

OPERATING AND MAINTENANCE MANUAL

J & M MODEL 216E

VIBRATORY PILE DRIVER/EXTRACTOR



**FOUNDATION
EQUIPMENT, LLC**

MANUFACTURERS OF VIBRATORY PILEDRIVERS
AND RELATED DEEP FOUNDATION EQUIPMENT

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OM-216E-0300

216E MANUAL

216E SERIAL NUMBER AND SETTINGS PAGE

216E Serial Number _____

Configured for Excavator: Make - _____

Model - _____

Configuration:

Yoke Part Number – _____

Motor Size - _____

FORWARD Relief Pressure Setting – _____ PSI

REVERSE Relief Pressure Setting – 2700 PSI

Pressure Reducing Valve Pressure Setting – 2500 PSI

Sequence Valve Pressure Setting – 2200 PSI

DO NOT ATTEMPT TO LIFT OR CARRY PILES IN THE 216E CLAMP. CLAMP MAY LOSE PRESSURE WHEN UNIT IS NOT VIBRATING. CABLE PILES TO THE LIFTING EYE PROVIDED.

(RENEW WARNING LABEL ON CLAMP IF DAMAGED)

PREFACE

This manual was prepared to acquaint the owner, operator and serviceman with the operation and maintenance of the vibratory driver/extractor. We suggest that this manual be carefully studied before operating or undertaking any maintenance work on the unit.

This manual is organized into two major categories.

The first category is for routine OPERATING INSTRUCTIONS of the unit and includes a GENERAL DESCRIPTION section, which presents a basic explanation of the driver/extractor and some of its specifications. The MAINTENANCE AND ADJUSTMENT section should be referred to periodically for normal servicing of equipment. All machines and equipment require systematic, periodic inspection and maintenance, if they are to perform satisfactorily, over a long period of time. The driver/extractor is primarily a vibrating machine and if not given the best of care, or if improperly used and maintained, it is self-destructive. Therefore, the unit should receive at least the same care and maintenance as other high quality construction equipment.

The second category is for parts reordering and it includes both a PARTS LIST and a pictorial drawing of the assembly, for easier determination of the required part. Refer to the ORDERING PARTS section of the PARTS LIST for more specific procedures regarding parts ordering. Adherence of the listed procedures will insure receipt of the required part(s) with the minimal amount of delay or error.

WARRANTY

J & M FOUNDATION EQUIPMENT STANDARD WARRANTY

J & M Foundation Equipment, LLC (J & M) warrants new products sold by it to be free from defects in material or workmanship for a period of 90 days after date of delivery to the first user and subject to the following conditions:

J & M's obligation and liability under this WARRANTY is expressly limited to repairing or replacing, at J & M's option, any parts which appear to J & M, 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 J & M or the authorized J & M distributor of the product, during regular working hours. This WARRANTY shall not apply to component parts or accessories of products not manufactured by J & M and which may carry the warranty of the manufacturer thereof, or to normal maintenance or to normal maintenance parts. 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. J & M COMPANY MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS, FOR ANY PARTICULAR PURPOSE.

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

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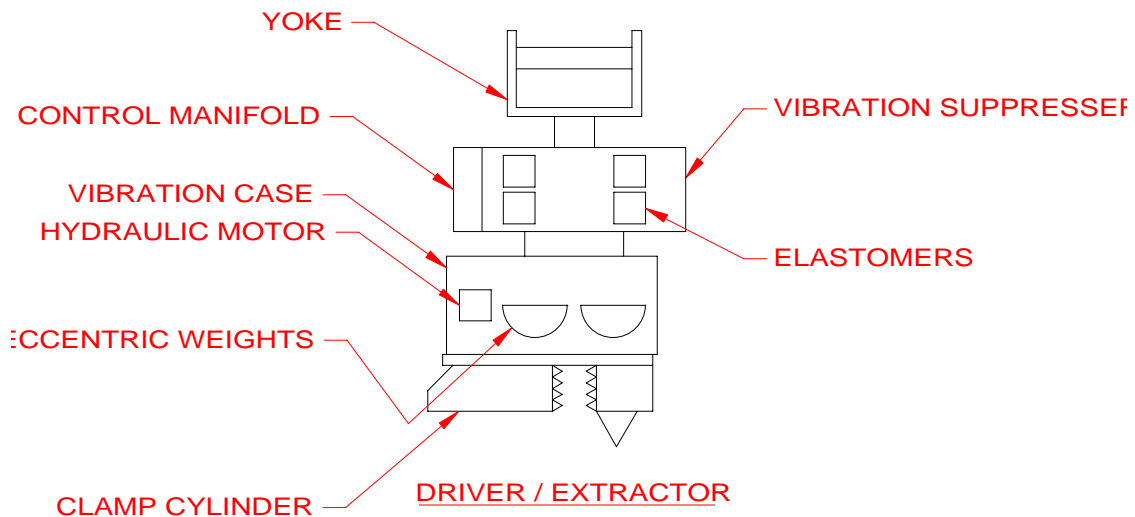
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I. GENERAL DESCRIPTION

A. GENERAL

The J & M Model 216E is a powerful low-frequency vibratory pile driver/extractor designed to drive and extract sheet piles, pipe, timber piles, concrete piles, and H, I and wide-flange beams. Specially adapted for connection to a hydraulic excavator, the 216E facilitates economies of operation by eliminating the requirement for leads, a pile driving crane, redundant personnel and A dedicated power unit, on many pile driving applications. Because no excavator modifications are required to attach the 216E, great flexibility is afforded the contractor, allowing use of a single excavator for both pile driving and digging operations.

The Model 216 operates in a frequency range of 800 to 1600 vibrations per minute to provide maximum pile penetration rates in a wide variety of soils. The unit has an eccentric moment of 1100 inch-pounds (12.7 kg-M) and produces a maximum amplitude of .94 inch (24mm). Optional clamps and clamp jaws allow various types and sizes of piling to be driven or extracted by the 216E.



B. MANIFOLD

Hydraulic power to drive the 216E comes from the “bucket” circuit of the excavator. A specialized control manifold, mounted on the vibrator, allows both the 216E vibrator drive motor, and the piling clamp, to be activated by a single excavator control lever (bucket “joy stick”). This manifold also permits the 216E to be used on excavators with various hydraulic system pressures and flows. No electrical connections, or modifications to the excavator hydraulic system are required.

I. GENERAL DESCRIPTION

C. SPECIFICATIONS

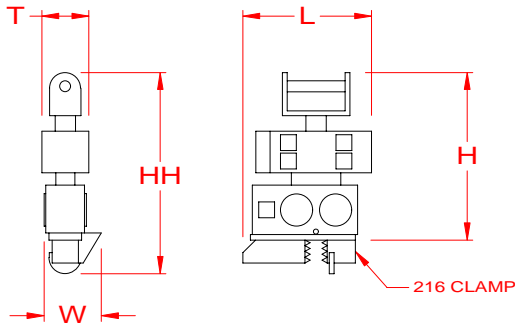
1. Constant improvement and engineering progress make it necessary that we reserve the right to make specification changes without notice.

2. MODEL 216E VIBRATOR

(with hydraulic clamp)

Type..... Hydraulic
 Eccentric Moment..... 1100 In-lbs.(12.7kg-M)
 Frequency.....800-1600 VPM
 Amplitude..... 0.94 in. (24mm)
 Pile Clamping Force 50 Tons (445kN)
 Max. Pull for
 Extraction..... 30 Tons (267kN)
 Suspended Weight with Clamp and
 hoses 5,000 lbs. (2268kg)
 Length [L] 56 in. (142cm)
 Width [W]..... 17 in. (43cm)
 Throat Width [T]..... 14 in. (35.5cm)
 Height with Clamp [HH]*..... 82 in. (208cm)
 Height without clamp [H]* 68.3 in. (173cm)

*Includes universal yoke



II. PREPARATION FOR OPERATION

A. GENERAL

When unloading and unpacking the vibratory driver, use extreme care. For your protection, make a thorough inspection of the unit immediately on delivery. In case of any damage or shortage, notify the transit agent at once and have the delivering carrier make a notation on the freight bill.

B. SAFETY PRECAUTIONS

Safety is basically common sense. There are standard safety rules, but each situation has its own peculiarities which can not always be covered by rules. Therefore, your experience and common sense will be your best guide to safety. Be ever watchful for safety hazards and correct deficiencies promptly.

Use the following safety precautions as a general guide to safe operations:

B. SAFETY PRECAUTIONS

1. Read this manual thoroughly before operating or working on the equipment.
2. Read and follow any safety instructions in the excavator operators manual.
3. Only well trained and experienced personnel should attempt to operate or maintain this equipment.
4. DO NOT ATTEMPT TO LIFT OR CARRY PILES IN THE VIBRATOR CLAMP. CLAMP MAY LOSE PRESSURE WHEN UNIT IS NOT VIBRATING. CABLE PILES TO THE LIFTING EYE PROVIDED. Renew warning label on clamp if damaged.
5. Never adjust, lubricate or repair the unit when it is in operation, or lifted above ground level.
6. Never remove, paint over or cover warning or safety labels. If labels become damaged or unreadable, replace immediately.
7. All personnel should wear approved safety clothing, including **HARD HATS, SAFETY SHOES, SAFETY GLASSES** and **HEARING PROTECTION** when in the vicinity of this machinery.
8. Do not stand any closer to this equipment than necessary when it is in operation. Parts may loosen and fall. Never stand under operating, or elevated, equipment.
9. When maintaining or repairing the equipment, never substitute parts not supplied, or approved in writing, by J & M.
10. Do not weld, or flame cut, on this equipment.
11. Never use or store flammable liquids on or near the engine.
12. Insure that all lifting equipment, including wire rope, slings, hooks, shackles, etc., are properly sized for the worst case loads anticipated during operations.
13. If there are any questions about the weights, specifications, or performance of the unit, contact J & M, or the excavator manufacturer, before handling or operating the equipment.
14. If the equipment is to be used for anything other than driving or extracting plumb piles, contact J & M before using the unit.
15. Check wire rope clips for tightness, and check wire ropes for wear, daily.

II. PREPARATION FOR OPERATION

B. SAFETY PRECAUTIONS (CONTINUED)

16. Insure that ground vibrations will not damage or collapse adjacent structures or excavations.
17. Remove all tools, parts and electrical cords before starting the unit.
18. When operating in an enclosed area, pipe exhaust fumes outside. Continued breathing of exhaust fumes may be fatal.
19. When servicing batteries, do not smoke or use open flames in the vicinity. Batteries generate explosive gas during charging. There must be proper ventilation when charging batteries.
20. When filling fuel tank, do not smoke or use open flame in the vicinity.
21. If abnormal equipment operation is observed, discontinue use immediately and correct the problem. Do not leave the equipment control pendant (radio control) unattended.
22. Store oily rags in approved containers, and away from engine exhaust system.
23. Make sure that the vibrator control (bucket lever) is OFF before starting the excavator engine.
24. Do not adjust, or set, hydraulic pressures higher or lower than those specified in this manual.
25. Never operate this equipment with hydraulic hoses that are damaged or "kinked". Replace damaged hoses immediately.
26. Be sure that the vibrator connection hoses do not kink, or pull tight, at any point within the full range of excavator motion.
27. Never attempt to connect quick disconnects when the engine is running.
28. Do not pull on, or allow hoses to get snagged, when moving the excavator.
29. Do not attempt to locate hydraulic leaks with your hands. High pressure hydraulic leaks can penetrate the skin, causing severe damage, blood poisoning and infection. Do not attempt to repair leaks while the equipment is in operation.
30. Do not attempt to tighten, or loosen, fittings or hoses when the machine is in operation.
31. Always check the excavator load radius chart before lifting vibrator and/or piles.
32. Check vibrator swivel retaining nut, and swivel nut locking bolt for tightness daily.
33. A properly maintained fire extinguisher, suitable for oil fires, must be kept in the immediate vicinity of equipment operations.
34. When moving or transporting this equipment, insure that the vehicle or vessel is of sufficient capacity to handle the load, and that the equipment is properly tied down.
35. When moving or transporting this equipment, be sure that quick disconnect dust caps are tight, and that cap safety cables are in place. Be sure that all equipment parts are tight, or properly secured, before shipment. Unsecured parts may vibrate loose and fall, during transport, causing injury or property damage.
36. Keep excavator, piles, vibrator, wire rope and other equipment at least 15' (5M) from electrical power lines, transformers and other electrical equipment, or at such distance as required by applicable safety codes.

II. PREPARATION FOR OPERATION

B. SAFETY PRECAUTIONS (CONTINUED)

37. Rounded or damaged bolt heads or nuts should be replaced so that proper torque values may be obtained. Proper torque values are necessary to prevent parts on this equipment from loosening and falling. Refer to Torque Chart, in this manual, for proper values.
38. Do not use the vibrator clamp to move piles. Loss of hydraulic pressure could cause piles to fall.
39. Never clamp vibrator to pile and disconnect from excavator. Loss of hydraulic pressure could cause vibrator to fall. Lay vibrator down when not in use.
40. When extracting piles, always attach a safety line between pile and the excavator.
41. When extracting piles, check excavator load/radius tables to be sure capacity is adequate for maximum allowable extraction pull.
42. When extracting piles, or any other driving operations, always be sure that the excavator bucket pivot pin is aligned with the centerline of the pile. Do not side load the vibrator. Dangerous vibrator damage may result.
43. When extracting piles, do not exceed the capacity of the vibrator suppressor.
44. Check vibrator suppressor for broken, or damaged, elastomers daily. Do not operate vibrator with damaged elastomers.
45. Never pull on a vibrator before starting the unit in vibration. Always start both driving and extraction of piles in an unloaded condition.
46. Keep hands away from clamp jaws.
47. Keep hands away from vibrator suppressor during operation. Clearances may change causing pinch points.
48. Do not run vibrator unless clamp jaws are closed.
49. Use a tag line to control vibrator whenever possible.

REMEMBER, SAFETY IS EVERYONE'S BUSINESS.

C. RIGGING OF VIBRATOR

1. EXCAVATOR PREPARATION

WARNING: ALWAYS BE SURE THAT EXCAVATOR PARTS, AND/OR 216E, ARE FULLY SUPPORTED WHEN REMOVING MOUNTING PINS, TO PREVENT SUDDEN SHIFTS AND INJURY.

- 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. 216E INSTALLATION

- a. Remove the yoke from the 216E, by removing the swivel pin 130541.
- b. Check the 216E yoke to be sure that the ears fit onto the excavator stick, in the area of the bucket pivot. If yoke width spacers were provided, check the yoke fit with spacers included. Axial play of the yoke should not exceed $\frac{1}{2}$ "(12mm).

II. PREPARATION FOR OPERATION

C. RIGGING OF VIBRATOR (CONTINUED)

- c. Check the fit of the yoke pin in the bucket pivot bore on the stick. If bushings were provided, check the pin fit with bushings installed. Maximum pin (bushing) clearance should not exceed .04”(1mm).
- d. If all fits are correct, connect 216E yoke to the excavator stick, using pin (include spacers or bushings if required) and pin locking bolts 100067 and 100079 provided.
- e. Move excavator to the 216E location. Lift, and safely support. the 216E in a vertical position.
- f. Connect the yoke to the 216E, using the swivel pin 130541.
- g. Fully retract the bucket cylinder, and turn off excavator.
- h. Disconnect the bucket cylinder hoses from the solid tubing (pipes) on the boom. Plug these hoses with the proper size steel plugs.

NOTE: If frequent changes are anticipated, between pile driving and digging operations, it may be more convenient to install quick disconnect fittings on the 216E and bucket cylinder pipes. Contact J & M, or your excavator dealer, for advice on quick disconnects fittings.

- i. **BUCKET CIRCUIT vs AUXILIARY CIRCUIT:** Many excavators are equipped with internal valving, and piping along the boom and stick, to accommodate breakers and other types of auxiliary attachments. In some cases it is possible to use this auxiliary circuit to operate the 216E, and eliminate the necessity of disconnecting the bucket cylinder hoses. **However**, some excavators only have one way flow in their auxiliary circuit, which will not allow its use with a 216E. Secondly, many excavators use drastically reduced tubing and hose diameters in their auxiliary circuit, which will generate excessive heat with the oil flows required by a 216E. Finally, the types of cab mounted controls, used in some excavators, will not allow the fine control desirable for 216E operations. If it is anticipated to connect the 216E to the excavator auxiliary circuit, contact J & M or your excavator dealer.
- j. Measure the lengths of hydraulic hose that will be required to connect the two 1.25” NPT swivel fittings, on the 216E manifold, to the steel tubing on the boom (where the bucket cylinder hoses were connected). Include enough extra hose length to allow the 216E to rotate $\pm 90^\circ$, and to allow the full range of motion of the excavator stick. See manifold assembly drawing (810747) for the location of the FORWARD and REVERSE swivel fitting. The hose that is pressurized when the bucket cylinder was extended (to curl the bucket) should be connected to the FORWARD swivel fitting. The hose that is pressurized when the bucket cylinder was retracted (to dump the bucket) should be connected to the REVERSE swivel fitting.
- k. Measure the lengths of a $\frac{3}{4}$ ” ID, low pressure, hydraulic hose that will be required to connect the 0.75” NPT swivel, on the 216E manifold, to excavator hydraulic reservoir, in the engine compartment. (this hose will have to be tied to the boom and stick to prevent fouling). Include enough extra hose length to allow the 216E to rotate $\pm 90^\circ$, and to allow the full range of motion of the excavator stick and boom.

II. PREPARATION FOR OPERATION

C. RIGGING OF VIBRATOR (CONTINUED)

3. GAGE HOSE: It is recommended that a 0-3000 PSI pressure gage be installed, within convenient view of the excavator operator, for situations when the operator desires to close the 216E clamp, without starting the vibrator. A #4 JIC fitting (capped) is provided, on the bottom of the 216E manifold for connecting the clamp pressure gage (See manifold assembly drawing for fitting location).
 - a. Measure the length of ¼" ID hydraulic hose that will be required to connect the gage fitting, on the 216E manifold, to the desired gage location. Include enough extra hose length to allow the 216E to rotate $\pm 90^\circ$, and to 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 216E application. See the first page of this manual for pressure settings that are specific to your 216E.
 - c. After the hoses are installed, slowly move the 216E, 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. To bleed the air from the hoses, loosen the two 0.38" ID hoses at the 216E clamp cylinder (approx. one turn). With the excavator running at low RPM, move the bucket control joy stick **slightly** toward the "Curl Bucket" position. Wait until oil flows from the connection at the hydraulic clamp (clamp close). When oil flows without air, tighten the connection. Now move the bucket control joy stick **slightly** toward the "Dump Bucket" position. Wait until oil flows from the connection at the hydraulic clamp (clamp open). When oil flows without air, tighten the connection.

4. CHANGING EXCAVATORS
 - a. NEVER SWITCH THE 216E TO AN EXCAVATOR OF A DIFFERENT MAKE OR MODEL WITHOUT CONTACTING J & M. Moving a 216E to a different excavator than it was designed for can cause serious vibrator damage, or inferior performance. To move a 216E to a different excavator, the following items must be analyzed by J & M personnel to insure a correct match to the new excavator;
 - i. Yoke width
 - ii. Yoke pin diameter
 - iii. Hydraulic motor size
 - iv. Manifold pressure settings
 - v. Excavator horsepower
 - vi. Excavator hydraulic system
 - b. For the convenience of the owner, a 216E application form has been included as page VIII-20 of this manual. If it is contemplated to move the 216E to a different excavator, complete this form and mail, or fax, this form to your local J & M office.

III. OPERATING INSTRUCTIONS

A. COMPLETION OF SET-UP AND MAINTENANCE

1. Complete all preparation as described in Section II.
2. Read all safety instructions in Section I.
3. Read Section IV - MAINTENANCE AND ADJUSTMENTS and perform any required maintenance.
4. Before starting the 216E, read the the EXCAVATOR OPERATION GUIDE carefully. Follow the engine starting, operating and maintenance procedures in that manual.

B. WARMING HYDRAULIC OIL

1. The vibrator should not be operated at full speed if the temperature of the hydraulic oil is below 70°F (21°C).
2. If temperature of the hydraulic oil is below 70°F (21°C), run the vibrator at reduced speed until the temperature of the hydraulic oil exceeds 70°F (21°C). Vibrator should be clamped to a pile during warm up.
3. When the engine is warmed up and hydraulic oil temperature is at least 70°F (21°C), full speed operation may begin. Adjust the throttle so the engine is running at maximum RPM, unloaded.

CAUTION: Do not operate the vibrator if hydraulic oil temperature exceeds 160°F (71°C) as this may damage hydraulic components.

C. CONVENTIONS OF OPERATION

1. FORWARD – Moving the excavator joy stick (Bucket Control) in the direction that normally would have “curled” the bucket, shall hereinafter by referred to as moving the joy stick FORWARD. The hose that is pressurized when the bucket cylinder would have extended (to curl the bucket) should be connected to the FORWARD swivel fitting.
2. REVERSE – Moving the excavator joy stick (Bucket Control) in the direction that normally would have “dumped” the bucket, shall hereinafter by referred to as moving the joy stick in REVERSE. The hose that is pressurised when the bucket cylinder would have retracted (to dump the bucket) should be connected to the REVERSE swivel fitting.
3. CLOSE – Causing the movable jaw, in the 216E clamp, to move toward the fixed jaw, shall hereinafter be referred to as causing the clamp to CLOSE.
4. OPEN – Causing the movable jaw, in the 216E clamp, to move away from the fixed jaw, shall hereinafter be referred to as causing the clamp to OPEN.

III. OPERATING INSTRUCTIONS

D. POSITIONING THE PILE AND 216E

1. Using a short wire rope sling, connect the pile to the lifting eye on the bottom of the 216E.
2. INSURE THAT THE HOLE IN THE PILE, OR PILE LIFTING DEVICE, IS ADEQUATE TO LIFT THE WEIGHT OF THE PILE.
3. INSURE THAT THE SLING IS RATED FOR THE WEIGHT OF THE PILE.
4. ALWAYS REFER TO THE EXCAVATOR "LIFT RADIUS CHART" TO BE SURE THAT THE WEIGHT OF THE VIBRATOR, AND PILE, ARE WITHIN THE SAFE LIMITS OF THE MACHINE.
5. INSURE THAT ALL SHACKLES, AND OTHER LIFTING FIXTURES, ARE SAFETY WIRED, OR OTHERWISE LOCKED, TO PREVENT LOOSENING FROM VIBRATION.
6. DO NOT ATTEMPT TO LIFT OR WALK WITH PILES EXCEEDING 10 TONS WEIGHT.
7. DO NOT ATTEMPT TO LIFT OR CARRY PILES IN THE 216E CLAMP. CLAMP MAY LOSE PRESSURE WHEN UNIT IS NOT VIBRATING. CABLE PILES TO THE LIFTING EYE PROVIDED.
(RENEW WARNING LABEL ON CLAMP IF DAMAGED)
8. Lift the pile to vertical, and move to the desired driving location.
9. SUPPORT THE PILE WITH AN ADEQUATE TEMPORARY STRUCTURE.

E. DRIVING OPERATIONS

1. Insure that the 216E clamp is fully OPEN.
2. Slide the 216E clamp fully down onto the piling. If the pile top is damaged, **DO NOT** attempt to force, or drive, the clamp onto the pile. Replace or repair damaged piles. Be sure that the 216E is parallel to the centerline of the pile before closing the clamp.
3. NOTE: If it is desired to close the clamp, without starting the vibrator, move the bucket control joy stick **slightly** toward the FORWARD position, while watching the clamp pressure gage (see SECTION II, RIGGING OF VIBRATOR). When clamp pressure reaches approximately 2000 PSI, quickly return the joy stick to the NEUTRAL position. The clamp will close, but the vibrator will not start.
4. To start driving, move the excavator joy stick (bucket control) to the full FORWARD position. The clamp will CLOSE, and achieve maximum clamping force. The 216E will then, automatically, start to vibrate, at maximum vibrations per minute (VPM).
5. 216E VPM may be reduced by slowing the excavator engine RPM, or by moving the joy stick partially toward the NEUTRAL position.
6. As the piling penetrates the ground, it is **IMPORTANT** that the excavator operator manipulates the boom and stick functions to follow the pile in a vertical, straight line, path. Serious damage to the vibrator will result, if the operator attempts to push or pull the 216E, perpendicular to the centerline of the piling.

III. OPERATING INSTRUCTIONS

E. DRIVING OPERATIONS (CONTINUED)

7. To accelerate pile penetration, it is permissible to apply moderate downward force to the 216E, with the excavator. DO NOT APPLY MORE THAN 10 TONS OF DOWNWARD FORCE, OR CAUSE ANY PART OF THE VIBRATOR SUPPRESSOR HOUSING TO COME IN CONTACT WITH THE TRANSMISSION.
8. When the pile has reached the proper elevation, return the joy stick to the NEUTRAL position. The vibrator will stop in a few seconds. DO NOT open the clamp until the vibrator has come to a complete stop.
9. To open the clamp, move the joy stick, partially, toward the REVERSE position. The clamp will open. Insure that the clamp is fully open before removing the vibrator from the pile.
10. Disconnect the sling, and remove the 216E from the pile.

F. EXTRACTING OPERATIONS

1. Using a short wire rope sling, connect the pile to the lifting eye on the bottom of the 216E.
2. INSURE THAT THE HOLE IN THE PILE, OR PILE LIFTING DEVICE, IS ADEQUATE TO LIFT THE WEIGHT OF THE PILE.
3. INSURE THAT THE SLING IS RATED FOR THE WEIGHT OF THE PILE.
4. ALWAYS REFER TO THE EXCAVATOR "LIFT RADIUS CHART" TO BE SURE THAT THE WEIGHT OF THE VIBRATOR, AND PILE, ARE WITHIN THE SAFE LIMITS OF THE MACHINE.
5. INSURE THAT ALL SHACKLES, AND OTHER LIFTING FIXTURES, ARE SAFETY WIRED, OF OTHERWISE LOCKED, TO PREVENT LOOSENING FROM VIBRATION.
6. DO NOT ATTEMPT TO LIFT OR WALK WITH PILES EXCEEDING 10 TONS WEIGHT.
7. Insure that the 216E clamp is fully OPEN.
8. Slide the 216E clamp fully down onto the piling. If the pile top is damaged, **DO NOT** attempt to force, or drive, the clamp onto the pile. Discard or repair damaged piles.
9. Be sure that the 216E is parallel to the centerline of the pile before closing the clamp.
10. NOTE: If it is desired to close the clamp, without starting the vibrator, move the bucket control joy stick **slightly** toward the FORWARD position, while watching the clamp pressure gage (see SECTION II, RIGGING OF VIBRATOR). When clamp pressure reaches approximately 2000 PSI, quickly return the joy stick to the NEUTRAL position. The clamp will close, but the vibrator will not start.
11. To start extracting, move the excavator joy stick (bucket control) to the full FORWARD position. The clamp will CLOSE, and achieve maximum clamping force. The 216E will then, automatically, start to vibrate, at maximum vibrations per minute (VPM).

III. OPERATING INSTRUCTIONS

F. EXTRACTING OPERATIONS (CONTINUED)

12. 216E VPM may be reduced by slowing the excavator engine RPM, or by moving the joy stick partially toward the NEUTRAL position.
13. To extract the pile, apply an upward force, with the excavator, of up to 30 tons. EXCAVATOR UPWARD FORCE **MUST BE LIMITED** TO PREVENT MORE THAN 6" OF UPWARD MOVEMENT OF THE SUPPRESSOR HOUSING, RELATIVE TO THE VIBRATOR TRANSMISSION,
14. As the piling exits the ground, it is **IMPORTANT** that the excavator operator manipulates the boom and stick functions to follow the pile in a vertical, straight line, path. Serious damage to the vibrator will result, if the operator attempts to push or pull the 216E, perpendicular to the centerline of the piling.
15. When the pile has reached an elevation where vibration is no longer required to extract the pile, stop lifting and return the joy stick to the NEUTRAL position. The vibrator will stop in a few seconds. SUFFICIENT LENGTH OF PILE MUST REMAIN IN THE GROUND TO SUPPORT THE PILE WHEN THE CLAMP IS OPENED. VISUALLY INSPECT THE SLING AND FITTINGS TO INSURE THAT THEY ARE STILL PROPERLY CONNECTED. DO NOT open the clamp until the vibrator has come to a complete stop.
16. To open the clamp, move the joy stick, partially, toward the REVERSE position. The clamp will open. Insure that the clamp is fully open before removing the vibrator from the pile.
17. Lift the 216E until the sling lifts the pile fully out of the ground.
18. Move the excavator to lay the pile down in the desired location, and disconnect the sling.

IV. MAINTENANCE AND ADJUSTMENTS

A. GENERAL

Preventive maintenance includes normal servicing that will keep the vibratory driver and clamp in peak operating condition and prevent unnecessary trouble from developing. This servicing consists of periodic lubrication and inspection of the moving parts and accessories of the unit.

Lubrication is an essential part of protective maintenance, controlling to a great extent the useful life of the unit. Different lubricants are needed and some components in the unit require more frequent lubrication than others. Therefore, it is important that the instructions regarding types of lubricants and frequency of their applications be closely followed.

To prevent minor irregularities from developing into serious conditions, that might involve shut-down and major repair, several other services or inspections are recommended for the same intervals as the periodic lubrications. The purpose of these services or inspections is to assure the uninterrupted operation of the unit.

Thoroughly clean all lubrication fittings, caps, filler and level plugs and their surrounding surfaces before servicing. Prevent dirt from entering with lubricants. The intervals given in the schedule are based on normal operation. Perform these services, inspections, etc., more often for operation under abnormal or severe conditions.

B. DAILY

1. Check the entire unit prior to and during set-up each day or at the beginning of each shift.
2. Prior to starting driving operations or at the beginning of each shift, check the following items:
 - a. Visibly inspect all bolts, nuts and screws including the bolts fastening the hydraulic clamp to the vibration case to insure they are tight. **IMPORTANT:** vibration loosens bolts- check carefully.
 - b. Tighten bolts holding gripping jaws to the hydraulic clamp.
 - c. Tighten locking bolt (.62-11 SHCS) fixing the swivel nut (p/n) to the swivel stud (p/n). Rotate swivel until locking bolt aligns with the hole in the side of the suppressor housing.
 - d. Grease plunger in hydraulic clamp with any good multi-purpose grease.
 - e. Grease swivel bearings with any good multi-purpose grease. Grease fitting is located in a hole in the side of the suppressor housing.
 - f. Grease swivel pin with any good multi-purpose grease. Grease fitting is located on the side of the swivel stud.

IV. MAINTENANCE AND ADJUSTMENTS

B. DAILY (CONTINUED)

- g. Check the oil level in the vibration case and add oil if required. The oil level should be in the middle of the sight glass. Change oil if milky or contaminated. DO NOT OVERFILL

CAUTION: It is absolutely imperative that no dirt or other impurities be permitted to contaminate the transmission case. Any contamination will drastically shorten the life of the vibrator bearings.

- h. Visually check all hoses for signs of damage or cuts that might cause hose failure during operation. Be sure all connections are tight.
 - i. Visually inspect all suppressor elastomers.
 - j. Perform all daily maintenance checks and lubrication indicated in the EXCAVATOR OPERATION GUIDE.
3. After engine start-up, check the following:
 - a. Check all hydraulic hoses for leaks. Make sure they hang freely with no kinks.
 - b. Check hydraulic motor and hydraulic manifold for leaks.

C. 100 HOURS

1. Every 100 hours, drain and add new lubricant in the vibration case.

D. SEVERE CONDITIONS

The servicing intervals specified are based on normal operating conditions. Operation under severe or unusual conditions will require some adjustments in servicing intervals.

1. When the average temperature is above 80°F (26°C) or below -10°F (-23°C), reduce service time intervals by one-half of those specified above.
2. When operating in the presence of dust or sand, reduce service time intervals by one-half of those specified.
3. When operating in excess of twelve hours per day, reduce service time intervals by one-half of those specified.
4. When operating in air with high salt or moisture, the servicing intervals need not usually be changed. However, the unit should be inspected weekly to determine if additional servicing be required.
5. For extended inactive periods, servicing time intervals may be extended from those specified, but for actual time intervals, contact you local J & M dealer, especially during lengthy storage periods.

IV. MAINTENANCE AND ADJUSTMENTS

E. LUBRICATION

1. Vibration Case

The oil level is easily read through the sight glass located at the lower center of the vibration case on the motor side. Lubricating oil may be added when necessary, through the hole in the vibration case top plate, after removing the 1" pipe plug. To drain the case, remove the 3/4" pipe plug at the end of the base plate. Tilt the case for complete drainage.

The preferred lubricating oil for J & M vibration cases is "High Moly" oil (Schaeffer 268). Longer intervals between oil changes and fewer maintenance hours spent on mechanical service can generally be realized with this oil.

Therefore, whenever the "first preferred" oil is not available, or desired, and an alternate oil is selected, it will be necessary to test and/or change the oil at shorter intervals.

Extensive tests have indicated that the use of Schaeffer 268 results in cooler operation and extended bearing and gear life.

- a. The vibration case lubricant installed at the factory is Schaeffer 268 but the following gear lubes may be used when changing lubricants:

FIRST Preference Group:

SCHAEFFER 268

SECOND Preference Group:

MOBIL	SHC-634
BORON	Gearep 140
CHEVRON	Gear Comp. NL460
CITGO	Premium MP 85W-140
CITGO	Standard MP 85W-140
GULF	Lub 85W-140 Lub 85W-140
PHILLIPS	MP 85W-140
SHELL	Omala 460 Omala 460
SUN	Sunep 1110

IV. MAINTENANCE AND ADJUSTMENTS

E. LUBRICATION (CONTINUED)

THIRD Preference Group (Natural Petroleum Base):

AMOCO	Perma Gear EP140
ARCO	Pennant NL 460
CONOCO	EP 460
EXXON	Spartan EP 460
PHILLIPS	AP 140
TEXACO	Meropa 460
UNION	MP 85W-140
VALVOLINE	Gear Lub 85W-140

SCHAEFFER 268 Lubricant is available from J & M in five gallon cans. See SECTION VIII ORDERING PARTS, page VIII-15

F. CAPACITIES

1. Vibration Case	1.5	Gallons
2. Swivel Bearings Grease	5	Pounds

IV. MAINTENANCE AND ADJUSTMENTS

G. BOLT TORQUE INFORMATION

The only way to correctly tighten high strength bolts is with a calibrated torque wrench. Proper use of the torque wrench is important. To obtain the listed torques, a steady pull should be exerted to the handle until the desired torque is reached.

The following torque specifications apply to the bolts from the vibrator assemblies listed. Whenever any of these bolts, are replaced, the given torque specifications should be adhered to.

VIBRATION SUPPRESSOR Page VIII-6

Item 59	5/16"-18	27 Ft-Lbs (3.7 Kg-M)
Item 2, 5, 47, 48, 65	1/2"-13	119 Ft-Lbs (16.4 Kg-M)
Item 13, 16, 49, 63	5/8"-11	233 Ft-Lbs (32.3 Kg-M)
Item 14, 24, 41	3/4"-10	417 Ft-Lbs (57.6 Kg-M)
Item 25, 54	1"-8	1,009 Ft-Lbs (139.4 Kg-M)*
Item 26	1-1/2"-6	2,800 Ft-Lbs (387 Kg-M)*

VIBRATION CASE Page VIII-9

Item 3, 10, 22	1/2"-13	119 Ft-Lbs (16.4 Kg-M)
Item 16	5/8"-11	233 Ft-Lbs (32.3 Kg-M)

* Hydraulic torque wrench recommended

V. PROCEDURES AND ADJUSTMENTS

A. CONVENTIONS OF VALVES

1. FORWARD Relief Valve 130547 is an adjustable relief valve used to set the maximum pressure at which the hammer will run driving and extracting piles, and closing the calmp.
2. REVERSE Relief Valve 130547 is an adjustable relief valve used to set the maximum pressure that will be used to open the clamp.
3. PO CHECK Valve 120629 is a pressure operated check valve used to hold clamp pressure in the clamp cylinder.
4. PRESSURE REDUCING Valve 130827 is a used to set the maximum operating pressure of the clamp cylinder.
5. SEQUENCING Valve 130545 is a valve used to signal the vibrator motor to start, after sufficient clamping pressure has been achieved. During driving and extrating this valve maintains pressure to the clamp close line.

B. MANIFOLD ADJUSTMENTS (Reference: Hydraulic Schematic Page VI-1)

1. FORWARD and REVERSE relief valves (Reference Manifold Assembly drawing 810747 on page VIII-11).
 - a. Tools and equipment required.
 - i. 2 pieces. 1.25", 4 bolt, SAE, Code 61, blanking flange.
 - ii. A 0-3000 PSI, liquid filled, pressure gage.
 - iii. A 0-5000 PSI, liquid filled, pressure gage.
 - iv. A set of hex keys (Allen wrenches).
 - b. Remove both motor hoses from the 216E manifold, and install blanking flanges on these manifold ports.. Tighten blanking flange bolts.
 - c. Remove the pipe plugs from the FORWARD and REVERSE gage ports.
 - d. Install a 0-3000 PSI gage in in the REVERSE gage port (see manifold assembly drawing 810747 for gage port locations).
 - e. Install a 0-5000 PSI gage in in the FORWARD gage port (see manifold assembly drawing 810747 for gage port locations).
 - f. Set the excavator throttle at maximum RPM.
 - g. While observing the FORWARD pressure gage, move the joy stick to the full FORWARD position, and note the pressure reading. See the cover page of this manual for the correct FORWARD relief valve pressure setting on your 216E. Return the joy stick to NEUTRAL.
 - h. If the pressure is incorrect, loosen the jam nut, on the FORWARD relief valve, and make a small adjustment (1/4 turn recommended) to the adjusting screw. Turning the adjusting screw clockwise will increase pressure. Repeat steps f and g.
 - i. Retighten the jam nut when the pressure setting is correct.

V. PROCEDURES AND ADJUSTMENTS

B. MANIFOLD ADJUSTMENTS (CONTINUED)

- j. While observing the REVERSE pressure gage, move the joy stick to the full REVERSE position, and note the pressure reading. The REVERSE pressure setting should be 2700 PSI. Return the joy stick to NEUTRAL.
 - k. If the pressure is incorrect, loosen the jam nut, on the REVERSE relief valve, and make a small adjustment (1/4 turn recommended) to the adjusting screw. Turning the adjusting screw clockwise will increase pressure. Repeat step j.
 - l. Retighten the jam nut when the pressure setting is correct.
 - m. Re-connect all hoses, and remove pressure gages.
 2. Pressure Reducing Valve (Clamp pressure setting)
 - a. Remove both motor hoses from the 216E manifold, and install blanking flanges on these manifold ports. Tighten blanking flange bolts.
 - b. Install a 0-3000 PSI gage in the clamp gage port (see manifold assembly drawing 810747 for gage port locations).
 - c. Set the excavator throttle at maximum RPM.
 - d. While observing the clamp pressure gage, move the joy stick to the full FORWARD position, and note the pressure reading. Clamp pressure should be 2500 PSI. Return the joy stick to NEUTRAL.
 - e. If the pressure is incorrect, loosen the jam nut, on the pressure reducing valve, and make a small adjustment (1/4 turn recommended) to the adjusting screw. Turning the adjusting screw clockwise will increase pressure.
 - f. Retighten the jam nut when the pressure setting is correct.
 - g. Re-connect all hoses, and remove pressure gages.
 3. Sequence Valve
 - a. Position 216E with the clamp on the ground to prevent excessive movement during adjustment.
 - b. Loosen jam nut, on sequence valve, and turn adjusting screw fully in (Clockwise).
 - c. **Slowly**, move the excavator joy stick to the full FORWARD position. The clamp should close, but the vibrator should not start.
 - d. With the joy stick held in FORWARD, slowly unscrew the sequence valve adjusting screw, until the vibrator starts. When the vibrator starts, release the joy stick immediately.
 - e. Unscrew the sequence valve adjusting screw an additional ¼ turn, and tighten the jam nut.
 - f. Start and stop the 216E, several times to confirm proper operation.

V. PROCEDURES AND ADJUSTMENTS

C. CLAMP LUBRICATION

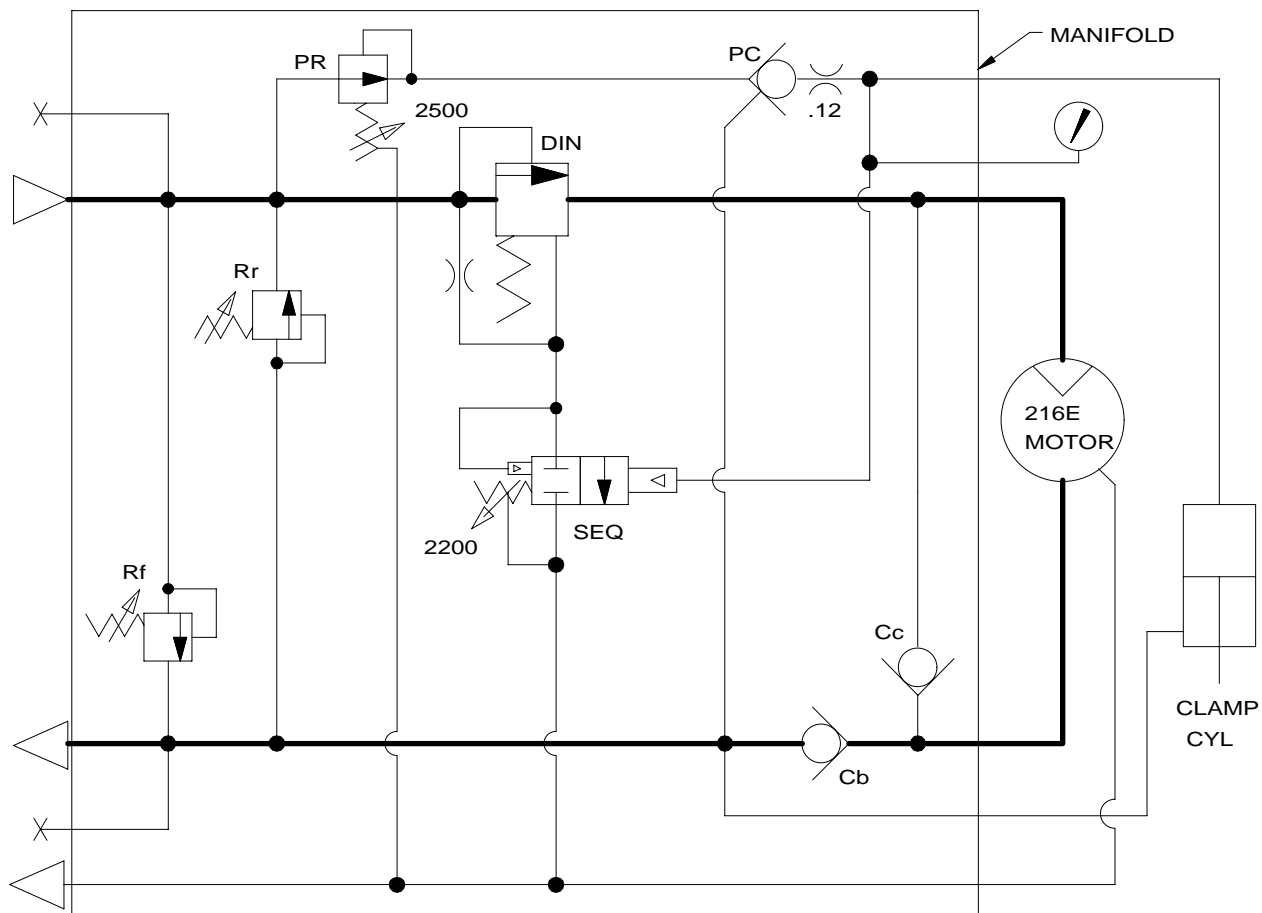
1. Clean grease fitting on the side on the Guide Block (130001).
2. Partially extend the clamp cylinder.
3. Connect grease gun to fitting, and pump until grease exits around the cylinder rod.
4. OPEN and CLOSE the clamp several times, and repeat steps "2" and "3" above.

D. SWIVEL

1. Lubrication
 - a. Clean the grease fitting, located in a hole in the side of the suppressor housing. Also, clean the swivel pin fitting, located on the side of the swivel stud 130535.
 - b. Connect grease gun to fitting, and pump until grease exits around the top, or bottom, of the swivel.
 - c. Connect grease gun to swivel pin fitting, and pump until grease exits around the ends of the pin bore.
2. Bearing Adjustment
 - a. Lay 216E on the ground, with the swivel grease fitting up.
 - b. Remove the Yoke from the swivel stud, by removing swivel pin 130541.
 - c. Rotate the swivel stud to align the locking bolt with the hole in the suppressor. Loosen the swivel nut 130537 locking bolt 130849, by inserting a ½" hex key through the hole in the suppressor side, and unscrewing this .625-11UNC X 5.00 Lg SHCS.
 - d. The hex key must remain in the locking bolt SHCS, as this is the only way to prevent the swivel nut from turning.
 - e. With the hex key in place, turn the swivel stud clockwise, to tighten the swivel nut. This will pre-load the swivel bearings.
 - f. Remove the hex key and rotate the swivel stud by hand. The stud should be difficult, but not impossible, to turn by hand. If the adjustment is not correct, repeat steps "4" and "5" above.
 - g. When adjustment is correct, re-tighten the swivel nut locking bolt to 230 Ft-Lbs (32.3Kg-M).

VI. HYDRAULIC CIRCUITRY

HYDRAULIC SCHEMATIC



VI. HYDRAULIC CIRCUITRY

A. HYDRAULIC COMPONENTS LIST

<u>Notation</u>	<u>Description</u>	<u>Part Number</u>	<u>Page Ref.</u>
Cb	Check Valve	130549	VIII-12
Cc	Check Valve	130549	VIII-12
Cyl	Hydraulic Clamp Cylinder	810217	VIII-14
DIN	Cartridge Valve	130551	VIII-12
MOTOR	Motor (216E)	130577	VIII-10
PC	P O Check Valve	120629	VIII-12
PR	Pressure Reducing Valve	130827	VIII-12
Rf	Forward Relief Valve	130547	VIII-12
Rr	Reverse Relief Valve	130547	VIII-12
SEQ	Sequencing Valve	130545	VIII-12

VII. GENERAL DATA

A. ABBREVIATIONS

The abbreviations shown below are used throughout the parts lists and various other parts of the manual.

ASM.	Assembly
BHCS	Button Head Cap Screw
Cyl.	Cylinder
DC	Direct Current
FHCS	Flat Head Cap Screw
FLCS	Flanged Head Cap Screw
HC	High Collar
HHCS	Hex Head Cap Screw
HHPP	Hex Head Pipe Plug
HSSS	Hex Socket Set Screw
Hyd.	Hydraulic
Lg.	Long
mm	Millimeter
Mtg.	Mounting
NPT.	National Pipe Thread
PHMS	Phillips Head Machine Screw
P/N	Part Number
RHMS	Round Head Machine Screw
Sch.	Schedule
SHCS	Socket Head Cap Screw
SHPP	Socket Head Pipe Plug
SHSS	Socket Head Shoulder Screw
S/N	Serial Number
Sol.	Solenoid
Qty.	Quantity

B. SCREWS AND BOLTS

1. Practically all connections on the unit are made with socket head (Allen) cap screws. These high-strength screws are available at most industrial supply houses.
2. Screws and bolts are designated in the PARTS LIST in abbreviated form. (Refer to sub-section A, above, for specific abbreviations.) Listed below is a typical screw description:
.5 - 13 UNC x 1.50 LG SHCS .5 = Diameter
13 UNC = Threads Per Inch
1.50 LG = Length
SHCS = Screw Type Abbreviation
3. Some screws or bolts require a specific torque when replacing. For identification of these bolts and a more thorough understanding of torque, refer to Page IV-5.

VII. GENERAL DATA

C. SERIAL NUMBER LOCATIONS

1. J & M vibratory units are serial numbered separately:
2. In addition to the serial number plate itself (on vibrators), the serial number is stamped into each unit in one or more places as follows:
 - a. The vibrator stamped twice - once on top left side of suppressor housing by the manifold, once on bottom lip of vibration case on right side of sight gage.

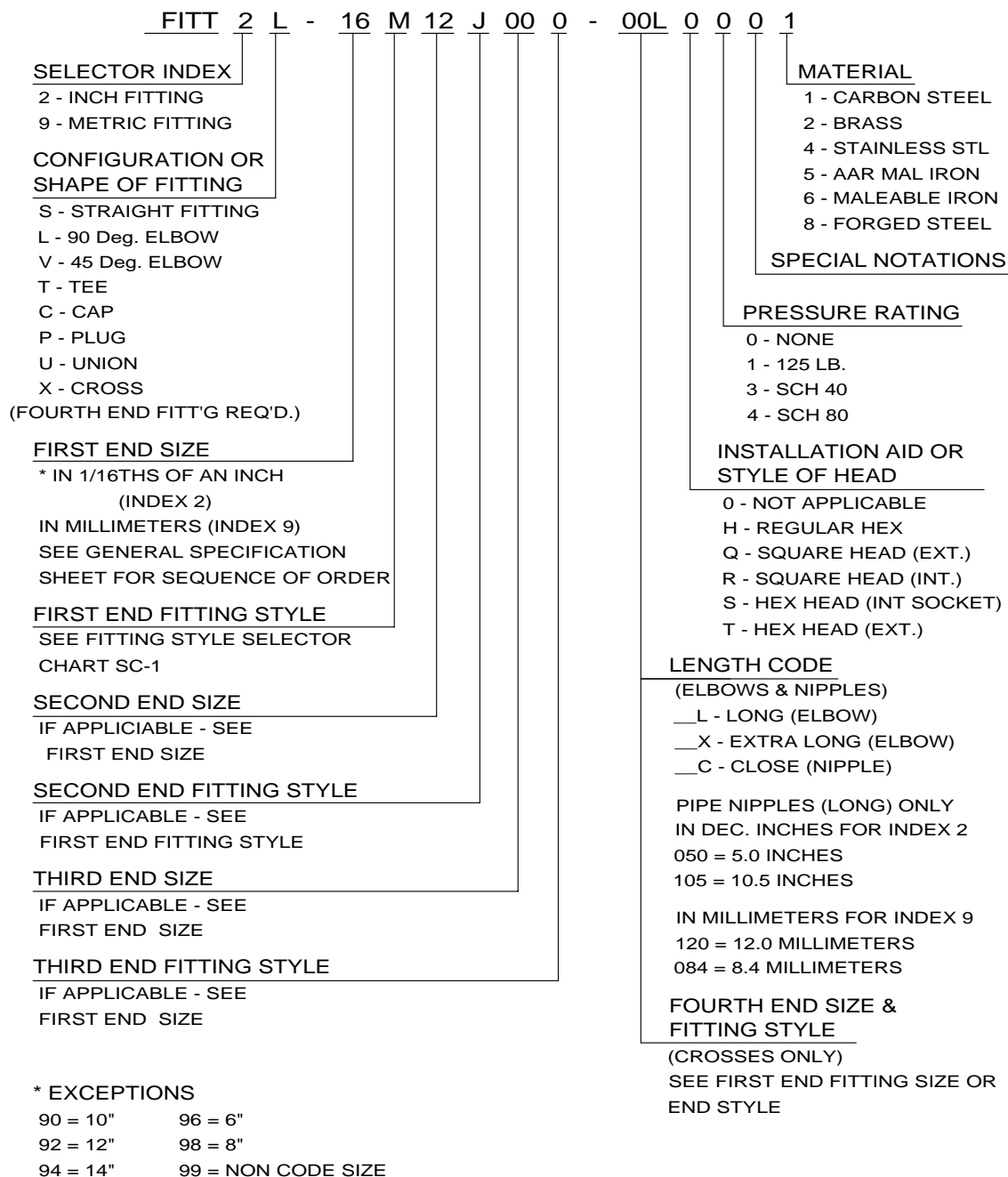
VIII. ORDERING PARTS

A. PROCEDURE

1. When ordering parts, be sure to include the model and serial number of the unit or component. The serial number may be located by referring to SECTION VII, SERIAL NUMBER LOCATION. Confirm all telephone orders, in writing immediately to avoid duplicating shipment.
2. ORIGINAL EQUIPMENT; Where component serial numbers are given, these apply only to equipment and components originally furnished with the unit. Where equipment has been changed or upgraded these numbers may not be an adequate description.
3. SHIPMENT; State to whom shipment is to be made and method of shipment desired, otherwise our own judgment will be used.
4. SHORTAGES; Claims for shortages or errors should be made immediately upon receipt of parts. No responsibility will be assumed for delay, damage or loss of material while in transit. Broken, damaged or lost material should be refused or a full description made of damage or loss to the carrier agent on the freight or express bill.
5. RETURN OF PARTS; If for any reason you desire to return parts to the factory or to any distributor from whom these parts were obtained, you must first secure permission to return the parts. Shipping instructions will be given along with this permission. A ten percent handling charge must be assessed against the returned shipment unless an error is made by the factory or by the distributor when filling your order.

VIII. ORDERING PARTS

B. FITTING DESCRIPTION KEY



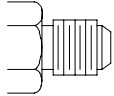
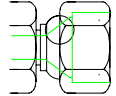
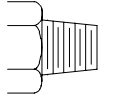
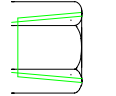
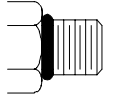
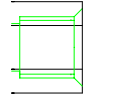
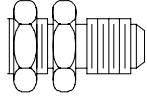
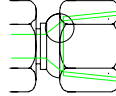
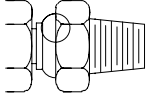
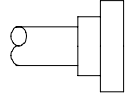
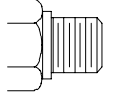
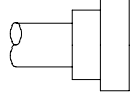
VIII. ORDERING PARTS

B. FITTING DESCRIPTION KEY (CONTINUED)

FITTING STYLE SELECTOR CHART

SC-1

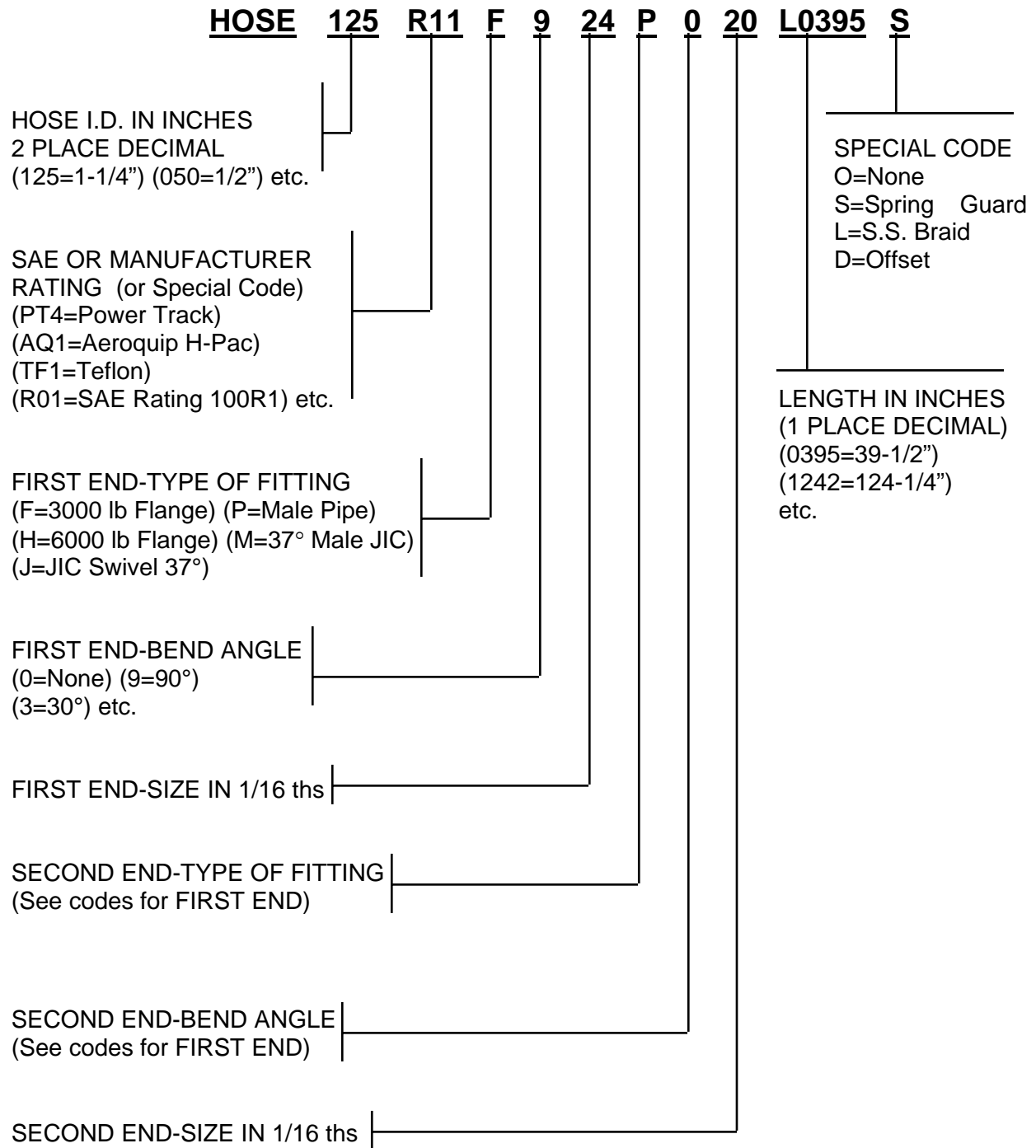
FOR END FITTING STYLE SELECTION

M		JIC MALE 37 Deg. FLARE	J		JIC FEMALE 37 Deg. FLARE (& SWIVEL)
P		MALE PIPE NPT	Q		FEMALE PIPE NPTF
R		S.A.E. MALE O-RING (& ADJUSTABLE)	K		S.A.E. FEMALE O-RING
B		JIC MALE 37 Deg. FLARE BULKHEAD	N		FEMALE PIPE NPSM-SWIVEL
D		MALE PIPE NPT SWIVEL	F		SPLIT FLANGE 3000 PSI. CODE 61
S		B.S.P. MALE PIPE	H		SPLIT FLANGE 6000 PSI. CODE 62

VIII. ORDERING PARTS

C. HOSE DESCRIPTION CODE

The HOSE DESCRIPTION CODE is a 24 digit number enabling easier and quicker identification whenever a hose replacement is desired. The key below explains the structure of the coded number in detail.



VIII. ORDERING PARTS

D. PARTS IDENTIFICATION

1. Parts lists and drawings are included on the following pages for the equipment components shown below:

a. VIBRATION SUPPRESSOR	800415
b. VIBRATION CASE	810637
c. CONTROL MANIFOLD ASSEMBLY	810747
d. 216 CLAMP CYLINDER	810217

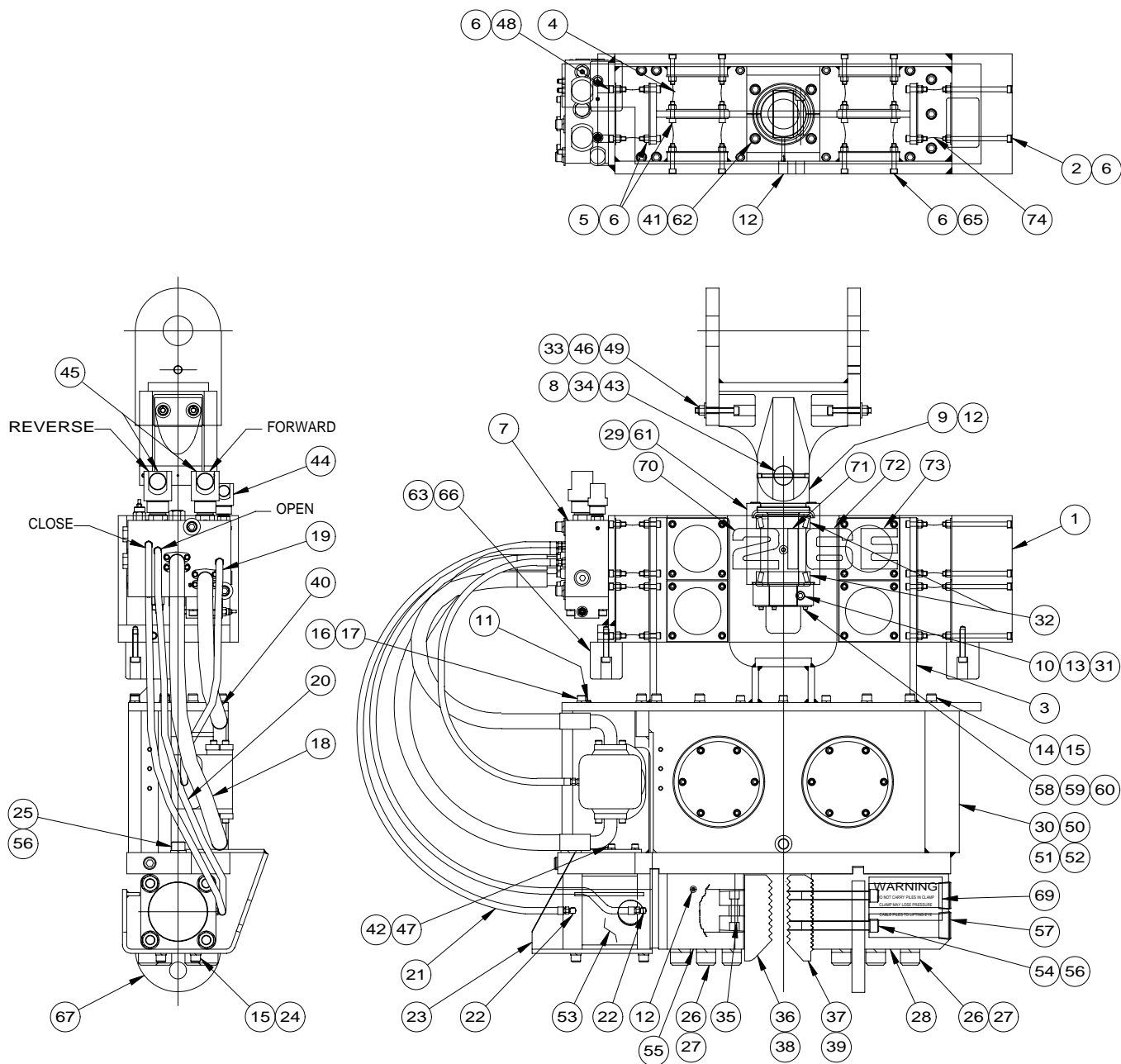
2. The spare parts list SECTION VIII - RECOMMENDED SPARE PARTS contains spare parts which may be very useful in keeping down-time to a minimum, especially in remote or secluded job sites where unforeseen communication problems could cause delay of the delivery of an awaited part.

These RECOMMENDED SPARE PARTS may be ordered beforehand, individually or as a package group as shown in the PARTS LIST.

VIII. ORDERING PARTS

VIBRATION SUPPRESSOR

800415



VIBRATION SUPPRESSOR

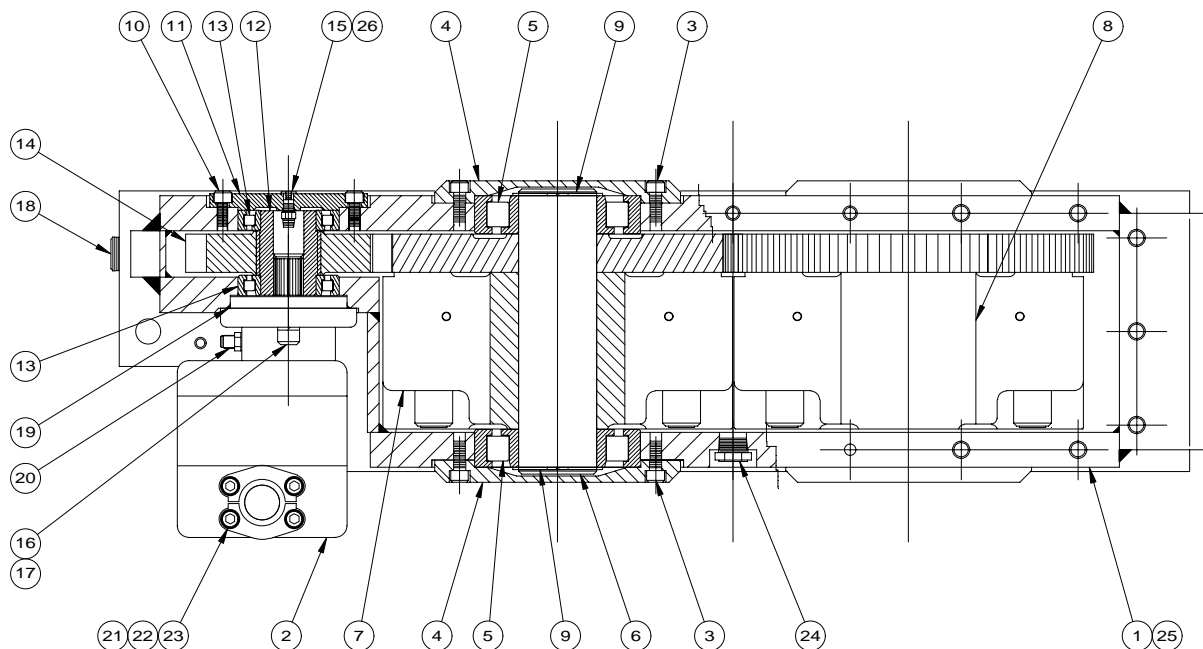
800415

Item	Part Number	Qty.	Description
1	130531	1	216E Suppressor Housing
2	130729	8	.50-13UNC X 7.50 Lg SHCS
3	130525	1	Transmission Adapter
4	130023	8	Elastomer
5	100011	32	.50-13 X 2.0 Lg SHCS
6	130049	80	.50-13 ESNA Nut
7	810747	1	216E Manifold Asm.
8	100845	4	FITT2P-04P000000-000S007
9	130535	1	Swivel Stud
10	130537	1	Swivel Nut
11	100063	1	FITT2P-16P000000-000S007
12	100229	2	Grease Fitting
13	130849	1	.625-11 X 5.00 SHCS
14	100067	15	.75-10 X 2.50 Lg Shcs Locwel
15	100069	19	.75 Lock Washer Medium
16	100071	8	.625-11 X 2.50 Lg SHCS Locwel
17	100007	8	.625 Lock Washer-Medium
18	130555	1	HOSE125PT4F020F924L0620C
19	130559	1	HOSE038R02J006J006L0480C
20	130561	1	HOSE038R02J006J006L0700C
21	130563	1	HOSE038R02J006J006L0630C
22	130057	2	FITT2L-06M06R000-000H001
23	130542	1	Motor Guard
24	400275	4	.75-10 X 1.50 Lg SHCS
25	100212	1	1.00-8 X 4 Lg Shcs Locwel
26	130077	12	1.50-6 X 11.00 Lg SHCS
27	100195	12	1.50 Lock Washer Extra Heavy
28	130523	1	Fixed Jaw Bracket
29	130603	1	Shield
30	130579	1	216E S/N Plate
31	130721	1	.625-11 ESNA Nut Extra Heavy
32	130565	2	Bearing
33	100086	4	.625-11 Esna Nut
34	130541	1	Swivel Pin
35	130449	1	Roll Pin .75 X 3"
36	810433	1	216 Universal Movable Jaw
37	110515	1	Universal Fixed Jaw-Ser.
38	810535	1	6" 216 DS Movable Jaw
39	130469	1	6" Fixed Jaw
40	130557	1	HOSE125PT4F020F924L0480C

VIBRATION SUPPRESSOR 800415

Item	Part Number	Qty.	Description
41	130977	4	.75-10 X 1.75 Lg SHCS
42	100121	3	.50 Lock Washer Medium
43	130923	10	.375 Dia. Rod / Inch
44	100187	1	FITT2P-12P000000-000S0M7
45	110055	2	FITT2P-20P000000-000S007
46	130141	4	.625 Flat Washer
47	100119	3	.5-13 X 1.25 Lg SHCS Locwel
48	100513	8	.5-13 X 1.50 Lg SHCS
49	100773	4	.625-11 X 4.50 Lg SHCS
50	810637	1	216E Transmission Case
51	100299	2	Primer/Gal
52	100298	2	Paint/Gal
53	810217	1	216 Clamp Cylinder
54	300043	2	1.00-8 X 8.00 Lg SHCS
55	130001	1	Guide Block
56	100209	3	1.0 Lock Washer Medium
57	130571	2	FITT2P-24P000000-000S007
58	130573	1	Rubber Bumper
59	130575	4	.312-18UNC X .63 Lg SHCS
60	100287	4	.312 Lock Washer
61	130641	1	Safety Catch
62	400727	4	.75 Hi-Collar Lock Washer
63	400157	4	.625-11 X 2.75 Lg SHCS
65	130235	32	.5-13 X 3.0 Lg SHCS
66	130725	4	Rectangular Bumper
67	130607	1	216E Pile Eye
69	130843	1	Warning Decal
70	130867	2	Small # 2 Logo
71	130869	2	Small # 1 Logo
72	130871	2	Small # 6 Logo
73	130873	2	Small "E" Logo
74	130883	4	Elastomer W/ Hard Compound

VIBRATION CASE 810637



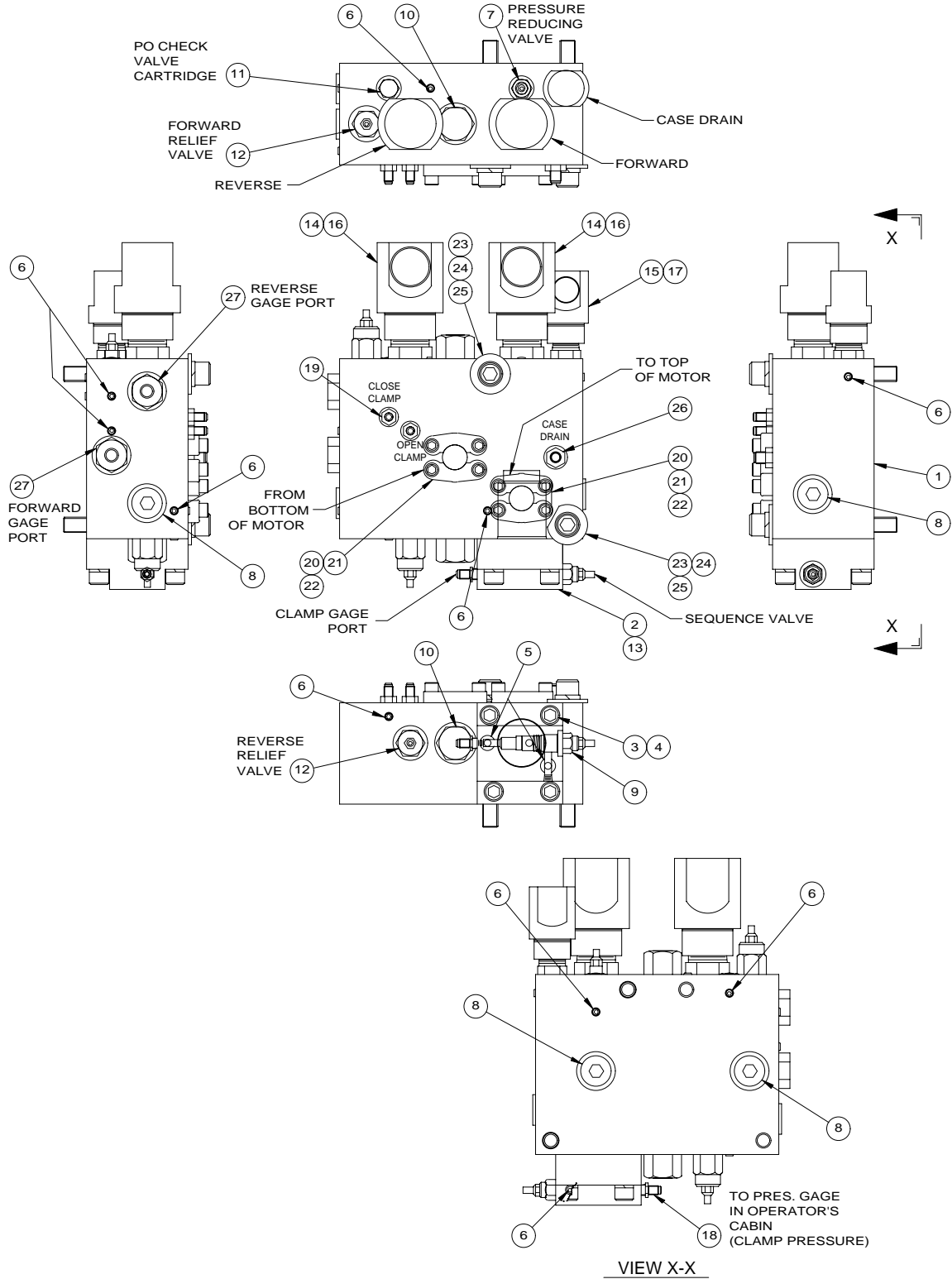
NOTE: APPLY SEALANT ITEM 27 TO ALL BEARING CAPS

VIBRATION CASE 810637

Item	Part Number	Qty.	Description
1	810043	1	216 Transmission Case Frame
2	130577	1	Motor (216E)
3	100119	27	.5-13 X 1.25 Lg SHCS Locwel
4	100754	4	Bearing Cap
5	100824	4	Bearing
6	100752	2	Eccentric Shaft
7	810417	1	416 Eccentric Gear Asm
8	810437	1	416 Eccentric Gear Asm
9	100678	4	Snap Ring
10	100445	4	.5-13 X 1.00 Lg SHCS Locwell
11	100750	1	Bearing Housing
12	100755	1	Motor Gear Shaft
13	100161	2	Motor Bearing
14	100739	1	Motor Gear
15	100822	1	Breather
16	100005	2	.625-11 X 1.75 Lg SHCS Locwel
17	130261	2	.625 Lock Washer H C
18	100187	2	FITT2P-12P000000-000S0M7
19	110197	1	2-159 O-Ring
20	100053	1	6 O-Ring X 6 JIC Conn
21	100596	4	#24 Split Flange Half
22	100163	8	.5-13 X 1.75 Lg SHCS Locwel
23	110119	2	2-225 O-Ring
24	100185	1	Sight Gauge
25	110444	2	Transmission Oil / Gal.
26	100662	1	Filter
27	100814	1	Sealant

CONTROL MANIFOLD

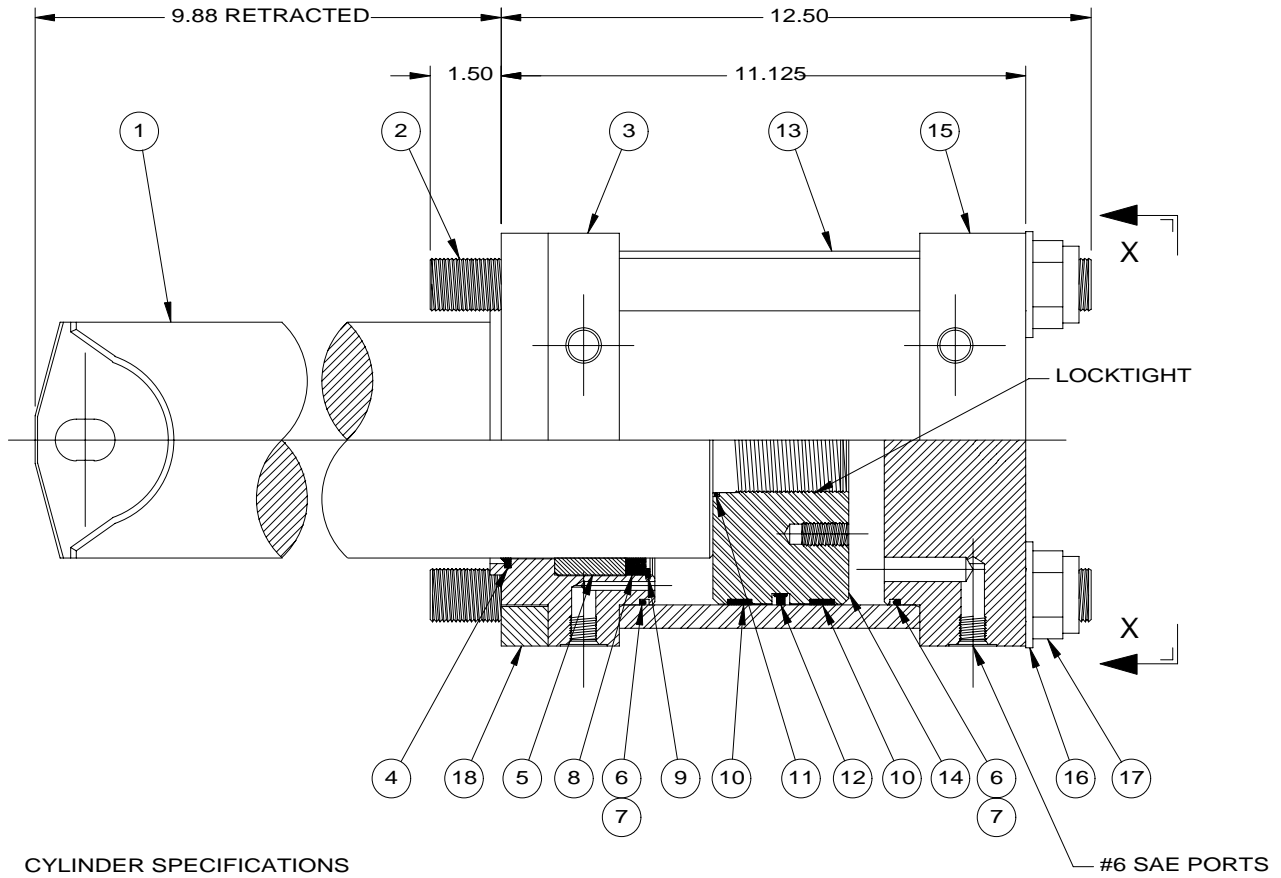
810747



CONTROL MANIFOLD 810747

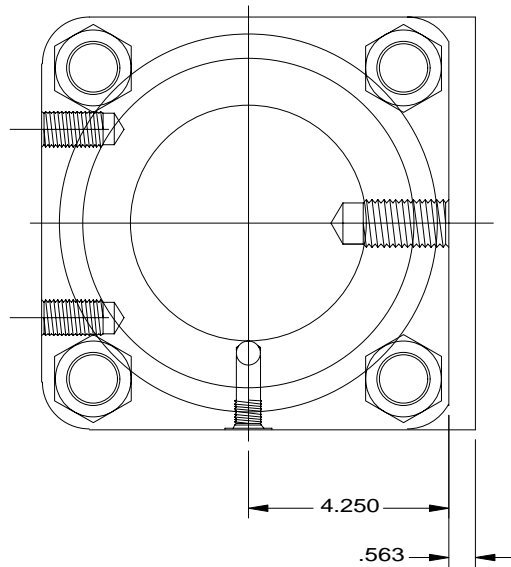
Item	Part Number	Qty.	Description
1	130735	1	Manifold Block
2	130529	1	Cover
3	100071	4	.625-11 X 2.50 Lg SHCS Locwel
4	130261	4	.625 Lock Washer H C
5	140255	2	2-113 O-Ring
6	100646	10	FITT2P-02P000000-000S007
7	130827	1	Pressure Reducing Valve (PR)
8	130829	4	FITT2P-16R000000-000S001
9	130545	1	Sequence 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-16R06Q000-0000001

216 CLAMP ASM 810217



CYLINDER SPECIFICATIONS

BORE: 7.00 ϕ
 STROKE: 2.00
 ROD: 5.00 ϕ



VIEW X-X

216 CLAMP ASM 810217

Item	Part Number	Qty.	Description
1	130439	1	Cylinder Rod
2	120309	4	Tie Rod - 80, 216
3	130415	1	Rod End Cap -216
4	120289	1	Rod Wiper (Note)
5	120267	1	Rod Bushing - 216, 122
6	120347	2	2-261 O-RING 90 DURO (Note)
7	120349	2	261 Back-Up Ring Pc Teflon (Note)
8	120287	1	Rod Seal (Note)
9	120291	1	Retaining Ring (Note)
10	120355	2	Piston Bearing (Note)
11	120281	1	2-140 O-RING (Note)
12	120357	1	Piston Seal (Note)
13	120315	1	Cylinder Tube - 80, 216
14	120313	1	Piston - 80, 216, WPH
15	130417	1	Piston End Cap - 216
16	120303	4	1.12 H. S. Flat Washer
17	120343	4	1.125 - 12 H. S. Hex Nut
18	130419	1	Front Plate -216
19	810225	1	216 Cylinder Seal Kit

Note: Included in 216 Cylinder Seal Kit

VIII. ORDERING PARTS

E. MISCELLANEOUS ACCESSORIES

1. Tools

Part Number	Qty.	Description
100651	1	24-Volt Test Light
100653	1	Set of Allen Wrenches - Includes All Wrenches Shown Below:
100655		(1) 1/16" Allen Wrench - Long Arm
100691		(1) 5/64" Allen Wrench - Long Arm
100659		(1) 3/32" Allen Wrench - Long Arm
100661		(1) 7/64" Allen Wrench - Long Arm
100663		(1) 1/ 8" Allen Wrench - Long Arm
100665		(1) 9/64" Allen Wrench - Long Arm
100667		(1) 5/32" Allen Wrench - Long Arm
100669		(1) 3/16" Allen Wrench - Long Arm
100671		(1) 7/32" Allen Wrench - Long Arm
100673		(1) 1/ 4" Allen Wrench - Long Arm
100657		(1) 5/16" Allen Wrench - Long Arm
100675		(1) 3/ 8" Allen Wrench - Long Arm
100677		(1) 7/16" Allen Wrench - Long Arm
100679		(1) 1/ 2" Allen Wrench - Long Arm
100681		(1) 9/16" Allen Wrench - Long Arm
100683		(1) 5/ 8" Allen Wrench - Long Arm
100685		(1) 3/ 4" Allen Wrench - Long Arm
100687		(1) 7/ 8" Allen Wrench - Short Arm
100689		(1) 1" Allen Wrench - Short Arm

2. Bulk

Part Number	Qty.	Description
810013	5 GAL	Hydraulic Oil
810011	5 GAL	Vibration Case Lubricant
100726	1 GAL	Coolant/Anti-Freeze
100298	1 GAL	I C E Green Paint
100299	1 GAL	Primer

VIII. ORDERING PARTS

E. MISCELLANEOUS ACCESSORIES (CONTINUED)

3. 216E Hose Group Kit - Internal 850155

<u>Item</u>	<u>P/N</u>	<u>Qty.</u>	<u>Description</u>	<u>Ref.</u>
18	130555	1	HOSE125PT4F020F924L0620C	VIII-7
19	130559	1	HOSE038R02J006J006L0480C	VIII-7
20	130561	1	HOSE038R02J006J006L0700C	VIII-7
21	130563	1	HOSE038R02J006J006L0630C	VIII-7
40	130557	1	HOSE125PT4F020F924L0480C	VIII-7

4. 216E O-Ring Kit 850157

<u>Item</u>	<u>P/N</u>	<u>Qty.</u>	<u>Description</u>	<u>Page Ref.</u>
19	110197	1	2-159 O-Ring	VIII-10
23	110119	2	2-225 O-Ring	VIII-10
5	140255	2	2-113 O-Ring	VIII-12
22	100037	2	2-222 O-Ring 70 Duro	VIII-12

5. Cylinder Seal Kit

MODEL 216 CLAMP CYLINDER 810225 Refer to page VIII-14

<u>Item</u>	<u>P/N</u>	<u>Qty</u>	<u>Description</u>
4	120289	1	Rod Wiper
6	120347	2	2-261 O-RING 90 DURO
7	120349	2	261 Back-Up Ring Pc Teflon
8	120287	1	Rod Seal
10	120355	2	Piston Bearing
11	120281	1	2-140 O-RING
12	120357	1	Piston Seal

VIII. ORDERING PARTS

F. RECOMENDED SPARE PARTS

VIBRATION SUPPRESSOR 800415 Refer to page VIII-6

<u>Item</u>	<u>P/N</u>	<u>Qty.</u>	<u>Description</u>
4	130023	1	Elastomer
35	130449	2	Roll Pin .75 X 3"
74	130883	1	Elastomer W/ Hard Compound
		1	Movable Jaw
		1	Fixed Jaw

VIBRATION CASE 810637 Refer to page VIII-9

<u>Item</u>	<u>P/N</u>	<u>Qty.</u>	<u>Description</u>
19	110197	2	Motor O-Ring (#159)
24	100185	1	Sight Gage
26	100662	1	Filter
27	100814	1	Sealant (Tube)
--		2	Motor Shaft Seal

CONTROL MANIFOLD 810747 Refer to page VIII-11

<u>Item</u>	<u>P/N</u>	<u>Qty.</u>	<u>Description</u>
7	130827	1	Pressure Reducing Valve
9	130545	1	Sequencing Valve
10	130549	1	Check Valve
11	120629	1	Holding Valve Cartridge
12	130547	1	Relief Valve
13	130551	1	Cartridge Valve
14	130635	1	1.25 Swivel Fitting
15	130637	1	.75 Swivel Fitting

G. RECOMMENDED TIGHTENING TORQUE

Nominal Screw Size	Nominal Socket Size	Tightening Torque Ft-Lbs. (Kg-M)	Nominal Screw Size	Nominal Socket Size	Tightening Torque Ft-Lbs. (Kg-M)
#10-24	5/32	6 Ft-Lbs. (.83 Kg-M)	#10-32	5/32	6 Ft-Lbs. (.83 Kg-M)
1/4-20	3/16	13 Ft-Lbs. (1.8 Kg-M)	1/4-28	3/16	15 Ft-Lbs. (2.1 Kg-M)
5/16-18	1/4	27 Ft-Lbs. (3.7 Kg-M)	5/16-24	1/4	30 Ft-Lbs. (4.2 Kg-M)
3/8-16	5/16	48 Ft-Lbs. (6.6 Kg-M)	3/8-24	5/16	55 Ft-Lbs. (7.6 Kg-M)
7/16-14	3/8	77 Ft-Lbs. (10.6 Kg-M)	7/16-20	3/8	86 Ft-Lbs. (11.9 Kg-M)
1/2-13	3/8	119 Ft-Lbs. (16.4 Kg-M)	1/2-20	3/8	133 Ft-Lbs. (18.4 Kg-M)
5/8-11	1/2	234 Ft-Lbs. (32.3 Kg-M)	5/8-18	1/2	267 Ft-Lbs. (36.9 Kg-M)
3/4-10	5/8	417 Ft-Lbs. (57.6 Kg-M)	3/4-16	5/8	467 Ft-Lbs. (64.5 Kg-M)
7/8-9	3/4	676 Ft-Lbs. (93.4 Kg-M)	7/8-14	3/4	742 Ft-Lbs. (102.5 Kg-M)
1-8	3/4	1,009 Ft-Lbs. (139.4 Kg-M)	1-12	3/4	1,126 Ft-Lbs. (155.6 Kg-M)
1-1/4-7	7/8	1,600 Ft-Lbs. (221.1 Kg-M)	1-1/4-12	7/8	1,800 Ft-Lbs. (248.8 Kg-M)
1-1/2-6	1	2,800 Ft-Lbs. (387 Kg-M)	1-1/2-12	1	3,000 Ft-Lbs. (414.6 Kg-M)

NOTE: These values are for Socket head cap screws only. Button heads, Flat heads and Set screws have different values. Check the Allen Hand Book for correct torque specifications.

**DO NOT ATTEMPT TO LIFT OR
CARRY PILES IN THE 216E CLAMP.
CLAMP MAY LOSE PRESSURE
WHEN UNIT IS NOT VIBRATING.
CABLE PILES TO THE LIFTING EYE
PROVIDED.**

(RENEW WARNING LABEL ON CLAMP IF DAMAGED)

H. 216E EXCAVATOR APPLICATION FORM

Excavator Make = _____

Excavator Model = _____

Excavator S/N = _____

Max Flow to Bucket Circuit = _____

Max Pressure in Bucket Circuit = _____

Max Reservoir Pressure = _____

Rated Engine Horsepower = _____

