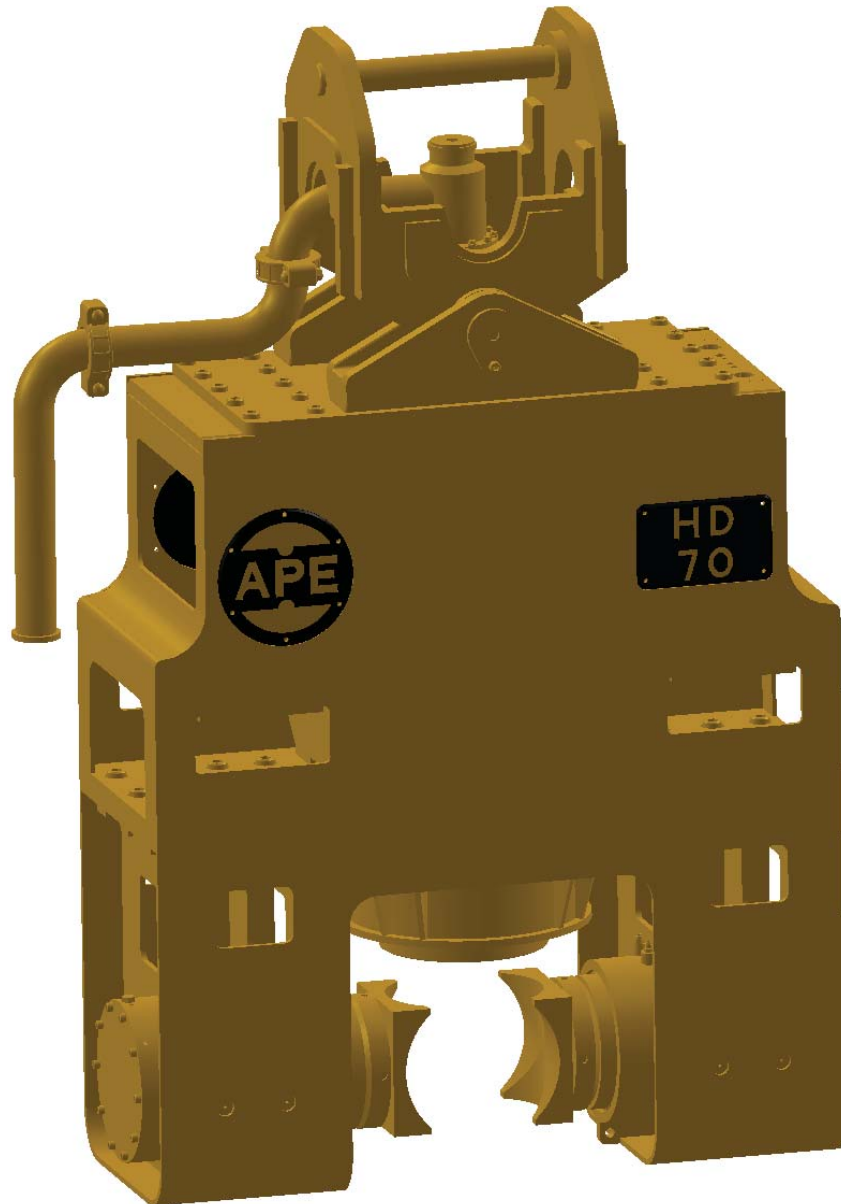




OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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SERIAL NUMBER:

**MODEL HD70
HELICAL PILE DRILL**



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Preface

General

This manual covers the **Model HD70 Helical Pile Drill**. The data provided in this manual gives the necessary information to operate and maintain APE equipment. The listed procedures are to be performed by qualified personnel who have an understanding of the equipment and who follow all safety precautions.

Guide to Using the Manual

1. Refer to the Table of Contents for the page location of applicable sections.
2. All weights and measurements in this manual are in both English and Metric units.
3. The manual will be revised as necessary to reflect current information.



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Safety Precautions

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

1. Read this manual from beginning to end before operating or working on this machine.
2. When operating in a closed area, pipe exhaust fumes outside. (WARNING: Breathing exhaust fumes can cause serious injury and even death.)
3. When servicing batteries, avoid any type of spark or open flame. Batteries generate explosive gases during charging. There must be proper ventilation when charging batteries.
4. Never Adjust or repair the unit while it is in operation.
5. Remove all tools and electrical cords before starting the unit.
6. Keep oily rags away from the exhaust system.
7. Never store flammable liquids near the engine.
8. Never stand under driver at any time and keep your eyes on the driver when it is in operation. Keep a look out for loose bolts or leaking hydraulic lines.
9. Avoid pulling on hose quick dis-connect fittings. Use unit closer to work if hoses cannot reach. Do not use hoses as a tow line! If a hose fails at the hydraulic couplers then it is a result of "hose tugging by the pile crew".
10. Avoid kinks in the hoses. Kinks will cut the hose safety factor by 50 percent.
11. Always wear eye and ear protection.
12. Avoid standing downwind of rotating piles. Dirt and other matter may become airborne and fall into the unprotected eye.
13. Always wear a hardhat, gloves, and safety shoes.
14. Do not truck power unit with quick disconnect caps and plugs screwed on to fittings unless the caps and plugs have wire rope safety lines attached. Store in storage box under control panel.



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Warranty

American Piledriving Equipment, Inc.
STANDARD WARRANTY

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

APE/J&M's obligation and liability under this WARRANTY is expressly limited to repairing or replacing at APE/J&M's option, any parts which appear to APE/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 APE/J&M or the authorized APE/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 APE/J&M and which carry the warranty of the manufacturer thereof, or to normal maintenance (scraped and skived lube and fuel lines, worn cushion material in the drive base) or normal maintenance parts (such as fouled injectors, weakened check valve springs, damaged grease fittings caused by use over time).

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. APE/J&M makes no other warranty, expressed or implied and makes no warranty of merchantability of fitness for any particular purpose.

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

ANY TYPE OF WELDING ON EQUIPMENT
WILL VOID THE WARRANTY

Refusal: Vibros: If the pile does not move one foot in 30 seconds of vibro operation at full speed. Resort to a larger vibro. APE/J&M equipment may exceed the refusal driving criteria for short periods of time as may be needed to penetrate hard soil layers or obstacles. In such cases, a heat gun is used to monitor the temperature of the bearings and related components to prevent use of the machine beyond 210 degrees F. Contact APE/J&M or your local

APE/J&M distributor for special instructions when faced with refusal conditions.

Refusal: Diesels: Do not exceed 10 blows per inch or 120 blows per foot. In cases of setting of the pile it is permitted to increase the blow count to 250 blows per foot, but only for one foot of driving penetration. Pile inspectors should consult the APE factory for permission to exceed these limits. Failure to do so will void the warranty. This standard specification is accepted by the DFI (Deep Foundations Institute) and the PDCA (Pile Driving Contractors Association) and by all manufacturers of pile driving equipment.

I-1. Machine Features - Model HD70 Helical Pile Drill

Bale Assembly is modular and can be removed to reduce weight and height.

Through Hole Grout System.

The heavy duty lifting pin allows easy rigging of the driver to excavator to ensure maximum safety.

Grout post installation with APE patented breakthrough push out tip.

Hydraulic motor is recessed in the drill housing to be fully protected.

Clamp manifold assembly simplifies the centering of pile.

Drill Manifold regulates maximum pressure to the motor as well as protect it from cavitating.

Displacement Shift Interlock Manifold controls speed and motor case flushing.

Fork Lift slots allow additional options.

Clamp Housing is designed to maintain good pile alignment.

Heavy duty cylinder needs no guards and all hoses are tucked out of harms way.

Jaws made to fit specific size pile.

Safety catch system.

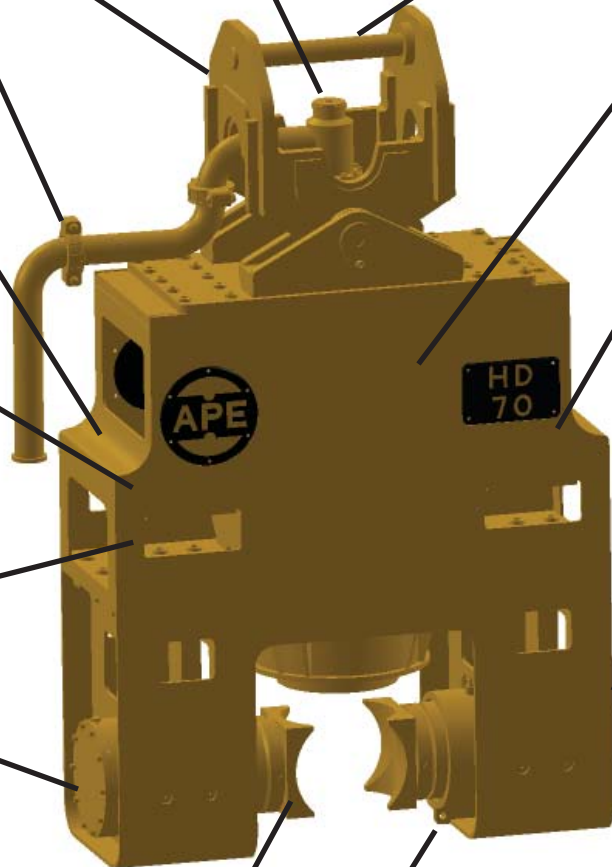


Figure 1-A. Machine Features



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I. GENERAL INFORMATION

I-2. Machine Specifications

Model HD70



Model HD70

Torque Low Speed	56,300ft-lbs (76,332Nm)
Torque High Speed	16,600ft-lbs (22,507Nm)
Drill Speed "Low"	30 rpm
Drill Speed "High"	45 rpm
Max. Hydraulic Flow	120 gpm (454 lpm)
Max. Hydraulic Pressure	4,641 psi (320 bar)
Weight (with Clamp)	8,440 lbs (3,828 kg)
Height	99" (2,515 mm)
Width	61" (1,549 mm)
Depth	25" (635 mm)

Recommended Excavator CAT 320E is the bare minimum
 330 Class is a better with no quick coupler
 349 Class maximum size with quick coupler

Table 1-A. - Drill

I. GENERAL INFORMATION

I-3. General Description of Model HD70

The **APE Model HD70** is a variable speed helical pile driver designed to drive and extract all APE helical piles sizes 4.5 to 13.375. All of which can be grouted.

The five major parts to the Model HD70 are as follows:

- A.) Lifting Bale
- B.) Grouting System
- C.) Drill Housing
- D.) Drive Socket
- E.) Clamp

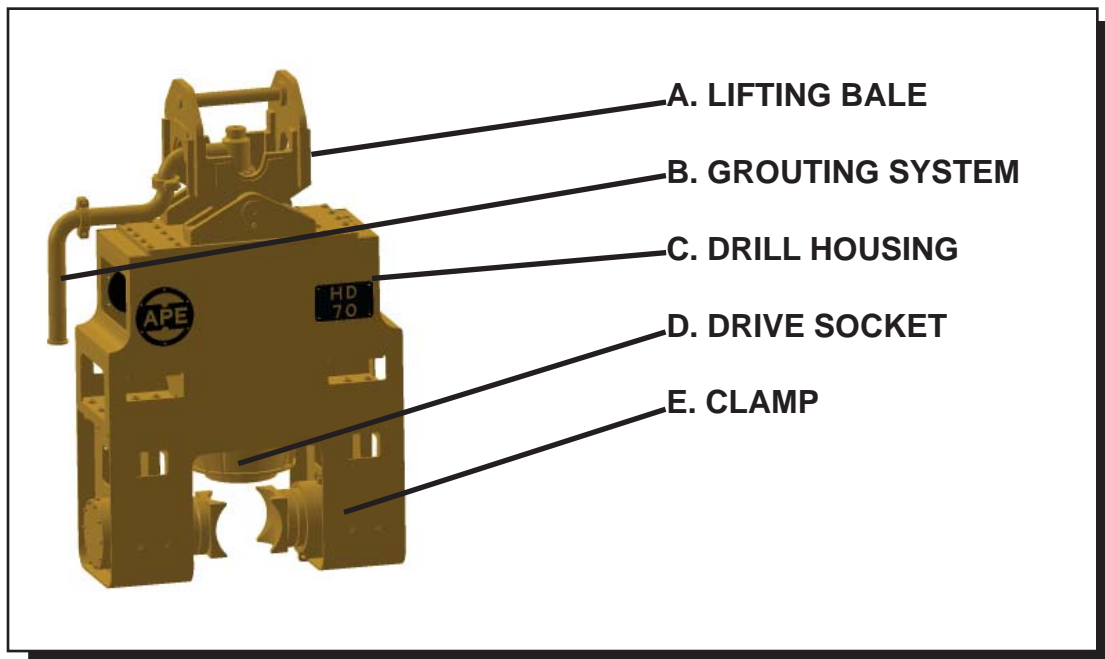


Figure 1-B. General Description of HD70.

I. GENERAL INFORMATION

I-3A. Lifting Bale

The lifting bale is shipped to accommodate excavators with a bucket pin diameter as small as 2.75 (70 mm) and as wide as 17.75 (450 mm). Bushings are used to fit the lifting bale to the excavator. The lifting bale allows the HD70 to hang the helical pile plumb to start and allows the operator to keep it plumb while driving (installing) pile.

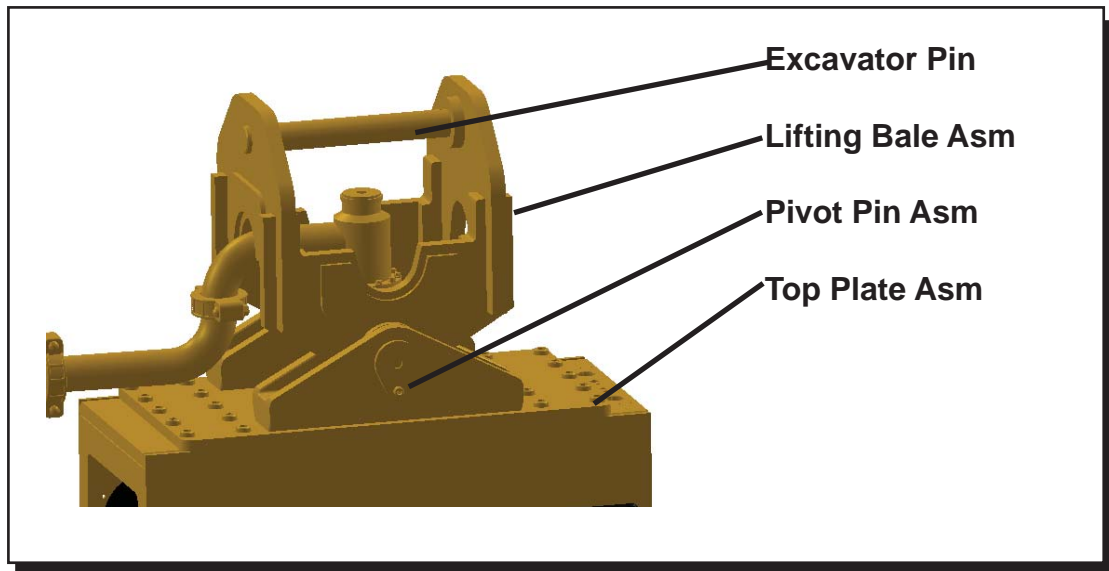


Figure 1-C. General Description of Lifting Bale

I. GENERAL INFORMATION Continued

I-3B. Grouting System

The grouting system allows full depth soil mix grouting through the tip of the pile. The grout swivel allows the grout to be pumped while the pile is being driven (inserted) through a system that keeps the grout from harming any other components of the HD70 or other surroundings. The grout cover plate, auger shaft sleeve, oil seal carrier, motor end plate along with other items continue the link of mechanisms of pumping grout through the system including the hydraulic motor without grout leakage.

The Model HD70 can be operated under water with slight modifications. (Consult factory for modifications)

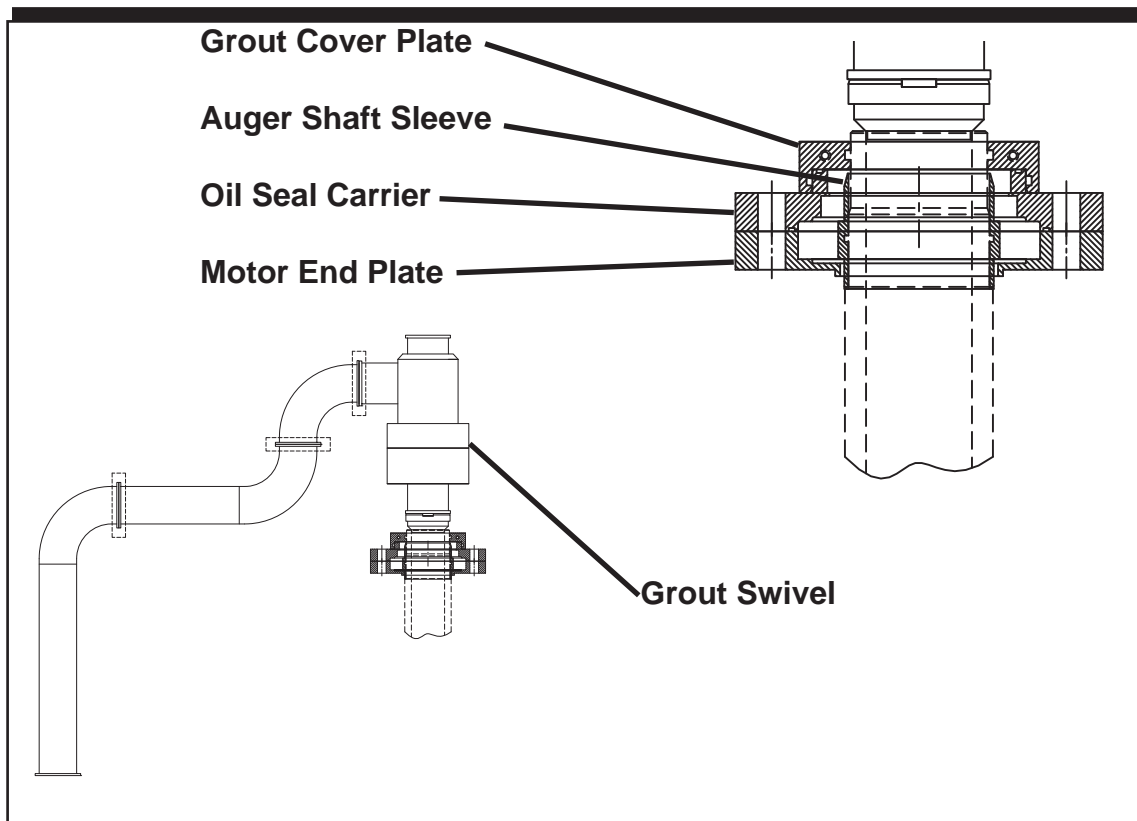


Figure 1-D. General Description of Grouting System

I. GENERAL INFORMATION Continued

I-3C. Drill Housing

The APE HD70 drill housing is the main body which contains many key components. The hydraulic motor along with a square drive, a tapered roller bearing, bushings and a grout stem are bolted in. A hose block assembly as well as the drill manifold, DSI and clamp manifold assemblies are bolted in. There are several covers and brackets bolted to the outside of the drill housing.



Figure 1-E. General Description of Drill Housing

I. GENERAL INFORMATION Continued

I-3D. Drive Socket

The APE HD70 drive socket is the system that transfers the hydraulic motor rotation into the fighting system. Adapting the hydraulic motor into a standard square drive into the needed size drive socket of the pile. The drive socket has a through hole to allow grouting.



Figure 1-F. General Description of Drive Socket

I. GENERAL INFORMATION Continued

I-3E. Clamp

The APE HD70 clamp makes it possible to pickup pile from the horizontal position to the vertical driving position. The clamp centers the pile to allow mating to the drive socket and keep it there while driving.

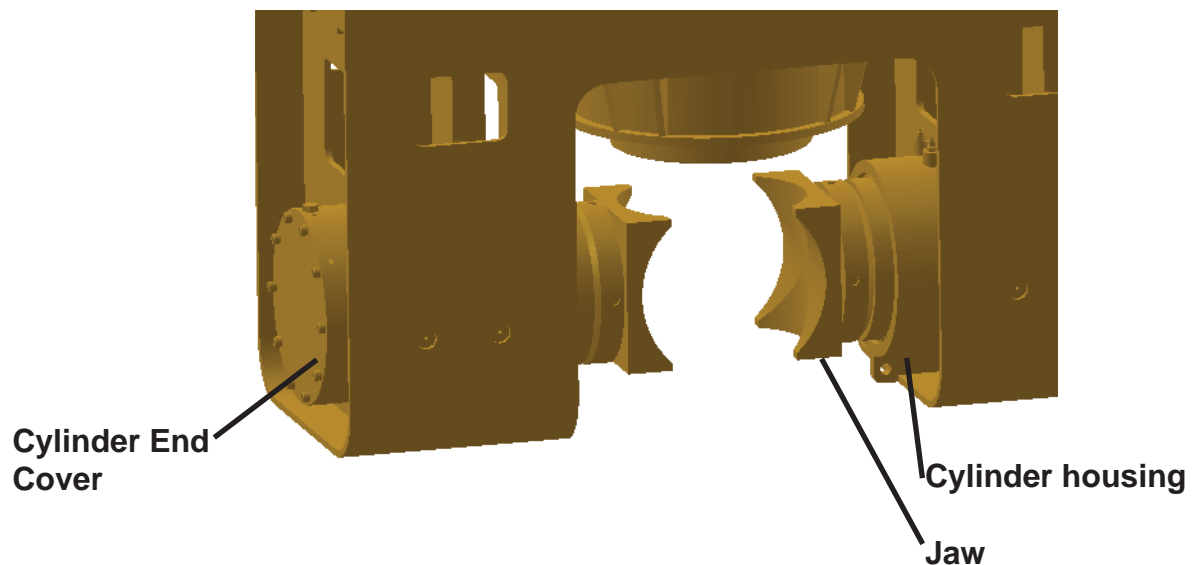


Figure 1-G. General Description of Clamp

II. PREPARATION FOR OPERATION

II-1. General

When unloading and unpacking the helical pile 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.

II-2. Rigging of Helical Pile Driver

The lifting bale has a pin that will fit in the stick of the excavator as a replacement of the bucket pin. This is done with the use of bushings that are sized to properly fit the excavator being used. Once the bucket has been removed and the cylinder controlling the motion of the bucket is either removed or secured. The bucket cylinder is not used, but the hydraulic circuit will be used for the operation of the helical pile driver.

II-3. Connection of Hydraulic Clamp

The helical pile driver is usually shipped with the hydraulic clamp already attached.

If the clamp is not attached, it will be necessary to attach it to the bottom of the drill housing. Make sure the top of the clamp body and the bottom of the drill housing surfaces are clean of all paint, dirt, rust or grime of any kind. The clamp body needs to be aligned with the drill housing, install all (24) 1.25-7UNC bolts thru the bottom of the drill housing into the clamp body. With anti-seize on the threads all 24 bolts are torqued to 580 ft-lbs.

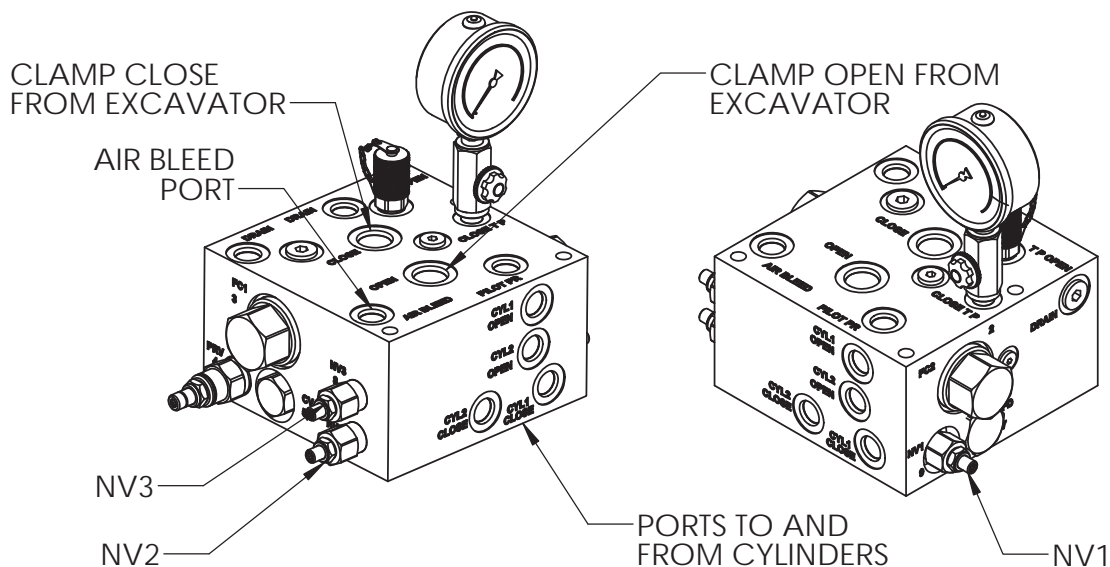


Figure 2-A. Port and Valve Identification of Clamp Manifold

II. PREPARATION FOR OPERATION

II-4. Connection of Hydraulic Hoses

The Clamp manifold is to be connected to the excavator's bucket circuit. Clamp Close should be connected to the "Curl Bucket" supply tube and the Clamp Open should be connected to the "Open Bucket" supply tube. Connect the four hoses from the clamp manifold to the fittings on the cylinders. The clamp open fitting on the cylinder is the fitting on the right when looking at the cylinder rod, the ports on the manifold are labeled respectfully. Send oil to the open ports of the cylinders by using the hand control in the excavator. With clamps all the way open. Rotate one jaw 45 degrees to be sure jaw tips clear. A hose is provided to cleanly bleed the air from the cylinders connected to the AIR BLEED port on the clamp manifold. Place this hose into a bucket. Open valve NV2. Send oil to the close ports of the cylinders by using the hand control in excavator and close cylinders until fully extended, the air will be evacuated from the rod side of the cylinders. Close valve NV2. To bleed the remainder of the air in the clamp system open valves BV2 and BV3 which are mounted on the top of the cylinder. Close the jaws and hold joystick for a full 45 seconds. Close valves BV2 and BV3. This process puts the jaws in sync as well as bleeding the air. If the jaws become out of sync or action becomes spongy repeat this process.

The Drill Manifold is to be connected to the auxiliary circuit. The Forward FWD rotation flow from the excavator will be connected to the "A1" port and Reverse REV flow will be connected to the "B1" port. The port "A2" will connect to the "L" port on the motor and the port "B2" will be connected to the "R" port on the motor. A case drain hose will need to be run back to the excavator's hydraulic tank.

Clamp "OPEN" hose goes to the fitting on the left and Clamp "CLOSE hoses goes to the fitting on the right.



Figure 2-B. Clamp Cylinder Hose Locations

II. MAJOR COMPONENT DEFINITION

II-5. Port Identification of Drill Manifold

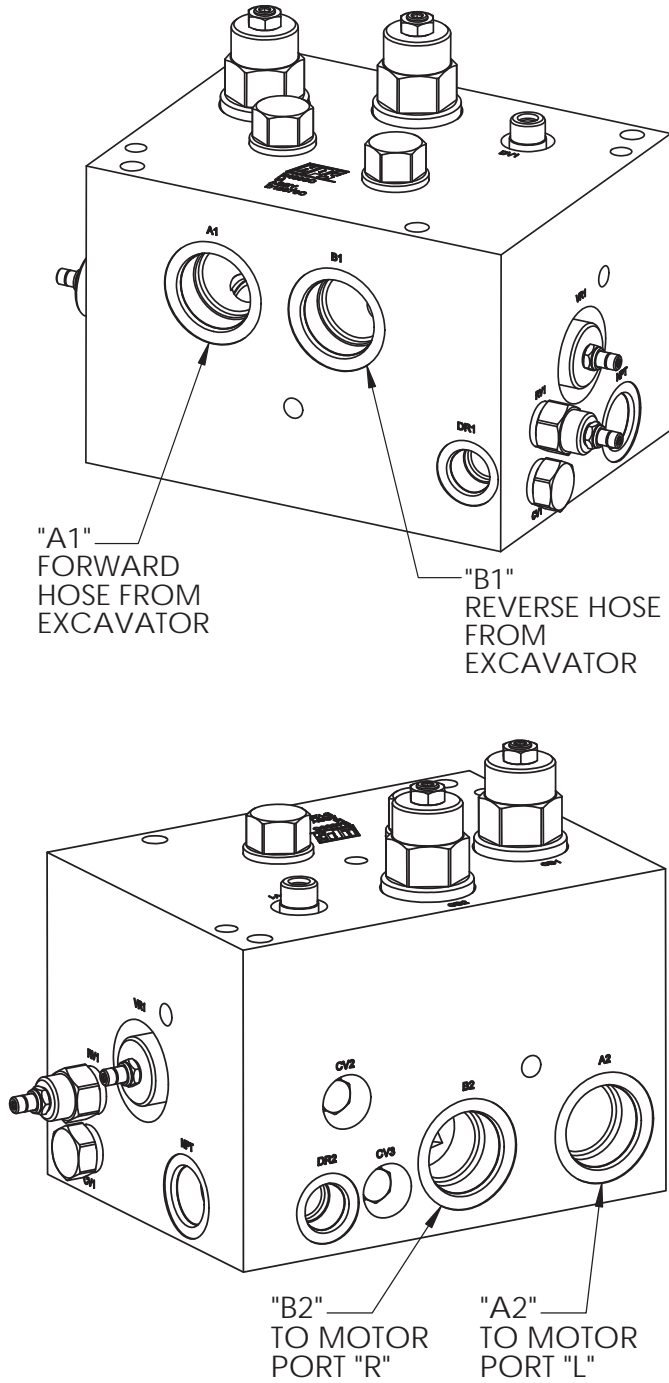


Figure 2-C. Drill Manifold Ports

II. MAJOR COMPONENT DEFINITION

II-6. Motor Port Identification



Figure 2-D. Motor Ports

II-7. Filling Drill Motor Hoses

The Helical Pile Drill is usually shipped with the drill motor hoses full of fluid and the unit may be used immediately. However, if the drive hoses have been removed from the drill motor, they will need to be filled before full speed operation.

1. The motor case is going to need to be filled by removing the top fill plug in port labeled "CD" and pouring in new clean hydraulic oil. Port CD is the connection for the case drain hose.
2. To fill the displacement shift hose with hydraulic oil. With the shift hose removed from the motor and placed in a bucket. Turn the knob on the Displacement Shift Valve (See Fig 3-A) CCW until it clicks. Hold the clamp close joystick (See Fig 3-A) in the close position and allow oil to flow clear of air. Release joystick turn the knob on displacement shift valve CW and install hose onto fitting in Port Y.
3. This is the LOW speed position.
4. With all hoses connected, run the excavator at low engine RPM and slowly push the toggle on the left hand joystick FWD (See Fig 3-B). Continue to send this small amount of flow to the drill motor for 2 minutes. This will push the air that is present in the system through to have only oil in all of the hoses and motor.

CAUTION

NEVER shift speed if the drill motor is spinning!



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II. MAJOR COMPONENT DEFINITION

II-7. Filling Drill Motor Hoses (Continued)

5. Slowly switch the drill direction to REV by pulling back on the toggle on the left hand joystick and allow it to run for another 2 minutes.
6. Stop the rotation. Shift the manual "Displacement Shift Valve" to HIGH Speed
7. Slowly push the toggle to FWD. Bring excavator to full engine RPM, allow the drill motor for 2 minutes. Pull the toggle to REV to confirm the drill motor will run in REV at full speed.



NEVER shift speed if the drill motor is spinning!

III. OPERATING INSTRUCTIONS

DRILL SPEED, CLAMP AND ROTATION CONTROLS

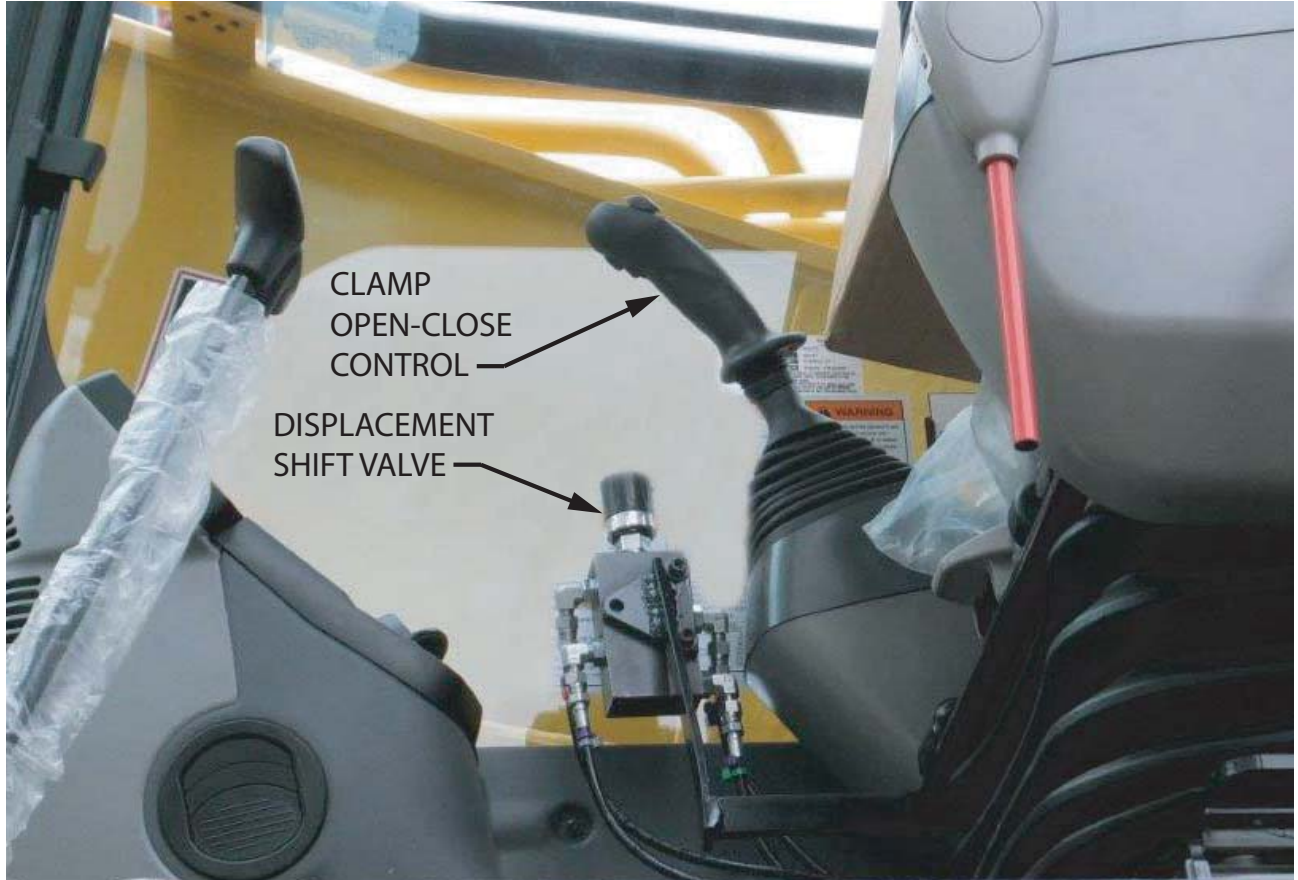


Figure 3-A. Clamp OPEN-CLOSE Control / Displacement Shift Valve

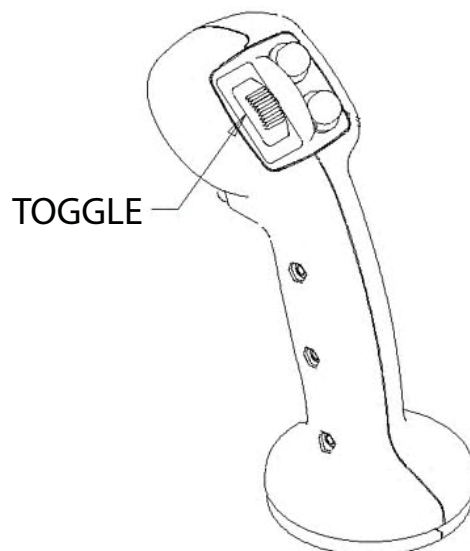


Figure 3-B. Drill Rotation Control Toggle



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III. OPERATING INSTRUCTIONS

III-1. COMPLETION OF SET-UP AND MAINTENANCE

1. Complete all preparation as described in Section II.
2. Read Section IV - MAINTENANCE AND ADJUSTMENTS and perform any required maintenance.

III-2. DRILL SPEED, CLAMP AND ROTATION CONTROLS

1. The Displacement Shift Valve as shown in Figure 3-A controls the speed of rotation of the drill motor. Changing speed can ONLY be done when the drill motor is NOT rotating. With valve knob turned all the way clockwise in the forward position the drill motor will run in LOW-SPEED / HIGH TORQUE. While holding the clamp joystick in the close position turn the displacement shift valve knob counter clockwise until it clicks and stays in position. This will allow the drill motor run in HIGH-SPEED / LOW TORQUE.
2. The Clamp OPEN-CLOSE control is the Right hand joystick as shown in Figure 3-A. This control is replacing the use of the Bucket.
3. To close the clamp jaws. Pulling the Right hand joystick in to the LEFT "Curl Bucket" will close the clamp jaws.
4. To open the clamp jaws. Pushing the Right hand joystick out to the RIGHT "Open Bucket" will open the clamp jaws.
5. For drill rotation the Left hand joy stick has a toggle shown in Figure 3-B. Pushing the toggle forward will cause the drill to spin clockwise (CW). The farther the toggle is pushed the faster the drill RPM. Releasing the toggle stops the drill rotation.
6. Pulling the toggle backwards will cause the drill to spin counter clockwise (CCW). In the same fashion as CW the farther you pull the faster the drill RPM. Releasing the toggle stops the drill rotation.



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III. OPERATING INSTRUCTIONS

III-3. WARMING HYDRAULIC FLUID

1. The helical pile drill should not be operated at full speed if the temperature of the hydraulic fluid is below 70°F(21°C).
2. If temperature of the hydraulic fluid is below 70°F(21°C), set the diesel engine at 1500 RPM and run the auger at reduced speed until the temperature of the hydraulic fluid exceeds 70°F(21°C).
3. When the engine is warmed up and hydraulic fluid temperature is at least 70°F(21°C), full speed operation may begin. Adjust the throttle so the engine is running at full engine RPM.

Do not operate the helical pile drill if hydraulic fluid temperature exceeds 180°F(82°C) as this may damage hydraulic components.



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IV. MAINTENANCE AND ADJUSTMENTS

IV-1. GENERAL

Preventive maintenance includes normal servicing that will keep the helical pile driver 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 preventative 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 and coolants. The intervals given in the schedule are based on normal operation. Perform these services, inspections, etc., more often as needed for operation under abnormal or severe conditions.

IV-2 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 the unit or at the beginning of each shift, check the following items:
 - a. Visually inspect all bolts, nuts and screws, including the pins and bolts fastening the drill housing to the bale assembly, clamp housing, socket option and all grout clamp bolts, to insure they are tight.



CAUTION Vibration loosens bolts - check carefully.

- b. Grease the bale assembly pins, the rotary joint and the clamp cylinders with any good multi-purpose grease. As shown and described in Fig 4-A on the following page.
 - c. Visually inspect all hydraulic fittings for leaks. If a leak is found or suspected shut-down machine and get the correct size wrenches and tighten them. If a fitting appears to be damaged replace it.



CAUTION It is absolutely imperative that no dirt or other impurities be permitted to contaminate the hydraulic fluid. Any contamination will drastically shorten the life of the high-pressure hydraulic system.

IV. MAINTENANCE AND ADJUSTMENTS

IV-2 DAILY (CONTINUED)

- d. Visually check all hoses for signs of damage or cuts that might cause hose failure during operation. Be sure all connections are tight.
- e. Perform all daily maintenance checks and lubrication indicated in the EXCAVATOR OPERATION GUIDE.
- f. Grease the rotary joint packing box (the upper fitting) with 3 to 5 shots at the beginning of the shift and then every 2-4 hours always while rotating under no pressure.
- g. Grease the rotary joint bearing housing once daily (the lower fitting) after 1 hour of rotating until grease exits the bearing housing.

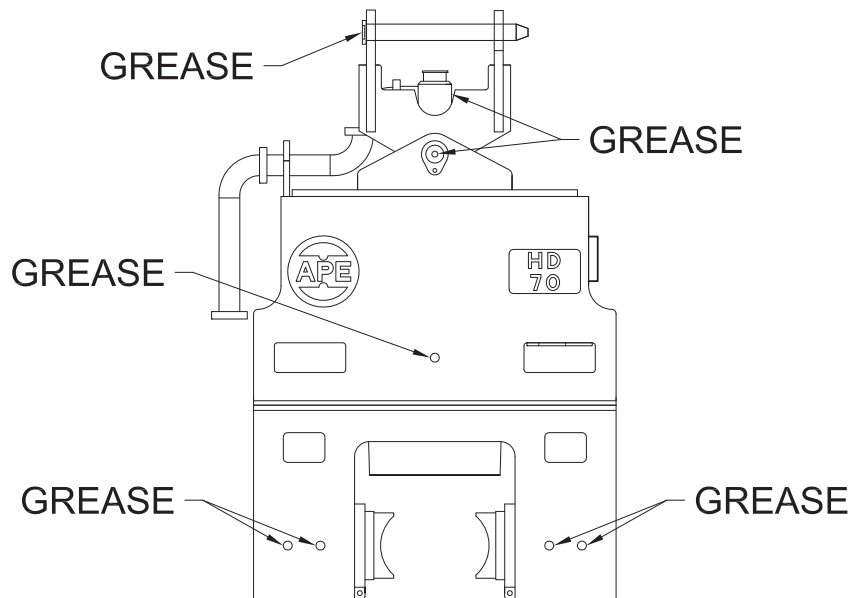


Figure 4-A. GREASE POINTS



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IV. MAINTENANCE AND ADJUSTMENTS

IV-3. BOLT TORQUE INFORMATION

Torque, in foot-pounds, is determined by the length of the wrench handle (in feet) multiplied by the weight (or force in pounds) applied at the end of the handle. For example, if the wrench is one foot long and five pounds of force is applied at the end of the handle, the total torque applied would be five foot pounds. A six inch wrench would require ten pounds of force to obtain five foot pounds of torque.

The only way to actually tighten high strength bolts is with a 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 auger assemblies listed. Whenever any of these bolts, are installed or replaced, the given torque specifications should be adhered to.

DRILL HOUSING ASSEMBLY Page 7-8

Item 5 1-1/4"-7 580 Ft-Lbs (80.2 Kg-M)

DRILL MOTOR ASSEMBLY Page 7-10

Item 5 M24-3 480 Ft-Lbs (66.4 Kg-M)

Item 9 M20-2.5 450 Ft-Lbs (62.2 Kg-M)

Item 20 5/16"-18 27 Ft-Lbs (3.7 Kg-M)

CLAMP CYLINDER ASSEMBLY Page 7-14

Item 8 1-1/4"-12 300 Ft-Lbs (41.5 Kg-M)

Item 13 5/8"-11 243 Ft-Lbs (32.3 Kg-M)

TOP PLATE ASSEMBLY Page 7-20

Item 2 1"-8 480 Ft-Lbs (66.4 Kg-M)

PIN ASSEMBLY Page 7-24

Item 3 5/8"-11 243 Ft-Lbs (32.3 Kg-M)

SOCKET RETAINER Page 7-28

Item 3 7/8"-9 480 Ft-Lbs (66.4 Kg-M)



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V. HYDRAULIC CIRCUITRY

V-1. HYDRAULIC CLAMP

With the excavator engine running, hydraulic fluid is fed to the bucket circuit. The bucket circuit is connected to the clamp manifold. Pulling the right handle to close the bucket will close the clamp jaws. The clamp pressure can be checked with a gauge installed in the CLAMP PRESSURE TEST POINT port in the clamp manifold. The jaws close together at the same speed due to the flow divider / combiner (FDC). The FDC feeds an equal amount of hydraulic fluid to each clamp cylinder at the same time. The factory sets clamping pressure is set at 2500 psi by the pressure reducing / relieving valve (PRV1). However the clamp pressure is maintained by the counter balance valve (CB3). Pushing the right handle to open the bucket will open the clamp jaws.

V-2. MAIN DRIVE

There are two manifolds to operate the helical pile drill. The "Drill Manifold" connects the excavator to the drill head and the "Interlock Manifold" provides speed control and case flushing. With the excavator engine running, hydraulic fluid is fed to the auxiliary circuit. The auxiliary circuit is connected to the drill manifold. Pushing the toggle on the left hand joystick controls direction control valve (DV5) allows hydraulic fluid to flow through the drill manifold which includes counter balance valve (CB2) into the L port of the drive motor and will spin the drive motor clockwise. Returning the toggle to the center will allow the drive motor to stop with the help of counter balance valve (CB1). Pulling the toggle on the left hand joystick controls the drill direction control valve (DV5) allows hydraulic fluid to flow through the drill manifold which includes CB1 into the R port of the drive motor and will spin the drive motor counter clockwise. Returning the toggle to the center will allow the drive motor to stop with the help of counter balance valve CB2. The forward drive pressure is set at the maximum of 4641 psi by the relief valve (RV3) in Hi Torque. In the same way the reverse drive pressure is set at the maximum of 4641 psi by the relief valve (RV2) in Hi Torque. When the drive motor is spinning pilot fluid is being directed to the speed lock hot oil shuttle valve (SHV2) and case flush hot oil shuttle valve (SHV3). SHV2 directs fluid to speed pilot check valve (CV5) and speed pilot directional valve (DV2). With these valves getting the pilot flow the drive motor speed can not be changed. SHV3 directs fluid through flow control (FC3) allowing a maximum of 1 gpm to flow into the drive motor case. Providing fresh fluid to flush during operation aiding in keeping the inside of the drive motor cleaner and cooler. This excess flow is removed from the drill motor through the case drain (CD) hose. The case drain flow is filtered by filter (F). During the initial set-up F is to be a 10 micron filter element, on subsequent filter replacements a 25 micron filter can be used. An indicator shows the level of filter cleanliness when the hydraulic oil temperature is above 90 degrees F. The pressure of the CD is limited to 50 psi by relief valve (RV4). When CD pressure exceeds 50 psi the hydraulic oil will squirt from RV4.

To change speed the drive motor must **NOT** be spinning! With the drive motor not spinning turn the knob on the displacement shift valve (DV4) counter clockwise (CCW) until it clicks and locks into place. Hold the clamp close joystick in the close position. The helical pile drill is now in high speed. Pushing the toggle on the left hand joystick controls direction control valve (DV5) allows hydraulic fluid to flow through the drill manifold which includes CB2 into the L port of the drive motor will spin the drive motor clockwise as well as pulling toggle back will cause the motor to spin CCW. RV3 is vented since pilot fluid has drill manifold directional valve (DV1) shifted which activates relief valve (RV1) and limits the drive pressure to 2700 psi.

V. HYDRAULIC CIRCUITRY

HYDRAULIC SCHEMATIC

1000225

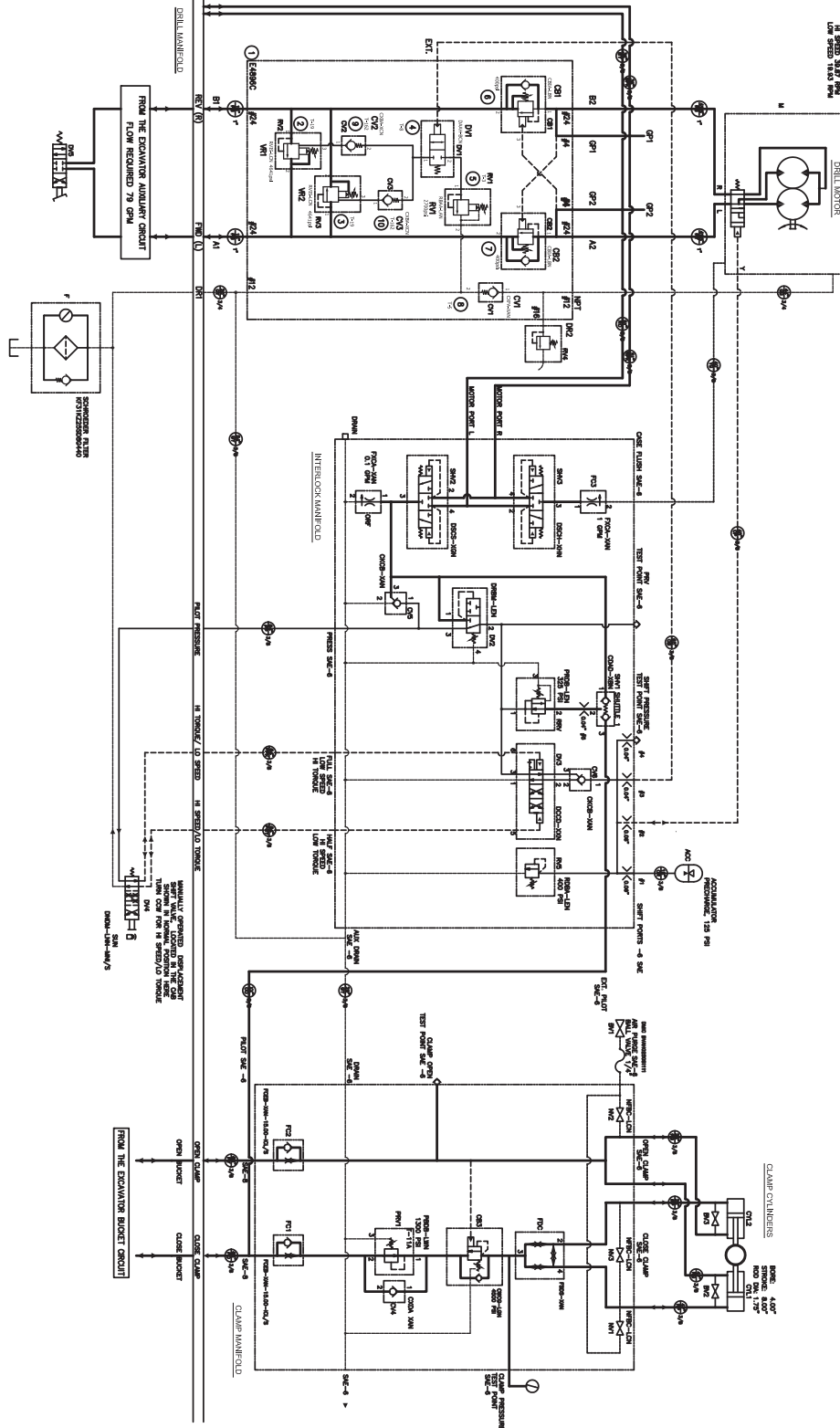


Figure 5-A. Hydraulic Schematic



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V. HYDRAULIC CIRCUITRY

V-3. HYDRAULIC COMPONENTS LIST

1000225

<u>Notation</u>	<u>Description</u>	<u>Part Number</u>
ACC	ACCUMULATOR	
BV1	AIR PURGE BALL VALVE	
BV2	BALL VALVE	
BV3	BALL VALVE	
CB1	DRILL MANIFOLD COUNTERBALANCE VALVE	352117
CB2	DRILL MANIFOLD COUNTERBALANCE VALVE	352117
CB3	CLAMP MANIFOLD COUNTERBALANCE VALVE	1000803
CV1	DRILL MANIFOLD CASE DRAIN CHECK VALVE	352115
CV2	DRILL MANIFOLD CHECK VALVE	1000838
CV3	DRILL MANIFOLD CHECK VALVE	1000838
CV4	CLAMP MANIFOLD CHECK VALVE	1000826
CV5	SPEED PILOT CHECK VALVE	1000792
CV6	SPEED CONTROL CHECK VALVE	1000792
CYL1	CLAMP CYLINDER	1000440
CYL2	CLAMP CYLINDER	1000440
DV1	DRILL MANIFOLD DIRECTIONAL VALVE	1000833
DV2	SPEED PILOT DIRECTIONAL VALVE	1000797
DV3	SPEED CONTROL DIRECTIONAL VALVE	1000791
DV4	DISPLACEMENT SHIFT VALVE	1000814
DV5	DRILL DIRECTION CONTROL VALVE	
F	CASE DRAIN FILTER	
FC1	OPEN CLAMP FIXED ORIFICE FLOW CONTROL VALVE	1000800
FC2	CLOSE CLAMP FIXED ORIFICE FLOW CONTROL VALVE	1000800
FC3	CASE FLUSH FIXED ORIFICE FLOW CONTROL VALVE	1000840
FDC	CLAMP CLOSE FLOW DIVIDER/COMBINER	1000804
M	MOTOR	1000344
NV1	FLOW CONTROL NEEDLE VALVE	1000805
NV2	FLOW CONTROL NEEDLE VALVE	1000805
NV3	FLOW CONTROL NEEDLE VALVE	1000805
ORF	SPEED CONTROL DRAIN ORIFICE	1000790
PRV1	CLAMP MANIFOLD PRESS REDUCING/RELIEVING VALVE	1000801
RRV	REDUCING RELIEF VALVE	1000815
RV1	DRILL MANIFOLD RELIEF VALVE	1000834
RV2	DRILL MANIFOLD RELIEF VALVE	1000766
RV3	DRILL MANIFOLD RELIEF VALVE	1000766
RV4	DRILL MANIFOLD CASE DRAIN RELIEF VALVE	321009
RV5	SPEED CONTROL RELIEF VALVE	1000799
SHV1	SPEED PILOT SIGNAL SHUTTLE VALVE	1000795
SHV2	SPEED LOCK HOT OIL SHUTTLE VALVE	1000794
SHV3	CASE FLUSH HOT OIL SHUTTLE VALVE	1000793

Table 5-A. Hydraulic Components

V. HYDRAULIC CIRCUITRY

HYDRAULIC SCHEMATIC

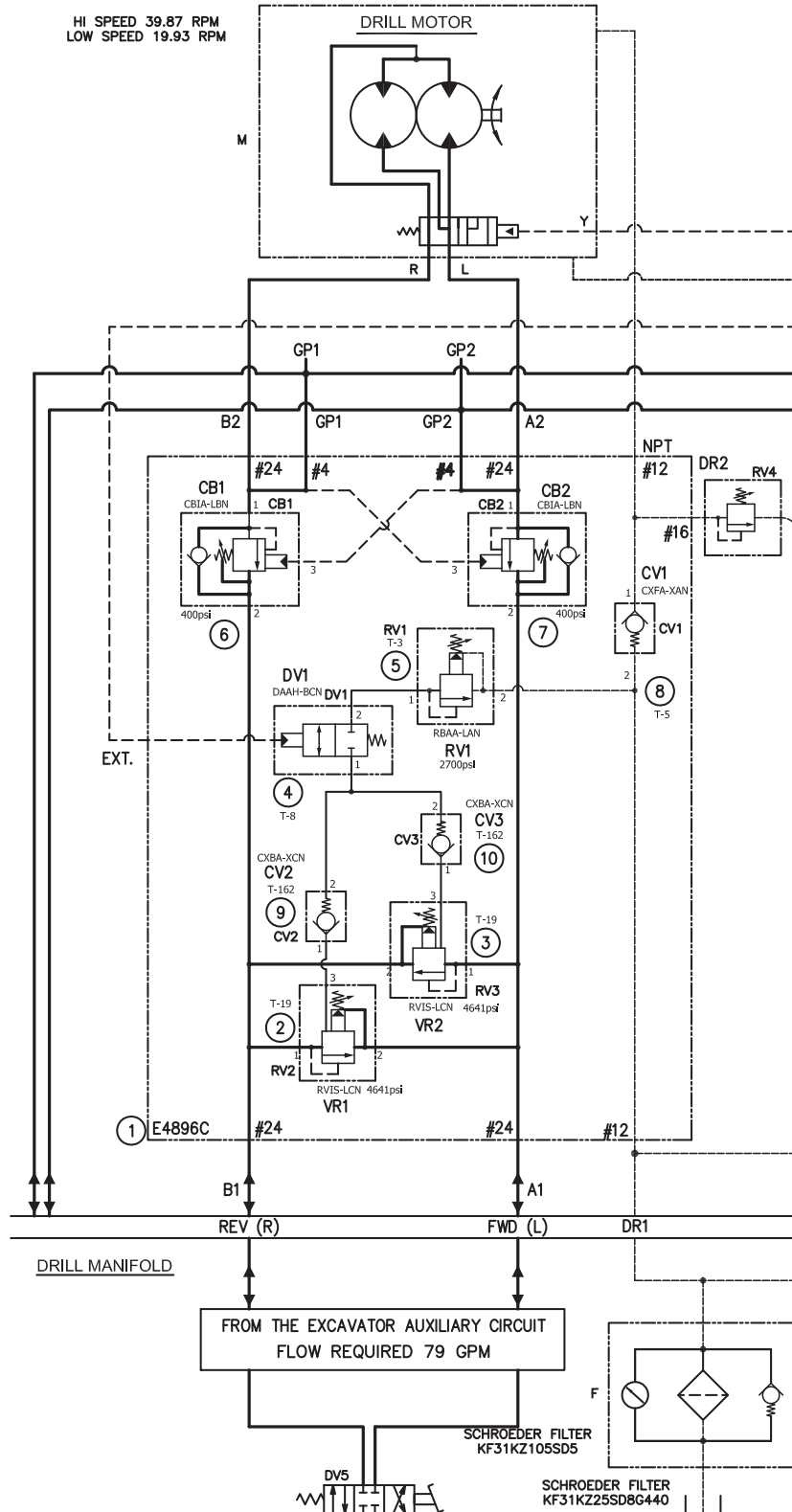


Figure 5-B. Hydraulic Schematic Drill Manifold

V. HYDRAULIC CIRCUITRY

HYDRAULIC SCHEMATIC

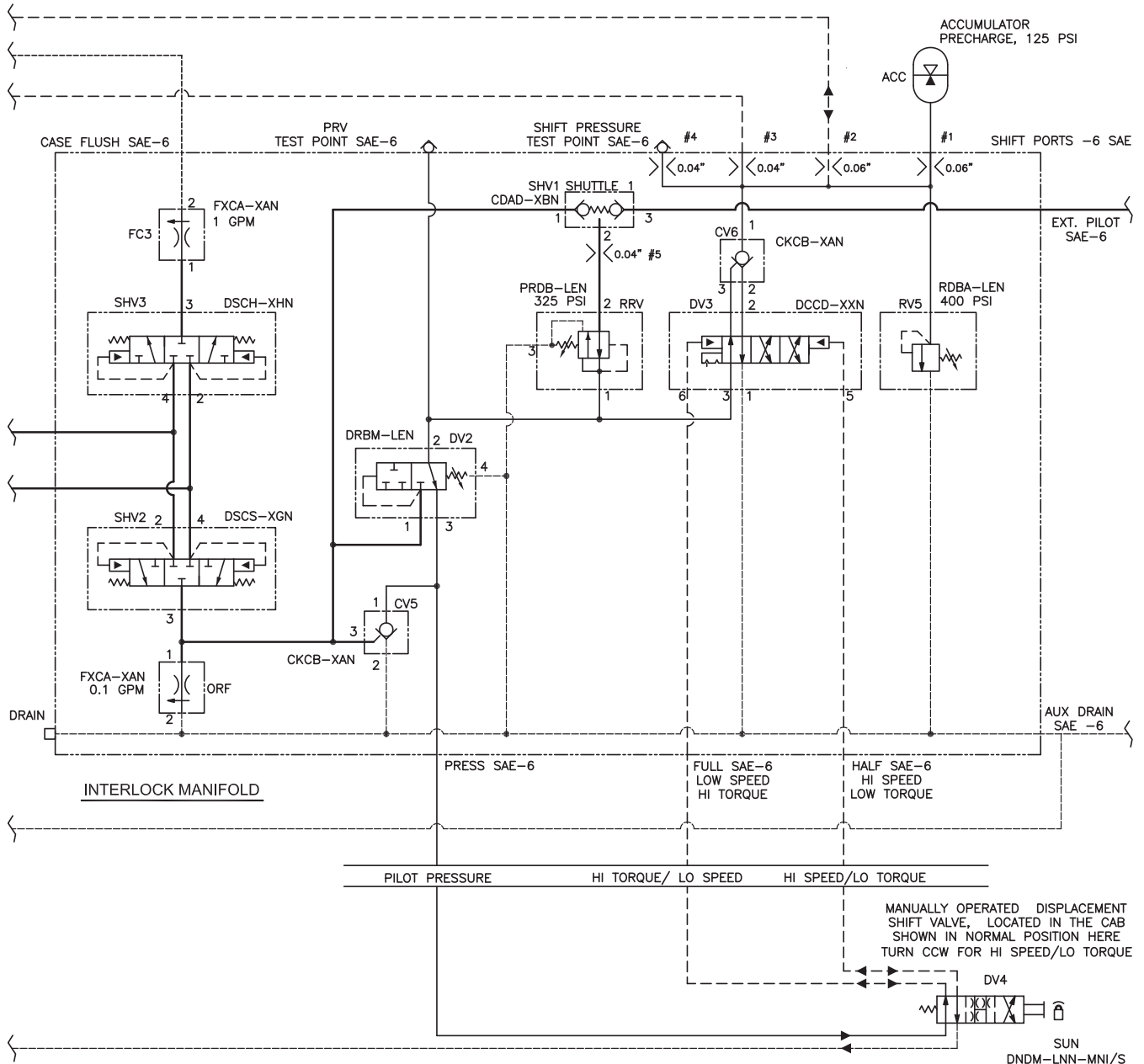


Figure 5-C. Hydraulic Schematic Drill Interlock Manifold

V. HYDRAULIC CIRCUITRY

HYDRAULIC SCHEMATIC

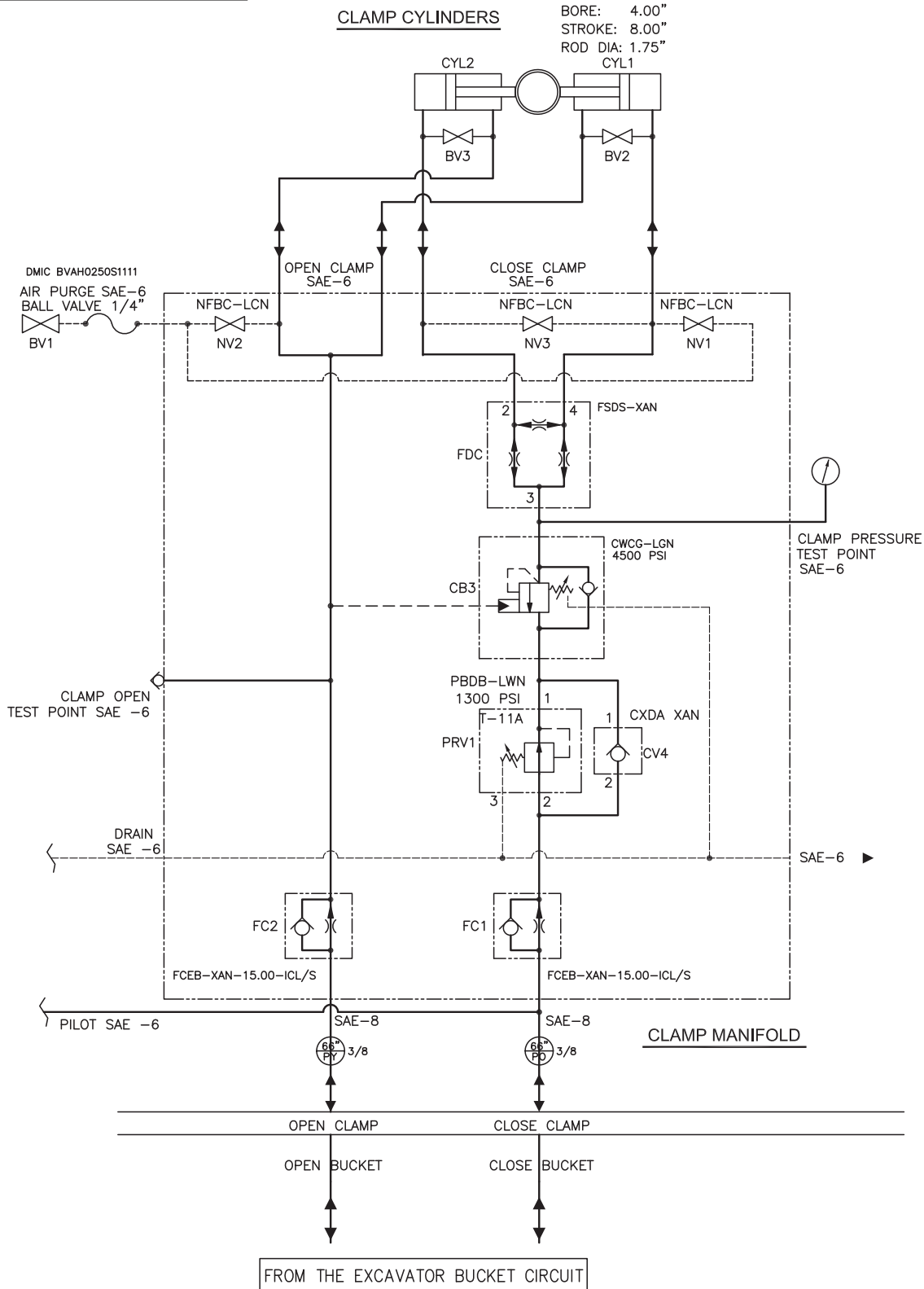


Figure 5-D. Hydraulic Schematic Clamp Manifold



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VI. GENERAL DATA

VI-1. 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
Qty.	Quantity
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

VI-2. SCREW 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:
0.50 - 13 UNC X 1.50 LG SHCS

0.50 = 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.



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VI. GENERAL DATA

VI-3. SERIAL NUMBER LOCATIONS

1. The following Helical Pile Driver units are serial numbered separately:
 - a. Drill head
 - b. Clamp Body
 - c. Socket
2. In addition to the serial number plate itself (on drill head, clamp body and sockets), the serial number are welded onto each unit as follows:
 - a. Drill head welded twice - once on top right side of housing, once on bottom lip of right side of motors' side.
 - b. Clamp body stamped twice - once on plate above jaw, once on plate above cylinder cover.
 - c. Sockets are stamped .



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VII. ORDERING PARTS

VII-1. 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 VI, SERIAL NUMBER LOCATION. Confirm all faxed or e-mailed orders by telephone 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 judgement 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.



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VII. ORDERING PARTS

VII-2. FITTING DESCRIPTION KEY

FITT 2 L - 16 M 12 J 00 0 - 00L 0 0 0 1

SELECTOR INDEX

- 2 - INCH FITTING
- 9 - METRIC FITTING

CONFIGURATION OR SHAPE OF FITTING

- S - STRAIGHT FITTING
- L - 90 Deg. ELBOW
- V - 45 Deg. ELBOW
- T - TEE
- C - CAP
- P - PLUG
- U - UNION
- X - CROSS
- (FOURTH END FITTING REQ'D.)

FIRST END SIZE

- * IN 1/16THS OF AN INCH (INDEX 2)
- IN MILLIMETERS (INDEX 9)
- SEE GENERAL SPECIFICATION SHEET FOR SEQUENCE OF ORDER

FIRST END FITTING STYLE

- SEE FITTING STYLE SELECTOR CHART SC-1

SECOND END SIZE

- IF APPLICABLE - SEE FIRST END SIZE

SECOND END FITTING STYLE

- IF APPLICABLE - SEE FIRST END FITTING STYLE

THIRD END SIZE

- IF APPLICABLE - SEE FIRST END SIZE

THIRD END FITTING STYLE

- IF APPLICABLE - SEE FIRST END SIZE

* EXCEPTIONS

- 90 = 10" 96 = 6"
- 92 = 12" 98 = 8"
- 94 = 14" 99 = NON CODE SIZE

MATERIAL

- 1 - CARBON STEEL
- 2 - BRASS
- 4 - STAINLESS STL
- 5 - AAR MAL IRON
- 6 - MALEABLE IRON
- 8 - FORGED STEEL

SPECIAL NOTATIONS

PRESSURE RATING

- 0 - NONE
- 1 - 125 LB.
- 3 - SCH 40
- 4 - SCH 80

INSTALLATION AID OR STYLE OF HEAD

- 0 - NOT APPLICABLE
- H - REGULAR HEX
- Q - SQUARE HEAD (EXT.)
- R - SQUARE HEAD (INT.)
- S - HEX HEAD (INT SOCKET)
- T - HEX HEAD (EXT.)

LENGTH CODE

- (ELBOWS & NIPPLES)
- __L - LONG (ELBOW)
- __X - EXTRA LONG (ELBOW)
- __C - CLOSE (NIPPLE)

PIPE NIPPLES (LONG) ONLY
IN DEC. INCHES FOR INDEX 2
050 = 5.0 INCHES
105 = 10.5 INCHES

IN MILLIMETERS FOR INDEX 9
120 = 12.0 MILLIMETERS
084 = 8.4 MILLIMETERS

FOURTH END SIZE & FITTING STYLE

- (CROSSES ONLY)
- SEE FIRST END FITTING SIZE OR END STYLE

VII. ORDERING PARTS

VII-3. FITTING STYLE SELECTOR CHART

For fitting end 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
T		HOSE BARB			

Figure 7-B. Fitting Style Selector Chart



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VII. ORDERING PARTS

VII-4. HOSE DESCRIPTION CODE

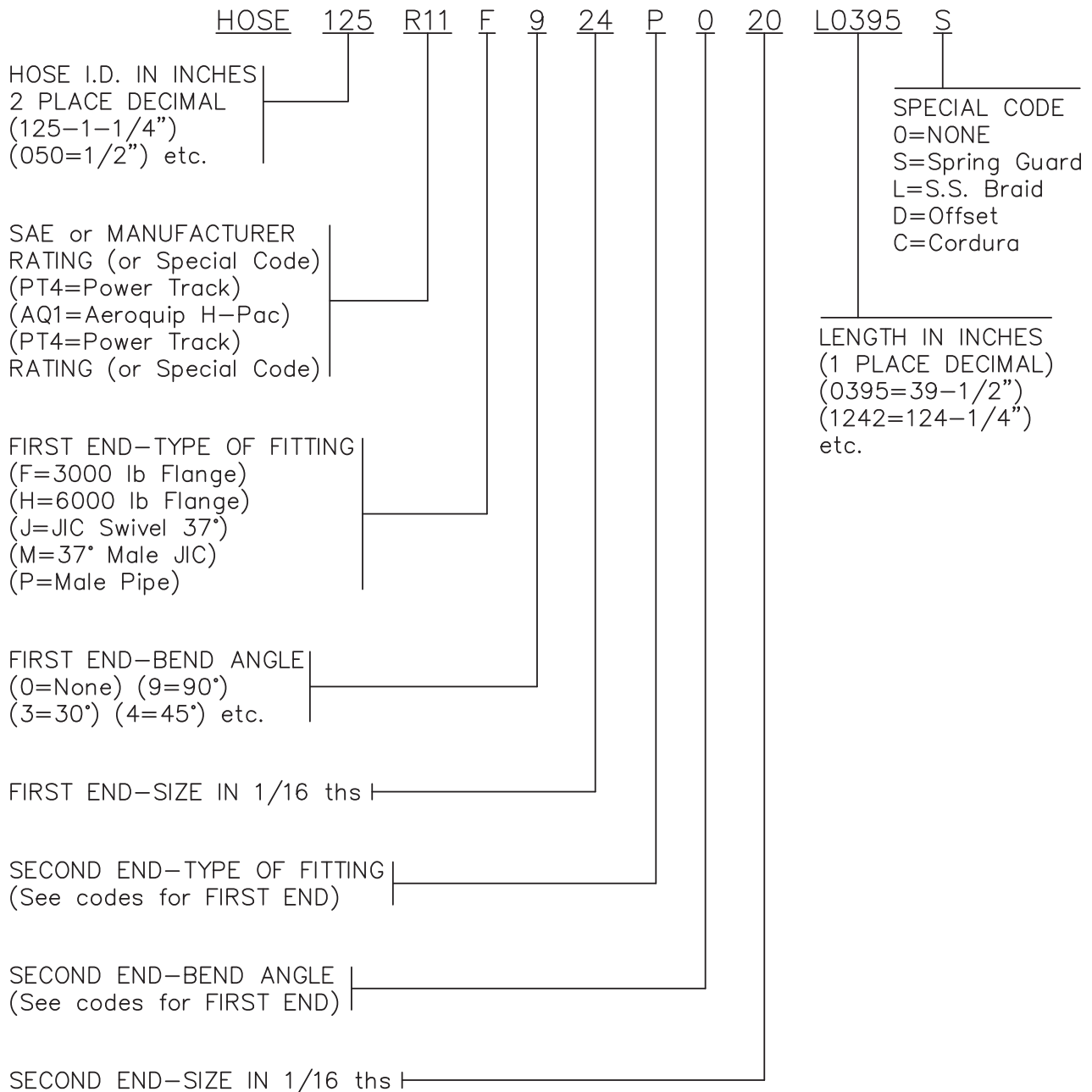


Figure 7-C. Hose Description Code



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VII. ORDERING PARTS

VII-5. PARTS IDENTIFICATION

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

a.	HELICAL PILE DRIVER ASSEMBLY	1000443
b.	DRILL HOUSING ASSEMBLY	1000345
c.	DRILL MOTOR ASSEMBLY	1000343
d.	CLAMP HOUSING ASSEMBLY	1000347
e.	CLAMP CYLINDER ASSEMBLY	1000440
f.	CLAMP MANIFOLD ASSEMBLY	1000441
g.	JAW OPTIONS	1000348
h.	TOP PLATE ASSEMBLY	1000355
i.	BALE ASSEMBLY	1000356
j.	PIN ASSEMBLY	1000357
k.	DRIVE SOCKET OPTIONS	1000358
l.	SOCKET RETAINER OPTIONS	1000365
m.	GROUTING ASSEMBLY OPTION	1000346
n.	GROUT PLUG OPTIONS	1000368
o.	BLANK PLATE OPTION	1000439
p.	DRILL MANIFOLD ASM	1000642
q.	INTERLOCK MANIFOLD ASM	1000375
r.	ACCUMULATOR ASSEMBLY	1000442
s.	SAFETY GATE OPTIONS	

VII. ORDERING PARTS

VII-6. HELICAL PILE DRILL IDENTIFICATION

1000443

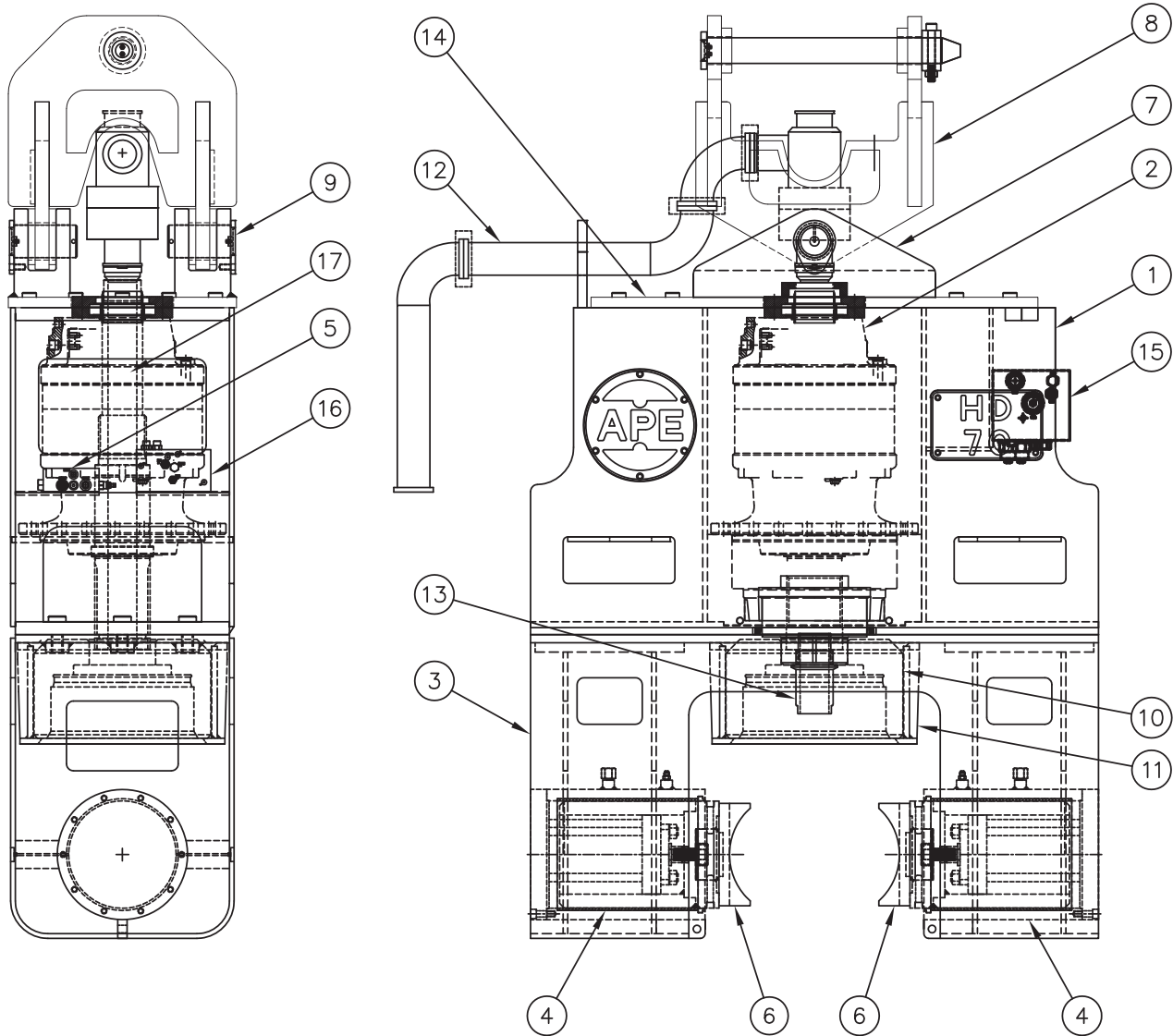


Figure 7-D. Helical Pile Drill Assembly



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VII. ORDERING PARTS

VII-6. HELICAL PILE DRILL IDENTIFICATION

1000443

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	1000345	1	DRILL HOUSING ASSEMBLY
2	1000343	1	DRILL MOTOR ASSEMBLY
3	1000347	1	CLAMP HOUSING ASSEMBLY
4	1000440	2	CLAMP CYLINDER ASSEMBLY
5	1000441	1	CLAMP MANIFOLD ASSEMBLY
6	1000348	2	JAW OPTIONS
7	1000355	1	TOP PLATE ASSEMBLY
8	1000356	1	BALE ASSEMBLY
9	1000357	2	PIN ASSEMBLY
10	1000358	2	DRIVE SOCKET OPTIONS
11	1000365	1	SOCKET RETAINER OPTIONS
12	1000346	1	GROUTING ASSEMBLY OPTION
13	1000368	1	GROUT PLUG OPTIONS
14	1000439	1	BLANK PLATE OPTION
15	523100	1	DRILL MANIFOLD ASM
16	1000375	1	INTERLOCK MANIFOLD ASM
17	1000442	1	ACCUMULATOR ASSEMBLY

Table 7-A. Helical Pile Drill Assembly

VII. ORDERING PARTS

VII-7. DRILL HOUSING ASSEMBLY IDENTIFICATION

1000345

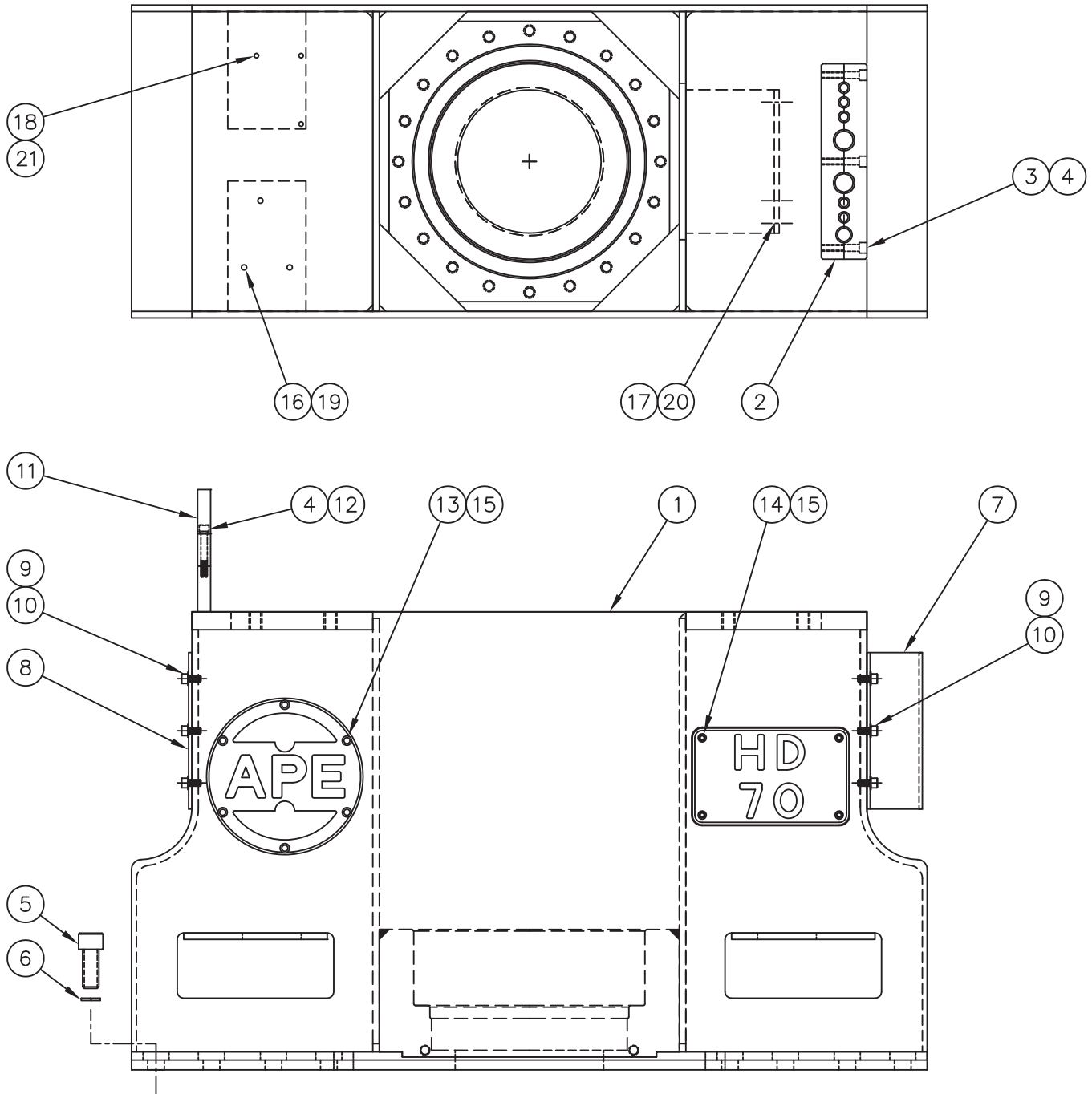


Figure 7-E. Drill Housing Assembly



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VII. ORDERING PARTS

VII-7. DRILL HOUSING ASSEMBLY IDENTIFICATION 1000345

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	HD-100053	1	Drill Housing - Machined
2	HD-100057	1	Hose Block Assembly
3	---	3	SHCS .50-13 NC x 2.25
4	---	5	HCLW .50
5	---	24	SHCS 1.25-7 NC x 3.00
6	---	24	HCLW 1.25
7	HD-100059	1	Cover (Drill Manifold End)
8	HD-100061	1	Cover (Clamp Manifold End)
9	---	12	SHCS .50-13 NC x 1.00
10		12	Std Washer .50
11	HD-100062	1	Yoke Clamp (For Grout Pipe)
12		2	SCHS .50-13 NC x 3.50
13	HD-100063	2	Custom APE Logo - Finished
14	HD-100065	2	HD 70 Logo
15	---	20	SHCS .44-14 NC X .75 (SS)
16	---	3	Stover Nut .31-18 NC
17	---	3	SHCS .50-13 NC x 9.25
18	---	3	SHCS .38-16 NC X 5.00
19	---	3	SHCS .31-18 NC X 3.50
20	---	3	Stover Nut .50-13 NC
21	---	3	Stover Nut .38-16 NC

Table 7-B. Drill Housing Assembly

VII. ORDERING PARTS

VII-8. DRILL MOTOR ASSEMBLY IDENTIFICATION

1000343

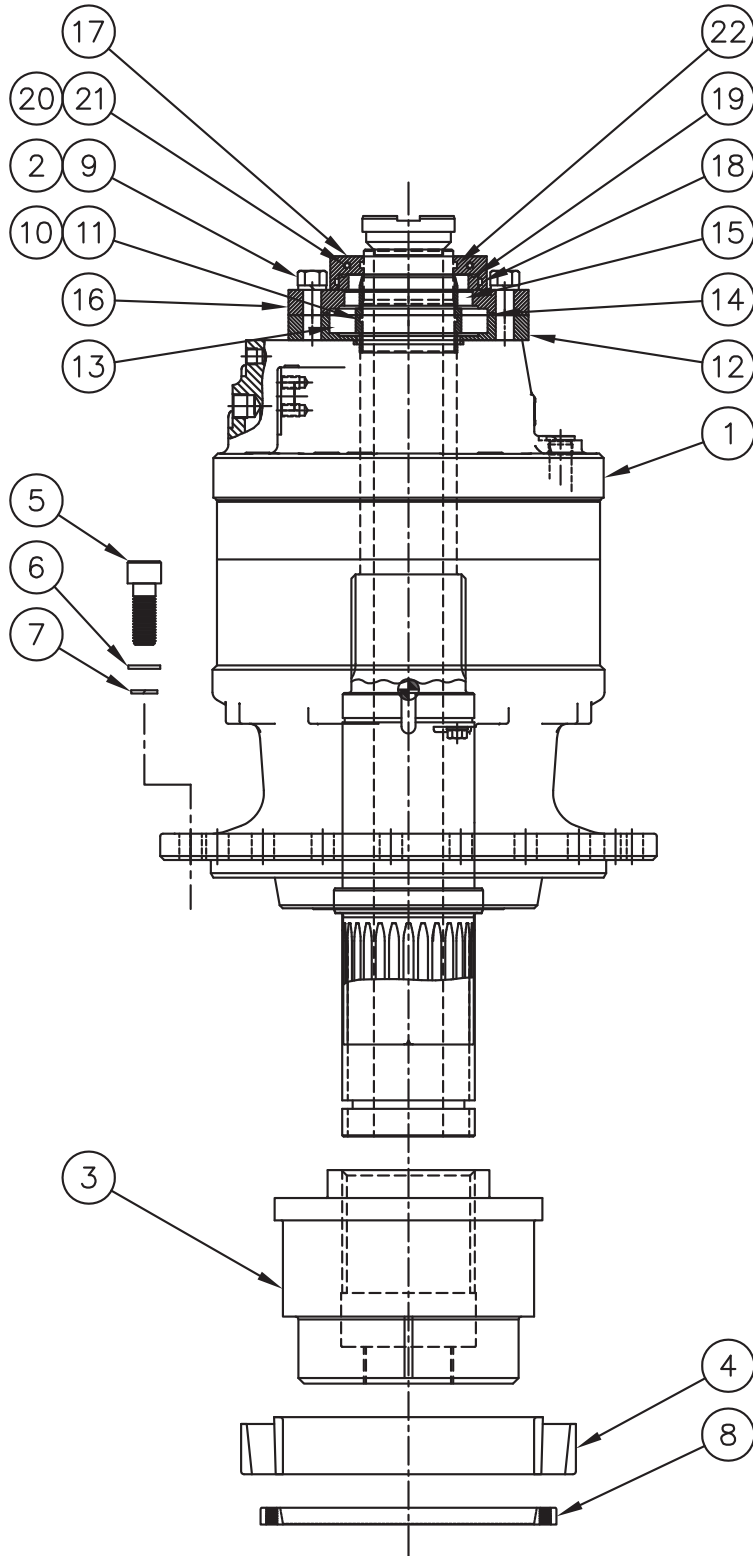


Figure 7-F. Drill Motor Assembly



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VII. ORDERING PARTS

VII-8. DRILL MOTOR ASSEMBLY IDENTIFICATION 1000343

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	1000344	1	HD 70 DRILL MOTOR
2		5	M20 Lock Washer
3	HD-100069	1	Square Drive
4	HD-100071	1	Timken Brg LM654649 / LM654610
5	---	20	SHCS M24-3 X 70mm
6	---	20	M24 Standard Washer
7	---	20	M24 HCLW
8	1000079	1	Lip Seal
9		5	M20-2.5 X 80 mm LG HHCS
10	630035	1	O-Ring Auger Sleeve
11	630505	1	Auger Shaft Sleeve (KI. B0698-001 Rev C)
12	630518	1	Hyd. Motor End Plate (KI. B0698-002 Rev B)
13	630517	1	Bearing - Top Seal Plate
14	630509A	1	O-Ring Top Plate (KI. B0698-003 Rev C)
15	630510	1	Upper Shaft Seal
16	HD-100002	1	Oil Seal Carrier
17	HD-100001	1	Grout Cover Plate
18		1	O-Ring Grout Cover
19	100159	1	O-Ring Top Plate
20	---	2	SHCS 5/16-18 NC x 1.25
21	---	2	HCLW 5/16
22	630516A	1	O-Ring Grout Cover

Table 7-C. Drill Motor Assembly

VII. ORDERING PARTS

VII-9. CLAMP HOUSING ASSEMBLY IDENTIFICATION

1000347

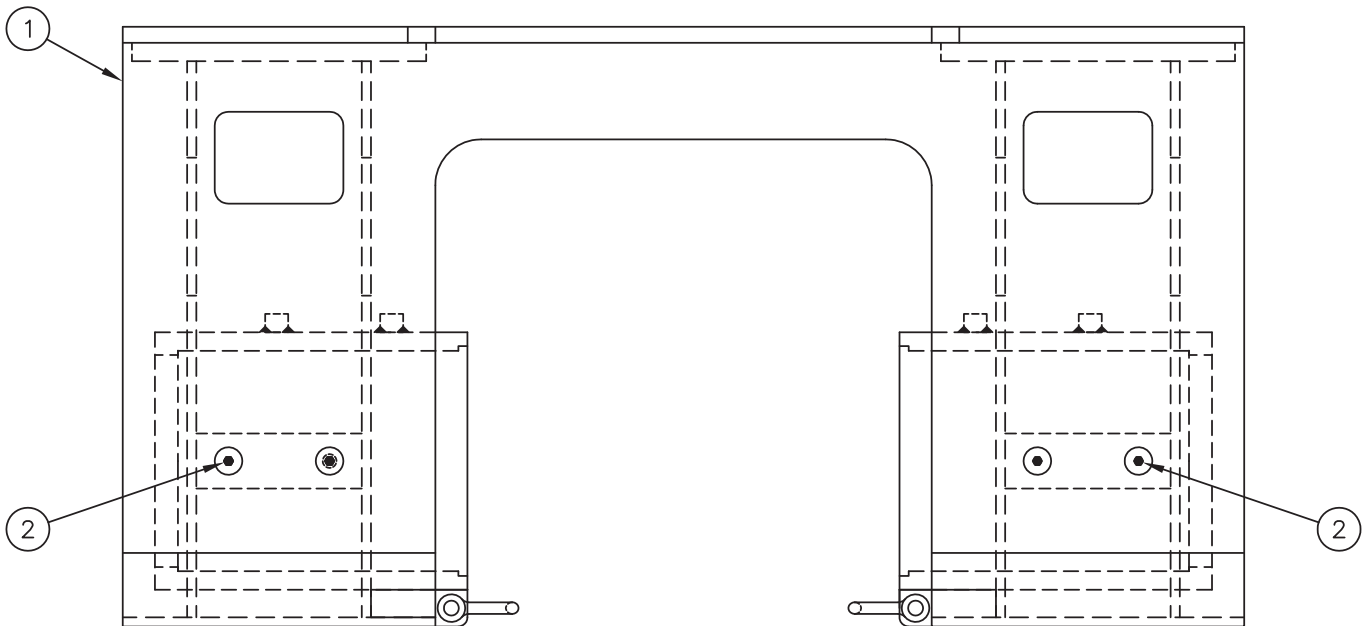
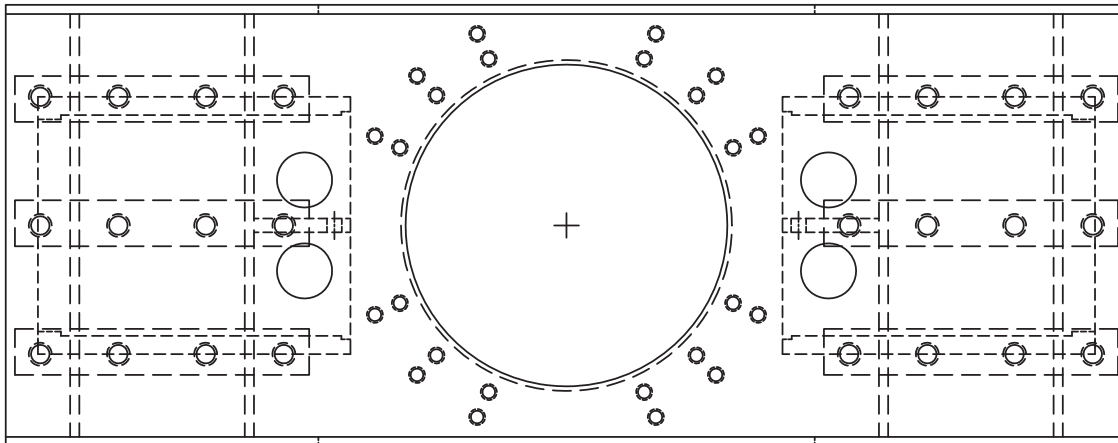


Figure 7-G. Clamp Housing Assembly



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VII. ORDERING PARTS

VII-9. CLAMP HOUSING ASSEMBLY IDENTIFICATION 1000347

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	HD-100101	1	Clamp Housing-Machined
2	- - -	4	1/8 npt Grease Fitting

Table 7-D. Clamp Housing Assembly

VII. ORDERING PARTS

VII-10. CLAMP CYLINDER ASSEMBLY IDENTIFICATION

1000440

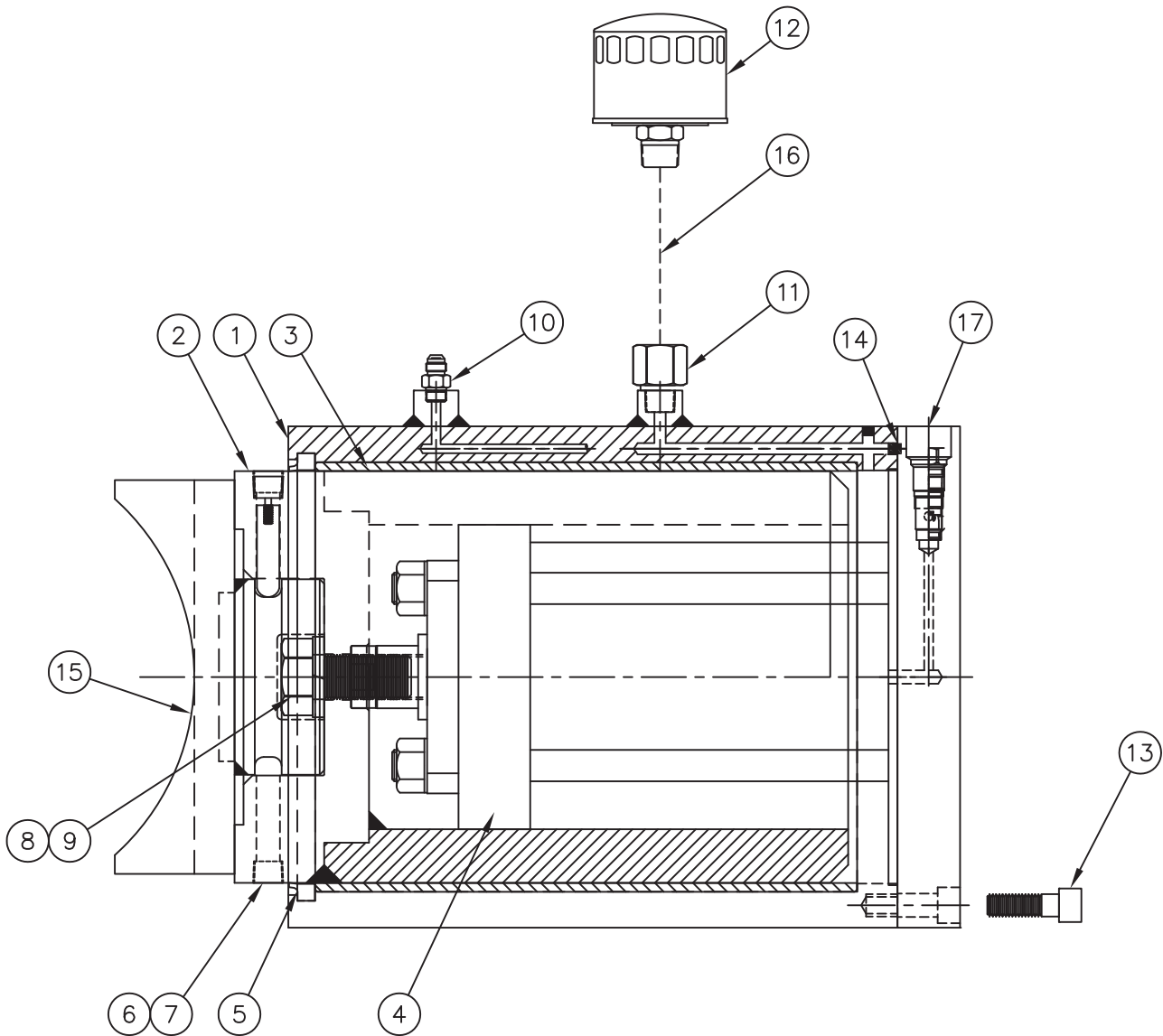


Figure 7-H. Clamp Cylinder Assembly



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VII. ORDERING PARTS

VII-10. CLAMP CYLINDER ASSEMBLY IDENTIFICATION 1000440

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	1000470	1	Outer Tube - Machined
2	1000532	1	Inner Tube - Final Machine
3	1000533	1	Bronze Sleeve
4	1000534	1	Purakal Cylinder Asm
5	1000535	1	11.500" Rod Wiper
6	1000531	4	Pin - Jaw Retainer
7	---	4	#8 SAE PLUG
8	---	1	Hex Bolt 1.25-12 NF X 2.50
9	---	1	HCLW 1.25
10	---	2	#6 SAE X #6 MJIC Fitting
11	---	1	1/2 NPT Pipe Fitting
12	1000536	1	Breather - Schroeder ABF-3/10-M-P12
13	---	10	SHCS .63-11 NC X 2.00
14	---	2	2-112 O-Ring
15	1000348	1	JAW (SIZED TO PILE) SEE JAW OPTIONS
16	1000853	1	HOSE
17	1000805	1	NEEDLE VALVE

Table 7-E. Clamp Cylinder Assembly

VII. ORDERING PARTS

VII-11. CLAMP MANIFOLD ASSEMBLY IDENTIFICATION

1000441

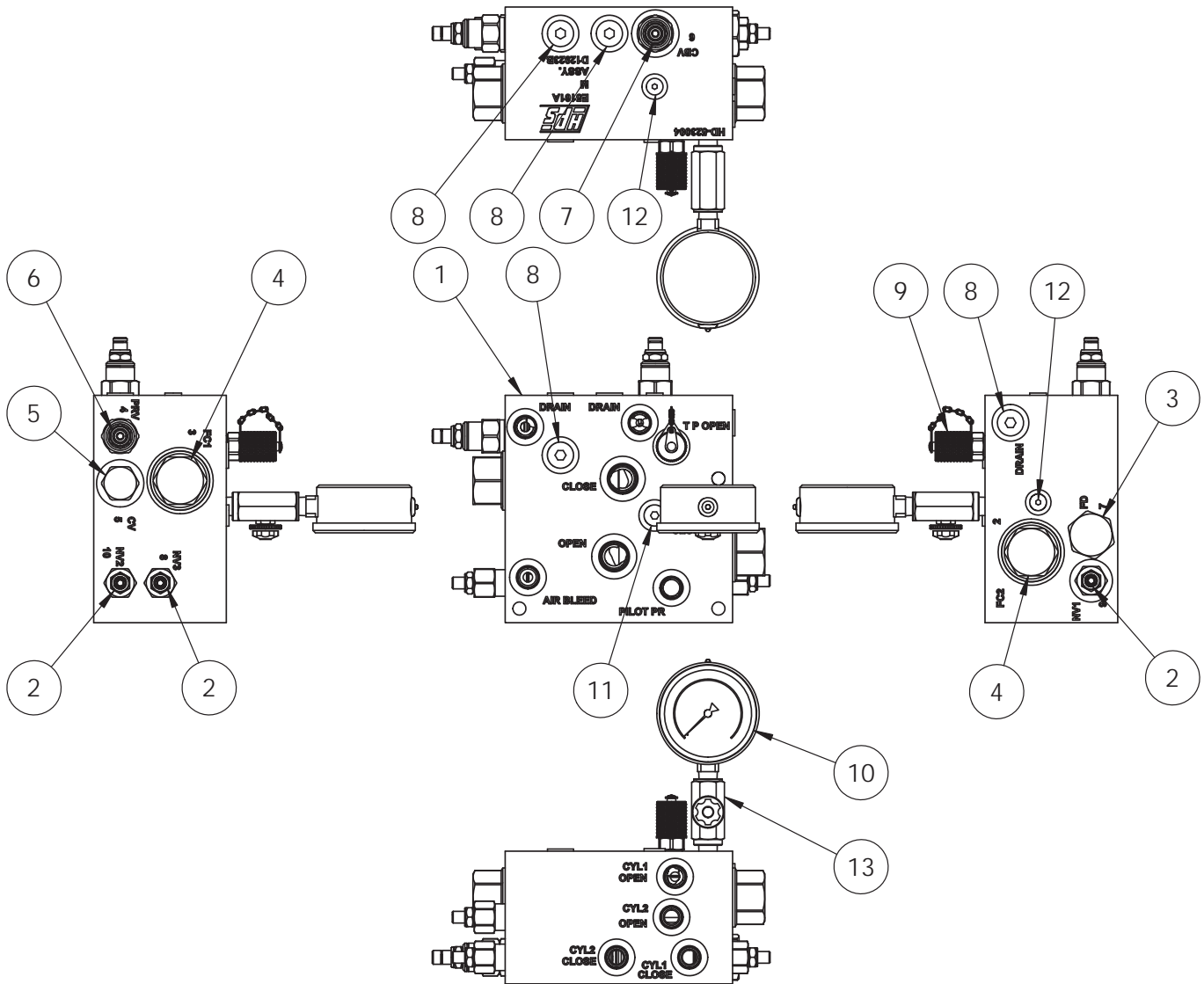


Figure 7-I. Assembly



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-11. CLAMP MANIFOLD ASSEMBLY IDENTIFICATION 1000441

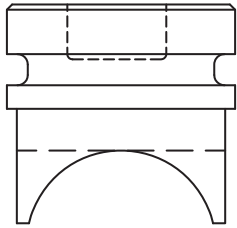
<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1		1	CLAMP MANIFOLD BLOCK
2	1000800	2	FLOW CONTROL VALVE
3	1000801	1	PRESSURE REDUCING VALVE
4	1000826	1	CHECK VALVE
5	1000803	1	COUNTERBALANCE VALVE
6	1000804	1	FLOW DIVIDE / COMBINER
7	1000805	3	NEEDLE VALVE
8		1	TEST POINT
9		1	GAUGE SNUBBER
10		1	PRESSURE GAUGE 0-5000 PSI
11		4	#6 O-RING PLUG
12		1	#4 O-RING PLUG
13		2	#2 O-RING PLUG

Table 7-F. Assembly

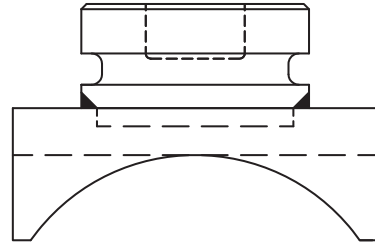
VII. ORDERING PARTS

VII-12. JAW OPTIONS IDENTIFICATION

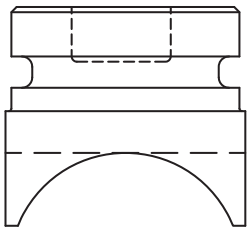
1000348



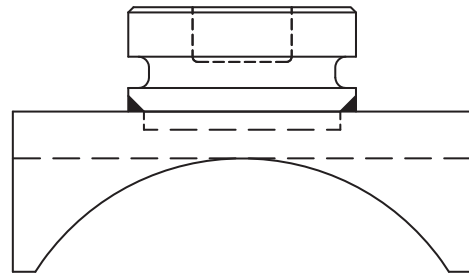
① HDJ.4.5
1000349



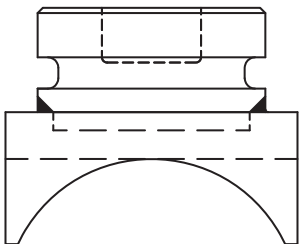
④ HDJ.9.625
1000352



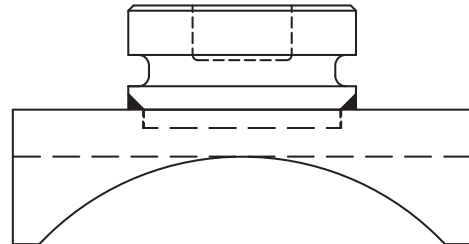
② HDJ.5.5
1000350



⑤ HDJ.11.75
1000353



③ HDJ.7
1000351



⑥ HDJ.13.375
1000354



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MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-12. JAW OPTIONS IDENTIFICATION

1000348

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	1000349	1	Jaw Set for 4-1/2"
2	1000350	1	Jaw Set for 5-1/2"
3	1000351	1	Jaw Set for 7"
4	1000352	1	Jaw Set for 9-5/8"
5	1000353	1	Jaw Set for 11-3/4"
6	1000354	1	Jaw Set for 13-3/8"

Table 7-G. Jaw Options

VII. ORDERING PARTS

VII-13. TOP PLATE ASSEMBLY IDENTIFICATION

1000355

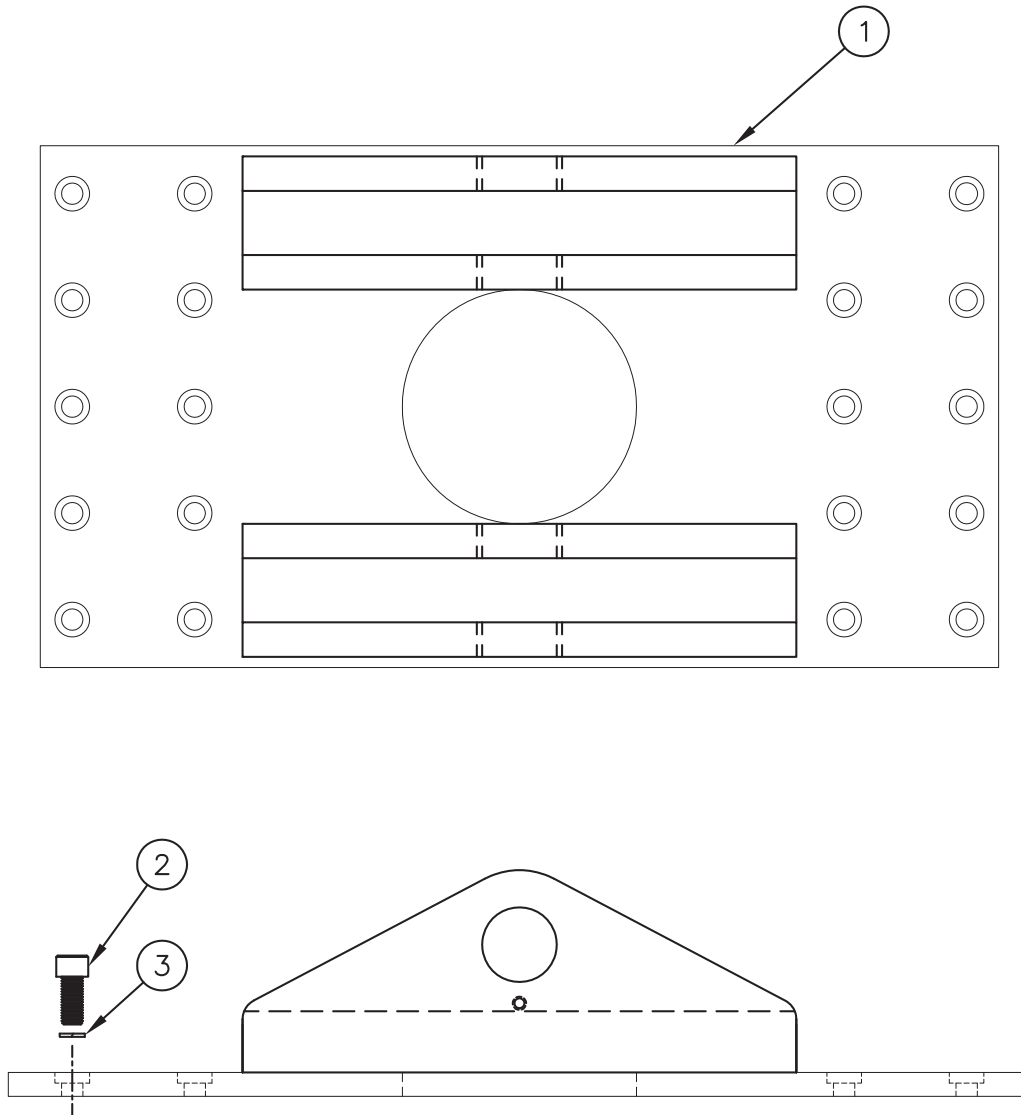


Figure 7-K. Top Plate Assembly



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-13. TOP PLATE ASSEMBLY IDENTIFICATION 1000355

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	HD-100049	1	Lug Plate
2	---	20	SHCS 1.00-8 NC x 2.25
3	---	20	HCLW 1.00

Table 7-H. Top Plate Assembly

VII. ORDERING PARTS

VII-14. BALE ASSEMBLY IDENTIFICATION

1000356

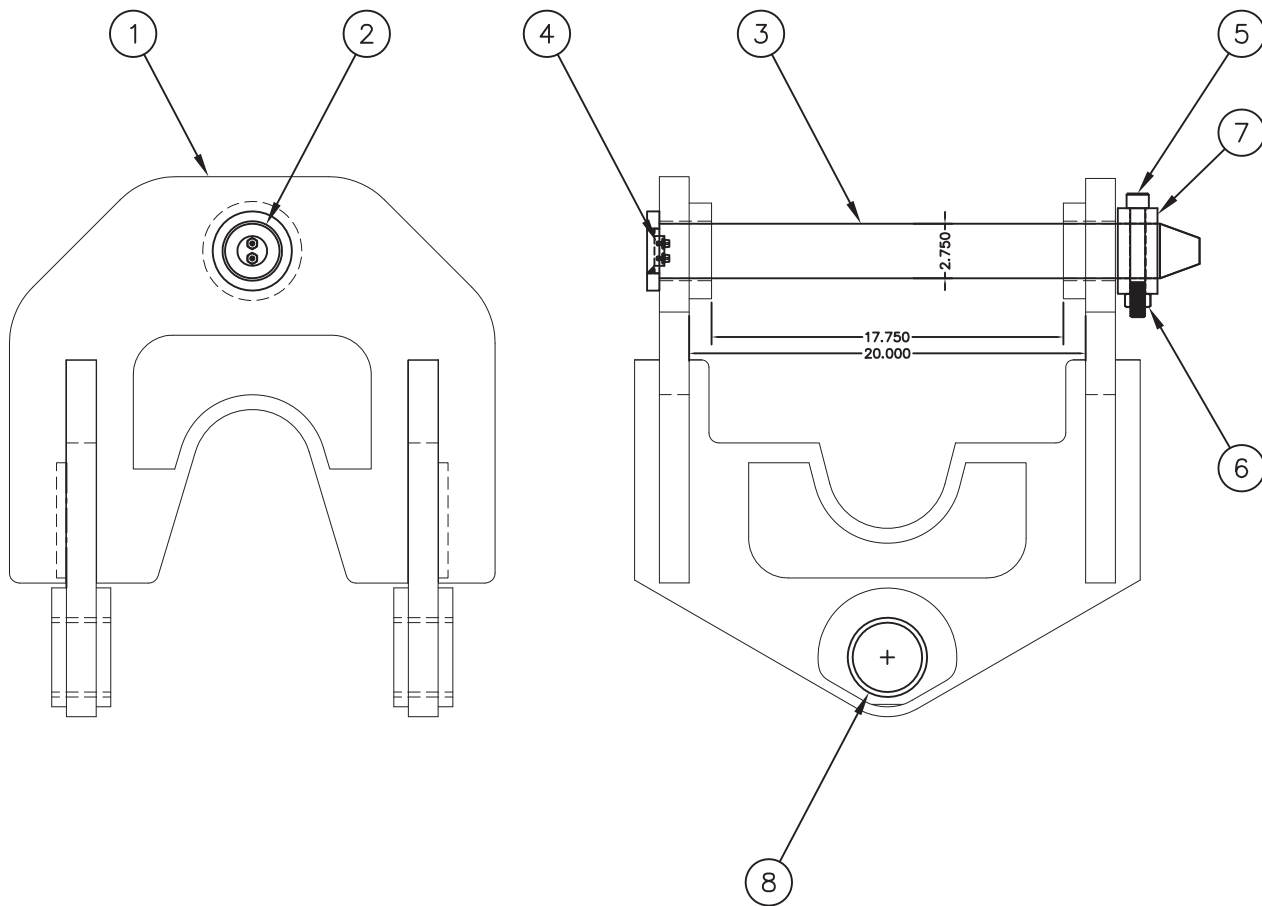


Figure 7-L. Bale Assembly



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MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-14. BALE ASSEMBLY IDENTIFICATION

1000356

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	HD-100035	1	Bale Assembly - Machined
2	HD-100039	2	Hardened Bushing
3	HD-100041	1	Standard Excavator Pin
4	100229	2	1/8 npt Grease Zerk
5	---	1	SHCS 3/4-10 NC x 5.50
6	---	1	3/4-10 Stover Nut
7	HD-100043	1	Retainer Donut
8	HD-100045	2	Connex 4" Dia Spring Bushing x 3.00

Table 7-I. Bale Assembly

VII. ORDERING PARTS

VII-15. PIN ASSEMBLY IDENTIFICATION

1000357

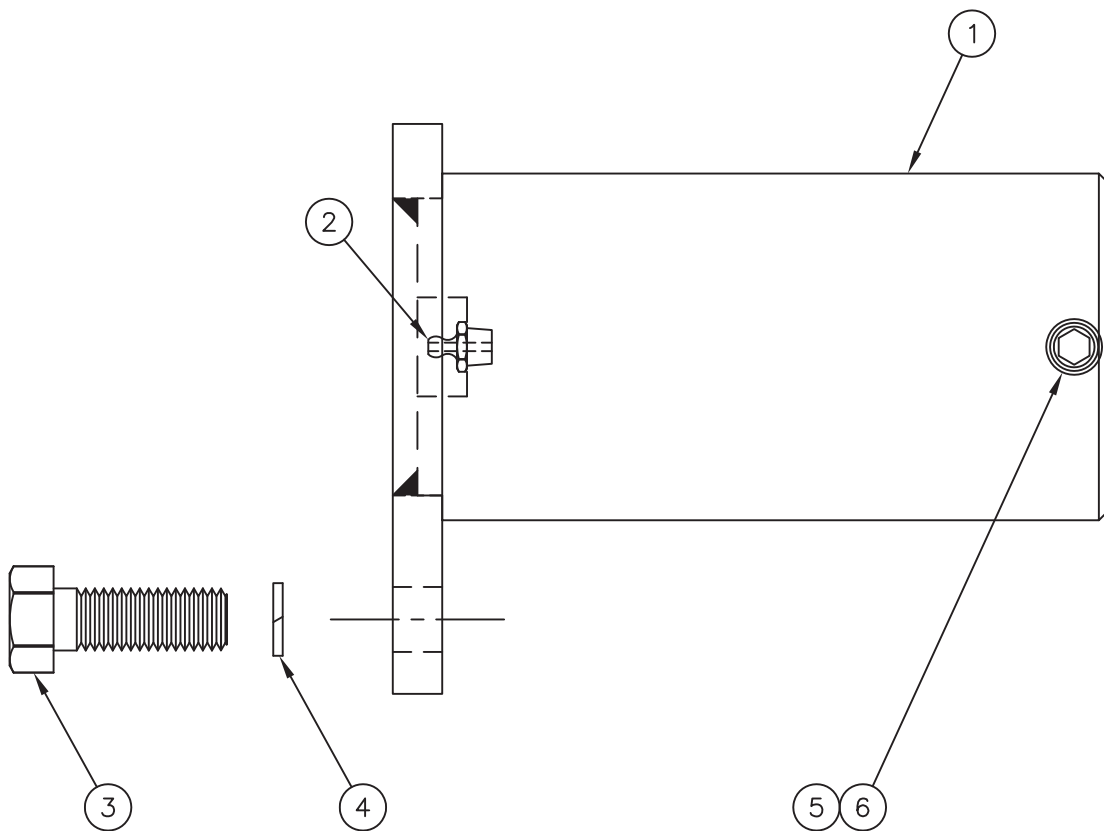


Figure 7-M. Pin Assembly



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-15. PIN ASSEMBLY IDENTIFICATION

1000357

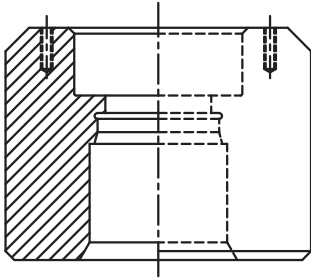
<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	HD-100047	1	Pin Finished Detail
2	100229	1	1/8 NPT Grease Fitting
3	---	1	Hex Bolt .63-11 NC x 1.75
4	---	1	HCLW .63
5	---	1	SHCS .38-16 NC X 3.75
6	---	1	3/8-16 NC Stover Nut

Table 7-J. Pin Assembly

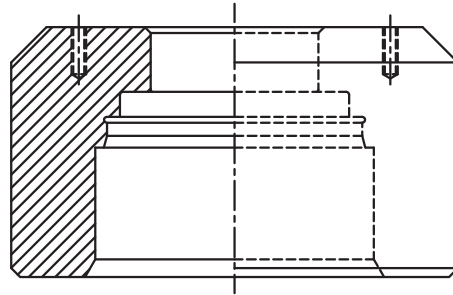
VII. ORDERING PARTS

VII-16. DRIVE SOCKET OPTIONS IDENTIFICATION

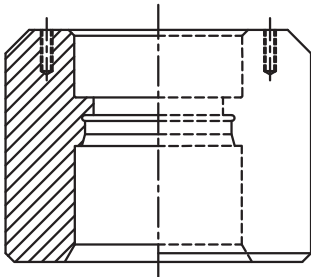
1000358



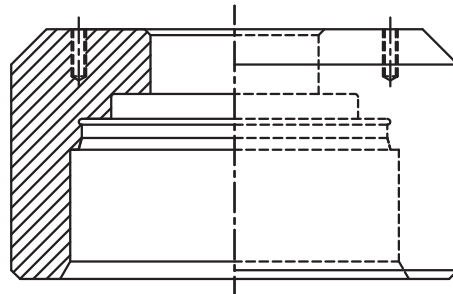
① HDS.4.5
1000359



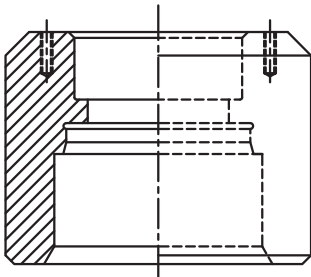
④ HDS.9.625
1000362



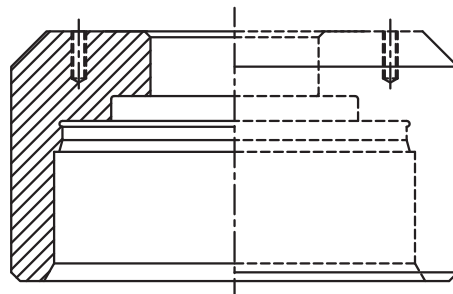
② HDS.5.5
1000360



⑤ HDS.11.75
1000363



③ HDS.7
1000361



⑥ HDS.13.375
1000364

Figure 7-N. Drive Socket Options



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-22. DRIVE SOCKET OPTIONS IDENTIFICATION 1000358

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	1000359	1	Drive Socket for 4-1/2"
2	1000360	1	Drive Socket for 5-1/2"
3	1000361	1	Drive Socket for 7"
4	1000362	1	Drive Socket for 9-5/8"
5	1000363	1	Drive Socket for 11-3/4"
6	1000364	1	Drive Socket for 13-3/8"

Table 7-K Drive Socket Options

VII. ORDERING PARTS

VII-17. SOCKET RETAINER IDENTIFICATION

1000365

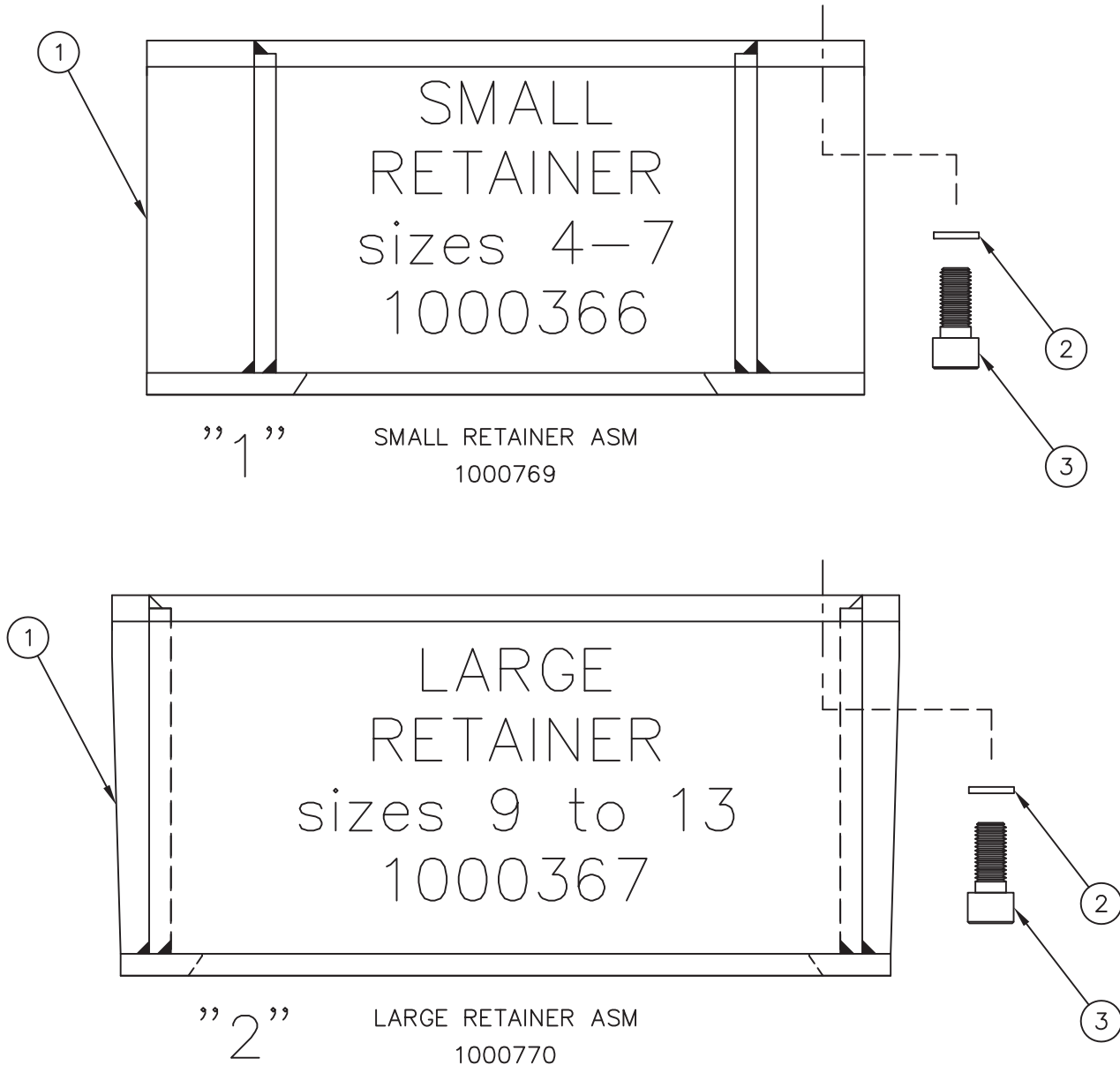


Figure 7-O. Socket Retainer Options



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-17. SOCKET RETAINER IDENTIFICATION

1000365

<u>Item</u>	<u>Part Number</u>		<u>Qty.</u>	<u>Description</u>
1	1000769		1	Small Socket Retainer Asm.
	<u>Item</u>	<u>P/N</u>	<u>Qty</u>	<u>Description</u>
	1	1000366	1	Small Socket Retainer
	2		12	.88 HCLW
	3		12	SHCS .88-9 NC X 2.00
2	1000770		1	Large Socket Retainer Asm.
	<u>Item</u>	<u>P/N</u>	<u>Qty</u>	<u>Description</u>
	1	1000367	1	Small Socket Retainer
	2		12	.88 HCLW
	3		12	SHCS .88-9 NC X 2.00

Table 7-L. Socket Retainer Options

VII. ORDERING PARTS

VII-18. GROUTING ASSEMBLY IDENTIFICATION

1000346

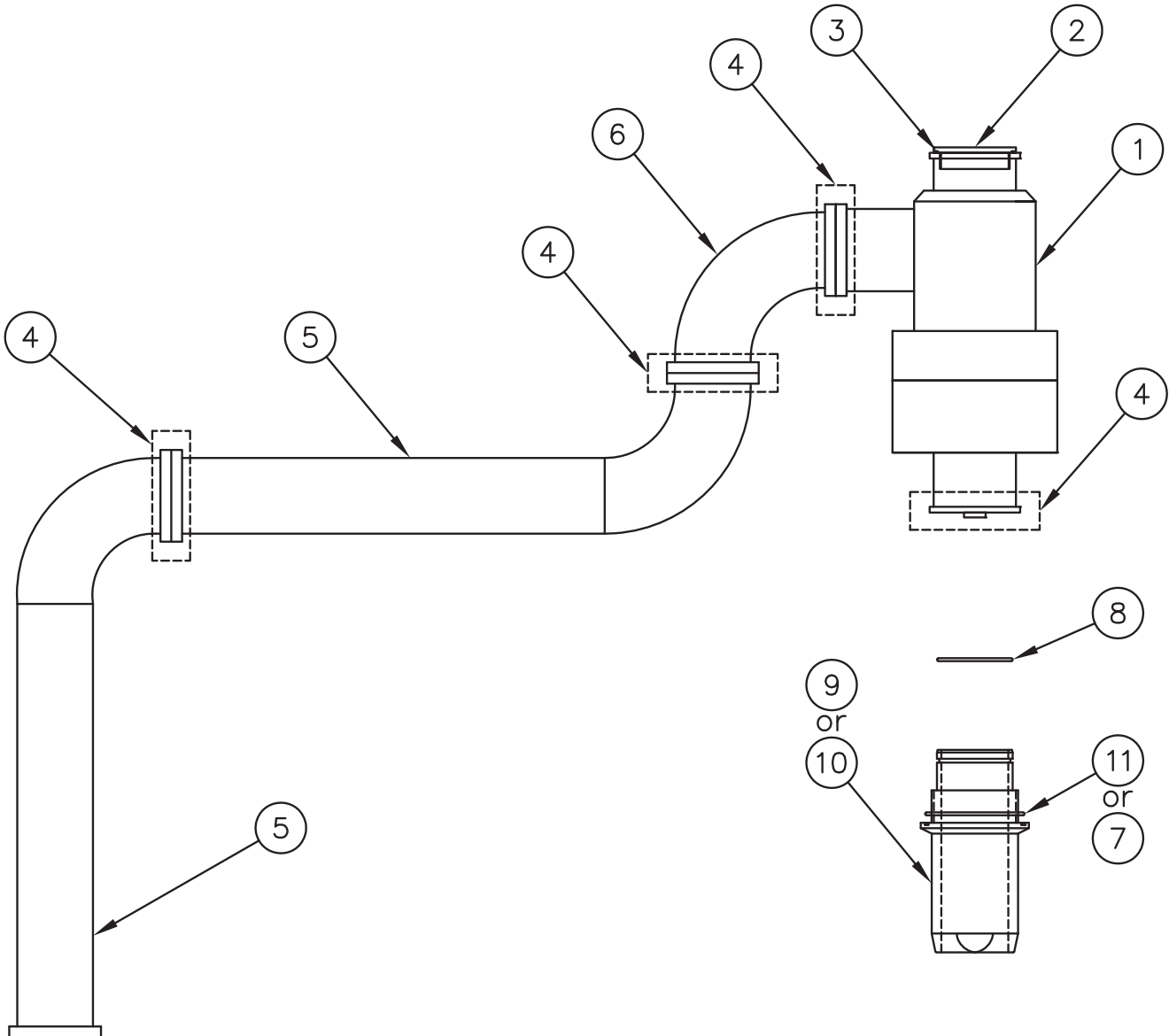


Figure 7-P. Grouting Assembly



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-18. GROUTING ASSEMBLY IDENTIFICATION

1000346

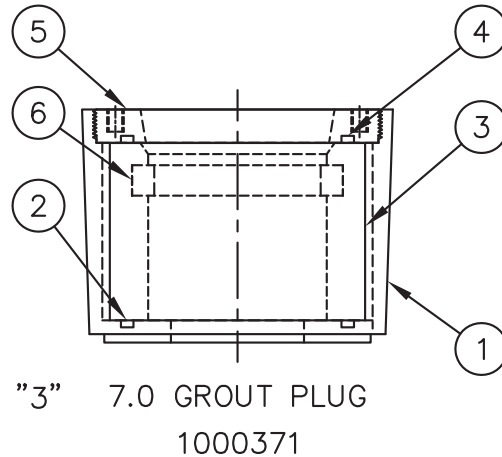
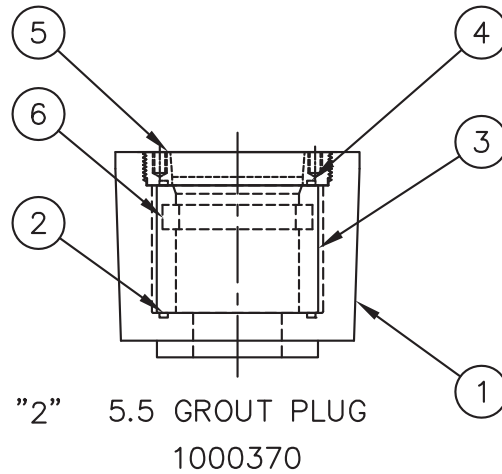
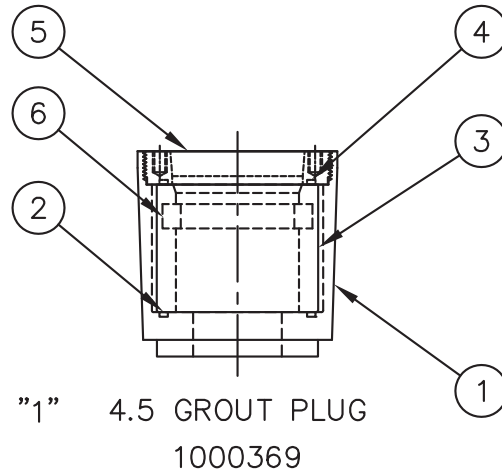
<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	1000341		3" Grout Swivel Modified
2	1000342	1	Cap
3	---	1	2-159 90 Duro O-Ring
4	631057	4	3" Two-Bolt Style Clamp CFB-3
5	631059	2	3" Sch 80 Elbow-Straight Asm 1112-092
6	631058	1	3" Sch 80 Elbow Assembly 1112-091
7	---	1	2-045 O-Ring 90 Duro for small grout stem
8	---	2	2-236 O-Ring 90 Duro
9	HD-100073	1	Grout Stem (Small)
10	HD-100075	1	Grout Stem (Large)
11	---	1	2-245 O-Ring 90 Duro for large grout stem

Table 7-M. Grouting Assembly

VII. ORDERING PARTS

VII-19. GROUT PLUG OPTIONS IDENTIFICATION

1000368





OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-19. GROUT PLUG OPTIONS IDENTIFICATION 1000368

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	1000369	1	Grout Plug Asm for 4-1/2"
	Item	P/N	Qty
	1		1
	2		1
	3		1
	4		1
	5		1
	6	1000767	1
			Body
			2- O-Ring
			Plug
			2- O-Ring
			Top Cap
			Seal
2	1000370	1	Grout Plug Asm for 5-1/2"
	Item	P/N	Qty
	1		1
	2		1
	3		1
	4		1
	5		1
	6	1000767	1
			Body
			2- O-Ring
			Plug
			2- O-Ring
			Retainer Ring
			Seal
3	1000371	1	Grout Plug Asm for 7"
	Item	P/N	Qty
	1		1
	2		1
	3		1
	4		1
	5		1
	6	1000768	1
			Body
			2- O-Ring
			Plug
			2- O-Ring
			Retainer Ring
			Seal

Table 7-N. Grout Plug Options



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MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-20. BLANK PLATE ASSEMBLY IDENTIFICATION 1000439



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MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-18. BLANK PLATE ASSEMBLY IDENTIFICATION 1000439

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	HD-10033	1	Blank Plate (Subs for Clamp Housing)

Table 7-O. Blank Plate Assembly

VII. ORDERING PARTS

VII-21. DRILL MANIFOLD ASSEMBLY IDENTIFICATION

1000642

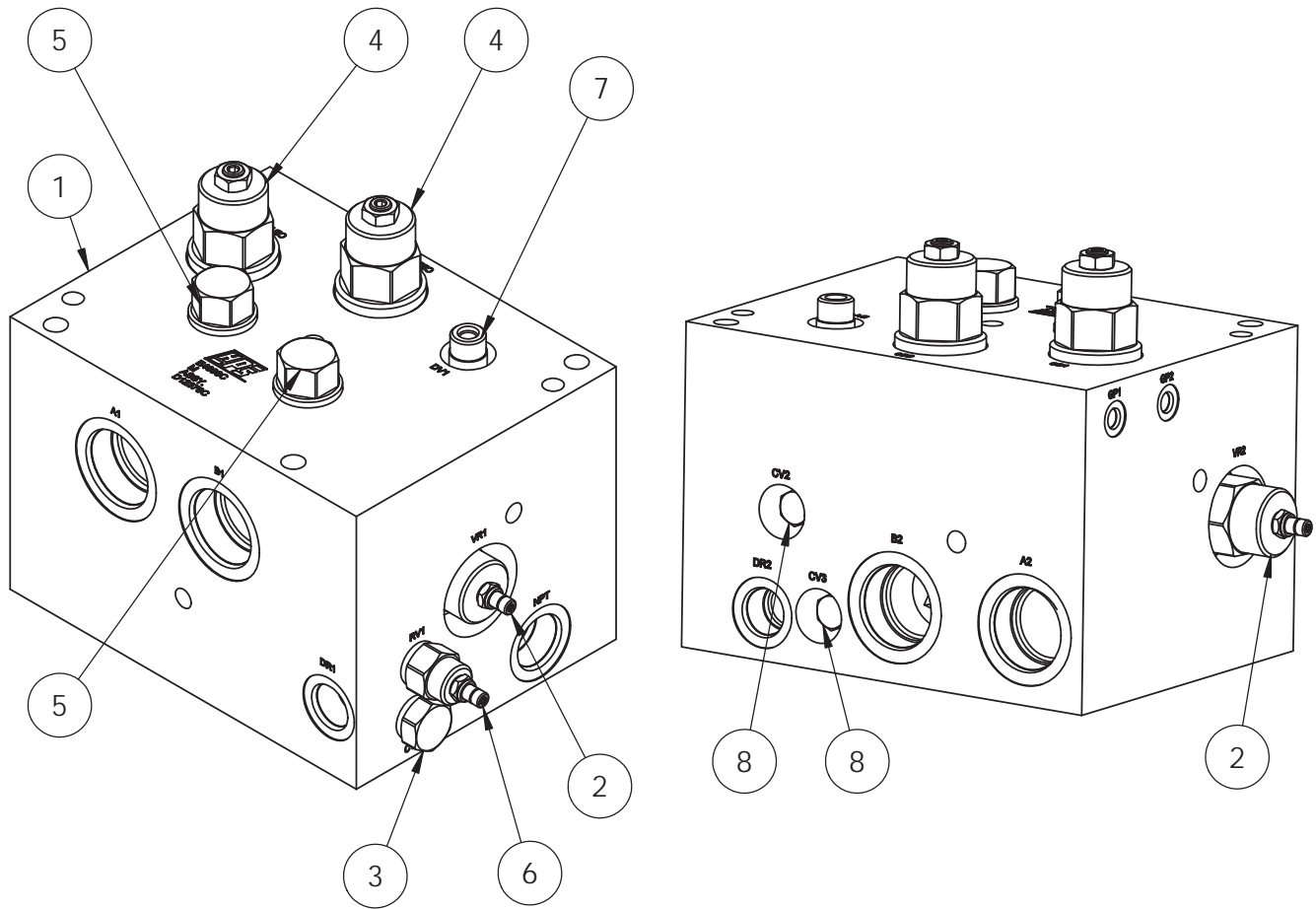


Figure 7-S. Drill Manifold Assembly



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-21. DRILL MANIFOLD ASSEMBLY IDENTIFICATION

1000642

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1		1	Manifold Block
2	1000766	2	RELIEF VALVE
3	352115	1	CHECK VALVE
4	352117	2	COUNTER BALANCE VALVE
5		2	CAVITY PLUG
6	1000834	1	RELIEF VAVLE
7	1000833	1	DIRECTIONAL VALVE
8	1000838	2	CHECK VALVE

Table 7-P. Drill Manifold Assembly

VII. ORDERING PARTS

VII-22. INTERLOCK MANIFOLD ASSEMBLY IDENTIFICATION 1000375

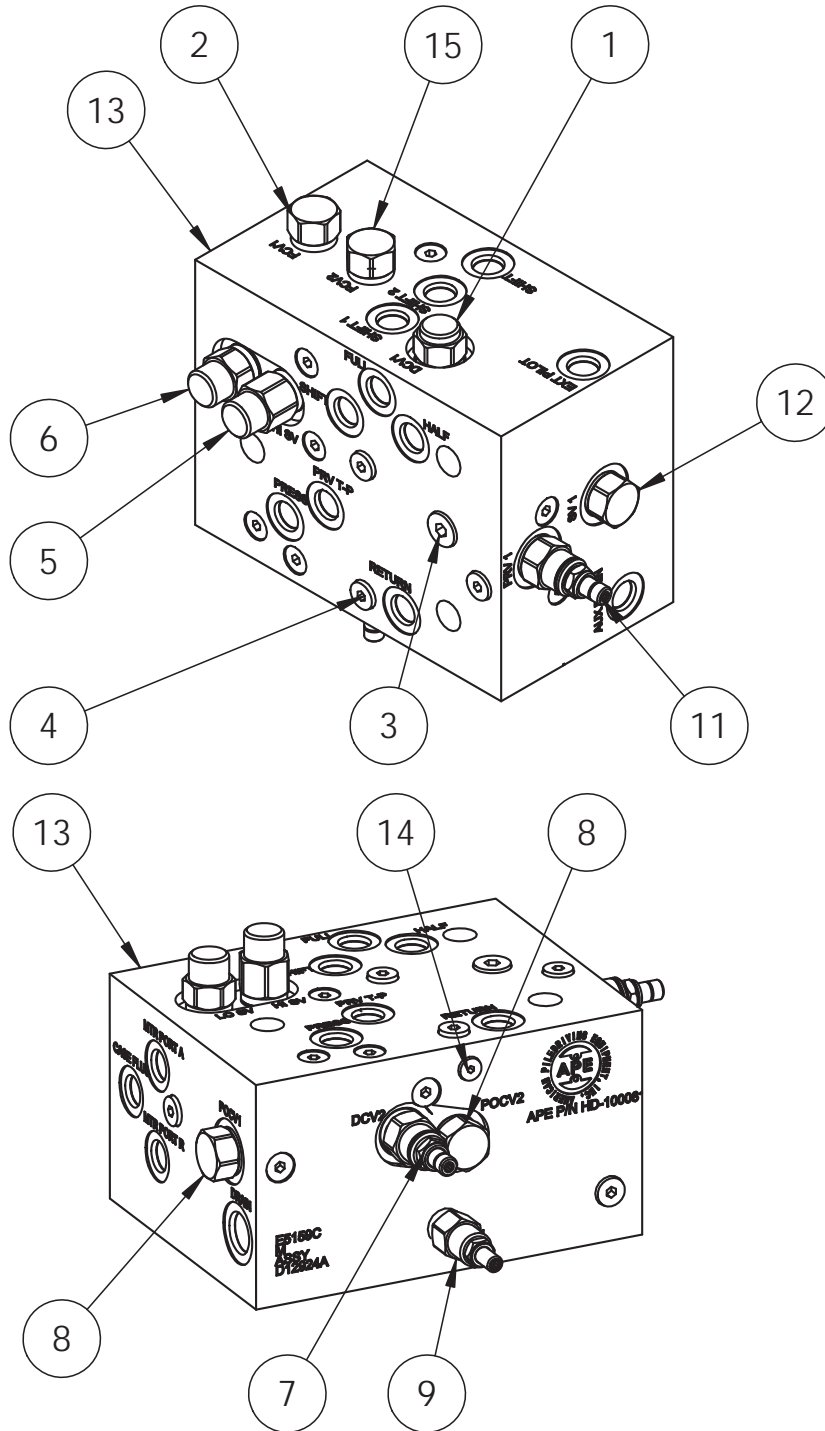


Figure 7-T. Interlock Manifold Assembly



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-22. INTERLOCK MANIFOLD ASSEMBLY IDENTIFICATION 1000375

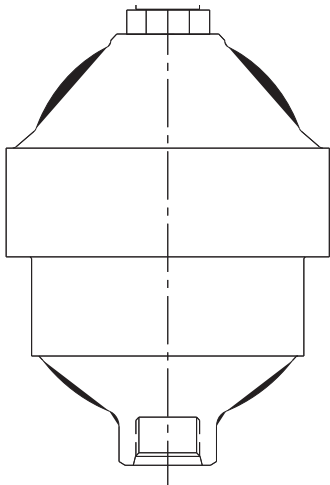
<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	1000791	1	DIRECTIONAL VALVE
2	1000840	1	FLOW CONTROL 1 GPM
3	400992	1	FITT2P-06R
4	110935	14	FITT2P-04R
5	1000794	1	SPEED SHUTTLE VALVE
6	1000793	1	FLUSH SHUTTLE VALVE
7	1000797	1	DIRECTIONAL VALVE
8	1000792	2	CHECK VALVE
9	1000799	1	RELIEF VALVE
10	100646	4	FITT2P-02P
11	1000815	1	REDUCING RELIEF VALVE
12	1000795	1	SHUTTLE VALVE
13	HD-100081	1	MANIFOLD BLOCK
14	170822	1	FITT2P-02R
15	1000790	1	ORIFICE 0.1 GPM

Table 7-Q. Interlock Manifold Assembly

VII. ORDERING PARTS

VII-23. ACCUMULATOR ASSEMBLY IDENTIFICATION

1000442



**Collar
(Clamp)**

**Base
("L" Shaped Bracket)**

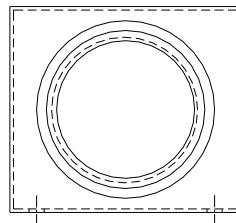
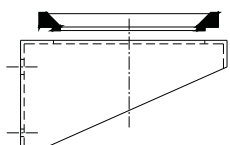
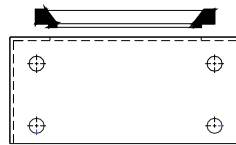
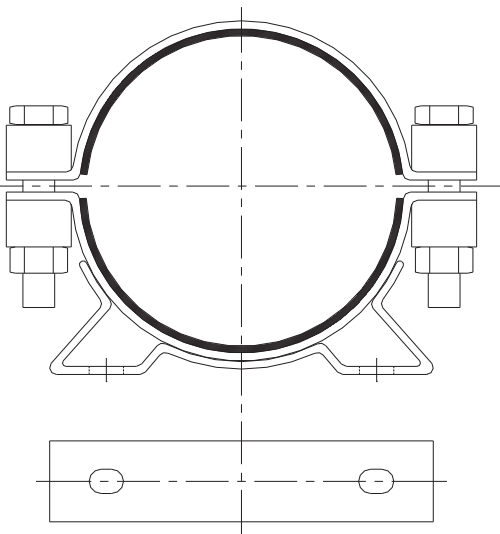


Figure 7-U. Accumulator Assembly



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-23. ACCUMULATOR SSEMBLY IDENTIFICATION 1000442

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>
1	HD-100013	1	Accumulator Bladder Type 30 CUBIC INCH
2	HD-100014	1	Accumulator Mounting Collar
3	HD-100015	1	Accumulator Mounting Base Note 1
4	HD-100016	1	Accumulator Spacer Bar
5		1	Accumulator Rubber Insert
6	1000078	1	Accumulator collar

Note 1. Used only on units 008 and older.

Table 7-R. Accumulator Assembly

VII. ORDERING PARTS

VII-24. SAFETY GATE OPTIONS IDENTIFICATION

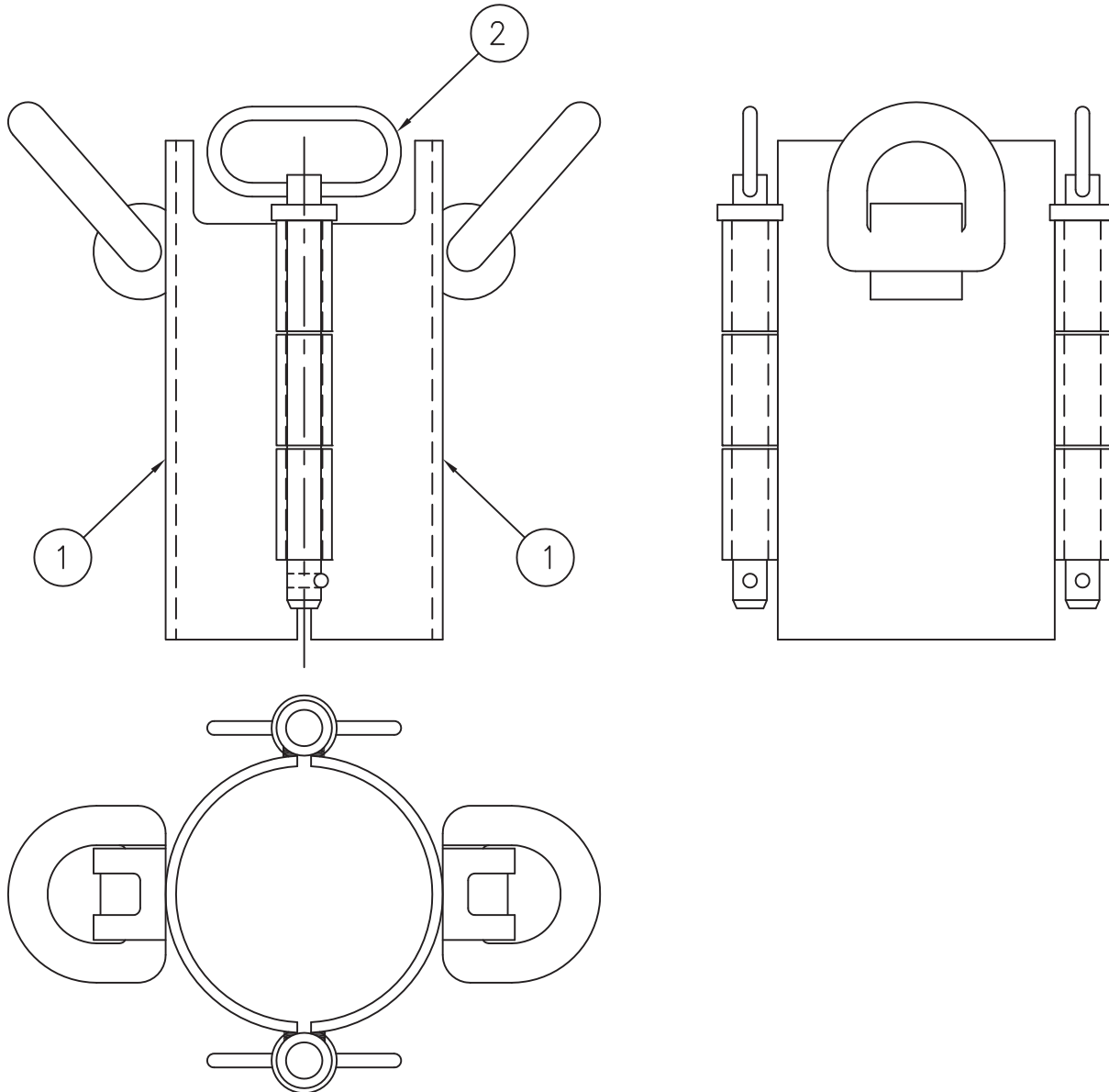


Figure 7-V. Safety Gate Options



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-24. SAFETY GATE OPTIONS IDENTIFICATION

<u>Item</u>	<u>Part Number</u>	<u>Qty.</u>	<u>Description</u>	
1	1000410	1	4.625" SAFETY GATE ASM	
	ITEM	P/N	QTY	
	1	1000417	2	4.625" CUFF
	2	1000416	2	SAFETY GATE PIN
2	1000411	1	5.625" SAFETY GATE ASM	
	ITEM	P/N	QTY	
	1	1000419	2	5.625" CUFF
	2	1000416	2	SAFETY GATE PIN
3	1000412	1	7.125" SAFETY GATE ASM	
	ITEM	P/N	QTY	
	1	1000421	2	7.125" CUFF
	2	1000416	2	SAFETY GATE PIN
4	1000413	1	9.875" SAFETY GATE ASM	
	ITEM	P/N	QTY	
	1	1000423	2	9.875" CUFF
	2	1000416	2	SAFETY GATE PIN
5	1000414	1	12" SAFETY GATE ASM	
	ITEM	P/N	QTY	
	1	1000425	2	12" CUFF
	2	1000416	2	SAFETY GATE PIN
6	1000415	1	13.625" SAFETY GATE ASM	
	ITEM	P/N	QTY	
	1	1000427	2	13.625" CUFF
	2	1000416	2	SAFETY GATE PIN

Table 7-S. Safety Gate Options



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MODEL HD70 HELICAL PILE DRILL

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VII. ORDERING PARTS

VII-25. RECOMMENDED BOLT 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.



OPERATION / MAINTENANCE MANUAL

MODEL HD70 HELICAL PILE DRILL

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