TM 5-2420-206-12

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL

TRACTOR, WHEELED, INDUSTRIAL: DIESEL DRIVEN; MED DBP, W/DOZER, W/SCARIFIER, W/DRAWBAR, TRAILER PINTLE AND HYDRAULIC SCRAPER CONTROLS (CLARK MODEL 290M)
FSN 2420-088-9384

CORRECTED COPY

This copy is a reprint which includes current pages from Changes 2 and 3.

HEADQUARTERS, DEPARTMENT OF THE ARMY
1 MARCH 1970

SAFETY PRECAUTIONS

BEFORE OPERATION

Do not start engine until transmission and control levers are positioned in neutral and handbrake is in set position.

Do not attempt to move tractor until air pressure gage indicates minimum of 90 psi.

Do not attempt to push-start on a hill where braking will be required. Brake system may not function until engine has started and compressor has built up proper pressure.

Disconnect battery leads at batteries before disconnecting engine electrical leads.

Do not smoke or use open flame in vicinity when servicing batteries or testing cold weather starting and fluid. Batteries generate hydrogen, a highly explosive gas. Prevent starting aid fluid from contacting hot engine parts.

Do not operate engine in an unvented enclosure unless exhaust fumes are piped outside.

Do not move tractor until all personnel have been cleared from tractor and operating areas.

When changing tires stand to the side. The lockring can snap out with enough force to cause serious [illegible]y.

[illegible]o not weld fuel tanks or hydraulic tank unless all fumes have been expelled. Ground welder to frame [illegible]ear weld point.

Use care during maintenance of oil pump and air brake chamber. Springs and covers can snap out with enough force to cause serious injury.

Replace and secure covers, lids, and guards after performing maintenance checks and services. Stow tools.

Remove lubricants from hand holds, control handles, catwalks and steps.

When using fire extinguishers avoid breathing fumes and smoke.

DURING OPERATION

Look in direction of move prior to initiating movement. Be sure all personnel are clear.

Do not allow personnel to ride on rear half, or stand at swivel point of tractor.

Keep personnel clear of raised blade. Rupture of hydraulic line would cause blade to fall suddenly.

Stop unit and engine when adjustments or servicing is required.

Do not operate tractor in an enclosed area unless exhaust gases are piped outside. Inhalation of exhaust fumes will result in serious illness or death.

Do not smoke or permit an open flame near batteries or fuel tank when servicing.

When using fire extinguisher avoid breathing fumes and smoke. Keep hands, floor, and controls free of grease, oil, or mud to avoid possible serious injury.

AFTER OPERATION

Place operating levers in neutral position and set handbrake. Lower dozer blade to ground (when applicable) before stopping engine.

Disconnect battery leads at batteries before disconnecting engine electrical leads.

Replace and secure covers, lids, and guards after performing maintenance checks and services. Stow tools.

Do not smoke or permit an open flame near batteries or fuel tank when servicing.

Remove lubricants from hand holes, control handles, catwalks and steps.

Do not operate engine in an unvented enclosure unless exhaust fumes are piped outside.

When changing tires, stand to the side. The lockring can snap out with enough force to cause serious injury.

Do not weld fuel tank or hydraulic tank until all fumes have been expelled. Ground welder to frame near weld point.

Use care during maintenance of oil pump and air brake chamber. Springs and covers can snap out with enough force to cause serious injury.

When using fire extinguisher avoid breathing fumes and smoke. When filling fuel tank, always provide a metal-[illegible]en fuel tank and container. This will prevent a spark from being generated as fuel fl[illegible]e.

Do [illegible]p from a hot engine until engine has been shut down for five minutes to re-[illegible]ieve pre[illegible]g burned.

*TM 5-2420-206-12
C 3

CHANGE
NO. 3

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *8 July 1974*

Operator and Organizational Maintenance Manual

TRACTOR, WHEELED, INDUSTRIAL: DIESEL DRIVEN; MED DBP, W/DOZER, W/SCARIFIER, W/DRAWBAR, TRAILER PINTLE AND HYDRAULIC SCRAPER CONTROLS (CLARK MODEL 290M) FSN 2420-088-9384

TM 5-2420-206-12, 19 March 1970, is changed as follows:

Inside Front Cover. Add the following warnings to the list of safety precautions:

WARNING

Operation of this equipment presents a noise hazard to personnel in the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F. - 138°F.

Page 1-1. Paragraph 1-2*b* is superseded as follows:

b. You can help to improve this manual by calling attention to errors and by recommending improvements. Your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) should be mailed direct to Commander, US Army Troop Support Command, ATTN: AMSTS-MPP, 4300 Goodfellow Boulevard, St. Louis, Missouri 63120. A reply will be furnished direct to you.

Page 2-1. Immediately after Chapter 2 title, add the following warning:

WARNING

Operation of this equipment presents a noise hazard to personnel to the area. The noise level exceeds the allowable limits for unprotected personnel. Wear ear muffs or ear plugs which were fitted by a trained professional.

Page 3-1. Immediately after Chapter 3 title, add the following warning:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F. - 138°F.

Page 3-1, paragraph 3-4. Add subparagraph *f* as follows:

f. Engine Oil Level. Check crankcase to insure that engine has oil in it. Start engine and let idle for three to five minutes. Stop engine and wait 30 minutes. Check oil level and add oil at this time to bring it to the proper level on the dipstick.

Paragraph 3-5*a* is superseded as follows:

a. Filters. Service engine oil system filters as illustrated in figure 3-1. After servicing, start engine and check filters for leaks. Stop engine. Wait 30 minutes, then check if engine oil level is up to full mark on dipstick. Check gages for proper pressure (sheet 1 of 6, fig. 2-7).

Page 3-12. Under "COOLANT SYSTEM", after "Security of hardware mounted items", add the following to table 3-1.

*This change supersedes C1, dated 24 June 1971.

Item number	Interval: Operator: Daily: S	D	A	Operator: W	Org: M	Org: Q	Item to be inspected	Procedure	Reference
						•	Water pump	Remove plug and inspect for lubrication. NOTE Grease cavity in water pump is to be one-half to two-thirds full. If accidentally overfilled, remove fitting to relieve pressure and run engine until a sufficient amount of grease has discharged. Over-lubrication can damage the seal.	

S Before operation D During operation A After operation W Weekly M Monthly Q Quarterly

Page 4-1. Immediately after Chapter 4 title, add the following warning:

WARNING

Dry cleaning solvent, P-D-680, used to clean parts is potentially dangerous to personnel and property. Do not use near open flame or excessive heat. Flash point of solvent is 100°F.- 138°F.

Page A-1, paragraph A-4. Add the following reference: "TB MED 251, Noise and Conservation of Hearing".

By Order of the Secretary of the Army:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:
VERNE L. BOWERS
Major General, United States Army
The Adjutant General

Distribution:
To be distributed in accordance with DA Form 12-25A, (qty rqr block no. 293) Operator maintenance requirements for Warehouse Equipment.

884-074

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TM 5-2420-206-12
C 2

Change
No. 2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., 2 June 1972

Operator and Organizational Maintenance Manual
TRACTOR, WHEELED, INDUSTRIAL: DIESEL DRIVEN; MED DBP, W/DOZER, W/SCARIFIER, W/DRAWBAR, TRAILER PINTLE AND HYDRAULIC SCRAPER CONTROLS (CLARK MODEL 290M) FSN 2420-088-9384

TM 5-2420-206-12, 19 March 1970, is changed as follows:

Page 2-1. Paragraph 2-1*e* is added as follows:

e. A list of maintenance and operating supplies required for initial operation of the tractor are contained in table 2-1.

Table 2-1. Maintenance and Operating Supplies

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
CRANKCASE	9150-680-1099 (2)	OIL, LUBRICATING: 5 gal can as follows:			
	9150-680-1102 (2)	HDO 30	40 qt	(3)	(1) Includes quantity of oil to fill engine oil system as follows: 36 qts - crankcase
	9150-242-7603 (2)	HDO 10	40 qt	(3)	4 qts - oil filter
		OES	40 qt	(3)	(2) See FSC C9100IL for additional data and requisitioning procedure.
FUEL TANK	9140-286-5294 (2)	FUEL OIL, DIESEL: Bulk as follows:			
	9140-286-5286 (2)	DF-2 Regular Grade	196 gal	(4)	(3) See current LO for grade application and replenishment intervals.
	9140-286-5283 (2)	DF-1 Winter Grade	196 gal	(4)	
ENGINE STARTING AID ANEROID CONTROL	2910-565-9424	DFA, Arctic Grade	196 gal	(4)	(4) Tank capacity.
	9150-265-9428 (2)	CYLINDER, FUEL	1		
BRAKE RESERVOIR	9150-242-7603 (2)	OIL, LUBRICATING: 5 gal can as follows: OE-10	2 oz	(3)	
		OES	2 oz	(3)	
BEARING BOX	9150-265-9428 (2)	OIL, LUBRICATING			
	9150-242-7603 (2)	OE-10	2 qt ea	(3)	
		OES	2 qt ea	(3)	
TRANSMISSION AND TORQUE CONVERTER	9150-265-9428 (2)	OIL, LUBRICATING			
	9150-242-7603 (2)	OE-10	5 qts	(3)	
		OES	5 qts	(3)	
HYDRAULIC RESERVOIR	9150-265-9428 (2)	OIL, LUBRICATING			
	9150-242-7603 (2)	OE-10	72 qts	(3)	
		OES	72 qts	(3)	
RADIATOR	9150-265-9428 (2)	OIL, LUBRICATING			
	9150-242-7603 (2)	OE-10	500	(3)	
		OES	500	(3)	
	6850-243-1990	WATER	84 qts		
		Ethylene Glycol	49 qts		

Table 2-1. Maintenance and Operating Supplies — Continued

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
	6850-174-1806	ANTIFREEZE: 55 gal drum as follows: Compound Arctic	84 qts		
DIFFERENTIALS FRONT AND REAR		LUBRICATING OIL, GEAR: 5 gal drum as follows:			
	9150-577-5844 (2)	GO-90	34½ qts ea	(3)	
	9150-257-5440 (2)	GOS	34½ qts ea	(3)	
PLANETARIES FRONT AND REAR		LUBRICATING OIL, GEAR: 5 gal drum as follows:			
	9150-577-8544 (2)	GO-90	13 qts ea	(3)	
	9150-257-5440 (2)	GOS	13 qts ea	(3)	
GREASE POINTS		GREASE, AUTOMOTIVE AND ARTILLERY: 35 lb pail as follows:			
	9150-190-0907 (2)	GAA		(3)	

Page B-1. Appendix B is superseded as follows:

APPENDIX B
BASIC ISSUE ITEMS LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

B-1. Scope

This appendix lists items required by the operator for operation of the tractor.

B-2. General

This list is divided into the following sections:

a. Basic Issue Items List — Section II. Not applicable.

b. Items Troop Installed or Authorized List — Section III. A list of items in alphabetical sequence, which at the discretion of the unit commander may accompany the tractor. These items are NOT subject to turn-in with the tractor when evacuated.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized, Section III.

a. Source, Maintenance, and Recoverability Code(s) (SMR):

(1) Source Code, indicates the source for the listed item. Source codes are:

Code	Explanation
P	Repair parts, special tools and test equipment supplied from GSA, DSA or Army supply system and authorized for use at indicated maintenance levels
P2	Repair parts, special tools and test equipment which are procured and stocked for insurance purposes because the combat or military essentiality of the end item dictates that a minimum quantity be available in the supply system

(2) Maintenance Code, indicates the lowest level of maintenance authorized to install the listed item. The maintenance level code is:

Code	Explanation
C	Crew/Operator

(3) Recoverability Code, indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are non-recoverable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts (assemblies and components), special tools and test equipment which are considered economically reparable at direct and general support maintenance levels.
S	Repair parts, special tools, test equipment and assemblies which are economically reparable at DSU and GSU activities and which normally are furnished by supply on an exchange basis.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name and any additional description of the item required.

d. Unit of Measure (U/M). A 2 character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based, e.g., ft, ea, pr, etc.

e. Quantity Furnished With Equipment (BIIL only). This column indicates the quantity of an item furnished with the equipment.

f. Quantity Authorized (Items Troop Installed or Authorized Only). This column indicates the quantity of the item authorized to be used with the equipment.

g. Illustration (BIIL only). This column is divided as follows:

(1) *Figure number.* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number.* Indicates the callout number used to reference the item in the illustration.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) Smr code	(2) Federal stock number	(3) Description: Ref No. & Mfr code	(3) Description: Usable on code	(4) Unit of meas	(5) Qty auth
	7520-559-9618	CASE, MAINTENANCE AND OPERATION MANUALS		EA	1
	4210-889-2221	EXTINGUISHER, FIRE		EA	1

By Order of the Secretary of the Army.

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

Official:

VERNE L. BOWERS,
Major General, United States Army,
The Adjutant General.

Distribution:
To be distributed in accordance with DA Form 12-25B (qty rqr block no. 489) Operator's Maintenance requirements for Tractor Wheeled: Medium.

US ARMY ADJUTANT GENERAL PUBLICATIONS CENTER, ST. LOUIS, MO 1965

Technical Manual
No. 5-2420-206-12

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, D. C., *19 March 1970*

Operator and Organizational Maintenance Manual

TRACTOR, WHEELED, INDUSTRIAL: DIESEL DRIVEN; MED DBP, W/DOZER, W/SCARIFIER, W/DRAWBAR, TRAILER PINTLE AND HYDRAULIC SCRAPER CONTROLS (CLARK MODEL 290M) FSN 2420-088-9384

*This manual together with TM 5-2420-206-35 supersedes TM 5-2420-206-15, 14 June 1966 including all changes.

LIST OF ILLUSTRATIONS

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1-1. Scope

a. This manual contains instructions for the use of operating and organizational personnel maintaining the Clark Tractor Model 290M as allocated by the Maintenance Allocation Chart. It provides information on the operation, lubrication, preventive maintenance checks and services of equipment, accessories, components and attachments. It provides organizational maintenance of the equipment, shipment and administrative storage, and destruction to prevent enemy use.

b. Repair parts for organizational maintenance are listed and illustrated in TM 5-2420-206-20P. Refer to TM 740-90-1 (Administrative Storage of Equipment), for information and instructions pertaining to organizational administrative storage.

c. Refer to TM 750-244-3 (Procedures for Destruction of Equipment to Prevent Enemy Use), for information and instructions on destruction of equipment to prevent enemy use.

1-2. Forms and Records

a. DA Forms and procedures used for equipment maintenance will be only those prescribed by TM 38-750, Army Equipment Record Procedures.

b. Report of errors, omissions and recommendations for improving this publication by the individual is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded to Commanding General, U. S. Army Mobility Equipment Command, ATTN: AMSME-MPP, 4300 Goodfellow Boulevard, St. Louis, Mo. 63120.

Section II. DESCRIPTION AND DATA

1-3. Description

a. The Clark Tractor Model 290M, figures 1-1 and 1-2, is a four wheel drive, hinged frame, industrial tractor, powered by a 6-cylinder, valve-in-head, diesel engine equipped with a turbocharter for operation of equipment at all altitudes. A hydraulically operated bulldozer/scarifier is attached to the tractor. Batteries supply 24 volt direct current power for starting tractor, lights, and engine controls. Refer to wiring diagram, figure 1-3.

b. The air system supplies controlled air pressure to individual air/hydraulic brake chambers which applies pressure to each tractor wheel brake. The system also supplies air to brakes of towed vehicle. Refer to tractor air system, figure 1-4.

c. The tractor hydraulic system supplies controlled oil pressures to activate steering, bulldozer and towed vehicle (scraper) cylinder assemblies. Refer to hydraulic system, figures 1-5 and 1-6.

d. Refer to figures 1-7 and 1-8 for engine oil and fuel lines and fittings diagrams.

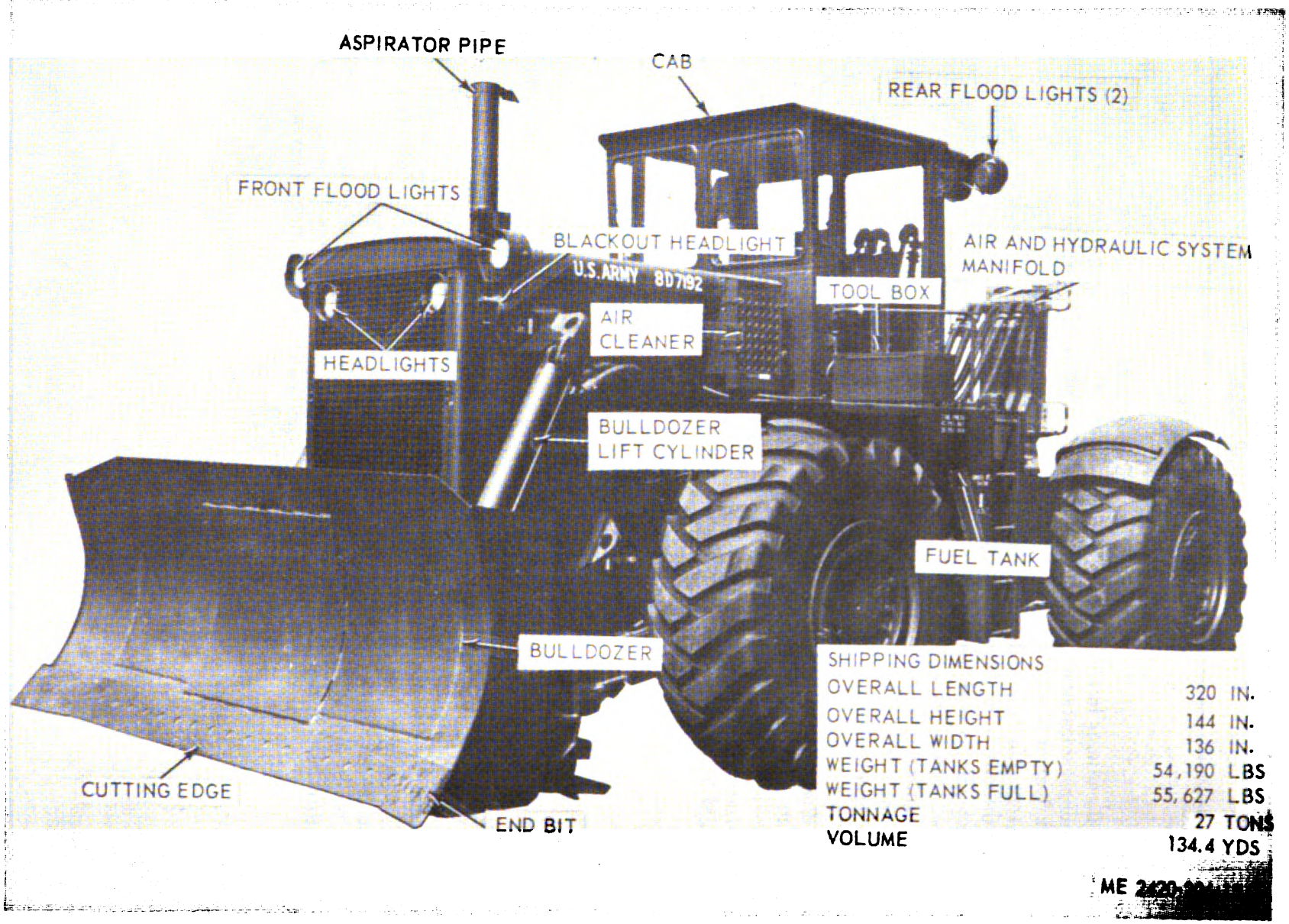


Figure 1-1. Left front three-quarter view with shipping dimension.

Figure 1-2. Right rear three-quarter view.

1 Lamp assembly
2 Tail and stop light
3 Lamp assembly
4 Trailer receptacle
5 Rear cab harness
6 Toggle switch
7 Light switch
8 Front cab harness
9 Main harness
10 Wiring harness
11 Stop light switch
12 Head lamp assembly
13 Blackout light assembly
14 Temperature switch
15 Indicator lamp
17 Pressure switch
18 Wiring harness
19 Fuel solonoid
20 Low air pressure warning switch
21 Cable
22 Low air pressure indicator
23 Generator
23A Starter-to-ground cable
24 Cranking motor
25 Solenoid switch
26 Neutral starter switch
26A Generator-to-regulator cable
27 Regulator
27A Regulator-to-ammeter harness
28 Ammeter
29 Circuit breaker
39 Starter switch
31 Selector switch
32 Utility outlet
33 Panel lamp
34 Horn
35 Horn button assembly
36 Battery
37 Master disconnect switch
38 Battery receptacle
39 Dash lamp
40 Dash lamp cable
41 Dash lamp cable
42 Overspeed governor
43 Overspeed governor to horn wire
44 Warning horn (overspeed)
45 Horn to circuit breaker wire

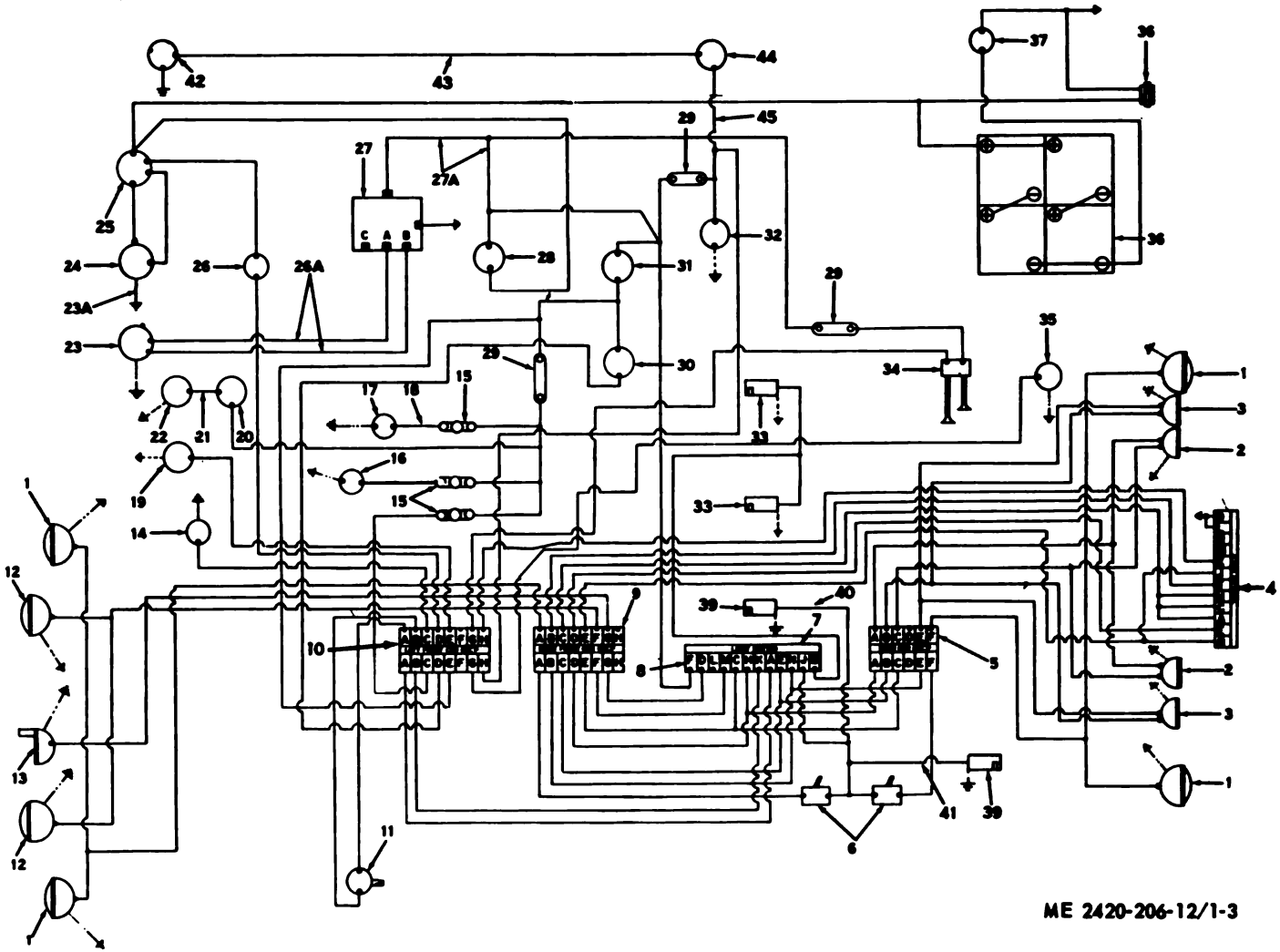
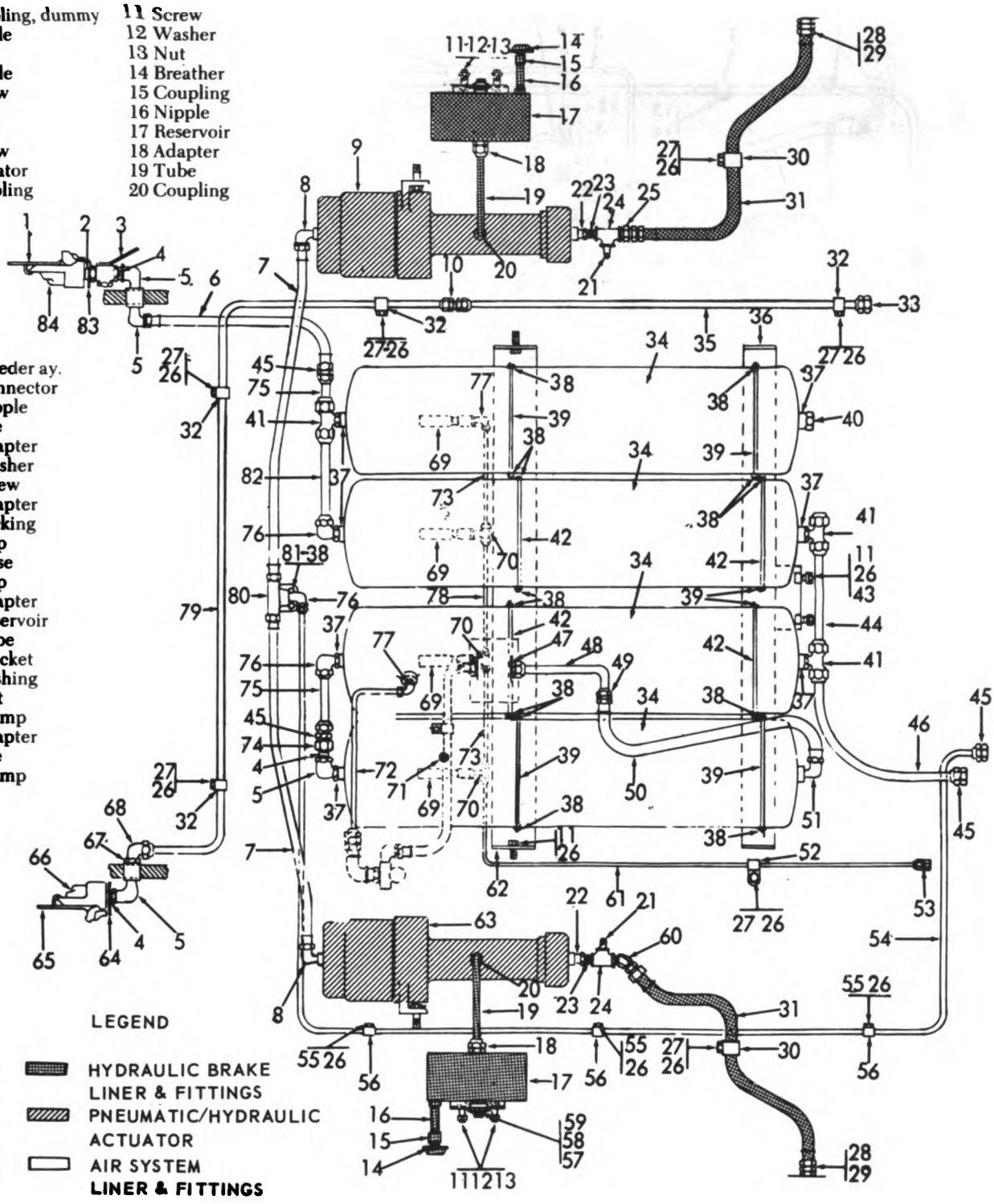


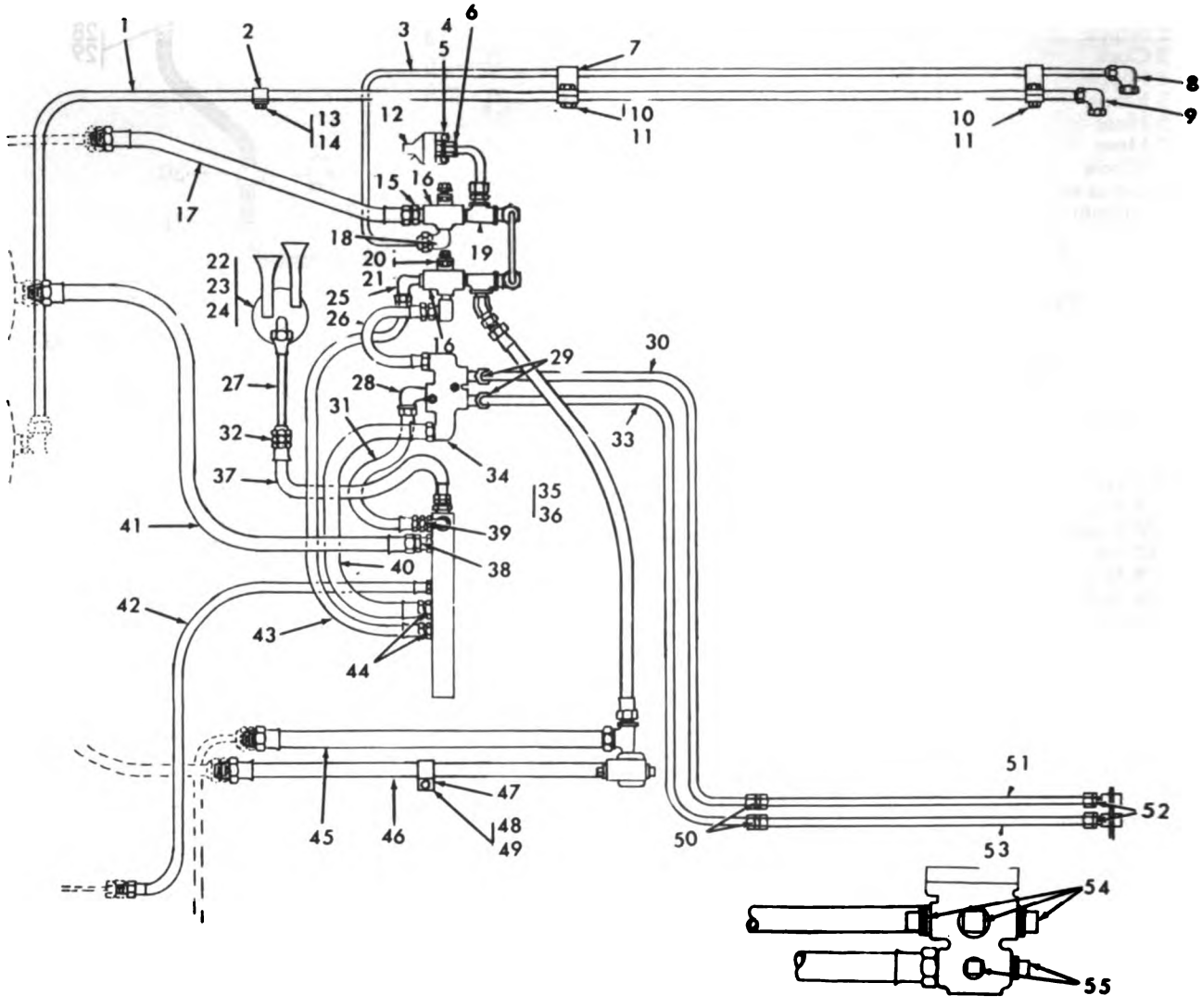
Figure 1-3. Wiring diagram.



1 Coupling, dummy
2 Nipple
3 Cock
4 Nipple
5 Elbow
6 Hose
7 Hose
8 Elbow
9 Actuator
10 Coupling
11 Screw
12 Washer
13 Nut
14 Breather
15 Coupling
16 Nipple
17 Reservoir
18 Adapter
19 Tube
20 Coupling
21 Bleeder ay.
22 Connector
23 Nipple
24 Tee
25 Adapter
26 Washer
27 Screw
28 Adapter
29 Packing
30 Clip
31 Hose
32 Clip
33 Adapter
34 Reservoir
35 Tube
36 Bracket
37 Bushing
38 Nut
39 Clamp
40 Adapter
41 Tee
42 Clamp
43 Washer
44 Tube
45 Adapter
46 Tube
47 Adapter
48 Tube
49 Adapter
50 Hose
51 Elbow
52 Clip
53 Elbow
54 Tube
55 Screw
56 Clip
57 Cap
58 Nut
59 Screw
60 Elbow
61 Tube
62 Bracket
63 Actuator
64 Tag
65 Coupling, dummy
66 Coupling
67 Bushing
68 Elbow
69 Valve
70 Tee
71 Valve
72 Tube
73 Tube
74 Valve
75 Tube
76 Elbow
77 Elbow
78 Tube
79 Tube
80 Valve
81 Screw
82 Tube
83 Tag
84 Coupling

ME 2420-206-12/1-4 (1)

Figure 1-4. Air system and hydraulic brake lines and fittings (sheet 1 of 3).



ME 2420-206-12/1-4 (2)

1 Tube
2 Clip
3 Tube
4 Capscrew
5 Self-locking nut
6 Connector
7 Clip
8 Elbow
9 Elbow
10 Capscrew
11 Lockwasher
12 Stoplight switch
13 Lockwasher
14 Capscrew
15 Pipe bushing
16 Check valve
17 Hose
18 Elbow
19 Tee
20 Capscrew
21 Self-locking nut
22 Capscrew
23 Self-locking nut
24 Horn
25 Pipe elbow
26 Capscrew
27 Self-locking nut
28 Hose
29 Tube
30 Pipe elbow
31 Pipe elbow
32 Tube
33 Hose
34 Straight adapter
35 Hose
36 Valve
37 Reducer bushing
38 Adapter
39 Hose
40 Straight adapter
41 Elbow
42 Hose
43 Hose
44 Hose
45 Hose
46 Straight adapter
47 Hose
48 Hose
49 Clip
50 Capscrew
51 Self-locking nut
52 Connector
53 Tube
54 Elbow
55 Tube

Figure 1-4. Air system and hydraulic brake lines and fittings (sheet 2 of 3).

1 Breather
2 Coupling
3 Pipe nipple
4 Elbow
5 Capscrew
6 Flat washer
7 Self-locking nut
8 Capscrew
9 Nut
10 Cap
11 Reservoir
12 Elbow
13 Left hand reservoir tube
14 Elbow
15 Tube coupling
16 Adapter
17 Hose
18 Straight adapter
19 Capscrew
20 Lockwasher
21 Clip
22 Tube
23 Nipple
24 Elbow
25 Tee
26 Inlet bleeder
27 Connector
28 Dummy connector
29 Hose coupling
30 Service tag
31 Pipe nipple
32 Coutout cock
33 Pipe nipple
34 Tube
35 Tube
36 Straight adapter
37 Tube
38 Pipe nipple
39 Cutout cock
40 Trailer tag
41 Pipe nipple
42 Hose coupling
43 Dummy coupling
44 Hose
45 Hose
46 Plate
47 Block
48 Straight adapter
49 Plate
50 Block
51 Tube
52 Straight adapter
53 Connector
54 Capscrew
55 Flat washer
56 Self-locking nut
57 Relay valve
58 Straight adapter
59 Hose
60 Elbow
61 Bracket
62 Right hand reservoir tube
63 Tube
64 Adapter

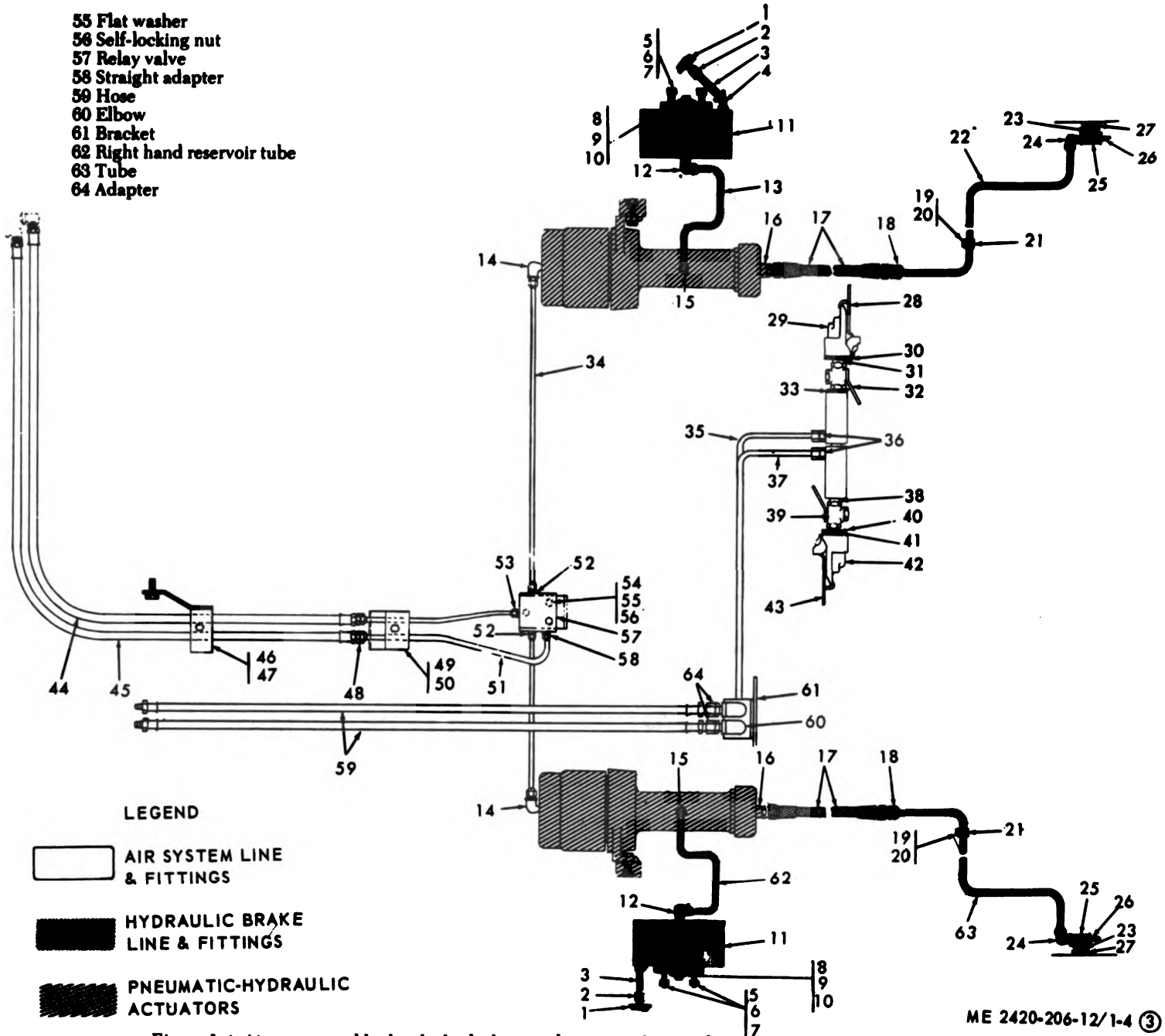
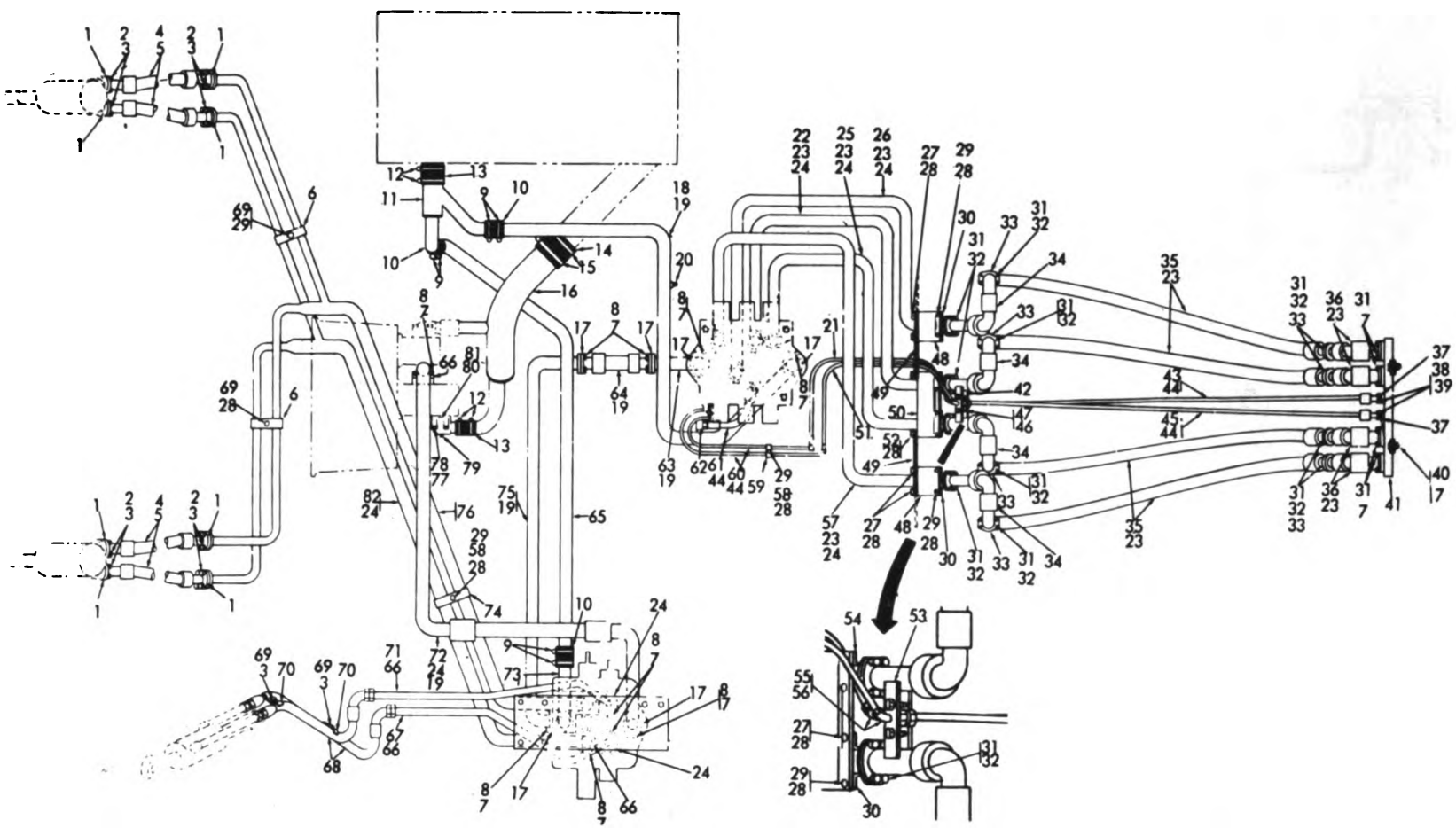


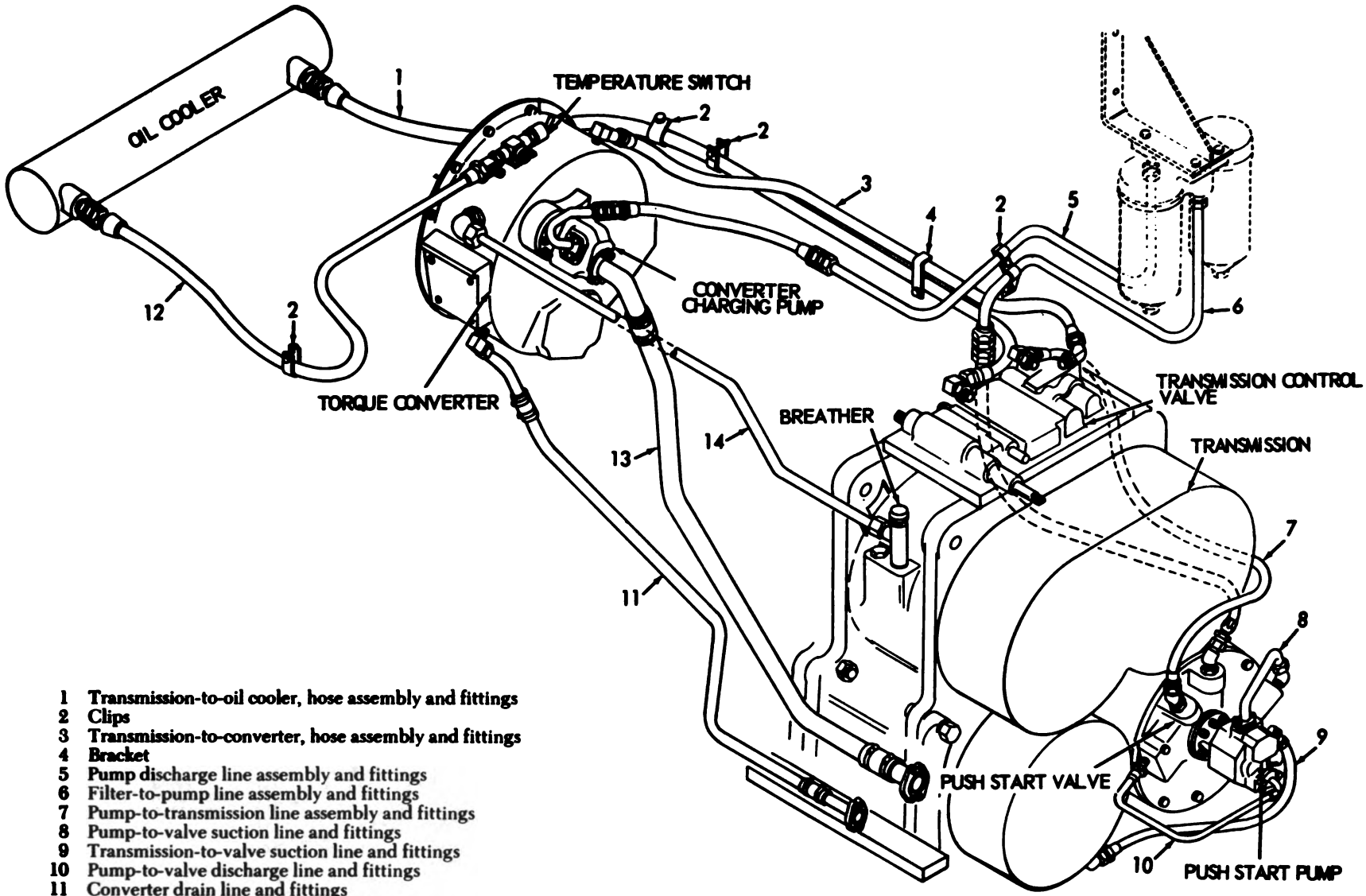
Figure 1-4. Air system and hydraulic brake lines and fittings (sheet 3 of 3).



1 Flange
2 Screw
3 Washer
4 Hose
5 Packing
6 Clip
7 Washer
8 Screw
9 Clamp
10 Hose
11 Tube
12 Clamp
13 Hose
14 Hose
15 Clamp
16 Tube
17 Flange
18 Tube
19 Packing
20 Plug
21 Hose
22 Tube
23 Packing
24 Packing
25 Tube
26 Tube
27 Screw
28 Nut
29 Screw
30 Clip
31 Screw
32 Washer
33 Flange
34 Swivel
35 Hose
36 Swivel
37 Flange
38 Screw
39 Washer
40 Screw
41 Stop
42 Clip
43 Hose
44 Packing
45 Hose
46 Screw
47 Nut
48 Bracket
49 Plate
50 Bracket
51 Hose
52 Screw
53 Plate
54 Clip
55 Elbow
56 Nut
57 Tube
58 Washer
59 Clip
60 Tube
61 Hose
62 Elbow
63 Tube
64 Hose
65 Tube
66 Flange
67 Tube
68 Hose
69 Screw
70 Clip
71 Tube
72 Hose
73 Tube
74 Clamp
75 Tube
76 Tube
77 Washer
78 Screw
79 Plug
80 Packing
81 Adapter
82 Adapter

ME 2420-206-12/1-5 (1)

Figure 1-5. Main and transmission-converter, hydraulic systems (sheet 1 of 2).



1 **Transmission-to-oil cooler, hose assembly and fittings**
2 **Clips**
3 **Transmission-to-converter, hose assembly and fittings**
4 **Bracket**
5 **Pump discharge line assembly and fittings**
6 Filter-to-pump line assembly and fittings
7 Pump-to-transmission line assembly and fittings
8 Pump-to-valve suction line and fittings
9 Transmission-to-valve suction line and fittings
10 Pump-to-valve discharge line and fittings
11 Converter drain line and fittings
12 Converter-to-oil cooler line and fittings
13 Converter pump suction line assembly and fittings
14 Converter-to-breather line assembly and fittings

Figure 1-5. Main and transmission-converter, hydraulic systems (sheet 2 of 2).

1 Capscrew
2 Lockwasher
3 Split flange
4 Capscrew
5 Lockwasher
6 Split flange
7 Hose
8 Preformed packing
9 Preformed packing
10 Hose clamp
11 Hose
12 Tube
13 Capscrew
14 Self-locking nut
15 Capscrew
16 Lockwasher
17 Split flange
18 Hose
19 Preformed packing
20 Hose
21 Straight adapter
22 Capscrew
23 Washer
24 Self-locking nut
25 Tube clamp
26 Capscrew
27 Self-locking nut
28 Tube bracket
29 Capscrew
30 Self-locking nut
31 Tube bracket
32 Capscrew
33 Self-locking nut
34 Tube clamp
35 Capscrew
36 Tube bracket
37 Capscrew
38 Lockwasher
39 Tube clamp
40 Plate
41 Lower tube
42 Upper tube
43 Capscrew
44 Lockwasher
45 Split flange
46 Capscrew
47 Lockwasher
48 Split flange
49 Hose
50 Preformed packing
51 Preformed packing

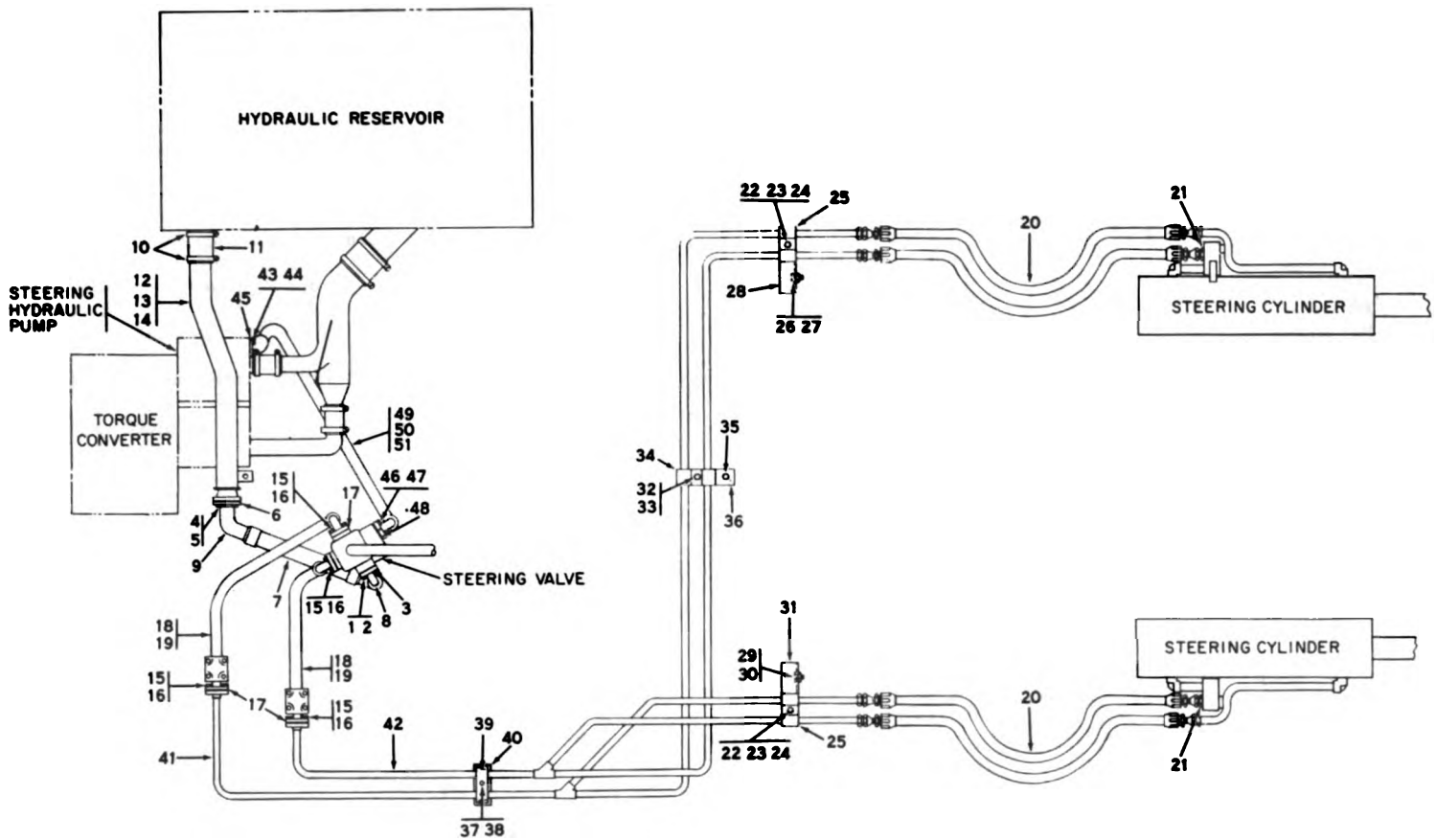
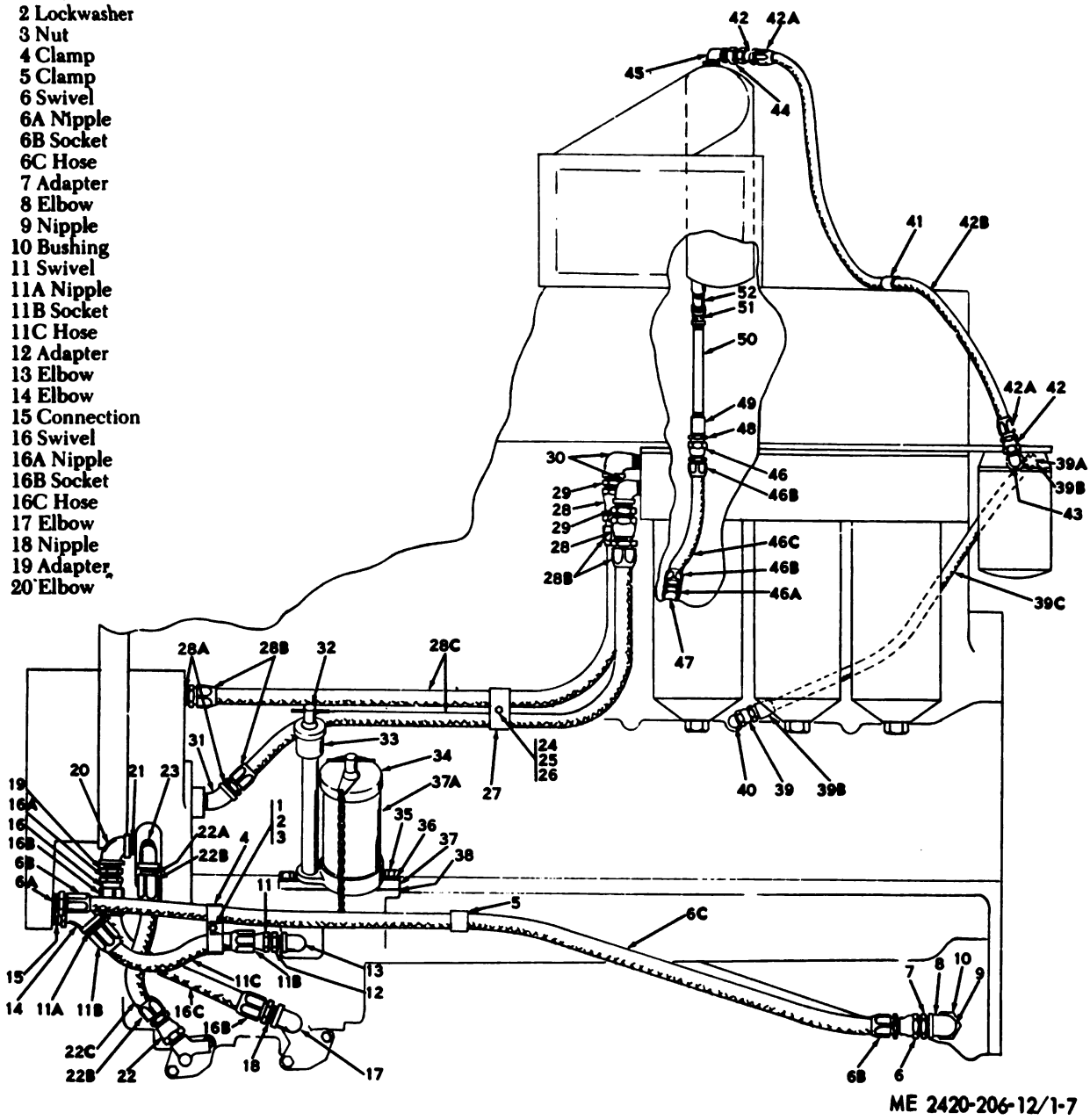


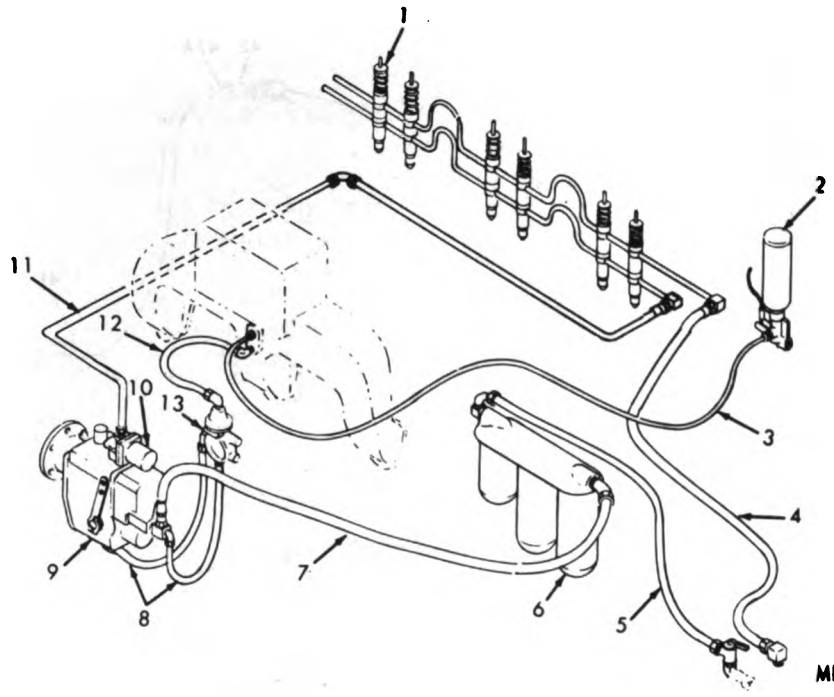
Figure 1-6. Steering hydraulic system, lines and fittings.

1 Screw
2 Lockwasher
3 Nut
4 Clamp
5 Clamp
6 Swivel
6A Nipple
6B Socket
6C Hose
7 Adapter
8 Elbow
9 Nipple
10 Bushing
11 Swivel
11A Nipple
11B Socket
11C Hose
12 Adapter
13 Elbow
14 Elbow
15 Connection
16 Swivel
16A Nipple
16B Socket
16C Hose
17 Elbow
18 Nipple
19 Adapter
20 Elbow



21 Nipple
22 Swivel
22A Nipple
22B Socket
22C Hose
23 Elbow
24 Screw
25 Lockwasher
26 Nut
27 Clamp
28 Swivel
28A Nipple
28B Socket
28C Hose
29 Adapter
30 Elbow
31 Elbow
32 Dipstick
33 Dipstick tube
34 Filler cap
35 Capscrew
36 Lockwasher
37 Bracket
37A Filler tube
38 Gasket
39 Swivel
39A Nipple
39B Socket
39C Hose
40 Elbow
41 Hose clip
42 Swivel
42A Socket
42B Hose
43 Elbow
44 Connector
45 Elbow
46 Swivel
46A Nipple
46B Socket
46C Hose
47 Elbow
48 Adapter
49 Coupling pipe
50 Pipe nipple
51 Elbow
52 Pipe nipple

Figure 1-7. Engine oil lines and fittings.



1 Injector
2 Ether starting aid
3 Tube
4 Hose
5 Hose
6 Filters
7 Hose
8 Hose
9 Fuel pump
10 Fuel shutoff solenoid
11 Tube
12 Hose
13 Aneroid

Figure 1-8. Fuel lines and fittings.

1-4. Identification and Tabulated Data

a. Identification. The tractor has seven identification plates.

(1) *U. S. Army plate.* Located in cab to right of instrument panel, specifies tractor and engine manufacturer, models, serial numbers, FSN and contract number.

(2) *Transportation data plate.* Located in cab to right of the instrument panel, specifies center of gravity and tonnage for lifting with cables.

(3) *Tractor lubrication plate.* Located next to transportation plate.

(4) *Engine plate.* Located on left front side of engine. Specifies manufacturer, model, size, and serial number.

(5) *Generator plate.* Located on generator. Specifies voltage, amperes and manufacturer.

(6) *Starter plate.* Located on starter. Specifies voltage, amperes and manufacturer.

(7) *U. S. Corp of Engineers plate.* Located on scarifier assembly. Specifies model, size and manufacturer.

b. Tabulated Data.

(1) *Tractor.*

Manufacturer	Clark
Model	290M

(2) *Engine.*

Type	Diesel
Manufacturer	Cummins
Model No.	NT380
Rotation, viewed from fan	Right hand
Rated brake horsepower	350
At governed speed	2000 rpm (sea level)
Low idle speed	700 rpm
Number of cylinders	6
Firing order	1-5-3-6-2-4
Bore dia.	5 ½ inches
Stroke	6 inches
Engine aspiration	Turbocharged

(3) *Engine accessories.*

(a) Generator.

Manufacturer	Delco-Remy
Part No.	1117478
Rating	24 volts

(b) Generator regulator.

Manufacturer	Delco-Remy
Part No.	1118558
Rating	24 volts

(c) Starter.

Manufacturer	Delco-Remy
Part No.	1113868
Rating	24 volts

(d) Air compressor.

Manufacturer	Cummins
Part No.	BM-92467

(e) Fuel pump.

Manufacturer	Cummins
Model No.	PTG

(f) Air cleaner.

Manufacturer	Farr
Part No.	B24059
Type	Dual element

(g) Turbocharger.

Manufacturer	Cummins
Model No.	T-590

(4) *Drive systems.*

(a) Torque converter.

Manufacturer	Clark
Model No.	C-8602-2

(b) Transmission.

Manufacturer	Clark
Model No.	8420-4
Type	Power shift
Speeds	Four forward, two reverse
Output shafts	2

(c) Axles.

Manufacturer	Clark
Model Nos.	
Front	131518
Rear	131519

(5) *Hydraulic system.*

(a) Hydraulic pump.

Manufacturer	Vickers
Model No.	45V57A-19D10A-1
Type	Vane

(b) Bulldozer control valve.

Manufacturer	Parker-Hannifin
Model No.	VDSP26DF23

(c) Main control valve.

Manufacturer	Caterpillar Tractor Co.
Part No.	4J9323

(6) *Steering system.*

(a) Steering gears.

Manufacturer	Saginaw
Part No.	5693792

(b) Hydraulic pump.

Manufacturer	Vickers
Model No.	45V47A-19B10A-L
Type	Vane

(7) *Brake system.*

(a) Brake actuators.

Manufacturer	Goodrich
Model No.	228-1

(b) Wheel brakes.

Manufacturer	Goodrich
Model No.	2-968

(c) Brake treadle valve.

Manufacturer	Bendix-Westinghouse
Model No.	279076

(d) Relay valve.

Manufacturer	Bendix-Westinghouse
Model No.	R-5

(8) *Tires.*

Size	29.5 x 29-28 ply
Pressure	45 psi

(9) *Capacities.*

Engine crankcase	10 gal
Fuel tank	196 gal
Cooling system	21 gal
Transmission and torque converter	18 gal

Mid-mount bearing ..... 5 qts
Differentials ..... 69 pts each
Planetaries, front and rear (4 each) ..... 13 qts GO each
Aneroid control ..... 2 oz
Brake reservoirs, each ..... 2 qts
Hydraulic system ..... 125 gal

(10) *Adjustments.*

Engine valve adjustment:
Intake valves cold ..... 0.016 inch
Intake valves hot ..... 0.014 inch
Exhaust valves cold ..... 0.029 inch
Exhaust valves hot ..... 0.027 inch
Engine injector adjustment:
Cold setting ..... 48 in. lb.
Hot setting ..... 60 in. lb.

(11) *Scarifier (backripper).*

Manufacturer ..... Renner Mfg. Co.
Type 1
Size 4
Bulldozer lift cylinder cap screws ..... 50 ft. lb.

(12) *Dimensions and weights (fig. 1-1).*

(a) Tractor.

Height ..... 144 in. (inch)
Length ..... 320 in.
Width ..... 136 in.
Weight ..... 54,190 lbs. (pounds)
Tons 27
Volume ..... 134.4 yd. (yard)

(b) Scraper.

Length ..... 320 in.
Weight (empty) ..... 31,860 lbs.
Capacity (load struck) ..... 18.9 cu. yd. (cubic yard)

(c) Bridge weights.

Tractor with tanks filled ..... 28 tons
Tractor and scraper with pay load ..... 70 tons
Tractor with scraper, empty ..... 44 tons

(13) *General Torque specification-bolt and screws.* See table 1-1.

Table 1-1. General Torque Specifications — Bolts and Screws

(All torque values are given in pound feet)

Size	Threads per inch	Standard heat-treated bolts and screws	Special heat-treated bolts, screws, Allen-head screws, and self-locking capscrews
1/4	20	6-8	9-11
	28	8-10	10-12
5/16	18	15-18	17-20
	24	17-20	19-23
3/8	16	26-32	36-43
	24	33-40	41-49
7/16	14	42-50	54-65
	20	50-60	64-77
1/2	13	67-80	81-97
	20	83-100	96-115
9/16	12	85-100	103-123
	18	100-120	122-146
5/8	11	117-140	164-192
	18	134-160	193-225
3/4	10	180-210	284-325
	16	215-250	337-385
7/8	9	315-360	490-550
	14	372-425	575-650
1	8	445-500	685-770
	14	535-600	830-925

CHAPTER 2
INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

2-1. Inspecting and Servicing Equipment

Note. Make sure equipment is deprocessed before servicing. Make sure preservatives have been removed from such items as crankcase, tanks, gear boxes, wet clutches, and the like. Refer to DA Form 2258 attached in operator's cab.

a. Perform preventive maintenance checks and services, paragraph 3-13.

b. Inspect to see that the required tools, repair parts, publications, accessories and attachments are with the tractor.

c. Inspect tractor for loss of parts or damage which may have occurred during loading, unloading or shipment.

d. Report all damage and deficiencies that cannot be corrected by organizational maintenance to direct support maintenance.

2-2. Installation of Separately Packed Items

a. Refer to figure 2-1 and install batteries. Refer to wiring diagram (fig. 1-3) for proper cable connection. Fill batteries with electrolyte 3/8 inch above plates.

***Caution:* Do not splash or spill electrolyte on flesh, clothing or equipment.**

b. Install seat cushions, safety belts, lever knobs, outside rear view mirrors and fire extinguisher.

c. When extreme cold weather, 32°F., 0 C., is expected, prepare tractor engine coolant system in accordance to instructions in TB-ORD-651.

Note. A water corrosion resister used in coolant system shall be by-passed or element shall be removed before adding inhibited antifreeze in coolant system.

d. In freezing temperature run engine for one hour after adding water to batteries.

2-3. Installation or Setting Up Instructions

a. After performing lubrication, preventive maintenance checks and services and removal of tractor shipping lock links, wedges and braces, the tractor is operationally ready and able to move under its own power.

b. Refer to figure 2-2 and remove shipping lock link and wedge. Stow in tool box.

c. Refer to figure 2-3 and remove tractor universal coupler brace.

d. Refer to figure 2-4 and remove bulldozer lock link.

2-4. Equipment Conversion

a. General. The tractor is equipped for operating a material scraper attached to the universal coupler, figure 2-5. Refer to applicable scraper technical manual when securing scraper mounting plate to tractor universal coupler.

b. Scraper Operation.

(1) *Loading bowl.*

(a) Move bowl and apron levers (fig. 2-6) to fully raise bowl and apron, then to hold, move ejector lever to fully lower ejector, then to hold.

(b) Move tractor transmission lever to a low forward position while equipment is moving, move bowl lever to lower (slowly) to depth of material to be removed at one time, then move to hold. After filling bowl or end of material area is reached, move apron lever to lower at the same time move bowl lever to raise, then move both levers to hold.

***Caution:* During operation of equipment, check and remove large objects that may cause damage to equipment if operation is continued.**

(2) *Move loaded bowl.*

(a) Move all scraper control levers to hold.

(b) Move tractor transmission lever to higher speed position and move equipment to unloading (dumping) area.

Note. When observation reveals that loaded scraper is not trailing properly during equipment movement at high speed, stop operation and correct irregularities. Refer to applicable scraper TM.

(c) After reaching area for unloading (dumping) material, position tractor transmission lever in low forward speed.

(3) *Unloading scraper (dumping, spreading).*

(a) Move apron lever to raise position, then to hold.

(b) Lower scraper bowl to desired height (6 to 8 inches), move ejector lever to eject, then to hold.

(c) When unloading is completed move ejector lever to return, then hold and move bowl lever to raise, then hold, and apron lever to lower, then hold for return trip to loading area. The operator may vary lever positions during dumping to aid even spreading of the load.

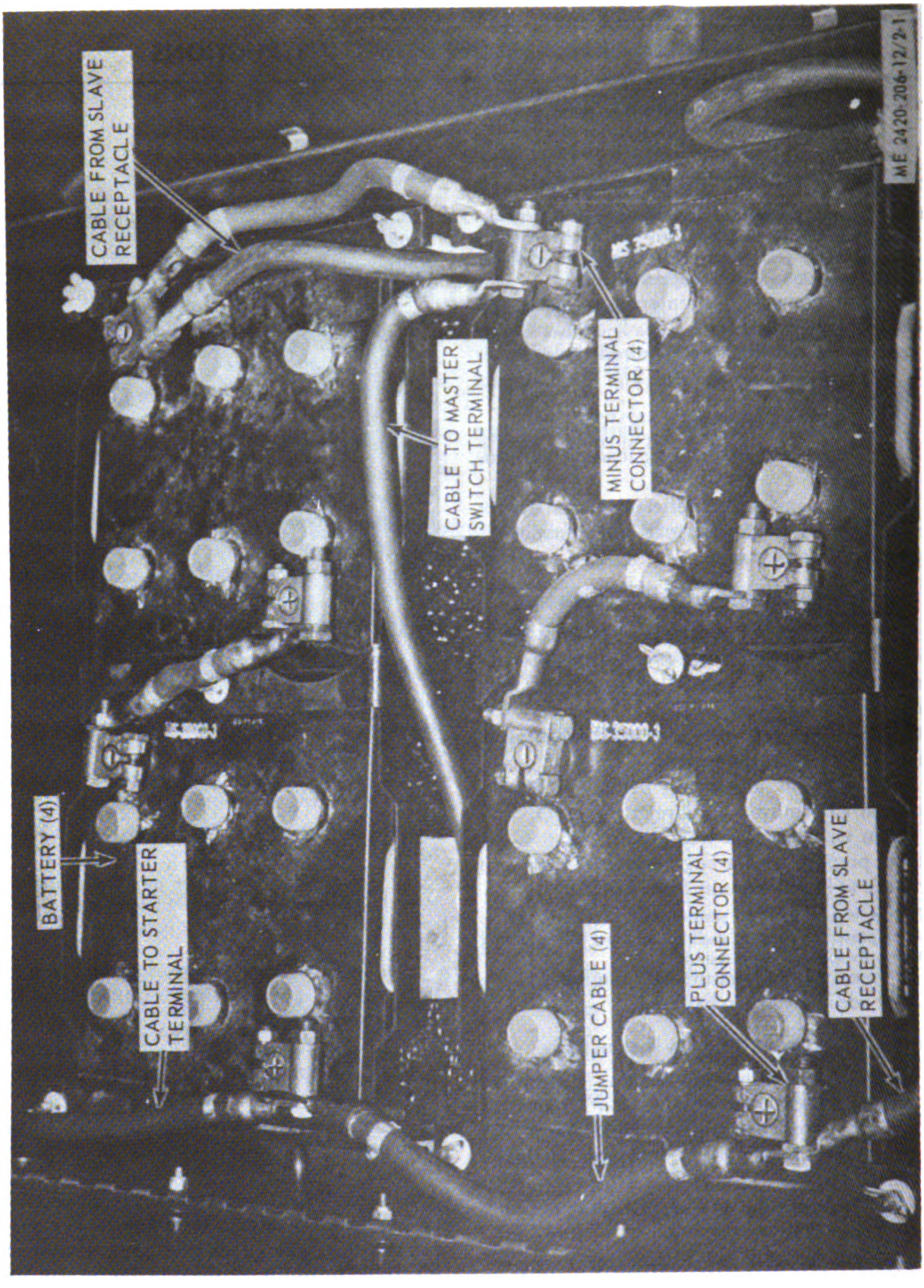


Figure 2-1. Batteries, installation and removal.

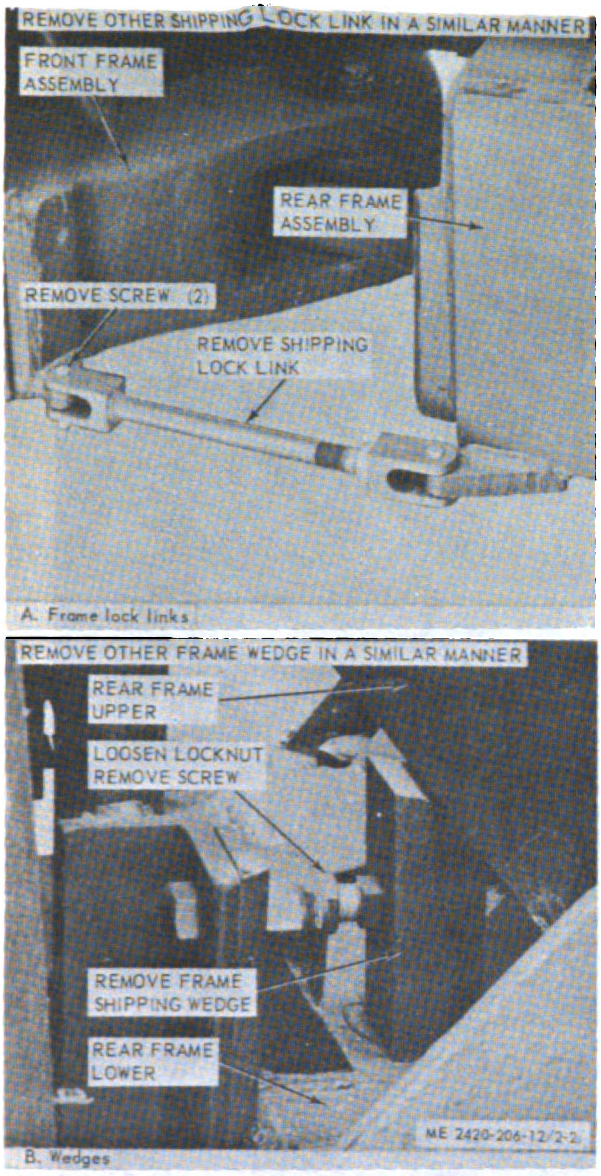


Figure 2-2. Shipping lock link and wedge, removal and installation.

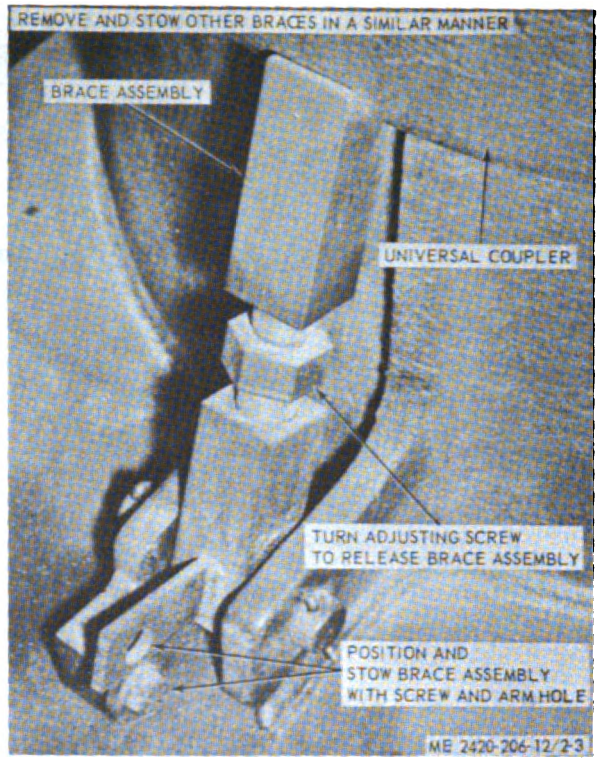


Figure 2-3. Tractor universal coupler brace, removal and stowage.

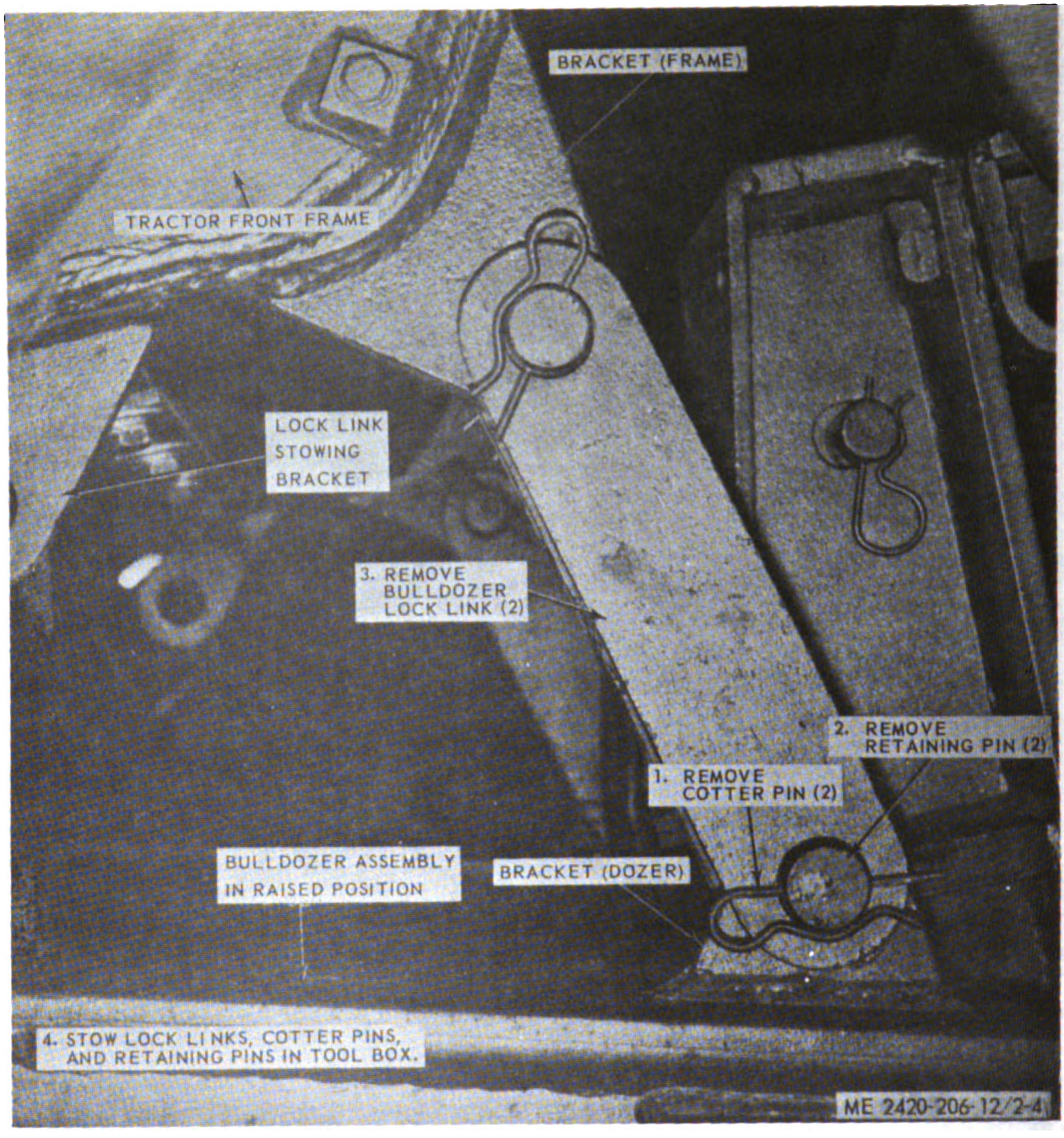


Figure 2-4. Bulldozer lock link, removal and installation.

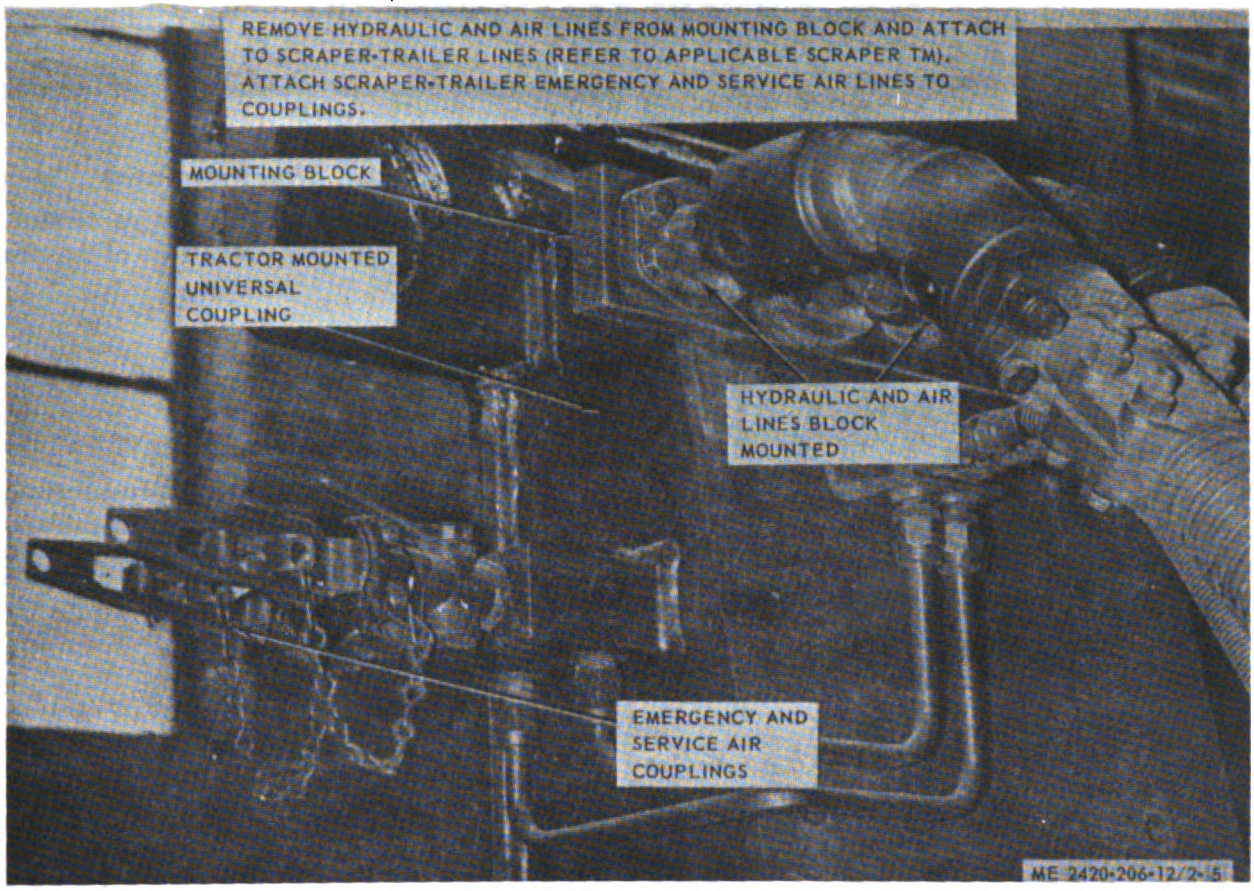


Figure 2-5. Tractor universal coupler, hoses and lines.

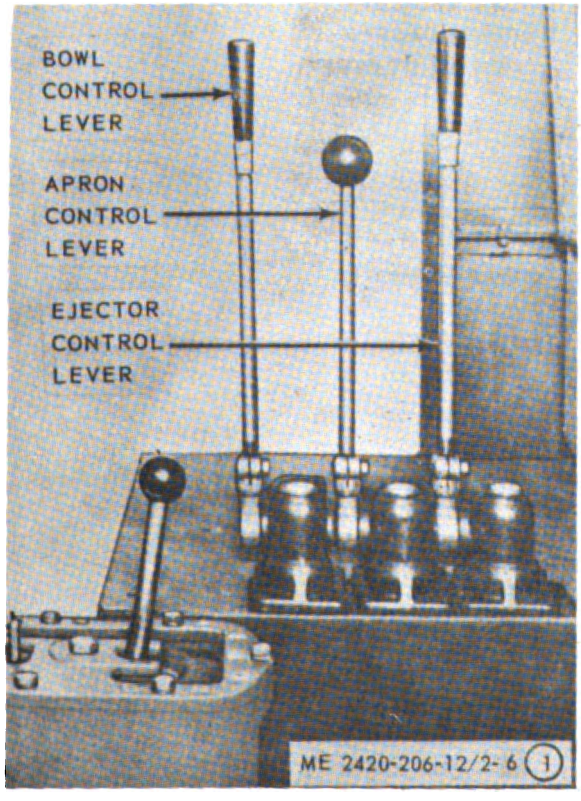


Figure 2-6. Scraper operating controls (sheet 1 of 2).

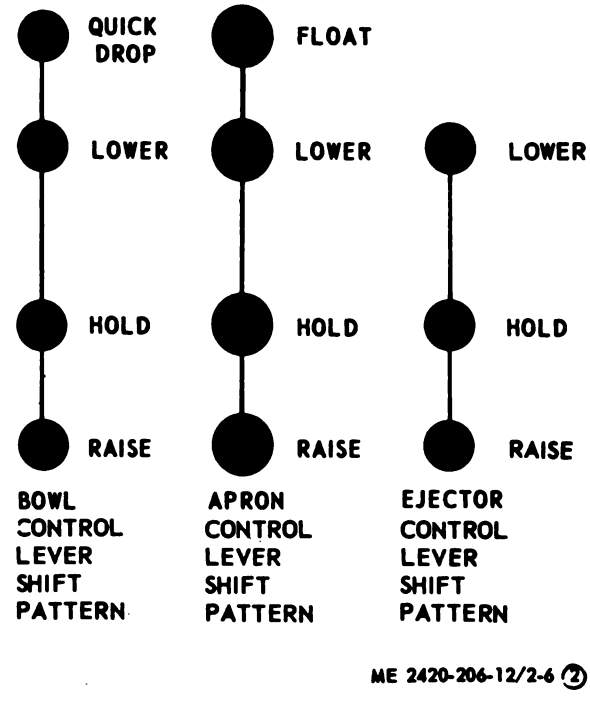


Figure 2-6. Scraper operating controls (sheet 2 of 2).

Section II. MOVEMENT TO A NEW WORKSITE

2-5. Dismantling for Movement

a. Dismantling tractor is not required for short-distance moves to a new worksite. Before crossing bridges with equipment, check bridge load tonnage. Refer to equipment tonnage, paragraph 1-4.

b. For movement to a new worksite within zone of interior, prepare tractor as outlined in paragraph 2-1.

2-6. Reinstallation After Movement

Refer to paragraph 2-3 and service tractor after movement to a worksite within zone of the interior.

Section III. CONTROLS AND INSTRUMENTS

2-7. General

This section describes various controls and instruments and provides the operator/crew sufficient information to insure proper operation of the tractor and towed equipment (when attached).

2-8. Controls and Instruments

The purpose of controls and instruments and the normal and maximum reading of gages are illustrated in figure 2-7. Should abnormal readings occur, shut off engine immediately.

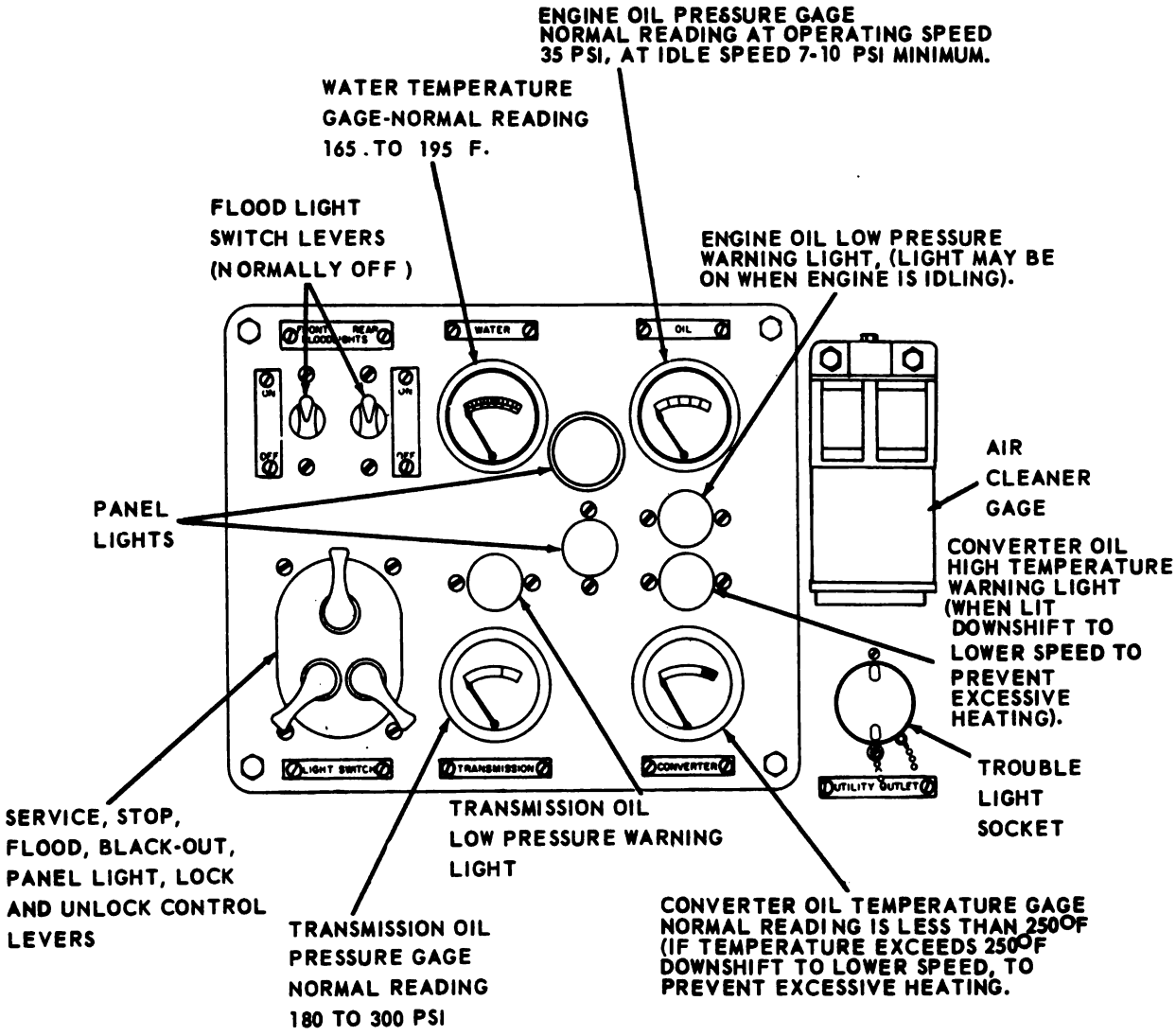


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Figure 2-7. Controls and instruments (sheet 1 of 6).

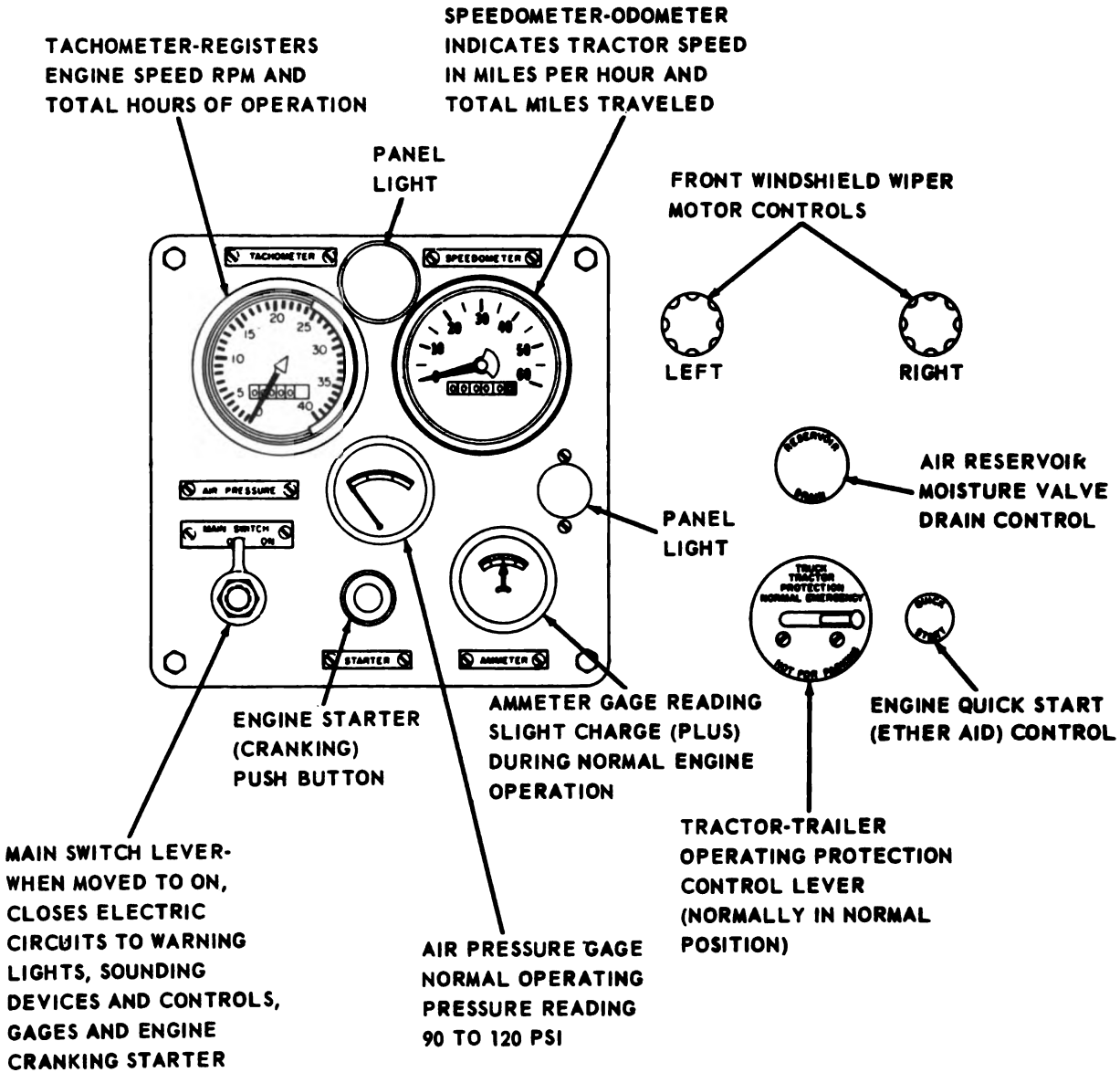


Figure 2-7. Controls and instruments (sheet 2 of 6).

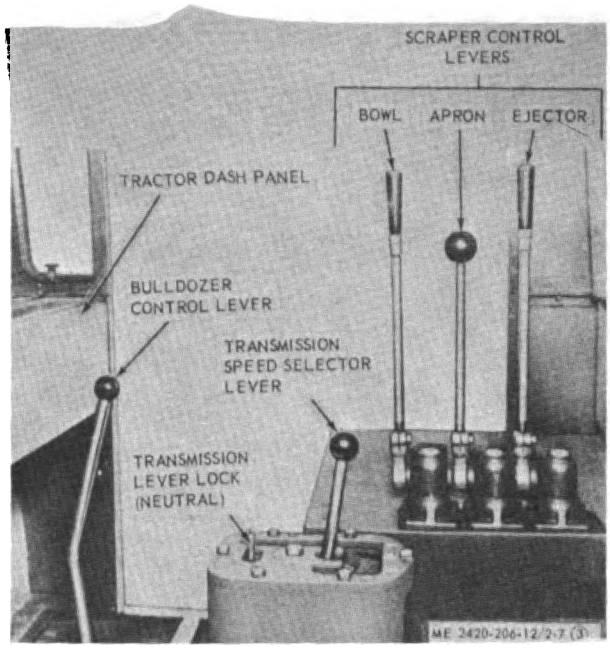


Figure 2-7. Controls and instruments (sheet 3 of 6).

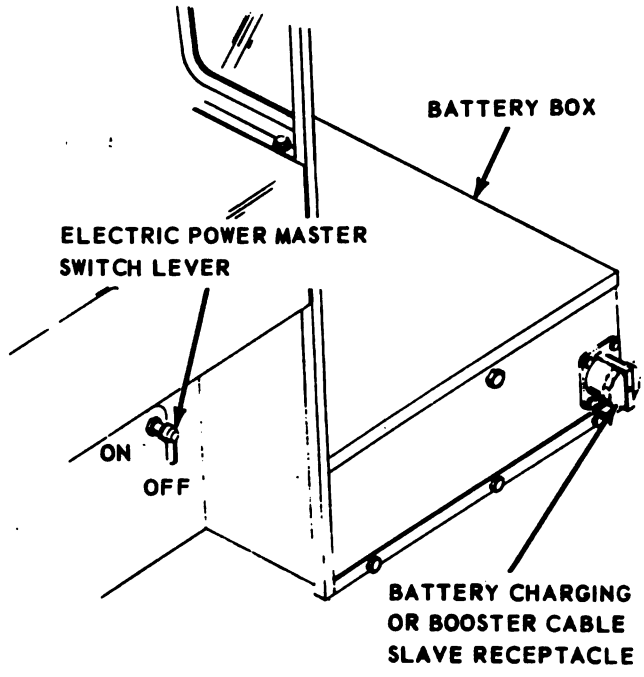


Figure 2-7. Controls and instruments (sheet 4 of 6).

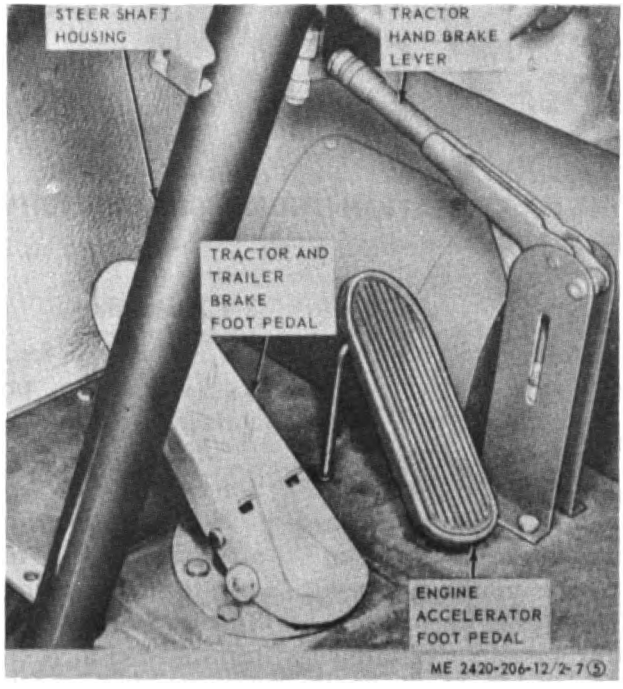


Figure 2-7. Controls and instruments (sheet 5 of 6).

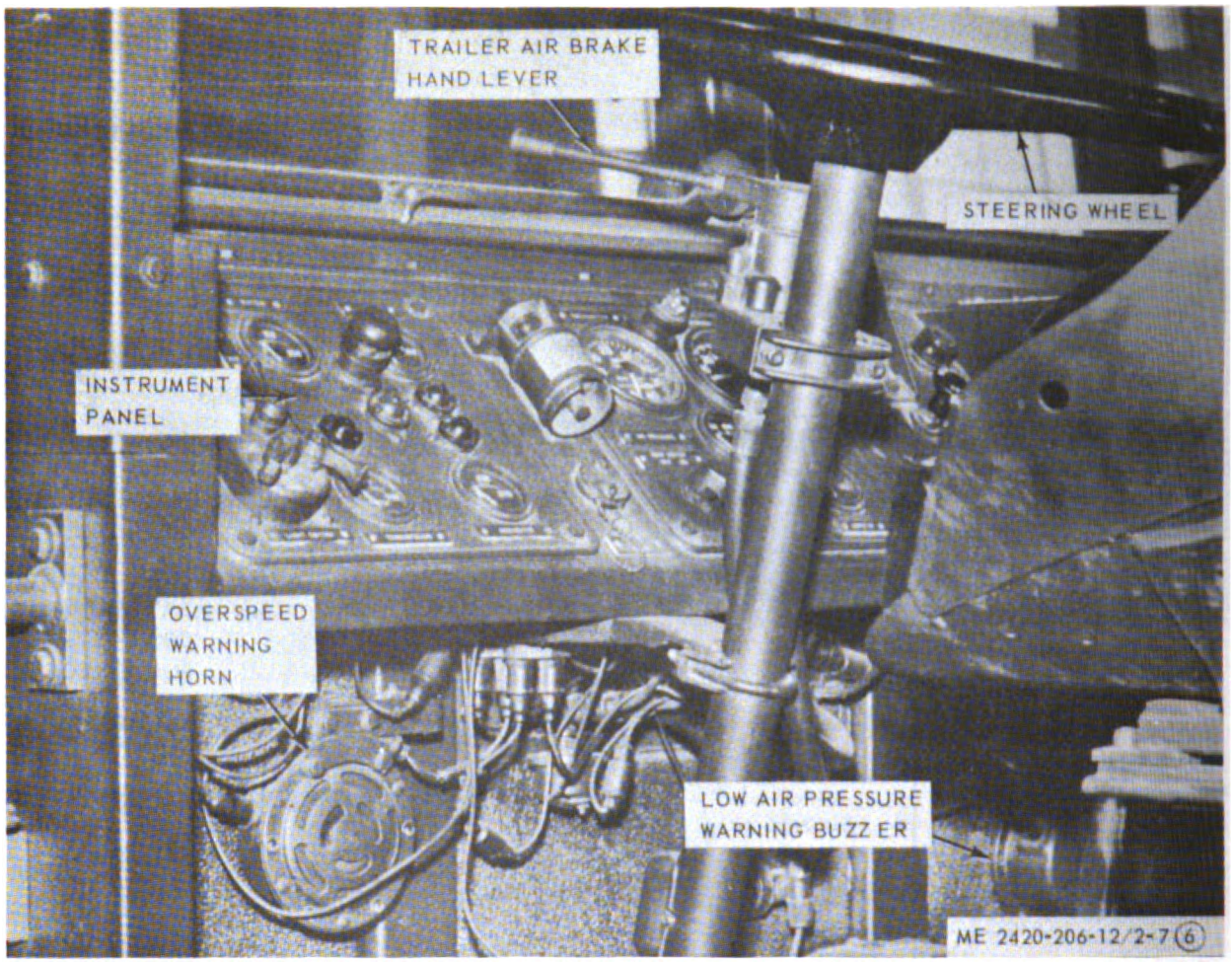


Figure 2-7. Controls and instruments (sheet 6 of 6).

Section IV. OPERATION UNDER USUAL CONDITIONS

2-9. General

a. The instructions in this section are published for the information and guidance of personnel responsible for operation of the tractor.

b. The operator must know how to perform every operation of which the tractor is capable. Instructions on starting and stopping tractor, operation of tractor, bulldozer and scraper (when towed) and on coordinating basic motions to perform specific tasks for which the equipment is designed. Since nearly every job presents a different problem the operator may have to vary given procedures to fit the individual job.

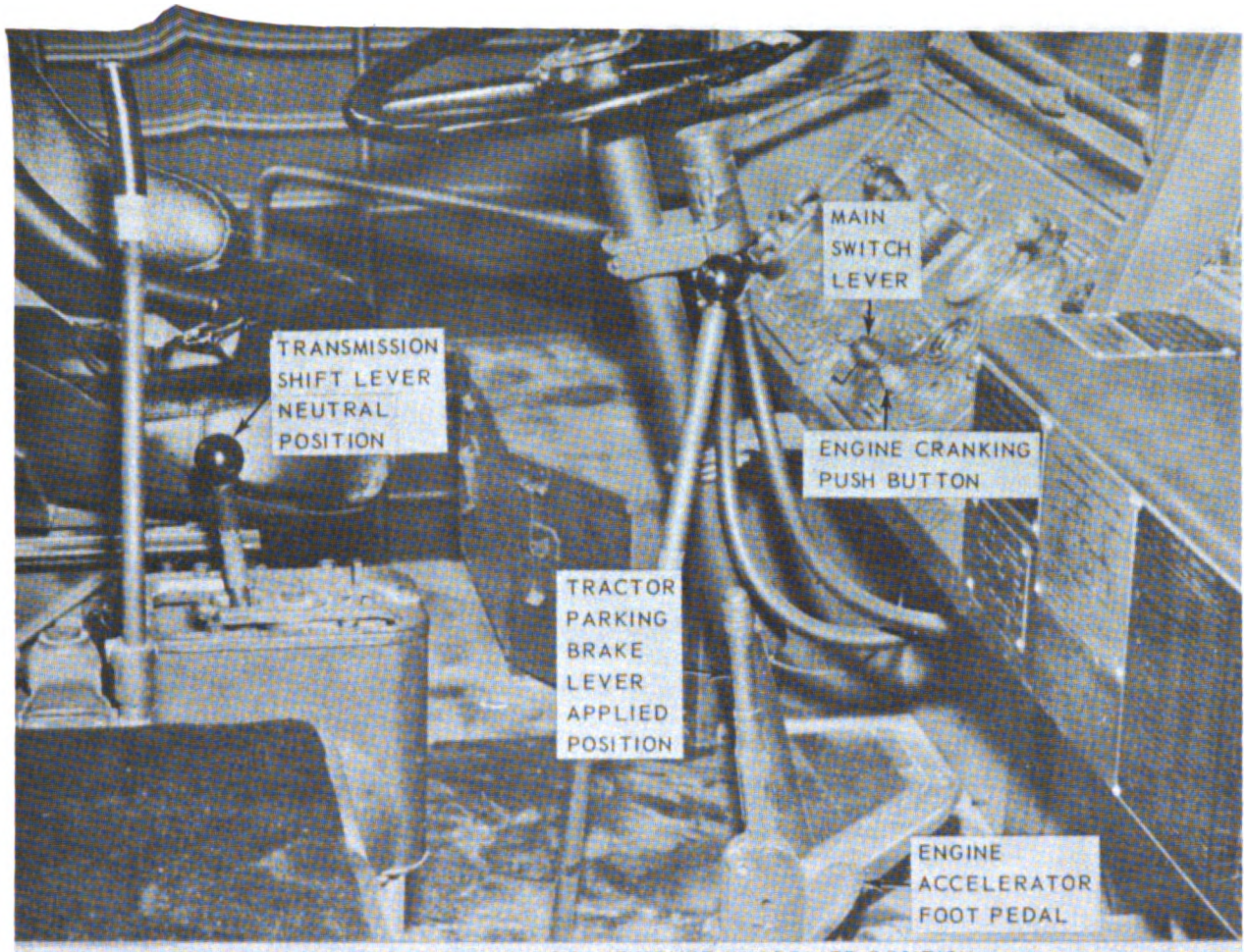
2-10. Starting

a. Preparation for Starting.

(1) Perform preventive maintenance checks and services, table 3-1.

(2) Lubricate as specified in current lubrication order.

b. Start tractor in numerical steps, figure 2-8. If air pressure in air reservoir is less than 60 psi, low air pressure warning buzzer (fig. 4-15) will sound. This is a normal condition. The parking brake locks transmission in N (neutral) position. Release parking brake before shifting transmission.



STEP 1. SET PARKING BRAKE LEVER IN APPLIED POSITION.

STEP 2. PLACE TRANSMISSION SHIFT LEVER IN "NEUTRAL" POSITION.

STEP 3. MOVE MASTER SWITCH LEVER (FIG. 2-7) TO "ON".

STEP 4. DEPRESS ENGINE ACCELERATOR FOOT PEDAL HALFWAY TO FLOOR, MOVE MAIN SWITCH LEVER TO "ON" AND DEPRESS ENGINE CRANKING (STARTING) PUSH BUTTON UNTIL ENGINE STARTS.

CAUTION: DO NOT CRANK ENGINE MORE THAN 30 SECONDS CONTINUOUSLY. ALLOW 2-MINUTE INTERVALS BETWEEN STARTING ATTEMPTS. IF ENGINE FAILS TO START AFTER SEVERAL ATTEMPTS, STOP CRANKING AND DETERMINE CAUSE. CORRECT OR REPORT CONDITION TO DIRECT SUPPORT MAINTENANCE.

STEP 5. AFTER ENGINE STARTS ACCELERATE TO 700 RPM UNTIL ENGINE RUNS SMOOTHLY, OBSERVE GAGES (FIG. 2-7) FOR READINGS. SLOWLY INCREASE RPM AND CHECK GAGES FOR NORMAL READINGS.

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Figure 2-8. Tractor starting instructions.

2-11. Stopping

a. Stop tractor in numerical steps, figure 2-9.

b. Perform preventive maintenance checks and services, Table 3-1.

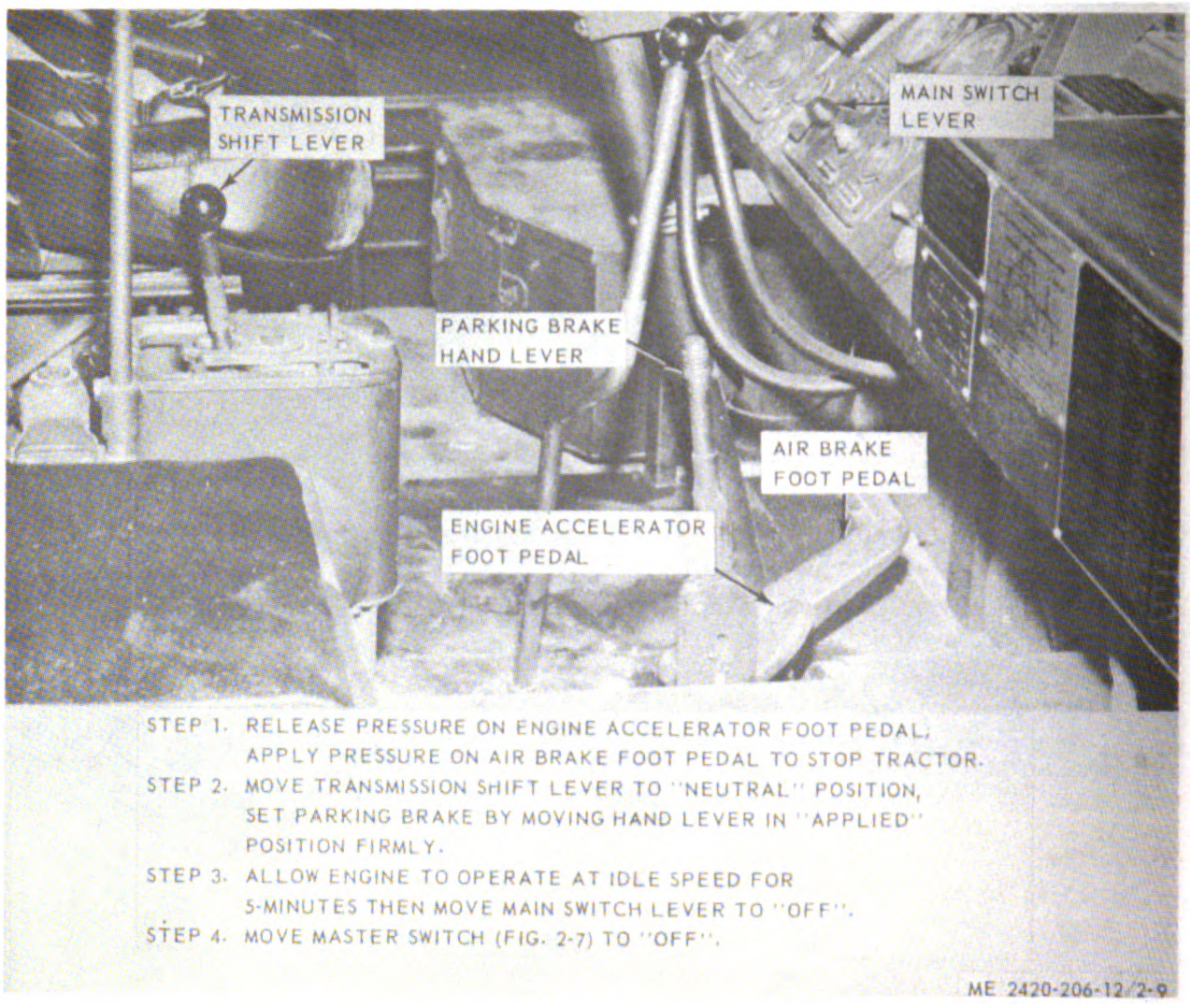


Figure 2-9. Tractor stopping instructions.

2-12. Operation of Equipment

a. General. Tractor bulldozer assembly and scraper attachment is used for moving, hauling, leveling and grading of material.

b. Tractor Operation.

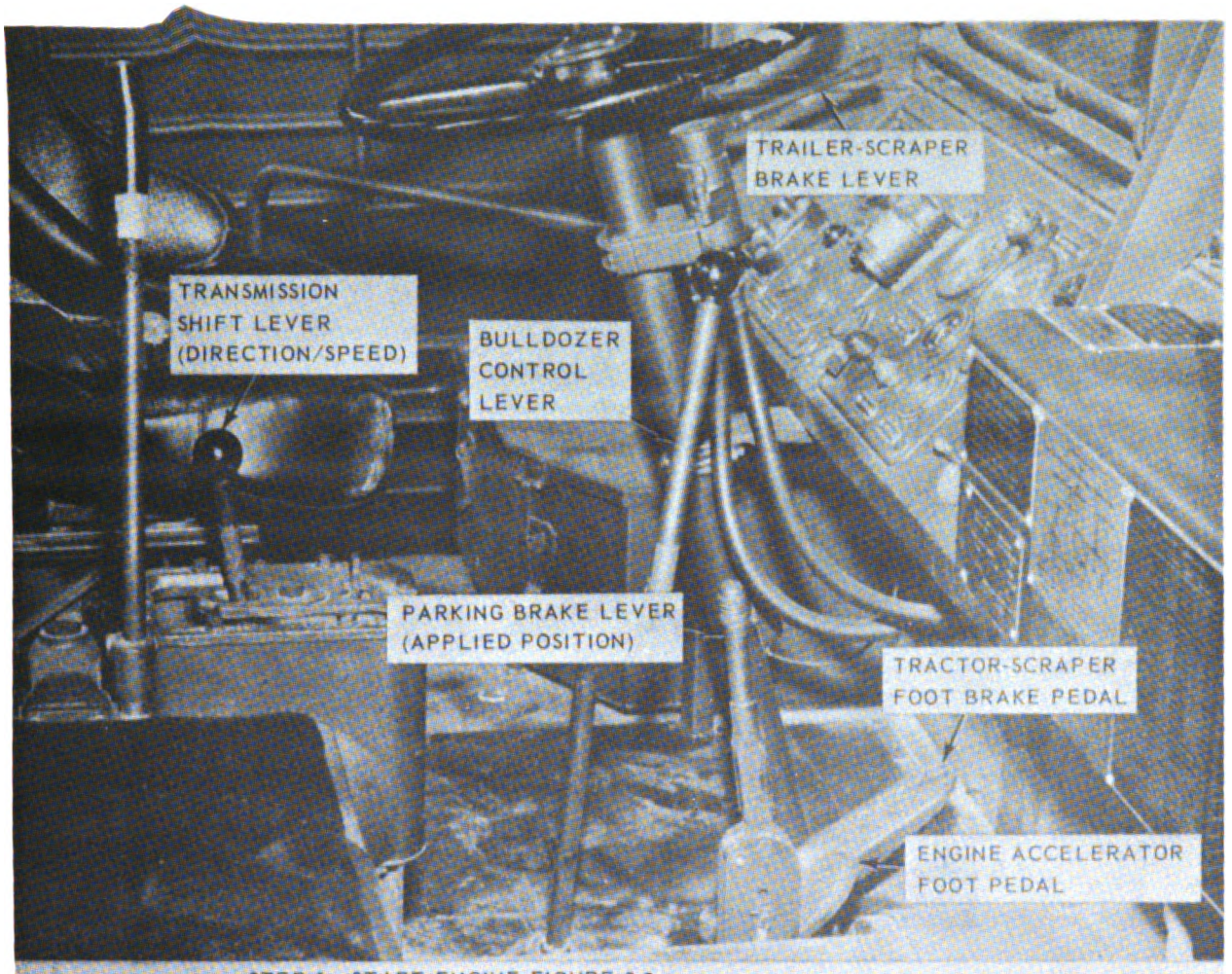
(1) Steering wheel is turned in the direction of travel desired, when moving forward or backward (reverse).

Caution: **Do not make sharp turns in any direction. Avoid striking tractor tires with trailer-scraper yoke when making turns. Avoid sharp turns as tractor can be steered into scraper yoke causing damage to fuel or hydraulic tank.**

(2) Start tractor (para 2-10).

(3) Adjust operator seat and fasten safety belt (para 2-22).

(4) See figure 2-10 for numerical step procedure for operating tractor. When towing scraper, do not drop scraper bowl to assist braking except in an emergency.



STEP 1. START ENGINE FIGURE 2-8.
STEP 2. RAISE BULLDOZER FIGURE 2-11 (IF NECESSARY).
STEP 3. MOVE PARKING BRAKE LEVER FORWARD AND DOWN.
STEP 4. POSITION TRANSMISSION SHIFT LEVER TO DESIRED DIRECTION AND SPEED.
STEP 5. USE ACCELERATOR FOOT PEDAL TO CONTROL ENGINE SPEED.
STEP 6. USE BRAKE LEVER TO CONTROL TRAILER-SCRAPER SPEED WHEN MOVING DOWN INCLINES.
STEP 7. USE FOOT BRAKE PEDAL TO SLOW DOWN AND STOP TRACTOR-SCRAPER.

CAUTION: ENGINE SPEED AND TRANSMISSION SPEEDS SHALL BE CONTROLLED AND ADJUSTED TO PREVENT ENGINE SPEED EXCEEDING 2,200 RPM. WHEN OVERSPEED WARNING HORN SOUNDS, APPLY BRAKES AND ADJUST TRANSMISSION SPEED TO CORRECT ENGINE OVERSPEED.

CAUTION: WHEN LOW AIR PRESSURE WARNING BUZZER SOUNDS, MOVE PROTECTION LEVER (FIG. 2-7) TO "EMERGENCY". MOVE TRANSMISSION LEVER TO A LOWER SPEED POSITION AND ALLOW UNIT TO ROLL TO A STOP.

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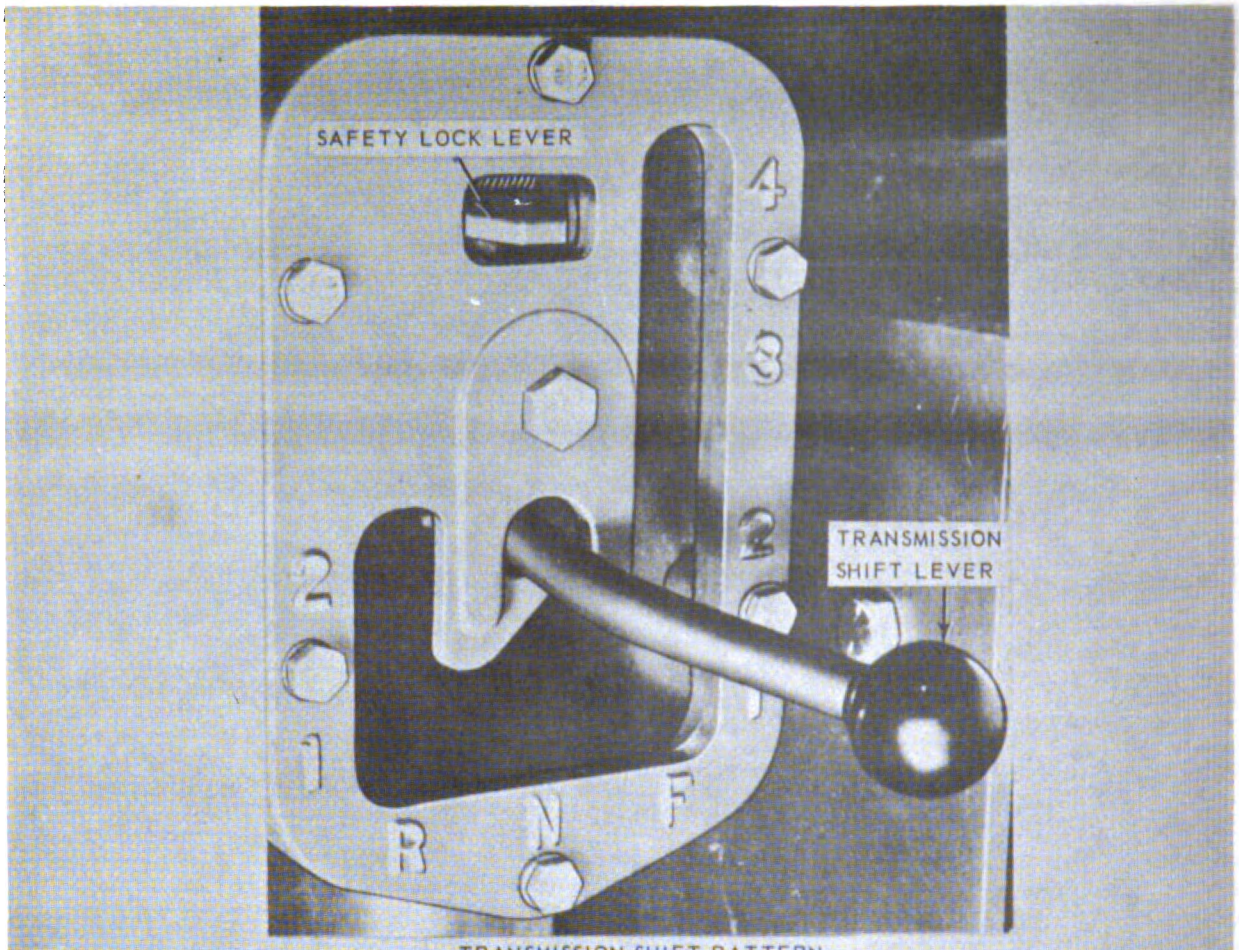
Figure 2-10. Tractor operating instructions (sheet 1 of 2).



TRANSMISSION SHIFT PATTERN

1. FOR BULLDOZING AND TRAILER SCRAPER OPERATION SHIFT TO A SPEED RANGE AND ACCELERATE ENGINE SPEED TO ASSUME THE LOAD. WHEN OVERSPEED WARNING HORN SOUNDS APPLY BRAKES TO SLOW DOWN EQUIPMENT, AS ENGINE SPEED REDUCES DOWNSHIFT ONE POSITION AT A TIME.
2. FOR OVER THE ROAD TRAVEL MOVE SHIFT LEVER TO "F-4". IF CONVERTER OIL TEMPERATURE RISES ABOVE NORMAL OR ENGINE LABORS, DOWNSHIFT TO NEXT LOWER SPEED.
3. STOP EQUIPMENT BEFORE SHIFTING TO REVERSE DIRECTION OF TRAVEL.
4. SHIFT TO "N" LOCKS SHIFT LEVER.
5. SHIFT TO "R-1" WHEN USING SCARIFIER.

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Figure 2-10. Tractor operating instructions (sheet 2 of 2).

c. See figure 2-11 for operation of bulldozer and scarifier. The skid shoes should be adjusted for use in soft dirt or sand to help support the blade. Remove skid shoes when working on hard rocky ground or a stone quarry.

Note. The adjustable pitch strut for increasing or decreasing the pitch angle of the dozer blade is hand operated. It is mounted on the right side of the dozer assembly between the right push beam and the top of the dozer blade.

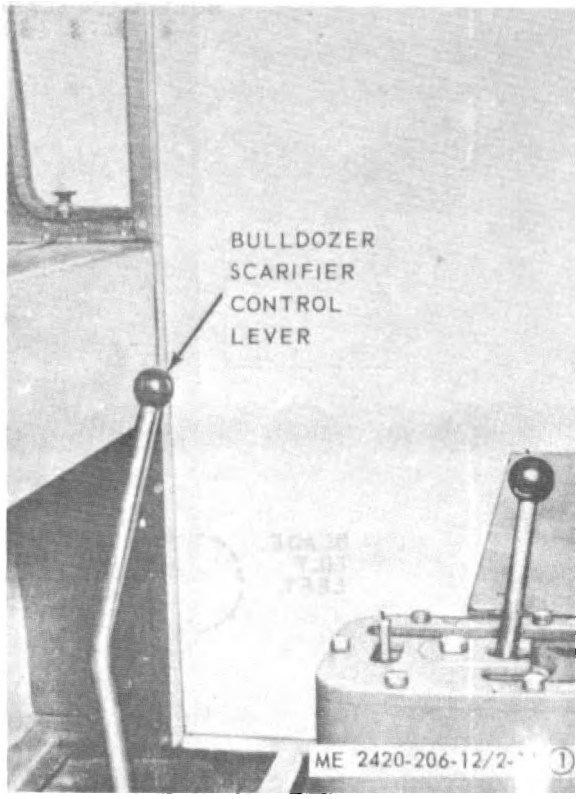
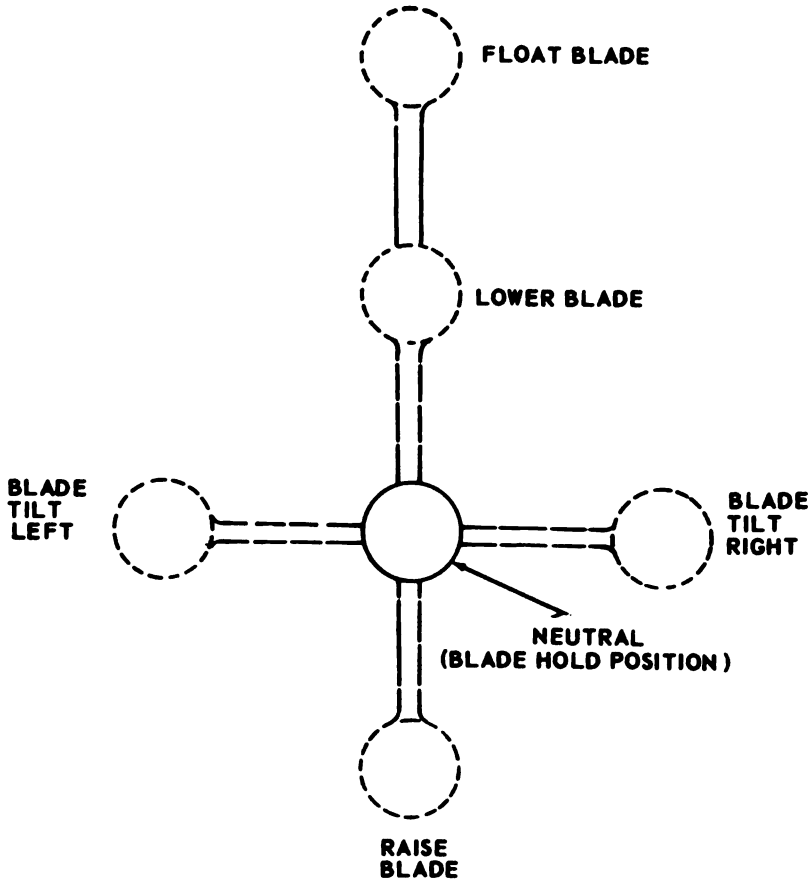


Figure 2-11. Bulldozer and scarifier operating instructions (sheet 1 of 3).

BULLDOZER SCARIFIER LEVER SHIFT PATTERN



NOTE: CONTROL LEVER AUTOMATICALLY SHIFTS TO NEUTRAL (HOLD) WHEN RELEASED (EXCEPT FLOAT).

1. TO MOVE MATERIAL AND CLEAR AREA OF SHRUBS, SMALL TREES AND BOULDERS, LOWER AND TILT BLADE TO DEPTH AND ANGLE DESIRED WHILE TRACTOR IS MOVING FORWARD (DO NOT RAM).

2. TO UPROOT LARGE TREES, RAISE BLADE TO HIGHEST LEVEL WHILE TRACTOR IS MOVING FORWARD (DO NOT RAM).

3. BEFORE GRADING AN AREA ATTACH SKID SHOES. LOWER AND TILT BLADE TO DESIRED POSITION WHILE TRACTOR IS MOVING FORWARD SHIFT LEVER TO FLOAT BLADE.

NOTE: SKID SHOES ARE USED FOR GRADING PURPOSES ONLY.

4. REMOVE LOCK PIN LOWER SHANK AND TOOTH AND SECURE WITH LOCK PIN IN LOWER LOCK PIN HOLE.

CAUTION: SUPPORT BLADE WHEN LOWERING OR RAISING SCARIFIER TEETH.

5. LOWER SCARIFIER TEETH (BLADE) TO DESIRED DEPTH AND TILT WHILE TRACTOR IS MOVING BACKWARD (REVERSE) RAISE TEETH (BLADE) WHEN MOVING TRACTOR FORWARD. REPEAT AS NECESSARY TO LOOSEN MATERIAL IN AREA. REFER TO 4 ABOVE AND SECURE TEETH IN RAISED POSITION. REFER TO 1 ABOVE AND MOVE MATERIAL.

ME 2420-206-12/2-11 (2)

Figure 2-11. Bulldozer and scarifier operating instructions (sheet 2 of 3).

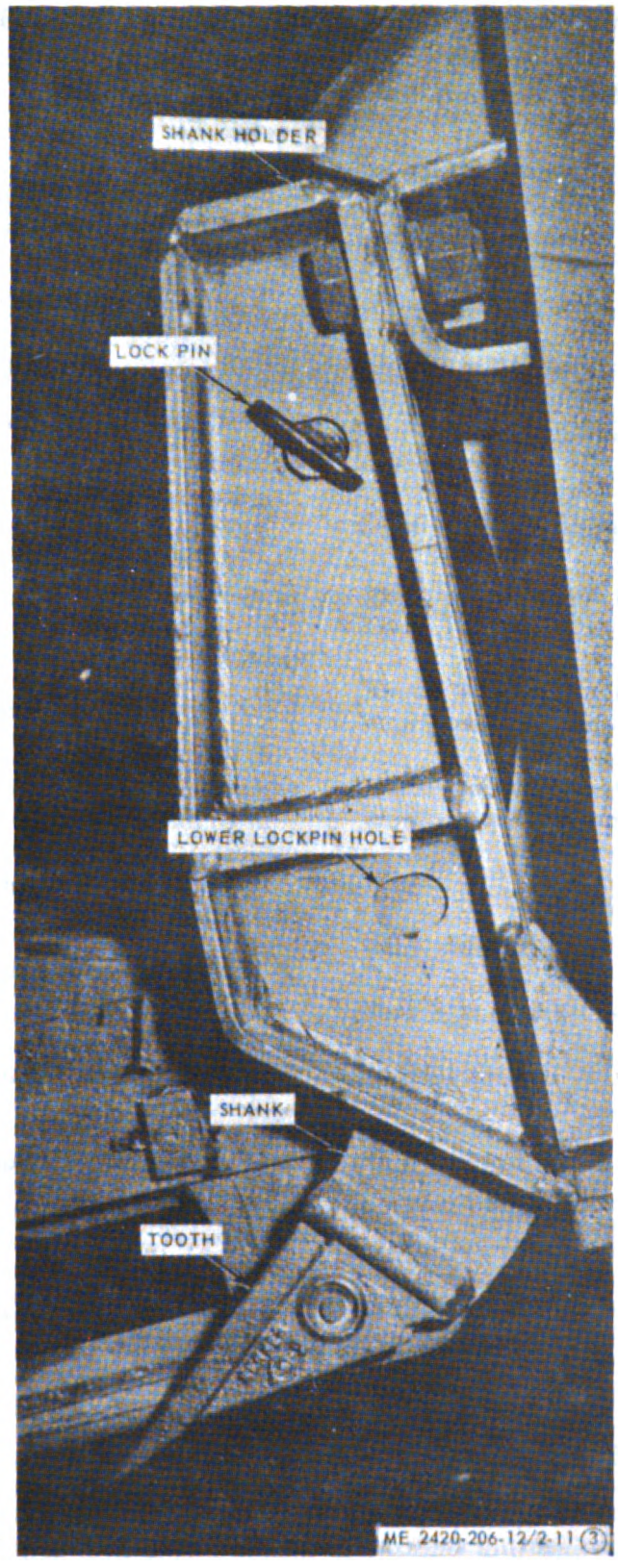


Figure 2-11. Bulldozer and scarifier operating instructions (sheet 3 of 3).

2-13. Operation in Extreme Cold (Below 0°F. — 18°C.)

a. Correct coolant antifreeze solution for lowest temperature expected, TB-ORD-651. Drain corrosion resister (para 2-2) and remove element before inhibited antifreeze is used in coolant system.

b. Inspect cooling system. Repair or report any leaks.

c. Keep batteries fully charged. After adding water run engine for at least one hour.

d. Keep fuel tank full when not in operation.

e. Lubricate in accordance with current lubrication order.

f. Allow engine to reach normal operating temperature before applying load.

g. Drain moisture from air tanks by operating reservoir drain on instrument panel (fig. 2-7, sheet 2).

h. Before stopping operation, see that equipment is positioned to prevent tires from freezing in mud and water.

i. After operation do not apply parking brake. Put blocks under wheels to prevent tractor from rolling.

2-14. Operation in Extreme Heat

a. Keep radiator filled to 2 inches below filler neck, repair or report coolant leaks.

b. Keep battery electrolyte level to 3/8 inch above plates.

c. Lubricate in accordance to current lubrication order.

2-15. Operation in Sandy or Dusty Areas

a. Keep lubricant containers clean and covered when not in use.

b. Keep lubrication equipment clean.

c. Lubricate in accordance to current lubrication order.

d. Service engine crankcase, transmission, fuel system, and hydraulic system breathers daily or as necessary.

e. Service fuel filters, hydraulic oil filters and engine oil filters daily or as necessary.

f. Service air cleaner as indicated by service indicator on dash panel.

2-16. Operation Under Rainy or Humid Conditions

a. Keep fuel tanks full at all times.

b. Release moisture from air system frequently.

c. Remove moisture from batteries and cables. Keep wiring dry.

d. Keep exposed finished parts and moving parts lubricated.

2-17. Operation in Salt Water Area

a. After operation, wash tractor with fresh water, when available.

b. Dry all exposed wiring terminals, batteries and cables.

c. Lubricate in accordance to current lubrication order.

2-18. Operation in Mud or Deep Water

a. Clean equipment with fresh water when available after operation.

b. Dry exposed wiring terminals, batteries and cable.

2-19. Operation in High Altitudes

Refer to DS maintenance when tractor is to be operated at higher altitudes.

Section VI. OPERATION OF AUXILIARY MATERIEL USED IN CONJUNCTION WITH EQUIPMENT

2-20. Fire Extinguisher (Dry Chemical Type)

a. Description and Operation.

(1) The 2½ pound fire extinguisher is charged with dry chemicals under pressure and is effective in extinguishing all types of fires starting and confined in small areas of equipment and in cold weather temperatures to —25 F.°(—31°C.). When extinguisher is winterized for extreme cold temperatures (nitrogen) fires can be extinguished in temperatures below —25 F. (—31 C.).

(2) Remove fire extinguisher from equipment, lift handle, press lever, using a side to side motion direct powered spray at base of flames.

b. Maintenance.

(1) When pressure indicator reading is below 125 psi, seal is broken or weight is less than 2½ pounds, replace extinguisher.

(2) Replace used fire extinguishers immediately.

2-21. Engine Starting Aid

a. A starting aid cylinder (fig. 2-12) containing ether under pressure and controlled by quick start knob (fig. 2-7) on instrument panel, is used to start

engine in cold weather temperatures, below 32°F. (0°C.). The cylinder and valve is mounted inside cab on lower right side.

b. When starter switch is depressed (fig. 2-7) and engine is cranking, pull out quick start knob for 1 or 2 *seconds*, then push knob in.

Note. Do not use quick start knob when engine is operating or before cranking has started.

Warning: **Ether is highly explosive. Do not apply heat to cylinder, or store cylinders where heat may become excessive; do not throw empty cylinders in an open fire. Cylinder can explode and cause death or serious injury to personnel.**

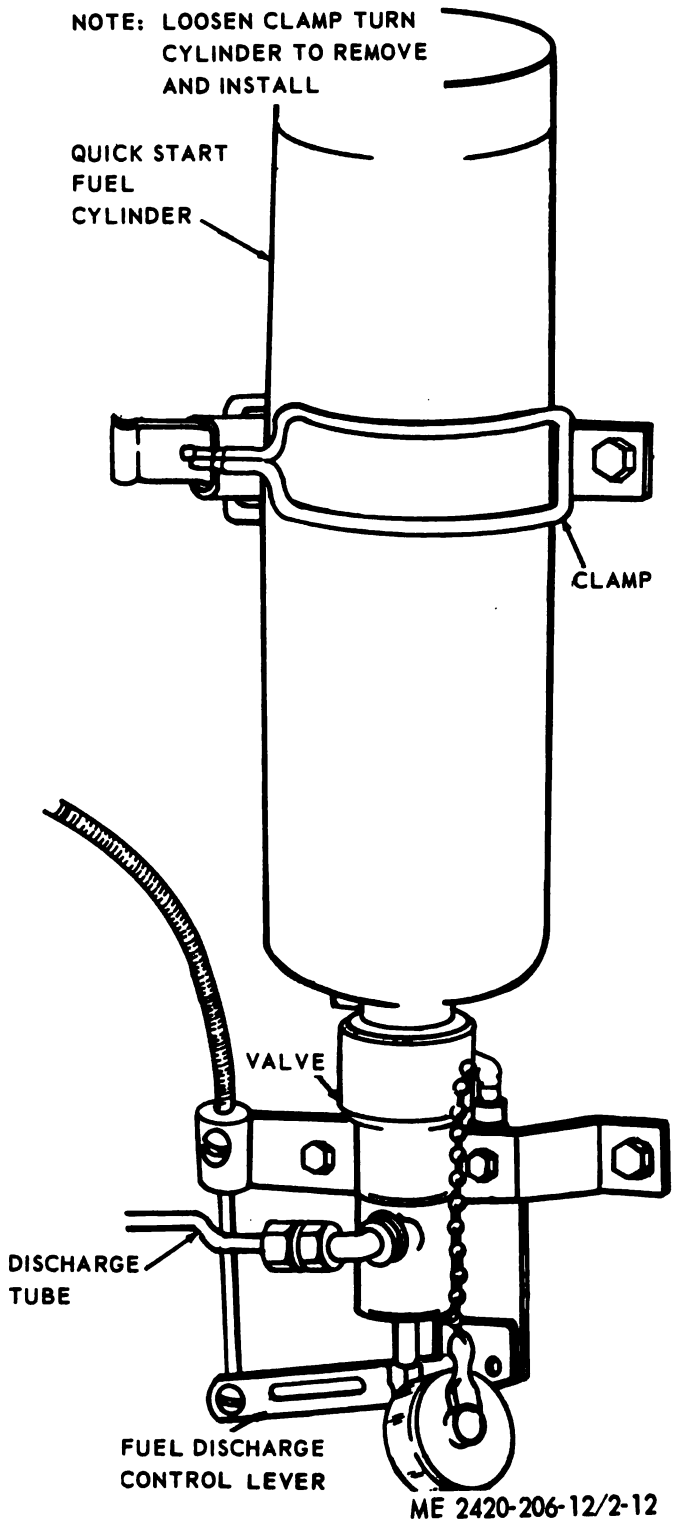


Figure 2-12. Engine starting aid.

2-22. Operator Seat

a. Operator shall check all safety belt attachments before starting and operating the equipment.

b. Operator seat adjustment is illustrated in figure 2-13.

c. Repair or replace seat cushions when upholstery is torn or ripped. Refer to para 4-62.

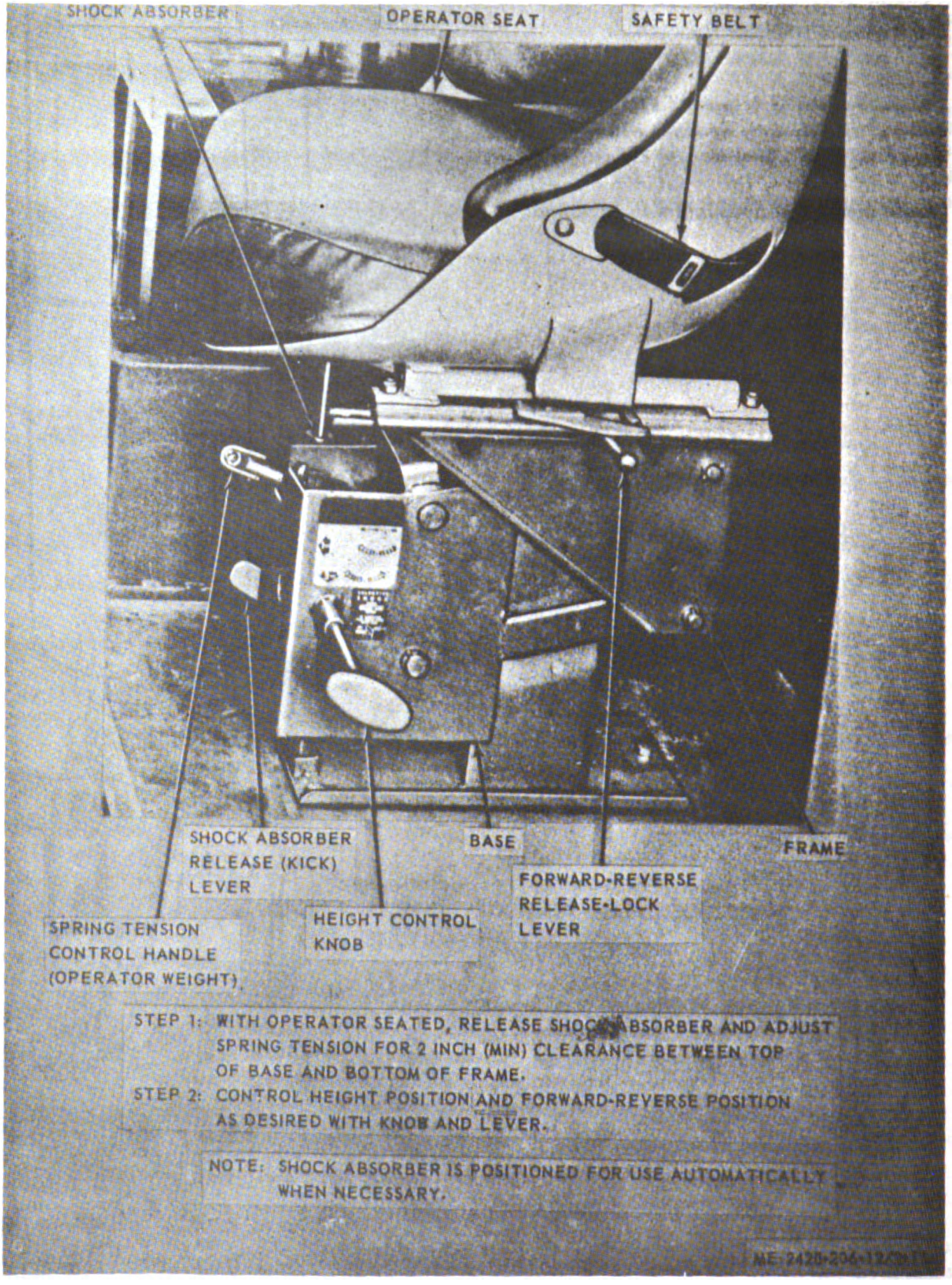


Figure 2-13. Operator seat adjustment.

d. Replace seat assembly when base or suspension items are broken and when adjustment control defects cannot be corrected.

2-23. Tractor Engine Emergency Starting

a. General. When a replacement starter or battery jumper cable is not available, the engine may be started by towing or pushing the tractor.

***Caution:* To prevent damage to push start pump when towing or pushing tractor backward with engine stopped, remove propeller shafts to front and rear axles.**

b. Towing or Pushing.

(1) Move master and main switches to ON (fig. 2-7) and shift transmission lever to neutral (fig. 2-10).

(2) Tow or push the tractor at speeds of 2 to 3 mph until transmission oil pressure gage indicates pressures between 180 to 200 pounds, depress accelerator pedal halfway, then shift transmission lever to "F-1" position. Quick start aid can be used (1 to 2 seconds) to help start engine. After engine starts, place transmission lever in neutral, allow engine to warm up and run at idle speed of 700 to 750 rpm.

CHAPTER 3
OPERATOR'S AND ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. OPERATOR'S AND ORGANIZATIONAL MAINTENANCE REPAIR PARTS, TOOLS AND EQUIPMENT

3-1. Tools and Equipment

No special tools or equipment are required by operator and organizational maintenance personnel for maintenance of tractor.

3-2. Organizational Maintenance Repair Parts

Organizational maintenance repair parts are listed in TM 5-2420-206-20P.

Section II. LUBRICATION

3-3. General Lubrication Information

This section contains lubrication instructions which are supplemental to, and not specifically covered in the lubrication order. For current lubrication order, refer to DA Pam 310-4.

3-4. Detailed Lubrication Information

a. Care of Lubricants. Keep all lubrication containers in a clean, dry place away from heat. Allow no dust, dirt, or other foreign material to mix with lubricants in containers. Keep all equipment clean and ready for use.

b. Cleaning. Keep external components of the tractor free of lubricants that are splashed, spilled, or dropped on the equipment. Wipe all lubricating points before and after lubricating.

c. Points of Lubrication. Service lubrication points at proper intervals as indicated on LO 5-2420-206-12.

d. Turbocharger Lubrication. Filtered engine crankcase oil lubricates turbocharger turbine shaft. During dusty, hot weather operating conditions, check engine crankcase oil level frequently and change turbocharger oil filter more frequently than usual in accordance with current lubrication order.

e. Transmission Oil Level. Check transmission oil level with engine operating at idle speed and transmission at operating temperature.

3-5. Engine Oil System Service

a. Filters. Service engine oil system filters as illustrated in figure 3-1. After servicing, start engine and check filters for leaks. Wait 30 minutes, then check if engine oil level is up to full mark on dipstick. Check gages for proper pressure (fig. 2-7 1).

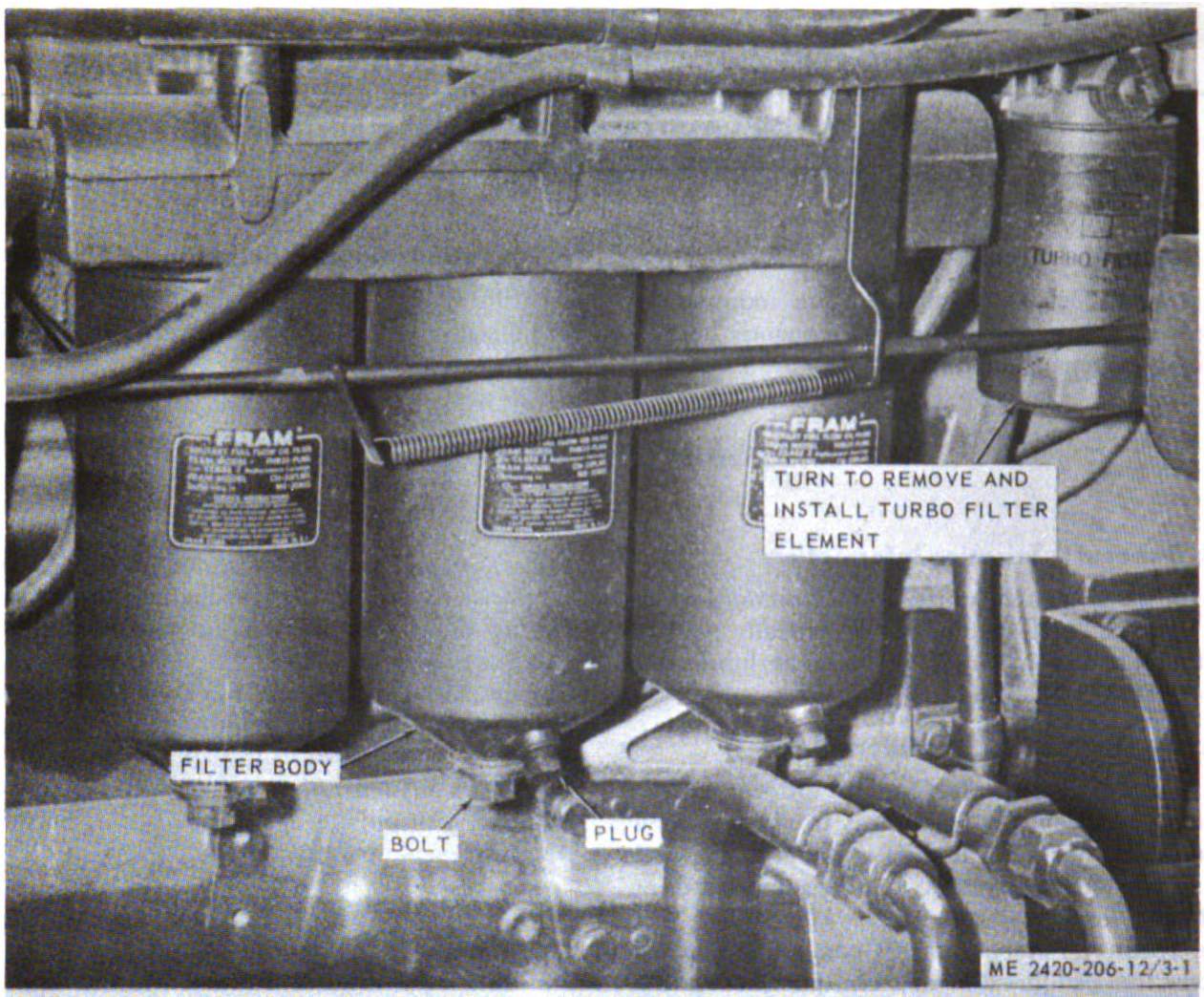
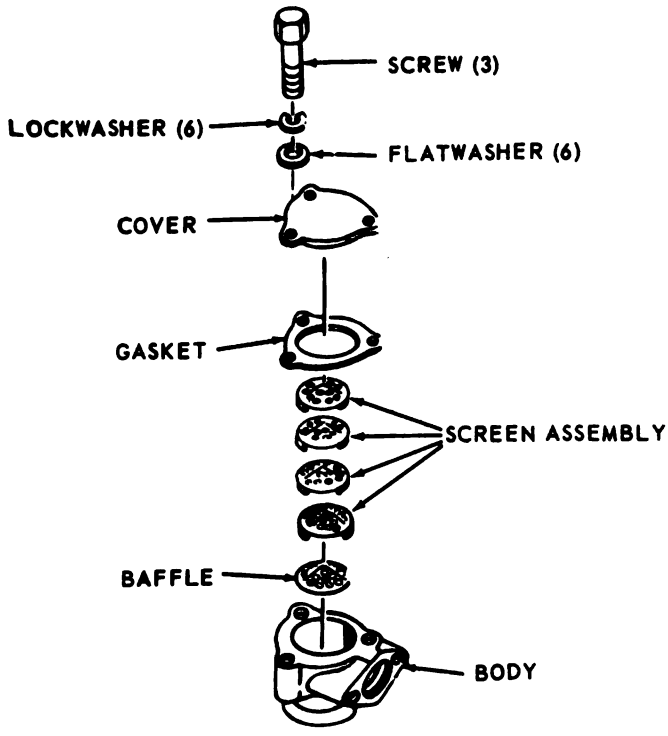


Figure 3-1. Engine oil system filter service.

b. Engine Crankcase Breather. Service engine crankcase breather as illustrated in figure 3-2. Under conditions of extreme dust, clean the engine crankcase breather daily.



STEP 1. REMOVE SCREWS, LOCKWASHERS, FLATWASHERS, COVER, GASKET, SCREEN ASSEMBLY AND BAFFLE FROM BODY.
STEP 2. CLEAN METAL PARTS WITH SOLVENT, DRY THOROUGHLY.
STEP 3. REPLACE GASKETS AND DEFECTIVE ITEMS.
STEP 4. INSTALL IN REVERSE ORDER OF REMOVAL.

ME 2420-206-12/3-2

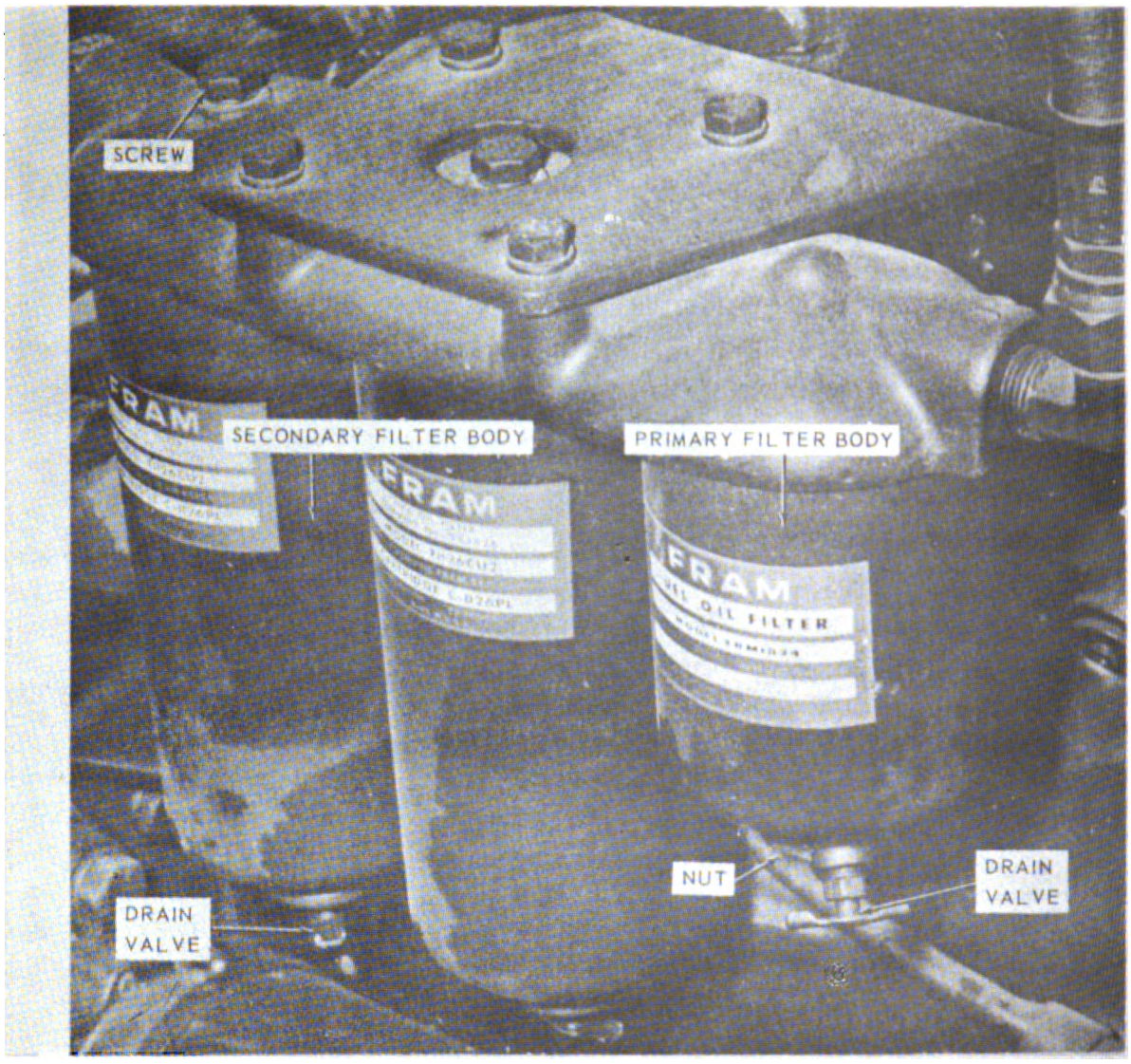
Figure 3-2. Engine crankcase breather service.

3-6. Fuel System Service

a. Filters. Service fuel filters as illustrated in figure 3-3. Inspect for leaks.

b. Fuel Tank Strainer Service. Service fuel tank strainer as illustrated in figure 3-4.

c. Engine starting aid. Service starting aid as illustrated in figure 2-12.



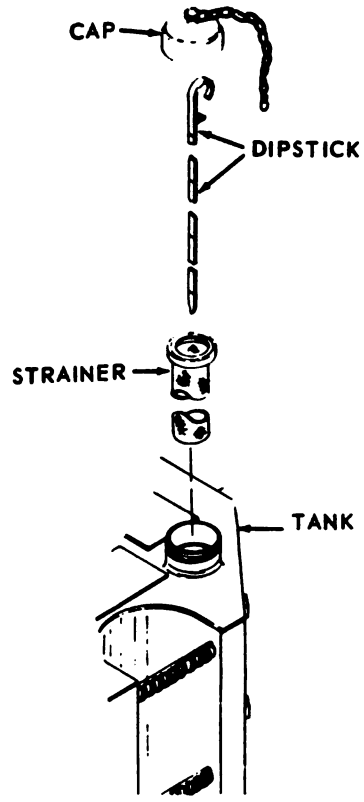
1. DRAIN FILTER BODIES.
2. REMOVE SCREW, SECONDARY FILTER BODY, GASKETS AND FILTER.
3. CLEAN FILTER BODY.
4. INSTALL NEW FILTER AND GASKETS, INSTALL BODY AND SCREW, CLOSE DRAIN VALVE.

NOTE REMOVE AND INSTALL OTHER SECONDARY FILTER IN A SIMILAR MANNER.

5. REMOVE NUT AND PRIMARY FILTER BODY, REMOVE FILTER ELEMENT.
6. CLEAN FILTER BODY, CLEAN FILTER ELEMENT IN SOLVENT, DRAIN TO DRY.
7. INSTALL ELEMENT, BODY AND NUT, CLOSE DRAIN VALVE.

ME 2420-206-12/3-3

Figure 3-3. Fuel filter service.



STEP 1. REMOVE CAP, DIPSTICK AND STRAINER FROM TANK.

STEP 2. CLEAN STRAINER WITH SOLVENT AND DRY THOROUGHLY.

STEP 3. INSTALL IN REVERSE ORDER OF REMOVAL.

ME 2420-206-12/3-4

Figure 3-4. Fuel tank strainer service.

3-7. Transmission and Torque Converter and Hydraulic Oil System Service

a. Transmission and Torque Converter Service.

(1) *Draining.*

(a) Drain transmission and torque converter every 500 operating hours. Operate tractor until temperature of 180 to 200 F. is indicated on converter oil temperature gage (fig. 2-7).

(b) Provide containers large enough to catch 18 gallons of oil used in system. Remove drain plugs from bottoms of torque converter and transmission.

(c) Check first oil emitted for metallic particles that indicate internal transmission damage. If metallic particles are present, report to direct support maintenance.

(d) Allow transmission and torque converter to drain thoroughly.

(e) Service filter as illustrated in figure 3-5.

(f) Remove six capscrews, flat washers, and lockwashers securing rear rock guard. Remove capscrews and lockwashers that secure oil pan to bottom of transmission; remove oil pan. Thoroughly clean screen exposed when oil pan is removed. Remove, clean, and install two magnets.

(g) Install oil pan using new gaskets.

(2) *Filling.*

(a) Fill transmission, refer to current LO for proper transmission fluid.

(b) Remove fill plug from top right of torque converter and fill transmission and torque converter hydraulic system.

(c) Fill transmission until fluid reaches full level on dipstick, mounted adjacent to rear of fuel tank.

(d) Operate engine at 700 to 750 rpm to.

prime transmission and torque converter lines.

(e) With engine running at 700 to 750 rpm, add transmission fluid to bring the level to the full mark on dipstick. Operate until a temperature of 180 ° to 200 ° F. is indicated on converter oil temperature gage; recheck level and add fluid if necessary.

b. Hydraulic Oil Tank Element and Strainer. Service element and strainer as illustrated in figure 3-6.

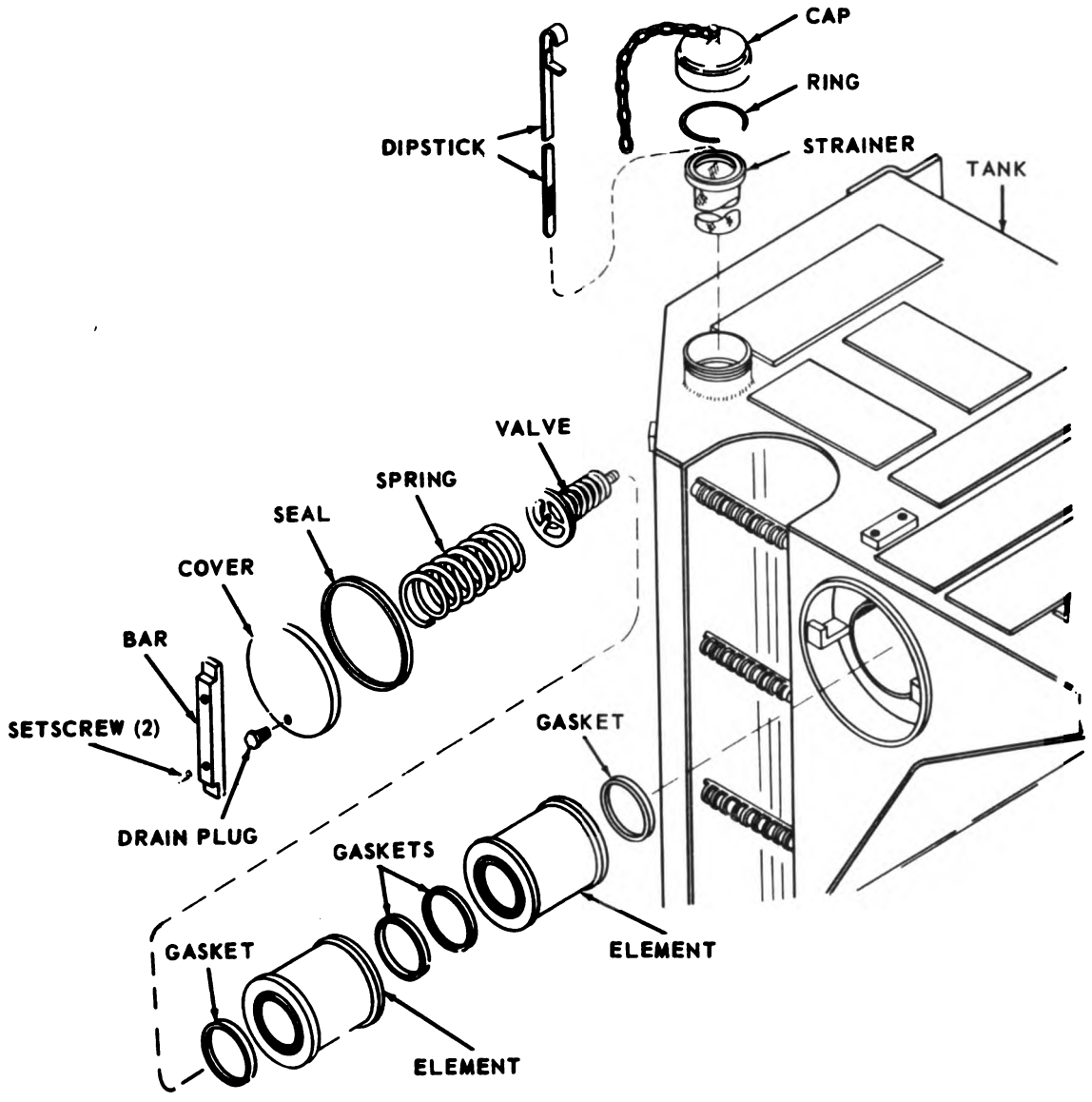
3-8. Air Cleaner Filter Service

a. Service Indicator. Air cleaner service indicator on dash panel will show red when filter service is necessary. Push plunger under indicator to reset.

b. Filter. Service air filter as illustrated in figure 3-7.

Caution: **Do not attempt to clean and reuse dirty filter element. Cleaning can rupture filter elements permitting dirt particles to enter engine. Do not use if dropped. Use extreme care when installing element.**

Figure 3-5. Transmission and torque converter, oil filter service.



STEP 1. REMOVE CAP, DIPSTICK, RING AND STRAINER FROM TANK.

STEP 2. CLEAN AND DRY STRAINER. REPLACE DAMAGED STRAINER AND INSTALL IN REVERSE ORDER OF REMOVAL.

STEP 3. REMOVE DRAIN PLUG FROM COVER AND ALLOW OIL TO DRAIN FROM ELEMENT HOUSING.

STEP 4. LOOSEN SETSCREWS AND REMOVE BAR, COVER, SEAL, SPRING, VALVE, GASKETS AND ELEMENTS FROM TANK HOUSING.

STEP 5. CLEAN TANK ELEMENT HOUSING. REPLACE GASKETS, ELEMENTS, AND DEFECTIVE SPRING, SEAL AND VALVE. INSTALL PARTS IN REVERSE ORDER REMOVAL. FILL TANK (SEE LO).

ME 2420-206-12/3-6

Figure 3-6. Hydraulic oil tank, element and strainer service.

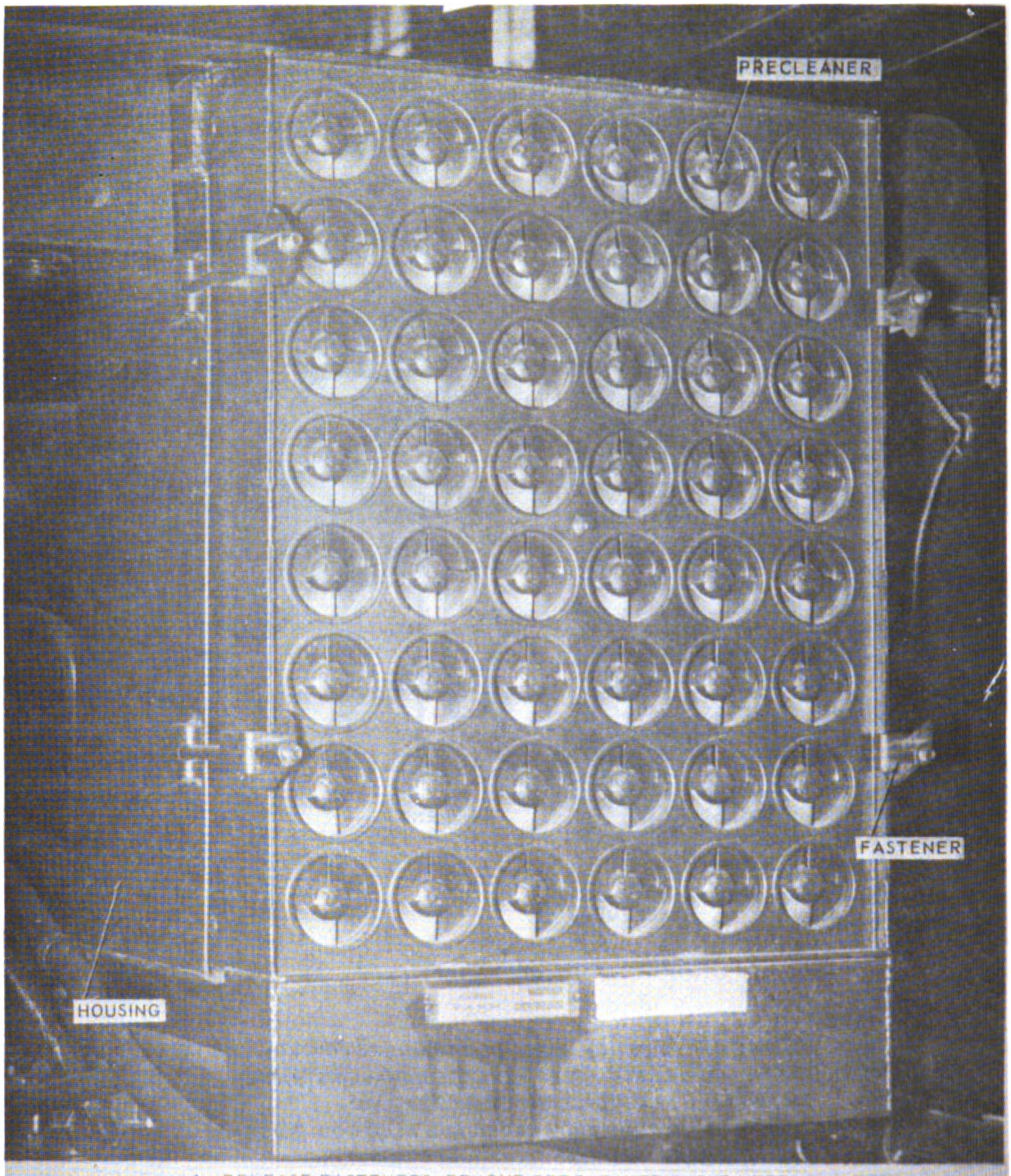
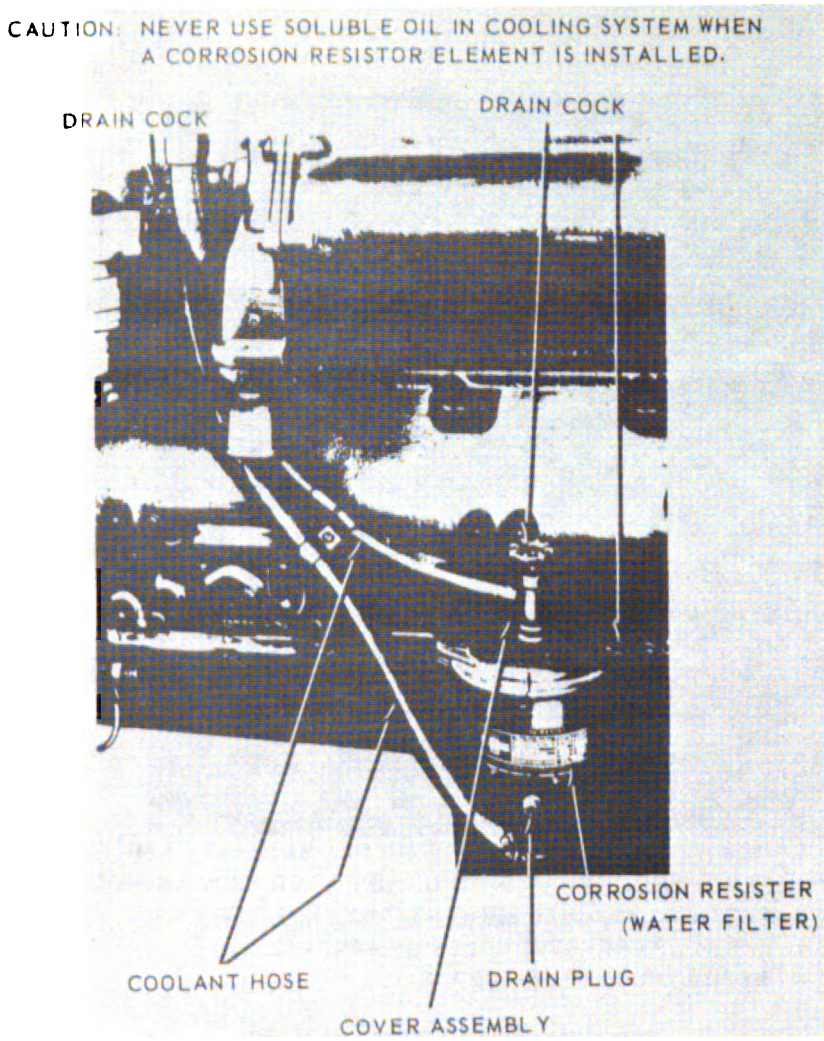


Figure 3-7. Air cleaner filter service.

3-9. Water Filter Service (Corrosion Resister)

Service water filter as illustrated in figure 3-8. Install new gasket.



STEP 1. CLOSE DRAIN COCKS, REMOVE DRAIN PLUG.
STEP 2. REMOVE BOLTS, COVER ASSEMBLY AND GASKET FROM CORROSION RESISTER.
STEP 3. REMOVE PLATE, CARTRIDGE, PLATE AND SPRING FROM FILTER .
STEP 4. USE CLEAN WATER AND FLUSH PLATES; SPRING AND FILTER.
STEP 5. OPEN DRAIN COCKS, CORRECT LEAKS, FILL RADIATOR.
CAUTION: BEFORE ADDING ANY INHIBITING AGENT TO COOLING SYSTEM CLOSE DRAIN COCKS.
NOTE:
WHEN COOLING SYSTEM DOES NOT CONTAIN ANTIFREEZE, USE CHROMATE TYPE FILTER ELEMENT FSN 2930-789-0651, P/N 13272.
NOTE:
WHEN COOLING SYSTEM CONTAINS PERMANENT TYPE ANTIFREEZE, USE CHROMATE TYPE FILTER ELEMENT. FSN 2930-929-5501, P/N 168481.

ME 2420-206-12/3-8

Figure 3-8. Water filter service.

3-10. Aneroid Filter Service

Service aneroid filter, figure 3-9.

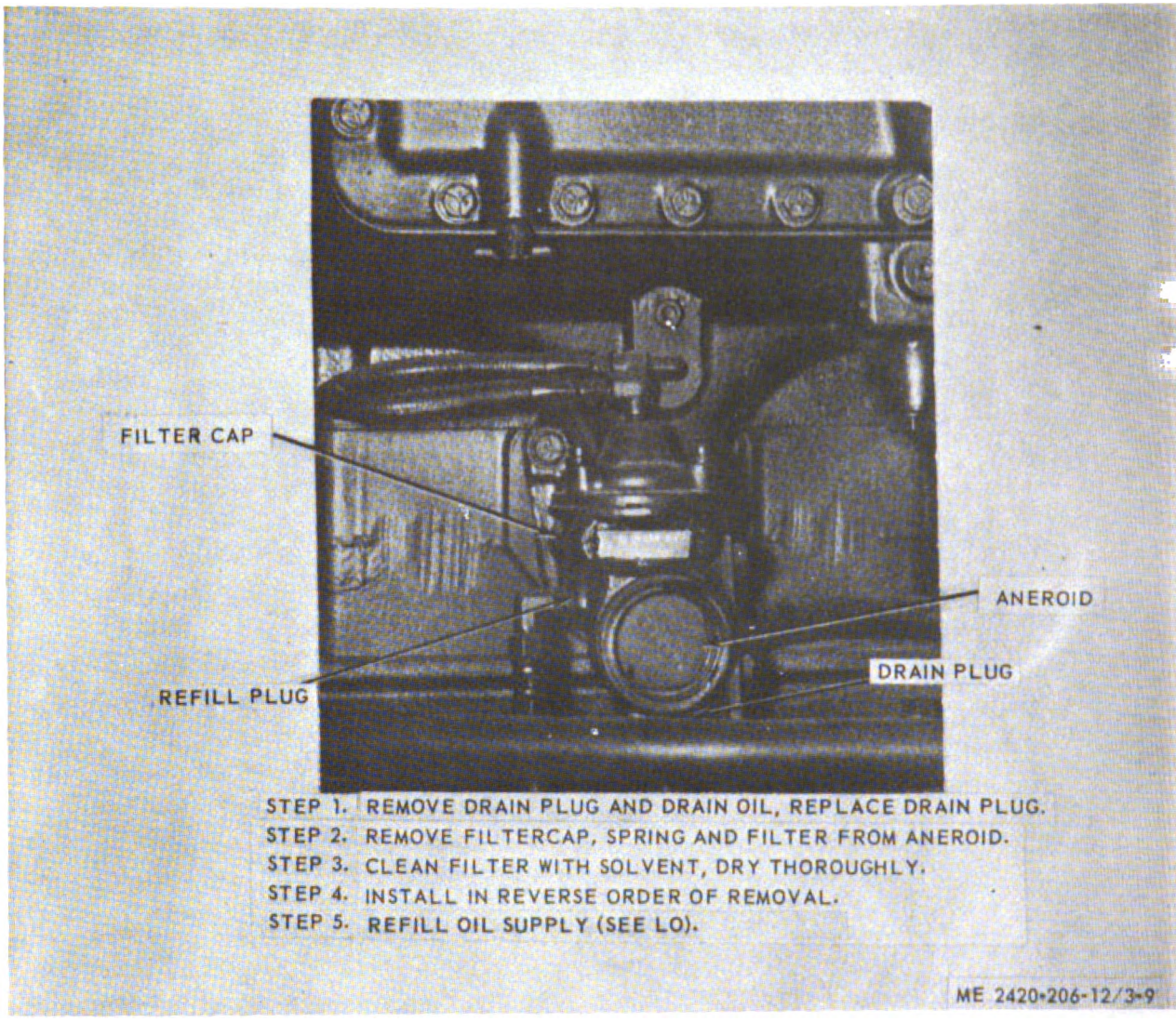


Figure 3-9. Aneroid filter service.

3-11. Fuel Pump Filter Service

Service fuel pump filter, figure 3-10.

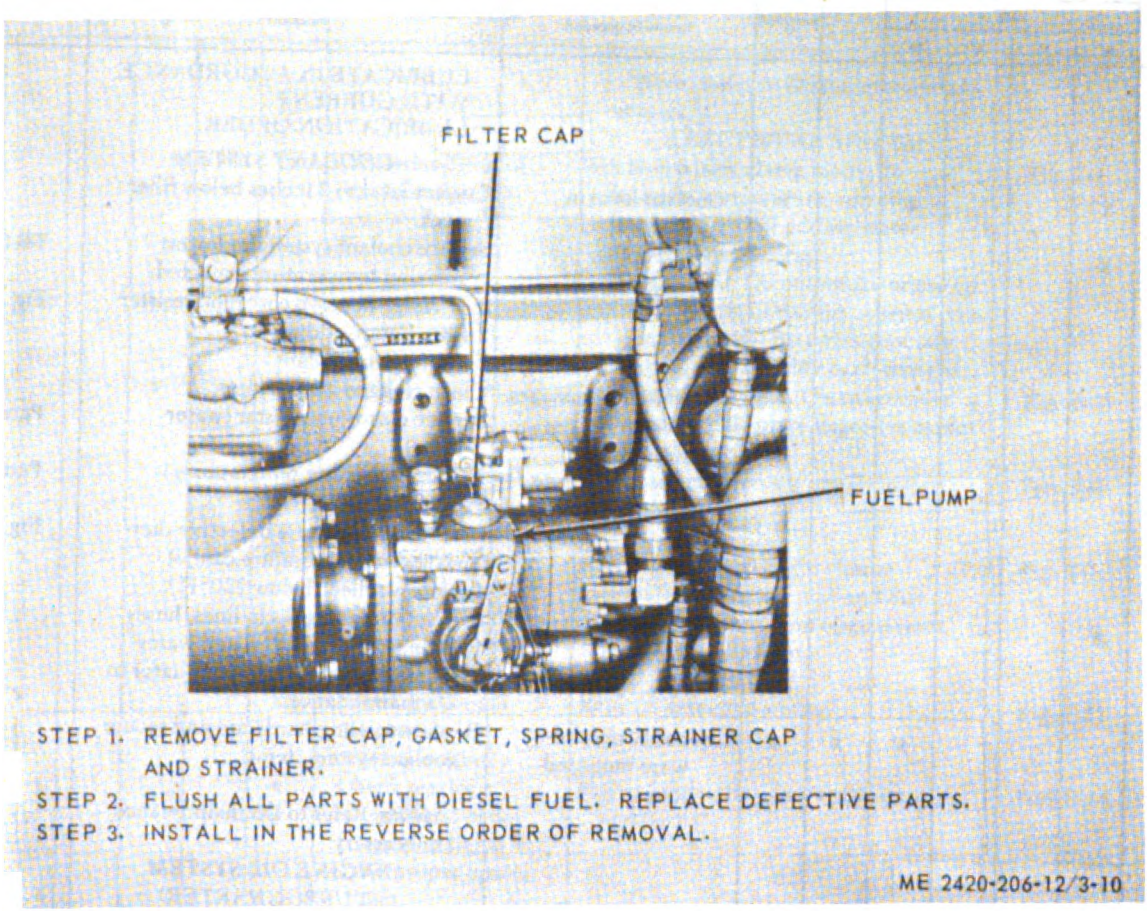


Figure 3-10. Fuel pump filter service.

3-12. Breather Service (Small)

a. Remove breathers from midmount bearing, brake fluid reservoirs, fuel tank, transmission housing, front and rear axle housings.

b. Clean breathers in P-D-680 solvent and dry thoroughly. Inspect for damage, replace damaged breathers.

Section III. PREVENTIVE MAINTENANCE CHECKS AND SERVICES

3-13. General

a. To insure that the 290M tractor is ready for operation at all times, it must be inspected systematically so that defects may be discovered and corrected before they result in serious damage or failure. Necessary preventive maintenance checks and services to be performed are listed in Table 3-1. Item numbers indicate the sequence of minimum inspection requirements.

b. Stop operation immediately if a deficiency is noted during operation which would damage equipment if operation were continued.

c. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased.

d. All deficiencies and shortcomings will be recorded together with corrective action taken on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) at the earliest possible opportunity.

Item Number	Interval						Item to be inspected	Procedure	Reference
	Operator				Org.		B–Before operation D–During operation	A–After operation W–Weekly	M–Monthly Q–Quarterly
	Daily				M	Q			
	B	D	A	W					
								LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER	
1								*COOLANT SYSTEM*	
	x			x		x	Coolant level in radiator.	Correct level to 2 inches below filler neck.	
	x					x	Cold weather protection	Service coolant system for lowest freezing temperature expected.	TB ORD-651
								Note. Remove corrosion resister filter before adding an inhibiter to coolant.	Fig. 3-8
			x			x	Radiator air passages.	Clean clogged air passages.	
					x	x	Corrosion resister (water filter).	Service corrosion resister (water filter).	Para 3-9
		x				x	Temperature gage reading.	Normal operating temperature is 165° to 195° F.	Para 2-8
								Note. Replace a defective thermostat if temperature cannot be controlled (below 220° F.).	Fig. 4-24
	x				x	x	Check for coolant leaks.	Correct coolant leaks in lines, hoses fittings, valves, filter, and water manifold. Refer leaks in radiator to DS maintenance.	
				x	x	x	Security of hardware mounted items	Replace missing hardware and secure coolant system items.	
								Note. Refer to DS maintenance as necessary.	
								ENGINE OIL SYSTEM (TURBOCHARTER)	
	x					x	Crankcase oil level.	Correct level to full mark on dip stick gage.	See LO
					x	x	Crankcase breather and filters.	Service dirty breather and filters.	Para 3-5
		x				x	Oil pressure gage reading.	At idle engine speed 7-10 psi, at maximum speed 35 psi (min.).	Para 2-8
		x	x			x	Check for oil leaks.	Correct leaks in exposed lines, hoses and fittings. Refer other oil leaks to DS maintenance.	Fig. 1-7
				x	x	x	Security of hardware mounted	Replace missing hardware and secure oil system items.	
								Note. Refer to DS maintenance as necessary.	
								FUEL SYSTEM	
	x					x	Level of fuel in tank.	Correct level to full mark on dip stick gage.	
					x	x	Tank breather.	Service dirty breather	Para 3-12
					x	x	Tank strainer.	Service dirty strainer.	Para 3-6
					x	x	Air cleaner.	Service dirty air cleaner filter.	Para 3-8
					x	x	Aneroid control.	Service control (oil). Service dirty filter.	Para 3-10
					x	x	Pump filter.	Service dirty filter.	Para 3-11
					x	x	Fuel filters.	Service dirty filters.	Para 3-6
	x	x				x	Check for fuel leaks.	Correct fuel leaks in lines, hoses, fittings (exposed), filters, and tank.	Fig. 1-8
				x	x	x	Security of hardware mounted items.	Replace missing hardware and secure fuel system items.	

Item Number	Interval: Operator: Daily: B	D	A	W	Org: M	Q	Item to be inspected	Procedure	Reference
								B—Before operation D—During operation A—After operation W—Weekly M—Monthly Q—Quarterly	
								- *Note.* Refer to DS maintenance as necessary.	
4								***ELECTRICAL SYSTEM***	
	x				x	x	Batteries (level of electrolyte)	Fill to 3/8 inch above plates. In freezing temperature, run engine 1 hour (min.) after adding water. Clean dirty filler caps. WARNING: Do not smoke or use an open flame in vicinity when servicing batteries. Batteries generate hydrogen, a highly explosive gas.	Fig. 2-1
				x	x	x	Cables.	Tighten loose cables. Clean corroded connectors. Replace defective cables and batteries.	Fig. 4-48
	x	x				x	Switches (master) (main) (starter) (lights).	Check all switches for proper operation.	Para 2-8
		x			x	x	Ammeter gage reading (includes generator and regulator operation).	Reading is zero to slight charge (plus) after engine start and during normal operation of generator, regulator and engine.	Fig. 2-7
	x	x				x	Check for proper operation to crank engine.	Replace defective starter.	Fig. 4-21
		x				x	Check service, panel and panel warning lights for proper operation.	Replace defective, damaged lamps and lights.	Para 3-14
				x		x	Check wire terminal connections.	Secure loose terminal connectors.	
		x		x			Security of hardware mounted electric control items.	Replace damaged, defective, inoperable warning buzzer.	
5								***AIR SYSTEM***	
		x			x	x	Air pressure gage reading.	During normal engine operation, reading is 90 to 120 psi.	Fig. 2-7
		x					Low air pressure gage.	When gage reading is less than 60 psi, buzzer sounds.	
		x				x		Replace damaged, defective, inoperabl warning buzzer.	Fig. 4-15
		x				x	Check for air leaks in lines, valves and fittings.	Correct leaks and replace defective valves, controls, lines and reservoirs.	Fig. 1-4
				x	x	x	Security of hardware mounted items.	Replace missing hardware and secure mounted items.	
6								***BRAKE OIL RESERVOIRS***	
	x				x	x	Oil level.	Check level of oil in tank.	See LO
				x	x	x	Tank breathers.	Service dirty breathers.	Para 3-12
		x			x	x	Check for oil leaks.	Correct leaks, replace damaged, defective lines, fittings and reservoir	

Interval						B–Before operation D–During operation	A–After operation W–Weekly	M–Monthly Q–Quarterly
Operator				Org.				
Daily								
B	D	A	W	M	Q	Item to be inspected	Procedure	Reference
							HYDRAULIC OIL SYSTEMS (TRANSMISSION-CONVERTER) (MAIN)	
	x			x	x	Check transmission oil level.	Check level with engine operating at low idle speed, fill to level mark on dip stick gage.	See LO, para 3-7
				x	x	Transmission breather.	Service dirty breather.	Para 3-12
				x	x	Transmission oil filters.	Service dirty filters.	Fig. 3-7
x	x			x	x	Transmission and converter gage readings.	Normal operating transmission pressure gage reading is 180 to 300 psi. Converter temperature gage reading is less than 250°F.	Fig. 2-7
x				x	x	Level of oil in main tank.	Fill to level mark on dip stick gage.	See LO
				x	x	Main tank filter and strainer.	Service dirty filter and strainer.	Fig. 3-6
	x		x	x	x	Check for leaks.	Correct leaks in oil lines, filters, hoses, and fittings. Drain and replace if worn, cracked, frayed, or damaged. Refer transmission control valve, converter charging pump and other hydraulic oil leaks to DS maintenance.	Fig. 1-5 and para 3-7
							MOLDBOARD ASSEMBLY	
x		x		x	x	Cutting edge and end bits.	Replace worn, broken, distorted cutting edge and end bits.	Para 4-3
x		x		x	x	Skid shoes.	Replace if worn, damaged, broken, or distorted.	Para 4-6
x		x		x	x	Scarifier.	Replace worn tooth. Replace broken, distorted shank or shank holder.	Para 4-4
			x		x	Security of hardware mounted items.	Replace missing hardware and secure loose items.	Para 4-1
							BODY AND FRAME	
			x		x	Cab, hood, glass.	Repair or replace hood. Refer other damage to DS maintenance.	Para 4-17
			x		x	Frame, rock guards, ladders.	Check for creaks, breaks and other damage. Repair or replace rock guard and ladders. Refer other damage to GS maintenance.	Para 4-58
							TIRES AND FINAL DRIVE (PLANETARY) OIL LEVEL	
x	x	x		x	x	Air pressure.	Correct tire air pressure is 45 psi (max.), 25 psi (min.).	Para 4-63
x	x	x			x	Tire wear and damage.	Check for wear, blisters, bruises. Remove imbedded foreign objects.	Para 4-63
x					x		Replace worn, damaged and defective tires.	TM 9-1870-1
x		x		x	x	Differential and final drive oil level.	Service differential and final drives (planetary). Report presence of particles in oil to DS maintenance. Prevent oil from contacting tires; oil causes rapid deterioration of rubber. Inspect and replace as necessary the breather (vent ay) mounted on top of differential housing.	See LO, Fig 4-52
x	x					Check for oil leaks.	Correct leaks. Refer to DS maintenance as necessary.	

B–Before operation A–After operation M–Monthly
D–During operation W–Weekly Q–Quarterly

Item Number	Interval: Operator: Daily: B	D	A	W	Org: M	Q	Item to be inspected	Procedure	Reference
	x	x					Midmount bearing mounted on inside front of rear frame unit, driven by a propeller shaft from the transmission and drives a propeller shaft to rear axle.	Check for oil leaks. Refer to DS maintenance as necessary.	
11								*BELTS*	
	x			x	x	x	Check for wear and defects.	Replace defective belts.	Paras 4-28, 4-38
12								*BRAKES*	
	x		x	x			Brake assembly.	Check for loose nuts. Check for overheated drums. Check for lining wear.	Para 4-50
13								*UNIVERSAL COUPLING*	
	x			x			Universal coupling.	Check for creaks, distortion, broken weldments, and other damage, refer to DS maintenance. Service universal coupling.	See LO
14								*STEERING*	
	x		x				Steering gear ay.	Check for leaks or other damage. Refer to DS maintenance.	
	x		x			x	Drag link ay.	Check for damage and proper adjustment. Adjust as necessary.	Para 4-21

Section IV. OPERATOR'S MAINTENANCE

3-14. Control Panel Light Bulbs

a. Remove damaged or defective control panel (para 2-7) warning and panel light lens, reflectors and bulbs.

b. Replace defective light bulbs, tag and disconnect leads and clean lens and reflectors as necessary.

3-15. Tractor Light Lamps

a. Headlight and Floodlight Lamps. Remove rubber lamp retainers, disconnect lead and replace damaged or defective sealed beam lamps. Replace retainers as necessary.

b. Blackout Headlight. Remove 3 screws and door. Replace damaged or defective sealed beam lamp, disconnect leads. Remove the C-washer and slip off the shell. Assemble in reverse order.

c. Taillight and Stoplight Lamps. Remove 2 screws and door. Replace damaged or defective lamps. Install door and screws.

d. Blackout Taillight. Remove 6 screws and door. Replace damaged or defective lamp. Install door and screws.

3-16. Radiator

a. Check to be sure radiator, engine cylinder block, water pump body, and air compressor drain cocks are closed. Remove radiator cap, fill radiator with clean fresh water. Open vent cock at top of thermostat housing (fig. 4-24) to allow trapped air to escape; close the vent cock when water flows from it. Install radiator cap.

***Caution:* Avoid adding water to a hot engine. Wait until engine has cooled. If necessary to add water to hot engine, add water slowly while the engine is running at a fast idle.**

b. Winter. Use ethylene-glycol base antifreeze in the percentage required for winter protection. Do not use a corrosion inhibitor in addition to antifreeze. Antifreeze is compatible with the corrosion resistor.

c. Draining and Cleaning.

(1) *Draining.* Open radiator, engine cylinder block and air compressor drain cocks. Open vent cock at top of thermostat housing and remove radiator cap. Remove plug from bottom of corrosion resistor.

(2) *Flushing.* Open corrosion resistor valves and run water through cooling system with drain cocks open until water coming out is clean. Close corrosion resistor valves.

(3) *Chemical cleaning.* If excessive rust and scale are present in the cooling system, clean the system with a cleaner such as sodium bisulphate or oxalic acid. Follow chemical cleaning by neutralizing and flushing. Always open the corrosion resistor valves during cleaning of cooling system.

Section V. TROUBLESHOOTING

3-17. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the 290M tractor and its components. Malfunctions which may occur are listed in table 3-2. Each malfunction stated is followed by a list of probable causes of the trouble. The corrective action recommended is described opposite the probable cause.

Table 3-2. Troubleshooting

Malfunction	Probable cause	Corrective action
1. Engine fails to start.	*a.* Master or main switch OFF.	*a.* Turn switches ON (fig. 2-7).
	b. Fuel tank empty.	*b.* Fill tank.
	c. Fuel systems filters dirty.	*c.* Service filters (figs. 3-3, 3-9, and 3-10).
	d. Fuel shutdown valve defective.	*d.* Replace fuel shutdown valve (fig. 4-27).
	e. Aneroid valve defective.	*e.* Replace aneroid valve (fig. 4-28).
	f. Fuel lines leaking or restricted.	*f.* Correct leaks and replace defective exposed lines (fig. 1-8).
	g. Other causes.	*g.* Refer other causes to DS maintenance.
2. Starter does not crank engine.	*a.* Master or main switch OFF.	*a.* Turn switches ON.
	b. Electric cable connection loose.	*b.* Tighten cable connections including battery.
	c. Defective starter.	*c.* Replace starter (fig. 4-21).
	d. Batteries discharge.	*d.* Replace batteries, (fig. 4-47).
	e. Starter solenoid defective.	*e.* Replace starter solenoid, (fig. 4-21).
	f. Faulty starter.	*f.* Replace starter brushes or starter. (fig. 4-21).
	g. Starter switch defective.	*g.* Replace starter switch. (fig. 4-15).
	h. Other causes.	*h.* Refer to DS maintenance.
3. Engine overheats	*a.* Coolant level low.	*a.* Fill radiator.
	b. Crankcase oil level low.	*b.* Fill crankcase (see LO).
	c. Radiator air passages clogged.	*c.* Clean air passages.
	d. Thermostat defective.	*d.* Replace thermostat (fig. 4-24).
	e. Other casuses.	*e.* Refer to DS maintenance.
4. Generator output low or not charging.	*a.* Generator belt loose or defective.	*a.* Replace belt, and correct belt tension.
	b. Generator defective.	*b.* Replace generator.
	c. Generator regulator defective.	*c.* Replace regulator.
	d. Cables connections loose.	*d.* Tighten connections.
	e. Other causes.	*e.* Refer to DS maintenance.
5. Batteries do not hold charge	*a.* Electrolyte level low.	*a.* Add water.
	b. Loose terminals or cables.	*b.* Tighten connections.
	c. Defective battery.	*c.* Replace battery (fig. 4-47).
	d. Other causes.	*d.* Refer to DS maintenance.
6. Engine knocks.	*a.* Crankcase oil level low.	*a.* Fill crankcase (see LO).
	b. Oil leaks in lines and filters.	*b.* Correct oil leaks.
	c. Other causes.	*c.* Refer to DS maintenance.
7. Engine smokes.	*a.* Crankcase oil level too high.	*a.* Drain excess oil.
	b. Air cleaner dirty.	*b.* Service air cleaner (fig. 3-7).
	c. Oil filters dirty.	*c.* Service oil filters (fig. 3-1;.
	d. Crankcase breather dirty.	*d.* Service breather (fig. 3-2).

Malfunction	Probable cause	Corrective action
	e. Fuel filters dirty.	*e.* Service fuel filters (fig. 3-3).
	f. Other causes.	*f.* Refer to DS maintenance.
8. Brakes do not operate.	*a.* Air in system trapped.	*a.* Bleed air system (fig. 1-4). Correct leaks.
	b. Brake oil reservoir breather dirty.	*b.* Service breather (para 3-12).
	c. Low oil in reservoir.	*c.* Add oil (see LO) Correct leaks.
	d. Other causes.	*d.* Refer to DS maintenance.
9. Main hydraulic system fails.	*a.* Hydraulic oil level low.	*a.* Fill hydraulic tank (see LO).
	b. Leaks in lines.	*b.* Correct leaks.
	c. Tank element dirty.	*c.* Service tank elements (fig. 3-6).
	d. Other causes.	*d.* Refer to DS maintenance.
10. Transmission converter hydraulic system fails.	*a.* Low oil level in system.	*a.* Add oil (see LO).
	b. Oil filters dirty.	*b.* Service oil filters (fig. 3-5).
	c. Leaks in external line.	*c.* Correct leaks in line (fig. 1-5).
	d. Other causes.	*d.* Refer to DS maintenance.

CHAPTER 4
ORGANIZATIONAL MAINTENANCE PROCEDURES

Section I. BULLDOZER ASSEMBLY

4-1. General

a. Bulldozer. The bulldozer consists of a blade, push beams, pitch strut, and skid shoes. The push beams are trunnion mounted to balls on the sides of the frame which provide the pivot points for the push beams. The bulldozer blade is attached to the push beams by pivot pins so that the blade can pivot on the push beams. An adjustable pitch strut is connected between the right push beam and the top of the bulldozer blade. The tilt hydraulic cylinder is connected between the left push beam and top of bulldozer blade. Adjustable position skid shoes are provided under the fronts of the push beams. The blade is fitted with replaceable cutting edge, and end bits.

b. Scarifier. Four scarifiers are bolted to the rear of the bulldozer blade. When released for use, they score the earth while the tractor moves in a reverse direction to allow easier working of the earth with the blade.

c. Inspection. Inspect bulldozer assembly and operating components daily for damage or defects.

4-2. Bulldozer End Bits

a. Removal. Remove bulldozer end bits as illustrated in figure 4-1.

b. Cleaning and Inspection.

(1) Clean all parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and other damage. Replace defective parts as necessary.

c. Installation. Install bulldozer end bits as illustrated in figure 4-1.

4-3. Bulldozer Cutting Edge

a. Removal. Remove bulldozer cutting edge as illustrated in figure 4-1.

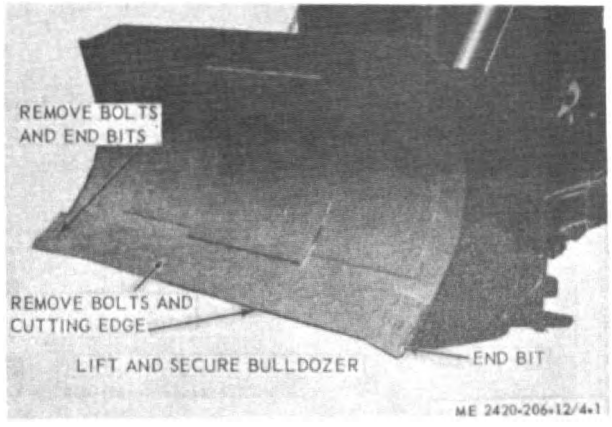


Figure 4-1. Bulldozer cutting edge and end bits, removal and installation.

b. Cleaning and Inspection.

(1) Clean all parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and other damage. Replace defective parts as necessary.

c. Installation. Install bulldozer cutting edge as illustrated in figure 4-1.

4-4. Scarifier Tooth

a. Removal. Remove scarifier tooth as illustrated in figure 4-2.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and other damage. Replace defective parts as necessary.

c. Installation. Install scarifier tooth as illustrated in figure 4-2.

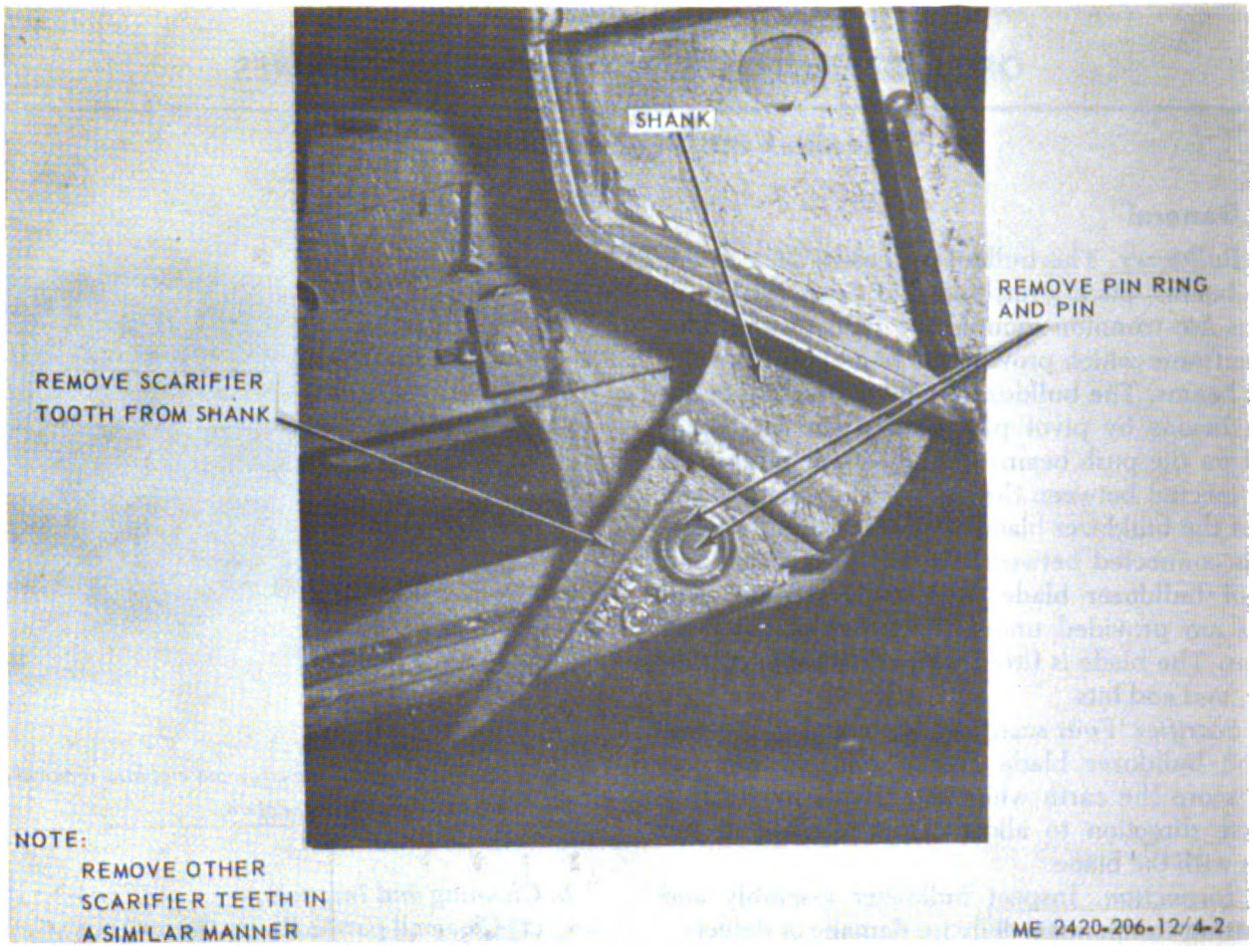


Figure 4-2. Scarifier tooth, removal and installation.

4-5. Scarifier Body

a. Removal.

(1) Remove scarifier tooth (para 4-4) and shank from body.

(2) Remove scarifier body as illustrated in figure 4-3.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and other damage. Replace damaged scarifier body as necessary.

c. Installation. Install scarifier body as illustrated in figure 4-3.

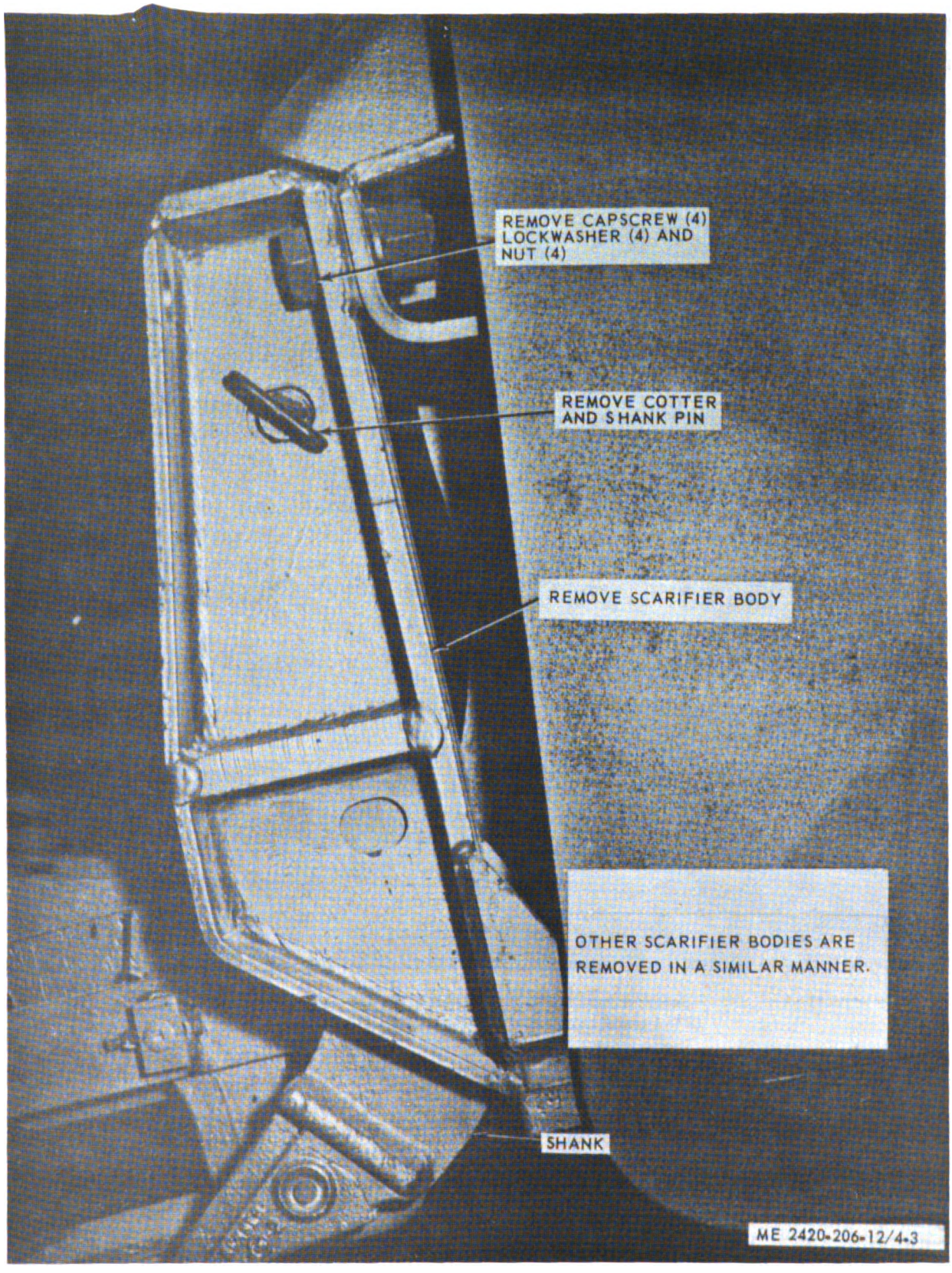


Figure 4-3. Scarifier body, removal and installation.

4-6. Skid Shoe

a. Removal. Remove skid shoe as illustrated in figure 4-4.

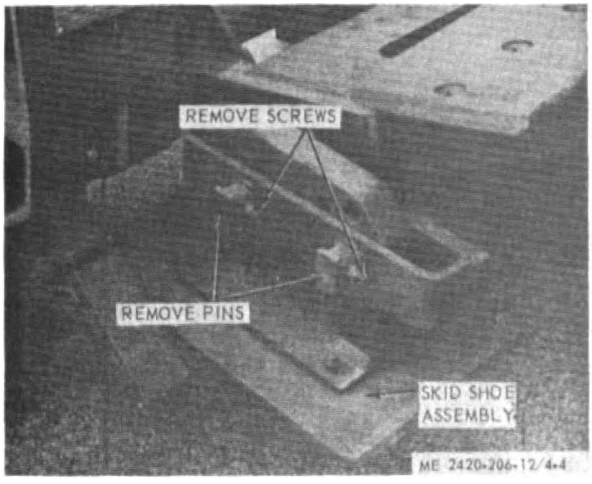


Figure 4-4. Skid shoe, removal and installation.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks, and other damage. Replace all defective parts.

c. Installation. Install skid shoes as illustrated in figure 4-4.

Note. Skid shoes are installed only when using bulldozer blade for grading material.

4-7. Cylinders

a. Removal and Disassembly. Remove and disassemble bulldozer lift and tilt cylinders as illustrated in figure 4-5.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and other damage. Replace defective parts as necessary. Replace wear ring assembly, preformed packings and seals.

c. Reassembly and Installation. Reassemble and install bulldozer lift and tilt cylinders as illustrated in figure 4-5. Lubricate interior of cylinder, packings, and piston.

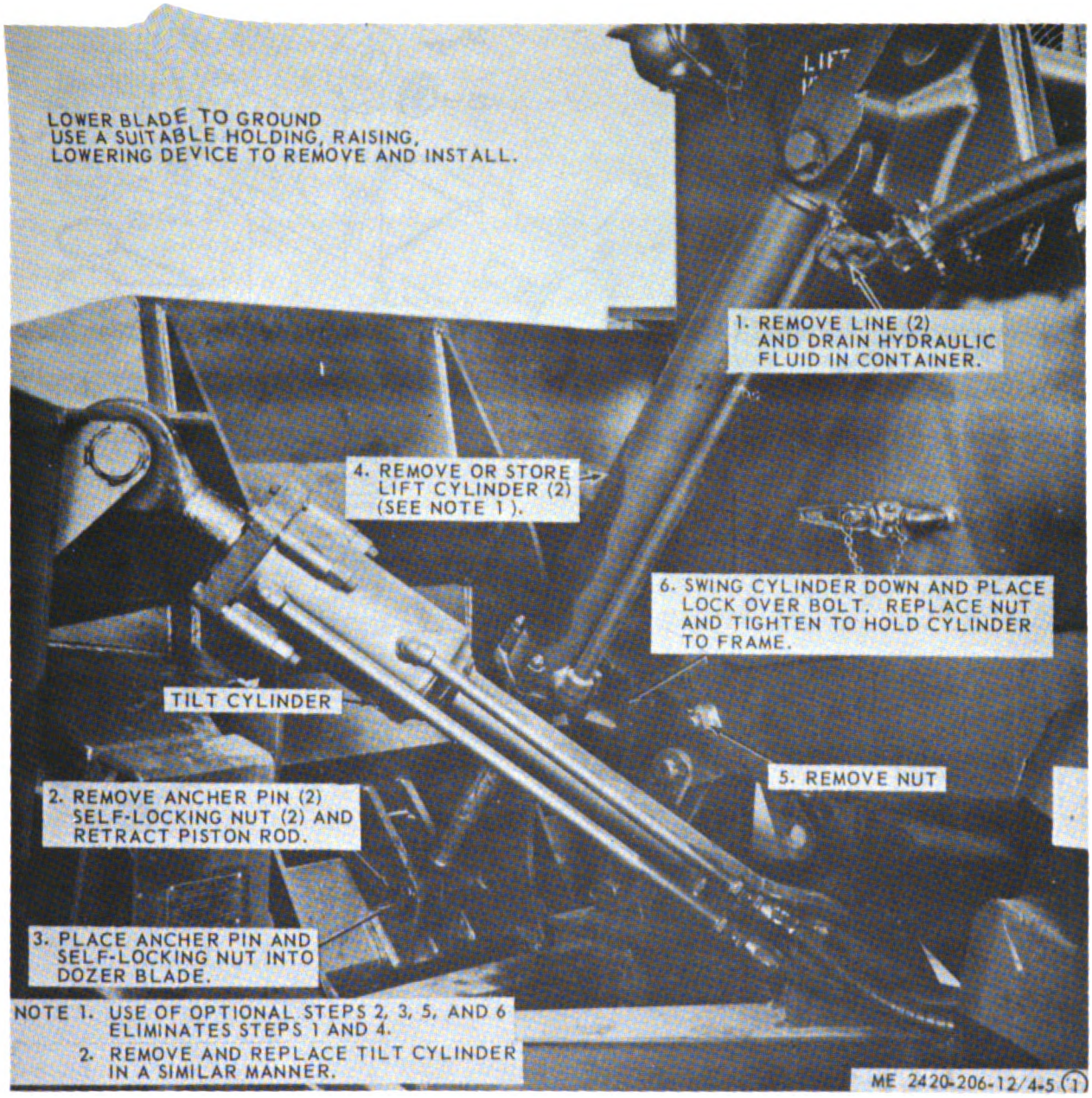


Figure 4-5. Bulldozer lift and tilt cylinder, removal, disassembly, reassembly, and installation (sheet 1 of 3).

1 Nut
2 Screw
3 Lock
4 Cap
5 Packing
6 Ring
7 Pin
8 Nut
9 Piston
10 Ring, packing, seal
11 Piston
12 Packing
13 Wire
14 Setscrew
15 Retainer
16 Wiper
17 Gland
18 Adapter
19 Packing
20 Packing
21 Adapter
22 Rod
23 Tube assembly
24 Screws
25 Bearings (do not remove unless damaged)

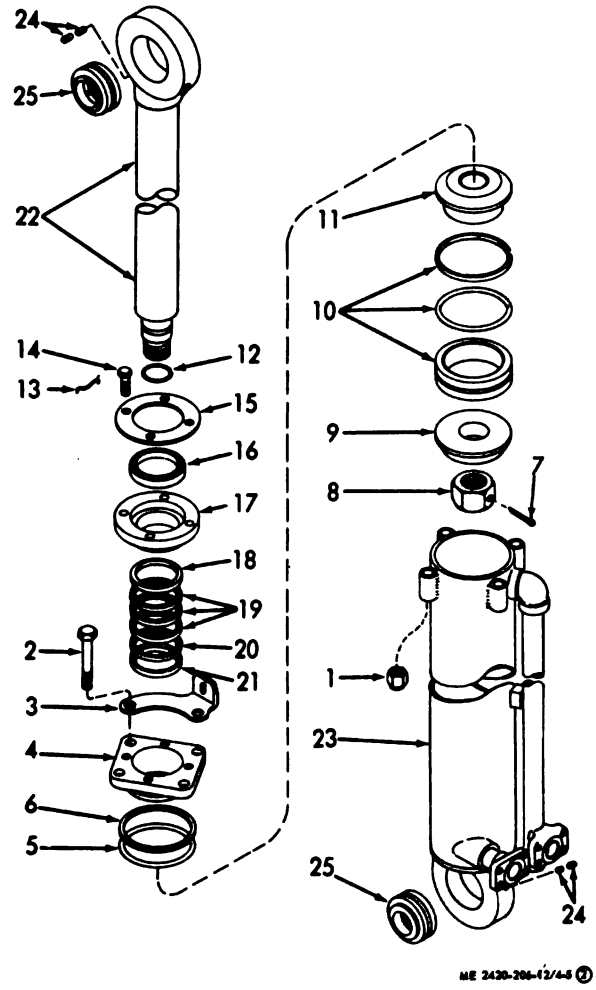
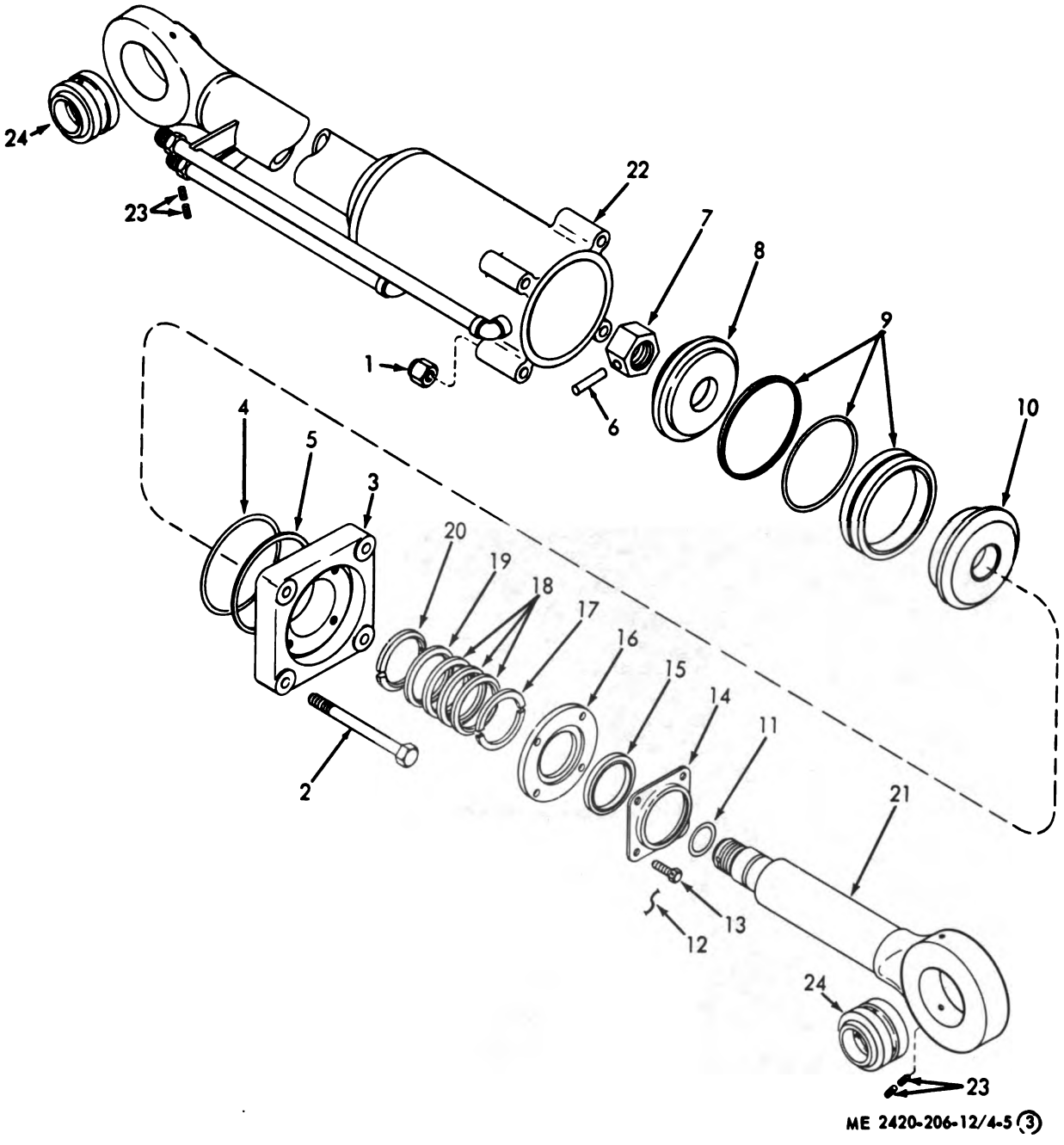


Figure 4-5. Bulldozer lift and tilt cylinder, removal, disassembly, reassembly, and installation (sheet 2 of 3).



1 Nut
2 Screw
3 Cap
4 Ring
5 Packing
6 Pin
7 Nut
8 Piston
9 Seal, packing wear ring
10 Piston
11 Packing
12 Wire
13 Screw
14 Retainer
15 Seal
16 Cap
17 Adapter
18 Packing
19 Packing
20 Adapter
21 Rod
22 Tube assembly
23 Setscrew
24 Bearings (do not remove unless damaged)

Figure 4-5. Bulldozer lift and tilt cylinder, removal, disassembly, reassembly, and installation (sheet 3 of 3).

(1) *Lift cylinder.* Torque nut (8) to 1,000 foot-pounds, and screws (2) to 50 foot-pounds. Tighten screws (14) finger tight, install lockwire (13).

(2) *Tilt cylinder.* Torque nut (7) to 1,000 foot-pounds, and screws (2) to 320 foot-pounds. Tighten screws (13) finger tight, install lockwire (12).

4-8. Bulldozer Assembly

a. Removal and Disassembly.

(1) Remove cutting edge and end bits (para 4-3).

(2) Remove scarifier body (para 4-5).

(3) Remove skid shoes (para 4-6).

(4) Remove bulldozer cylinders (para 4-7).

(5) Refer to figure 4-6 and remove push beam bearing cap.

(6) Refer to figure 4-7 and disassemble bulldozer blade, push beams, and pitch strut.

b. Cleaning, Inspection, and Repair.

(1) Clean parts and dry thoroughly.

(2) Inspect for wear, cracks, breaks and other damage.

(3) Replace defective parts as necessary.

c. Reassembly and Installation.

(1) Refer to figure 4-7 and reassemble bulldozer blade, push beams, and pitch strut.

(2) Refer to figure 4-6 and install push beam bearing cap.

(3) Install bulldozer cylinders (para 4-7).

(4) Install skid shoes (para 4-6).

(5) Install scarifier body (para 4-5).

(6) Install cutting edge and end bits (para 4-3).

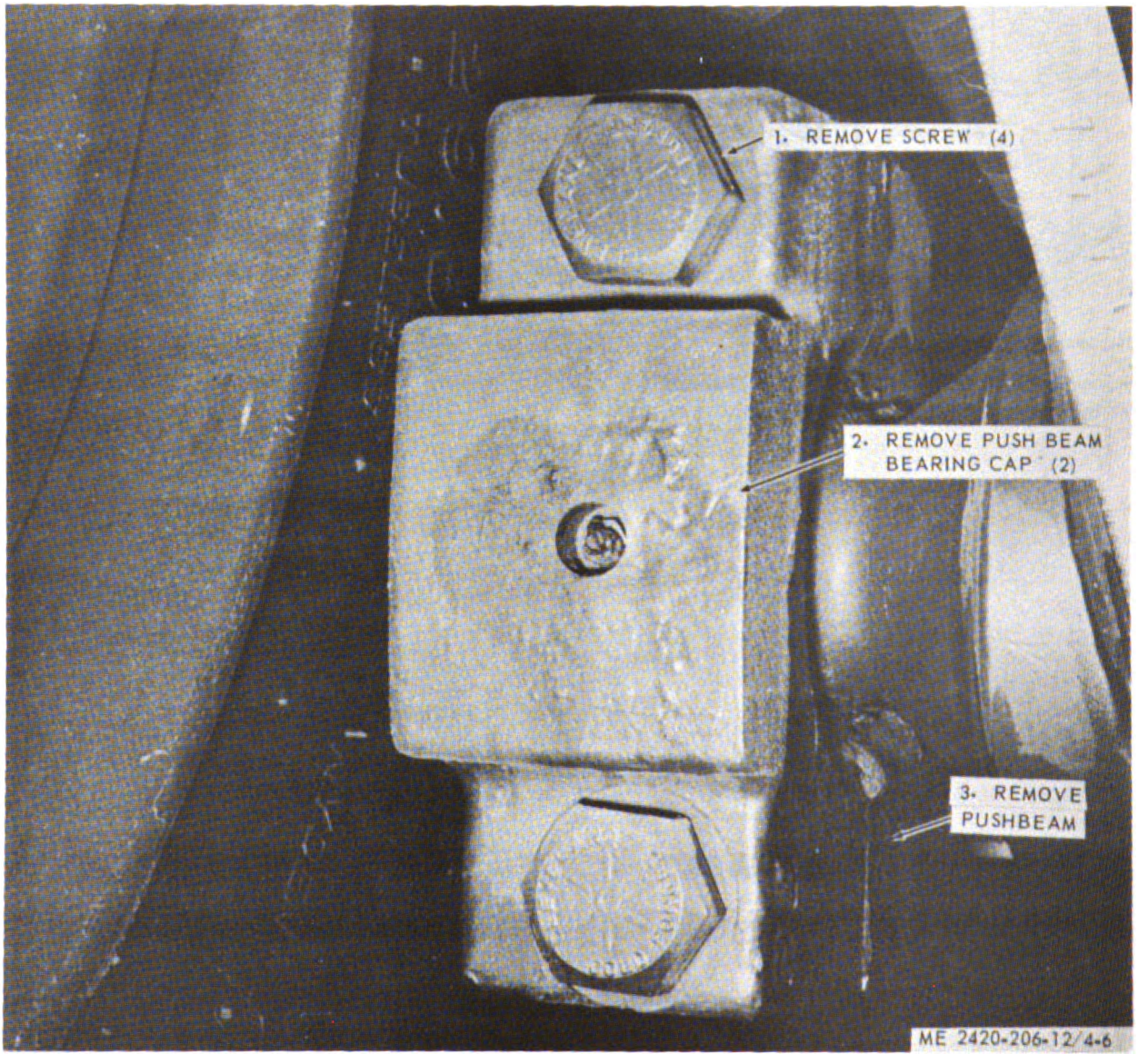
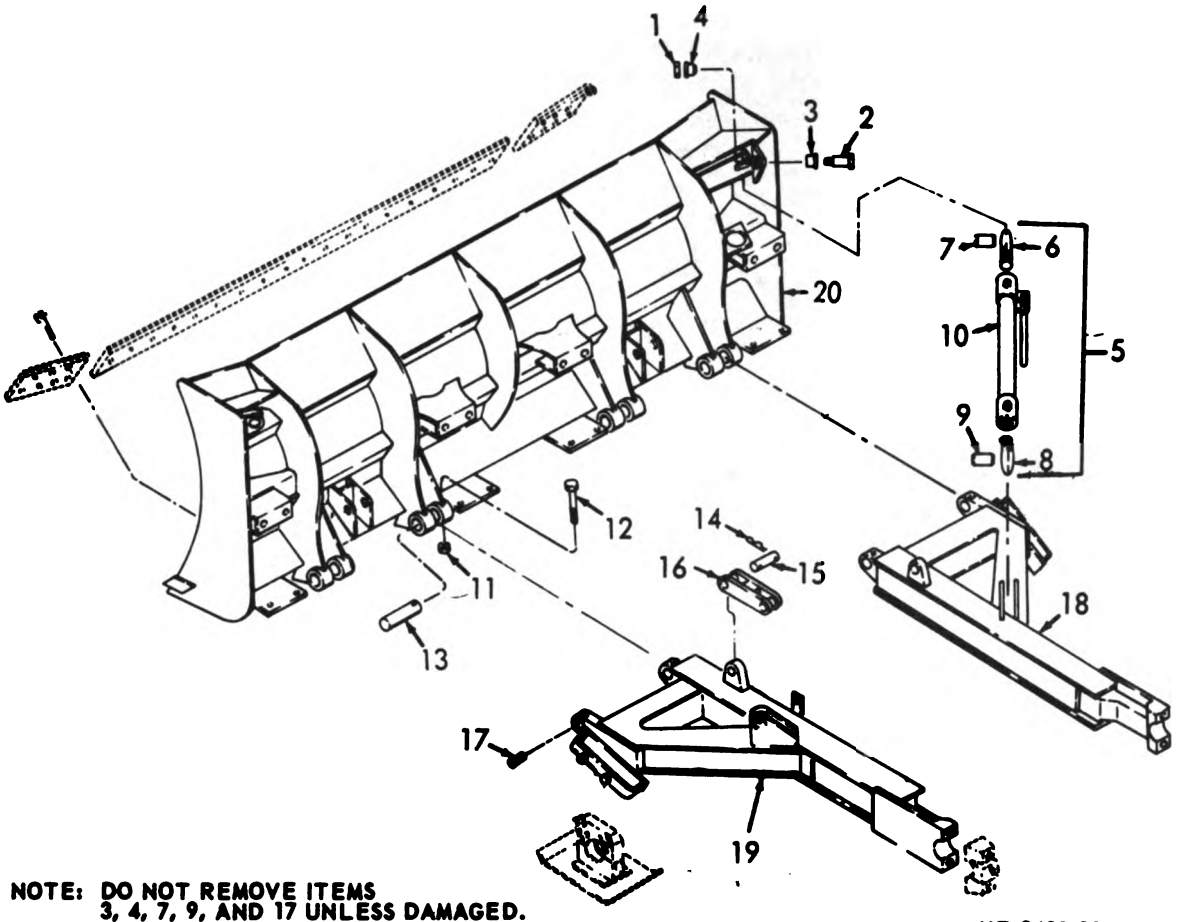


Figure 4-6. Push beam bearing cap, removal and installation.



1 Nut	11 Nut
2 Pin	12 Screw
3 Bearing	13 Pin
4 Bearing	14 Pin
5 Pitch strut assembly	15 Pin
6 Rod	16 Lock Link
7 Bearing	17 Bearing
8 Rod	18 Push beam assembly
9 Bearing	19 Push beam assembly
10 Pitch Assembly	20 Blade assembly

Figure 4-7. Bulldozer blade, push beams, and pitch strut, exploded view.

Section II. TRACTOR LIGHTS

4-9. General

Lights mounted on tractor cab and radiator shroud permits 24 hour continuous operation of equipment.

4-10. Headlight Assembly and Grill

a. Removal. Refer to figure 4-8 and remove headlight assembly and grill (para 3-15*a*).

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective headlight assembly, grill, and parts as necessary.

c. Installation. Refer to figure 4-8 and install headlight assembly and grill.

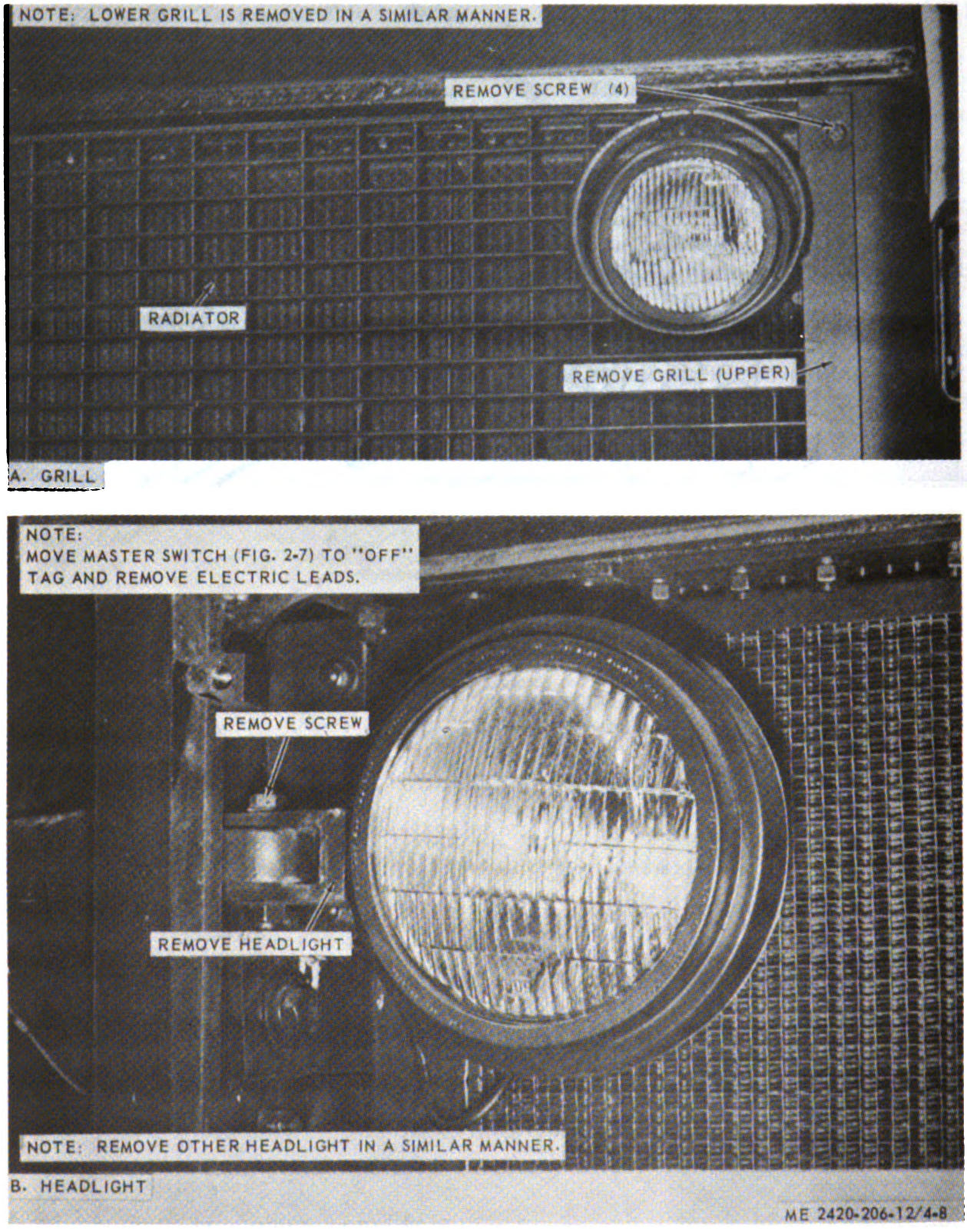


Figure 4-8. Headlight assembly and grill, removal and installation.

4-11. Floodlight Assembly

a. Removal. Refer to figure 4-9 and remove floodlight assembly (para 3-15a).

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

Figure 4-9. Floodlight assembly, removal and installation.

(2) Inspect for cracks, breaks and other damage. Replace defective floodlight assembly and parts as necessary.

c. Installation. Refer to figure 4-9 and install floodlight assembly.

4-12. Blackout Headlight Assembly

a. Removal. Refer to figure 4-10 and remove blackout headlight assembly (para 3-15b).

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective blackout headlight assembly as necessary.

c. Installation. Refer to figure 4-10 and install blackout headlight assembly.

4-13. Tail and Stoplight, Blackout Tail and Stoplight Assemblies

a. Removal. Refer to figure 4-11 and remove tail and stoplight, blackout tail and stoplight assembly (para 3-15c and 3-15d).

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace all defective lights as necessary.

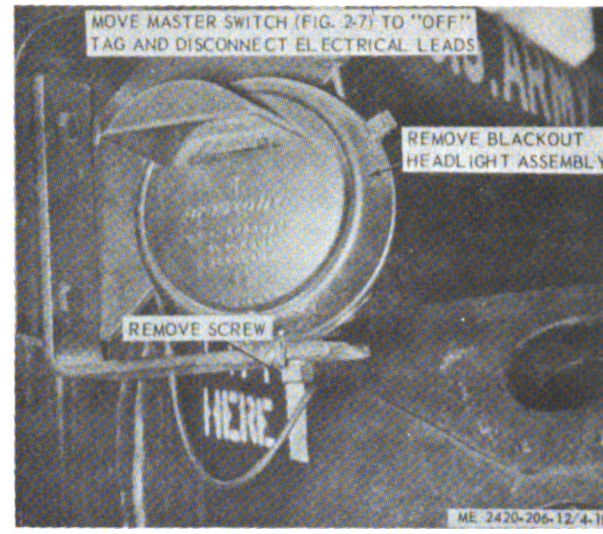


Figure 4-10. Blackout headlight assembly, removal and installation.

c. Installation. Refer to figure 4-11 and install tail and stoplight, blackout tail and stoplight assembly.

4-14. Wiring Harness Repair

a. General. Repair of wiring harness pertains to removal and replacement of a defective single wire in the harness.

b. Test and Inspection. Use a multimeter, test and inspect wiring for continuity and visual defects.

c. Removal and Repair. Remove damaged wire and replace with wire of same size, length and insulation. Install wire using an approved connection.

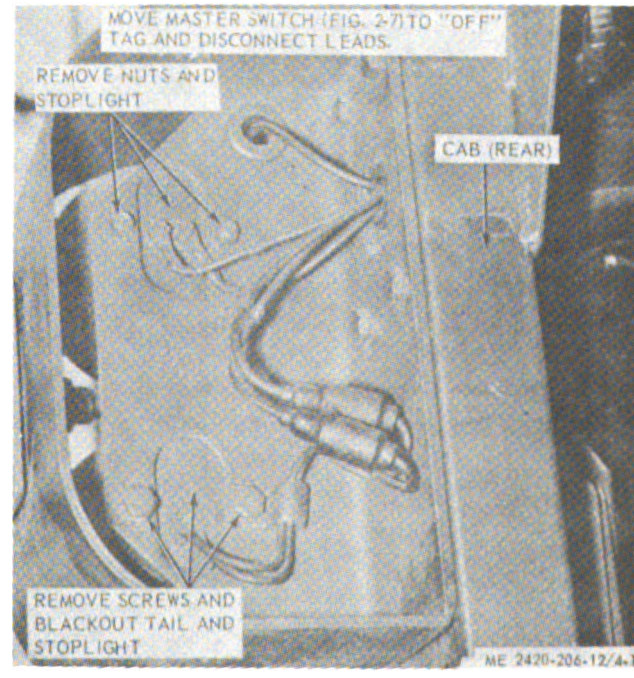


Figure 4-11. Tail and stoplight, blackout tail and stoplight assembly, removal and installation.

4-15. General

The engine mounted turbocharger uses an air cleaner and aspirator assemblies that are hood mounted and piped to and from intake manifold, air cleaner and aspirator.

4-16. Aspirator and Exhaust Pipe

a. Description. The aspirator creates a suction caused by exhaust gases passing through the venturi of the aspirator. As the gases pass, their speed is accelerated causing a decrease in pressure, creating a suction pulling dirt particles from the air cleaner.

b. Removal. Refer to figure 4-12 and:

(1) Remove exhaust pipe.

(2) Remove aspirator.

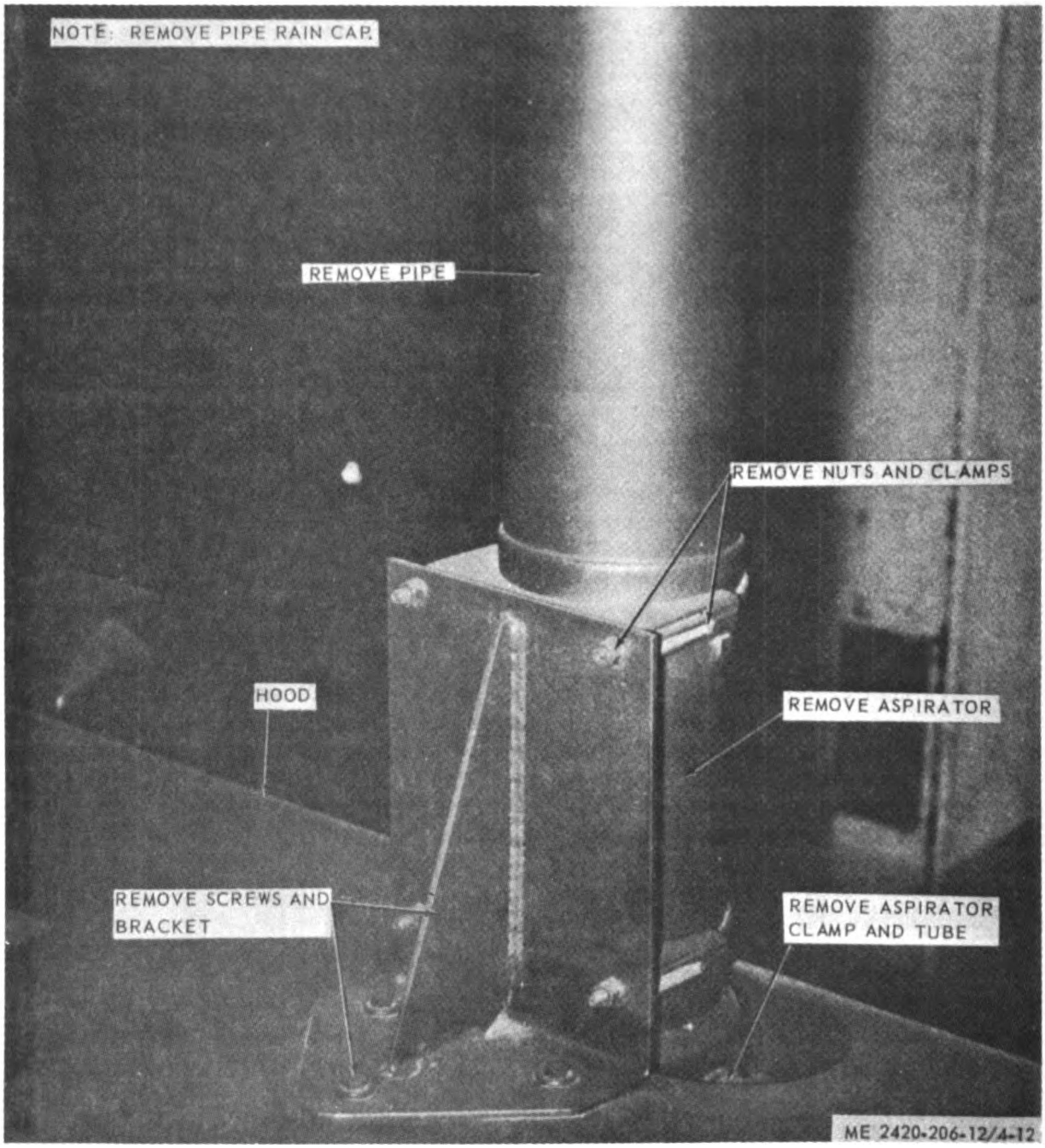


Figure 4-12. Aspirator and exhaust pipe, removal and installation.

c. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect parts for cracks, breaks and other damage. Replace defective parts as necessary.

d. Installation. Refer to figure 4-12 and install aspirator and exhaust pipe in reverse order of removal.

4-17. Air Cleaner, Piping and Hood

a. Description. The air cleaner consists of a precleaner and paper-type filter cartridge which operate together to remove dirt particles from the air before they enter the engine. As air enters precleaner, it passes through deflectors which impart a high speed spin to the air stream. The centrifugal force throws dirt particles outward, out of the air stream before the air enters the filter cartridge, leaving only small particles to become trapped in cartridge. Particles thrown from air stream drop to bottom of precleaner into a self-cleaning dust bin. The bin is cleaned by an air stream created by suction from the aspirator. The cleaned air is pulled into turbocharger and forced into the intake manifold of the engine under pressure. Pressurizing air enables more air to enter engine, which permits more fuel to be burned. This results in greater engine power. A vacuum-operated air system restriction indicator indicates when filter is dirty. The indicator is connected to the side of the air cleaner by a tube.

b. Removal and Disassembly.

(1) Remove aspirator (para 4-16).

(2) Remove radiator grill (fig. 4-8).

(3) Remove and disassemble air cleaner piping and hood as illustrated in figure 4-13. Always cover turbocharger openings when disconnecting turbocharger lines to prevent entry of dirt and foreign objects.

c. Cleaning and Inspection.

(1) Clean metal parts and dry thoroughly.

(2) Inspect all items for cracks, breaks, and other damage. Inspect for loose hoses and fittings. Replace defective parts as necessary.

d. Reassembly and Installation.

(1) Reassemble and install hood and air cleaner and piping as illustrated in figure 4-13.

(2) Install aspirator (para 4-16).

(3) Install radiator grill (fig. 4-8).

4-18. Turbocharger and Manifold

a. Description. The turbocharger forces additional air into engine combustion chambers so the engine burns more fuel, enabling engine to develop more horsepower. The turbocharger consists of a turbine wheel and a centrifugal blower, separately encased, but mounted on and rotating with a common shaft. The turbine side of the turbocharger mounts to exhaust manifold outlet flange, and the blower side connects with the air intake manifold. Lubrication is supplied by the engine lubrication system.

b. Impeller Service.

Note. After each 1,000 hours of engine operation perform turbocharger impeller service as contained herein.

(1) Remove intake air piping items (14, 15, 16) illustrated in figure 4-13. Remove air intake cover from turbocharger assembly.

(2) Remove carbon deposits from installed impeller and diffuser plate using an approved cleaning (non-abrasive) method.

(3) Using a suitable microinch measuring device, check impeller for end play (max. 0.008 inch).

(4) Replace turbocharger assembly as necessary. Install intake air piping items (14, 15, 16 in fig. 4-13).

c. Removal.

(1) Remove intake air piping items (14, 15, and 16 in fig. 4-13) and exhaust piping items (2 and 3).

(2) Remove turbocharger as illustrated in figure 4-14. Cover exhaust port in manifold to prevent entry of dirt into engine.

d. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective turbocharger as necessary.

e. Installation.

(1) Install turbocharger as illustrated in figure 4-14.

(2) Install items (2, 3, 14, 15, and 16 in Fig. 4-13).

f. Manifold Inspection. Check for frayed or broken hose, loose hose clamps, damaged heat shield; loose, worn or missing drain cocks, pipe plugs, capscrews, and washers; cracked or broken cover and manifolds.

1 Clamp
2 Clamp
3 Tube
4 Clamp
5 Clamp
6 Tube
7 Clamp
8 Clamp
9 Hose
10 Clamp
11 Clamp
12 Hose
13 Hose
14 Clamp
15 Clamp
16 Hose
17 Clamp
18 Clamp
19 Hose
20 Tube
21 Tube assembly
22 Adapter
23 Screw
24 Washer
25 Washer
26 Air cleaner assembly
27 Nut
28 Screw
29 Hood

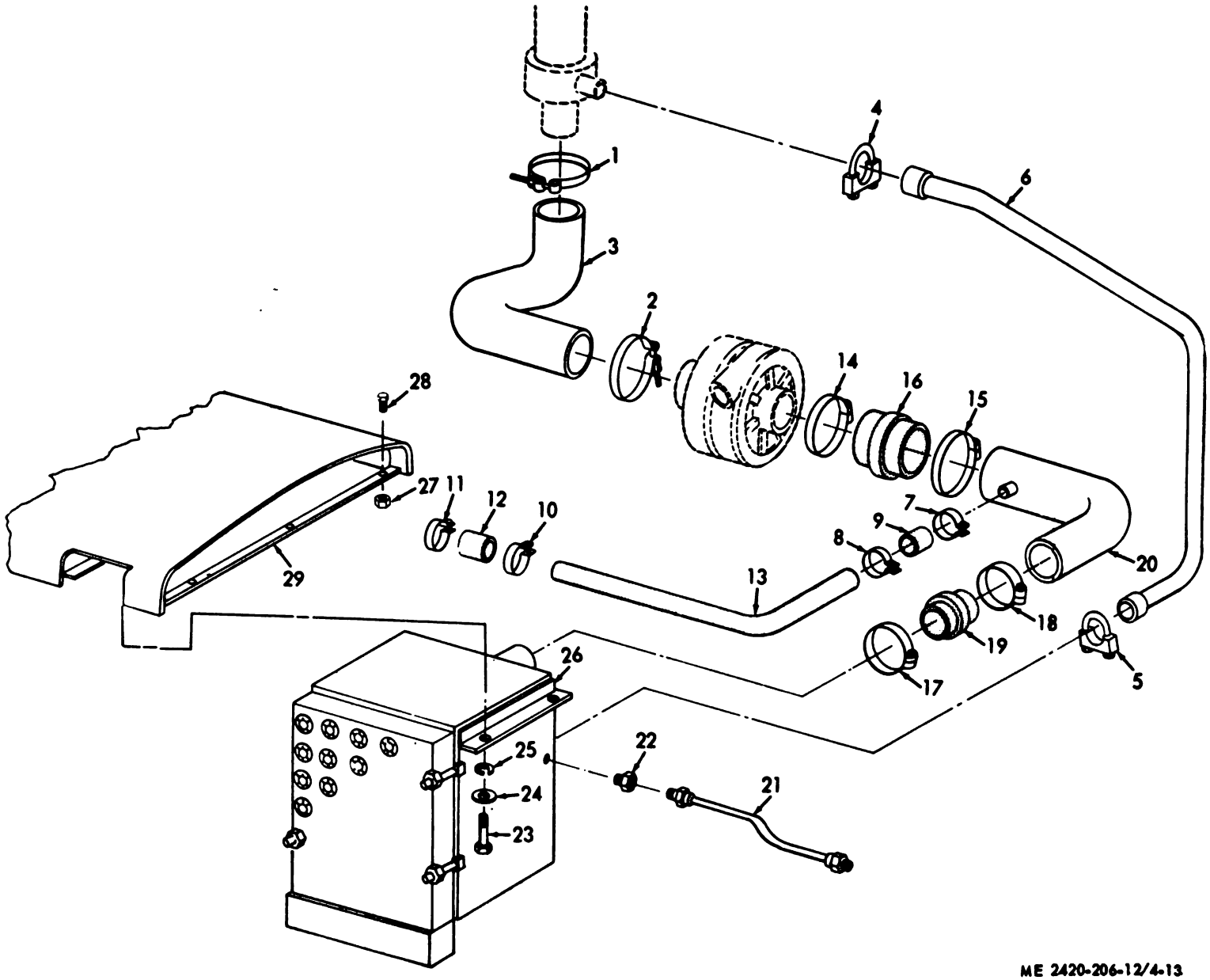


Figure 4-13. Air cleaner, piping and hood, exploded view.

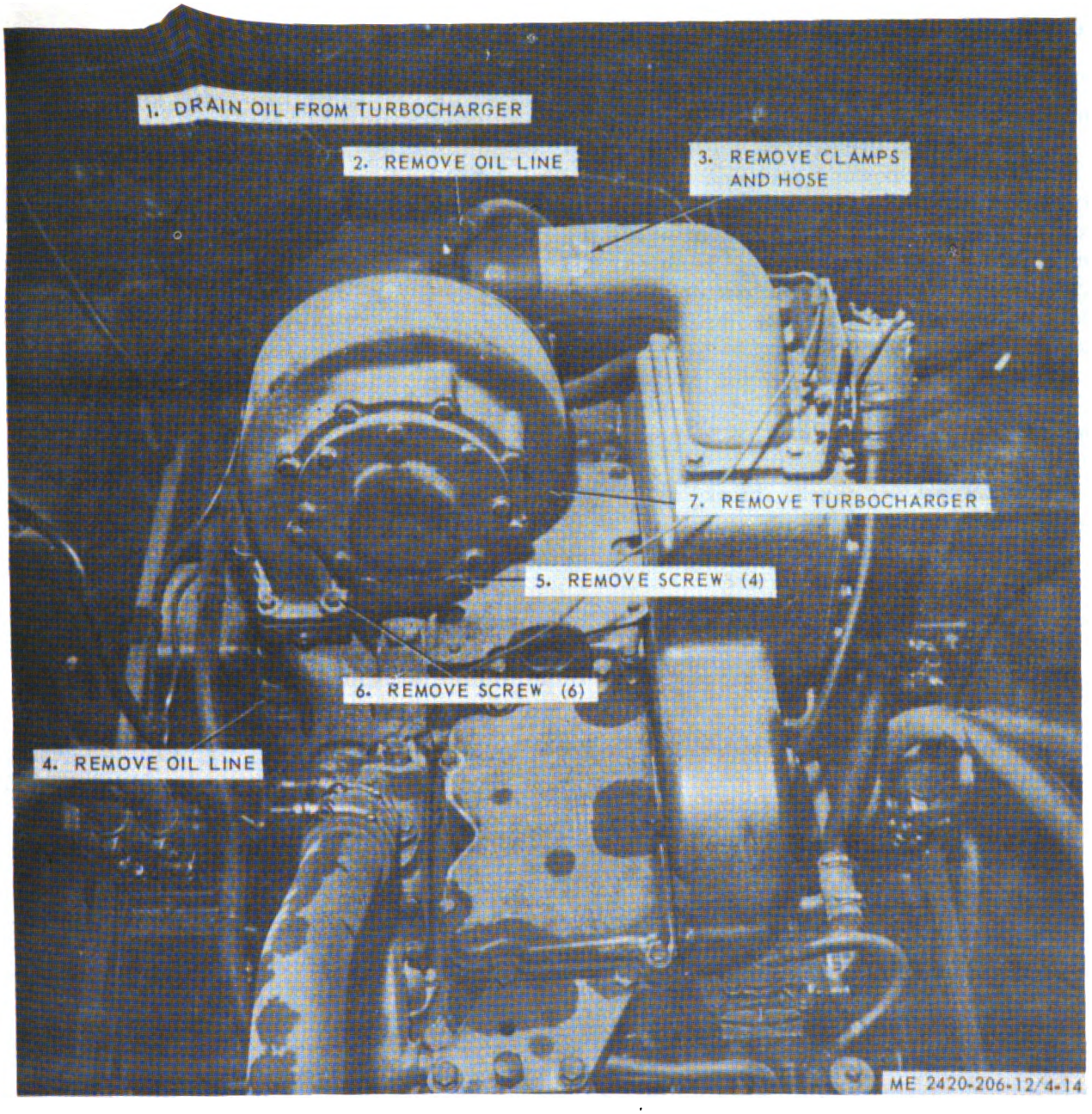


Figure 4-14. Turbocharger, removal and installation.

Section IV. CONTROLS AND INSTRUMENTS

4-19. General

a. Instruments and controls are mounted on sheet metal panels and installed on right and left side of the tractor dash panel. Air lines, oil lines, electrical wiring, and speed cables are attached to applicable instruments directly or to a manifold attached to cab firewall.

b. Refer to controls and instruments, paragraph 2-8.

4-20. Controls and Instruments

a. Removal.

(1) *Master switch.* Move master switch (fig. 2-7) to OFF position. Tag controls and instruments, piping, wiring, and cables, remove attaching hardware, and remove controls and instruments as illustrated in figure 4-15.

(2) *Circuit breaker.*

(a) Tag and disconnect leads and remove

screws securing circuit breaker to dash panel.

(b) Inspect and test.

1. Inspect for loose terminals or cracked insulator case.

2. Connect each circuit breaker in series with a 24-volt DC power source and a test lamp. Short across terminals of test lamp after lamp is lit. The circuit breaker should open the circuit and the lamp should not light when short is removed. The circuit breaker should close the circuit again and light test lamp after a short time has elapsed. Replace a defective circuit breaker.

(3) ***Instrument panel.***

(a) Remove screws securing instrument panel to dash panel and remove instrument panel from dash panel.

(b) Inspect for cracks, breaks and other damage. Replace as necessary.

(4) ***Starting aid.*** Remove starting aid as illustrated in figures 2-12 and 4-15.

b. Cleaning and Inspection.

(1) Clean lines, cables and wires.

(2) Inspect lines and fittings for breaks, cracks and other damage. Inspect cables for damage and defects. Inspect wiring for defects. Replace defective lines, fittings and cables as necessary. Repair or replace wiring as necessary. Refer to figure 1-3. Replace all preformed packings, gaskets and all defective parts of the starting aid.

c. Installation.

(1) Install starting aid as illustrated in figure 4-15.

(2) Install instrument panel on dash panel.

(3) Install circuit breakers on dash panel.

(4) Install instruments and controls in reverse order of removal, figure 4-15. Do not break or kink capillary tubing.

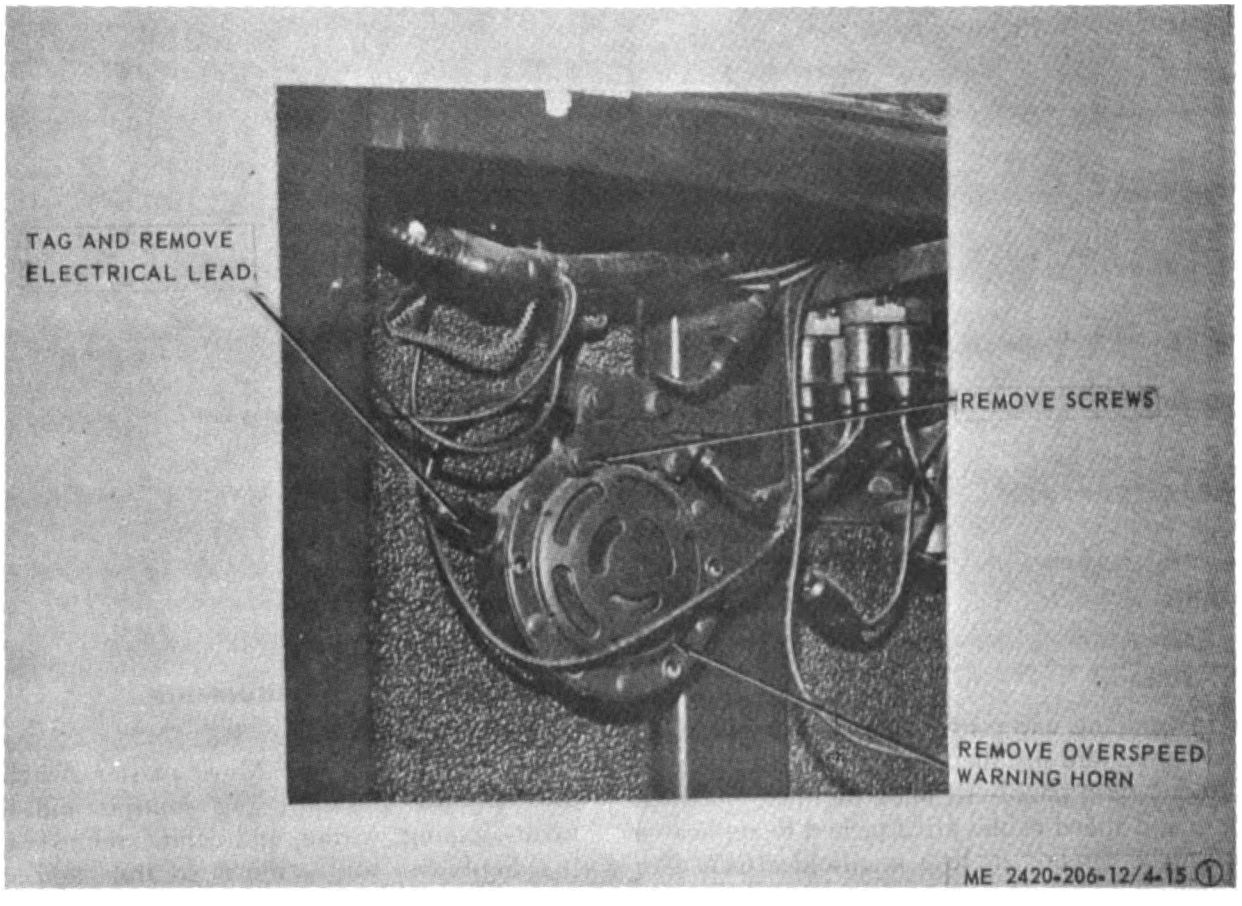


Figure 4-15. Controls and instruments, removal and installation, (sheet 1 of 10).

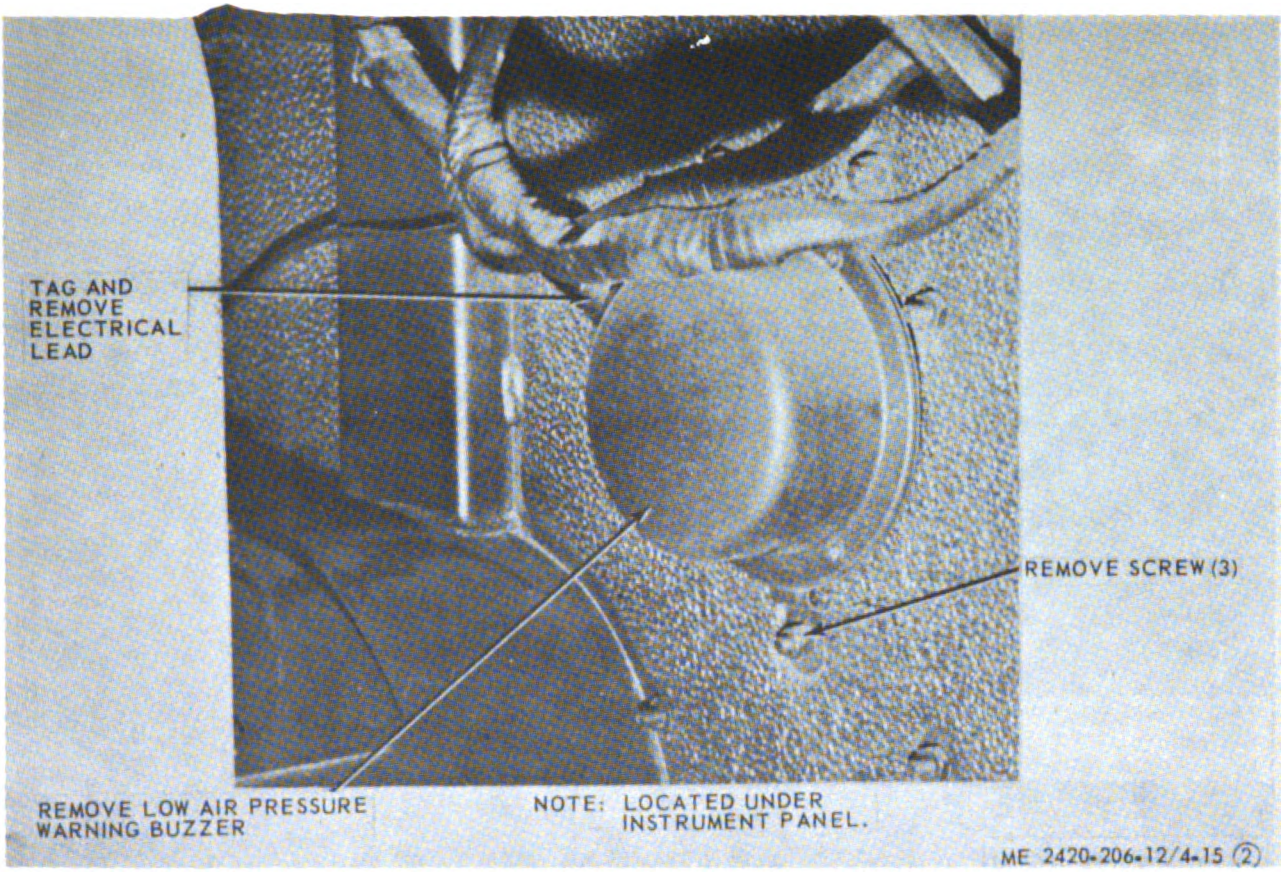


Figure 4-15. Controls and instruments, removal and installation, (sheet 2 of 10).

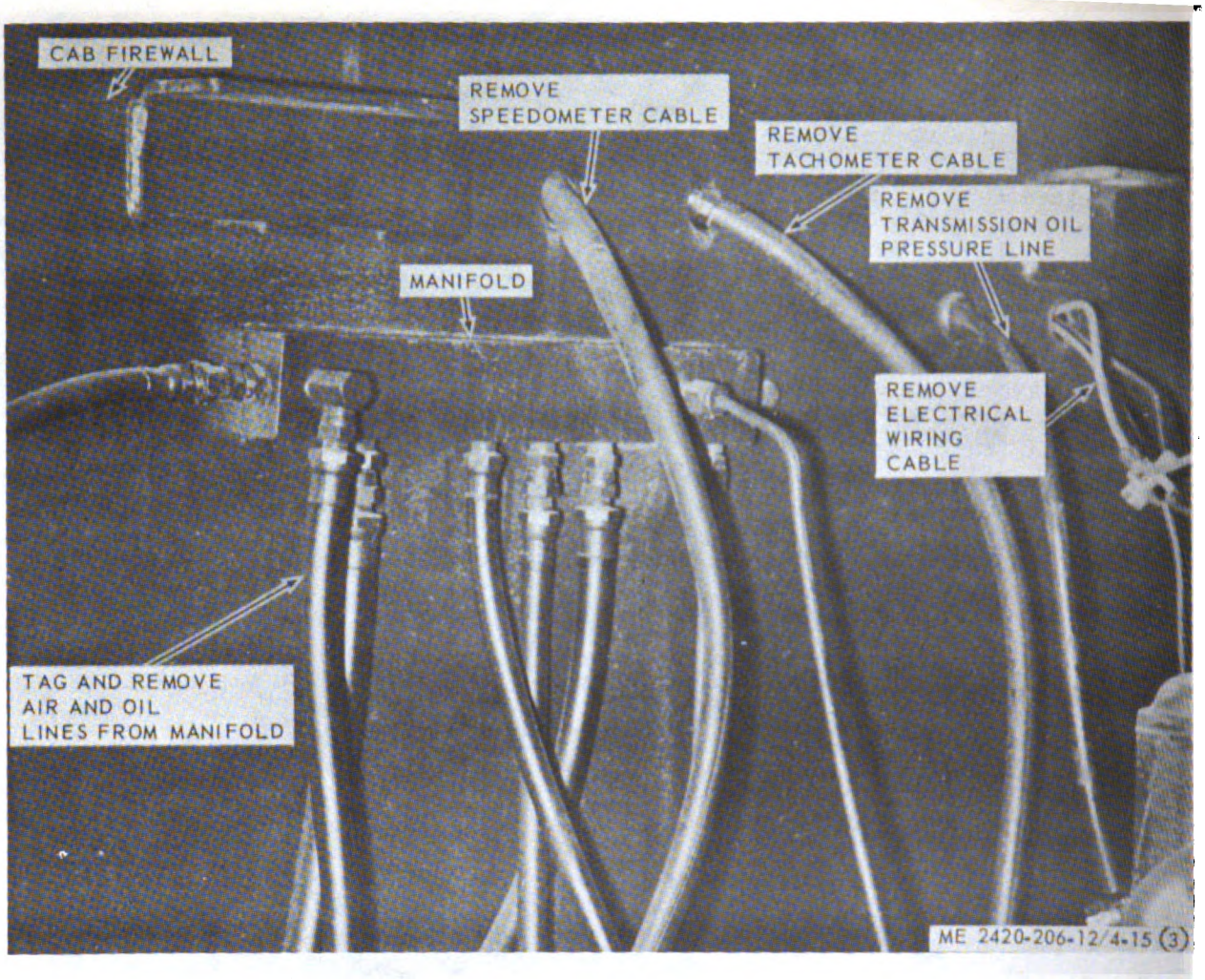


Figure 4-15. Controls and instruments, removal and installation, (sheet 3 of 10).

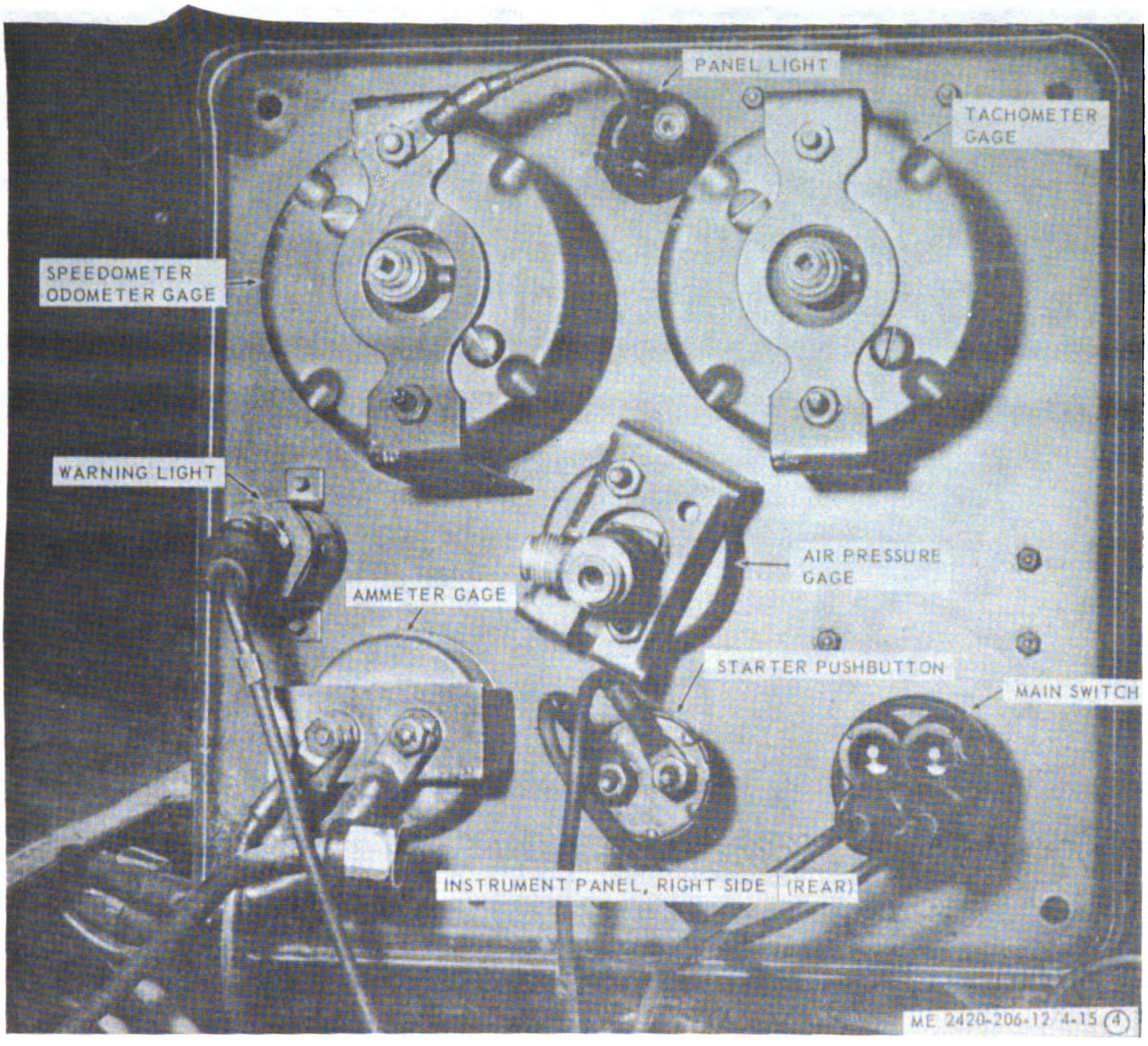


Figure 4-15. Controls and instruments, removal and installation, (sheet 4 of 10).

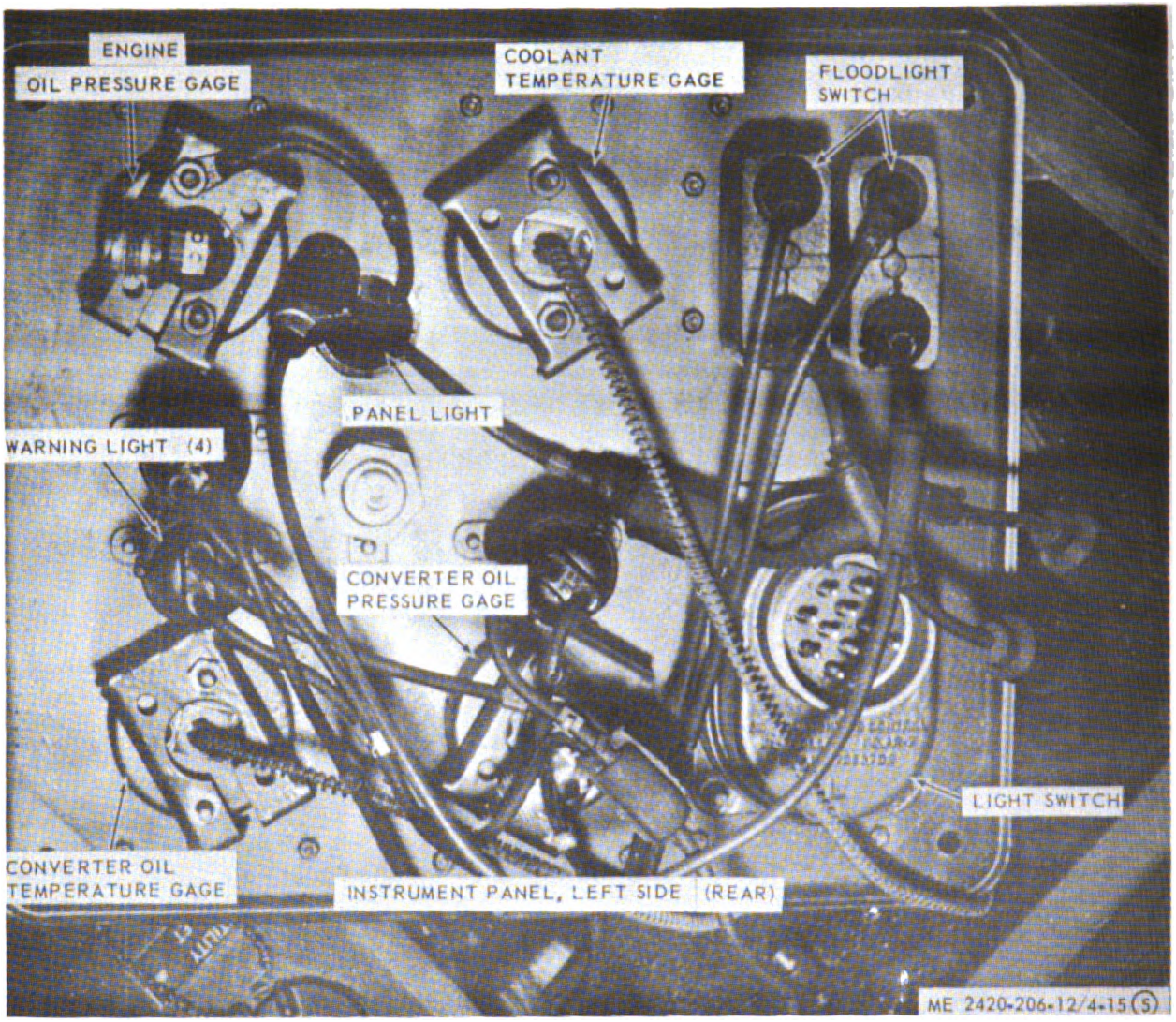


Figure 4-15. Controls and instruments, removal and installation, (sheet 5 of 10).

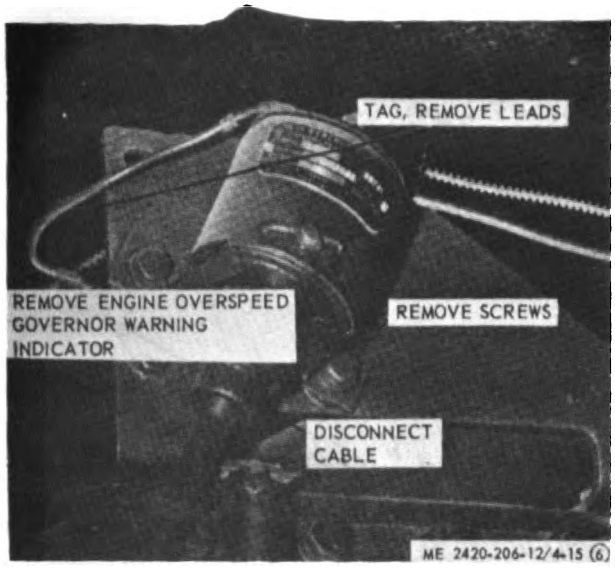


Figure 4-15. Controls and instruments, removal and installation, (sheet 6 of 10).

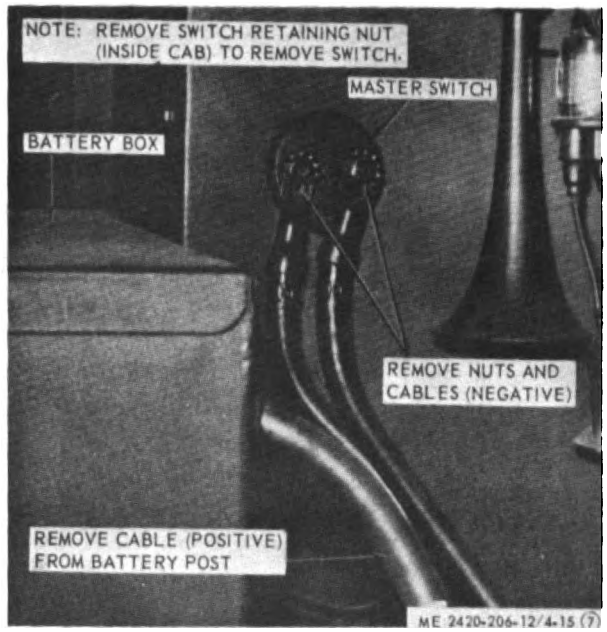
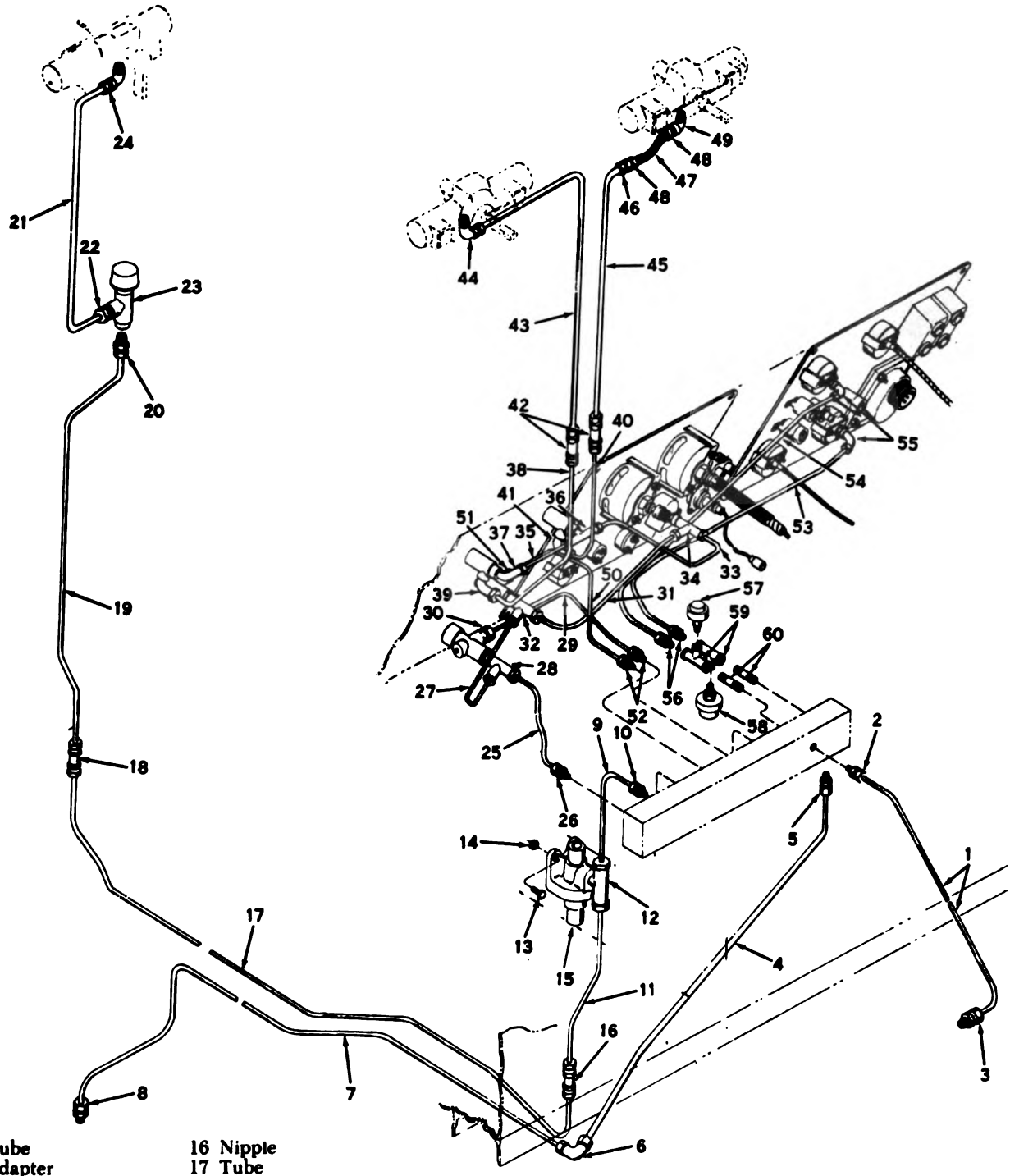


Figure 4-15. Controls and instruments, removal and installation, (sheet 7 of 10).



ME 2420-206-12/4-15 (8)

1	Tube	16	Nipple				
2	Adapter	17	Tube				
3	Adapter	18	Nipple				
4	Tube	19	Tube				
5	Adapter	20	Adapter				
6	Elbow	21	Tube	31	Tube	41	Elbow	51	Adapter
7	Tube	22	Adapter	32	Tee	42	Nipple	52	Adapter
8	Adapter	23	Switch assembly	33	Tube	43	Tube	53	Tube
9	Tube	24	Elbow	34	Tee	44	Elbow	54	Tube
10	Adapter	25	Tube	35	Tube	45	Tube	55	Elbow
11	Tube	26	Adapter	36	Tee	46	Adapter	56	Adapter
12	Tee	27	Tube	37	Elbow	47	Hose	57	Switch assembly
13	Screw	28	Tee	38	Tube	48	Fitting	58	Switch assembly
14	Nut	29	Tube	39	Elbow	49	Elbow	59	Tee
15	Switch assembly	30	Adapter	40	Tube	50	Tube	60	Nipple

Figure 4-15. Controls and instruments, removal and installation, (sheet 8 of 10).

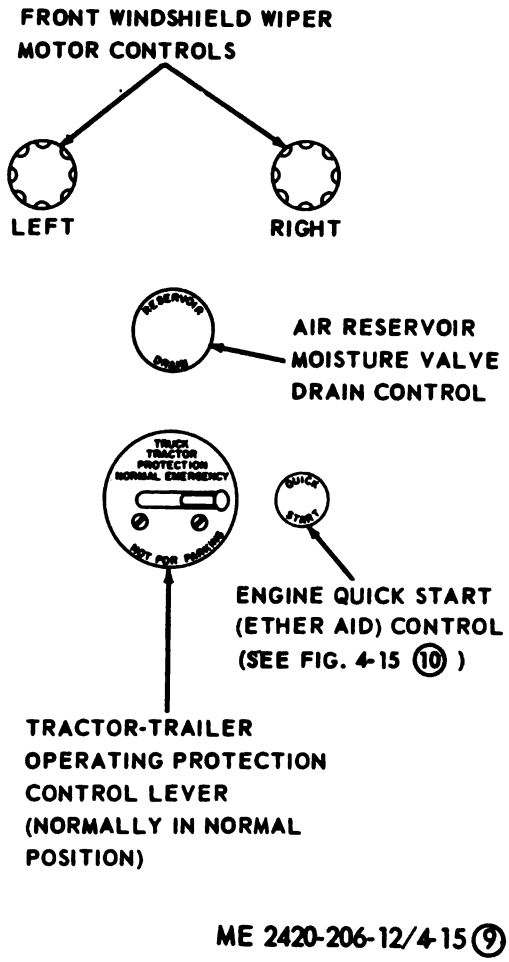


Figure 4-15. Controls and instruments, removal and installation, (sheet 9 of 10).

1 Fuel cylinder
1A Capscrew
1B Self-locking nut
2 Clamp and bracket
3 Chain cap
4 Gasket
5 Manifold fitting
5A Clip
6 Tube
7 Adapter
8 Screen
8A Throttle stop
8B Machine screw
9 Machine screw
10 Choke cable
11 Roll pin
12 Hinge pin
13 Lever
14 Plug
15 Capscrew
16 Identification plate
17 Washer
18 Nut
19 Bracket
20 Retaining ring
21 Preformed packing
22 Seperator
23 Preformed packing
24 Retaining ring
25 Washer
26 Spring
27 Preformed packing
28 Guide
29 Preformed packing
30 Pusher pin
31 Body
32 Bushing

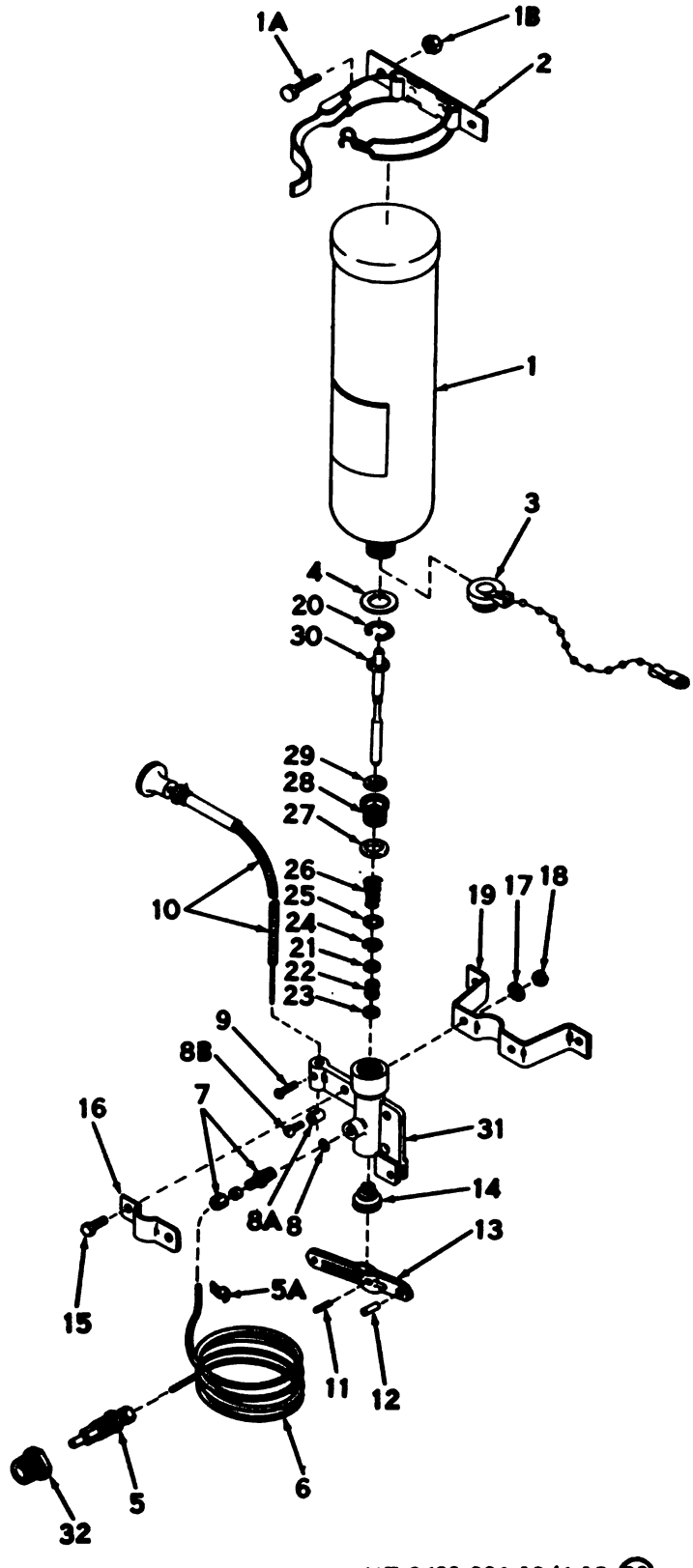


Figure 4-15. Controls and instruments, removal and installation, (sheet 10 of 10).

4-21. Steering Wheel, Trailer Brake Control and Drag Link Adjustment

a. Removal. Remove steering wheel and trailer brake control as illustrated in figure 4-16. Remove screws (9) from retainer (10), pry simultaneously with two small screwdrivers on opposite edges of retainer to remove. Remove cap (11), horn button (12), insulator (13), spring (14), and contact (15). Remove nut (16) from steering gear assembly (22) and use a puller to pull steering wheel (17). Remove key (18).

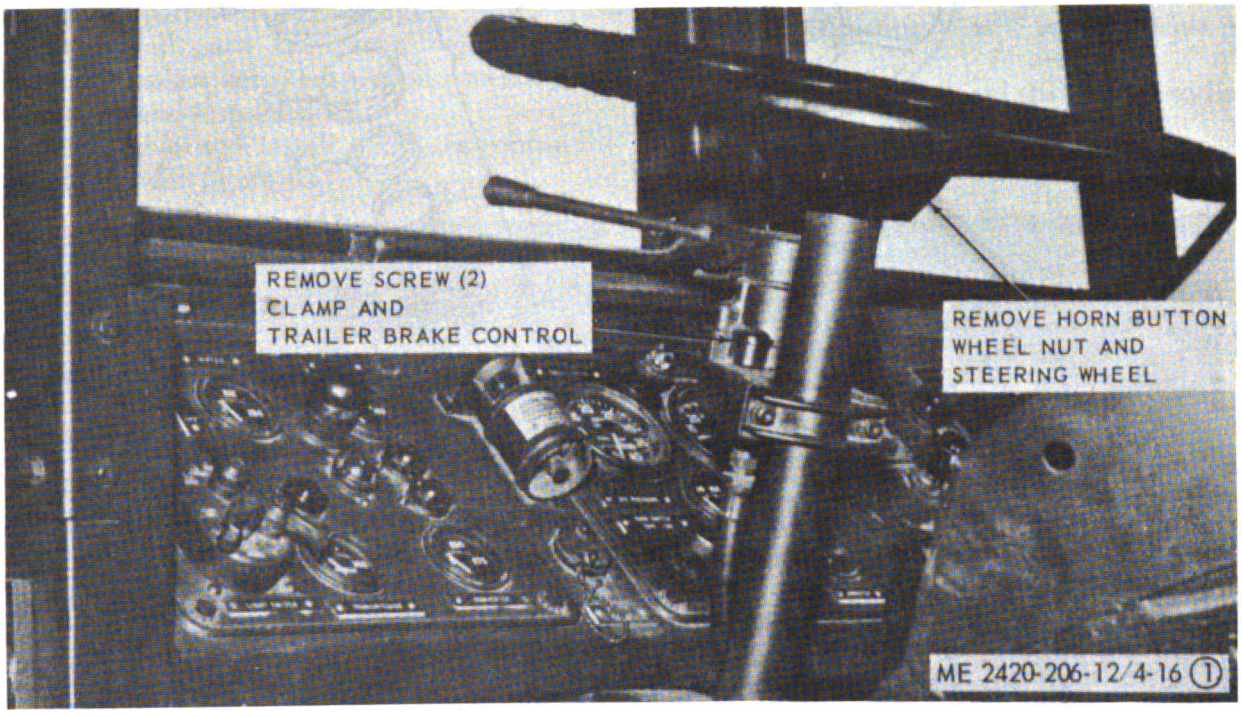


Figure 4-16. Steering wheel, trailer brake control, removal and installation. (sheet 1 of 2).

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

c. Installation. Install steering wheel and trailer brake control in reverse order of removal, figure 4-16.

d. Drag Link Adjustment.

(1) Park tractor in a straight direction.

(2) Remove floorplate beside steering column. Remove nut (2) that secures ball stud (4) of the drag link to the pitman arm (21) of steering gear (22). Disengage ball stud from pitman arm.

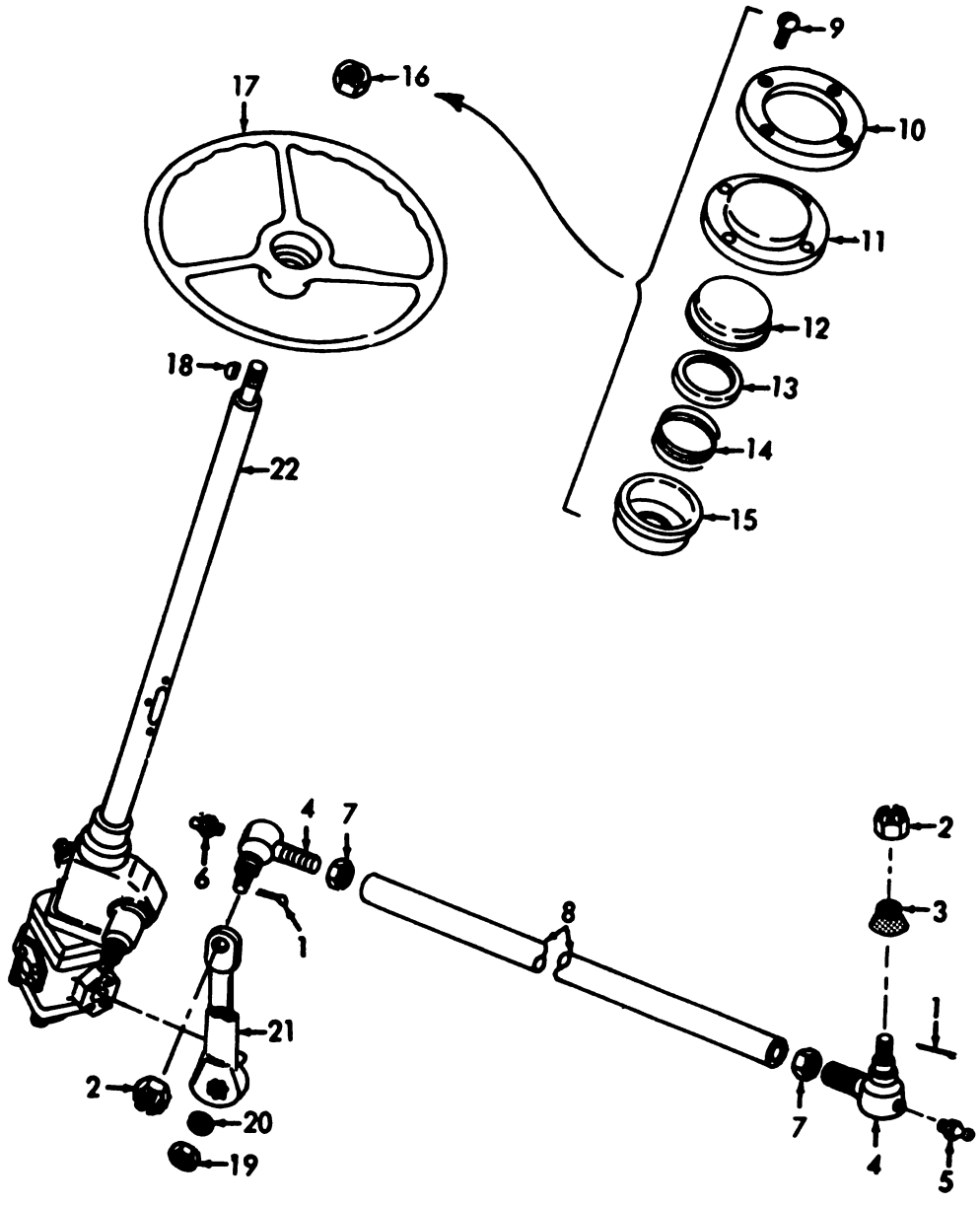
(3) With engine off, turn steering wheel gently until it stops at its limit of rotation in either direction. Turn steering wheel in opposite direction, counting number of turns necessary to reach limit of travel in the opposite direction.

(4) When total wheel travel is determined, divide this number by two. Turn wheel back toward midposition until it is centered.

(5) Check position of ball stud (4) to mounting hole on pitman arm. If it is not alined, loosen locknut (7) that locks ball joint to drag link tube (8) and turn ball stud in or out of tube until it is alined.

(6) If alinement cannot be made by adjusting the positions of ball studs, remove nut (19) and washer (20) and pull pitman arm (21) from steering gear shaft. Reposition pitman arm on the shaft to permit proper adjustment of drag link.

(7) Tighten all locknuts (7) after making adjustment.



ME 2420-206-12/4-16 (2)

1 Cotter pin
2 Nut
3 Rubber boot
4 Ball stud
5 Lubrication fitting
6 Lubrication fitting
7 Locknut
8 Drag link tube
9 Machine screw
10 Retainer
11 Cap
12 Horn button
13 Insulator
14 Spring
15 Contact
16 Nut
17 Steering wheel
18 Key
19 Nut
20 Washer
21 Pitman arm
22 Steering gear

Figure 4-16. Steering wheel, trailer brake control, removal and installation (sheet 2 of 2).

4-22. Bulldozer Control Levers

a. Removal and Disassembly.

(1) Remove floorplate and boot from lever. Remove rear rock guard (fig. 4-46).

(2) Remove and disassemble bulldozer control levers as illustrated in figure 4-17.

b. Cleaning and Inspection.

(1) Clean all parts and dry thoroughly.

(2) Inspect all parts for cracks, breaks and other damage. Replace defective parts as necessary.

c. Reassembly and Installation.

(1) Reassemble and install bulldozer control levers as illustrated in figure 4-17.

(2) *Adjustment.*

(a) To adjust bulldozer control lever linkage so control lever is farther to front when in neutral position, screw rod end (21) farther onto rod (22). For adjusting to rear reverse above procedure.

(b) To adjust bulldozer control lever linkage so control lever is farther to the right when in neutral position, screw rod end (14) farther onto rod (15). For adjusting to left, reverse above procedure.

(3) Install rear rock guard (fig. 4-46) and floorplate.

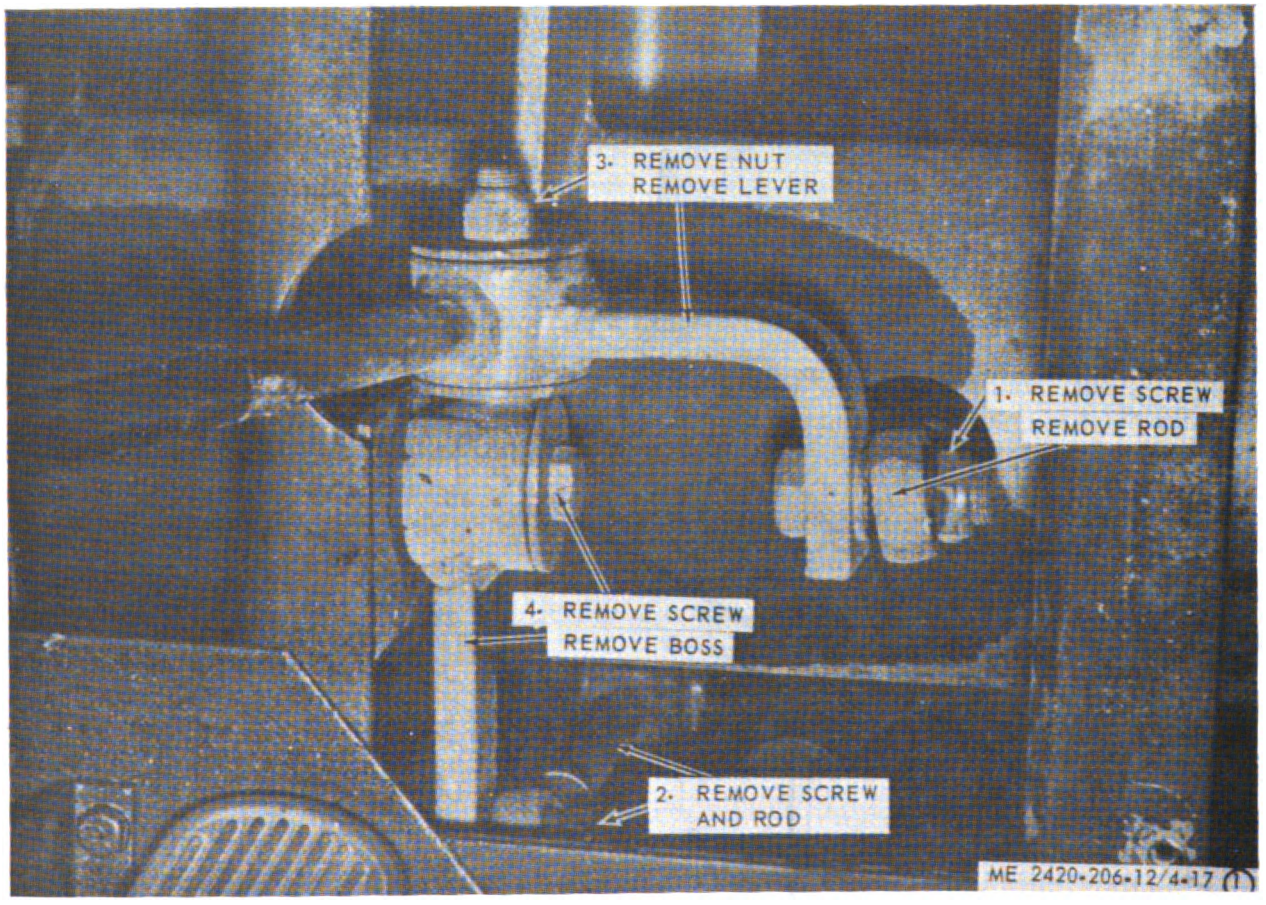


Figure 4-17. Bulldozer control lever, removal, disassembly, reassembly and installation (sheet 1 of 2).

1 Pin
2 Pin
3 Rod
4 Pin
5 Pin
6 Clevis
7 Jamnut
8 Rod
9 Pin
10 Pin
11 Washer
12 Nut
13 Screw
14 Rod end
15 Rod
16 Pin
17 Pin
18 Nut
19 Washer
20 Screw
21 Rod end
22 Rod
23 Screw
24 Nut
25 Sleeve
26 Bushing
27 Bellcrank
28 Nut
29 Washer
30 Knob
31 Lever
32 Sleeve
33 Bushing
34 Washer
35 Screw
36 Nut
37 Washer
38 Bushing
39 Sleeve
40 Boss
41 Washer
42 Screw
43 Nut
44 Shaft
45 Bushing
46 Tube

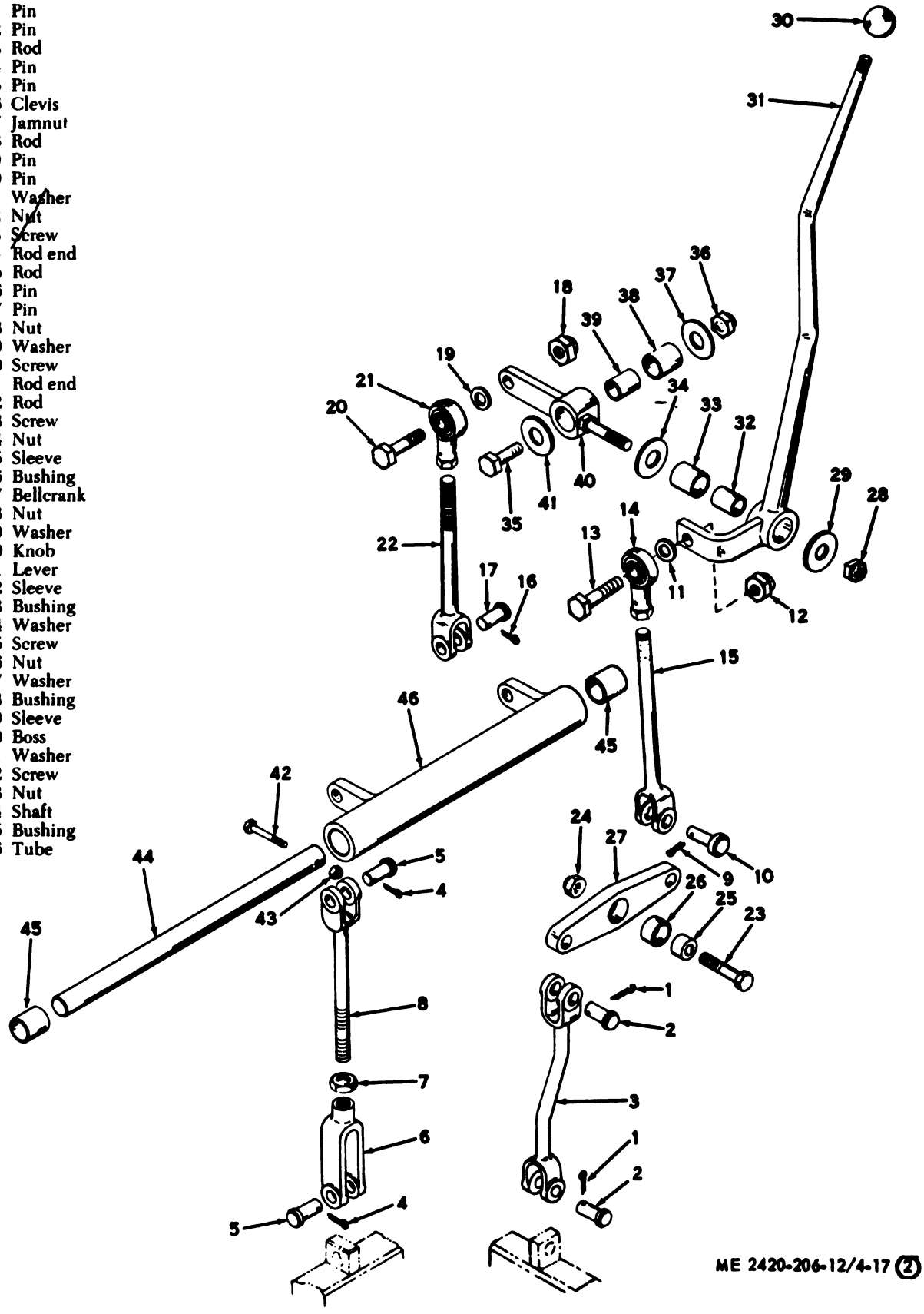


Figure 4-17. Bulldozer control lever, removal, disassembly, reassembly and installation (sheet 2 of 2).

4-23. Transmission Control Levers

a. Removal and Disassembly.

(1) Remove floorplates.

(2) Remove and disassemble transmission control levers as illustrated in figure 4-18.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

c. Reassembly and Installation.

(1) Reassemble and install transmission control levers as illustrated in figure 4-18.

(2) The speed and direction settings of spools in transmission control valve must coincide with numbers on shift cover. Adjust as follows:

(a) With transmission shift lever (50) in N (neutral) position, check that lever is centered in neutral position slot on shift cover (20). To move lever toward operator's position, loosen jamnut (4) and turn to disconnect the direction shift clevis rod (6) from transmission control valve spool. Turn clevis rod into clevis (3) to shorten the linkage. To move lever away from operator's position, reverse above procedure. Tighten jamnut and reconnect clevis rod with clevis pin (2) and cotter pin (1).

(b) After adjustment, shift lever to forward and reverse positions to make sure the shift lever is centered in speed range slots on shift cover.

(c) Make sure the speed range spool of transmission control valve is detented in first speed position when lever is shifted to that position. If lever is not properly alined with number 1 on cover, adjust length of speed control linkage. To move lever farther forward, loosen jamnut (4) and disconnect speed shift clevis rod (5) from spool of transmission control valve. Turn clevis rod in to shorten linkage. To move lever farther toward rear, turn clevis rod out of clevis to lengthen linkage. Connect with clevis pin (2) and cotter pin (1).

(d) Move shift lever to the fourth speed forward position. Make sure spool is detented in fourth speed position and lever is alined with number 4 on shift cover (20). Readjust if necessary.

(e) Move transmission shift lever to N position. Apply parking brake. When brake is applied, brake and shift interlock lever (16) must engage notch in direction shift bellcrank (57). If it does not, adjust position of cable spring anchor (10) on parking brake cable so interlock lever does engage bellcrank. With transmission cover valve spool in neutral, if interlock lever (16) does not engage bellcrank, adjust effective lengths of the direction shift rod (39) and direction shift clevis rod (6), as necessary. When adjusted, the spring (7) should be under moderate tension. Release the brake. Check distance between top of cable spring anchor and underside of floorplate. It should be approximately 1 7/8 inches.

(3) Install floorplate.

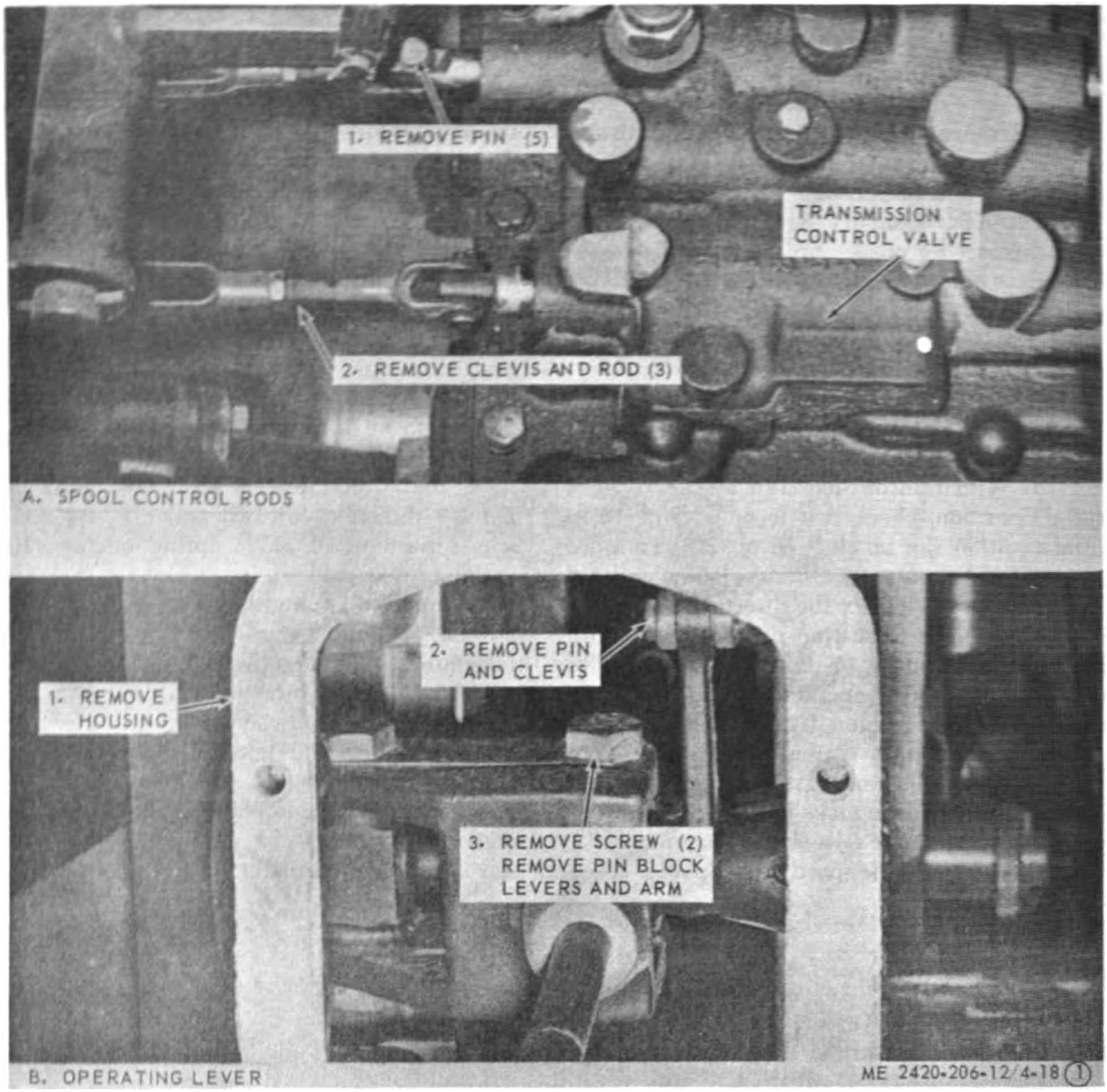


Figure 4-18. Transmission control levers, removal, disassembly, reassembly and installation (sheet 1 of 2).

1 Pin
2 Pin
3 Clevis
4 Jamnut
5 Rod
6 Rod
7 Spring
8 Screw
9 Nut
10 Spring anchor
11 Screw
12 Washer
13 Nut
14 Fitting
15 Bushing
16 Lever
17 Knob
18 Screw
19 Washer
20 Cover
21 Spring
22 Screw
23 Washer
24 Spring tab
25 Screw
26 Nut
27 Washer
28 Plate
29 Bushing
30 Pin
31 Pin
32 Clevis
33 Nut
34 Rod
35 Pin
36 Washer
37 Pin
38 Clevis
39 Rod
40 Screw
41 Washer
42 Pin
43 Pin
44 Fitting
45 Screw
46 Tab
47 Block
48 Arm
49 Pin
50 Lever
51 Lever
52 Housing
53 Fitting
54 Pin
55 Shaft
56 Bushing
57 Bellcrank
58 Bellcrank

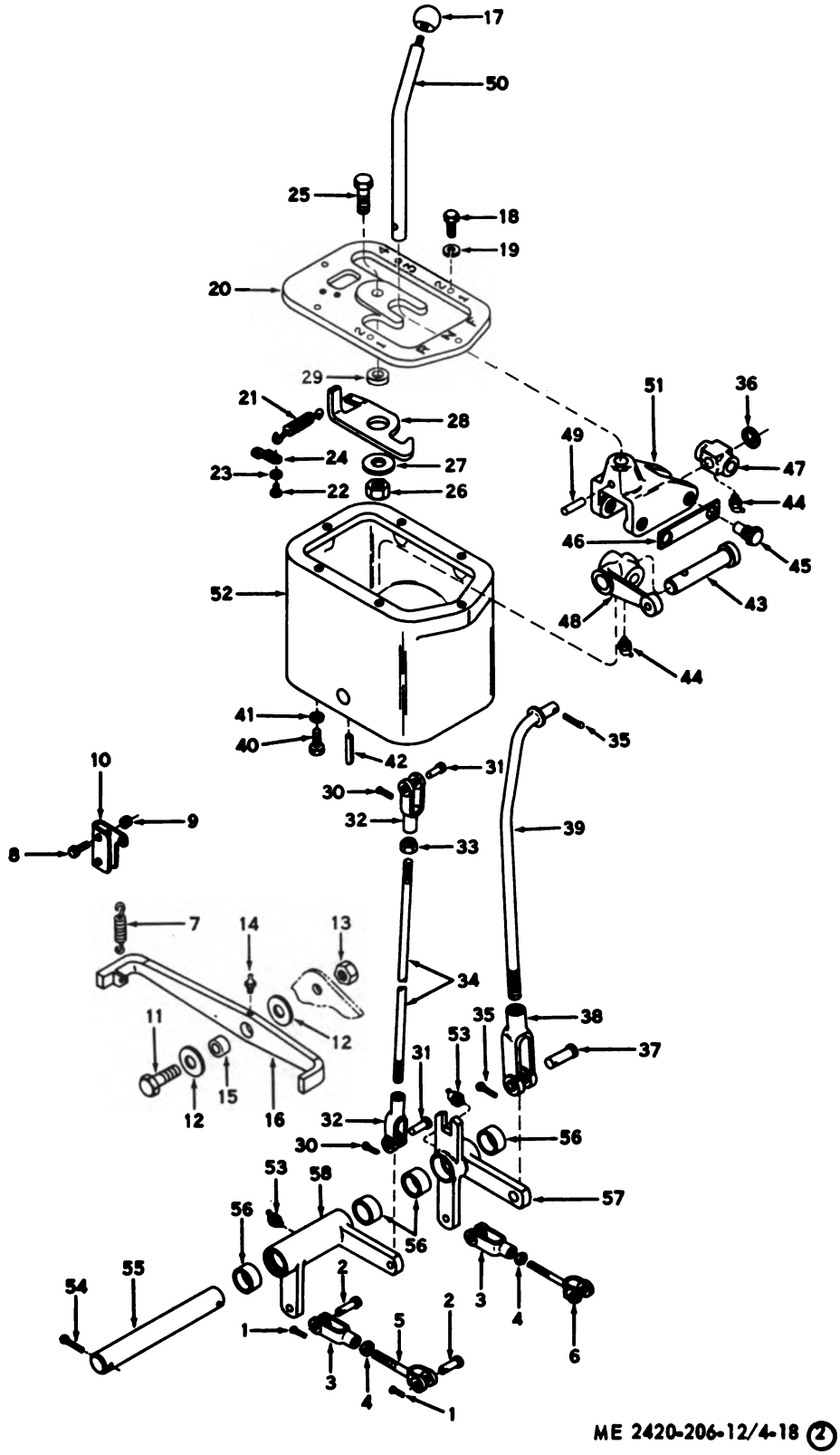


Figure 4-18. Transmission control levers, removal, disassembly, reassembly and installation (sheet 2 of 2).

4-24. Parking Brake Hand Lever and Cable

a. Removal.

(1) Remove rock guard (para 4-58).

(2) Remove parking brake hand lever assembly and cable as illustrated in figure 4-19.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace damaged or defective parts as necessary. Lubricate cable with light oil.

c. Installation and Adjustment.

(1) Install parking brake hand lever and cable as illustrated in figure 4-19.

(a) Rotate adjustment knob clockwise to correct cable tension pressure on brake shoe. If adjustment cannot be corrected, rotate counterclockwise and remove cotter and clevis pins that secure lower end of parking brake cable to operating lever on brake. Turn clevis farther onto threaded end of cable. Reconnect cable with clevis and cotter pins and readjust as directed above.

(b) To adjust brake shoe remove cotter and clevis pins from parking brake operating lever. Rotate eccentric adjuster in direction of forward brake drum rotation until adjustment end of lining on the shoe contacting the eccentric is within 0.010 inch of drum surface, when measured by a snug fit on feeler gages inserted from open end of drum.

(c) Expand brake shoes by turning adjusting star wheel with a screwdriver inserted through hole in drum.

(d) Repeat adjustment until adjustment end of lining on other shoe is within 0.010 inch of drum surface.

(e) Install brake cable.

(2) Install rock guard (para 4-58).

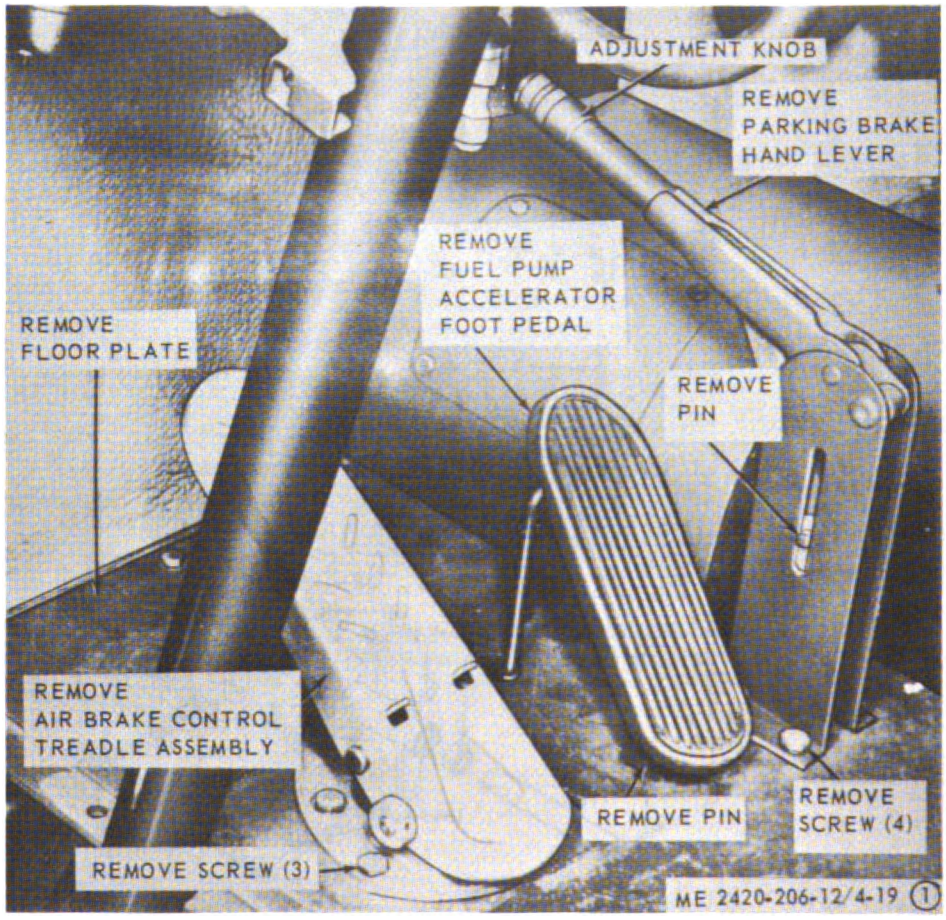


Figure 4-19. Parking brake hand lever and cable, removal and installation (sheet 1 of 2).

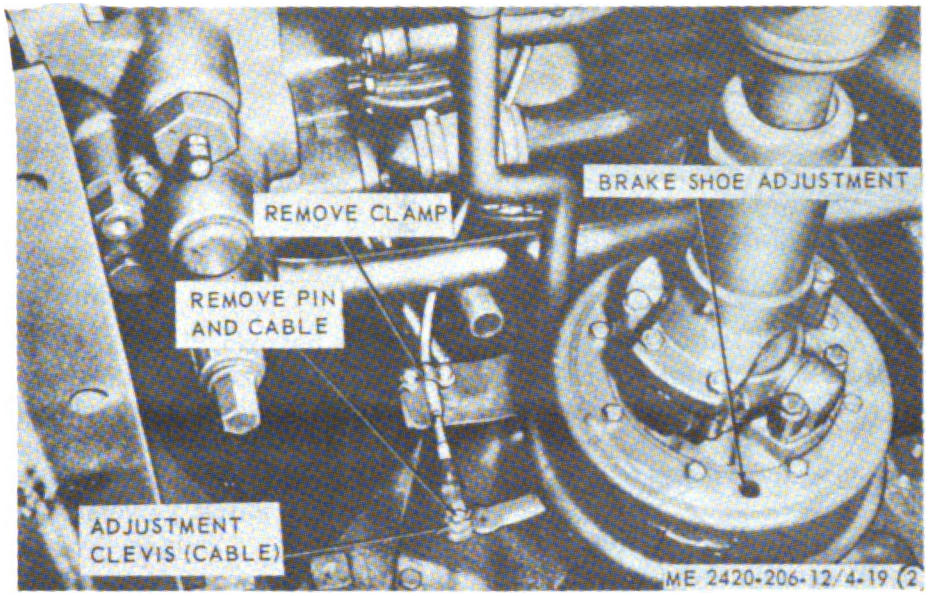


Figure 19. Parking brake hand lever and cable, removal and installation (sheet 2 of 2).

4-25. Accelerator Pedal and Linkage

a. Removal and Disassembly. Remove and disassemble accelerator pedal and linkage as illustrated in figure 4-20.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

c. Reassembly and Installation. Reassemble and install as illustrated in figure 4-20.

d. Adjustment.

(1) Adjust ball joints to correct operation of linkage. Position accelerator pedal by adjusting clevis (11) on rod (12).

(2) Adjust pedal stop screw to correct operation on pedal.

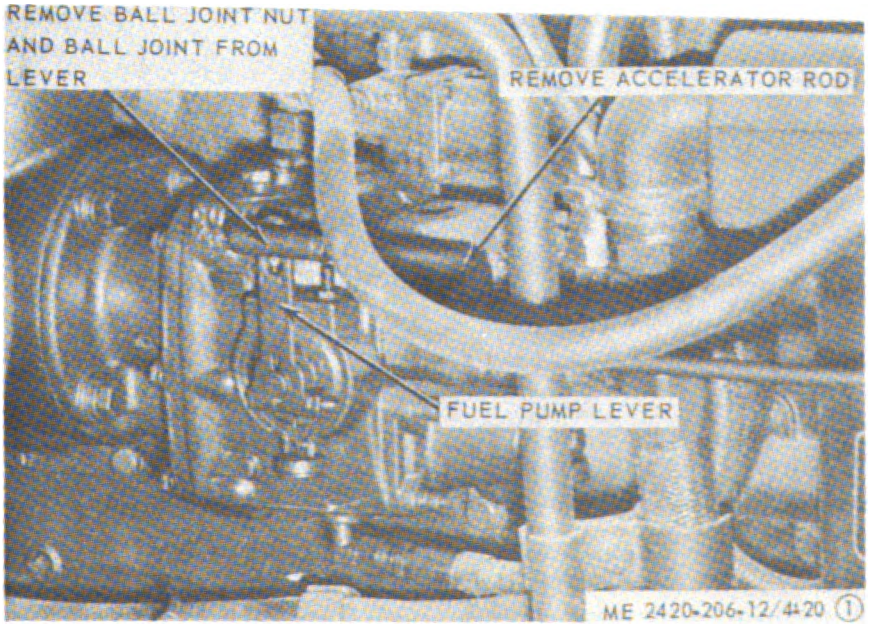
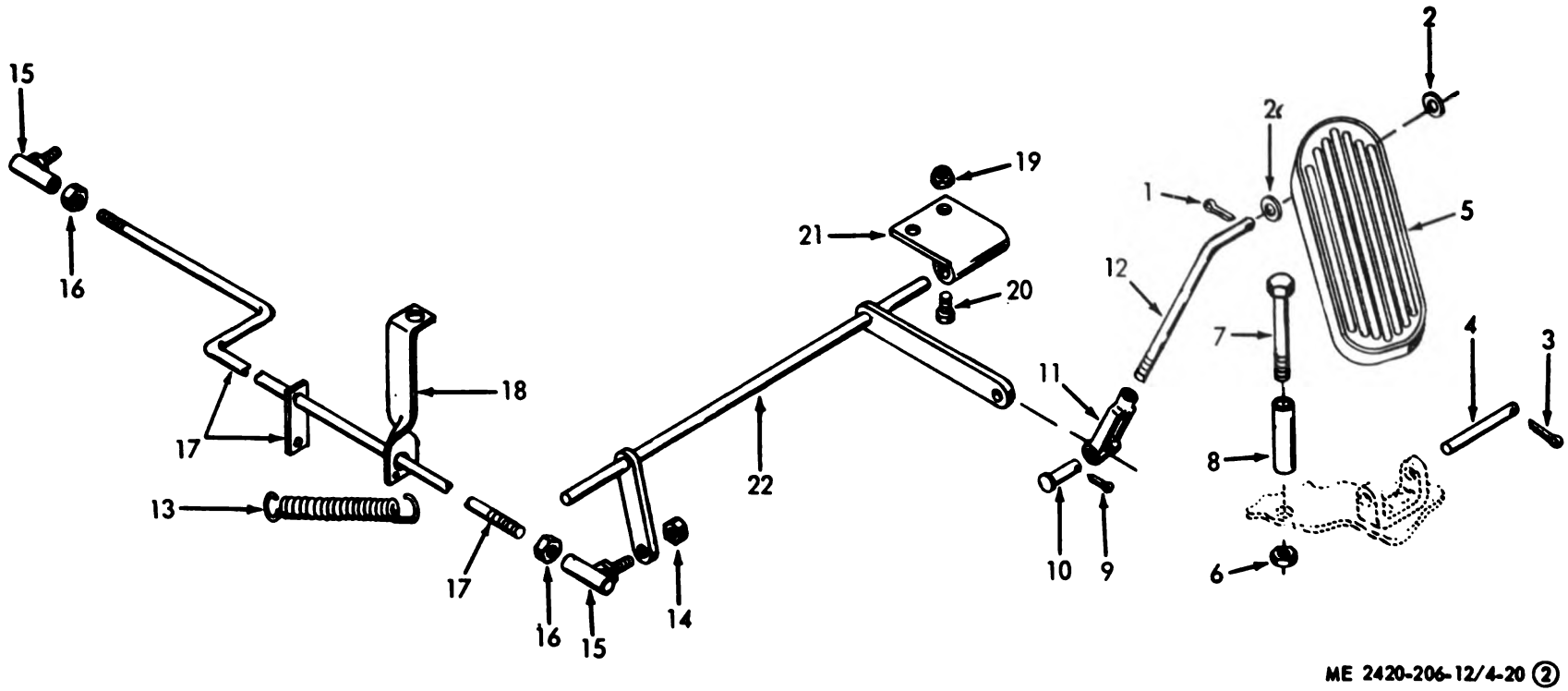


Figure 4-20. Accelerator pedal and linkage, removal, disassembly, reassembly, and installation (sheet 1 of 2).



1	Pin	12	Rod
2	Washer	13	Spring
3	Pin	14	Nut
4	Pin	15	Ball joint
5	Pedal	16	Nut
6	Nut	17	Rod
7	Screw	18	Guide
8	Stop	19	Nut
9	Pin	20	Screw
10	Pin	21	Plate
11	Clevis	22	Bellcrank

Figure 4-20. Accelerator pedal and linkage, removal, disassembly, reassembly, and installation (sheet 2 of 2).

4-26. General

Engine coolant, electrical, oil and fuel components listed herein are attached on or near the engine block.

4-27. Starter and Solenoid

a. Testing. With battery fully charged and main switch in the ON position, press starter switch. The starting motor should smoothly turn over engine at a sufficient rate of speed to cause starting without unusual noise or vibration. Check all electrical leads before removing starter and solenoid if starter fails to turn over engine.

Note. Remove cable from battery terminal before removing starter.

b. Removal. Remove starter as illustrated in figure 4-21. Match mark the end bell frame (3), starter motor housing (55), lever housing (28), and drive housing (21) to assure proper reassembly.

c. Cleaning, Inspection and Test.

(1) Clean starter and solenoid with a clean cloth.

(2) *Inspection.*

(a) Inspect brushes (17) for wear and brush springs (18) for distortion or weakness. Replace brushes if worn to less then half their original length. Spring tension should be 80 ounces minimum with brushes installed.

(b) Inspect motor drive clutch (23) for cracked, chipped, or broken gear teeth, or other defects.

(c) Inspect plunger assembly (41) for damage.

(d) Inspect all items removed for cracks, breaks and other damage. Repair or replace items 4, 8, 10, 13, 14, 17, 18, 22, 24, 25, 29, 30, 42, 44, 47, and 49 which are in the repair kit. Turn armature shaft by hand to assure it rotates freely. Replace defective starter, solenoid, and cables.

d. Installation. Install starter and solenoid as illustrated in figure 4-21. Replace gasket.

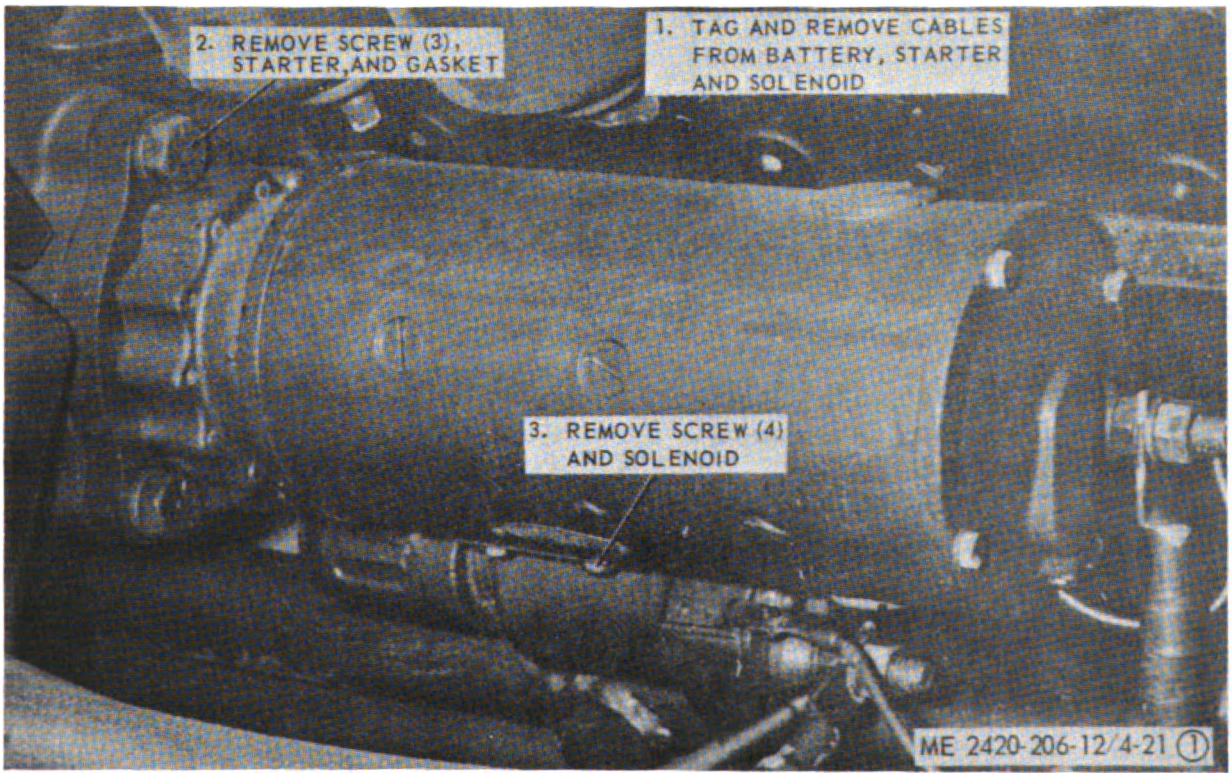
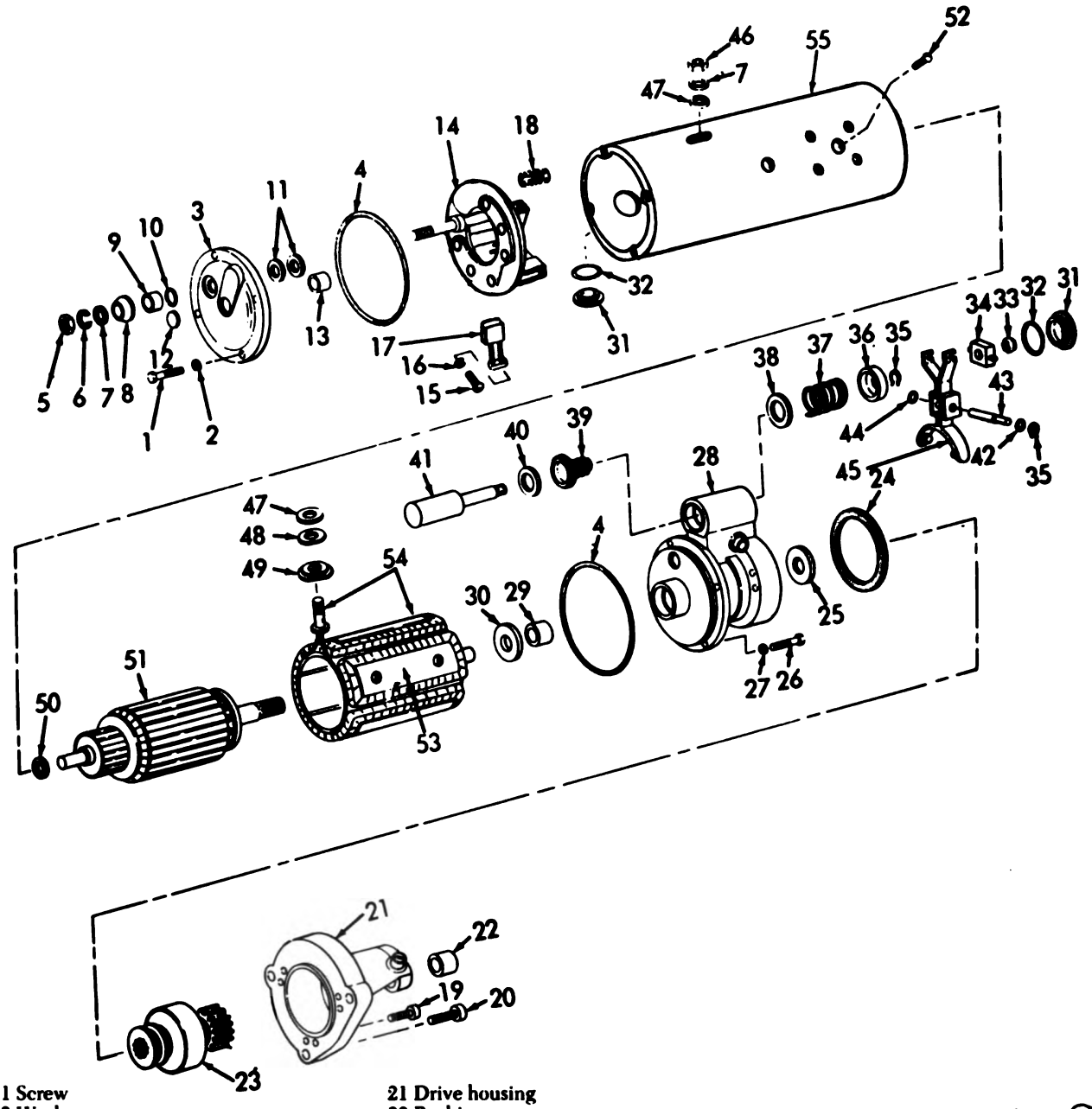


Figure 4-21. Starter and solenoid, removal, disassembly, reassembly, and installation (sheet 1 of 2).



1 Screw
2 Washer
3 End bell frame
4 Ring
5 Nut
6 Washer
7 Washer
8 Insulator
9 Bushing
10 Packing
11 Washer
12 Plug
13 Bearing
14 Brush holder assembly
15 Screw
16 Washer
17 Brush
18 Brush spring
19 Bolt
20 Bolt
21 Drive housing
22 Bushing
23 Motor drive clutch
24 Gasket
25 Washer
26 Bolt
27 Washer
28 Lever Housing
29 Bearing
30 Washer
31 Plug
32 Gasket
33 Nut
34 Plunger guide
35 Ring
36 Retainer
37 Spring
38 Retainer
39 Bellows
40 Washer
41 Plunger assembly
42 Packing
43 Shaft
44 Packing
45 Shift lever assembly
46 Nut
47 Washer
48 Gasket
49 Insulator
50 Washer
51 Armature
52 Screw
53 Shoe pole
54 Field coil assembly
55 Starter motor housing

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Figure 4-21. Starter and solenoid, removal, disassembly, reassembly, and installation (sheet 2 of 2).

a. Replacement of Kit Items.

(1) Refer to figure 4-22 and remove inspection cover from generator.

(2) Inspect brush holders, springs and brushes for cracks, breaks, wear, distortion and other damage. Brushes should move freely in their holders. Replace damaged or defective parts as necessary.

(a) Remove screw and lockwasher that secure brush leads to holder.

(b) Lift brush arm that retains brush in holder; remove brush.

(c) To replace, reverse above procedure.

(3) If commutator segment wear and excessive heat burns cannot be corrected with emery cloth application to segments, replace generator assembly.

b. Removal of Generator Drive Belt.

(1) Remove generator drive belt as illustrated in figure 4-22.

(a) Remove generator drive belt by removing upper capscrew (4) and lockwasher from fan bracket (3).

(b) Loosen lower capscrew (4), nut (5), and adjusting screw (2) to relieve fan belt tension; remove lower capscrew (4) and its lockwasher, and capscrew (13), flat washer, lockwasher, and nut (5).

(c) Loosen capscrews (6) and (10) that secure generator adjusting strap and loosen nut (11) that secures generator (12) to the frame; push generator towards frame to loosen generator drive belt.

(d) Slide fan blade, fan hub, and fan bracket (3) forward until space between water pump and fan bracket is adequate to remove generator and fan belts.

c. Cleaning and Inspection of Generator Drive Belt.

(1) Clean generator drive belt with a clean cloth.

(2) Inspect belt for cracks, missing belt teeth, or other damage. Replace as necessary.

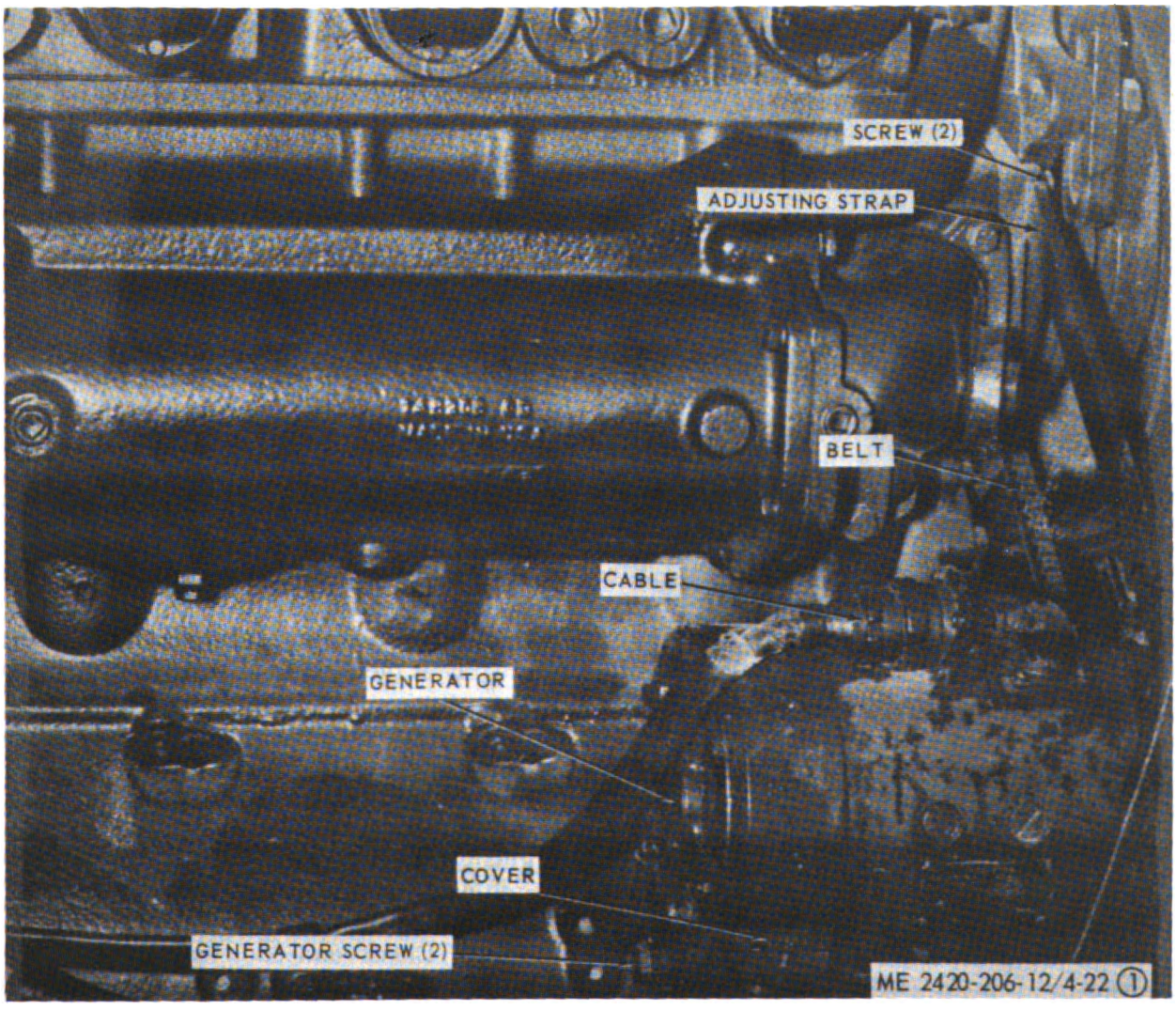


Figure 4-22. Generator repair, removal and installation (sheet 1 of 2).

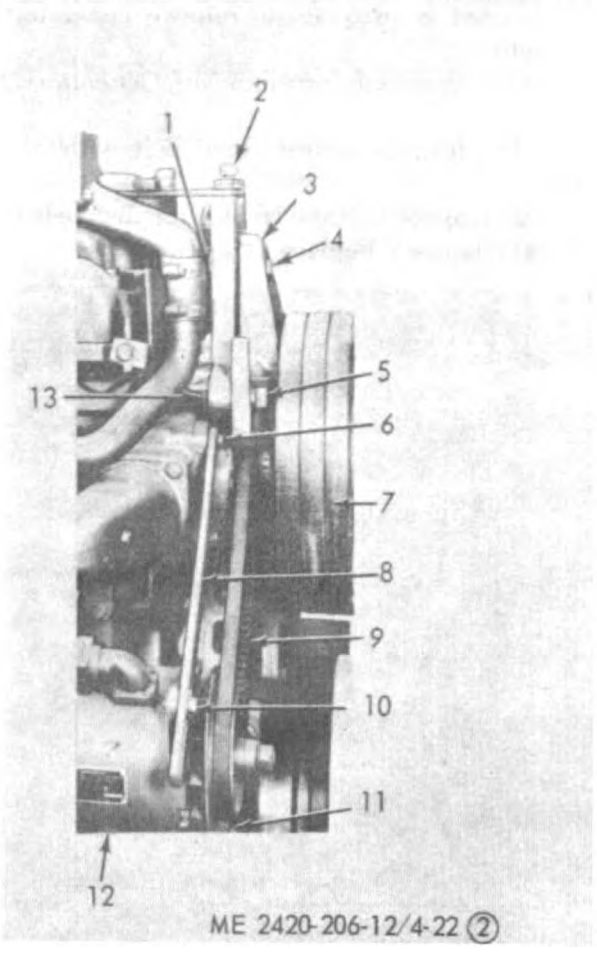
d. Installation of Generator Drive Belt. Install generator drive belt in reverse order of removal.

e. Belt Tension Adjustment.

(1) Loosen adjusting strap and generator screws and move generator away from engine to apply tension on belt.

(2) Secure adjusting strap and generator screws when tension deflection of 1 inch is indicated by depressing belt with fingers midway between pulleys.

(3) Correct generator belt tension after correcting water pump belt tension (para 4-38).



1 Fan bracket adjusting block
2 Adjusting screw
3 Fan bracket
4 Capscrew
5 Nut
6 Capscrew
7 Fan belt
8 Adjusting strap
9 Generator drive belt
10 Capscrew
11 Nut
12 Generator
13 Capscrew

Figure 4-22. Generator, repair, removal and installation, (sheet 2 of 2).

f. Removal of Generator.

(1) Remove generator drive belt as directed in b above.

(2) Disconnect shielded cable from receptacle on generator (12).

(3) Remove capscrew (10), flat washer, and lockwasher that secure generator to adjusting strap (8) and two capscrews, lockwashers, and nuts (11) that secure generator to bracket; remove generator.

g. Cleaning and Inspection of Generator.

(1) Clean exterior of generator and dry thoroughly.

(2) Inspect generator as directed in *a* above. Rotate generator armature shaft manually to assure it rotates freely. Inspect for overheating and burned insulation.

(3) Inspect all parts for cracks, wear or other damage; replace as necessary.

h. Installation of generator.

(1) Install generator in reverse order of removal.

(2) Install generator drive belt as directed in *d* above.

(3) Polarize generator as directed in *i* below.

i. Generator Polarizing.

(1) Polarize generator before starting engine whenever generator cable has been removed from generator.

(2) Disconnect generator-to-voltage regulator cable at voltage regulator, and battery connection cable from voltage regulator; momentarily connect a wire from the B terminal of generator cable to battery connection cable.

(3) Install cable.

4-29. Generator Regulator

a. Description. The generator regulator is a water-tight, radio-suppressed, corrosion and fungus-resistant unit designed for use with a generator having an internally grounded field circuit, and in a system with a negative ground. The regulator is composed of three units, a cutout relay, voltage regulator, and current regulator. The cutout relay closes the circuit to the batteries. The voltage regulator regulates the generator output to the batteries within preset limits. The current regulator regulates the amount of current being delivered to the batteries.

b. Testing. When ammeter on instrument panel indicates:

(1) High charging rate with fully charged battery. (If temperatures are high, the battery will normally accept a high rate of charge. If operating condition is not due to high temperatures, perform the following checks:)

(a) Check connection for looseness.

(b) Insert testing harness, Fig 4-23, in generator regulator circuit. Open the field circuit at slip connection, then operate generator at medium

speed. If output remains high, the generator or wiring is at fault. If no output is obtained, remove generator regulator for adjustment or refer to direct support maintenance for repair.

(2) Low or no charging rate with low battery.

(a) Check for loose connections, frayed or damaged wires.

(b) Check battery (para 4-59).

(c) Insert testing harness, fig 4-23, in generator regulator circuit. Operate generator regulator at medium speed and (battery connected) momentarily connect T-3 to T-1 (armature) and increase generator speed. If output does not increase, check generator. If output increases, remove generator regulator for adjustment or refer to direct support maintenance for repair.

c. Removal. Remove defective, damaged, generator regulator as illustrated in figure 4-23. Tape ends of cables to avoid short circuiting.

d. Installation. Install new generator regulator in reverse order of removal.

Note. **Polarize generator before cranking engine (para 4-28i).**

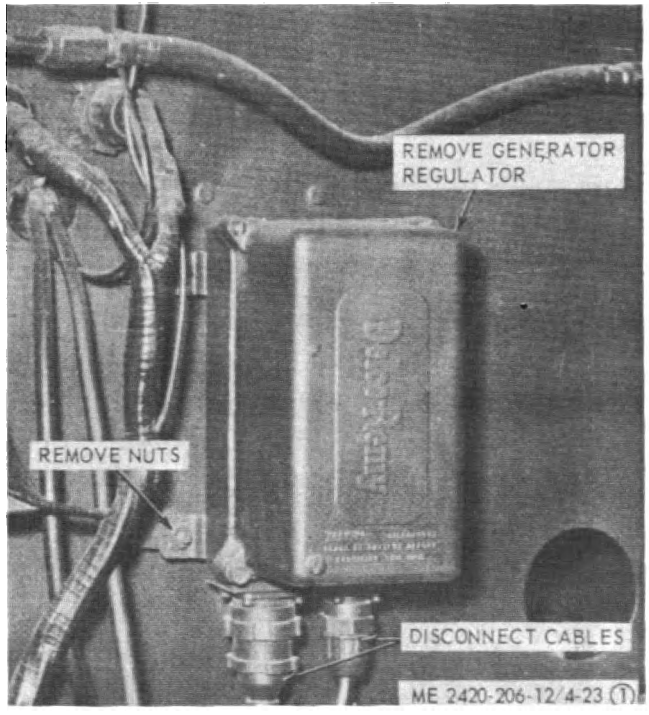


Figure 4-23. Generator regulator, testing, removal and installation (sheet 1 of 2).

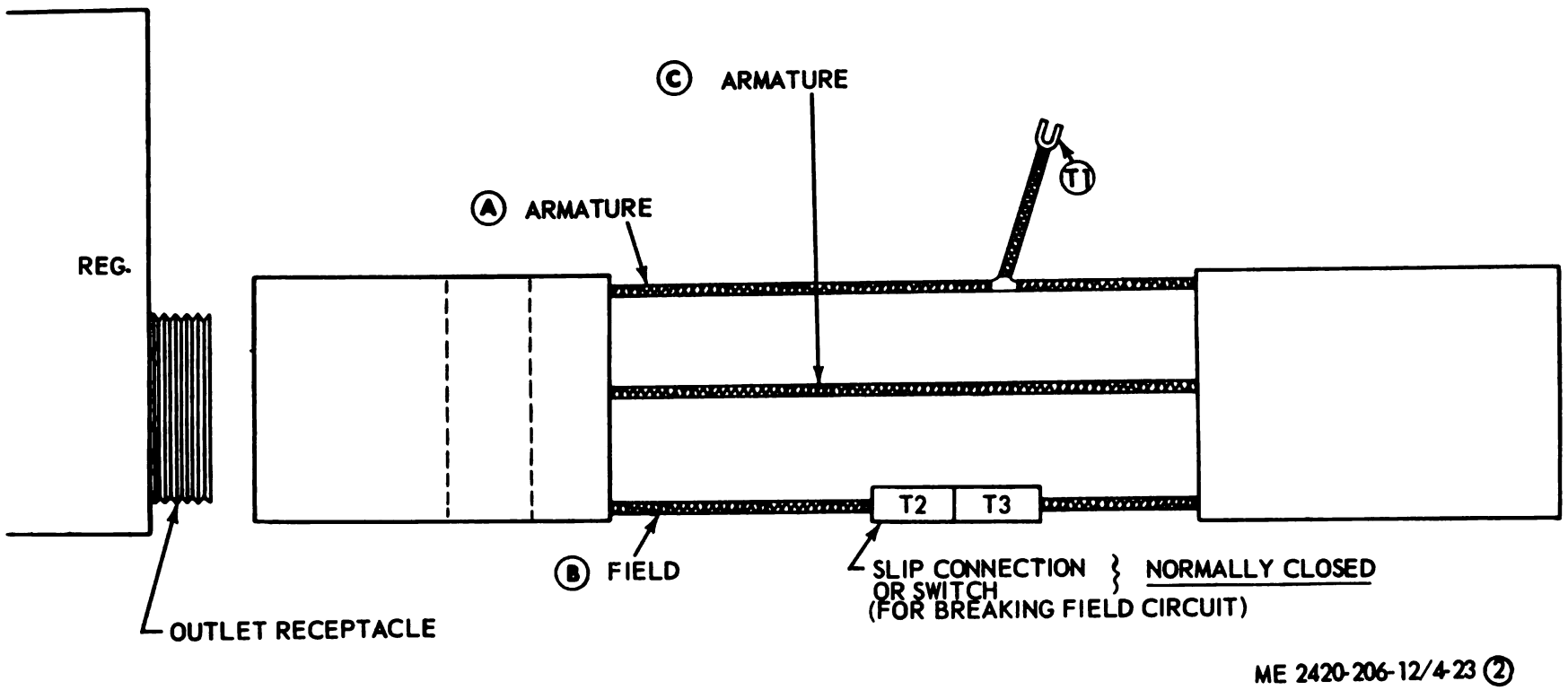


Figure 4-23. Generator regulator, testing, removal and installation (sheet 2 of 2).

4-30. Coolant Thermostat

Note. Replace coolant thermostat when temperatures of 180° F to 195° F. cannot be maintained during normal operation of tractor.

a. Removal. Remove thermostat as illustrated in figure 4-24.

b. Cleaning and Inspection.

(1) Clean thermostat housing and parts with a cooling system flushing solution.

(2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

c. Test. Thermostat should open fully when immersed in water heated to 200° F. Replace a defective thermostat.

d. Installation. Install thermostat in reverse order of removal; replace gasket, fill radiator.

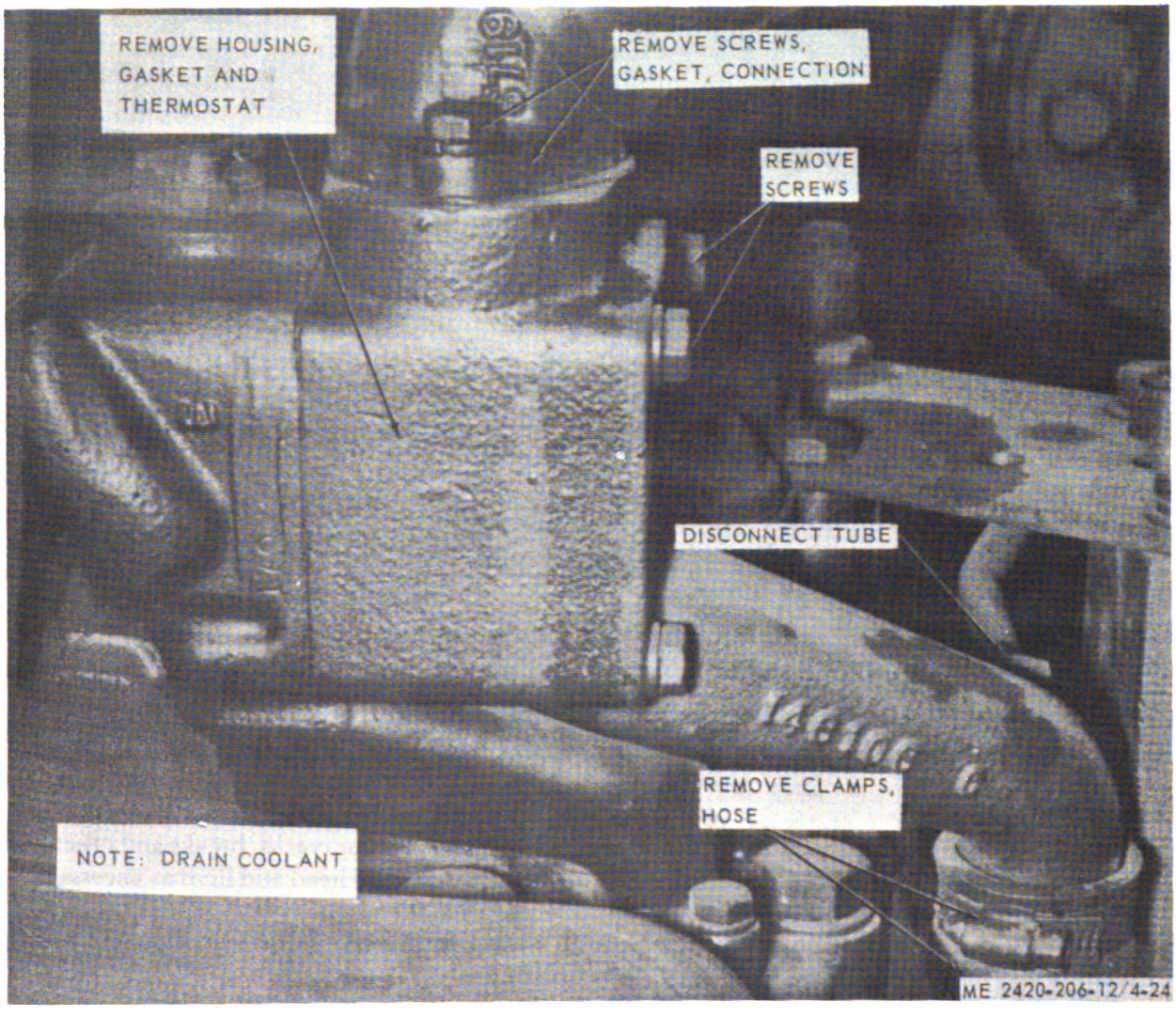


Figure 4-24. Coolant thermostat, removal and installation.

4-31. Water Filter (Corrosion Resistor)

a. Removal.

(1) Refer filter service illustration (fig. 3-8) and close coolant cocks on engine and filter and remove coolant hose.

(2) Remove mounting screws and water filter from engine block.

b. Cleaning and Inspection.

(1) Clean filter and dry thoroughly.

(2) Inspect for cracks, breaks and other defects. Replace defective filter as necessary.

c. Installation. Install water filter in reverse order of removal, replace gasket.

4-32. Engine and Turbocharger Filter Head

a. Removal.

(1) Remove elements (para 3-5).

(2) Remove filter head and oil lines as illustrated in figure 4-25.

b. Cleaning and Inspection.

(1) Clean heads and dry thoroughly. Clean lines with a cloth.

(2) Inspect for cracks, breaks and damage. Replace defective head and lines.

c. Installation.

(1) Install filter heads as illustrated in figure 4-25.

(2) Install elements (para 3-5).

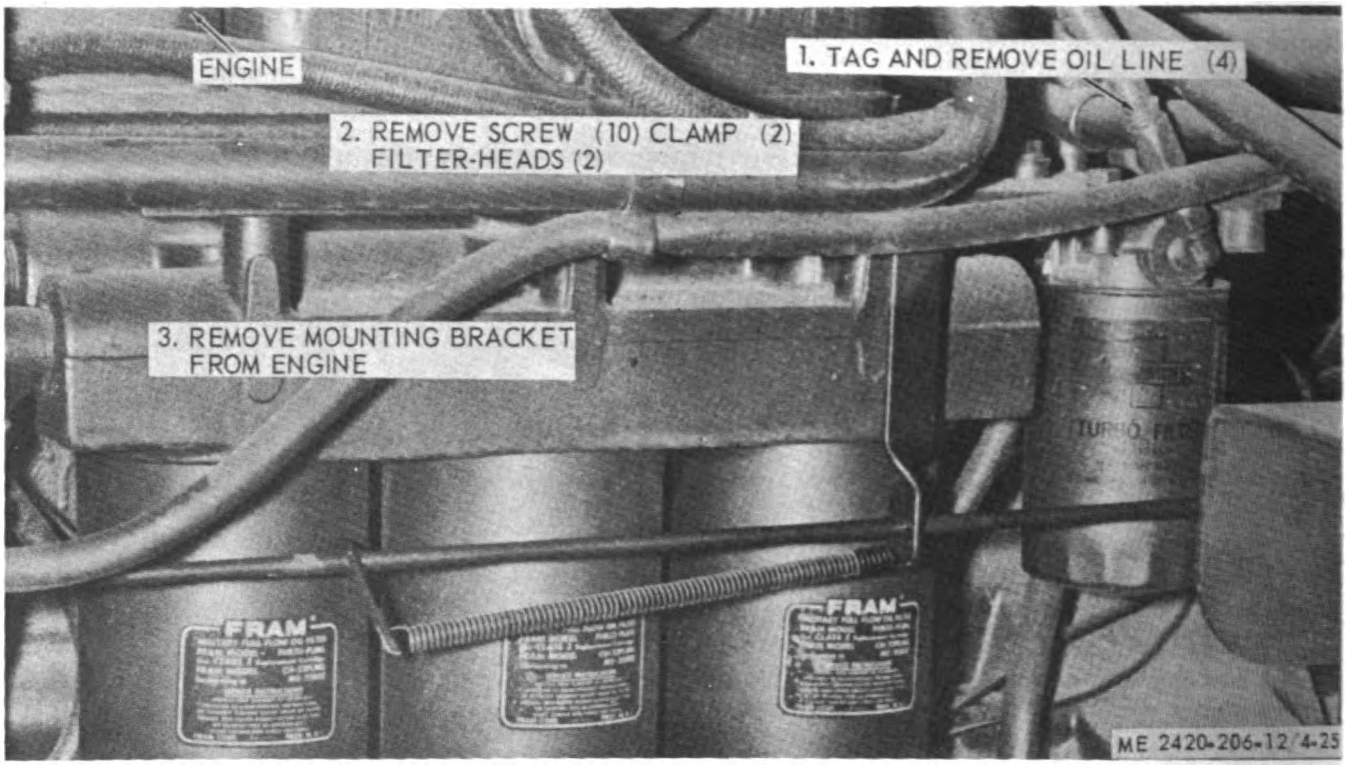


Figure 4-25. Engine and turbocharger filter head, removal and installation.

4-33. Fuel Filter Head

a. Removal.

(1) Remove elements (para 3-6).

(2) Remove filter head as illustrated in figure 4-26.

b. Cleaning and Inspection.

(1) Clean head and dry thoroughly.

(2) Wipe lines with a cloth.

(3) Inspect for cracks, breaks and other damage. Replace defective head and lines as necessary.

c. Installation.

(1) Install filter heads as illustrated in figure 4-26.

(2) Install elements (para 3-5).

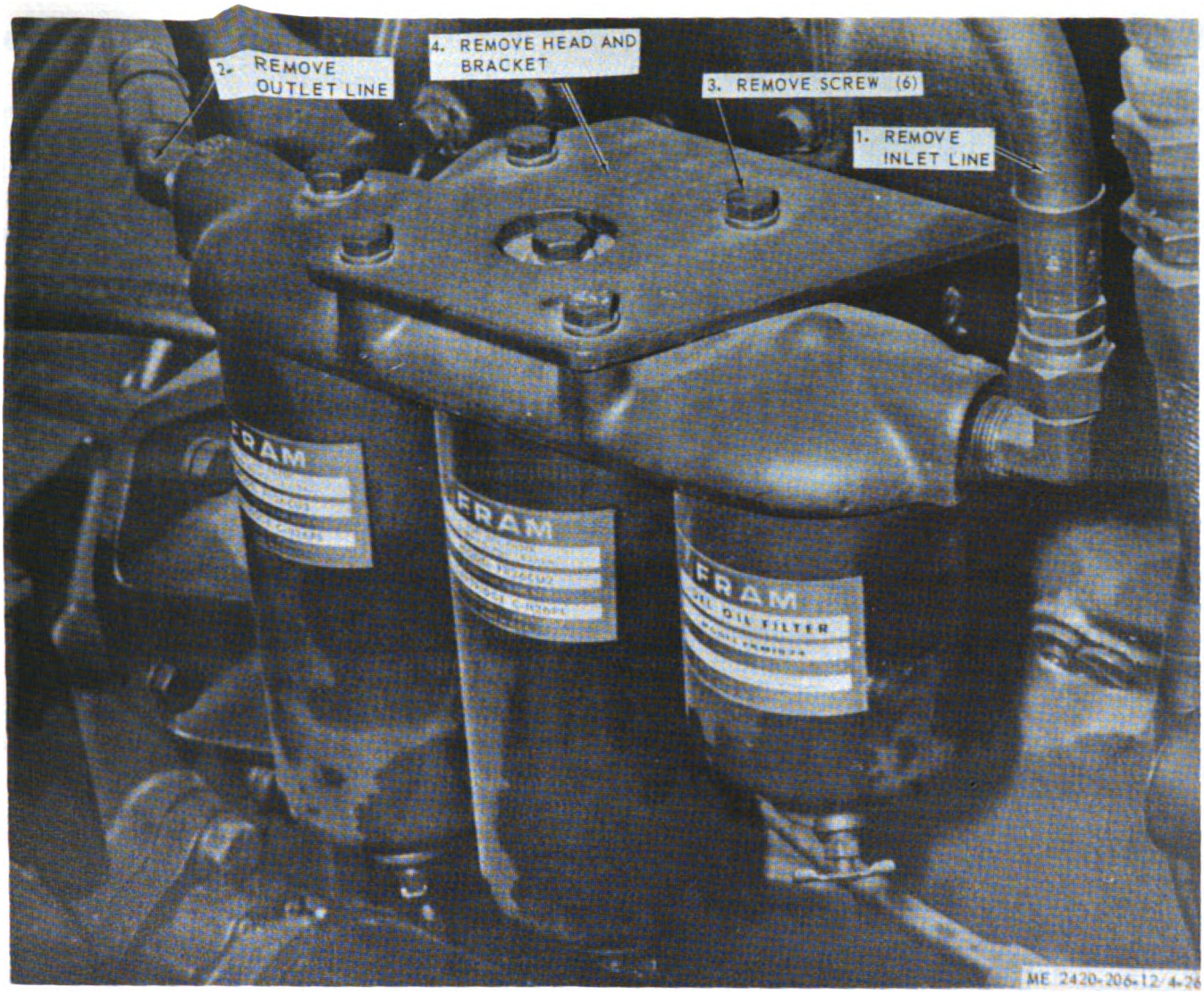


Figure 4-26. Fuel filter head, removal and installation.

4-34. Fuel Shut Down Valve

a. Removal and Disassembly.

(1) Tag and disconnect electrical leads.

(2) Remove governor speed and tachometer cables.

(3) Remove and disassemble fuel shut down valve as illustrated in figure 4-27.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly. Clean lines and cables. Replace and lubricate preformed packings.

(2) Inspect for cracks, breaks and other damage. Apply 24 volts DC across terminals of coil assembly and check magnetic attraction at the inner face of coil assembly with a screwdriver blade. With power applied, it should exert a strong magnetic force. Replace a defective fuel shut down valve if necessary.

c. Reassembly and Installation.

(1) Reassemble and install fuel shut down valve as illustrated in figure 4-27.

(2) Install governor speed and tachometer cables.

(3) Connect electrical leads.

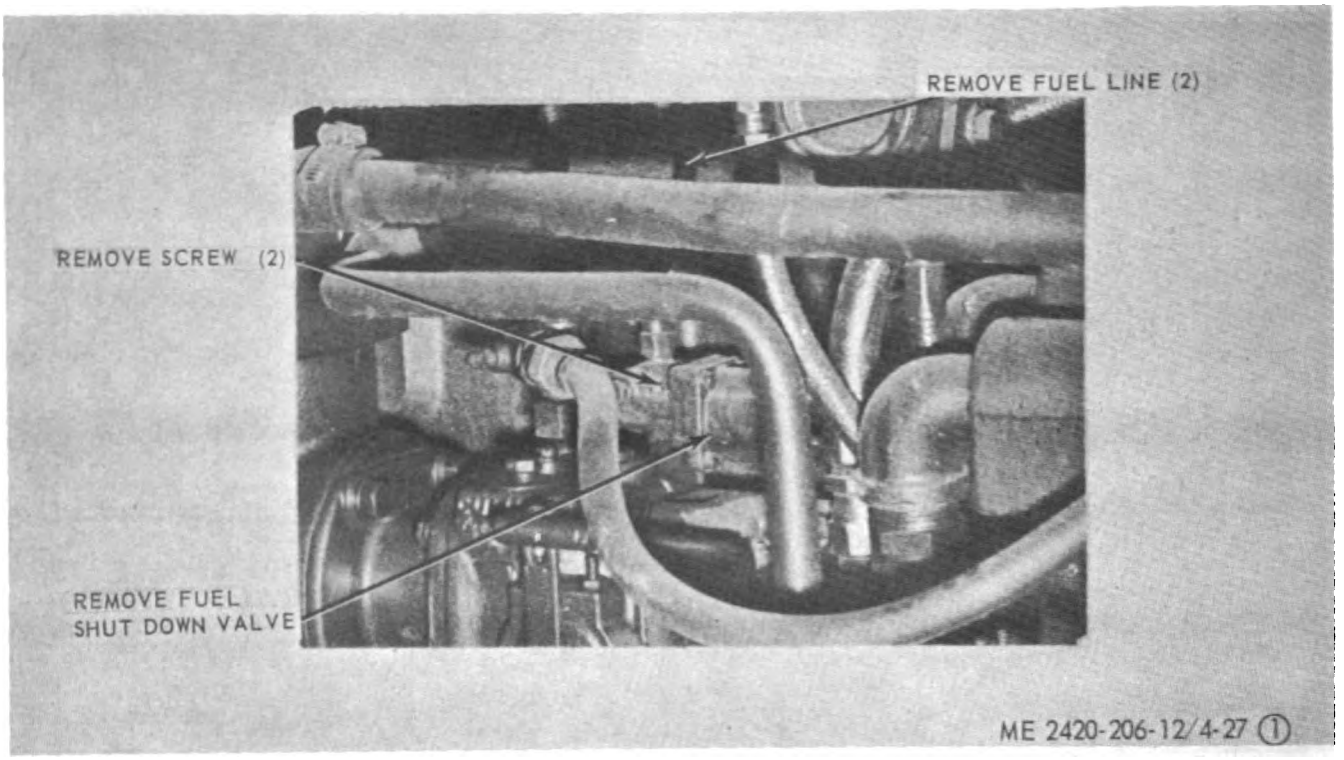
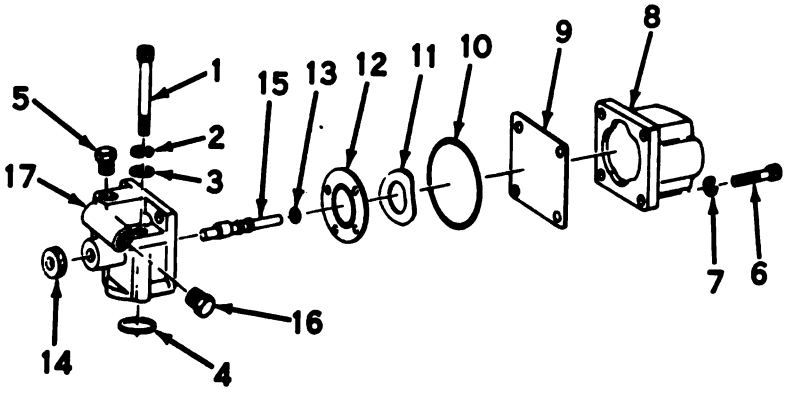


Figure 4-27. Fuel shut down valve, removal, disassembly, reassembly, and installation (sheet 1 of 2).



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1 Capscrew
2 Lockwasher
3 Flat washer
4 Preformed packing
5 Connection
6 Capscrew
7 Lockwasher
8 Coil assembly
9 Fuel shield
10 Preformed packing
11 Spring
12 Valve
13 Preformed packing
14 Knob
15 Shaft
16 Pipe plug
17 Housing

Figure 4-27. Fuel shut down valve, removal, disassembly, reassembly and installation (sheet 2 of 2).

4-35. Aneroid

a. Description. The aneroid provides a fuel bypass system that responds to intake manifold pressure of turbocharged engine to provide a close control of exhaust smoke. It limits the fuel pressure to the injectors when acceleration speeds are below normal operating speed range and manifold air pressure is not sufficient for complete combustion.

b. Removal and Disassembly.

(1) Remove elements (para 3-10).

(2) Remove and disassemble aneroid as illustrated in figure 4-28.

c. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks, wear and other damage. Replace defective parts as necessary.

d. Reassembly and Installation.

Reassemble and install aneroid as illustrated in figure 4-28.

(2) Install elements (para 3-10).

e. Adjustment.

(1) Fuel pump must be calibrated before adjusting aneroid; refer to DS Maintenance. Fill aneroid with lubricating oil.

(2) Check fuel manifold pressure as follows:

(a) Disconnect pressure line and drain line from aneroid to fuel pump. Disconnect air line from aneroid to air intake manifold. Plug lines and connections to keep air out of fuel system.

(b) Check fuel manifold pressure with pressure gage. Accelerate from idle to full throttle and check maximum pressure indicated on gage.

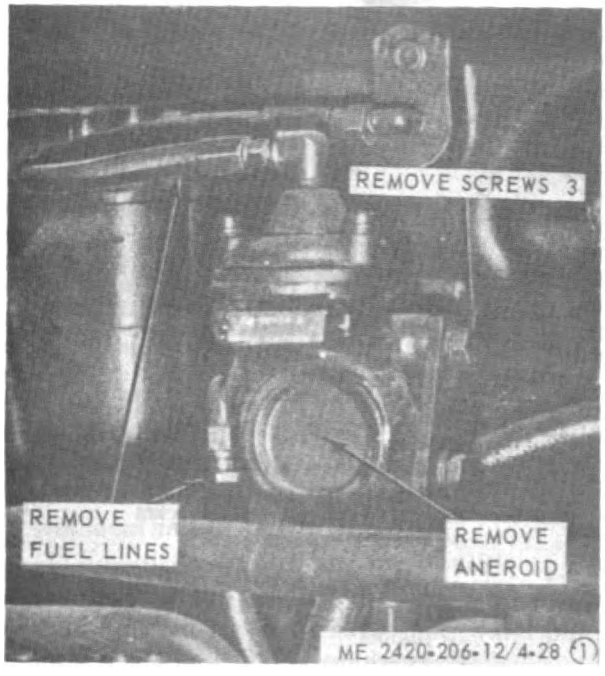
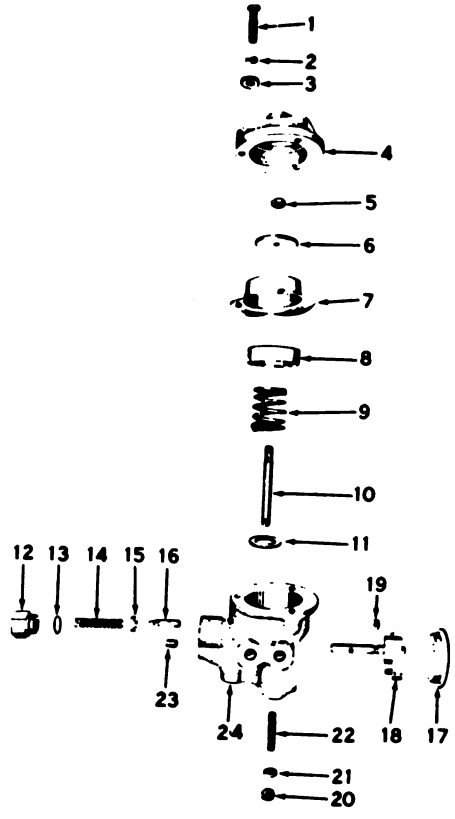


Figure 4-28. Aneroid, removal, disassembly, reassembly, and installation (sheet 1 of 2).



1 Screw	13 Packing
2 Washer	14 Spring
3 Washer	15 Washer
4 Cover	16 Plunger
5 Nut	17 Cover
6 Washer	18 Lever and valve assembly
7 Bellows	19 Packing
8 Piston	20 Nut
9 Spring	21 Seal
10 Shaft	22 Screw
11 Shim	23 Pin
12 Retainer	24 Housing

Figure 4-28. Aneroid, removal, disassembly, reassembly and installation (sheet 2 of 2).

Pressure must be 2000 psi at 2300 rpm. Refer errors to DS Maintenance.

(3) Check air intake manifold pressure with a mercury manometer. Pressure should be 34 to 41 psi. If pressure is low, check turbocharger for proper operation.

(4) Connect fuel lines from aneroid to fuel pump. Start and warm up engine.

(5) Accelerate engine from idle to full throttle and check fuel manifold pressure with pressure gage.

(6) Turn aneroid fuel screw (22) in or out to obtain correct manifold pressure.

(7) Make final adjustments as follows:

(a) Connect line from aneroid to air intake manifold.

(b) Start engine and check idle speed. In most cases, idle will be low and must be adjusted upward with fuel pump governor idle screw.

(c) Check engine operation. If smoke is not excessive during first 15 seconds of full throttle operation, but becomes excessive thereafter, check fuel system and turbocharger before readjusting aneroid.

(d) If hard starting is encountered, aneroid valve may be sticking in the open position. Replace if necessary.

4-36. Engine Speed Governor (Indicating)

a. Removal and Disassembly.

(1) Refer to paragraph 4-20 and figure 4-15.

(2) Disassemble engine speed governor as illustrated in figure 4-29.

b. Cleaning and Inspection.

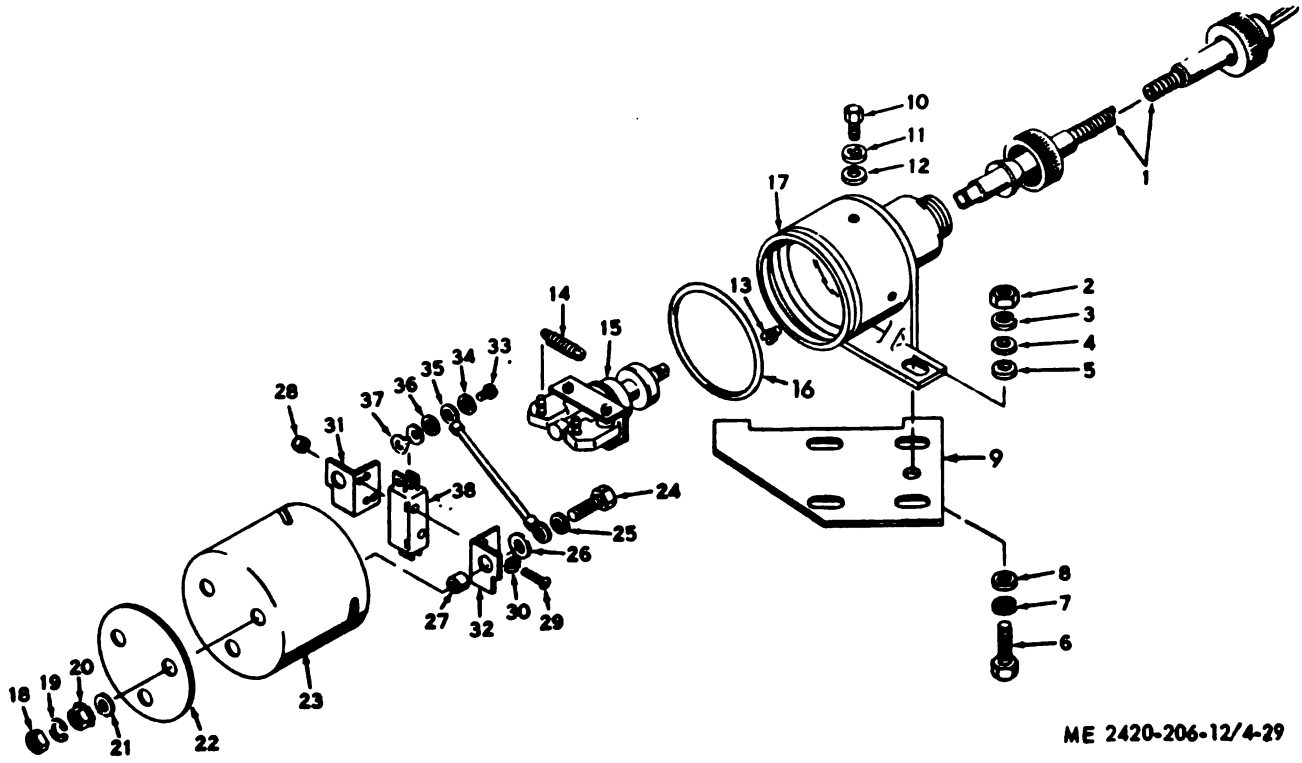
(1) Clean parts and dry thoroughly. Replace preformed packing.

(2) Inspect for cracks, breaks, wear and other damage. Replace defective parts as necessary.

c. Reassembly and Installation.

(1) Reassemble and install engine speed governor as illustrated in figure 4-29.

(2) Refer to paragraph 4-20 and figure 4-15.



1 Drive shaft
2 Nut
3 Lockwasher
4 Flatwasher
5 Rubber washer
6 Capscrew
7 Lockwasher
8 Flatwasher
9 Overspeed top bracket
10 Capscrew
11 Lockwasher
12 Flatwasher
13 Guide stud
14 Spring
15 Rotor
16 Preformed packing
17 Body
18 Nut
19 Lockwasher
20 Nut
21 Flatwasher
22 Insulating washer
23 Cap
24 Capscrew
25 Flatwasher
26 Insulating washer
27 Insulating bushing
28 Nut
29 Screw
30 Lockwasher
31 Right switch mounting bracket
32 Left switch mounting bracket
33 Screw
34 Lockwasher
35 Wire assembly
36 Lockwasher
37 Jumper
38 Switch

Figure 4-29. Engine speed governor, exploded view.

4-37. Fan Drive Pulley and Belts

a. Removal. Remove fan drive pulley and belts as illustrated in figure 4-30. Remove hood (fig 4-13) and upper radiator hose.

b. Cleaning and Inspection.

(1) Clean metal parts and dry thoroughly. Clean belts with a cloth.

(2) Inspect all parts for cracks, breaks and other damage. Replace defective parts as necessary. Replace belts in matched sets. Replace fan spacer gasket.

c. Installation. Install fan drive pulley and belts as illustrated in figure 4-30.

d. Belt Adjustment. Loosen fan pulley bracket capscrews (4, fig 4-22), nut (5), and turn adjusting screw (2), on fan bracket support to correct belt tension. Adjust belt tension for a deflection of 1 inch when belt is depressed manually (finger) midway between pulleys. Tighten capscrews, and adjust generator drive belt (para 4-28e).

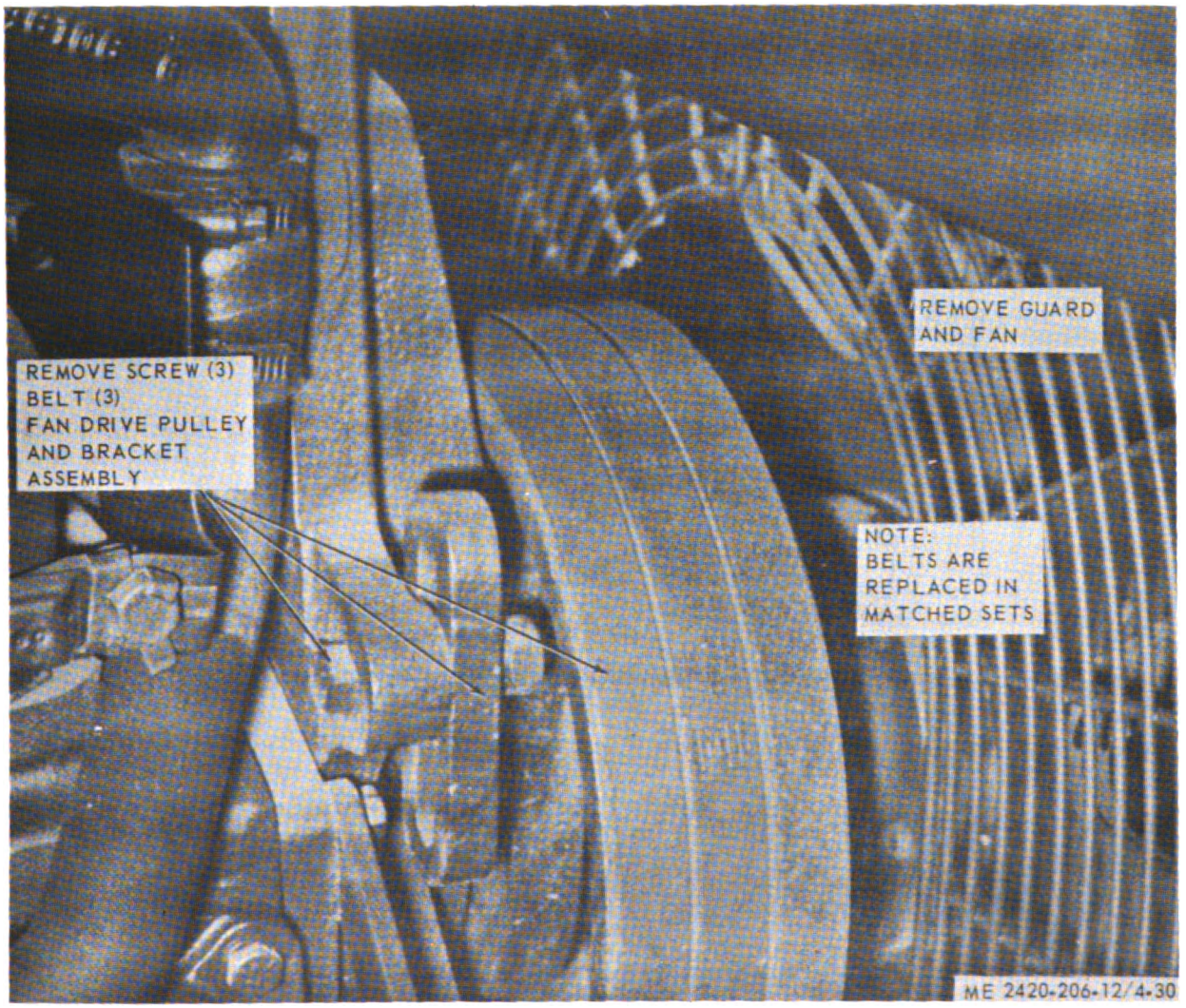


Figure 4-30. Fan drive pulley and belts, removal and installation.

4-38. Water Pump Belt

a. Removal and Installation.

(1) Remove generator belt (para 4-28).

(2) Water pump bracket screws must be loosened (do not permit coolant leaks). Turn water pump assembly and remove belt from pump pulley.

(3) Replace a defective belt in reverse order of removal.

b. Belt adjustment.

(1) Turn water pump assembly to apply tension on belt, with screwdriver inserted in holes provided in water pump. Correct tension is 1 inch deflection when belt is depressed manually (finger) midway between pulleys.

(2) Tighten water pump bracket screws.

(3) Install and adjust generator belt (para 4-28).

4-39. General

Engine timing as contained herein, refers to adjustment of cylinder fuel injectors, crossheads and valves.

4-40. Timing Adjustments

a. Turn engine over manually to cylinder time mark on pulley as illustrated in figure 4-31.

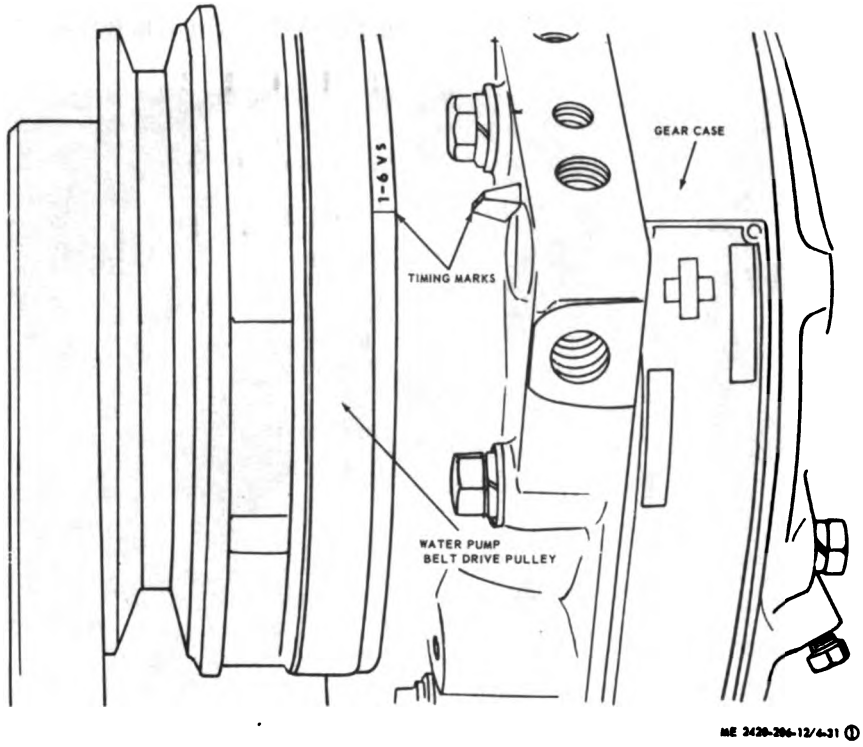
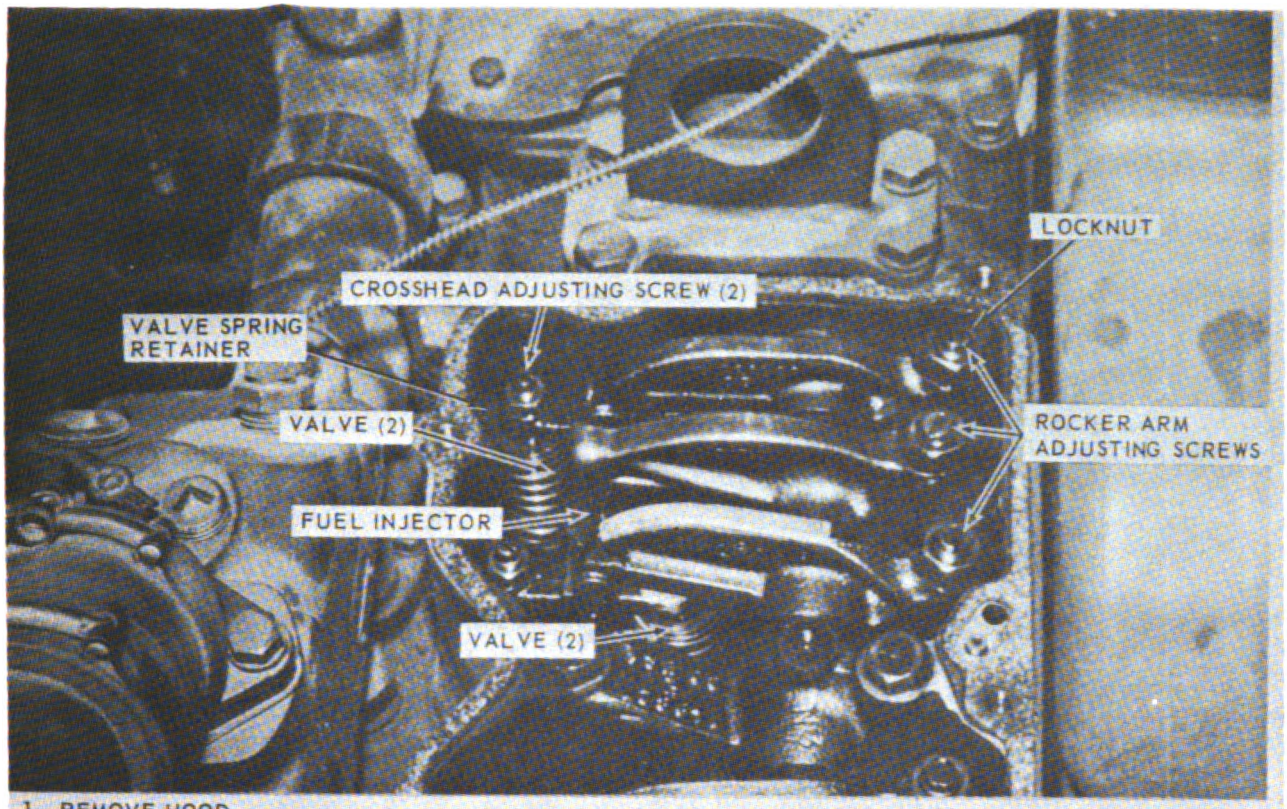


Figure 4-31. Cylinder timing mark and timing adjustments. (Sheet 1 of 2).



1. REMOVE HOOD.
2. REMOVE TURBOCHARGER.
3. REMOVE ROCKER ARM COVERS.
4. USE CYLINDER FIRING ORDER 1-5-3-6-2-4 AND TURN ENGINE OVER MANUALLY (BY DEPRESSING V-BELTS TO TIGHTEN) IN NORMAL DIRECTION (RIGHT-HAND ROTATION VIEWED FROM FAN END) TO TIME MARKS FOR NO. 1 CYLINDER.
5. ADJUST FUEL INJECTOR, CROSSHEAD AND VALVES AS FOLLOWS:
   A. FUEL INJECTOR: MAKE SURE ROCKER ARM ADJUSTING SCREW IS SEATED IN PUSHROD SOCKET, TORQUE ADJUSTING SCREW 48 INCH POUNDS (COLD), 60 INCH POUNDS (HOT). TORQUE LOCKNUT 79 TO 80 FOOT POUNDS.
   B. CROSSHEAD: LOOSEN ADJUSTING SCREW LOCKNUT AND BACK OFF SCREW ONE TURN. WITH A LIGHT FINGER PRESSURE APPLIED TO CROSSHEAD, HOLD IN CONTACT WITH VALVE STEM. USE ADJUSTING SCREW TO ALINE STEM TO BORE AND EQUALIZE PRESSURE ON VALVE STEMS. TORQUE LOCKNUT 25 TO 30 FOOT POUNDS. CHECK CLEARANCE BETWEEN CROSSHEAD AND VALVE SPRING RETAINER WITH A WIRE GAGE. MINIMUM CLEARANCE MUST BE 0.020 TO 0.025 INCH.
   C. VALVES: LOSSEN ROCKER ARM LOCKNUT AND BACK OFF ADJUSTING SCREW. INSERT FEELER GAGE BETWEEN ROCKER ARM AND CROSSHEAD. THE GAGE THICKNESS MUST BE AS FOLLOWS
   INTAKE VALVES (CROSSHEAD) (COLD) 0.016 INCH (HOT) 0.014 INCH.
   EXHAUST VALVES (COLD) 0.029 INCH (HOT) 0.027 INCH.
   ADJUST SCREW UNTIL ROCKER ARM TOUCHES FEELER GAGE. TORQUE LOCKNUT 79 TO 80 FOOT POUNDS.
6. INSTALL ROCKER ARM COVERS, TURBOCHARGER AND HOOD.

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Figure 4-31. Cylinder timing mark and timing adjustments (Sheet 2 of 2).

b. Adjust injectors, crossheads, and valves in that order before cranking engine to cylinder time mark 5-6VS.

4-41. Fuel injectors.

a. Removal (fig. 4-32).

(1) Remove rocker arm cover from rocker arm housing.

(2) Loosen injector lever adjusting screw nut and loosen adjusting screw until the push tube can be disengaged from injector lever. Disengage push tube and tip back injector lever until the injector can be removed.

(3) Remove two capscrews that secure holddown plate of the injector to the cylinder head. Use one of the removed screws as a jacking screw, inserted in the threaded hole in the holddown plate to pull the injector free from head. Remove injector.

(4) Remove plunger and spring from injector.

(5) Remove two half collets and remove holddown plate from the injector body.

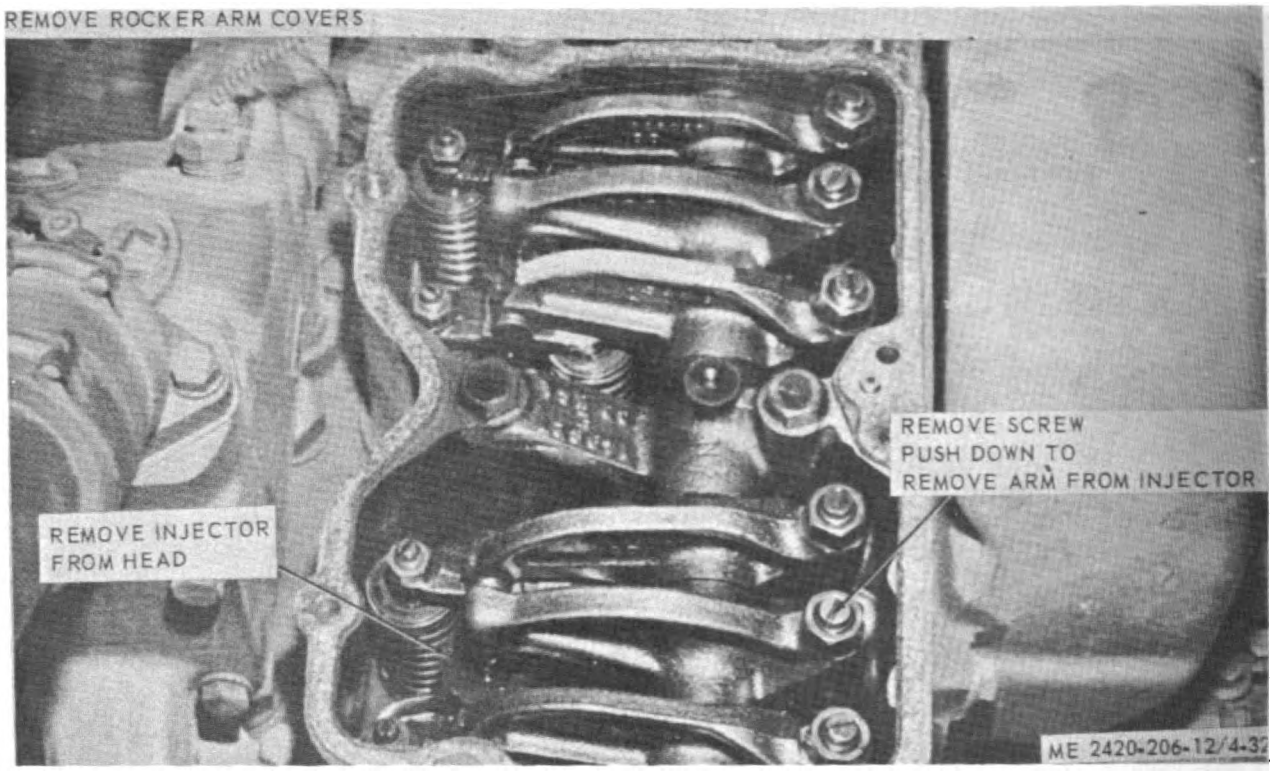


Figure 4-32. Fuel injector, removal and installation.

b. Installation and adjustment.

(1) Install fuel injector in reverse order of removal, fig. 4-32.

(2) Refer to paragraph 4-40 and adjust.

(3) Install new rocker arm cover gasket.

Section VII. STEERING AND SCRAPER HYDRAULIC SYSTEM

4-42. General

This section consists of steering and scraper hydraulic hose, lines, fittings, tank, filter, valves and cylinders.

4-43. Swivels and Hydraulic Lines

a. Description. The swivels provide 360° movement in one or more positions to prevent hydraulic lines connecting tractor and scraper from twisting or kinking.

b. Removal and Disassembly. Remove and disassemble hydraulic lines and swivels, and remove coupling as illustrated in figure 4-33. Sleeves (12) and (13) must be inserted far enough into casing (15) to remove 18 bearings (10).

c. Cleaning and Inspection.

(1) Clean parts with P-D-680 solvent and dry thoroughly.

(2) Inspect for wear, cracks, breaks, and other damage. Replace defective parts as necessary.

d. Reassembly and Installation.

(1) Reassemble and install hydraulic lines and swivels and install coupling as illustrated in the assembled view of figure 4-33. Before installing pipe plug (14), install grease fitting and lubricate with MIL-G-3278 until grease appears at filler hole. Use caution that balls are not displaced by grease; remove grease fitting and install pipe plug.

(2) Lips of dust seal (11) and U-cup seal (3) must point toward retainer (5).

(3) Lubricate shaft of sleeves (12) and (13) and U-cup seal.

(4) Apply teflon tape to threads of retainer and setscrew (1) to act as a sealer.

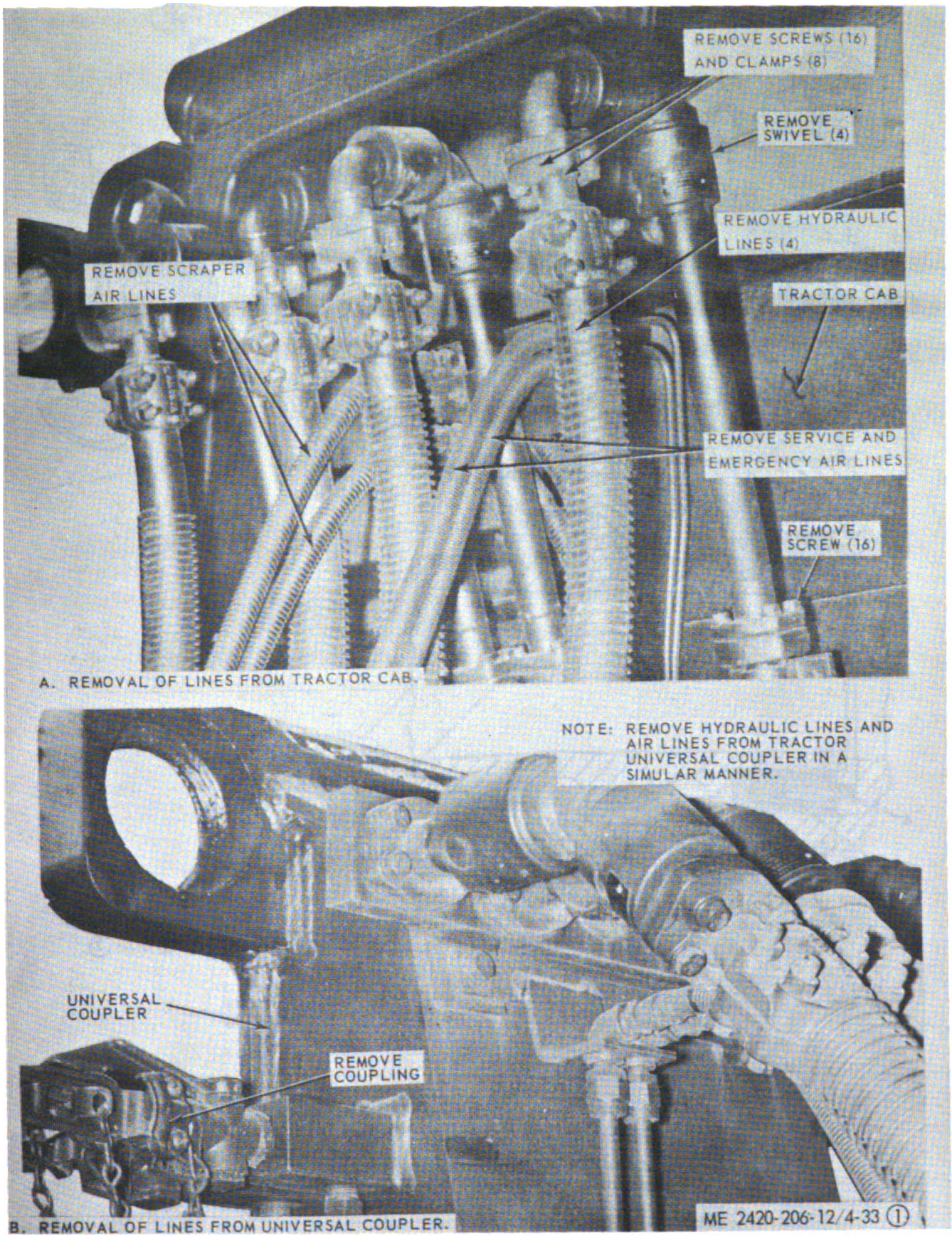
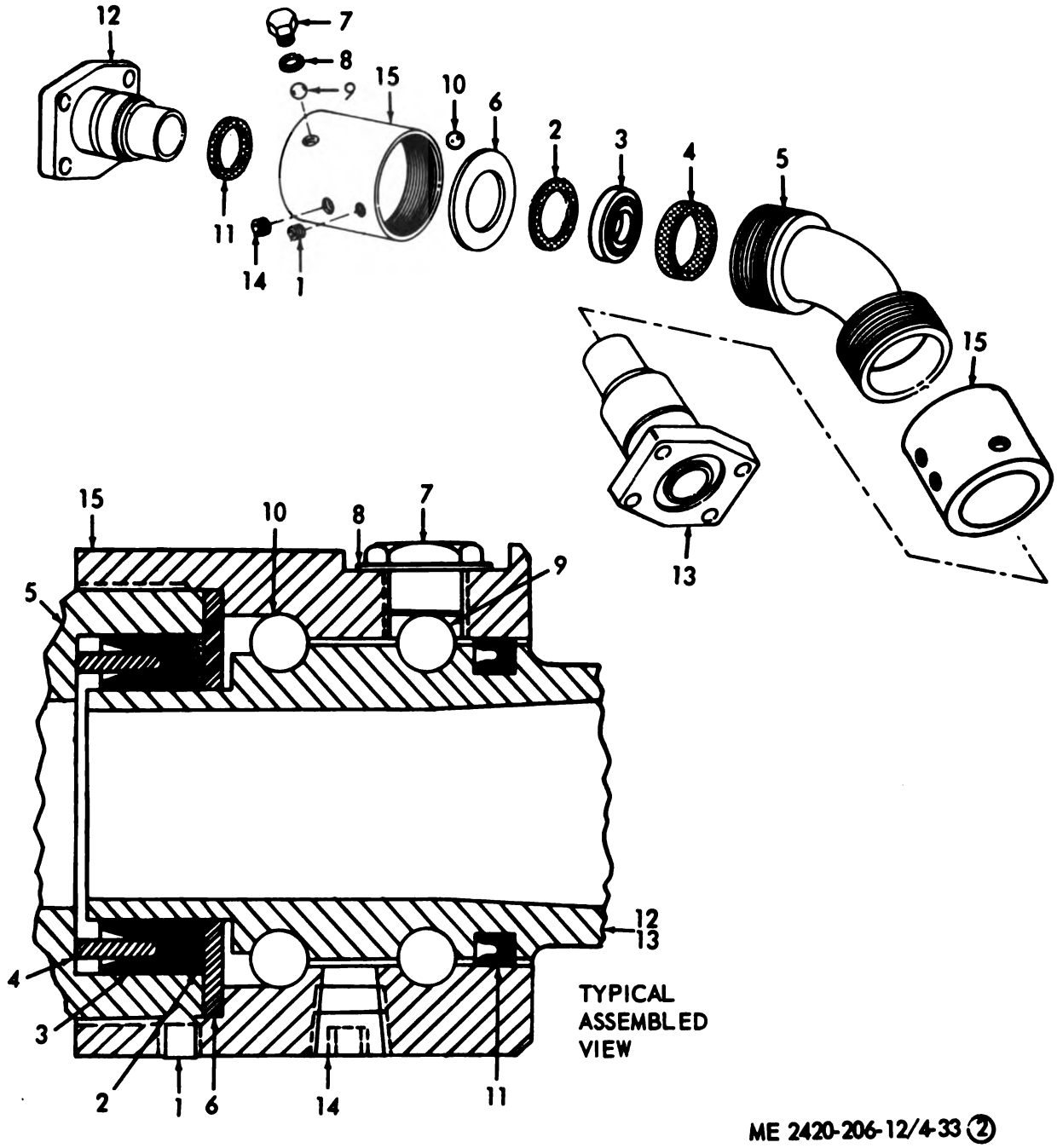


Figure 4-33. Swivels and hydraulic lines, removal, disassembly, reassembly, and installation (Sheet 1 of 3).



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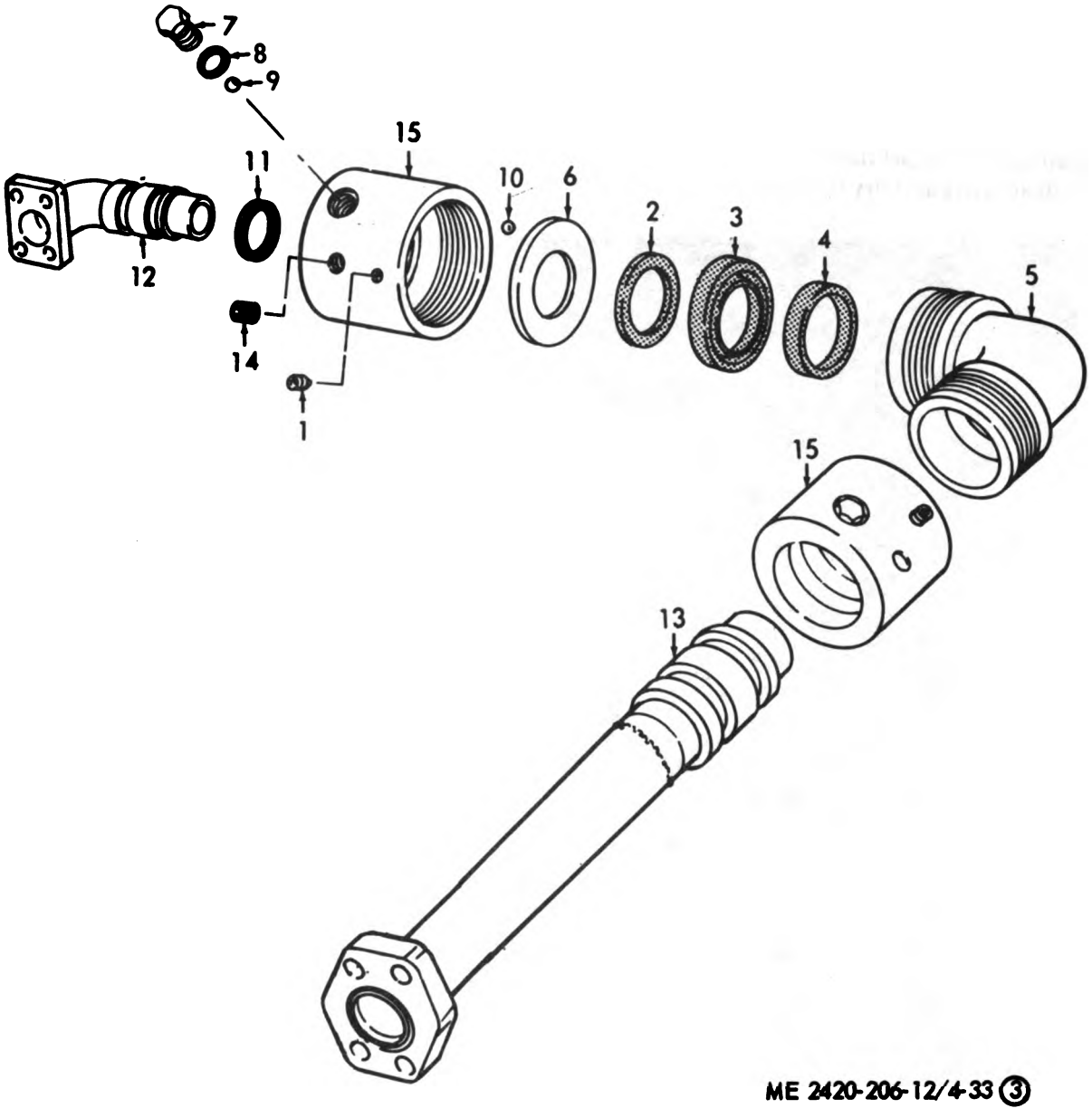
1 Setscrew
2 Ring
3 Seal
4 Spacer
5 Retainer
6 Ring
7 Plug
8 Washer
9 Bearing
10 Bearing
11 Seal
12 Sleeve
13 Sleeve
14 Plug
15 Casing

Figure 4-33. Swivels and hydraulic lines, removal, disassembly, reassembly, and installation (sheet 2 of 3).



1 Setscrew
2 Ring
3 Seal
4 Spacer
5 Retainer
6 Ring
7 Plug
8 Washer
9 Bearing
10 Bearing
11 Seal
12 Sleeve
13 Sleeve
14 Plug
15 Casing

Figure 4-33. Swivels and hydraulic lines, removal, disassembly, reassembly, and installation (sheet 3 of 3).

4-44. Hydraulic Filter Base

a. Removal.

(1) Remove element (para 3-7).

(2) Remove hydraulic filter base, figure 4-34.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect parts for cracks, breaks and other damage. Replace defective parts as necessary.

c. Installation.

(1) Install hydraulic filter base in reverse order of removal, *a* above.

(2) Install elements (para 3-7).

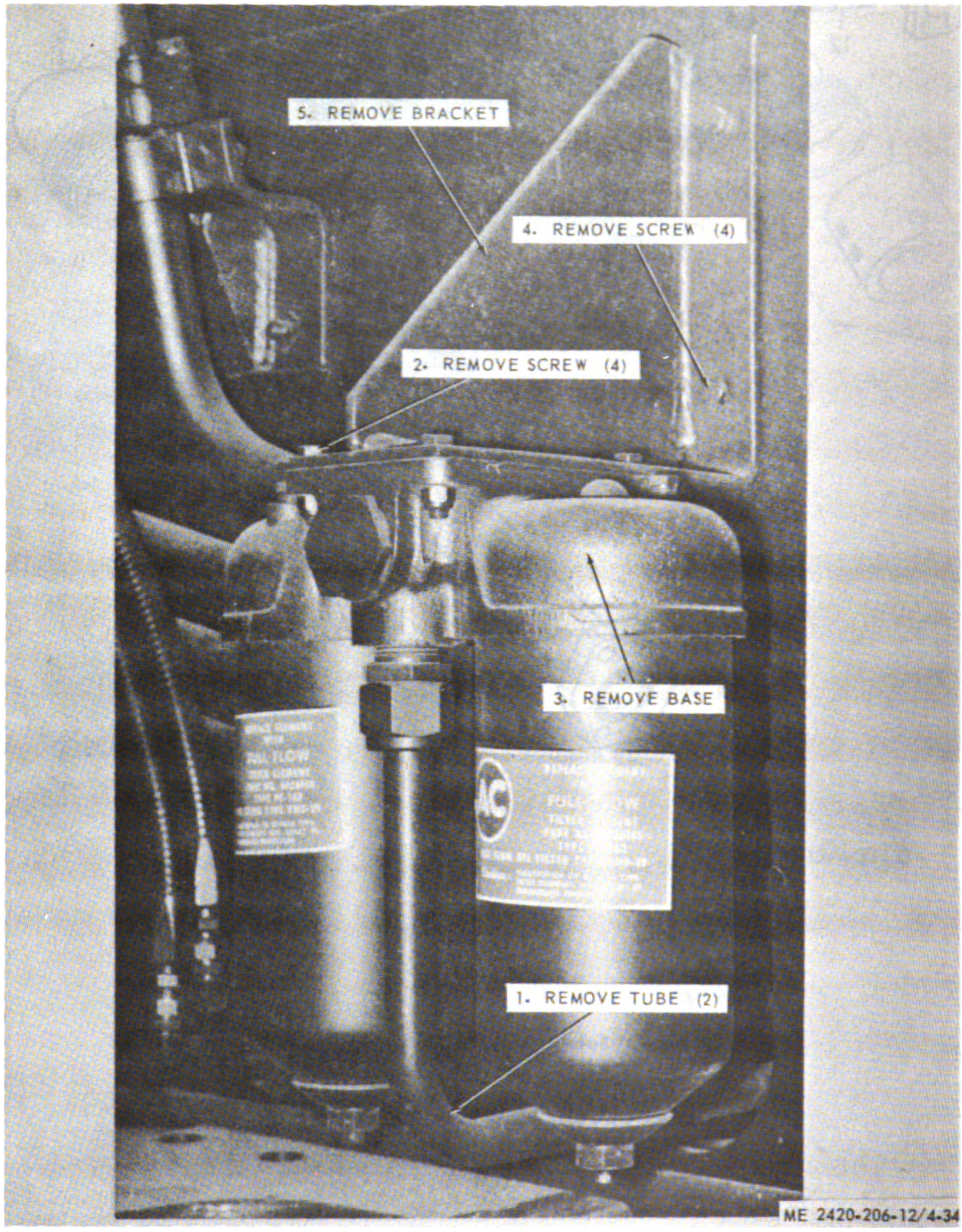


Figure 4-34. Hydraulic filter base, removal and installation.

4-45. Push Start Pump and Valve

a. Removal. Remove pump and valve as illustrated in figure 4-35.

b. Cleaning and Inspection.

(1) Clean exterior and dry thoroughly.

(2) Inspect for cracks, breaks, and other damage. Rotate pump input shaft and check for rough, catching, or noisy operation. Replace defective parts as necessary.

c. Installation. Install valve and pump as illustrated in figure 4-35. Replace push start pump gasket.

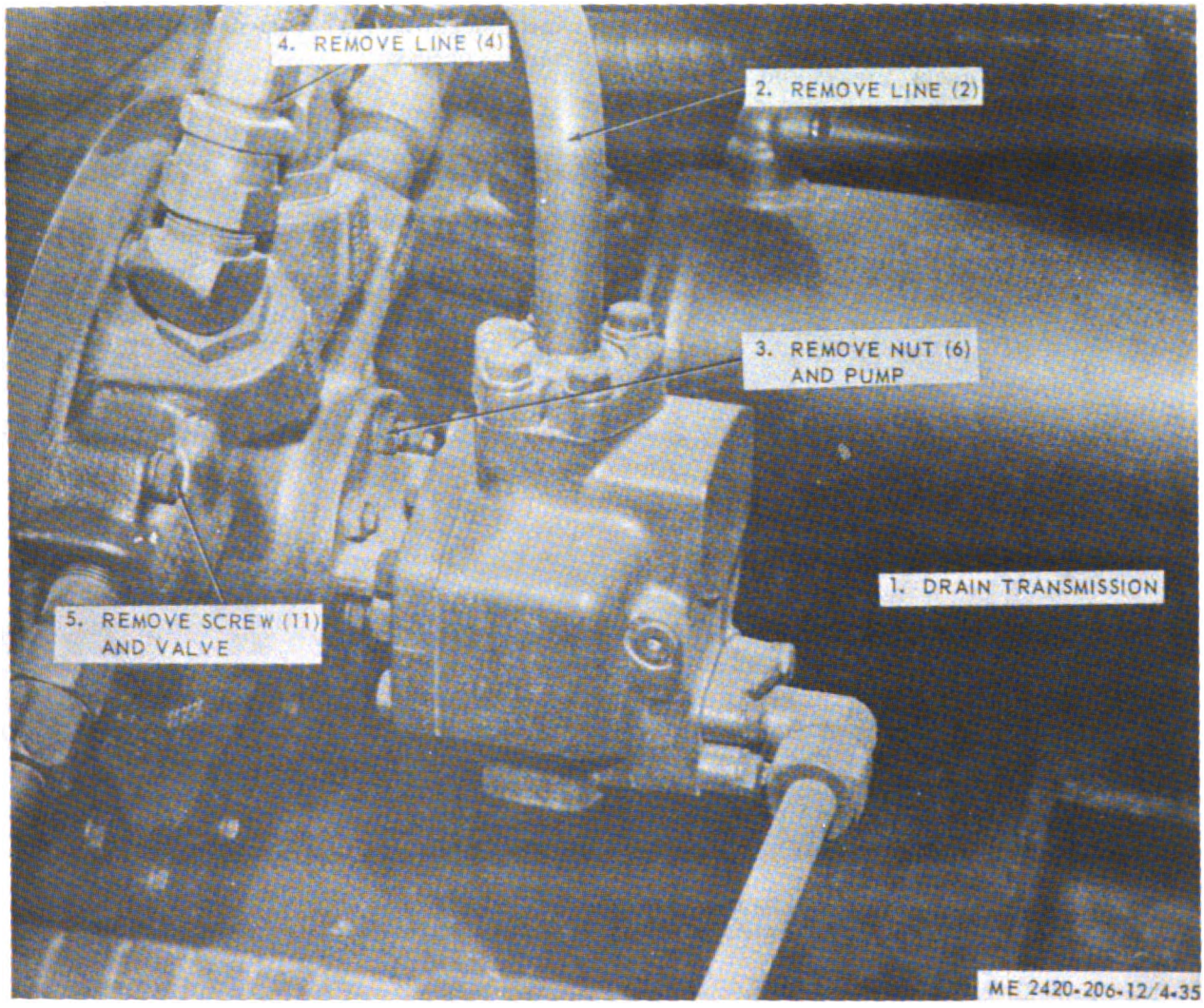


Figure 4-35. Push start pump and valve, removal and installation.

4-46. Steering Hydraulic Cylinder

a. Removal and Disassembly. Remove and disassemble steering hydraulic cylinder as illustrated in figure 4-36. Drain lines into a container. Lift and secure cylinder, do not damage piping. Remove nuts and anchor pins securing cylinder to tractor frame.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary. Replace wear ring assembly, preformed packings and seals.

c. Reassembly and Installation. Reassemble and install steering hydraulic cylinder as illustrated in figure 4-36. Lubricate inside of cylinder bore and all packing with MIL-L-2104A oil. Torque nut 6 to 1,000 foot-pounds and capscrew 2 to 155 foot-pounds. Tighten capscrews 12 finger tight and install lockwire 11. Correct fluid level in hydraulic tank as necessary.

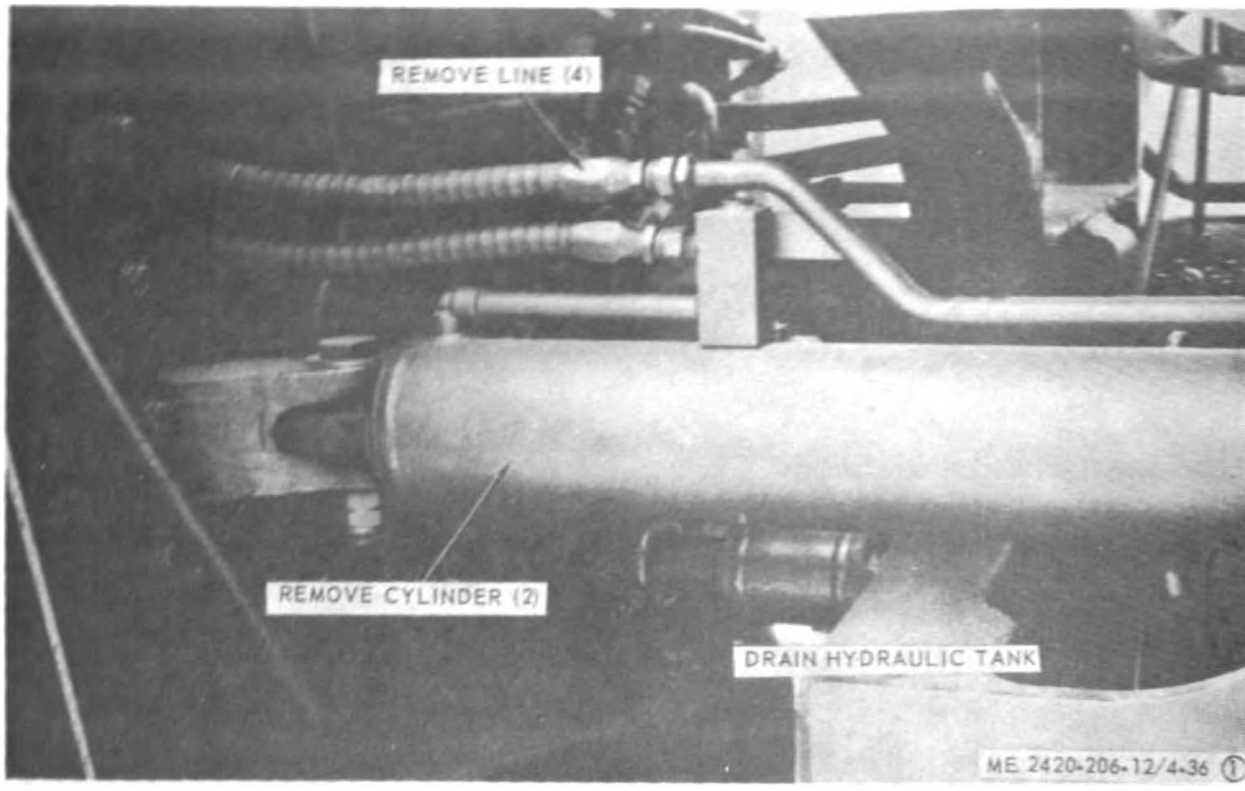
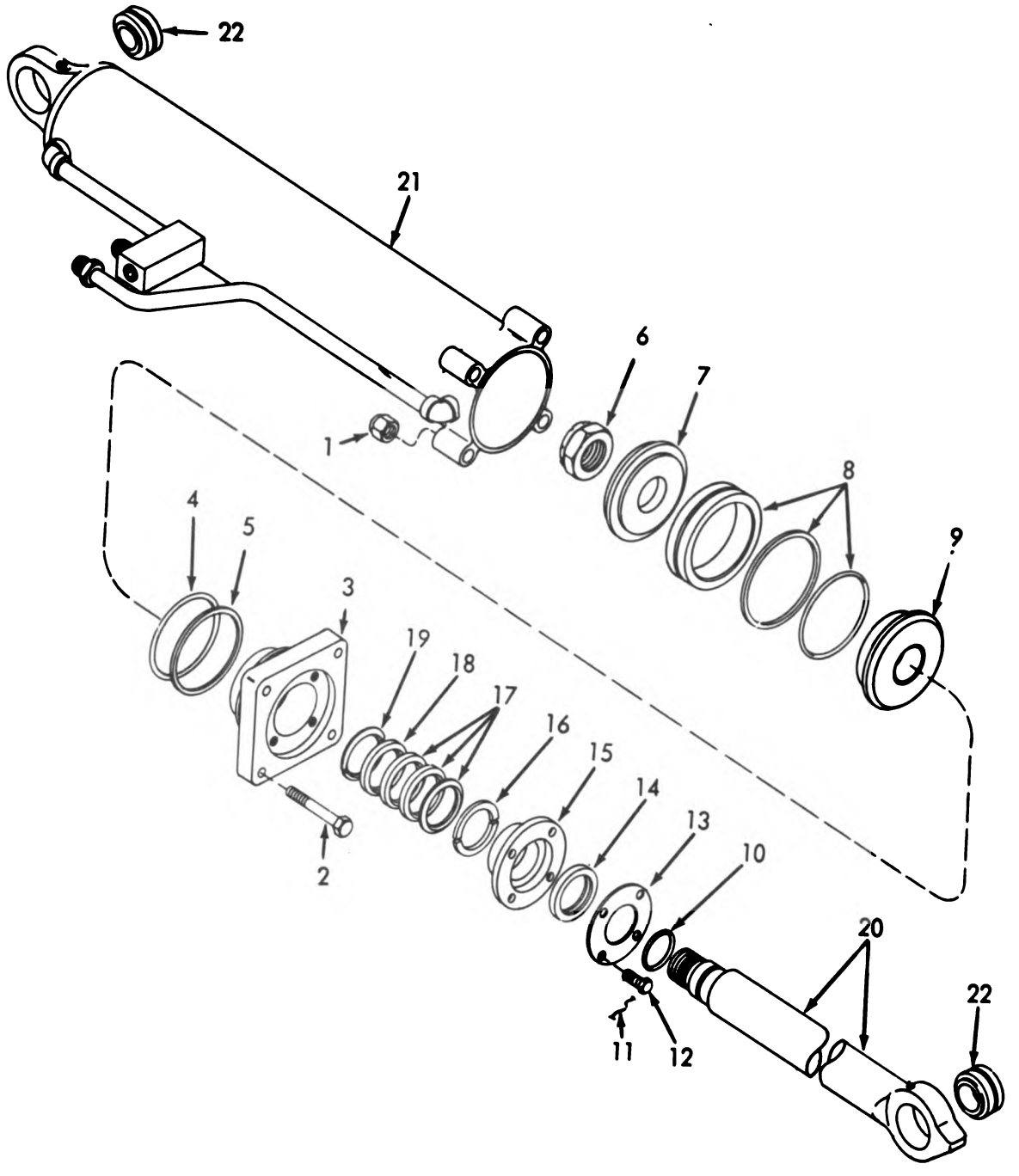


Figure 4-36. Steering hydraulic cylinder, removal, disassembly, reassembly and installation (sheet 1 of 2).



ME 2420-206-12/4-36 (2)

1 Nut
2 Screw
3 Cap
4 Packing
5 Ring
6 Nut
7 Piston
8 Wear ring assembly
9 Piston
10 Packing
11 Wire
12 Screw
13 Retainer
14 Seal
15 Gland
16 Adapter
17 Packing
18 Packing
19 Adapter
20 Rod
21 Tube assembly
22 Bearing (do not remove unless damaged)

Figure 4-36. Steering hydraulic cylinder, removal, disassembly, reassembly and installation (sheet 2 of 2).

4-47. Bulldozer Hydraulic Valve and Floorplates

a. Removal.

(1) Remove screws that secure floorplates, remove floorplates.

(2) Remove bulldozer hydraulic valve as illustrated in figure 4-37.

b. Cleaning and Inspection.

(1) Wipe valve with a cloth and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective valve and floorplates as necessary.

c. Installation.

(1) Install bulldozer hydraulic valve as illustrated in figure 4-37.

(2) Install floorplates.

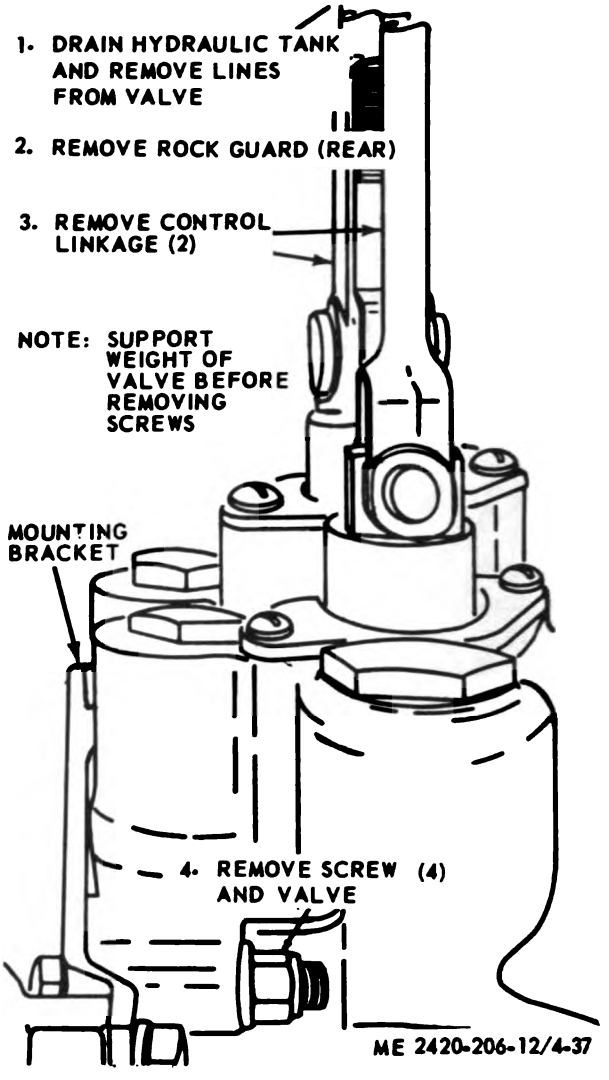


Figure 4-37. Bulldozer hydraulic valve, removal and installation.

4-48. Scraper Hydraulic Valve

a. Removal. Remove scraper hydraulic valve as illustrated in figure 4-38.

b. Cleaning and Inspection.

(1) Wipe parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective valve.

c. Installation. Install scraper hydraulic valve as illustrated in figure 4-38.

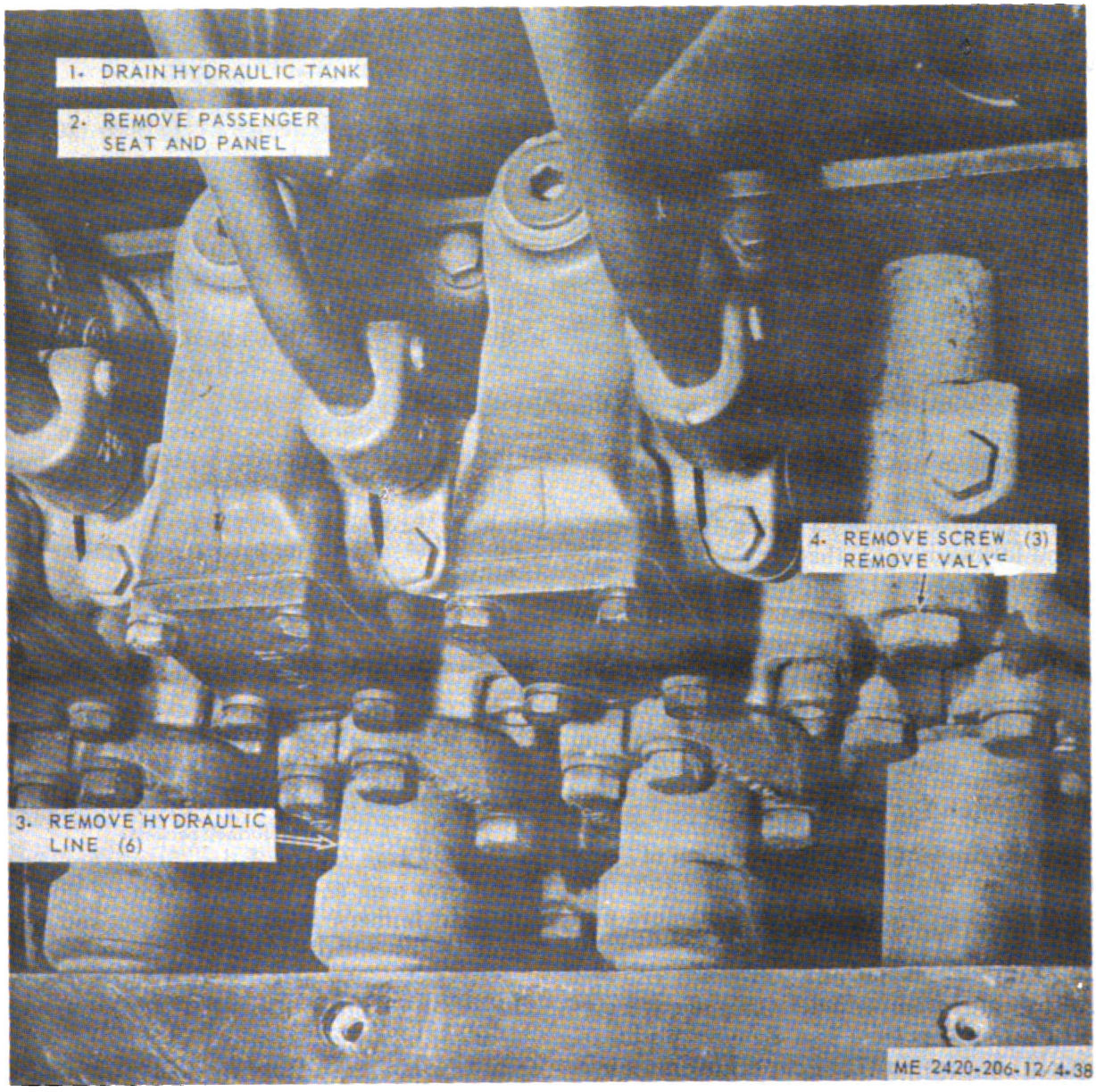


Figure 4-38. Scraper hydraulic valve, removal and installation.

4-49. General

Tractor air hydraulic system as contained herein consists of tanks, valves, controls and accumulator, lines and fittings for application of controlled pressures to tractor and scraper wheel brakes.

4-50. Brake Actuator and Hydraulic Tank

a. Description. The brake system is an air-over hydraulic type, in which air is used to actuate the hydraulic brake cylinder to apply brakes. The brake actuator is an intergrated unit which contains both air cylinder and hydraulic brake cylinder. As air from air brake system is ported to brake actuator, the push rod in air cylinder in the brake actuator extends and applies force to a hydraulic piston at end of push rod. This forces hydraulic fluid into brake expander tube in the wheel brake.

b. Removal and Disassembly. Remove and disassemble brake actuator and hydraulic tank as illustrated in figure 4-39.

(1) *Brake actuator.*

(a) Remove capscrews (1, Fig 4-39 (sheet 2 of 3)) and lockwashers (2) that secure cylinder (18) to mounting bracket (21). Apply air pressure to air brake chamber to actuate brake. While cylinder is extended away from mounting bracket (21), remove retaining ring (3) that secures push rod (19, Fig 4-39 (sheet 3 of 3)) to the piston (5, Fig 4-39 (sheet 2 of 3)); remove piston and associated parts from the push rod. Slowly release air pressure from chamber.

(b) Remove retaining ring (4) that secures piston (5) to cylinder (18). Slide piston out of cylinder and remove washer (6), retaining ring (7), flat washer (8), spring (9), and ball (10). Remove preformed packings (11 and 12) from piston.

(c) Install cylinder in a soft-jawed vise and remove cap (13) from cylinder (18); remove preformed packing (14) from cap. Remove piston assembly (15) and spring (16) from cylinder; remove preformed packing (17) from piston.

(d) Remove two nuts (19) and flat washers (20) from push rod (19, Fig 4-39 (sheet 3 of 3)). Remove nuts (1) and lockwashers (2) that secure mounting bracket (21, Fig 4-39 (sheet 2 of 3)) to brake chamber. Remove capscrews (4), lockwashers cover (7, Fig 4-39 (sheet 3 of 3)).

(e) Remove boot (3) from push rod (19). Use C-clamps to clamp cover (7) to body (20) of brake chamber. emove capscrews (4), lockwashers (5), and flat washers (6) that secure cover to body. Carefully loosen C-clamps and remove cover from body.

***Warning:* The cover is heavily spring-loaded by springs (8 and 9). Failure to apply C-clamps to brake chamber before removing cover may cause cover to be ejected with enough force to cause bodily injury.**

(f) Remove two springs (8 and 9) and spring guide (10) from brake chamber.

(g) Remove nuts (11) and lockwashers (12) that secure outer clamp (13) to body (20). Remove push rod (19), diaphragm (17), and associated parts from body by pulling out the push rod.

(h) Straighten the rolled diaphragm and remove outer clamp (13). Remove nuts (14) and lockwashers (15) that secure inner clamp (16) and diaphragm guide (18) to push rod (19). Remove inner clamp and diaphragm guide. Remove diaphragm (17) from diaphragm guide.

(2) *Hydraulic tank.*

(a) Position a container under hydraulic tank. Disconnect tank-to-brake cylinder line from fittings on tank. Allow lines and tank to drain.

(b) Remove four capscrews, washers, and nuts that secure tank to tractor frame; remove tank.

(c) Remove filler cap and breather from tank.

c. Cleaning and Inspection.

(1) Clean actuator and dry thoroughly.

***Caution:* Do not immerse piston assembly 15, fig. 4-39 (sheet 2 of 3)) in cleaning solution as it will destroy the internal coated parts of piston.**

Note. Discard all preformed packings.

(2) Clean tank and dry thoroughly. Pour solvent into tank and agitate to remove sludge from interior. Immerse breather in solvent and agitate to remove dust and dirt. Shake out excess solvent.

(3) Inspect actuator and tank for cracks, breaks, and other damage. Check operation of actuator's piston assembly (15) by inserting a smooth, blunt tool into the small opening in the face of piston assembly and pushing forward. If a definite movement cannot be easily obtained, replace piston assembly. If there is movement, apply low pressure compressed air at opening to produce a pressure inside piston assembly. If air passes through, replace piston assembly. Replace defective parts as necessary.

d. Reassembly and Installation. Install tank and actuator as illustrated in figure 4-39.

(1) *Brake actuator.*

(a) Lubricate inside of brake chamber body (20, Fig 4-39 (sheet 3 of 3)) and both sides of diaphragm (17) with diaphragm lubricant.

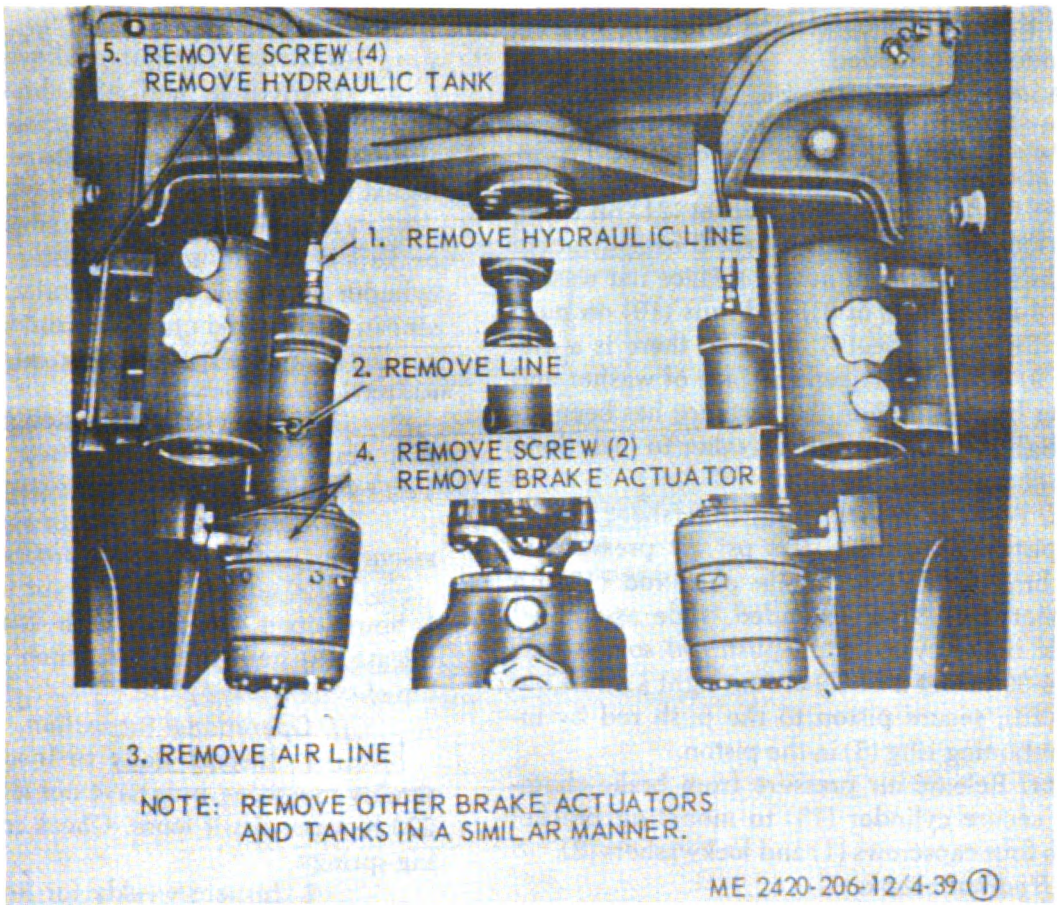


Figure 4-39. Brake actuator and hydraulic tank, removal, disassembly, reassembly and installation (sheet 1 of 3).

(b) Lay inner clamp (16) on a bench and position the small end of diaphragm (17) inside flange. Slide diaphragm guide (18) and push rod (19) down into the diaphragm, position them on bolts of the inner clamp, and secure with nuts (14) and lockwashers (15).

(c) Slide diaphragm assembly down into the outer clamp (13) and roll diaphragm back over fluted edge of outer clamp.

(d) Slide assembled push rod and diaphragm into body (20) and position it so bolts of the outer clamp pass through holes provided; secure assembled push rod and diaphragm with nuts (11) and lockwashers (12).

(e) Position spring guide (10) and springs (9 and 8) on push rod; position cover (7) over push rod and, using C-clamps, aline cover so it can be secured with capscrews (4), lockwashers (5), and flat washers (6); secure cover. Position boot (3) on cover and push rod.

(f) Connect brake chamber to a 100 psi compressed air line; apply pressure. The push rod must move out quickly without binding. Release the pressure. Push rod must retract completely with no binding.

(g) Cover boot (3) and cover (7) with soap suds and apply air pressure to brake chamber; check for leakage. If leakage is observed or operation of brake chamber is not quick and smooth, dismantle brake chamber and check for cause of faulty operation.

(h) Lubricate bore of cylinder (18, Fig. 4-39 (sheet 2 of 3)) with MIL-L-2104A, Amendment 1, Grade 10. Insert spring (16) into bore of the cylinder.

***Caution:* Do not use automotive brake fluid in this brake system. Automotive brake fluid will cause deterioration of rubber parts and greatly shorten the effective life of unit.**

(i) Lubricate and place preformed packing (17) on piston assembly (15); insert piston assembly into cylinder (18). Position preformed packing (14) in cap (13), turn cap onto the cylinder, and torque to 50 foot-pounds minimum.

(j) Position ball (10), spring (9), and flat washer (8) in the piston (5) and secure with retaining ring (7). Lubricate preformed packings (11 and 12) with hydraulic fluid; position them on piston (5). Insert piston into cylinder (18); secure piston

piston in the cylinder by placing retaining ring (4) into cylinder slot provided.

Note. The preformed packing (11) is identified by a white paint slash on its outside diameter. This preformed packing must be positioned in the correct groove for proper operation of the hydraulic brake cylinder.

(k) Position mounting bracket (21) on brake chamber cover (7, Fig 4-39 (sheet 3 of 3)); secure with lockwashers (2) and nuts (1). Place flat washer (20, Fig 4-39 (sheet 2 of 3)) and nuts (19) on push rod (19, Fig 4-39 (sheet 3 of 3)) so there is a distance of 9/16 inch between the face of washer and mounting bracket. When this distance has been attained, tighten the two nuts together to lock them in place.

(l) Position washer (6, fig 4-39 (sheet 2 of 3)) in the piston (5). Apply 100 psi air pressure to actuate brake chamber. While push rod (19, fig 4-39 (sheet 3 of 3)) is extended, slide assembled hydraulic brake cylinder on push rod so the nuts (19, fig 4-39 (sheet 2 of 3)) are up tight against flat washer (20); secure piston to the push rod by installing retaining ring (3) in the piston.

(m) Release air pressure from brake chamber and secure cylinder (18) to mounting bracket (21) with four capscrews (1) and lockwashers (2).

(2) *Hydraulic tank.*

(a) Fill hydraulic tank, LO 5-2420-206-12 and bleed brake system as follows:

***Caution:* Do not fill brake system with automotive brake fluid. This type of fluid is destructive to brake assemblies and hydraulic brake cylinders.**

(b) Depress and hold brake treadle valve. Open bleeder valve to vent air from hydraulic brake cylinder. When no more fluid flows from bleeder, close and release brake treadle valve.

(c) Wait 2 minutes to permit hydraulic brake cylinder to fill; then check and refill the brake reservoir tank.

(d) Repeat *(b)* and *(c)* above.

(e) Actuate and hold brake treadle valve for 10 seconds with bleeder closed; then release. Wait 2 minutes, refill the brake reservoir tank, and repeat this step.

(f) Repeat *(b)* and *(c)* above to clear air from brake side of automatic adjuster in the hydraulic cylinder and from expander tube. Repeat until no air can be detected escaping from bleeder.

Note. Wait 2 minutes after each brake release before making the next application.

(g) Repeat *(e)* above enough times to ensure that brake shoes are contracting the brake drum. Test by holding against engine power.

(h) Move to the bleeder for the other brake assemblies and repeat above procedure.

(i) After operating tractor for approximately 1 hour, open bleeders, with brakes released, to release any remaining air which may work to the top of system during use.

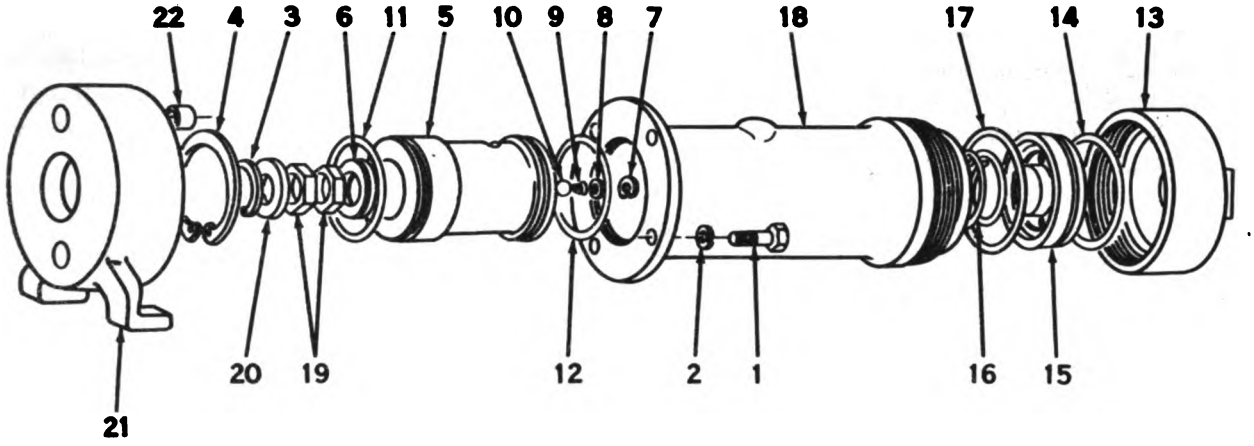
(j) Operational Inspection.

1. Inspect daily to insure the brake assembly mounting nuts have not loosened; torque to 270 foot-pounds if loose. Check for broken retracting springs.

2. Inspect weekly for lining wear. To inspect for wear, apply brakes and visually inspect retracting spring on inside of brake assembly. If brake shoes tend to shear the retracting springs at a point between frame and shoes, travel is at a maximum and brake blocks should be replaced.

***Caution:* Continued operation of tractor in this condition will result in damage to brake structure.**

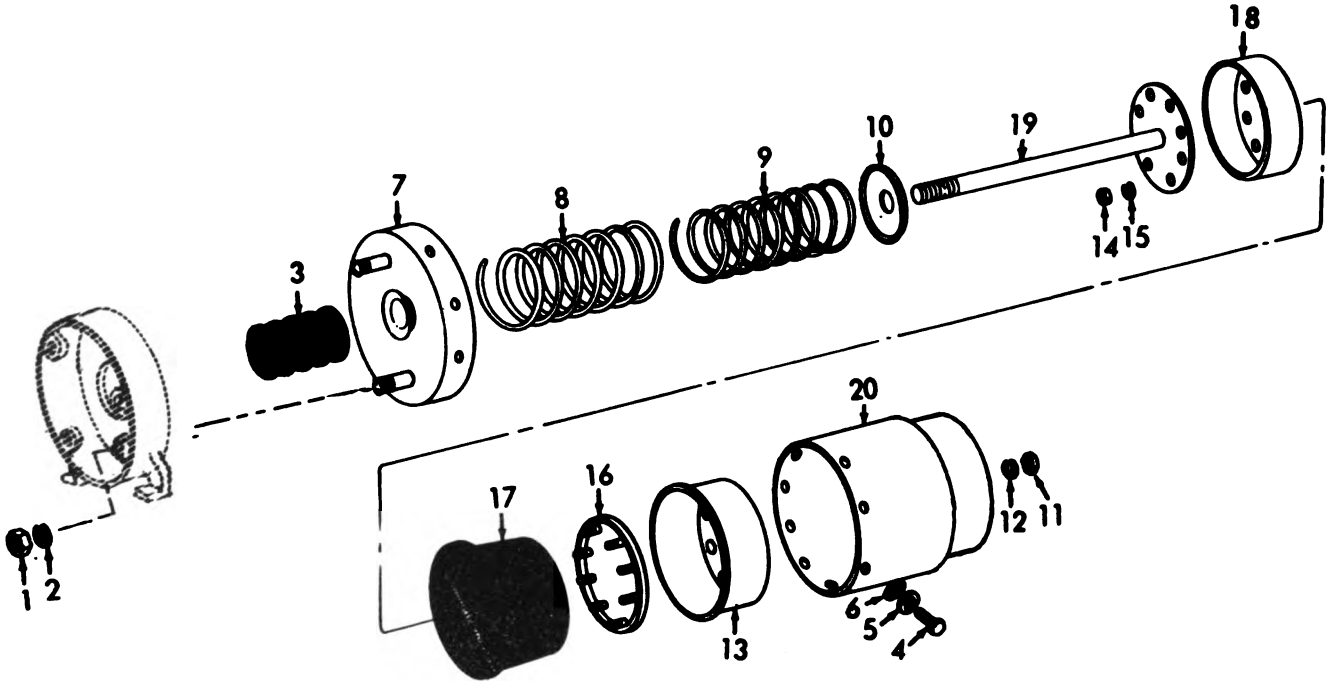
3. Inspect weekly for dirt or stones between expander tube and brake assembly. If excess dirt is found that would impair operation of brakes, refer to direct support maintenance.



1 Capscrew
2 Lockwasher
3 Retaining ring
4 Retaining ring
5 Piston
6 Washer
7 Retaining ring
8 Flat washer
9 Spring
10 Ball
11 Preformed packing
12 Preformed packing
13 Cap
14 Preformed packing
15 Piston assembly
16 Spring
17 Preformed packing
18 Cylinder
19 Nut
20 Flat washer
21 Mounting bracket
22 Bearing

ME 2420-206-12/4-39 (2)

Figure 4-39. Brake actuator and hydraulic tank, removal, disassembly, reassembly and installation (sheet 2 of 3).



ME 2420-206-12/4-39 (3)

1 Nut
2 Lockwasher
3 Boot
4 Capscrew
5 Lockwasher
6 Flat washer
7 Cover
8 Spring
9 Spring
10 Spring guide
11 Nut
12 Lockwasher
13 Outer clamp
14 Nut
15 Lockwasher
16 Inner clamp
17 Diaphragm
18 Diaphragm guide
19 Push rod
20 Body

Figure 4-39. Brake actuator and hydraulic tank, removal, disassembly, reassembly and installation (sheet 3 of 3).

4-51. Brake Relay Air Valve

a. Removal. Remove brake relay air valve as illustrated in figure 4-40.

b. Cleaning and Inspection.

(1) Clean with a cloth and dry thoroughly.

(2) Inspect parts for cracks, breaks and other damage. Replace defective parts as necessary.

c. Installation. Install brake relay air valve as illustrated in figure 4-40.

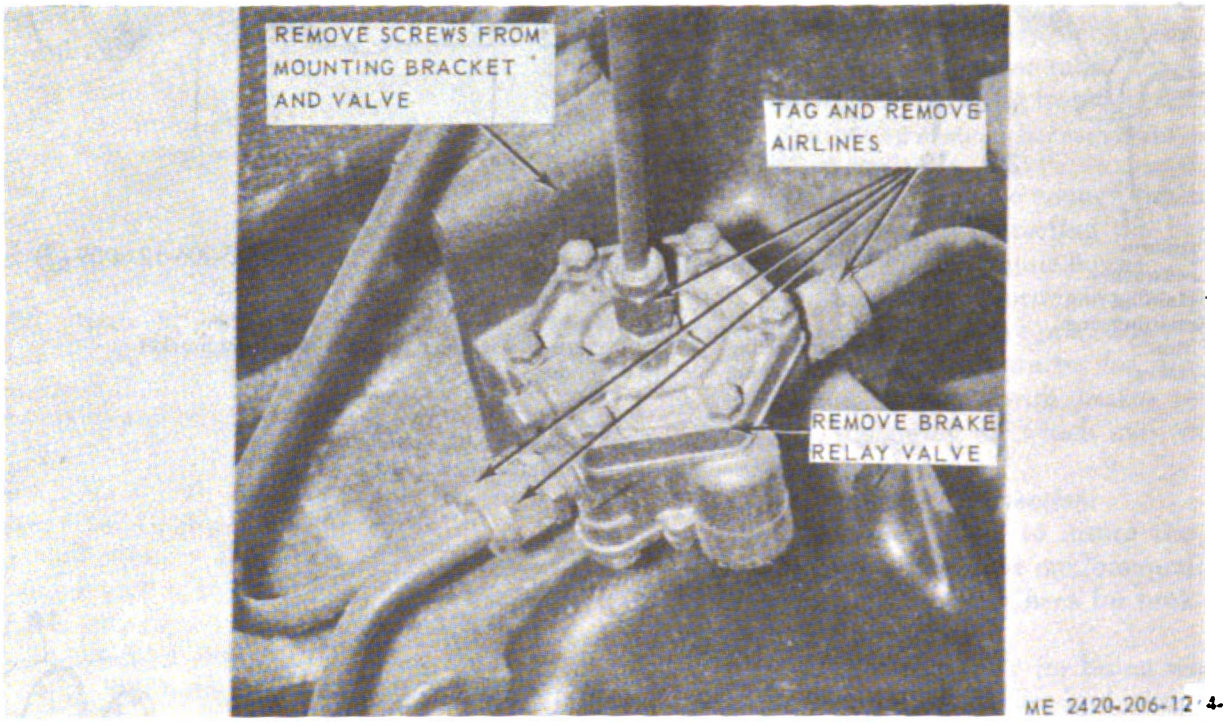


Figure 4-40. Brake relay air valve, removal and installation.

4-52. Check and Protection Valves and Stoplight Switch

a. Removal. Remove check and protection valves and stoplight switch as illustrated in figure 4-41.

b. Cleaning and Inspection.

(1) Clean all parts and dry thoroughly.

(2) Inspect parts for cracks, breaks and other damage. Replace defective parts as necessary.

c. Installation. Install parts as illustrated in figure 4-41.

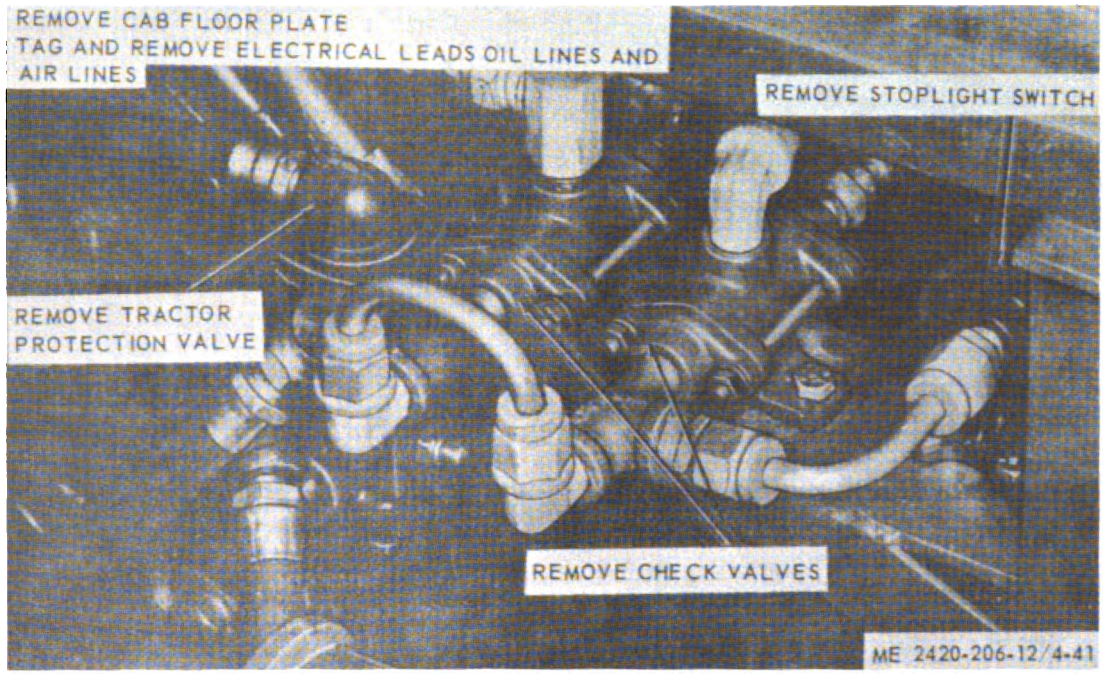


Figure 4-41. Check and protection valves and stoplight switch, removal and installation.

4-53. Air Reservoirs

a. Removal. Remove air reservoirs as illustrated in figure 4-42.

b. Cleaning and Inspection.

(1) Clean all parts and dry thoroughly. Flush interior with P-D-680 solvent.

(2) Inspect for cracks, breaks and damage. Replace defective parts as necessary.

c. Installation. Install air reservoirs as illustrated in figure 4-42. Check for air leaks.

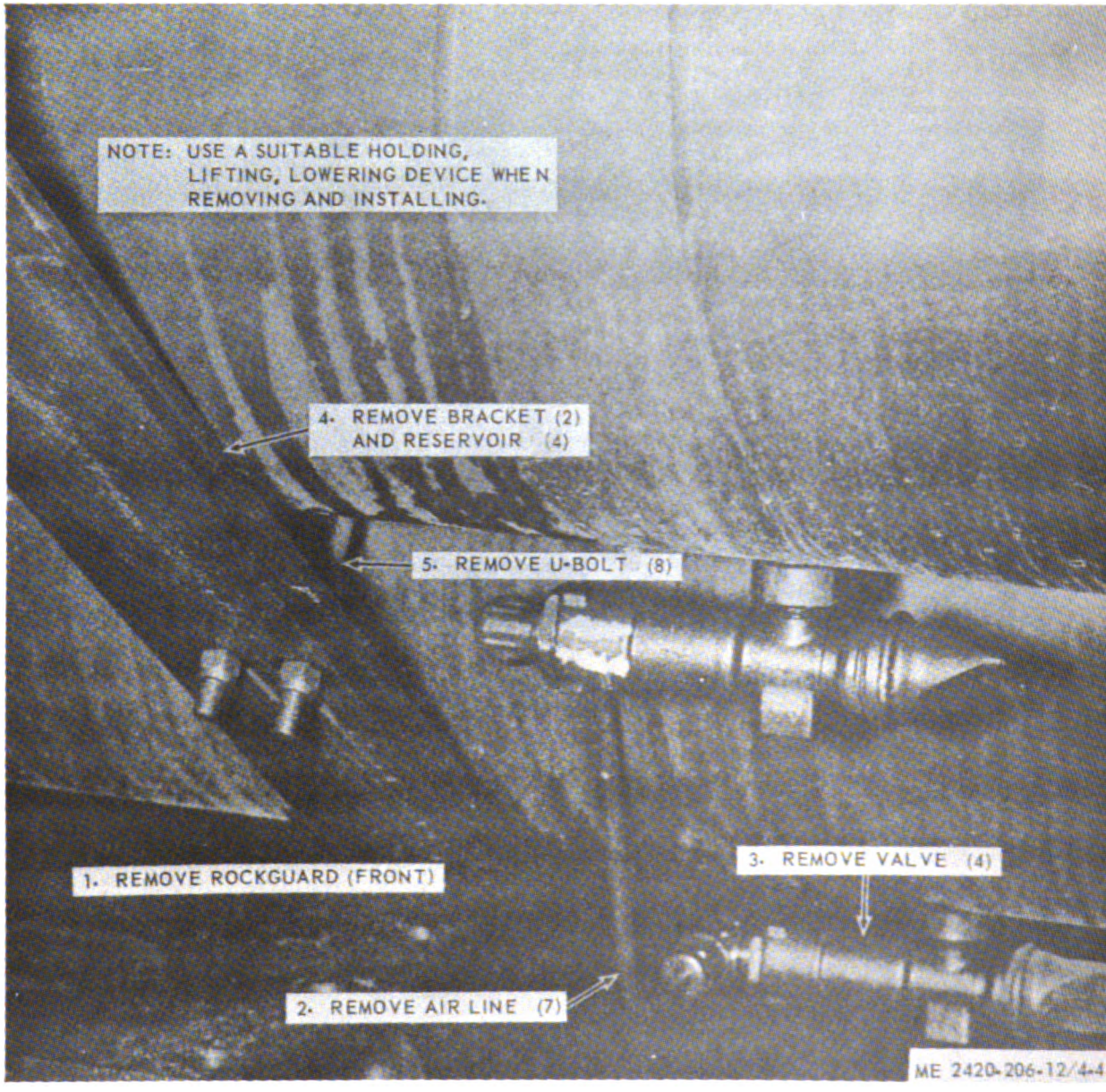


Figure 4-42. Air reservoirs, removal and installation.

4-54. Air Horns

a. Removal. Remove air horns as illustrated in figure 4-43.

b. Cleaning and Inspection.

(1) Wipe parts with a cloth and dry thoroughly.

(2) Inspect for cracks, breaks and damage. Replace defective parts as necessary.

c. Installation. Install air horns as illustrated in figure 4-43.

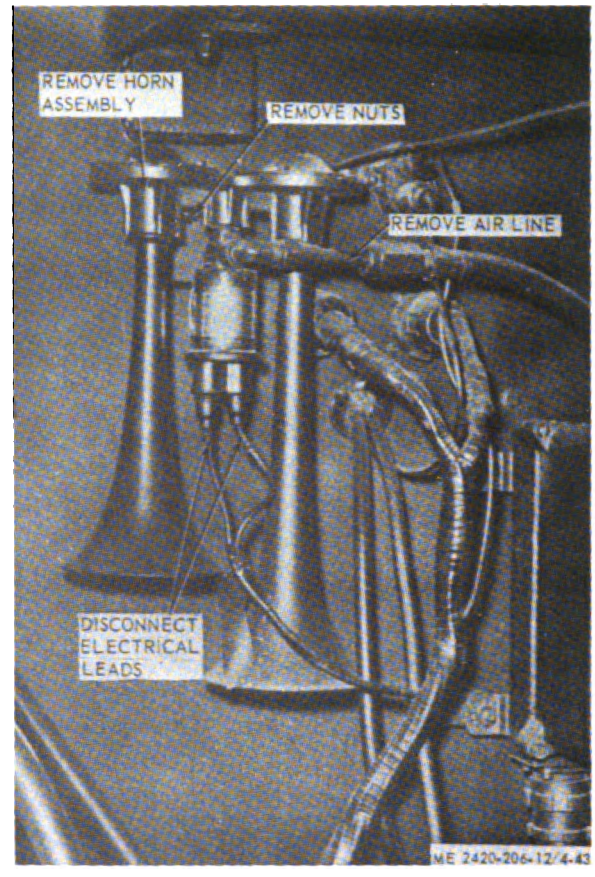


Figure 4-43. Air horns, removal and installation.

4-55. Windshield Wiper Motor

a. Removal. Remove windshield wiper motor as illustrated in figure 4-44.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective windshield wiper motors as necessary.

c. Installation. Install windshield wiper motors as illustrated in figure 4-44.

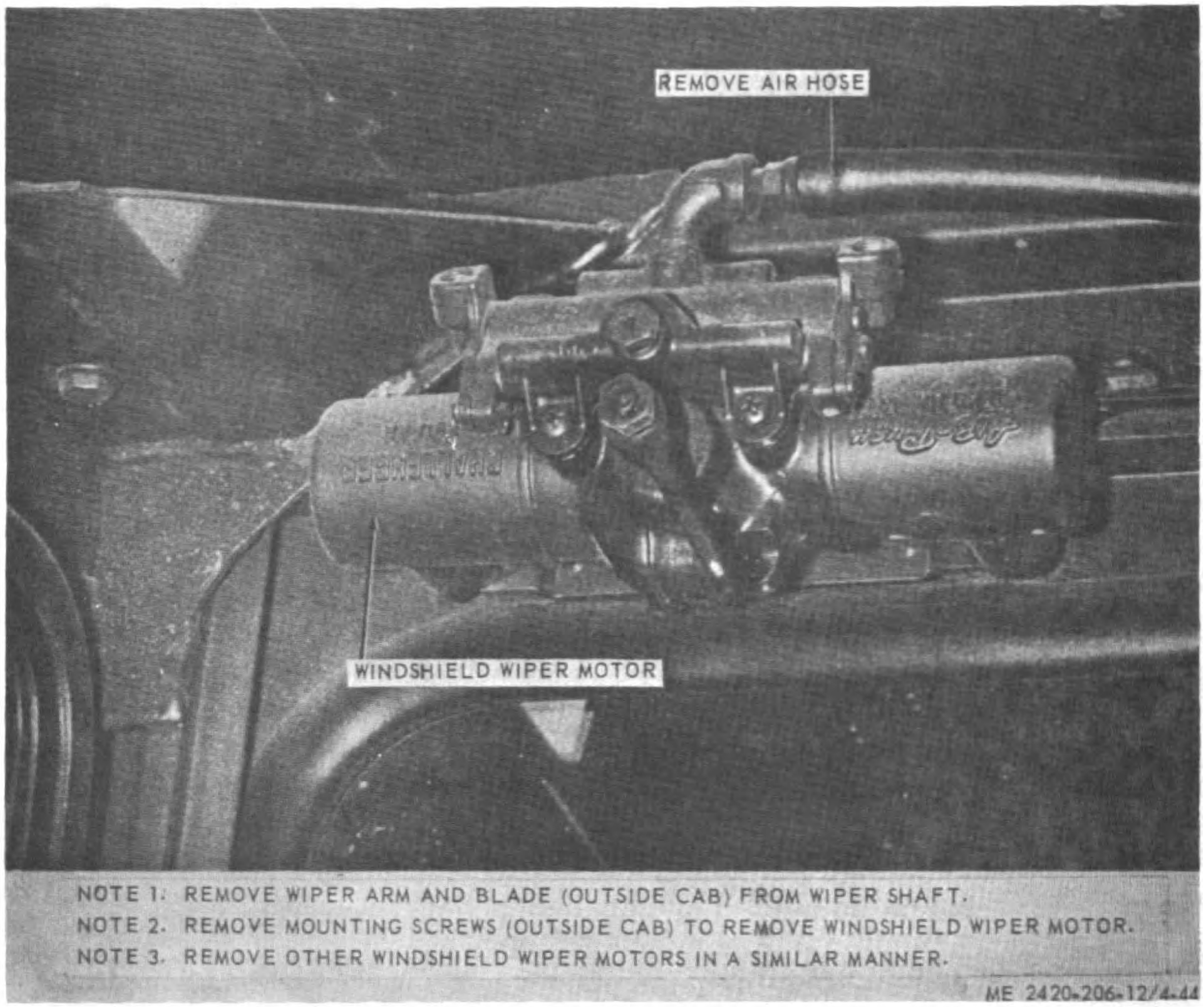


Figure 4-44. Windshield wiper motor, removal and installation.

4-56. General

Tractor components contained in this section consist of items not listed in any other section.

4-57. Propeller Shaft

a. Removal. Remove propeller shafts as illustrated in figure 4-45. Compress shaft and remove from tractor, tap bearings with a soft hammer if necessary, to release them. Take care not to loose rollers from bearings.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective propeller shafts as necessary.

(3) Lubricate Midmount bearing, mounted on the inside front of rear frame unit, driven by a propeller shaft from the transmission and drives a propeller shaft to the rear axle. Refer to LO.

c. Installation. Install propeller shafts as illustrated in figure 4-45. Replace seals, lubricate inside of bearing to retain the rollers.

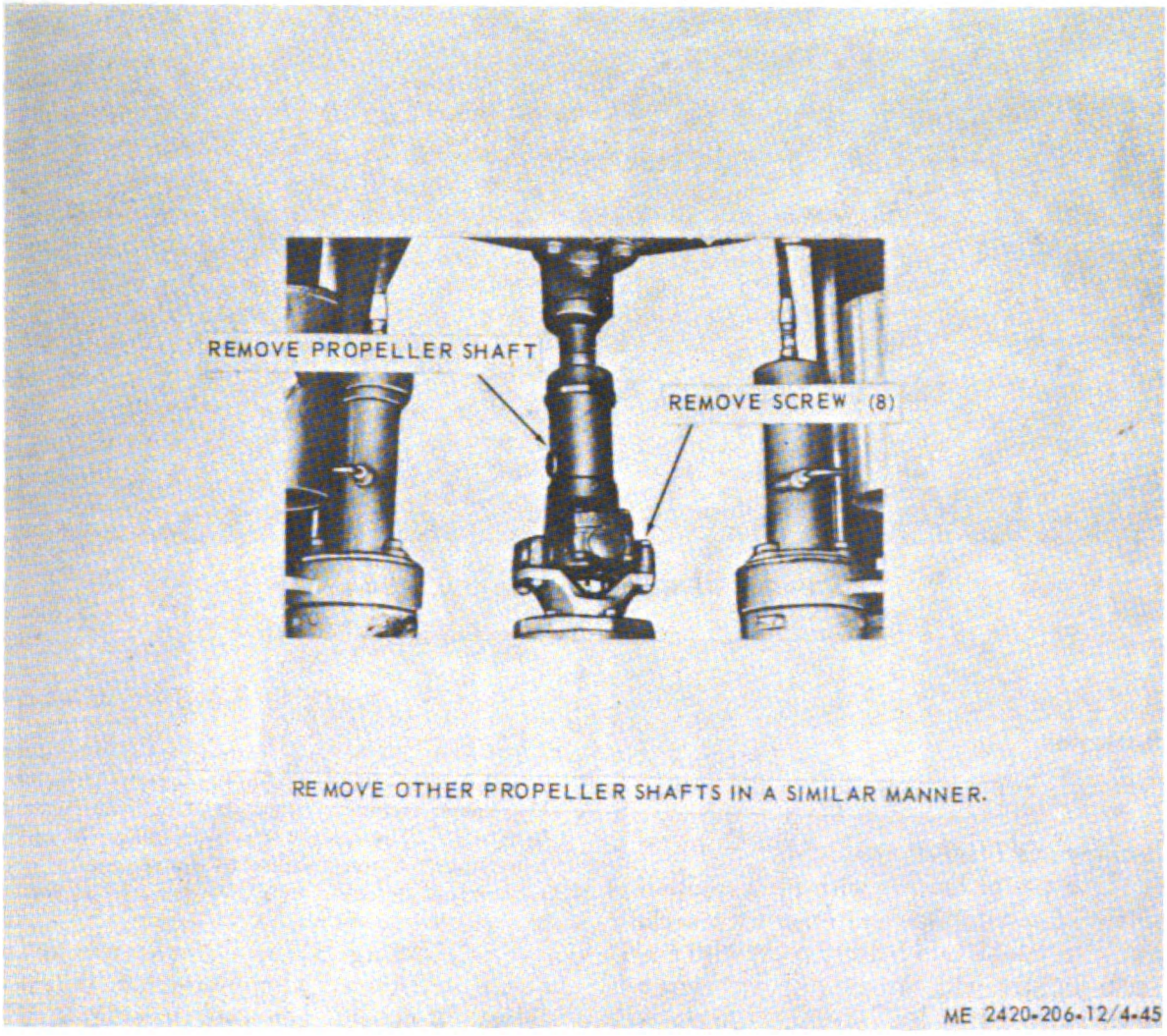


Figure 4-45. Propeller shaft, removal and installation.

4-58. Rock Guards

a. Removal. Remove rock guards as illustrated in figure 4-46.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace unrepairable defective rock guards as necessary.

c. Installation. Install rock guards as illustrated in figure 4-46.

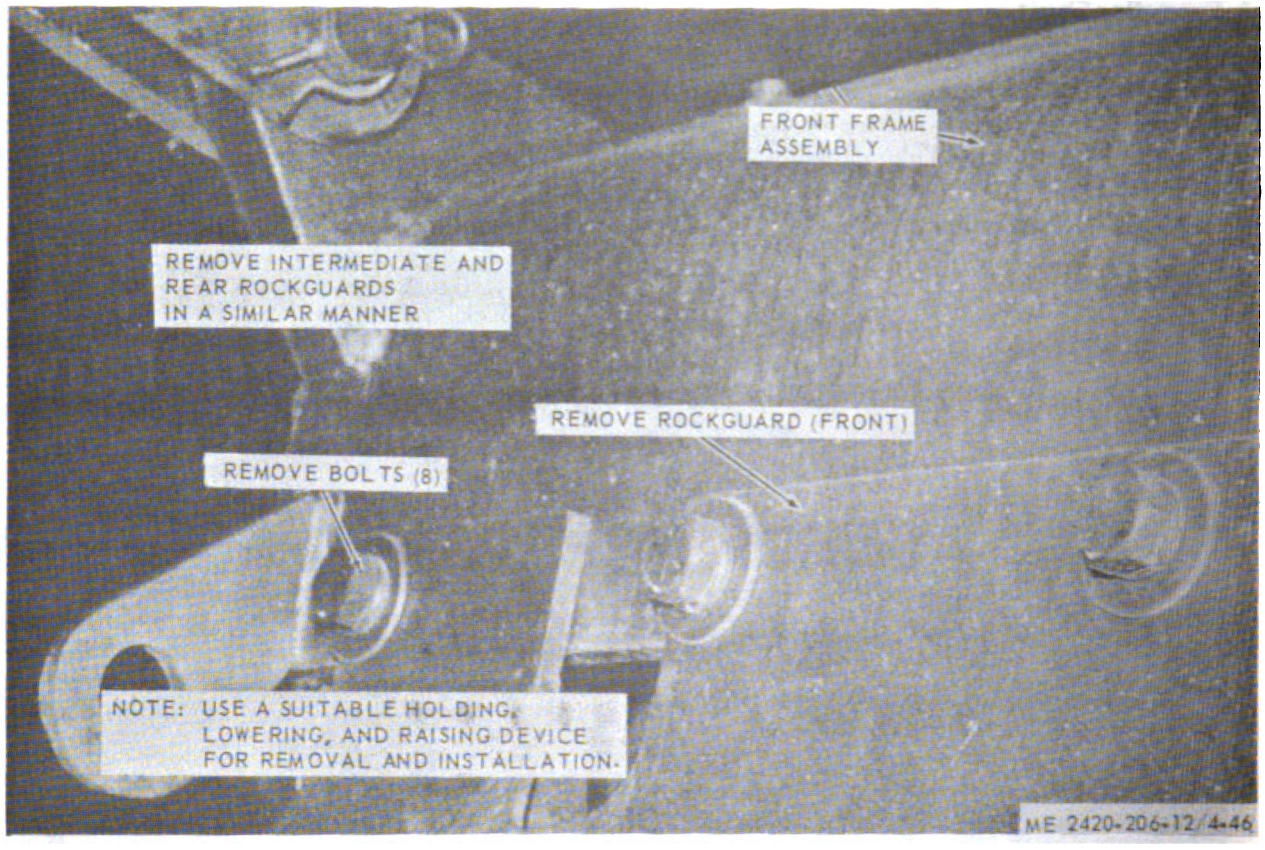


Figure 4-46. Rock guards, removal and installation.

4-59. Batteries

a. Removal. Remove batteries as illustrated in figure 4-47.

b. Cleaning and Inspection.

(1) Flush top of battery with mild solution of bicarbonate of soda. Wipe batteries with a cloth. Clean cable terminals and battery posts with emery cloth; coat lightly with grease. Inspect level of electrolyte, Table 3-1.

(2) Inspect for cracks, breaks and other damage.

(3) Test for specific gravity reading.

Note. Do not take battery test reading directly after adding water. Allow engine to run for an hour before taking a hydrometer reading. With a standard hydrometer, test each battery cell. The specific gravity reading will vary with the temperature. Correct reading to compensate for temperature variation as prescribed in TM 9-6140-200-15. Replace defective batteries as necessary.

***Warning:* Do not smoke or use an open flame in vicinity when servicing or testing batteries. Batteries generate hydrogen, a highly explosive gas.**

c. Installation. Install batteries as illustrated in figure 4-47.

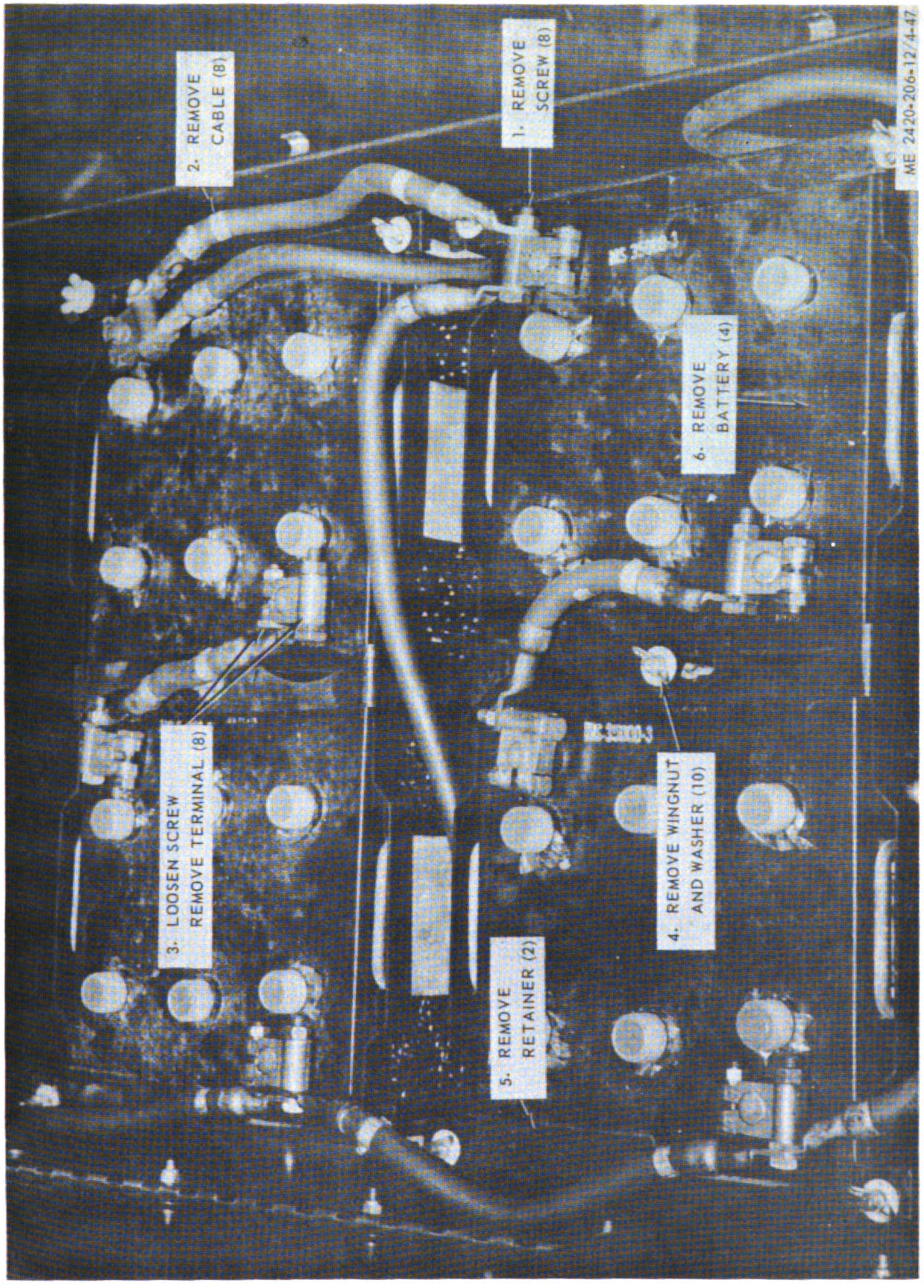


Figure 4-47. Batteries, removal and installation.

4-60. Battery Box and Fender

a. Removal and Disassembly.

(1) Remove batteries (para 4-59).

(2) Remove and disassemble battery box and fender as illustrated in figure 4-48.

b. Cleaning and Inspection.

(1) Clean battery box with a solution of water and baking soda to neutralize any acid that may have spilled on the parts. Clean parts and dry thoroughly.

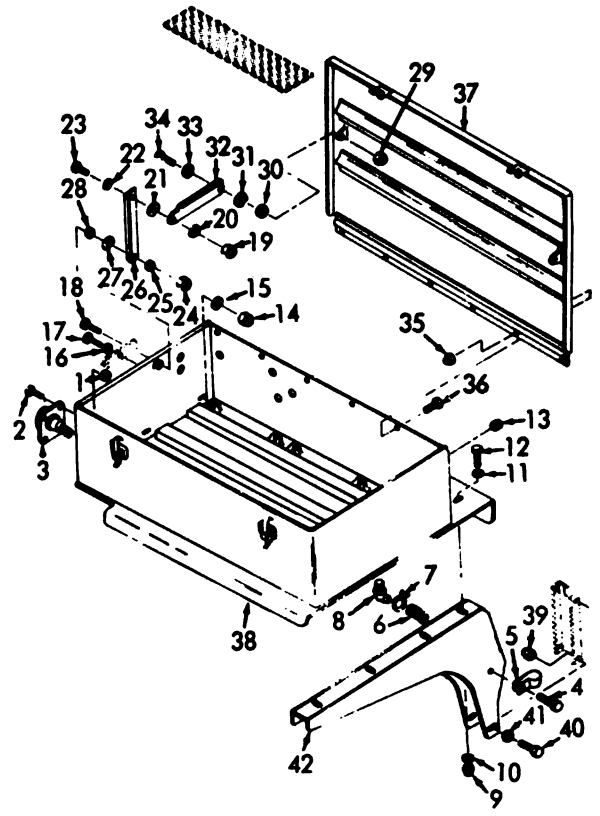
(2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

c. Reassembly and Installation.

(1) Reassemble and install battery box and fender as illustrated in figure 4-48.

(2) Install batteries (para 4-59).

Note. Tool box and fender mounted on the left side of tractor is removed and installed in a similar manner as the battery box and fender.



ME 2420-206-12 4-48

1	Nut	22	Washer
2	Screw	23	Screw
3	Receptacle	24	Nut
4	Screw	25	Washer
5	Clip	26	Arm
6	Hose	27	Washer
7	Clamp	28	Washer
8	Fitting	29	Nut
9	Nut	30	Washer
10	Washer	31	Washer
11	Washer	32	Arm
12	Screw	33	Washer
13	Grommet	34	Screw
14	Nut	35	Nut
15	Washer	36	Screw
16	Washer	37	Cover
17	Screw	38	Box and fender assembly
18	Screw	39	Nut
19	Nut	40	Screw
20	Washer	41	Washer
21	Washer	42	Bracket

Figure 4-48. Battery box and fender, exploded view.

4-61. Rear Fenders

a. Removal. Remove rear fenders from tractor as illustrated in figure 4-49.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and damage. Replace unrepairable defective rear fenders as necessary.

c. Installation. Install rear fenders as illustrated in figure 4-49.

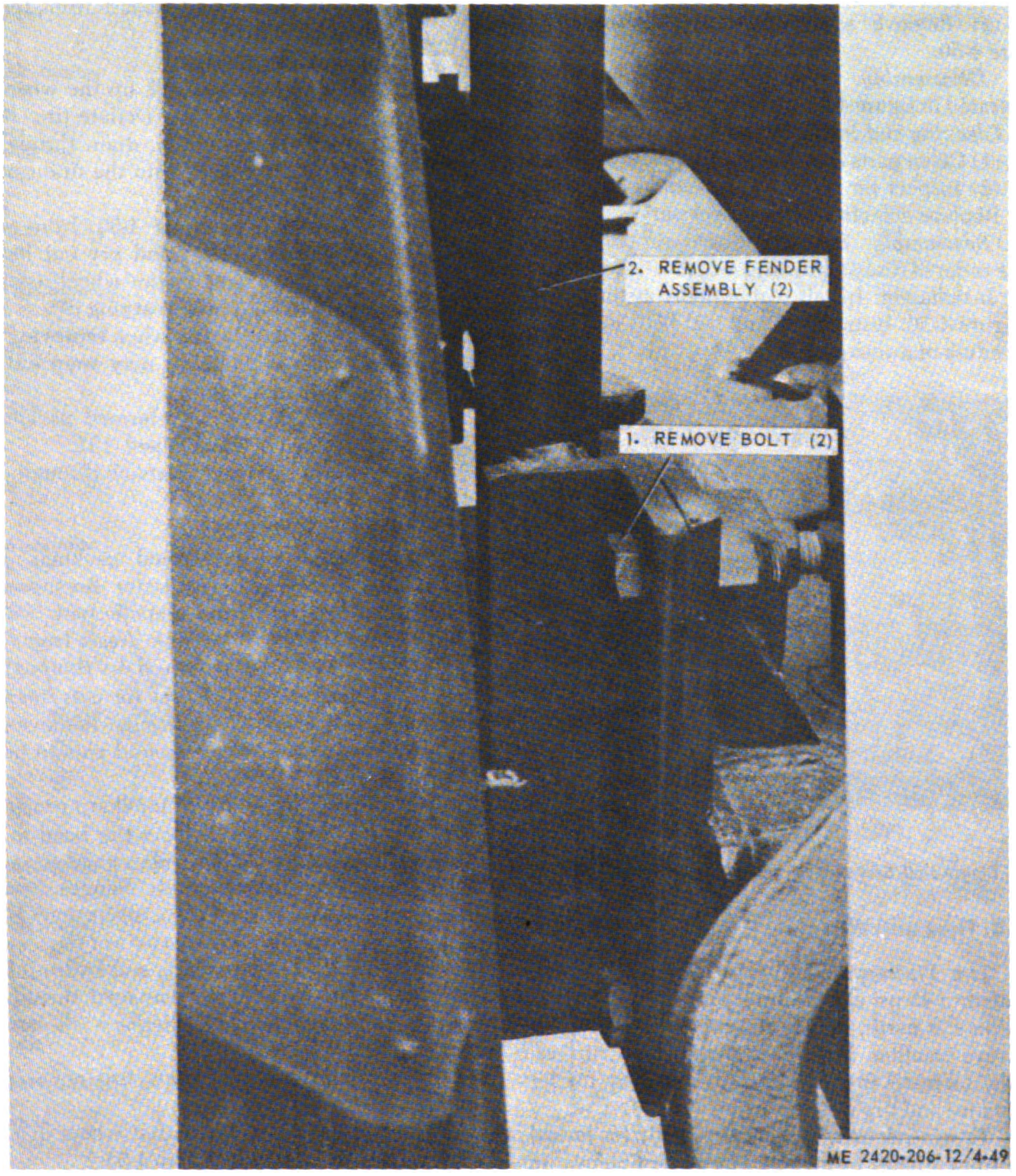


Figure 4-49. Rear fenders, removal and installation.

4-62. Seats, Belts, and Seat Support

a. Removal.

(1) Remove capscrew and flat washer securing operator's seat belt and backrest to shell. Remove capscrew securing seat cushion to shell. Remove capscrew and nut securing shell to seat support. Remove passengers seat in a similar manner.

(2) Remove seat support as illustrated in figure 4-50.

b. Disassembly. Disassemble seat support as illustrated in figure 4-51.

c. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective parts as necessary.

d. Reassembly. Reassemble seat support in reverse order of disassembly (fig 4-51).

e. Installation. Install seat support as illustrated in figure 4-50. Install seats and seat belts in reverse procedure of *a* above.

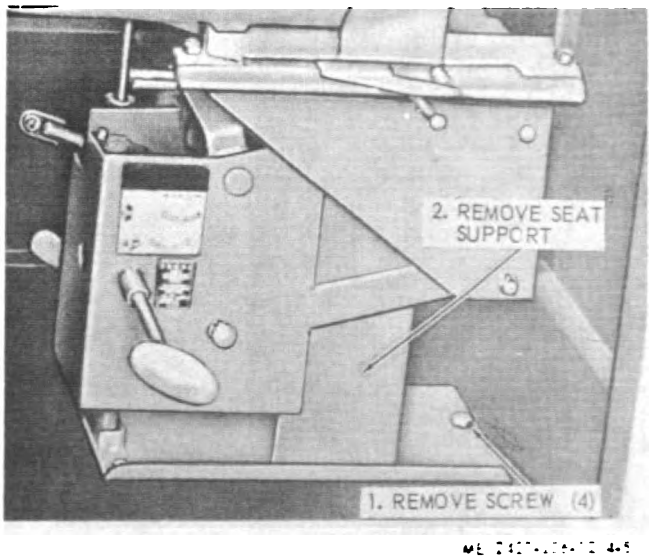


Figure 4-50. Seat support, removal and installation.

4-63. Tires and Wheels

a. Tire Pressure. For normal services, tires are inflated to 45 psi at both front and rear. For operation on soft earth, reduce tire pressure to 35 psi to improve traction. For operation on hard surfaced roads, increase tire pressure to 50-55 psi for less resistance and tire wear.

b. Tire Inspection. Inspect tires daily for imbedded stones, nails, or metallic particles. Remove imbedded materials to prevent further penetration. Replace missing valve caps.

c. Ballast Inflation. Each tire is provided with a hydro-inflation connector so that the tires can be filled with a calcium chloride solution to add ballast to the vehicle. The fill hole (fig 4-52) is large enough so that the plug can be removed and a hose inserted to remove all ballast from the tire without removing the tire.

d. Tire and Wheel Removal.

(1) Set parking brake. Jack up the wheel and block securely under the axle. Deflate tire. If tires are filled with ballast solution, drain through the hydro-inflator. Insert a hose into the drain port to drain all ballast from tire.

(2) Remove driver (6, fig 4-53) from wheel. Locate joint of lockring (7) and pry out lockring that locks bead seat ring to the wheel assembly. Remove flange (10) and bead seat ring (9).

***Warning:* Stand aside when removing lockring from tire. The lockring may snap out with enough force to cause injury.**

(3) Remove tire (11), preformed packing (8), and second flange (12) from wheel (13).

(4) Remove air valve parts (1 through 5 and 14).

e. Cleaning and Inspection.

(1) Discard all preformed packings. Clean tire, wheel, and flanges with water. Remove greasy and gummy deposits from metallic parts with solvent and dry thoroughly. Scrape grease from tire.

(2) Clean all other parts and dry thoroughly.

(3) Inspect outside of tires for cuts, tears, imbedded stones, or metallic particles. Remove stones or metallic particles. Skive around cuts to prevent further tearing.

(4) Inspect inside of tire for sharp projections, cuts, or ruptured cords. Inspect tire bead to make sure it is smooth and will provide a good air seal.

(5) Inspect wheel assembly, flanges, bead seat rings, and lockrings for cracks, distortion, gouges, or burrs. Remove burrs with a stone or file.

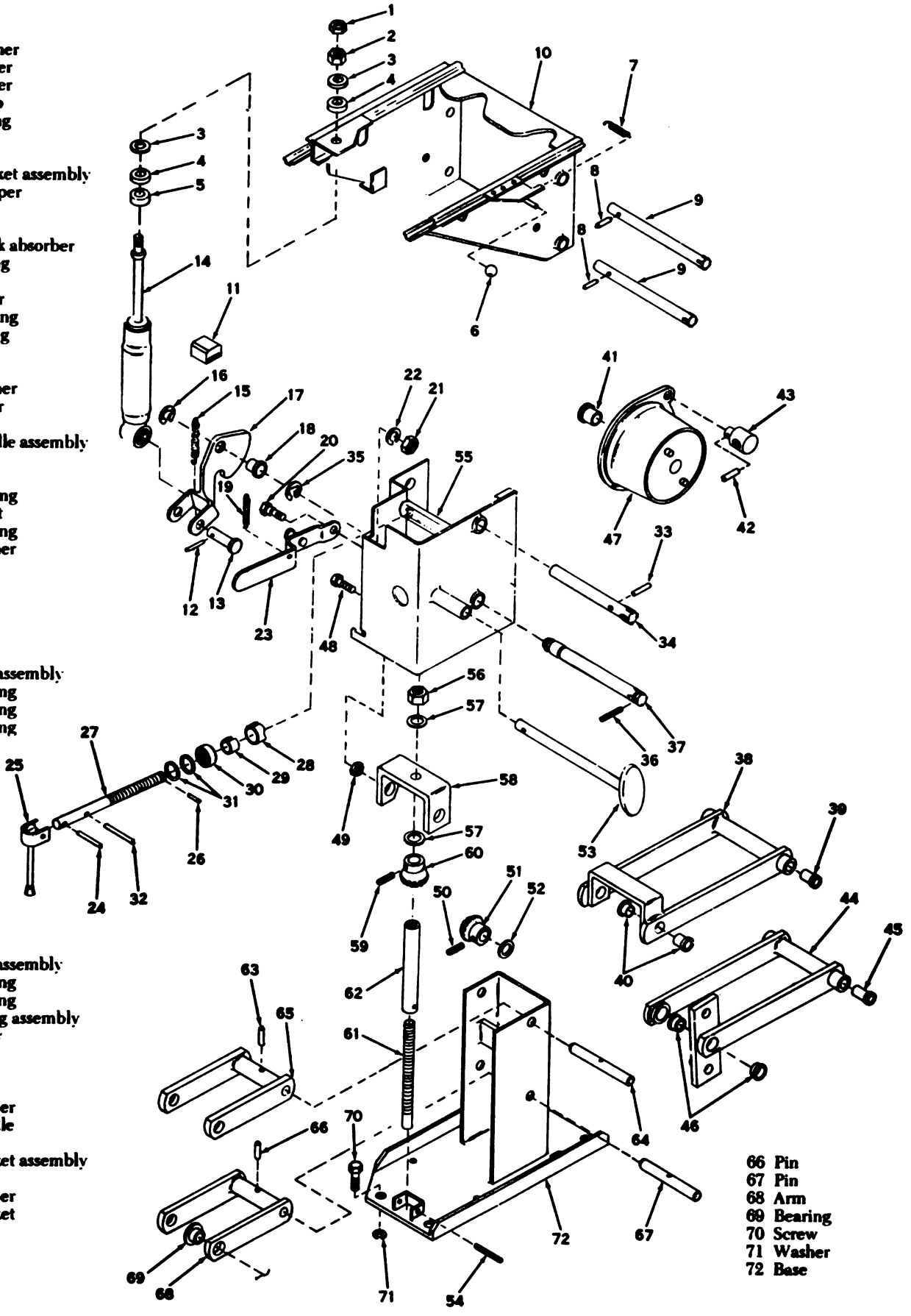
(6) Inspect air valve parts and hydro-inflation connector parts for cracks, damaged threads, distortion, or other damage. Replace all damaged parts.

f. Tire Repair. For tubeless tire repair procedures, refer to TM 9-1870-1.

g. Installation. Install tire and wheel in reverse order of removal given in figure 4-53.

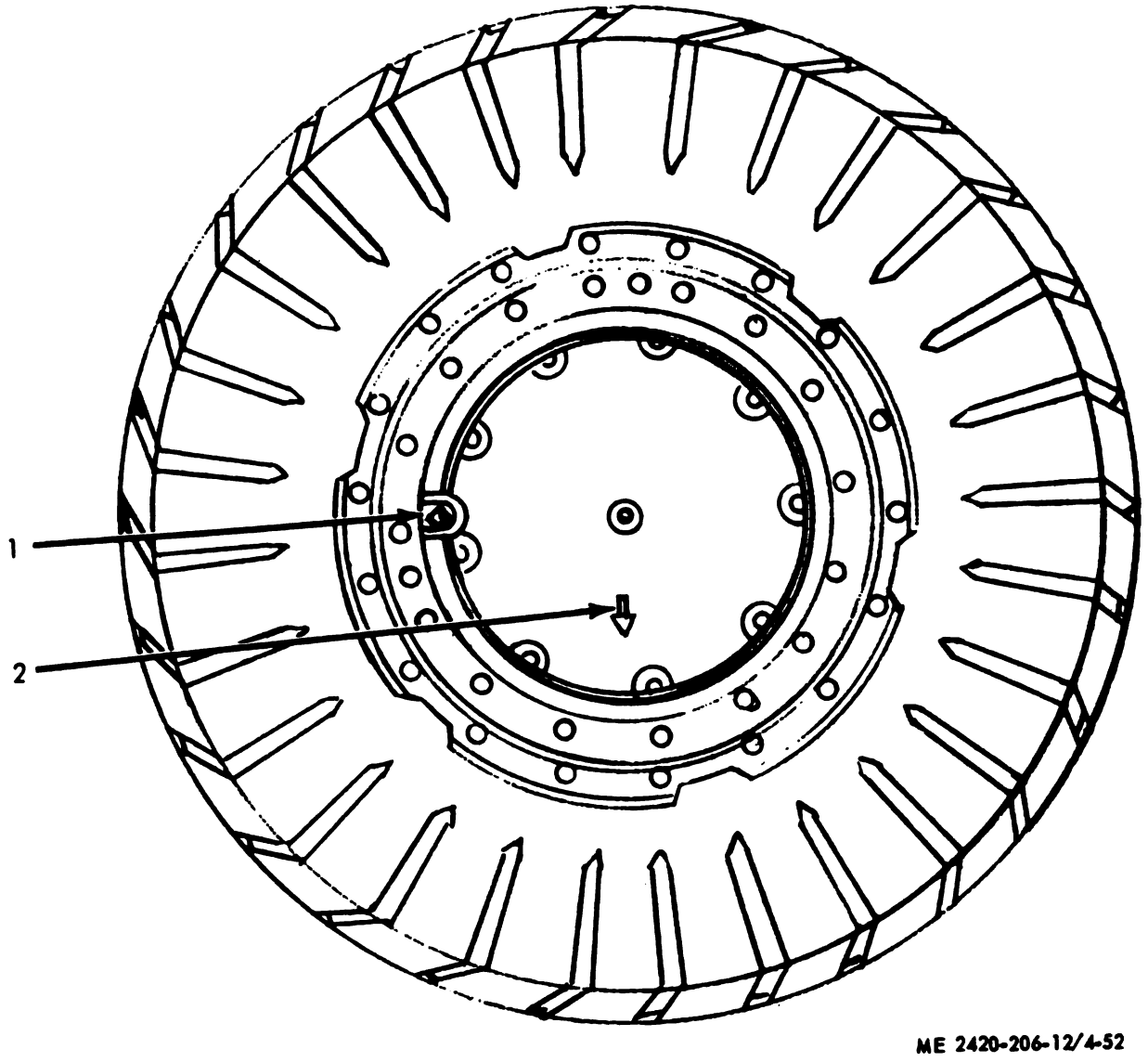
Note. Torque nuts to 650 ft.-lb. Check wheel nuts weekly.

1 Nut
2 Nut
3 Washer
4 Spacer
5 Spacer
6 Knob
7 Spring
8 Pin
9 Pin
10 Bracket assembly
11 Bumper
12 Pin
13 Pin
14 Shock absorber
15 Spring
16 Ring
17 Lever
18 Bearing
19 Spring
20 Bolt
21 Nut
22 Washer
23 Lever
24 Pin
25 Handle assembly
26 Pin
27 Stud
28 Bearing
29 Insert
30 Bearing
31 Washer
32 Pin
33 Pin
34 Pin
35 Ring
36 Pin
37 Pin
38 Arm assembly
39 Bearing
40 Bearing
41 Bearing
42 Pin
43 Pin
44 Arm assembly
45 Bearing
46 Bearing
47 Spring assembly
48 Screw
49 Nut
50 Pin
51 Gear
52 Washer
53 Handle
54 Pin
55 Bracket assembly
56 Nut
57 Washer
58 Bracket
59 Pin
60 Gear
61 Stud
62 Tube
63 Pin
64 Pin
65 Arm
66 Pin
67 Pin
68 Arm
69 Bearing
70 Screw
71 Washer
72 Base



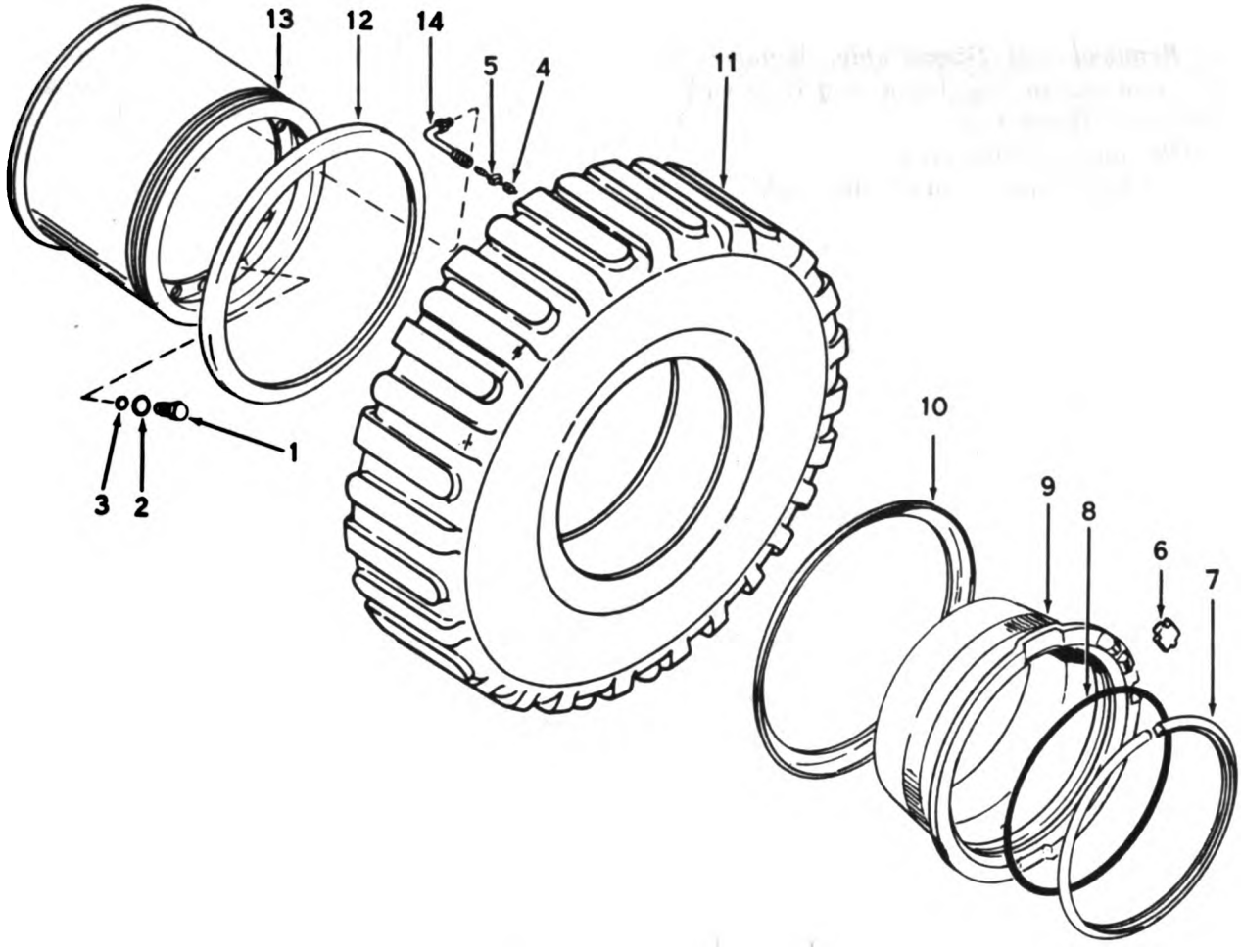
ME 2420-206-12/4-51

Figure 4-51. Seat support, exploded view.



1 Final drive fill and drain plug
2 Fill arrow

Figure 4-52. Wheel hub showing fill and drain plug.



ME 2420-206-12/4-53

1 Connector plug
2 Preformed packing
3 Preformed packing
4 Valve cap
5 Core
6 Driver
7 Lockring
8 Preformed packing
9 Bead seat ring
10 Flange
11 Tire
12 Flange
13 Wheel
14 Valve stem

Figure 4-53. Tire and wheel, removal and installation.

4-64. Pintle Hook

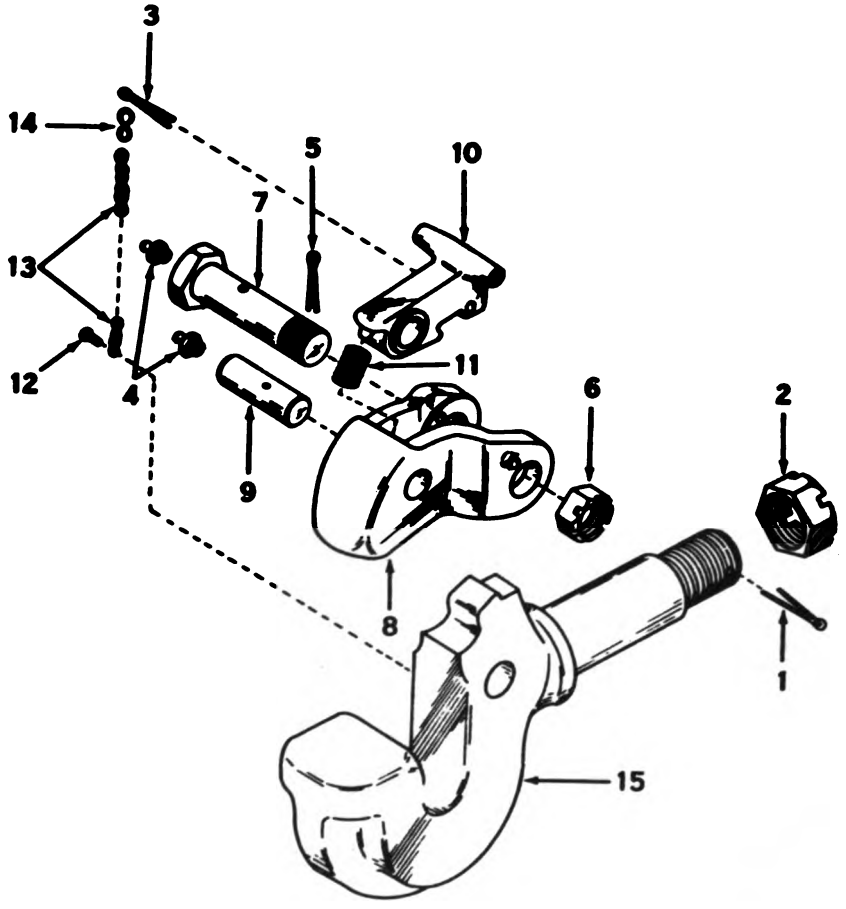
a. Removal and Disassembly. Remove pintle hook from tractor rear frame and disassemble as illustrated in figure 4-54.

b. Cleaning and Inspection.

(1) Clean all parts and dry thoroughly.

(2) Inspect for cracks, breaks and other damage. Replace defective parts.

c. Reassembly and Installation. Reassemble and install pintle hook on rear tractor frame as illustrated in figure 4-54.



ME 2420-206-12/4-54

1 Cotter pin
2 Nut
3 Cotter pin
4 Lubrication fitting
5 Cotter pin
6 Nut
7 Latch bolt
8 Lock
9 Latch pin
10 Latch
11 Spring
12 Drive screw
13 Chain
14 S-hook
15 Pintle

Figure 4-54. Pintle hook, removal, disassembly, reassembly, and installation.

4-65. Lunette

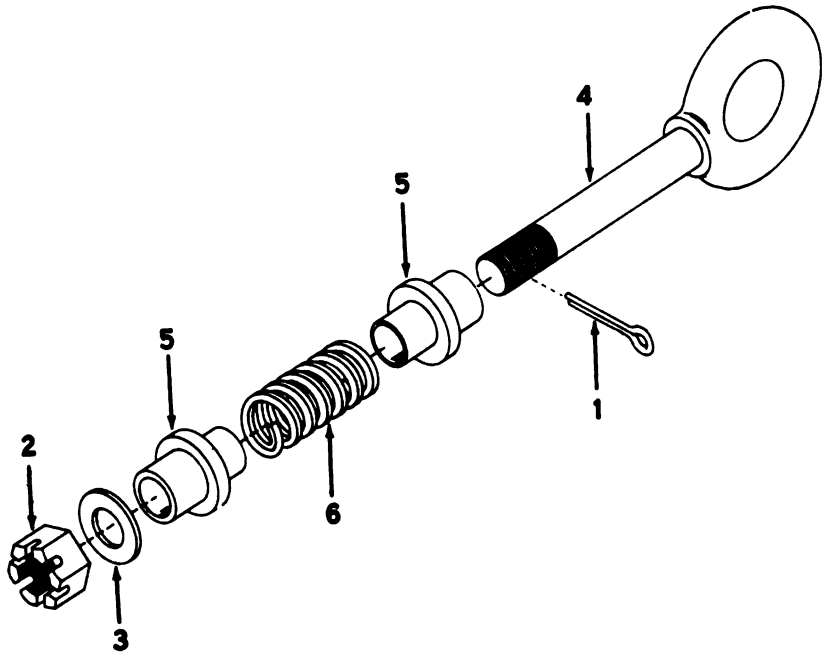
a. Removal and Disassembly. Remove lunette from center rock guard and disassemble as illustrated in figure 4-55.

b. Cleaning and Inspection.

(1) Clean parts and dry thoroughly.

(2) Inspect for damage. Replace damaged parts.

c. Reassembly and Installation. Reassemble and install lunette on center rock guard as illustrated in figure 4-55.



ME 2420-206-12/4-55

1 Cotter pin
2 Nut
3 Washer
4 Lunette
5 Sleeve
6 Spring

Figure 4-55. Lunette, removal, disassembly, reassembly, and installation.

APPENDIX A
REFERENCES

A-1. Fire Protection

TB 5-4200-200-10	Hand Portable Fire Extinguishers for Army Users

A-2. Lubrication

C9100IL	Fuels, Lubricants, Oils and Waxes
LO 5-2420-206-12	Lubrication Order

A-3. Painting

TM 9-213	Painting Instructions for Field Use

A-4. Maintenance

TM 9-1870-1	Care and Maintenance of Pneumatic Tires
TB-ORD-651	Use of Antifreeze Solutions and Cleaning Compounds in Engine Cooling Systems
TM 38-750	Army Equipment Record Procedures
TM 5-2420-206-20P	Operator and Organizational Repair Parts
TM 9-6140-200-15	Storage Batteries, Lead Acid Type

A-5. Shipment and Storage

TM 38-230	Preservation, Packaging, and Packing of Military Supplies and Equipment
TB 740-93-2	Preservation of USAMEC Mechanical Equipment for Shipment and Storage
TM 740-90-1	Administrative Storage of Equipment
TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use

APPENDIX B
BASIC ISSUE ITEMS LIST

Section 1. INTRODUCTION

B-1. Scope

This appendis lists items which accompany the tractor or are required for installation, operation, or operator's maintenance.

B-2. General

This Basic Issue Items List is divided into the following sections:

a. Basic Issue Items — Section II. A list of items which accompany the tractor or are required for the installation, operation, or operator's maintenance.

b. Maintenance and Operating Supplies — Section III. A listing of maintenance and operating supplies required for initial operation.

B-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items, Section II.

a. Source, Maintenance, and Recoverability Codes (SMR), Column (1):

(1) Source code indicates the selection status and source for the listed item. Source codes are:

Code	Explanation
P	Applied to repair parts which are stocked in or supplied from GSA/DSA or Army supply system, and authorized for use at indicated maintenance categories.
M	Applied to repair parts which are not procured or stocked but are to be manufactured at indicated maintenance categories.
A	Applied to assemblies which are not procured or stocked as such, but made up of two or more units, each of which carry individual stock numbers and descriptions and are procured and stocked and can be assembled by units at indicated maintenance categories.
X	Applied to parts and assemblies which are not procured or stocked, the mortality of which is normally below that of the applicable end item, and the failure of which should result in retirement of the end item from the supply system.
X1	Applied to repair parts which are not procured or stocked, the requirement for which will be supplied by use of the next higher assembly or components.
X2	Applied to repair parts which are not stocked. The indicated maintenance category requiring such repair parts will attempt to obtain them through cannibalization; if not obtainable through cannibalization, such repair parts will be requisitioned with supporting justification through normal supply channels.
G	Applied to major assemblies that are procured with PEMA (Procurement Equipment Missile Army) funds for initial issue only to be used as exchange assemblies at DSU and GSU level or returned to depot supply level.

Note. Source code and level of maintenance are not shown on common hardware items known to be readily available in Army supply channels and through local procurement.

(2) Maintenance code indicates the lowest category of maintenance authorized to install the listed item. The maintenance level code is

Code	Explanation
C	Operator/crew

(3) Recoverability code indicates whether unserviceable items should be returned for recovery or salvage. Items not coded are expendable. Recoverability codes are:

Code	Explanation
R	Applied to repair parts (assemblies and components) which are considered economically repairable at direct and general support maintenance levels. When the maintenance capability to repair these items does not exist, they are normally disposed of at the GS level. When supply considerations dictate, some of these repair parts may be listed for automatic return to supply for depot level repair as set forth in AR 710-50. When so listed, they will be replaced by supply on an exchange basis.
T	Applied to high dollar value recoverable repair parts which are subject to special handling and are issued on an exchange basis. Such repair parts are normally repaired or overhauled at depot maintenance activities.
U	Applied to repair parts specifically selected for salvage by reclamation units because of precious metal content, critical materials, high dollar value reusable casings and castings.

b. Federal Stock Number, Column (2). This column indicates the Federal stock number for the item.

c. Description, Column (3). This column indicates the Federal item name and any additional description of the item required. A part number or other reference number is followed by the applicable five-digit Federal supply code for manufacturers in parentheses. Repair parts quantities included in kits, sets, and assemblies are shown in front of the repair part name.

d. Unit of measure, Column (4). This column indicates the unit used as a basis for issue, e.g., ea, pr, ft, yd, etc.

e. Quantity Incorporated in Unit, Column (5). This column indicates the actual quantity contained in the unit.

f. Quantity Furnished With Equipment, Column (6). This column indicates the quantity of an item furnished with the equipment.

g. Illustration, Column (7). This column is divided as follows:

(1) *Figure number, column (7)(a).* Indicates the figure number of the illustration in which the item is shown.

(2) *Item number, column (7)(b).* Indicates the callout number used to reference the item in the illustration.

B-4. Explanation of Columns in the Tabular List of Maintenance and Operating Supplies — Section III

a. Component Application, Column (1). This column identifies the component application of each maintenance or operating supply item.

b. Federal Stock Number, Column (2). This column indicates the Federal stock number for the item and will be used for requisitioning purposes.

c. Description, Column (3). This column indicates the item and brief description.

d. Quantity Required for Initial Operation, Column (4). This column indicates the quantity of each maintenance or operating supply item required for initial operation of the equipment.

e. Quantity Required for 8 Hours Operation, Column (5). This column indicates the estimated quantities required for an average eight hours of operation.

f. Notes, Column (6). This column indicates informative notes keyed to data appearing in a preceding column.

Section II. BASIC ISSUE ITEMS

(1) SMR Code	(2) Federal Stock Number	(3) Description Ref No. & Mfr Code Usable on code	(4) Unit of Meas	(5) Qty Inc in Unit	(6) Qty Furn with Equip	(7) Illustrations (A) Fig No.	(7) Illustrations (B) Item No.
PC	7510-889-3494	Binder, Loose Leaf: U.S. Army Equipment Log Book	EA		1		
PC	7520-559-9618	Case: Maintenance and Operational Manuals, Cotton Duck, Water Repellant, Mildew Resistant	EA		1		
PC	4210-889-2221	Extinguisher, Fire: Dry Chemical Hand Type, 2 ½ lbs., FED. Spec. 0-E-915, Type III, Class 2, Size 2 ½ Walter Kiddie P/N 874195 or Equal	EA		1		
		DA Lubrication Order LO 5-2420-206-12	EA		1		
		DA Technical Manual TM 5-2420-206-12	EA		1		
		DA Technical Manual TM 5-2420-206-20P	EA		1		

Section III. MAINTENANCE AND OPERATING SUPPLIES

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hrs operation	(6) Notes
CRANKCASE		OIL, LUBRICATING: 5 gal can as follows:			(1) Includes quantity or oil to fill engine oil system as follows:
	9150-680-1099(2)	HDO 30	40 qt	(3)	
	9150-680-1102(2)	HDO 10	40 qt	(3)	36 qts—crankcase
	9150-242-7603(2)	OES	40 qt	(3)	4 qts—oil filter
FUEL TANK		FUEL OIL DIESEL: Bulk as follows:			(2) See FSC C9100-IL for additional data and requisitioning procedure.
	9140-286-5294(2)	DF-2 Regular Grade	196 gal	(4)	
	9140-286-5286(2)	DF-1 Winter Grade	196 gal	(4)	(3) See current LO for grade application and replenishment intervals.
	9140-286-5283(2)	DFA- Artic Grade	196 gal	(4)	
ENGINE STARTING AID	2910-565-9424	CYLINDER, FUEL	1		
ANEROID CONTROL		OIL, LUBRICATING: 5 gal can as follows:			(4) Tank capacity
	9150-265-9428(2)	OE-10	2 oz	(3)	
	9150-242-7603(2)	OES	2 oz	(3)	
BRAKE RESERVOIR		OIL, LUBRICATING			
	9150-265-9428(2)	OE-10	2 qt ea	(3)	
	9150-242-7603(2)	OES	2 qt ea	(3)	
BEARING BOX		OIL, LUBRICATING			
	9150-265-9428(2)	OE-10	5 qts	(3)	
	9150-242-7603(2)	OES	5 qts	(3)	
TRANSMISSION AND TORQUE CONVERTER		OIL, LUBRICATING			
	9150-265-9428(2)	OE-10	72 qts	(3)	
	9150-242-7603(2)	OES	72 qts	(3)	
HYDRAULIC RESERVOIR		OIL, LUBRICATING			
	9150-265-9428(2)	OE-10	500	(3)	
	9150-242-7603(2)	OES	500	(3)	
RADIATOR		WATER	84 qts		
	6850-243-1990	Ethylene, Glycol	49 qts		
		ANTIFREEZE: 55 gal drum as follows:			
	6850-174-1806	Compound Artic	84 qts		
DIFFERENTIALS FRONT AND REAR		LUBRICATING OIL, GEAR: 5 gal drum as follows:			
	9150-577-5844(2)	GO-90	34 ½ qts ea	(3)	
	9150-257-5440(2)	GOS	34 ½ qts ea	(3)	

(1) Component application	(2) Federal stock number	(3) Description	(4) Quantity required f/initial operation	(5) Quantity required f/8 hr operation	(6) Notes
PLANETARIES FRONT AND REAR		LUBRICATING OIL, GEAR: 5 gal drum as follows:			
	9150-577-8544(2)	GO-90	13 qts ea	(3)	
	9150-257-5440(2)	GOS	13 qts ea	(3)	
GREASE POINTS		GREASE, AUTOMOTIVE AND ARTILLERY: 35 lb pail as follows:			
	9150-190-0907(2)	GAA		(3)	

APPENDIX C
MAINTENANCE ALLOCATION CHART

Section I. INTRODUCTION

C-1. General

a. This section provides a general explanation of all maintenance and repair functions authorized at various maintenance levels.

b. Section II designates overall responsibility for the performance of maintenance functions on the identified end item or component. The implementation of the maintenance functions upon the end item or component will be consistent with the assigned maintenance functions.

c. Section III lists the special tools and test equipment required for each maintenance function as referenced from Section II.

d. Section IV contains supplemental instructions, explanatory notes and/or illustrations required for a particular maintenance function.

C-2. Explanation of Columns in Section II

a. Group Number, Column (1). The functional group is a numerical group set up on a functional basis. The applicable functional grouping indexes (obtained from TB 750-93-1), Functional Grouping Codes) are listed on the MAC in the appropriate numerical sequence. These indexes are normally set up in accordance with their function and proximity to each other.

b. Functional Group, Column (2). This column contains a brief description of the components of each functional group.

c. Maintenance Functions, Column (3). This column lists the various maintenance functions (A through K) and indicates the lowest maintenance category authorized to perform these functions. The symbol designations for the various maintenance categories are as follows:

C — Operator or crew
O — Organizational maintenance
F — Direct support maintenance
H — General support maintenance
D — Depot maintenance

The maintenance functions are defined as follows:

A — Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

B — Test. To verify serviceability and to detect electrical or mechanical failure by use of test equipment.

C — Service. To clean, to preserve, to charge, to paint, and to add fuel, lubricants, cooling agents, and air.

D — Adjust. To rectify to the extent necessary to bring into proper operating range.

E — Aline. To adjust specified variable elements of an item to bring to optimum performance.

F — Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

G — Install. To set up for use in an operational environment such as an implacement, site or vehicle.

H — Replace. To replace unserviceable items with serviceable assemblies, subassemblies, or parts.

I — Repair. To restore an item to serviceable condition. This includes, but is not limited to, inspection, cleaning, preserving, adjusting, replacing, welding, riveting and strengthening.

J — Overhaul. To restore an item to a completely serviceable condition as prescribed by maintenance serviceability standards using the Inspect and Repair Only as Necessary (IROAN) concept.

K — Rebuild. To restore an item to a standard as nearly as possible to original or new condition in appearance, performance, and life expectancy. This is accomplished through complete disassembly of the item, inspection of all parts or components, repair or replacement of worn or unserviceable elements (items) using original manufacturing tolerances and specifications, and subsequent reassembly of the item.

d. Tools and Equipment. Column 4. This column is provided for referencing by code the special tools and test equipment, (Section III) required to perform the maintenance functions (Section II).

e. Remarks, Column (5). This column is provided for referencing by code the remarks (sec. IV) pertinent to the maintenance functions.

C-3. Explanation of Columns in Section III

a. Reference Code. This column consists of a number and a letter separated by a dash. The number references the T&TE requirements column on the MAC. The letter represents the specific maintenance function the item is to be used with. The letter is representative of columns A through K onthe MAC.

b. Maintenance Level. This column shows the lowest level of maintenance authorized to use the special tool or test equipment.

c. Nomenclature. This column lists the name or identification of the tool or test equipment.

d. Tool Number. This column lists the manufacturer's code and part number, or Federal Stock Number of tools and test equipment.

C-4. Explanation of Columns in Section IV

a. Reference Code. This column consists of two letters separated by a dash, both of which are references to Section II. The first letter references column 5 and the second letter references a maintenance function, column 3, A through K.

b. Remarks. This column lists information pertinent to the maintenance function being performed, as indicated on the MAC, Section II.

Section II. MAINTENANCE ALLOCATION CHART

(1) Group No.	(2) Assembly Group	(3) Maintenance Functions A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and Equipment	(5) Remarks
0100	Engine													
	Engine assembly													A-B
	Engine assy Diesel	..	F	C	..	..	..	..	F	F	H	D		
0101	Crankcase, Block, Cyl Head													
	Block	..	..	..	..	..	..	..	H	D	..	..		C-I
	Cyl head	..	..	..	..	..	..	..	F	F	..	D	1-1	
0102	Crankshaft													
	Crankshaft assy	..	..	..	..	..	..	..	H	..	..	D		
0103	Flywheel Assy													
	Flywheel assy	..	..	..	..	..	..	..	F	F				
	Gear conv drive	F	..	..	..	..	..	..	F					
0104	Pistons, Connecting Rods													
	Piston assy	..	..	..	..	..	..	..	H	H				
	Rod assy	..	..	..	..	..	..	..	H	H				
0105	Valves, Camshaft & Timing													
	Sys Valves, push rods etc.	..	..	..	F	..	..	..	F					
	Cam follower	..	..	..	F	..	..	..	F					
	Rocker arm	..	..	..	..	..	..	..	F	F				
	Gear timing	H	..	..	..	..	..	..	H					
	Camshaft	H	..	..	..	..	..	..	H					
0106	Engine Lubrication System													
	Pump Assy Oil	O	..	..	F	..	..	..	F	F				
	Pump Assy Scavenger	..	..	O	F	..	..	..	F	F	..	..		B-C
	Hoses, Lines, Fittings	O	..	..	..	..	..	..	O					C-I
	Pan, Oil	O	..	..	..	..	..	..	F					
	Cooler, Oil	O	..	..	..	..	..	..	F	F				
	Filter Assy, Oil, Element	O	..	O	..	..	..	..	O	O				
	Breather	..	..	O	..	..	..	..	O					
0108	Manifolds													
	Manifolds Intake & Exhaust	O	..	..	..	..	..	..	F					
0109	Accessory Drive Mechanism Compressor	..	..	..	..	..	..	..	F	F				

(1) Group No.	(2) Assembly Group	(3) Maintenance Functions A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and Equipment
02	Clutch												
0203	Torque Converter	O	..	O	..	..	..	..	F	H	D		
	Torque Converter Fittings	C	..	..	..	..	..	..	O				
	Pump Converter	..	..	..	..	..	..	..	F	F	D		
	Filter Assy, Oil, Element	C	..	O	..	..	..	..	O				
03	Fuel System												
0301	Fuel Injector												
	Injector assy	C	F	..	O	..	..	..	O	F			
0302	Fuel Pumps												
	Fuel pump assy	..	F	..	..	..	..	..	F	H	..	D	
	Screen fuel pump	..	..	O	..	..	..	..	O				
0304	Air Cleaner												
	Air cleaner assy	..	..	O	..	..	..	..	O	O	..	..	
0305	Turbocharger												
	Turbocharger assy	C	..	O	..	..	..		O	F		D	
0306	Tanks, Lines, Fittings												
	Tank assy, screen	C	..	C	..	..	..	..	F	O	..	..	
	Valve, fuel shut down	O	..	..	..	..	..	..	O				
	Aneroid assy, filter	..	..	O	..	..	..	..	O	O			
	Hoses, lines & fittings	O	..	..	..	..	..	..	O				
0308	Engine Speed Governor												
	Governor	H	..	..	..	..	..	..	H				
0309	Fuel Filters												
	Filter assy, element	C	..	O	..	..	..	..	O	O			
0311	Engine Starting Aids												
	Quick start assy	C	..	C	..	..	..	..	O				
0312	Accelerator, Throttle												
	Controls Linkage	C	..	C	..	..	..		O				
04	Exhaust System												
0401	Muffler and pipes												
	Muffler and pipes	C	..	..	..	..	..	..	O				
05	Cooling System												
0501	Radiator												
	Radiator assy	C	..	C	..	..	..	..	F	F			
0502	Cowling, Deflector, Air Duct & Shrouds												
	Grille	O	..	..	..	..	..	..	O				
0503	Water Manifold, Thermostats Housing, gasket												
	Hoses, lines & fittings	C	..	..	..	..	..	..	O				
	Water manifolds	C	..	..	..	..	..	..	F				
	Thermostat	..	O	..	..	..	..	..	O				
0504	Water Pump												
	Water pump assy	..	..	C	..	..	..	..	F	F			
	Belt	C	..	..	O	..	..	..	O				
0505	Fan Assy												
	Fan assy	..	..	..	..	..	..	..	O	F			
	Belt, fan drive	C	..	..	O	..	..	..	O				
0508	Water Filter												
	Filter, water	..	..	O	..	..	..	..	O	O			
	Hoses, lines & fittings	C	..	..	..	..	..	..	O				

(1) Group No.	(2) Assembly Group	(3) Maintenance Functions A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and Equipment	(5) Remarks
06	Electrical System													
0601	Generator													
	Generator assy	O	O	C	..	..	..	..	O	O	..	D		G-I
	Belt	C	..	..	O	..	..	..	O					
0602	Generator, Regulator													
	Regulator voltage	O	O	..	F	..	..	..	O	H				
0603	Starting Motor													
	Motor, cranking	O	O	O	..	..	..	..	O	O	..	D		H-I
	Solenoid	O	O	..	..	..	..	..	O					
	Plunger	..	..	..	..	..	..	..	O					
	Drive clutch	O	..	..	..	..	..	..	F					
	Wiring	O	..	..	..	..	..	..	O					
0607	Engine Control Panel													
	Gages	O	..	..	..	..	..	..	O					
	Switches, lights, panel & circuit breakers	..	O	..	..	..	..	..	O					
	Bulbs	C	..	..	..	..	..	..	C					
	Wiring panel	C	..	..	..	..	..	..	O					
	Panel	O	..	..	..	..	..	..	O					
0608	Miscellaneous Items													
	Utility outlet	C	..	..	..	..	..	..	O					
	Receptacle, battery	C	..	..	..	..	..	..	O					
0609	Lights													
	Light assemblies	C	..	C	..	..	..	..	O					
	Lamp incandescent	C	..	..	..	..	..	..	C					
0610	Sending Units & Warning Switches													
	Sending units	..	O	..	..	..	..	..	O					
	Warning switch, over speed device	..	O	..	..	..	..	..	O					
0611	Horn													
	Horn, Vehicular & warning	..	O	..	..	..	..	..	O					
	Wiring	O	..	..	..	..	..	..	O					
0612	Batteries, Storage													
	Batteries	C	O	C	..	..	..	C	O					
	Wiring	..	..	..	..	..	..	C	O					
0613	Hull or Chassis Wiring Harness													
	Harness wiring	..	..	..	..	..	..	..	F	O				
07	Transmission													
0704	Control shaft	C	..	..	..	..	..	..	O					
0710	Transmission Assy	C	..	O	..	..	..	..	F	H	..	D		
0713	Intermediate Clutch													
	Clutch assemblies	..	..	..	..	..	..	..	H	H				
0714	Servo Unit													
	Control valve	C	..	..	..	..	..	..	F	F				
0720	Accessory Drive	..	..	..	..	..	..	..	F	F				
	Speedometer drive													
0721	Coolers, Pumps, Motors													
	Pump, push start	..	..	..	..	..	..	..	O	F				
	hoses, lines & fittings	C	..	..	..	..	..	..	O					

(1) Group No.	(2) Assembly Group	(3) Maintenance Functions A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and Equipment	(5) Remarks
09	Propeller & Propeller shafts													
0900	Propeller shafts													
	Shaft, propeller	C	..	..	..	..	..	..	O					
	Bearings	O	..	C	..	..	..	..	O					
	Midmount bearing	C	..	O	..	..	..	..	F	F				
10	Front Axle													
1000	Front axle assy													
	Axle assy, front	C	..	C	..	..	..	..	F	F	..	D		
	Vent assy	O	..	..	..	..	..	..	O					
1002	Differential													
	Differential assy	..	..	..	..	..	..	..	F	F				
1003	Planitary or Final Drive													
	Planitary assy	..	..	..	..	..	..	..	F	F				
11	Rear Axle													
1100	Rear axle assy													
	Axle assy, rear	C	..	C	..	..	..	..	F	F	..	D		
1102	Differential													
	Differential assy	..	..	..	..	..	..	..	F	F				
1103	Planitary or Final Drive													
	Planitary assy	..	..	..	..	..	..	..	F	F				
12	Brakes													
1201	Hand brake													
	Shoe assembly	..	..	..	..	..	..	..	F	F				
1202	Service Brakes													
	Expander assembly	..	..	..	..	..	..	..	F	F				
1204	Hydraulic Brake System													
	Actuator, brake	C	..	O	..	..	..	..	O	O				
	Breather	..	..	C	..	..	..	..	O					
	Lines, hydraulic	C	..	..	..	..	..	..	O					
1206	Mechanical Brake System													
	Hand lever, linkage	C	..	C	..	..	..	..	O					
1208	Air Brake System													
	Valves, brake system	..	..	..	..	..	..	..	O	F				
	Chamber, brake	..	..	..	..	..	..	..	O	O				
	Reservoir	C	O	C	..	..	..	..	O	O	..	..	.....	I-B, J-1
	Lines & fittings	C	..	..	..	..	..	..	O					
1209	Air Compressor Assy													
	Air compressor assy	O	..	..	..	..	..	..	F	F	..	D		
1211	Trailer Brake Connections & Controls													
	Valve, trailer brake	O	..	..	..	..	..	..	O					
	Hoses, lines & fittings	O	..	..	..	..	..	..	O					
	Coupling, half	C	..	..	..	..	..	..	O	O				
13	Wheels & Tracks													
1311	Wheel Assy													
	Wheel assy	O	..	..	..	..	..	..	O					
1313	Tires													
	Tires	C	C	C	..	..	..	..	O	C				
14	Steering													
1401	Steering assy													
	Steering wheel	C	..	..	..	..	..	..	O					
	Gear assy steering	..	..	C	..	..	..	..	F	F	..	D		
	Drag link assy	..	..	C	O	..	..	..	F					

(1) Group No.	(2) Assembly Group	(3) Maintenance Functions A Inspect	B Test	C Service	D Adjust	E Align	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and Equipment	(5) Remarks
1410	Hydraulic Pump													
	Pump assy	..	F	..	..	..	..	..	F	F				
1411	Hoses, Lines & Fittings													
	Hoses, lines & fittings	C	..	..	..	..	..	..	O					
1412	Hydraulic Cylinders													
	Cylinder, hydraulic	C	..	..	..	..	..	..	O	O				
15	Frame													
1501	Frame assembly													
	Frame	C	..	..	..	..	..	..	H	O	..	..	.....	K-1
	Rock guards, ladders	C	..	..	..	..	..	..	O	O				
1503	Pintles & Towing Attachments													
	Lunette	C	..	..	..	..	..	..	O					
	Pintle	C	..	C	..	..	..	..	O	O				
1506	Universal Coupler													
	Coupler, universal	C	..	C	..	..	..	..	F	F				
18	Body, Cab, Hood													
1801	Body, cab, hood													
	Body, cab	C	..	..	..	..	..	..	F	O	..	..	.....	L-1
	Hod	C	..	..	..	..	..	..	O	O	..	..	.....	M-1
	Glass	C	..	..	..	..	..	..	F					
1805	Floors													
	Floorplates	O	..	..	..	..	..	..	O					
1806	Seats													
	Seat	C	..	..	..	..	..	..	O	O				
	Seat-belt	C	..	..	..	..	..	..	O					
1808	Tool Box													
	Box, tool	C	..	..	..	..	..	..	O	O				
22	Body Chassis or Hull & Accessory Items													
2202	Accessory Items													
	Wiper assy	0	..	..	..	..	..	..	0					
	Blade	0	..	..	..	..	..	..	0					
43	Hydraulic & Air System													
4300	Hydraulic system													
	Hydraulic system	C	..	C	..	..	..	..	..	0				
4301	Strainers, Filters, Hose Lines, & Fittings													
	Strainers, filters	C	..	C	..	..	..	..	0					
	Hose, lines & fittings	C	..	..	..	..	..	..	0					
	Swivels	C	..	C	..	..	..	..	0	0				
4302	Pump & Pump Drive													
	Pump hydraulic	C	..	..	..	..	..	..	F	F				
	Drive, pump	..	..	..	..	..	..	..	H	H				
4305	Control Valves													
	Valves, control	..	..	..	..	..	..	..	0	0				
4307	Hydraulic Cylinders													
	Cylinder, hydraulic	C	..	..	..	..	..	..	0	0				
4308	Reservoir													
	Reservoir assy	C	..	..	..	..	..	..	0	0				
	Filter, tank	..	..	0	..	..	..	..	0					
	Strainer & cap	C	..	..	..	..	..	C	0					
4309	Hydraulic or Manual Controls													
	Levers, valve	0	..	..	..	..	..	..	0					

(1) Group No.	(2) Assembly Group	(3) Maintenance Functions A Inspect	B Test	C Service	D Adjust	E Aline	F Calibrate	G Install	H Replace	I Repair	J Overhaul	K Rebuild	(4) Tools and Equipmen
47	Gages, (Non-Electrical)												
4701	Instruments												
	Speedometer & drive shaft	C	..	0	..	..	..	..	0				
	Adapter	..	..	..	..	..	..	..	F	F			
	Tachometer	0	..	..	..	..	..	..	0				
	Adapter	..	..	0	..	..	..	..	0				
4702	Gages, Mounting Lines & Fittings Gages, mounting lines & fittings	0	..	..	..	..	..	..	0				
4703	Hourmeter												
	Hourmeter	0	..	..	..	..	..	..	0				
50	Pneumatic Equipment												
5001	Cylinder & Head Assy	..	..	..	..	..	..	..	F	F			
	Cylinder & head assy												
5002	Crank Shaft Assy	..	..	..	..	..	..	..	F	F			
	Crank shaft assy												
5004	Piston, Connecting Rod & Rings												
	Piston, connecting rod & rings	F	..	..	..	..	..	..	F				
5005	Valves	F	..	..	..	..	..	..	F				
	Valves												
5007	Compressor Drive	F	..	..	..	..	..	..	F				
	Compressor drive												
5008	Air Intake	F	..	..	..	..	..	..	F				
	Air intake												
5009	Unloader System Components												
	Unloader system components	F							F				
5012	Throttling Devices	..	..	..	..	..	..	..	F	F			
	Governor												
5015	Air Discharge System	0	..	..	..	..	..	..	0				
	Lines & fittings												
74	Earth Moving Components												
7435	Moldboard assy	..	..	..	..	..	..	..	0	H			
	Moldboard assy												
7440	Scarifier Assy	..	..	..	..	..	..	..	0	0			
	Scarifier assy												
7447	Push Beam & Yoke Components												
	Push beam & yoke components	..	..	..	..	..	..	..	0	0			
76	Fire Fighting Equipment Components												
7638	Fire extinguisher	0	..	..	..	..	..	..	0				
	Fire extinguisher												

Section III. SPECIAL TOOL AND SPECIAL TEST EQUIPMENT REQUIREMENTS

Reference Code	Maintenance level	Nomenclature	Tool number
1 - 1	F	Grooving Tool, Injector Sleeve Installation (Cummins Diesel Co. Topic No. 2-73A)	ST-1100

Section IV. REMARKS

Reference code	Remarks
A—B	Compression test
B—C	Oil pump sump screen
C—I	Weld only
D—I	Weld only
E—C	Clean impeller and diffuser only
F—I	Weld only
G—I	Repair kit only
H—I	Repair kit only
I—B	Test after welding
J—I	Weld only
K—I	Includes welding as required
L—I	Weld only
M—I	Weld only

INDEX

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Distribution:

To be distributed in accordance with DA Form 12-25, (qty rqr block no. 489) Section II, Operator maintenance requirements for Tractors, Wheeled, Medium.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1989 0 - 242-451 (06021)