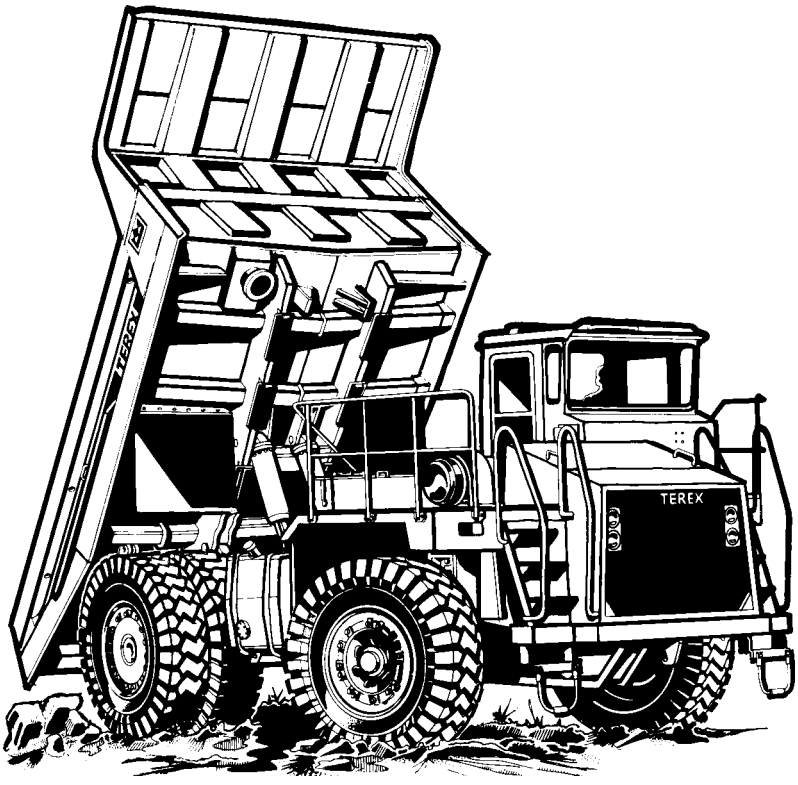
TEREX

TR35
Off-Highway Truck
Maintenance Manual



TECHNICAL PUBLICATIONS DEPARTMENT
TEREX EQUIPMENT LIMITED,
MOTHERWELL, SCOTLAND, ML1 5RY
REF. NO. SM788

SM 1827 11-99

THIS PAGE IS INTENTIONALLY LEFT BLANK

TEREX

The information contained within this Alert must not be made available to third parties not authorised to receive it.

Service Information Alert

DATE: **April 1994** **B168**

MODEL: **General**

SUBJECT: **VITON 'O' RINGS AND SEALS (FLUORO-ELASTOMERS) - SAFETY HAZARDS**

PURPOSE:

To advise potentially hazardous condition.

DETAIL:

It has been brought to our attention that 'Viton' material used in manufacture of oil seals and 'O' rings, produces a highly corrosive acid (Hydrofluoric) when subjected to temperatures above 315° C.

The resulting contamination can have extreme consequences on human tissue since it is almost impossible to remove after contact.

We therefore recommend the following procedure when it is necessary to inspect any equipment that has been subjected to a high temperature i.e. fire.

a. Visually inspect for any gaskets or seals which have suffered from heat; they will appear black and sticky.

b. If this is affirmed - **Do Not Touch**

c. Make enquiries to ascertain the material composition. Any Fluoro-elastomer (Viton, Fluorel or Tecmoflon) should be considered dangerous but natural rubber and nitrile are non-hazardous.

d. If Fluoro-elastomer seals have been used, then the affected area MUST be decontaminated before undertaking further work.

e. Disposable Heavy Duty Gloves (Neoprene) MUST be worn and the affected area decontaminated by washing thoroughly with Limewater (Calcium Hydroxide solution).

f. Any cloths, residue and gloves used MUST be safely discarded after use.

Note: Burning of the discarded items is NOT RECOMMENDED, except in an approved incineration process where the gaseous products are treated by alkaline scrubbing.

TEREX SERVICE DEPARTMENT

TEREX Equipment Limited, Motherwell, Scotland ML1 5RY Tel. (0698) 732121 Tlx. 77141 Fax. (0698) 734046
TEREX Division, Tulsa, Oklahoma, 74107 USA Tel. (918) 446-5581 Fax. (918) 446-9752

TEREX

THIS PAGE IS INTENTIONALLY LEFT BLANK

IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all motor vehicles. The service procedures recommended and described in this publication, are effective methods for performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when, and as recommended.

It is important to note that this publication contains various WARNINGS and NOTES which should be carefully read in order to minimize the risk of personal injury to personnel, or the possibility that improper service methods will be followed which may damage the vehicle or render it unsafe. It is also important to understand these WARNINGS and NOTES are not exhaustive. It is not possible to know, evaluate and advise the service trade of ALL conceivable ways in which service might be carried out, or, of the possible hazardous consequences of each way. Consequently, no such broad evaluation has been undertaken. Accordingly, anyone who uses a service procedure, or tool, which is not recommended, must first satisfy themselves thoroughly that neither their safety, nor vehicle safety, will be jeopardized by the service method he/she selects.

Two types of heading are used in this manual to attract your attention.

1. ⚠ **WARNING** - This symbol is used when an operating procedure, practice, etc., which, if not correctly followed could result in personal injury or loss of life. Look for this symbol to point out important safety precautions. It means - **ATTENTION! BECOME ALERT! YOUR SAFETY IS INVOLVED!**

2. **Note -** This is used when an operating procedure, practice, etc., which, if not strictly observed, could result in damage to or destruction of equipment.

⚠ **WARNING**
Never use parts which are altered, modified, or weakened in operation. This can seriously jeopardize the integrity of the machine and could result in property damage or serious personal injury.

THIS PAGE IS INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

TABLE OF CONTENTS

* * * *

SM - 2353

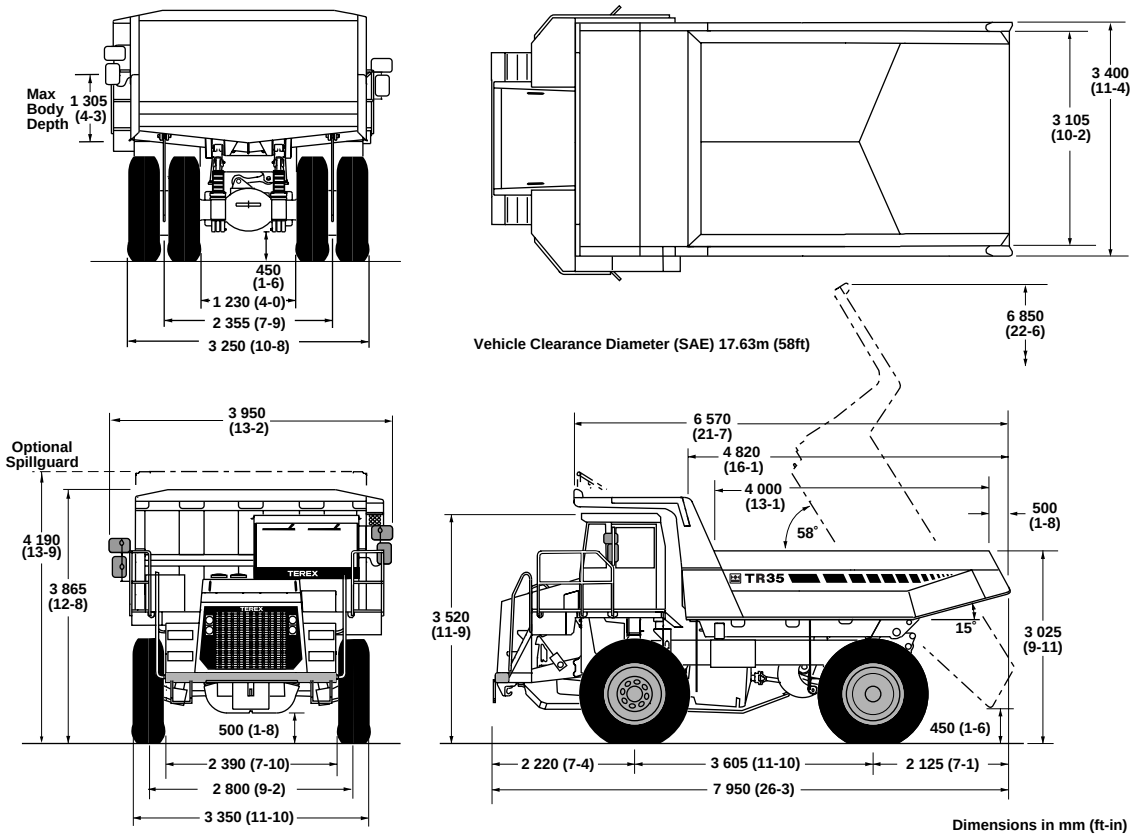


Fig. 1 - Machine Dimensions

ENGINE

Make/Model ..... Cummins MTA11-C350
Type ..... 4 Cycle, low emission, direct injection diesel, water-cooled, turbocharged and aftercooled
Gross Power at 2 100 rev/min ..... 261 kW (350 hp, 355 PS)
Net Power at 2 100 rev/min ..... 238 kW (319 hp, 324 PS)

Note: Gross power rated to SAE J1995 Jun 90. Engine emission meets USA EPA/CARB MOH 40 CFR 89 and EU NRMM (non-road mobile machinery) directive.

Maximum Torque ..... 1 559 Nm (1 150 lbf ft) at 1 300 rev/min
Number of Cylinders/Configuration ..... 6, in line
Bore x Stroke ..... 125 x 147 mm (4.9 x 5.8 in)
Total Displacement ..... 10.8 litres (661 in³)
Starting ..... Electric
Maximum Speed, Full Load ..... 2 100 rev/min
Maximum Speed, No Load ..... 2 450 rev/min
Idle Speed ..... 750 rev/min
Safe Operating Angle ..... 45°/100% Grade

TRANSMISSION

Make/Model ..... Allison CBLT-754 Automatic
Remote mounted in the frame with integral torque converter, hydraulic retarder and planetary gearing. Five speeds forward, one reverse. Automatic shifting within ranges 2 to 5. Downshift and reverse inhibitors. Automatic converter lockup action in all speed ranges.

Speeds With Standard Planetary					
Forward					
Gear	1	2	3	4	5
Ratio	5.20	3.20	2.00	1.40	1.00
km/h	10.7	17.4	27.5	40.1	55.5
mile/h	6.7	10.8	17.1	24.9	34.5
Reverse					
Gear	1				
Ratio	4.70				
km/h	11.8				
mile/h	7.3				

DRIVE AXLE

Heavy duty axle with full floating axle shafts, single reduction spiral bevel gear differential and planetary reduction at each wheel.

Ratios:	Standard	Optional
Differential	2.50:1	3.13:1
Planetary	4.59:1	4.59:1
Total Reduction	11.48:1	14.37:1

SUSPENSION

Front: King pin strut type independent front wheel suspension by self-contained, variable rate, nitrogen/oil cylinders.

Rear: Variable rate nitrogen/oil cylinders with A-frame linkage and lateral stabilizer bar.

Maximum Strut Stroke
- Front ..... 225 mm (9.0 in)
- Rear ..... 160 mm (6.3 in)

Maximum Rear Axle Oscillation ..... ± 8.0 Degrees

WHEELS AND TYRES

Wheel Rim Width ..... 13 in
Tyres (Front & Rear):
- Standard ..... 18.00 R 25** Radial
- Optional ..... 18.00-25 (32 PR) E-3

Note: It is recommended that for tyres both listed and unlisted, the user should consult the tyre manufacturer and evaluate all job conditions in order to make the proper selection.

BRAKES

Service

Dual shoe, internal expanding, mechanically actuated by air pressure. Independent front and rear circuits actuated by single treadle valve with auxiliary manual control. Operator controlled wet/dry road valve reduces front brake pressure by 50% for improved control in slippery conditions.

Front Linings:
- Diameter X Width ..... 508 x 152 mm (20 x 6 in)
- Area, Front Axle ..... 3 459 cm² (536 in²)

Rear Linings:
- Diameter X Width ..... 508 x 190 mm (20 x 7.5 in)
- Area, Rear Axle ..... 4 323 cm² (670 in²)

Total Lining Area ..... 7 782 cm² (1 206 in²)
Air Compressor Capacity ..... 425 litre/min (15 ft³/min)

Parking

Service brakes act as parking brakes when applied by manual control valve on the instrument panel.

Retardation

Non-wearing hydrodynamic retarder integral with transmission, 320 kW (430 hp) continuous.

Emergency

Warning light in cab indicates when air pressure drops below 5.5 bar (80 lbf/in²). Front and rear brakes automatically actuate if system air pressure falls to 3.1 bar (45 lbf/in²).

Total brake air reservoir capacity ..... 81 litre (4 950 in³)

STEERING SYSTEM

Independent hydrostatic steering with closed-centre steering valve, accumulator and pressure compensating piston pump.

Accumulator provides uniform steering regardless of engine speed. In the event of loss of engine power it provides steering of approximately two lock-to-lock turns.
A low pressure indicator light warns of system pressure below 83 bar (1 200 lbf/in²). Steering conforms to ISO 5010, SAE J53.

System Pressure ..... 159 bar (2 300 lbf/in²)
Relief Pressure ..... 207 bar (3 000 lbf/in²)
Steering Cylinders ..... Double Acting, Single Stage
Accumulator:
- Oil Capacity ..... 14.0 litres (3.70 US gal)
- Nitrogen Precharge Pressure ..... 55 bar (800 lbf/in²)

Steering Angle (Left and Right) ..... 42°
Pump:
- Type ..... Piston
- Capacity at 2 100 rev/min ..... 1.4 litres/s (22 US gal/min)

BODY HYDRAULICS

Two body hoist cylinders are mounted between the frame rails. Cylinders are two-stage with power down in the second stage. The body hydraulic system is independent of the steering hydraulic system.

System Relief Pressure ..... 138 bar (2 000 lbf/in²)
Pump:
- Type ..... Gear
- Capacity at 2 100 rev/min .. 210 litres/min (55.5 US gal/min)

Control Valve ..... Servo Controlled Open Centre
Body Raise Time ..... 14 Seconds
Body Lower Time ..... 9.5 Seconds

ELECTRICAL

Type ..... 24 Volt, Negative Ground
Battery ..... Two, 12 Volt, 165 Ah each, Maintenance Free
Accessories ..... 24 Volt
Alternator ..... 70 Amp
Starter ..... 7.7 kW

BODY

Longitudinal 'V' type floor with integral transverse box-section stiffeners. The body is exhaust heated and rests on resilient impact absorption pads.

Body wear surfaces are high hardness (360-440 BHN) abrasion resistant steel. Yield strength of plates 1 000 MPa (145 000 lbf/in²).

Plate Thicknesses:
- Floor ..... 16 mm (0.63 in)
- Side ..... 8 mm (0.31 in)
- Front, lower ..... 10 mm (0.39 in)

ROPS Cabguard SAE J1040 Feb 86. ISO 3471

Volumes:
- Struck (SAE) ..... 15.3 m³ (20 yd³)
- Heaped 2:1 (SAE) ..... 19.4 m³ (25 yd³)

SERVICE CAPACITIES

Engine Crankcase and Filters ..... 33 litres (8.7 US gal)
Transmission and Filters ..... 26.5 litres (7 US gal)
Cooling System ..... 90 litres (23.8 US gal)
Fuel Tank ..... 371 litres (98 US gal)
Steering Hydraulic Tank ..... 30 litres (8 US gal)
Steering System ..... 47 litres (12.4 US gal)
Main Hydraulic Tank ..... 83 litres (22 US gal)
Main Hydraulic System ..... 121 litres (32 US gal)
Planetaries (Total) ..... 30 litres (8 US gal)
Differential ..... 57 litres (15 US gal)
Front Ride Strut (Each) ..... 14 litres (3.7 US gal)
Rear Ride Strut (Each) ..... 8 litres (2.1 US gal)
Power Takeoff ..... 0.6 litres (0.2 US gal)

Typical Noise Levels

Operator Ear (ISO 6394) ..... 81 dbA

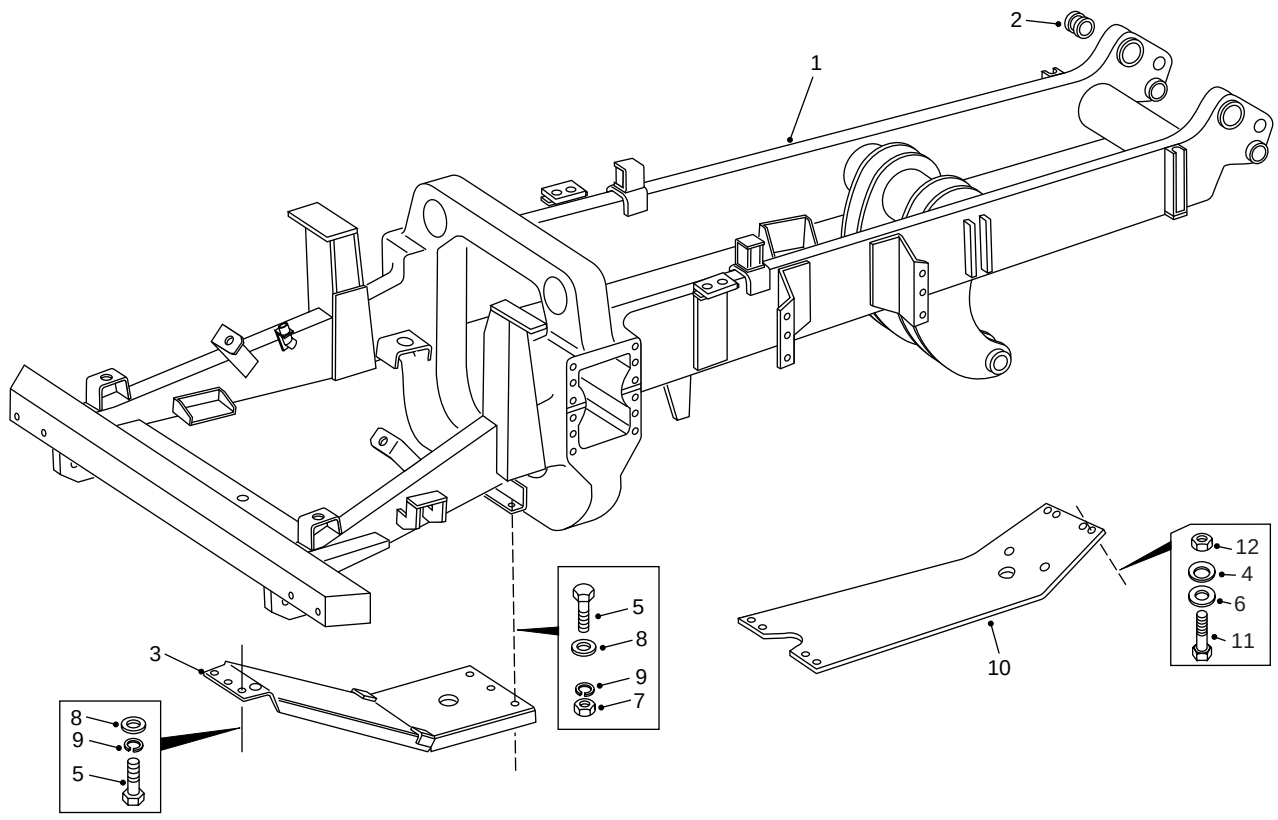
*Exterior Sound Rating (SAE J88 JUN 86) ..... 86 dbA
* - The above result is for the mode giving the highest exterior sound level when measured and operated as per the prescribed procedures of the standard. Results shown are for the vehicle in base configuration.

Note: Noise Level Exposure to the operator and bystander personnel may be higher depending upon proximity to buildings, rock piles, machinery etc.. The actual job site Noise Level Exposure must be measured and applicable regulations complied with in respect to Employee Hearing Protection.

VEHICLE WEIGHTS (MASS)		
	kg	**lb**
Chassis, with hoists	17 250	38 030
Body, standard	6 000	13 230
Net Weight	23 250	51 260
PAYLOAD, maximum	**31 750**	**70 000**
Maximum Gross Weight*	**55 000**	**121 260**
FOR UNIT EQUIPPED WITH OPTIONAL BODY WEAR PLATES:		
Chassis, with hoists	17 250	38 030
Body, standard	7 200	15 880
Net Weight	24 450	53 910
PAYLOAD, maximum	**30 550**	**67 350**
Maximum Gross Weight*	**55 000**	**121 260**
* Maximum permissible gross vehicle weight with options, attachments, full fuel tank and payload.		
WEIGHT DISTRIBUTION	Front Axle	Rear Axle
Empty %	48	52
Loaded %	33	67

* * * *

THIS PAGE IS INTENTIONALLY LEFT BLANK



1 - Frame Assembly
2 - Bushing
3 - Engine Guard
4 - Spring Disc
5 - Bolt
6 - Hardened Washer
7 - Nut
8 - Washer
9 - Lockwasher
10 - Transmission Guard
11 - Bolt
12 - Nut

Fig. 1 - Exploded View of Chassis and Guards

REMOVAL

WARNING
To prevent personal injury and property damage, be sure wheel chocks, blocking materials and lifting equipment are properly secured and of adequate capacity to do the job safely.

To remove any of the components shown in Figs. 1, 2, 3 or 4 (or similar components) the following procedures should be carried out.

1. Position the vehicle in a level work area, apply the parking brake and switch off the engine.

2. Turn steering wheel several times to relieve pressure in the steering circuit. Block all road wheels.

3. Attach a suitable lifting device to the component and remove mounting hardware. Remove the component from the vehicle.

INSTALLATION

Note: Tighten all fasteners to standard torques listed in Section 300-0080, STANDARD BOLT AND NUT TORQUE SPECIFICATIONS.

WARNING
To prevent personal injury and property damage, be sure wheel chocks, blocking materials and lifting equipment are properly secured and of adequate capacity to do the job safely.

Using a suitable lifting device, align the component to be installed in position on the chassis. Secure the component securely to the chassis with mounting hardware removed during removal.

MAINTENANCE

Inspection

Inspect the frame and attached parts at intervals not exceeding 250 hours for cracked or broken welds and bending/twisting of the frame. Any defects found should be repaired before they progress into major failures. Contact your dealer for recommended weld and repair instructions.

Welding

⚠ WARNING
Welding and flame cutting cadmium plated metals produce odourless fumes which are toxic. Recommended industrial hygiene practice for protection of the welding operator from the cadmium fumes and metallic oxides requires enclosure ventilation specifically designed for the welding process. A respiratory protective device such as the M.S.A. 'Gasfoe' respirator with G.M.A. cartridge will provide protection against cadmium, fumes and metallic oxides. The 'Gasfoe' respirator has been approved by the U.S. Bureau of Mines: Approval number 23B-10, and is designed to protect against gases, vapours, and/or metal fumes.

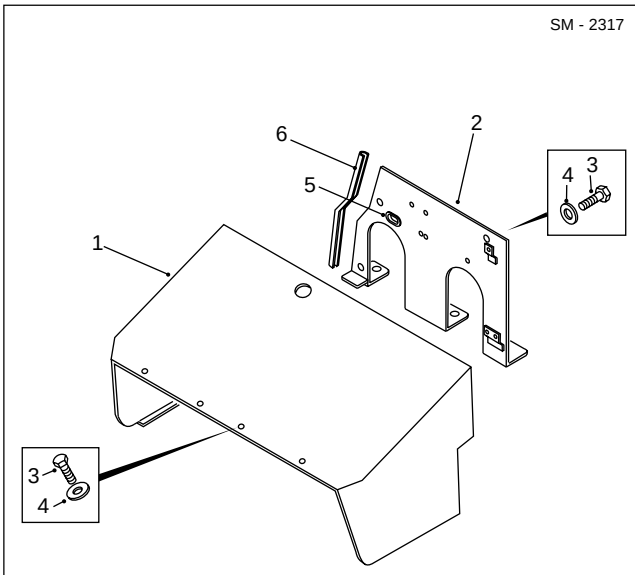
Note: Prior to welding, switch off/disconnect the following in the order given. Failure to do so may seriously damage the machines electrical components.

a - Turn ignition keyswitch off
b - Battery earth cables
c - Battery supply cables
d - Alternator earth cables
e - Alternator supply cables

After welding, connect all of the above in the reverse order.

Note: Always fasten the welding machines ground cable to the piece/frame being welded if possible.

Electric arc welding is recommended for all welded frame repairs. Since the nature and extent of damage to the frame cannot be predetermined, no definite repair procedure can be established. As a general rule however, if parts are twisted, bent or pulled apart, or a frame is bent or out of alignment, no welding should be done until the parts are straightened or realigned.



1 - Hood Assembly
2 - Baffle Plate
3 - Bolt
4 - Hardened Washer
5 - Grommet
6 - Beading

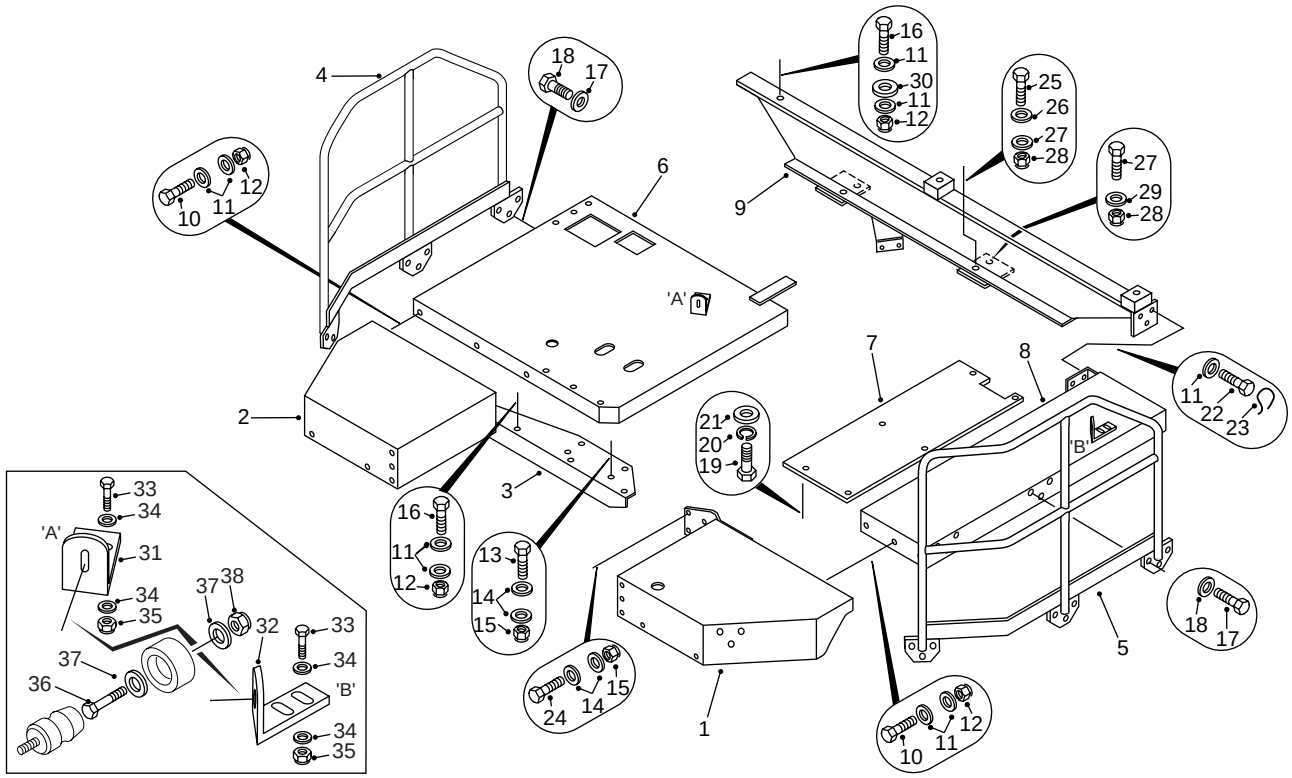
Fig. 2 - Exploded View of Hood and Mounting

Successfully welded repairs will depend to a great extent upon the use of the proper equipment, materials and the ability of the welder. The Service Department can be consulted regarding the feasibility of welding repairs.

Painting

A check of the condition of the paint should be made approximately twice a year and chassis repainted if necessary.

⚠ WARNING
Welding, burning, heating or dressing surfaces previously painted using polyurethane paint produces fumes which are toxic. Surfaces must be prepared using paint stripper prior to area being reworked. Recommended Industrial Hygiene and Safety Rules should be followed for protection of the welding operator from fumes.



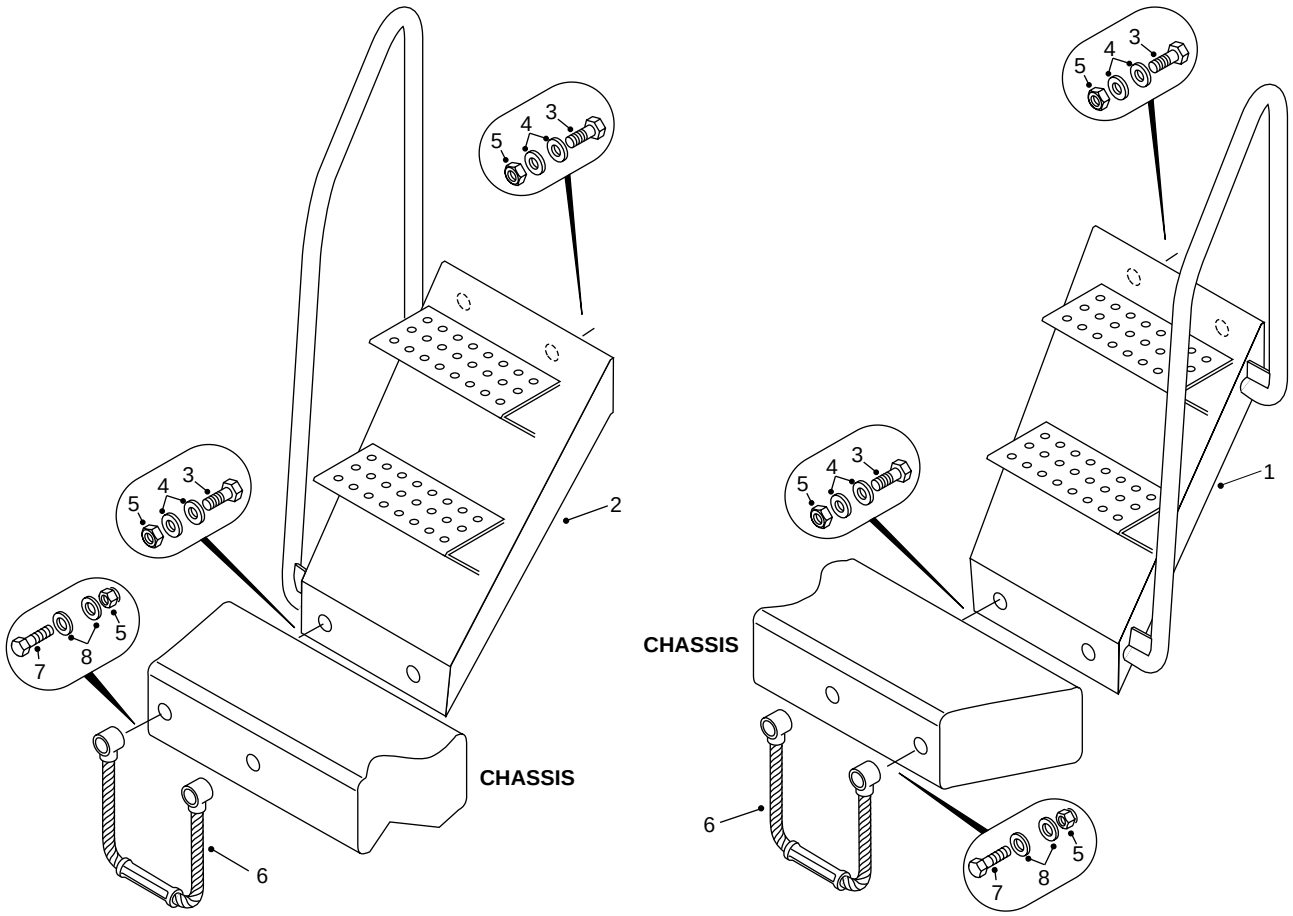
1 - LH Fender Assembly
2 - RH Fender Assembly
3 - Bracket
4 - RH Handrail Assembly
5 - LH Handrail Assembly
6 - RH Platform Assembly
7 - Plate
8 - LH Platform Assembly
9 - Channel
10 - Bolt
11 - Hardened Washer
12 - Locknut
13 - Bolt
14 - Washer
15 - Locknut
16 - Bolt
17 - Bolt
18 - Hardened Washer
19 - Bolt
20 - Lockwasher
21 - Washer
22 - Bolt
23 - Lockwire
24 - Bolt
25 - Bolt
26 - Tapered Washer
27 - Washer
28 - Locknut
29 - Bolt
30 - Tapered Washer
31 - Bracket
32 - Bracket
33 - Bolt
34 - Hardened Washer
35 - Locknut
36 - Bolt
37 - Washer
38 - Locknut

Fig. 3 - Exploded View of Fenders and Mounting

If painting of the actual frame of the unit is required, thoroughly clean the areas to be painted. Apply a primer coat of red oxide and then a finish coat of polyurethane enamel.

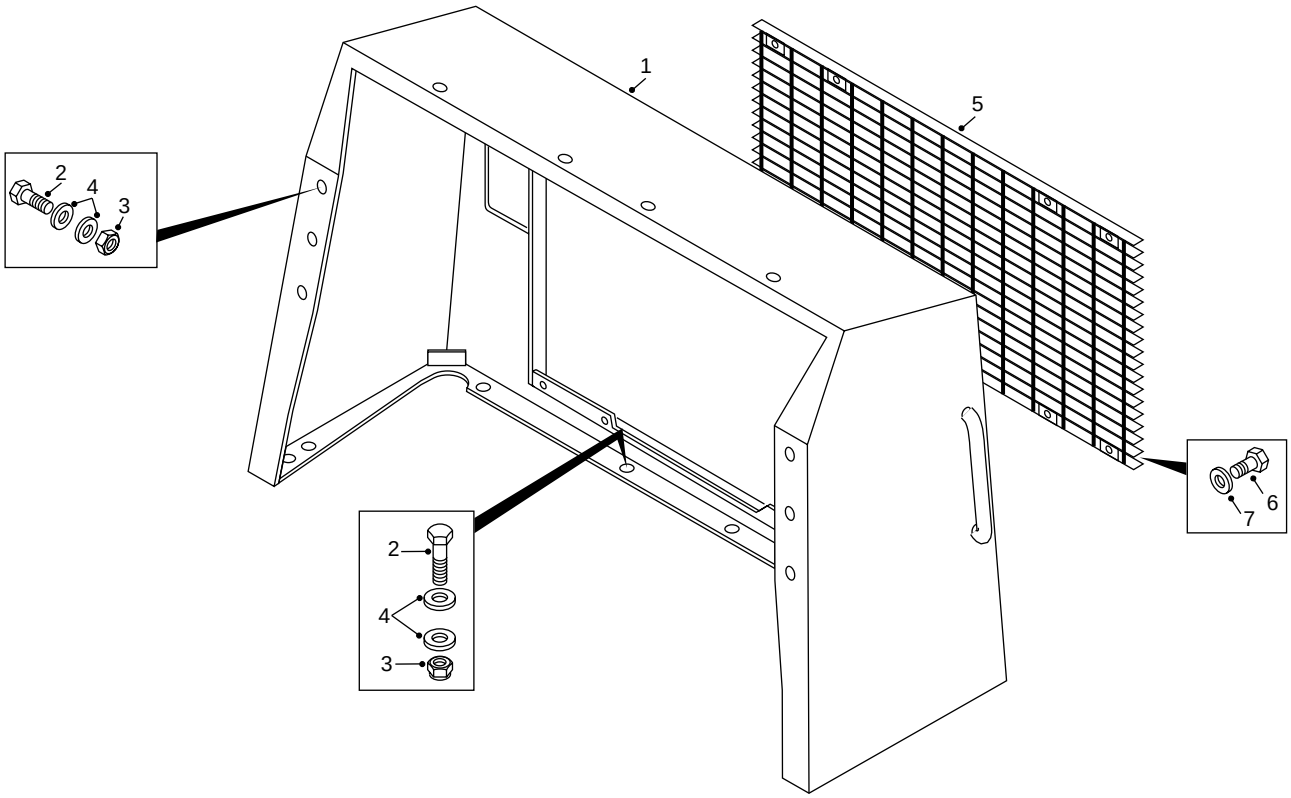
To keep rust and corrosion to a minimum, periodic painting of abrasions and other exposed metal areas on the frame is highly recommended.

SM - 1718



1 - LH Step Assembly
2 - RH Step Assembly
3 - Bolt
4 - Hardened Washer
5 - Locknut
6 - Step
7 - Bolt
8 - Hardened Washer

Fig. 4 - Exploded View of Ladders and Handrails

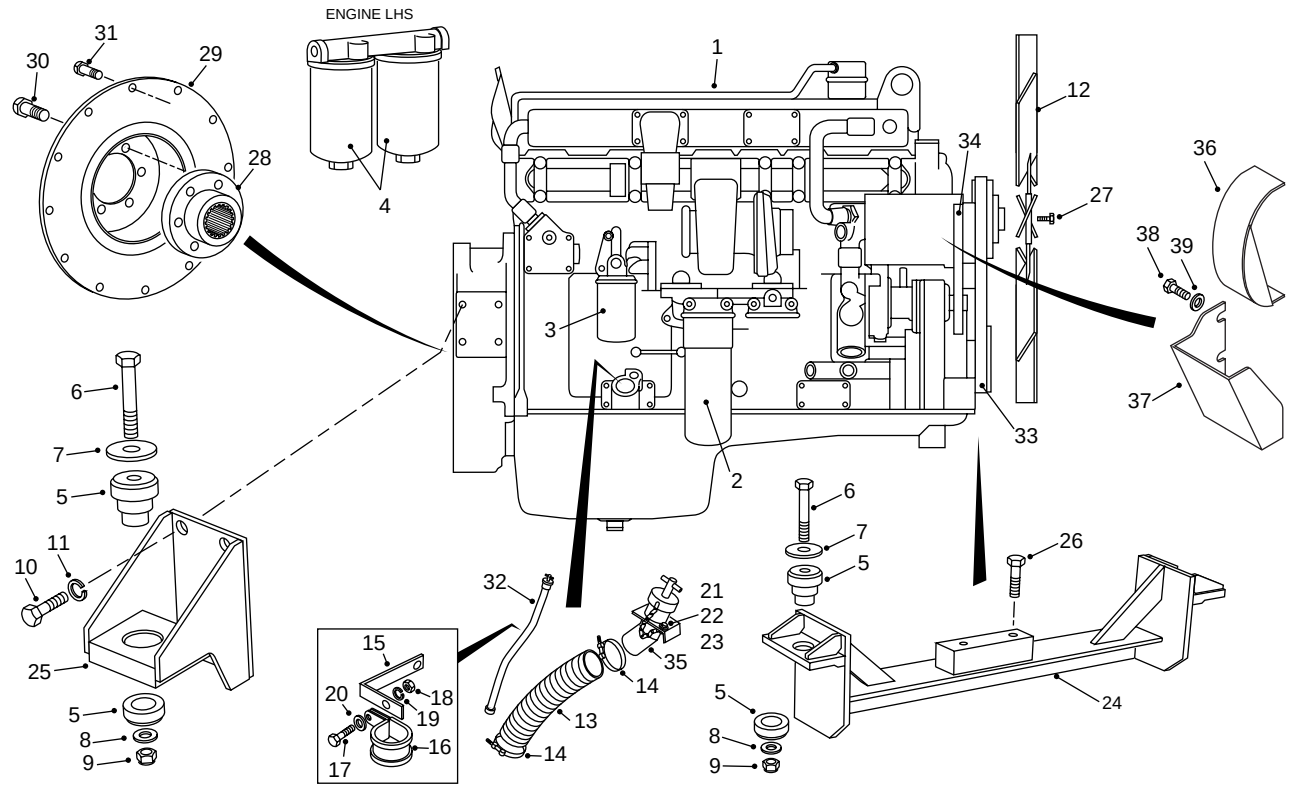


1 - Radiator Guard
2 - Bolt
3 - Locknut
4 - Hardened Washer
5 - Grille
6 - Bolt
7 - Washer

Fig. 5 - Radiator Guard and Mounting

* * * *

THIS PAGE IS INTENTIONALLY LEFT BLANK



1 - Engine
2 - Lube Oil Filter
3 - Coolant Filter
4 - Fuel Filter
5 - Rubber Mount
6 - Bolt
7 - Snubbing Washer
8 - Washer
9 - Locknut
10 - Bolt
11 - Lockwasher
12 - Fan
13 - Tube
14 - Clamp
15 - Bracket
16 - P-Clip
17 - Bolt
18 - Nut
19 - Lockwasher
20 - Washer
21 - Bolt
22 - Nut
23 - Washer
24 - Front Mounting Bracket
25 - Rear Mounting Bracket
26 - Bolt
27 - Bolt
28 - Flange Coupling
29 - Hub Flanged
30 - Bolt
31 - Bolt
32 - Dipstick Assembly
33 - Fan Belt
34 - Alternator Belt
35 - Filler Neck Assembly
36 - Guard
37 - Bracket
38 - Bolt
39 - Hardened Washer

Fig. 1 - Engine and Mounting

DESCRIPTION

Numbers in parentheses refer to Fig. 1.

For engine make, model and specification, refer to Section 000-0000, GENERAL INFORMATION. For engine servicing and repair data refer to the engine manufacturers service manual.

The engine is supported by front mounting bracket (24) and two rear mounting brackets (25) which are bolted to the engine and attached to the tractor frame through rubber mounts (5). Rubber mounts (5) provide sufficient flexibility to absorb varying engine vibration and torsional loads.

Lube oil filter (2) and coolant filter (3) are mounted on the right hand side of engine (1) and fuel filters (4) are mounted on the left hand side.

REMOVAL

Numbers in parentheses refer to Fig. 1.

⚠ WARNINGS
To prevent personal injury and property damage, be sure wheel blocks, blocking materials and lifting equipment are properly secured and of adequate capacity to do the job safely.

⚠ High electrical current. Disconnect battery ground cable at battery before removing engine attachments. High electrical current can cause sparks and personal injury from burns.

Note: Tag all lines, cables and linkages disconnected during removal to aid in installation.

1. Position the vehicle in a level work area, apply the parking brake, switch off the engine and turn the steering wheel in both directions several times to relieve pressure in the steering system.

2. Block all road wheels. Disconnect battery cables from terminal posts (ground cable first).

3. Remove engine hood assembly. Refer to Section 100-0010, CHASSIS, HOOD AND FENDERS.

4. Place a suitable container under the engine drain port, remove drain plug and drain oil. After draining, reinstall drain plug and tighten securely.

Note: If anti-spill drain plug is fitted, remove cap from connection, install drain tube connection and drain oil into a suitable container.

⚠ WARNING
Air Conditioners contain harmful gas. Refrigerant will rapidly freeze all objects with which it comes into contact. It can cause serious damage to the eyes and skin. Refer to Section 260-0130, AIR CONDITIONING before disconnecting any air conditioner lines.

5. If the vehicle is equipped with an air conditioning system, evacuate the system and disconnect the lines at the compressor. Refer to Section 260-0130, AIR CONDITIONING.

6. With suitable containers in position, open drain cocks and drain coolant from the radiator and engine. Close all drain cocks securely after draining.

7. Identify cooling and heater lines for ease of installation and, with suitable containers in position to catch spillage, disconnect lines from engine (1) and remove the radiator assembly. Refer to Section 210-0040, RADIATOR AND MOUNTING.

8. Disconnect exhaust piping from the engine turbocharger at the silencer.

9. Disconnect compressor air outlet tube and secure clear of engine.

10. Disconnect accelerator cable at engine (1).

11. Identify and disconnect cables at starter motor and alternator.

12. Identify and disconnect electrical cables from the oil pressure sender switch, engine temperature switch, fuel shut off solenoid and proximity switches on engine (1).

13. Identify fuel lines for ease of installation and, with a suitable container in position, disconnect fuel lines from engine (1). Cap open line ends and fittings to prevent entry of dirt.

14. Slacken clamp (14) securing filler tube (13) to filler neck assembly (35). Disconnect filler tube and tie onto engine (1) to prevent fouling.

15. Disconnect clips securing items to the engine that cannot be removed with the engine.

16. Disconnect driveline between transmission and engine (1) and secure clear of the engine. Refer to Section 130-0010, FRONT DRIVELINE.

⚠ WARNING
Heavy assembly. To prevent personal injury and property damage, be sure lifting device is properly secured and of adequate capacity to do the job safely.

17. Attach suitable lifting equipment to lifting brackets on engine (1) and raise lifting equipment to take up the slack.

18. Remove locknuts (9), snubbing washers (7), washers (8) and bolts (6) securing front and rear mounting brackets (24 & 25) to the rubber mounts/ support brackets and rubber mounts/crossmember.

19. Check to make certain that all necessary line and cable disconnections have been made, before lifting engine (1).

20. Carefully lift engine (1) up and forwards clear of the frame and remove to a suitable work area. Mount engine (1) securely on a work stand.

DISASSEMBLY

Numbers in parentheses refer to Fig. 1.

1. Remove bolts (26) securing front mounting bracket (24) to engine (1). Remove front mounting bracket (24).

2. Remove bolts (10) and lockwashers (11) securing rear mounting brackets (25) to engine (1). Remove rear mounting brackets (25).

3. Remove air cleaner tubes and piping from turbocharger.

4. Remove exhaust piping from turbocharger.

5. Remove bolts (27) securing fan (12) on engine (1). Remove fan (12).

6. If necessary, the hub flange (29) and flange coupling (28) can be removed from the flywheel after the power takeoff assembly is removed. Refer to Section 110-0130, POWER TAKEOFF.

7. With the power takeoff assembly removed, remove bolts (31) securing hub flange (29) and flange coupling (28) to flywheel housing. Remove hub flange (29). Remove bolts (30) securing flange coupling (28) to hub flange (29). Remove flange coupling (28).

8. If required, loosen clamp (14) and remove tube (13) from engine (1).

9. Remove and discard lube oil filter (2), coolant filter (3) and fuel filters (4) from engine (1), as described under 'Maintenance'. Cover engine ports to prevent entry of dirt.

10. Refer to engine manufacturers SERVICE MANUAL if engine service or repair is required.

INSPECTION

Numbers in parentheses refer to Fig. 1.

1. Inspect rubber mounts (5) for damage and replace if required.

2. Check mounting brackets (24 & 25), engine support brackets and crossmember on the frame for cracks and damage. Repair or replace as necessary.

3. Inspect flange coupling (28) for damage and repair or replace if required.

ASSEMBLY

Numbers in parentheses refer to Fig. 1.

1. Remove covers from engine ports and install new lube oil filter (2), coolant filter (3) and fuel filters (4) on engine (1), as described under 'Maintenance'.

2. Install front mounting bracket (24) on engine (1) and secure with bolts (26). Tighten bolts (26) to a torque of 31 Nm (23 lbf ft).

3. Install both rear mounting brackets (25) on engine (1) and secure with bolts (10) and lockwashers (11). Tighten bolts (10) to a torque of 149 Nm (110 lbf ft).

4. Install air cleaner tubes and piping and connect to turbocharger.

5. Install exhaust piping and connect to turbocharger.

6. If removed, secure filler tube (13) to engine (1) with clamp (14).

7. If removed, secure flange coupling (28) to hub flange (29) with bolts (30). Install hub flange (29) to engine flywheel housing and secure with bolts (31). Tighten bolts (30 & 31) to a torque of 31 Nm (23 lbf ft).

8. Install power takeoff assembly to engine (1). Refer to Section 110-0130, POWER TAKEOFF.

9. Install fan (12) on engine and secure with bolts (27). Tighten bolts (27) to a torque of 31 Nm (23 lbf ft).

INSTALLATION

Numbers in parentheses refer to Fig. 1.

Note: Tighten all fasteners without special torques specified to standard torques listed in Section 300-0080, STANDARD BOLT AND NUT TORQUE SPECIFICATIONS.

⚠ WARNING
Heavy assembly. To prevent personal injury and property damage, be sure wheel blocks, blocking materials and lifting equipment are properly secured and of adequate capacity to do the job safely.

1. Lubricate rubber mounts (5) with water or a suitable rubber lubricant. Insert rubber mounts (5) into the frame crossmember from above and support brackets from below. Use a driver of the same diameter as the internal metal sleeve in rubber mount (5) to drive the mounts fully home. Install opposite half of rubber mounts (5) over protruding diameter of rubber mounts previously installed.

2. Attach suitable lifting equipment to engine (1) lifting brackets and carefully position engine (1) in the frame.

3. Install bolts (6) through snubbing washers (7), front mounting bracket (24), rubber mounts (5) and the frame crossmember. Install washers (8) and locknuts (9) on bolts (6). Tighten locknuts (8) to a torque of 298 Nm (220 lbf ft).

4. Install a snubbing washer (7) onto each rear mounting bolt (6) and install bolts through rear mounting brackets (25), rubber mounts (5) and frame support brackets. Install washers (8) and locknuts (9) on bolts (6). Tighten locknuts (9) to a torque of 298 Nm (220 lbf ft).

5. Connect driveline between transmission and engine and secure with mounting hardware removed during removal. Refer to Section 130-0010, FRONT DRIVELINE.

6. Remove blanking caps and connect fuel lines to engine (1) ports, as identified at removal.

7. Connect electrical cables to the alternator and starter motor, as identified at removal.

8. Connect cables to the oil pressure sender switch, engine temperature switch, fuel shut off solenoid and proximity switches on engine (1), as identified at removal.

9. Connect accelerator cable to engine (1).

10. Connect compressor air outlet tube to engine (1).

11. If the vehicle is equipped with air conditioning, connect the lines at the compressor as identified at removal. On completion of engine (1) installation, the air conditioning system will require to be charged. Refer to Section 260-0130, AIR CONDITIONING.

12. Connect exhaust piping to the turbocharger at the silencer.

13. Install radiator assembly on the tractor frame and connect cooling and heater lines to radiator assembly and engine (1). Refer to Section 210-0040, RADIATOR AND MOUNTING.

14. Connect filler tube (13) to filler neck assembly (35) and secure with clamp (14).

15. Secure any clips to the engine which were removed to facilitate engine removal.

16. Connect air tube to the air cleaner and secure with mounting hardware removed during removal.

17. Connect cables to battery terminal posts (ground cable last).

18. Ensure all lines, harnesses and cables are secured with clips and clamps as removed during removal. Ensure no lines are chaffing on sharp edges or resting against areas where heat will be evident.

19. Ensure all coolant drain cocks on engine (1) and the radiator assembly are securely closed and shut off cock at coolant filter (3) housing is open. Fill the cooling system with coolant specified in Section 300-0020, LUBRICATION SYSTEM. Check the coolant level as described in Section 210-0000, COOLING SYSTEM.

20. Fill engine (1) with lube oil specified in Section 300-0020, LUBRICATION SYSTEM. Check oil level as described under 'Maintenance'.

21. Start the engine and bring the engine oil to operating temperature. Check all lines and fittings for leaks and tighten as required.

22. Using suitable lifting equipment, install hood assembly to the vehicle. Refer to Section 100-0010, CHASSIS, HOOD AND FENDERS.

23. Ensure parking brake is applied and remove wheel blocks from all road wheels.

MAINTENANCE

Numbers in parentheses refer to Fig. 1.

Note: Carry out the following maintenance procedures in conjunction with additional procedures listed in Section 300-0020, LUBRICATION SYSTEM.

WARNING
Do not use the rocker cover as a step. The material is plastic and will not withstand weight of any consequence.

Every 10 Hours (Daily)

General - Visually check the engine for leaks, loose or damaged parts, worn or damaged belts or any change in engine appearance. Listen for any unusual engine noise which can indicate that a service is required.

Oil Level Check - Position the vehicle on a level work area, apply the parking brake, shut off the engine and wait at least five minutes (to allow oil to drain to the oil pan) before checking the oil level. The oil level should be between the low (L) and high (H) marks on the dipstick. Add oil if low. Refer to Section 300-0020, LUBRICATION SYSTEM for oil specification.

Note: Never operate the engine with oil level below the low (L) or above the high (H) mark on the dipstick.

Fuel Filter/Water Separators (4) - Drain the water and sediment from the separators daily. Position the vehicle on a level work area, apply the parking brake, shut off the engine and, with a suitable container below the drain valve to catch spillage, open the drain valve by hand. Turn the valve anticlockwise approximately 1.5 - 2 turns until draining occurs. Drain the filter sump until clear fuel is visible. Turn the valve clockwise to close the drain valve.

Note: Do not overtighten the drain valve as overtightening can damage the threads.

Cooling Fan (12) - Visually inspect the fan for cracks, loose rivets, and bent or loose blades. Check the fan to make sure that mounting bolts (27) are secure. Tighten bolts as required. Replace any fan that is damaged.

WARNING
Personal injury can result from a fan blade failure. Never pull or pry on the fan as this can damage the blades and lead to fan failure.

Drive Belts - Visually inspect all drive belts daily. Replace belts that are cracked or frayed and adjust belts that have a glazed or shiny surface which indicates belt slippage. Correctly installed and tensioned belts will show even pulley and belt wear.

Every 250 Hours

Fuel Filters (4) - Clean the area around the fuel filter head and replace the fuel filter.

Position the vehicle on a level work area, apply the parking brake and switch off the engine. Using a strap type filter wrench, remove fuel filter (4) and discard the thread adaptor sealing ring. Clean the gasket surface of the filter head.

Install the new thread adaptor sealing ring (supplied with new filter) and apply a film of clean engine oil to lubricate the filter seal. Fill the new filter with clean fuel specified in Section 300-0020, LUBRICATION SYSTEM.

Install new fuel filter (4) on the filter head and tighten by hand until the gasket contacts the filter head surface. Tighten fuel filter (4) per filter manufacturer's instructions.

Note: Mechanical tightening of the filter is not recommended and may result in seal and/or cartridge damage. Tighten filter by hand only.

Engine Oil and Lube Oil Filter (2) - Replace the lubricating oil and oil filters.

WARNING
Avoid direct contact of hot oil with your skin. Hot oil can cause serious personal injury.

Operate the engine until the water temperature reaches 60° C (140° F). Position the vehicle on a level work area, apply the parking brake and switch off the engine. Position a suitable container under the engine oil drain plug and drain the oil immediately to make sure all the oil and suspended contaminants are removed from the engine.

Clean the area around the lube oil filter head and, using strap type filter wrench, remove lube oil filter (2). Discard lube oil filter (2) if it is not required for a failure analysis. Clean the gasket sealing surface of the filter head.

Note: The 'O' ring can stick on the filter head. Make sure the 'O' ring is removed and discarded.

Note: Fill the filter with clean lubricating oil prior to installation. The lack of lubrication during the delay until the filter is pumped full of oil is harmful to the engine.

Apply a light film of clean lubricating oil to the gasket surface of the new filter and install the filter on the filter head as specified by the filter manufacturer. The tightening instructions are normally printed on the outside of the filter.

Note: Mechanical tightening of the filter is not recommended and may result in seal and/or cartridge damage. Tighten filter by hand only.

Check and clean the engine oil drain plug threads and the seal surface. Install and tighten the drain plug to a torque of 90 Nm (65 lbf ft). Fill the engine with clean lubricating oil specified in Section 300-0020, LUBRICATION SYSTEM. The oil level should be between the low (L) and high (H) marks on the dipstick.

Note: Before starting the engine, follow the steps below to make sure the engine receives correct lubrication. Lack of lubrication will damage the engine.

a. Disconnect the electrical wire from the fuel pump solenoid valve.

b. Switch on the ignition and rotate the crankshaft using the starter motor, until oil pressure appears on the pressure gauge or the warning light goes out.

c. Connect the electrical wire to the fuel pump solenoid valve.

Start the engine and operate at idle speed to inspect for leaks at the filter and oil drain plug. Shut off the engine, wait approximately five minutes to let the oil drain back to the sump and check the oil level again. Add oil as necessary to bring the level to the high (H) mark on the dipstick.

Coolant Filter (3) - Check the DCA4 concentration and replace the coolant filter at every oil and filter change interval. Refer to Section 210-0000, COOLING SYSTEM.

Crankcase Breather - Check and clean the crankcase breather hose. Remove the breather hose and check internally for obstructions or sludge buildup. Clean or replace breather hose as necessary, to prevent excess crankcase pressure buildup.

Drive Belts - Check belt tension and adjust if necessary, as described under 'Drive Belt Adjustment'.

Air Intake System - Inspect the air intake piping for cracked hoses, loose clamps, or punctures which can damage the engine. Tighten or replace parts as necessary to make sure the air intake system does not leak.

DRIVE BELT ADJUSTMENT

Note: Position the vehicle in a level work area, apply the parking brake and switch off the engine. Turn the steering wheel several times to relieve pressure in the steering system. Block all road wheels.

Measure the belt tension in the centre span of the pulleys using a belt tension gauge. The belt tension should be within the following limits:

Fan Belt Tension
Belt Tension 'New' - 890 N (200 lbf)
Belt Tension 'Used' - 360 to 710 N (80 to 160 lbf)

Alternator Belt Tension
Belt Tension 'New' - 670 N (150 lbf)
Belt Tension 'Used' - 270 to 530 N (60 to 120 lbf)

Note: A belt is considered 'Used' if it has been in service for 10 minutes or longer. If the used belt tension is less than the minimum value, tighten the belt to the maximum value.

An alternative method (deflection method) can be used to check the belt tension by applying 110 N (25 lbf) force on the belt between the pulleys. If the deflection is more than one belt thickness per foot (305 mm) of pulley centre distance, the belt tension must be adjusted.

Fan Belt Adjustment
Loosen the idler pulley lock nut and adjust the belt to the correct tension. Tighten the idler pulley lock nut to a torque of 165 - 190 Nm (120 - 140 lbf ft).

Note: Do not adjust fan belt tension to full value with the adjusting screw. Belt tension can increase when the lock nut is tightened and cause reduced belt and bearing life.

Alternator Belt Adjustment
Loosen the adjustment link locking capscrew and turn the capscrew to adjust belt tension. Tighten the adjustment link locking capscrew to a torque of 80 Nm (60 lbf ft).

SPECIAL TOOLS

Refer to Section 300-0070, SERVICE TOOLS, for part numbers of special tools outlined in this section and general service tools required. These tools are available from your dealer.

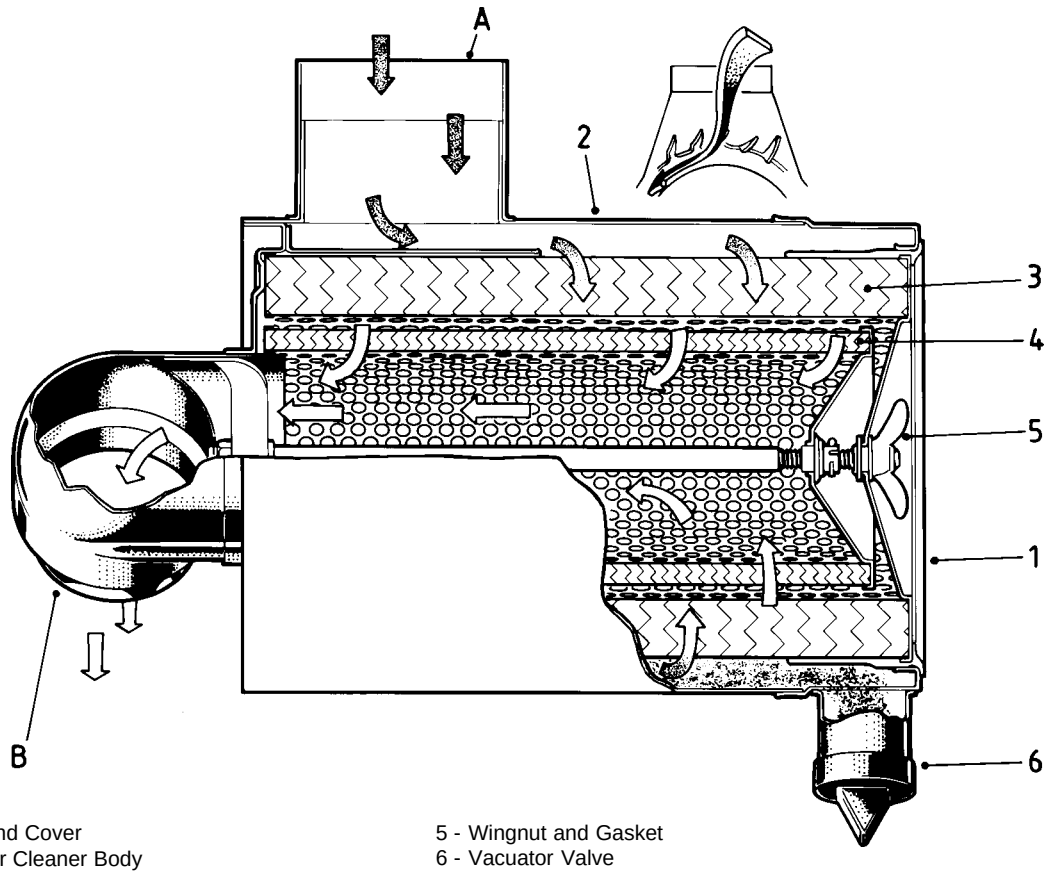
SPECIAL TORQUE SPECIFICATIONS

FIG. NO.	ITEM NO.	ITEM NAME	TORQUE	
			Nm	lbf ft
1	9	Locknut	298	220
1	10	Bolt	149	110
1	26	Bolt	31	23
1	31	Bolt	31	23
1	30	Bolt	31	23
1	12	Bolt	31	23
-	-	Engine Drain Plug	90	65
-	-	Fan Idler Pulley Lock Nut	165 - 190	120 - 140
-	-	Alternator Adjustment Link Capscrew	80	60

* * * *

THIS PAGE IS INTENTIONALLY LEFT BLANK

SM - 045



1 - End Cover
2 - Air Cleaner Body
3 - Primary Element
4 - Secondary (Safety) Element
5 - Wingnut and Gasket
6 - Vacuator Valve
A - Air Inlet
B - Air Outlet

Fig. 1 - Cutaway View of Typical Air Cleaner

DESCRIPTION AND OPERATION

Numbers in parentheses refer to Fig. 1, unless otherwise specified.

There are two, dual dry element type air cleaner assemblies mounted on the platform to the right hand side of the cab. Air cleaner assemblies prolong engine life by removing grit, dust and water from the air as it enters the engine. Grit and dust combined with engine oil, forms a highly abrasive compound which can destroy the engine in a comparatively short period of time.

A rubber vacuator valve (6) attached to end cover (1) in a downward position, ejects grit, dust and water while the engine is running. Vacuator valve (6) minimizes the need for daily servicing. Even though vacuator valve (6) is normally under a slight vacuum when the engine is running, pulsing of the vacuum opens and closes the rubber valve, expelling dust and water as they collect. When the engine is stopped, vacuator valve (6) opens and expels any accumulated grit, dust or water.

SM - 1898

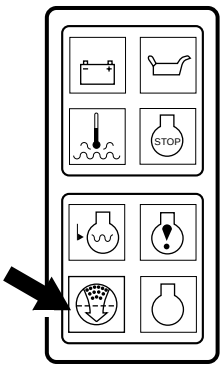
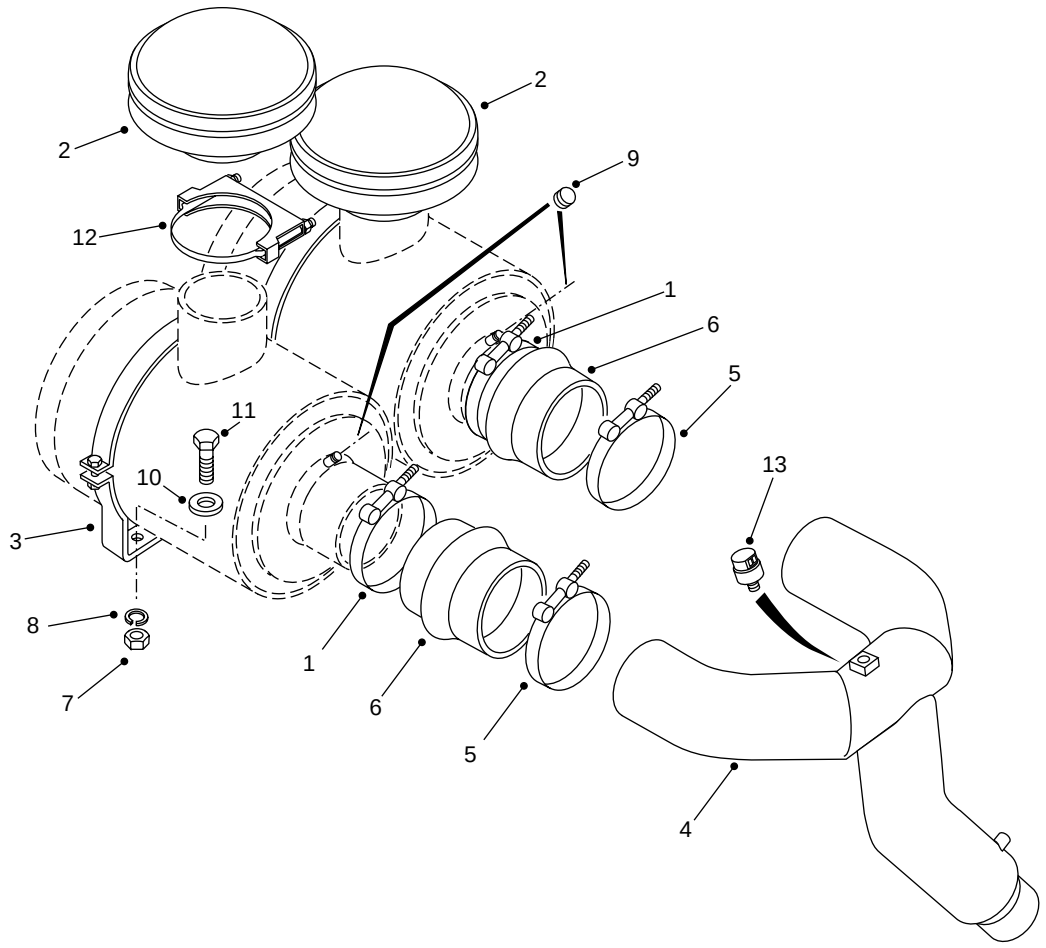


Fig. 2 - Air Cleaner Restriction Indicator Light

An electrical air restriction gauge indicates when air restriction levels reach the maximum allowable limit.

SM - 2320



1 - Clamp
2 - Cap Assembly
3 - Mounting Band
4 - Tube Assembly
5 - Clamp
6 - Hose
7 - Nut
8 - Lockwasher
9 - Cap
10 - Washer
11 - Nut
12 - Clamp
13 - Switch

Fig. 3 - Exploded View of Typical Air Cleaner Mounting

When air restriction levels are reached, the circuit closes and a restriction indicator light located on the dash panel (Fig. 2) illuminates. This light shows at a glance when the system air flow is being restricted indicating that primary element (2) should be serviced. Air restriction gauge automatically resets after each air cleaner assembly is serviced.

While the indicator light indicates the need for servicing, it does not give as precise a measurement as a water manometer or vacuum gauge. Refer to 'Measuring Air Restriction'.

Secondary (safety) element (4) is installed in air cleaner body (2) inside of primary element (3). This element increases the reliability of the air cleaner's protection of the engine from airborne dirt. It protects the engine from dirt admitted by a damaged primary element (3), or dirt that might be dropped into air cleaner body (2) while changing primary element (3).

Dust-laden air enters air cleaner body (2) through air inlet (A). An inlet cap fits over the opening and prevents leaves, twigs, and other large particles from entering air cleaner body (2).

As the air enters air cleaner body (2), it flows past deflector vanes that encircle primary element (3). These vanes give the air a whirling motion before it passes through primary element (3) and secondary (safety) element (4). As the air rotates along the inner wall of air cleaner body (2), the centrifugal force imparted to the dust particles forces most dust particles into vacuator valve (6). Any remaining dust is

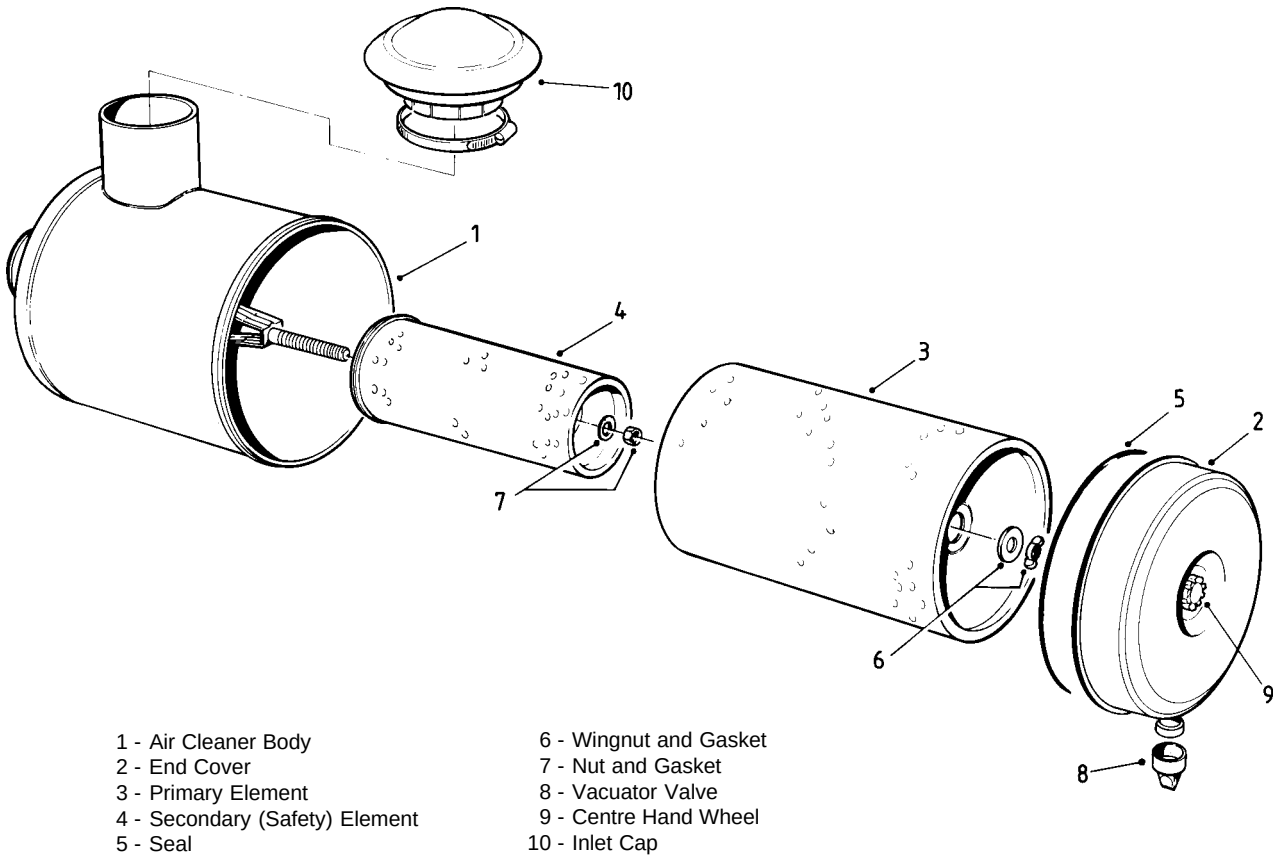


Fig. 4 - Exploded View of Typical Air Cleaner

removed by the primary and secondary (safety) filters. As the filtered air leaves the cleaner through air outlet (B), it is drawn through a ducting pipe which is securely clamped between the air cleaner and the engine air intake.

AIR CLEANER

Removal

Numbers in parentheses refer to Fig. 3.

1. Position the vehicle in a level work area, apply the parking brake and switch off the engine.

2. Turn the steering wheel in both directions several times to relieve pressure in the steering system. Block all road wheels.

3. Slacken clamps (1 & 5) and slide hose (6) clear of the air cleaner assemblies.

4. Using suitable lifting equipment, support the air cleaner assemblies and remove bolts (11), washers (10), lockwashers (8) and nuts (7). Remove air cleaner assemblies from the vehicle.

5. Blank off air cleaner outlet and hose (6) end with tape or cardboard to prevent entry of dirt.

Disassembly

Numbers in parentheses refer to Fig. 4.

1. Remove inlet cap (10) and cover air inlet temporarily. Clean inlet cap, refit and secure.

2. Remove air cleaner end cover assembly by undoing centre hand wheel (9). Empty dust collected in end cover (2) and wipe clean.

3. Check rubber vacuator valve (8) for wear. Replace if worn or damaged. On assembly ensure vacuator valve (8) lips are pointing downwards.

4. Unscrew wingnut and gasket (6) and carefully withdraw primary filter element (3). Replace seal (5) and gasket of wingnut (6).

5. Do not disturb secondary (safety) element (4) and replace end cover (2) temporarily.

6. Primary filter element (3) should be replaced after a maximum of six cleanings, or annually whichever comes first. Should primary element (3) require cleaning, follow the appropriate procedure under 'Cleaning Methods'.

Assembly/Installation

Numbers in parentheses refer to Fig. 4.

Note: Tighten all fasteners to standard torques listed in Section 300-0080, STANDARD BOLT AND NUT TORQUE SPECIFICATIONS.

Assembly and installation of the air cleaner assembly is the reverse of disassembly and removal. Always check air cleaner threads are clean and undamaged.

Following installation, but before starting the engine, the following system checks should be carried out:

a. Check air cleaner to engine tube (4) for defects and that clamps (18 & 19) are securely tightened to ensure that there are no leaks in the system.

b. Check that air cleaner mounting brackets (3) are secure and that air cleaner is mounted securely.

MAINTENANCE

Numbers in parentheses refer to Fig. 1, unless otherwise specified.

⚠ WARNING
Always shut down the engine before servicing the air cleaner.

The air cleaner elements should be serviced only when the maximum allowable restriction has been reached, as indicated by air restriction indicator light. The elements should not be serviced on the basis of visual observation as this would lead to over service. When restriction readings finally indicate a change, remove primary element (3) carefully and clean/ replace as required. Refer to 'Primary Element'.

Never attempt to clean secondary (safety) element (4). The element must be replaced when it affects the total air flow restriction of the air cleaner, or, on at least every third primary element (3) service.

Make sure vacuator valve (6) is not damaged or plugged and that the joint with end cover (1) is not broken. If vacuator valve (6) is lost or damaged, replace it to maintain pre-cleaner efficiency and normal filter element service life.

Check air cleaner body (2) for cracks or other structural damage. Replace damaged parts immediately.

Check condition of clamps (1 & 5, Fig. 3), hose (6, Fig. 3) and tube (4, Fig. 3). Tighten/replace as necessary.

Primary Element

Numbers in parentheses refer to Fig. 4.

Although a paper primary element (3) is used, it is possible to clean it so that it can be reused. The number of times one element can be reused depends on the type of dirt on it and the care exercised in cleaning. Element damage will be indicated by areas of concentrated dust on the clean side of the element.

The life of a properly cleaned element will be approximately as long as that of a new element for the first one or two cleanings. After that the life of the element will gradually decrease with each cleaning; however, it should perform satisfactorily through approximately six cleanings, providing it does not rupture. If in doubt, always fit a new element.

Visually determine the condition of primary element (3) and choose either the compressed air or washing method.

1. Unscrew centre hand wheel (9) and remove end cover (2) from air cleaner body (1). Remove and discard seal (5).

2. Remove wing nut and gasket (6) and primary element (3) from air cleaner body (1). Discard the gasket.

3. If secondary (safety) element (4) requires to be changed, refer to 'Secondary (Safety) Element'.

4. Using a damp cloth and a suitable solvent, wipe out all excess dirt from air cleaner body (1) and allow to dry.