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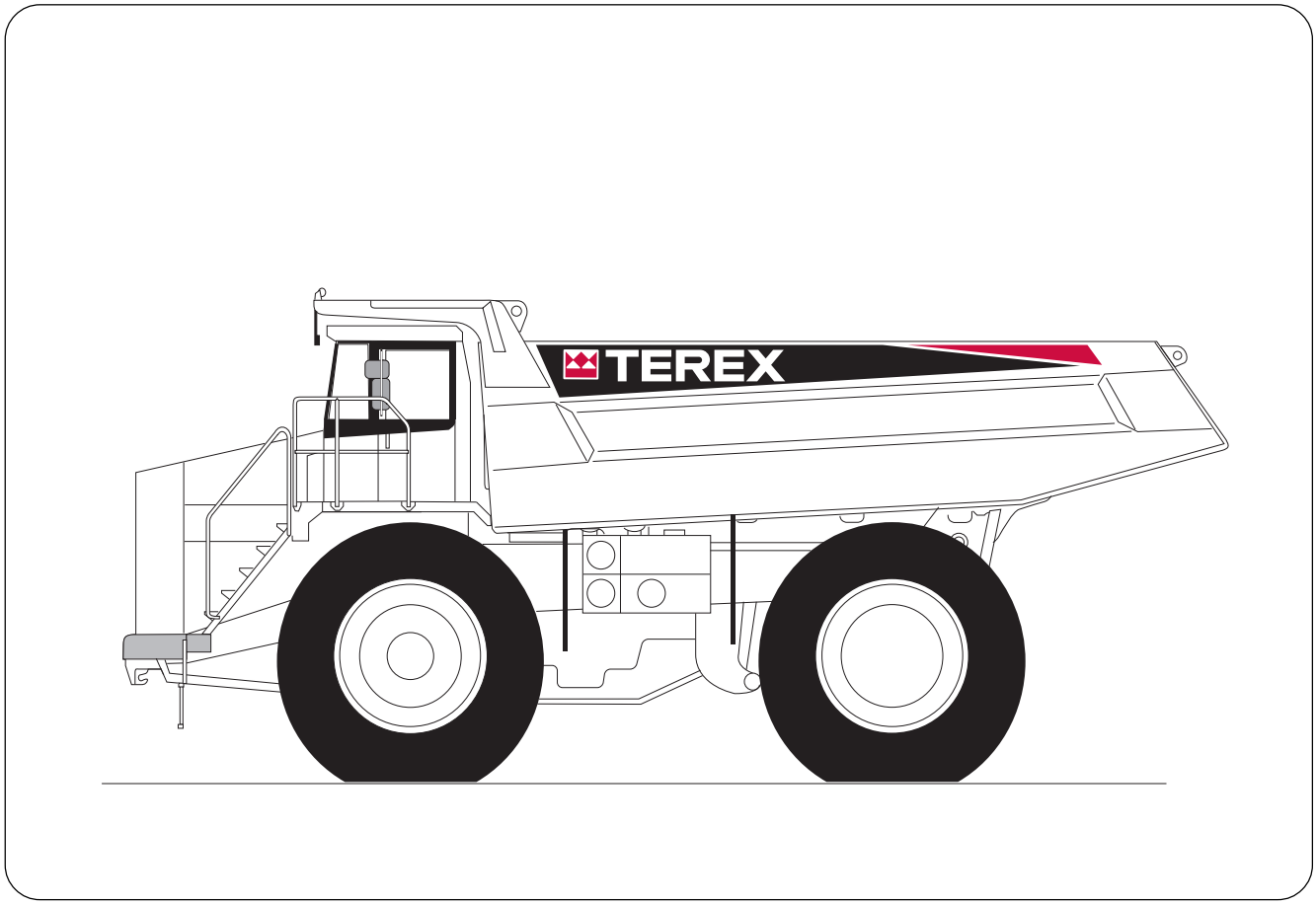
TEREX

TR100 Mining Truck Maintenance Manual



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TEREX EQUIPMENT LIMITED,
MOTHERWELL, SCOTLAND, ML1 5RY
REF. NO. SM755/783

SM1616 Rev.10.12.08

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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.

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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
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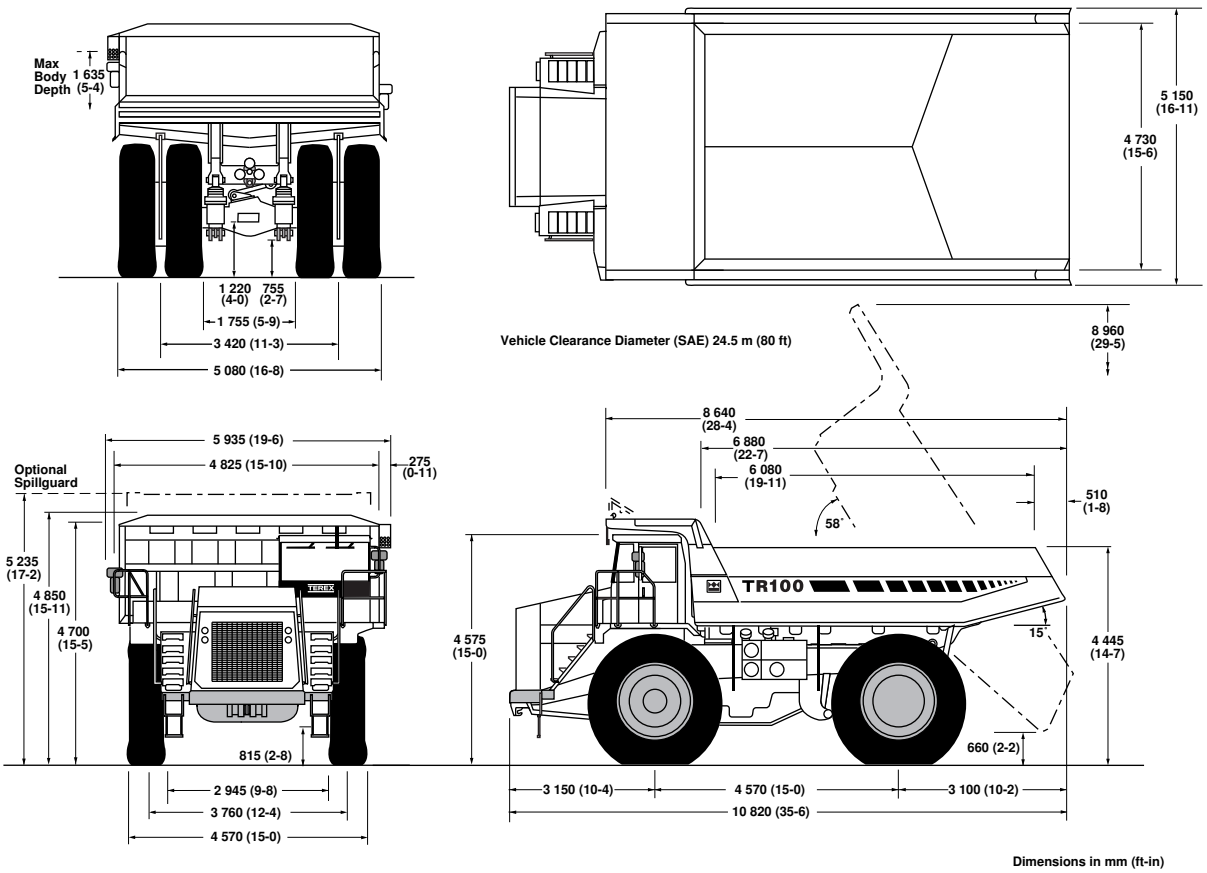

Fig. 1 - Machine Dimensions

ENGINE

Make/Model ..... Cummins KTA-38-C1050
Type ..... 4 Cycle, Turbocharged/Aftercooled
Gross Power
at 2 100 rev/min ..... 783 kW (1 050 hp, 1 094 PS)
Net Power at 2 100 rev/min .....727 kW (975 hp, 988 PS)

Note: Power ratings to SAE J1995 June 1990. Net Power is after deductions for fan and alternator. Engine requires no derating up to 3 050 m (10 000 ft) altitude.

Maximum Torque..... 4631 Nm (3415 lbf ft) at 1300 rev/min
Number of Cylinders/Configuration 12V
Bore x Stroke ..... 159 x 159 mm (6.25 x 6.25 in)
Total Displacement..... 37.7 litres (2300 in^3)
Starting ..... Electric
Maximum Speed, Full Load ..... 2100 rev/min
Maximum Speed, No Load..... 2400 rev/min
Idle Speed ..... 750 rev/min

TRANSMISSION

Make/Model ..... Allison H 8610 AR CEC 2
Automatic electronic control with soft shift feature. Remote mounted in the frame with integral TC 890 torque converter and planetary gearing. Six speeds forward, one reverse. Automatic converter lockup action in all speed ranges. Downshift inhibitor. Hydraulic retarder.

Speeds With Standard Planetary						
Forward						
Gear	1	2	3	4	5	6
Ratio	4.24	2.32	1.69	1.31	1.00	0.73
km/h	8.2	15.0	20.6	26.5	34.8	47.6
mile/h	5.1	9.3	12.8	16.5	21.6	29.6
Reverse						
Ratio	5.75					
km/h	6.0					
mile/h	3.8					

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	2.16:1	2.16:1
Planetary	13.75:1	10.50:1
Total Reduction	29.70:1	22.68:1

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 ..... 229 mm (9.0 in)
- Rear ..... 175 mm (6.9 in)

Maximum Rear Axle Oscillation ..... ± 7.0 Degrees

WHEELS AND TYRES

Wheel Rim Width ..... 19.5 in
Tyres (Front & Rear)
- Standard ..... 27.00 R 49** Radial
- Optional ..... 27.00-49 (48 PR) E-4

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

All hydraulic brake system. Transmission mounted pressure compensating pump provides hydraulic pressure for brakes and steering. Independent circuits front and rear. Each circuit incorporates a nitrogen accumulator which stores energy to provide consistent braking response.

Front Brake Circuit Pressure ..... 159 bar (2300 lbf/in²)
Rear Brake Circuit Pressure ..... 52 bar (750 lbf/in²)
Accumulators:
- Nitrogen Precharge Pressure ..... 55 bar (800 lbf/in²)

Front:
- Type ..... Dry Disc with 1 calliper per wheel
- Disc Diameter ..... 965 mm (38 in)
- Pad Area, Total ..... 2015 cm² (320 in²)

Rear:
- Type ..... Oil cooled, multiple friction discs, completely sealed from dirt and water.
- Braking Surface, Total ..... 87567 cm² (13573 in²)

Parking

Application of rear brakes by springs in brake disc pack. Hydraulically released.
Hold-off Pressure ..... 83 bar (1200 lbf/in²)

Retardation

Modulated lever control of rear disc pack.
Retarder Actuation Pressure ..... up to 33 bar (480 lbf/in²)

Emergency

Push button solenoid control applies service and parking brakes. Automatically applies when engine is switched off. Parking brake applies should system pressure fall below a predetermined level.

Brakes conform to ISO 3450, SAE J1473 OCT 90.

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 (1200 lbf/in²). Steering conforms to ISO 5010, SAE J53.

System Pressure ..... 159 bar (2300 lbf/in²)
Relief Pressure ..... 207 bar (3000 lbf/in²)
Steering Cylinders ..... Double Acting, Single Stage
Accumulator:
- Oil Capacity ..... 16.4 litres (4.33 US gal)
- Nitrogen Precharge Pressure ..... 55 bar (800 lbf/in²)

Steering Angle (Left and Right) ..... 39°
Pump:
- Type ..... Piston
- Capacity at 2100 rev/min ..... 2.0 litres/s (32 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.

System Relief Pressure ..... 190 bar (2750 lbf/in²)
Pump:
- Type ..... Gear
- Capacity at 2100 rev/min ..... 6.1 l/s (97 US gal/min)

Control Valve ..... Servo Controlled, Open Centre
Body Raise Time ..... 16.3 Seconds
Body Lower Time ..... 18 Seconds

ELECTRICAL

Type ..... 24 V, Negative Ground
Battery ..... Four, 12 V, 210 Ah each, Maintenance Free
Accessories ..... 24 V
Alternator ..... 70 Amp
Starter ..... Two, 8.9 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 1000 MPa (145000 lbf/in²).

Plate Thicknesses:

Floor	19 mm (0.75 in)
Side	10 mm (0.39 in)
Front, lower	10 mm (0.39 in)

ROPS Cabguard SAE J1040 Feb 86. ISO 3471

Volumes:

Struck (SAE)	41.6 m³ (54.4 yd³)
Heaped 2:1 (SAE)	57.0 m³ (74.5 yd³)

TYPICAL NOISE LEVELS

OPERATOR EAR (ISO 6394) ..... 83 dbA

*EXTERIOR SOUND RATING
(SAE J88 JUN 86) ..... 93 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 unit 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.

SERVICE CAPACITIES

Engine Crankcase and Filters	134 litres (35.4 US gal)
Transmission and Filters	100 litres (26 US gal)
Cooling System	304 litres (80.3 US gal)
Fuel Tank	1090 litres (288 US gal)
Steering Hydraulic Tank	61 litres (16.1 US gal)
Steering System	72 litres (19 US gal)
Body and Brake Cooling Tank	297 litres (78.5 US gal)
Body and Brake Cooling System	564 litres (149 US gal)
Planetaries (Total)	57 litres (15.1 US gal)
Differential	61 litres (16.1 US gal)
Front Ride Strut (Each)	27 litres (7.1 US gal)
Rear Ride Strut (Each)	18 litres (4.8 US gal)
Power Takeoff	1.5 litres (0.4 US gal)
Air Conditioning Compressor	0.135 litres (0.036 US gal)

VEHICLE WEIGHTS (MASS)		
	kg	lb
Chassis, with hoists	53240	117380
Body, standard	15380	33900
Net Weight	68620	151280
PAYLOAD, maximum	**90720**	**200000**
Maximum Gross Weight*	159340	351280
FOR UNIT EQUIPPED WITH OPTIONAL BODY LINER PLATES:		
Chassis, with hoists	53240	117380
Body, with wear plates	20910	46100
Net Weight	74150	163480
PAYLOAD, maximum	**85190**	**187800**
Maximum Gross Weight*	159340	351280
* Maximum permissible gross vehicle weight with options, attachments, full fuel tank and payload.		
WEIGHT DISTRIBUTION	Front Axle	Rear Axle
Empty %	49	51
Loaded %	34	66

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Welding

WARNINGS
Before any welding is done on a machine equipped with any electronic systems, disconnect the following (if applicable) in this order: Battery earth cable, battery supply cable, alternator earth cables, alternator supply cables and electrical connections at the engine ECM, transmission ECU, body control lever, hydraulics ECU and cab bulkhead to avoid damage to electrical components. Turn off battery master switch to isolate the batteries before disconnecting any components.
After welding connect all of the above in the reverse order.

Before any welding is done ensure all paint has been removed from the area to be welded. Failure to do so may result in hazardous fumes being given off from the paint.

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.

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

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: The current from the welding rod always follows the path of least resistance. If, for example, the ground clamp is attached to the rear frame when welding is performed on the front frame, the current must pass a frame connection to return to the welding machine. Since the pivot coupling offers the least resistance but not a sound electrical connection, small electric arcs may be set up across the moving parts which may cause welding blotches on their wearing surfaces and increase the wear rate of these components.

General Welding Procedure

The following general procedure should be used for the repair of defects outwith the vicinity of alloy steel castings.

1. Completely ARC-AIR gouge or grind out the crack until sound metal is reached. If ARC-AIR method is employed, pre-heat area to 100° C (212° F), measure 3 - 4" either side of repair prior to gouging. On completion of gouging grind to remove thin carbon layer.

2. Apply dye-penetrant check to ensure crack has been completely removed.

3. Pre-heat area to 100° C (212° F), measured 3 - 4" either side of repair. Avoid local overheating.

4. Weld completely using E-7016 electrodes. Care must be taken to ensure electrodes are protected from moisture pick-ups at all times.

5. Allow repair weld to cool slowly.

6. Grind and blend repair to original contour. Paint heat damaged areas.

The following general procedure should be used for the repair of defects in alloy steel castings and in the welds joining steel castings.

1. Completely ARC-AIR gouge or grind out the crack until sound metal is reached. If ARC-AIR method is employed, pre-heat area to 200° C (392° F), measure 3 - 4" either side of repair prior to gouging. On completion of gouging grind to remove thin carbon layer.

2. Apply dye-penetrant check to ensure crack has been completely removed.

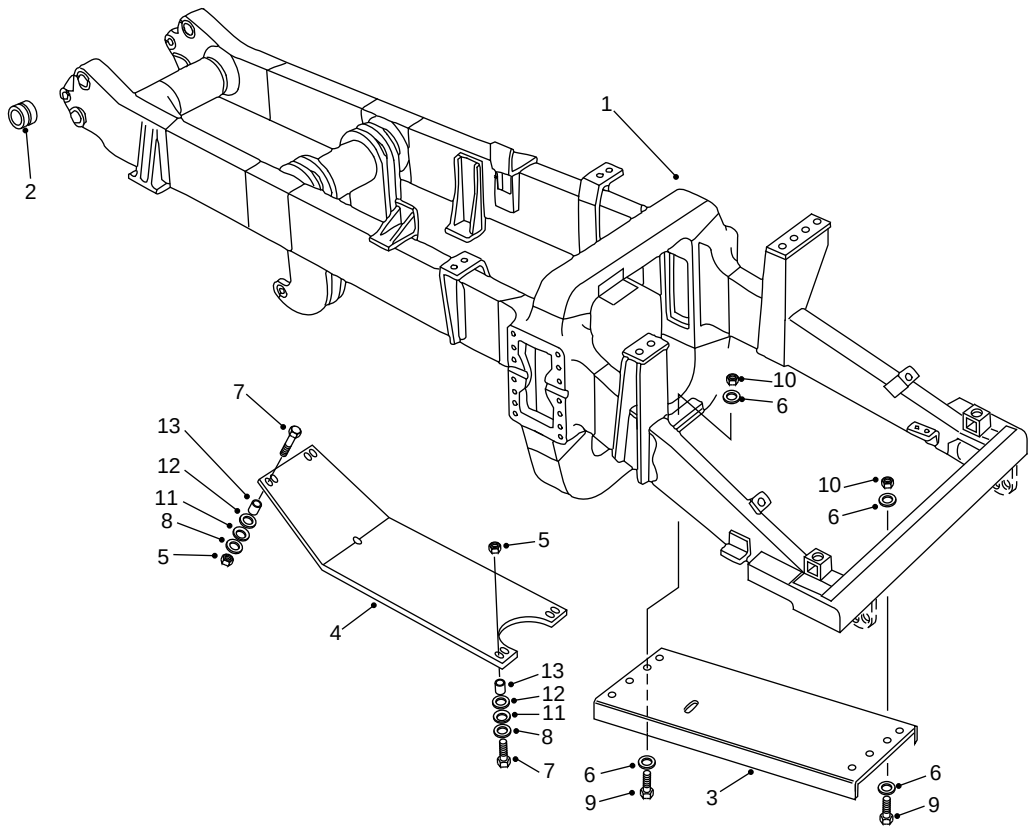
3. Pre-heat area to 200° C (392° F), measured 3 - 4" either side of repair. Avoid local overheating.

4. Weld completely using E-7016 electrodes. Care must be taken to ensure electrodes are protected from moisture pick-ups at all times.

5. On completion of welding, post-heat repair area to 400° C (752° F), measure 3 - 4" either side of repair.

6. If welding has to be interrupted for any reason, e.g. overnight, post-heat immediately as in Step 5.

* * * *



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

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 through 6 (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.

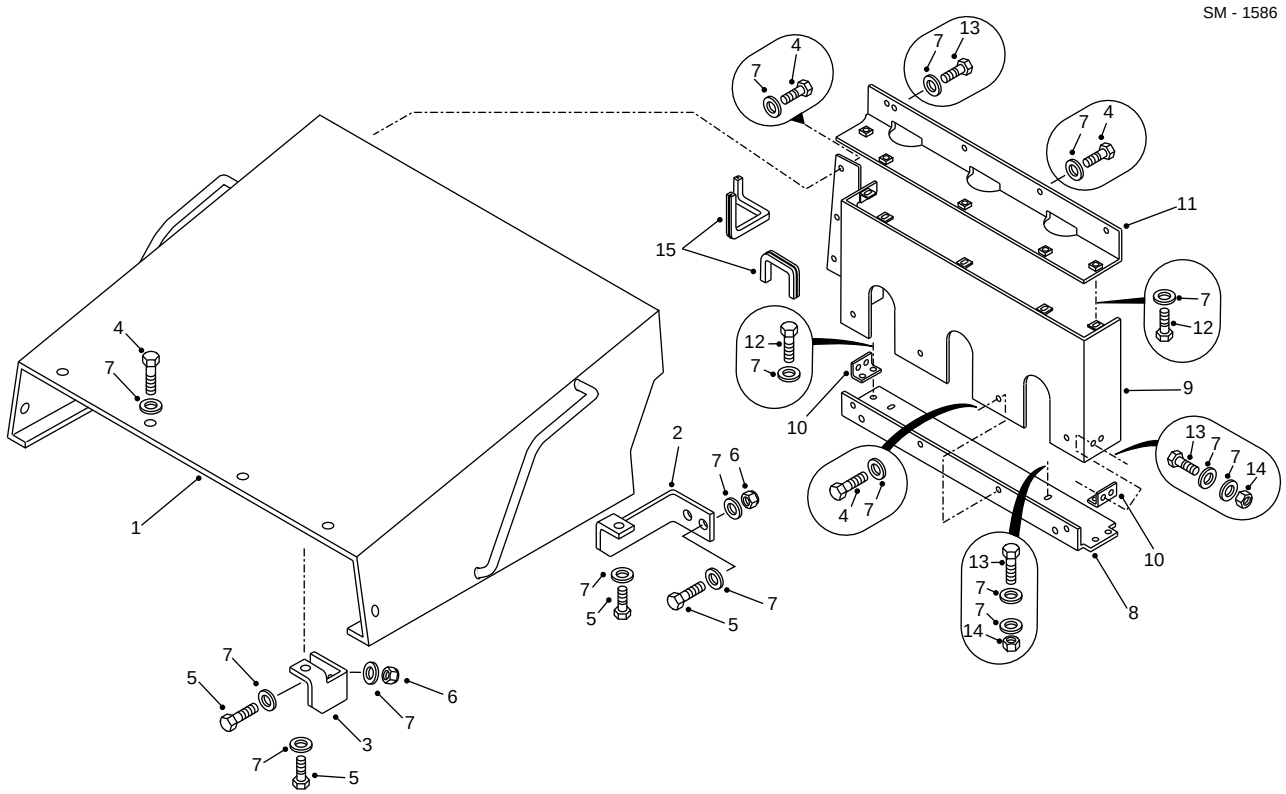
3. Attach a suitable lifting device to the component and remove mounting hardware. Remove the component from the vehicle.

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.



1 - Hood Assembly
2 - Bracket - LH
3 - Bracket - RH
4 - Bolt
5 - Bolt
6 - Locknut
7 - Hardened Washer
8 - Plate Assembly - Base
9 - Baffle Assembly
10 - Bracket
11 - Plate Assembly - Top
12 - Bolt
13 - Bolt
14 - Nut
15 - Beading

Fig. 2 - Exploded View of Hood and Mounting

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

Note: It is important that the electrical connections are disconnected in the following order to prevent damage to the electrical components:

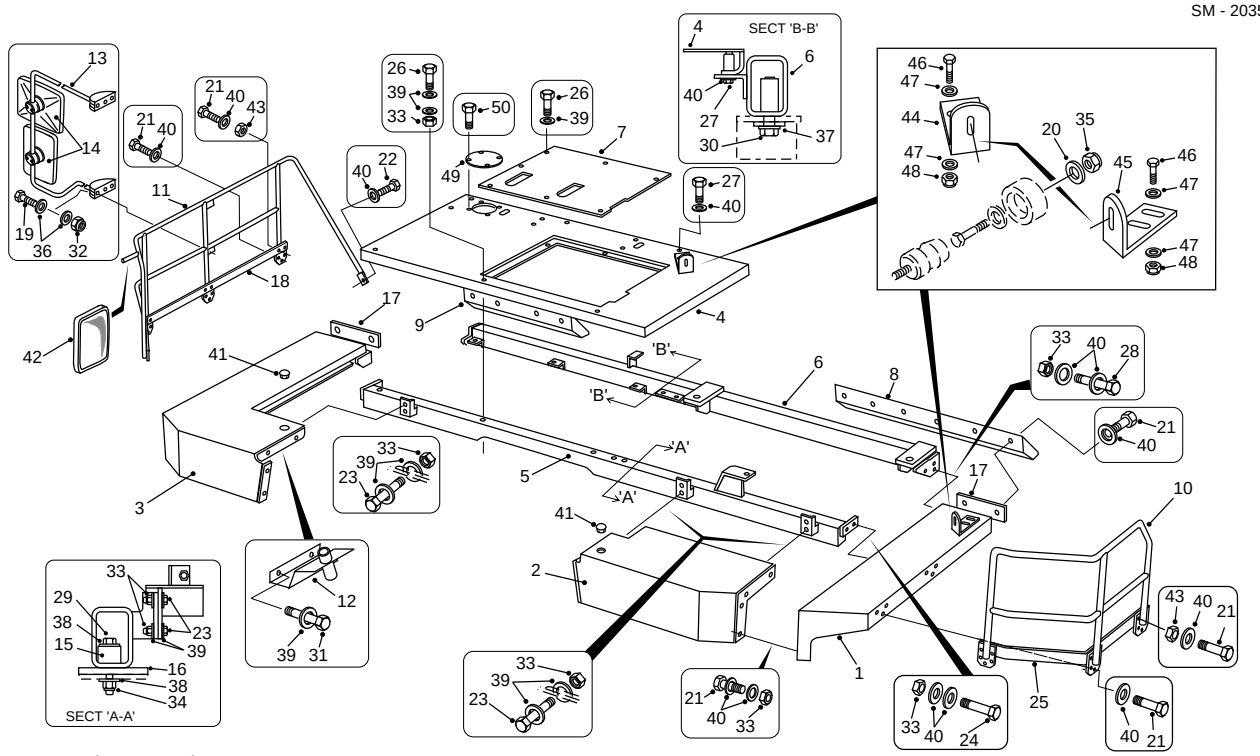
a. Disconnect battery equalizer ground cables.
b. Disconnect battery cables from terminal posts (ground cable first).
c. Disconnect battery equalizer positive cables.
d. Disconnect electrical connections at the ECU.

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

⚠ 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.

Electric arc welding is recommended for all chassis welding. 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 twisted, no welding should be done



1 - Fender Extension
2 - Fender Assembly - LH
3 - Fender Assembly - RH
4 - Platform Assembly - RH
5 - Front Crossmember
6 - Rear Crossmember
7 - Cover Plate
8 - Mudguard
9 - Mudguard
10 - Handrail - LH
11 - Handrail - RH
12 - Plate Assembly
13 - Arm
14 - Mirror
15 - Block
16 - Spacer
17 - Spacer
18 - Spacer
19 - Bolt
20 - Hardened Washer
21 - Bolt
22 - Bolt
23 - Bolt
24 - Bolt
25 - Bolt
26 - Bolt
27 - Bolt
28 - Bolt
29 - Bolt
30 - Bolt
31 - Bolt
32 - Nut
33 - Locknut
34 - Nut
35 - Nut
36 - Washer
37 - Hardened Washer
38 - Hardened Washer
39 - Hardened Washer
40 - Hardened Washer
41 - Plug
42 - Mirror
43 - Nut
44 - Bracket
45 - Bracket
46 - Nut
47 - Washer
48 - Nut
49 - Plate Cover
50 - Bolt

Fig. 3 - Exploded View of Fenders and Mounting

until the parts are straightened or realigned.

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

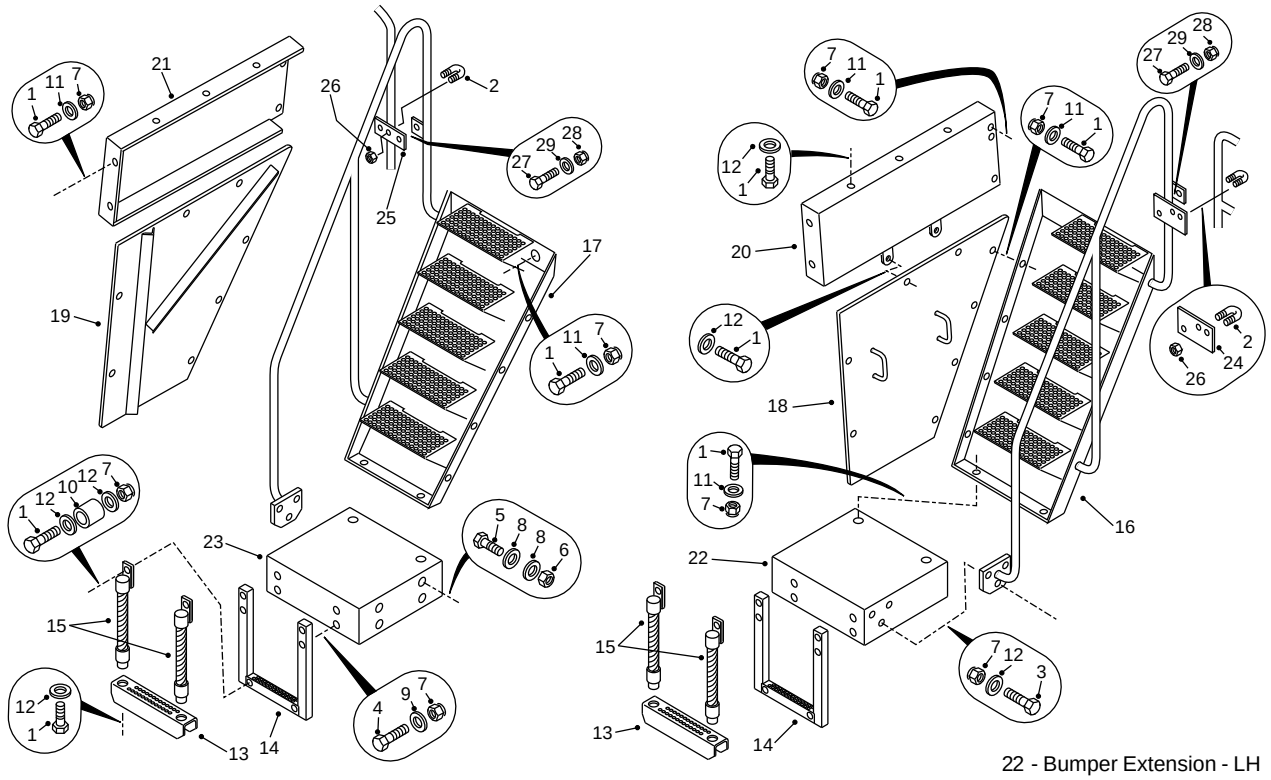
A check of the condition of the paint should be made approximately twice a year and chassis repainted if necessary.

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.

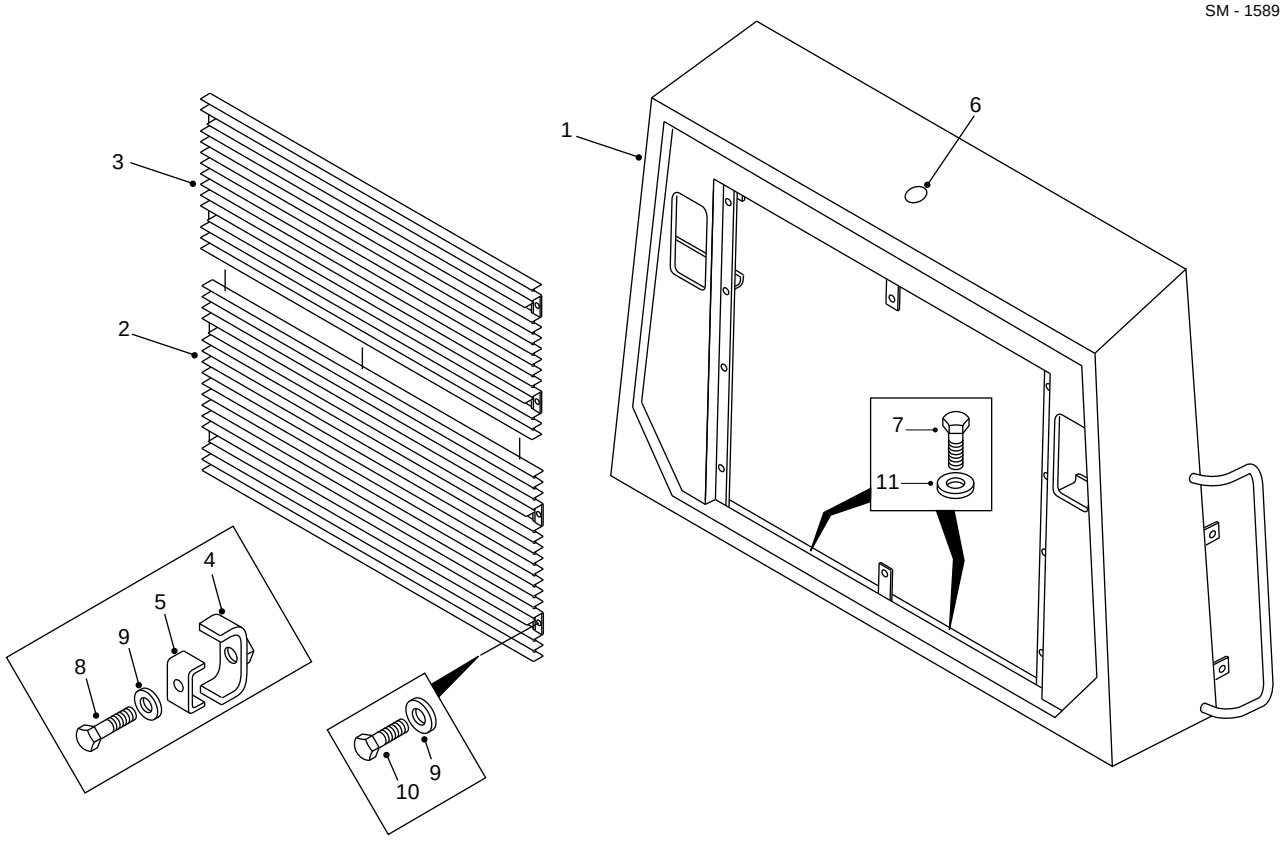
SPECIAL TOOLS

There are no special tools required for procedures outlined in this section. Refer to Section 300-0070, SERVICE TOOLS for part numbers of general service tools required. These tools are available from your dealer.



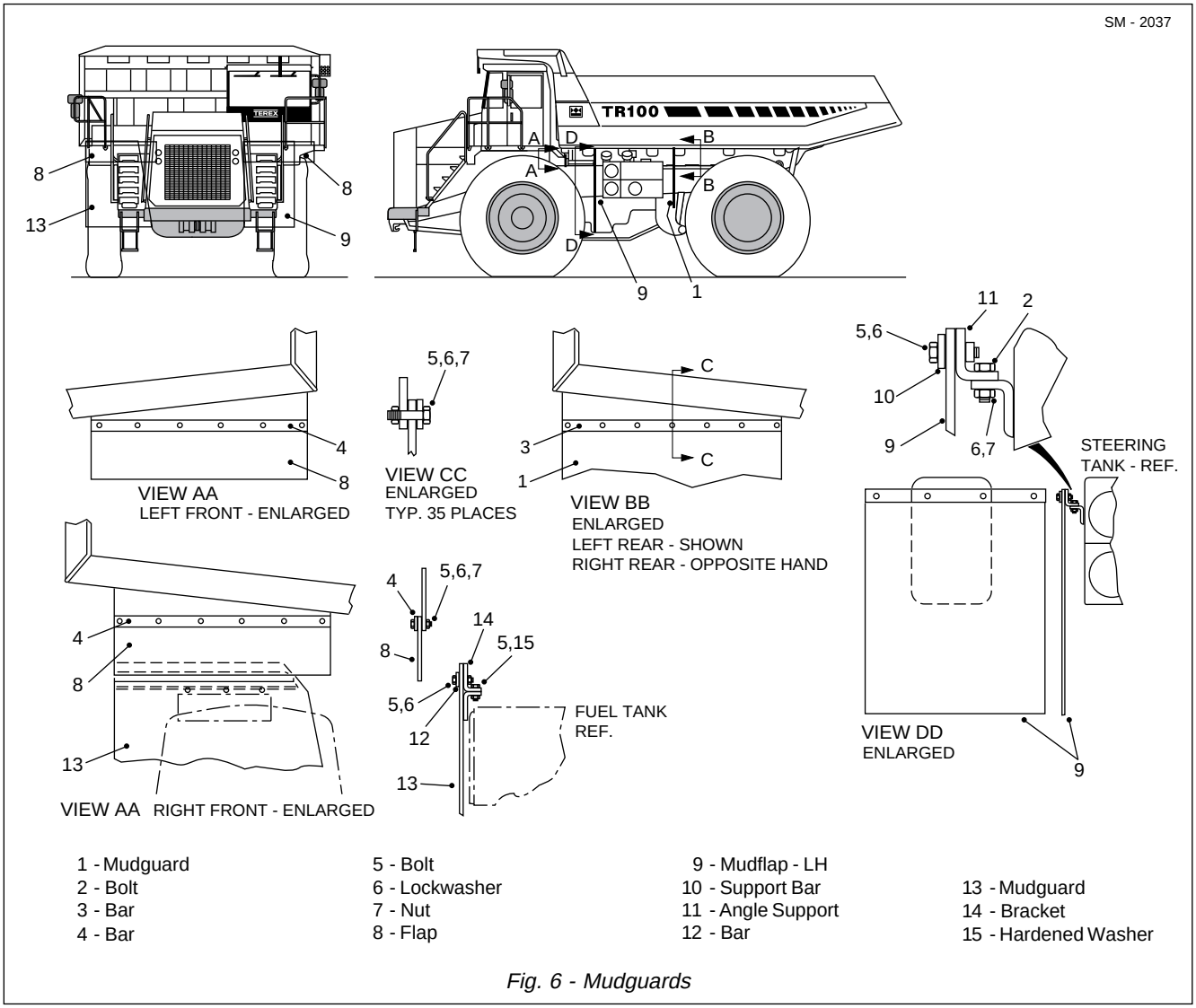
1 - Bolt
2 - 'U' Bolt
3 - Bolt
4 - Bolt
5 - Bolt
6 - Nut
7 - Locknut
8 - Hardened Washer
9 - Washer
10 - Spacer
11 - Hardened Washer
12 - Hardened Washer
13 - Rung
14 - Step Assembly
15 - Cable Assembly
16 - Step Assembly - LH
17 - Step Assembly - RH
18 - Hoodside - LH
19 - Hoodside - RH
20 - Panel Assembly - LH
21 - Panel Assembly - RH
22 - Bumper Extension - LH
23 - Bumper Assembly - RH
24 - Bracket
25 - Bracket
26 - Nut
27 - Bolt
28 - Nut
29 - Hardened Washer

Fig. 4 - Exploded View of Ladders and Handrails



1 - Radiator Guard
2 - Grille - Bottom
3 - Grille - Top
4 - Clamp
5 - Clip
6 - Button Plug
7 - Bolt
8 - Bolt
9 - Hardened Washer
10 - Bolt
11 - Hardened Washer

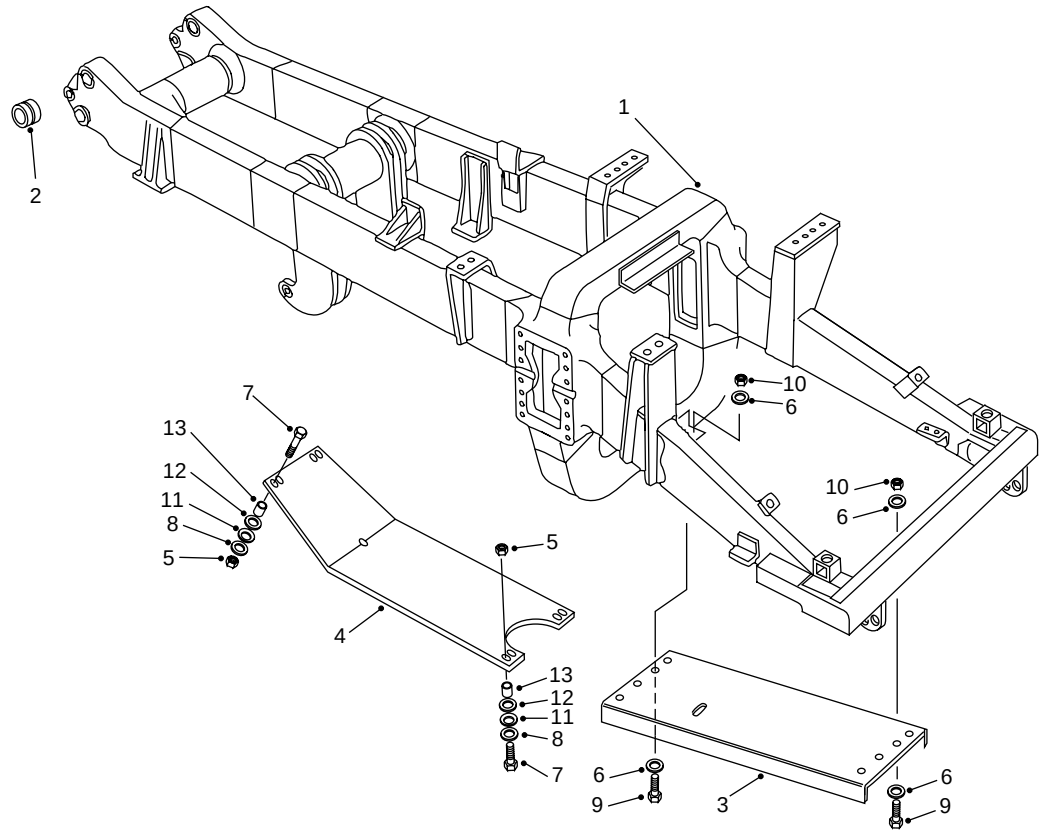
Fig. 5 - Exploded View of Radiator Guard and Mounting



1 - Mudguard
2 - Bolt
3 - Bar
4 - Bar
5 - Bolt
6 - Lockwasher
7 - Nut
8 - Flap
9 - Mudflap - LH
10 - Support Bar
11 - Angle Support
12 - Bar
13 - Mudguard
14 - Bracket
15 - Hardened Washer

Fig. 6 - Mudguards

* * * *



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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 through 6 (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.

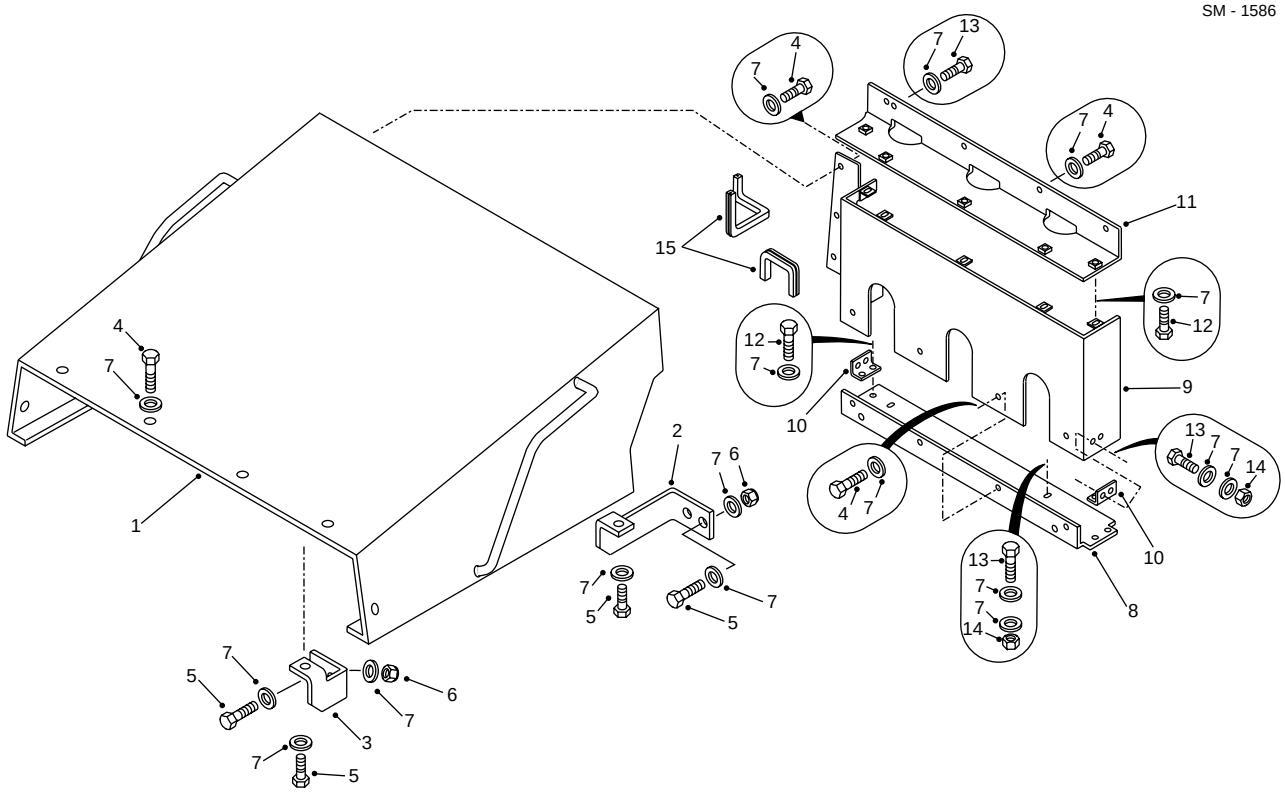
3. Attach a suitable lifting device to the component and remove mounting hardware. Remove the component from the vehicle.

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.



1 - Hood Assembly
2 - Bracket - LH
3 - Bracket - RH
4 - Bolt
5 - Bolt
6 - Locknut
7 - Hardened Washer
8 - Plate Assembly - Base
9 - Baffle Assembly
10 - Bracket
11 - Plate Assembly - Top
12 - Bolt
13 - Bolt
14 - Nut
15 - Beading

Fig. 2 - Exploded View of Hood and Mounting

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

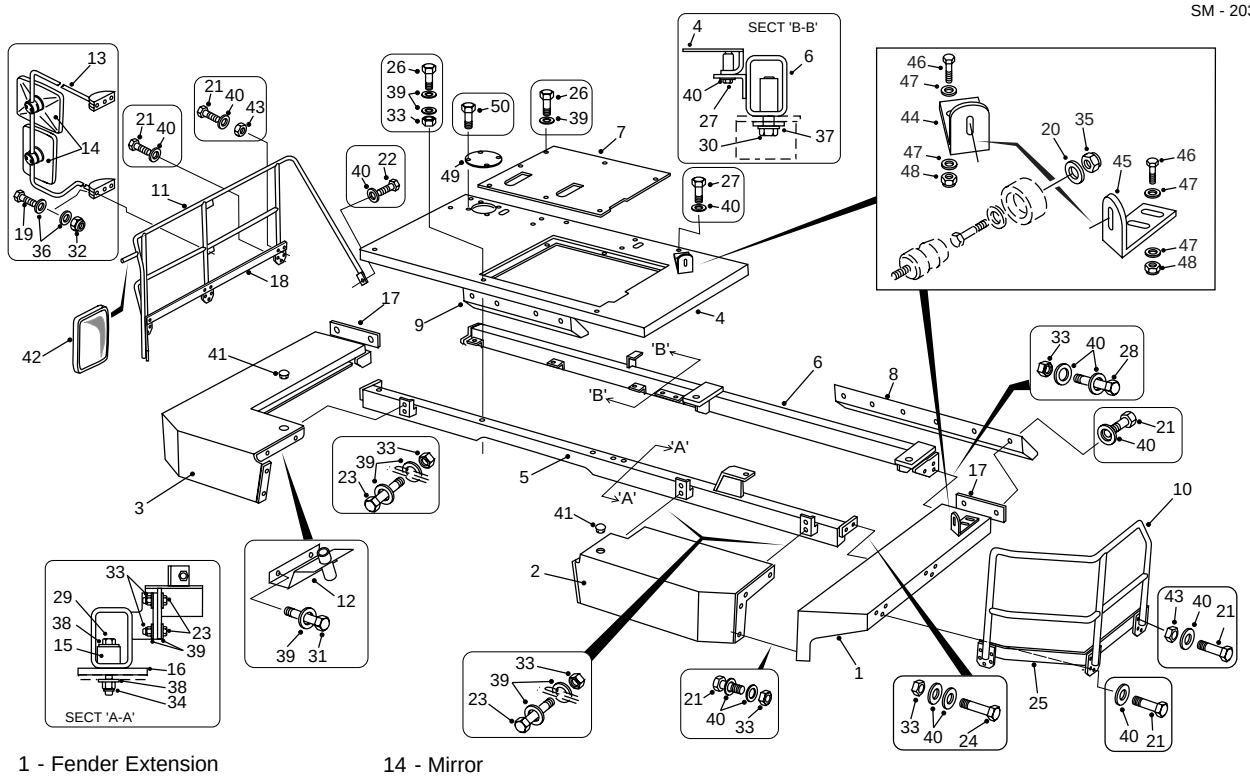
Note: It is important that the electrical connections are disconnected in the following order to prevent damage to the electrical components:

a. Disconnect battery equalizer ground cables.
b. Disconnect battery cables from terminal posts (ground cable first).
c. Disconnect battery equalizer positive cables.
d. Disconnect electrical connections at the ECU.

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

⚠ 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.

Electric arc welding is recommended for all chassis welding. 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 twisted, no welding should be done



1 - Fender Extension
2 - Fender Assembly - LH
3 - Fender Assembly - RH
4 - Platform Assembly - RH
5 - Front Crossmember
6 - Rear Crossmember
7 - Cover Plate
8 - Mudguard
9 - Mudguard
10 - Handrail - LH
11 - Handrail - RH
12 - Plate Assembly
13 - Arm
14 - Mirror
15 - Block
16 - Spacer
17 - Spacer
18 - Spacer
19 - Bolt
20 - Hardened Washer
21 - Bolt
22 - Bolt
23 - Bolt
24 - Bolt
25 - Bolt
26 - Bolt
27 - Bolt
28 - Bolt
29 - Bolt
30 - Bolt
31 - Bolt
32 - Nut
33 - Locknut
34 - Nut
35 - Nut
36 - Washer
37 - Hardened Washer
38 - Hardened Washer
39 - Hardened Washer
40 - Hardened Washer
41 - Plug
42 - Mirror
43 - Nut
44 - Bracket
45 - Bracket
46 - Nut
47 - Washer
48 - Nut
49 - Plate Cover
50 - Bolt

Fig. 3 - Exploded View of Fenders and Mounting

until the parts are straightened or realigned.

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.

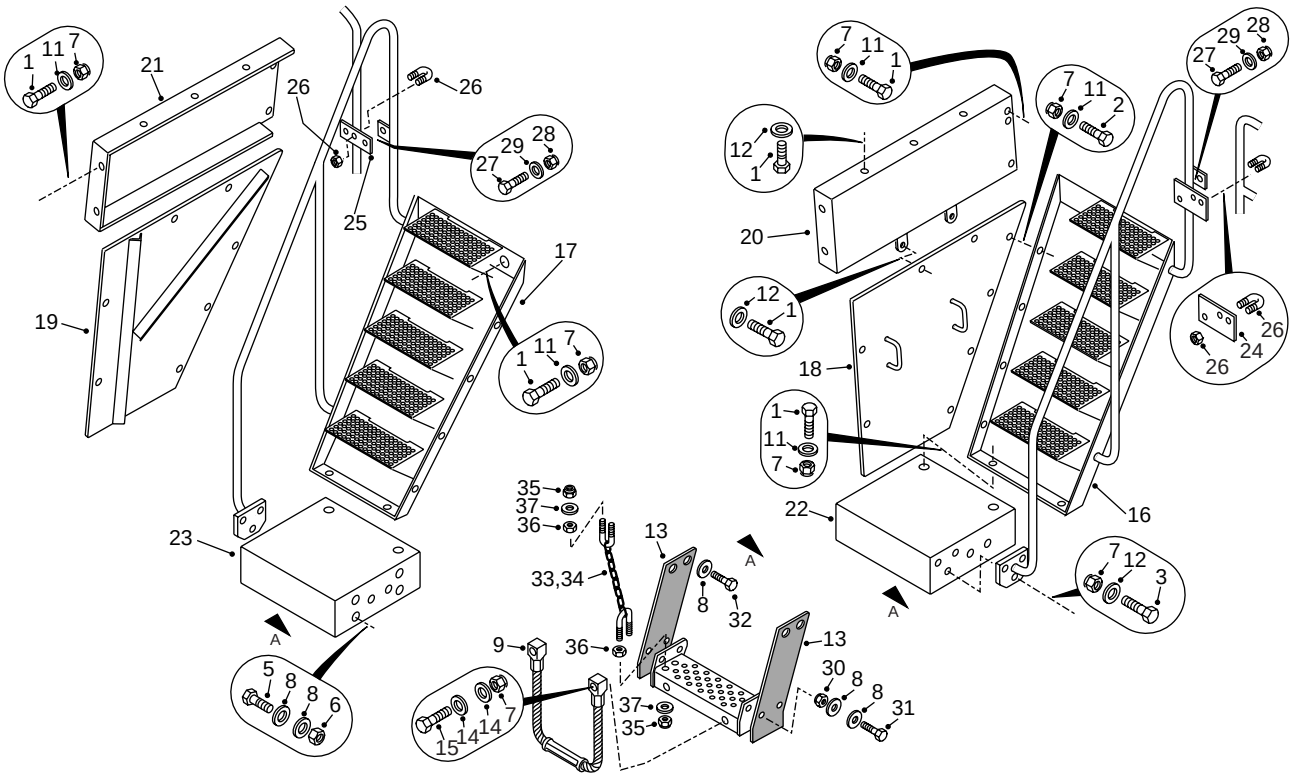
If painting of the actual frame of the unit is required, thoroughly clean the areas to be painted. Apply a primer coat of red oxide and then a finish coat of polyurethane enamel.

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

SPECIAL TOOLS

There are no special tools required for procedures outlined in this section. Refer to Section 300-0070, SERVICE TOOLS for part numbers of general service tools required. These tools are available from your dealer.

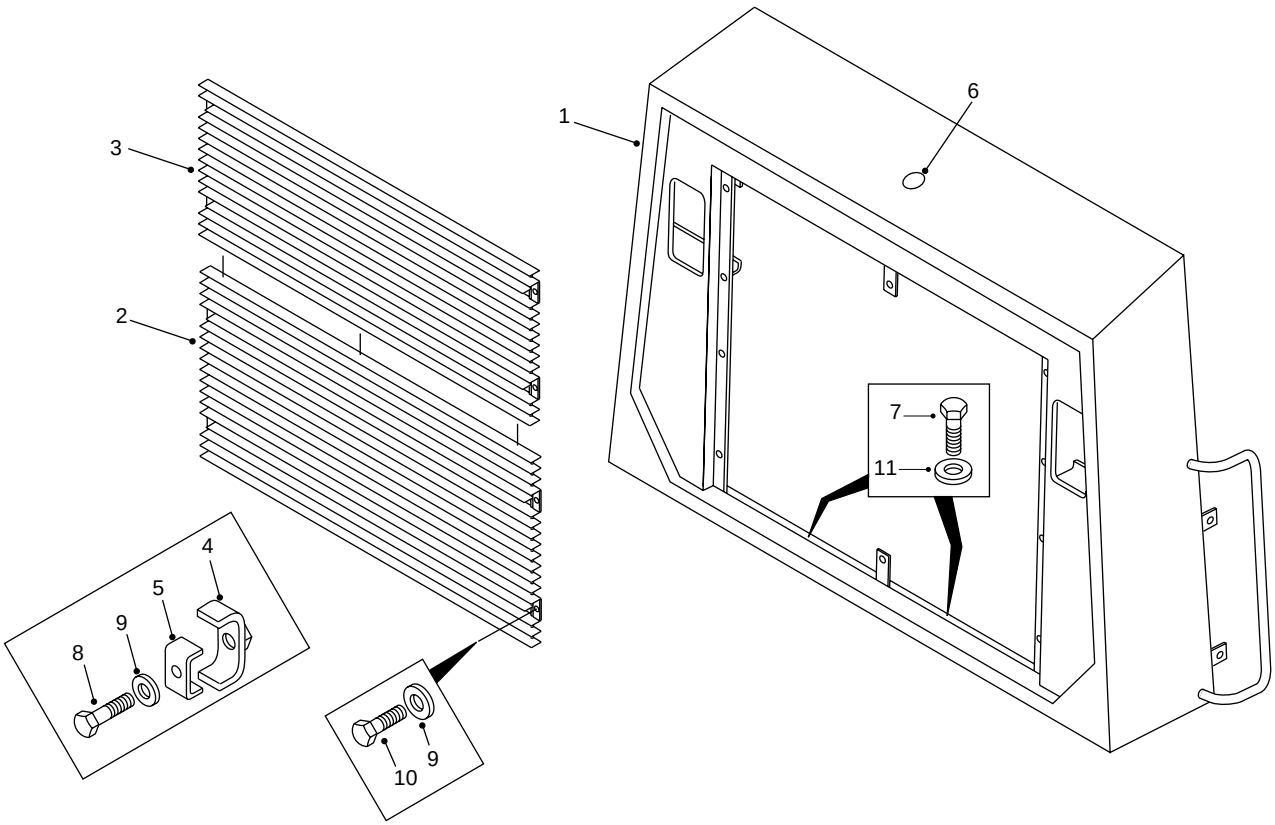
SM - 2386



1 - Bolt
2 - Bolt
3 - Bolt
4 - Hardened Washer
5 - Bolt
6 - Nut
7 - Locknut
8 - Hardened Washer
9 - Step Assembly
10 - Rung
11 - Hardened Washer
12 - Hardened Washer
13 - Rubber Strip
14 - Hardened Washer
15 - Bolt
16 - Step Assembly - LH
17 - Step Assembly - RH
18 - Hoodside - LH
19 - Hoodside - RH
20 - Panel Assembly - LH
21 - Panel Assembly - RH
22 - Bumper Extension - LH
23 - Bumper Assembly - RH
24 - Bracket
25 - Bracket
26 - 'U' Bolt & Nut
27 - Bolt
28 - Nut
29 - Hardened Washer
30 - Locknut
31 - Bolt
32 - Bolt
33 - Chain Assembly
34 - 'U' Bolt
35 - Locknut
36 - Nut
37 - Hardened Washer

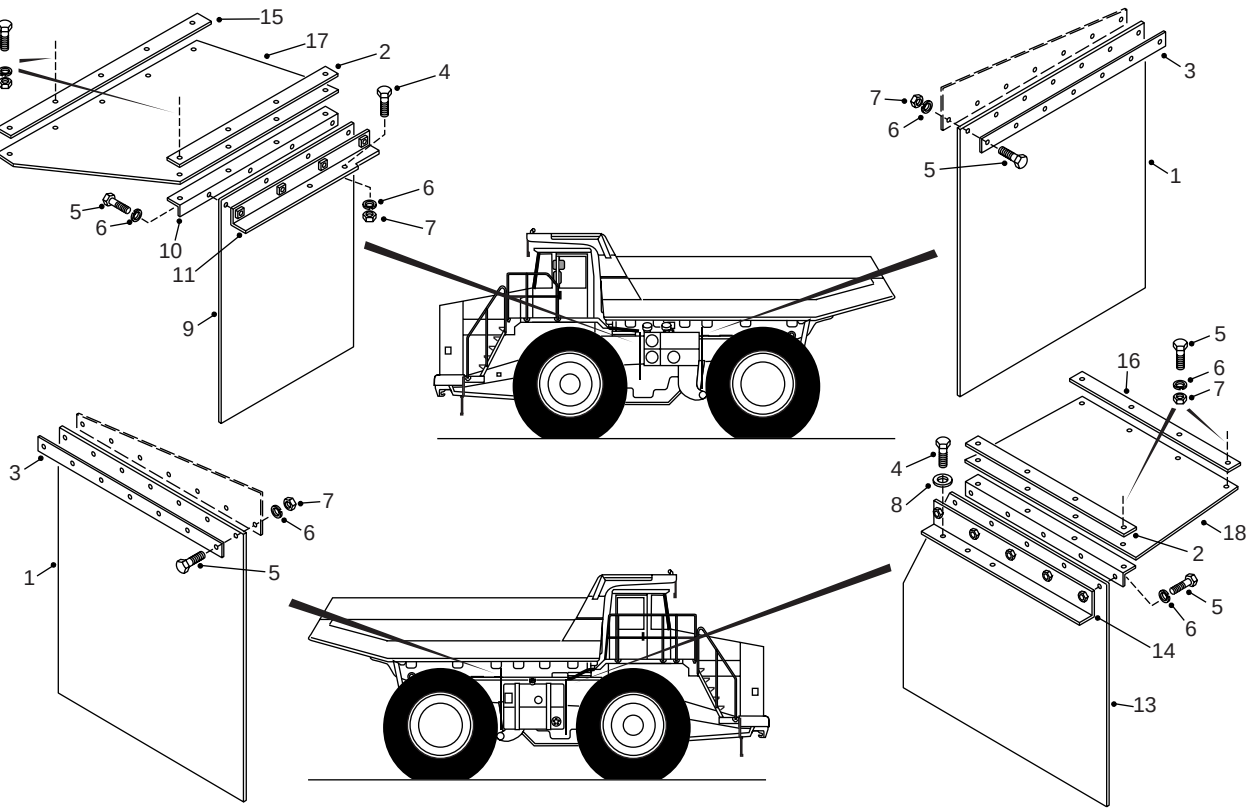
Fig. 4 - Exploded View of Ladders and Handrails

SM - 1589



1 - Radiator Guard
2 - Grille - Bottom
3 - Grille - Top
4 - Clamp
5 - Clip
6 - Button Plug
7 - Bolt
8 - Bolt
9 - Hardened Washer
10 - Bolt
11 - Hardened Washer

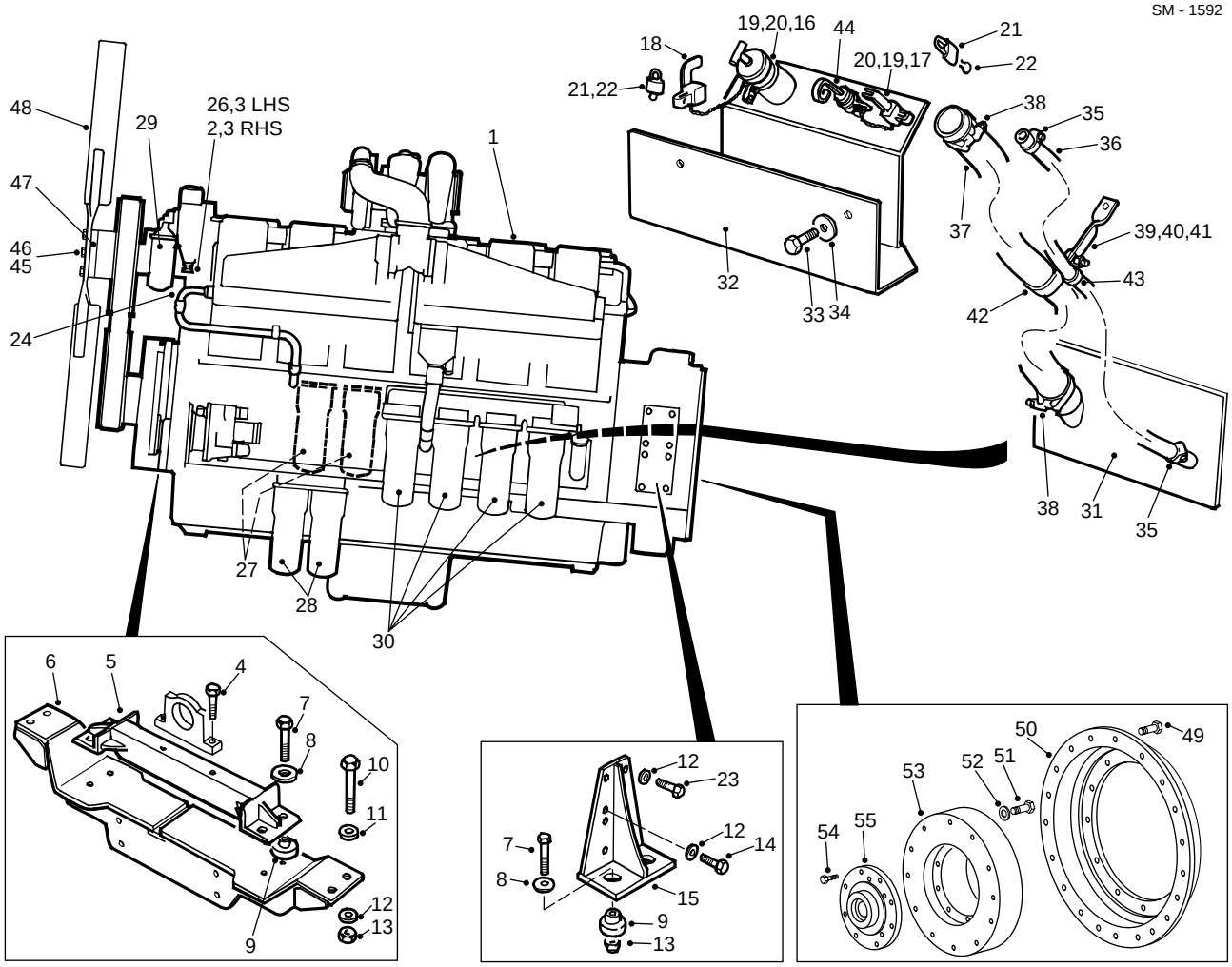
Fig. 5 - Exploded View of Radiator Guard and Mounting



1 - Mudguard
2 - Bar
3 - Bar
4 - Bolt
5 - Bolt
6 - Lockwasher
7 - Nut
8 - Hardened Washer
9 - Mudflap - LH
10 - Angle Support
11 - Angle Support
12 - Angle Support
13 - Mudflap - RH
14 - Angle Support
15 - Bar
16 - Bar
17 - Flap
18 - Flap

Fig. 6 - Mudguards

* * * *



1 - Engine	15 - Rear Mount	29 - Coolant Filter	
2 - Reducer Bush	16 - Clamp	30 - Lube Oil Filter	43 - Clip
3 - Drain Cock	17 - Latch	31 - Hand Hole Cover	44 - Dipstick
4 - Bolt	18 - Latch	32 - Plate Assembly	45 - Bolt
5 - Support	19 - Bolt	33 - Bolt	46 - Lockwasher
6 - Crossmember	20 - Locknut	34 - Hardened Washer	47 - Spacer
7 - Bolt	21 - Lock	35 - Clamp	48 - Fan
8 - Hardened Washer	22 - Key	36 - Dipstick Hose	49 - Bolt
9 - Shock Mount	23 - Bolt	37 - Filler Hose	50 - Adaptor
10 - Bolt	24 - Tube Assembly	38 - T-bar Clamp	51 - Bolt
11 - Hardened Washer	25 - Tube Assembly	39 - Twisted Bracket	52 - Hardened Washer
12 - Hardened Washer	26 - Reducer Bushing	40 - Bolt	53 - Drive Coupling
13 - Locknut	27 - Lube Oil Bypass Filter	41 - Nut	54 - Bolt
14 - Bolt	28 - Fuel Filter	42 - Clip	55 - Flange Coupling

Fig. 1 - Exploded View of Engine Mounting

DESCRIPTION

Numbers in parentheses refer to Fig. 1.

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

There are four full flow lube oil filters (30), two lube oil bypass filters (27) two fuel filters (28) and four coolant filters (29) installed on engine (1). Mounted at the front left hand side of the engine is the fuel pump and at the front right hand side of the engine is the alternator. There are two starter motors mounted at the rear right hand side of the engine, one of which is a prelube starter motor.

REMOVAL

Numbers in parentheses refer to Fig. 1.

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

⚠ High electrical current. Disconnect battery equalizer and battery cables at the batteries before removing engine attachments. High electrical current can cause sparks and personal injury from burns.

Note: Tag and identify all lines, hoses, cables and linkages disconnected to remove the engine.

1. Position the vehicle in a level work area, ensure the body is fully lowered, 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. Disconnect electrical connections as follows:
   a. Disconnect battery equalizer ground cables.
   b. Disconnect battery cables from terminal posts (ground cable first).
   c. Disconnect battery equalizer positive cables.
   d. Disconnect electrical connections at the ECU.

4. Remove mounting hardware securing the hood and hoodsides on the vehicle. Remove hood and hood side assemblies from the vehicle. Refer to Section 100-0010, CHASSIS, HOOD AND FENDERS.

5. Disconnect electrical connections from the radiator guard and remove mounting hardware securing the radiator guard on the vehicle. Remove radiator guard from the vehicle. Refer to Section 100-0010, CHASSIS, HOOD AND FENDERS.

⚠ WARNING
Harmful gas. Before disconnecting any air conditioner lines refer to Section 260-0130, AIR CONDITIONING. Refrigerant will rapidly freeze all objects with which it comes into contact, and it can cause serious damage to the skin and eyes.

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

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

8. With suitable containers in position, open drain cocks and drain coolant from the radiator assembly and engine (1) assembly. Close all drain cocks after draining.

9. Identify all cooling lines for ease of installation and with suitable containers in position, disconnect all cooling lines from engine (1).

10. Using suitable lifting equipment, carefully remove the radiator, shroud and screen assemblies from the vehicle. Refer to Section 210-0040, RADIATOR, HEADER TANK AND MOUNTING.

11. Disconnect and remove air cleaner intake pipes from the engine turbochargers and air cleaner plenum chamber. Refer to Section 110-0050, AIR CLEANER.

12. Disconnect and remove exhaust tubes from the engine turbochargers.

13. Disconnect throttle control linkage from engine (1).

14. Identify heater lines for ease of installation and, with a suitable container in position, disconnect heater lines from engine (1).

15. Close fuel shutoff valve at filter head, identify fuel lines for ease of installation and, with a suitable container in position, disconnect fuel lines from engine (1).

16. Slacken T-bar clamp (38) and clamp (35) securing filler hose (37) and dipstick hose (36) respectively to hand hole cover (31) on left hand side of engine (1). Remove hose assemblies (36 & 37) from hand hole cover (31) and cover hose ends and fittings to prevent entry of dirt.

17. Remove bolt (40), nut (41) and clips (42 & 43) from twisted bracket (39). Tie hose assemblies (36 & 37) away from engine (1) to prevent fouling during engine removal.

18. Identify all electrical harnesses and cables attached to engine (1) assembly for ease of installation and disconnect from engine (1) assembly.

19. Disconnect front driveline from engine coupling and secure clear of engine (1). Refer to Section 130-0010, FRONT DRIVELINE.

20. Using suitable lifting equipment, remove tandem pump assembly from the left hand side of the engine power takeoff. Refer to Section 250-0055, TANDEM PUMP. The hydraulic lines can be left attached to the tandem pump.

21. Using suitable lifting equipment, remove main hydraulic pump assembly from theright hand side of the engine power takeoff. Refer to Section 230-0050, MAIN HYDRAULIC PUMP. The hydraulic lines can be left attached to the main hydraulic pump.

⚠ 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.

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

23. Remove bolts (7) and hardened washers (8) securing support (5) assembly to crossmember (6). Remove locknuts (13), bolts (7) and hardened washers (8) securing rear mounts (15) to the chassis.

24. Check to make certain that all necessary line and electrical disconnections have been made before lifting engine (1) assembly.

25. Carefully lift engine (1) assembly clear of the chassis and move to a clean work area. Securely mount engine (1) assembly to a work stand.

26. If necessary, remove shock mounts (9) from support (5) assembly and rear mounts (15). Rear mounts (15) can be removed from engine (1) by removing bolts (14 & 23) and hardened washers (12). Support (5) assembly can be removed by removing bolts (4).

27. If it is necessary to remove crossmember (6) from the chassis, remove disc brake oil cooler and transmission oil cooler from crossmember (6) first. Refer to Section 210-0050, DISC BRAKE OIL COOLER, and, Section 210-0060, TRANSMISSION OIL COOLER.

28. With oil coolers removed, remove locknuts (13), hardened washers (12), bolts (10) and hardened washers (11). Remove front crossmember (6) from chassis mounts.

29. If necessary, adaptor (50) can be removed from the flywheel housing after the power takeoff and yoke assembly is removed. Refer to Section 110-0130, POWER TAKEOFF.

30. With the power takeoff and yoke assembly removed, remove bolts (49) and adapter (50) from the flywheel housing.

31. Remove bolts (51), hardened washers (52) and drive coupling (53) assembly from the flywheel.

32. Remove bolts (54) securing flange coupling (55) in drive coupling (53) and remove flange coupling (55) from drive coupling (53).

33. If necessary, support fan (48) assembly with suitable lifting equipment and remove bolts (45) and lockwashers (46) securing fan (48) and spacer (47) on engine (1) fan hub. Remove fan (48) and spacer (47).

INSPECTION

Numbers in parentheses refer to Fig. 1.

1. Inspect shock mounts (9) for damage and replace if damaged.

2. Check all mounting components for cracks and excessive wear. Repair or replace as required.

3. Inspect drive coupling (53) and flange coupling (55) for wear or damage and replace if necessary.

4. Replace all filters (27, 28, 29 & 30). Check all drive belts for tension and wear, as described under 'Maintenance'.

5. Refer to the Engine Service Manual for additional engine disassembly/assembly, repair, adjustment and tune-up procedures.

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

1. Position spacer (47) and fan (48) on engine (1) fan hub and secure with bolts (45) and lockwashers (46).

2. Thoroughly clean and dry threads on bolts (54) and drive coupling (53) and apply Loctite Activator 'T' to the threads. Apply Loctite 638 to the threads of bolts (54) and drive coupling (53). Position flange coupling (55) to drive coupling (53) and secure with bolts (54).

Note: The flange coupling must be installed on the drive coupling side opposite the side that has the part number on it. See Fig. 2.

3. Thoroughly clean and dry threads on bolts (51) and engine flywheel and apply Loctite Activator 'T' to the threads. Apply Loctite 638 to the threads of bolts (51) and engine flywheel. Position drive coupling (53) assembly to engine flywheel and secure with bolts (51) and hardened washers (52). The part number must be facing out. See Fig. 2.

Note: Incorrect assembly of drive coupling (53) assembly to the engine flywheel can cause engine and/or power takeoff damage.

4. Position adaptor (50) to the engine flywheel housing and secure with bolts (49). Install the power takeoff and yoke assembly to adaptor (50). Refer to Section 110-0130, POWER TAKEOFF.

5. Install new shock mounts (9) in support (5) assembly and rear mounts (15). Lubricate shock mounts (9) with water and press in using a driver of same diameter as internal metal sleeve in the shock mount to protect the rubber from damage.

6. Secure support (5) assembly to engine (1) with bolts (4). Secure rear mounts (15) to engine (1) with bolts (14 & 23) and hardened washers (12).

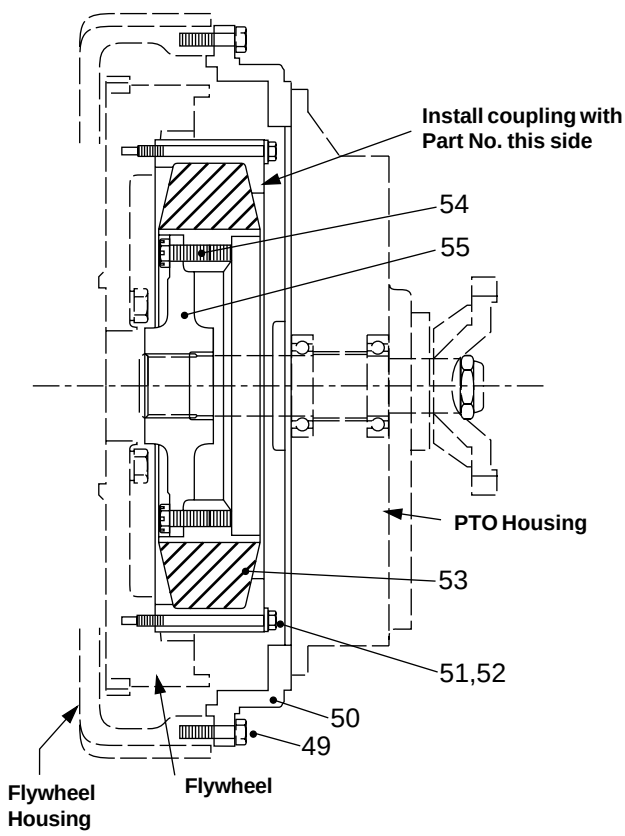

Fig. 2 - Sectional View of Engine Coupling Installation

7. Install front crossmember (6) on the chassis mounts and secure with bolts (10), hardened washers (11 & 12) and locknuts (13).

8. Install disc brake oil cooler and transmission oil cooler on front crossmember (6). Refer to Section 210-0050, DISC BRAKE OIL COOLER and, Section 210-0060, TRANSMISSION OIL COOLER.

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.

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

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