TM 5-3895-363-13&P

TECHNICAL MANUAL

UNIT, INTERMEDIATE DIRECT SUPPORT
MAINTENANCE MANUAL
INCLUDING SUPPLEMENTAL OPERATING
MAINTENANCE AND REPAIRS PARTS INSTRUCTIONS
(SOMARPI)
AND
REPAIR PARTS AND SPECIAL TOOLS LIST

FOR

HAMMER, PILEDRIVER
SELF-POWERED, DIESEL
NSN 3895-01-200-8448
MODEL F1500

Approved for public release. Distribution unlimited.

HEADQUARTERS, DEPARTMENT OF THE ARMY

17 DECEMBER 1987

CHANGE

NO. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington DC., *22 April 1992*

UNIT, INTERMEDIATE DIRECT SUPPORT MAINTENANCE MANUAL INCLUDING SUPPLEMENTAL OPERATING, MAINTENANCE, AND REPAIR PARTS INSTRUCTIONS (SOMARPI) AND REPAIR PARTS AND SPECIAL TOOLS LIST

FOR

HAMMER, PILEDRIVER SELF-POWERED, DIESEL
NSN 3895-01-200-8448
MODEL F1 500

Current as of 22 July 1991

TM 5-3895-363-13&P, dated 17 December 1987, is changed as follows:

1. Remove old pages and insert new pages.
2. New or changed material is indicated by an asterisk or by a vertical bar in the outside margin.

Remove Pages	Insert Pages
Chapter **3** *(in its entirety)*	Chapter 3 *(in its entirety)*

4. File this change sheet in front of the publication for reference purposes.

By Order of the Secretary of the Army:

GORDON R. SULLIVAN
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Official:

MILTON H. HAMILTON
Administrative Assistant to the
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00740

Distribution:

To be distributed in accordance with DA Form 12-25-E (Block 0547) Unit and Direct Support maintenance requirements for TM5-3895-36-13&P.

WARNINGS

Never tie or wire down the lifting cam lever. Use 1/4" nylon rope or equal to operate the lifting cam lever. Keep the trip rope clear at all times,

Do not attempt to start hammer without first reading Section 9.

Do not raise trip any further once the trip cam reaches the trip release plate, since the piston will be released automatically.

It is good practice to check out the tripping device before mounting it on the lead.
Check to see that:
A.) The lifting cam rotates freely and has sufficient spring to automatically return to the horizontal position.
B.) The trip cam rotates freely and has sufficient spring and locking action.

Dropping the piston will cause trip damage or could lead to accidental firing. With an engaged trip, this could cause serious damage to the machine and be hazardous to the crew.

Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in well ventilated area. Avoid contact with skin, eyes and clothes and don't breath vapors. Do not use near open flame of excessive heat. The flash point is 100 F. (38 C - 59 C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

Compressed air, used for cleaning purposes will not exceed 30 psi. Use only with personnel protective equipment (goggles/shield/gloves etc).

Moving the pile driver and leads while attached to the crane may result in overturning the crane. DO NOT move equipment over rough terrain while attached to the crane boom. DO NOT move equipment in high winds, 15-20 mph.

Use TRC High Temp. Grease only. The use of any other grease may void the warranty.

CAUTION

In very soft driving, it is advisable to cable the drive cap slightly shorter so the cable can dampen the impact block. A travel of at least 6" must remain for the impact block.

Do not overload with ether.

When greasing, set the hammer on the ground or on a pile so the impact block is fully pushed into machine. Do not grease when the impact block is hanging out.

Wear beyond 50/1000" (1.25mm) causes excessive wear on lower cylinder and eventually will crack the lower cylinder, voiding the warranty.

Keep it clean: Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (P-D-680) to clean surfaces. Use soap and water when you clean rubber or plastic material.

Bolts, nuts and screws: Check that they are not loose, missing, bent or broken. You can't try them all with a tool, but look for chipped paint, bare metal or rust around bolt heads. Secure any bolt, nut, or screw that you find loose. Replace missing hardware.

Welds: Look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad weld, report it to maintenance personnel.

Hoses and fluid lines: Look for wear, damage and leaks. Make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If leakage comes from a loose fitting or connector, secure the fitting or connector. If something is broken or worn out, either correct it or report it to maintenance personnel before operating the equipment.

It is necessary for you to know how fluid leaks affect the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them and REMEMBER – when in doubt, notify your supervisor.

LEAKAGE DEFINITIONS FOR UNIT PMCS

CLASS I Seepage of fluid, as indicated by wetness or

discoloration not great enough to form drops.

CLASS II Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.

CLASS III Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

TECHNICAL MANUAL

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Washington, D.C., 17 December 1987

UNIT, INTERMEDIATE DIRECT SUPPORT MAINTENANCE MANUAL INCLUDING SUPPLEMENTAL OPERATING MAINTENANCE AND REPAIRS PARTS INSTRUCTIONS (SOMARPI) AND REPAIR PARTS AND SPECIAL TOOLS LIST

FOR

HAMMER, PILEDRIVER SELF-POWERED, DIESEL NSN 3895-01-200-8448 MODEL F1500

Current as of
December 10, 1987

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), of DA Form 2028-2 located in back of this manual direct to: U.S. Army Tank–Automotive Command, ATTN: AMSTA-MB, Warren, MI 48397-5000. A reply will be furnished to you.

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CHAPTER 1

INTRODUCTION

Section 1. GENERAL INFORMATION

Scope

a. Type of Manual: Unit Intermediate Direct Support Maintenance, including supplemental operating repair parts instructions (SOMARPI) and repair parts special tools list (RPSTL).

b. Model Numbers and Equipment Name: Model 1500-Hammer, Pile Driver, Self-Powered.

c. Purpose of Equipment: Designed to be used with a crane having a lattice or solid boom for driving piles of different lengths.

MAINTENANCE FORMS, RECORDS, AND REPORTS

Department of the Army forms and procedures used for equipment maintenance will be those prescribed by DA PAM 738-750, The Army Maintenance Management System (TAMMS).

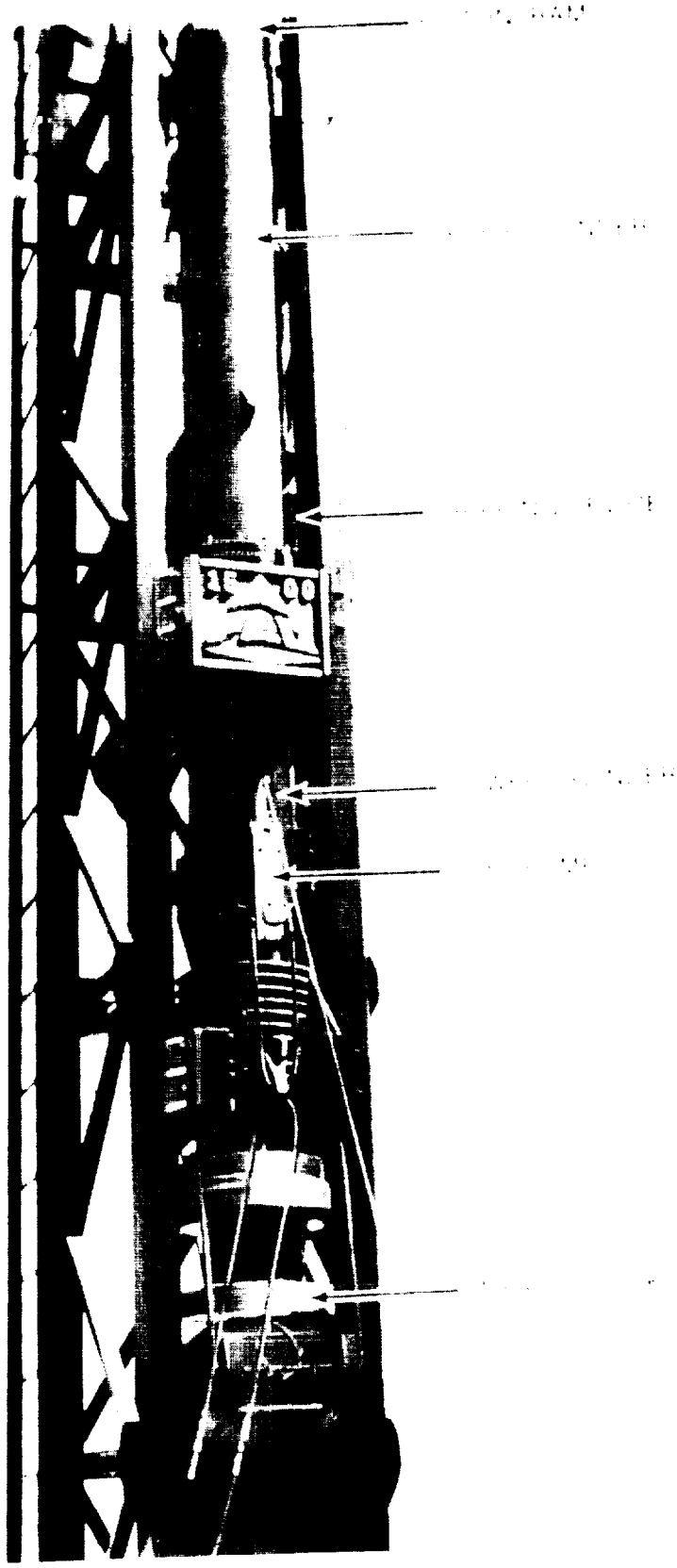
DESTRUCTION OF ARMY MATERIAL TO PREVENT ENEMY USE

Refer to Appendix C of this manual.

REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

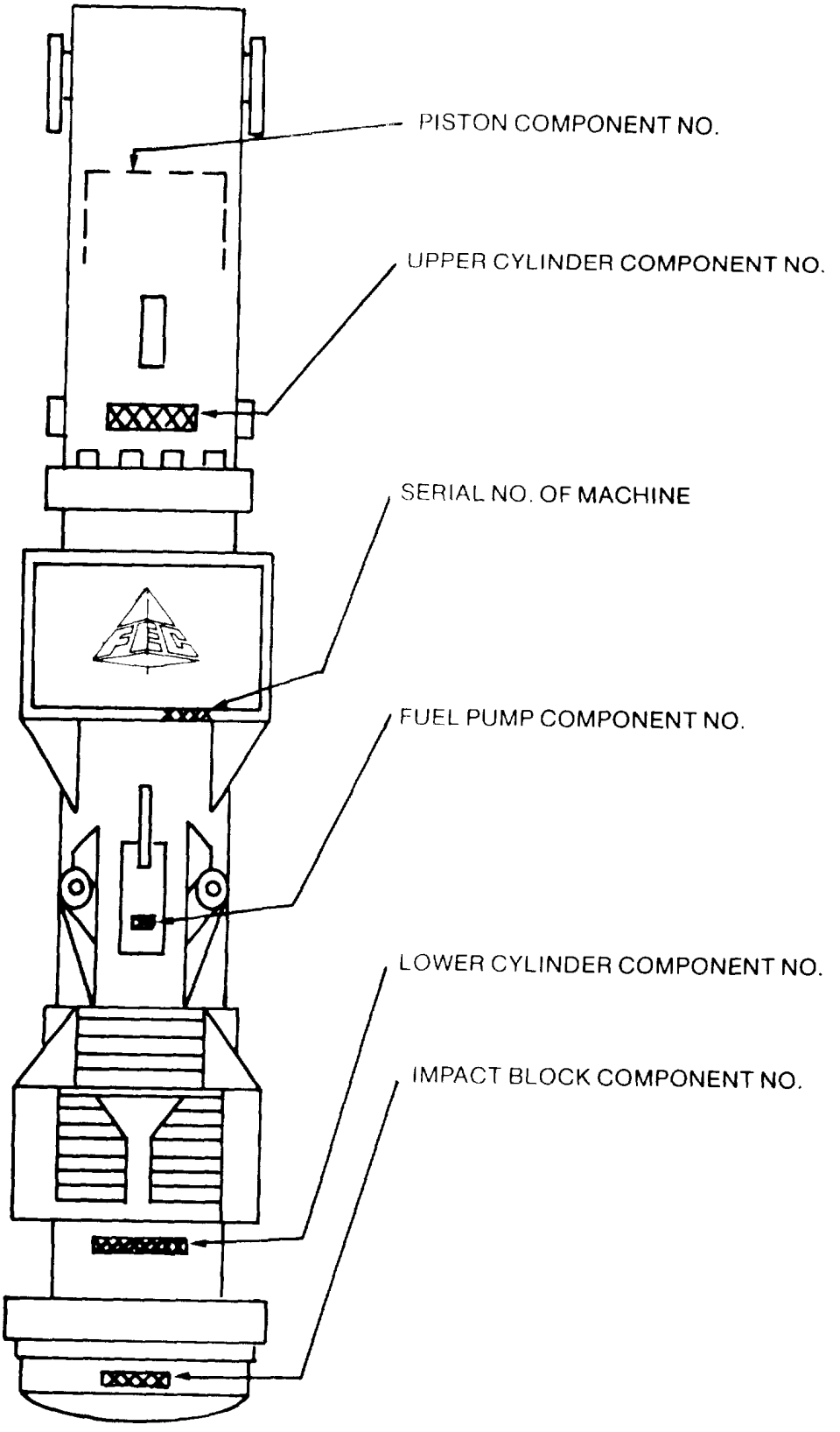
If your Pile Driver needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design or performance. Put it on an SF 368 (Quality Deficiency Report). Mail it to us at U.S. Tank Automotive Command, AMSTA-MP. We'll send you a reply.

1. HAMMER – COMPONENTS



2. SERIAL NUMBER & COMPONENT NUMBERS

When ordering spare parts, always give serial number.



3. SPECIFICATIONS

	FEC 1500
GEOMETRIC	
Overall Length	14' 2" (4310 mm.)
Width	18" (457 mm.)
Depth Including Trip	23 3/4" (605 mm.)
WEIGHT	
Hammer Without Guides	6675 lbs. (3027 kg.)
Trip Without Guides	300 lbs. (136 kg.)
Operational Including Guides	7820 lbs. (3546 kg.)
Piston	3300 lbs. (1500 kg.)
Impact Block	810 lbs. (368 kg.)
CAPACITIES	
Fuel Tank	9.25 gal. (35 L.)
Oil Reservoir	3.5 qts. (3.3 L.)
Hours of Continuous Operation	5 1/2 hours
TECHNICAL	
Manfactured Energy	27,100 ft./lbs. (3750 m.k.p.)
Maximum Stroke	10' 11 3/4" (3346 mm.)
Speed	40-60 b./min.
Explosive Force	130,000 lbs. (59,100 kp.)
Maximum Batter Ratio	1:3

4. INTRODUCTION

The FEC Pile Hammer is a single acting diesel hammer operating on the two-cycle diesel principle. It is completely self-contained and does not require an auxiliary power source. Once started, the hammer will continue to operate automatically until the fuel supply is shut off or depleted.

4.1 OPERATING PRINCIPLE

The initial start up of the hammer requires the piston (ram) to be raised to a point where the trip automatically releases the piston, allowing it to fall by gravity. As the piston falls, it activates the fuel pump, which discharges a metered amount of fuel into the ball pan of the impact block. The falling piston also blocks the exhaust ports, and compression of fuel trapped in the cylinder begins. The compressed air exerts a pre-load force (approx. 44,000 lbs. or 20,000 kg.) to hold the impact block firmly against the drive cap and pile. At the bottom of the compression stroke, the piston strikes the impact block, atomizing the fuel and starting the pile on its downward movement. In the instant after the piston strikes, the atomized fuel ignites, and the resulting explosion exerts an even greater force on the already moving pile, driving it further into the ground. The reaction of the explosion rebounding from the resistance of the pile drives the piston upward. As the piston rises, the exhaust ports

4.1 OPERATING PRINCIPLE (cont'd.)

open, releasing the gases and force of the explosion into the atmosphere. After the piston stops its upward movement, it again falls by gravity to start another cycle.

READ SECTIONS 5 THROUGH 8 BEFORE STARTING THE HAMMER SECTION 9.

5. TRIPPING DEVICE

The tripping device (trip) which is mounted on the starter guides is raised or lowered by the crane operator. It serves two purposes:

A) To raise the entire hammer along the lead.
B) To start the hammer.

Figs. 1 & 2 show the tripping device and provide the nomenclature and location of its related parts.

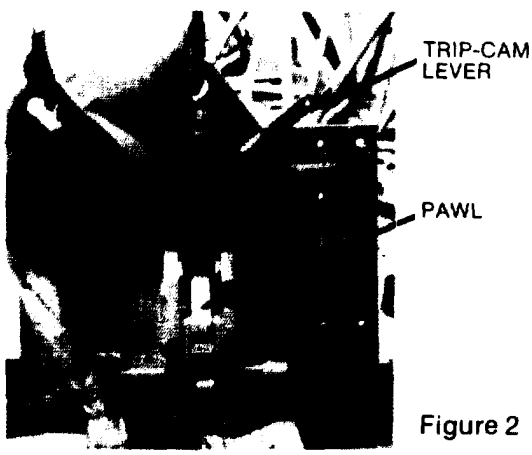
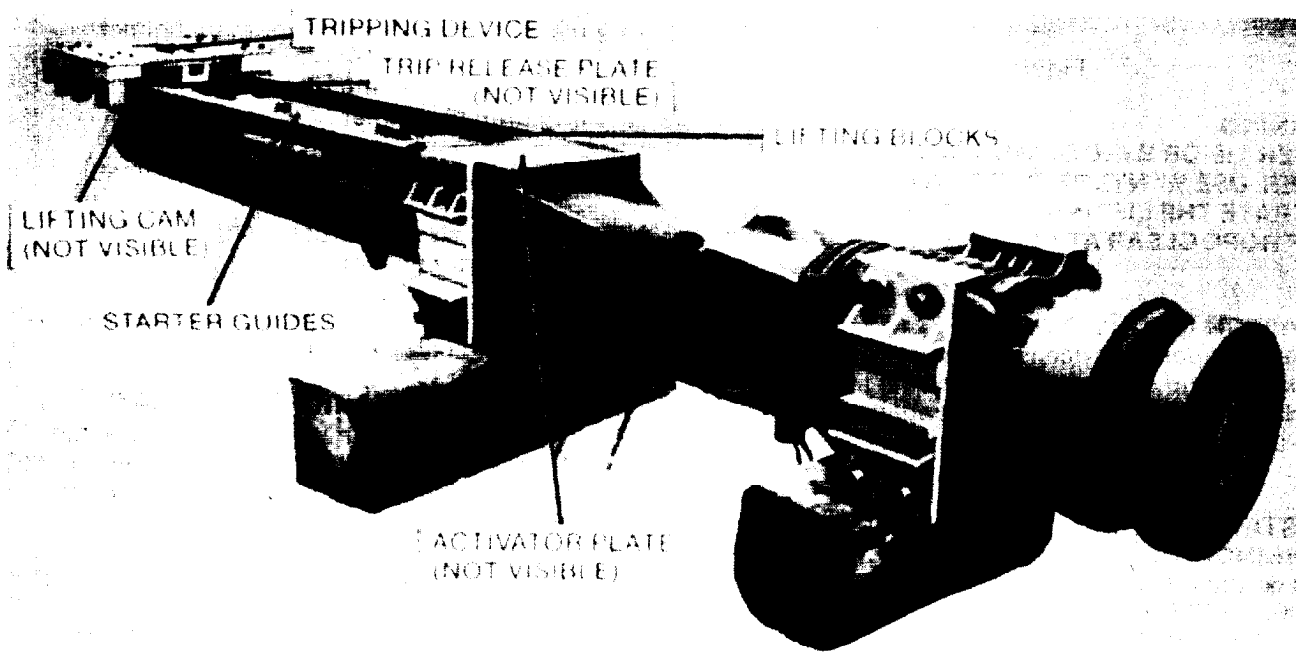


Figure 2

Figure 1



5.1 LIFTING CAM
The lifting cam is a part of the tripping device, and it can be manually engaged to raise or lower the hammer on the lead. A rope connected to the cam lever and controlled by a member of the hammer crew must be pulled downward to rotate the lifting cam so the tripping device can pass between the lifting blocks. Once the trip is below the lifting blocks, the rope is released and the cam rotates by spring action to the horizontal position (see Fig. 3). The lifting cam also prevents accidental engagement of the trip into the machine while operating.

Figure 3

WARNING:
NEVER TIE OR WIRE DOWN THE LIFTING CAM LEVER. USE 1/4" NYLON ROPE OR EQUAL TO OPERATE THE LIFTING CAM LEVER. KEEP THE TRIP ROPE CLEAR AT ALL TIMES.

5.2 PISTON LIFTING PAWL
Once the tripping device is lowered past the lifting blocks, the trip cam lever contacts the trip activator plate and the pawl rotates to engage in the pick-up groove of the piston.

5.3 STARTING EXPLANATION
WARNING:
This paragraph is for explanation ONLY – DO NOT ATTEMPT TO START THE HAMMER WITHOUT FIRST READING SECTION 9.

5.3.1 The tripping device should be lowered past the lifting block so the trip cam lever strikes the trip activator plate, engaging the pawl in the pick-up groove of the piston.

5.3.2 The trip rope should be pulled all the way downward to rotate the lifting cam to a vertical position so that it can pass freely between the lifting blocks.

5.3.3 Signal the crane operator to raise the tripping device. Once the trip is above the lifting blocks, release the trip rope.

5.3.4 As the tripping device continues to move upward, it will strike the trip release plate, disengaging the pawl and allowing the piston to fall.
WARNING:
It is good practice to check out the tripping device before mounting it on the lead. Check to see that:
A.) The lifting cam rotates freely and has sufficient spring action to automatically return to the horizontal position.
B.) The trip cam rotates freely and has sufficient spring and locking action.

6.1 INSTALLING CUSHION AND ANVIL
6.1.1 First install 1/2" aluminum plate with chamfer down into primary helmet.

6.1.2 Install 1 1/2" conbest into primary helmet.

6.1.3 Install 1/2" aluminum plate without chamfer into primary helmet.

6.1.4 Install 1 1/2" conbest into primary helmet.

6.1.5 Install 1/2" aluminum pate without chamfer into primary helmet.

6.1.6 Install anvil on top of previously installed cushion and cable to primary helmet.

6.2 RIGGING PRIMARY DRIVE CAP
6.2.1 When rigging the drive cap, make sure that all drive cap cables are of the same length, so that the drive cap is suspended evenly and does not bind on the lead.

6.2.2 Once the drive cap cables are tight, a gap of 1" to 2" should remain between the anvil plate and the fully dropped out impact block (Fig. 4).

Figure 4

For FEC helmets, this is easily done by cutting two cables of equal length, giving them an overlap of 18".

CAUTION:
In very soft driving, it is advisable to cable the drive cap slightly shorter so the cable can dampen the impact block. A travel of at least 6" must remain for the impact block.

6.3 RIGGING SECONDARY DRIVE CAP

6.3.1 install secondary drive cap into primary, thread cable through, and install cable clips (Fig. 5).

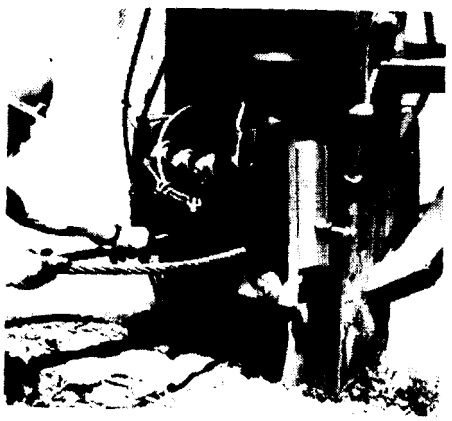


Figure 5

FUELING AND OILING

1 FUELING

1 Remove dust cap (Fig. 6), transport screw (Fig. 7), port covers (Fig. 8) and safety clamp (Fig. 9).

Figure 6

Figure 7

Figure 8

Figure 9

7.1.2 Remove tank drawn plug located on bottom of fuel tank on the rear.

7.1.3 Remove fuel plug.

7.1.4 Leaning the hammer slightly to the rear, flush tank with approx. 1/2 gal. of diesel fuel to flush out water and other contaminants.

7.1.5 Install and tighten drain plug.

7.1.6 Fill tank with clean diesel fuel until the fuel escapes through the breather hole (1/8") in front of the upper tank plate (Fig. 10)

Figure 10

7.1.7 Install fuel plug.

7.1.8 Attach pump lever rope (Fig. 11).

Figure 11

7.1.9 The pipe joint filters connecting the fuel lines to the tank should be cleaned. Unscrew and wash in an authorized cleaning solvent.

7.2 OILING

7.2.1 Tie rope (hereafter referred to as trip rope) to lifting cam lever on tripping device (Fig. 12). Make sure that pawl is engaged in piston.

Figure 12

7.2.2 Pull trip rope and hold down (Fig. 13).

Figure 13

7.2.3 Carefully raise trip until the piston just shows above the upper cylinder (Fig. 14).

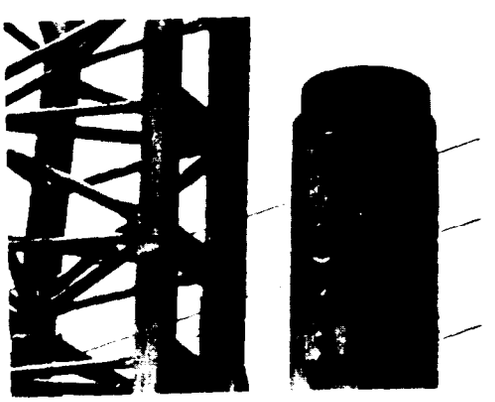


Figure 14

WARNING:
Do not raise trip any further, since the piston will be released automatically once the trip cam reaches the trip release plate.

7.2.4 Remove oiler plug on top of piston and fill oil chamber with 3 1/2 qts. (3.3 Ltrs.) of motor oil (Fig. 15).

Summer	50W oil
Winter	30W oil

Figure 15

7.2.5 Install oil plug and tighten securely (Fig. 16).

Figure 16

7.2.6 Pull trip rope and hold down. SLOWLY lower the piston until the tripping device rests on top of the tank (see Fig. 13). Then release trip rope.

WARNING:

Dropping the piston will cause trip damage or could lead to accidental firing. With an engaged trip, this could cause serious damage to the machine and be hazardous to the crew.

7.3 GREASING

7.3.1 With impact block full in, grease each of the lower cylinder fittings with 4 to 5 shots. Do not grease when impact block is in a drop down position, since this will put grease in firing chamber (see Fig. 4).

7.3.2 See Section 10 for grease specifications and daily maintenance.

7.4 CLEANING COMBUSTION CHAMBER

7.4.1 In the event that contaminants enter combustion chamber (generally, rain water or excess fuel), the hammer will not fire. The chamber must be cleaned.

7.4.2 Remove clean-out plug (Fig. 17), pull pump lever rope to shut off fuel, then drop piston (cold blow) until it blows clean.

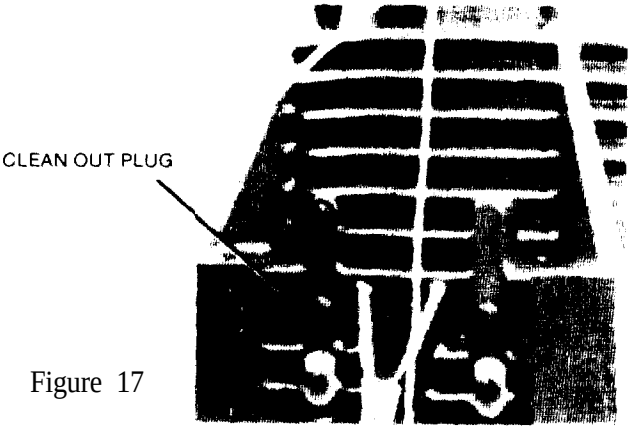


Figure 17

7.4.3 Reinstall clean out plug.

8. REMOTE ADJUSTABLE FUEL PUMP

8.1 FUEL PUMP – DESCRIPTION

8.1.1 The fuel pump is of fixed displacement, equipped with a regulating expansion chamber remotely controlled.

8.1.2 The regulating control enables the operator to control the piston stroke in case the piston jumps too high in hard driving with unusually high rebound or on batter piles. Mainly, it is a back-up system to shut off the hammer in case the pump lever rope breaks.

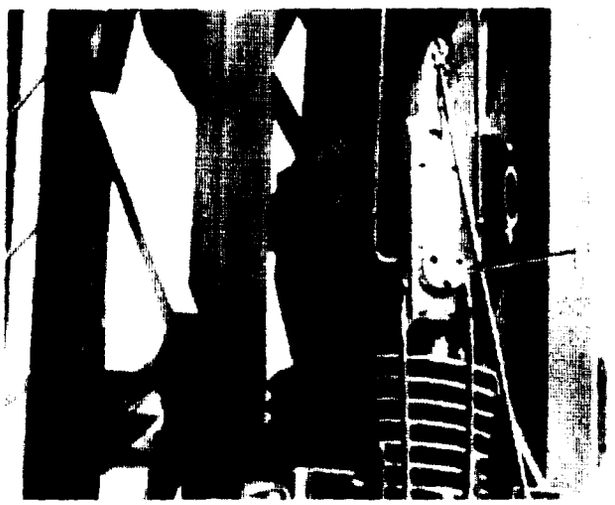


Figure 18

8.1.3 **Pump Shut Off:**
Pull pump lever rope and hold tight until hammer stops (Fig. 18).

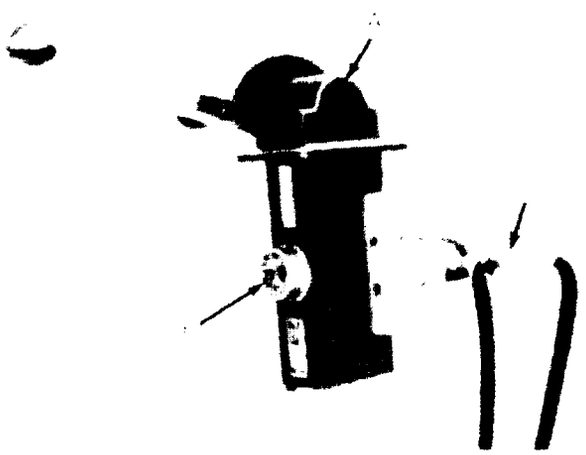


Figure 19

8.1.4 **Regulating:**
To regulate stroke, move remote lever anywhere in between wide open and shut off as needed (Fig. 19). In general, the hammer is stopped as in 8.1.3, but may also be stopped by pulling back regulating lever completely.

8.2 BLEEDING THE FUEL PUMP AT START UP

8.2.1 Raise piston carefully until the fuel pump lever moves completely into the cylinder, and then hold piston at this point.

8.2.2 Pull on pump lever rope with short rapid strokes to activate pump element, thereby bleeding out all of the air bubbles. DO NOT continue to pull hard enough to inject fuel into hammer, as flooding will occur.

8.3 FILLING AND BLEEDING THE REGULATING CONTROL SYSTEM (Fig. 18, 19, 20)

8.3.1 Open bleed valves on master control (A), fuel pump regulator (B), and filler/bleeder unit (C).

8.3.2 Close middle valve (D) on filler/bleeder unit.

8.3.3 Install filler hose (E) from filler/bleeder unit into clean hydraulic oil supply.

8.3.4 Pump master control lever back and forth rapidly until the unit is primed.

8.3.5 Continue to pump lever back and forth at a slower rate until oil flows from bleeder valve (C) without air bubbles.

8.3.6 The system's lines are now full and the expansion reservoir in the master control must be filled by closing valve (D).

8.3.7 Place allen wrench in pointer screw(F), loosen and move pointer to empty position, then re-tighten.

8.3.8 Turn pointer clockwise to surrounding temperature mark on gauge while continuing to pump lever slowly.

8.3.9 If unit is over-filled, oil will leak out small bleeder holes in master control. If so, re-open valve (C), continuing to pump unit, and reset temperature pointer. Then close valve (C).

8.3.10 Open valve (D) five turns.

8.3.11 Cap filler hose (E).

8.3.12 The relationship of the control lever to the regulating cylinder on the fuel pump is now set by first making sure regulating cylinder is in off positon.

8.3.13 Piston is still in raised position from 8.2.1, so the fuel pump lever may be activated to have fuel pressure move regulating cylinder to off position.

8.3.14 Move master control lever to off position and then close valves (A) and (B).

8.3.15 The relationship of the master lever to the pump regulating cylinder may be fine tuned by opening valve (A) and adjusting lever, then re-closing.

83.16 If sponginess is evident in system, it indicates air still exists in the lines. Repeat bleeding procedure.

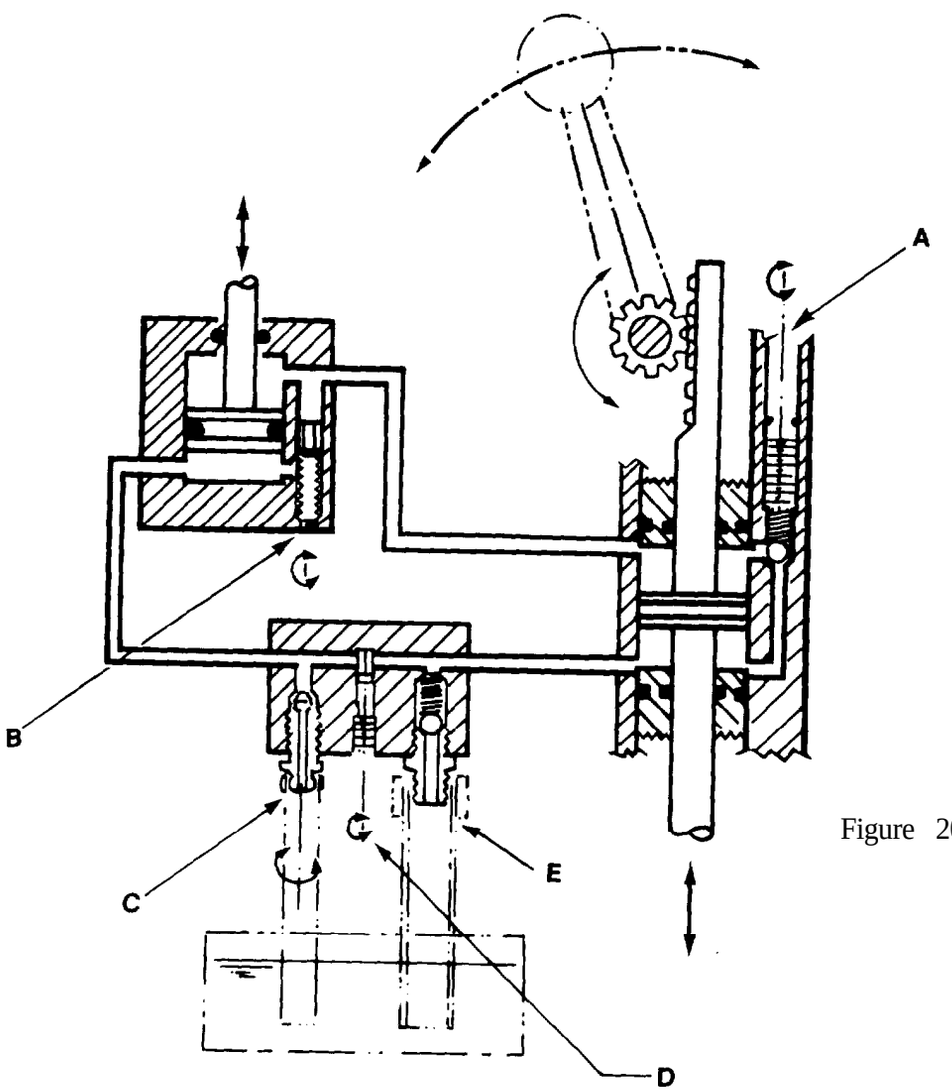


Figure 20

9. STARTING THE HAMMER

DON'T START WITHOUT READING SECTION 5.

9.1 NORMAL STARTING

9.1.1 Raise hammer.

9.1.2 Set pile and place hammer on top of it. Let hammer and pile sink in the ground. Hammer and pile must be in perfect alignment. Misalignment causes jarring blows which lead to excessive wear and tear on hammer, and is a major cause for pile damage.

9.1.3 Make sure the impact block is all the way in the lower cylinder.

CAUTION:
Never try to start the hammer with the impact block hanging out of the lower cylinder.

9.1.4 Pull pump lever rope tight so no fuel will be injected (cold blow).

9.1.5 Pull trip rope down and raise tripping device until the piston releases. With the fuel pump shut off, this is called a cold blow, and has the purpose of:

A.) Blowing excessive grease and oil out of the combustion chamber.

B.) Seating the pile firmly without running out of alignment.

9.1.6 Make 3 to 4 cold blows.

9.1.7 Release pump lever rope and start hammer (Fig. 21).

Figure 21

9.1.8 To stop hammer, pull pump lever rope and hold tight.

9.2 COLD WEATHER STARTING

Starting in cold weather, especially in regions having moist air, can present problems, but by revising procedures, they may be minimized.

9.2.1 Fill tank with warm fuel.

9.2.2 Start up hammer on a driven pile to warm up. If this is not possible, start up on heavy timber blocking.

9.2.3 Inject ether into exhaust port when piston is in raised position.
CAUTION:
Do not overload with ether.

9.2.4 Water in fuel is the major problem in winter. It is formed in fuel tank by condensation. Drain periodically.

10. MAINTENANCE AND REPAIR

10.1 DAILY MAINTENANCE

10.1.1 Keep bolts and nuts tight at all times. Immediately tighten or replace loose or broken bolts.

10.1.2 Fuel and oil up hammer.

10.1.3 After every 30-40 minutes of driving time, grease each grease fitting on lower cylinder (four grease fittings) with 4 to 5 strokes from the grease gun. Use only:
TRC Moly-High-Temp grease
Manufactured by Texas Refinery Corp.
CAUTION:
When greasing, set the hammer on the ground or on a pile so the impact block is fully pushed into machine. Do not grease when the impact block is hanging out.

10.1.4 Grease fittings on upper cylinder are only to be greased on batter piles in Intervals of two hours of driving time (4 to 5 strokes).

10.1.5 Check grease fitting on tripping device/ lifting cam and grease as needed.

10.1.6 Replace broken or plugged grease fittings immediately.

10.1.7 Check all cables, hammer, lead and drive cap. Make sure cables are of sufficient capacity for load requirements. (See OSHA table at the back of this manual.)

10.2 MONTHLY MAINTENANCE

10.2.1 Check inner cylinder end ring clearance (Fig. 22).

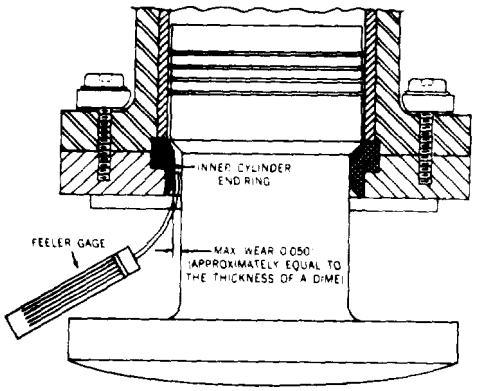


Figure 22

Drop impact block out approximately 5". Run come-along around impact block and lead and pull impact block towards the lead. Measure clearance between inner cylinder end ring and neck of impact block with feeler gauge. If clearance approaches 50/1000" (1.25mm), replace inner cylinder end ring. (See section 10.3.)

CAUTION:

Wear beyond 50/1000" (1.25mm) causes excessive wear on lower cylinder and eventually will crack the lower cylinder, and will void warranty.

10.2.2 Check compression. Place hammer on an already driven pile and make a cold blow. Observe piston through pick-up slot on upper cylinder. The piston should rebound at least eight times (pronounced rebounds) If not, change piston rings. (See section 10.3)

10.2.3 Check catch groove on upper cylinder. Corners must be square (Fig. 23).

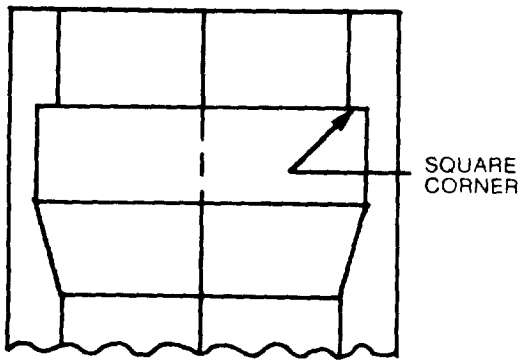


Figure 23

10.3 CHANGING INNER CYLINDER END RING, PISTON RINGS, AND/OR RUBBER RING IN VERTICAL POSITION

10.3.1 Block up drive cap on ground and detach drive cap cables. Drive cap must be level.

10.3.2 Set hammer on drive cap.

10.3.3 Raise piston by means of tripping device so piston barely shows at top of upper cylinder (just as you would fill the oil chamber).

10.3.4 Remove oil plug and install eye bolt instead.

10.3.5 Attach second crane line to eye bolt (Fig. 24).

Figure 24

10.3.6 Carefully lower piston via tripping device until the trip can be engaged to the lifting blocks on upper cylinder.

10.3.7 Put strain on hammer line and piston line, but do not lift the piston or the hammer.

10.3.8 Release piston from tripping device by striking the trip cam lever with a hand hammer (Fig. 25).

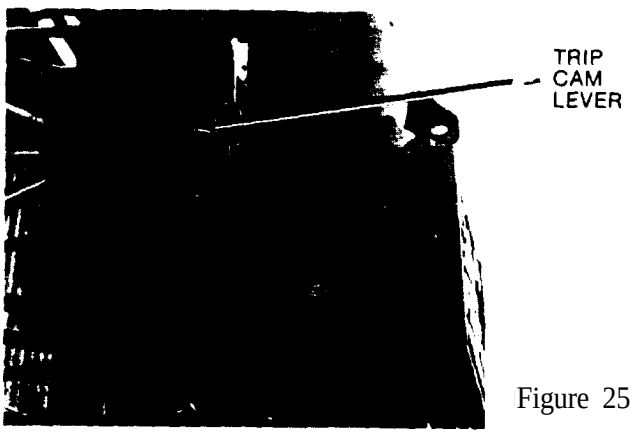


Figure 25

10.3.9 Lower piston via crane line until this line goes slack.

10.3.10 Remove cylinder end ring bolts and ring segments (Fig. 26).

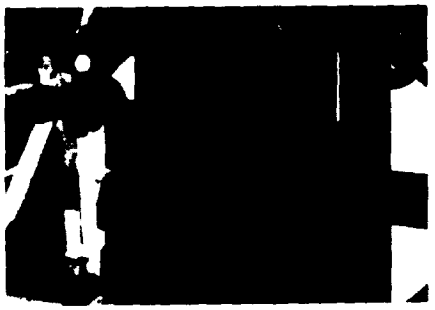


Figure 26

10.3.11 Lift cylinder by means of tripping device to the position shown (Fig. 27) and install two end ring bolts directly opposite each other. At this point, all piston rings and catch ring can be inspected.

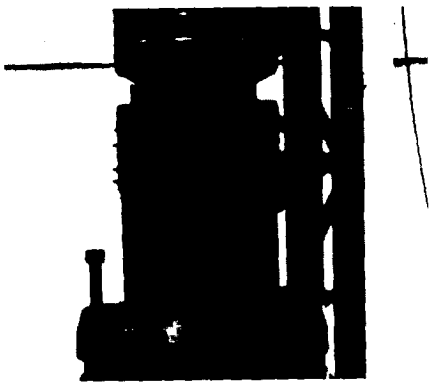


Figure 27

10.3.12 Install two equally long chains or chokers to the end ring bolts and the lifting eyes on lower cylinder and raise cylinder so the outer end ring is high enough to slip the dismounting plates under the end ring (Fig. 28).

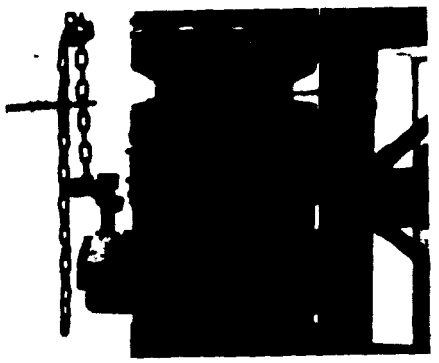


Figure 28

10.3.13 Lower cylinder until chains or chokers have a slack of approximately 2" (50mm).

10.3.14 Tap outer end ring with hand hammer until the two halves of the inner cylinder end ring can be removed

10.3.15 Lift outer end ring via cylinder until the dismounting plates can be removed. Lower outer end ring until it firmly rests on the flange of the impact block. Remove chains or chokers and the two end ring bolts.

10.3.16 Install new inner cylinder end ring. Do not use a hammer directly on the end ring. Tap with wood blocking only (Fig. 29).

Figure 29

10.3.17 Raise piston until a gap of approximately 2" (50mm) is seen between piston and impact block. Remove old rings and install new rings using piston ring pliers (Fig. 30)

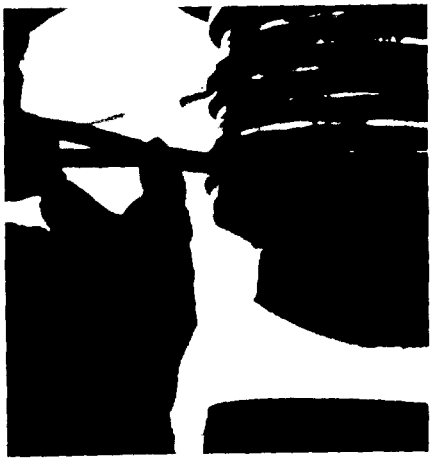


Figure 30

10.3.18 Install piston ring band around the piston and carefully raise until piston is fully into cylinder (Fig. 31).

Figure 31

10.3.19 Dog off piston line.

10.3.20 Install piston ring band around impact block and carefully lower the cylinder (Fig. 32).

Figure 32

10.3.21 Just before the installing band touches the outer end ring, remove installing band (Fig. 33).

Figure 33

10.3.22 Lower cylinder down to end ring. Leave small gap so the end ring can be turned to line up the bolt holes. Install ring segments and end ring bolts. Ring segments and bolts must be installed simultaneously (Fig. 34). Chamfer on ring segment must bridge radius between cylinder and flange (Fig. 35).

Figure 34

Figure 35

10.3.23 Tighten end ring bolts securely.

10.3.24 Lower piston line until piston rests on impact block.

10.3.25 Lower tripping device so the pawl will be engaged in pick-up groove on piston.

10.3.26 Pull trip rope and carefully lift piston until the piston is just visible above top of upper cylinder.

10.3.27 Detach crane line from piston, remove eye bolt and install oil plug.

10.3.28 Carefully lower piston with tripping device until the hammer can be picked up by the lifting blocks.

10.3.29 Raise hammer about 6 inches allowing impact block to come out of hammer. Check rubber ring per 10.4.6.1.

10.3.30 Pry out rubber ring halves from outer end ring.

10.3.31 Grease wide side of rubber ring halves and reinstall into end ring cavity.

10.3.32 Drop hammer using it's weight to snap rubber ring into cavity.

10.4 DISASSEMBLY AND REASSEMBLY OF HAMMER IN HORIZONTAL POSITION.

The hammer should be in a horizontal position supported on blocks (approximately 12" off ground), placed beneath the guiding positions of the lower cylinder. The work will require either a crane or fork lift of at least 8,000 lb. capacity.

10.4.1 GUIDES COMPLETE (item 1 page 55).

10.4.1.1 Remove 16 ea. socket head cap screws (item 7 page 55) and lock washers (item 5 page 55) that connect tripping device to gibs (item 8 page 55). Remove from starter guides (item 3 and 4 page 55).

10.4.1.2 Remove 4 ea. hex head screws (item 6 page 55) and lock washers (item 5 page 55) connecting starter guides to upper cylinder.

10.4.1.3 Remove 4 ea. socket head cap screws (item 18 page 35) and lock washers (item 15 page 35) and take off starter guides from upper cylinder.

10.4.1.4 Reassemble in reverse order, torque bolts to following minimums, item 18 to 260 ft.-lb., and item 6 and 7 to 144 ft.-lb.

10.4.1.5 The side guides (item 10 page 55) do not have to be removed to perform any other maintenance but removal is accomplished by taking out 16 ea. socket head cap screws (item 14 page 55) and lock washers (item 13 page 55) and then prying out the side guide from lower cylinder. The spool (item 12 page 55) and split pin (item 11 page 55) come with side guide and do not have to be disassembled.

10.4.1.6 Reassemble in reverse order, torque item 14 to a minimum of 470 ft.-lb.

10.4.2 UPPER CYLINDER (item 2 page 33).

10.4.2.1 Remove 8 ea. socket head cap screws (item 14 page 35) and lock washers (item 15 page 35) connecting upper cylinder to lower cylinder.

10.4.2.2 Place chocker around upper and support as upper cylinder is slid off the piston.

10.4.2.3 Check upper for any inward projections that would drag on piston such as a rolled in catch groove, see Section 10.2.3, repair.

10.4.2.4 Reassemble in reverse order, torque bolts to a minimum of 260 ft.-lb.

10.4.3 IMPACT BLOCK (item 4 page 33).

10.4.3.1 Remove 16 ea. socket head cap screws (item 12) lock washers (item 13) along with 4 ea. ring segments (item 5) connecting lower cylinder (item 1) to outer end ring (item 2) as shown on page 35.

10.4.3.2 Pry out impact block enough to place chocker around impact block shank. Support impact block while sliding it out of lower cylinder. The impact block will come out as a unit with it's piston rings (item 6 page 39), outer end ring (item 2 page 35), inner cylinder end ring (item 3 page 35), and rubber ring (item 4 page 35).

10.4.3.3 Check piston rings (10.4.4), inner cylinder end ring (10.4.5), rubber ring 10.4.6), and lower cylinder (10.4.8) before reassembly.

10.4.3.4 Reassemble in reverse order (see 10.3.20 through 10.3.22), torque bolts to a minimum 470 ft.-lb.

10.4.4 PISTON RINGS (item 6 page 39).

10.4.4.1 Remove piston rings using piston ring pliers (see 10.3.17).

10.4.4.2 Check gap of ring. A new ring will have a gap of approximately 1-5/16" if the gap is less than 1/2" replace.

10.4.4.3 Check chrome on outer ring surface, if badly worn, replace.

10.4.4.4 Reassemble after checking inner cylinder end ring and rubber ring.

10.4.5 INNER CYLINDER END RING (item 3 page 35).

10.451 Check clearance per 10.2.1, if in excess of 0.050", replace.

10.4.4.2 Remove and install new inner cylinder end ring per procedure detailed in 10.3.12 through 10.3.16.

10.4.6 RUBBER RING (item 4 page 35).

10.4.6.1 Check both halves to see if rubber has at least 1/2 of it's original surface, if not, replace.

10.4.6.2 Lift outer end ring (item 2 page 35) up over the impact block after the inner cylinder end ring has been removed.

10.4.6.3 Turn end ring over so that rubber ring is up and pry out of end ring cavity with screw driver.

10.4.6.4 Grease rubber ring and set wide side down into cavity of end ring and drive into same with hammer.

10.4.7 PISTON (item 3 page 33).

10.4.7.1 Place checker about piston at two points and hold up as the piston is slid out the top of the lower cylinder.

10.4.7.2 Remove piston rings (item 2 page 39) and catch ring (item 3 page 39) using piston ring pliers (see 10.3.17).

10.4.7.3 Check ring gap per 10.4.4.2, replace as needed.

10.4.7.4 Check chrome surface per 10.4.4.3, replace as needed.

10.4.7.5 Reassemble in reverse order using piston ring installing band to compress rings.

10.4.8 LOWER CYLINDER (item 1 page 33).

10.4.8.1 The lower cylinder is in it's disassembled state after removal of upper cylinder (see 10.4.2), impact block (see 10.4.3), and piston (10.4.7).

10.4.8.2 The bore diameter as manufactured is 11.811" plus 0.008", this measurement should be checked at the area where the rings of the impact block and piston ride during combustion. The maximum bore allowed is 11.851" with a maximum out of round tolerance of 0.0l0", readings in excess require replacement of lower cylinder.

10.4.9 FUEL PUMP (item 6 page 33).

10.4.9.1 Remove 6 ea. lock nuts (item 11 page 35) and disconnect 2 ea. fuel lines (item 7 page 33) from fuel pump.

10.4.9.2 Lift pump off pump studs and perform testing and repair per section 11.

10.4.9.3 Reassemble pump on lower cylinder, torque nuts to a minimum of 32 ft.-lb. Hook up fuel lines, tighten snugly only.

10.4.10 TRIPPING DEVICE (item 5 page 33).

10.4.10.1 Remove 4 ea. locking screws (item 13 page 41) with spring plate (item 11 page 41) and leaf spring (item 12 page 41), replace leaf spring if bent.

10.4.10.2 Drive out roll pins (item 15 and 16 page 41) connecting cam to lever (item 7 page 41), replace if broken.

10.4.10.3 Drive out lever from cam (item 7 page 41) and trip body (item 1 page 41), replace if shaft is bent.

10.4.10.4 Pull cam out of body and remove 2 ea. joint pins (items 5 page 41) from 2 ea. lugs (item 6 page 41). If pins are bent or lugs are stretched, replace.

10.4.10.5 Remove circlip (item 18 page 41) from pawl pin (item 4 page 41).

10.4.10.6 Drive out pawl pin from trip body (item 1 page 41) and pawl (item 3 page 41). If end of pawl has been damaged, or holes oblonged, replace. If pawl pin is bent, replace.

10.4.10.7 Remove 3 ea. locking screws (item 13 page 41) to release cover (item 10 page 41) and torsion spring (item 9 page 41), if damaged, replace.

10.4.10.8 Drive out roll pin (item 17 page 41) to disconnect lever (item 8 page 41) from lifting cam (item 2 page 41).

10.4.10.9 Reassemble in reverse order, torque locking screw to a minimum 32 ft-lb.

10.5 PRIMARY DRIVE CAP (item 1 page 57).

The Installation of cushion and anvil are covered under 6.1. The rigging of the primary drive cap is covered under 6.2 and of the secondary under 6.3.

10.5.1 Drive out 8 ea. split pins (item 13 and 14 page 57) completely from primary drive cap. It is good practice to replace split pins if they have been in service more than 6 months even though they may appear undamaged.

10.5.2 The insert (item 12 page 57) will slide out of the slot in the primary drive cap.

10.5.3 Reassemble in reverse order playing attention that the slot of the larger split pin (item 13 page 57) is pointing down and the slot of the smaller split pin (Item 14 page 57) is pointing up.

11. FUEL PUMP REPAIR AND TESTING

11.1 DISASSEMBLY (Fig. 36)

11.1.1 Disassembly is best done while holding the pump body in a vise with regulator control hoses removed.

11.1.2 Pull pump lever pin (N) and remove pump lever (P).

11.1.3 Remove locking screw (A) with 13mm socket and pull off locking plate (B).

11.1.4 Remove locking nut (C) with 32mm socket and carefully pull out element's piston (D) and spring (E).

11.1.5 Remove entire check valve assembly by unscrewing locking screw (L) with 32mm socket.

11.1.6 Remove regulator unit by removing three locking screws (M).

11.1.7 Remove all regulator parts.

11.1.8 Take pump body out of vise. Turn pump body upside down and bounce the body on a piece of hardwood until pressure piece (F) and cylinder element (H) drop out.

11.1.9 Clean all parts thoroughly with an authorized cleaning solvent.

11.1.l0 Check all parts for wear or damage as follows:

11.1.11 Check pump lever (P) for flat spots on face of lever and for wear on lever's nose.

11.1.12 Check pump lever pin (N) for wear. Replace if necessary.

11.1.13 Insert piston (D) into cylinder element (H). Close bottom of cylinder element with the palm of your hand and pull piston out. The element should create obvious suction. Check top of piston assembly for wear. The pump element assembly must be replaced as a whole, since the piston (D) and the cylinder (H) are a lapped set.

11.1.14 Check buna cone (I) for damage or dirt inclusions on the sealing surface. Check valve spring (K) for proper length. It should be 40mm (1.57") long. If length approaches 38mm (1.5"), the spring has lost tension and should be replaced.

11.1.15 Check whether valve body (J) moves freely within the locking nut (L).

11.1.16 Check all O-rings for damage.

11.2 ASSEMBLY (Fig. 36)

11.2.1 Make sure all parts, including pump body, are absolutely clean. Assembly is best done while holding the pump body in a vise.

11.2.2 Place O-ring (G) over cylinder element (H). Place pressure piece (F) over cylinder element (H). Install pressure spring (E) and piston element (D) into cylinder element (H). Install complete assembly into pump body. Be sure the inside of the pump body is clean, since there is a metal to metal seal between the cylinder (H) and the body.

11.2.3 Install locking nut (C) with 32mm socket and tighten securely. Install locking plate (B), and secure with locking screw (A) using a 13mm socket.

11.2.4 Install pump lever (P) with pump lever pin (N). Set cotter pin (O).

11.2.5 Install check valve assembly (L). Secure buna cone (I) to valve body (J) with a drop of petroleum jelly. Grease O-ring slightly with petroleum jelly, and tighten locking screw (L) securely with 32mm socket.

11.2.6 Assemble and install regulator unit and plug, and tighten locking screws (M) securely with 13mm socket.

11.3 BENCH TESTING THE PUMP (Fig. 36)

11.3.1 Hook up hydraulic control lines and master control (see Section 8.3).

11.3.2 Place fully assembled pump upright into vise, with pan below nozzle to catch fuel.

11.3.3 Connect one side of the pump to a diesel fuel reservoir by means of the fuel line. Connect second fuel line to other side of pump. This line acts as a breather line, and must return back to the reservoir.

11.3.4 Operate the pump lever (P) slowly by hand until no more air bubbles are visible in either breather line or fuel line. Place a 7.2mm (9/32") thick washer over the top of the piston assembly (D). This washer limits the stroke to the actual conditions that would exist were the pump mounted to the machine.

11.3.5 **Output Test:**
Activate pump lever (P) for 20 strokes, stroking about once every second. Measure the output with a cc Burette. Repeat test a minimum of three times.

11.3.6 **Output Test Result More Than 50cc:**

11.3.6.1 Observe nozzle for dripping fuel when pump is idle. If dripping, check for:
A.) Damaged buna cone (I)
B.) Weak valve spring (K), see 2.8.4
C.) Valve body damaged beneath buna cone (I).

11.3.6.2 Excessive stroke caused by incorrect gauge washer or lack of washer (see 4.3).

11.3.7 **Output Test Result Less Than 47cc:**

11.3.7.1 Air in system (see 8.2 and 8.3).

11.3.7.2 Improper return of element piston (D). Look for damage between the shaft and the inside of the locking nut (C).

11.3.7.3 Check to see if locking pin in element piston (D) has worked out, preventing movement in locking nut (C).

11.3.7.4 Leakage out top of pump. Check O-ring (G) for damage.

11.3.7.5 Master control lever improperly positioned (see 8.3.12).

NOTE:
A worn pump lever (P), pump lever pin (N), and/or top of piston assembly (D) will not affect output of bench test, but will affect actual output when machine is in operation.

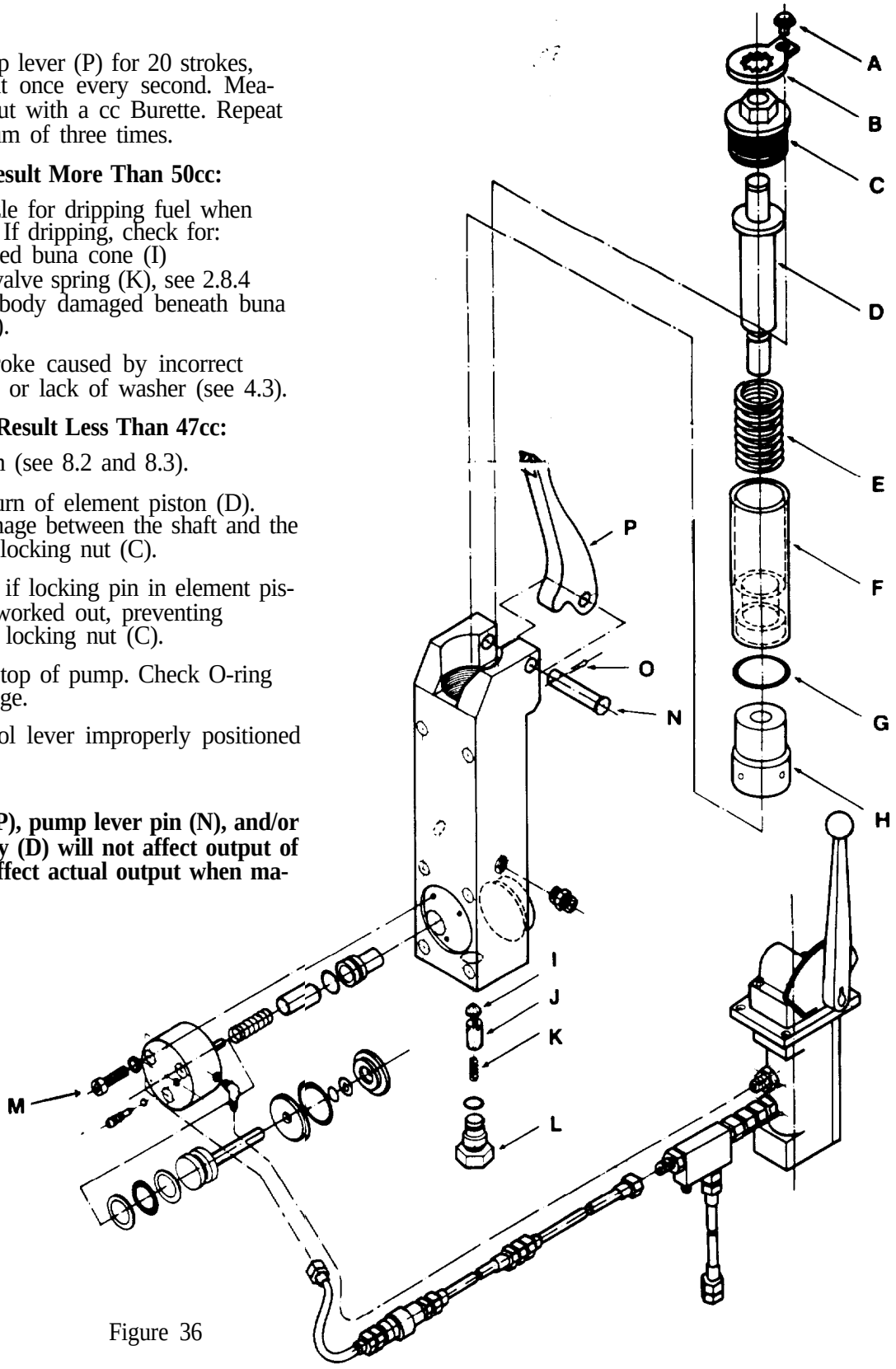


Figure 36

12. PILE DRIVING DO'S AND DON'TS

12.1 Do keep hammer and pile in alignment. Misalignment causes excessive wear and tear on the hammer and can cause pile damage.

12.2 Do not allow the piston to hit the catch groove. Regulate pump down in time.

12.3 Do not exceed the maximum permissible batter as given in the specifications.

12.4 Do not attempt to start the hammer if the impact block is hanging out. This will increase the compression and most certainly damage the catch groove and catch ring, and could fire the piston clear out of the machine.

12.5 Do set the machine gently on a pile or on the ground. Do not drop it on the pile. A warmed up machine can fire if it is dropped on pile.

12.6 Do not tie the trip rope down. Keep the rope clear at all times.

12.7 Do not operate the hammer in excess of 240 blows per foot = 20 blows per inch = 1/2" per 10 blows (8 blows per centimeter).

12.8 Do not operate the hammer with worn or bent side guides and gibs.

12.9 If the driving is soft, use a few cold blows to get to sufficient resistance instead of trying to fire the hammer at the first blow.

12.10 Do not use the entire hammer as a drop hammer to seat a pile. Use a cold blow.

12.11 Use #2 diesel fuel only. Do not use kerosene or other substitutes.

12.12 Use specified grease only:
TRC Moly-High Temp grease
Manufactured by Texas Refinery Corp.

12.13 Do not stand in a position where you could be struck by the hammer if it should come down the lead at any time.

12.14 During operation, keep clear of hammer at all times.

12.15 Keep clear of high tension power lines. (See OSHA table at the back of this manual.)

12.16 Use safety belt when climbing leads.

13. HAMMER IN TRANSIT

13.1 When transporting the hammer, make sure to have transport screw and safety clamp installed to keep piston and impact block from sliding out of cylinder.

13.2 Do not run chain binders over the upper cylinder. Use chain binders on lower cylinder only.

13.3 Install dust cap and exhaust port covers.

14. TROUBLE SHOOTING

14.1 HAMMER WON'T START

NOTE: A difficulty not related to any mechanical problem is a lack of pile resistance — soft ground. The trouble shooting of the pile hammer should be approached with the same logic as would be utilized for a diesel engine.

	SYMPTOM OF TROUBLE	PROBABLE CAUSE	TEST	REMEDY
14.1.1	Black exhaust smoke, dead sound when piston strikes impact block.	Hammer flooded with fuel.	Remove lock nut (item 11 page 35) slide pump back away from hammer, leaving fuel lines hooked up. FUEL DRIPPING FROM NOZZLE — YES: Replace buna cone (item 28 page 43) or valve pressure spring (item 26 page 43); NO: Clean combustion chamber per 7.4 and restart	
14.1.2	Intermittent gray to white exhaust smoke	Hammer flooded with contaminated fuel, from water in tank, or rain.	Remove locking screw (item 24 page 43) from fuel pump. WATER IN LOCKING SCREW — YES: Drain fuel tank, clean pipe joint filters (item 17, page 35), and refill with clean diesel fuel; NO: Clean combustion chamber per 7.4 and restart	
14.1.3	No smoke or little smoke	No fuel or too little.	Remove lock nut (item 11 page 35) slide pump back away from hammer, leaving fuel lines hooked up. Pull on pump lever. FUEL SQUIRTING OUT NOZZLE — YES: Remove fuel pump per section 10.4.9 check fuel pump and regulation system per section 8 and 11, repair.; NO: Check fuel output per Section 11.3, repair and restart	
14.1.4	Piston hits impact block with sharp noise but does not rebound.	Compression too low.	Raise hammer so impact block is capable of dropping out. Impact block drops out — YES: Disassemble impact block per Section 10.3. check piston rings per 10.4.4, inner cylinder end ring per 10.4.5, rubber ring per 10.4.6 and lower cylinder per 10.4.8, replace.; NO: Make a cold blow of hammer per Section 10.2.2. Piston rebound 8 times — NO: Disassemble piston per Section 10.3 check piston rings per 10.4.4, replace, reassemble and restart.	

14.2 TRIPPING DEVICE WON'T START THE HAMMER

	SYMPTOM OF TROUBLE	PROBABLE CAUSE	TEST	REMEDY
14.2.1	Piston can't be raised.	Tripping device linkage is damaged.	The failure to pick the piston is the test. →	Remove tripping device from hammer per Section 10.4.1.1. Disassemble per Section 10.4.10.1 through 10.4.10.6, repair, reassemble and restart.
14.2.2	Piston releases too early.	Tripping device leaf spring, or trip cam with lever is damaged	The early release of the piston is the test. →	

14.3 TRIPPING DEVICE WON'T RAISE HAMMER

	SYMPTOM OF TROUBLE	PROBABLE CAUSE	TEST	REMEDY
14.3.1	Lifting cam doesn't engage upper cylinder.	Lifting cam torsion spring has failed or lack of lubrication on lifting cam's shaft.	The inability to raise the hammer is the test. →	Remove tripping device from hammer per Section 10.4.1.1. Disassemble per Sections 10.4.10.7 through 10.4.10.9 repair, reassemble and install.

14.4 ERRATIC PISTON STROKE

NOTE: Variable soil conditions can cause a variable stroke for which there is no mechanical solution.

SYMPTOM OF TROUBLE	PROBABLE CAUSE	TEST	REMEDY
Short, slow, steady stroke as if piston is dragging.	Lack of lubrication or damaged upper cylinder.	Visually observe piston OIL PRESENT — NO → Fill piston with oil per Section 7.2 YES ↓ PISTON ROTATING — NO → Check upper cylinder for damage see Section 10.4.2.3.	
Erratic stroke, with black exhaust smoke.	Hammer flooding.	See Section 14.1.1	See Section 14.1.1
Erratic stroke, with intermittent gray to white exhaust smoke	Contaminated fuel.	See Section 14.1.2	See Section 14.1.2

15. OSHA TABLES

MINIMUM ELECTRICAL CLEARANCES

Voltage	Minimum Clearance
0 kV to 50 kV	10 feet
50 kV to 100 kV	12 feet
100 kV to 150 kV	14 feet
150 kV to 200 kV	16 feet

MINIMUM CABLE CAPACITIES
(WIRE ROPE – 6 x 19, 6 x 21 and 6 x 25)

	Improved Plow Steel		Extra Improved Plow Steel
	Fiber Core	Wire Rope Core	Wire Rope Core
Diameter	Breaking Strength in Tons		
3/8"	6.10	6.56	– –
7/16"	8.27	8.89	– –
1/2"	10.70	11.50	13.3
9/16"	13.50	14.50	16.8
5/8"	16.70	17.90	20.6
3/4"	23.80	25.60	29.4
7/8"	32.20	34.60	39.8
1"	41.80	44.90	51.7
1-1/8"	52.60	56.50	65.0
1-1/4"	64.60	69.40	79.9
1-3/8"	77.70	83.50	96.0
1-1/2"	92.00	98.90	114.0

SAFETY FACTORS: OSHA 1926.251 (c)(l) Wire rope "provided that a safety factor of not less than 5 is maintained."

16. SAXIMETER™

16.1 INTRODUCTION

The SAXIMETER™ stroke indicator is an electronic instrument that (a) detects the occurence of an impact; (b) determines the duration between consecutive blows, Δt; (c) converts Δt to the corresponding fall height or stroke of an *Open End Diesel* ram; (d) counts blows; and (e) determines average stroke values. The current model contains two methods by which the occurrence of the blow is detected; the first is a manual *pushbutton* and the second is a *sound recognition* circuit.

The conversion from Δt to the fall height is made using an equation derived from both field observation and laboratory analysis and is based on a free fall assumption with a built in correction for friction and precompression. Comparisons with field results indicate that the equation predicts well within $\pm$0.3 feet.

It must be emphasized that only open end diesel hammers have both upward and downward free fall ram motion. However, the SAXIMETER™ Stroke Indicator can effectively be utilized to monitor other hammer types by converting the indicated stroke value to blow rate, BR, using either Figure 39 or 40 on page 25. Blow rate has the dimension blows per minute (BPM). The highest blow rate measurable by the SAXIMETER™ Stroke Indicator is 85 BPM.

16.2 OPERATION

Several circuits and controls are built into the SAXIMETER™ stroke indicator. The following details for proper operation are dealt with in this section (see also Figure 37).

(1) Power Switch (BAT)
(2) Microphone Switch (MIC) and External Microphone
(3) Sound Level Adjustment (I, II, III)
(4) Manual Trigger (M)
(5) Average Display Mode (A)
(6) Blow Display Mode (B)
(7) Warning Signals

16.3 DISPLAY MODES

16.3.1 MANUAL TRIGGER

There may be instances when no distinct hammer sound can trigger the instrument; for example, the hammer may be visible but not audible, or the background noise exceeds the hammer SPL. In those cases the instrument can be triggered manually by depressing M quickly and firmly. "MIC" should be switched *off*.

16.3.2 DISPLAY MODE B

All time increments, Δt, , recognized by the instrument and converted to stroke cause the blow number to be incremented by one and to display the the new stroke and its corresponding blow number. Note that the blow number displayed is one less than the number of actual impacts. Thus, if the blow counter is used to obtain a driving log, one blow has to be added to the number displayed. The maximum blow number is 999. After exceeding this upper limit, counting restarts at 0.

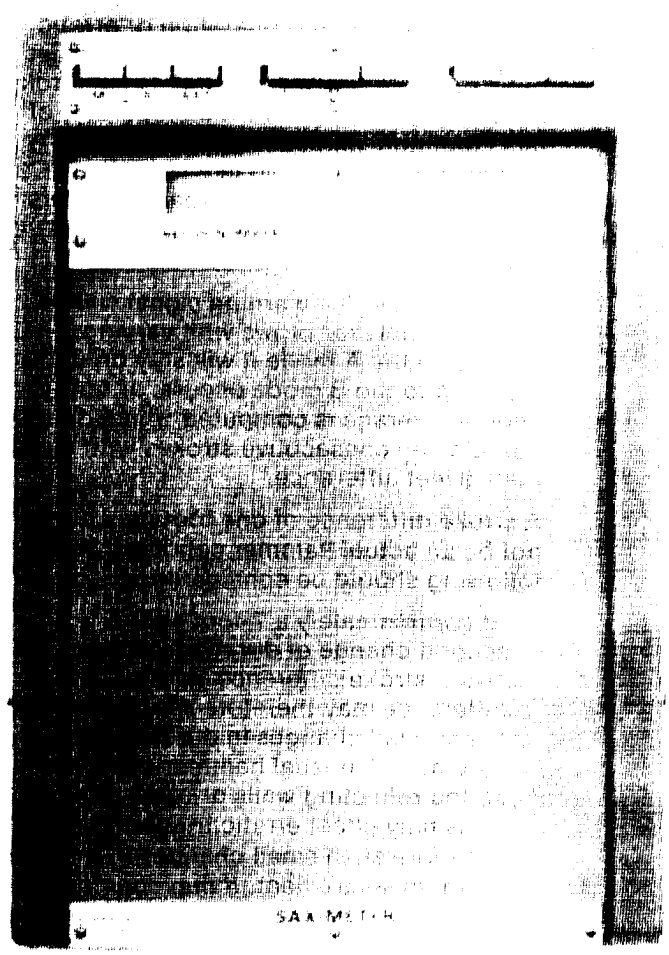


Figure 37

16.3.3 DISPLAY MODE A

All strokes determined after "BAT" was switched on or after "A" was depressed are summed. When "A" is depressed. the average stroke is computed and displayed together with the number of strokes averaged. The average mode of display is identified by an A in the last position of the stroke display. The average result is displayed until either "B" or "A" is again depressed.

In the "A" mode, triggering and computation proceed exactly as in the "B" mode An indication that triggering occurs is given by the blinking of the A indicator. The blow number is reset and the summation of strokes is restarted at zero with each depression of "A". If "A" is again depressed, a new average and corresponding blow count will be given. Note that the computation of the average takes a brief but noticeable time and that display of the average occurs approximately one-half second after "A" is depressed.

16.3.4 WARNING SIGNAL

Inconsistent hammer operation or erratic triggering can cause varying stroke values to be displayed by the SAXIMETER™ Stroke Indicator. In order to warn the operator of this condition, all decimal points in BLOW NUMBER and the colon in STROKE are displayed when any stroke reading differs from the previous stroke by one foot or more.

In the B mode, the warning signal will be displayed only for blows with varying strokes. In the A mode it will stay on until resetting to the B mode occurs or until another average is computed which did not contain any consecutive strokes with more than 9 feet difference.

A stroke difference of one foot may or may not be an actual hammer condition and the following should be considered.

At approximately a 7-foot stroke, a 0.10 second change of duration, Δt, causes a l-foot stroke difference. A 1-foot stroke difference may therefore result from relatively small changes in duration measurement. Unusual hammer-pile systems, sound reflecting walls or other conditions may effect erratic triggering and therefore such small changes in the duration measurement. *It may then be necessary to find another microphone location where steady triggering occurs.* It is easily determined by observation of the ram travel whether or not the hammer strokes inconsistently. If it does, the cause (lack of lubrication, malfunctioning fuel pump, poor hammer-pile alignment, etc.) for the varying stroke should be determined and corrected to improve the hammer performance.

16.4 BATTERED PILE DRIVING

Driving battered piles causes increased ram friction and a gravity that is reduced in the axial direction.

Figure 40 lists correct strokes, h_b, given a SAXIMETER™ Stroke Indicator reading h and a batter angle α. A friction angle of ϑ = 1.1 degrees was assumed for computation of the results and has little effect on the correction

The results of Figure 40 indicate insignificant errors of the uncorrected readings for batters less than 1 5. Corrections for such small batters can therefore be ignored For batters greater than 1-2 the results are greatly affected by the corrections Even after correction. the SAXIMETER™ may be in error due to the uncertainty of friction losses.

16.5 ACCURACY

SAXIMETER™ Stroke Indicator equations were derived under the assumption of normal, i.e minimal. ram friction. Of course, extreme friction would reduce the ram velocity. Then the stroke reading on the SAXIMETER™ Stroke Indicator would be too high. The ram surface should appear moist if it is well lubricated. Scratches on the piston surface caused by foreign matter may be an indicator of extreme friction.

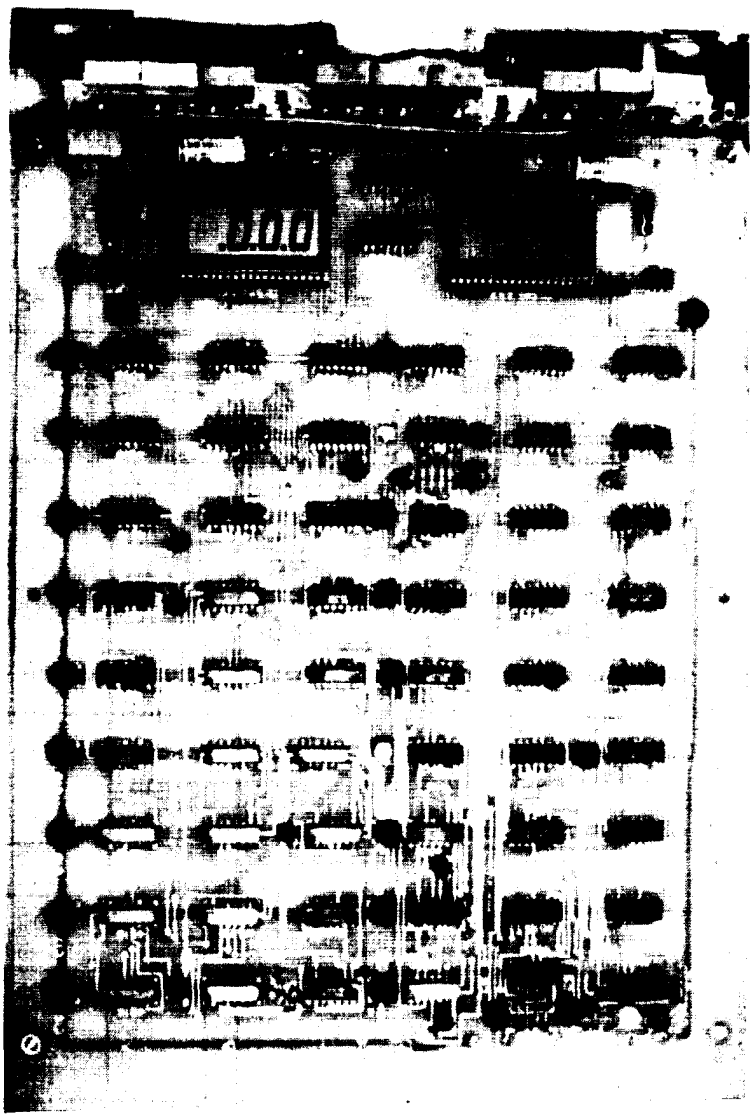
Another note: the built-in microphone easily picks up "body-noise" of the SAXIMETER™ Stroke Indicator. For example, working on the unit or switching the A, B or other controls may be interpreted as hammer impact. Thus, for a reduced change of erractic readings, switching and writing should be limited to the trigger delay time of 0.7 seconds after a blow.

16.6 MAINTENANCE

There is little maintenance needed. However, caution must be exercised to insure the displays are protected from extended exposure to direct sunlight or heat. LCD displays have a limited life and replacement should be done by the manufacturer.

The 9V transistor batteries are rechargeable. Recharging is only possible with "BAT" switched off. The SAXIMETER™ Stroke Indicator should be attached to the recharger unit and be used only on 60 Hz 115 volt power. Full battery capacity will be achieved after 14 hours of recharging. If the charger is left on even longer, no damage to the unit will occur.

In case the batteries need to be exchanged, the "BAT" button must be released to the off position. Then the four screws holding the top to the bottom case have to be removed (see Figure 38). The top cover can now be lifted and the batteries removed from their fittings. The new batteries, after being connected to their respective clips, should be carefully inserted in their foam fittings.



SAXIMETER™ Stroke Indicator View After Removing Cover

Figure 38

16.7 CONVERSION TABLE

Conversion of SAXIMETER™ Stroke Indicator reading, h (feet) to Blow Rate BR (Blows per Minute)

(tenths) Stroke (ft)	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
2	79.1	77.5	75.9	74.4	73.0	71.7	70.5	69.3	68.2	67.1
3	66.1	65.1	64.2	63.3	62.4	61.6	60.8	60.0	59.3	58.6
4	57.9	57.2	56.6	56.0	55.4	54.8	54.2	53.7	53.1	52.6
5	52.1	51.6	51.2	50.7	50.3	49.8	49.4	49.0	48.6	48.2
6	47.8	47.4	47.1	46.7	46.4	46.0	45.7	45.4	45.0	44.7
7	44.4	44.1	43.8	43.5	43.2	43.0	42.7	42.4	42.2	41.9
8	41.7	41.4	41.2	40.9	40.7	40.5	40.2	40.0	39.8	39.6
9	39.3	39.1	38.9	38.7	38.5	38.3	38.1	37.9	37.8	37.6
10	37.4	37.2	37.0	36.9	36.7	36.5	36.3	36.2	36.0	35.9
11	35.7	35.5	35.4	35.2	35.1	34.9	34.8	34.6	34.5	34.4
12	34.2	34.1	33.9	33.8	33.7	33.5	33.4	33.3	33.2	33.0

Example: h = 6.5 feet yields blow rate BR = 46.0 blows per minute

Figure 39

16.8 Curve-Stroke (FT) vs Blow Rate (B/M) vs Potential Energy (FST-LB)

Conversion of SAXIMETER™ Stroke Indicator Reading, h (feet) to Blow Rate BR (Blows per Minute)

Example:
h = 6.5 feet yields blow rate BR = 46.0 blows per minute = 21,450 ft-lbs.

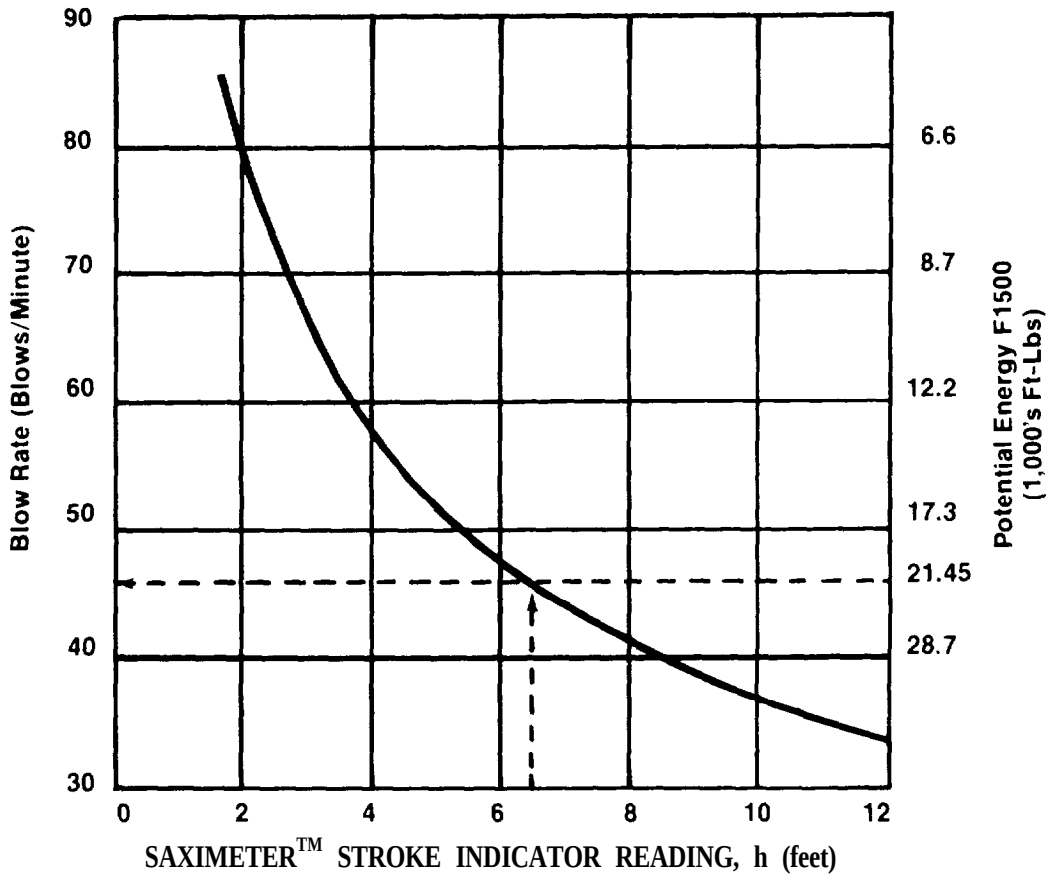


Figure 40

16.9 CORRECTED STROKES TABLE

Corrected Strokes h_b (Feet) as a function of Reading, h and batter

Batter Angle α	Batter Ratio	Stroke Reading, h, (Feet) 4	5	6	7	8	9	10	11	12
4.8	1:12	4.0	5.0	6.0	7.0	8.0	9.0	10.0	10.9	11.9
5.7	1:10	4.0	5.0	6.0	7.0	7.9	8.9	9.9	10.9	11.9
7.1	1:8	4.0	5.0	5.9	6.9	7.9	8.9	9.9	10.9	11.9
9.5	1:6	3.9	4.9	5.9	6.9	7.9	8.9	9.8	10.8	11.8
11.3	1:5	3.9	4.9	5.9	6.8	7.8	8.8	9.8	10.7	11.7
12.5	1:4.5	3.9	4.8	5.8	6.8	7.8	8.7	9.7	10.7	11.7
14.0	1:4	3.8	4.8	5.8	6.7	7.7	8.7	9.6	10.6	11.6
16.0	1:3.5	3.8	4.8	5.7	6.7	7.6	8.6	9.5	10.5	11.5
18.4	1:3	3.7	4.7	5.6	6.6	7.5	8.5	9.4	10.3	11.3
21.8	1:2.5	3.6	4.6	5.5	6.4	7.3	8.2	9.2	10.1	11.0
26.6	1:2	3.5	4.4	5.2	6.1	7.0	7.9	8.8	9.7	10.6
29.7	1:1.75	3.4	4.2	5.1	5.9	6.8	7.6	8.5	9.4	10.2
33.7	1:1.5	3.2	4.0	4.8	5.6	6.5	7.3	8.1	8.9	9.7
38.7	1:1.25	3.0	3.8	4.5	5.3	6.1	6.9	7.7	8.4	9.2
45.0	1:1	2.6	3.3	3.9	4.6	5.3	6.0	6.7	7.4	8.1

Example: SAXIMETER™ Stroke Indicator Reading h = 7.5 feet and batter 1:2 yield stroke 6.5 feet (in axial direction)

CHAPTER 2

SECTION I

SUPPLEMENTAL OPERATING MAINTENANCE AND REPAIR PARTS INSTRUCTIONS (SOMARPI)

1. PURPOSE: To provide user and support personnel supplemental operating, maintenance and repair parts instructions that have special application to Military Adopted Commercial Items (MACI).

2. SCOPE: This application applies to Department of the Army Units, organizations and activities that use and/or support the hammer, pile driver, Foundation Equipment Corporation Model 1500.

3. MILITARY ADOPTED COMMERCIAL ITEM (MACI): The term "MACI Item" used in this publication applies to a standard commercial item of construction equipment that has been approved and adopted by the Army for a specific TOE requirement and is procured and supported under the CCI system plan. The plan permits maximum utilization of the civilian construction industry's competitive research and development, manufacturer's equipment publications and commercial sources for repair parts.

4. DESCRIPTION: The hammer shall be self-contained, consisting essentially of a cylinder, free piston or ram, anvil, starting and stopping devices, fuel and lubricating oil systems, remote adjustable fuel pump and saximeter. The self-powered hammer shall be air-cooled and shall operate on the two-stroke cycle, compression ignition principle. The hammer shall depend on gravity to arrest the upward stroke of the ram. The hammer is diesel driven self-powered.

5. OPERATIONAL CONCEPT: The piledriver hammer; with leads and bottom brace is DESIGNED TO BE USED WITH A CRANE HAVING A LATTICE OR SOLID BOOM FOR driving piles of different lengths. It is portable, and is used by Engineer Construction Support Companies and Engineer Port Construction Companies.

WARNING

Movement of the pile driver, hammer and leads while attached to the crane MAY result in overturning the crane and injury to personnel. IN HIGH WINDS (15-20 mph) DO NOT move the equipment while it is attached to the crane. DO NOT move the equipment over rough terrain while it is attached to the crane.

6. EQUIPMENT PUBLICATIONS: Initial publications are a commercial manual and Supplemental Operating, Maintenance and Repair Parts Instructions (SOMARPI). Two manuals will be overpacked and shipped with each end item.
Department of the Army publications will be forthcoming and will be available through the normal publications supply channels.

7. PERSONNEL REQUIRED:

a. MOS Requirements: In accordance with AR611-201

(1) Hammer Operator: MOS 62F

(2) Organizational Maintenance: MOS 62B

(3) Direct/General Support Maintenance: MOS 62B

b. Depot maintenance is not required.

8. LOGISTICS ASSISTANCE: Logistic Assistance Representatives (LARs) are stationed at CONUS and OCONUS installations and are available to provide onsite technical assistance, upon request from the installation.

9. RECOMMENDING PUBLICATION CHANGE: You can improve this publication by recommending improvements, using DA Form 2028, (Recommended Changes to Publications and Blank Forms) and mail direct to Commander, US ARMY TANK-AUTOMOTIVE COMMAND, ATTN: AMSTA-MVB, Warren, MI 43397-5000.

10. OPERATIONAL EQUIPMENT REQUIREMENTS:

a. The equipment required to operate the hammer are a crane with adapter plates and a pile hammer lead assembly. The hammer may be used with any of the following cranes:

	NSN	MODEL
(1)	3810-00-043-5354	2385 20 TON RT
(2)	3810-00-763-7728	2380 20 TON RT
(3)	3810-00-275-1167	M320 RT 20 ton
(4)	3810-00-542-3048	855BG2 40 ton
(5)	3810-00-542-3049	855BG2 40 ton
(6)	3818-00-606-3569	855BG 40 ton
(7)	3810-00-786-5200	855BG 40 ton
(8)	3810-00-933-0588	855BG2 40 ton
(9)	3810-00-933-0589	855BG 40 ton
(10)	3810-00-933-0590	855BG3 40 ton
(11)	3310-01-145-8288	5060 40 ton
(12)	3810-00-151-4431	M320T-2 20 ton truck/crane
(13)	3810-00-527-8612	M-20-B 20 ton truck/crane
(14)	3810-00-527-8613	M-20AF 20 ton truck/crane
(15)	3810-00-542-4930	M200W 20 ton truck/crane
(16)	3810-00-542-4982	M200 20 ton truck/crane
(17)	3310-00-820-0698	M202 20 ton truck/crane
(18)	3810-00-861-8088	M320T 20 ton truck/crane
(19)	3810-00-989-0505	2360 20 ton truck/crane
(20)	3810-00-869-3092	22BM 12 1/2 ton
(21)	3810-00-937-3939	L36M 12 1/2 ton
(22)	3810-00-018-2021	MT250 25 ton hydraulic
(23)	3810-01-054-9779	TMS300-5 25 ton hydraulic

b. There is no separately authorized equipment required to transport this hammer.

MAINTENANCE

1. MAINTENANCE CONCEPT: Operators shall possess an MOS of 62F and maintenance will be performed by a 62B MOS. This is a Non-Developmental Item (NDI) and as such, there is no maintenance engineering effort on the part of the Army. However, consistant with maintenance policy and procedures, of Preventive Maintenance Checks and Services (PMCS) and Maintenance Allocation Charts (MAC). The level of repair assigned to maintenance and associated tasks identified in the MAC should be reflective of training and repair part support for similar items of equipment in the inventory for unit through depot maintenance. Maintenance will be performed by MOS 62B at the level authorized by the MAC and TOE mission statements.

a. MAINTENANCE PLAN: Maintenance capabilities will be governed by the MAC and will be tailored to accomodate the complexity of the maintenance requirement.

b. UNIT MAINTENANCE: Unit Maintenance is performed by a crew, the operator, or unit maintenance personnel as shown in the MAC of the appropriate TM or commercial manual. Unit Maintenance normally includes inspection by sight and touch of easily accessible components; lubrication, cleaning, preserving, tightening, and isolation using BITE, go no-go or onboard instrumentation (if applicable), and the replacement of easily removed and installed components that do not require other than common tools.

c. INTERMEDIATE DIRECT SUPPORT MAINTENANCE: Intermediate Direct Support Maintenance is performed by installation shops and selected intermediate maintenance support units and activities in the Army force structure. Intermediate Direct Support Maintenance will remove and replace major assemblies and components and provide contact maintenance teams for local support of unit maintenance when required. Intermediate Direct Support Maintenance personnel shall be capable of diagnosing causes of equipment failures, repairing specified components and repair parts so they may be returned to the supply system in support of the pile hammer. This maintenance level shall maintain a supply support system which allows unit maintenance to obtain repair parts through direct exchange (DX) and requisitions.

d. INTERMEDIATE GENERAL SUPPORT MAINTENANCE: Not included for the Pile Drive Hammer.

e. DEPOT MAINTENANCE: No depot maintenance programs are planned for the overhaul of these pile hammers.

2. MAINTENANCE ALLOCATION CHART (MAC): (See Appendix A) Units may exceed their authorized scope and function in the MAC when approved by the support maintenance commander.

3. MODIFICATION: Modifications will be accomplished by the end item manufacturer after TACOM approves the field campaign or modification plan.

4. EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR): Equipment Improvement Recommendations will be submitted in accordance with DA PAM 738-750.

5. SHIPMENT AND STORAGE: Refer to the manufacturer's manual and TB 740-97-2. Packaging, handling and storage will be IAW MIL-H-21103D.

6. DESTRUCTION to PREVENT ENEMY USE: Refer to TM 750-244-3, FM 5-25 and Appendix C for instructions governing destruction of equipment to prevent enemy use.

7. BASIC ISSUE ITEMS LIST (BIIL): See Appendix D

8. SPECIAL TOOLS and EQUIPMENT: See Section 3 of Appendix A

9. MAINTENANCE and OPERATING SUPPLIES: See Appendix E for a list of maintenance and operating supplies required for initial operation.

10. MAINTENANCE FORMS and RECORDS;

a. Operational Records: Operational records (DD Form 1970, daily dispatch and DA Form 2401, Equipment Control Record) will be used to control the use and record operators and locations of equipment operation.

b. Maintenance Records:

(1) SF 91 Accident Form
(2) DD 518 Personnel Injury Accident Form
(3) DD Form 314, Preventive Maintenance Schedule and Records
(4) DA Form 2404, Equipment Inspection and Maintenance Worksheet
(5) DA Form 2407, Maintenance Request
(6) DA Form 2408-14, Uncorrected Faults Record

c. Historical Records:

(1) DA Form 2408, Equipment Log Book Assembly
(2) DA Form 2408-3, Equipment Control Record

11. LUBRICATION: To insure proper operation of this machine, all points requiring lubrication must be serviced with the correct lubrication, at the proper time intervals. All lubrications points requiring service are shown on the lubrication chart (Appendix G).

a. Points not equipped with lubrication fittings (clevis, pins, lever, guides, linkages etc.) should be lubricated according to working and climate conditions with an oil squirt can using OE 30.

b. Intervals specified are for normal operations where moderate temperatures, humidity, and atmospheric conditions prevail. In areas of extreme condition the service periods should be adjusted accordingly.

12. QUALITY DEFICIENCY REPORT (QDR): Standard Form 368 (Quality Deficiency Report) was adopted for Equipment Improvement Recommendation (EIR) reporting. This action was taken to standardize reporting within all governmental services. submissions to be in accordance with DA Pam 738-750.

13. MAINTENANCE EXPENDITURE LIMITS:

The average life expectancy for the Hammer, Pile Driver is 18 years.

REPAIR LIMITS	YEAR
50%	1990
45%	1992
40%	1994
35%	1996
30%	2000
20%	2002

14. FIRE PROTECTION:

a. A hand operated fire extinguisher may be positioned at the work site by the using unit, 15 feet from the equipment.

b. Refer to TB 5-4200-200-10, Hand Portable Fire Extinguishers Approved for Army users.

15. MIXTURE OF INCH AND METRIC FASTENERS:

a. The use of worldwide sources for components has made it possible for Foundation Equipment Corporation (FEC) products to have a mixture of inch and metric fasteners. For example, metric fasteners may be used on the fuel pump, Guides etc; and other components. It is possible that the internal bolts on a component may be metric while the mounting bolts may be inch size.

b. To help mechanics know when metric fasteners are used on a product, future service publications such as Parts Books, Operation and Maintenance Manuals will use a notice similiar to the one that follows.

NOTICE

Caution must be taken to avoid mixing metric and inch (customary) fasteners. Mismatched or incorrect fasteners can result in equipment damage or malfunction, or possible personal injury. Original fasteners removed from the vehicle should be saved for assembly when possible. If new ones are required, caution must be taken to replace with one that is of the same part number and grade or better.

REPAIR PARTS SUPPLY

General

a. The basic policies and procedures in AR 710-2 and AR 725-50 are generally applicable to repair parts management for this item.

b. National Stock Numbers (NSN) will be assigned to all repair parts expected to be replaced at any maintenance level.

c. Prior to submitting requisitions for repair parts, the Federal Supply Code for Manufacturers (FSCM) and the part number must be screened to identify possible NSNs.

d. Repair parts not immediately available through the Department of Defense Supply System may be locally purchased IAW AR 725-50, paragraph 3-29.

APPENDIX A

MAINTENANCE ALLOCATION CHART

FOR

HAMMER, PILE DRIVER, SELF-POWERED

NSN 3895-01-200-8448

FOUNDATION EQUIPMENT CORP. (FEC) MODEL 1500

SECTION I

1. General: This Maintenance Allocation Chart (MAC) designates responsibility for performance of maintenance functions to specific maintenance categories.

2. Maintenance Functions: Maintenance functions will be limited to and defined as follows:

a. Inspect: To determine the serviceability of an item and detect incipient failure by comparing its physical, mechanical and/or electrical characteristics with established standards through examination.

b. Test: To verify serviceability and detect incipient failure by measuring this mechanical or electrical characteristics of an item and comparing those characteristics with prescribed standards.

c. Service: Operations required periodically to keep an item in proper operating condition, i.e., to clean (decontaminate), to preserve, to drain, to paint or to replenish fuel, lubricants, hydraulic fluids, or compressed air supplies.

d. Adjust: To maintain, within prescribed limits, by bringing into proper or exact position, or by setting the operating characteristics to specified parameters.

e. Install: The act of emplacing, seating, or fixing into position an item, part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

f. Replace: The act of substituting a serviceable like-type part, subassembly, or module (component or subassembly) for an unserviceable counterpart.

g. Repair: The application of maintenance services (inspect, test service adjust align, calibrate, or replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly) end item or system.

h. Overhaul: That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standards (i.e. DMWR) in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the army. Overhaul does not normally return an item to like new condition.

3. Column Entries: Columns used in the MAC and entries for these columns are explained below:

a. Column 1: Group Number: Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2 Component Assembly: Column 2 contains the noun names of components, assemblies, subassemblies, and modules for which maintenance is authorized.

c. Column 3: Maintenance Functions: Column 3 lists the functions to be formed on the item listed in Column 2.

d. Column 4: Maintenance Category: Column 4 specifies, by the listing of a "work time": figure in the appropriate subcolumn(s) the lowest level of maintenance authorized to perform the function listed in Column 3. This figure represents the active time required to perform the maintenance function at the indicated category of maintenance. If the number or complexity of the task within the listed maintenance function vary at different maintenance categories, appropriate "work time" figures will be shown for each category. The number of man-hours specified by the "work time" figure represents the average time required to restore an item (assembly, subassembly, component, module, and item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, troubleshooting time and quality assurance/quality control time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC.

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4) C	O	F	H	D	TOOLS & EQUIP (5)	REMARKS (6)
	Hammer, Pile Driver w/Remote Adj. Pump								
0101	Upper/lower Cylinder	Inspect	1.0						
		Replace			10.0				
	Inner Cylinder End Ring (lower cyl)	Inspect		0.2					
		Respect			4.0				
	Rubber Rings (lower cyl)	Inspect		0.2					
		Replace		0.5					
	Fuel, Oil Plug (lower cyl)	Replace		0.2					
	Pump Stud (lower cyl)	Replace		0.2					A
0104	Piston	Test		1.0					
		Replace			5.0				
		Repair			4.0				
	Oil Plug	Replace		0.1					
	Rings	Replace			3.0				
	Combustion Chamber	Service	0.5						A
		Replace			4.0				
	Impact Block/Anvil	Assemble	1.0						
		Replace			2.0				
		Repair			1.0				
0106	Lubricating System	Service	1.0						
	Grease Fittings	Service	0.2						
		Replace		0.2					
	Oil Plugs	Replace		0.2					
0107	Engine Starting System								
	Tripping Device	Service	0.2						
		Replace			2.0				
	Pawl	Replace		2.0					
	Joint Pin	Replace		2.0					

*MAINTENANCE CATEGORIES:

C - OPERATOR/CREW
C - ORGANIZATIONAL
F - DIRECT SUPPORT
H - GENERAL SUPPORT
D - DEPOT

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4) C	O	F	H	D	TOOLS & EQUIP (5)	REMARKS (6)
0107	Engine Starting System Tripping Device (cont)								
	Lug	Replace		2.0					
	Tripcam w/lever	Replace		2.0					
03	Fuel System	Inspect	0.5						
0302	Fuel Pump	Adjust		0.5					
		Test			2.0				
		Service		0.5					
		Replace		2.0					
		Repair			3.0				
	Buna Cone w/plug	Service		0.5					
		Replace		1.0					
0306	Tanks, Lines and Fittings Fuel Tank	Inspect	0.2						
		Service	0.5						
74	Lines and Fittings Cranes, shovels & Earth moving Equip. components	Inspect	0.2						
		Replace		1.0					
7404	Saximeter Circuit Cards	Replace			1.0				
	Battery	Replace		0.2					
		Recharge	14.0						
	Microphone	Replace		0.2					
	Charger	Replace		0.2					
7413	Primary Drive Cap	Replace		2.0					
	Secondary Drive Cap	Assemble		0.5					
	Guides	Replace		2.5					

*MAINTENANCE CATEGORIES:

C - OPERATOR/CREW
C - ORGANIZATIONAL
F - DIRECT SUPPORT
H - GENERAL SUPPORT
D - DEPOT

Appendix A

SECTION II. MAINTENANCE ALLOCATION CHART

GROUP NUMBER (1)	COMPONENT/ASSEMBLY (2)	MAINTENANCE FUNCTION (3)	MAINT CAT* (4) C	O	F	H	D	TOOLS & EQUIP (5)	REMARKS (6)
7413	Primary Drive Cap (cont)								
	Conbest Cushion	Inspect	0.2						
		Replace		1.0					
	Inserts	Inspect	0.2						
		Replace		1.0					
	Cables	Inspect	0.2						
		Replace		1.0					
					2.0				
	Gib	Inspect	0.2						
		Replace		1.0					

*MAINTENANCE CATEGORIES:

C - OPERATOR/CREW
C - ORGANIZATIONAL
F - DIRECT SUPPORT
H - GENERAL SUPPORT
D - DEPOT

APPENDIX A

SECTION 3

1. SPECIAL TOOLS AND TEST SETS

ITEM	FSCM	PART NUMBER	NSN
Step Pin	64866	5364505080	5315-01-231-7663
Eye Bolt	64866	5058042450	5306-01-229-8969
Dismounting Plates	64866	1000734000	3895-01-226-5209
Piston Ring Installing Band	64866	1000852001	5120-01-239-6829
Piston Ring Pliers	64866	1000626000	5120-01-227-1681

2. COMMON TOOLS and TEST SETS
   See BIIL

3. SPECIAL TMDE and TEST SETS
   None

4. COMMON TMDE and TEST SETS
   None

5. SPECIAL PURPOSE KITS
   None

SECTION IV. MAINTENANCE ALLOCATION CHART

REFERENCE CODE	REMARKS
A	Test Includes Operation and Compression

APPENDIX B

OPERATOR/CREW
PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

GENERAL

Your Preventive Maintenance Checks and Services table lists the inspection and care of your equipment required to keep it in good operating condition.

OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES

1. The number column of your PMCS is the source for the number used on the TM Number Column on DA Form 2404.

2. The interval column of your PMCS table tells you when to do a certain check or service.

a. Before you operate. Always keep in mind the CAUTIONS and WARNINGS. Perform your before (B) PMCS.

b. While you operate. Always keep in mind the CAUTIONS and WARNING. Perform your during (D) PMCS.

c. After you operate. Be sure to perform your after (A) PMCS.

d. DO your weekly (W) PMCS once a week.

e. Do your monthly (M) PMCS once a month.

3. The procedure column of your PMCS table tells you how to do the required checks and services. Carefully follow these instructions. If you do not have the tools, or if the procedure tells you to, contact unit maintenance.

4. If your equipment does not perform as required, refer to the manual trouble-shooting section for possible problems. Report any malfunctions or failures on the proper DA Form 2404 or refer to DA Pamphlet 738-750.

NOTE

The terms ready/available and mission capable refer to the same status: Equipment is on hand and is able to perform all its combat missions without further endangering the lives of crew or operators in a combat environment (See DA PAM 738-750).

5. Equipment is not ready/available if: column. This column tells you when and why your equipment cannot be used.

6. Always do your PMCS in the same order so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry.

7. When you do your PMCS, take along a rag or two.

8. While performing PMCS, observe CAUTIONS and WARNING preceeding those operations which could endanger your safety or result in damage to the equipment.

Appendix B

WARNING

Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in well ventilated area. Avoid contact with skin, eyes, and clothes and don't breathe vapors. Do not use near open flame or excessive heat. The flash point is 100°f – 138°F (38°C – 59°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

a. Keep it clean: Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (P-D-680) to clean metal surfaces. Use soap and water when you clean rubber or plastic material.

b. Bolts, nuts, and screws: Check that they are not loose, missing, bent or broken. You can't try them all with a tool, of course, but look for chipped paint, bare metal or rust around bolt heads. Tighten any bolt, nut, or screw that you find loose.

c. Welds: Look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad weld, report it to unit maintenance.

d. Electric wires and connectors: Look for cracked or broken insulation, bare wires and loose or broken connectors. Report damaged or loose wiring to unit maintenance.

e. Hoses and fluid lines: Look for wear, damage and leaks. Make sure clamps and fittings are tight. Wet spots show leaks but a stain around a fitting or connector can also mean a leak. If leakage comes from a loose fitting or connector, tighten the fitting or connector. If something is broken or worn out, report it to unit maintenance.

f. Vehicle must be on level ground in order to get correct fluid level measurement.

It is necessary for you to know how leaks affect the status of your equipment. The following are definitions of the types/classes of leakage you need to know to be able to determine the status of your equipment. Learn and be familiar with them and REMEMBER – when in doubt, notify your supervisor.

LEAKAGE DEFINITIONS FOR OPERATOR/CREW PMCS

Class I	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class II	Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.
Class III	Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

APPENDIX B

CAUTION

Equipment operation is allowable with minor leakage (Class I or II). Of course, consideration must be given to the fluid capicity in the item/system being checked/inspected. When operating with Class I or II leaks, continue to check fluid levels as required on your PMCS. Class II leaks should be reported to your supervisor or unit maintenance.

OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B - BEFORE D - DURING A - AFTER W - WEEKLY M - MONTHLY

ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
						NOTE: PERFORM WEEKLY AS WELL AS BEFORE PMCS IF:	
						A. YOU ARE THE ASSIGNED OPERATOR BUT HAVE NOT OPERATED THE EQUIPMENT DURING THE PAST WEEK.	
						B. YOU ARE OPERATING THE EQUIPMENT FOR THE FIRST TIME.	
						NOTE: ASSURE ALL THE LUBRICATION REQUIREMENTS ARE PERFORMED ON THE LEADS AND HAMMER, PILE DRIVER AS DIRECTED BY THE OPERATOR'S MANUAL (COMMERCIAL) AND THE LUBRICATION CHART (APPENDIX H).	
1.						GENERAL: Make the following walk around checks:	
	●					A. Visually check for loose wiring and damaged hoses.	
	●					B. Look for evidence of fluid leakage.	Any Class III leak
	●					C. Look for loose or missing bolts.	3 or more lead guide. Bolts missing or won't tighten.
2.						<u>Drive Caps</u>	
	●					A. Check for cracked or damaged cushions/anvil.	Cracked cushion/anvil, helmet or caps.
	●					B. Check for crushed, split, frayed or damaged cable.	Cable crushed, or more than 1 winding cut.
						NOTE:	
						HAMMER MUST BE IN AN ERECT POSITION TO CHECK/FILL OIL OR FUEL.	

OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B - BEFORE D - DURING A - AFTER W - WEEKLY M - MONTHLY

ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
3.	●					Piston Oil Level Check piston oil level for proper level. Fill to the bottom of the oil fill plug. Check and refill every 5 hours of continuous operation.	
4.	●					Fuel Pump A. Check the pump rope for cuts or frays.	Rope missing.
	●					B. Check the fuel pump level for damage, operate the lever down and up.	Lever won't move.
	●					C. Check the locking nut on the bottom of the pump, tighten if loose. WARNING A. Shut the pile driver down before lubricating . Use TRC high-temp grease only. Use of other grease may void the warranty.	
5.	●					B. Lubricate the leads before attaching them to the crane. Ref: Lubrication chart (Appendix H). Lubrication Lubricate in accordance with the manufacturer's manual, page 12, para 10 and the lubrication chart (Appendix H).	

OPERATOR/CREW PREVENTIVE MAINTENANCE CHECKS AND SERVICES

B - BEFORE D - DURING A - AFTER W - WEEKLY M - MONTHLY

ITEM NO	INTERVAL					ITEM TO BE INSPECTED PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED	EQUIPMENT IS NOT READY/AVAILABLE IF:
	B	D	A	W	M		
6.	●					Impact Block Check for cracks.	Cracked Block.
7.	●					Lifting/Tripping Device A. Check cam lever for ease of movement and damage.	Cam lever won't return to the horizontal position.
	●						
	●					B. Check cam lever rope for cuts.	
8.	●					Leads/guides Check for cracked welds, bent lattice or lead/guides.	2 or more cracked welds, bent lead/guides.
9.		●				Lower Cylinder Check for cracks or broken welds.	Any cracks or broken welds.
10.			●			Saximeter Check for proper operation. Ref: Manufacturer's Manual, Sec 16.	
11.	●					Saximeter Battery Charge the battery. Ref: Manufacturer's Manual, page 28, para 16.6.	

Appendix B

ORGANIZATIONAL

PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)

GENERAL

To make sure that your vehicle is ready for operation at all times, inspect it systematically so you can discover any defects and have them corrected before they result in serious damage or failure. The charts on the next few pages contain your unit PMCS. The item numbers indicate the sequence of minimum inspection requirements. If you're operating the vehicle and notice something wrong which could damage the equipment if you continue operation, stop operation immediately.

Record all deficiencies and shortcomings, along with the corrective action taken, on a DA Form 2404. The Item Number column is the source for the numbers used on the TM Number column on DA Form 2404.

PREVENTIVE MAINTENANCE CHECKS AND SERVICES

1. The item numbers of the table indicate the sequence of the PMCS. Perform at the intervals shown below:

   a. Do your (Q) PREVENTIVE MAINTENANCE quarterly (every three months).
   b. Do your (S) PREVENTIVE MAINTENANCE semiannually (every six months).
   C. Do your (A) PREVENTIVE MAINTENANCE annually (once every year).
   d. Do your (B) PREVENTIVE MAINTENANCE biennially (once every two years).
   e. Do your (H) PREVENTIVE MAINTENANCE at the hour interval listed..
   f. Do your (WI) PREVENTIVE MAINTENANCE at the mile interval listed.

2. If something doesn't work, troubleshoot it according to the instructions in this manual or the commercial manual or notify your supervisor.

3. Always do your preventive maintenance in the same order, so it gets to be a habit. Once you've had some practice, you'll spot anything wrong in a hurry.

4. If anything looks wrong and you can't fix it, write it down on your DA Form 2404. If you find something seriously wrong, report it to direct support as soon as possible.

WARNING

Dry cleaning solvent P-D-680 is toxic and flammable. Wear protective goggles and gloves and use only in well ventilated area. Avoid contact with skin, eyes and clothes and don't breath vapors. Do not use near open flame or excessive heat. The flash point is 100°F – 138°F (38°C – 59°C). If you become dizzy while using cleaning solvent, get fresh air immediately and get medical aid. If contact with eyes is made, wash your eyes with water and get medical aid immediately.

WARNING

Compressed air, used for cleaning purposes will not exceed 30 psi. Use only with effective chip guarding and personnel protective equipment (goggles/. shield/gloves, etc.).

APPENDIX B

a. Keep it clean: Dirt, grease, oil and debris only get in the way and may cover up a serious problem. Clean as you work and as needed. Use dry cleaning solvent (P-D-680) to clean metal surfaces. Use soap and water when you clean rubber or plastic material.

b. Bolts, nuts and screws: Check that they are not loose, missing, bent or broken. You can't try them all with a tool, of course, but look for chipped paint, bare metal or rust around bolt heads. Tighten any bolt, nut, or screw that you find loose.

c. Welds: Look for loose or chipped paint, rust or gaps where parts are welded together. If you find a bad weld, report it to intermediate direct support.

d. Electric wires and connectors: Look for cracked or broken insulation, bare wires and loose or broken connectors. Tighten loose connections and make sure the wires are in good condition.

e. Hoses and fluid lines: Look for wear, damage and leaks. Make sure clamps and fittings are tight. Wet spots show leaks, but a stain around a fitting or connector can also mean a leak. If leakage comes from a loose fitting or connector, tighten the fitting or connector. If something is broken or worn out, either correct it or report it to intermediate direct support (refer to the maintenance allocation chart).

5. It is necessary for you to know how fluid leaks affect the status of your equipment. The following are definitions of the types/classes of leakage you need to knew to be able to determine the status of your equipment. Learn and be familiar with them and REMEMBER – when in doubt, notify your supervisor.

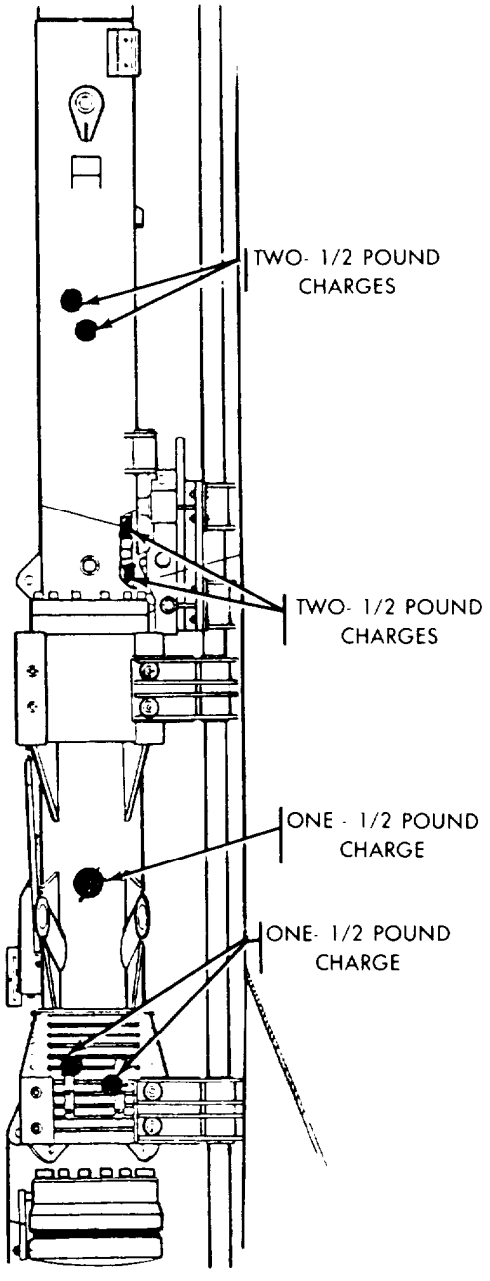
LEAKAGE DEFINITIONS FOR UNIT PMCS

Class I	Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
Class II	Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.
Class II	Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

ITEM NO	INTERVAL B	D	A	W	M	ITEM TO BE INSPECTED PROCEDURE: CHECK FOR AND HAVE REPAIRED, FILLED, OR ADJUSTED AS NEEDED **PERFORM ALL OPERATOR PMCS FIRST**
1.	●					Check inner cylinder end ring clearance (P. 13, Para 10.2, manufacturer's manual). If clearance is greater than .050 (1.25mm), replace the rings. Ref: P. 13, Para 10.3 manufacturer's manual.
2.	●					Check compression: Ref: P. 13, section 10.2.2, manufacturer's manual.
3.	●					Check the catch groove on the upper cylinder. The corners must be square. File rounded corners. Ref: P. 13, para 10.2.3, manufacturer's manual.
4.	●					Clean the pipe joint filter. Ref: P. 8 para 7.1.9, manufacturer's manual.

APPENDIX C

DEMOLITION/DESTRUCTION TO PREVENT ENEMY USE



Demolition by Explosives or Weapon's Fire

a. Demolition by Explosives. Place the following charges and detonate them simultaneously with a detonating cord and a suitable detonator. Refer to figure above.

(1) two 1/2 pound charges on fuel and lube tank.

(2) One 1/2 pound charge near the lower end of starting device.

(3) One 1/2 pound charge on pump drive housing. Over priming lever opening.

(4) One 1/2 pound charge touching cylinder wail and fuel pump.

(5) One 1/2 pound charge on lower cylinder, on upper side of injector cover.

b. Demolition by Weapon's Fire. Fire on the hammer with the heaviest practicable weapons available aiming at fuel tank, fuel pump intake, and exhaust ports.

Other Demolition Methods

a. Scattering and Concealment. Remove all easily accessible parts such as the injector assembly, fuel pump, lube pump, and hydraulic transmitter system. Scatter them in foilage, bury them in dirt or sand, or throw them in a lake, stream, well, other body of water.

b. Burning, Pack rags, clothing, or canvas around the hammer and open drain plugs in fuel and lube tanks to allow slow leakage. Pour gasoline, oil, or diesel fuel over this material and ignite.

c. Submersion. Totally submerge the hammer in a body of water to provide water damage and concealment. Salt water will do greater damage than fresh water.

Training

All operators should receive thorough training in the destruction of the hammer. Refer to FM 5-25. Simulated destruction using all of the methods listed above, should be included in the operator training program. It must he emphasized in training that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason it is necessary that operators be thoroughly familiar with all methods of destruction without reference to this or any other manual.

APPENDIX D

1. BASIC ISSUE ITEM (BIIL) LIST

ITEM	FSCM	PART NUMBER
Tool Box	64866	3105000001
* M13x17 Open End Wrench	64866	5389513170
* M19x22 Open End Wrench	64966	5389519220
* M24 Box-Open end Wrench	64866	5360024000
* M30 Box-Open End Wrench	64866	5360030000
* M32 Box-Open End Wrench	64866	5360032000
* M36 Box-Open End Wrench	64866	5360036000
* Ratchet 1/2" Drive	64866	5383920800
* M13-1/2" Drive Socket	64866	5383900813
* M17-1/2" Drive Socket	64366	5383900817
* M19-1/2" Drive Socket	64866	5383900819
* M22-1/2" Drive Socket	64866	5383900822
* M8-1/2" Drive Hex Bit	64866	5383910808
* M14-1/2" Drive Hex Bit	64866	5383910814
Ratchet, 3/4" Drive	64866	5383921200
Flex Handle, 3/4" Drive	64866	5383941200
* M24-3/4' Drive Socket	64866	5383901224
* M30-3/4" Drive Socket	64866	5383901230
* M32-3/4" Drive Socket	64866	5383901232
* M36-3/4" Drive Socket	64866	5383901236
* M46-3/4" Drive Socket	64866	5383901246
* M19-3/4" Drive Socket	64866	5383911219
* M8 Hex Key	64866	5391100080
* M14 Hex Key	64866	5391100140
* M17 Hex Key	64966	5391100170
* M19 Hex Key	64866	5391100190
Grease Gun	64866	6034201142
Funnel	64866	1090951000

NOTE: * Denotes a Metric size tool

APPENDIX D

ADDITIONAL AUTHORIZED ITEMS

SMR CODE	NATIONAL STOCK NUMBER	DESCRIPTION	U/M	QTY AUTH
PAOZZ	4240-00-052-3776	Goggles, Industrial GSA	EA	1
PCOZZ	7520-00-559-9618	Container, W/Maint. Forms	EA	1
PAOZZ	4210-00-555-8837	MIL-C-11743 (81349) Extinguisher, Fire	EA	2
PAOZZ	7420-00-177-4997	Container, Fuel 5 gal	EA	1
PAOZZ	7520-00-559-9618	Bag, Pamphlet	EA	1

APPENDIX E

MAINTENANCE AND OPERATING SUPPLY

NOMENCLATURE: HAMMER, PILEDRIVER Self-Powered			Foundation Equipment **MAKE:** Corporation		**MODEL:** 1500
MFG. PART NO.: 85806560100		**NSN:** 3895-01-200-8448	**SERIAL RANGE NUMBER:** 31-0-86-0001 to 31-0-86-0006		**DATE**
(1) **Components Application**	**(2)** **Mfg. Part No. or Nat'l Stock No.**	**(3)** **Description**	**(4)** **Qty. Req. F/8 Hrs. Opn**	**(5)** **Qty. Req. F/8 Hrs. Opn**	**(6)** **Notes**
ENGINE	9150-00-188-9858	OIL, LUBRICATIONG OE/HDO 30 Winter OE/HDO 50 Summer		Vari-able	59°F or below 60° or above
FUEL SYSTEM	9140-00-286-56296	DIESEL FUEL OIL Diesel DF-2		Vari-able	
GREASE	60-342-01350 (64866)	TRC MOLY-HIGH TEMP GREASE Mfg. by: Texas Refinery Corp.		Vari-able	

APPENDIX F

Diesel Pile Hammer Warranty

Not Applicable

APPENDIX G

LUBRICATION INTERVALS

Hard time intervals and the related man-hour times are based on normal operation. The man-hour time specified is the time you need to do all the services prescribed for a particular interval. Change the hard time interval if your lubricants are contaminated or if you are operating the equipment under adverse operating conditions, including longer than-usual operating hours. The hard time interval may be extended during periods of low activity. If extended, adequate preservation precautions must be taken.

WARNING

Dry cleaning fluid is flammable. Do not use near flame or excessive heat. Use only with adequate ventilation. Avoid prolonged breathing of vapors and minimize skin contact.

Clean parts or fittings with dry cleaning solvent (SD). Type II or equivalent. Dry before lubricating. Dotted arrow shafts indicate lubrication on both sides of equipment. A dotted circle indicates a drain below. Relubricate all items found contaminated after fording or washing.

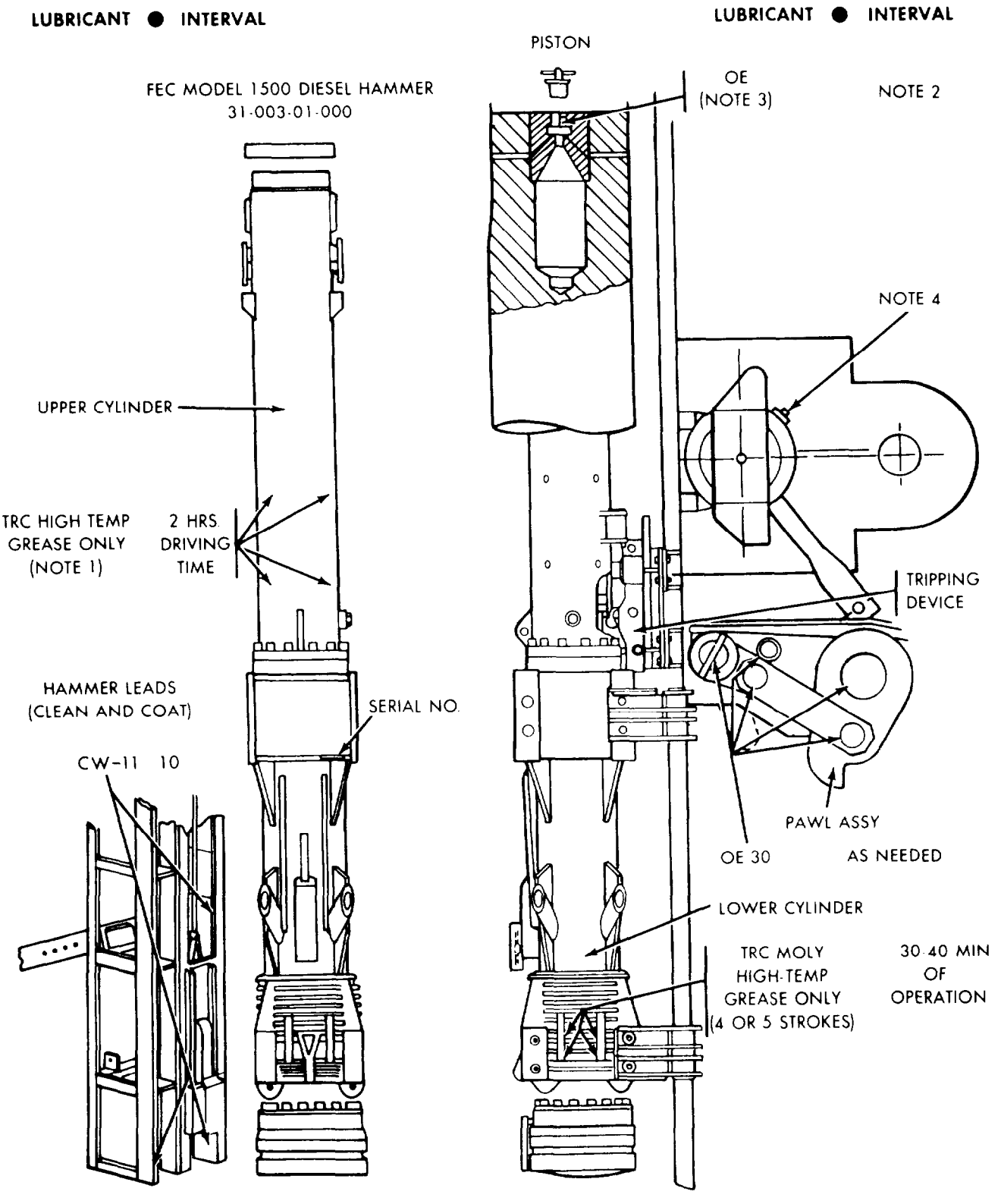
The lowest level of maintenance authorized to lubricate a point is indicated by one of the following symbols as appropriate: Operator/Crew (C); and Organizational Maintenance (O).

LUBRICANTS. The following is a list of lubricants with military symbols and applicable specification numbers.

OE/HDO	MIL-L-2104
GAA	MIL-G-10924
OEA	MIL-L-46167
TRC MOLY	HIGH TEMP GREASE (MANUFACTURED BY TEXAS REFINERY CORP)

* The time specified is the time required to perform all services at the particular Interval.

* TOTAL MAN- HOURS		* TOTAL MAN-HOURS	
INTERVAL	**MAN-HOURS**	**INTERVAL**	**MAN-HOURS**
30-40 Min of Operation	0.3	As needed	0.2
2 Hours of Driving Time (note 1)	0.5		


LUBRICANT ● INTERVAL
FEC MODEL 1500 DIESEL HAMMER
31-003-01-000
UPPER CYLINDER
TRC HIGH TEMP
GREASE ONLY
(NOTE 1)
2 HRS.
DRIVING
TIME
HAMMER LEADS
(CLEAN AND COAT)
SERIAL NO.
CW-11 10
LUBRICANT ● INTERVAL
PISTON
OE
(NOTE 3)
NOTE 2
NOTE 4
TRIPPING
DEVICE
PAWL ASSY
OE 30
AS NEEDED
LOWER CYLINDER
TRC MOLY
HIGH-TEMP
GREASE ONLY
(4 OR 5 STROKES)
30-40 MIN
OF
OPERATION

APPENDIX G

KEY

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			For Arctic operation refer to FM 9-207	INTERVALS
		Above + 60°F (Above + 15°C)	+ 59° to 15°F (+ 15° to 25°C)	- 14° to - 65°F (-25° to -65°C)		
OE/ – Lubricating **HDO** Oil, Internal Combustion Engine, Tactical Service **OEA** – Lubricating Oil, Internal Combustion, Arctic – Lubrication Tank	3 1/2 qts (3.3L)	**OE** 50	**OE** 30	**OEA** (see note 3)		Intervals given are in hours of normal operation unless otherwise specified
TRC – High-Temp Grease		ALL TEMPERATURES				
GAA – Grease, CW-11 Automotive and Artillery		ALL TEMPERATURES				

* See Notes for lubricant specification number

NOTES

1. Grease fittings on the upper cylinder are to be lubricated only when driving batter piles in intervals of 2 hours of driving time. Batter piles are defined as piles driven on an angle, 4-5 strokes of the grease gun.

2. Everytime fuel is added, check the oil and refill to the bottom of the filler plug hole. Fill fuel and oil tanks prior to daily operation. The fuel will last approximately 5 1/2 hours of continuous operation.

3. Use 50W motor oil (OE) in temperatures of + 59°F to - 15°F(+ 15° to - 25°C). Above 60°F(+ 15°C). use 30W motor oil (OE). Use OEA below - 15°F(-25°C) in place of OE/HDO 10.

4. Check before operation and when the equipment is shut down. Lube is needed, 4-5 strokes of the grease gun.

CHAPTER 3

UNIT AND DIRECT SUPPORT

REPAIR PARTS AND SPECIAL TOOLS LISTS

Section I. INTRODUCTION

1. SCOPE.

This RPSTL lists and authorizes spares and repair parts; special tools; special test, measurement, and diagnostic equipment (TMDE); and other special support equipment required for performance of Unit and Direct Support Maintenance of the Self-Powered Piledriver Hammer. It authorizes the requisitioning, issue, and disposition of spares, repair parts and special tools as indicated by the source, maintenance and recoverability (SMR) codes.

2. GENERAL.

In addition to Section I, *Introduction,* this Repair Parts and Special Tools List is divided into the following sections:

a. **Section II. Repair Parts List.** A list of spares and repair parts authorized by this RPSTL for use in the performance of maintenance. The list also includes parts which must be removed for replacement of the authorized parts. Parts lists are composed of functional groups in ascending alphanumeric sequence, with the parts in each group listed in ascending figure and item number sequence. Bulk materiels are listed in item name sequence. Repair parts kits are listed separately in their own functional group within Section II. Repair parts for reparable special tools are also listed in this section. Items listed are shown on the associated illustration(s)/figure(s).

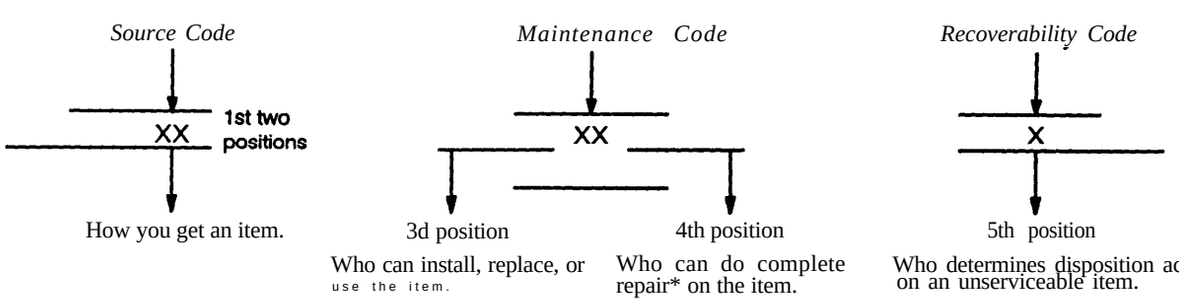
b. **Section III. Special Tools List.** A list of special tools, special TMDE, and other special support equipment authorized by this RPSTL [as indicated by Basis of Issue (BOI) information in the *DESCRIPTION AND USABLE ON CODE* column] for the performance of maintenance.

c. **Section IV. Cross-reference Indexes.** A list, in National Item Identification Number (NIIN) sequence, of all National stock numbered items appearing in the listing, followed by a list in alphanumeric sequence of all part numbers appearing in the listings. National stock numbers and part numbers are cross-referenced to each illustration/figure and item number appearance. The figure and item number index lists figure and item numbers in alphanumeric sequence and cross-references NSN, FSCM or CAGE, and part numbers.

3. Explanation of Columns (Sections II and III).

a. **ITEM NO. [Column (1)].** Indicates the number used to identify items called out in the illustration.

b. **SMR CODE [Column (2)].** The Source, Maintenance, and Recoverability (SMR) code is a 5-position code containing supply/requisitioning information, maintenance category authorization criteria, and disposition instruction, as shown in the following breakout:



* Complete Repair: Maintenance capacity, capability, and authority to perform all corrective maintenance tasks of the "Repair" function in a use/user environment in order to restore serviceability to a failed item.

(1) **Source Code.** The source code tells you how to get an item needed for maintenance, repair, or overhaul of an end item/equipment. Explanations of source codes follow:

Code	*Application/Explanation*
PA **PB** **PC**** **PD** **PE** **PF** **PG**	Stocked items; use the applicable NSN to request/requisition items with these source codes. They are authorized to the category indicated by the code entered in the 3d position of the SMR code. ***Items coded PC are subject to deterioration.*
KD KF KB	Items with these codes are not to be requested/requisitioned individually. They are part of a kit which is authorized to the maintenance category indicated in the 3d position of the SMR code. The complete kit must be requisitioned and applied.
MO - Made at UM/AVUM Level *MF - Made at* DS/AVUM *Level* *MH - Made at GS Level* *MD - Made at Depot*	Items with these codes are not to be requested/requisitioned individually. They must be made from bulk materiel which is identified by the part number in the *DESCRIPTION AND USABLE ON CODE* (UOC) column and listed in the bulk materiel group of the repair parts list in this RPSTL. If the item is authorized to you by the 3d position code of the SMR code, but the source code indicates it is made at a higher level, order the item from the higher level of maintenance.
AO- Assembled by Um/ AVUM< Level AF - Assembled by DS/ AVUM Level AH - Assembled by Gs Level AD - Assembled at Depot	Items with these codes are not to be requested/requisitioned individually. The parts that make up the assembled item must be requisitioned or fabricated and assembled at the level of maintenance indicted by the source code. If the 3d position code of the SMR code authorizes you to replace the item, but the source code indicates that the item is assembled at a higher level, order the item from the higher level of maintenance.

NOTE

Cannibalization or controlled exchange, when authorized, may be used as a source of supply for items with the above source codes, except for those source coded "XA."

XA- DO NOT requisition an "XA"-coded item. Order its next higher assembly.

XB - If an "XB" item is not available from salvage, order it using the FSCM or CAGE and part number given.

XC- Installation drawing, diagram, instruction sheet, field service drawing, that is identified by manufacturer's part number.

XD - Item is not stocked. Order an "XD"-coded item through normal supply channels using the FSCM or CAGE and part number given, if no NSN is available.

(2) **Maintenance Code.** Maintenance codes tell you the level(s) of maintenance authorized to use and repair support items. The maintenance codes are entered in the third and fourth positions of the SMR code as follows:

(a) The maintenance code entered in the third position tells you the lowest maintenance level authorized to remove, replace, and use an item. The maintenance code entered in the third position will indicate authorization to one of the following levels of maintenance.

Code	*Application/Explanation*
C	- Crew or operator maintenance done within unit maintenance or aviation unit maintenance.
O	- Unit maintenance or aviation unit can remove, replace, and use the item.
F	- Direct support or aviation intermediate level can remove, replace, and use the item.
H	- General support level can remove, replace, and use the item.
L	- Specialized repair activity can remove, replace, and use the item.
D	- Depot level can remove, replace, and use the item.

NOTE

Some limited repair may be done on the item at a lower level of maintenance, if authorized by the Maintenance Allocation Chart (MAC) and SMR codes.

(b) The maintenance code entered in the fourth position tells whether or not the item is to be repaired and identifies the lowest maintenance level with the capability to do complete repair (i.e., perform all authorized *"Repair"* functions). This position will contain one of the following maintenance codes:

Code	*Application/Explanation*
O	- Unit maintenance or aviation unit is the lowest level that can do complete repair of the item.
F	- Direct support or aviation intermediate is the lowest level than can do complete repair of the item.
H	- General support is the lowest level that can do complete repair of the item.
L	- Specialized repair activity is the lowest level that can do complete repair of the item.
D	- Depot is the lowest level that can do complete repair of the item.
Z	- Nonreparable. No repair is authorized.
B	- No repair is authorized. (No parts or special tools are authorized for the maintenance of a "B"-coded item.) However, the item may be reconditioned by adjusting, lubricating, etc., at the user level.

(3) **Recoverability Code.** Recoverability codes are assigned to items to indicate the disposition action on unserviceable items. The recoverability code is entered in the fifth position of the SMR code as follows:

Code	*Application/Explanation*
Z	- Nonreparable item. When unserviceable, condemn and dispose of the item at the level of maintenance shown in the 3d position of the SMR code.
0	- Reparable item. When uneconomically reparable, condemn and dispose of the item at unit maintenance or aviation unit level.
F	- Reparable item. When uneconomically reparable, condemn and dispose of the item at the direct support or aviation intermediate level.
H	- Reparable item. When uneconomically reparable, condemn and dispose of the item at the general support level.
D	- Reparable item. When beyond lower level repair capability, return to depot. Condemnation and disposal of item not authorized below depot level.
L	- Reparable item. Condemnation and disposal of item not authorized below specialized repair activity (SRA).
A	- Item requires special handling or condemnation procedures because of specific reasons (e.g., precious metal content, high dollar value, critical material, or hazardous material). Refer to appropriate manuals/directives for specific instructions.

c. **FSCM or CAGEC [Column (3)].** The Federal Supply Code for Manufacturer (FSCM) or the Commercial and Government Entity (CAGE) Code (C) is a 5-digit alphanumeric code which is used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

NOTE

When you use an NSN to requisition an item, the item you receive may have a different part number from the part ordered.

d. **PART NUMBER [Column (4)].** Indicates the primary number used by the manufacturer (individual, company, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards, and inspection requirements to identify an item or range of items.

e. **DESCRIPTION AND USABLE ON CODE (UOC) [Column (5)].** This column includes the following information:

(1) The Federal item name and, when required, a minimum description to identify the item.

(2) Physical security classification. Not Applicable.

(3) Items that are included in kits and sets are listed below the name of the kit or set on Figure KIT.

(4) Spare/repair parts that make up an assembled item are listed immediately following the assembled item line entry.

(5) Part numbers for bulk materiels are referenced in this column in the line item entry for the item to be manufactured/fabricated.

(6) When the item is not used with all serial numbers of the same model, the effective serial numbers are shown on the last line(s) of the description (before UOC). Not Applicable.

(7) The usable on code, when applicable (see paragraph F-5, Special Information).

(8) In the Special Tools List section, the Basis of Issue (BOI) appears as the last line(s) in the entry for each special tool, special TMDE, and other special support equipment. When density of equipments supported exceeds density spread indicated in the Basis of Issue, the total authorization is increased proportionately.

(9) The statement "END OF FIGURE" appears just below the last item description in Column 5 for a given figure in both Section II and Section Ill.

f. **QTY [Column (6)].** The QTY (quantity per figure) column indicates the quantity of the item used in the breakout shown on the illustration/figure, which is prepared for a functional group, subfunctional group, or an assembly. A "V" appearing in this column in lieu of a quantity indicates that the quantity is variable and the quantity may vary from application to application.

4. **Explanation of Columns (Section IV).**

a. **National Stock Number (NSN) Index.**

(1) ***STOCK NUMBER* column.** This column lists the NSN by National Item Identification Number (NIIN) sequence. The NIIN consists of the last nine digits of the NSN (i.e., 5305-01-674-1467). When using this column to locate an item, ignore the first 4 digits of the NSN. However, the complete NSN should be used when ordering items by stock number.

(2) ***FIG.* column.** This column lists the number of the figure where the item is identified/located. The figures are in numerical order in Section II and Section III.

(3) ***Item* column.** The item number identifies the item associated with the figure listed in the adjacent FIG. column. This item is also identified by the NSN listed on the same line.

b. **Part Number Index.** Part numbers in this index are listed by part number in ascending alphanumeric sequence (i.e., vertical arrangement of letter and number combination which places the first letter or digit of each group in order A through Z, followed by the numbers 0 through 9 and each following letter or digit in like order).

(1) ***FSCM or CAGEC* column.** The Federal Supply Code for Manufacturer (FSCM) or the Commercial and Government Entity (CAGE) Code (C) is a 5-digit alphanumeric code used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

(2) ***PART NUMBER* column.** Indicates the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards and inspection requirements to identify an item or range of items.

(3) ***STOCK NUMBER* column.** This column lists the NSN for the associated part number and manufacturer identified in the PART NUMBER and FSCM or CAGE columns to the left.

(4) ***FIG.* column.** This column lists the number of the figure where the item is identified/located in Section II and Section Ill.

(5) ***ITEM* column.** The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

c. **Figure and Item Number Index.**

(1) ***FIG.* column.** This column lists the number of the figure where the item is identified/located in Sections II and Ill.

(2) ***ITEM* column.** The item number is that number assigned to the item as it appears in the figure referenced in the adjacent figure number column.

(3) ***STOCK NUMBER* column.** This column lists the NSN for the item.

(4) ***FSCM* or *CAGE* column.** The Federal Supply Code for Manufacturer (FSCM) or the Commercial and Government Entity (CAGE) is a 5-digit alphanumeric code used to identify the manufacturer, distributor, or Government agency, etc., that supplies the item.

(5) ***PART NUMBER* column.** indicates the primary number used by the manufacturer (individual, firm, corporation, or Government activity), which controls the design and characteristics of the item by means of its engineering drawings, specifications standards and inspection requirements to identify an item or range of items.

5. Special Information.

a. **Usable On Code.** The usable on code appears in the lower left comer of the Description column heading. Not Applicable.

b. **Fabrication Instructions.** Bulk materiels required to manufacture items are listed in the Bulk Materiel Functional Group of this RPSTL. Part numbers for bulk materiels are also referenced in the DESCRIPTION column of the line item entry for the item to be manufactured/fabricated. Detailed fabrication instructions for items source coded to be manufactured or fabricated are found in this manual.

c. **Assembly Instructions.** Detailed assembly instructions for items source coded to be assembled from component spare/repair parts are found in this manual. Items that make up the assembly are listed immediately following the assembly item entry or reference is made to an applicable figure.

d. **Kits.** Line item entries for repair pans kits appear in group 9401 in Section II. Not Applicable.

e. **Index Numbers.** Items which have the word BULK in the FIG. column will have an index number shown in the item column. This Index number is a cross-reference between the National Stock Number/Part Number Index and the bulk materiel list in Section II.

6. How To Locate Repair Parts.

a. **When National Stock Number or Part Number is Not Known:**

(1) **First.** Using the Table of Contents, determine the assembly group or subassembly group to which the item belongs. This is necessary since figures are prepared for assembly groups and subassembly groups, and listings are divided into the same groups.

(2) **Second.** Find the figure covering the assembly group or subassembly group to which the item belongs.

(3) **Third.** identify the item on the figure and use the Figure and Item Number Index to find the NSN.

b. **When National Stock Number or Part Number is Known:**

(1) **First.** Using the National Stock Number or Part Number Index, find the pertinent National Stock Number or Part Number. The NSN Index is in National Item Identification Number (NIIN) sequence [see paragraph 4.a(l)l]. The part numbers in the Part Number Index are listed in ascending alphanumeric sequence (see paragraph 4.b). Both indexes cross-reference you to the illustration/figure and item number of the item you are looking for.

(2) **Second.** Turn to the figure and item number, verify that the item is the one you're looking for, then locate the item number in the repair parts list for the figure.

7. ABBREVIATIONS.

For standard abbreviations see MIL-STD-12D, *Military Standard Abbreviations for Use on Drawings, Specifications, Standards, and in Technical Documents.*

Abbreviations	*Explanation*
NIIN	National Item Identification Number (consists of the last 9 digits of the NSN)
RPSTL	Repair Parts and Special Tools Lists

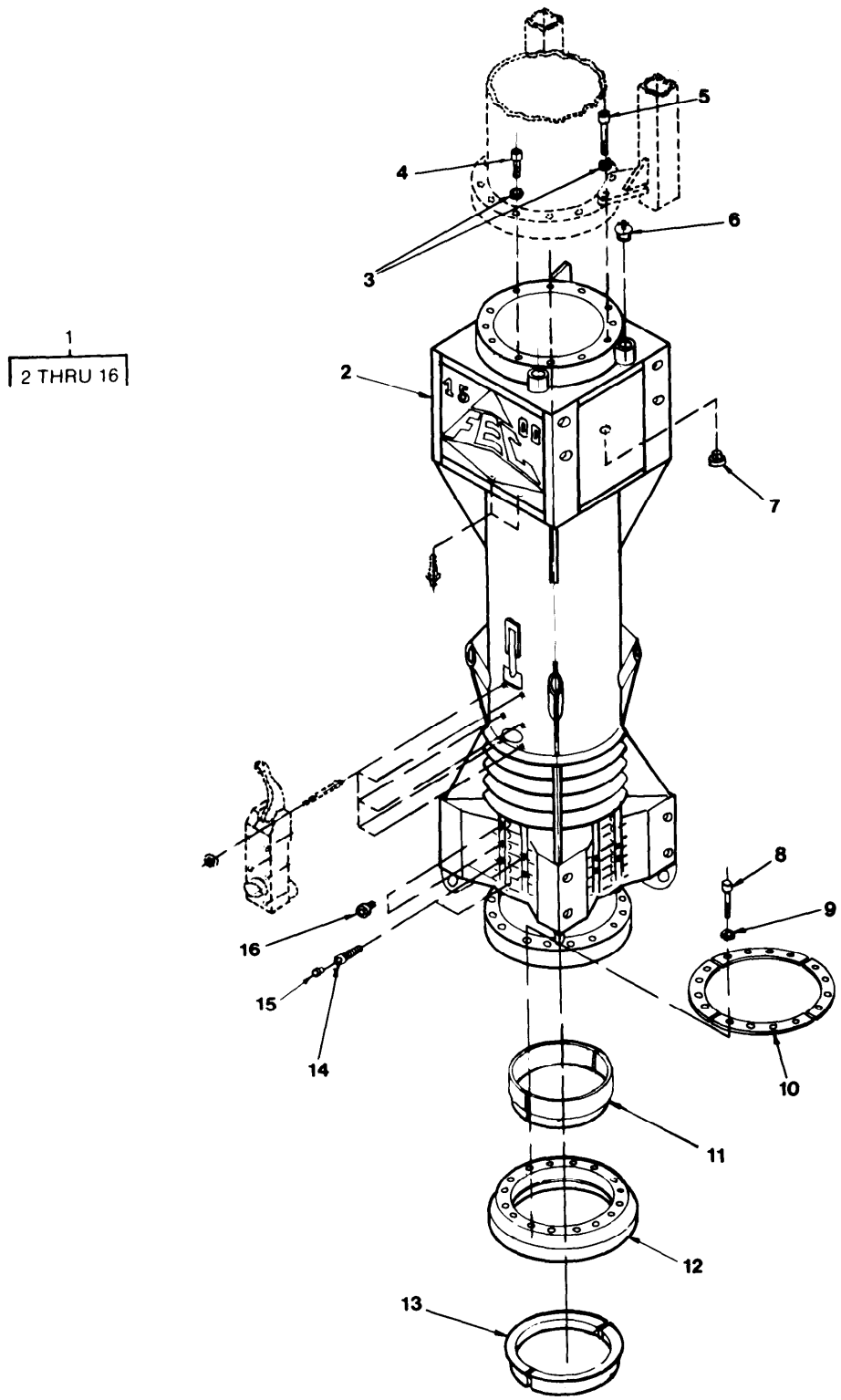


FIGURE 1. LOWER CYLINDER COMPLETE

(1) ITEM NO.	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 01 ENGINE	
				GROUP 0101 ENGINE ASSEMBLY	
				FIG. 1 LOWER CYLINDER COMPLETE	
1	PDFFF	64866	3110001000	CYLINDER ASSEMBLY, L	1
2	PDFFF	64866	3110001001	.CYLINDER, LOWER	1
3	PFOZZZ	64866	5012720000	.WASHER, LOCK	12
4	PFOZZ	64866	5091220080	.SCREW, CAP, SOCKET HE	8
5	PFOZZ	64866	5091220100	.SCREW, CAP, SOCKET HE	4
6	PAOZZ	64866	1000446000	.PLUG, PIPE	2
7	PFOZZ	64866	5090800037	.PLUG, PIPE	1
8	PFOZZ	64866	5091224110	.SCREW, CAP, SOCKET HE	16
9	PFOZZ	64866	5012724000	.WASHER, LOCK	16
10	PBOZZ	64866	3110007001	.RING SEGMENT, LOWER	4
11	PAOZZ	64866	3110301001	.CYLINDER SLEEVE	1
12	PBFZZ	64866	3110201001	.CYLINDER SLEEVE	1
13	PBOZZ	64866	3110701001	.RING, DAMPING	1
14	PBOZZ	64866	1002592000	.PLUG, TUBE FITTING, T	4
* 15	PFOZZ	95879	A1184	FITTING, LUBRICATION	4
16	PFOZZ	64866	5090818150	.PLUG, PIPE	13

END OF FIGURE

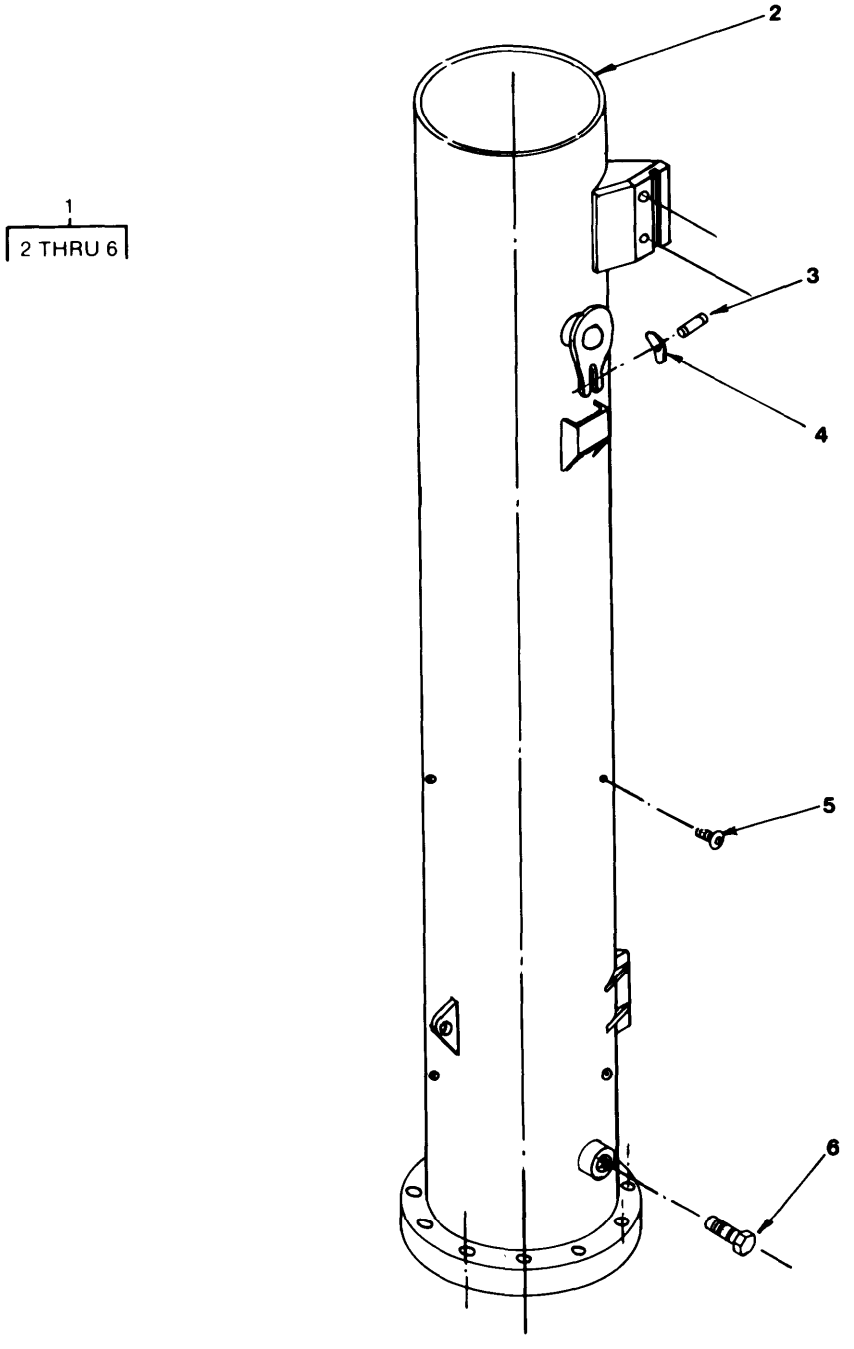


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FIGURE 2. UPPER CYLINDER COMPLETE

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE CODES (UOC)	(6) QTY
				GROUP 0101 CRANKCASE, BLOCK, CYLINDER HEAD	
				FIG. 2 UPPER CYLINDER COMPLETE	
1	PFFFF	64866	3120001000	CYLINDER ASSEMBLY,U.	1
2	PFFFF	64866	3121201001	.CYLINDER,UPPER,HAMM	1
3	PFOZZ	64866	5014808045	.PIN, SPRING	2
4	PFOZZ	64866	3120204001	.PLATE, LATCH	2
* 5	PFOZZ	95879	A1184	.FITTING, LUBRICATION.	8
6	PFOZZ	64866	3110006001	.SCREW,CAP,HEXAG0N	1
				END OF FIGURE	

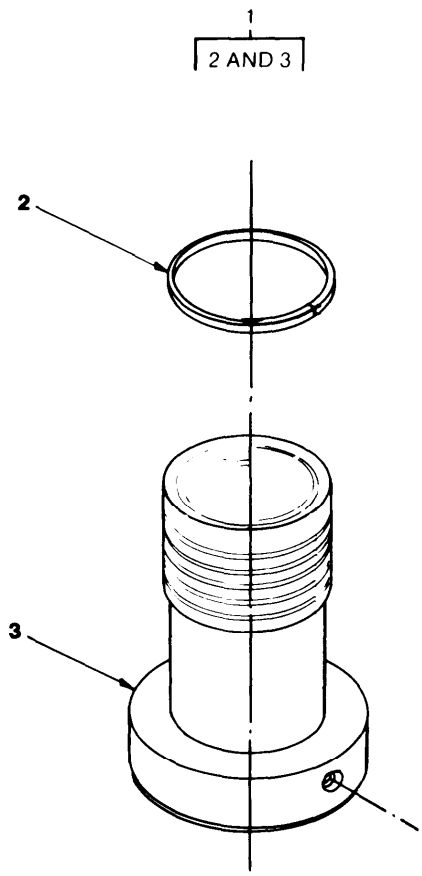

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FIGURE 3. IMPACT BLOCK COMPLETE

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 0104 PISTONS, CONNECTING RODS	
				FIG. 3 IMPACT BLOCK COMPLETE	
1	PDOZZ	64866	3140004000	PISTON	1
2	PBOZZ	64866	1002589000	.RING, PISTON	5
3	PDOZZ	64866	3140002001	.BLOCK, HEAD	1

END OF FIGURE

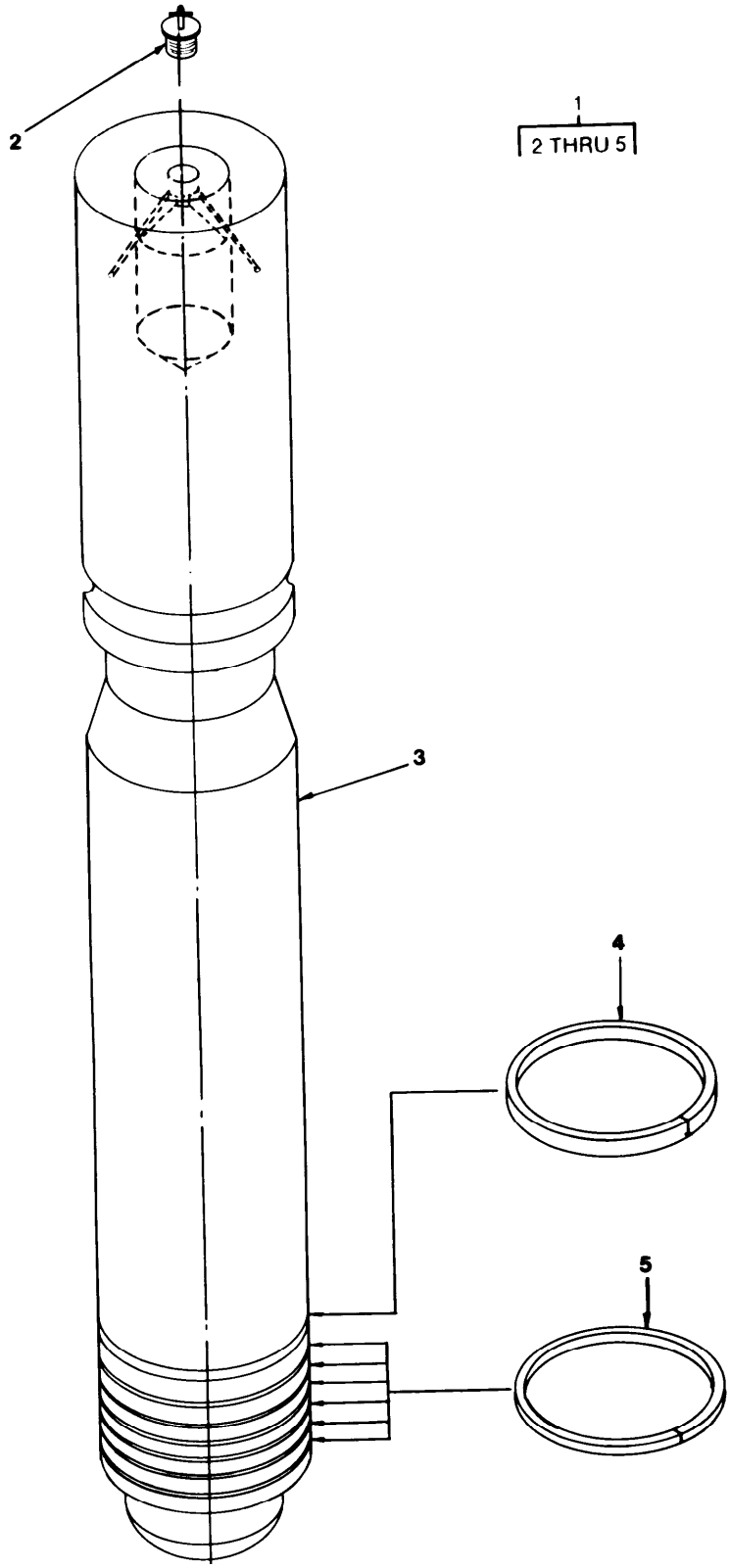

FIGURE 4. PISTON COMPLETE

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 0104 PISTONS AND CONNECTING RODS	
				FIG. 4 PISTON COMPLETE	
1	PDOOO	64866	3130001000	PIST0N ASSEMBLY, HAM	1
2	PAOZZ	64866	1000446000	.PLUG, PIPE	1
3	PDOOO	64866	3130001001	.PISTON, HAMMER, PlLE	1
* 4	PBOZZ	64866	1000708000	.RING, PISTON	1
5	PBOZZ	64866	1002589000	.RING, PISTON	6

END OF FIGURE

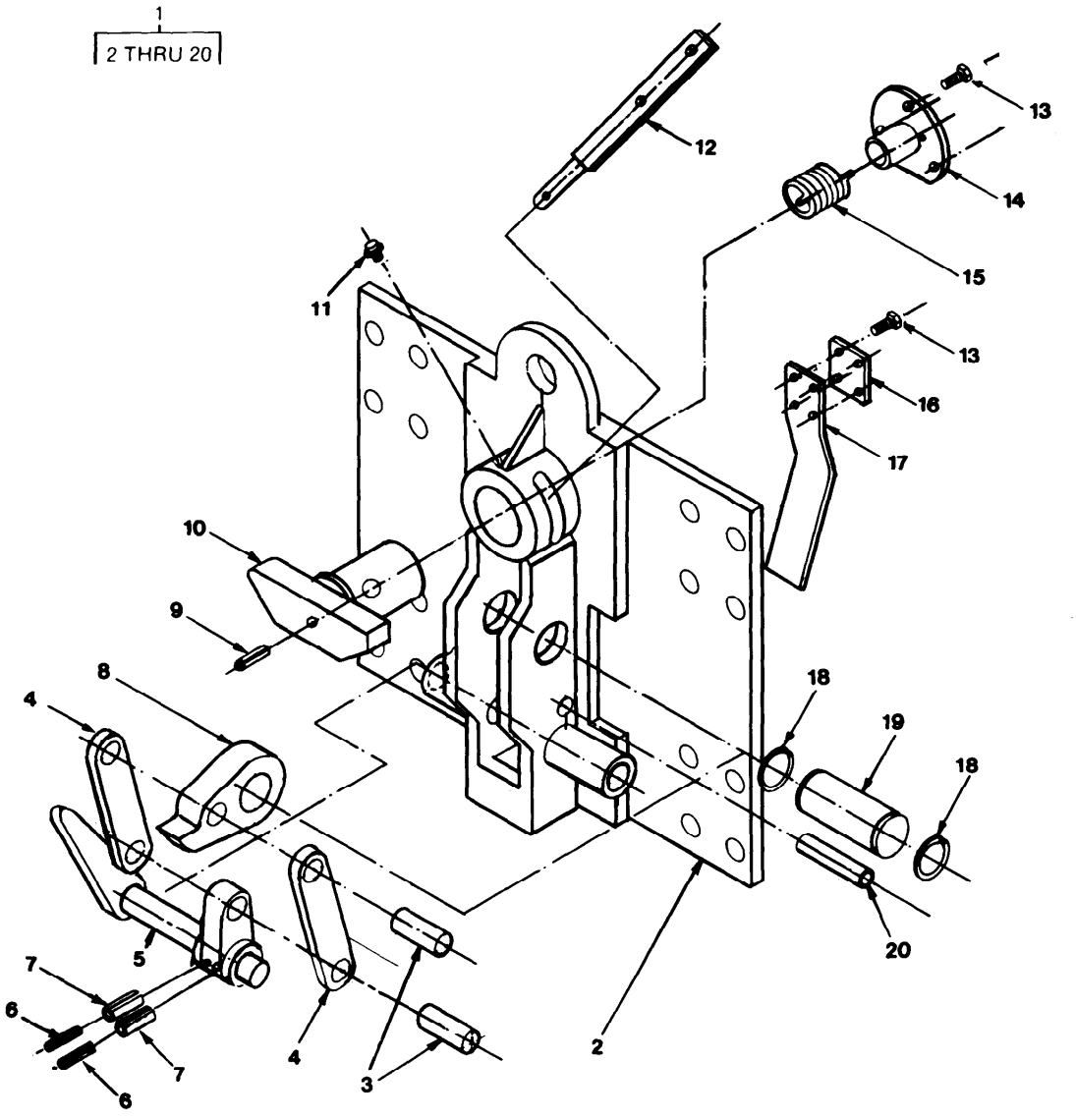

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FIGURE 5. TRIPPING DEVICE COMPLETE

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMRER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 0110 DIESEL STARTING CONTROLS AND CONVERSION UNITS	
				FIG. 5 TRIPPING DEVICE COMPLETE	
1	PFOFF	64866	3151001000	TRIPPING DEVICE ASS	1
2	PFOZZ	64866	3151001001	.TRIPPING DEVICE, HAM	1
3	PAOZZ	64866	1000835000	.PIN, STRAIGHT, HEADLE.	2
4	PAOZZ	64866	1000833000	.CONNECTING LINK, RIG	2
* 5	PFOZZ	64866	1002474000	.TRIP CAP ASSEMBLY,H	1
6	PAOZZ	64866	5014806045	. . PIN, SPRING	2
7	PAOZZ	64866	5014810050	. . PIN, SPRING	2
* 8	PFOZZ	64866	3150002001	.PAWL	1
9	PFOZZ	64866	5014808040	. PIN, SPRING	1
* 10	PFOZZ	64866	3150301001	.CAM, CONTROL	1
* 11	PFOZZ	95879	A1184	.FITTING, LUBRICATION.	1
12	XDOZZ	64866	3150003004	.LEVER, MANUAL CONTRO.	1
13	PFOZZ	64866	5015110030	.SCREW, SELF-LOCKING	7
14	PFOZZ	64866	3150002002	.COVER, ACCESS	1
* 15	PFOZZ	64866	3150003002	.SPRING, HELICAL, TORS.	1
16	PFOZZ	64866	3150002004	.SPRING PLATE.	1
* 17	PFOZZ	64866	3150003001	.SPRlNG, FLAT	1
18	PFOZZ	64866	5047105020	.RING,RETAINING	2
* 19	PFOZZ	64866	3151004001	.PIN, GROOVED, HEADLES.	1
20	PFOZZ	64866	5014825140	.PIN, SPRING	1
				END OF FIGURE	

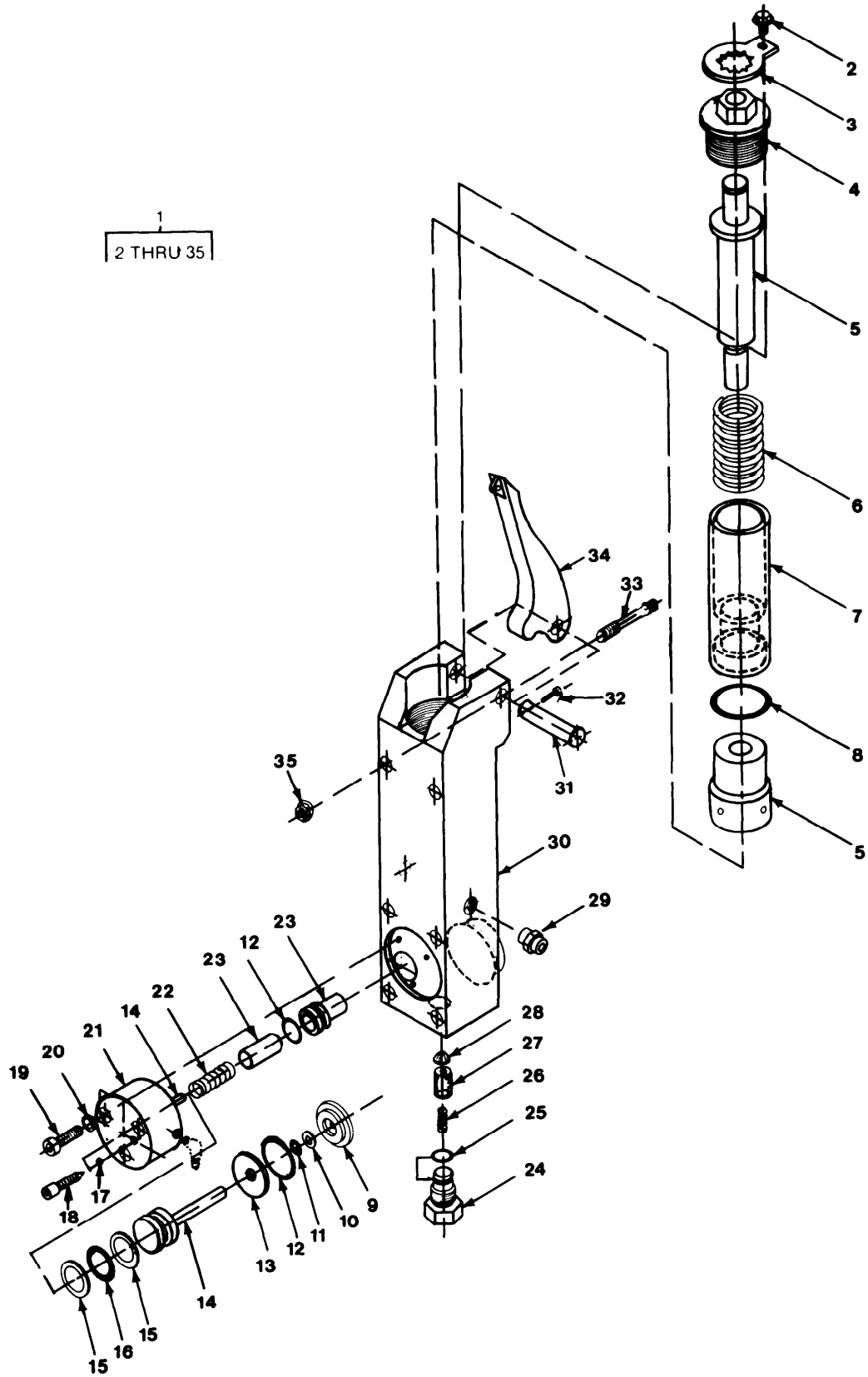

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FIGURE 6. REMOTE ADJUSTABLE FUEL PUMP

SECTION II CO1

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GRGUP 03 FUEL SYSTEM	
				GROUP 0302 FUEL PUMPS	
				FIG. 6 REMOTE ADJUSTABLE FUEL PUMP	
1	PAOFF	64866	3161901000	PUMP, RECIPROCATING	1
2	PFOZZ	64866	5015108012	.BOLT, SELF-LOCKING	1
3	PFOZZ	64866	3160004001	.RETAINER, NUT AND BO	1
4	PFOZZ	64866	3160003001	.BUSHING, MACHINE THR	1
* 5	PFFZZ	64866	3160101001	.PUMP ELEMET	1
* 6	PFFZZ	64866	3160104001	.SPRING, HELICAL, COMP	1
7	PFFZZ	64866	3160103001	.SLEEVE, SHAFT, PUMP	1
* 8	PFFZZ	64866	5078003840	.PACKING, PREFORMED	1
9	PFFZZ	64866	316200002	.CAP, END, HAMMER, PILE	1
* 10	PFFZZ	19204	8432757	.RETAINER, PACKING	1
11	PAFZZ	02697	2-010674-70	.PACKING, PREFORMED	1
12	PAFZZ	64866	5078002525	.PACKING, PREFORMED	2
13	PFFZZ	64866	3162002003	.WASHER, FLAT	1
14	PFFZZ	64866	3162002001	.PISTON, HAMMER, PILE	1
* 15	PFFZZ	02697	8-208N300-90	.RETAINER, PACKING	2
16	PAFZZ	02697	2-208 N674-70	.PACKING, PREFORMED	1
17	PAOZZ	06853	293804	.PACKIG, PREFORMED	1
* 18	PFOZZ	64866	3162001002	.BLEEDER VALVE, HYDRA	1
19	PFOZZ	64866	5091208050	.SCREW, SOCKET HE	3
20	PFOZZ	64866	5079808000	.WASHER, LOCK	3
21	PFFZZ	64866	3162001001	.BODY, CYLINDER	1
* 22	PFFZZ	92830	C0360-032-2250-M	.SPRING, HELICAL COMP	1
23	XDFZZ	64866	3162003001	.REGULATING ELEMENT	1
24	PBOZZ	64866	3160301001	.BOLT, INTERNALLY REL	1
25	PAOZZ	64866	5078002430	.PACKING, PREFORMED	1
* 26	PAOZZ	64866	3160304001	.SPRING, HELICAL, COMP	1
27	PFFZZ	64866	3160302001	.VALVE BODY	1
28	PAOZZ	64866	3160303001	.BUMPER, NONMETALLIC	1
29	PFOZZ	64866	7981250618	.ADAPTER, STRAIGHT, TU	2
30	PFFZZ	64866	31630901001	.BODY, FUEL PUMP, HAMM	1
31	PFOZZ	64866	3160106001	.PIN, GROOVED, HEADED	1
32	PFOZZ	56161	10503413	.PIN, COTTER	1
33	PAOZZ	64866	3160501001	.STUD, STEPPED	6
34	PBOZZ	64866	3160105001	.LEVER, MANUAL CONTRO	1
35	PAOZZ	64866	5019610150	.NUT, PLAIN, EXTENDED	6

END OF FIGURE

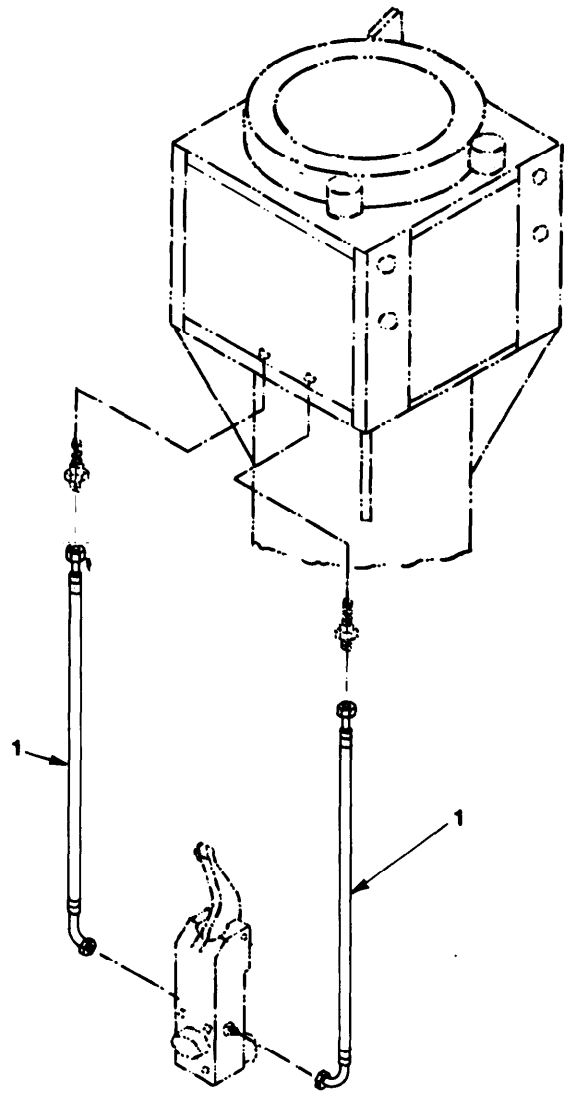

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FIGURE 7. FUEL LINES

SECTION II

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 0306 TANKS, LINES, FITTINGS, HEADERS	
				FIG. 7 FUEL LINES	
1	PAOZZ	64866	31-604-01-001	HOSE ASSEMBLY, NONME	2
				END OF FIGURE	

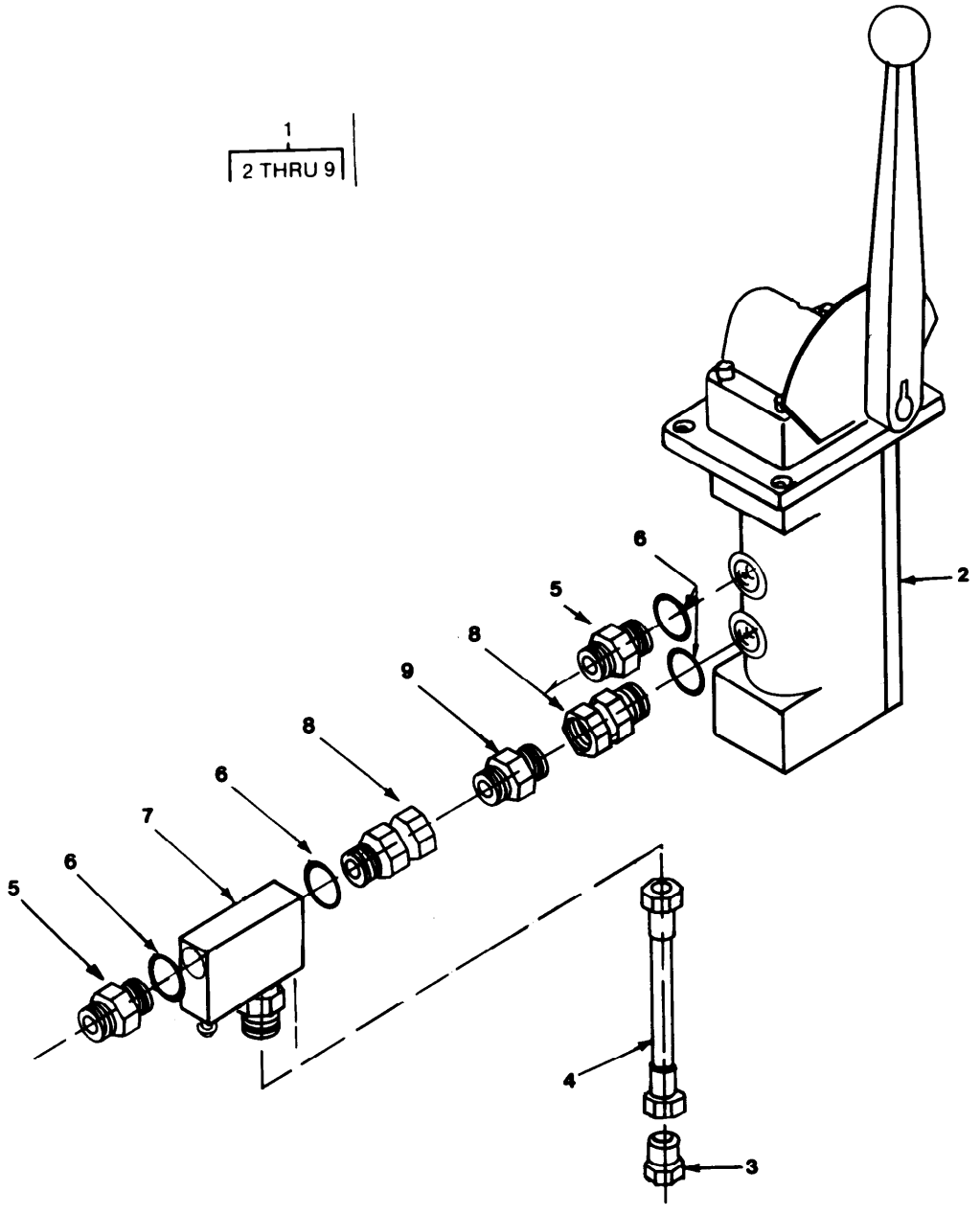

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FIGURE 8. PUMP CONTROL UNIT

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES (UOC)	(6) QTY
				GROUP 0308 ENGINE SPEED GOVERNOR AND CONTROLS	
				FIG. 8 PUMP CONTROL UNIT	
1	PAOFF	64866	3162060000	CONTROL UNIT, PUMP	1
2	PAOFF	12017	M3	.MASTER CONTROL ASSE	1
* 3	PFOZZ	96906	MS51518-B4	.PLUG, TUBE FITTING, T	1
* 4	PFOZZ	64866	31-620-63-000	.HOSE ASSEMBLY, NONME	1
* 5	PFOZZ	96906	MS51525A4	.ADAPTER, STRAIGHT, TU	3
6	PAFZZ	12017	1550	.PACKING, PREFORMED	4
* 7	XDOOO	12017	F1	.FILLER AND BLEEDER	1
* 8	PFOZZZ	00624	2066-4-4S	.ADAPTER, STRAIGHT, TU	2
9	XDOZZ	64866	728-1220-0404	.NIPPLE	1
				END OF FIGURE	

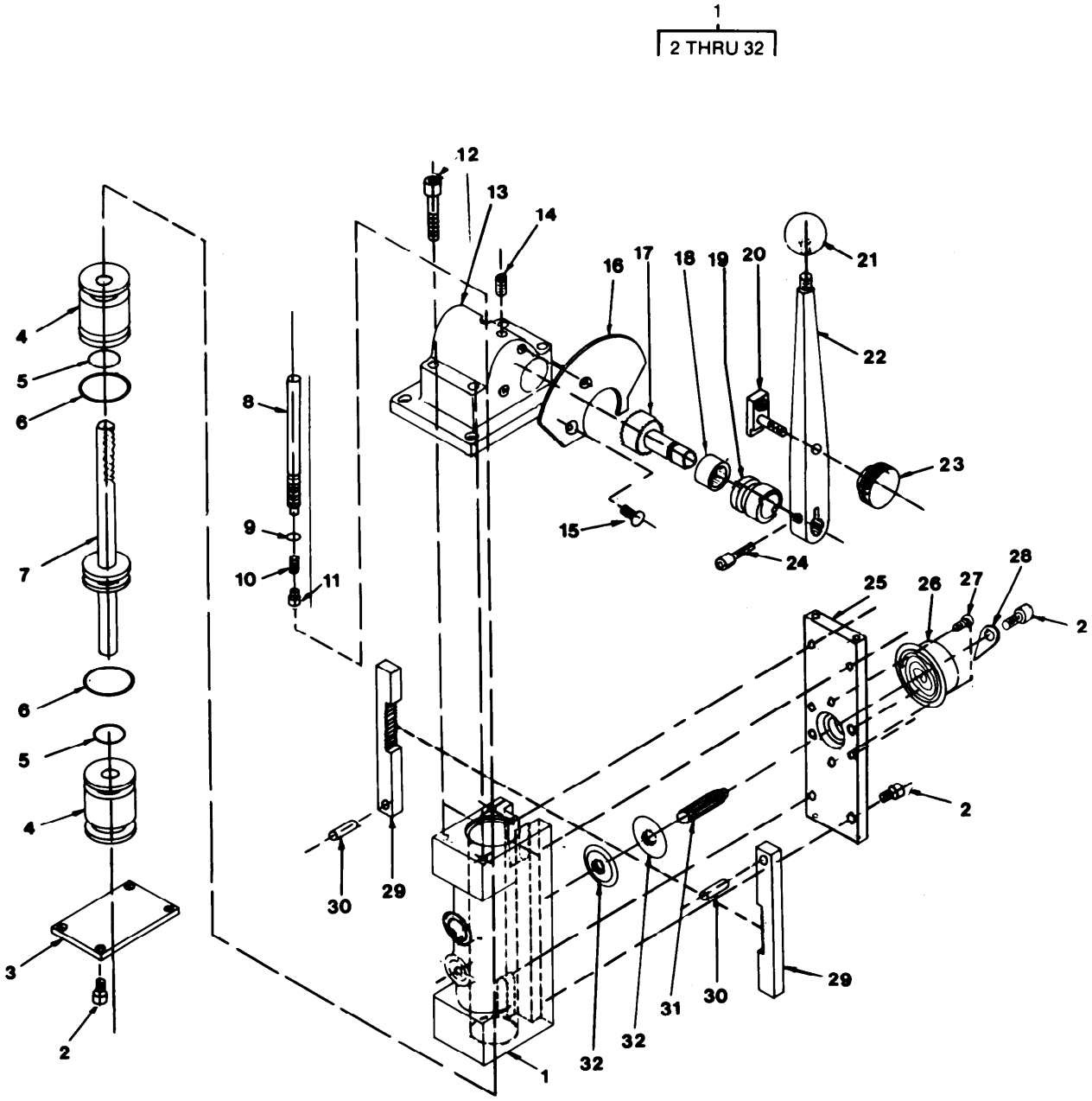

FIGURE 9. MASTER CONTROL EXPLODED

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP ENGINE SPEED GOVERNOR AND CONTROLS	
				FIG 9 MASTER CONTROL, EXPLODED	
1	PFFFF	12017	2115	BODY, VALVE	1
2	PFOZZ	80205	NAS1352-3-6P	.SCREW, CAP, SOCKET HE	13
3	PFOZZ	12017	3023	.COVER, ACCESS	1
* 4	PFFZZ	12017	3025	.CAP, VALVE	2
5	PAFZZ	12017	1534	.PACKING, PREFORMED	2
6	PAFZZ	12017	1533	.PACKING, PREFORMED	2
* 7	PFFZZ	12017	3337	.PISTON, VALVE	1
* 8	PFFZZ	12017	3342	.SETSCREW	1
9	PAFZZ	12017	1535	.PACKING, PREFORMED	1
* 10	PBFZZ	12017	3349-S	.SPRING	1
* 11	PFFZZ	12017	3343	.VALVE, CHECK	1
12	PFOZZ	80205	NAS1352-3-24	.BOLT, INTERNAL WRENC	4
13	PFOZZ	12017	3334	.COVER, ACCESS	1
14	PFODZZ	96906	MS51963-68	.SETSCREW	1
15	PFOZZ	12017	1546	.SCREW, CAP, SOCKET HE	2
16	PFFZZ	12017	3350	.PLATE, SECTOR	1
* 17	PFFZZ	12017	3335	.GEARSHAFT, SPUR	1
* 18	PFFZZ	12017	1540	.BEARING	1
* 19	PFFZZ	12017	3336	.BUSHING , SLEEVE	1
* 20	PFOZZ	12017	3351	.CLAMP, TEST STAND	1
21	PFOZZ	12017	1541	.KNOB	1
22	PBOZZ	12017	3353	.LEVER, REMOTE CONTRO	1
* 23	PFFZZ	12017	3352	.KNOB	1
24	PFOZZ	80205	NAS1352-3-10P	.SCREW, CAP, SOCKET HE	1
25	PBFZZ	12017	3004	.BODY, VALVE	1
* 26	PFFZZ	12017	3031	.COVER AND SPRING AS	1
27	PFOZZ	12017	1554	.SCREW, CAP, SOCKET HE	2
28	PFOZZ	12017	1543	.POINTER, DIAL	1
29	XDFZZ	12017	3011	.RACK, GEAR TYPE	2
30	PFFZZ	12017	1530	.PIN, STRAIGHT, HEADLE	2
* 31	PFFZZ	12017	3029	.GEARSHAFT, SPUR	1
* 32	PFFZZ	12017	3027	.WASHER, KEYWAY	2

END OF FIGURE

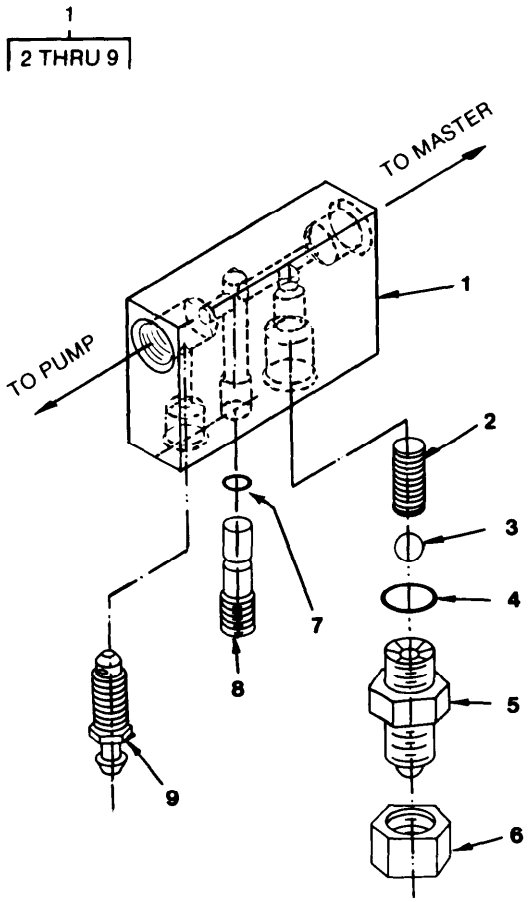

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FIGURE 10. FILLER/BLEEDER EXPLODED

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 0308 ENGINE SPEED GOVERNOR AND CONTROLS	
				FIG. 10 FILLER/BLEEDER, EXPLODED	
* 1	PBFZZ	12017	3354	BODY, FILL AND BLEED	1
2	PBOZZ	12017	3356	.SPRING, HELICAL, COMP	1
3	PBOZZ	00141	AK6	.BALL, BEARING	1
* 4	PAOZZ	12017	1550	.PACKING, PREFORMED	1
5	PFOZZ	12017	3357	.VALVE, CHECK	1
6	PFOZZ	12017	1551	.CAP, VALVE	1
7	PAOZZ	12017	1532	.PACKING, PREFORMED	1
8	PBOZZ	12017	3355	.VALVE, SHUTTLE	1
* 9	PFOZZ	12017	1540	.FITTING, BLEEDER	1
				END OF FIGURE	

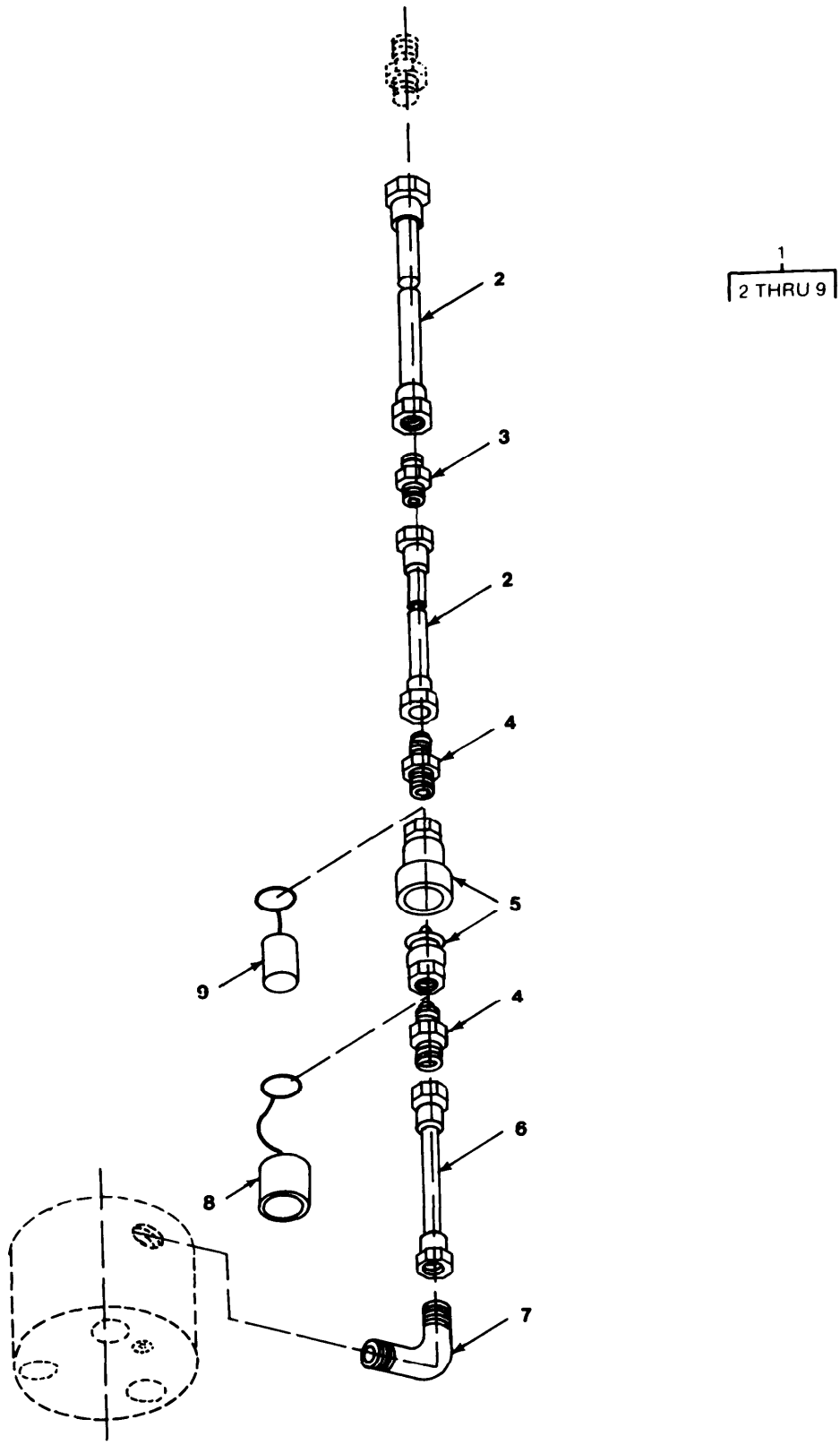

FIGURE 11. PUMP CONTROL HOSE

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 0308 ENGINE SPEED GOVERNOR AND CONTROLS	
				FIG. 11 PUMP CONTROL HOSE	
1	PAOZZ	64866	3162070001	HOSE ASSEMBLY NONME	2
2	PAOZZ	64866	3162070002	.HOSE ASSEMBLY, NONME	4
* 3	PFOZZ	30780	4-HTX-S	.NIPPLE, TUBE	3
4	PFOZZ	96906	MS51500A4	.ADAPTER, STRAIGHT,PI	2
5	PAOZZ	01276	FD45-1130-02-02	.COUPLING ASSEMBLY, C	1
6	PAOZZ	64866	3162070003	.HOSE ASSEMBLY, NONME	1
7	PFOZZ	96906	MS20822-4-4	.ELBOW, PIPE TO TUBE	1
8	XDOZZ	01276	FD45-1040-02	.CAP-PLUG, PROTECTIVE	1
9	XDOZZ	01276	FD45-1041-02	.CAP-PLUG, PROTECTIVE	1
				END OF FIGURE	

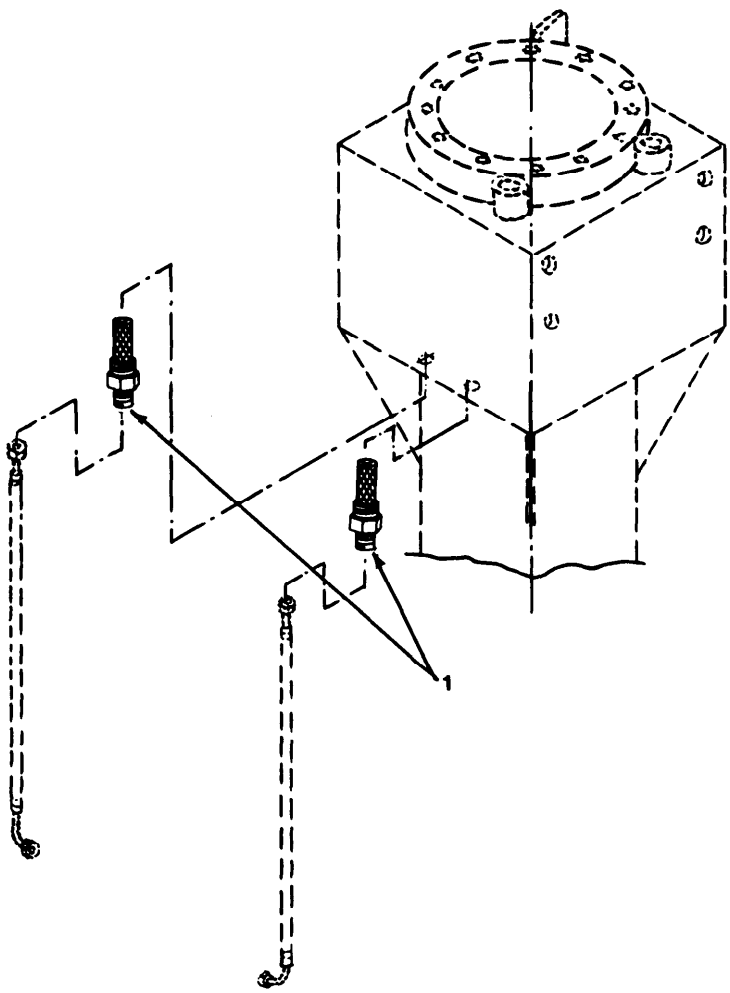

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FIGURE 12. PIPE JOINT FILTER

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 0309 FUEL FILTERS	
				FIG. 12 PIPE J0INT FILTER	
1	PBOZZ	64866	3111401001	STRAINER ELEMEN, SE	2
				END OF FIGURE	

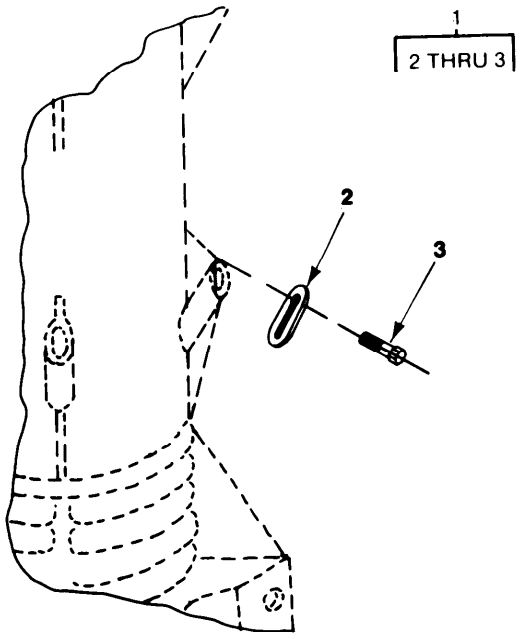

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FIGURE 13. PORT COVER

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 04 EXHAUST SYSTEM	
				GROUP 0401 MUFFLER AND PIPES	
				FIG. 13 PORT COVER	
1	PFOZZ	64866	3110010000	COVER, EXHAUST	4
2	PFOZZ	64866	3110010001	.COVER, ACCESS	1
3	PFOZZ	64866	5093312035	.SCREW, CAP, HEXAGON H.	1

END OF FIGURE

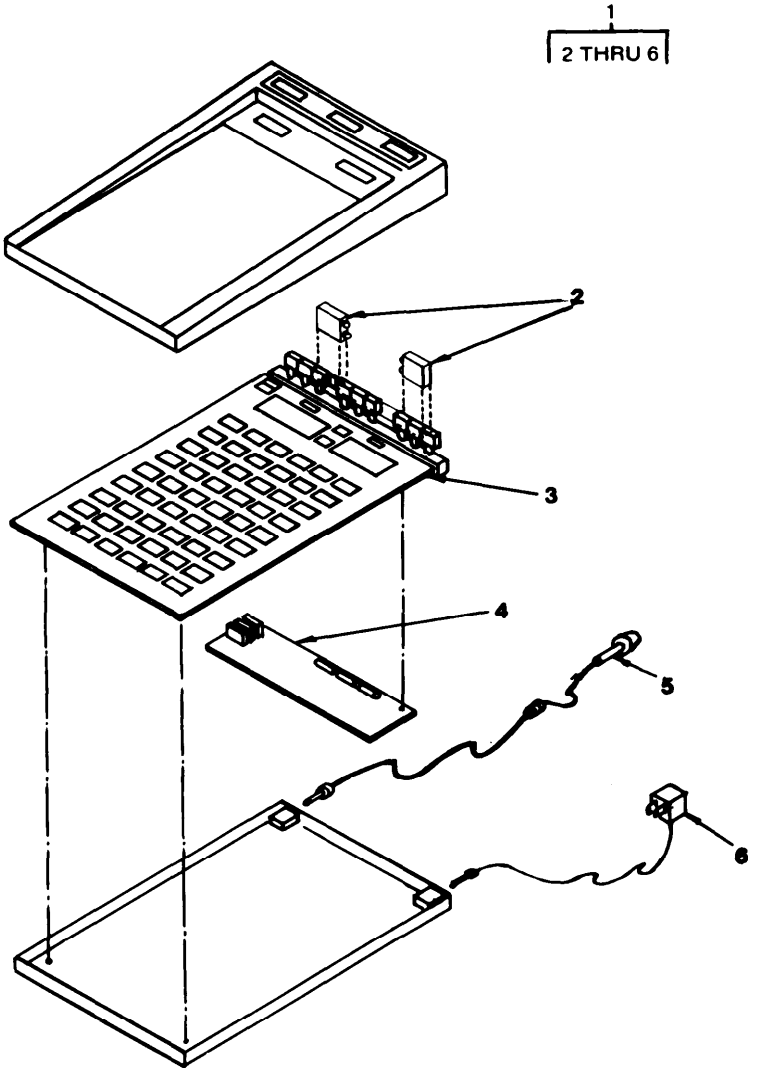

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FIGURE 14. SAXIMETER ™

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 06 ELECTRICAL SYSTEM	
				GROUP 0607 INSTRUMENT OR ENGINE CONTROL PANEL	
				FIG. 14 SAXIMETER	
1	PAOFF	65256	440	SAXIMETER	1
2	PFOZZ	36129	TR7/8	.BATTERY, STORAGE.	2
3	XDFFF	65256	S1	.CIRCUIT CARD ASSEMB.	1
* 4	PFFZZ	65256	S2	.CIRCUIT CARD ASSEMB	1
* 5	PFFZZ	65256	S5	.MICROPHONE, MAGNETIC	1
6	PFFZZ	65256	S4	.CHARGER, BATTERY	1

END OF FIGURE

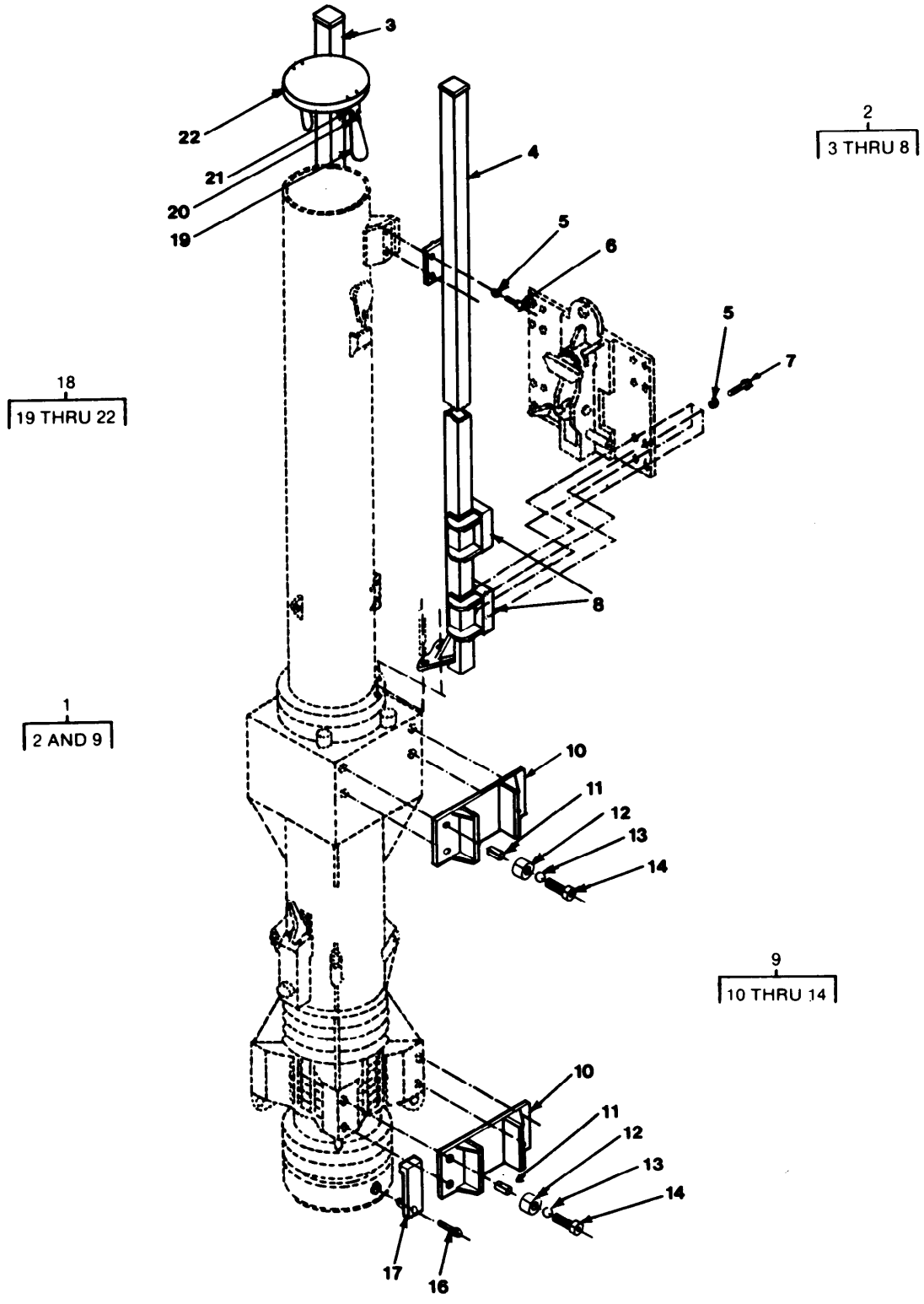

FIGURE 15. GUIDES COMPLETE PROTECTION CAP AND SAFETY CLAMP

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 74 CRANE SHOVELS AND EARTHMOVING EQUIPMENT COMPONENTS	
				GROUP 7413 PILE DRIVE ATTACHMENT	
				FIG. 15 GUIDES COMPLETE PROTECTION CAP AND SAFETY CLAMPS	
1	PAOOO	64866	3091000000	GUIDE SET,HAMMER, PI.	1
2	PFOOO	64866	3122110000	.GUIDE, STARTER, PILE	1
3	PBOZZ	64866	3122101002	..GUIDE, STARTER, PILE.	1
4	XDOZZ	64866	3122101001	..GUIDE, STARTER INDIC	1
5	PFOZZ	64866	5012716000	..WASHER, LOCK	20
6	PFOZZ	64866	5093316040	..SCREW, CAP, HEXAGON H	4
7	PFOZZ	64866	5091216050	..SCREW, CAP SOCKET HE	1
8	PBOZZ	64866	3092203000	..GIB, GUIDE	4
9	PFOZZ	64866	3091020000	.GUIDE ASSEMBLY, HAMM	1
10	PBOZZ	64866	3091001001	..GUIDE, SIDE, U-LEAD	4
11	PFOZZ	64866	5014840075	..PIN, SPRING	16
12	PFOZZ	64866	3090302002	..SPOOL	16
13	PFOZZ	64866	5012724000	..WASHER, LOCK	16
14	PFOZZ	64866	5091224140	..SCREW, CAP, SOCKET HE	16
* 15	PFOZZ	64866	3110003000	CLAMP, SAFETY	1
* 16	PFOZZ	64866	3010007001	.BOLT, EXTERNALLY REL	1
* 17	PFOZZ	64866	3110003001	.CLAMP, SAFETY	1
18	PFOZZ	64866	100079000	PROTECTION CAP COMP	1
19	PFOZZ	64866	2025	.STRAP, RETAINING	2
* 20	PFOZZ	80535	610-8415	.HOOK.	2
21	PFOZZ	64866	1000790003	.BOLT, U	2
22	PFOZZ	64866	l000790001	.CAP, PROTECTION	1

END OF FIGURE

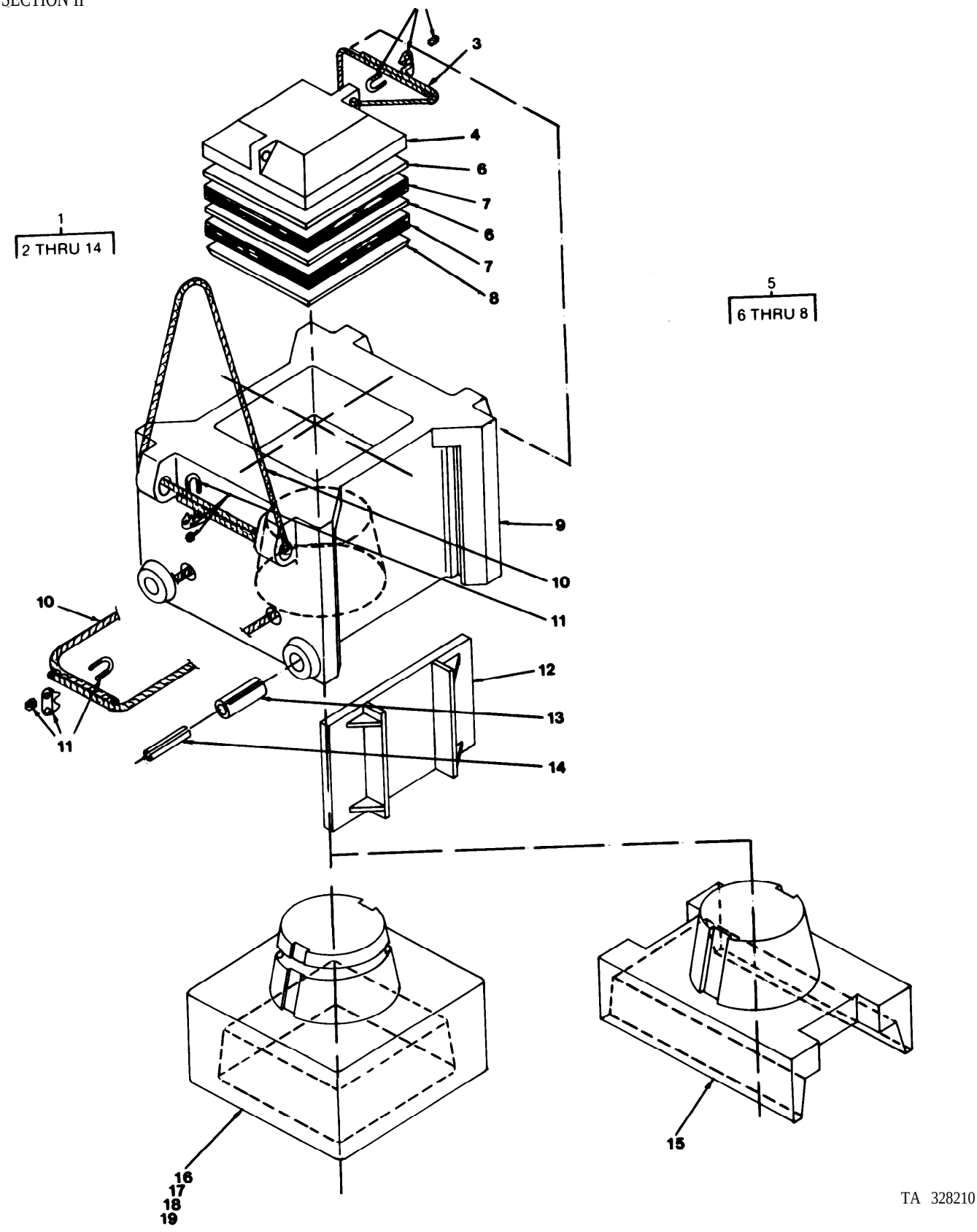

FIGURE 16. PRIMARY AND SECONDARY DRIVE CAPS

(1) ITEM NO	(2) SMR CODE	(3) FSCM	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 7413 PILE DRIVE ATTACHMENT	
				FIG. 16 PRIMARY AND SECONDARY DRIVE CAPS	
1	PFOFF	64866	4010000820	CAP ASSEMBLY, DRIVE.	1
2	PFOZZ	96906	MS16842-7	.CLAMP, WIRE ROPE, SAD.	4
3	MOOZZ	37581	l/2-6X37-1PSlWRC	.CABLE 1/2”1PS-1WRC MAKE FROM WIRE ROPE STRAND P/N 4010004000	2
4	PFOZZ	64866	4000100412	.ANVIL, PILE DRIVER	1
5	PBOZZ	64866	4000100612	.CUSHION BLOCK, PILE.	1
6	PBOZZ	64866	4000102612	..COVER, ACCESS.	2
7	PBOZZ	64866	4000101612	..CUSHION BLOCK, PILE	2
8	PBOZZ	64866	4000103612	..COVER, ACCESS.	1
9	PFOZZ	64866	4010001001	.CAP, DRIVE	1
10	MOOZZ	37581	3/4-6X37-1PS1WRC	.CABLE 3/4"-1PS-l WRC MAKE FROM WIRE ROPE STRAND P/N 4010003000.	3
11	PFOZZ	96906	MS16842-9	.CLAMP, WIRE ROPE, SAD	7
12	PBOZZ	64866	4182001000	.INSERT.	2
13	PFOZZ	64866	5014840100	.PIN, SPRING.	4
14	PFOZZ	64866	5014825100	.PIN, SPRING.	4
15	PFOZZ	64866	4010001584	HELMET, PILE DRIVER	1
16	PFOZZ	64866	4010001010	DRIVE CAP, SECONDARY.	1
17	PFOZZ	64866	4010001012	DRIVE CAP, SECONDARY.	1
18	PFOZZ	64866	4010001014	DRlVE CAP, SECONDARY	1
19	PFOZZ	64866	4010001018	DRIVE CAP, SECONDARY	1

END OF FIGURE

(1) ITEM NO	(2) SMR CODE	(3) CAGEC	(4) PART NUMBER	(5) DESCRIPTION AND USABLE ON CODES(UOC)	(6) QTY
				GROUP 95 GENERAL USE STANDARDIZED PARTS	
				GROUP 9501 BULK MATERIEL	
				FIG. BULK	
* 1	PAOZZ	64866	4010003000	WIRE ROPE STRAND.....	V
* 2	PAOZZ	64866	4010004000	WIRE ROPE STRAND.....	V
				END OF FIGURE	

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM	STOCK NUMBER	FIG.	ITEM
5330-00-113-3804	9	9	4820-01-226-3845	6	18
3110-00-198-1050	10	3	4820-01-226-3855	9	4
	1	15	4320-01-226-4991	6	7
	2	5	4730-01-226-5044	6	29
4730-00-231-4010	5	11	4730-01-226-5958	11	6
4030-00-243-4440	11	7	3895-01-226-5203	11	5
4030-00-243-4442	16	2	3895-01-226-5204	5	2
5360-00-247-1013	16	11	3895-01-226-5205	6	30
4730-00-289-0383	9	10	3895-01-226-5206	6	9
6140-00-372-3174	11	4	3895-01-226-5207	15	17
5330-00-467-0472	14	2	4730-01-226-5208	15	9
5330-00-595-6325	6	15	3895-01-226-5210	10	1
5330-00-595-6227	6	17	3895-01-226-5252	5	5
5330-00-690-0162	6	11	4820-01-226-5268	16	15
5330-00-690-0163	10	7	4820-01-226-5269	9	1
5330-00-690-3369	9	5	3040-01-226-5438	9	25
5305-00-723-9382	9	6	3040-01-226-5442	5	8
4730-00-814-5187	9	14	3815-01-226-5449	5	4
4920-00-841-9671	11	3	5340-01-226-5995	1	11
5340-00-936-5056	9	16	5340-01-226-5996	16	8
5330-00-937-5680	9	20	5340-01-226-5997	9	13
4730-01-007-5232	6	10	5340-01-226-5998	16	6
5330-01-013-3723	8	5	4310-01-226-6045	9	3
4730-01-021-3850	6	16		3	2
5330-01-037-7135	8	3	4310-01-226-6046	4	5
	8	6	4330-01-226-6085	4	4
5306-01-051-8025	10	4	3895-01-226-6141	1	16
5305-01-111-6679	9	12	3895-01-226-6142	16	16
4730-01-123-1640	9	24	3895-01-226-6143	16	17
4820-01-124-0227	10	9	3895-01-226-6144	16	18
4820-01-124-0227	9	11	3895-01-226-6144	16	19
4820-01-124-0330	9	7	3895-01-226-6145	4	1
4820-01-124-9011	10	8	3895-01-226-6146	15	15
4820-01-125-1937	10	5	3895-01-226-6147	13	1
3120-01-128-1116	9	19	3895-01-226-6148	1	2
3120-01-129-9619	9	18	3895-01-226-6149	1	10
5305-01-130-6080	9	2	3895-01-226-6150	2	2
5315-01-158-3143	6	32	3895-01-226-6151	2	4
4730-01-161-2672	8	8	3895-01-226-6152	4	3
6130-01-225-6444	14	6	3895-01-226-6153	3	3
5340-01-225-6862	13	2	3895-01-226-6154	6	21
3040-01-225-9070	9	31	3895-01-226-6155	6	14
3040-01-225-9071	9	17	3895-01-226-6156	8	2
4720-01-226-2081	7	1	3895-01-226-6157	15	12
3040-01-226-2212	5	10	3895-01-226-6158	15	10
3895-01-226-3766	15	1	3895-01-226-6159	15	3
3895-01-226-3767	16	1	3895-01-226-6160	15	8
3895-01-226-3768	1	1	3895-01-226-6161	16	9
3895-01-226-3769	2	1	3895-01-226-6162	16	4
3895-01-226-3770	5	1	3895-01-226-6163	16	12

CROSS-REFERENCE INDEXES

NATIONAL STOCK NUMBER INDEX

STOCK NUMBER	FIG.	ITEM
3895-01-226-6176	16	5
3895-01-226-6177	16	7
2815-01-226-6310	1	12
4720-01-227-1070	8	4
4730-01-227-1099	1	7
3895-01-227-1991	15	2
3040-01-227-5475	9	22
4730-01-227-9224	1	14
5965-01-227-9937	14	5
5305-01-229-8972	9	8
5310-01-230-1749	6	13
5310-01-230-1756	1	3
5310-01-230-1757	15	5
5306-01-230-9895	15	21
5306-01-230-9896	6	24
5310-01-231-5187	9	32
5355-01-231-5261	9	28
5315-01-231-5373	16	14
5315-01-231-5374	16	13
5315-01-231-5375	9	30
5310-01-231-5912	1	9
	15	13
5330-01-231-5922	6	12
5340-01-231-5964	5	14
5315-01-231-5978	6	31
5315-01-231-5984	2	3
5315-01-231-5985	5	20
5315-01-231-5986	5	7
5315-01-231-5987	5	6
5315-01-231-5988	5	9
5315-01-231-5989	15	11
5315-01-231-5990	5	3
5365-01-231-6013	5	18
5340-01-231-6015	15	19
5340-01-231-6020	6	28
5305-01-231-7365	15	16
5306-01-231-7377	6	2
5305-01-231-7401	15	7
5305-01-231-7405	2	6
5305-01-231-7406	13	3
5305-01-231-7407	15	6
5310-01-231-7456	6	35
5365-01-231-7520	5	16
5355-01-231-7552	9	23
5355-01-231-7553	9	21
5360-01-231-7807	10	2
5360-01-231-7808	6	6
5360-01-231-7809	6	22
5360-01-231-7817	5	15
5998-01-231-8676	14	4
5340-01-232-1894	6	3
5306-01-232-4256	5	13
5305-01-233-7775	15	14
5305-01-233-7776	9	27
5310-01-233-7783	6	20
5365-01-234-1491	6	4
5305-01-234-3079	1	5
5305-01-234-3080	1	4
3895-01-234-7353	14	1
5315-01-234-9521	5	19
4820-01-235-3654	10	6
3040-01-235-5726	6	34
5340-01-235-6208	15	20
3895-01-236-0634	9	26
5360-01-236-0696	5	17
5305-01-236-1667	1	8
5340-01-236-1928	15	22
4010-01-236-7065	BULK	1
5305-01-237-0828	9	15
5305-01-237-1692	6	19
4010-01-237-9307	BULK	2
5307-01-239-2076	6	33
5340-01-242-2216	15	18
4730-01-243-7041	1	6
	4	2
4820-01-245-1672	6	27
3895-01-245-6699	1	13
3895-01-245-6700	6	5
4730-01-246-1174	12	1
4320-01-248-7236	6	1
4320-01-248-8011	3	1
4320-01-249-0046	8	1
5330-01-249-0913	6	8
4720-01-249-2069	11	1
4720-01-250-1819	11	2
5360-01-250-6954	6	26
5330-01-253-1623	6	25

CROSS-REFERENCE INDEXES

PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
001Q41	AK6	3110-00-198-1050	10	3
95879	A1184	4730-00-223-6416	1	15
			2	5
			5	11
92830	C0360-032-2250-M	5360-01-231-7809	6	22
01276	FD45-1040-02		11	8
01276	FD45-1041-02		11	9
01276	FD45-1100-02-02	4730-01-226-5058	11	5
12017	F1		8	7
96906	MS16842-7	4030-00-243-4440	16	2
96906	MS16842-9	4030-00-243-4442	16	11
96906	MS20822-4-4	4730-00-231-4010	11	7
96906	MS51500A4	4730-00-289-0383	11	4
96906	MS51518-B4	4730-01-021-3850	8	3
96906	MS51525A4	4730-01-007-5232	8	5
96906	MS51963-68	5305-00-723-9382	9	14
12017	M3	3895-01-226-6156	8	2
80205	NAS1352-3-10P	5305-01-111-6679	9	24
80205	NAS1352-3-24	5306-01-051-8025	9	12
80205	NAS1352-3-6P	5305-01-139-6080	9	2
65256	S1		14	3
65256	S2	5998-01-231-8676	14	4
65256	S4	6130-01-225-6444	14	6
65256	S5	5965-01-223-9937	14	5
36129	TR7/8	6140-00-372-3174	14	2
37581	1/2-6X37-1PS1WRC		16	3
64866	1000446000	4730-01-243-7041	1	6
			4	2
64866	1000708000	4310-01-226-6046	4	4
64866	1000790000	5340-01-242-2216	15	18
64866	1000790001	5340-01-236-1928	15	22
64866	1000790003	5306-01-230-9895	15	21
64866	1000833000	3040-01-226-5442	5	4
64866	1000835000	5315-01-231-5990	5	3
64866	1002474000	3895-01-226-5210	5	5
64866	1002589000	4310-01-226-6045	3	2
			4	5
64866	1002592000	4730-01-227-9224	1	14
56161	10503413	5315-01-158-3143	6	32
12017	1530	5315-01-231-5375	9	30
12017	1532	5330-00-690-0162	10	7
12017	1533	5330-00-690-3369	9	6
12017	1534	5330-00-690-0163	9	5
12017	1535	5330-00-113-3804	9	9
12017	1540	3120-01-129-9619	9	18
12017	1541	5355-01-231-7553	9	21
12017	1543	5355-01-231-5261	9	28
12017	1546	5305-01-237-0828	9	15
12017	1548	4730-01-123-1640	10	9
12017	1550	5330-01-037-7135	8	6

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PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
12017	1550	5330-01-037-7135	10	4
12017	1551	4820-01-235-3654	10	6
12017	1554	5305-01-233-7776	9	27
02697	2-010N674-70	5330-00-595-6327	6	11
02697	2-208 N674-70	5330-01-013-3723	6	16
60648	2025	5340-01-231-6015	15	19
00624	2066-4-4S	4730-01-161-2672	8	8
12017	2115	4820-01-226-5268	9	1
06853	293804	5330-00-595-6325	6	17
37581	3/4-6X37-1PS1WRC		16	10
12017	3004	4820-01-226-5269	9	25
64866	3010007001	5305-01-231-7365	15	16
12017	3011		9	29
12017	3023	5340-01-226-5998	9	3
12017	3025	4820-01-226-3855	9	4
12017	3027	5310-01-231-5187	9	32
12017	3029	3040-01-225--9070	9	31
12017	3032	3895-01-236-0634	9	26
64866	3090302002	3895-01-226-6157	15	12
64866	3091000000	3895-01-226-3766	15	1
64866	3091001001	3895-01-226-6158	15	10
64866	3091020000	3895-01-226-5207	15	9
64866	3092203000	3895-01-226-6160	15	8
64866	31-604--01-001	4720-01-226-2081	7	1
64866	31-620-63-000	4720-01-227-1070	8	4
64866	3110001000	3895-01-226-3768	1	1
64866	3110001001	3895-01-226-6148	1	2
64866	3110003000	3895-01-226-6146	15	15
64866	3110003001	3895-01-226-5206	15	17
64866	3110006001	5305-01-231-7405	2	6
64866	3110007001	3895-01-226-6149	1	10
64866	3110010000	3895-01-226-6147	13	1
64866	3110010001	5340-01-225-6862	13	2
64866	3110201001	2815-01-226-6310	1	12
64866	3110301001	2815-01-226-5449	1	11
64866	3110701001	3895-01-245-6699	1	13
64866	3111401001	4730-01-246-1174	12	1
64866	3120001000	3895-01-226-3769	2	1
64866	3120204001	3895-01-226-6151	2	4
64866	3121201001	3895-01-226-6150	2	2
64866	3122101001		15	4
64866	3122101002	3895-01-226-6159	15	3
64866	3122110000	3895-01-227-1991	15	2
64866	3130001000	3895-01-226-6145	4	1
64866	3130001001	3895-01-226-6152	4	3
64866	3140001000	4320-01-248-8011	3	1
64866	3140002001	3895-01-226-6153	3	3
64866	3150002001	3040-01-226-5438	5	8
64866	3150002002	5340-01-231-5964	5	14
64866	3150002004	5365-01-231-7520	5	16
64866	3150003001	5360-01-236-0696	5	17

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PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
64866	3150003002	5360-01-231-7817	5	15
64866	3150003004		5	12
64866	3150301001	3040-01-226-2212	5	10
64866	3151001000	3895-01-226-3770	5	1
64866	3151001001	3895-01-226-5203	5	2
64866	3151004001	5315-01-234-9521	6	19
64866	3160003001	5365-01-234-1491	6	4
64866	3160004001	5340-01-232-1894	6	3
64866	3160101001	3895-01-245-6700	6	5
64866	3160103001	4320-01-226-4991	6	7
64866	3160104001	5360-01-231-7808	6	6
64866	3160105001	3040-01-235-5726	6	34
64866	3160106001	5315-01-231-5978	6	31
64866	3160301001	5306-01-230-9896	6	24
64866	3160302001	4820-01-245-1672	6	27
64866	3160303001	5340-01-231-6020	6	28
64866	3160304001	5360-01-250-6954	6	26
64866	3160501001	5307-01-239-2076	6	33
64866	3160901001	3895-01-226-5204	6	30
64866	3161901000	4320-01-248-7236	6	1
64866	3162001002	3895-01-226-6154	6	21
64866	3162001002	4820-01-226-3845	6	18
64866	3162002001	3895-01-226-6155	6	14
64866	3162002002	3895-01-226-5205	6	9
64866	3162002003	5310-01-230-1749	6	13
64866	3162003001		6	23
64866	3162060000	4320-01-249-0046	8	1
64866	3162070001	4720-01-249-2069	11	1
64866	3162070002	4720-01-250-1819	11	2
64866	3162070003	4720-01-226-5044	11	6
12017	3334	5340-01-226-5996	9	13
12017	3335	3040-01-225-9071	9	17
12017	3336	3120-01-128-1116	9	19
12017	3337	4820-01-124-0330	9	7
12017	3342	5305-01-229-8972	9	8
12017	3343	4820-01-124-0227	9	11
12017	3349-S	5360-00-247-1013	9	10
12017	3350	4920-00-841-9671	9	16
12017	3351	5340-00-936-5056	9	20
12017	3352	5355-01-231-7552	9	23
12017	3353	3040-01-227-5475	9	22
12017	3354	4730-01-226-5208	10	1
12017	3355	4820-01-124-9011	10	8
12017	3356	5360-01-231-7807	10	2
12017	3357	4820-01-125-1937	10	5
30780	4-HTX-S	4730-00-814-5187	11	3
64866	4000100412	3895-01-226-6162	16	4
64866	4000100612	3895-01-226-6176	16	5
64866	4000101612	3895-01-226-6177	16	7
64866	4000101612	5340-01-226-5997	16	6
64866	4000103612	5340-01-226-5995	16	8

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PART NUMBER INDEX

CAGEC	PART NUMBER	STOCK NUMBER	FIG.	ITEM
64866	4010000820	3895-01-226-3767	16	1
64866	4010001001	3895-01-226-6161	16	9
64866	4010001010	3895-01-226-6141	16	16
64866	4010001012	3895-01-226-6142	16	17
64866	4010001014	3895-01-226-6143	16	18
64866	4010001018	3895-01-226-6144	16	19
64866	4010001584	3895-01-226-5252	16	15
64866	4010003000	4010-01-236-7065	BULK	1
64866	4010004000	4010-01-237-9307	BULK	2
64866	4182001000	3895-01-226-6163	16	12
65256	440	3895-01-234-7353	14	1
64866	5012716000	5310-01-230-1757	15	5
64866	5012720000	5310-01-230-1756	1	3
64866	5012724000	5310-01-231-5912	1	9
			15	13
64866	5014806045	5315-01-231-5987	5	6
64866	5014808040	5315-01-231-5988	5	9
64866	5014808045	5315-01-231-5984	2	3
64866	5014810050	5315-01-231-5986	5	7
64866	5014825100	5315-01-231-5373	16	14
64866	5014825140	5315-01-231-5985	5	20
64866	5014840075	5315-01-231-5989	15	11
64866	5014840100	5315-01-231-5374	16	13
64866	5015108012	5306-01-231-7377	6	2
64866	5015110030	5306-01-232-4256	5	13
64866	5019610150	5310-01-231-7456	6	35
64866	5047105020	5365-01-231-6013	5	18
64866	5078002430	5330-01-253-1623	6	25
64866	5078002525	5330-01-231-5922	6	12
64866	5078003840	5330-01-249-0913	6	8
64866	5079808000	5310-01-233-7783	6	20
64866	5090800037	4730-01-227-1099	1	7
64866	5090818150	4730-01-226-6085	1	16
64866	5091208050	5305-01-237-1692	6	19
64866	5091216050	5305-01-231-7401	15	7
64866	5091220080	5305-01-234-3080	1	4
64866	5091220100	5305-01-234-3079	1	5
64866	5091224110	5305-01-236-1667	1	8
64866	5091224140	5305-01-233-7775	15	14
64866	5093312035	5305-01-231-7406	13	3
64866	5093316040	5305-01-231-7407	15	6
80535	610-8415	5340-01-235-6208	15	20
64866	728-122-0404		8	9
64866	7981250618	4730-01-226-5042	6	29
02697	8-208N300-90	5330-00-467-0472	6	15
19204	8432757	5330-00-937-5680	6	10

CROSS-REFERENCE INDEXES

FIGURE AND ITEM NUMBER INDEX

FIG	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
BULK	1	4010-01-236-7065	64866	4010003000
BULK	2	4010-01-237-9307	64866	4010004000
1	1	3895-01-226-3768	64866	311001000
1	2	3895-01-226-6148	64866	3110001001
1	3	5310-01-230-1756	64866	5012720000
1	4	5305-01-234-3080	64866	5091220080
1	5	5305-01-234-3079	64866	5091220100
1	6	4730-01-243-7041	64866	1000446000
1	7	4730-01-227-1099	64866	5090800037
1	8	5305-01-236-1667	64866	5091224110
1	9	5310-01-231-5912	64866	5012724000
1	10	3895-01-226-6149	64866	3110007001
1	11	2815-01-226-5449	64866	3110301001
1	12	2815-01-226-6310	64866	3110201001
1	13	3895-01-245-6699	64866	3110701001
1	14	4730-01-227-9224	64866	1002592000
1	15	4730-01-223-6416	95879	A1184
1	16	4730-01-226-6085	64866	5090818150
2	1	3895-01-226-3769	64866	3120001000
2	2	3895-01-226-6150	64866	3121201001
2	3	5315-01-231-5984	64866	5014808045
2	4	3895-01-226-6151	64866	3120204001
2	5	4730-00-223-6416	95879	A1184
2	6	5305-01-231-7405	64866	3110006001
3	1	4320-01-248-8011	64866	3140001000
3	2	4310-01-226-6045	64866	1002589000
3	3	3895-01-226-6153	64866	3140002001
4	1	3895-01-226-6145	64866	3130001000
4	2	4730-01-243-7041	64866	1000446000
4	3	3895-01-226-6152	64866	3130001001
4	4	4310-01-226-6046	64866	1000408000
4	5	4310-01-226-6045	64866	1002589000
5	1	3895-01-226-3770	64866	3151001000
5	2	3895-01-226-5203	64866	3151001001
5	3	5315-01-231-5990	64866	1000835000
5	4	3040-01-226-5442	64866	1000833000
5	5	3895-01-226-5210	64866	1002474000
5	6	5315-01-231-5987	64866	5014806045
5	7	5315-01-231-5986	64866	5014810050
5	8	3040-01-226-5438	64866	3150002001
5	9	5315-01-231-5988	64866	5014808040
5	10	3040-01-226-2212	64866	3150301001
5	11	4730-00-223-6416	95879	A1184
5	12		64866	3150003004
5	13	5306-01-232-4256	64866	5015110030
5	14	5340-01-231=5964	64866	3150002002
5	15	5360-01-231-7817	64866	3150003002
5	16	5365-01-231-7520	64866	3150002004
5	17	5360-01-236-0696	64866	3150003001
5	18	5365-01-231-6013	64866	5047105020

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FIGURE AND ITEM NUMBER INDEX

FIG	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
5	19	5315-01-234-9521	64866	3151004001
5	20	5315-01-231-5985	64866	5014825140
6	1	4320-01-248-7236	64866	3161901000
6	2	5306-01-231-7377	64866	5015108012
6	3	5340-01-232-1894	64866	3160004002
6	4	5365-01-234-1491	64866	3160003001
6	5	3895-01-245-6700	64866	3160101001
6	6	5360-01-231-7808	64866	3160104001
6	7	4320-01-226-4991	64866	3160103001
6	8	5330-01-249-0913	64866	5078003840
6	9	3895-01-226-5205	64866	3162002002
6	10	5330-00-937-5680	19204	8432757
6	11	5330-00-595-6327	02697	2-010N674-70
6	12	5330-01-231-5922	64866	5078002525
6	13	5310-01-230-1749	64866	3162002003
6	14	3895-01-226-6155	64866	3162002001
6	15	5330-00-467-0472	02697	8-208N300-90
6	16	5330-01-013-3723	02697	2-208 N674-70
6	17	5330-00-595-6325	06853	293804
6	18	4820-01-226-3845	64866	3162001002
6	19	5305-01-237-1692	64866	5091208050
6	20	5310-01-233-7783	64866	5079808000
6	21	3895-01-226-6154	64866	3162001001
6	22	5360-01-231-7809	92830	C0360-032-2250-M
6	23		64866	3162003001
6	24	5306-01-230-9896	64866	3160301001
6	25	5330-01-253-1623	64866	5078002430
6	26	5360-01-250-6954	64866	3160304001
6	27	4820-01-245-1672	64866	3160302001
6	28	5340-01-231-6020	64866	3160303001
6	29	4730-01-226-5042	64866	7981250618
6	30	3895-01-226-5204	64866	3160901001
6	31	5315-01-231-5978	64866	3160106001
6	32	5315-01-158-3143	56161	10503413
6	33	5307-01-239-2076	64866	3160501001
6	34	3040-01-235-5726	64866	3160105001
6	35	5310-01-231-7456	64866	5019610150
7	1	4720-01-226-2081	64866	31-604-01-001
8	1	4320-01-249-0046	64866	3162060000
8	2	3895-01-226-6156	12017	M3
8	3	4730-01-021-3850	96906	MS51518-B4
8	4	4720-01-227-1070	64866	310620-63-000
8	5	4730-01-007-5232	96906	MS51525A4
8	6	5330-01-037-7135	12017	1550
8	7		12017	F1
8	8	4730-01-161-2672	00624	2066-4-4S
8	9		64866	728-122--0404
9	1	4820-01-226-5268	12017	2115
9	2	5305-01-139-6080	80205	NAS1352-3-60
9	3	5340-01-226-5998	12017	3023
9	4	4820-01-226-3855	12017	3025

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FIGURE AND ITEM NUMBER INDEX

FIG	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
9	5	5330-00-690-0163	12017	1534
9	6	5330-00-690-3369	12017	1533
9	7	4820-01-124-0330	12017	3337
9	8	5305-01-229-8972	12017	3342
9	9	5330-00-113-3804	12017	1535
9	10	5360-00-247-1013	12017	3349-S
9	11	4820-01-124-0227	12017	3343
9	12	5306-01-051-8025	80205	NAS1352-3-24
9	13	5340-01-226-5996	12017	3334
9	14	5305-00-723-9382	96906	MS51963-68
9	15	5305-01-237-0828	12017	1546
9	16	4920-00-841-9671	12017	3350
9	17	3040-01-225-9071	12017	3335
9	18	3120-01-129-9619	12017	1540
9	19	3120-01-128-1116	12017	3336
9	20	5340-00-936-5056	12017	3351
9	21	5355-01-231-7553	12017	1541
9	22	3040-01-227-5475	12017	3353
9	23	5355-01-231-5475	12017	3352
9	24	5305-01-111-6679	80205	NAS1352-3-10P
9	25	4820-01-226-5269	12017	3004
9	26	3895-01-236-0634	12017	3031
9	27	5305-01-233-7776	12017	1554
9	28	5355-01-231-5261	12017	1543
9	29		12017	3011
9	30	5315-01-231-5375	12017	1530
9	31	3040-01-225-9070	12017	3029
9	32	5310-01-231-5187	12017	3027
10	1	4730-01-226-5208	12017	3354
10	2	5360-01-231-7807	12017	3356
10	3	3110-00-198-1050	00141	AK6
10	4	5330-01-037-7135	12017	1550
10	5	4820-01-125-1937	12017	3357
10	6	4820-01-235-3654	12017	1551
10	7	5330-00-690-0162	12017	1532
10	8	4820-01-124-9011	12017	3355
10	9	4730-01-123-1640	12017	1548
11	1	4720-01-249-2069	64866	3162070001
11	2	4720-01-250-1819	64866	3162070002
11	3	4730-00-814-5187	30780	4-HTX-S
11	4	4730-00-289-0383	96906	MS51500A4
11	5	4730-01-226-5958	01276	FD45-1100-02-02
11	6	4720-01-226-5044	64866	3162070003
11	7	4730-00-231-4010	06906	MS20822-4-4
11	8		01276	FD45-1040-02
11	9		01276	FD45-1041-02
12	1	4730-01-246-1174	64866	3111401001
13	1	3895-01-226-6147	64866	3110010000
13	2	5340-01-225-6862	64866	3110010001
13	3	5305-01-231-7406	64866	5093312035
14	1	3895-01-234-7353	65256	440

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FIGURE AND ITEM NUMBER INDEX

FIG	ITEM	STOCK NUMBER	CAGEC	PART NUMBER
14	2	61400-00-372-3174	36129	TR7/8
14	3		65256	S1
14	4	5998-01-231-8676	65256	S2
14	5	5965-01-227-9937	65256	S5
14	6	6130-01-225-6444	65256	S4
15	1	3895-01-226-3766	64866	3091000000
15	2	3895-01-227-1991	64866	3122110000
15	3	3895-01-226-6159	64866	3122101002
15	4		64866	3122101001
15	5	5310-01-230-1757	64866	5012716000
15	6	5305-01-231-7407	64866	5093316040
15	7	5305-01-231-7401	64866	5091216050
15	8	3895-01-226-6160	64866	3092203000
15	9	3895-01-226-5207	64866	3091020000
15	10	3895-01-226-6158	64866	3091001001
15	11	5315-01-231-5989	64866	5014840075
15	12	3895-01-226-6157	64866	3090302002
15	13	5310-01-231-5912	64866	5012724000
15	14	5305-01-233-7775	64866	5091224140
15	15	3895-01-226-6146	64866	3110003000
15	16	5305-01-231-7365	64866	3010007001
15	17	3895-01-226-5206	64866	3110003001
15	18	5340-01-242-2216	64866	1000790000
15	19	5340-01-231-6015	60648	2025
15	20	5340-01-235-6208	80535	610-8415
15	21	5306-01-230-9895	64866	1000790003
15	22	5340-01-236-1928	64866	1000790001
16	1	3895-01-226-3767	64866	4010000820
16	2	4030-00-243-4440	96906	MS16842-7
16	3		37581	A/2-6X37-1PS1WRC
16	4	3895-01-226-6162	64866	4000100412
16	5	3895-01-226-6176	64866	4000100612
16	6	5340-01-226-5997	64866	4000102612
16	7	3895-01-226-6177	64866	4000101612
16	8	5340-01-226-5995	64866	4000103612
16	9	3895-01-226-6161	64866	4010001001
16	10		37581	3/4-6X37-1PS1WRC
16	11	4030-00-243-4442	96906	MS16842-9
16	12	3895-01-226-6163	64866	4182001000
16	13	5315-01-231-5374	64866	5014840100
16	14	5315-01-231-5373	64866	5014825100
16	15	3895-01-226-5252	64866	4010001584
16	16	3895-01-226-6141	64866	4010001010
16	17	3895-01-226-6142	64866	4010001012
16	18	3895-01-226-6143	64866	4010001014
16	19	3895-01-226-6144	64866	4010001018

20. ALPHABETICAL INDEX

20. ALPHABETICAL INDEX, cont.

20. ALPHABETICAL INDEX, cont.

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1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

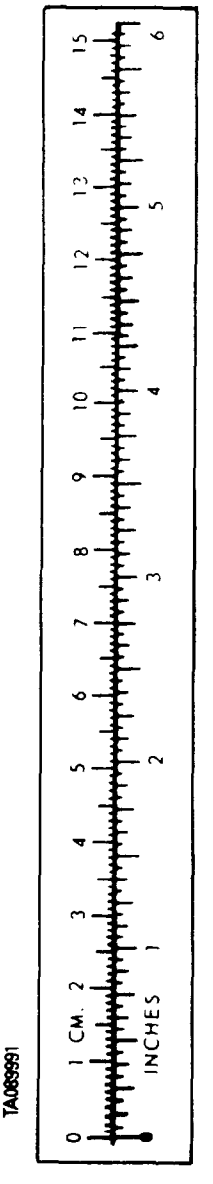
TEMPERATURE

$\frac{5}{9}(°F - 32) = °C$
212° Fahrenheit is equivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
$\frac{9}{5}(°C + 32) = °F$

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
Pints	Liters	0.473
Quarts	Liters	0.946
Gallons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
Liters	Gallons	0.264
Grams	Ounces	0.035
Kilograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pound-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



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