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FOSTER

L.B. FOSTER COMPANY

**FOUNDATION
CONSTRUCTION
EQUIPMENT**

**4200 VIBRATORY
DRIVER/EXTRACTOR**

VIBRO MODEL:

SERIAL NUMBER:

POWER PACK MODEL:

SERIAL NUMBER:

CLAMP MODEL:

SERIAL NUMBER:

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GENERAL SAFETY INFORMATION

- Pile hammers are to be operated by well-trained, experienced personnel only.
- Operating personnel are to review all instructions and safety manuals before using pile hammers. Copies of all pertinent manuals must be kept with the pile hammer.
- All workmen at the pile driving site must wear safety clothing, including hard hats, safety shoes, safety glasses, and hearing protection.
- If any operating abnormalities are observed, the operator is to stop the hammer immediately.
- Personnel are to stay clear of the hammer while the hammer is in operation.
- Fire extinguishers must be kept available at all times.
- All federal, state, and local safety and health regulations are to be observed.

For additional information, see "Specifications."

ORDERING PARTS AND ASSEMBLIES 1-800-367-6016

Refer to the parts lists and drawings for the size of hammer involved. Locate the item on the drawing. The key (or number) next to the item is the number used in the parts list. Use the EXACT NAME given in the list and the EXACT PART NUMBER.

Part orders must contain the following identification:

- SIZE and SERIAL NUMBER of the hammer.
- PART NAME AND PART NUMBER of the item(s)
- Quantity required

INTRODUCTION

CAUTION

*Before starting unit, read the section
"Safety Precautions"*

The purpose of this manual is to familiarize the owner, operator, and/or service personnel with the operation and maintenance of a Foster vibratory driver/extractor.

This manual should be completely read and thoroughly understood before operating or performing maintenance on the hammer.

All equipment requires periodic inspection and maintenance so that optimum working condition

is maintained. The vibratory hammer, because it is a vibrating machine, requires extra care and maintenance to ensure maximum performance and the longest product life. If it is misused or neglected, problems can occur.

Following the guidelines in this manual will help to ensure the proper performance and durability of the hammer. Prompt inspection and maintenance are the keys to this success. There is no substitute to regular, competent maintenance on any piece of equipment, and vibratory hammers are no exception.

OVERVIEW

Basic Concepts

A vibratory pile driver is a machine that installs piling into the ground by applying a rapidly alternating force to the pile. This force is generally accomplished by rotating eccentric weights about shafts. (An eccentric is a weight with its shaft mounted off-center.) Each rotating eccentric produces a force acting in a single plane and directed toward the centerline of the shaft. The weights are set off center of the axis of rotation by the eccentric arm. There are two main components of the system:

- The vibro, which produces the actual vibrating force.
- The power pack, which provides the usable energy for the motor(s) on the hammer to spin the eccentrics.

Vibro

The vibro is divided into three major parts:

- Vibro case (Transmission Case)
- Vibration isolator
- Clamp assembly

Transmission Case

The transmission case contains an even number of eccentric weights which rotate in a vertical plane to produce the vibration. The eccentric weights are driven by hydraulic motors. The motors and eccentric weights are geared

together for proper synchronization. The eccentric and motor shafts are mounted using heavy-duty anti-friction bearings. Lubrication is achieved using a splash system activated by the rotating eccentric weights and gears.

Vibration Isolator

The vibration isolator is connected to the transmission case by rubber springs, which are usually referred to as elastomers. This vibration isolator provides additional weight to the system during driving to force the pile into the ground without degrading the vibration of the system, although with most units additional bias weight can be attached to the suspension.

In extraction, the suspension system transmits static pull while dampening out vibration and thus protecting the crane boom. For the extraction to be effective, the springs must be sufficiently soft and the bias weight sufficiently heavy to ensure a suspension-natural frequency that is much lower than the vibrator's operating frequency. The maximum line pull depends on the hammer size and is given in the section "Specifications."

Clamp Assembly

The clamp assembly connects the transmission case to the pile and thereby transmits the vibrator's power from the transmission case to the pile. The clamp pinches the pile using a

hydraulic cylinder and jaws, which together produce a frictional connection. Many different types of clamp assemblies are available for the different sizes of hammers, including sheeting clamps, timber pile clamps, pipe pile clamps, concrete clamps, and caisson clamps.

Power Pack

The power pack supplies hydraulic power to the vibro. One or more hydraulic pumps send oil to the exciter motors and hydraulic clamp cylinder. A hydraulic reservoir supplies hydraulic fluid to the pumps. Power for the pumps is provided by a diesel engine. The total power package is mounted on a skid-type fuel tank sub-base. Control panels on the back of the unit contain all operating gauges and controls.

Hydraulic hoses from the vibro are connected to the power pack using quick-disconnect couplers. The hydraulic fluid is circulated through a heat exchanger and oil filter before it is returned to the reservoir.

System Control and Power Pack Enclosure

The system is operated using either a hand held pendant or from the main control panel. The pendant includes a throttle control, drive on/off switch and a clamp on/off switch and a clamp pressure indicator light. The "remote/local" switch must be in the "remote" position to operate the system from the pendant, and in the "local" position to operate the system from the main control panel. The emergency stop buttons operate from any position at any time. The power pack's components are protected by a sheet metal enclosure.

Applications

Note

As a general operating rule, piles should be driven at a penetration rate of no less than one foot per minute. The Pile will be deemed

at refusal if the rate of penetration is one foot or less in three minutes, or if hammer rebounds during operation. STOP HAMMER IMMEDIATELY AND CONTACT A FOSTER SERVICE CENTER IF HAMMER REBOUNDS DURING OPERATION.

Sheet Piling

The sheet piling capability includes almost all shapes used, whether hot or cold formed, steel or aluminum. Normal American practice calls for the sheeting to be set in place using a template and then to be driven to the desired depth. This practice requires that the vibratory hammer be no wider at the throat than about 14 inches (355mm), as the hammer must clear the adjacent piles. It is also normal to drive the sheets two at a time, using a jaw with two sets of teeth and a recess between them large enough to accommodate the interlock.

H-Beams

Conditions for driving H-Beams are similar to those for driving sheeting; however, when the pile's angle is critical, the vibratory hammer can be mounted on a set of leaders much as is done with an impact hammer. In addition to a bearing application, where the beam might be impacted to refusal, vibrated H-Beams are used for soldier beams and in slurry wall construction.

Wood Piling

Because wood is almost exclusively bearing pile, it is rarely driven with a vibratory hammer in the United States. However, extraction of wood pile is common, and the vibratory hammer is an effective tool for this purpose.

Concrete Piling

Concrete pile installation with vibratory hammers is rare in the United States, but it is more common abroad. It is done with both prismatic (square and octagonal) and cylinder pile. Because concrete pile is always displacement pile, the vibratory hammer must develop some toe impact by raising and lowering the pile during the vibration cycle, thus allowing penetration. The toe impact is generally accomplished by using low-frequency vibrators with high amplitudes.

Caissons

Caissons are versatile items, extensively used with drilled shafts. To drive them, a caisson beam is employed. A caisson beam is a horizontal slide with a set of two clamps attached to it. The clamps affix the pile to the hammer on opposite sides of the caisson. The clamps are locked to the slide during use, but they can be moved along the slide to enable a caisson beam setup to drive a variety of pile diameters.

Pipe Pile

The equipment setup for caissons is duplicated with pipe pile. Generally, it is best to vibrate pipes in an open-ended fashion

SPECIFICATIONS

VIBRO	U.S.	METRIC
Eccentric Moment	4166 in.-lbs	471Nm
Frequency	1200-1500 RPM	20-25 Hz
Maximum Line Pull	80 tons	711 Kn
Working Clamp Force	176 tons	1566 kn
Maximum Clamp Force	196 tons	1744 kn
Working Clamp Pressure	4500 psi	310 bar
Maximum Clamp Pressure	5000 psi	345 bar
Dynamic Weight (w/o clamp)	6650 lbs.	3016 kg
Sheeting Clamp Weight	3000 lbs.	1360 kg
Static Weight	6650 lbs.	3016 kg
Total Suspended Weight	16,300 lbs. *	7394 kg
Amplitude	1/4 - 1 in.	6 - 25 mm
Length	92 in.	2337 mm
Width	23.5 in.	597 mm
Height (W/Std. Clamp)	134 in.	3404 mm
Throat Width	14 in.	356 mm
Power Pack		
Engine Caterpillar 3408 DITA		
Maximum Engine Power	503 HP	375 kW
Engine Speed @ Max. Power	2050 RPM	2050 RPM
Max. Drive Pressure	5000 psi	345 bar
Weight Wet	13,920 lbs.	6340 kg
Length	162 in.	4115 mm
Width	72 in.	1829 mm
Height	96.75 in.	2458 mm

*Includes one-half of hose bundle.

General

Personnel unloading the vibratory hammer must be extremely careful. The hammer and power pack should be thoroughly inspected for damage or missing parts. If any problems are found, the carrier should note these problems on the freight bill.

Safety Specifications

Safety is basically common sense. There are standard safety rules, but each situation is different. Common sense and experience are the best guides to safety. Operators should always be alert to problems and correct deficiencies promptly. The following general guidelines for safe operation may be helpful:

FIRST

- Review all of the operating and safety features in the vibro and power pack manual.
- Familiarize anyone else working on or with the equipment with the information.

NEVER

- Allow unauthorized or unqualified people to operate, maintain, or even *approach* the equipment.
- Allow anyone to stand directly under the vibro during operation.
- Operate the power pack's diesel engine in a closed area. Breathing the fumes can be fatal.
- Smoke or use an open flame when servicing batteries. Proper ventilation is necessary when charging batteries. On units with a power pack enclosure, all of the doors of the unit must be open during battery charging.
- Smoke when filling the fuel tank or hydraulic reservoir while anywhere near the vibro, hoses, or power pack. Diesel fuel and hydraulic fluid are highly flammable.

- Adjust or repair the unit while it is in operation.
- Attempt to operate the diesel engine with the governor linkage disconnected.
- Store flammable liquids near the engine.
- Unscrew the check valve on the clamp cylinder if there is pressure in the blind end. The valve will be blown violently out of the cylinder, possibly causing serious injury or death.
- Unclamp the vibro from the pile when there is any line pull on the suspension or when the hammer is still vibrating.

ALWAYS

- Store oily rags in containers to avoid disorder and problems in the hydraulic system.
- Remove all tools from the unit before starting.
- Be sure that all pressure is out of the system and that all pressure gauges read zero before working on the hydraulics of the system. The high-pressure fluid in hydraulic lines can be very dangerous if it escapes, such as in a hose break or a loose fitting or component. Even when the system pressure may be zero, proceed with extreme caution, as if all of the lines were still fully pressurized. Open all fittings and connections slowly until there is no pressure on that particular connection. Keep face and body away from the potential line of fire of any fluid while working with hydraulic connections.
- Wear gloves and other protective clothing while working on any part of the system. Even better, wait until the system has cooled down. Hydraulic components and the diesel engine become very hot during operation.

- Make any hose fittings or connections very tight when they are reassembled. Failure to ensure tightness can cause the hoses to come loose, which causes hydraulic fluid to be sprayed causing possible injury or death. Any bolted or otherwise fastened connection on either the vibro or power pack must also be tightly assembled.
- Make sure that the pile is firmly gripped by the jaws when clamping.

Rigging of Vibro

To permit lifting of the hammer, a wire rope must be secured from the crane line to the lifting shackle on the hammer. When choosing the wire rope for any unit, operators should use a generous safety factor. All wire ropes, and necessary rigging are to be in good condition, without any sign of wear or breakage.

Clamp Assembly Installation

The vibro is normally shipped with the clamp assembly attached. If installation is necessary, there are two procedures which may be used.

1. Lay the exciter on its side with appropriate substantial support. Position the clamp assembly against the bottom of the exciter case. The clamp cylinder should be on the side with the hose bundle. Line up the holes, and insert and tighten the clamp bolts.
2. Position the clamp assembly so that the mounting holes are facing up. Position the exciter over the clamp assembly and line up the mounting holes. Insert and tighten the bolts.

When tightening the clamp bolts, special care must be taken to ensure that these fasteners are properly torqued. Torque values are given in the section "Fastener Torque."

Hose Connections

CAUTION

Shut down the power pack to connect or disconnect all hoses

The vibro and power pack are connected by five hydraulic hoses (bundle). The hoses are

connected to the power pack with quick-disconnect couplers. These couplers ensure that hoses are connected correctly and prevent them from losing oil when disconnected. Couplers must be clean before connecting them by wiping both ends with a clean cloth.

The connection scheme of the hoses to the power pack is similar on all models. The hoses from the power pack to the vibro are connected to the power pack with quick disconnects. On the vibro end, the hoses are connected to the hammer using pigtailed, which are short hoses (about 12 feet long). Using the pigtailed permits the disconnection of the main hose bundle without removing any connections on the manifold (hose connection block) or loosening the main hose clamp. All hoses are connected to the suspension, which routes the oil to the motor(s) according to the physical requirements of the machine. The hoses must be secured to the suspension with the hose blocks on the suspension provided for that purpose.

Engine Start-up

The diesel engine start-up procedure in the manufacturer's operation manual should be read carefully and all applicable instructions followed.

The unit is not to be started if the temperature of the hydraulic oil is below 0° F. An immersion heater should be used to warm the fluid. The fluid temperature should be at least 30° F before starting the vibro at slow speed. After starting, the engine should run at about 1500 RPM for five minutes.

Hose Preparation

When the unit is shipped, the hydraulic hoses are full of fluid and ready to use. If a hose is shipped separately or fluid is lost from the existing hoses, the air must be removed before hammer operation. Neither the return nor the case drain lines need to be full before operation.

Clamp Hose

To bleed the air from the clamp lines, the operator of the clamp assembly should stand in

front of the end cap, looking directly at the face of the end cap. Two clamp ports with hoses are connected to the cylinder, either (a) into the end cap or (b) directly into the clamp block.

The positioning of the hoses determines which line is CLAMP OPEN and which line is CLAMP CLOSED.

- For cylinders with hoses connected to the end cap, the line and port on the left is CLAMP OPEN and the line on the right is CLAMP CLOSED.
- For cylinders with hoses connected to the clamp block, the line and port on the left is CLAMP CLOSED and the line on the right is CLAMP OPEN.

Once these ports have been identified the CLAMP CLOSED line on the hydraulic cylinder must be loosened and the procedure below followed:

- With the power unit at low idle, close the clamp with the controls.
- When fluid flows from the fitting without air, retighten the fitting.
- Loosen the clamp open fitting.
- Open the clamp with the controls until fluid flows without air from the loosened fitting.
- Retighten the fitting.

CAUTION

Do not try to bleed the lines or free the cylinder by removing the check valve. See section on hydraulic circuitry for a detailed explanation of valve and its operation.

Drive Hose

The drive hose should fill with oil after the power unit has been running for about ten minutes without operation of the vibro. An additional precaution is to jog the hammer. With the diesel engine nearly idling, start the vibro with the controls; when the vibro moves, stop the vibro with the controls. The drive hose should now be completely full of oil.

OPERATING INSTRUCTIONS

Completion of Set- up

1. Complete all applicable preparation as described in the section "Preparation for Operation."
2. Read "Maintenance and Adjustments" and perform any required maintenance.

Warming Hydraulic Fluid

The vibro is not to be operated at full speed if the temperature of the hydraulic fluid is below 60° F. If the temperature of the fluid is below that level, the diesel engine should be set at 1500 RPM and the START button pushed to start the hammer. The vibro is to run until the oil reaches the required temperature. Full speed operation is permissible at this point.

Vibro Operation

General

Before putting the vibro to work operators should read the section "Hydraulic and Electric Circuitry." Understanding how the unit works will give them invaluable information for troubleshooting problems in the unit.

System Controls

General

Power Pack Remote Control Pendant/Switches

The operation of the hammer can be controlled by the Power Pack remote control pendant/switches. The pendant box is connected to the power pack by a 30 feet (9.15m) cable. The operator then has the flexibility to move to the required position for optimum viewing of the work. The "remote/local" switch must be in the "remote" position to operate the system from the pendant.

Clamping Pile

The vibro must be positioned parallel to the pile and the full length of the jaw must make

contact with the pile when clamped. The CLAMP CLOSED control must be engaged. The clamp will close in two to three seconds. The pile must be firmly gripped by the jaws.

Driving and Extracting

When adequate clamping pressure has been reached, the vibro is ready to vibrate. The START control or the VIBRO ON switch is to be engaged. The vibro and pile will begin vibrating.

When the vibro is driving, the combined weight of the vibro and pile will force the pile into the ground. As the driving resistance increases, the drive pressure will increase until it reaches the maximum pressure setting of the power pack. Any increased resistance will cause the vibro to slow down somewhat.

The hammer may be operated in this condition for short periods of time; however, extended periods may cause over-heating of various components.

When the vibro is extracting, the crane must exert a net pull on the vibro-pile system, which will cause the pile to move upward. It is good practice to attempt driving the pile prior to extracting to break soil to pile adhesive. All sizes of vibros have a mechanism to indicate the load on the crane and to prevent the over-extension of the elastomers. The pulling force of the hammer should not be allowed past the maximum force shown on the indicator, and should be restricted to the lowest possible level at all other times. Never exceed the maximum pull indicator, as damage or injury may result.

Stopping the Vibration

The STOP control or the VIBRO OFF selector switch must be engaged. The vibro will stop in a couple of seconds.

Unclamping the Pile

There should be no crane tension on the vibro, and the operator should ensure that the vibro has stopped vibrating. Then engage the CLAMP OPEN control.

The diesel engine speed is controlled by an electric actuator. Most operations can be made with the throttle wide open; however, the frequency of this practice may be intermittent with use of the control if conditions warrant.

Unit Shut Down

To shut down the hammer, the following steps must be taken:

1. Stop the vibro.
2. Open the clamp.
3. Allow the engine to run at 1000 RPM for 5 minutes to cool.
4. Reduce engine speed to idle.
5. Shut off engine.

If the diesel engine shuts down while the vibro is clamped to a pile, the check valve will maintain the clamping force. Otherwise, the engine must be running to disengage the clamp.

CAUTION

Over time, system leakage could cause a loss of clamp pressure, allowing the unit to fall to the ground or on personnel. Do not leave the exciter clamped to a pile without the power pack running and pressure on the CLAMP CLOSED line.

Maintenance & Service

General

Regular Servicing

Preventive maintenance includes normal servicing that will keep the engine, vibratory driver, and power pack in peak operating condition and prevent unnecessary trouble from developing. This servicing is designed to prevent minor irregularities from developing into serious conditions that might involve shutdown and major repairs. It consists of:

- A. periodic lubrication
- B. inspection of the moving parts

The purpose of these services is to ensure the uninterrupted operation of the unit.

This section provides instructions in the servicing of the vibratory hammers and their power packs. The intervals given in the schedule are based on normal operation. These services and inspections are to be performed more often as needed for operation under abnormal or severe conditions.

Lubrication and Cleaning

Lubrication is an essential part of protective maintenance, greatly controlling 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 to follow the instructions concerning types of lubricants and frequency of application closely.

All lubrication fittings, caps, filler and level plugs, and their surrounding surfaces must be thoroughly cleaned before servicing. A dirty system will malfunction even when the rest of the schedule is followed accurately.

Daily Maintenance

When To Perform Daily Maintenance

The entire unit before and during start-up each day or at the beginning of each shift.

Checks Before Starting the Engine

Before starting the diesel engine at each shift, the following steps must be completed:

1. Visually inspect all bolts, nuts, and screws to ensure they are tight.
2. Tighten bolts holding the gripping jaws in the hydraulic clamp and bolts fastening the hydraulic clamp to the vibro case.
3. Grease the clamp slide in hydraulic clamp with any good multipurpose grease.
4. Examine the jaw teeth for wear. Worn teeth could cause the hammer to slip off a pile during extracting. Worn teeth may be built up by hardface welding as a temporary repair. Worn jaws should be replaced.
5. Check the oil level in the vibro case and fill if required. The oil level should be in the middle of the sight glass. Change oil if black or milky.
6. Check the fluid level in the hydraulic reservoir and refill if necessary.

CAUTION

It is very important that no dirt or other contaminants enter the hydraulic system. Any contamination will dramatically shorten the life of the high pressure hydraulic system.

7. Visually inspect all hoses for signs of damage that might cause hose failure during operation. Be sure all connections are tight, especially the quick-disconnect couplers.
8. Visually inspect all suspension elastomers.
9. Perform all daily maintenance checks and lubrication on the diesel engine as indicated in the engine operation guide.

Checks after Starting the Engine but before Driving

1. Check all hydraulic hoses for leaks. Make sure they hang freely with no kinks.
2. Check all pumps and valves for leaks.
3. Check the filter indicator on the panel on the power pack. Do so with the diesel engine at full throttle.

Maintenance after 100 Hours of Operation

1. Drain and refill the vibro transmission case with lubricant.
2. Perform all maintenance checks and lubrication on the engine as indicated in the engine operation guide.

Engine Maintenance

All maintenance checks and lubrication on the engine must be performed as indicated in the engine operation guide.

Annual Maintenance

The hydraulic fluid should be tested by a local hydraulic service center and replaced if necessary.

All maintenance checks and lubrication on the engine are to be performed as indicated in the engine operation guide.

Maintenance During Severe Conditions

The servicing intervals specified above are based on normal operating conditions. Operation under unusual conditions requires some adjustments in servicing intervals. Some of these conditions are discussed below.

Extreme Temperatures

Extreme temperatures for this equipment are:

1. When the average ambient temperature exceeds 80° F.
2. When the average ambient temperature is below +30 ° F.

Under these conditions, the servicing intervals can be reduced to one-half of the recommended intervals.

Long Operating Hours

Foster vibratory hammers are being subjected to long operating hours when the hammer is operating more than twelve (12) hours per day. Under this condition, servicing intervals are to be reduced to one-half of the recommended intervals.

Dust or Sand

If the hammers are operated in the presence of dust or sand, the servicing intervals should be reduced to one-third of the recommended intervals.

Salt or Moisture

If the hammers are operated in air with high salt or moisture salt or moisture, the servicing intervals do not usually need to be changed. However, the unit should be inspected weekly to determine if additional servicing is required.

Standby or Inactive Periods

During standby or inactive periods, the servicing intervals need to be expanded to twice the recommended intervals. The unit should be run at least briefly every week. The engine may have special requirements during periods of extended idleness; refer to the engine operation guide for details. Keep lubricant on all internal components (e.g., gears, shafts, bearings) by:

1. Turning the hammer periodically to bathe various parts of the transmissioncase in the oil pool that settles on the bottom.
2. Using the proper gear case oil.
3. If unit is not operated for six months or longer, all fluids and lubricants should be checked and replaced as required.

LUBRICATION

Diesel Engine

The engine manufacturer's operating and maintenance instructions should be followed.

Vibro Transmission Case

When adding or changing oil in the vibro transmission case, maintenance personnel are encouraged to use Lubrication Engineers Type 605 oil. New units are shipped with this type of oil which is an extreme-pressure gear lubricant and contains antiwear and antifoam additives. Substitutes, especially for long-term storage, are discouraged.

Hydraulic Fluid

When adding or changing hydraulic fluid, maintenance personnel should use any of the following fluids listed below. New units are shipped with Mobil AW-46. Mixing different manufacturers' hydraulic fluids is not recommended; however, it can be done if they have the same base and additives.

Manufacturer	Brand Name
EXXON	Univis P-46
MOBIL	AW-46
TEXACO	RANDO HD-46
SHELL	TELLUS 46

Draining and Filling Hydraulic Reservoir

Draining

The hydraulic reservoir is drained by removing a plug on the side of the reservoir.

Filling

When adding fluid to the reservoir, maintenance personnel should ensure that all fluid is pumped to the reservoir through a separate ten-micron filter so that no dirt enters the hydraulic system.

Changing Power Pack Hydraulic Filter Element

The power pack hydraulic filter is located directly in the reservoir. To remove the elements, the wing nuts on the top cover and on the cover assembly must be removed. The filter interior

and all parts must be cleaned, and the O-ring checked for damage and lubricated with a multipurpose grease. Install new elements. When the cover assembly is replaced, the cover screws must be replaced and tightened.

Follow EPA guidelines for disposal of all oil, lubricants and filters.

When operating in extreme temperatures, it may be necessary to use different lubricants and fluids. Contact your local oil supply representative or L. B. Foster Company for suggested procedures.

Gearbox Problems and Solutions

Maintenance on the transmission case in any vibratory hammer is a major undertaking and, an uncommon one. Nevertheless, there are a few pointers for troubleshooting.

Generally, if the case drain relief valve of a vibratory hammer blows off, the transmission case needs to be repaired. Although other conditions can cause this to happen, such as motor problems or the nature of the vibration, the transmission case first should be analyzed by laying the hammer down and checking the magnetic plug at the base of the transmission case. Metal pieces more substantial than fine dust can signal internal damage in the gearbox. Also, the lubricant level should be checked because lack of lubrication for any length of time will lead to serious damage.

If small metal pieces are suspected as the problem, take the unit out of service and contact L. B. Foster Company.

Checklist

The following chart is a checklist for preparing the vibratory hammer before operation or afterward. Following this checklist will be very beneficial in servicing the vibratory hammer.

4200 Vibratory Driver/Extractor

CHECKLIST BEFORE AND AFTER OPERATION OF VIBRO

CHECK ITEM	CHECK	SERVICE
Batteries		
Clamp Pressure		
Clamp Slide/Piston Rod		
Drive Pressure (with or with out Vibro)		
Engine Air Filter		
Engine AntiFreeze Level and Condition of Radiator		
Engine Belts		
Engine Charging System		
Engine Fuel Filter		
Engine Oil Level		
Engine Oil Pressure		
Engine Speed (RPM)		
Engine Temperature		
Vibro Bearings		
Vibro Hose Clamps		
Fixed Jaw and Bolts		
Moveable Jaw and Pin		
Hose Bundle Banding		
Hose Bundle Condition		
Hour Meter—Reading and Operation		
Housing Condition		
Hydraulic Oil Cooler		
Hydraulic Oil Leaks		
Hydraulic Oil Level (Reservoir)		
Hydraulic Oil Temperature		
Instrument Panels		
Pendant and Cable		
Power Pack Hoses		
Quick Disconnects		
Return Filters		
Safety Guards and Shields		
Elastomers and Bolts		
Starting System		
Transmission (Gearbox, Drive Plate)		
Vibratory Transmission Case Lubricant (Level and Condition)		

4200 Vibratory Driver/Extractor

By _____ Date _____ Comments _____

HYDRAULIC AND ELECTRIC CIRCUITRY

Variations in Products

Although all Foster vibratory hammers and power packs operate basically in the same manner, they vary in detail from one another. When variations occur, personnel should adjust maintenance and troubleshooting procedures to account for them.

Hydraulic Pumps

The hydraulic motor and clamp are each powered by separate hydraulic pumps. These pumps may be completely separate or mounted together, allowing the clamp and motors to operate independently of one another. One outlet may be under high pressure while the other is under low pressure. The hydraulic oil is drawn out of the reservoir through both a suction strainer and the shut-off valve to each hydraulic pump.

Clamp

The low-volume pump supplies oil to the clamp. Engaging the CLAMP control shifts the clamp DCV spool, which is then held in place by a detent. Flow is directed to the head end of the hydraulic clamp cylinder, and both cylinder and movable jaw move towards the fixed jaw. This movement should never take place without piling or a piece of steel plate between the jaws. Otherwise, premature wear of the jaws will result.

When the pressure in the clamp line reaches maximum pressure, the pressure compensated pump will automatically reduce the flow to the clamp. As internal or external hydraulic leakage takes place, the clamp circuit will depressurize; again, the pump flow picks up until the system is once again repressurized. The pilot-to-open check valve (located in the hydraulic clamp cylinder) keeps the blind end of the cylinder under pressure even if the clamp line loses pressure. This feature prevents the hammer from slipping off the pile in case of a hose break or other failure.

CAUTION

Never unscrew the check valve if there is pressure in the blind end of the clamp cylinder. The valve will be blown violently out of the cylinder, possibly causing serious injury.

The check valve has an adjustment screw on the back. To release the pressure in the cylinder, the operator simply screws in on the adjustment. **Remember to screw the adjustment back out for normal operation.**

Engaging the UNCLAMP control will shift the spool out of the clamp position, through the center or neutral position, to the CLAMP OPEN position. The oil is directed to the rod end of the hydraulic cylinder. Before the clamp cylinder will open, the pressure in the CLAMP OPEN line must be great enough to open the check valve. This pressure is equal to one-third of the CLAMP CLOSED pressure. When this pressure is attained, the clamp cylinder will open.

The UNCLAMP control need only be actuated momentarily. The DCV is then shifted to the other position, which then directs flow to the rod end of the clamp cylinder and thus opens the clamp. This pressure continues to be held until either the clamp is closed again, or the power pack is shut down. **NEVER** attempt to service the clamp circuit, or cylinder with the power pack engine operating.

Motor(s)

The high-volume pump supplies oil to the hydraulic motor(s) on the hammer. When the drive DCV is off, the hydraulic pump is placed at minimum dead-head pressure, (about 300 PSI), insufficient pressure to operate the hammer. When the "Drive" control switch is actuated, the DCV applies its own pressure to the pump, which then turns the flow and pressure on, thus starting the hammer to vibrate. Upon return from the hammer, the oil passes thru a braking valve, (discussed under STOP below), and then is directed to the oil cooler mounted in front of the engine radiator. All main system motor flow is passed through this oil cooler, and then through

the in-tank return line filter, and back to the reservoir.

The drive pressure is limited by the pressure setting of the compensator on the hydraulic pump. As the pump reaches the maximum pressure setting, (5000 PSI) the pump automatically starts to de-stroke, thus preventing over-pressurization of the system. This method of control prevents both the hydraulic system and the engine from over heating common to fixed displacement systems.

When the stop control is actuated, the DCV returns to the "off" position, thus destroying the pump and returning the system pressure to minimum dead head as explained above. When the pump pressure drops below 500 PSI, the brake valve pilot pressure is lost, and the brake valve located in the return line circuit inside the power pack is closed. The hydraulic motors, now acting like a pump because of the momentum of eccentrics, builds pressure in the return line. The brake valve limits the maximum pressure to 1500 PSI, and brings the hammer to a quick (2-4 second) stop. Since the pump is still trying to flow oil at 300 PSI, cavitation is avoided in the circuit.

The case drain fluid from the motor flows back to the reservoir in the case drain line. The case drain relief valve, which is located on the suspension, limits the case drain pressure to 90 PSI.

Control Methods

General Description

Five basic control actions are used to operate Foster vibratory hammers:

1. Clamp
2. Unclamp
3. Start
4. Stop
5. Engine Throttle

Actions 1 thru 4 have already been described. Action 5, the engine throttle, is a continuous control to regulate the speed of the diesel engine.

Electric Controls (FV-4200)

All the functions on the power pack are controlled electrically using two sets of controls. One set is mounted on the power pack and the other is on a 30-foot remote control pendant. Only one set of controls will work at a time. A selector switch on the power pack enables either the panel control or the pendant control. The clamp pressure indicator on the pendant works no matter which set of controls is selected.

The engine throttle is electronically operated by a 24-volt, direct-current (DC) motor-driven unit. Power is supplied to the throttle unit by two directional relays (K4 and K5) in the mounted control cabinet. The throttle selector switches energize the control relays to increase or decrease the throttle position.

The valves which control the clamp and vibro drive are 24-volt DC control valves. These valves are controlled by selector switches on the power pack and remote control pendant. The clamp and unclamp valve can be energized whenever the ignition switch is in the ON position. However, they will not shift the main valve spool unless the engine is running and the pump is producing pilot pressure. The vibro valve will only shift when the engine is running, the clamp is clamped and up to pressure (sensed by a CLAMP PRESSURE switch), and one of the vibro selector switches is in the ON position.

Several sensors protect the hydraulic components from damage due to oil level or temperature. A float switch in the reservoir will close if the oil level drops below a safe depth. The float switch will cause an emergency engine shut-down and illuminate a LOW OIL pilot light.

Two oil temperature switches warn of a high oil temperature. A high oil temperature switch closes when the oil temperature reaches 180° F., illuminating the HIGH OIL TEMPERATURE pilot light. When the second high temperature switch opens at 220° F., a pilot relay in the control panel de-energizes, causing an emergency stop condition and also illuminating the HIGH OIL TEMPERATURE light.

A pressure switch on the inlet side of the hydraulic oil filter closes if the filter becomes clogged with foreign matter. When this pressure

switch closes, the HYDRAULIC OIL FILTER DIRTY pilot light illuminates warning of restricted oil flow. The filter must be changed regularly to avoid a clogged filter condition.

The remote control pendant consists of the following controls:

1. Selector switch for throttle control
2. Clamp engage/disengage switch
3. Vibro on/off switch
4. Clamp pressure indicator light

The throttle selector switch operates two pilot relays which supply directional power to an electric throttle control.

ELECTRICAL SYSTEM TROUBLE SHOOTING GUIDE

Symptom	Possible Causes	Remedies
Green ignition ON does not illuminate when ignition is pressed on	<ol style="list-style-type: none"> 1. If volt meter reads 0, control fuse is blown 2. If volt meter reads greater than 15 volts, ignition lamp is bad 	<ol style="list-style-type: none"> 1. Replace 10-amp control fuse 2. Replace ignition lamp
Engine will not crank	<ol style="list-style-type: none"> 1. 60-amp fuse blown on engine 2. Ammeter mounted on engine defective 3. Ignition switch defective 4. Relay K1 energized 5. Relay K1 contacts defective 	<ol style="list-style-type: none"> 1. Re-set 2. Replace 3. If wire 22 not energized when ignition switch is in START position, replace switch 4. Turn Vibro switches off 5. Replace relay
Engine shuts down as soon as Engine starts (within 10 sec.)	<ol style="list-style-type: none"> 1. Governor switch defective if engine not in over-speed condition 2. Emergency stop switch pressed or defective 3. Engine oil pressure gauge not indicating pressure <ol style="list-style-type: none"> A. Gauge defective B. Sender on engine defective 4. Diode D1 or D2 shorted 5. Engine water temperature indicates high temperature <ol style="list-style-type: none"> A. Wire #5 grounded B. Sender on engine defective 6. Relay K2 not energized <ol style="list-style-type: none"> A. Wiring to hydraulic over-temp switch defective B. Hydraulic oil over temp C. Defective over-temp switch D. Defective relay 	<ol style="list-style-type: none"> 1. Replace 2. Replace if defective 3A. Replace 3B. Replace 4. Replace 5A. Check wiring 5B. Replace 6A. Check and repair 6B. Check oil cooling system 6C. Replace 6D. Replace

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Symptom	Possible Causes	Remedies
No water temperature indication	<ol style="list-style-type: none"> 1. Gauge defective 2. Temperature sender on engine defective 	<ol style="list-style-type: none"> 1. Replace 2. Replace
Throttle will not increase and/or will not decrease	<ol style="list-style-type: none"> 1. Throttle relays K4 and/or K5 do not energize <ol style="list-style-type: none"> A. Control fuse blown B. Local remote switch defective C. Throttle selector switch SS1, SS4 bad D. If only inoperative when on remote, pendant cable defective 2. Throttle relays K4 and/or K5 energize <ol style="list-style-type: none"> A. Limit switches inside throttle unit stuck or defective 	<ol style="list-style-type: none"> 1A. Replace 1B. Replace 1C. Replace 1D. Replace 2A. Repair or replace throttle unit
Engine shuts down as water temperature light illuminates	<ol style="list-style-type: none"> 1. Engine cooling over temperature <ol style="list-style-type: none"> A. Insufficient engine coolant B. Engine water pump defective C. Engine radiator plugged up (air flow or water flow) 	<ol style="list-style-type: none"> 1A. Refill 1B. Replace 1C. Check water and air flow for restrictions
High oil temperature light illuminates, but engine still runs	<ol style="list-style-type: none"> 1. Hydraulic oil temperature over 180° <ol style="list-style-type: none"> A. Hydraulic load too high B. Hydraulic cooler plugged C. Low air flow over hydraulic cooler D. Hydraulic circuit problem 	<ol style="list-style-type: none"> 1A. Reduce power output of unit 1B. Check flow through cooler 1C. Check air flow over cooler 1D. Call your local representative
High oil temperature on and engine shuts down	<ol style="list-style-type: none"> 1. Hydraulic oil temperature over 220° <ol style="list-style-type: none"> A. Hydraulic load too high B. Hydraulic cooler plugged up C. Low air flow over hydraulic cooler D. Hydraulic circuit problem 	<ol style="list-style-type: none"> 1A. Reduce power output of unit 1B. Check flow through cooler 1C. Check air flow over cooler 1D. Call your local representative
FILTER DIRTY lamp illuminates	<ol style="list-style-type: none"> 1. Hydraulic oil filter dirty 2. Oil filter pressure switch defective 	<ol style="list-style-type: none"> 1. Replace filter element 2. Replace switch

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Symptom	Possible Cause	Remedy
Clamp will not engage	<ol style="list-style-type: none"> 1. Clamp solenoid energizes <ol style="list-style-type: none"> A. Clamp hydraulic pump B. Clamp cylinder C. Clamp hoses D. Clamp mechanism 2. Clamp solenoid does not energize <ol style="list-style-type: none"> A. Blown 10A control fuse B. Defective local/remote switch C. Defective clamp selector switch D. Defective wiring 	<p>1A-D—Check clamp pressure gauge—if no pressure, check all clamp hoses and clamp cylinder for leaks.</p> <p>1A-D— If clamp pressure is indicated, but is not clamped, check clamp mechanism for proper operation.</p> <p>2A. Fuse blown in no indication on volt meter</p> <p>2B. Check for voltage on wire 39 (local) or wire 46 (remote)</p> <p>2C. Replace</p> <p>2D. Check and repair if necessary</p>

Recommended Torque for Threaded Fasteners

Diameter	Torque (Ft-Lbs) Property Class 10.9	Torque (Newton- Meters) Property Class 10.9
M8	27	37
M10	53	72
M12	95	125
M14	148	201
M16	230	312
M18	335	454
M20	449	609
M24	775	1051
M30	1540	2088
M39	2520	3417

PARTS AND COMPONENTS

Parts Lists

Parts lists and drawings are included for the following individual vibratory hammer parts:

1. *Power Pack*: This section includes a hydraulic schematic for each size, followed by a common parts list for all sizes.
2. *Vibro Parts*: Parts diagrams appear for each hammer.
3. *Clamps and Accessories*: Parts diagram for the clamp assembly is given.
4. *Hose Assemblies (bundle)*: All sizes have a parts diagram and list.

In each case, the parts list appears first, followed by the diagram or schematic. Some drawings have a parts list included on the same page. Others refer to the parts list at the beginning of each section.

Abbreviations

Abbreviations in the parts list are as follows:

DCV	Directional Control Valve
HSFCHCS	Hex Socket Flat Countersunk Head Cap Screw
QD	Quick Disconnect
SHCS	Socket Head Cap Screw

Ordering Parts: Call 1-800-367-6016

When ordering parts:

1. Be sure to include both the model and serial number of the unit.
2. Confirm all telephone orders immediately to avoid duplication.
3. Provide the exact shipping address and method of shipment.
4. Make any claims for shortages or errors immediately upon receipt of parts.
5. Refuse any damaged or lost material or make a full description of damage or loss to the carrier agent on the freight bill.

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Materials List Power Pack

Key	Part Name	Qty.	Part No.
1	Air Intake	1	12500101
2	Air Intake Hose	30"	1000607
3	Air Intake Hose Clamp	2	1000608
4	Battery	2	30100032
5	Battery Bracket	1	13304
6	Battery Bracket Bolt	2	1000005
7	Battery Bracket Nut	4	1000006
8	Battery Cable-Jumper	1	1000007
9	Battery Cable-Negative	1	1000008
10	Battery Cable-Positive	1	1000009
11	Battery-Ground to Frame Bolt	2	1000010
12	Battery-Ground to Frame-Nut	2	1000011
13	Brake Valve	1	1000228
14	Brake Valve Adapter	1	1000342
15	Brake Valve Flange Kit	1	1000341
16	Brake Valve Mounting Bolt	4	1000015
17	Brake Valve Mounting Washer	4	1000019
18	Brake Valve Pilot Port Adapter	1	1000254
19	Case Drain @ QD-Connector	1	1000248
20	Case Drain @ QD-Nipple	1	1000263
21	Case Drain Connector-Reducer	1	1000034
22	Case Drain Connector-Tee	1	1000033
23	Case Drain (Drive Pump To Tank) Hose Assy'	1	1000088
24	Case Drain (Tank To Clamp Pump) Hose Assy'	1	1000085
24b	Case Drain to Reservoir Hose Assembly	1	1000089
25	Case Drain Quick Disconnect	1	1000205
26	Case Drain Quick Disconnect-Decal	1	1000038
27	Circuit Breaker, 15 Amp	1	1000378
28	Circuit Breaker, 50 AMP, Main Engine	1	30600513
29	Circuit Breaker Decal	1	1000000
30	Clamp Pressure @ QD-Connector	1	1000385
31	Clamp Pressure @ QD-Nipple	1	1000032
32	Clamp Pressure Gauge	1	93000312
33	Clamp Pressure Gauge Adapter	1	1000052
34	Clamp Pressure Gauge Decal	1	1000053
35	Clamp Pressure Gauge Line	1	1000054
36	Clamp Pressure Gauge Line Connector	1	1000056
37	Clamp Pressure Light-Pendant-Green	1	30600504
38	Clamp Pressure Quick Disconnect Dust Cap	1	1000506
39	Clamp Pressure Quick Disconnect Nipple	1	1000647
40	Clamp Pressure Quick Disconnect-Decal	1	1000060
41	Clamp Pressure Switch	1	1000193
42	Clamp Pump Connector (Pressure Flange)	1	1000401
43	Clamp Pump Drain Line Adapter	1	1000597
44	Clamp Pump Inlet Flange	1	1000177

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Key	Part Name	Qty.	Part No.
45	Clamp Pump Outlet Flange Kit	1	1000063
46	Clamp Pump Port Flange Bolt	8	1000612
47	Clamp Pump Reducer (Pressure)	1	1000034
48	Clamp Pump Suction Hose Assembly	1	1000096
49	Clamp Pump Suction Port Adapter	1	1000092
50	Clamp Pump Suction Strainer	1	1000302
51	Clamp Pump To Control Valve Hose Assembly	1	1000097
52	Clamp Return Quick Disconnect Coupler	1	1000648
53	Clamp Return Quick Disconnect Coupler Dust Plug	1	1000507
54	Clamp Return Quick Disconnect-Connector	1	1000386
55	Clamp Return Quick Disconnect-Decal	1	1000072
56	Clamp Valve	1	1000045
57	Clamp Valve Bolt Kit	1	1000187
58	Clamp Valve Connector	2	1000046
59	Clamp Valve Connector Tee	1	1000260
60	Clamp Valve Pipe	1	1000047
61	Clamp Valve Pipe Connector	1	1000046
62	Clamp Valve Pipe Sleeve	1	1000048
63	Clamp Valve Pipe-Nut	1	1000049
64	Clamp Valve Subplate	1	1000186
65	Clamp Valve To Q.D.(Supply) Hose Assy'	1	1000098
66	Clamp Valve To QD Hose Assy' (Return)	1	1000099
67	Clamp/Unclamp Switch	2	30600151
68	Din Connector-Control Valves	3	1000553
69	Din Rail-35mm	14"	1000373
70	Drive Control Valve	1	1000199
71	Drive Control Valve Bolt Kit	1	1000530
72	Drive Control Valve Connector (Inlet)	1	1000057
73	Drive Control Valve Connector (Outlet)	1	1000387
74	Drive Control Valve Pipe	1	1000047
75	Drive Control Valve Pipe-Nut	1	1000049
76	Drive Control Valve Pipe-Sleeve	1	1000048
77	Drive Control Valve Port Plug	1	1000086
78	Drive Control Valve Subplate	1	1000201
79	Drive Control Valve Washer	2	1000087
80	Drive Coupling	1	1000497
81	Drive Plate	1	1000498
82	Drive Pressure @ QD-Nipple (Return)	1	1000326
83	Drive Pressure @ QD-Nipple (Supply)	1	1000326
84	Drive Pressure Gauge	1	93000312
85	Drive Pressure Gauge Adapter	1	1000052
86	Drive Pressure Gauge Decal	1	1000091
87	Drive Pressure Gauge Line	1	1000054
88	Drive Pressure Quick Disconnect-Decal	1	1000095
89	Drive Pressure To Q.D. Hose Assy'	2	1000112
90	Drive Pump Connection-Bottom (Case Drain)	2	1000047
91	Drive Pump Connection-Top (Case Drain)	1	1000043
92	Drive Pump Drain Connector	1	1000031
92b	Drive Pump Overflow Hose (Inlet to Outlet)	1	1000931

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Key	Part Name	Qty.	Part No.
92c	Drive Pump Overflow Hose (Outlet to Drain Line)	1	1000930
93	Drive Pump Gauge Line Connector	1	1000070
94	Drive Pump Inlet Flange	1	13278
95	Drive Pump Inlet Flange Mounting Bolts	4	1000698
96	Drive Pump Inlet Flange Mounting Washers	4	1000125
97	Drive Pump Outlet Split Flange Bolts	8	1000409
98	Drive Pump Split Flange Bolts, Manifold	8	1000631
99	Drive Pump Split Flange, Outlet	4	20520062
100	Drive Pump Suction Hose	1	1000565
101	Drive Pump Suction Nipple	1	1000192
102	Drive Pump Suction Strainer	1	1000197
103	Drive Pump To Brake Valve Hose Assy'	1	1000100
104	Drive Pump To Control Valve Hose Assy'	1	1000113
105	Drive Quick Disconnect Nipple	1	1000203
106	Drive Quick Disconnect Nipple Dust Cap	1	1000584
107	Drive Return Quick Disconnect Coupler	1	1000583
108	Drive Return Quick Disconnect Coupler Dust Plug	1	1000585
109	Drive Return Quick Disconnect-Decal	1	1000117
110	Electrical Box Bolt	4	1000120
111	Electrical Box Nut	4	1000119
112	Electrical Box Washer	8	1000087
113	Electrical Cable-16/10	10'	1000368
114	Electrical Cable-Pendant Cord	30'	30700011
115	Electrical Control Box, Complete	1	1000733
116	Electrical Enclosure	1	1000343
117	Electrical Panel	1	1000344
118	End Anchor	2	1000381
119	End Barrier	2	1000377
120	Engine Amp. Meter Gauge	1	93000501
121	Engine Mounting Bolt	12	1000551
122	Engine Mounting Flat Washer	12	11F0126
123	Engine Mounting Lock Washer	12	10F0115
124	Engine Mounting Nut	12	08E0102
125	Engine Oil Filter	2	23000101
126	Engine Oil Filter Pressure Switch	1	93000316
127	Engine Oil Pressure Gauge	1	93000316
129	Engine Oil Pressure Sending Unit	1	93000325
130	Engine Oil Pressure Switch (low)	1	30600312
131	Engine Throttle Motor	1	1000173
132	Engine Water Temp. Sending Unit	1	93000326
133	Engine Water Temp. Shutdown Switch	1	30600202
134	Engine Water Temperature Gauge	1	93000323
135	Engine to Drive Pump Adapter	1	1000170
136	Engine to Drive Pump Adapter Mounting Bolt	12	1000106
137	Engine to Drive Pump Adapter Mounting Washer	12	1000107
138	Engine-Diesel	1	1000458
139	Exhaust Mounting Block/Pipe	1	13504
140	Exhaust Mounting Flat Washer	4	1000472
141	Exhaust Mounting Lock Washer	4	1000473

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Key	Part Name	Qty.	Part No.
142	Exhaust Mounting Nut	4	1000485
143	Exhaust Mounting Screw	4	1000482
144	Flex Plate Mounting Bolts	8	1000126
145	Flex Plate Mounting Washer	8	1000019
146	Frame/Fuel Tank	1	13447
147	Fuel Filler/Vent Cap	1	1000340
148	Fuel Filter-Primary	1	23000091
149	Fuel Filter-Secondary	1	23000093
150	Fuel Level Gauge	1	1000882
151	Fuel Return Connector	1	1000389
152	Hourmeter-Vibro	1	93000701
153	House	1	13236
154	House Quick Release Pin	6	13523
155	House Rear Door Latch	1	1000878
156	House Side Door Latch	4	1000879
157	House Steps	5	1000883
158	Hydraulic Cooler By-Pass Valve	1	1000204
159	Hydraulic Oil	250	50K0328
160	Hydraulic Oil Cooler	1	1000322
161	Hydraulic Oil Cooler Fitting	4	1000323
162	Hydraulic Oil Cooler Mounting Bolts	14	1000010
163	Hydraulic Oil Cooler Mounting Bracket	2	13504
164	Hydraulic Oil Cooler Mounting Washers	28	1000019
165	Hydraulic Oil Cooler Piping Bushing	2	1000324
166	Hydraulic Oil Cooler Piping Elbow	4	1000329
167	Hydraulic Oil Cooler Piping Tee	2	1000325
168	Hydraulic Oil Cooler Return Hose Assy'	1	1000404
168b	Hydraulic Oil Cooler Return Bypass Hose Assy'	1	1000929
169	Hydraulic Oil Cooler Supply Hose Assy'	1	1000443
170	Hydraulic Oil Level Switch	1	1000145
171	Hydraulic Oil Sensor Wiring Cover	1	1000150
172	Hydraulic Oil Temp. Low Switch	1	1000152
173	Hydraulic Oil Temperature Switch (High)	1	1000151
174	Ignition Switch	1	30600081
175	Ignition-Green Pilot Light	1	1000345
176	Indicator Lights-Pilot Light	5	1000358
177	Indicator Lights-Red Lens	5	1000359
178	Indicator Lights-Switchboard Lamps	5	1000360
179	Isolation Diode	3	1000511
180	Load Sense Hose Assy'	1	1000115
181	Load Sense Pigtail Hose Assy'	2	1000405
182	Load Sense Pigtail Tee	1	1000233
183	Load Sense Port Adapters	2	1000246
184	Load Sense Relief Valve	1	1000283
185	Local/Remote Switch	1	1000349
186	Mounting Rail	22"	1000379
187	Oil Filler Cap	1	1000129
188	Pendant Cable-Strain Relief	2	1000367
189	Pendant Cord-10 COND.,16 GA. SO.	30'	30700011

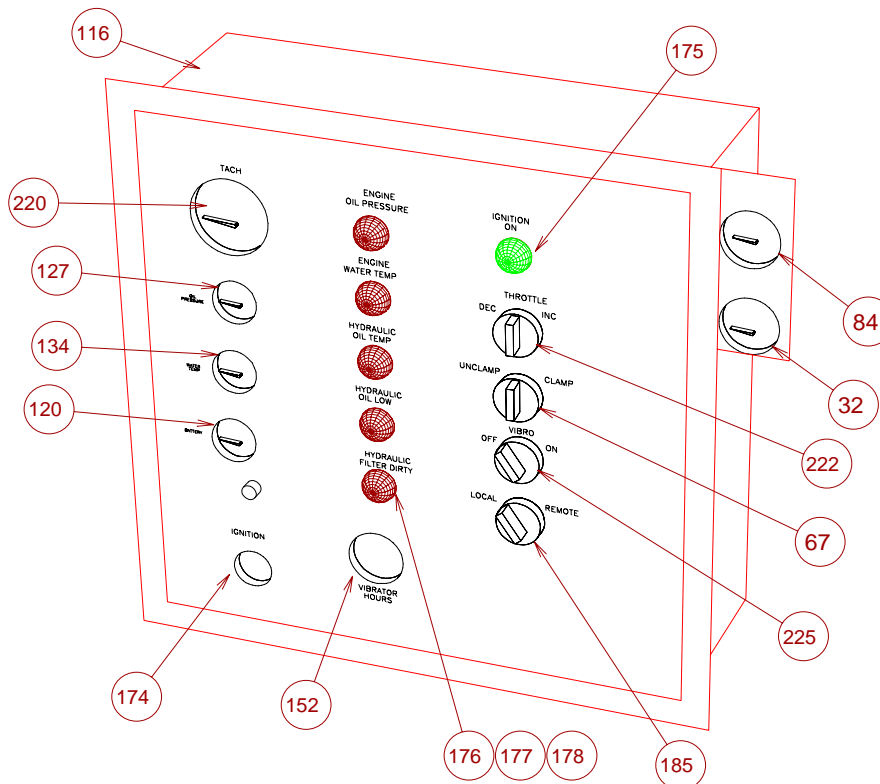
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Key	Part Name	Qty.	Part No.
190	Pendant Housing	1	1000365
191	Pendant Storage Bracket	1	13514
192	Pressure Port Orifice Plate	2	13518
193	Pump Stack	1	1000447
194	Pump Stack Mounting Bolts	12	1000073
195	Pump Stack Mounting Washer	12	1000141
196	Radiator	1	12400052
197	Radiator Shroud (Sides)	2	1000880
198	Radiator Shroud (Top/Bottom)	2	1000881
199	Radiator Shroud Flat Washer	24	1000629
200	Radiator Shroud Lock Washer	24	1000628
201	Radiator Shroud Screws	24	1000627
202	Rain Cap	1	12500072
203	Relay-DPDT	7	1000374
204	Reservoir	1	13422
204a	Reservoir Clean-out Cover	1	13121
204b	Reservoir Clean-out Cover Gasket	1	1000290
204c	Reservoir Clean-out Cover Screw	16	1000120
204d	Reservoir Clean-out Cover Flat Washer	16	1000176
204e	Reservoir Clean-out Cover Lock Washer	16	1000087
205	Reservoir Return Adapter Fittings	1	1000403
206	Return Filter	1	1000179
207	Return Filter Bolt	4	1000140
208	Return Filter Flange	1	1000074
209	Return Filter Replacement Element	1	23000193
209b	Return Filter Pressure Switch	1	1000182
210	Return Filter Washer	4	1000141
211	Shutoff Valve - Clamp Pump	1	1000303
212	Shutoff Valve - Drive Pump	1	1000189
213	Shutoff Valve Bolt	4	1000190
214	Shutoff Valve Flange	2	1000191
215	Shutoff Valve Nipple	2	1000192
216	Shutoff Valve Nut	4	1000124
217	Shutoff Valve Washer	4	1000125
218	Sight Level Gauge	1	1000196
219	Socket	7	1000375
220	Tachometer	1	93000609
221	Terminals	39	1000380
222	Throttle Control Switch	2	30600141
223	Time Delay Relay	1	1000559
224	Time Delay Relay Socket	1	1000558
225	Vibro On/Off Switch	2	30600161
226	Voltmeter 18-32V	1	9301500
227	Wireway	5'	1000369
228	Wireway Cover	5'	1000370

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Components List (External View) Electrical Control Panel

Key	Part Name	Qty.	Part No.
32	Clamp Pressure Gauge	1	93000312
67	Clamp/Unclamp Switch	2	30600151
84	Drive Pressure Gauge	1	93000312
116	Electrical Enclosure	1	1000343
120	Engine Amp. Meter Gauge	1	93000501
127	Engine Oil Pressure Gauge	1	93000316
134	Engine Water Temperature Gauge	1	93000323
152	Hourmeter-Vibro	1	93000701
174	Ignition Switch	1	30600081
175	Ignition-Green Pilot Light	1	1000345
176	Indicator Lights-Pilot Light	5	1000358
177	Indicator Lights-Red Lens	5	1000359
178	Indicator Lights-Switchboard Lamps	5	1000360
185	Local/Remote Switch	1	1000349
220	Tachometer	1	93000609
222	Throttle Control Switch	2	30600141
225	Vibro On/Off Switch	2	30600161

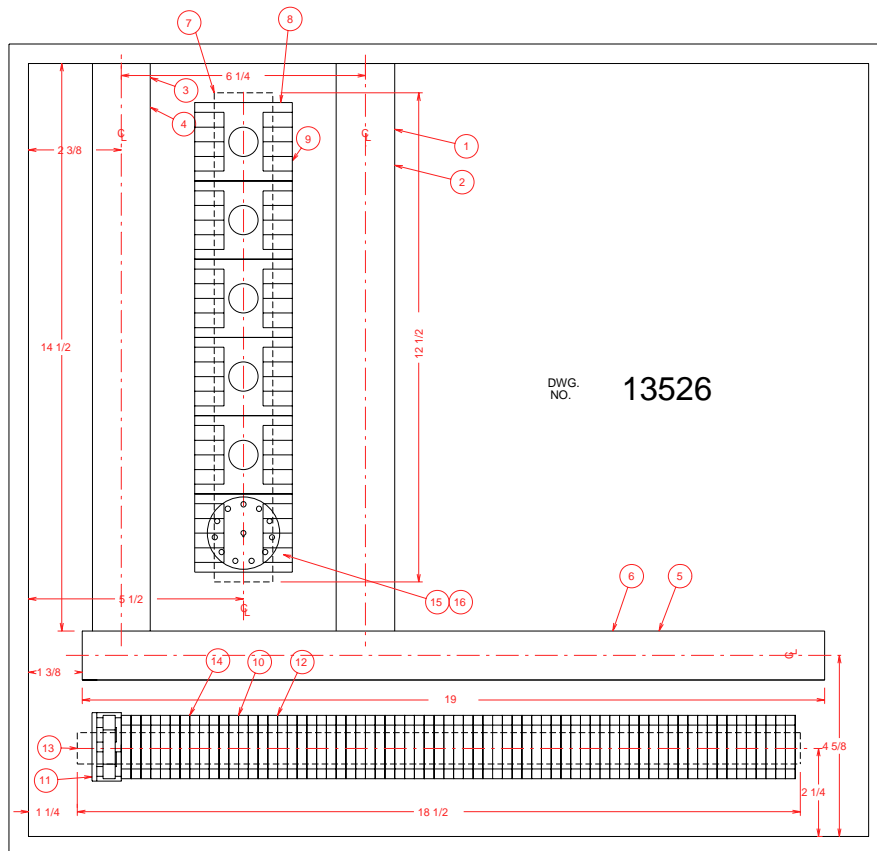


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Components List (Internal View) Electrical Control Panel

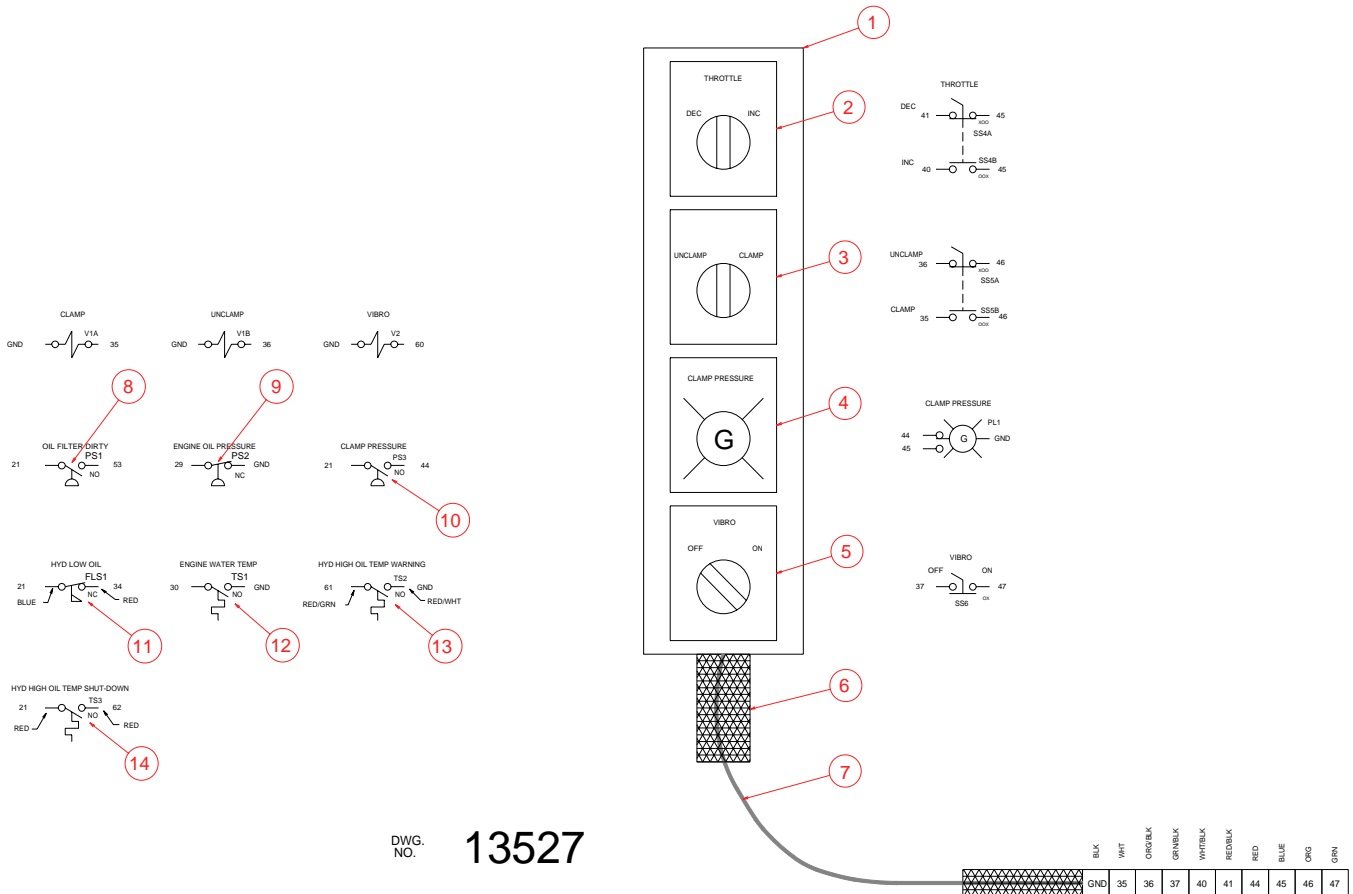
Key	Part Name	Qty.	P/N
1	Wireway	18"	1000369
2	Wireway Cover	18"	1000370
3	Wireway	18"	1000369
4	Wireway Cover	18"	1000370
5	Wireway	22"	1000369
6	Wireway Cover	22"	1000370
7	Din Rail	12.5"	1000373
8	Relay	5	1000374
9	Socket	5	1000375
10	End Anchor	2	1000381
11	End Barrier	1	1000377
12	End Barrier	1	1000377
13	Mounting Rail	22"	1000379
14	Terminal	39	1000380
15	Time Delay Relay Socket	1	1000559
16	Time Delay Relay	1	1000558



4200 Vibratory Driver/Extractor

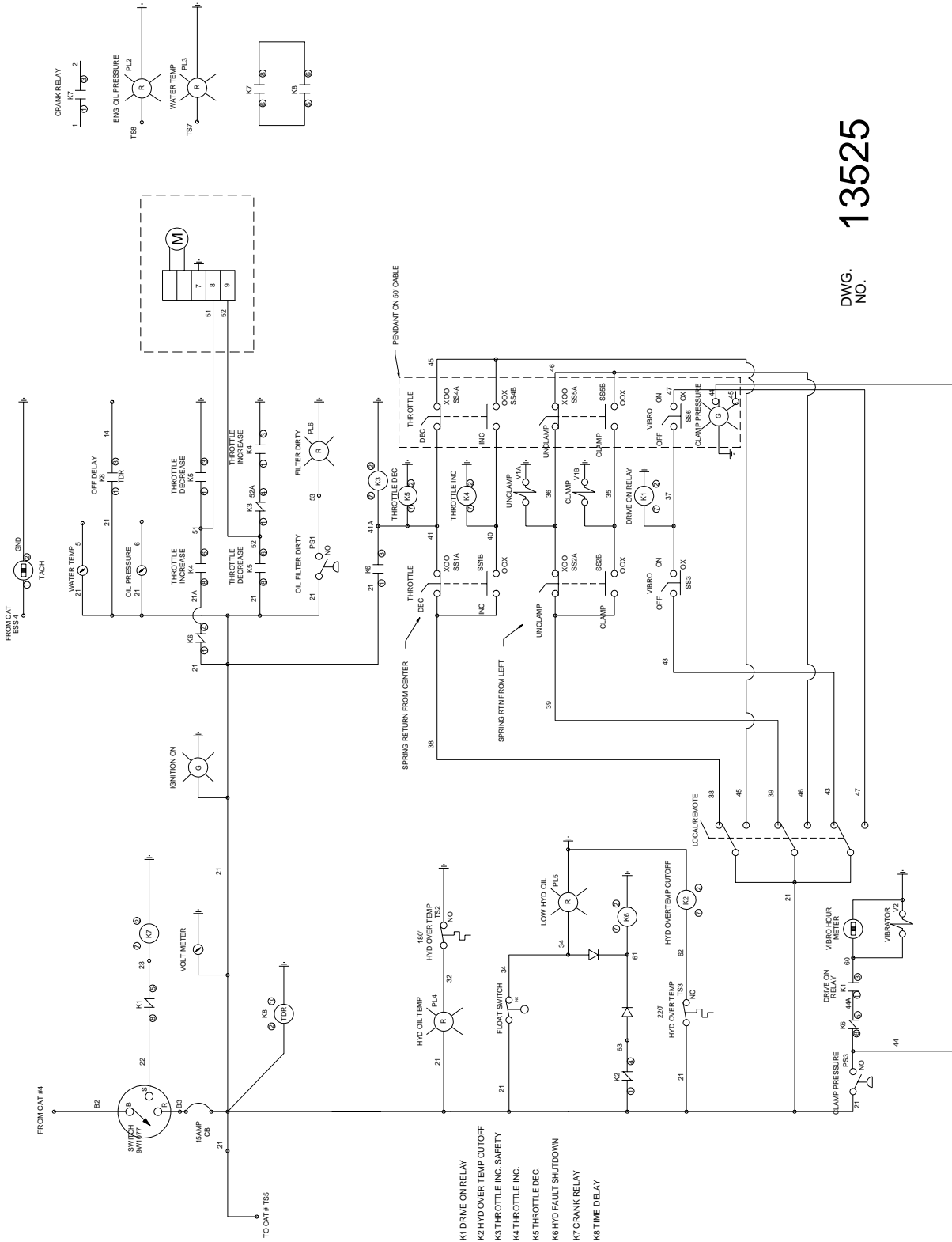
Components List Remote Control Pendant

Key	Part Name	Qty.	P/N
1	Pendant Housing	1	1000365
2	Throttle Control Switch	1	30600141
3	Clamp/Unclamp Switch	1	30600151
4	Clamp Pressure Light-Pendant-Green	1	1000366
5	Vibro On/Off Switch	2	30600161
6	Pendant Cable - Strain Relief	1	1000367
7	Pendant Cord	30'	30700011
8	Hydraulic Filter Pressure Switch	1	30600203
9	Engine Oil Pressure Switch (Low)	1	30600312
10	Clamp Pressure Switch	1	1000193
11	Hydraulic Oil Level Switch	1	1000145
12	Engine Water Temperature Shutdown Switch	1	30600202
13	Hydraulic Oil Temperature Switch (Low)	1	1000152
14	Hydraulic Oil Temperature Switch (High)	1	1000151



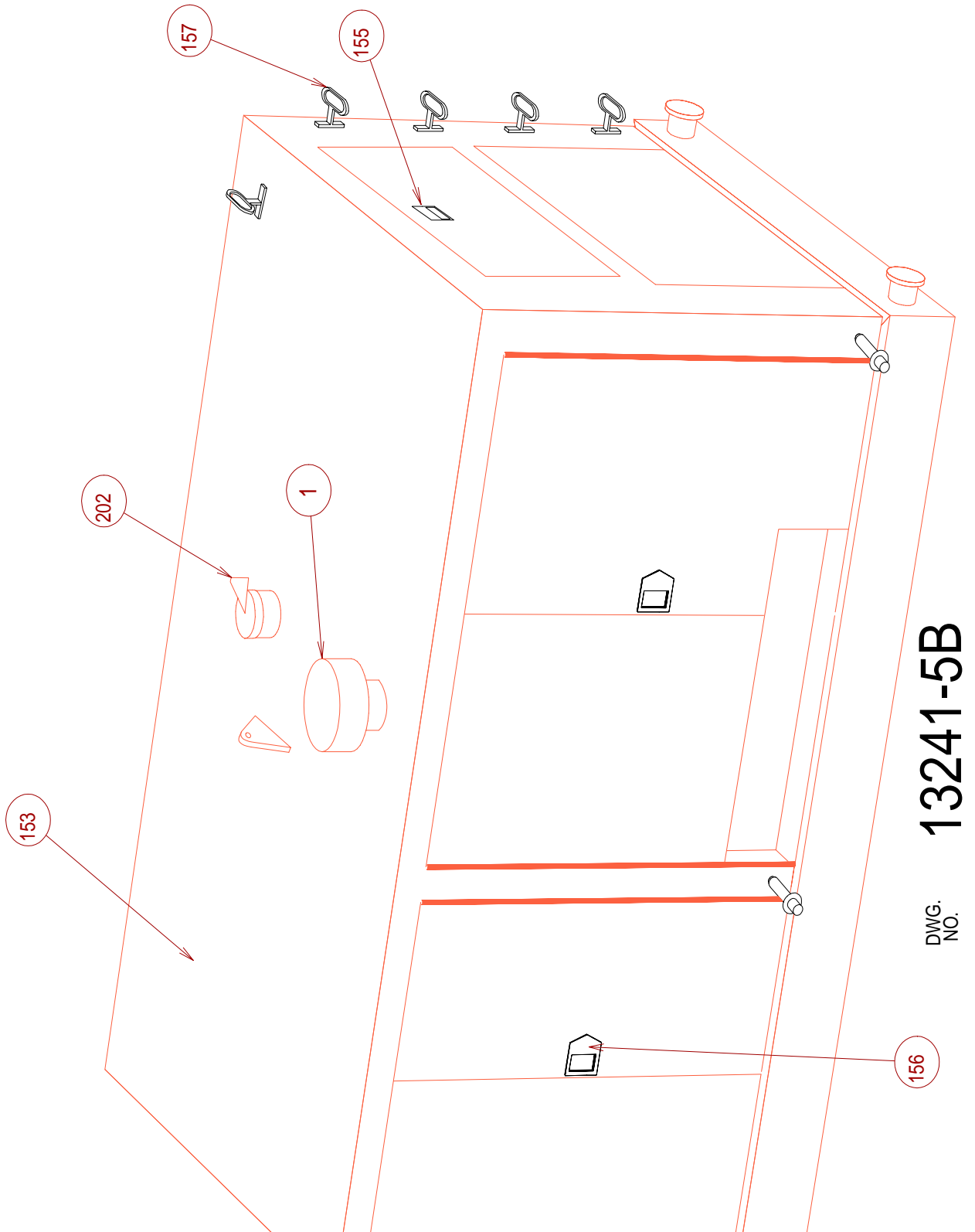
4200 Vibratory Driver/Extractor

Electrical Wiring Schematic

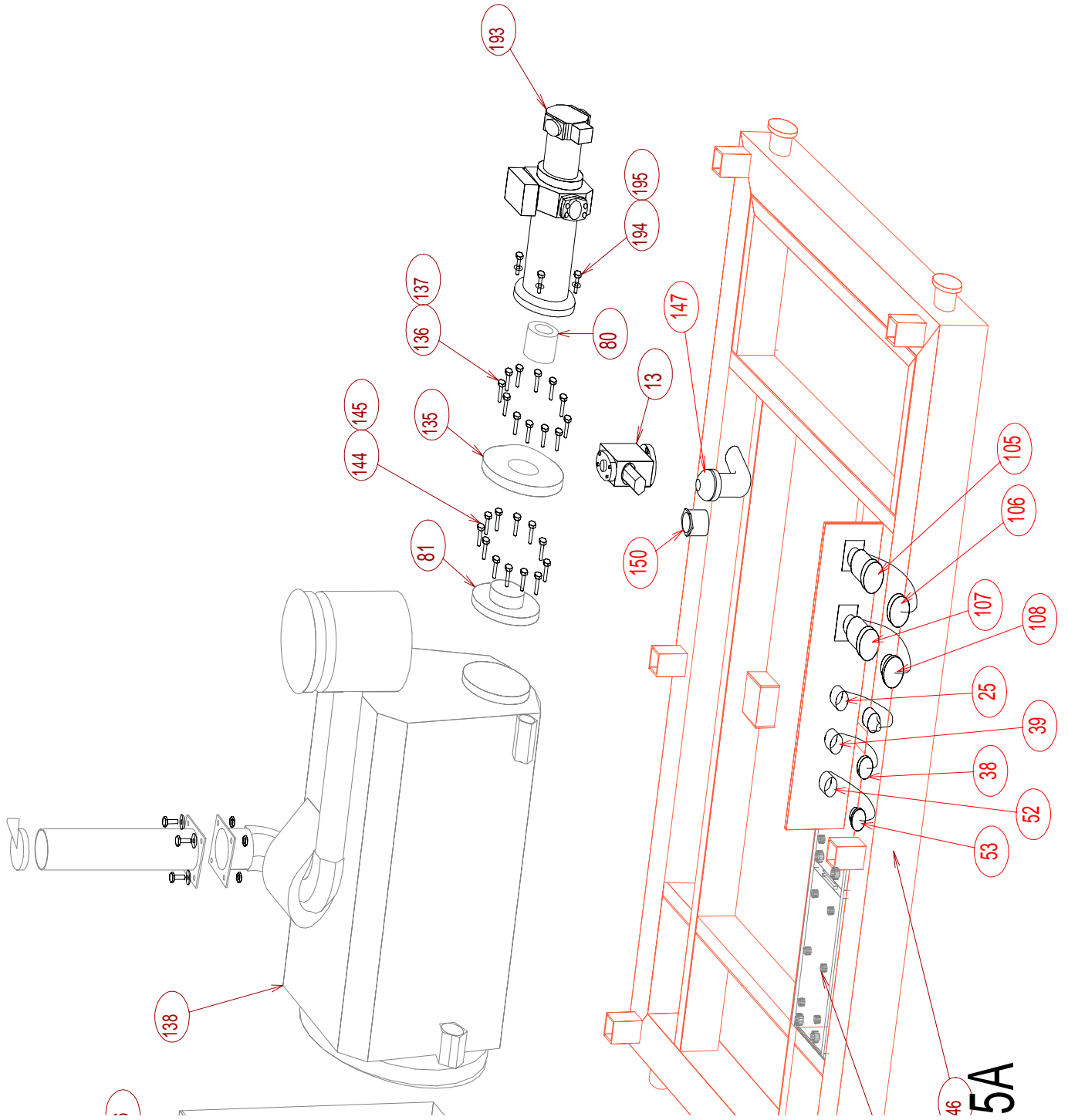


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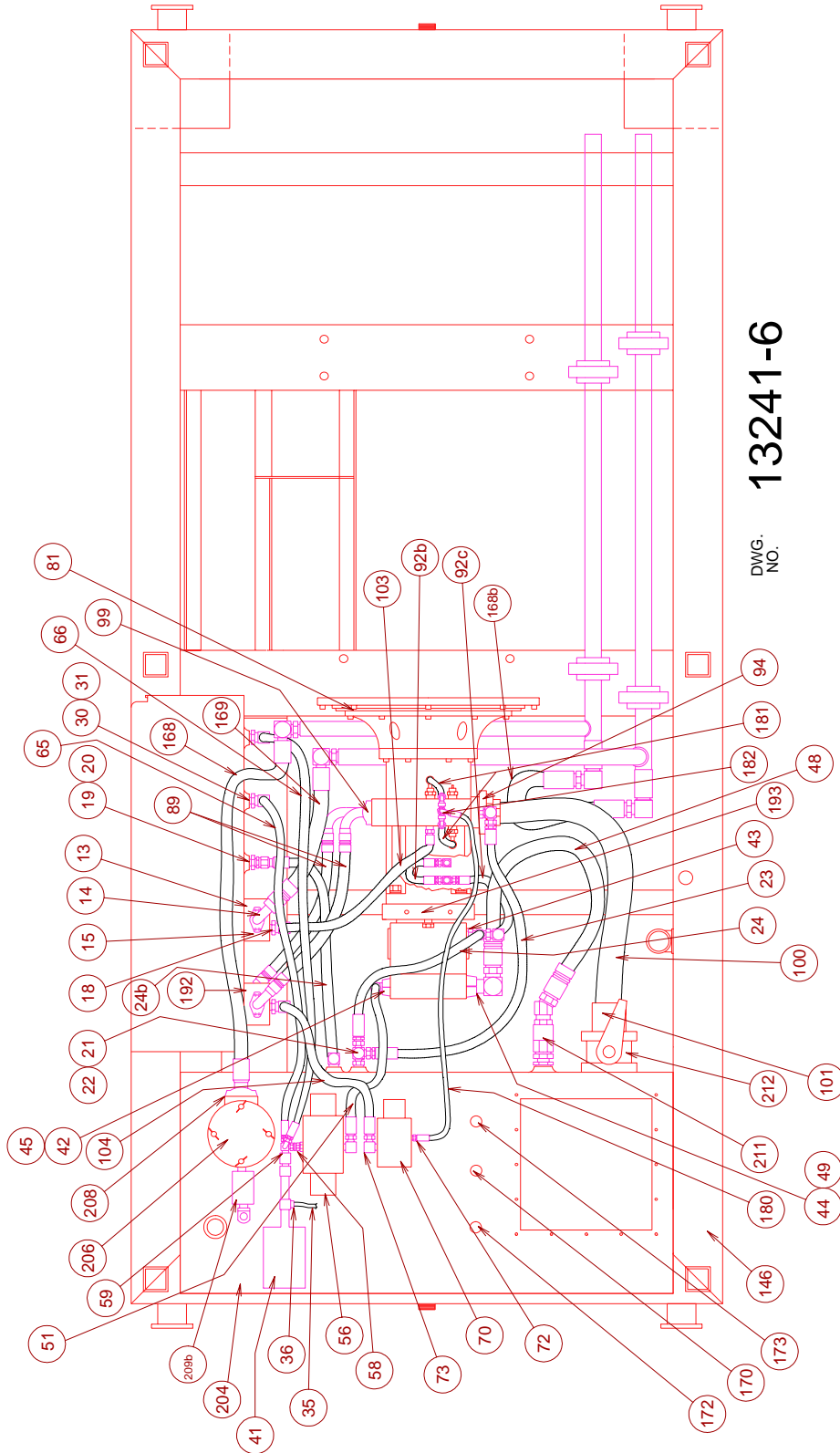
Power Pack (External View)



Power Pack (Exploded View)



Hose Configuration
Power Pack

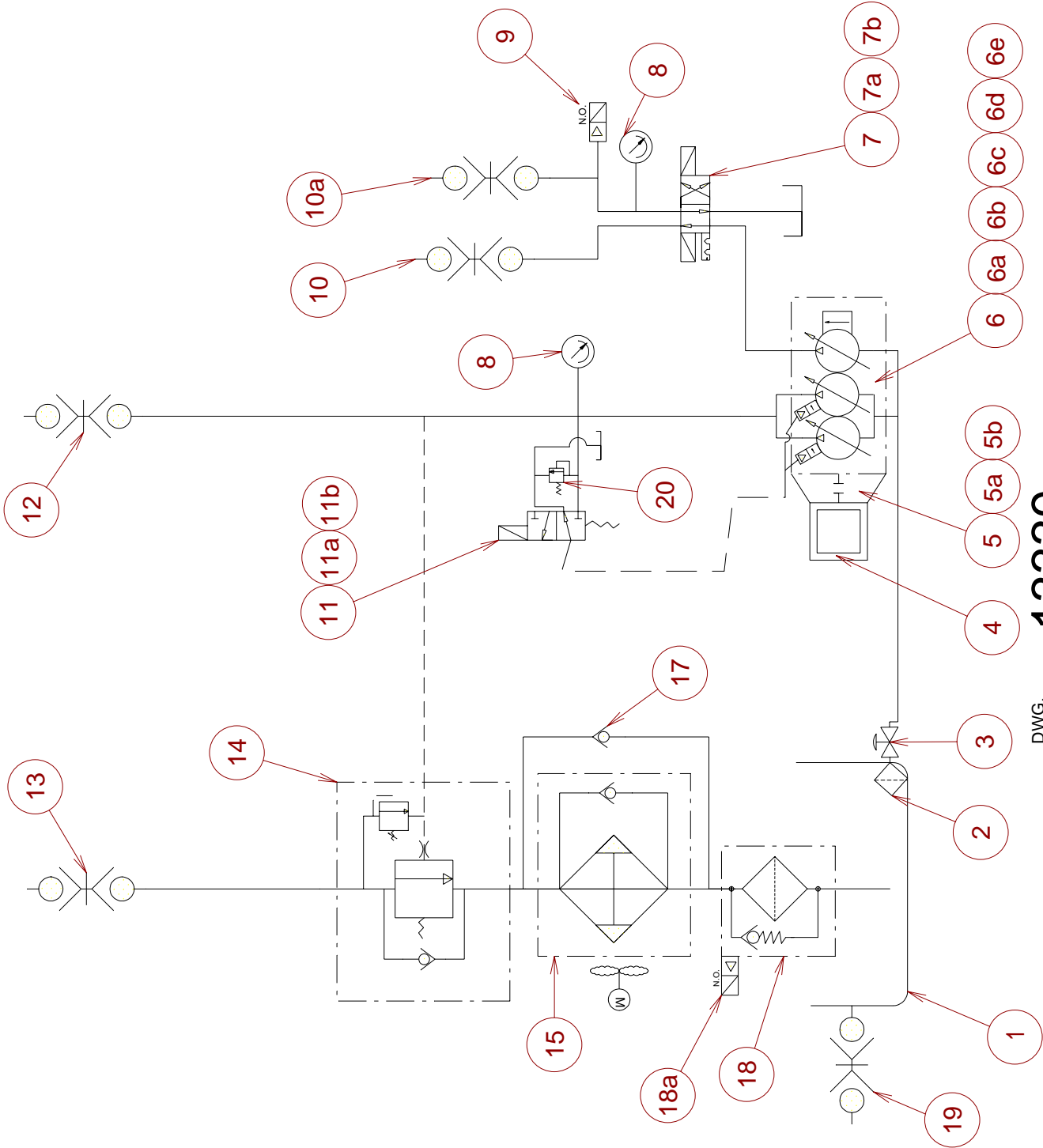


4200 Vibratory Driver/Extractor

Hydraulic Schematic Components List

Key	Part Name	Qty.	P/N
1	Reservoir	1	13152
2	Suction Strainer	1	1000197
3	Butterfly Valve	1	1000189
4	Engine	1	1000169
5	Adapter	1	1000170
5a	Drive Plate	1	1000128
5b	Drive Coupling	1	1000212
6	Drive Pump	1	1000447
6a	Drive Pump Inlet Flange	1	1000175
6b	Clamp Pump Inlet Flange	1	1000175
6c	Clamp Pump Outlet Adapter Block	1	1000180
6d	Drive Pump Outlet Flange	1	1000068
6e	Drive Pump Manifold Block	1	13271
7	Clamp Valve	1	1000045
7a	Clamp Valve Subplate	1	1000186
7b	Clamp Valve Bolt Kit	1	1000187
8	Pressure Gauge	2	93000312
9	Clamp Pressure Switch	1	1000193
10	Clamp Quick Disconnect (Supply)	1	1000647
10a	Clamp Quick Disconnect (Return)	1	1000648
11	Drive Control Valve	1	1000199
11a	Drive Valve Subplate	1	1000201
11b	Drive Valve Bolt Kit	1	1000081
12	Drive Quick Disconnect	1	1000203
13	Return Quick Disconnect	1	1000583
14	Brake Valve	1	1000228
15	Oil Cooler	1	1000138
17	Check Valve	1	1000204
18	Return Filter	1	1000179
18a	Return Filter Pressure Switch		30600203
19	Drain Line Quick Disconnect	1	1000205
20	Load Sense Relief Valve	1	1000283

Hydraulic Schematic



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DWG. NO.

4200 Vibratory Driver/Extractor

Materials List Vibro

Key	Part Name	Qty.	Part No.
1	Case	1	13261
2	Case Drain Pigtail	1	1000678
3	Case Drain Quick Disconnect(Bundle)	1	1000205
4	Case Drain Relief Valve	1	50K0221
5	Case Oil	4.75	50K0234
6	Case Vent	1	50K0223
7	Clamp Block	1	13242
8	Head Bolt	12	48050934
9	Head Bolt Washer	12	47053900
10	Clamp Bulkhead Line Adapters @ Clamp Block	2	1000701
11	Clamp Cylinder Check Valve	1	50K0355
12	Clamp Cylinder Cover	1	46K0381
13	Clamp Cylinder Cover O-Ring	1	46K0382
14	Clamp Cylinder Cover Screw	12	46K0384
15	Clamp Line Pigtail	2	1000679
16	Clamp Press Q.D. Dust Plug	1	1000507
17	Clamp Press. Quick Disconnect Coupler(Bundle)	1	1000648
18	Clamp Q.D. Adaptors	2	1000031
19	Clamp Retract O-Ring	1	28K0387
20	Clamp Return Q.D. Dust Cap	1	1000506
21	Clamp Return Quick Disconnect Nipple(Bundle)	1	1000647
22	Clamp Seal Kit	1	46K0389
23	Drain Line Adaptors @ Motor	2	1000102
24	Drain Line Flange Kits	5	1000063
25	Drive Motor Pressure Line-Left Side	1	1000682
26	Drive Motor Pressure Line-Right Side	1	1000682
27	Drive Motor Pressure Line-Suspension to Gearbox	1	1000682
28	Drive Motor Return Line-Left Side	1	1000683
29	Drive Motor Return Line-Right Side	1	1000683
30	Drive Motor Return Line-Suspension to Gearbox	1	1000683
31	Drive Q.D. Adaptor	1	20624141
32	Drive Q.D. Bushing	1	1000768
33	Drive Q.D. Dust Plug	1	1000585
34	Drive Quick Disconnect Coupler(Bundle)	1	1000583
35	Eccentric	8	2-7720202
36	Eccentric Bearing	16	10403314
37	Eccentric Bearing Cover	16	3-7710206
38	Eccentric Bearing Cover O-Ring	16	V1033490
39	Eccentric Bearing Cover Screw	96	45011202
40	Eccentric Bearing Cover Washer	96	47021200
41	Eccentric Gear	8	2-7720204
42	Eccentric Screw	32	1000466
43	Eccentric Shaft	8	3-7710205
44	Eccentric Washers	32	47022000

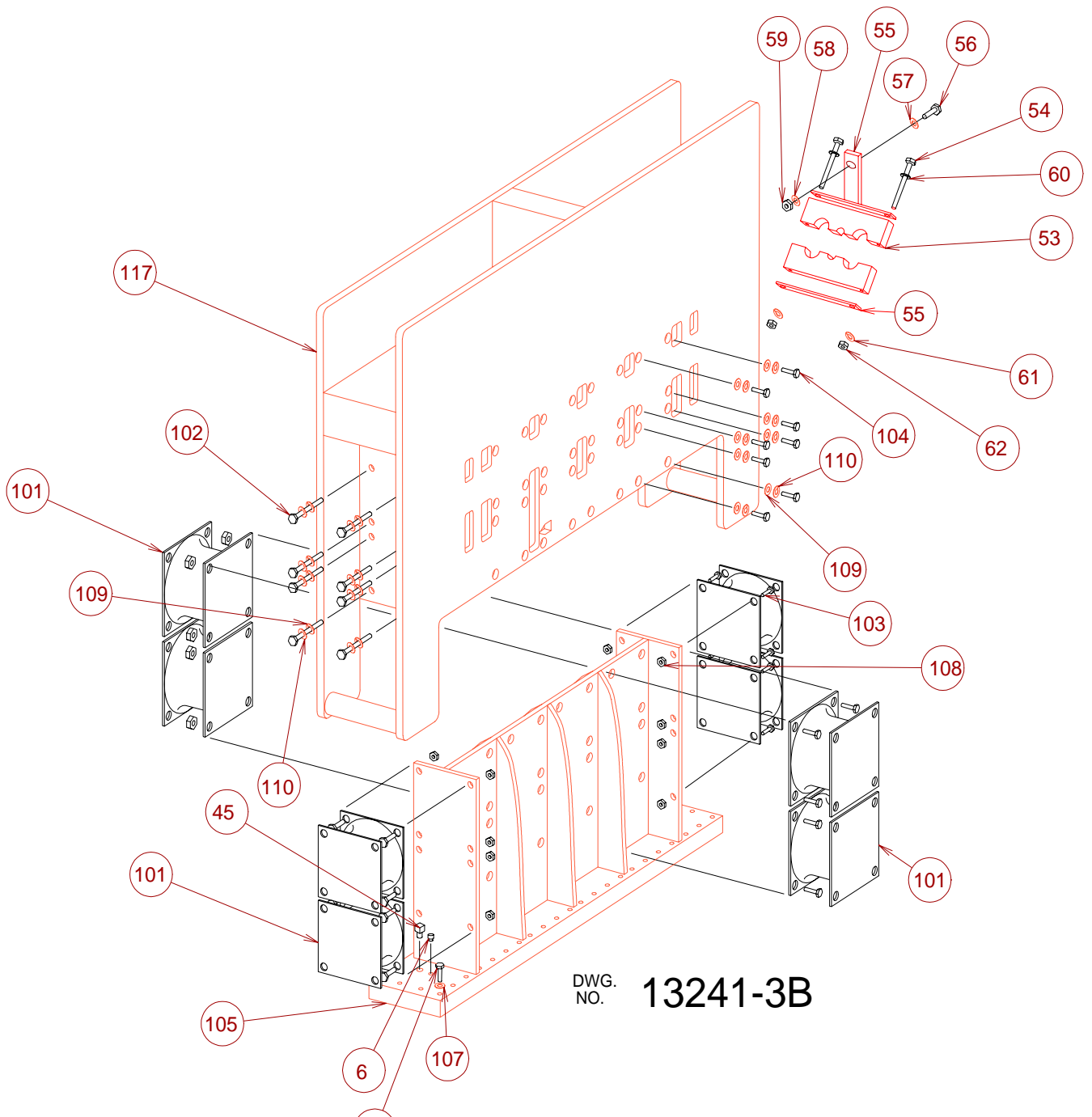
4200 Vibratory Driver/Extractor

Key	Part Name	Qty.	Part No.
45	Filler Plug	2	50K0237
46	Fixed Jaw	1	46K0308
47	Fixed Jaw Bolt	2	28K0373
48	Hose Bundle	1	1000522
49	Hydraulic Motor Flange Kits	4	20524062
50	Hydraulic Motor Port Adaptor Reducers	4	1000599
51	Hydraulic Motor Port Adaptors	4	1000598
52	Magnetic Plug	2	50K0231
53	Main Hose Support Block	1	13524
54	Main Hose Support Block Bolt	2	1000874
55	Main Hose Support Block Bracket	1	13521
56	Main Hose Support Block Bracket Bolt	1	45031205
57	Main Hose Support Block Bracket Flat Washer	1	47011200
58	Main Hose Support Block Bracket Lock Washer	1	47021200
59	Main Hose Support Block Bracket Nut	1	46011200
60	Main Hose Support Block Flat Washer	2	47011200
61	Main Hose Support Block Lock Washer	2	47021200
62	Main Hose Support Block Nut	2	46011200
63	Manifold Pressure Line Flange Kits	4	1000548
64	Manifold Return Line Flange Kits	4	20516061
65	Motor	2	22509031
66	Motor Drain Line-Left Side	1	1000684
67	Motor Drain Line-Right Side	1	1000684
68	Motor Drain Line-Suspension to Gearbox	1	1000684
69	Motor Guard	2	13266
70	Motor Guard Screw	24	45091630
71	Motor Housing	2	1000470
72	Motor Housing Bolt	8	45091801
73	Motor Housing Flat Washer	8	47011800
74	Motor Housing Lock Washer	8	47021800
75	Motor Port Adaptor	4	1000685
76	Motor Support Bolt	4	45092001
77	Motor Support Lock Nut	4	46012000
78	Motor Support Pad	4	1000868
79	Movable Jaw	1	46K0304
80	Movable Jaw Slider Pin	1	50K0308
81	Pigtail Drive Hose Flange Kit	1	1000014
82	Pigtail Return Hose Flange Kit	1	1000541
83	Pinion	2	3-7720206
84	Pinion Bearing	4	10401214
85	Pinion Bearing Housing	2	3-7720211
86	Pinion Bearing Housing O-Ring	2	1000479
87	Pinion Bearing Housing Screw	12	45011202
88	Pinion Housing Cover	2	13501
89	Pinion Housing Cover Screws	24	45010801
90	Pinion Housing Cover Washers	24	47030800
91	Piston Liner	1	46K0379
92	Piston Rod	1	46K0376
93	Pressure Line Pigtail	1	1000676

4200 Vibratory Driver/Extractor

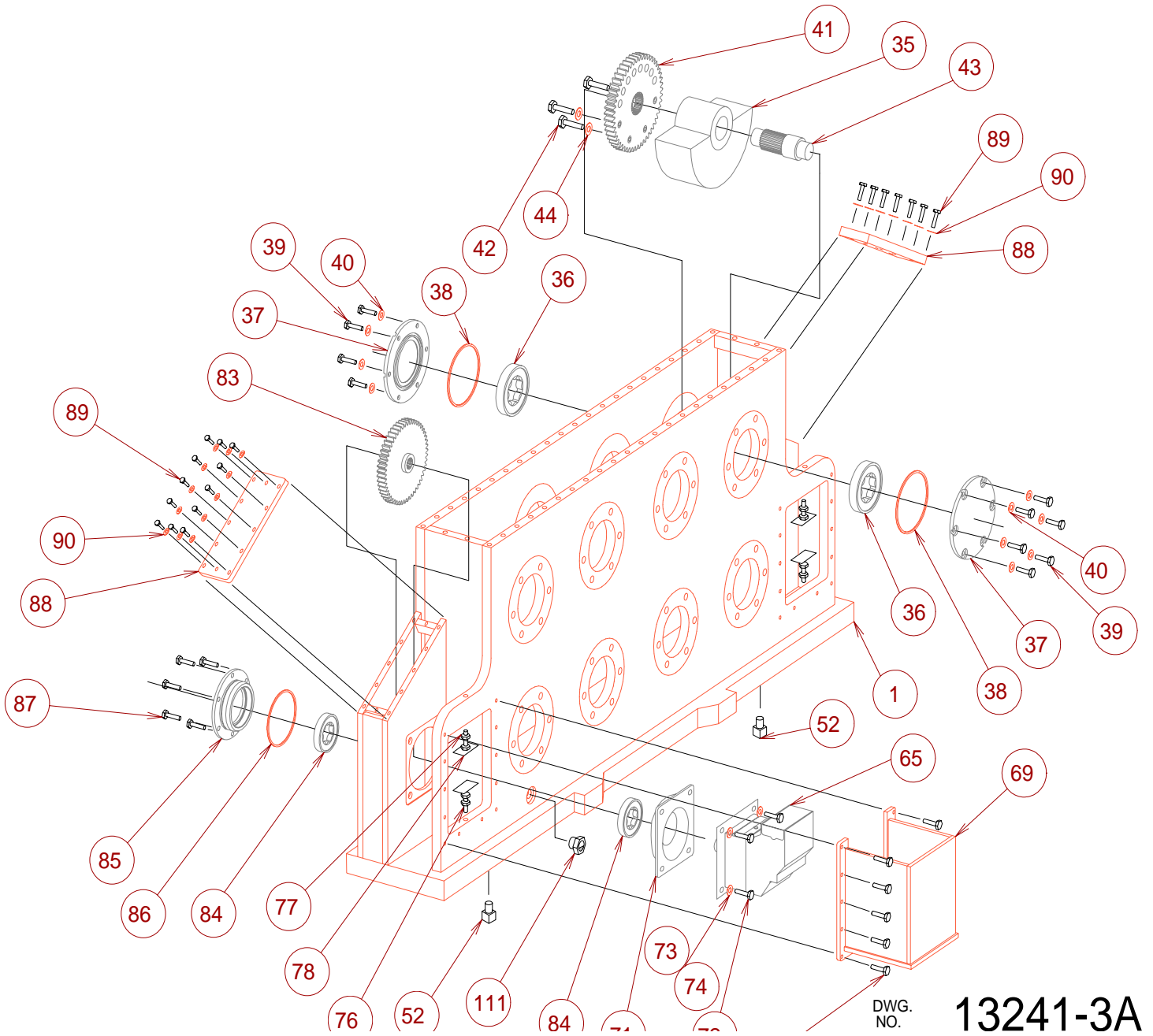
Key	Part Name	Qty.	Part No.
94	Return Line Pigtail	1	1000677
95	Return Q.D. Adpator	1	1000242
96	Return Q.D. Bushing	1	1000768
97	Return Q.D. Dust Cap	1	1000584
98	Return Quick Disconnect Nipple(Bundle)	1	1000203
99	Rod Liner	1	46K0377
100	Rod Seal Kit	1	46K0380
101	Elastomeric	20	11300031
102	Elastomeric Bolts -- End (Outside)	16	1000480
103	Elastomeric Bolts -- Inside	48	1000481
104	Elastomeric Bolts -- Outside	64	1000471
105	Elastomeric Mounting Bracket	1	13265
106	Elastomeric Mounting Bracket Bolt	48	1000483
107	Elastomeric Mounting Bracket Washer	48	1000484
108	Elastomeric Nuts	128	1000485
109	Elastomeric Washers Flat	64	1000472
110	Elastomeric Washers Lock	176	1000473
111	Sight Glass	1	93000204
112	Support Block Bolt-Clamp Pigtails	2	1000575
113	Support Block Bushing-Clamp Pigtails	2	1000574
114	Support Block Stacking Nut-Clamp Pigtails	2	1000575
115	Support Block Weld Bracket-Clamp Pigtails	2	1000576
116	Support Block-Clamp Pigtails	1	1000573
117	Suspension Housing	1	13264

Vibration Isolator (Exploded View)

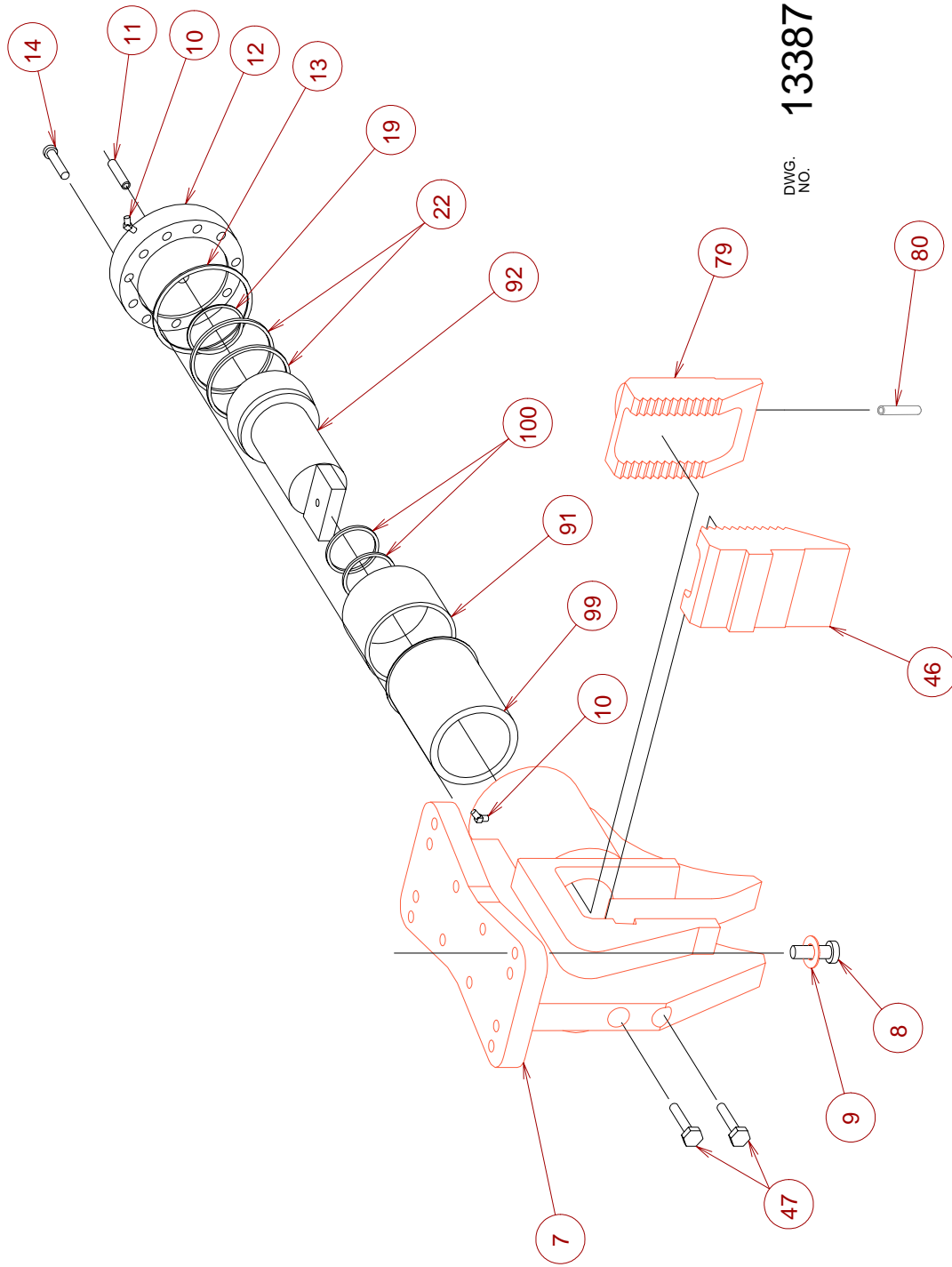


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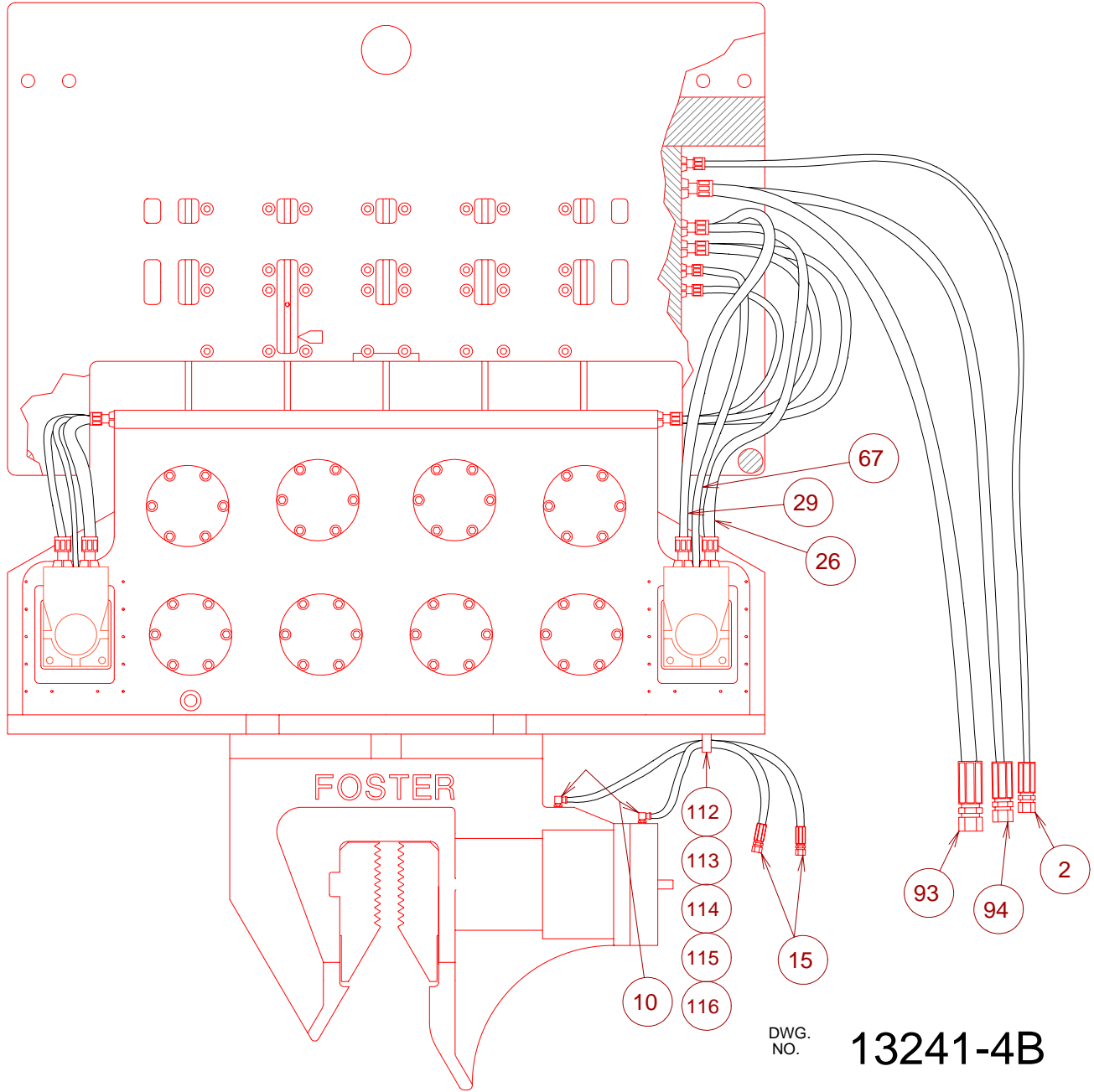
Transmission Case (Exploded View)



Clamp Assembly (Exploded View)



Vibro Hose Configuration
(Side View)



Vibro Hose Configuration
(End View)

