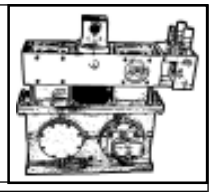
OPERATION AND MAINTENANCE MANUAL

APE Model 15E
with excavator suppressor

SERIAL NUMBER:

MODEL 15E VIBRO

7032 SOUTH 196th - KENT, WA 98032 - (253) 872-0141 / FAX (253) 872-8710



Revision Record

Change Number	Page Number	Date	Revision Description

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Preface

General

This manual covers the **Model 15E Vibratory Hammer**. The data provided in this manual gives the necessary information to operate and maintain APE equipment. The listed procedures are to be performed by qualified personnel who have an understanding of the equipment and who follow all safety precautions.

Guide to Using the Manual

1. Refer to the Table of Contents for the page location of applicable sections.

2. All weights and measurements in this manual are in both English and Metric units.

3. The manual will be revised as necessary to reflect current information.

Abbreviations

The following are abbreviations used within this manual.

lbs. = Pounds

psi. = Pounds per Square Inch

hp. = Horse Power

gpm. = Gallons Per Minute

rpm. = Revolutions Per Minute

hyd. = Hydraulic

NPT. = National Pipe Thread

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Safety Precautions

(This list of precautions must be followed at all times to ensure personal & equipment safety.)

1. Read this manual from beginning to end before operating or working on this machine.

2. When operating in a closed area, pipe exhaust fumes outside. (**WARNING:** Breathing exhaust fumes can cause serious injury and even death.)

3. When servicing batteries, avoid any type of spark or open flame. Batteries generate explosive gases during charging. There must be proper ventilation when charging batteries.

4. Never adjust or repair the unit while it is in operation.

5. Never stand under vibro at any time and keep your eyes on the vibro when it is in operation. Keep a look out for loose bolts or leaking hydraulic lines.

6. Avoid pulling on hose quick dis-connect fittings. Move power unit closer to work if hoses cannot reach. Do not use hoses as a tow line to tug the power unit! If a hose fails at the hydraulic couplers then it is a result of "hose tugging by the pile crew".

7. Avoid kinks in the hoses. Kinks will cut the hose safety factor by 50 percent.

8. Always wear eye and ear protection.

9. Avoid standing downwind of vibrating piles. Dirt and other matter may become airborne and fall into the unprotected eye.

10. Always wear a hardhat, gloves, and safety shoes.

11. Always attach safety line to pile when extracting or hoisting into position.

12. (WARNING) Never clamp vibro to pile and dis-connect from crane line. Lay vibro down on ground when not in use.

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Illustration List

Table List

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Warranty

American Piledriving Equipment, Inc. STANDARD WARRANTY

American Piledriving Equipment, Inc. (APE) warrants new products sold by it to be free from defects in material or workmanship for a period of one year after the date of delivery to the first user and subject to the following conditions:

APE's obligation and liability under this WARRANTY is expressly limited to repairing or replacing at APE's option, any parts which appear to APE upon inspection to have been defective in material or workmanship. Such parts shall be provided at no cost to the user, at the business establishment of APE or the authorized APE distributor of the product during regular working hours. **This WARRANTY, shall not apply to component parts or accessories of products not manufactured by APE** and which carry the warranty of the manufacturer thereof, or to normal maintenance (such as engine tune-up) or normal maintenance parts (such as filters). Replacement or repair parts installed in the product covered by this WARRANTY are warranted only for the remainder of the warranty as if such parts were original components of said product. AMERICAN PILEDRIVING EQUIPMENT, INC. makes no other warranty, expressed or implied and makes no warranty of merchantability of fitness for any particular purpose.

APE's obligation under this WARRANTY shall not include any transportation charges, costs of installation, duty, taxes or any other charges whatsoever, or any liability for direct, indirect, incidental or consequential damage or delay. If requested by APE, products or parts for which a warranty claim is made are to be returned transportation prepaid to APE. Any improper use, including operation after discovery of defective or worn parts, operation beyond rated capacity, substitution of any parts whatsoever, or parts not approved by APE or any alteration or repair by others in such manner as in APE's judgment affects the product materially and adversely, shall void this warranty.

NO EMPLOYEE OR REPRESENTATIVE IS AUTHORIZED TO CHANGE THIS WARRANTY IN ANY WAY OR GRANT ANY OTHER WARRANTY UNLESS SUCH CHANGE IS MADE IN WRITING AND SIGNED BY AN OFFICER OF APE, INC.

ANY TYPE OF WELDING ON EQUIPMENT WILL VOID THE WARRANTY

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I. GENERAL INFORMATION

I-1. Machine Features

APE MODEL 15 VIBRATORY DRIVER/EXTRACTOR

FOR ALL TYPES OF PILE DRIVING AND EXTRACTING

- Just 1580 pounds
- One piece gear/eccentric design
- No pins, splines or keyways
- Eccentrics enhanced with lead
- 600 inch pounds - very powerful
- Visual indicator shows crane line pull
- Large rubber elastomers - smooth
- Can mount and operate off backhoe
- Can be used under water
- Drives double & single sheets
- 4 wire hoses prevent failures
- Clamp fits H-beams & plates
- 29 Tons of drive force
- Attachments for wood & pipe piles

Figure 1-A. Machine Features

I. GENERAL INFORMATION (Continued...)

I-2. Machine Specifications

I-2A. Model 15 Vibro - (Table 1-A.)

Eccentric Moment	600
Drive Force	29 Tons (258 kN)
Frequency (cpm)	0 - 1850
Amplitude	0.65" (16mm)
Suspended Weight	1580 lbs.
Length	35" (890 mm)
Width	12 inches (305 mm)
Height	42" (1,067 mm)
Height with Clamp*	62" (1,575 mm)

* Weight and height includes sheeting clamp and 1/2 of hose bundle.

Figure 1-B. Machine Specifications

I. GENERAL INFORMATION (Continued...)

I-3. General Description of Model 15 Vibro

The **APE Model 15E** is a variable frequency vibratory pile driver/extractor designed to drive and extract all types of piles including sheet, pipe, timber, concrete, H-beam, I-beam, and steel plates. In addition, the vibrator can be used for soil compaction, installing well casings, and installation of tie-backs and wick drains.

The Model 15 operates in a frequency range of 0 to 1850 cycles per minute depending on the hydraulic flow and on the hydraulic motors fitted to the gear train. The Model 15E is especially suited for driving or extracting piles that are near buildings or other structures. This is because the Model 15E vibrates at higher frequencies and thus is less damaging to surrounding soils.

The three major parts to the Model 15E are as follows:

A.) The Swivel
B.) The Suppressor housing
B.) The Gearbox
C.) The Clamping Attachment
D.) The Hydraulic Manifold
E.) The Hydraulic Drive Motor

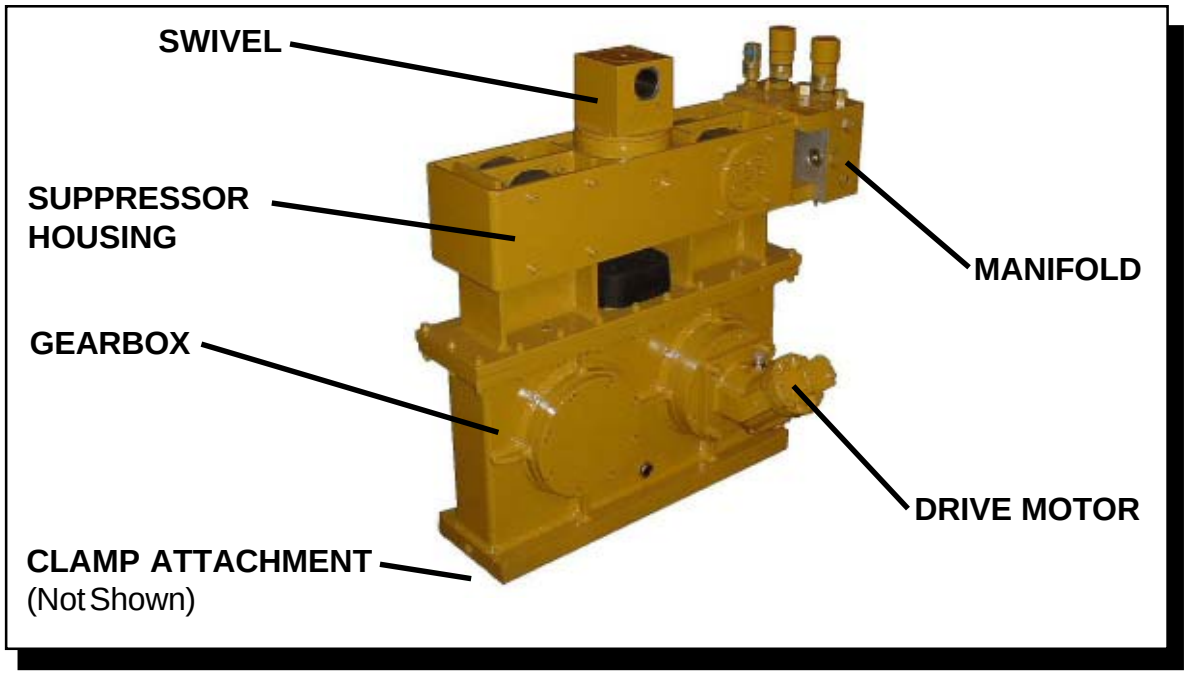

Figure 1-C. General Description of 15E Vibro.

I. GENERAL INFORMATION (Continued...)

I-3A. The Suppressor Housing

The suppressor housing of the **Model 15 APE Vibrator** is the top part of the vibro that attaches excavator swivel. It is designed to absorb the vibration generated from the vibrator gearbox. Three different types of suppressors can be mounted to the APE Model 15E vibro. The standard suppressor is for light to medium work, the heavy duty suppressor is for hard extraction. A third type of suppressor is used when the unit is mounted to an excavator. In addition, many special suppressors have designed for unique jobs, such as inside buildings where headroom is a problem.

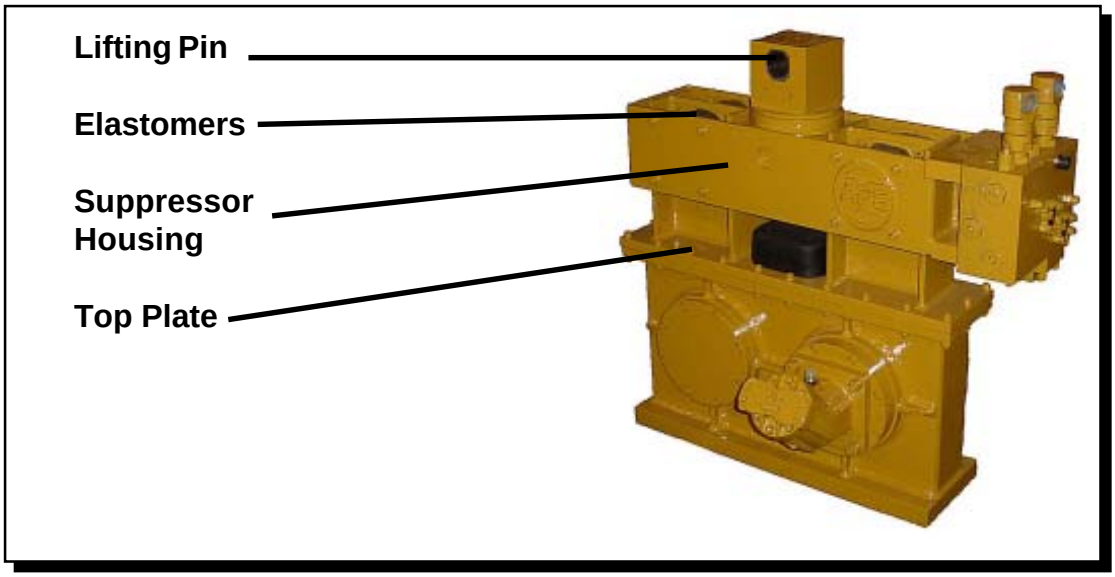

Figure 1-D. General Description of Suppressor Housing.

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I. GENERAL INFORMATION (Continued...)

I-3B. The Vibrator Gearbox

The vibrator gearbox contains two high amplitude eccentric weights cast in one piece with the gear. The counterweight is filled, and therefore, enhanced with lead to increase eccentric moment. This design is unique to the industry and was developed by the engineers of APE to solve a number of problems associated with other types of vibrator machines. Both the eccentric and the drive gear have been helically cut to provide high speed operation with reduced noise and wear. Vibration is caused by the vertical movement created when the eccentrics are rotated. The eccentric and drive gear are driven in line by one Volvo motor mounted on the outside face of the gearbox. The eccentrics rotate on two shafts housed by four giant spherical bearings. The gears and bearings receive lubrication as a result of the fluid splashing inside the gearbox when the gears are rotated. The oil level is quickly determined by looking at the site gauge. The Model 15E can be operated under water to a depth of 30 feet without modifications. (Consult factory for depths below 30 feet.)

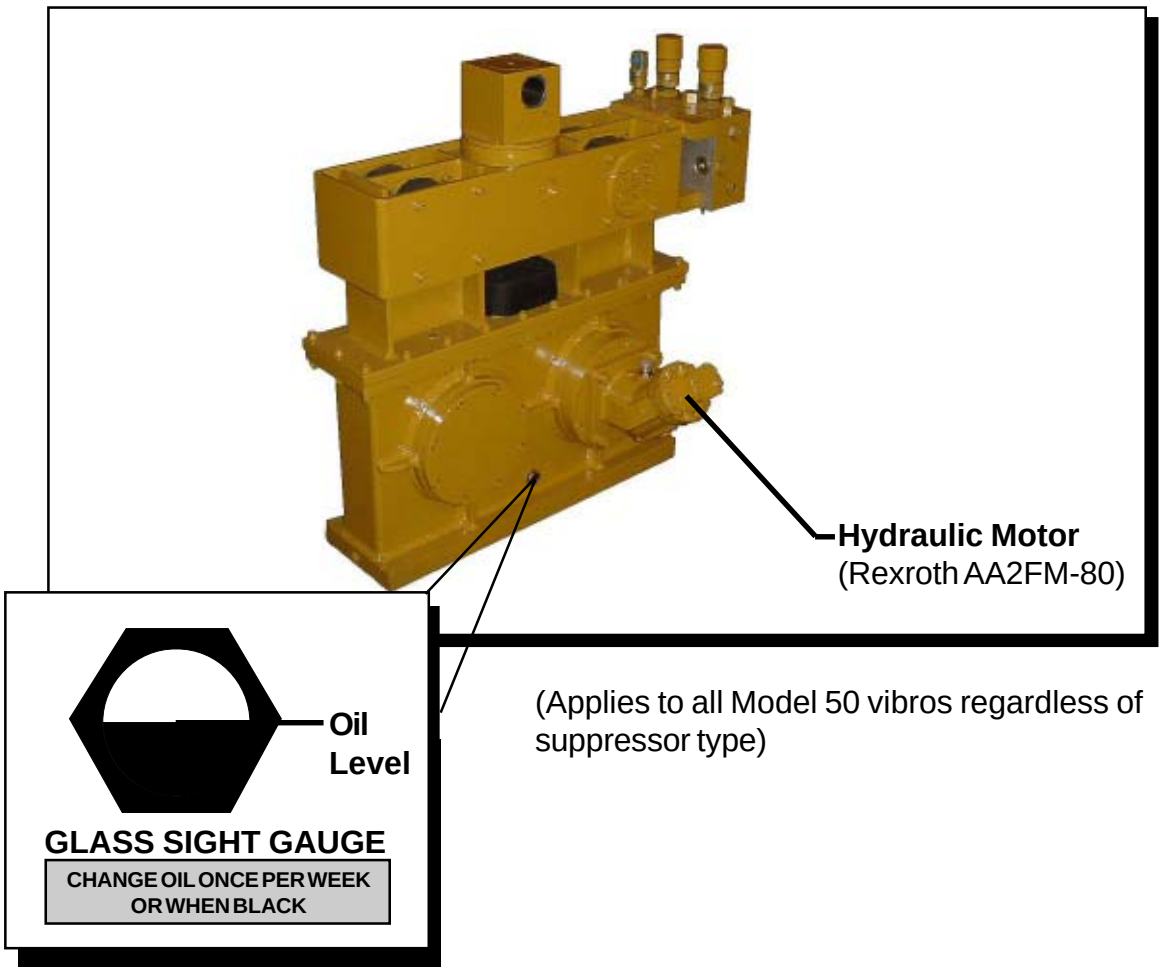

Figure 1-E. General Description of Vibrator Gearbox.

I. GENERAL INFORMATION (Continued...)

I-3C. The Clamp Attachment

The APE 15 comes with a **standard Model 20 sheet clamp attachment**. The clamp contains two gripping jaws. One is "fixed" and one is "moveable." A large hydraulic cylinder operates the moveable jaw with up to 177 tons of clamping force depending on clamp pump relief pressure. The jaws open and close by the bucket lever on the excavator. The valve can be manually operated with a screwdriver if all electrical fails. **The APE standard sheet pile clamp** can be fitted with jaws to fit many different types of piles including sheet piles, H-Beams, steel plates, steel rods, pipe piles, wood piles, and concrete piles. (Contact APE or your local APE distributor for more information on clamp attachments for special pile types.)

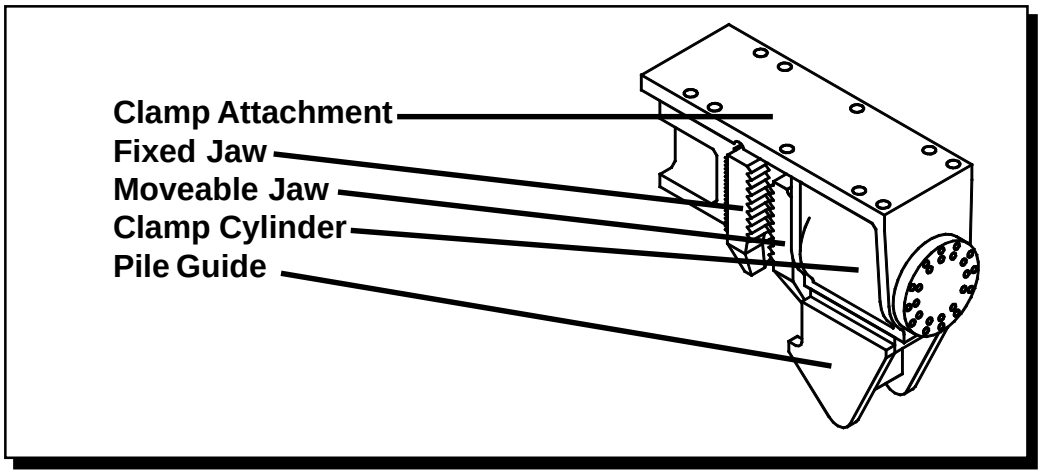

Figure 1-F. General Description of Clamp Attachment.

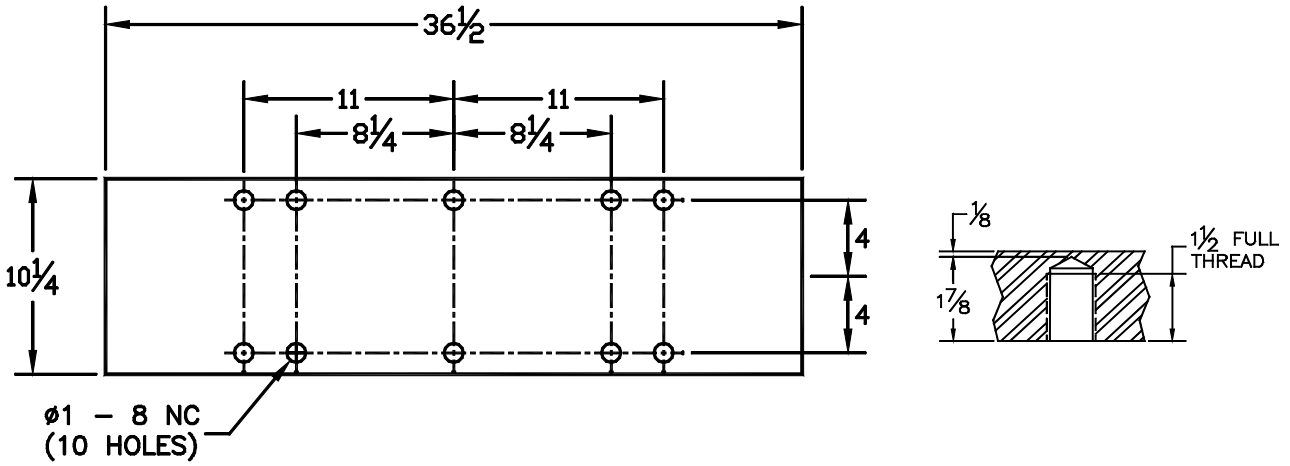

Figure 1-G. Clamp Attachment Hole Configuration.

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II. COMPONENT DEFINITION

II-1. Component Identification - Model 15E Vibratory Hammer

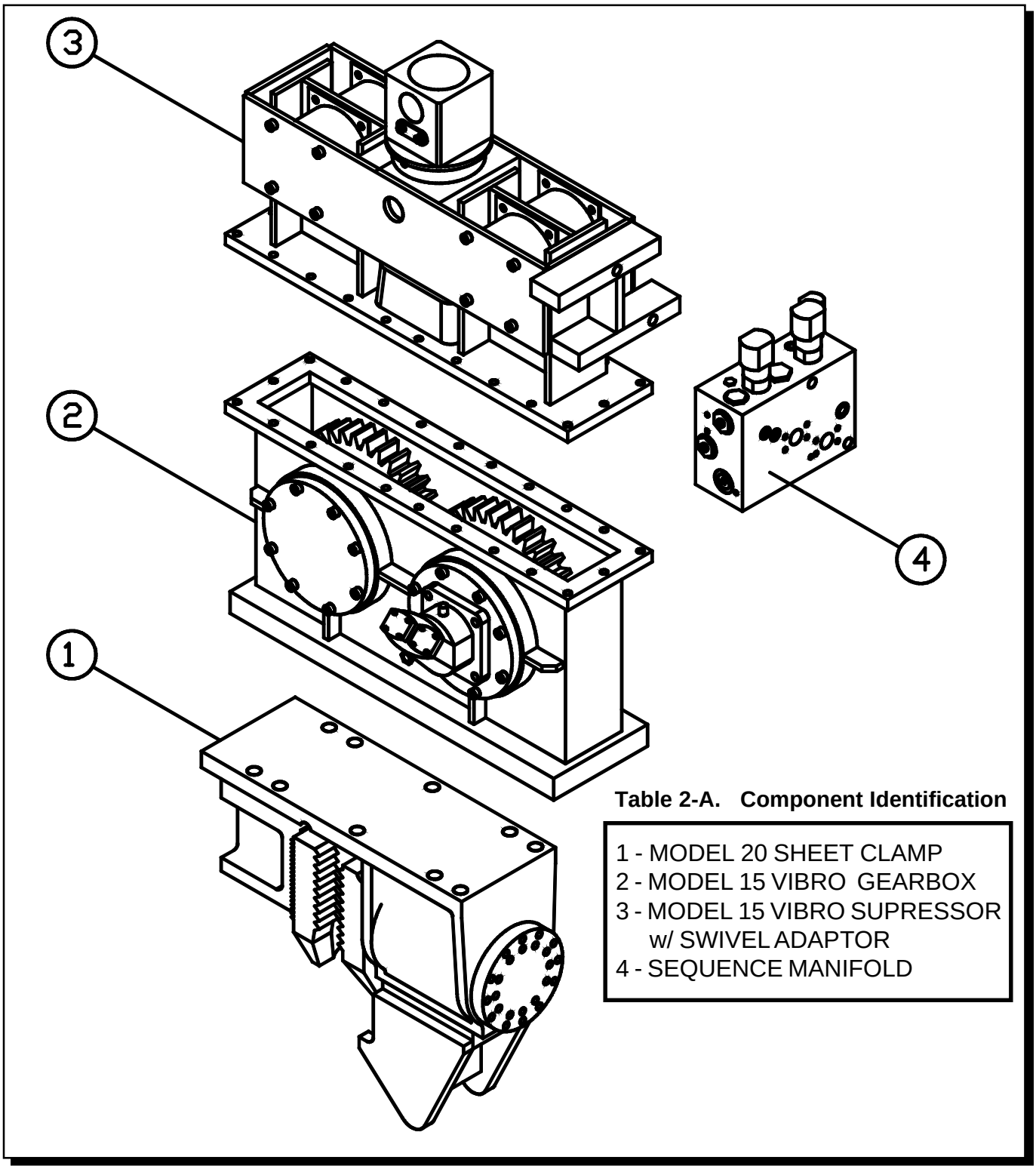

Table 2-A. Component Identification

1 - MODEL 20 SHEET CLAMP
2 - MODEL 15 VIBRO GEARBOX
3 - MODEL 15 VIBRO SUPRESSOR w/ SWIVEL ADAPTOR
4 - SEQUENCE MANIFOLD

Figure 2-A. Component Identification

II. COMPONENT DEFINITION (Continued...)

II-2. Model 20 Sheet Clamp

The following is a list of the standard APE Model 20 Sheet clamp components. (Please see Figure 2-B. for component location.)

Table 2-B. Model 20 Sheet Clamp Component Identification

Item	Qty	Description	Part #
1	1	Model 20 Clamp Casting	#208109F
2	1	Fixed Jaw	#221011
3	2	1" NC x 9" SHCS	#124206
4	1	Moveable Jaw	#221005
5	2	Jaw Pin	#221002
6	1	Sheet Guide	#221017
7	4	1" NC x 3" SHCS	#
8	6	1" Hi-Collar Lock Washer	#124207
9	1	1/8 NPT Grease Zerk	#211001
10	1	Cylinder Rod	#208301
11	12	7/16 NC x 1-1/4" SHCS	#
12	1	Parker O-Ring #2-248 w/ Parbak	#208010
13	1	Hyd. Cylinder Rod End Cap	#208302

Item	Qty	Description	Part #
14	1	Parker Wear Ring #W2-4250-500	#208010
15	1	Parker O-Ring #2-345 w/ Parbak	#208010
16	1	Parker Rod Wiper #SHU-4000	#208010
17	1	Parker Wear Ring #W2-5000-500	#208010
18	1	Piston	#208303
19	1	#R-5100-80 w/ Expander #349	#208010
20	1	Hydraulic Cylinder Shell	#208001
21	1	Parker O-Ring #2-248 w/ Parbak	#208010
22	1	Hyd. Cylinder Mounting Flange	#208001A
23	24	1/2 NC x 3/4" SHCS	#
24	12	1/2 Hi-Collar Lock Washer	#
25	4	5/8 NC x 1-1/2" SHCS	#
26	10	1" NC x 3" SHCS	#
27	2	#6 M SAE x #6 M JIC	#

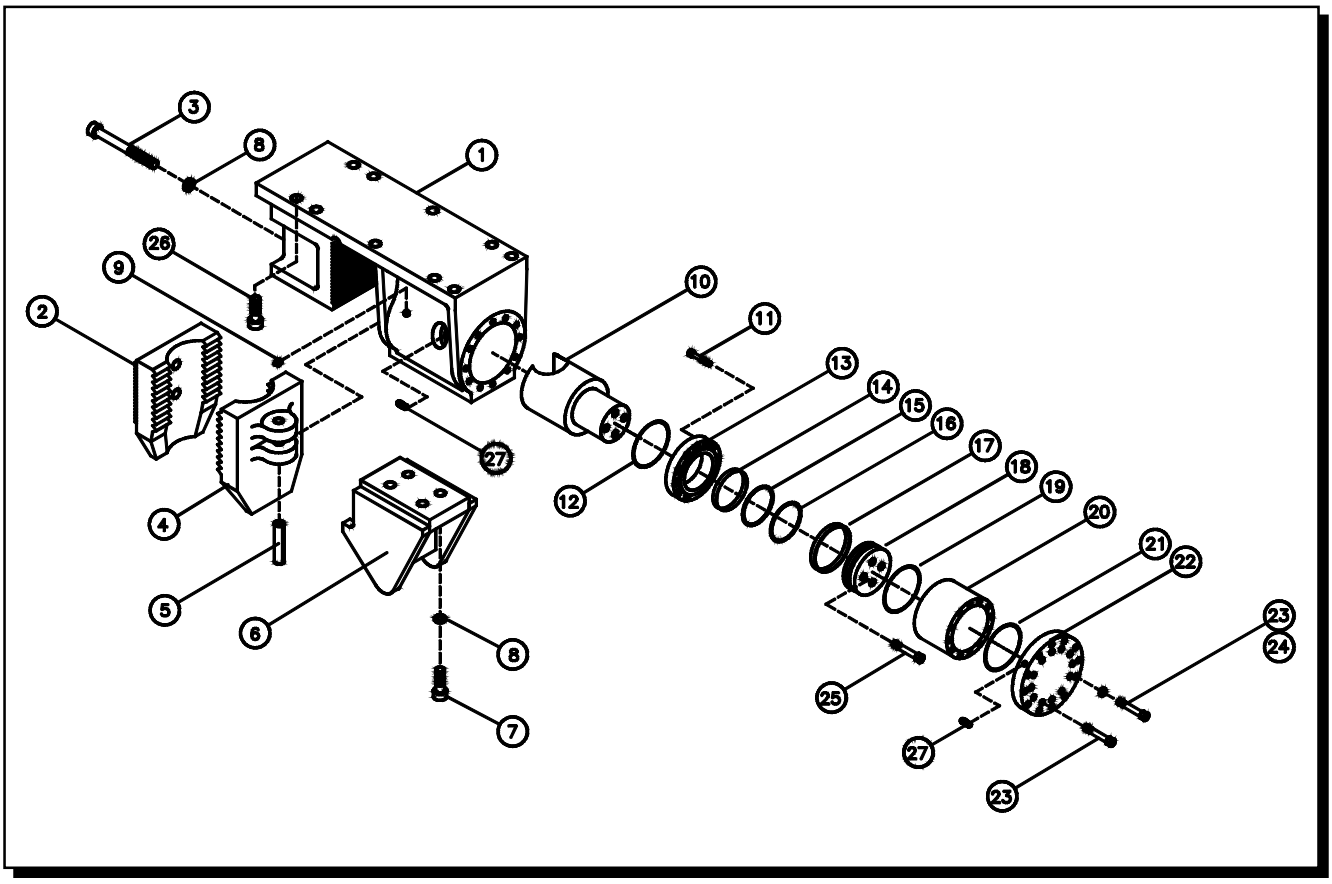

Figure 2-B. Component Identification - Sheet Clamp

II. COMPONENT DEFINITION (Continued...)

II-3. Model 15 Vibro Gearbox

The following is a list of the standard APE Model 15 Vibro Gearbox components. (Please see Figure 2-C. for component location.)

Table 2-C. Model 15 Vibro Gearbox Component Identification

Item	Qty	Description	Part #
1	1	Model 15 Gearbox Weldment	#113001
2	1	Eccentric (Drive Side)	#111007F
3	1	Eccentric	#111007F
4	1	Rexroth AA2FM-80 Hyd. Motor	#122001B
5	2	Seal - Hyd. Motor	#113003E
6	1	Bearing Cover - Hyd. Motor	#111005W
7	4	Bearing Race - Hyd. Motor	#181001
8	4	Bearing Sleeve	#181005
9	1	Drive Shaft	#111003C
10	1	Key	#
11	3	Seal - Bearing Cover	#113003E
12	3	Bearing Cover	#111004B
13	32	Socket Head Cap Screw	#114000

Item	Qty	Description	Part #
14	1	Shaft	#111003
15	1	Sight Glass - 1" NPT	#123005
16	1	Drain Plug - 3/4" NPT	#123004

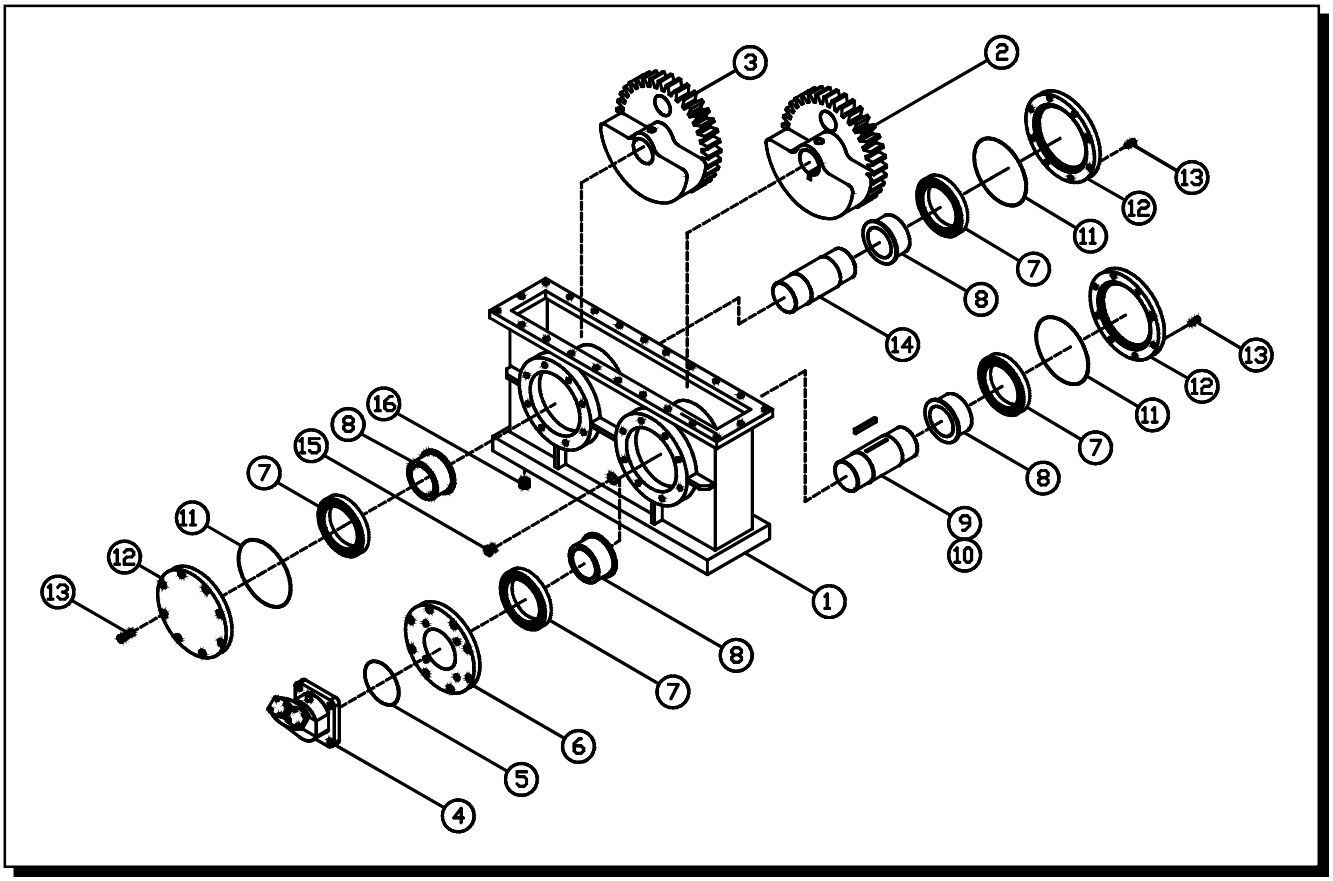

Figure 2-C. Component Identification - Gearbox

II. COMPONENT DEFINITION (Continued...)

II-4. Model 15E Suppressor

The following is a list of the standard APE Model 15 Suppressor components. (Please see Figure 2-D. for component location.)

Table 2-D. Model 15E Suppressor Component Identification

Item	Qty	Description	Part #
1	1	Outer Suppressor Housing	#312102-15
2	1	Inner Suppressor Weldment	#312103-15
3	1	Sequence Control Manifold	#810747
4	1	Swivel Pin	#312106
5	2	Nylon Bushing	#312108
6	1	Shackle Mount	#312107
7	1	Connecting Pin	#312110
8	2	Keeper Plate	#312111
9	4	Elastomer	#311004
10	1	Bump Pad	#312109
11	4	Bushing	#312112
12	4	1/2 x 2-1/4" Hex w/ Gr. 8 LW	#114000-15
13	22	1/2 x 2-3/4" SHCS w/ LW & Stover	#114000-15

Item	Qty	Description	Part #
14	8	1/2 x 1-1/2" SHCS	#114000-15
15	24	1/2" Stover Nut	#114000-15
16	16	1/2 x 1-1/4" SHCS	#114000-15
17	4	1/4"-20 Flathead	#114000-15
18	2	1/8" NPT Grease Zerk	#221001

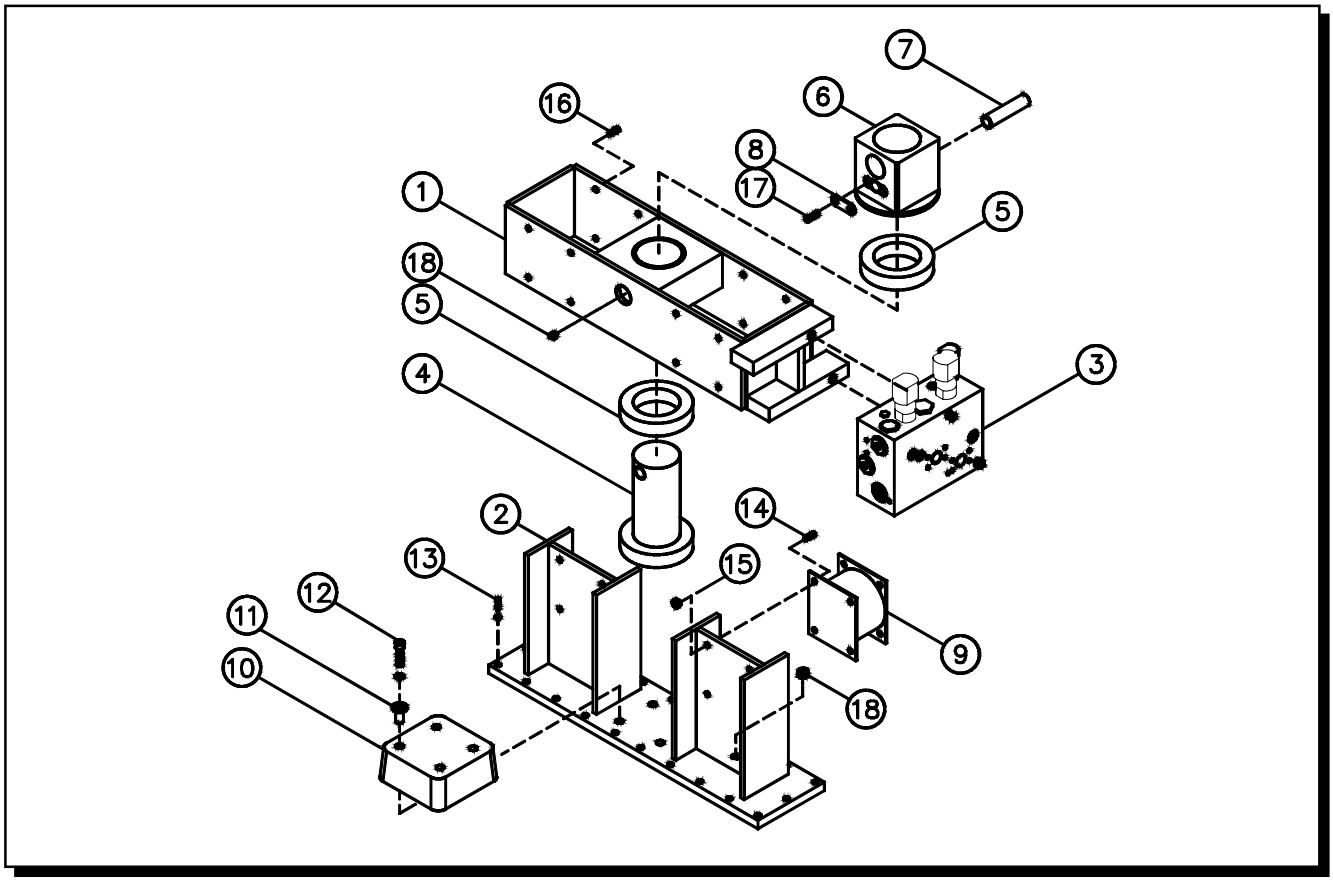

Figure 2-D. Component Identification - Suppressor

II. MAJOR COMPONENT DEFINITION (Continued...)

II-5. Sequence Control Manifold

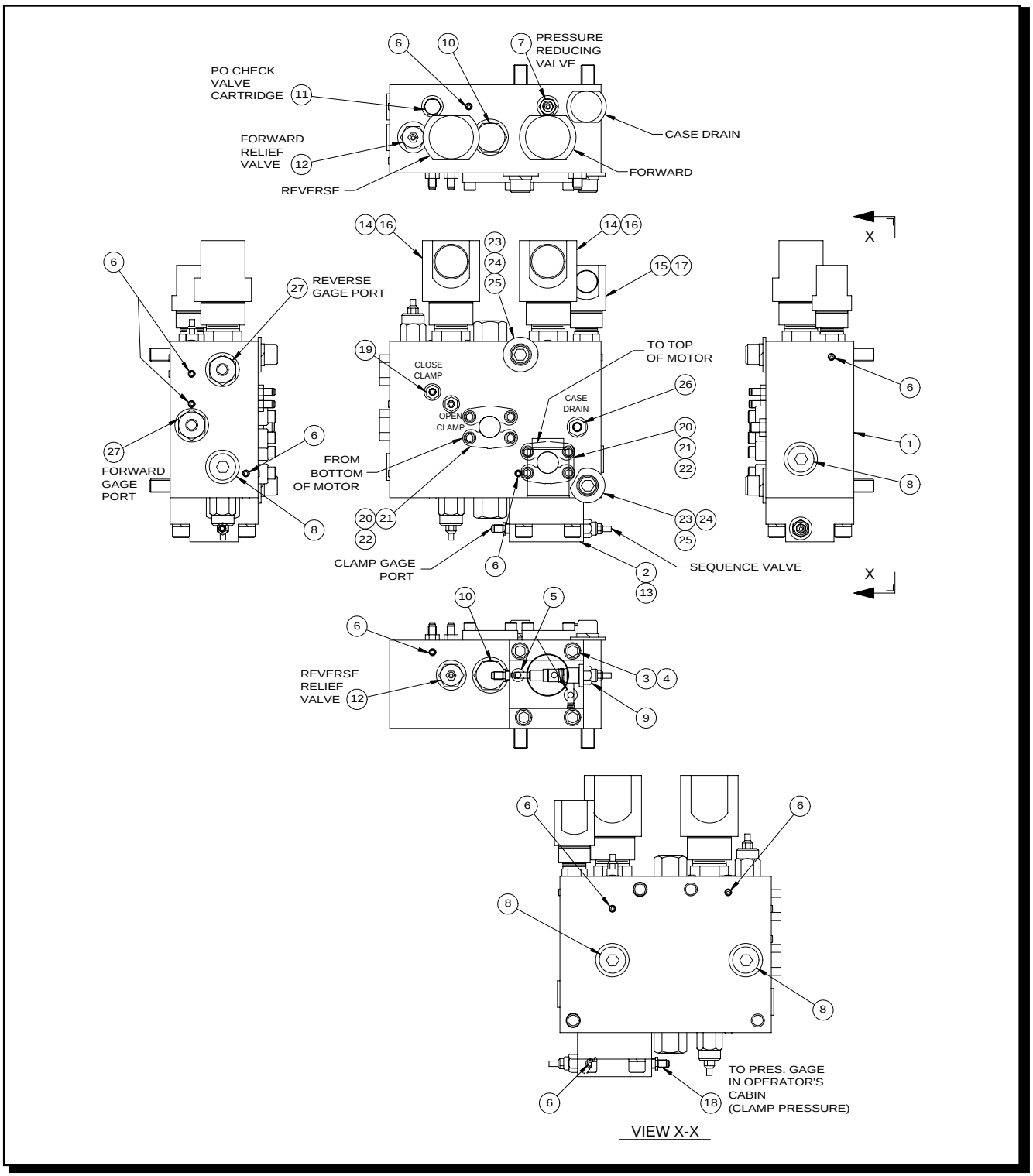

Figure 2-E. Component Identification - Control Manifold

II. MAJOR COMPONENT DEFINITION (Continued...)

II-5. Sequence Control Manifold (Continued...)

Table 2-E. Control Manifold Component Identification

J & M CONTROL MANIFOLD 810747

Item	Part Number	Qty.	Description
1	130735	1	Manifold Block
2	130529	1	Cover
3	100071	4	.625-11 X 2.50 Lg SHCS Locwel
4	130261	4	.625 Lock Washer H C
5	140255	2	2-113 O-Ring
6	100646	10	FITT2P-02P000000-000S007
7	130827	1	Pressure Reducing Valve (PR)
8	130829	4	FITT2P-16R000000-000S001
9	130545	1	Sequence Valve (SEQ)
10	130549	2	Check Valve (Cb & Cc)
11	120629	1	Holding Valve Cartridge (PC)
12	130547	2	Relief Valve (Rf & Rr)
13	130551	1	Cartridge Valve (DIN)
14	130635	2	1.25 Swivel Fitting
15	130637	1	.75 Swivel Fitting
16	130831	2	FITT2S-20P20R000-000H001
17	130639	1	FITT2S-12R12P000-000H001
18	110203	1	FITT2S-04M04P000-000H001
19	100053	2	6 O-Ring X 6 JIC Conn
20	100045	4	#20 Pa Split Flange Half
21	100851	8	.438-14 X 1.25 Lg SHCS
22	100037	2	2-222 O-Ring 70 Duro
23	160311	2	.75-10UNC X 6.50 Lg SHCS
24	100069	2	.75 Lock Washer Medium
25	100589	2	.75 Flat Washer
26	130645	1	FITT2S-08R6M000-000H01
27	130693	2	FITT2S-16R06Q000-00000

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Figure 2-F. Hydraulic Circuit

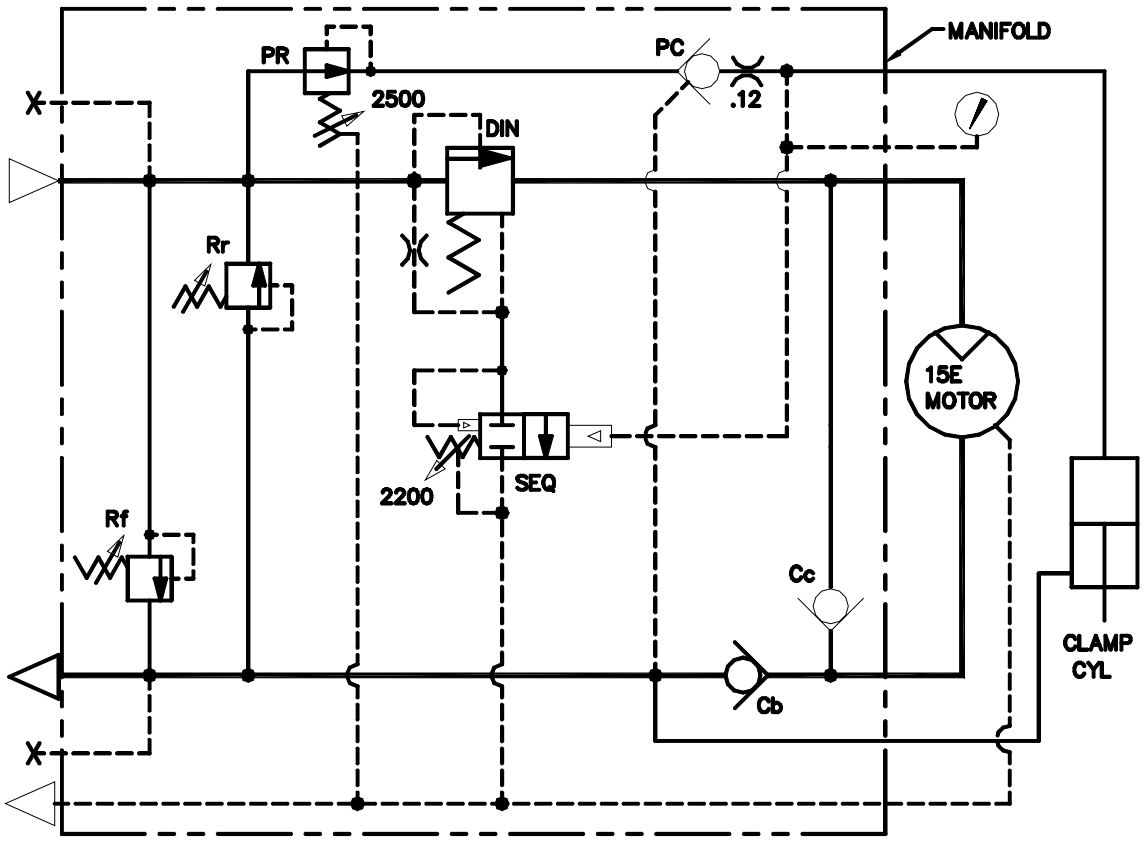

Table 2-F HYDRAULIC COMPONENTS LIST (X-Ref to Table 2-E)

Notation	Description	Part Number
Cb	Check Valve	130549
Cc	Check Valve	130549
Cyl	Hydraulic Clamp Cylinder	810217
DIN	Cartridge Valve	130551
MOTOR	Motor (216E)	130577
PC	P O Check Valve	120629
PR	Pressure Reducing Valve	130827
Rf	Forward Relief Valve	130547
Rr	Reverse Relief Valve	130547
SEQ	Sequencing Valve	130545

II. COMPONENT DEFINITION (Continued...)

II-2. Hose Identification

The following is a general listing of the standard hoses that are shipped with the Model 15E Vibratory Hammer. (Please see Figure 2-B. for component location.)

Item	Qty	Description	Part
1	1	1/2x48" R2AT C/W 8 FJX E/E	Case Drain
2	1	1x48" C13 C/W 16 FJX &20 FL90M	Motor Hose
3	1	1x48" C13 C/W 16 FJX &20 FL90M	Motor Hose
4	1	3/8x60" CPB MTF 6 FJX E/E	Open Clamp
5	1	3/8x60" CPB MTF 6 FJX E/E	Close Clamp

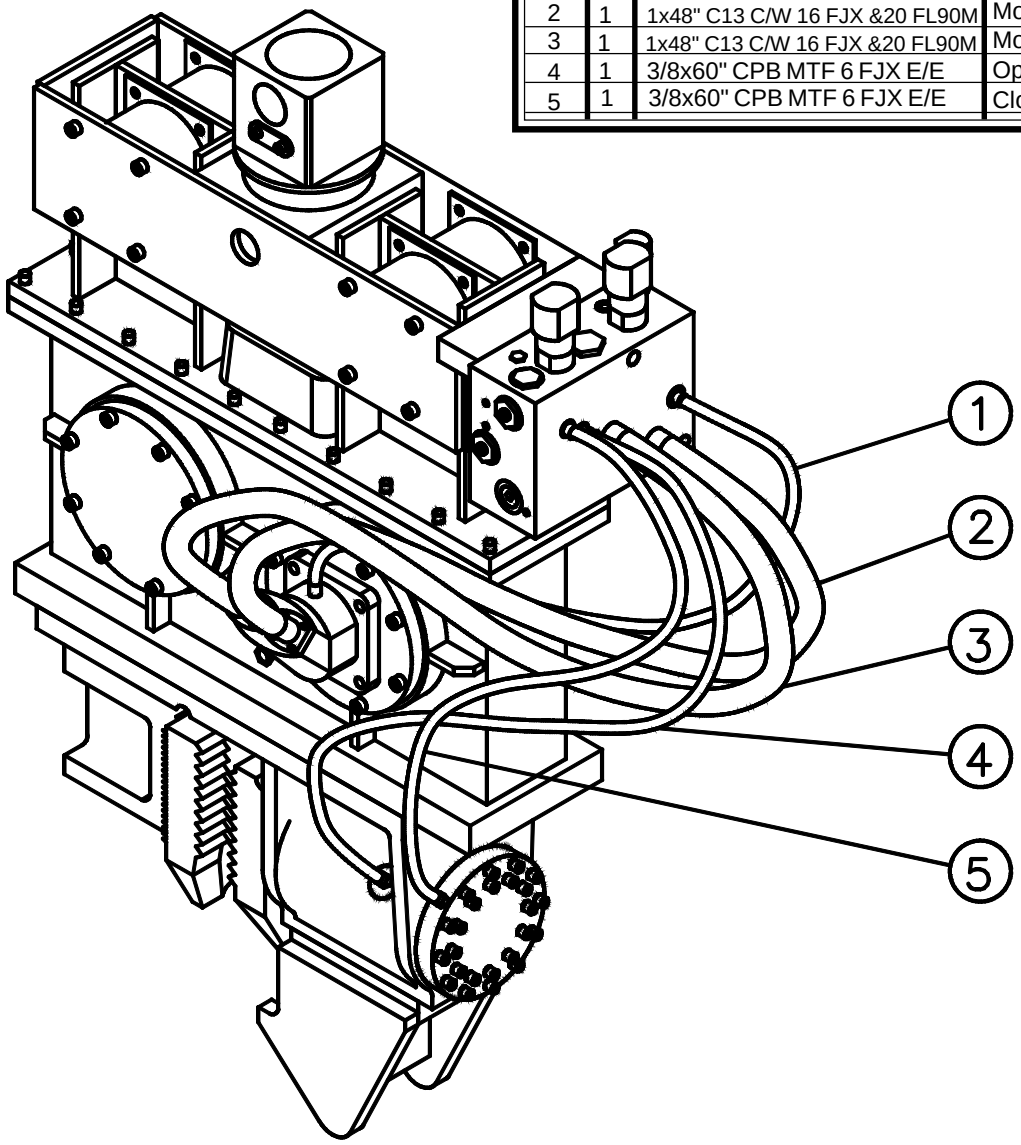

Figure 2-B. Hose Bundle Identification

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III. LOADING AND UNLOADING

III-1. Model 15E Vibratory Hammer

The APE15E vibrator is normally shipped laying flat on the trailer deck and the hose bundle is coiled on top. Lift the vibrator by rigging one line to the lifting pin and one line around the clamp attachment lifting the vibro and hose bundle as one load. Avoid smashing hydraulic lines. Vibro should be loaded with hydraulic motor facing up and breather valves facing the deck. Before the truck has left, carefully inspect the machine and hoses for any missing equipment or sign of damage that may have occured during shipment or unloading.

III-3. What to do if damaged during shipment

In the event of damage, notify the trucking agent at once. Note all damage on the bill of lading. Fax the information as soon as possible, any delay may make it impossible to find the responsible party.

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IV. PREPARATION AND OPERATION

IV-1. Installing the Clamp Attachment

The Vibro is fitted with a standard sheet clamp at the factory. However, several types of clamps are used on APE vibros to fit many different types of piles. A step by step procedure is provided as follows:

1.) Clean all drilled and tapped threads on the bottom surface of the gearbox. Use a 1" UNC tap to clean any rusted threads and blow out any remaining fragments with compressed air. If there is a cutting torch on the jobsite then use the oxygen setting to blast the threads clean. Hold a rag over the tapped hole to prevent flying dirt from blasting into your eyes.

2.) Clean the machined bottom surface of the gearbox and prepare to mount the clamp. If the clamp bolts should ever break, check the machined surface with a straight edge to make sure it is true and flat.

3.) Clean the machined surface of clamp. Eye-ball the entire surface for damage. Make sure the surface is flat and void of all dirt.

4.) Start by getting the center bolt in first and work outwards. Do not tighten bolts until you have all of the bolts started.

5.) Tighten bolts using a six-foot cheater pipe. If you do not have a cheater pipe then use a sledge hammer.

6.) Go around all bolts at least three times making sure they are tight.

7.) After vibrating the first pile, check the bolts again.

8.) If one bolt breaks, replace them all since they may be weak or cracked.

9.) Never operate the vibro with missing clamp bolts.

Recommended Torque Tightening Values

Description	Torque (ft-lbs)
1/2" NC HEX	105
1/2" NC SHCS	119
3/4" NC SHCS	417
1" NC SHCS	1009

WARNING: Do not use grade five bolts. All bolts should be allen head cap screw bolts. If one bolt breaks then the others are damaged and must be replaced. Never drive piles if one bolt is broken. Bolts break only because they were not tight and the crew neglected to check them. A good operator insists that every bolt is checked twice daily.

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IV. PREPARATION AND OPERATION (Continued...)

IV-2. Rigging of Vibratory Hammer

1. EXCAVATOR PREPARATION

WARNING: ALWAYS BE SURE THAT EXCAVATOR PARTS ARE FULLY SUPPORTED WHEN REMOVING, TO PREVENT SUDDEN SHIFTING.

A.) Remove bucket pivot pin, bucket link pin and bucket.
B.) Remove bucket linkage pins from stick (dipper arm) and bucket cylinder pin (rod end). Remove bucket linkage.

2. 15E INSTALLATION

A.) Check the 15E yoke to be sure that the ears fit onto the excavator stick, in the area of the bucket pivot. Axial play of yoke should not exceed 1/2".
B.) Check the fit of the yoke pin in the bucket pivot bore on the stick. Maximum pin clearance should not exceed 0.04"
C.) Connect the 15E yoke to the excavator stick, using pin and pin locking bolts.
D.) Move excavator to 15E location. Lift and support the 15E in a vertical postion.
E.) Connect the yoke to the 15E, using the swivel pin.
F.) Fully retract the bucket cylinder, and turn off the excavator.
G.) Disconnect the bucket cylinder hoses from the solid tubing (pipes) on the boom. Plug these hoses with the proper size steel plugs.
H.) Bucket Circuit
I.) Measure the lengths of hydraulic hose that will be required to connect the two NPT swivel fittings on the 15E to the steel tubing on the boom (where the bucket hoses were connected). Include enough extra hose to allow the 15E to rotate 90 deg. each way, and allow the full range of motion of the excavator stick. See manifold drawing for the location of the FORWARD and REVERSE swivel fitting. The pressurized hose for extending the bucket should be connected to the FORWARD swivel fitting. The pressurized hose for retracting (dumping) the bucket should be connected to the REVERSE swivel fitting.
J.) Measure the lengths of 3/4" ID low pressure hydraulic hose that will be required to connect the 3/4" NPT swivel on the 15E manifold to the excavator hydraulic reservoir in the engine compartment. (Tie this hose down to the boom and stick to prevent fouling.) Include enough exta hose to allow the 15E to rotate 90 deg. each way, and allow the full range of motion of the excavator stick and boom.

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IV. PREPARATION AND OPERATION (Continued...)

IV-2. Rigging of Vibratory Hammer (Continued...)

3. CLAMP & GAGE HOSE

It is recommended that a 0-3000 PSI pressure gage be installed, within view of the operator, for situations when the operator desires to close the 15E clamp without starting the vibrator. A capped #4 JIC fitting is provided on the bottom of the 15E manifold for connecting the clamp pressure gage.

A.) Measure the length of 1/4 ID hydraulic hose that will be required to connect the gage fitting on the 15E manifold, to the desired gage location. Include enough extra hose length to allow the 15E to rotate 90 deg. each way, and allow the full range of motion of the excavator stick and boom. Gage hose pressure rating to be 3000 psi minimum.

B.) Order and install the hoses measured above. Be sure that the hose working pressures match or exceed the maximum pressure for your specific 15E application.

C.) After the hoses are installed, slowly move the 15E, and the excavator, through a full range of motion to be sure that the hoses do not bind, or pull tight.

D.) Fasten the non-flexing portions of the hoses to convenient structures on the boom and stick. Re-check range of motion.

E.) For bleeding, see IV-4.

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IV. PREPARATION AND OPERATION (Continued...)

IV-3. Filling Vibrator Pressure Hose

The vibrator is shipped with the hoses filled with oil. However, if the unit has been sitting for a long period of time or if a damaged hose has been replaced with a new one, then the hoses must be filled. Hook up all the hoses to the power unit (see Section IV-3 on [page 4-2] and Figure 4-A.). Start the power unit and let it run for ten minutes before running the vibro. The hoses will fill up by themselves in ten minutes even if the vibro is not in the vibrate mode.

IV-4. Bleeding the Clamp Attachment Hydraulic Hoses

If the opening and closing of the jaws seems spongy or slow, it may be a result of air in the clamp hoses. Normally there is no need to worry about bleeding the clamp lines because the unit is shipped fully tested. However, should the vibro sit for a long period of time, if a new attachment is being installed or if a damaged clamp hose has been replaced, then the system may require bleeding to remove unwanted air in the system. To bleed the clamp system, follow these steps:

1.) Shut the Excavator OFF.
2.) Make sure the clamp line is coupled to the Excavator.
3.) Start the Excavator. Give the engine time to warm up.
4.) Loosen the clamp lines at the hydraulic cylinder by backing the fittings approx. one turn.
5.) Move the bucket control joy stick slightly toward the "CLOSE" (Curl Bucket) position. Wait for oil to flow from the fittings. WATCH FOR AIR BUBBLES. When air bubbles have stopped then quickly re-tighten the fittings.
6.) Repeat the same procedure for "OPEN" (Dump Bucket) side.
7.) Operate the jaws. If they are still a bit spongy then repeat bleeding steps once more.

WARNING: DO NOT BLEED SYSTEM AT FULL ENGINE THROTTLE BECAUSE TOO MUCH OIL WILL FLOW FROM THE HOSES AND COULD CAUSE INJURY.

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IV. PREPARATION AND OPERATION (Continued...)

IV-5. Precautions and Rules for Operation

The following is a list of precautions, suggestions and rules that are intended to help promote the safe and productive use of the APE Model 15E Vibratory Hammer.

1.) Follow the Daily Maintenance Required Prior to Operation, [Section V-1.] [page 5-1].
2.) Read and follow the Safety Precautions, [page v].
3.) Follow the start-up procedures listed in the manual for the excavator being used.
4.) Start with piles in good condition.
5.) Put all teeth in pile.
6.) Drive in steps eight feet or less.
7.) Keep sheets plumb.
8.) Come up to speed before doing work.
9.) No dancing. Avoid de-intensification.
10.) Drive past obstacles and then go back.
11.) Backhoe on site to remove obstacles.
12.) Lead with the ball.
13.) Probe the pile if it appears stuck.
14.) Keep piles plumb or down the road you go.
15.) Never rush the sheet pile foreman.
16.) Slow and plumb and the job will get done.
17.) Melted inner locks - piles out of plumb.
18.) Never stand under pile hammers.
19.) Low clamp pressure means jaw failures.
20.) Wait for vibro to get to full speed then pull.
21.) Don't over excavate - lower the ring.
22.) Look at the jaws during driving.
23.) Beware of cracked or broken sheets.
24.) In sandy soils drive faster.
25.) In clay amplitude is everything.
26.) Low drive pressure means easy work.
27.) High pressure means friction on piles.
28.) Over 4500 psi means get a bigger hammer.
29.) No amplitude means get a bigger hammer.
30.) Caissons need heavy wall to avoid flex.
31.) Check clamp bolts each morning.
32.) Read the manual - know your machine.
33.) Attach whip line to pile when pulling.
34.) Know your line pull.
35.) Extract straight - look at boom and cable.
36.) Give boom stops some room.
37.) Stalled engine means dirty fuel filters.

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IV. PREPARATION AND OPERATION (Continued...)

IV-6. Shut-down Procedures

The following procedures explain what to do with the power unit to correctly shut down the APE Model 15E Vibratory Hammer.

1.) Stop the vibrator.
2.) Allow the engine to run for five minutes at 1000 rpm.
3.) Reduce engine speed to low idle for about 60 seconds.
4.) Shut engine off.

WARNING: Do not shut the excavator engine down while the vibrator is clamped onto a pile. The clamp check valve will slowly bleed off if there is any leakage in the hose lines or worn clamp seals in the cylinder that moves the jaw open or closed.

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V. MAINTENANCE

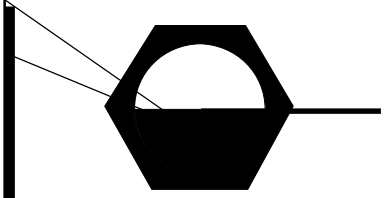
V-1. Daily Maintenance Required Prior to Operation

1.) Visually inspect the entire vibro for loose nuts or bolts. Put a wrench on the clamp bolts and check them for tightness.

2.) Grease the Jaw Plunger on the clamp housing.

3.) Check the oil level in the vibrator. Hang vibro from crane and look at sight gauge. Make sure the oil is half way up gauge. If you cannot read it then you can't run the vibro. Remove the gauge and clean it by spraying a shot of starting fluid at it. **YOU MUST KNOW THE LEVEL!**

IF THE OIL LOOKS BLACK OR MILKY THEN DRAIN THE GEARCASE AND ADD NEW HYDRAULIC OIL.



Oil Level Mobil Gear SHC 629 or equal.

Sight Gauge

4.) If the oil is milky or black then change it. **Change the oil every 75 hours regardless.**

5.) Check the fluid level in the power unit hydraulic tank.

6.) Look at all the hoses. Check for cuts or other damage that might cause an oil leak.

7.) Check the rubbers in the suppressor housing. Look for cracks.

8.) Perform all start up checks as per the "start-up procedures" in the Power Unit manual.

V-2. Checklist Once Power Unit (Excavator) Engine Is Started

1.) Check all hydraulic hoses for leaks. Make sure they hang free with no kinks.

2.) Check pin connection.

3.) Check jaws for wear. Replace if necessary.

4.) Close and open jaws. Check for proper operation.

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V. MAINTENANCE (Continued...)

V-3. Maintenance and Adjustments (75 Hours)

Change the oil in vibrator gearbox. Remove the drain plug from bottom of gearbox and drain the oil into a bucket. Check oil for any metal shavings. Replace oil in gearbox by adding 1.5 gallons of standard weight oil. Mobil Gear SHC 629 or equivalent.

Clean the gearbox breathers each time the oil is changed. Replace the breathers if necessary.

V-4. Maintenance and Adjustments (Eccentric Bearings)

1.) Model 15E - The Eccentric Bearings should be checked and/or replaced after every 5000 hours of operation.

V-5. Maintenance and Adjustments in Severe Conditions

When average temperature is above (80 deg. F) or below (-1 deg. F) reduce servicing intervals to one half of those specified above.

When operating in the presence of dust or sand, reduce servicing intervals to one-third of those specified.

During stand-by or inactive periods, the servicing intervals may be reduced to one-half. The unit should be run every 30 days or less to keep internal parts lubricated.

V-6A. Lubrication - Vibratory Gearbox

The Gearbox oil should be changed weekly or when black or milky. Mobil Gear SHC 629 or equal is the preferred oil. Just ask your oil supplier for an equivalent type of oil. The gearbox requires 1.5 gallons of oil.

V-6B. Lubrication - Clamp Attachment

The Clamp Attachment hydraulic oil must be checked and changed on a regular basis. The Clamp Cylinder Plunger should be checked for rust and debris. Lubricate the plunger on a regular basis using the grease zert on the side of the clamp housing.