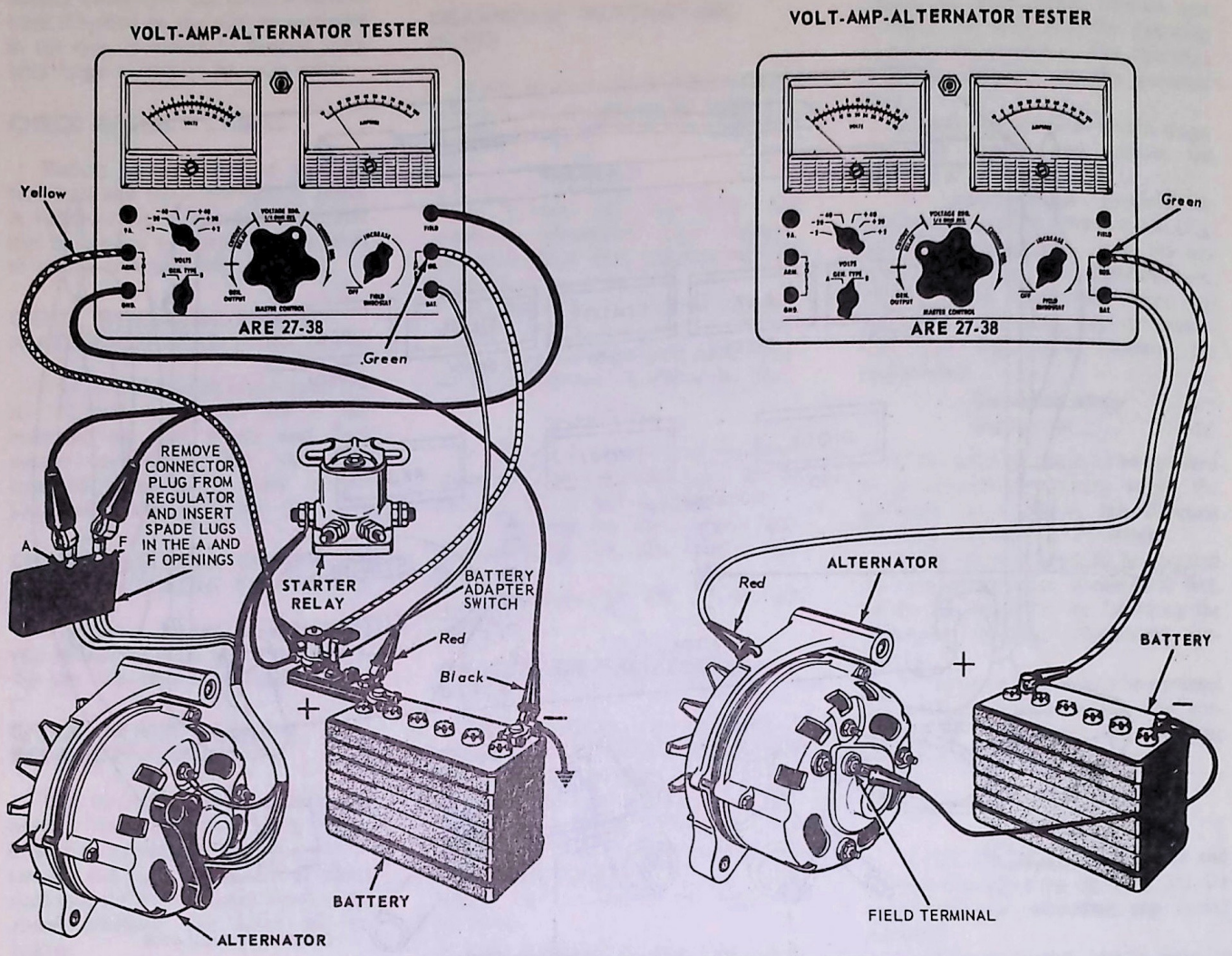


FIG. 30 Alternator Tests

Tighten clamps or replace parts as necessary to insure an airtight air intake system. Make sure that all air goes through the air cleaner.

Check Engine High and Low Idle Speed

Check the engine high (governed no-load) rpm and low idle rpm per Fig. 32. Use of a direct-reading tachometer is recommended.

If the high idle or low idle rpm is not to specifications, free up or adjust the throttle linkage before making any adjustment of the governor settings. The idle settings, both high and low, are adjusted at the factory and any deviation from specifications should be due to the throttle linkage assembly or operation.

If throttle linkage adjustment will not correct the idle speeds to specifications, follow the procedure given below to adjust both high and low idle. **Only qualified personnel should perform this operation.**

High and Low Idle RPM

Check the engine rpm with an accurate tachometer. Install the tachometer on the adapter located on the front cover (Fig. 33). The reading taken at this point, with a 1:1 tachometer, will be one-half engine rpm.

Remove the high idle adjustment screw cover from the rear of the governor. Turn the high idle adjusting screw (Figs. 34 and 35) clockwise to increase or counterclockwise to decrease high idle speed.

If the adjusting screw requires alignment to install the cover, turn the screw in a clockwise direction the minimum distance required for installation.

Adjust low idle speed by loosening locknut (Fig. 34) and turning the adjustable stop. Turning the stop IN decreases and OUT increases the low idle speed. Tighten the locknut and recheck the adjustment.

Valve Clearance Adjustment

Valves on this engine are adjusted cold. Make sure that the engine has been stopped for at least twenty minutes before checking or adjusting the valve clearance.

1. Remove both valve covers.
2. Refer to Fig. 36 for cylinder and valve arrangement. Set No. 1 piston on top center of the compression stroke by rotating the crankshaft until the timing mark on the damper is aligned with the timing pointer and number 1 and number 2 exhaust and inlet valves are closed. The rocker arms should be free and each push rod at its lowest point.
3. Loosen the valve adjusting screw lock nuts. Use a standard feeler gauge and adjust the valve rocker arm to valve stem clearance to 0.025 in. for exhaust valves and 0.015 in. for inlet valves (Fig. 37). Tighten the adjusting screw lock nuts. Check the adjustment clearance.
4. Adjust the remaining valves using the procedure above. Use the following sequence: Rotate the crankshaft 180 degrees clockwise (as viewed from the front) and adjust No. 7 and No. 3 exhaust and inlet valves. Rotate the crankshaft 180 degrees clockwise and adjust No. 4 and No. 5 exhaust and inlet valves. Rotate the crankshaft another 180 degrees and adjust No. 6 and No. 8 exhaust and inlet valves.
5. Install the valve covers using new gaskets.

CUMMINS DIESEL ENGINES

Check Fan Hub and Drive Pulley

Check the fan hub and drive pulley to be sure that they are securely mounted.

Tighten the fan capscrews. Check the drive pulley for looseness or wobble, and, if necessary, remove fan and hub and tighten the shaft nut. Tighten the bracket capscrews.

Check Air Intake Piping

Check air intake piping from air cleaner to intake manifold (Fig. 38). Check for loose clamps or connections, cracks, punctures, or tears in hose or tubing, collapsing hose, or other damage. Tighten clamps or replace parts as necessary to insure an airtight air intake system. Make sure that all air goes through the air cleaner.

Drive Belt Tension Adjustment—NH-Series Diesel Engines

Fan Belts

Loosen the adjusting screw locknut on the fan hub. Adjust the fan hub adjusting screw to obtain the specified fan belt tension (Section 9) and tighten the locknut.

Water Pump Belts

1. Loosen the alternator adjusting bracket and the alternator to mounting bracket bolts. Loosen the water pump retainer mounting bolts.
2. Pivot the water pump assembly to obtain the specified drive belt tension (at the end of this Part) and tighten the water pump retainer bolts to specifications.

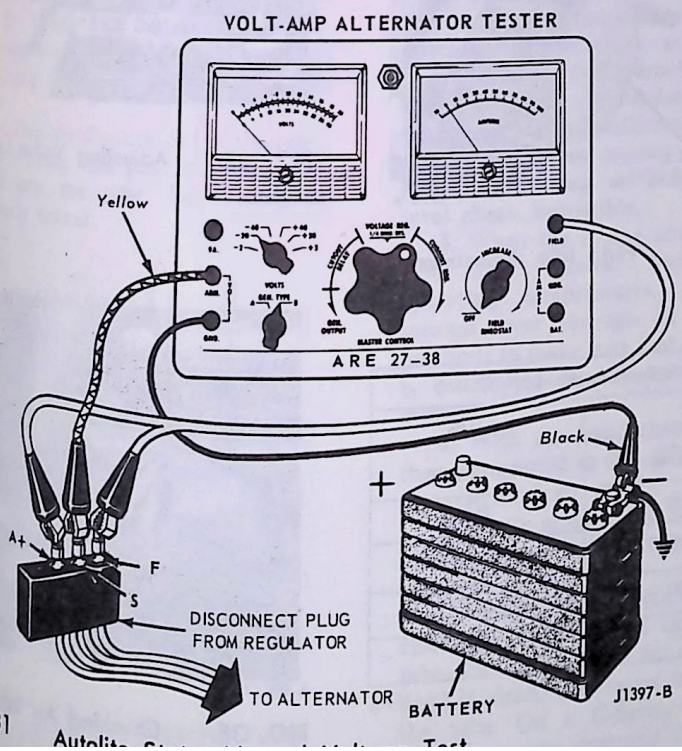


FIG. 31 Autolite Stator and Rectifier Test

FIG. 32 Tachometer Adapter Location

3. Adjust the alternator to obtain the specified drive belt tension and tighten the adjusting bracket bolt and alternator to mounting bracket bolts.

Drive Belt Tension Adjustment—NH-Series Engines—LN-Series Trucks

1. Loosen the water pump retainer bolts. Loosen the alternator to mounting bracket bolts and the adjusting bracket bolt. Loosen the adjusting locknut on the cooling fan hub and back-off the adjusting screw.
2. Adjust the tension of the cooling fan belts to specification (at the end of this Part) by means of the adjusting screw and tighten the adjusting locknut. Pivot the water pump assembly counterclockwise until the specified tension on the pump belts is obtained and tighten the water pump retainer bolts.

CHECK ANTI-FREEZE PROTECTION

Be sure the engine is at operating temperature. Check the anti-freeze in the cooling system by using a permanent anti-freeze test hydrometer. Standard protection is to -20 degrees F. (-35 degrees F. for Canadian vehicles) with a solution of Ford Permanent Anti-Freeze and water. The freeze protection of engines should be maintained at an adequate level for the temperatures which may occur in the area in which the vehicle will be operated. Regardless of the freeze protection required for gasoline engines during cold weather, it must be maintained at least to 0 degrees F. to provide adequate corrosion and boiling protection.

REPLACE CRANKCASE FILL CAP BREATHER—SUPER DUTY ENGINES

Replace the filler cap and breather assembly at specified maintenance

intervals. With a closed type crankcase ventilation system, the air hoses will have to be disconnected before removing the filler cap assemblies.

REPLACE CARBURETOR AIR CLEANER FILTER

1. Remove the wing nuts retaining the air cleaner assembly to the carburetor. Disconnect the crankcase ventilation system hose at the air cleaner and remove the assembly.
2. Install a new air cleaner mounting gasket on the carburetor, if necessary.
3. Install the air cleaner body on the carburetor so that the word **Front faces the front.**
4. Place the air cleaner filter element in the air cleaner body.
5. Install the cover and tighten the wing nut.
6. Connect the crankcase vent hose to the air cleaner.

CHECK AND CLEAN AIR COMPRESSOR FILTER

Remove and disassemble the air inlet filter. If it is dirty and clogged, wash all parts including the filter element, in a suitable cleaning solvent. Saturate the filter element with clean light engine oil and squeeze dry before replacing it in the filter body. Assemble and install the filter.

REPLACE POWER STEERING PUMP RESERVOIR FLUID FILTER—EXCEPT F-100-250 AND ECONOLINE

Remove nut and two washers securing reservoir cover and seal. Remove cotter pin, washer, spring, and retainer plate. Lift out filter element and replace with a new one. Reassemble parts securing filter element, seal and reservoir cover in reverse order of disassembly (Fig. 39). Be sure cover gasket is properly seated. Secure cover with wingnut and two washers.

FIG. 34 Idle Adjustment Locations

CHECK EXHAUST CONTROL VALVE FOR FREE OPERATION (IF SO EQUIPPED)

Check the thermostatic spring of the valve to make sure it is hooked on the stop pin. The spring stop is at the top of the valve housing when the valve is properly installed.

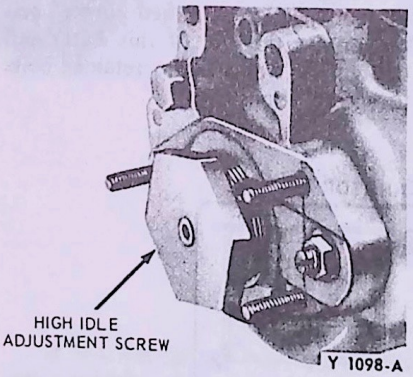


FIG. 35 High Idle Adjustment Screw

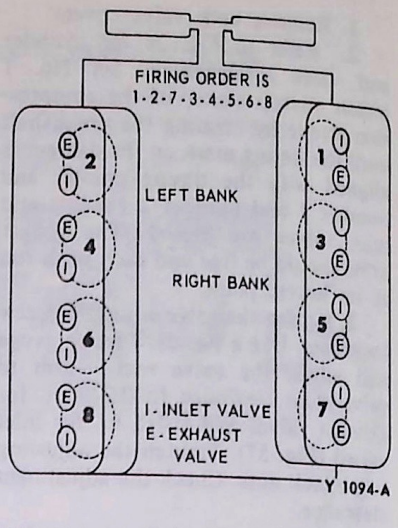


FIG. 36 Cylinder and Valve Arrangement

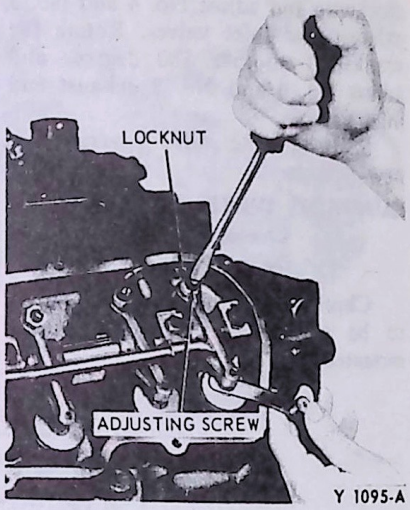


FIG. 37 Adjusting Valve Lash

Model	Engine Speed – RPM (Hydraulic Governor)		
	High Idle	Full Load	Low Idle (+0, –10 RPM)
150	3380	3200	525
175	3410	3200	525
200	3255	3000	525
225	3040	2800	525

CY 1177-B

FIG. 33 Ford V-8 Diesel Idle RPM

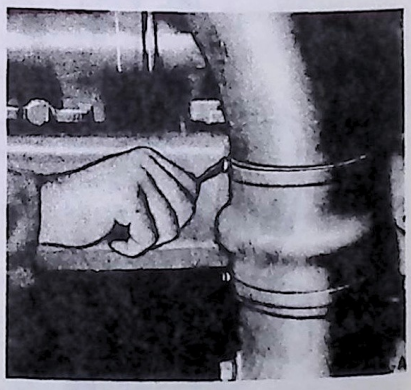


FIG. 38 Checking Air Inlet Piping

To check the exhaust control valve, make sure the spring holds the valve closed. Actuate the counterweight by hand to make sure it moves freely through approximately 90 degrees of rotation without binding.

The valve is closed when the engine is cold (Fig. 40). However, a properly operating valve will open when very light finger pressure is applied to the counterweight. Rapidly accelerate the engine to make sure the valve momentarily opens. The valve is designed to open when the engine is at normal operating temperature and is operated at high rpm.

Lubricate and free the valve with the specified solvent (Section 9) if the valve is sluggish or stuck.

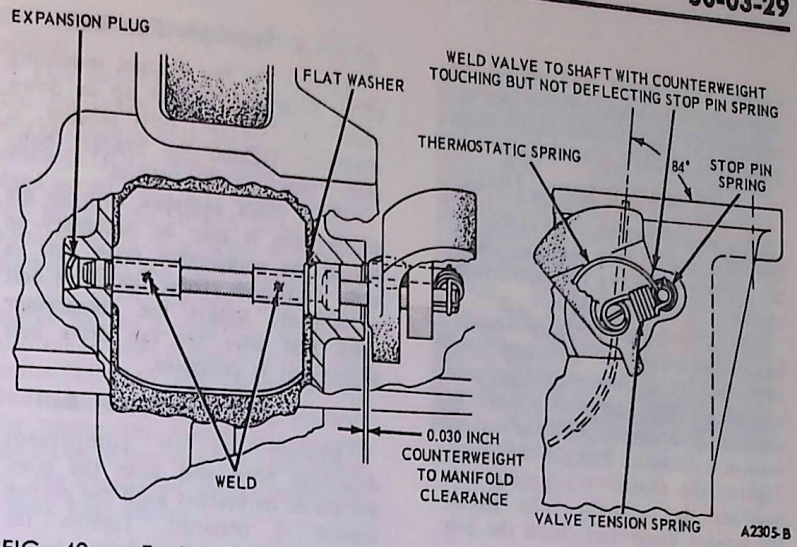


FIG. 40 Engine Exhaust Control Valve—Typical

CHECK FLUID LEVEL—AUTOMATIC TRANSMISSION (EXCEPT TRANSMATIC)

The transmission fluid level should be checked using the following procedure.

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

2. Run the engine at normal idle speed. If the transmission fluid is cold, run the engine at fast idle speed (about 1200 rpm) until the engine reaches its normal operating temperature. When the engine is warm, slow it down to normal idle speed, shift the selector lever through all positions, and place the lever at P. Do not turn off the engine during the fluid level check.

3. Clean all dirt from the transmission dipstick cap before removing the dipstick from the fill tube.

4. Pull the dipstick out of the tube, wipe it clean, and push it all the way back into the tube. Be sure it is properly seated.

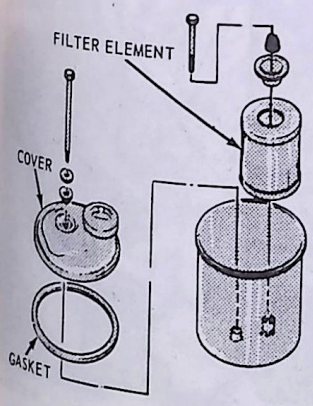


FIG. 39 Power Steering Pump Filter

5. Pull the dipstick out of the tube again, and check the fluid level. The fluid level should be above the ADD mark. If necessary, add enough fluid to the transmission through the filler tube to bring the level between the ADD and FULL marks on the dipstick. **Do not overfill the transmission. Install the dipstick, making sure it is fully seated in the tube.**

CHECK TRANSMATIC TRANSMISSION FLUID LEVEL

1. With the vehicle standing level, apply the parking brake, and place the range selector lever in N. Start the engine.

2. If the transmission fluid is cold, operate the transmission until normal operating temperatures are reached. **Do not operate the hydraulic retarder to warm the transmission fluid. Operating the hydraulic retarder when the vehicle is not moving will aerate the fluid, making an accurate fluid level check impossible.**

3. When the engine and transmission have reached their normal operating temperatures, move the selector lever through all the range positions to make sure that warm fluid is distributed throughout the transmission.

4. With the hand throttle, adjust the engine speed to 800-1000 rpm with the selector lever at N.

5. Clean around the transmission dipstick cap before removing the dipstick.

6. Twist the dipstick counterclockwise to unlock the cap from the tube. Pull the dipstick out of the tube, wipe it clean, and insert it back into the tube. On a C-Series truck, the [illegible] through the opening in the panel behind the seat back cushion with the cab in its normal position.

7. Remove the dipstick again and check the fluid level. If necessary, add Specified Automatic Transmission Fluid to raise the fluid level to the FULL mark on the dipstick. If the fluid level is more than 5/16 inch above the FULL MARK, drain fluid until the FULL level is obtained.

8. Replace the dipstick in the tube. Turn the cap clockwise to lock it. **Failure to lock the cap may cause fluid leakage during retarder operation.**

DRIVE BELT TENSION ADJUSTMENT— GASOLINE ENGINES

Recommended belt tensions are included in the Specifications Section.

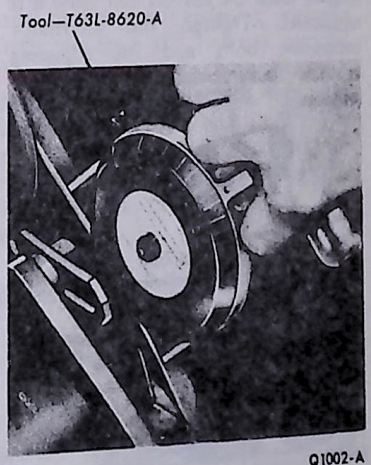


FIG. 41 Checking Drive Belt Tension

Check the tension and adjust as necessary. To insure proper tension use Burroughs Belt Tension Checking Tool T63L-8620-A (Fig. 41).

100-350 Series Trucks

1. Install the belt tension tool on the drive belt(s) (Fig. 41) and check the tension following the instructions of the tool manufacturer.
2. If adjustment is necessary, loosen the alternator mounting bolts and move the alternator adjusting arm bolt. Move the alternator toward or away from the engine until the correct tension is obtained. Remove the gauge. Tighten the alternator adjusting arm bolt and the mounting bolts. Install the tension gauge and check the belt tension.

500-900 Series Trucks

1. Install the belt tension tool on the drive belt(s) (Fig. 41) and check the tension following the instructions of the tool manufacturer.

The tension is checked between the water pump pulley and the alternator pulley on single or double fan drive belts and all alternator and water pump fan drive belts. The tension on separate fan drive belts is checked between the fan pulley and the crankshaft pulley. The tension of the air compressor drive belt is checked between the compressor pulley and the fan pulley or the crankshaft (C-Series).

2. If adjustment is necessary, follow the applicable procedure.

Single or Double Fan Belts

Loosen the alternator mounting bolts and the alternator adjusting bracket bolt. Move the alternator generator toward or away from the engine until the correct belt tension is obtained. Tighten the alternator mounting bolts and the adjusting bracket bolt before checking the tension.

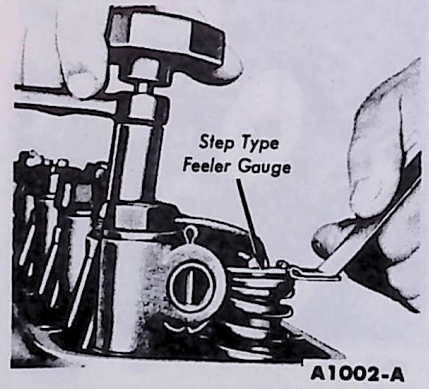


FIG. 42 Typical Valve Lash Adjustment—401, 477, 534 Engines

Separate Fan Belt

Loosen the fan bracket mounting bolts. Slide the bracket up or down until the correct belt tension is obtained. Tighten the bracket bolts before checking the tension.

On a truck equipped with an air compressor, it may be necessary to loosen the compressor drive belt in order to obtain proper fan drive belt adjustment. Adjust the compressor drive belt after the fan drive belt adjustment is complete.

Air Compressor Belt

Loosen the air compressor mounting bolts and slide the compressor in its bracket until the correct tension is obtained. Tighten the compressor mounting bolts before checking the deflection. **Adjust the air compressor drive belt whenever the fan drive belt is adjusted or replaced. Adjust the air compressor drive belt last.**

CHECK AND ADJUST VALVE LASH (170, 401, 477 AND 534 C.I.D.)

It is very important that the valve lash be held to the correct specifications because:

If the lash is set too close, the valve will open too early and close too late, resulting in rough engine idle. Burning and warping of the valves will occur also because the valves cannot make firm contact with the seats long enough to cool properly. If the lash is excessive, it will cause the valve to open too late and close too early causing valve bounce. In addition, damage to the camshaft lobe is likely because the tappet foot will not follow the pattern of the camshaft lobe causing a shock contact between these two parts.

1. Be sure the engine is at normal operating temperature before attempting to set the valve lash.
2. With the engine idling, set the valve lash (Fig. 42) using a step-type feeler gauge only (go and no go). The final (hot) intake and exhaust valve lash settings are listed below:

Engine Valve Lash

170 0.018
401, 477, 534 0.020

CHECK DISTRIBUTOR POINTS AND ADJUST DWELL

Use a dwell meter to check the contact dwell. It is not advisable to use a feeler gauge to adjust or to check the gap of used breaker points because the roughness of the points makes an accurate gap reading or setting impossible. Sand or file the breaker points and check and adjust the alignment. Check the spring tension. Check the contact dwell following the instructions of the dwell meter manufacturer.

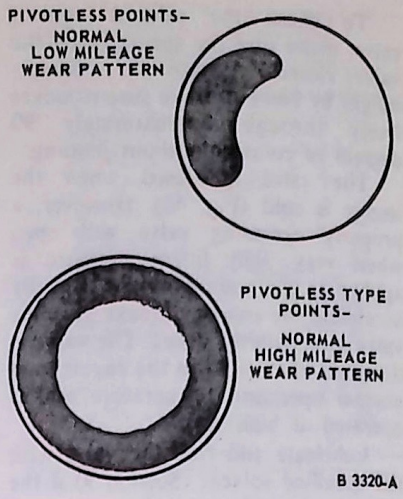


FIG. 43 Pivotless Point Wear Pattern

Breaker Point Alignment

The pivoted-type breaker points used in Ford distributors should be accurately aligned and strike squarely to assure normal breaker point life. However, misalignment of the pivotless-type points is not so critical, and as Fig. 43 indicates, alignment tends to improve with use.

1. Turn the distributor cam so that the breaker points are closed and check the alignment of the points.
2. Using the tool shown in Fig. 44 and **using very light pressure,** align

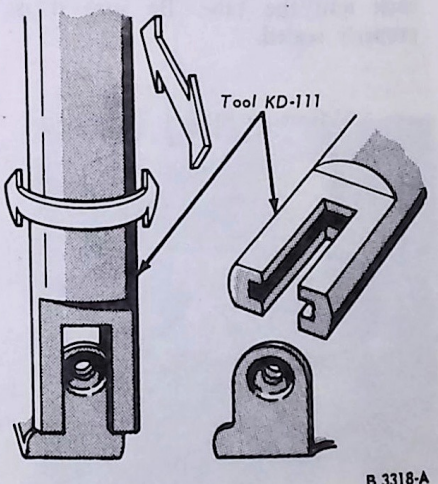


FIG. 44 Using Alignment Tool

the breaker points to make full face contact by bending the stationary breaker point bracket (Fig. 44). **Do not bend the breaker arm.**

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

Breaker Point Spring Tension

To check the spring tension, place the hooked end of the spring tension gauge over the movable breaker point, then pull the gauge at a right angle (90 degrees) to the movable arm until the breaker points just start to open (Fig. 45. If the tension is not within specifications, adjust the spring tension.

To adjust the spring tension (Fig. 46):

1. Disconnect the primary and condenser leads at the breaker point assembly primary terminal.

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

3. Tighten the locknut, then check spring tension. Repeat the adjustment until the specified spring tension is obtained.

4. Install the primary and condenser leads with the lockwasher and tighten the nut securely.

CHECK AND ADJUST IGNITION TIMING— INITIAL TIMING, MECHANICAL AND VACUUM ADVANCE AND VACUUM RETARD

Timing Mark Locations

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

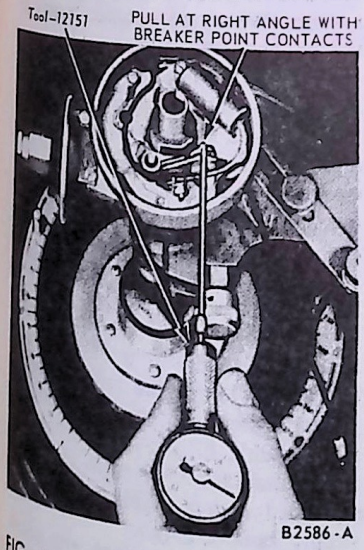


FIG. 45 Checking Breaker Point Spring Tension

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

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

Initial Ignition Timing

Because of the high engine idle speeds required on exhaust emission control engines, precautions must be taken when setting the initial ignition timing to be sure that the distributor is not partially advanced. To be sure that no distributor advance is taking place, idle speed should be reduced to 600 rpm **after the vacuum hoses have been disconnected from the diaphragm unit and plugged.** Reset the idle to the specified rpm after adjusting the initial timing. Initial ignition timing and idle specifications for 1971 Trucks are given in Section 9.

1. Clean and mark the timing marks. Be sure the distributor vacuum lines are properly connected.

2. Disconnect the vacuum line (single-diaphragm distributors) or vacuum lines (dual-diaphragm distributor), and plug the disconnected vacuum line(s) (Fig. 47).

3. Connect a timing light to the No. 1 cylinder spark plug wire. Install an engine speed tachometer.

4. Start the engine and reduce the engine idle speed to 600 rpm to be sure that the centrifugal advance is not operating. Adjust the initial ignition timing to specifications by rotating the distributor in the proper direction. See Engine Timing Specifications in Section 9.

5. Check the centrifugal advance for proper operation. Start the engine and accelerate it to approximately 2000 rpm. If the ignition timing advances, the centrifugal advance mechanism is functioning properly. Note the engine speed when the advance begins and the amount of advance. Stop the engine.

6. Unplug the carburetor source vacuum line and connect it to the vacuum advance unit

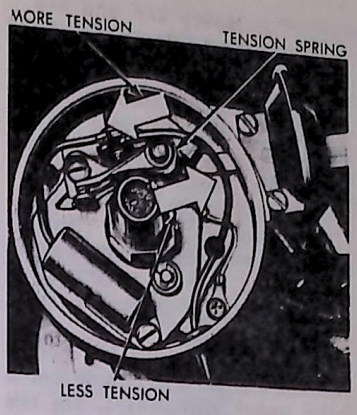


FIG. 46 Adjusting Spring Tension—Pivot- Type Points

(outer diaphragm on dual diaphragm distributors). Start the engine and accelerate it to approximately 2000 rpm. Note the engine speed when the advance begins and the amount of advance. Advance of the ignition timing should begin sooner and advance farther than when checking the centrifugal advance alone. Stop the engine.

7. Check the vacuum retard operation on dual diaphragm distributors. Connect the intake manifold vacuum line to the inner (retard) diaphragm side of the vacuum advance. Reset the carburetor to normal idle speed. The initial timing should retard to approximately TDC, if the initial ignition timing is correct. On some engines it will go as low as 6 degrees ATDC (degrees after top dead center).

8. If the vacuum advance or vacuum retard (dual diaphragm distribu tors) is not functioning properly (refer to steps 6 and 7 above), remove the distributor and check it on a distributor tester. Replace the dual diaphragm unit if the retard portion is out of calibration, the advance portion cannot be calibrated to specifications, or either of the diaphragms are leaking.

CARBURETOR ADJUSTMENTS

Idle Speed and Fuel Mixture

To help assure that 1971 Ford Motor Company vehicles operate within the limits of Government regulations governing exhaust emission, all carburetors are equipped with idle fuel mixture adjusting limiters.

Holley 2-V and 4-V Fast Idle Speed—Final Setting

A hand (cable) operated throttle control has been provided for the engines in various vehicle models and series. The throttle is actuated by a knob, located on the instrument panel. The hand operated throttle control is useful for maintaining constant engine speed when running power take-off equipment or when performing certain service operations.

The fast (cold engine) idle speed is adjusted with the hand throttle control knob pushed fully inward. The idle (hot engine) speed must be adjusted to specification before the fast idle speed can be adjusted.

330 and 361 2-V V-8 and 391 4-V V-8 Engines

The fast idle speed adjustment screw for the carburetor on a 330 and 361 2-V V-8 engine is located in the throttle housing. The fast idle speed adjustment screw for the 391 4-V V-8 engine is located in the governor housing (Fig. 63).

The fast idle adjustment screw contacts the fast idle cam during the engine warm-up period and controls the fast (cold engine) idle speed.

1. Adjust the idle (hot engine) speed and mixture to specifications before attempting to set the fast (cold engine) idle speed. **The fast idle speed adjustment is made with the engine at normal, stabilized operating temperature.**

2. With the engine operating and a tachometer attached to the engine, disconnect the choke cable housing from the choke cable housing from the choke cable bracket clamp. Pull the choke cable housing rearward until the choke plate operating lever is against the stop on the choke cable bracket. **Hold the choke plate open to the choke pulldown limit, to keep the engine running.**

3. Check the fast (cold engine) rpm. If the idle rpm is not to specification, turn the fast idle screw clockwise with a 3/16 inch wrench to decrease the engine rpm or counter-clockwise to increase the rpm. **On a 4-V carburetor, a 3/16 inch wrench with a 90 degree head will be required to perform the adjustment.**

4. Turn off the engine and remove the tachometer.

5. Push the choke lever, cable and housing forward to the full choke position and clamp the choke cable housing to the choke cable bracket.

6. Install the air cleaner assembly if other adjustments are not required.

The fast idle adjustment screw on the left side of the carburetor contacts the fast idle cam during the engine warm-up period and controls the fast (cold engine) idle speed (Fig. 63).

401, 477 and 534 4-V V-8 Engines

1. Adjust the idle (hot engine) speed and mixture before attempting to set the fast (cold engine) idle speed. **The fast idle speed adjustment is made with the engine at a normal, stabilized operating temperature.**

2. With the choke in the wide open position, turn the fast idle adjusting screw (Fig. 63) in until it just touches the fast idle cam; then back it off 1/8 to 1/4 turn.

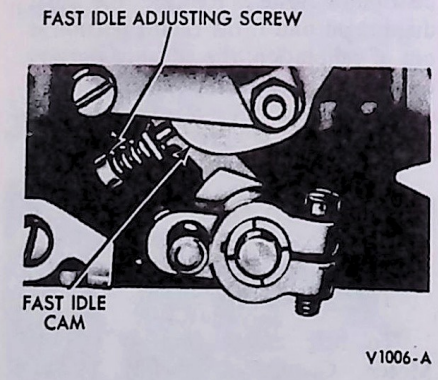


FIG. 64 Fast (Cold Engine) Idle Speed Adjustment—401, 477 and 534 4-V V-8 Engines

Holley Carburetor Accelerating Pump Lever Adjustment

1. Using a feeler gauge and with the throttle plates (primary throttle plates on 4-V carburetors) in the wide open position, there should be the specified clearance between the accelerating pump operating lever adjustment screw head and the pump arm when the pump arm is depressed manually.

2. If adjustment is required, loosen the adjusting screw lock nut and turn the adjusting screw in to increase the clearance and out to decrease the clearance. **One-half turn of the adjusting screw is equal to approximately 0.015 inch.** When the proper adjustment has been obtained hold the adjustment screw in position with a wrench and tighten the lock nut.

3. Perform an accelerating pump stroke adjustment, if required.

Holley Carburetor Accelerating Pump Stroke Adjustment

The accelerating pump stroke has been set to help keep the exhaust emission level of the engine within the specified limits. The additional holes provided for pump stroke adjustment are for adjusting the stroke for specific engine applications. **The stroke should not be changed from the specified setting.**

If the pump stroke has been changed from the specified setting refer to the following instructions to correct the stroke to specifications.

If a change in the adjustment is required, make certain the proper hole (top or bottom) in plastic accelerating pump cam, located behind the throttle lever, is properly aligned (indexed) with the numbered hole (top or bottom) in the throttle lever before installing the retaining screw.

DRAINING AND FILLING THE COOLING SYSTEM

Trucks with Gasoline Engines

To prevent loss of anti-freeze when draining the radiator attach a hose on the radiator drain cock and drain the coolant from the radiator into a clean container.

To drain the radiator, open the drain cock located at the bottom of the radiator and remove the radiator or supply tank cap. The cylinder block of the V-8 engine is drained by removing the drain plugs located on both sides of the block. The 6-cylinder engines have one drain plug located at the left rear of the cylinder block.

To fill the cooling system, install the cylinder block drain plug(s) and close the radiator drain cock. On 100-750 Series trucks, disconnect the heater outlet hose at the water pump to bleed or release trapped air in the system. When the coolant begins to escape, connect the heater outlet hose.

On C-800-900 Series trucks with super duty engines, open the air vent valve located at the front of the intake manifold to bleed the system. When coolant begins to escape at the opening, close the valve finger-tight. Do not overtighten, as the air vent valve is designed to be closed finger-tight only.

On downflow radiators, operate the engine and add more coolant, if necessary, to fill the radiator to the proper level. On trucks without a supply tank, fill the radiator one inch above the baffles (or core). On trucks equipped with a supply tank, fill the supply tank 2/3 full.

On L-Series equipped with cross-flow radiators, fill until the coolant is 1 inch from the top of the tank-engine

cold (Caution—Do not operate engine if coolant level is below sightglass.)

After the initial fill, the coolant level will drop approximately 1 quart after the engine has been operated about 20 minutes at 2000 rpm. This is due to the displacement of entrapped air.

COOLANT

Correct coolant level is essential for maximum circulation and adequate cooling. In addition, for the cooling system to perform its function, it must receive proper care. This includes keeping the radiator fins clean and a periodic inspection of the cooling system for leakage.

Use care when removing the radiator cap to avoid injury from escaping steam or hot water.

In production, the cooling system is filled with a 45-55 solution of Ford Permanent Anti-freeze and water (50-50 solution for Canadian and export delivery) which prevents corrosion, keeps the cooling system clean, provides anti-freeze protection to -20 degrees F. in winter (-35 degrees for Canadian and export delivery) and provides for higher sum mer operation temperatures.

For the most effective cooling system operation, this mixture strength should be maintained all year around and in all climates.

You should keep the freeze protection of your engine at an adequate level for the temperatures which may occur in the area in which your truck will be operated. Regardless of the freeze protection required for your climate during cold weather, it must be maintained at least to 0 degrees F. to provide adequate corrosion and boiling protection.

All coolant added should be the specified mixture of Ford permanent anti-freeze and water.

Ordinary tap water may be used in an emergency **except in areas where the water is known to be exceptionally hard or to have a high alkali content, The cooling system should be drained and flushed and the proper mixture of anti-freeze added as soon as possible, however.**

To avoid possible overheating in very hot weather, do not use mixtures with more than 50 percent anti-freeze except in areas where anti-freeze protection below -35 degrees F is required. In this case, refer to the coolant mixture chart on the Ford Permanent Anti-freeze container.

Do not add any radiator sealers containing water soluble oil to the cooling system as it will make the corrosion resistor (water filter) inoperative.

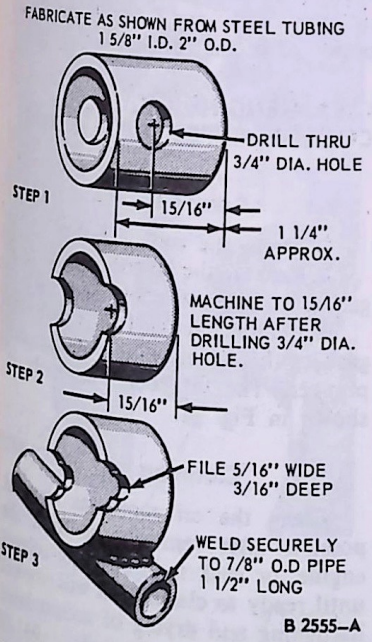


FIG. 65 Tool— Shutterstat Holding

RADIATOR COOLANT MIXTURE

To prevent damage to the cooling system during periods of below freezing ambient temperature, when water or anti-freeze is added to the supply tank, always operate the engine at fast idle for 30 minutes before letting the truck stand with the engine off for prolonged periods. This will allow a uniform mixture throughout the cooling system and prevent damage by freezing, when sufficient anti-freeze is used.

A standard ethylene glycol hydrometer can be used to check the protection level of the long-life coolant.

CHECK THE COOLING SYSTEM, HOSES AND LINES

Inspect the cooling system hoses for evidence of cracking, checking for extreme weathering. Replace cracked hoses. Check for leaking or porous hoses and tighten or replace.

Make sure all supporting brackets for hoses are in place and that the hoses are properly installed in the supports.

Inspect the radiator core and tanks for seepage or leaks.

CHECK ENGINE MOUNTINGS

Occasionally, the engine mountings ... checked. If the

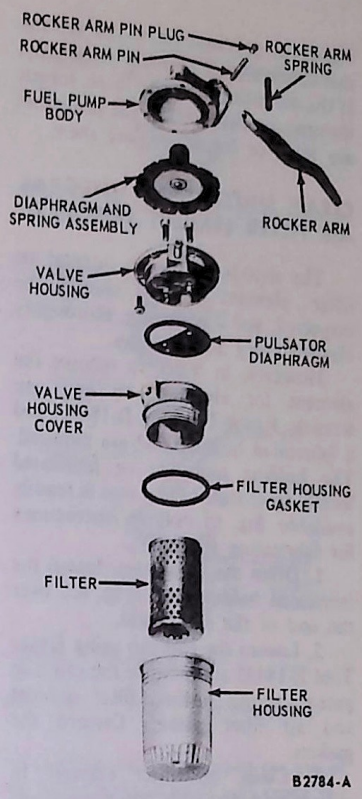


FIG. 66 Carter Fuel Pump Assembly—300 H.D., 330, 361 and 391 C.I.D. Engines

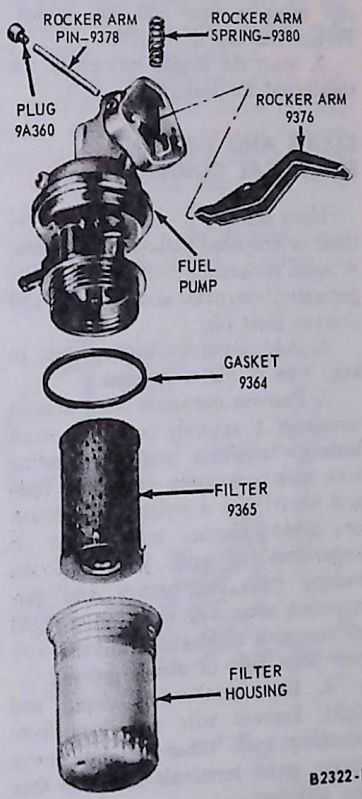


FIG. 67 Carter Sealed Design Fuel Pump Assembly—240, 300, 360 and 390 C.I.D. Engines

vehicle is operated on rough terrain, this check should be made frequently. If the mounting bolts are loose, torque them to specifications. If the insulators are worn or frayed, replace them.

CLEAN SHUTTERSTAT INTEGRAL AIR FILTER (EXCEPT W-SERIES)

The shutterstat has an integral air filter element which should be inspected, and if necessary, thoroughly cleaned every 24,000 miles.

However, in order to remove the element for cleaning, an end cap wrench, Kysor Tool No. B-18475, and a fabricated holding tool are required. The holding tool can be fabricated locally from steel tubing that is readily available. Fig. 65 outlines instructions for fabricating the tool.

1. Drain the air system. Install the fabricated holding tool (Fig. 65) over the end of the shutterstat.
2. Loosen the end cap using Kysor Tool B-18475 and remove the cap, cap gasket, spring washer, filter element and air filter gasket. Discard the gaskets.
3. Clean the filter element in solvent and dry with compressed air.
4. Place a new filter gasket in the shutterstat body. Then, install the air filter element, spring washer and end cap using a new end cap gasket. Torque the cap to 45 ft-lbs.
5. Start the engine and check the shutterstat for leaks.

CLEAN AND TIGHTEN ELECTRICAL CONNECTIONS

Hard starting is often traceable to loose or corroded battery connections. A loose connection will overwork the generator/alternator and regulator and shorten their life.

1. Add water to battery cells to keep tops of plates covered.
2. Remove corrosion from around terminals. If severely corroded, scrub battery, terminals and surrounding area with a solution of baking soda and water. Use a nylon-bristle brush or other plastic brush that is impervious to acid. Wash off the residue from the battery and surrounding areas with clean water. Coat all corroded areas and terminals with petroleum jelly or chassis grease.
3. Keep connections clean and tight. Prevent wire and lugs from touching each other or any metal except screw terminals to which they are attached.
4. Replace broken or worn wires and their terminals.
5. Have battery tested periodically. Follow battery manufacturer's instructions for maintenance.

FUEL FILTERS

Long-Life Disposable Filter

1. Unscrew the filter housing from the fuel pump, and remove the filter element and gasket. Discard the element and gasket. Clean the filter housing in cleaning solvent.
2. Place a new filter element over the spout in the fuel pump valve housing cover. **Be sure to use the proper type element for the installation.** Coat a new gasket with light engine oil and position the gasket on the filter housing (Figs. 66 and 67). Screw the filter housing onto the fuel pump. Hand tighten the filter housing until the gasket contacts the pump, and then advance it 1/8 turn.
3. Start the engine and check for leaks.

In-Line Fuel Filter—Bronco and Econoline

The in-line fuel filter used on all engines is of one piece construction and cannot be cleaned. Replace the filter if it becomes clogged or restricted.

1. Remove the air cleaner.
2. Loosen the retaining clamp securing the fuel inlet hose to the fuel filter.
3. Unscrew the fuel filter from the carburetor. Disconnect the fuel filter from the hose and discard the retaining clamp.
4. Install a new clamp on the inlet hose and connect the hose to the filter. Screw the filter into the carburetor inlet port. Tighten the filter.
5. Position the fuel line hose clamp and crimp the clamp securely.
6. Start the engine and check for fuel leaks.
7. Install the air cleaner.

In-Line Fuel Filter—500-800 Series—With Electric Fuel Pump

1. Unscrew the lower section from the upper section and remove the filter element and gasket (Fig. 68). Discard the element and gasket.
2. Clean the lower section in cleaning solvent. Clean the upper section with a cloth.
3. Coat a new gasket with light engine oil and position the gasket on the lower section.
4. Place a new filter element in the lower section.
5. Screw the lower section onto the upper section until the gasket contacts the upper section. Turn the lower section an additional 1/8 turn.

In-Line Fuel Filter—850-900 Series—With Electric Fuel Pump

1. Remove the drain plug from the filter bowl, and drain the fuel from the bowl into a suitable container (Fig. 69).
2. Remove the center bolt and washer, then remove the filter bowl and mounting gasket (Fig. 70). Remove the filter element, gaskets, spring and spring seat.
3. Discard the filter element and gaskets. Clean the filter lower section in cleaning solvent. Clean the upper section with a cloth.
4. Position the spring seat, spring and new lower gaskets in the filter bowl as shown in Fig. 70. Install a new element in the filter bowl. Position the filter and new upper gaskets against the upper body. Install and tighten the center bolt and washer.

INSPECT SECONDARY IGNITION WIRING

Inspect the secondary (high-tension) wiring for cracked insulation or indications of heat damage to the outer cover. Be sure that the spark plug wires are fully seated on the spark plugs and that the connections to the coil and distributor are bottomed in the receptacles provided.

CLEAN ENGINE OIL COOLER—SUPER DUTY ENGINES

Removal

1. Drain the cooling system.
2. Remove the oil cooler cover and gasket and the oil cooler and gasket.
3. Remove the relief valve plug and gasket; then remove the spring and plunger. The oil cooler assembly is shown in Fig. 71.

Cleaning

Clean the oil cooler as soon as possible after removing it from the engine, or soak it in cleaning solvent until ready to clean. This will prevent hardening and drying of accumulated foreign material.

Immerse the oil cooler in a commercial cleaning solvent and clean

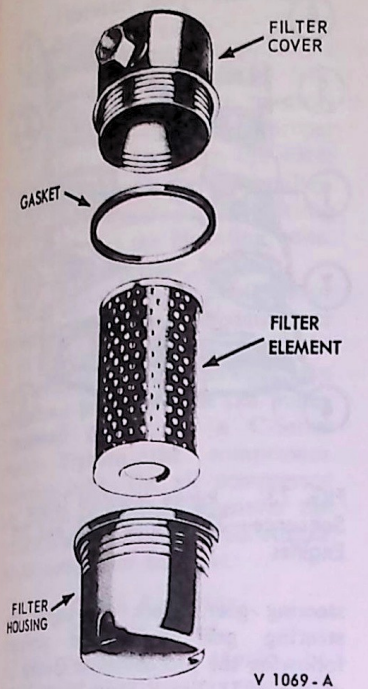


FIG. 68 Typical In-Line Fuel Filter—500-800 Series withElectric Fuel Pump

the outside of the plates with a stiff bristle brush.

Pressure circulate a standard commercial solvent (at a pressure of approximately 20 psi) through the oil passages of the cooler in the reverse direction of normal flow. Normal flow is from the bottom hole (inlet) to the top hole (outlet). If a circulating pump is not available, soak the cooler in solvent for a few minutes and force the solvent through the oil passages with a plunger or piston-type hand pump. If the oil passages are severely clogged, use an oakite or alkaline solution. After cleaning, pressure flush the cooler with clean hot water.

Thoroughly clean the passages in the cover and clean the relief valve assembly. Remove gasket sealer from the cover, oil cooler, and block.

Installation

1. Install the relief valve plunger (with the open chamber up), spring, gasket and plug in the cover.

2. Place a new cooler gasket, with sealer on both sides, on the block. Position the oil cooler in the block.

3. Place a new cover gasket on the cover with sealer on both sides and install the cover, then tighten the cover bolts to specifications.

4. Fill and bleed the cooling system.

TORQUE INTAKE MANIFOLD BOLTS— 8-CYLINDER ONLY

Refer to the appropriate illustration for the correct tightening sequence (Figs. 72 and 73). Using a torque wrench, and following the sequence given, tighten the manifold to specifications. Torque bolts evenly, criss-crossing the manifold at the fuel and coolant passage connections.

INSPECT, CLEAN, ADJUST AND TEST SPARK PLUGS

Removal

1. Remove the wire from each spark plug by grasping, twisting and then pulling the moulded cap of the wire only. **Do not pull on the wire because the wire connection inside the cap may become separated or the weatherseal may be damaged.**

2. Clean the area around each spark plug port with compressed air, then remove the spark plugs.

Cleaning and Inspection

1. Examine the firing ends of the spark plugs, noting the type of deposits and degree or electrode erosion. Refer to Fig. 74 for the various types of spark plug fouling and their causes.

2. Clean the plugs on a sand blast cleaner, following the manufacturer's instructions. **Do not prolong the use of the abrasive blast as it will erode the insulator.** Remove carbon and other deposts from the threads with stiff wire brush. Any deposits will retard the heat flow from the plug to the cylinder head causing spark plug overheating and pre-ignition.

3. Clean the electrode surfaces with a small file (Fig. 75). Dress the elec trodes to secure flat parallel surfaces on both the center and side electrode.

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

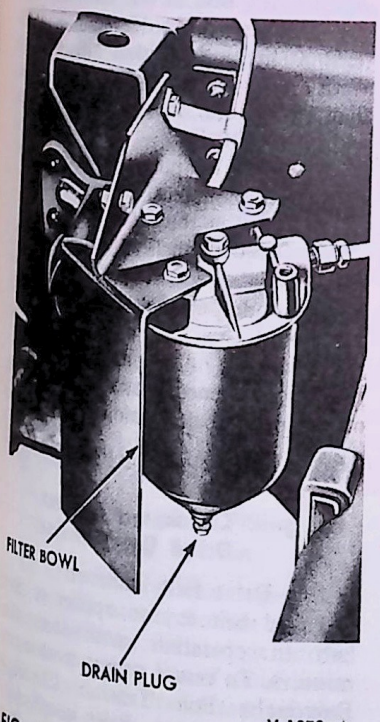


FIG. 69 Fuel Filter Installation—850-900 Series—with Electric Fuel Pump

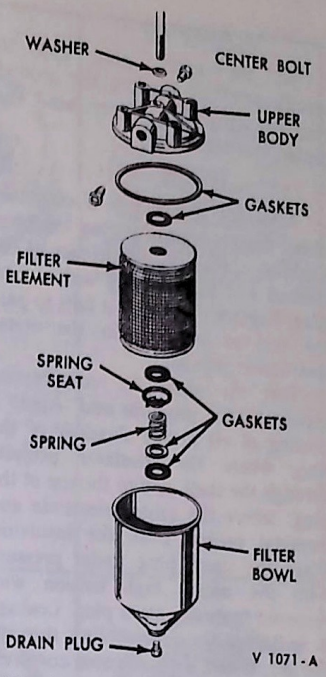


FIG. 70 Fuel Filter Assembly

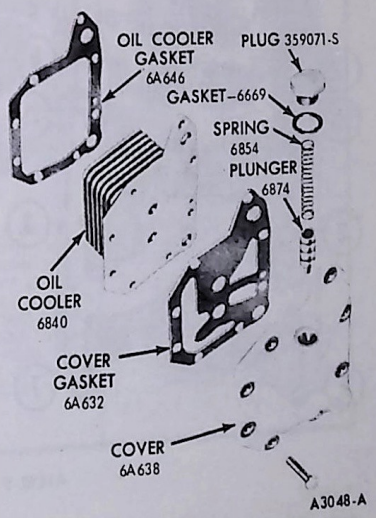


FIG. 71 Oil Cooler Assembly

Adjustment

Set the spark plug gap to specifications by bending the ground electrode (Fig. 76). **Never bend the center electrode.**

Testing

After the proper gap is obtained, check the plugs on a testing machine. Compare the sparking efficiency of the cleaned and gapped plug with a new plug. Replace the plug if it fails to pass the test as outlined in the tester instruction manual.

Test the plugs for compression leakage at the insulator seal. Apply a coating of oil to the shoulder of the plug where the insulator projects through the shell, and to the top of the plug, where the center electrode and terminal project from the insulator. Place the spark plug under pressure with the testers high tension wire removed from the spark plug. Leakage is indicated by air bubbling through the oil. If the test indicates compression leakage, replace the plug. If the plug is satisfactory, wipe it clean.

Installation

1. Install the spark plugs and torque each plug to 15-20 ft-lbs.

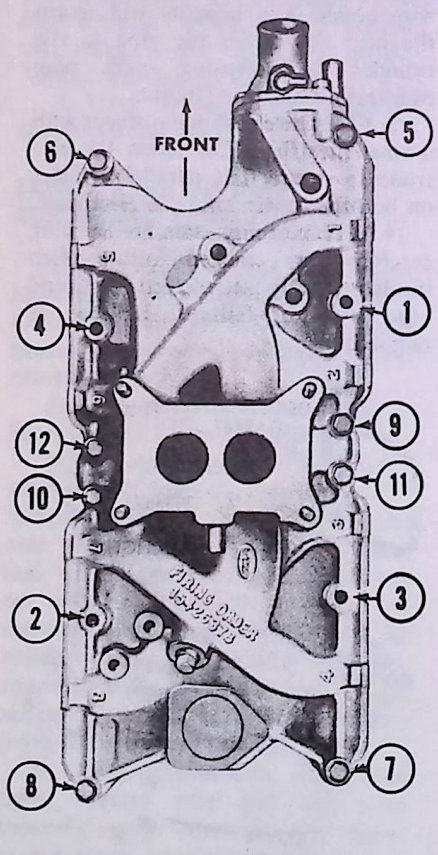


FIG. 72 Intake Manifold Torque Sequence—302 Engine

2. Connect the spark plug wires. Push all weather seals into position.

AUTOMATIC CHOKE OPERATION

Check the choke shaft for grooves, wear and excessive looseness or binding. Inspect the choke plate for nicked edges and for ease of operation and free it if necessary. Make sure all carbon and foreign material has been removed from the automatic choke housing and the piston. Check the operation of the choke piston in the choke housing to make certain it has free movement.

CLEAN CHOKE EXTERNAL LINKAGE

Examine the choke external linkage for free operation. If the linkage appears to be sticking, or is dirty, clean the linkage using a brush and common mineral-spirits type cleaning fluid.

CLEAN CRANKCASE EMISSION SYSTEM AND REPLACE VALVE

Do not attempt to clean the crankcase ventilation system valve. It must be replaced at the scheduled maintenance interval. The crankcase ventilation system valve is located inside the oil fill cap on vehicles equipped with a closed crankcase system.

The oil filler tube breather cap, located on the valve rocker arm cover should be cleaned at the proper mileage interval. **On a closed crankcase ventilation system, the oil filler tube cap does not filter air; therefore it does not require cleaning.** Remove the cap and wash it in a low volatility, petroleum-base solvent. Probe the breather hole(s) to assure removal of any accumulated deposits. Shake the cap dry and install it. **Do not dry with compressed air as air pressure may damage the filter element.**

Clean the crankcase ventilation system connection on the carburetor spacer or intake manifold by probing the inlet nipple with a flexible wire or bottle brush.

Clean the rubber hoses with a low-volatility, petroleum-base solvent and dry with compressed air.

STEERING GEAR MESH AND BEARING PRE-LOAD ADJUSTMENT

If loose steering slack in steering system or shimmy is isolated to the steering gear, check and adjust the steering gear mesh and preload following the procedures in Group 13 of the 1971 Truck Shop Manual.

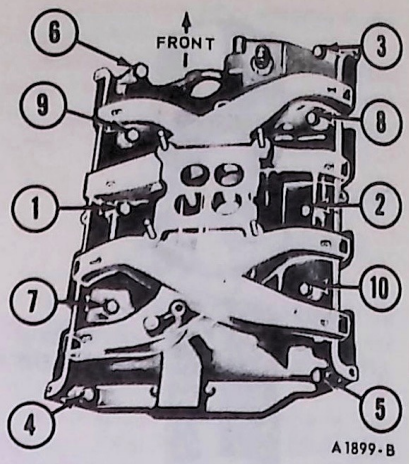


FIG. 73 Intake Manifold Torque Sequence—330,360,361,390, and 391 Engines

POWER STEERING PUMP BELT TENSION ADJUSTMENT

Pump drive belt tension should not be checked using the thumb pressure or belt deflection methods. Correct belt adjustment is assured only with the use of a belt tension gauge.

1. Check the belt tension with a belt tension gauge, Tool T63L-8620-A. With a new belt, or one that has been run for less than 15 minutes, the tension should be within 110-140 lbs. With a belt that has been run for more than 15 minutes, the tension should be within 80-110 lbs.
2. Pivot the pump to loosen or tighten the belt tension as necessary. **Do not pry on the reservoir.**
3. Torque the belt adjusting bolt to 30-35 ft-lbs. Check the tightness of the other mounting bolt (20-25 ft-lbs torque).
4. When all bolts have been properly tightened, make a final check of the pump belt tension.

FORD V-8 DIESEL ENGINES

Check and Adjust Drive Belt Tension

Drive Belt Tensions

Used belt tension applies to any belt in operation more than ten minutes. To insure proper tension use Burroughs Belt Tension Checking Tool T63L-8620-A. Belts installed in pairs should be replaced in pairs. Belt tension specifications are given at the end of this Part.

Alternator and Water Pump Belts

Loosen the alternator mounting bolts and the adjusting bracket bolt. Move the alternator toward or away from the engine until the proper tension is obtained between the water pump pulley and the alternator pulley. Tighten the alternator adjusting bracket bolt and the mounting bolts.

Air Compressor Belt

Loosen the air compressor mounting bolts. Slide the compressor in its mounting bracket to obtain the recommended tension between the compressor pulley and the fan pulley (crankshaft damper on a C-Series truck). Tighten the compressor mounting bolts. The air compressor belt should be adjusted whenever the fan belt is adjusted or replaced. Adjust the air compressor belt last.

Check Radiator Coolant Level

The coolant level should be maintained at approximately one inch below the filler neck of the radiator.

On L-Series with crossflow radiators, fill until the coolant is 1 inch from the top of the tank-engine cold. **(Caution— Do not operate engine if coolant level is below sight glass.)**

Check Condition of Coolant

Coolant water should be soft and free from scale-forming minerals. Add rust inhibitor if necessary. During freezing weather add sufficient ethylene glycol base anti-freeze to the coolant to prevent freeze-up. Do not add rust inhibitor to an anti-freeze solution containing its own rust inhibitor.

Clean Cooling System

Before cleaning this cooling system, refer to the appropriate Caterpillar Shop Manual for instructions and precautions.

To drain the system: Open radiator drain cock. Remove plugs from the engine block. Remove plug from the thermostat housing. Remove plug from the oil cooler.

Draining and Filling the Cooling System

To drain the radiator, open the drain petcock at the bottom of the radiator and drain the coolant into a container to prevent loss of anti-freeze. The radiator will drain faster if the filler cap is removed.

To drain the cylinder block, open the drain cocks at the thermostat housing and oil cooler, and remove the

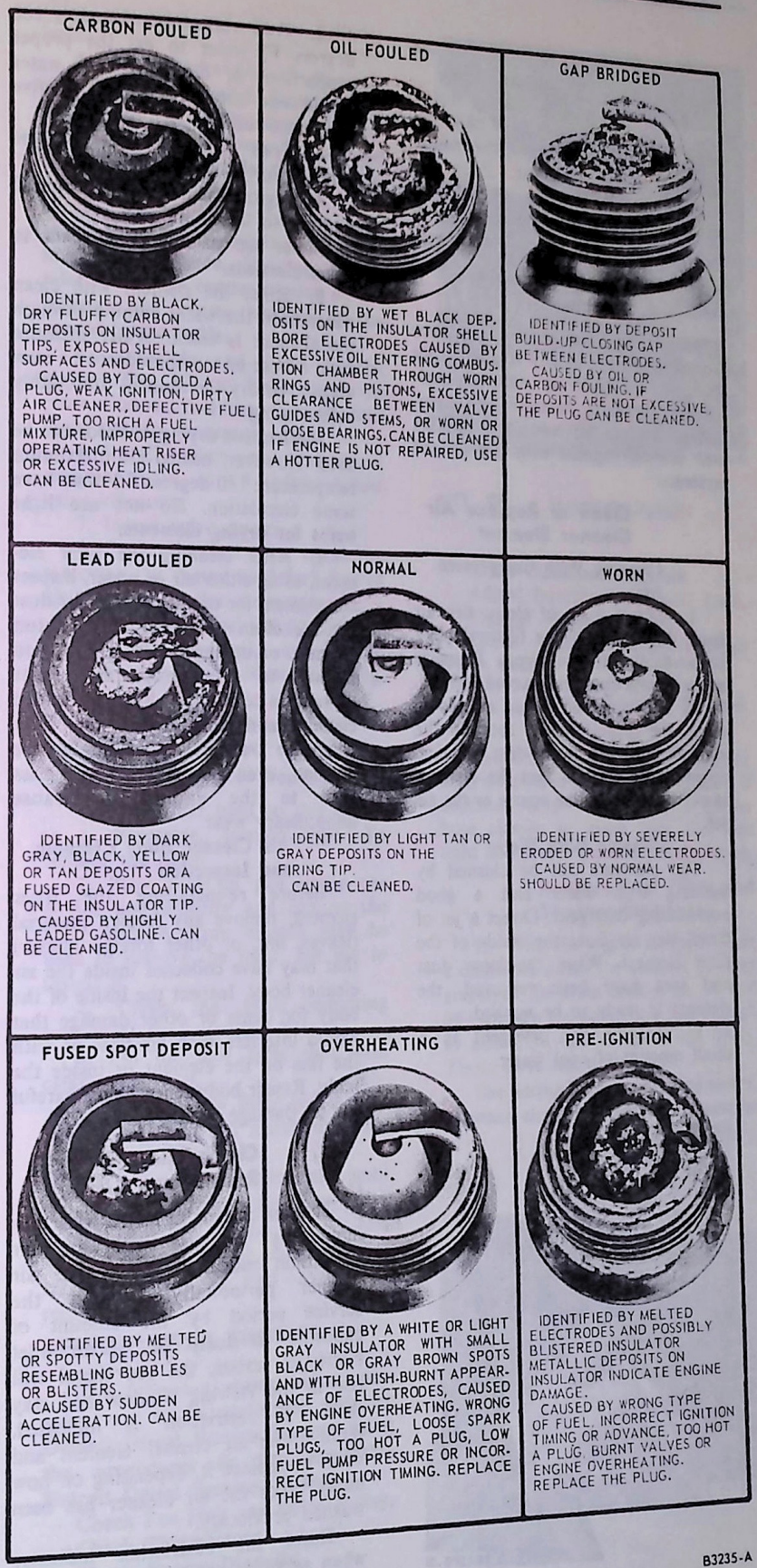


FIG. 74 Spark Plug Inspection Guide

drain plugs from the rear of the cylinder block (one on each side).

To fill the cooling system, install the cylinder block plugs and close the drain cocks at the radiator, thermostat housing and oil cooler. Pour the coolant into the radiator. Operate the engine until operating temperature is reached and check the coolant level.

Change Crankcase Breather

Dry-type crankcase breathers containing a chemically treated paper element are used on naturally-aspirated engines. Install new element—**Do not attempt to clean. Do not use on engines with pressurized systems.**

Clean or Replace Air Cleaner Element

Cleaning With Compressed Air

1. Direct a jet of clean, dry air from the inside of the filter element perpendicular to the pleats. **Pressure at air nozzle must not exceed 100 psi.**

2. Move the air jet up and down along the pleats, slowly rotating the element until no more dust is being removed. **Be certain that the element is not ruptured by the nozzle or the air jet.**

Cleaning With Water

The elements can be cleaned by washing with water and a good non-sudsing detergent. Direct a jet of clean, dry air from the inside of the filter element. When the loose dust and soot have been removed, the element is ready to be washed.

1. Dissolve the detergent in a small amount of cool water.

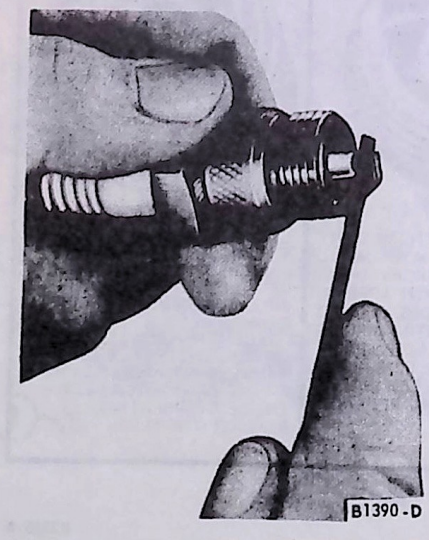


FIG. 75 Cleaning Spark Plug Electrode

2. Add warm (approximately 100 degrees F) water to get the proper proportions of detergent and water (about one cup of detergent to five gallons of water).

3. Soak the element in the solution for at least 15 minutes.

4. Agitate the element for about 2 minutes to loosen the dirt.

Never use gasoline or solvents to clean elements.

5. Rinse the element with clean water until the water coming through the element is clean. Water pressure from a hose or tap should not be over 40 psi. Air-dry the element thoroughly before using.

Mechanized drying methods can be used. However, heated air (maximum temperature 180 degrees F.) must have some circulation. **Do not use light bulbs for drying elements.**

6. After cleaning the filter element, using either air or water, inspect the element for damage. Look for dust on the clean air side, the slightest rupture, or damaged gaskets. A good method to detect ruptures in the element is to place a light inside the element and look toward the light from the outside. Any hole in the element, even the smallest, will pass dust to the engine and cause unnecessary wear.

Air Cleaner Body Cleaning and Inspection

Before re-installing the filter element, remove any foreign material (leaves, lint, or other foreign matter) that may have collected inside the air cleaner body. Inspect the inside of the body for dents or other damage that would interfere with air flow or with the fins on the element or inside the body. Repair body dents, being careful not to damage sealing surfaces.

Check Inlet Air Restriction

The air cleaner furnished with this engine is equipped with an air restriction indicator. Check the air cleaner periodically, judging the service period by the amount of exposure to dusty air. If air inlet restriction exists, the red signal will rise in the viewing window and stay there. If restriction is indicated, remove the air cleaner element and wash or replace it, depending on how many times the air cleaner has been washed previously.

Reset the restriction indicator when servicing the air cleaner.

Priming the Fuel System

If air is trapped in the fuel system, the diesel engine either will not start

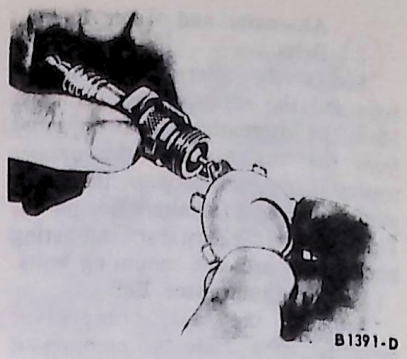


FIG. 76 Checking Spark Plug Gap

or will misfire. Loosen the line nut on the fuel line between the fuel filter and the fuel injection pump housing. Operate the starter until the flow of fuel from the filter is continuous and free of bubbles. Tighten fuel line nut. If the engine continues to misfire or smoke, further bleeding is necessary. While the engine is running, loosen each fuel line nut (at the injector) and allow the fuel to flow until it is free of air bubbles. Then tighten the fuel line nut.

Clean Fuel Injectors

Removal

A Caterpillar 8S2245 Nozzle Cleaning Kit is available and contains all the special tools required for servicing the injection nozzle.

1. Remove the valve covers.

2. Remove the valve rocker arm shafts and fuel return manifolds (Fig. 77) to gain access to the fuel injectors.

Before removing or disconnecting a fuel line, clean the entire cylinder head area around the fuel line.

When loosening or tightening a fuel line connection, always use the one-hand, two-wrench squeeze method as illustrated (Fig. 78).

3. Disconnect the fuel line at the cylinder head as shown.

4. Remove the injector retaining clamp (Fig. 79).

5. **Pull nozzle straight out, by hand, to remove a slight twisting action is permissible if necessary. Never attempt to pry out a nozzle with a screwdriver or other similar tools.**

6. Remove compression seal and carbon seal dam from injector using needle-nose pliers (Fig. 80).

Disassembly

Do not disassemble the nozzle unless testing indicates that servicing is necessary. See the topic, Testing and Adjusting in the Caterpillar Service Manual for this engine.

1. Handle valve by its shank and slide it partially into the body.

2. Assemble ball washer, spring upper seat, spring and spring lower seat to the lift and pressure adjusting screw assembly (Fig. 89).

3. Tilt the nozzle body and with spring lower seat in contact with the top of valve, as illustrated, push the valve and spring components into the body.

Be careful not to dislodge spring lower seat during assembly.

4. Tighten the adjusting screw assembly (Fig. 89) by hand until the spring compresses with enough force to hold all parts in place (8-10 turns).

5. Adjust valve lift and opening pressure and tighten the locknut. See covering topics in Caterpillar 1100 Series Service Manual.

Installation

Never install an injection nozzle that has been dropped, without first testing it with the 8S2242 Nozzle Tester Group. The injector tips are very hard and brittle and break easily.

1. Clean the nozzle bore in the cylinder head, nozzle inlet fittings and the gasket surfaces. Dirt or burrs on gasket surfaces can cause body distortion, resulting in a sticking valve.

Always install a new compression seal and carbon seal dam before installing nozzle into cylinder head. Use an 8S2252 Carbon Seal Dam Installation Tool (Fig. 90) to install the carbon seal dam.

Install a new grommet (Fig. 91) before reinstalling an injection nozzle.

2. Lubricate the exterior surface of cap. Pull grommet over cap in the direction indicated by the arrows (Fig. 91).

3. The shaded area shows grommet correctly installed: Rotate grommet so the flat surface will face the valve cover when nozzle is installed into cylinder head.

Groove (A) to be installed in the half-moon cut-out provided in the valve mounting pad of the cylinder head.

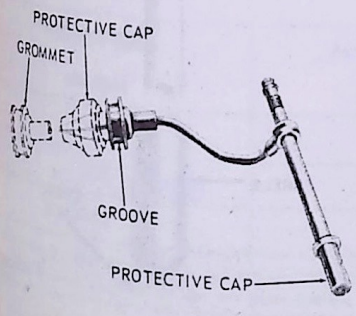


FIG. 91 Injector Assembly

4. Coat groove (A) of grommet with 3S6252 Adhesive. Remove caps and install nozzle into cylinder head using a twisting motion. Do not use lubricant in the cylinder head bore or on the nozzle body.

Do not bend the injector inlet connection when installing injector into cylinder head. Bending of the inlet connection creates tension on the injector and causes binding of the needle in the guide.

5. Assemble and hand tighten clamp (Fig. 92) to hold nozzle in place. Connect fuel lines to nozzle and hand tighten connector nuts.

6. Install rocker arms and torque retaining bolts to 18 ft-lbs. Adjust valve clearance.

7. Install valve covers.

8. Purge the fuel lines of air by motoring the engine until fuel, free of air, flows from the connections.

9. Tighten the fuel line connections using the one-hand, two-wrench squeeze method as illustrated (Fig. 93).

10. Start the engine and correct any fuel leaks that may occur.

Fuel Filter Replacement

The fuel filter used on this engine is a disposable, spin-on type. To replace the filter:

1. Place a drain pan under the engine and unscrew and remove the filter unit. A strap wrench may be used to remove the filter, but not to install it.

2. Clean the filter mounting surface of the mounting base.

3. Fill the new filter unit with clean diesel fuel.

4. Coat the new filter gasket with clean diesel fuel and install the filter on the mounting base.

5. Tighten the filter by hand until the gasket contacts the base, then tighten 1/2 turn more.

6. Start the engine and check for leaks. Prime the fuel system if required.

DETROIT DIESEL ENGINES

The following maintenance operations are to be performed **only by Detroit Diesel Service Dealers using the procedures in the applicable Detroit Deisel Service Manual:**

Check Fan Hub and Drive Pulley.
Check Thermostats.
Check Engine Blow-By.
Clean Injector Inlet Screen.
Clean injectors.
Clean Blower Screen and Check Seals.

FIG. 92 Installing Injector

Clean Crankcase Breather.
Adjust Injectors and Valve Lash.
Tighten Mounting Bolts.
Check Engine Emergency Shut-Down Cable.

Check Cooling System Hoses

Check the cooling system hoses for deterioration or damage and replace, if necessary (Fig. 94). Check all of the hose clamps to make sure they are tight and properly seated on the hoses.

Replace Fuel Filter and Strainer Elements

1. With the engine stopped, place a container under the strainer or filter and open the drain cock (Figs. 95 and 96). Loosen the cover bolt just enough to allow the fuel to drain out freely. Then, close the drain cock.

The wiring harness, starting motor, or other electrical equipment must be

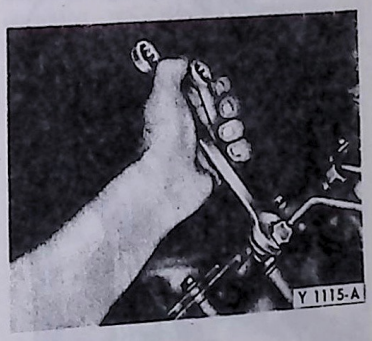


FIG. 93 Tightening Fuel Lines

shielded during the filter change, since fuel oil can permanently damage the electrical insulation.

2. While supporting the shell, unscrew the cover bolt and remove the shell and the element.

3. Remove and discard the element and the shell gasket.

4. Wash the shell thoroughly with fuel oil and dry it with compressed air.

5. Examine the element seat and the retaining ring to make sure they have not slipped out of place. Check the spring by pressing on the element seat. When released, the seat must return against the retaining ring.

The element seat, spring, washer and seal cannot be removed from the strainer shell. If necessary, the shell assembly must be replaced. However, the components of the filter shell are serviced.

6. Place a new element over the stud and down against the seat. Make sure the drain cock is closed; then, fill the shell about two-thirds full with clean fuel oil.

Thoroughly soak the density-type STRAINER element in clean fuel oil before installing it. This will expel any air entrapped in the element and is conducive to a faster initial start.

7. Install a new gasket in the recess of the shell.

8. Place the shell and element in position under the cover. Then, thread the cover bolt into the stud.

On a W-Series truck with Detroit Diesel 8V-71 Engine the drain cock must be pointing to the rear of the engine to prevent interference with the cab retaining arm.

9. With the shell and gasket properly positioned, tighten the cover bolt just enough to prevent leakage.

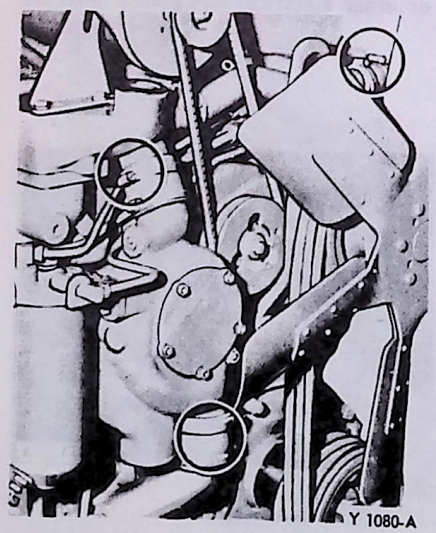


FIG. 94 Cooling System Hoses Check Points

10. Remove the filler plug in the cover and complete filling of the shell with fuel. Primer J 5956 may be used to prime the entire fuel system.

11. Start the engine and check the fuel system for leaks.

Clean Cooling System

Drain and flush the cooling system to remove the anti-freeze solution in the spring and the rust inhibitor in the fall, thus preparing the cooling system for the next solution. If necessary, use a cooling system cleaner and reverse flush. Refill the cooling system with clean soft water and add rust inhibitor or anti-freeze. Start the engine and check for leaks. **CAUTION—Do not backflush cooling systems that have a water shut-off valve in the heater system, or damage to the valve can result.**

Water Filter and Conditioner

For maintenance of the engine coolant and water filter, refer to the Detroit Diesel Engine Maintenance Manual.

Anti-Freeze Solutions

High boiling point type anti-freeze solutions are used in diesel engines during the winter because of the high coolant temperature encountered in their operation. Alcohol base anti-freeze has too low a boiling point. An alcohol base anti-freeze solution protecting a unit to -20 degrees F. would begin to boil at 180 degrees F., whereas a high boiling point type ethylene glycol anti-freeze solution protecting a unit to -20 degrees F. would begin to boil at 223 degrees F. Most high boiling point type anti-freeze solutions include a corrosion inhibitor which will protect the cooling system through the winter season. No additives should be added to a system that is protected by this anti- freeze solution. In the spring, the anti-freeze solution should be drained and discarded.

The corrosion inhibitor in a used anti-freeze solution will not be of sufficient strength to protect the system from corrosion the following winter. The addition of a corrosion inhibitor to an anti-freeze solution to permit reuse could cause a reaction within the solution. A precipitation could result and clog the cooling passages, necessitating extensive engine and radiator cleaning.

Draining and Filling the Cooling System

To drain the radiator, open the drain petcock at the bottom of the radiator and drain the coolant into a container to prevent loss of anti-freeze. The radiator will drain faster if the filler cap is removed.

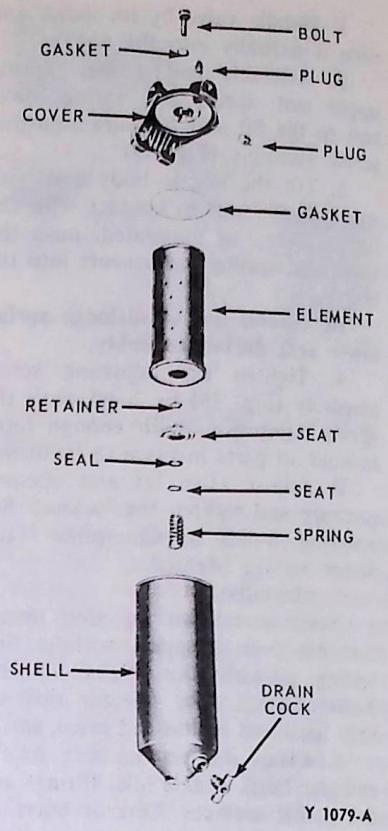


FIG. 95 Fuel Filter Details and Relative Location of Parts

To drain the cylinder block, open the two drain petcocks on each side of the engine block and on the bottom of the oil cooler.

To fill the cooling system, close the drain petcocks and pour the coolant

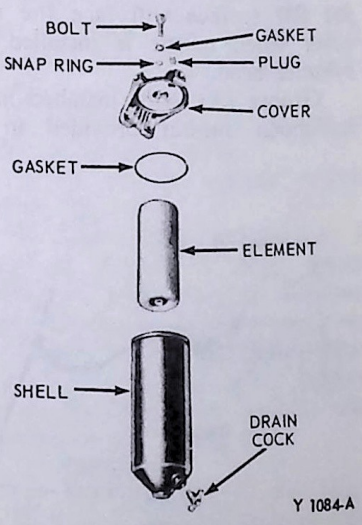


FIG. 96 Fuel Strainer Details

into the radiator. Operate the engine until operating temperature is obtained and check the coolant level.

CUMMINS DIESEL ENGINES

Tighten Engine Mounting Bolts

Mounting bolts may occasionally work loose and cause the supports and brackets to wear rapidly. Tighten all mounting bolts or nuts and replace any broken or lost bolts or capscrews.

Steam Clean Engine

There are many reasons why the exterior of the engine should be kept clean. Dirt from the outside will find its way into the fuel and lubricating oil filter cases and into the rocker housings when the covers are removed unless dirt is removed first.

Steam is the most satisfactory method of cleaning a dirty engine or piece of equipment. If steam is not available, use mineral spirits or some other solvent to wash down the engine.

All electrical components and wiring should be protected from the full force of the steam jet.

Draining and Filling Cooling System—NH Series Engine

To prevent loss of anti-freeze when draining the radiator, attach a hose to the radiator drain cock and drain the coolant from the radiator into a clean container.

To drain the radiator, open the drain cock located at the bottom of the radiator. The cylinder block is drained by opening one drain plug located at the right rear of the block. Also, drain the oil cooler and heat exchanger (if so equipped).

To fill the cooling system, close the drain cocks, venting is automatic.

On downflow radiators, operate the engine and add more coolant, if necessary, to fill the radiator to the proper level. On trucks without a supply tank, fill the radiator one ince above the baffle (or core). On trucks equipped with a supply tank, fill the supply tank 2/3 full.

On L-Series, fill until the coolant is 1 inch from the top of the tank with engine cold. (Caution—Do not operate engine if coolant level is below the lower sight glass). After the initial fill, the coolant level will drop approximately 1 quart when the engine has been operated about 20 minutes at 2000 rpm. This is due to the displacement of entrapped air.

Check Condition of Coolant

Periodic tests of engine coolant should be made to insure the frequency of corrosion resistor servicing or concentration of chromate is adequate to control corrosion for the specific condition of operation.

When using plain water in a cooling system with a corrosion resistor (with chromate-type element) or when treating with chromate compounds the concentration of effective inhibitor dissolved in the coolant can be measured by the color comparison method. Cummins Coolant Checking Kit St-993 is available from Cummins Distributors for this check.

Most commercially available anti-freezes contain a coloring dye which renders the color comparison method ineffective. When colored anti-freezes are present in the coolant effective control of corrosion can be determined by inspecting the coolant for accumulation of reddish-brown or black finely granulated dirt. A small amount of corrosion produces significant quantities of these corrosion products; therefore, if corrosion resistor servicing is adjusted at the first indication of increased accumulation of these products actual corrosion will be limited to a negligible amount.

Examine the sump of corrosion resistor for these dirt materials at time of servicing or inspect for them in a small sample of coolant drained from the bottom of the radiator after allowing coolant to settle.

Use of chromate compound, added to the coolant without a corrosion resistor, with anti-freeze is not recommended.

PH Value Test

1. Separate tubes marked PH are furnished in the test kit. Select a tube and fill to mark with coolant to be checked.
2. Add eight drops of the PH Reagent to tube and mix thoroughly.
3. Insert the tube in the comparator, hole marked PH.
4. Compare color of test sample with color standards on either side. Preferred range is 8.3 to 9.5.
5. Wash out test tubes after each test and keep reagent container caps in place.

Chromate Concentration Test

1. Draw sample of coolant and pour into tube marked CHROMATE.
2. Insert sample into comparator, hole marked CHROMATE.
3. Compare color of test sample with color standards on either side. Preferred range (Fig. 97) is 100 to 150 grains per gallon or 1700 to 2500 parts per million (ppm).
4. Wash test tubes thoroughly after each test.

Adjusting Coolant to Specifications

If the tests indicate that the coolant is outside specifications, make an adjustment immediately to prevent corrosion.

If the Cummins Corrosion Resistor is used, change the element or elements and run engine four to six hours; then, check coolant again. In extreme cases it may be necessary to change element a second time. However, the latter condition may be due to a larger coolant system than the corrosion resistor was designed to treat. Note reference on resistor label.

Corrosion Resistor Element Replacement

Check the coolant chromate concentration to determine if the corrosion resistor element should be changed.

Change the chromate element when the concentration drops below 1700 parts per million. To change the element, perform the following procedure.

1. Close the shut-off valves on the inlet and drain lines of the corrosion resistor assembly. Unscrew the drain

Ounces Per Gallon (Oz./Gal.)	Parts Per Million (PPM)	Grains/Gallons (Gr./Gal.)
0.16	850	50
0.32	1700	100
0.50	2550	150

If chromate compounds are used, add enough compound to bring concentration to proper level. Normal usage is one-half (1/2) ounce chromate for each one gallon coolant.

CY 1211-B

FIG. 97 Comparison Units for Chromate Concentration

plug at the bottom of the housing (Fig. 98).

2. Remove the cover retaining bolts. Remove the cover (with hose attached) and gasket. Discard the gasket. Remove the upper plate, element, lower plate and the spring from the housing. Discard the element.

3. Polish the surfaces of both plates. If less than one-half of the upper and lower surfaces of each plate can be exposed by polishing, replace the plate.

4. Install the spring and lower plate. Remove the transparent bag from the new resistor element, and install the element in the housing.

5. Install the upper plate, gasket and cover. Install the drain plug, and open the shut-off valves in the corrosion resistor inlet and drain lines.

Do not add any radiator sealers containing water soluble oil to the cooling system as it will make the corrosion resistor plates inoperative.

Clean Cooling System

The cooling system must be clean to do its work properly. Scale in the system slows down heat absorption from water jackets and heat rejection from the radiator. Use clean water which will not clog any of the hundreds of small passages in the radiator or water passages in the block.

Clean out radiator cores, heater cores, oil cooler, and block passages which have become clogged with scale and sediment by chemical cleaning, neutralizing and flushing.

Chemical Cleaning

The best way to insure an efficient cooling system is to prevent formation of rust and scale by using a Cummins Corrosion Resistor, but if they have collected, the system must be chemically cleaned. Use a good cooling system cleaner such as sodium bisulphate or oxalic acid followed by neutralizer and flushing.

Pressure Flushing

Flush the radiator and block when anti-freeze is added or removed, or before installing a Corrosion Resistor on a used engine.

When pressure flushing the radiator, open the upper and lower hose connections and screw the radiator cap on tight. Remove thermostats from housing and flush block with water. Use hose connections on both upper and lower connections to make the operation easier. Attach the flushing gun nozzle to the lower hose connection and let water run until the radiator is full. When full, apply air pressure gradually to avoid damage to the core. Shut off air and allow radiator to refill, then apply air pressure. Repeat until water coming from radiator is clean. **Do not backflush cooling systems that have a water shut-off valve in the heater system.**

Sediment and dirt settles into pockets in the block as well as the radiator core. Remove thermostats from housing and flush block with water. Partially restrict the lower opening until the block fills up. Apply air pressure and force water from the lower opening. Repeat the process until stream of water coming from block is clean.

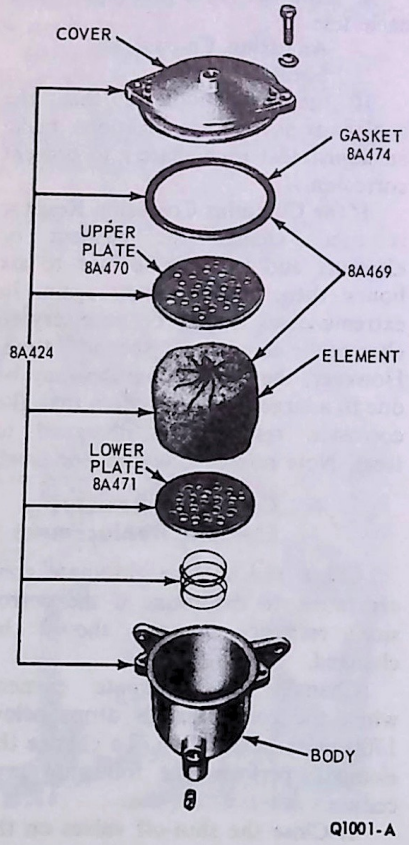


FIG. 98 Corrosion Resistor

Check Inlet Air Restriction

The best method for determining dry-type air cleaner maintenance periods is through air restriction checks.

Check Air Inlet Restriction at Engine

1. On naturally aspirated engines attach a vacuum gauge or water manometer in the middle of the intake manifold or on the air intake piping. When located in the air intake piping, the adaptor must be perpendicular to the air flow and not more than 6 inches from the air intake manifold connection.

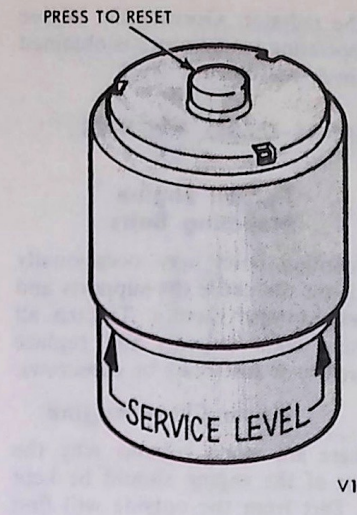


FIG. 99 Mechanical Restriction Indicator Gauge

2. On turbocharged or supercharged engines, attach the checking fixture on pipe diameter upstream from the supercharger or turbocharger in a straight section of tubing.

3. Idle the engine until normal operating temperature is reached.

4. Operate engine at rated speed full-load and take reading from vacuum gauge or manometer. Air restriction must not exceed 25 inches of water or 1.8 inches of mercury.

5. If air restriction exceeds 25 inches or water or 1.8 inches of mercury:

Clean or replace dry-type cleaner element.

Replace damaged air piping, rain chield or housing.

Remove excessive bends or other source of restriction in air piping.

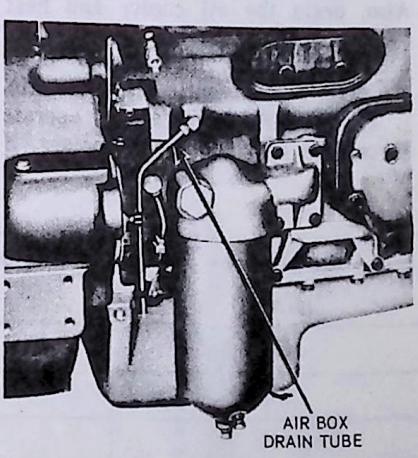


FIG. 100 Air Box Drain Tube

Check Air Inlet Restriction at Cleaner

A mechanical restriction indicator is installed on the air cleaner. The gauge shows completely red in the indicator window when restriction reaches 25 inches of water (Fig. 99).

Change Crankcase Breather

Dry-type crankcase breathers containing a chemically treated paper element are used on naturally aspirated engines. Install new element—**Do not attempt to clean. Do not use on engines with pressurized systems.**

Check Air Box Drain Tubes

During normal engine operation, water vapor from the air charge, as well as a slight amount of fuel and lubricating oil fumes, condense and settle on the bottom of the air box. This condensation is removed by the air box pressure through air box drain tubes mounted on the side of the cylinder block (Fig. 100).

The air box drain tubes must be open at all times. With the engine running, check for air discharge by placing your finger at the outlet end of the drain tube. If no air flow is felt, the drain tube is plugged and must be removed and cleaned. Also, remove the air box covers and wipe out the liquid accumulation on the bottom of the cylinder block air box. Then, blow out the drain passages with compressed air. Reinstall the air box covers and drain tubes. Tighten the air box cover bolts to 8-12 ft-lb torque.

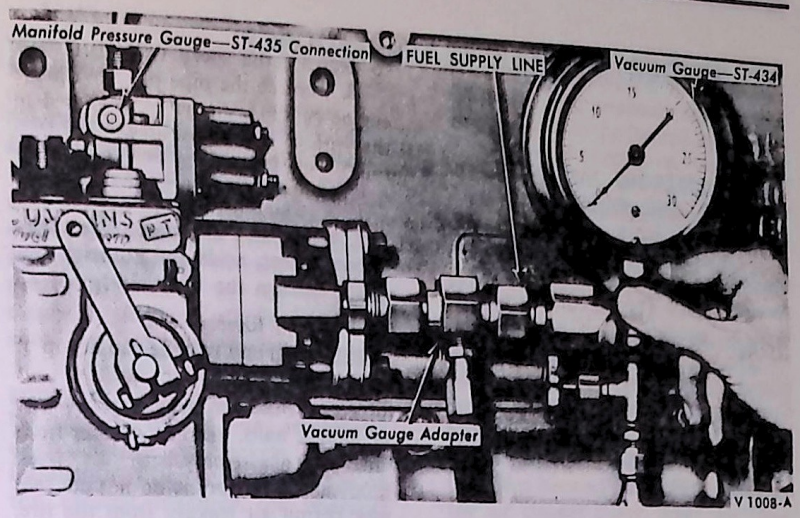


FIG. 102 Fuel Pump Gauge Connections

Fuel Pump Adjustments

Only those fuel pump adjustments described herein should be performed in the truck. Make the adjustments in the order given.

In-chassis adjustments of the fuel pump are based on fuel manifold pressure and fuel supply vacuum. To determine these pressures follow the procedures in Group 25 of the 1971 Truck Shop Manual.

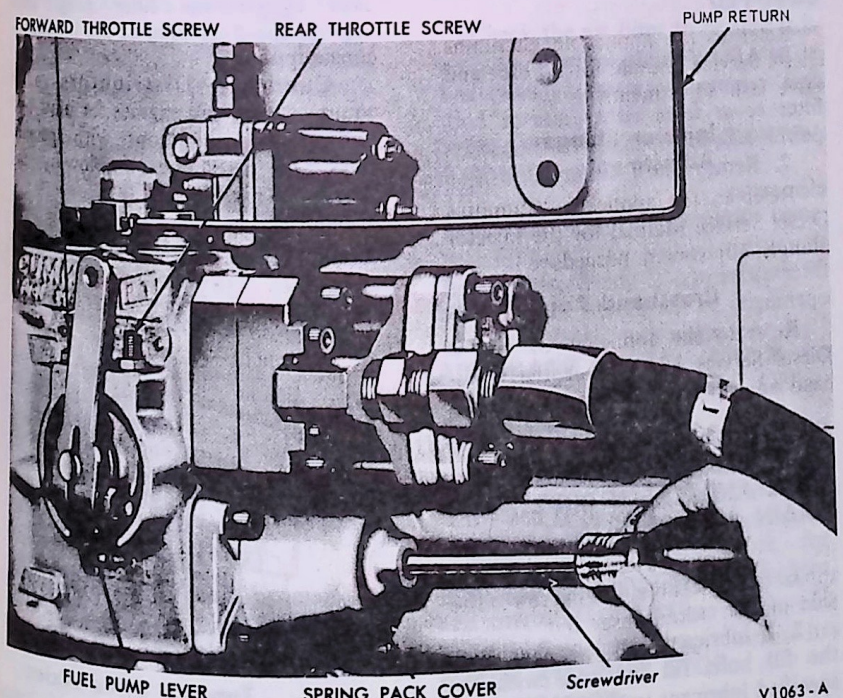


FIG. 101 Fuel Pump Adjustments

The following adjustment procedures refer to forward throttle screw and rear throttle screw. The forward throttle screw is closer to the drive end of the fuel pump (Fig. 101).

Before Making Adjustments

1. Operate the engine until the oil temperature reaches 140 degrees to 160 degrees F. Make all fuel pump or injector settings on a hot engine.
2. Install a vacuum gauge Cummins (ST-434) in the fuel supply line (Fig. 102). Check the suction restriction of the fuel supply line. If the vacuum reading exceeds 8 inches of mercury, determine the cause and correct.
3. Adjust valve and injector lash to specifications.
4. Check high-idle or maximum governed speed.

Rear Throttle Screw Adjustment

1. Connect a manifold pressure gauge Cummins (ST-435) at the manifold pressure gauge connection (Fig. 102). Check the fuel manifold pressure at rated speed and full load.
2. Turn the rear throttle screw out until the highest fuel manifold pressure reading is obtained.
3. Turn the rear throttle screw in to reduce the fuel manifold pressure 5 psi.

Do not increase the rear throttle adjustment more than 5 psi or the engine speed at which peak torque occurs will change. Throttle restriction over 5 psi allows unauthorized adjustment to raise fuel manifold pressure, thereby overfueling the engine.

Forward Throttle Screw or Throttle Leakage Adjustment

1. With the engine operating at idle speed, turn in the forward throttle

4 UNDER VEHICLE MAINTENANCE

CHECK STEERING MOUNTINGS, LINKAGE AND CONNECTIONS

Check the steering gear attaching bolts to be sure they are tightened to specifications. Torque the attaching bolts to specifications if necessary.

Check the linkage for tightness and proper installation of cotter pins. Correct as required.

ADJUST BRAKES—SADDLE MOUNT DELIVERY

When a truck is delivered by saddle mount transportation, the rear wheel brakes must be adjusted at vehicle pre-delivery. This is necessary because the brakes are backed-off before a saddle mount delivery is made.

CHECK AIR BRAKE AIR RESERVOIR

Check the connections to the air brake reservoir for leaks. Check to be sure the drain cock is closed and the reservoir is securely attached. Make any necessary corrections.

CHECK FRONT WHEEL BEARING ADJUSTMENT

Check the front wheel bearings for proper adjustment when the wheel is off the ground. Grasp the tire at the sides and alternately push inward and pull outward on the tire. If any looseness is felt, adjust the wheel bearing.

TORQUE CHECKS

Some mounting bolts and nuts must be torque checked at Pre-delivery; others must be torque checked at specified maintenance intervals. Refer to the Pre-delivery Service sheets and vehicle maintenance schedules which bolts must be torqued and at what recommended interval. Refer to the pertinent group of the Truck Shop Manual for torque specifications.

HYDRAULIC BRAKE SYSTEM—CHECK BRAKE LINES AND FITTINGS

Check the brake lines and hoses for fluid leaks and/or loose connections. Inspect lines and hoses for kinks and interference with adjacent moving or frictional components. Check the brake booster and master cylinder for vacuum and fluid leaks. Tighten and correct as required. **CAUTION: During maintenance and repair, protect nylon tube air brake lines from external heat, acids and abrasion that could damage the lines.**

TIRES AND AIR PRESSURES

Inspect the tire treads, and remove all stones, nails, glass or other objects that may be wedged in the tread grooves. Check for holes or cuts that may permit air leakage from the tire, and make the necessary repairs.

Inspect the tire sade walls for cuts, bruises, and other damage. If internal damage to the tire is suspected, demount the tire from the wheel or rim for further inspection and repair or replacement.

Check the tire valve for air leaks, and replace the valve if necessary. If the valve cap is missing, install a new cap.

The tires should be checked frequently to insure the air pressure agrees with those specified for the tire and vehicle model.

REPLACE AIR FILTER ELEMENT—FULLER AND SPICER TRANSMISSIONS IF SO EQUIPPED

1. After draining the transmission case, remove the attaching bolts and filter cover from either one or both power take-off openings in the case.
2. Remove and discard the filter element(s).
3. After the case has been thoroughly flushed out, install the new filter element(s) to the power take-off opening(s) in the case.
4. Assemble the cover(s) to the case with the attaching bolts.

CHECK MANUAL TRANSMISSION LUBRICANT LEVEL AND CLEAN BREATHER (MAIN AND AUXILIARY)

1. Remove the fill plug from the side of the case.
2. If lubricant does not flow from the fill hole, fill the case with the specified lubricant until it is level with the bottom of the fill hole.
3. Install the filler plug.
4. Clean all dirt from the breather.

MANUAL TRANSMISSION FILL PROCEDURE

3-Speed Ford and 4-Speed Warner and New Process Transmissions

The following instructions should be used when a transmission has been drained for any reason: Remove the speedometer cable and fill the transmission with the specified lubricant (Section 9) through the speedometer cable hole in the transmission extension housing.

CHECK TRANSFER CASE FLUID LEVEL (4-WHEEL DRIVE)

1. Remove the fill plug from the case.
2. If lubricant does not flow from the fill hole, fill the case with the specified lubricant until it is level with the bottom of the fill hole.
3. Install the fill plug.

CHECK AXLE LUBRICANT LEVEL

Where magnetic drain plugs are used, the plugs should be cleaned each time they are removed.

Clean dirt and grease from the area around the filler plug, and remove the filler plug at the locations shown on the Lubrication Charts (Section 9). If additional lubricant is required, use only the specified type.

When checking lubricant level, the axle must be in running position (normal curb attitude). If checked on a frame contact hoist, use safety stands to hold the axle in normal curb attitude.

Ford Axle

With the filler hole in the housing cover, fill to the bottom of the filler hole. If the filler hole is in the carrier casting, fill to a maximum of 5/8 inch below the bottom of the filler hole.

All Axles except Ford and Tandem

Remove the filler hole plug. The lubricant should be level with the bottom of the hole.

Tandem Drive Axles

The axle must be run first, then allowed to stand for 5 minutes. The power divider and the forward rear axle use the same lubrication system

and the 5-minute interval allows the lubricant to settle to the proper levels in the power divider case and axle housing. After the 5 minutes, check the lubricant level in the rear filler hole of the forward rear axle only. It is not necessary to check the oil level in the power divider. If the level is up to the bottom of the filler hole of the forward rear axle, the power divider is also adequately lubricated. If the level is not up to the bottom of the filler hole, add the necessary lubricant. Check the rear axle lubricant level through the rear filler hole.

CHECK 2- AND 3-SPEED AXLE SHIFT UNIT OIL LEVEL

The level should be maintained at the bottom of the filler plug hole. Above 0 degrees F, use SAE 10W engine oil. Below 0 degrees F, use three parts of SAE 10W engine oil to one part of kerosene.

CLEAN POWER DIVIDER LOCKOUT CONTROL VENT FILTER

Remove control cover, piston assembly and vent filter. Clean the parts and soak piston felt oilers in SAE 10 oil for one hour. Clean and air dry the vent filter. Install the vent filter, piston assembly and cover on the lockout control.

INSPECT EXHAUST SYSTEM

The exhaust system must be free of leakage, binds, groundings, excessive vibration and restrictions.

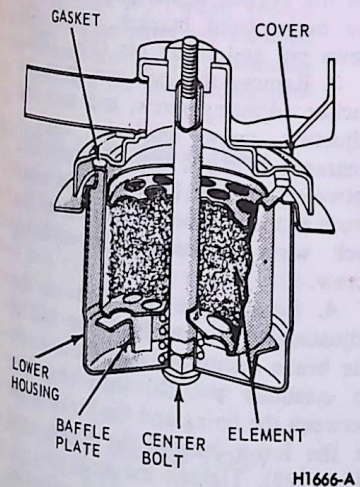


FIG. 107 Booster Air Filter—C-Series with Bendix Dual Diaphragm Booster

Leaks can usually be detected visually, or in some cases, a whistling noise may be heard at the pipe connections. Check the various sections of the exhaust system for signs of leaking or burning through.

Muffler inlet and outlet pipes and the various pipe connectors must overlap sufficiently to prevent leakage, and provide enough overlap to support proper tightening of the retaining clamp(s). Replace all sections that show signs of burning through.

Exhaust system vibration, grounding or binds are usually caused by: loose, broken or improperly aligned clamps or brackets; improper installation of the inlet pipe flange on the exhaust manifold, or improper pipe connections. Any of the aforementioned conditions may cause changes to the clearances of the exhaust system components. If any of these conditions exist, the exhaust system components must be checked and adjusted to make certain clearances are maintained.

CHECK TRANSMISSION SUPPORT-TO-FRAME BOLT TORQUE (W-SERIES)

Check the torque of the bolt that holds the transmission support to the frame. The torque should be 50-62 ft-lbs.

CHECK FULLER TRANSMISSION AIR FILTER

Check the air filter to be sure it is properly installed and the air inlet is not restricted.

INSPECT SPRINGS AND TIGHTEN U-BOLTS

Inspect the spring leaves for being broken or sagged.

Torque the spring U-Bolts to specifications as required.

AIR BRAKE SYSTEM—CHECK FITTINGS, CONNECTIONS, LINES AND COMPONENTS

Check for evidence of leakage at all fittings. Inspect lines for kinks and interference with adjacent moving or frictional components. Check for proximity to exhaust system. Tighten and correct as required.

CHECK STEERING STOP ADJUSTMENTS

To avoid tire and/or steering linkage damage, the steering stop adjustments should be checked periodically, and adjusted if necessary. There are two separate adjustments which should be performed depending on the type of steering on the vehicle.

CLEAN AND REFILL FRAME MOUNTED BOOSTER OIL BATH AIR CLEANER—C-SERIES WITH SPLIT HYDRAULIC BRAKES

On C-Series models an oil bath air cleaner is mounted beside the control valve assembly on the U-shaped mounting bracket for the No. 1 hydraulic cylinder (Fig. 107). To service the air cleaner element, grasp the lower housing and unscrew it from the air cleaner cover. Slide the filter element, housing and sleeve assembly off the center bolt. Drain the fluid from the lower housing and remove the baffle plate. No further disassembly should be attempted. Rinse the filter element, housing and the sleeve assembly in clean isopropyl alcohol. Rinse the baffle plate and the inside of the lower housing with the same solvent. Use an air hose to blow dirt out of the lower housing. **Do not use an air hose on the filter element.** If the filter element is too dirty to clean, replace the element, housing and the sleeve as an assembly. Use a cloth dampened with isopropyl alcohol to wipe the inside of the air cleaner cover and the hose nipple. If the gasket in the cover is loose, cement it securely to the cover with Permatex No. 1. If it is damaged, replace the gasket. Insert the baffle plate, legs first, in the lower housing and fill to the level indicated with SAE-10W engine oil. Slide the filter assembly onto the center bolt in the lower housing and screw the center bolt into the cover. Hand-tighten the lower housing.

TORQUE U-BOLTS—ROCKWELL STANDARD (TIMKEN) TANDEM AXLE

On vehicles equipped with Rockwell Standard tandem axles, torque the (spring clips) U-bolts to specifications after the first 12,000 miles.

CHECK AND ADJUST C-4 AUTOMATIC TRANSMISSION BANDS

Intermediate Band

1. Clean all dirt from the band adjusting screw and apply penetrating oil to the adjusting screw threads. Remove and discard the locknut.

vehicle) to move the release bearing toward the flywheel; or clockwise to move the release bearing away from the flywheel. Rotation or movement of one lug position will move the release bearing approximately 1/32 inch.

6. Remove the clutch pedal block to engage the clutch.

7. Recheck the clearance as outlined in step 2. Readjust if necessary.

8. After the clutch has been properly adjusted, install the lock and bolt.

9. Recheck the slave cylinder push rod-to-release lever clearance if so equipped.

10. Connect the retracting spring and install the inspection cover on the clutch housing.

CHECK TRANSMISSION AND AUXILIARY TRANSMISSION MOUNTINGS

Occasionally, the transmission and auxiliary transmission mountings should be visually checked. If the vehicle is operated on rough terrain, this check should be made frequently. If the mounting bolts are loose, torque them to specifications. If the insulators are worn or frayed, replace them.

CLEAN INTERNAL EXPANDING SHOE PARKING BRAKE (WITHOUT DUST SHIELD)

Remove the universal joint assembly and drive shaft from the parking brake drum. Remove the drum from the transmission. Clean the dirt and dust from the brake shoes and drum with a scraper and air hose. Install the brake drum and connect the universal joint and drive shaft.

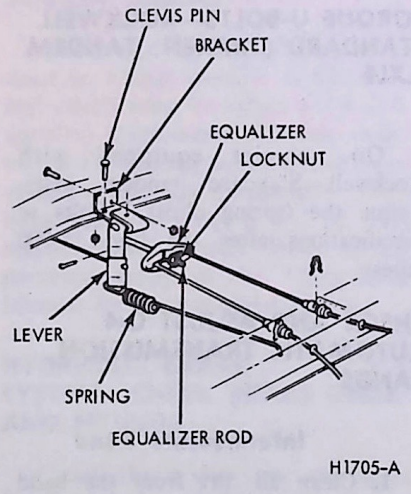


FIG. 128 Parking Brake Cable Adjustment

PARKING BRAKE ADJUSTMENT

Vehicles Equipped with Orscheln Lever

The Orscheln parking brake (Fig. 127) is the over center locking type. It is adjusted (while in the released position) by turning the lever knob. When properly adjusted, it pulls over center with a distinct click. No other adjustment is normally required.

Cable Actuated Type

Adjust the service brakes before attempting to adjust the parking brake cables.

Place the parking brake lever in the fully released position, then check for slack in the parking brake two rear cables (Fig. 128).

The cables should be tight enough to provide full application of the rear brake shoes, when the parking brake lever or foot pedal is placed in the fully applied position, yet loose enough to ensure complete release of the brake shoes when the lever is in the released position.

If the cables are loose, adjust them as follows:

1. Set the parking brake control handle (if applicable) in the fully applied position. On F-100, F-250, F-350 and Bronco models, set the foot pedal at two notches or clicks.

2. Attach a brake cable tension gauge to the brake cables behind the equalizer as indicated in Fig. 127.

3. Loosen the lock nut and tighten the adjusting nut against the equalizer until the specified cable tension is obtained. Release and reset the cable tension gauge to make certain the specified cable tension has been obtained.

The cable tensions **must** be taken on **both rear cables** on the E-100, E-200 and E-300 models and on the **left rear cable only** for F-100, F-250, F-350, P-350, P-400 and Bronco models.

4. When the cables are properly adjusted, tighten the lock nut against the equalizer.

5. If rear wheel brake drag is noted after adjustment on F-250, F-350, E-300, P-350, P-3500, P-400, P-4000 models equipped with web ledge brakes, the rear drums must be removed after the service and parking brakes have been adjusted. Check the clearance between the parking brake lever and the cam plate. The clearance should be 0.015 inch with the brakes fully released. If the clearance is not within specifications, readjust the parking brake cable.

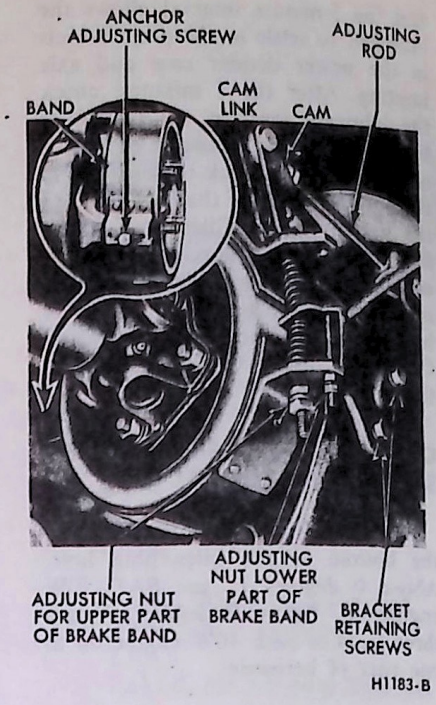


FIG. 129 External Band Type Parking Brake

External Band Type

1. On cable-controlled parking brakes (Fig. 129), move the parking brake lever to the fully released position. On a vehicle with a rod-type linkage, set the lever at the first notch.

2. Check the position of the cam to make sure the flat portion is resting on the brake band bracket. If the cam is not flat with the bracket, remove the clevis pin from the upper part of the cam, and adjust the clevis rod to allow the flat portion of the cam to rest on the brake band bracket. Install the clevis pin and cotter pin (Fig. 129).

3. Remove the lock wire from the anchor adjusting screw, and turn the adjusting screw clockwise until a clearance of 0.010 inch is established between the brake lining and the brake drum at the anchor bracket. Install the lock wire in the anchor adjusting screw.

4. Loosen the lock nut on the adjusting screw for the lower half of the brake band, and adjust the screw to establish a 0.010 inch clearance between the lining and the brake drum at the lower half of the brake band (Fig. 129). Tighten the lock nut.

5. Turn the upper band adjusting rod nut until a 0.010 inch clearance is established between the upper half of the band and the drum.

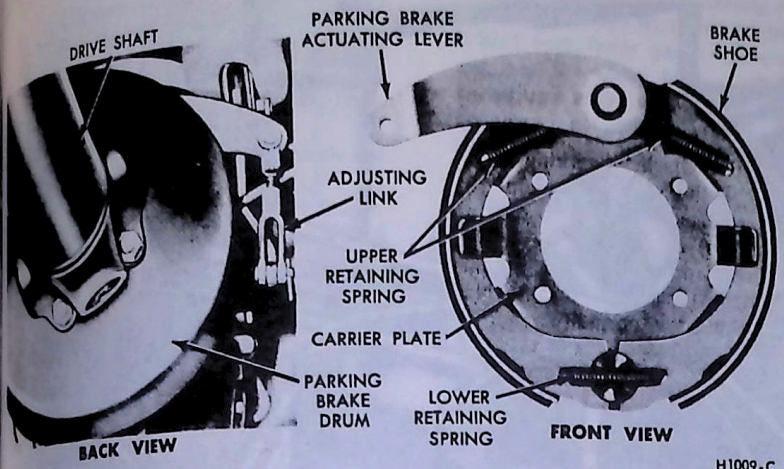


FIG. 130 Transmission Mounted Internal Shoe Type Parking Brake—9 Inch

Internal Shoe Type

Nine-Inch Diameter Drum

1. Release the parking brake lever in the cab.
2. From under the truck, remove the cotter pin from the parking brake linkage adjusting clevis pin (Fig. 130). Remove the clevis pin.
3. Lengthen the parking brake adjusting link by turning the clevis. Continue to lengthen the adjusting link until the shoes seat against the drum when the clevis pin is installed.
4. Remove the clevis pin and shorten the linkage adjustment until there is 0.010 inch clearance between the shoes and the drum. The measurement should be taken at all points around the drum with the clevis pin installed.
5. Install a new cotter pin in the clevis retaining pin and check the brake operation.

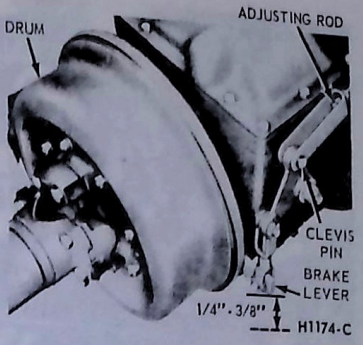


FIG. 131 Shoe-Type Parking Brake—Twelve Inch Drum

Twelve-Inch Diameter Drum

There is no internal adjustment on this brake. Adjustment is made on the linkage. Remove the clevis pin, loosen the nuts on the adjusting rod, and turn the clevis on the rod until a 1/4-3/8 inch free play is obtained at the brake lever (Fig. 131). Tighten the nuts, and connect the clevis to the bellcrank with the clevis pin.

5 LUBRICATION

LUBRICATION CHARTS

Important lubrication points for typical chassis and engines are shown in Figs. 160 thru 165. When special equipment or accessories are installed on the truck, consult the manufacturer's literature for lubrication procedures.

LUBRICATE IGNITION LOCK

Check for ease of operation by inserting key and turning to all positions. Remove key and lubricate ignition lock cylinder if necessary with the specified lock lubricant. Insert key and operate several times to be sure lubricant has effectively worked in. Remove key and wipe off any excess lubricant.

LUBRICATE AIR BRAKE FOOT CONTROL VALVE

Lubricate the treadle pivots, roller and plunger face. Use only the specified lubricant recommended at the end of this part.

LUBRICATE CLUTCH AND BRAKE PEDAL PIVOT SHAFT

On all except P-Series, apply SAE 10W oil to the clutch and brake pedal shaft. If equipped with air brakes, lubricate clutch pedal shaft only. On P-Series, apply the specified Chassis Lube with a pressure gun at the fitting.

LUBRICATE SPEEDOMETER CABLE

1. Disconnect the speedometer cable from the speedometer.
2. Pull the core out of the casing.
3. Wash all old lubricant from the cable. Wipe the cable dry.
4. Apply a thin film of specified Speedometer Cable lubricant to the cable.
5. Insert the core in the casing.
6. Connect the cable to the speedometer.

LUBRICATE TACHOMETER CABLE

1. Disconnect the tachometer cable from the tachometer head.
2. Pull the core out of the casing.
3. Wipe off all the old lubricant from the cable and apply specified Speedometer Cable Lubricant sparingly.
4. Install the tachometer cable core in the cable casing and connect the cable to the tachometer head.

LUBRICATE TACHOMETER ADAPTER—C- LN- AND W-SERIES

Disconnect the cable housing at both ends of the adapter. Daub the cable ends liberally with Ford All-purpose Lubriplate, insert them into the adapter and reconnect the cable housings.

LUBRICATE DOOR HINGE, HINGE CHECK, ROTOR AND STRIKER PLATE

Spray Ford Polyethylene Grease (refer to Section 9) on the hinge pivot

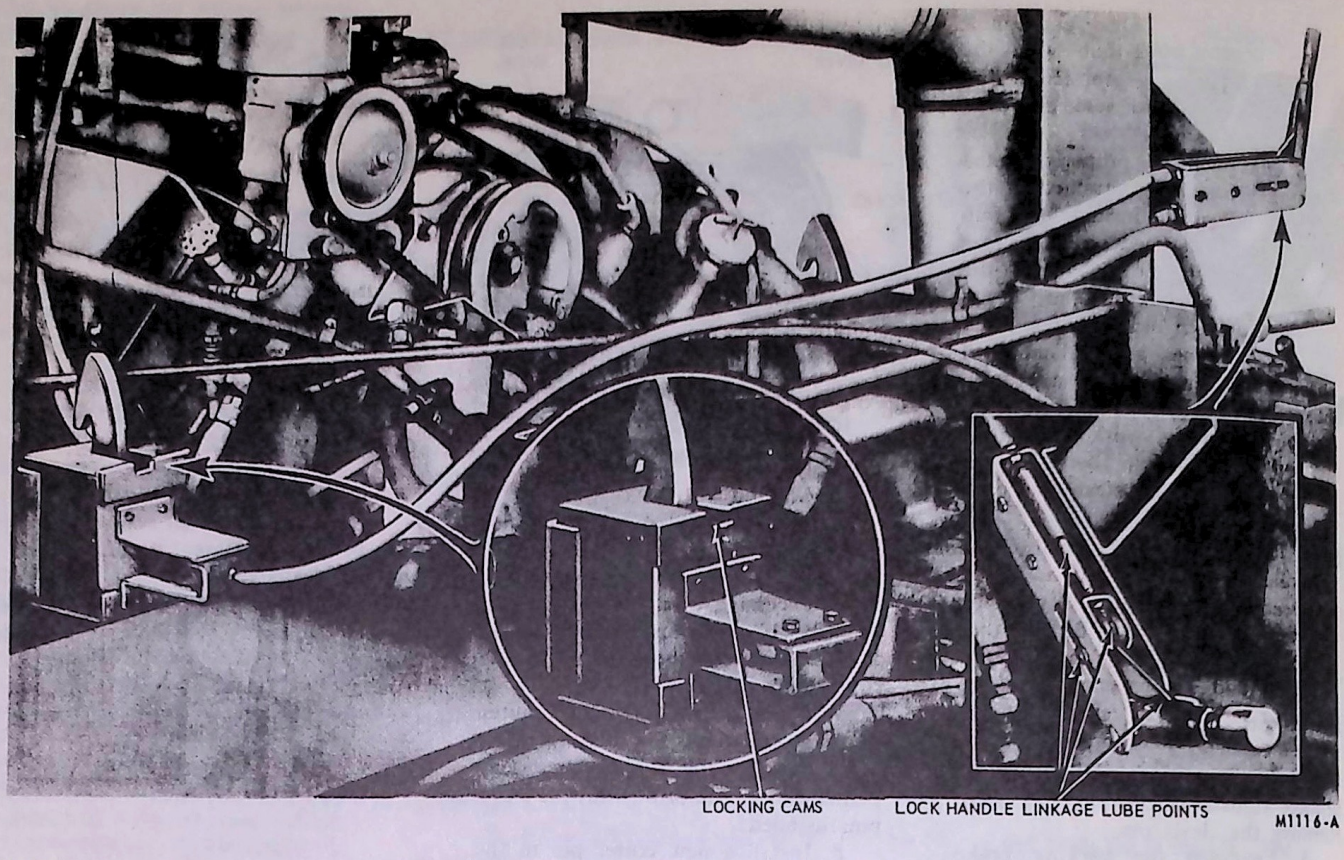


FIG. 132 Cab Locking Mechanism—W-Series

points, rotor, and striker plate as required to eliminate any binding condition. Open and close the door several times to be sure that the lubricant has effectively worked in.

LUBRICATE LOCK CYLINDERS

Apply Specified Lock Lubricant sparingly through the key slot. Insert the key and operate the lock several times to be sure that the lubricant has effectively worked in.

LUBRICATE TAILGATE HINGE

Spray Specified Polyethylene Grease on all pivot and friction points to eliminate any binding conditions. Operate the tailgate several times to be sure that the lubricant has effectively worked in.

LUBRICATE CAB LOCKING CAMS AND LOCK HANDLE LINKAGE (W-SERIES)

Squirt 10W oil into the cab locking hook boxes to lubricate the locking cams (Fig. 132). Lubricate the lock handle linkage with 10W oil at the points shown.

REPACK AND ADJUST FRONT WHEEL BEARINGS

Sodium base grease is not compatible with lithium base grease and should not be intermixed. Therefore, do not lubricate front and/or rear wheel bearings without first ascertaining the type of original wheel bearing lubricant. Usage of incompatible bearing lubricants could result in premature lubricant breakdown.

If bearing adjustment will not eliminate looseness or rough and noisy operation, the hub and bearings should be cleaned, inspected, and repacked with specified wheel lubricant. If the bearing cups or the cone and roller assemblies are worn or damaged, they should be replaced.

Light Vehicle

1. Raise the vehicle until the wheel and tire clear the floor and remove the wheel and tire from the hub. If the drums will not remove easily, back off the brake shoe adjusting screw so that the shoes do not contact the brake drum. Remove the grease cap from the hub.

2. Remove the cotter pin, nut lock, adjusting nut and washer from the spindle (Fig. 133).

3. Remove the outer bearing cone and roller. Pull the hub and drum assembly off the wheel spindle. Then, remove and discard the grease retainer and the inner bearing cone and roller from the hub. **Remove all traces of old lubricant from bearings, hubs, and axle spindle.**

4. Inspect the cups for scratches, pits or cracks. If the cups are worn or damaged, remove them with a drift. Clean the inner and outer bearing cones and rollers with solvent and dry them thoroughly. **Do not spin the bearings dry with compressed air.**

5. Inspect the cones and rollers for cracks, nicks, brinelling, or seized rollers. Inspect the grease retainer and replace it if it is cracked, nicked, or dented. If the new grease retainer is leather, soak it in light engine oil for about 30 minutes before installation.

6. Cover the spindle with a clean cloth and brush all loose dust and dirt from the brake assembly. **Remove the cloth from the spindle carefully to prevent dirt from falling on the spindle.**

3. Remove the axle shaft stud nuts.

4. If tapered dowels are installed in the axle shaft flange, place a drift in the center of the flange and strike it sharply to loosen the dowels (Fig. 141). Remove the axle shaft.

On axles where tapered dowels are not used, two threaded holes (5/8-11) are provided in the axle shaft flange. These axle shafts may be pulled with a slide hammer installed in the threaded holes or with the type of tool shown in Fig. 142. This tool can be made from a piece of flat steel bar with an 11/16 inch hole in it, and a 2 1/4 inch long 5/8-11 bolt. As the bolt is turned clockwise, the axle shaft flange is pulled away from the wheel hub. If the thread load becomes excessive when pulling an axle shaft, install a second puller on the opposite side of the flange.

5. With the axle shaft removed, remove the seal assembly from the axle shaft flange studs.

6. Bend the lock washer tab away from the lock nut, and then remove the lock nut, lock washer, and the adjusting nut.

7. With the type of wheel jack shown in Fig. 143, raise the wheel to the point that all wheel weight is removed from the wheel bearings. Remove the outer bearing cone. Now pull the wheel straight off the axle.

8. With a piece of hard wood which will just clear the outer bearing cup, drive the inner bearing cone and inner seal out of the wheel hub.

9. Wash all the old grease or axle lubricant out of the wheel hub, using a suitable solvent.

10. Wash the bearing races and rollers and inspect for pitting, galling, and erratic wear patterns. Inspect the roller for end wear.

11. If the bearing cups are to be replaced, drive them out with a drift. Install the new cups with the tool shown in Fig. 135 or press them in.

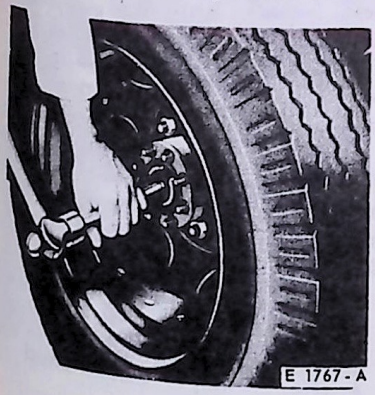


FIG. 141 Axle Shaft Removal Tapered Dowels

12. Check for proper seating of the new bearing cups by trying to insert a 0.0015 inch feeler gauge between the cup and the wheel hub.

13. A ring of specified Chassis Lube as high as the cup should be placed in the hub on each side of both bearing cups. These rings form a dam which prevents thinned grease from flowing out of the bearing.

14. Pack each bearing cone and roller with a bearing packer tool.

15. Place the inner bearing cone and roller assembly in the wheel hub, and then install a new hub inner seal using tool T53T-1175-A or T53T-1175-D.

16. Adjust the jack so that the wheel can be installed straight on the axle housing without damaging the inner seal.

17. **Wheel end play after assembly must be .001 to .010 inches end play.** To obtain the specified end play, torque the bearing adjusting nut to 50 to 80 ft-lbs while rotating the wheel.

18. Back off (loosen) the adjusting nut 3/8 turn.

19. Apply axle lube to a new lockwasher and install with smooth side out (away from adjusting nut).

20. Install lock nut and torque to 90 to 110 ft-lbs (Fig. 144). Wheel must rotate freely after torque.

21. With a suitable dial indicator, check wheel assembly end play (acceptable range .001-inch to .010-inch). If less than .001-inch or more than .010-inch, the procedure will have to be repeated starting with a loose bearing.

22. With a satisfactory end play and freely turning wheel, bend two lockwasher tabs inward over an adjusting nut flat and two outward over the lock nut flat.

23. Install the axle shaft, gasket, lock washers and axle shaft retainer. Torque to 40-50 ft-lbs.

24. Adjust the brakes.

25. Use the above procedure to lubricate the other wheel bearings.

CHECK ENGINE OIL LEVEL

Check the dipstick for the correct quantity of oil. Use only the specified oil (Section 9). Observe the following when checking the oil.

Gasoline Engine

The engine oil level should be above the ADD oil mark and not above the FULL mark.

Ford V-8 Diesel

Keep the oil level above the ADD 3 qts. mark.

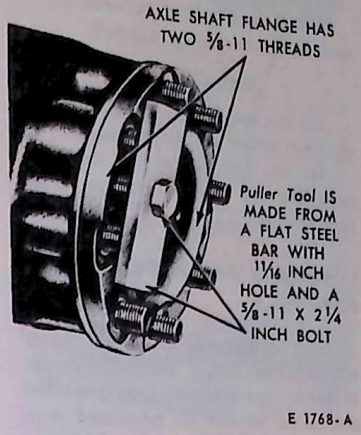


FIG. 142 Axle Shaft Puller

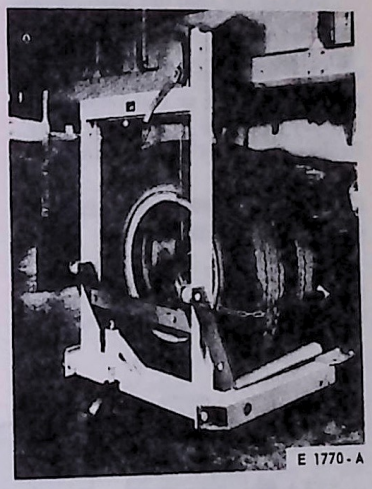


FIG. 143 Typical Wheel Jack

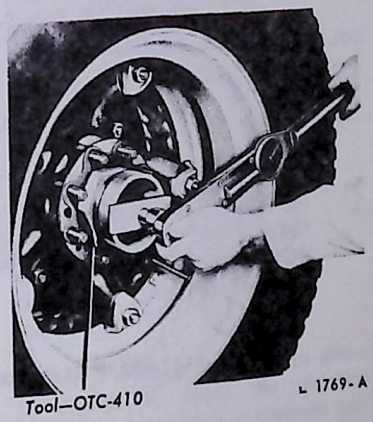


FIG. 144 Lock Nut Installation

Cummins Diesel

Keep the oil level between the L and H marks on the dipstick.

Detroit Diesel

Do not operate the engine with the oil level below the LOW mark.

Do not add oil to any engine to raise the oil level above the mark indicating FULL.

LUBRICATE RADIATOR SHUTTER ASSEMBLY

All vanes should move freely without binding. On all except W-Series, the shutter blade pivot rod and arms should be lubricated with SAE 10W engine oil. On W-Series, lubricate the shutter control shaft bushings with SAE 10W engine oil.

CHECK OIL BATH AIR CLEANER OIL LEVEL

Remove the reservoir from the air cleaner body. Fill the reservoir to the oil level mark with the specified motor oil. **Do not overfill the reservoir. Inspect the gasket or seal between the reservoir and the air cleaner body. Replace the gasket or seal if damaged.**

CLEAN OIL BATH AIR CLEANER AND REFILL RESERVOIR

1. Remove the wing nut retaining the air cleaner to the carburetor and remove the air cleaner.
2. Remove the cover and drain the oil from the reservoir. Wash all the air cleaner parts in a suitable cleaning solvent. Dry them with compressed air.
3. Inspect the gasket between the oil reservoir chamber and cleaner body and replace it if necessary.
4. Saturate the filter element with engine oil.
5. Fill the oil reservoir to the full mark with the recommended engine oil.
6. Install the air cleaner on the carburetor.

CHECK STEERING GEAR LUBRICANT LEVEL

F-100, F-250 and 350 (4 x 2) Series Manual Steering

1. Center the steering wheel.
2. Remove the steering gear housing filler plug.
3. Remove the lower cover-to-housing attaching bolt.
4. With a clean punch or like instrument, clean out or push the loose lubricant in the filler plug hole and cover-to-housing attaching bolt hole inward.
5. Slowly turn the steering wheel to the left until linkage reaches stop. Lubricant should rise within the cover lower bolt hole; then slowly turn the steering wheel to the right until linkage reaches stop. Lubricant should rise within the filler plug hole. If lubricant does not rise in both the cover bolt hole and the filler plug hole, add specified lubricant until it comes out both holes during this check.
6. Install the lower cover-to-housing attaching bolt and the filler plug.

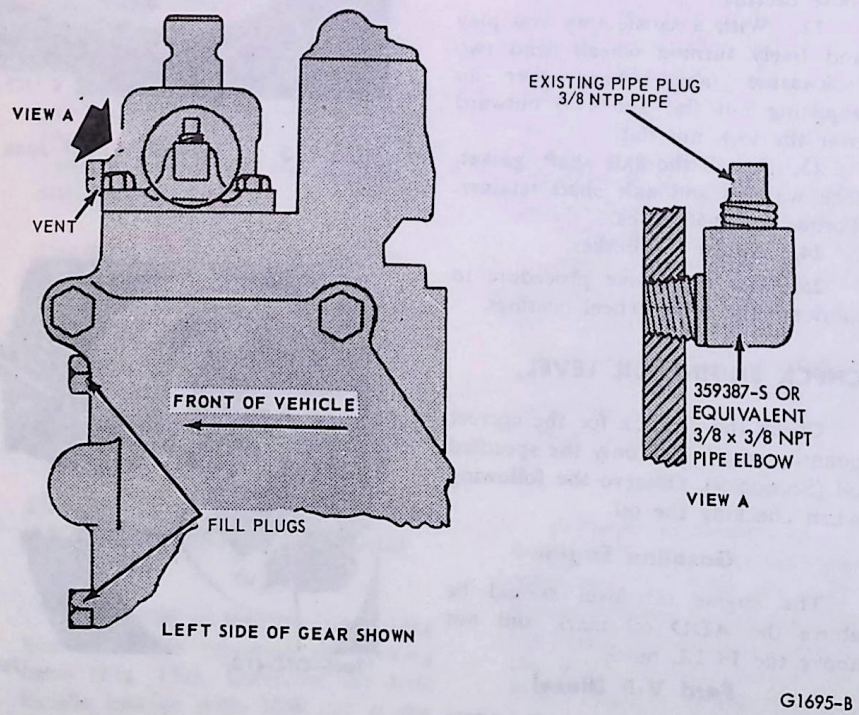


FIG. 145 Ross HPS-70 Steering Gear Lubricant Fill—W-Series

Econoline

1. Remove the steering gear housing filler plug.
2. With a clean punch or like instrument, clean out or push the loose lubricant into the filler plug hole. Turn the steering wheel to the **left.** Then turn the steering wheel slowly to the **right** until linkage reaches stop. Lubricant should rise in the filler plug hole. If lubricant does not rise in the filler plug hole, add specified lubricant.

The location of the steering gear does not allow clearance for the removal of a cover bolt for creating a vent. To prevent air from being trapped and forming pockets in the housing while lubricant is being added, it is suggested that a curved length of 1/4 inch tubing be adapted to the end of the grease gun being used. This tube should be inserted into the filler hole and extend down toward the bottom of the housing cavity. By this method, the lower housing cavity will fill first and as lubricant is added, air will be expelled upward and out the filler hole.

To add lubricant, turn the steering wheel to the extreme **left** to position the ball nut away from the filler plug hole and fill gear by method described above until lubricant rises in the filler plug hole.

F-100 4-Wheel Drive and Bronco

1. Remove the filler plug from the sector shaft cover.
2. Check to see if the lubricant level is visible in the filler plug-tower. If the lubricant is visible, install the filler plug. If the lubricant is not visible, add specified lubricant as outlined in step 3.
3. Add steering gear lubricant until the lubricant level is visible approximately 1 inch from the top of the hole in the filler plug tower; then, install the filler plug.

500 Thru 900 Series, F-250 (4 x 4) and P-Series with Manual Steering

1. Remove the filler plug from the top of the steering gear housing.

2. Check the lubricant level. If the level is to the bottom of the filler plug opening, install the filler plug. If the level is not to the bottom of the filler plug hole, add fluid to raise the level to that level. **Do not use a pressure gun as it could damage the seals in the gear.**

Ross Semi-Integral Power Steering Gear—W-Series

1. Remove the upper most filler plug from the gear housing.
2. Install a 90 degree, 3/8 inch street pipe elbow in the filler plug hole of the gear as shown in Fig. 145.
3. Add specified lubricant into the open end of the elbow until the lubricant is visible.
4. Install the plug, removed in step 1, in the street elbow.

LUBRICATE STEERING SHAFT SLIP SPLINE (W-SERIES)

Apply pressure gun grease to the grease fitting (Fig. 146) until the grease appears at the spline end. Refer to Section 9, Lubricants Chart, for the recommended lubricant.

LUBRICATE STEERING COLUMN U-JOINTS (C-, LN- AND W-SERIES)

Apply Ford Chassis Lubricant to the U-joint fittings, using a pressure gun. Refer to Section 9 for lubricant specifications.

LUBRICATE DISTRIBUTOR BUSHING (OIL CUP)

Squirt a few drops of SAE 10W engine oil into the distributor oil cup, if so equipped.

FIG. 146 Steering Shaft Slip Spline—W-Series

LUBRICATE HOOD LATCH AND HINGE

Spray Specified Polyethylene Grease on all pivot points and on the striker plate as required to eliminate any binding condition. Operate the latch mechanism several times to be sure that the lubricant has effectively worked in.

LUBRICATE HOOD AUXILIARY CATCH

Spray Specified Polytheylene Grease on all pivot points as required to eliminate any binding conditions. Operate the catch several times to be sure that the lubricant has effectively worked in.

FORD V-8 DIESEL ENGINES

Lubricate Electric Starting Motor

Add a few drops of clean SAE 30 weight lubricating oil to cranking motor bearings.

Lubricate Air Starting Motor

Air cranking motor may be equipped with grease fittings, felt wicks with outer grease cups or air line lubricators. Follow manufacturer's recommendation for procedure, interval and lubricant specification.

Lubricate Accelerator Linkage

Lubricate the friction points of the accelerator linkage with the specified lubricant at the recommended mileage interval.

DETROIT DIESEL ENGINES

Lubricate Accelerator Linkage

Lubricate the friction points of the accelerator linkage with the specified lubricant at the recommended mileage interval.

Lubricate Starter Motor

Some starting motors do not require lubrication except during overhaul. However, motors (Fig. 147) which are provided with lubrication fittings (grease cups, hinge cap oilers, or oil tubes sealed with pipe plugs) should be lubricated at the specified interval

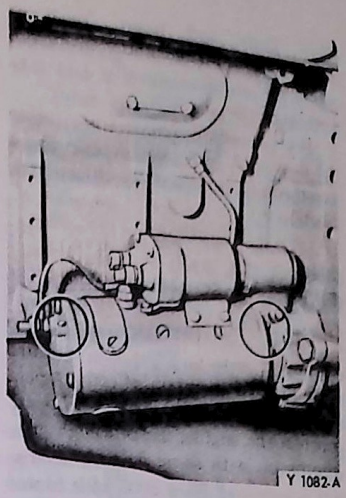


FIG. 147 Starter Motor Lubrication Points—Typical

Add 8 to 10 drops of oil, of the same grade as used in the engine, to hinge cap oilers; if sealed tubes are provided, remove the pipe plugs, add oil and reseal the tubes. Grease cups should be turned down one turn. Refill the grease cups, if necessary.

CUMMINS DIESEL ENGINES

Lubricate Electric Starting Motor

Add a few drops of clean SAE 30 weight lubricating oil to cranking motor bearings.

Lubricate Air Starting Motor

Air cranking motor may be equipped with grease fittings, felt wicks with outer grease cups or air line lubricators. Follow manufacturer's recommendation for procedure, interval and lubricant specification.

Lubricate Accelerator Linkage

Lubricate the friction points of the accelerator linkage with the specified lubricant (refer to the Lubricants Chart in Section 9) recommended mileage interval.

LUBRICATE TRANSMISSION REMOTE GEAR SHIFT AND AUXILIARY TRANSMISSION LINKAGE, CABLES AND U-JOINTS

For prevailing temperatures above 10 degrees F, apply the specified chassis lubricant with a pressure gun to transmission remote gear shift front

cross shaft and levers, auxiliary transmission linkage, and transmission cables, U-joints, crank arm and side bushings (C- and W-Series only).

For prevailing temperatures below 10 degrees F, use calcium soap grease (conforming to Ford Specification in Section 9).

ENGINE OIL AND FILTER—GASOLINE ENGINES

By law, all 1971 U.S. vehicles are equipped with air pollution control systems. To maintain effective operation of these systems to properly protect the engine, use of a high grade motor oil with some new characteristics is essential. Ford 6000 Mile Motor Oil is formulated to meet these requirements. If another brand of oil is used, it must meet the new Ford Motor Company performance specification, 101-B.

These required oils contain a special additive which neutralizes the corrosive acids (generated in all engines by burning gasoline) which are not completely removed by the required anti-smog emission system controls. In addition, the specified oils have been formulated to keep the crankcase ventilation valve clean and fully operative, so that the emission control (anti-smog) system will operate as designed.

Oil Viscosity

From the table in Section 9, select the viscosity that most nearly matches the expected temperature range of vehicle operation for the next 6 months or 6,000 miles.

FIG. 148 Oil Filter Installed—Typical

Use the Right Oil Filter

Proper oil filtration is just as essential as use of good motor oil. The two-stage filtering action of the Autolite oil filter has been shown by tests to be more effective than ordinary filters. Use only an Autolite 6,000 mile oil filter or one of equal quality which meets the Ford Motor Company specification.

Change Engine Oil

1. Remove the oil pan drain plug, drain oil into a container, then replace the plug.
2. **Install a new filter or element each time the oil is changed.**
3. Fill the crankcase with the specified engine oil. Run the engine at fast idle and check for leaks.

Engine Oil Filter Replacement

Disposable-Type Oil Filter Assembly—All except Econoline

1. Place a drip pan under the oil filter. Unscrew the filter from the cylinder block with a filter wrench.
2. Coat the gasket on the filter with oil. Place the filter in position on the cylinder block (Fig. 148). Hand tighten the filter until the gasket contacts the adapter face; then advance it 1/2 turn.
3. Operate the engine at fast idle, and check for oil leaks. If oil leaks are evident, perform the necessary repairs to correct the leakage. Check the oil level and fill the crankcase if necessary.

Disposable-Type Oil Filter Assembly—Econoline

To remove the oil filter on Econoline models with V-8 engines and power steering, the following instructions are recommended:

1. With the wheels in the straight ahead position, loosen the oil filter with a strap wrench.
2. Unscrew the oil filter from the engine, turn it to a horizontal position, and let the excess oil drain off.
3. Slide the filter rearward and remove (Fig. 149).

Note: Some effort may be required to slide the oil filter between the engine crossmember and the power steering hoses. This is considered normal.

Replaceable Element Type Oil Filter

The oil filter assembly is shown in Fig. 150.

1. Place a drip pan under the filter. Remove the filter center bolt, then remove the filter assembly and gasket. Discard the gasket.
2. Remove the filter element, neoprene gasket, spring and seat; then remove the center bolt from the container and the fiber gasket from the bolt. Discard the element and gaskets.
3. Wash all parts in solvent. Make sure the openings in the bolt are clean.
4. Install the new filter element in the housing, following the instructions furnished with the new element.
5. Clean the cylinder block filter recess. Install a new gasket.
6. Place the filter assembly in position and thread the center bolt into the adapter finger-tight.
7. Rotate the filter assembly slightly, in each direction, to make sure the gasket is seated evenly.
8. Torque the bolt to specifications. **Do not over-torque the bolt.**
9. Add oil to the crankcase, if necessary. Operate the engine at fast idle and check for oil leaks.

FORD V-8 DIESEL ENGINES

Use SAE 10W-30, Supplement 1 oil (usually designated by MS or DG on container).

Normal crankcase oil change period is every 6,000 miles when fuel sulphur content is 0.4 or less. When sulphur content is 0.4 to 1.0, reduce interval one-half. If sulphur content is above 1.0, reduce interval to one-fourth of the normal interval.

Make the initial oil and filter change after the first 500 miles of operation for a reconditioned engine.

Filters are spin-on, throw-away units. They should be changed every 6,000 miles, regardless of oil change.

Change Engine Oil and Filters

Filters used on these engines are spin-on, disposable units. Drain the crankcase while the engine is warm.

1. Position a drain pan under the engine drain and the oil filters.
2. Remove the engine crankcase drain plug.
3. Unscrew and remove the two oil filters (Fig. 151). A filter wrench may be used to remove the filters but not to install them.
4. Coat each filter gasket surface with a film of clean engine oil and install the filters. Tighten each filter by hand until the gasket contacts the base, and then tighten 1/2 turn further.
5. Replace the crankcase drain plug.

6. Fill the crankcase with SAE 10W30 oil of supplement 1 quality (usually designated by MS or DG on container).

7. Operate the engine until the oil is warm and oil pressure normal; then check for leaks.

8. Check the engine oil level on the dipstick and add oil if necessary to bring level up to the FULL mark.

CUMMINS DIESEL ENGINES

Cummins Engine Company, Inc., recommends that owners of Cummins Diesels give special consideration to use of heavy duty oils developed for use in diesel engines. Under normal conditions, the oil used should meet the requirements of U.S. Military Specifications MIL-L-2104-B for normally aspirated engines, and MIL-L-2104-B/ MIL-L-45199-B for turbocharged or supercharged engines. The responsibility for meeting these specifications, the quality of the product and its performance must necessarily rest with the oil supplier. Cummins Engine Company, Inc., does not recommend any specific brand of LUBRICATION OIL. Many brands which meet specifications are listed in the Lubricating Oils for Industrial Engines booklet published by the Internal Combustion Engine Institute (Chicago 6, Illinois).

Change Engine Oil and Replace Filter

Engine Oil

The kind of oil used, the efficiency of the filtering system and the condition of the engine must be considered in determining when oil needs changing.

The schedule for oil changes is based on average crankcase and filter capacity when both full-flow and by-pass filters are used.

If a by-pass filter is not used, the oil change period must be reduced by one-third.

The safest method for determing oil change period is by lubricating oil analysis.

On engines equipped with double sump oil pans, both sumps must be drained when changing oil.

Full-Flow Oil Filter Replacement

1. Drain full-flow lubricating oil filters on all models by removing drain plug (Fig. 152).

2. Loosen filter cover bolt carefully. **The element contains a spring which will separate the head and case when capscrews are loosened. Do not remove case.**

3. Turn filter bag inside out and inspect for bearing metal, grit, etc., (Fig. 153). If metal is found in the bag, an inspection of all connecting rod and main bearings should be made at once.

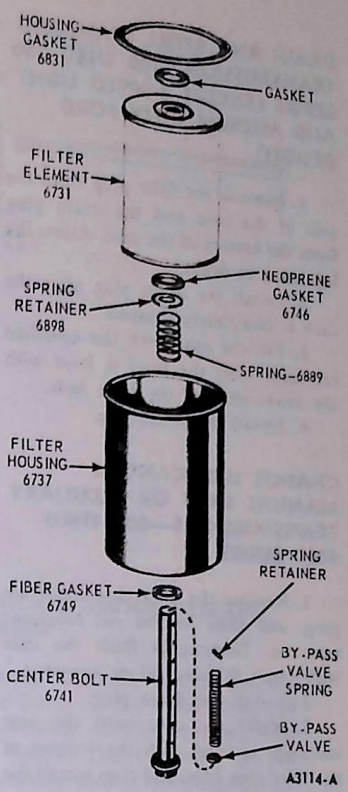


FIG. 150 Typical Replaceable Element—Type Oil Filter Assembly

Inspect spool gaskets, bag clamp, and spacer mat. If they are not in good condition, replace with new parts.

Do not attempt to wash and re-use filter bag.

4. Clean all parts thoroughly except bag, gaskets and O-rings.

5. Install a new filter bag as shown in Fig. 154.

6. Insert element, spring end down, in filter case; positioning case to cover with new O-ring(s) and tighten capscrews to secure.

Make certain cover capscrews are tightened evenly to assure a good seal between cover and case.

7. Add approximately one gallon of clean lubricating oil to fill filter case.

8. Check engine oil level after operation; bring level to H mark to replace oil absorbed by new element.

Paper-Type Oil Filter

If paper element is used by by-pass filter (Fig. 155), change at specified interval. If no by-pass filter is used reduce change by one third.

1. Remove drain plug from filter case and allow oil to drain.

2. Loosen center bolt and remove filter case from filter head. Some filters use the same case as the bag-type

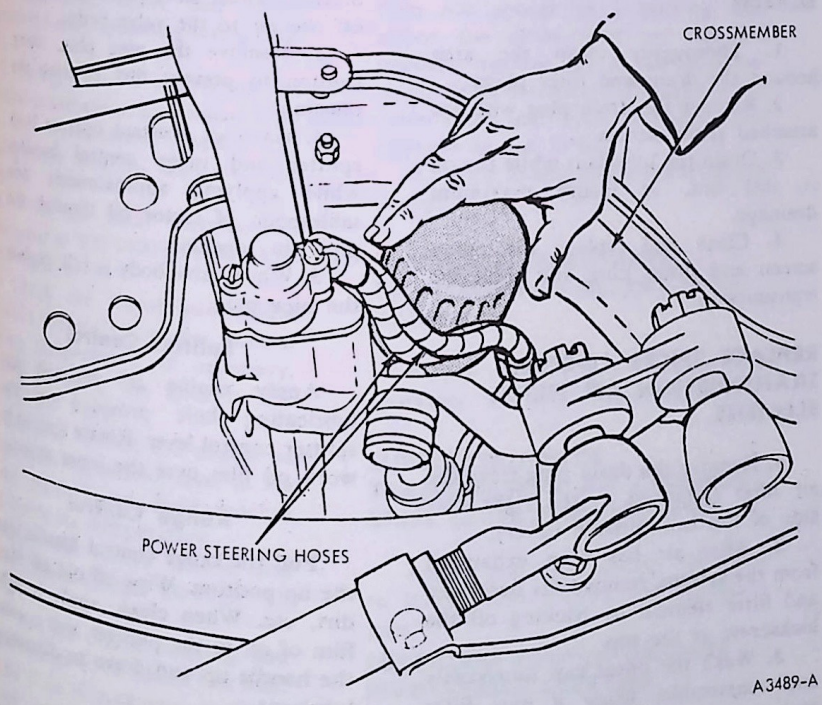


FIG. 149 Econoline Oil Filter Removal—V-8 Engine and Power Steering

DRAIN AND REFILL STANDARD TRANSMISSION—100 THRU 350 SERIES (EXCEPT 3-SPEED LIGHT AND MEDIUM DUTY FORD DESIGN)

1. Remove the filler plug from the side of the case and the drain plug from the bottom of the case. Allow the lubricant to drain.
2. Install the drain plug after the case is completely drained.
3. Fill the case with the specified lubricant until the fluid is level with the lower edge of the filler hole.
4. Install the filler plug.

CHANGE LUBRICANT IN MANUAL SHIFT OR AUXILIARY TRANSMISSIONS—500 THRU 9000 SERIES

1. Remove the filler plug and drain plug, and then let the old lubricant run out. Thoroughly flush the case with clean flushing oil or kerosene.
2. Install the drain plug.
3. Refill the case until the new lubricant is level with the bottom of the filler plug hole, and then install the filler plug.

DRAIN, FLUSH AND REFILL SPICER 16-SPEED TRANSMISSION

1. Thoroughly clean the area around the drain and filler plugs.
2. Remove the drain plug with the attached pump screen.
3. Drain the lubricant while the oil is still hot, to ensure maximum drainage.
4. Replace the drain plug.
5. Fill the transmission with 3-1/2 to 4 gallons of diesel fuel.
6. Run the engine at 800-900 rpm to 6 to 7 minutes with the transmission shift lever in 4th gear position and the auxiliary shift lever in neutral.

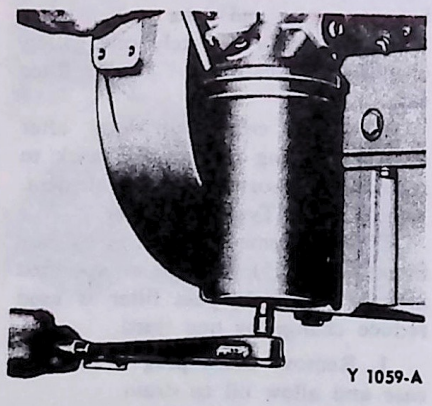


FIG. 155 Changing Paper Filter Element—Cummins Diesel

7. Drain flushing oil, clean the pump screen and replace the drain plug.
8. Refill the transmission with specified lubricant.

DRAIN, FLUSH AND REFILL 5-, 10- AND 15-SPEED FULLER TRANSMISSIONS

1. When the transmission is warm, remove the drain plug at the bottom of the case and drain the oil.
2. Clean the drain plug and replace it.
3. Remove all dirt from the area of the filler plug opening on the left side of the case, and remove the filler plug.
4. Fill the transmission with a clean flushing oil or kerosene to the level of the filler plug opening. Install the filler plug. **On off-highway equipment, remove the lubricating pump before flushing.**
5. With the transmission in neutral, run the engine at fast idle for a period of 10 seconds.
6. Remove the drain plug, drain the flushing oil, and replace the plug.
7. Remove the filler plug, fill the transmission with engine oil SAE 50 above 10 degrees F or SAE 30 below 10 degrees F to the level of the filler opening, and replace the plug. **Do not overfill. Overfilling will cause oil to be forced out of the case through the mainshaft openings.**

DRAIN 16-SPEED SPICER TRANSMISSION AND CLEAN OIL SCREEN

1. Thoroughly clean the area around the drain and filler plugs.
2. Remove the drain plug with the attached pump screen.
3. Drain the lubricant while the oil is still hot, to insure maximum drainage.
4. Clean and replace the pump screen and drain plug and refill the transmission.

REPLACE SPICER 16-SPEED TRANSMISSION AIR FILTER ELEMENT

1. Remove the drain plug from the air filter (attached to the right rear side of the transmission cover).
2. After air has been exhausted from the system, remove the outer can and filter element by backing off the lockscrew at the top.
3. Wash the outer can thoroughly and reassemble, using a new filter element and new gaskets for the top and bottom of the outer can.

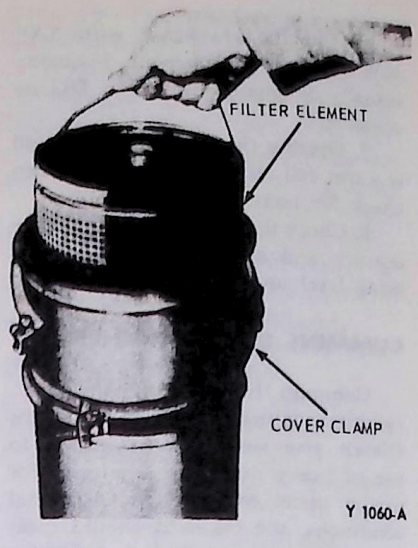


FIG. 156 By-Pass Filter and Element—Cummins Diesel

4. Replace the drain plug.
5. Build up air pressure in the system and check for leaks.

LUBRICATE SPICER 16-SPEED TRANSMISSION CONTROL VALVE BODY, SPLITTER AND RANGE CONTROLS

Control Valve Body

1. Wash off the top of the control valve body to expose the 1/8-inch pipe plug located in the center of the valve body.
2. Place the gear shift lever in one of the manual shift positions to shut off the air to the valve body.
3. Remove the pipe plug, using caution to prevent dirt entering the opening.
4. Have an assistant operate both splitter and range control handles while applying approximately one tablespoon of castor oil through the pipe plug opening.
5. When valve body is full, replace the pipe plug.

Splitter Control

Apply engine oil through the lubricating hole provided in the splitter control lever. Rotate splitter to work oil film over the inner sleeve.

Range Control

Pull the range control handle into the up position. Wipe off old oil film, dirt, etc. When clean, apply a light film of oil to the plunger and operate the handle up and down to distribute lubricant.

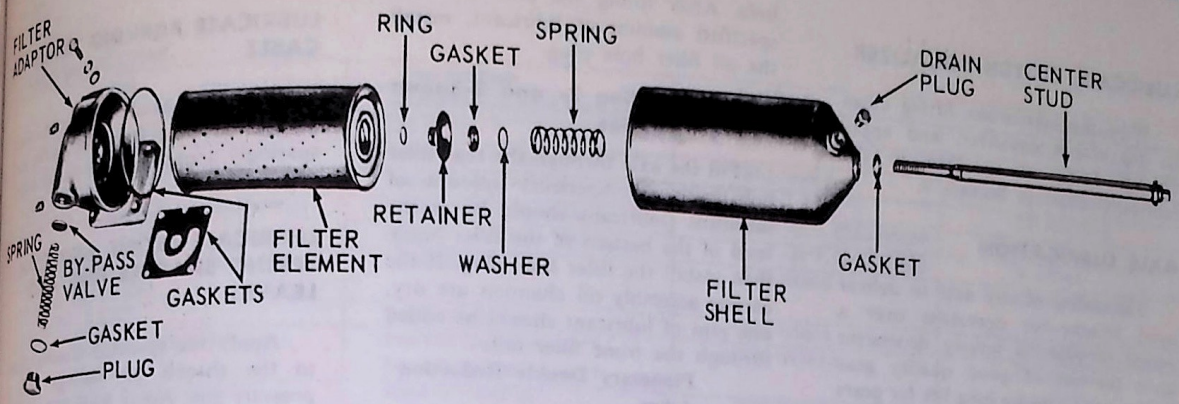


FIG. 157 Full-Flow Filter—Cummins Diesel

CHANGE TRANSMATIC DRIVE TRANSMISSION FLUID AND REPLACE FILTER ELEMENT

1. If the fluid is cold, operate the transmission until a normal operating temperature is reached.
2. Loosen, but do not remove, the screw which secures the filter cover to the transmission pan (Fig. 159).
3. Carefully separate the filter cover from the pan at the bottom edge only. When the drainage is complete, remove the cover, retainer, and filter. Discard the filter and fluid.
4. Install a new filter. Install a new retainer seal ring, filter retainer, a new cover seal ring, cover and strap. Tighten the strap attaching screw (Fig. 159).
5. Slowly pour 9 quarts of the specified automatic transmission fluid into the transmission. Apply the parking brake securely, then start the engine.
6. With the hand throttle, set engine speed at 800-1000 rpm with the selector lever at N.
7. Check the transmission fluid level when the engine reaches normal operating temperature. If necessary, add fluid to bring the level to the ADD FLUID mark.
8. Continue to run the engine at 1000 rpm with the selector lever at 3-6 until the transmission fluid reaches normal operating temperature.
9. Apply the service brakes, and shift the transmission through all ranges.
10. With the engine running and the selector lever at N, check the fluid level. Add fluid if necessary, to bring the level to the FULL mark. Approximately 13 quarts are required if the fluid pan and control valve body have been removed. Total dry capacity for the transmission and cooling system is approximately 19 quarts.

LUBRICATE UNIVERSAL JOINTS AND SLIP YOKE

1. Wipe all old lubricant and dirt from each universal joint lube fitting. Apply chassis Lube (Section 9) to each universal joint lubrication fitting. Be careful not to force the seals out of position.

Properly lubricated joints will show lubricant seeping from all four journal cross bearing seals. If lubricant does not appear at a bearing seal, rotate the drive shaft so that the opposite bearing cap is facing downward. Exert downward pressure on the drive shaft and apply lubricant gun pressure to the fitting.

2. Wipe excess lubricant from the fittings.

LUBRICATE TRANSMATIC TRANSMISSION DETENT STOP ASSEMBLY

Apply SAE 10W engine oil sparingly. Wipe off excess lubricant.

LUBRICATE FULLER TRANSMISSION AIR CYLINDER SHIFT LEVER AND LINKAGE

Apply Specified chassis lubricant to linkage connections with pressure gun.

LUBRICATE CLUTCH LINKAGE PIVOTS AND CLEVISES

Lubricate all clevis pins and pivot

LUBRICATE CLUTCH RELEASE BEARING

Apply lubricant to the pressure grease fitting on the bearing hub (all medium duty vehicles equipped with super duty or Diesel engines). **Do not use ordinary chassis lubricant. Do not over-lubricate.** Use only high temperature lubricant meeting Ford Specifications.

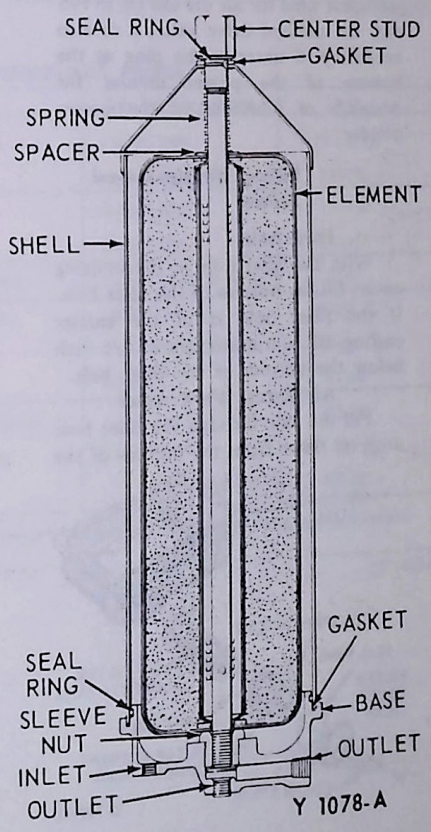


FIG. 158 By-Pass Type Oil Filter—Cummins Diesel

LUBRICATE CLUTCH EQUALIZER

Wipe the lubrication fitting clean on the clutch equalizer, and apply Chassis Lube as specified in the lubricants chart in Section 9.

AXLE LUBRICATION

The ability of any axle to deliver quiet trouble-free operation over a period of years is largely dependent upon the use of good quality gear lubricants. To insure long life for gears and bearings, use only gear lubricants specified.

Draining

Dana Axles and 4 x 4

Clean dirt and grease from the area around the fill plug, remove the fill plug and the cover lower bolt, and let the lubricant drain out at the bottom of the cover.

Ford Axles

Clean dirt and grease from the area around the fill plug, remove the fill plug, and draw out all the old lubricant through the fill plug hole with a suction pump.

Truck Axles

To drain, unscrew the plug at the bottom of the housing and allow sufficient time for all the old oil to run out. On tandem drive axles, it is also necessary to unscrew the plug at the bottom of the power divider for drainage of lubricant in the power divider.

Filling Single-Speed Axles

Ford Axle

With the filler hole in the housing cover, fill the bottom of the filler hole. If the filler hole is in the carrier casting, fill to a maximum of 5/8 inch below the bottom of the filler hole.

All Except Ford Axles

Fill the axle through the filler hole until oil flows from the bottom of the hole. After filling the axle with the specified amount of lubricant, install the oil filler hole plug.

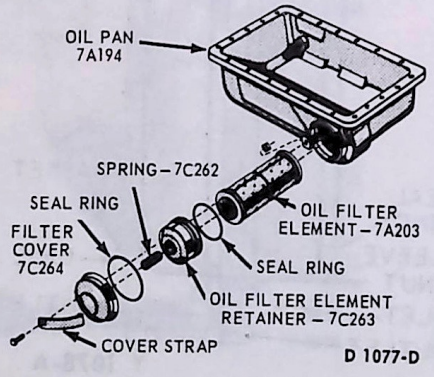


FIG. 159 Transmatic Transmission Fluid Filter Assembly

Filling 2- and 3-Speed Axles

Fill the axle through the rear filler hole with the specified amount of lubricant (lubricant should be at the level of the bottom of the filler hole), then install the filler hole plug. If the carrier assembly oil channels are dry, one pint of lubricant should be added through the front filler hole.

Planetary Double Reduction Axles

Fill the axle through the rear filler hole with the specified amount of lubricant (lubricant should be at the level of the bottom of the filler hole), then install the filler hole plug. If the carrier assembly oil channels are dry, one pint of lubricant should be added through the front filler hole.

Tandem Drive Axles

Fill both axles with the specified amount until the lubricant is level with the bottom of the rear filler hole, and then add the specified amount to the power divider through the filler hole located in the power divider case.

Eaton D Series Tandem Drive Axles

Fill the forward drive axle until the oil is level with the bottom of the filler hole in the rear cover. Then, add two pints through the forward filler hole located slightly offset to the right in the top portion of differential carrier. **Do not use the rear hole at top of the differential carrier as an oil filler hole. Fill the rear axle in accordance with instructions for single reduction, 2-speed or planetary double reduction, depending on the type of axle used.**

LUBRICATE FRONT AXLE SPINDLE PINS (BOLTS)

Apply the specified Chassis Lube with a pressure gun at the fittings on both spindles.

LUBRICATE STEERING LINKAGE

Apply the specified Chassis lubricant with a pressure gun at all fittings on the linkage.

LUBRICATE PARKING BRAKE LINKAGE

Lubricate all clevis pins and pivot point with SAE 10W engine oil. Clean the parking brake cables and apply Ford Speedometer Cable grease to the friction surfaces.

LUBRICATE PARKING BRAKE CABLE

Raise the vehicle on a hoist, clea all old lubricant from the cable, ar sparingly apply specified Speedomet Cable Grease.

LUBRICATE FRONT AND REAR SPRING SHACKLE PINS AND LEAVES

Apply the specified Chassis Lub to the shackle pin fittings with pressure gun. Apply SAE 10W engi oil to the spring leaves with a squi can.

CHECK OIL LEVEL AND LUBRICATE PISTON-TYPE VACUUM BRAKE BOOSTER

Remove the lubricating plug fro the end plate and add vacuum cylind oil meeting Ford Specifications (Ref to Lubricant Specifications Char until the oil runs out of the plu opening. The tandem piston-typ booster has a plug in the center pla as well as in the end plate. Fill bot openings.

LUBRICANT SPECIFICATIONS

Item	Ford Part Name	Ford Part No.	Ford Specification
Engine Oil Filter	Autolite Oil Filter 6,000 Mile type	C1AZ-6731-A	ES-C8AF-6714-A or C
Accelerator Linkage & Starting Motor	SAE 10W Oil	—	ESE-M2C35-A
Front Drive Axle (F-600 4 x 4)	Hypoid Gear Lubricant	C6AZ-19580-B	ESW-M2C105-B
Fuel Injection Pump	Engine Oil—Same Viscosity as Engine	—	ESE-M2C101-B
Rear Axle 750 thru 900 ④ Series and 8000, 9000	Hypoid Gear Lubricant (SAE 90)	Above –25°F. C2AZ-19580-F	M2C28-BA
	Hypoid Gear Lubricant (SAE 80)	Below –25°F. C2AZ-19580-B	M2C28-AA
Front and Rear Conventional Axles (Except 750 through 900, 8000 and 9000)	Hypoid Gear Lubricant	C6AZ-19580-B	ESW-M2C105-A ⑤
Ford Traction-Lok Axles	Hypoid Gear Lubricant	C9AZ-19580-A	ESW-M2C119-A
Manual Shift, Main and Auxiliary Transmissions (Except Ford 3-Speed)	Engine Oil SAE 50—above 0°F. Engine Oil SAE 30—Below 0°F.	C6TZ-19C547-A	ESE-M2C39-A ESE-M2C37-A
Transfer Case—4-Wheel Drive and 4-Speed Manual Transmission	Above 10°F.-SAE 50 Below 10°F.-SAE 30	C6TZ-19C547-A	ESE-M2C39-A ESE-M2C37-A
Exhaust Control Valve	Rust Penetrant and Inhibitor	C0AZ-19A501-A (Canadian-C8BA-19579-B)	ESR-M99C56-A
Ford 3-Speed Manual Transmissions	Standard Transmission Lube -	C3RZ-19C547-B	ESW-M2C83-B
Transmission Remove Gearshift Levers. Auxiliary Transmission Linkage and Transmission Cables, U-Joints Crank Arm and Side Bushing (C-Series Only).	Multi-Purpose Lubricant	C1AZ-19590-B	ESA-M1C75-B
Transmission Remote Gearshift Front Cross Shaft Tube (C-Series Only)	Calcium Soap Grease	C7AZ-19590-B	EST-M1C53-A
Two and Three-Speed Axle Shift Unit	Engine Oil SAE 10W Above 0°F.	—	ESE-M2C35-A
	3 Parts SAE 10W oil to 1 Part Kerosene—Below 0°F.	—	
Drive Shaft, Universal Joints, Slip Spline and Spring Stud Shackles (P-Series)	Multi-Purpose Lubricant	C1AZ-19590-B	ESA-M1C75-B
Clutch Release Bearing Hub			

④ (Rockwell axle only). Use Hypoid Gear Lubricant (SAE 140) for operation in temperatures above 0°F.

⑤ For complete refill of Dana limited-slip rear axles, add 2 ounces — Bronco or 4 ounces — Econoline and 100-350 Series Trucks EST-M2C118-A (friction modifier).

CY 1168-B1

TANDEM SUSPENSION TORQUE LIMITS (FT-LBS) — Hendrickson

Description	RU-RUE-RT	RS	SR
Beam & Adaptor to Axle	220-300	220-300	220-300
Spring Brackets to Frame	220-300	—	220-300
Shackle Pin Lock Nut	75-105	—	—
Torque Arm to Bracket to Crossmember	150-205	150-205	150-205
Torque Arm to Axle	220-300	220-300	220-300
Hanger Assembly to Frame	—	150-205	—
Hanger Assembly to Saddle Assembly	—	220-300	—
Spring Bracket to Saddle Assembly	—	—	150-205

FRONT SUSPENSION TORQUE LIMITS—P-SERIES

Description	Lb-Ft
Front Spring to Axle U-Bolt	100-120
Spring Retainer to Upper Spring Seat	18-25

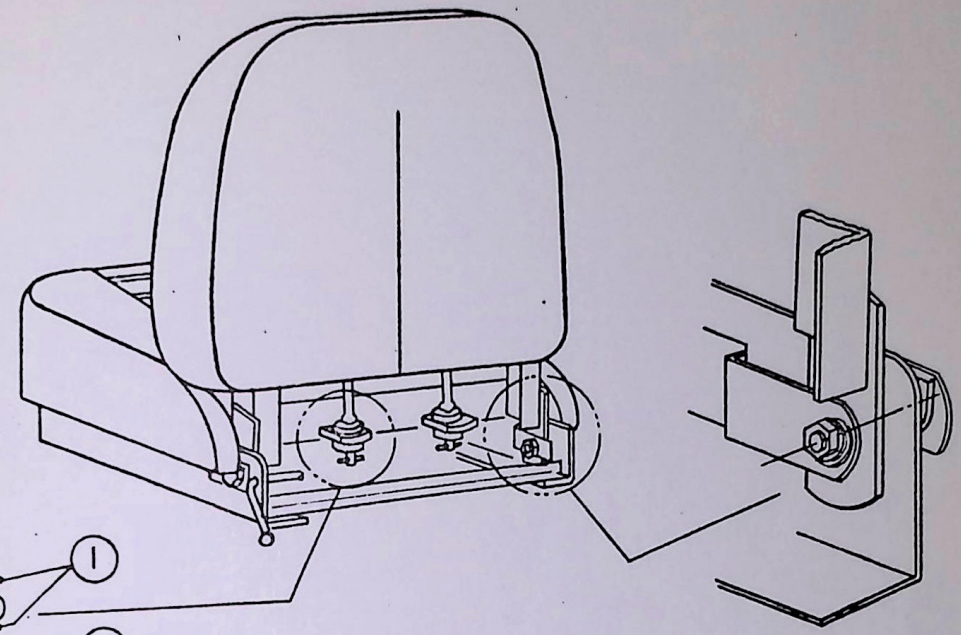
FRONT SUSPENSION TORQUE LIMITS- P-SERIES

Description	Bolt, Nut Size or Model	Lb-Ft
Rear Bracket to Frame	LN-500-7000	75-105 ①
	L-LT-LTS-LN-LNT-Series	150-205
U-Bolt Nuts	B-F-500-7000	110-150
	LN-500-7000	110-120
Shackle Through Bolt Nut	L-LT-LTS-LN-LNT-Series	31-42
Front Bracket to Frame	LN-500-7000	75-105 ①
	L-LT-LTS-LN-LNT-Series	150-205 ①
	W-Series	80-100
U-Bolt to Spring Assembly to Axle Assembly to Lower Shock Bracket	5/8—18 C-Series	155-195
	3/4—16	290-350

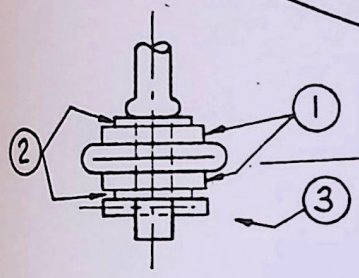
① Torque to specification and advance to next castellation if necessary to insert cotter pin.

CY 1403-A

ASSEMBLY PROCEDURE
DELUXE THINLINE SEAT ASSEMBLY



DETAIL "A"



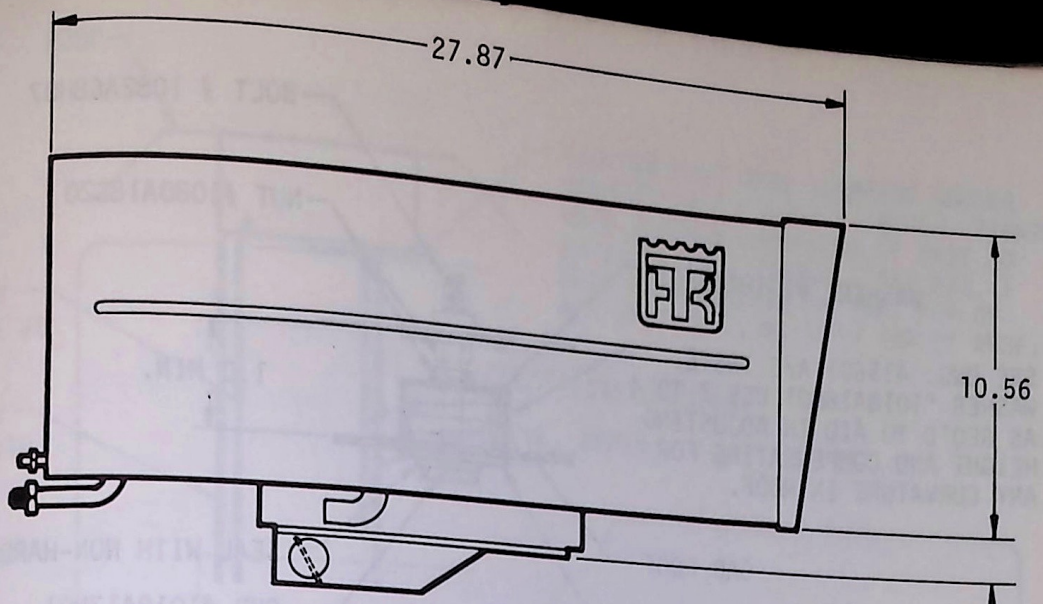
DETAIL "B"

ITEM	DESCRIPTION	NO.
1.	RUBBER WASHER	24128)
2.	STEEL WASHER, FLAT	353033) PACKAGED IN PARTS ENVELOPE
3.	DRIVE PIN	26136)

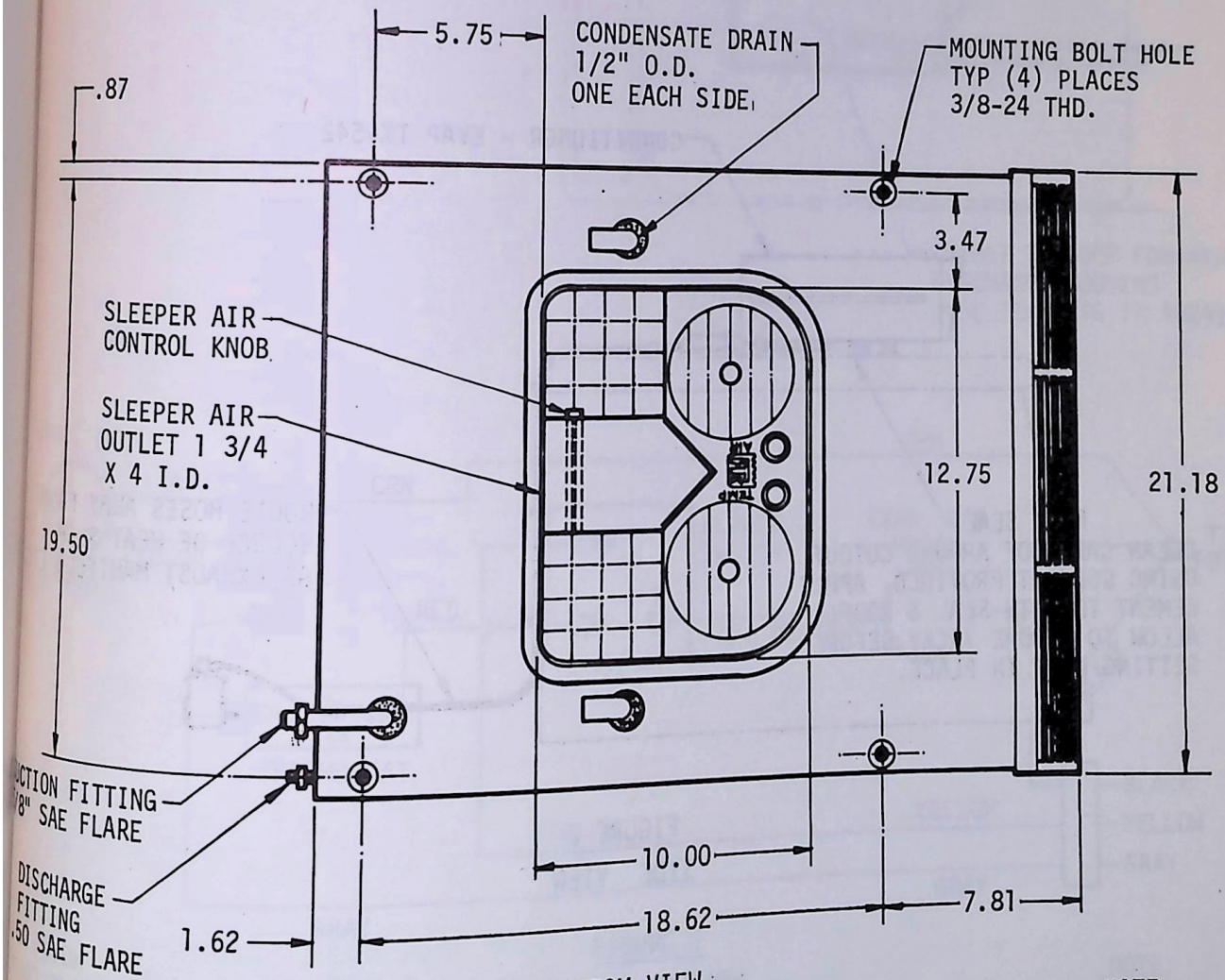
8.0 PROCEDURE

The seat cushion assembly has been temporarily bolted at the rear to the base assembly.

1. Remove rear assembly bolts, retaining hole alignment.)
2. Insert back cushion assembly.) SEE DETAIL "A"
3. Replace bolts, lockwashers, nuts & flat washers.)
4. Thread 1 each of steel washer (Item 2) & rubber washer (Item 1) onto each rod protruding downward from back cushion.
5. Connect rods to straps protruding from rear of seat cushion.)
6. Thread remaining rubber washers & steel washers to rods.) SEE DETAIL "B"
7. Lock with drive pins (Item 3).)



SIDE VIEW



BOTTOM VIEW

NOTE:
THERMO KING CORP.
DWG. NO. 3045C66

INSTALLATION DWG.
TRUCK CAB AIR CONDITIONER
(TK-542)

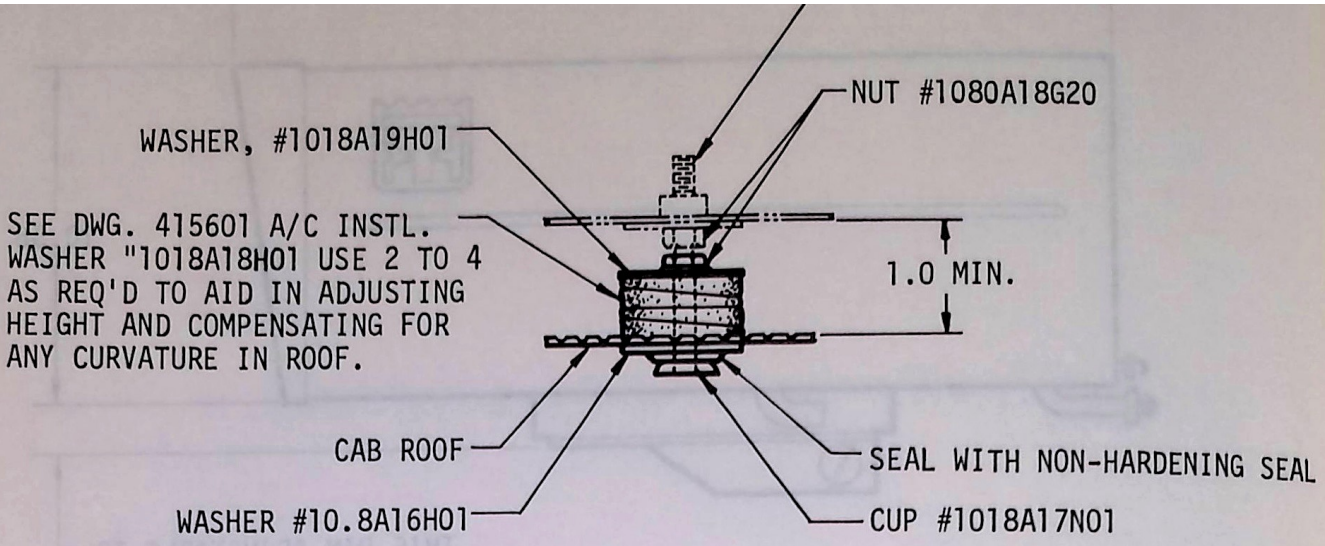


FIGURE 1

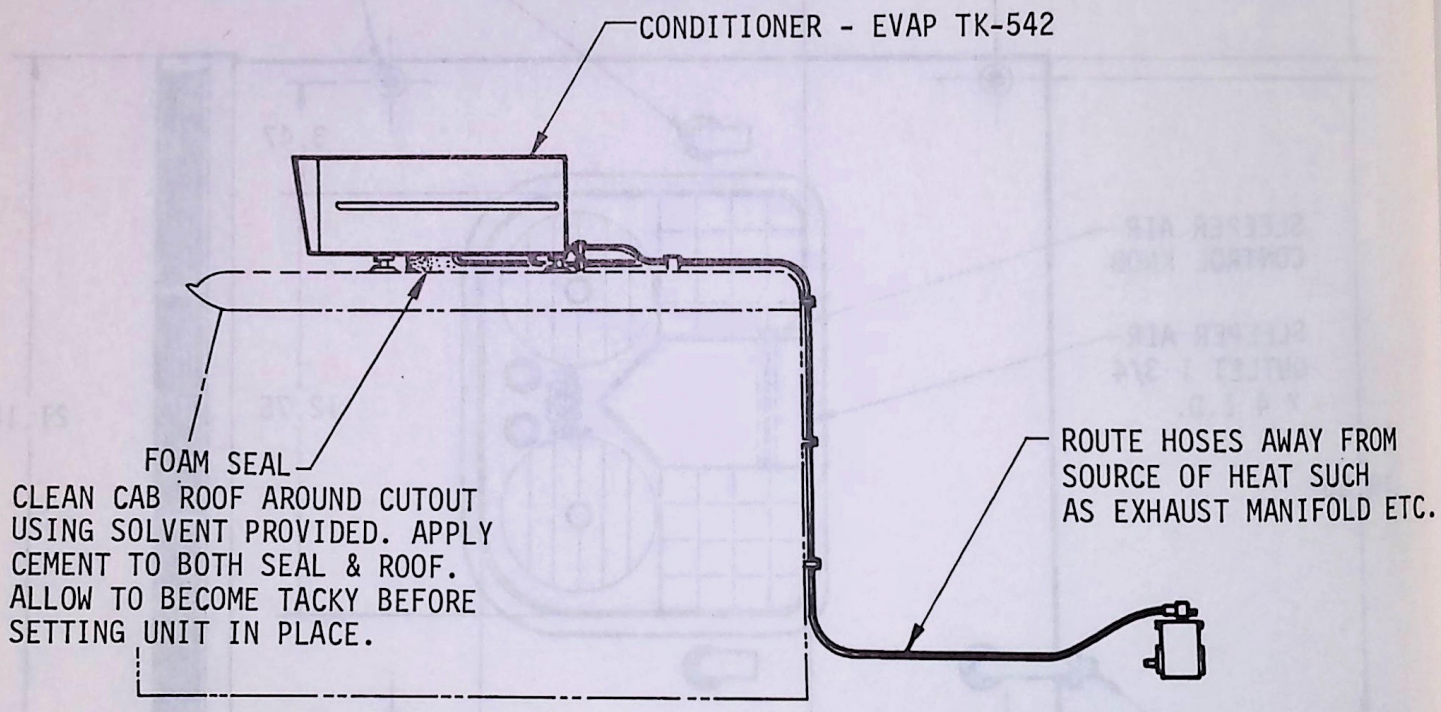


FIGURE 2
SIDE VIEW

NOTE:
THERMO KING CORP.
DWG. NO. 3045C66

INSTALLATION DWG.
TRUCK CAB AIR CONDITIONER
(TK-542)

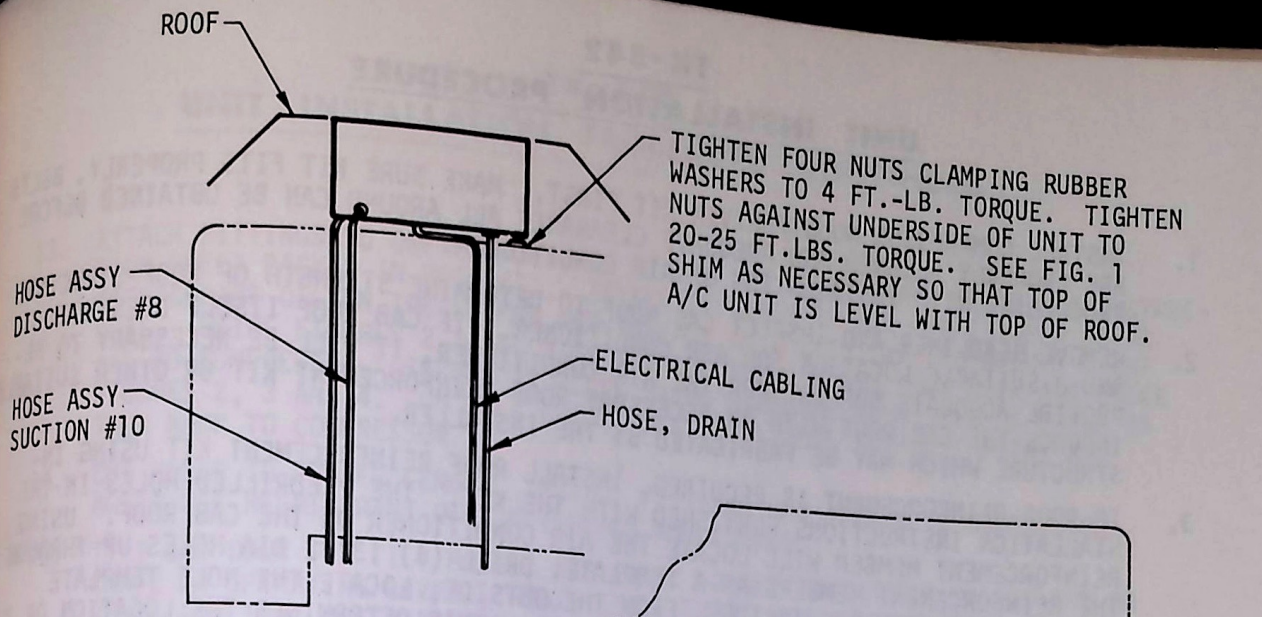


FIGURE 3
REAR VIEW

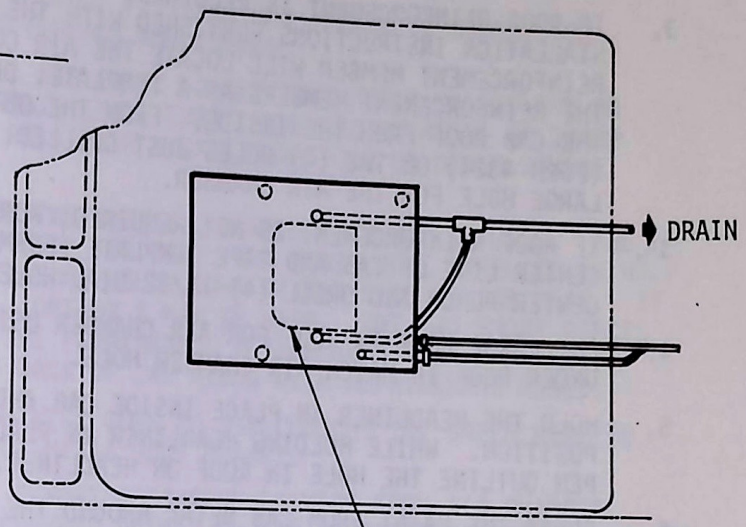


FIGURE 4
TOP VIEW

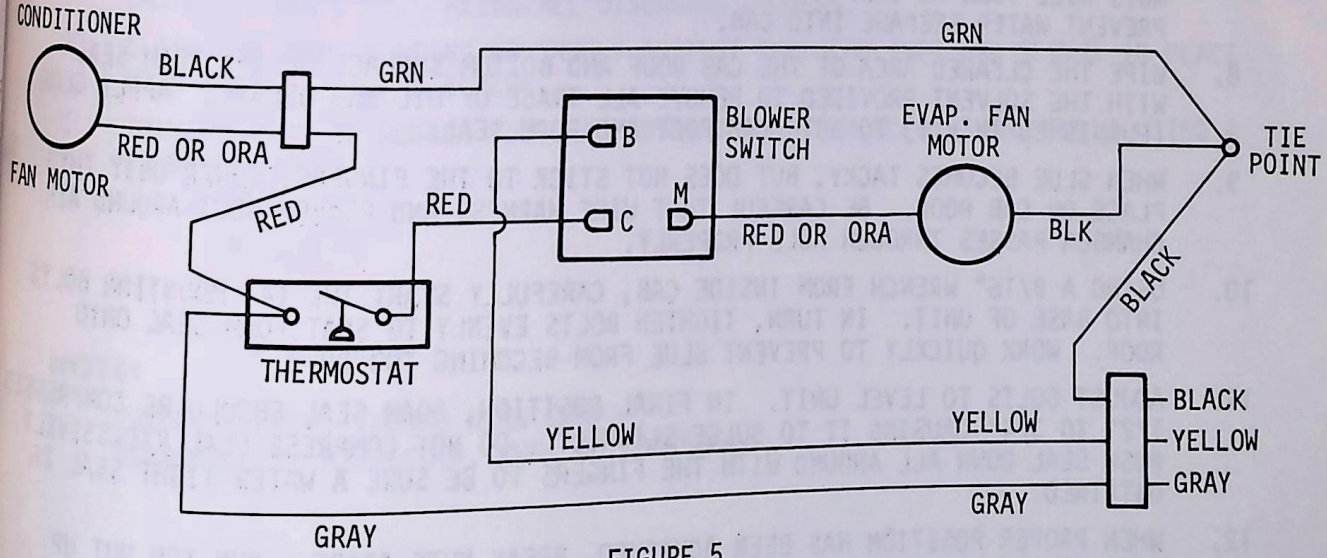


FIGURE 5
WIRING DIAGRAM

NOTE:
THERMO KING CORP.
DWG. NO. 3045C66

INSTALLATION DWG.
TRUCK CAB AIR CONDITIONER
(TK-542)

UNIT INSTALLATION PROCEDURE

1. INSTALL COMPRESSOR MOUNT/DRIVEN KIT FIRST. MAKE SURE KIT FITS PROPERLY, BELTS ARE PROPERLY ALIGNED AND ADEQUATE CLEARANCE ALL AROUND CAN BE OBTAINED BEFORE PROCEEDING WITH INSTALLATION OF AIR CONDITIONER.

2. REMOVE HEADLINER AND INSPECT CAB ROOF TO DETERMINE STRENGTH OF ROOF STRUCTURE AND A SUITABLE LOCATION FOR AIR CONDITIONER. IF CAB ROOF ITSELF DOES NOT PROVIDE ADEQUATE SUPPORT FOR THE AIR CONDITIONER, IT WILL BE NECESSARY TO REINFORCE THE CAB ROOF WITH AN ACCESSORY ROOF REINFORCEMENT KIT OR OTHER SUITABLE STRUCTURE WHICH MAY BE FABRICATED BY THE INSTALLER.

3. IF ROOF REINFORCEMENT IS REQUIRED, INSTALL ROOF REINFORCEMENT KIT USING INSTALLATION INSTRUCTIONS FURNISHED WITH THE KIT. THE PREDRILLED HOLES IN THE REINFORCEMENT MEMBER WILL LOCATE THE AIR CONDITIONER ON THE CAB ROOF. USING THE REINFORCEMENT MEMBERS AS A TEMPLATE, DRILL (4) 13/32 DIA HOLES UP THROUGH THE CAB ROOF FROM THE INSIDE. FROM THE OUTSIDE, LOCATE THE HOLE TEMPLATE (FORM 4324) ON THE (4) HOLES JUST DRILLED. THIS DETERMINES THE LOCATION OF THE LARGE HOLE FOR THE AIR CHAMBER.

3A. IF ROOF REINFORCEMENT IS NOT REQUIRED, WORKING FROM THE OUTSIDE DETERMINE CENTER LINE OF CAB AND TAPE TEMPLATE (FORM 4824) TO ROOF IN SUITABLE LOCATION. CENTER PUNCH AND DRILL (4) 13/32 DIA. HOLES FOR MOUNTING AIR CONDITIONER.

4. CUT LARGE HOLE IN ROOF FOR AIR CHAMBER USING SABER SAW. REMOVE INSULATION UNDER ROOF TO MATCH AIR CHAMBER HOLE.

5. HOLD THE HEADLINER IN PLACE INSIDE CAB AND PROPERLY ALIGN HEADLINER TO FINAL POSITION. WHILE HOLDING HEADLINER IN PLACE, HAVE A HELPER USING A FELT TIP PEN OUTLINE THE HOLE IN ROOF ON HEADLINER. REMOVE HEADLINER AND CUT HOLE.

6. CLEAN THE PAINT FROM CAB METAL AROUND THE EDGE OF THE ROOF HOLE FOR ABOUT ONE INCH USING EMERY CLOTH, SANDPAPER, SANDING DISC OR OTHER SUITABLE METHOD. (CEMENT SOFTENS PAINT AND PREVENTS A GOOD SEAL.)

7. INSTALL MOUNTING HARDWARE IN CAB ROOF IN ORDER SHOWN IN FIG. 1. USE 2 TO 4 RUBBER WEDGE WASHERS POSITIONING THEM APPROPRIATELY TO ADJUST HEIGHT AND COMPENSATE FOR ANY ROOF CURVATURE. LOCK DOUBLE NUTS TOGETHER SO THAT BOLT AND NUTS WILL TURN AS ONE. APPLY NON-HARDENING SEALER AS SHOWN IN FIG. 1 TO PREVENT WATER SEEPAGE INTO CAB.

8. WIPE THE CLEARED AREA OF THE CAB ROOF AND BOTTOM SURFACE OF THE FOAM SEAL WITH THE SOLVENT PROVIDED TO REMOVE ALL TRACE OF OIL AND GREASE. APPLY GLUE (FURNISHED IN KIT) TO BOTH CAB ROOF AND FOAM SEAL.

9. WHEN GLUE BECOMES TACKY, BUT DOES NOT STICK TO THE FINGERS, LOWER UNIT INTO PLACE ON CAB ROOF. BE CAREFUL THAT WIRE HARNESS AND RUBBER BOOT AROUND AIR CHAMBER PASSES THROUGH HOLE PROPERLY.

10. USING A 9/16" WRENCH FROM INSIDE CAB, CAREFULLY START THE (4) MOUNTING BOLTS INTO BASE OF UNIT. IN TURN, TIGHTEN BOLTS EVENLY TO SEAT FOAM SEAL ONTO ROOF. WORK QUICKLY TO PREVENT GLUE FROM BECOMING TOO DRY.

11. ADJUST BOLTS TO LEVEL UNIT. IN FINAL POSITION, FOAM SEAL SHOULD BE COMPRESSED 1/2" TO 3/4" CAUSING IT TO BULGE SLIGHTLY. DO NOT COMPRESS SEAL EXCESSIVELY. PUSH SEAL DOWN ALL AROUND WITH THE FINGERS TO BE SURE A WATER TIGHT SEAL IS OBTAINED.

12. WHEN PROPER POSITION HAS BEEN ACHIEVED, BREAK NUTS APART. RUN TOP NUT UP AGAINST BUSHING IN BOTTOM OF UNIT. SEE FIG. 1. TIGHTEN TO 20-25 FT.-LBS. TORQUE. RUN LOWER NUT DOWN AGAINST WASHER ON TOP OF RUBBER WEDGE WASHER STACK TIGHTEN TO 4 FT.-LBS. TORQUE.

UNIT INSTALLATION PROCEDURE (CONTINUED)

13. ATTACH FITTINGS TO ONE END OF EACH OF THE TWO REFRIGERANT HOSES PER INSTRUCTION SHEET PACKED IN HOSE KIT. ATTACH FITTINGS TO AIR CONDITIONER USING REFRIGERANT OIL ON THE FLARES AND THREADS AS A LUBRICANT TO ASSURE TIGHT SEAL. USING FIGURES 2,3 AND 4 AS A GUIDE ROUTE HOSES DOWN BACK AND UNDER CAB TO COMPRESSOR. SECURE IN PLACE USING HARDWARE FURNISHED AS SHOWN IN FIGURES 2, 3 AND 4. ON TILT CAB MODELS ROUTE HOSE TO PIVOT POINT AND THEN BACK TO COMPRESSOR.

14. CUT HOSES TO PROPER LENGTH, INSTALL FITTINGS AND ATTACH TO COMPRESSOR. AGAIN USE REFRIGERANT OIL ON THREADS AND FLARES.

15. TILT CAB DOWN (IF TILT MODEL) AND CHECK TO SEE THAT HOSES DO NOT RUB OR CHAFE ON OPERATING LEVERS, RODS, ETC., THAT THERE ARE NO KINKS OR SHARP BENDS AND THAT HOSES DO NOT PASS NEAR EXHAUST MANIFOLD OR OTHER SOURCE OF HEAT.

16. ATTACH DRAIN HOSE. EITHER OF TWO OPTIONAL CONNECTIONS MAY BE USED. THE PREFERRED METHOD IS OPTION 1 (SEE FIG. 4). CUT DRAIN HOSE SUPPLIED IN HALF, ATTACH ONE PIECE TO EACH DRAIN AND ROUTE DOWN EITHER SIDE OF CAB REAR. IF THIS METHOD IS NOT PRACTICAL, OPTION 2 MAY BE USED. CUT TWO SHORT PIECES OF DRAIN HOSE AND ATTACH TO TEE FURNISHED. ATTACH REMAINDER OF HOSE TO BRANCH OF TEE AND ROUTE DOWN BACK OF CAB ALONG WITH REFRIGERANT HOSES.

17. ROUTE THE WIRING. THE YELLOW WIRE GOES TO THE CLUTCH; THE GREEN WIRE TO GROUND; AND THE BLACK WIRE TO THE 12 VOLT SUPPLY.

18. REINSTALL HEADLINER IN CAB. REMOVE DISCHARGE LOUVERS FROM AIR CHAMBER. LOOSEN TWO NUTS HOLDING AIR CHAMBER BAFFLE TO AIR CONDITIONER AND ADJUST AIR CHAMBER TO DESIRED POSITION. USE AIR BAFFLE EXTENDER FURNISHED IN HARDWARE KIT IF TRUCK HAS A VERY THICK ROOF AND DESIRED POSITION CANNOT BE OBTAINED WITHIN THE NORMAL ADJUSTMENT RANGE. TIGHTEN NUTS SECURELY.

19. ATTACH ADHESIVE-BACKED INSULATION SHEET TO FRONT SIDE OF AIR CHAMBER BAFFLE. THIS MUST BE DONE TO PREVENT SWEATING OF BAFFLE WHICH WOULD RESULT IN WATER DRIPPING INTO CAB. REINSTALL DISCHARGE LOUVERS.

20. SLIDE THE TRIM MOLDING UP SNUGLY AGAINST THE HEADLINER AND SECURE IN PLACE WITH #9 SHEET METAL SCREWS.

21. TRIM PORTION OF RUBBER BOOT EXTENDING BELOW TRIM MOLDING CAREFULLY USING A SHARP KNIFE.

NOTE:

PURCHASE FROM: THERMO KING CORP.
MINNEAPOLIS, MINNESOTA. DWG. NO. 3045C66.