Operation & Service Manual
823213
08/19/2011

Quackenbush®

230QGDAB Series
Positive Feed Drills

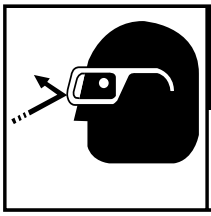
Models:
230QGDAB-B-SU-MS
230QGDABV-B-SU-MS

For additional product information visit our website at corvaer.com

Safety Recommendations

For your safety and the safety of others, read and understand the safety recommendations and operating instructions.

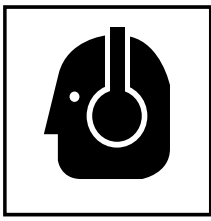
Always wear protective equipment:



⚠ WARNING

Impact resistant eye protection must be worn while operating or working near this tool.

For additional information on eye and face protection, refer to Federal OSHA Regulations, 29 Code of Federal Regulations, Section 1910.133., Eye and Face Protection, and American National Standards Institute, ANSI Z87.1, Occupational and Educational Eye and Face Protection. Z87.1 is available from the American National Standards Institute, Inc., 11 West 42nd Street, New York, NY 10036.



⚠ CAUTION

Personal hearing protection is recommended when operating or working near this tool.

Hearing protection is recommended in high noise areas, 85 dBA or greater. The operation of other tools and equipment in the area, reflective surfaces, process noises and resonant structures can substantially contribute to and increase the noise level in the area. For additional information on hearing protection, refer to Federal OSHA Regulations, 29 Code of Federal Regulations, Section 1910.95, Occupational Noise Exposure, and American National Standards Institute, ANSI S12.6, Hearing Protectors.

⚠ WARNING

Do not wear loose fitting clothes, long hair, gloves, ties or jewelry.

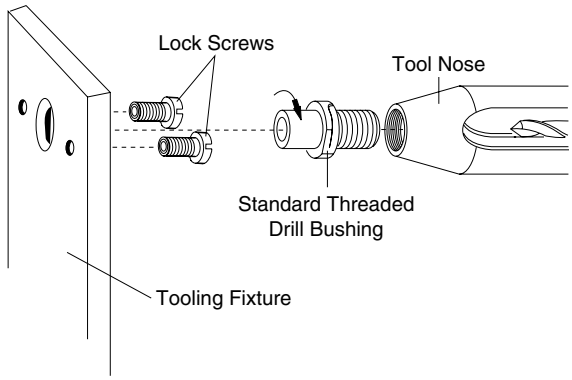
Follow good machine shop practices. Rotating shafts and moving components entangle and entrap, and may result in serious injuries. Never wear long hair, loose-fitting clothes, gloves, ties, or jewelry when working with or near a drill of any type.

⚠ CAUTION

- Quackenbush drills are designed to operate on **90psig (6.2 bar) air pressure**. Excessive air pressure can increase the loads and stresses on tool parts and drills, and may result in breakage. The installation of a filter-regulator-lubricator in the air supply line is highly recommended.
- Before removing a tool from service or changing drill bits, make sure the air line is shut off and drained of air. This will prevent the tool from operating if the throttle is accidently engaged.
- Cutting tools used with these Quackenbush drill motors are sharp. Handle them carefully to avoid injury.

⚠ CAUTION

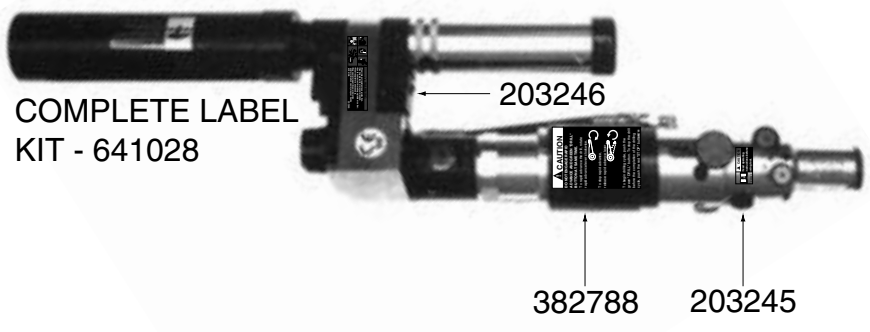
Before mounting any positive feed drill, check the lock screws in the tooling fixture and drill bushing. Make sure both are in good condition and securely tightened.



Positive feed drills can exert high torques and high thrust loads. If failure of the lock screws or drill bushing occurs, the drill may suddenly spin and back away from the drill fixture.

Warning Labels

The warning labels found on these tools are an essential part of this product. Labels should not be removed. Labels should be checked periodically for legibility. Replace warning labels when missing or when the information can no longer be read. Replacement labels can be ordered from the manufacturer.

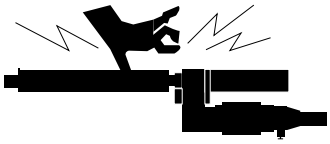


Safety Recommendations

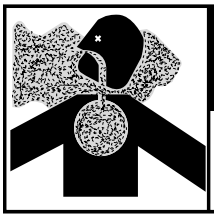
⚠ CAUTION

The spindle on right angle positive feed drills retracts at a much faster rate than it feeds. Care should be taken to avoid entrapment. Nose pieces usually used with these drills are generally slotted for visibility and access to chuck, cutter, and retract stop adjustments. A spindle guard should be used when operating tool. Spindle guards in one inch increments are available to accommodate any length spindle. Slotted spindle guards are available for tools with fluid swivels.

⚠ WARNING



Keep fingers and hands away from this area when handling or operating tool.



⚠ WARNING

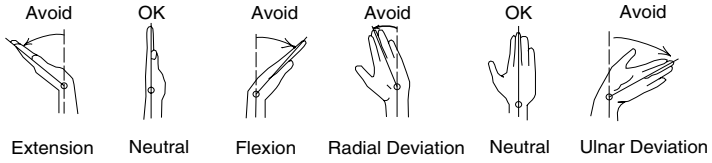
Wear respirator where necessary.

Drilling or other use of this tool may produce hazardous fumes and/or dust. To avoid adverse health effects utilize adequate ventilation and/or a respirator. Read the material safety data sheet for any cutting fluids or materials involved in the drilling process.

⚠ WARNING

- Most dusts are combustible. See material safety data sheets for combustibility of a specific dust.
- Non ferrous metal dusts are particularly hazardous.
  Examples: Aluminum, Magnesium, Titanium, Zirconium
  (Never collect Magnesium in a dry dust collector)
- Never collect spark generating material in the same dust collector with combustible material.
  Examples: Collecting both steel and Aluminum dust or Steel and Titanium dust.
- Never use flammable finishing lubricants.

Some individuals are susceptible to disorders of the hands and arms when exposed to tasks which involve repetitive work motions. Those individuals predisposed to vasculatory or circulatory problems may be particularly susceptible. Cumulative trauma disorders such as carpal tunnel syndrome and tendinitis can be caused or aggravated by repetitious, forceful exertions of the hands and arms. These disorders develop gradually over periods of weeks, months, and years.



- **Tasks should be performed in such a manner that the wrists are maintained in a neutral position, which is not flexed, hyperextended, or turned side to side.**

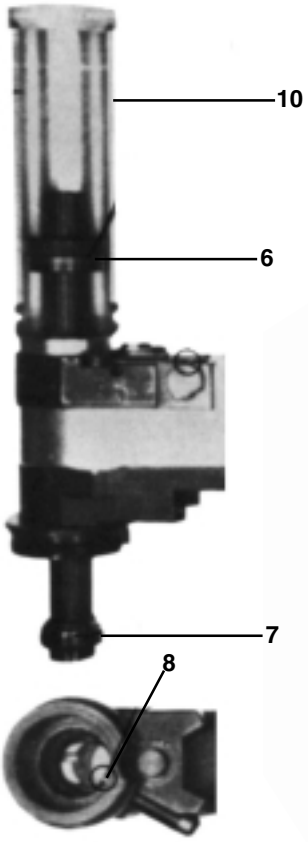
- **Stressful postures should be avoided and can be controlled through tool selection and work location.**

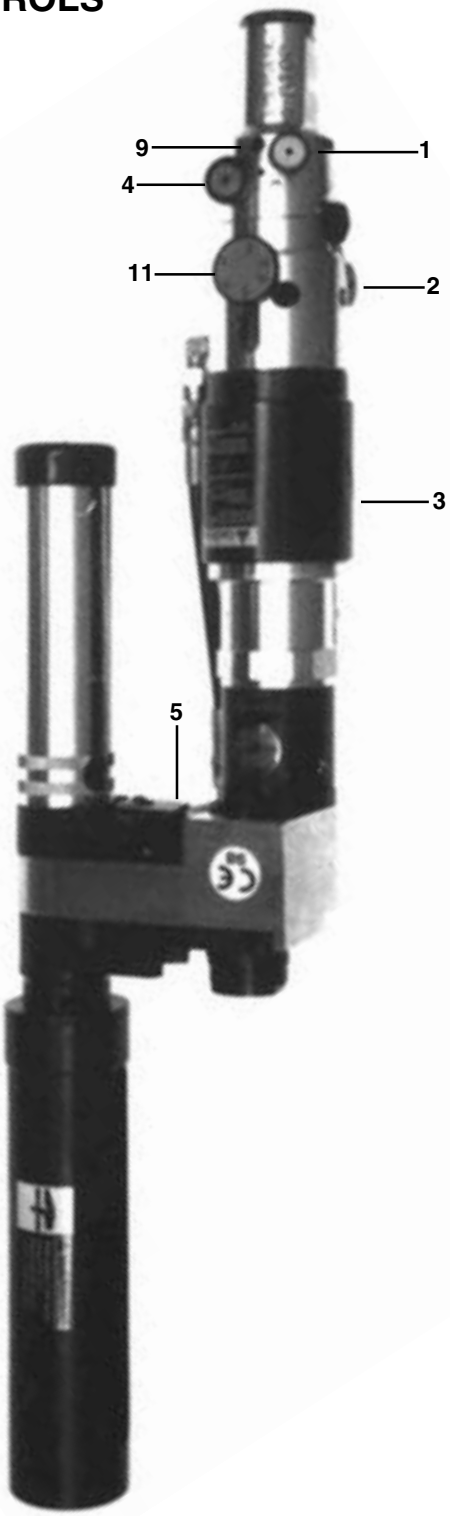
Any tool operator should be aware of the following warning signs and symptoms so that a problem can be addressed before it becomes a debilitating injury. Any user suffering prolonged symptoms of tingling, numbness, blanching of fingers, clumsiness or weakened grip, nocturnal pain in the hand, or any other disorder of the shoulders, arms, wrists, or fingers is advised to consult a physician. If it is determined that the symptoms are job related or aggravated by movements and postures dictated by the job design, it may be necessary for the employer to take steps to prevent further occurrences. These steps might include, but are not limited to, repositioning the workpiece or redesigning the workstation, reassigning workers to other jobs, rotating jobs, changing work pace, and/or changing the type of tool used to minimize stress on the operator. Some tasks may require more than one type of tool to obtain the optimum operator/tool/task relationship.

The following recommendations will help reduce or moderate the effects of repetitive work motions. The operator of any drill should:

- Use a minimum hand grip force consistent with proper control and safe operation
- Keep body and hands warm and dry
- Avoid anything that inhibits blood circulation
  - — Smoking Tobacco
  - — Cold Temperatures
  - — Certain Drugs
- Avoid awkward postures
- Keep wrists as straight as possible
- Interrupt work activities, or rotate jobs to provide periods free from repetitive work motions.

MAJOR TOOL CONTROLS





MAJOR TOOL CONTROLS

1	**Emergency Stop Button**
2	**Rapid Advance Lever**
3	**Exhaust Deflector**
4	**Drill Button**
5	**Manual Retract Lever**
6	**Adjustable Depth Stop**
7	**Retract Stop Collar**
8	**Signal Valve**
9	**Throttle Piston**
10	**Rear Spindle Guard**
11	**Variable Speed Control**

AIR SUPPLY

AIR PRESSURE, HOSES, AND COUPLINGS:

This tool is designed to operate at 81dbA on 90-110 psig (6.2-7.6 bars) supply pressure using a 1/2" hose up to 20 ft. in length. If additional hose is needed, a 5/8" or larger diameter hose should be connected to the 1/2" in. hose. Quick disconnect couplings (if used) should have flow capacity ratings exceeding 60 SCFM.

LOW PRESSURE:

This drill will shut-off automatically (while drilling or when retract begins) if the pressure at the tool inlet drops below 65 psig (4.5 bars). Manual restart is required. The drill will not continue to run when the green drill button is released if the pressure at the tool inlet is low.

HIGH PRESSURE:

This drill shuts off automatically at the end of the retract cycle. If the pressure at the tool inlet is over 115 psig (7.9 bars) the tool may continue to retract, jamming the retract stop collar into the housing cover causing the tool to either stall or shear the shear pin.

OPERATING INSTRUCTIONS

If the tool has been shipped recently, been in storage, or repaired, or disassembled; it should be run (without spindle) through a "tool crib check" of functions.

EMERGENCY STOP—Depressing the red emergency stop button **1** will stop the tool, except when the rapid advance mode is being utilized. Releasing the rapid advance lever **2** will stop the tool.

RAPID ADVANCE—Depressing the rapid advance lever **2** will advance the cutting tool to the work surface faster than the regular feed rate and stops advancing forward automatically until the green drill button **4** is depressed. Note: When the rapid advance lever is depressed, the exhaust deflector **3** will move forward (toward the head) approximately 3/8" and return to its original position when the lever is released.

DRILLING—Press the green drill button **4** firmly and release it to start the drilling cycle. The cutter will feed to a predetermined depth, dwell, and then retract. The drill motor will shut off automatically at the end of the retract stroke. The cutter may be manually retracted at any time by raising the retract lever **5**.

IMPORTANT: The spindle retracts at a much faster rate than it feeds. Care should be taken to avoid entrapment.

Do not hold the drill button down during the end of the retract stroke—this prevents "motor stop".

DEPTH ADJUSTMENT:

DEPTH COLLAR—Has four (4) holes for adjusting depth in increments of .005". Going from one hole to the next and using the same slot in the spindle will either increase (clockwise) or decrease (counterclockwise) the depth by .005". Using the same hole and rotating the collar 90° will give an adjustment of .020" and 360° will give an adjustment of .080". Tighten lock screw after each depth adjustment. Tip of lock screw must go into a spindle slot. IMPORTANT NOTE: To insure maximum repeatability, the work surface, fixtures, and depth stop must be cleared of any chips or foreign material before beginning the next hole. Always replace the rear spindle guard after making a depth adjustment.

TOOL CRIB CHECK

1. With air supply shut off, remove rear spindle guard.

2. Remove depth stop **6** (left hand threads).

WARNING: Keep hands and clothing clear of rotating spindle, turn air supply on and use rapid advance to remove spindle.

3. Shut off air supply pressure.

4. Depress 5/16" diameter steel end of throttle piston **9**. The throttle piston must spring return quickly when released.

5. With air supply on, move rapid advance lever **2** all the way. Motor runs and spindle feed gear (threaded I.D.) must not rotate. Spindle drive gear (splined I.D.) rotates. Shear pin is whole and intact.

6. Release rapid advance lever **2** and press green drill button **4** all the way in. Motor starts. Release drill button **4**. Motor continues to run. Both gears (splined and threaded) rotate.

7. Lift manual retract lever **5** and release. An audible "snap" indicates the retract valve 382333 is shifting as desired. Spindle feed gear (threaded I.D.) stops rotating.

8. Depress signal valve **8** with screwdriver and release. Motor stops and retract valve 382333 must reset (manual retract lever **5** should drop). Depress red stop button **1** slowly. There should be no venting of air as the stop button **1** is depressed.

9. The lift arm assembly 382665 must be intact, undamaged, and in place in the upper block. The lift arm assembly is factory adjusted (new tool) for little or no play.

10. Press green drill button **4** and release. Motor starts. Press stop button **1**. Motor stops. Do not proceed with test if steps 1 through 10 indicate malfunction.

11. WARNING: Keep hands and clothing clear of rotating spindle. Using tool 382593, install spindle (with retract stop collar **7** locked in place). The spindle will retract fully into the head and the motor will stop automatically. The retract valve 382333 must reset (manual retract lever **5** should drop) and there should be no venting of air when the stop button **1** is depressed.

12. Screw depth stop **6** (left hand threads) onto the rear end of the spindle and lock in place. Rapid advance until depth stop **6** bears against back of drill head. Rapid advance clutch will "chatter". Manual retract lever **5** must not rise as clutch "chatters". Release rapid advance lever.

13. Depress green drill button **4** and release. Motor starts. Retract lever **5** rises and spindle retracts automatically to full retract position. Motor will stop automatically.

14. Replace rear spindle guard.

INSTALLING A SPINDLE:

Run a "Tool Crib Check" (page 5)

Important: Retract stop collar **2** 382579 must be in place and locked on the spindle. Install the spindle in the spindle drive gear 617200 and use spindle "in & out" tool 382593 to push the spindle "in". Depress the green drill button to start the motor and raise the manual retract lever **5**. The spindle will retract. Release the drill button. The spindle will continue to retract until the retract stop collar **7** depresses the signal valve **8** and the tool will automatically shut off. Note: When the retract stop collar **7** is near or touching the signal valve **8**; Do not press the green drill button **4**; as this will prevent tool shutoff and jam the spindle into the head.

CHANGING FEED GEARS—Remove (left hand threads) the adjustable depth stop **6** from the rear of the spindle. Using the spindle "in & out" tool 382593 to support the front of the spindle, depress the rapid advance lever **2** and feed the spindle forward until the spindle feeds itself out of the spindle feed gear. Release the rapid advance lever, shut off the air supply, and pull the spindle out of the spindle drive gear. Remove the side hose assembly. Unscrew and remove one (1) 6-32 x 1 (7164" hex) socket head cap screw 382539 and two (2) 1/4-20 x 2-1/4 (3/16" hex) socket head cap screws 867839 Note: Clamping the tool in a vise will make removal of the screws more convenient. Insert finger in spindle feed gear to prevent the eighteen (18) 7/32" balls 842160 from being lost when removing upper block assembly and spindle feed gear. Remove differential feed gear. Remove gear holder 382557. Refer to the feed chart on assembly drawing for the appropriate feed gears. The feed gears are marked with the number of teeth each one has— example 33T (thirty three teeth). After installing the replacement gears, be sure that gear holder 382557 is aligned and in place. The right angle head should be securely clamped in the vise and compressed so that the two (2) cap screws 867839 and cap screw 382539 can be firmly tightened.

SHEAR PIN MAY SHEAR BECAUSE:

1. Motor doesn't stop at full retract, or the retract valve did not reset. Retract collar **7** jams into housing cover 382582 or 382591. Pin shears.

2. Packed chips or dull cutter may overload the spindle. Feed rate may be too high. Drilling or reaming may be beyond the torque capability of this right angle drill. Pin shears.

3. Improper adjustment of lift arm assembly may prevent automatic retract when the depth stop **6** contacts the drill head. If this occurs possible damage to gears and shearing of pin will result.

4. Gear teeth have broken, spindle threads have been damaged, or parts inside the drill head have failed.

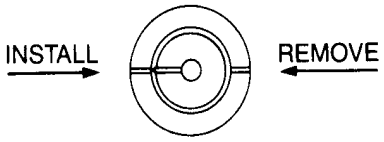
DOES NOT REQUIRE DISASSEMBLY:

1. Does not require disassembly of drill head, spindle may be freed in this manner:
   - A. Turn off air supply.
   - B. Remove tool from drilling fixture.
   - C. Rotate spindle with wrench (CCW from rear). . . opposite drilling direction 2 or 3 turns. This will require high torque.
   - D. When spindle is free, replace shear pin. Leave the pin guard in place. Supply air pressure and rapid advance the spindle out of the drill head.
   - E. Correct malfunction and run "Tool Crib Check".

2. Turn off air supply.
   - A. Remove tool from drilling fixture.
   - B. Correct torque overload problem.
   - C. Replace shear pin.
   - D. Make sure the pin guard is in good condition and in place.
   - E. Return tool to service.

3 and 4 require disassembly, cleaning, inspection, and replacement of damaged parts inside the drill head. All parts inside the drill head should be washed and re-greased. When cause of malfunction is corrected, run "Tool Crib Check" (page 5).

SHEAR PIN INSTALLATION AND REMOVAL

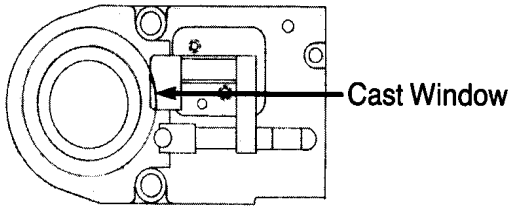


CHANGING RAPID ADVANCE CLUTCH SPRING: Unscrew and remove the clutch cover 382537. Drive the shear pin out of the driven gear 629046 and clutch shaft 382525. Remove clutch assembly from right angle head. Clamp the clutch assembly in the vise to remove the spring load before driving the roll pin 415019 out of the lower clutch jaw 382535. Remove from the vise and slip the clutch shaft 382525 out of the pinion and clutch hub 382526.

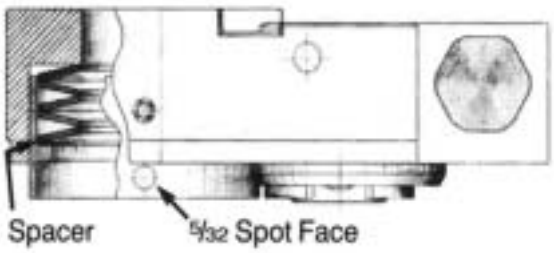
CHANGING THRUST PACKAGE: Remove the upper block assembly following the instructions for changing feed gears (place finger into the spindle feed gear to keep the eighteen (18) balls from falling out). Remove the feed gear and eighteen (18) balls. Clamp the spring case 382663 and upper block assembly in the vise to compress the thrust package. Use a 7/32" hex wrench to remove the two (2) 1 0-32 x 1/4" set screws 382637. Remove the assembly from the vise and slip the spring case and thrust package out of the upper block.

REASSEMBLY:

Turn the two (2) set screws 382637 in until the tips are nearly flush with the bore (must clear spring case). Place one bead of thread locking liquid on outer thread of each set screw. Using a vise (or similar device), align the spring case (with Belleville washers inside) and compress somewhat, until the 5/32" dia. spotface is in the position shown. Tighten each set screw 1 & 1/2 turns, and remove from vise. Set screws should retain spring case; but allow spring stack to compress and "spring back".



Note: Milled slot on top rim of spring case must be visible thru cast window in the upper block.



Note: Spring washers must be stacked exactly as shown. A spacer may be included in the spring stack and must be installed under the bottom washer against the spring case. Align the bore of the spring washers to clear the 7/8" O.D. of the spindle.

LUBRICATION:

An automatic in-line filter-lubricator is highly recommended. This will supply the tool with clean, lubricated air; keep it in sustained operation; and increase tool life.

The in-line lubricator should be regularly checked and filled with a good grade of 10W machine oil. In the event an in-line lubricator is not used, the tool should be disconnected from the air supply several times daily and several drops of oil poured into the tool's air inlet bushing.

The right angle drill head should receive a generous amount of "Lubriplate #907" grease every fifteen (15) to twenty-five (25) hours of "actual motor running" time through the two (2) flush type grease fittings in the right angle housing. "Lubriplate #907" may be purchased in a 5 gallon can using Part No. 107210.

GENERAL MAINTENANCE:

Tool Maintenance and Pressure Test Equipment Kit 381273 is available and can be used for some trouble shooting.

Air control system filter 382505 located in the handle 382480 should be replaced every 2000 drilling cycles or when low air control system pressure is suspected.

Spindle threads should be blown clean and lubricated every 100 drilling cycles.

DISASSEMBLY—DRILL HEAD:

Remove the side hose assembly. Clamp the drill head in vise and loosen lockring 619421. Unscrew and remove power unit. Remove shear pin. Unscrew one (1) 6-32 x 1 (7/64" hex) socket head cap screw 382539 and two (2) 1/4-20 x 2 1/4 (3/6" hex) socket head screws 867839. Clamp drill head in upright position in vise. Insert finger in spindle feed gear to prevent the eighteen (18) 7/32" balls 842160 from being lost when removing upper block assembly. Remove upper block assembly. Remove gear holder 382557. Unscrew the two (2) 1/4-20 x 7/8 (3/1 6" hex) socket head cap screws 865123 and remove the housing cover 382582 or 382591. Gears will come out with housing cover.

DISASSEMBLY—GEAR TRAIN:

SINGLE REDUCTION—Unscrew and remove the lock ring 619421. Clamp the flats of the internal gear case 382590 in the vise and unscrew the motor housing 382509. Remove the spider assembly from the gear case. Remove the rear ball bearing 613281. Remove the three (3) idler gear pins and gears. Hold a large hex wrench or similar tool on the side of the spider and clamp in the vise. Heat the spider and pinion to approximately 300°F. Insert a suitable pin thru the hole in the pinion 629045 and unscrew the pinion. Use Tool Maintenance and Pressure Test Equipment Kit 381273 for easier disassembly.

DOUBLE REDUCTION—Unscrew and remove the lock ring 619421. Clamp the flats of the internal gear case 382590 in the vise and unscrew the motor housing 382509. Unscrew and remove the internal gear and housing 617369. Remove the rear ball bearing 613281 from both spiders. Remove the six (6) idler gear pins and gears. Hold a large hex wrench or similar tool on the side of the second reduction spider and clamp in the vise. Heat the spider and pinion to approximately 300°F. Insert a suitable pin thru the hole in the pinion 629045 and unscrew the pinion. Use Tool Maintenance and Pressure Test Equipment Kit 381273 for easier disassembly.

FOR VARIABLE SPEED TOOLS, SEE PAGES 10 AND 11

DISASSEMBLY—MOTOR UNIT:

Clamp the handle in a vise with the motor housing upwards. Unscrew both the motor housing 382509 and the turnbuckle collar 382508 in unison from the handle. Tap motor and motor housing on wooden bench top to remove motor unit. Hold either the pinion gear 617609 or rotor nut 382522 and unscrew (left hand threads) the governor assembly. Remove the rear bearing 864522, bearing plate 867369, cylinder 867377, and three (3) rotor blades 382520. Note: Check the function of the rotor blade kickout pins at this time. Blades should stick out approximately 1/8". If required, the spring cap 382514 must be drilled and tapped for removal. Clamp the body of the rotor in the vise and unscrew the pinion 617609 or nut 382522.

Before disassembling the governor, note which "step" the adjustment ring pin 867187 is "on" in the adjustment ring 867214. Depress the adjustment ring and remove the pin. Remove the pin retainer 864532 and remove the two (2) governor weight pins 867184.

DISASSEMBLY—MOTOR BACKHEAD

Important Note: Pressure cap 382507 must not be unscrewed while the motor backhead is connected to air supply. This cavity is supplied with high pressure air whenever the backhead is connected to the air system. Remove pressure cap, spring 864681, ball 812156, and pin 847031. Rapid advance valve 382501 may be removed by unscrewing valve cap 382502 and removing retainer ring 869460. The rapid advance lever 382503 may be removed by unscrewing (3/16" hex) the flat head cap screw 382504.

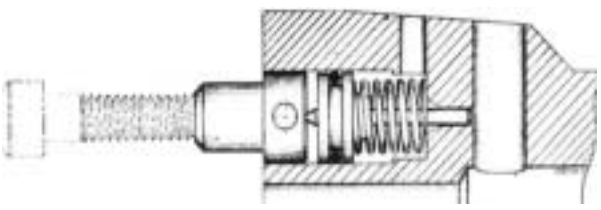
DISASSEMBLY— HANDLE

Unscrew plug 864387 and remove drill button spring 622833. Depress the drill button 382484 and use a 1/8" diameter rod to unscrew button guard 382671.

Unscrew inlet bushing 867758 and remove spring 863072 and throttle valve 202365.

Unscrew end cap 382668 and spring 382489. Push out throttle piston 382677.

Screw a 1/4-20 cap screw into the metering seat 382491. Clamp the cap screw in the vise and use a soft faced hammer to drive the handle off.



Filter 382505 located in 13/32" dia. hole adjacent to the metering seat should be checked and replaced if necessary.

The emergency stop button 381243 should not be removed unless the O-ring 844301 needs replacing. Clamp the stop button in the vise and use a soft faced hammer to drive the handle off. Tap the bushing 202354 with a 1/4-20 thread. Screw a 1/4-20 bolt in the vise. Drive the handle off.

Unscrew the check valve seat 382487 and remove O-ring 844302, 3/16" steel ball 842161 and check valve spring 382488. NOTE: Spring is very small.

FOR VARIABLE SPEED TOOLS, SEE PAGES 10 AND 11

REASSEMBLY— GENERAL

The tool is reassembled in the reverse order of disassembly. Clean all parts thoroughly in a solvent and inspect for damage or wear. Check all bearings for wear which can be detected by excessive end play and/or roughness which would indicate a brinelled condition. Inspect and replace any O-ring that is damaged or worn. Rotor blades should be replaced at every repair cycle or if they measure less than 1/4" (6.35mm) at either end. All gear teeth, bearings, and pins should receive a close inspection and be replaced if necessary.

All gears and bearings in the planetary gear train should receive a generous amount of NLGI 2-EP grease during reassembly.

All gears and bearings in the right angle drill head should receive a generous amount of "Lubriplate #907" grease during reassembly.

Lubricate all O-rings during reassembly with 10W machine oil.

HANDLE REASSEMBLY:

Insert throttle piston 382677 (with O-rings) into throttle piston cylinder 382676. Replace spring 382489 and end cap 382668.

Rotate the throttle piston 382677, to line up the slot for the throttle valve 202365. Replace spring 863072, O-ring, and inlet bushing 867758. If the screen in the inlet bushing is torn or clogged, replace the inlet bushing.

Insert spring 382489, O-ring 844307, and latch piston 382490, into handle. Line up the air ports in the metering seat 382491, and handle 382480, and tap the metering seat into the handle until the shoulder on the seat is flush with the surface of the handle. Use a 1/4-20 bolt to tap or press the metering seat. Install the drill button and shaft assembly 381171, using a thread retaining compound. Install the drill button spring 622833 and plug 864387 with O-ring.

Press the stop button assembly 381243, into the handle until the shoulder on the bushing is flush with the handle.

When installing the check valve assembly, the spring 382488, should be installed with the small coil up. Use a slender rod. Place the 3/16" steel ball 842161, on the small coil and the O-ring 844302, on the top of the ball. Install the check valve seat 382487, and O-ring 844303, and tighten firmly.

MOTOR BACKHEAD REASSEMBLY:

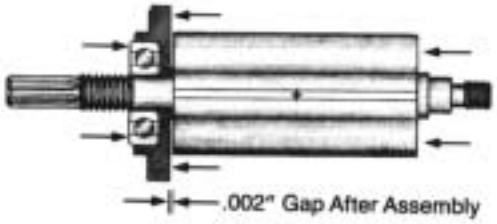
Install rapid advance valve 382501, muffler plate 382506, and retainer ring 869460. Put on muffler 869850, exhaust deflector 869844, and valve cap 382502. Fit rapid advance lever 382503, into detents and tighten flat head screw 382502, tight.

Place 9/32" steel ball 812156 in 25/64" dia. hole and rap with a soft metal punch to form aluminum seat. Be certain that pin 847031 moves freely in hole. Install pin, ball, spring 864681, and pressure cap 382507.

FOR VARIABLE SPEED TOOLS, SEE PAGES 10 AND 11

MOTOR AND GOVERNOR REASSEMBLY:

Assemble governor and pin retainer 864532. Seat the front rotor bearing 842870, in the front bearing plate 382521, and support the bearing on its outer race. Measure from the face of the bearing plate to the bearing inner race. Select or fit by sanding a rotor collar .002" longer than this measurement. Install the rotor collar (chamfered side first) and bearing plate assembly on the rotor. Tighten rotor pinion 617609, or rotor nut 382522, to approximately 35 ft. lbs. (47.5 Nm). When installing the rotor blades 382520, be certain that the rotor blade kick-out pins are working. Assemble the three (3) rotor blades, cylinder 867377, rear bearing plate 867369, rear bearing 864522, and governor assembly. Be certain pin retainer 864532, is in place. Tighten (left hand threads) the governor assembly or rear rotor nut 382523, almost as tight as the pinion gear or front rotor nut.

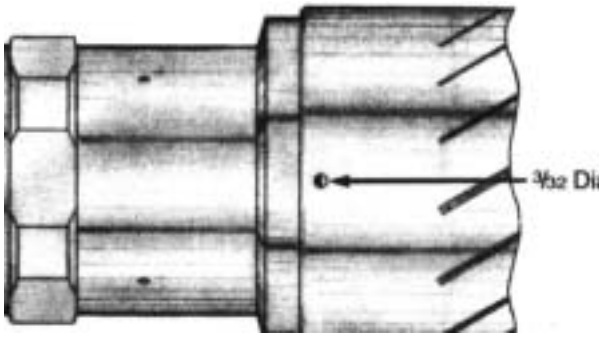


FOR VARIABLE SPEED TOOLS, SEE PAGES 10 AND 11

MOTOR HOUSING AND RUNNING MOTOR:

Work the motor unit into the housing and clamp the housing in the vise with the governor assembly up.

Work the muffler element 382517, into the exhaust deflector 382516. Assemble the O-ring 864589, onto the turnbuckle collar 382508. Place spring 619394, on motor housing 382509, and work the exhaust deflector on, compressing the spring. Screw (left hand threads) the turnbuckle collar on until the 3/32" dia. hole in the front of the exhaust deflector is half covered.



Screw the motor backhead onto the motor housing (prevent turnbuckle rotation), clamping the motor unit securely. Use two (2) 1/4-20 cap screws and wooden hammer handle to tighten the motor backhead.

Install gasket 382492, and handle 382480, on the backhead, 16 ft. lbs. (21.7 Nm) minimum. Be sure to include filter 382505.

Temporarily plug the 1/8 NPT port in the motor backhead with a pipe plug.

Invert unit and clamp in vise on the handle flats with motor gear up.

NOTE: The exhaust deflector moves forward approximately 3/8" when rapid advance lever is depressed.

Apply 90 PSI air to the inlet bushing. Do not press drill button. Operate the rapid advance lever and release, several times. The 9/32" dia. steel ball should seat without leakage, and there should be little or no slack in the lever. Pin 847031 may require hand grinding to proper length. Make certain the air supply is shut off and drained before removing pressure cap 382507. If the pin is too short, get a new pin and resize. Tighten pressure cap securely.

It does not matter whether the rotor has been turning or not; but the following method should get the motor running with the least chance of rubbing.

Place wrenches on the motor housing hex and the turnbuckle collar flats rotating them together to loosen the threaded joint between the turnbuckle collar and the motor backhead 1/4 turn.

Put a few drops of 10W machine oil into the inlet bushing and apply 90 PSI air pressure to the motor unit. Press the drill button. The motor should run forward at governed speed. Then using both wrenches, tighten the motor housing and the turnbuckle collar in unison to securely clamp the motor unit.

Adjust governed speed when needed by removing the motor backhead and rotating the governor adjusting ring 867214. Rotate clockwise to decrease the R.P.M. and counterclockwise to increase the R.P.M. setting.

Reverse rotation (rapid advance lever depressed) should be 5,700 R.P.M. minimum.

Desired forward rotor speeds (R.P.M.)

Drill Spindle R.P.M.	Rotor Speed R.P.M.		
75	5,800	-	6,200
100	7,200	-	7,760
120	8,870	-	9,400
150	11,300	-	12,100
190	7,100	-	7,500
240	8,900	-	9,350
310	11,100	-	12,200
390	6,900	-	7,450
480	8,600	-	9,100
585	10,200	-	11,100
660	11,600	-	12,400
825	7,400	-	7,900
960	8,600	-	9,130
1165	10.200	-	11,100
1,500		13,000 Min.	

VARIABLE SPEED TOOLS

For disassembly of drill head and gear trains, see page 7 & 8.

DISASSEMBLY—VARIABLE SPEED MOTOR AND GOVERNOR UNIT

Clamp handle in vise with motor housing upwards. Unscrew both motor housing 382509 and turnbuckle collar 382508 in unison from handle. Keep governor center 382619, shims, and bearing 847095 together as a unit. Replace this bearing if it is damaged.

CAUTION: Do not lose these shims. The same shims must be used for reassembly.

Tap motor and motor housing on wooden bench top to remove motor unit. Hold either the pinion gear 617609 or rotor nut 382522 and unscrew (left hand threads) governor assembly. Remove rear bearing 864522, bearing plate 867369, cylinder 867377 and three (3) rotor blades 382520. Note: Check function of rotor blade kick-out approximately 1/8". If required, the spring cap 382514 must be drilled and tapped for removal. Clamp body of the rotor in vise and unscrew pinion 617609 or nut 382522. To remove governor weights from spider, press governor weight pins 867184 out.

DISASSEMBLY—VARIABLE SPEED MOTOR BACKHEAD

WARNING: Pressure cap 382507 must not be unscrewed while the motor backhead is connected to air supply. This cavity is supplied with high pressure air whenever the backhead is connected to the air system.

Remove pressure cap, spring 864681, ball 812156, and pin 847031. Rapid advance valve 382501 may be removed by unscrewing valve cap 382502 and removing retainer ring 869460. The rapid advance lever 382503 may be removed by unscrewing (3/16" hex) flat head cap screw 382504. Remove button head screw 844288. That will release the governor valve 382618. Remove governor spring 382238, shims 202349, auxiliary spring cap 382264, spring 382271 (inside cap) and guide stud 382620. Caution: Do not lose those shims. The same shims must be used for reassembly. Remove set screw 382512 and speed cam. Remove detent pad 382627, set screw 867502, and spring 512275 for inspection.

DISASSEMBLY—HANDLE Same as on page 8.

REASSEMBLY—GENERAL Same as on page 8.

REASSEMBLY—HANDLE Same as on page 8.

REASSEMBLY—VARIABLE SPEED MOTOR BACKHEAD

Install rapid advance valve and related parts (same as single speed tool). Lubricate O-ring 844307 on speed cam. Assemble spring 512275, set screw 867502, and detent pad 382627 onto backhead. Install speed cam and lock set screw 382512. Install governor parts in reverse order of disassembly and secure with button head screw.

REASSEMBLY—VARIABLE SPEED MOTOR AND GOVERNOR

Assemble governor weights 867189, pins 867184, and spider 382621. Seat front rotor bearing 842870, in front bearing plate 382521, and support bearing on its outer race. Measure from face of the bearing plate to bearing inner race. Select or fit by sanding a rotor collar .002" longer than this measurement. Install rotor collar (chamfered side first) and bearing plate assembly on rotor. Tighten rotor pinion 617609, or rotor nut 382522, to approximately 35 ft. lbs. (47.4 Nm). When installing the rotor blades 382520, be certain that the rotor blade kickout pins are working. Assemble the three (3) rotor blades, cylinder 867377, rear bearing plate 867369, rear bearing 864522, and governor assembly. Tighten (left hand threads) governor assembly almost as tight as pinion gear or front rotor nut.

VARIABLE SPEED MOTOR HOUSING AND RUNNING MOTOR

Work the motor unit into the housing and clamp the housing into a vise with the governor assembly upward. Assemble the governor center 382619, shims, and bearing 847095, with the governor weights leaning inward.

Set the speed adjustment to one of these settings:
125 RPM (190V)
240 RPM (375V)
480 RPM (780V)
900 RPM (1500V)

REASSEMBLY—MOTOR HOUSING AND RUNNING MOTOR

Same as on page 9 & 10.

DESIRED FORWARD ROTOR SPEED

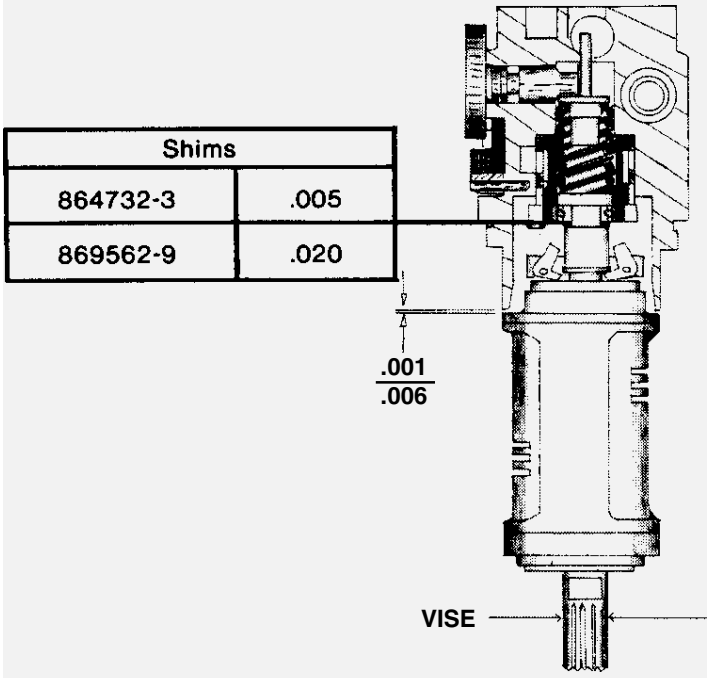
At the selected speed setting (80, 160, 320, or 650) the rotor speed should be 8200 - 9700 RPM.

The motor speed should change smoothly as the speed is adjusted step by step.

Reverse rotation (rapid advance lever depressed) should be 5,700 RPM minimum.

IF SHIMS ARE LOST, OR IF ROTOR SPEED IS IMPROPER

Remove motor unit and clamp in vise with the governor assembly upward and the governor weights leaning inward. Add or adjust shims 864732 and 869562 to provide this clearance:



Reassemble and run motor. If the desired forward rotor speed is still not acceptable (8200 - 9700 RPM); disassemble motor backhead and add shims 203349 under governor spring 382238 to increase speed, or remove shims to decrease speed.

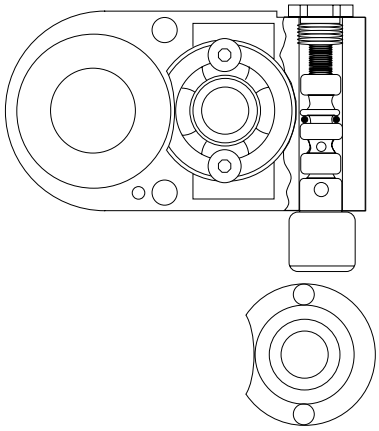
Continue reassembly same as single speed tools

FINAL REDUCTION ASSEMBLY:

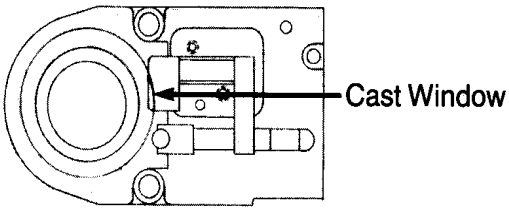
Reassemble in the reverse order of disassembly. Grease all parts with a good grade of NLGI 2-EP grease. Install the washer and ball bearing 864471 on the front of the output spider. Clean the threads on the spider and pinion gear 382461. Hold a large hex wrench or similar tool on the side of the spider and clamp in the vise. Apply a thread locking liquid to the threads and screw the pinion into the spider (tighten to approximately 60 ft. lbs.—81.4Nm). Use Tool Maintenance Kit for easier assembly.

HEAD REASSEMBLY:

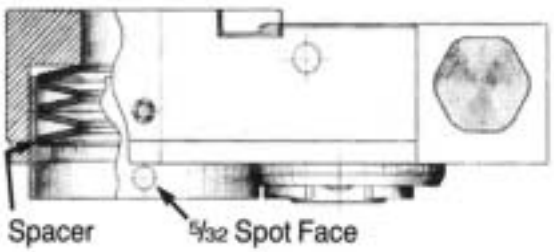
UPPER BLOCK: The retract valve must slide freely (without O-ring) By its own weight inside the bore. Lubricate and assemble O-ring 844306, retract valve 382333, spring 382540, and tighten valve cap 382331. Press (press on the bearings stamped end) the needle bearing 617253, into the rear of the gear stop 382547. The bearing should be flush with face. Assemble O-ring 863009, on feed piston 382548 lubricate and fit into bore. Piston should move with finger tip pressure. Press the gear stop into bore. Apply a drop of thread locking liquid on the two (2) screws 812667 and tighten them.



Screw the two (2) set screws, 382637 in until they are nearly flush with the bore (must clear spring case). Place a drop of thread locking liquid on the outer thread of each screw. Assemble the thrust package as shown into the spring case. Clamp the spring case and upper block in the vise, aligning the spring case and compressing until the 5/32" dia. spotface is in the position shown. Tighten each set screw 1 & 1/2 turns, and remove from vise. The set screws should retain spring case; but allow spring stack to compress and "spring back".



Note: Milled slot on top rim of spring case must be visible through cast window in the upper block.



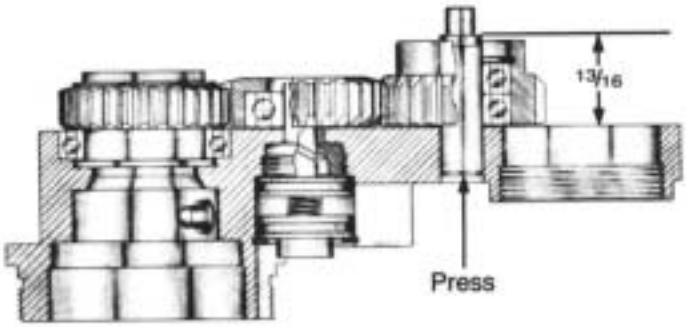
Note: Spring washers must be stacked exactly as shown. A spacer may be included in the spring stack and must be installed under the bottom washer against the spring case. Align the bore of the spring washers to clear the 7/8" O.D. of the spindle.

RAPID ADVANCE CLUTCH (OMIT SHEAR PIN)

Assemble the clutch spring, clutch shaft 632598 pinion and clutch hub 382526, ball bearing 844966, upper clutch jaw 382536, lower clutch jaw 382535. Compress in vise and install roll pin 415019. Remove from the vise and drive pin to central position. Press bearing 812219 into cap 382537.

HOUSING COVER ASSEMBLY:

Place the retract piston 382550, two (2) O-rings 863009, spring 864681, and cylinder plug 382552, into housing cover, 382582, or 382591 (lubricate with 10W oil) and install retainer ring 619017. Use Tool Maintenance Kit (823170).



Press the idler gear shaft 617208 through the cover until the shoulder is 13/16" above the surface of the cover. Install ball bearing 617220 and spindle drive gear 617200 in the cover. Place one (1) spacer 843390 on each of the two (2) gear shafts on the cover. Press two (2) ball bearings 619019 on the idler gear shaft 617208. Recheck the 13/16" dimension and reset if necessary. Install retainer ring 619017 in idler gear 382527 and assemble over ball bearings. Install ball bearing 619377 and differential drive gear 382545. Install signal valve assembly and tighten cap screw 863337.

Grease two (2) O-rings 844301 and place one (1) in machined pocket in housing and the other in machined pocket in cover. Use grease to hold gear spacer 613687 in place. Align one (1) notch in spacer with pin in head. Place assembled housing cover on housing and snug up two (2) cap screws 865123.

FINAL HEAD REASSEMBLY:

Place eighteen (18) balls 842160 in spring case 382663 with grease.

NOTE: The eighteen (18) balls 842160 should be replaced if there is any indication of roughness.

Place spindle feed gear inside balls and install in housing. Align and install gear holder 382557.

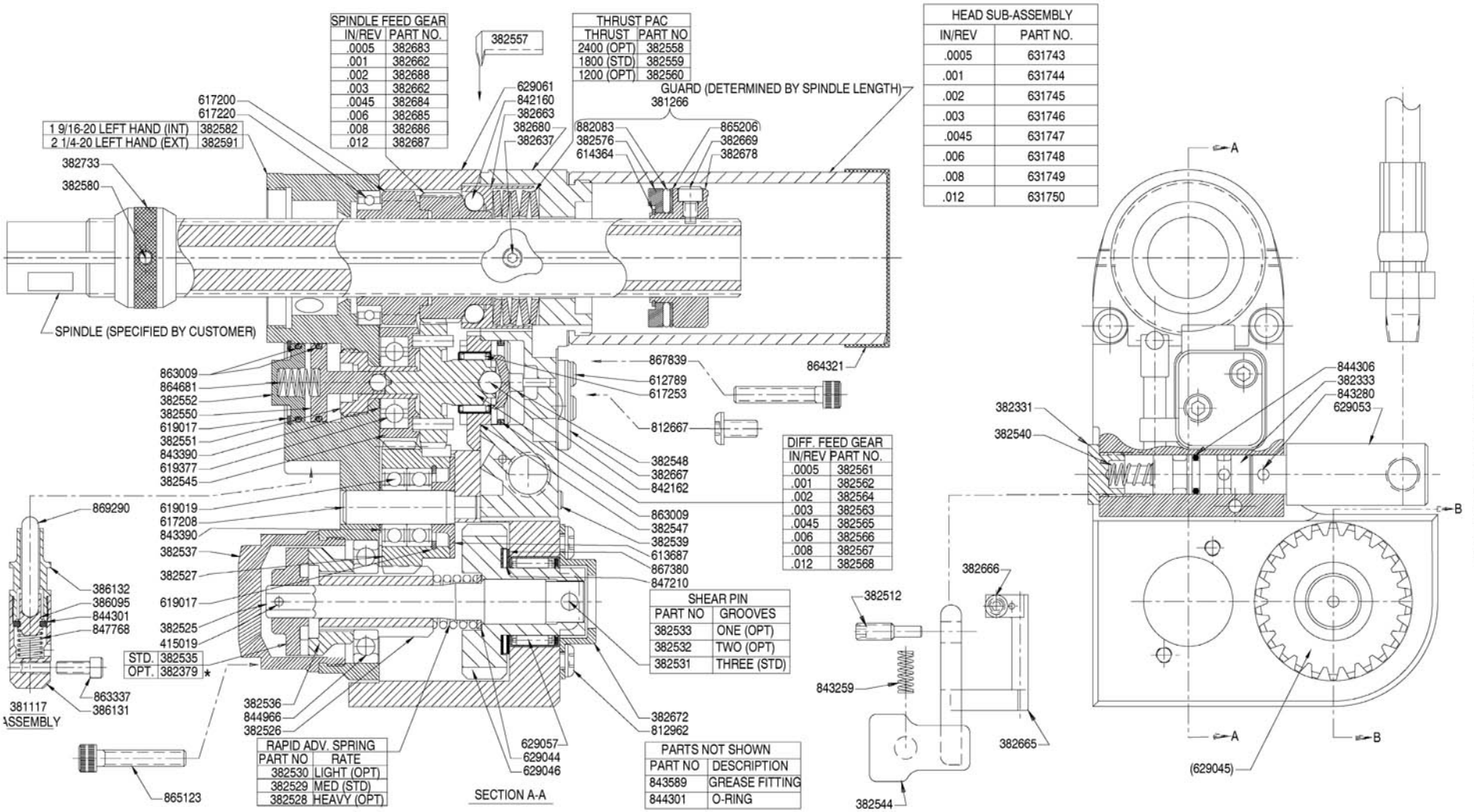
IMPORTANT: The tang (hooked end) on the gear holder must be installed in the head first and the tang should be between the differential drive gear, 382545, and differential feed gear. Place differential feed gear in housing. Grease two (2) O-rings 844301 and place in machined pockets in upper block, and assemble upper block to housing. Clamp head in vise and compress. Firmly tighten two (2) cap screws 867839 and one (1) cap screw 382539 on the upper block and two (2) cap screws 865123 on the housing cover. Insert clutch assembly, shear pin, and install pin guard and clutch cover.

Install spring 843259, retract lever 382544, and fulcrum screw 382512 in the upper block. Assemble the lift arm assembly 382665, pivot plate 382667, and two (2) cap screws 612789 on the upper block. Use a thread locking liquid on the threads of the slack adjust screw 382666 and adjust the screw until the lift arm touches (but does not lift) the retract lever 382544.

FINAL ASSEMBLY:

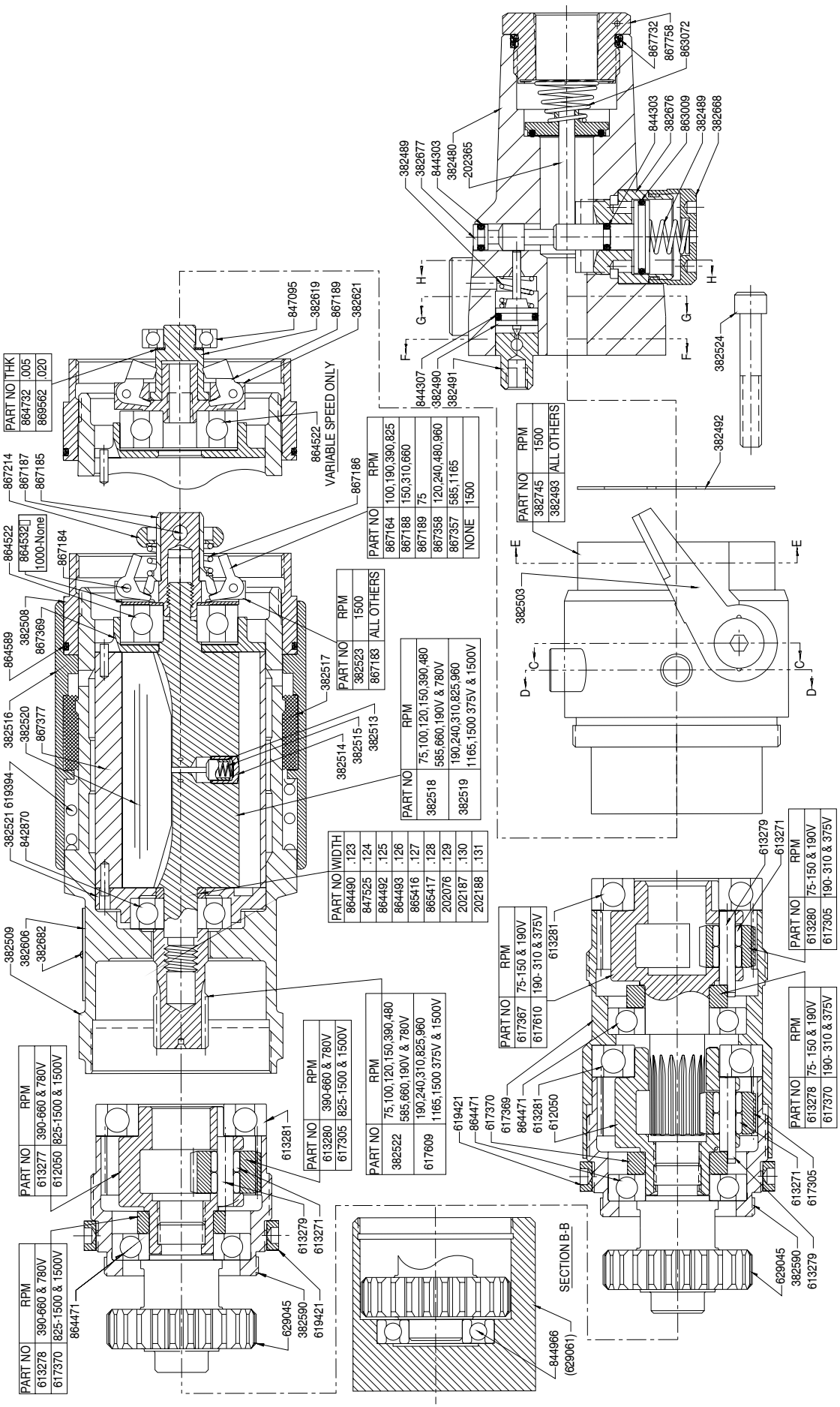
Assemble planetary gear cases (complete with all gears) onto head and tighten securely using flats on motor housing 382509. Place tool in vise with inlet bushing down and clamp vise jaws on handle 382480 flats. Loosen turnbuckle 382508 and motor housing in unison CCW 1/4 turn. By adjusting turnbuckle and tightening (CW) flats on motor housing 382509 position head in desired location and tighten (CW) flats on motor housing securely

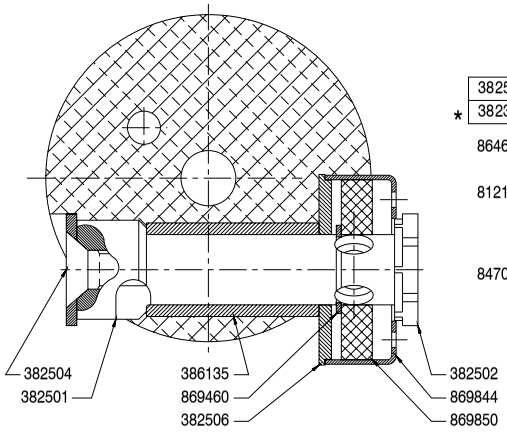
Remove 1/8" NPT pipe plug (installed temporarily) from the motor backhead. Install right angle fitting 382664 pointing forward when tight. Install side hose assembly 382674 (long) or 382673 (short).



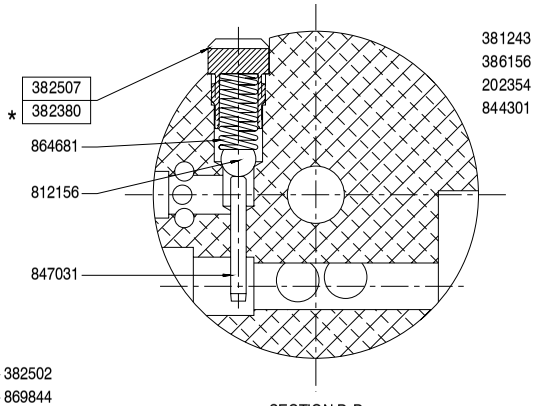
★USE THESE PARTS ONLY FOR TOOLS WITH 825 OR GREATER RPM WITH 1200 LBS. THRUST PACKET.

POSITIVE FEED DRILL GEAR TRAINS & MOTOR

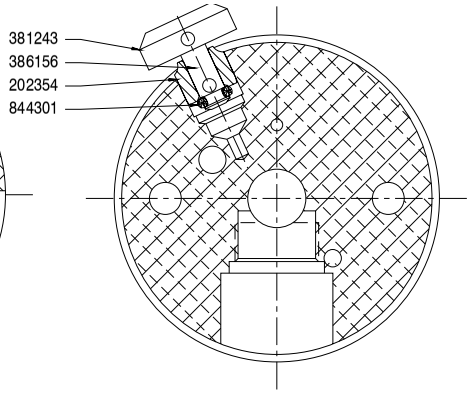




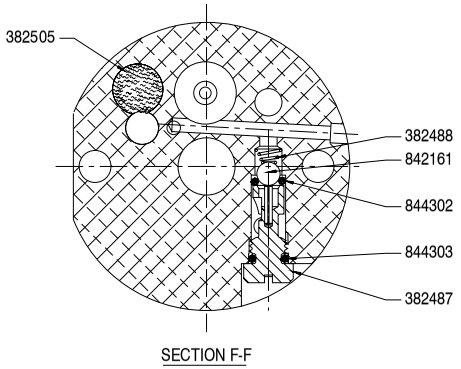
SECTION C-C



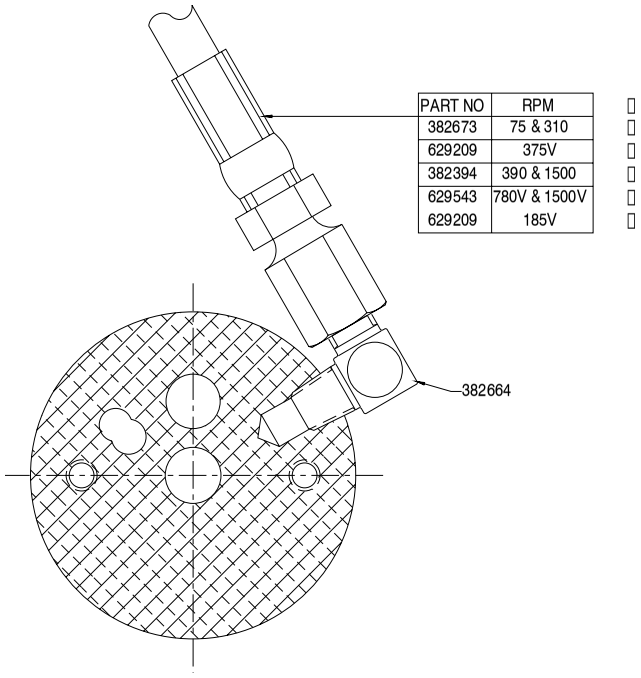
SECTION D-D



SECTION H-H

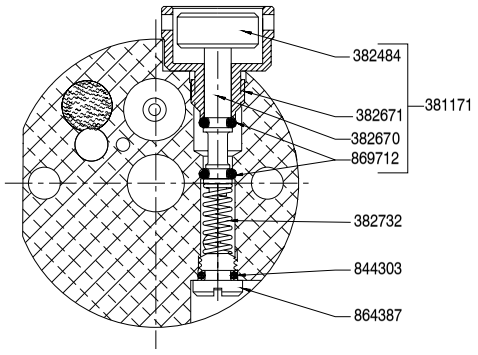


SECTION F-F

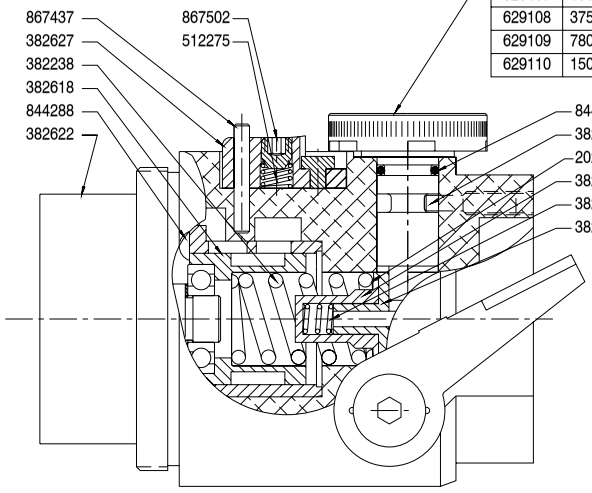


PART NO	RPM
382673	75 & 310
629209	375V
382394	390 & 1500
629543	780V & 1500V
629209	185V

SECTION E-E



SECTION G-G



PART NO	RPM-MAX.
629107	190V
629108	375V
629109	780V
629110	1500V

BACKHEAD - VARIABLE SPEED

PARTS LIST FOR POSITIVE FEED DRILL

PART NO	NAME OF PART	QTY.	PART NO.	NAME OF PART	QTY.
202076	.129" ROTOR COLLAR	1	382544	RETRACT LEVER	1
202187	.130" ROTOR COLLAR	1	382545	DIFFERENTIAL DRIVE GEAR (27T)	1
202188	.131" ROTOR COLLAR	1	382546	DOWEL PIN (SPECIAL)	1
202349	SHIM (V MODEL ONLY)	*	382547	GEAR STOP	1
202354	BUSHING	1	382548	FEED PISTON (INCL. 843281)	1
202365	THROTTLE VALVE	1	382550	RETRACT PISTON (INCL. 842161)	1
381117	SIGNAL VALVE ASSEMBLY (INCL.		382551	THREADED BUSHING	1
	386095,386131,386132, 869290		382552	CYLINDER PLUG	1
	844301,8477768)	1	382557	GEAR HOLDER	1
381171	DRILL BUTTON AND SHAFT ASSEMBLY		382558	THRUST PACKET-2400 LBS. THRUST (OPT.)	1
	(INCL. 382484, 382670,		382559	THRUST PACKET-1800 LBS. THRUST (STD.)	1
	382671, 2 O-RINGS 869712)	1	382560	THRUST PACKET-1200 LBS. THRUST (OPT.)	1
381243	STOP BUTTON ASSEMBLY (INCL.		382561	.0005" DIFFERENTIAL FEED GEAR (33T)****	1
	202354,386156,844301)	1	382562	.001" DIFFERENTIAL FEED GEAR (43T)****	1
381266	DEPTH STOP ASSEMBLY (INCL. 382669,		382563	.003" DIFFERENTIAL FEED GEAR (44T)****	1
	382678, 865206, 882083, 382576, 614364)	1	382564	.002" DIFFERENTIAL FEED GEAR (65T)****	1
382238	GOVERNOR SPRING (V MODEL ONLY)	1	382565	.0045" DIFFERENTIAL FEED GEAR (50T)****	1
382264	AUXILIARY SPRING CAP (V MODEL ONLY)	1	382566	.006" DIFFERENTIAL FEED GEAR (56T)****	1
382271	SPRING (V MODEL ONLY)	1	382567	.008" DIFFERENTIAL FEED GEAR (51T)****	1
382331	VALVE CAP	1	382568	.012" DIFFERENTIAL FEED GEAR (52T)****	1
N/A	RETRACT VALVE (included in 382680)	1	382576	ROTATING THRUST PLATE	1
382379	LOWER CLUTCH JAWS (OPT.)	1	382580	LOCK SCREW (1/4 - 28)	1
382380	PRESSURE CAP (WITH SPACERS)		382582	1-9/16" - 20 L.H. (INT.) HOUSING COVER	
	(825, 960, 1165, 1500, 1500V)	1		(INCL. 382551)	1
382480	HANDLE	1	382590	INTERNAL GEAR CASE (50T)	1
382484	DRILL BUTTON	1	382591	21/4 - 20 L.H. (EXT.) HOUSING COVER	
382487	CHECK VALVE SEAT	1		(INCL. 382551)	1
382488	CHECK VALVE SPRING	1	382606	NAME PLATE	1
382489	SPRING	2	382618	GOVERNOR VALVE (V MODEL ONLY)	1
382490	LATCH PISTON	1	382619	GOVERNOR CENTER (V MODEL ONLY)	1
382491	METERING SEAT	1	382620	GUIDE STUD (V MODEL ONLY)	1
382492	GASKET	1	382621	SPIDER (V MODEL ONLY)	1
382493	MOTOR BACKHEAD (INCL. 386135)	1	382622	MOTOR BACKHEAD (V MODEL ONLY)	1
382501	RAPID ADVANCE VALVE	1	382627	DETENT PAD (V MODEL ONLY)	1
382502	RAPID ADVANCE VALVE CAP	1	382637	10 - 32 X 1/4 SET SCREW	2
382503	RAPID ADVANCE LEVER	1	382662	SPINDLE FEED GEAR (.001 & .003) (44T)	1
382504	5/16"-18 X 1/2 FLAT HEAD CAP SCREW	1	382663	SPRING CASE	1
382505	FILTER	1	382664	RIGHT ANGLE FITTING	1
382506	MUFFLER PLATE	1	382665	LIFT ARM ASSY. (INCL 382666)	1
382507	PRESSURE CAP (825 AND BELOW)	1	382666	SLACK ADJ. SCREW	1
382508	TURNBUCKLE COLLAR	1	382667	PIVOT PLATE	1
382509	MOTOR HOUSING	1	382668	END CAP	1
382512	FULCRUM SCREW (10-32)		382669	LOCK SCREW (1/4)	1
	(V MODEL REQ. 2)	1	382670	DRILL BUTTON SHAFT	1
382513	FLYWEIGHT	1	382671	DRILL BUTTON GUARD	1
382514	SPRING CAP	3	382672	PIN GUARD	1
382515	BLADE SPRING	3	382673	SIDE HOSE (SHORT)	1
382516	EXHAUST DEFLECTOR	3	382674	SIDE HOSE (LONG)	1
382517	MUFFLER	1	382675	REAR SPINDLE GUARD**	1
382518	7T ROTOR (INCL. 382513, 382514,		382676	THROTTLE PISTON CYLINDER	1
	382515)	1	382677	THROTTLE PISTON	1
382519	THREADED ROTOR (INCL. 382513,		382678	DEPTH COLLAR	1
	382514, 382515)	1	382680	UPPER BLOCK	1
382520	ROTOR BLADE	3	382682	TAPPING SCREW	1
382521	FRONT BEARING PLATE	1	382683	SPINDLE FEED GEAR (.0005) (34T)	1
382522	ROTOR NUT	1	382684	SPINDLE FEED GEAR (.0045) (49T)	1
382523	REAR NUT (1500 R.P.M. ONLY)***	1	382685	SPINDLE FEED GEAR (.006) (54T)	1
382524	1/4-20 X 2 SOCKET HEAD CAP SCREW	2	382686	SPINDLE FEED GEAR (.008) (48T)	1
382525	CLUTCH SHAFT	1	382687	SPINDLE FEED GEAR (.012) (47T)	1
382526	PINION (13T) AND CLUTCH HUB	1	382688	SPINDLE FEED GEAR (.002) (66T)	1
382527	IDLER GEAR (27T)	1	382732	SPRING	1
382528	CLUTCH SPRING - SEE CHART	1	386095	SIGNAL VALVE HEAD	1
382529	CLUTCH SPRING - SEE CHART	1	386131	SIGNAL VALVE CASING	1
382530	CLUTCH SPRING - SEE CHART	1	386132	SIGNAL VALVE GUIDE	1
382531	SHEAR PIN - SEE CHART	1			
382532	SHEAR PIN - SEE CHART	1			
382533	SHEAR PIN - SEE CHART	1			
382535	LOWER CLUTCH JAW	1			
382536	UPPER CLUTCH JAW	1			
382537	CLUTCH COVER	1			
382539	6-32 X 1 SOCKET HEAD CAP SCREW	1			
382540	RETRACT VALVE SPRING	1			

PARTS LIST FOR POSITIVE FEED DRILL

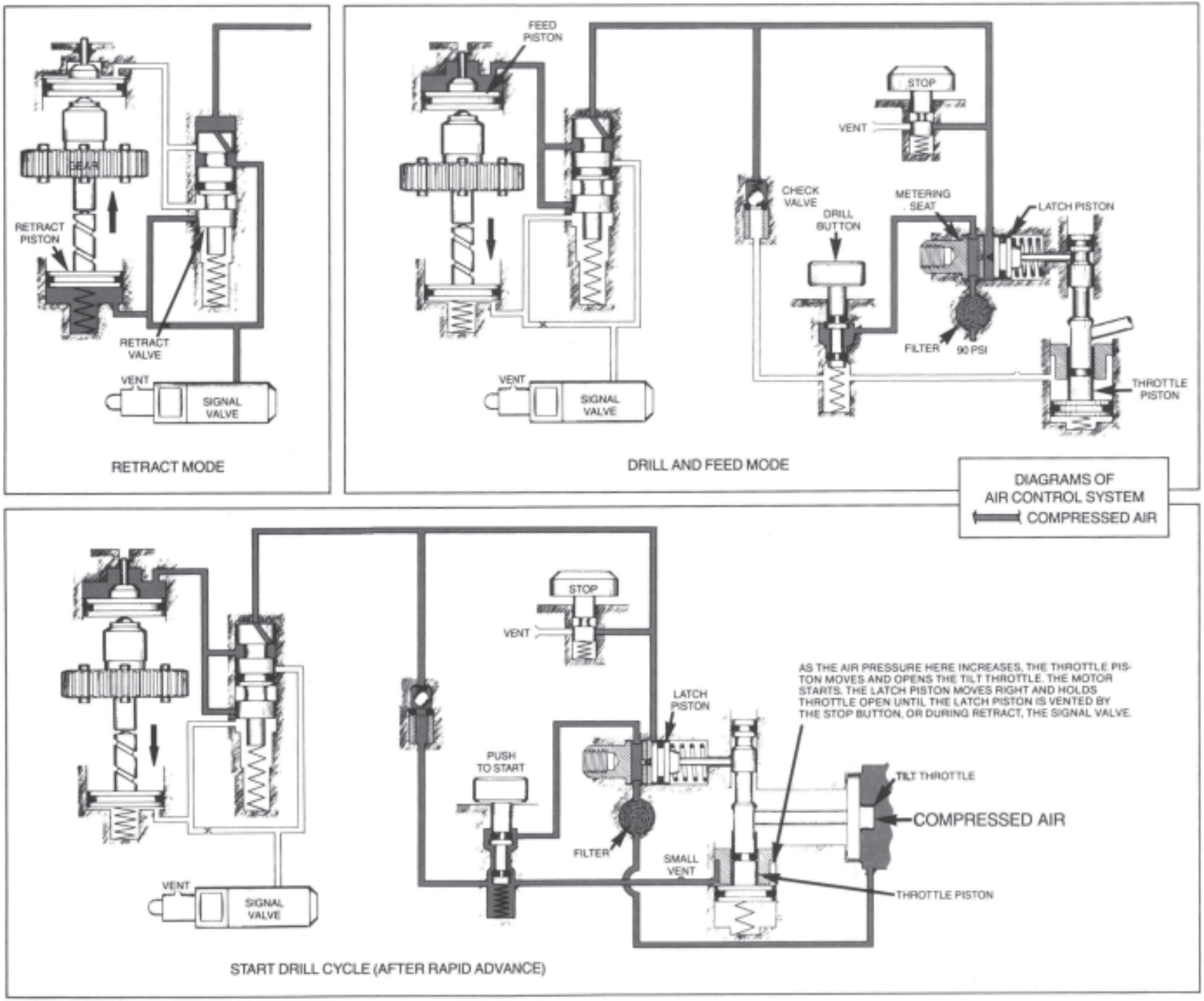
PART NO	NAME OF PART	QTY.	PART NO.	NAME OF PART	QTY.
386135	RAPID ADVANCE VALVE BUSHING	1	844307	012B00 "O"-RING 3/8" X 1/2"	
386156	STOP BUTTON SHAFT	1		(V MODEL REQUIRES 2)	1
382379	LOWER CLUTCH JAWS (OPTIONAL)	1	844966	BALL BEARING	2
382507	PRESSURE CAP (825 AND BELOW)	1	847031	DOWEL PIN (1/8- X 1")	1
382733	RETRACT COLLAR	1	847095	BALL BEARING (V MODEL ONLY)	1
415019	ROLL PIN	1	847210	THRUST BEARING	1
512275	SPRING (V MODEL ONLY)	1	847525	.124" ROTOR COLLAR	1
512442	SEAL	1	847768	SPRING	1
612050	SPIDER	1	863009	"O"-RING	4
612789	8 - 32 X 1/4 SOCKET HEAD CAP SCREW	2	863072	THROTTLE VALVE SPRING	1
613271	NEEDLE BEARING (DOUBLE REDUCTION		863337	6 - 32 X 1/2 SOCKET HEAD CAP SCREW	1
	REQUIRES 12)	6	863926	.005"- SHIM	*
613277	SPIDER	1	864387	PLUG	1
613278	WASHER	1	864471	BALL BEARING (DOUBLE REDUCTION	
613279	IDLER GEAR PIN (DOUBLE REDUCTION			REQUIRES 3)	2
	REQUIRES 6)	3	864490	.123" ROTOR COLLAR	1
613280	IDLER GEAR (21T)	3	864492	.125" ROTOR COLLAR	1
613281	BALL BEARING (DOUBLE REDUCTION		864493	.126" ROTOR COLLAR	1
	REQUIRES 2)	1	864522	REAR ROTOR BEARING	1
613687	SPACER	1	864532	PIN RETAINER	1
614269	.005" SHIM	*	864589	"O" -RING 2- 1/8" X 2- 1/4"	1
614270	.010" SHIM	*	864681	SPRING	2
614364	RETAINER RING	1	864732	SHIM .005" (V MODEL ONLY)	*
617200	DRIVE GEAR (28T)	1	865123	1/4 - 20 X 7/8 SOCKET HEAD CAP SCREW	2
617208	IDLER GEAR SHAFT	1	865206	THRUST RACE	1
617220	BALL BEARING	1	865416	ROTOR COLLAR	1
617253	NEEDLE BEARING	1	865417	.128" ROTOR COLLAR	1
617305	IDLER GEAR (17T) (190 - 310 R.P.M		867164	GOVERNOR WEIGHT***	2
	REQUIRES 6)	3	867183	GOVERNOR SPIDER***	1
617367	SPIDER (16T)	1	867184	WEIGHT PIN	2
617369	INTERNAL GEAR AND HOUSING (50T)	1	867185	GOVERNOR VALVE***	1
617370	WASHER (190 - 310 R.P.M. REQUIRES 2)	1	867186	GOVERNOR SPRING***	1
617609	PINION GEAR (16T)	1	867187	PIN***	1
617610	SPIDER (16T)	1	867188	GOVERNOR WEIGHT***	2
619017	RETAINER RING	2	867189	GOVERNOR WEIGHT	2
619019	BALL BEARING	2	867214	GOVERNOR ADJUSTING RING***	1
619377	BALL BEARING	1	867357	GOVERNOR WEIGHT***	2
619394	SPRING	1	867358	GOVERNOR WEIGHT***	2
619421	LOCK RING	1	867369	REAR BEARING PLATE	1
624358	SHIMS	*	867377	CYLINDER (INCL. 812166-7)	1
629044	SPRING WASHER	1	867380	THRUST RACE	1
629045	PINION GEAR	1	867437	PIN (V MODEL ONLY)	2
629046	DRIVEN GEAR	1	867502	SET SCREW (V MODEL ONLY)	1
629053	AIR TUBE FITTING	1	867732	"O" -RING 1- 1/8" X 1- 5/16"	1
629057	BEARING	1	867758	INLET BUSHING	1
629061	HOUSING	1	867839	1/4 -20 X 2-1/4" SOCKET HEAD CAP SCREW	2
629107	SPEED CAM 190V (V MODEL ONLY)	1	869290	PIN	1
629108	SPEED CAM 375V (V MODEL ONLY)	1	869460	RETAINER RING	1
629109	SPEED CAM 780V (V MODEL ONLY)	1	869559	.010" SHIM	*
629110	SPEED CAM 1500V (V MODEL ONLY)	1	869562	SHIM .020" (V MODEL ONLY)	*
631741	UPPER BLOCK ASSEMBLY	1	869712	"O"-RING 5/64" X 13/64"	2
812156	9/32- STEEL BALL	1	869844	EXHAUST DEFLECTOR	1
812166	CYLINDER PIN	2	869850	MUFFLER	1
812667	10 - 32 X 3/8 BUTTON HEAD CAP SCREW	2	882083	THRUST BEARING	1
812962	SCREW	2	884125	DOWEL PIN (1/8" X 1/2")	3
842160	BALL (7/32")	18			
842161	3/16- STEEL BALL	1			
842162	1/4- STEEL BALL	1		* NUMBER OF SHIMS REQUIRED IS VARIABLE	
842870	FRONT ROTOR BEARING	1			
843259	SPRING	1		** FOR SPINDLE LENGTHS UP TO 9 INCHES IF SPINDLE	
843280	DOWEL PIN (1/8"X 3/4")	1		LENGTH IS OVER 9 INCHES, OTHER REAR SPINDLE	
843281	DOWEL PIN (3/32" X 1/2")	1		GUARDS ARE AVAILABLE	
843390	SPACER	2			
843589	GREASE FITTING (NOT SHOWN)	2			
844111	DOWEL PIN (1/8" X 5/8")	1			
844288	SCREW (V MODEL ONLY)	1		*** SINGLE SPEED MODEL ONLY	
844301	006B00 "O"-RING 1/8" X 1/4"	4			
844302	007B00 "O"-RING 5/32" X 9/32"	1		****INCLUDES 842162	
844303	008B00 "O"-RING 3/16" X 5/16"	4			
844306	011B00 "O"-RING 5/16" X 7/16"	1			

SOLID SPINDLES AND GUARDS — **GUARD CAP** - 624359 (1)

SPINDLE	GUARD
382390 382628	624397 6"
382391	624500 7"
382617 382708	624398 8"
382349 382616	624399 9"
382631 623853	624402 13"
382639	624403 15"

FLUID SPINDLES AND GUARDS — **GUARD CAP** - 624359 (1) — **GUARD SHIM** (.010) - 624358 (4)

SPINDLE	GUARD
	624404 4"
382373	624505 5"
	624405 6"
382346 382599	624406 7"
382614	624407 8"
382607 623856	624408 9"
382554 382636 382661	624409 10"
382605	624506 11"
	624410 12"
382399 382555	624411 13"
382371 623855	624502 14"


RETRACT PISTON
RETRACT VALVE
VENT
SIGNAL VALVE
RETRACT MODE
FEED PISTON
VENT
SIGNAL VALVE
STOP
VENT
CHECK VALVE
DRILL BUTTON
METERING SEAT
LATCH PISTON
FILTER
90 PSI
THROTTLE PISTON
DRILL AND FEED MODE
DIAGRAMS OF AIR CONTROL SYSTEM
COMPRESSED AIR
VENT
SIGNAL VALVE
STOP
VENT
LATCH PISTON
PUSH TO START
FILTER
SMALL VENT
AS THE AIR PRESSURE HERE INCREASES, THE THROTTLE PISTON MOVES AND OPENS THE TILT THROTTLE. THE MOTOR STARTS. THE LATCH PISTON MOVES RIGHT AND HOLDS THROTTLE OPEN UNTIL THE LATCH PISTON IS VENTED BY THE STOP BUTTON, OR DURING RETRACT, THE SIGNAL VALVE.
TILT THROTTLE
COMPRESSED AIR
THROTTLE PISTON
START DRILL CYCLE (AFTER RAPID ADVANCE)

TOOL MAINTENANCE AND PRESSURE TEST KIT - 381273

This kit and instructions are for use in conjunction with the Operating Instructions and Service Manual provided with the above drills.

381273 (ALL ITEMS INCLUDED IN KIT)

382370 Tool Box
823170 Contents list, diagram, and instructions
381272 Guage and fitting assembly
382360 Hex wrench bar
382361 Offset hex wrench
382362 3/16 inch pin wrench
382363 Bevel pinion socket
844767 Dowel Pin
382364 Cage Holder
382365 Throttle Cylinder Wrench
622466 Spindle Wrench

The hex wrench bar is to assist tightening cap screws, to straighten stack of 5 belleville springs (if required), and to install cylinder plug 382552. The cage holder holds spider 612050 or 613277.

Performing Pressure Tests

This is a governed air motor, and air flow usually increases as the load increases.

A variable speed drill motor will use more air at higher speed settings.

For all tests on the following pages, screw the 1/2 inch pipe nipple and tee directly into the inlet bushing of the air tool. Do not use a quick disconnect fitting between the tee and the inlet bushing (see diagram). The 1/8 inch tee need not be installed at this time.

Adequate Air Supply

This includes valves, hoses, couplings, supply pressure, etc. Normally this test would be performed at the drilling site with the length of hoses and couplings in use.

Attach the air hose or the large quick disconnect coupling to the 1/2 inch tee. Plug the air guage into the fitting on the tee. Rapid advance the tool and read the guage pressure before and during rapid advance.

All 230 Drills
Maximum Allowable Pressure Drop At Tool Inlet (RAP/ADV Flow Test):

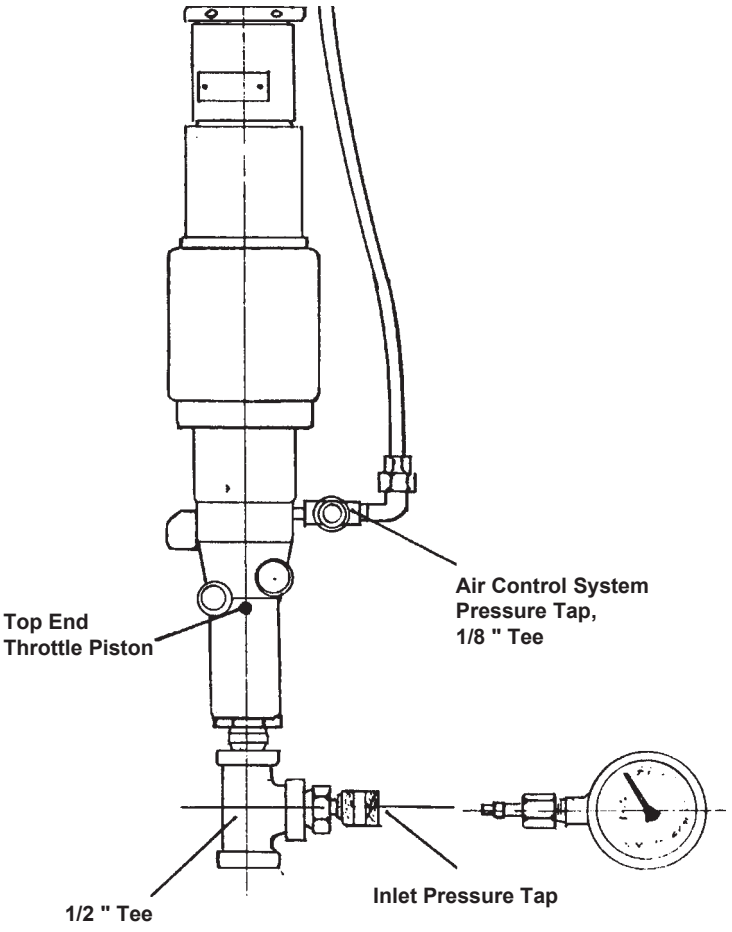
psig Before	psig During
90	82
100	90
110	98
115	102

See Appendix I for unusual conditions.

The following tests should be done in the tool crib or repair-maintenance area. **NOTE:** Remove the tool nose and spindle.

Air control system (A.C.S.) pressure checks. The 1/8 inch tee should also be installed at this time (see diagram).

Feed piston pressure—plug air guage into the A.C.S. Start motor with the drill button. The tool automatically goes into feed with the motor running. The A.C.S. pressure must be over 60 psig.



If the pressure is 0-60 psig it would indicate a very substantial leak in the air control system; a damaged side air hose or fitting, a damaged stop button assembly, check valve, or a leaking feed piston. On "B" model tools this could indicate a badly leaking signal valve. Also a severely clogged A.C.S. filter might be the problem or a clogged metering seat (382491).

Excess Leakage (A.C.S.)

Turn on the air supply and press the "drill" button. Press the rapid advance lever and return the lever fully. This places the tool into the "air-lock mode" with the throttle open, the motor stalled, and the air control system (A.C.S.) pressurized.

Plug the air gauge alternately into each small quick disconnect fitting. The difference in pressure should be no more than 7 psi. A difference of more than 7 psi means excessive leakage in the A.C.S. See Appendix II. Lift the retract lever. The retract valve will move with and audible snap. Again, the difference in pressure should be no more than 7 psi when plugging the air gauge alternately into each quick disconnect fitting.

Press the stop button. Exhaust deflector and retract lever reset.

Throttle Closing Test

The throttle unlatches and closes as the air control system pressure drops. With the air gauge plugged into the A.C.S., place the tool back into the "air-lock mode". Now, very gradually press the stop button. The throttle should close when the A.C.S. pressure drops to between 42-50 psi. If the throttle doesn't close, the throttle piston may be sticking, or the latch piston 382490 is not functioning properly.

Signal Valve Venting

Use the highest air supply pressure available (110 psig maximum). With the air gauge plugged into the air control system, place the tool back into the "air-lock mode". Lift the retract lever. (The retract valve will move with an audible snap). Depress the plunger of the venting signal valve (assembly 381117). The A.C.S. pressure will drop and the throttle should close. If the A.C.S. pressure does not drop below 38 psig, the A.C.S. system is receiving an oversupply of air or does not vent properly.

An oversupply of air to the A.C.S. system may be caused by leakage around the O.D. of the metering seat (382491), or leakage past the lower "O"ring (869712) on the drill button shaft.

APPENDIX I

Unusual Drilling Conditions: If the air supply conditions (valves, hoses, fittings, etc.) can not be improved to meet the tool inlet pressure operating conditions in the chart, or if the supply pressure (static) must be below 90 psig, the tool may operate adequately at the work site if the pressure at the inlet tee while drilling and cutting chips does not drop below 70 psi. This would require monitoring the particular tool at the job site while in use to ensure the pressure at the inlet tee does not drop below 70 psig.

APPENDIX II

Locating Excessive Leakage In The A.C.S.

Most air leaks create a hissing noise that is easily heard if background noise is not too loud.

With the air supply on, place a small punch against the bottom end of the throttle piston (place the punch through the throttle cylinder slot or the throttle cylinder end cap). This will prevent the throttle from opening if you push firmly. Now push the drill button a small amount until the A.C.S. is holding pressure. Remove the punch. You will now be able to locate leaking air audibly. Some leakage at the retract valve is normal. By lifting the retract lever you can detect excess leakage at the signal valve, or in the retract piston air circuit.

Missing "O"-rings or a damaged signal valve are the most common sources of excessive leakage.

NOTES

NOTES

Sales & Service Centers

Note: All locations may not service all products. Please contact the nearest Sales & Service Center for the appropriate facility to handle your service requirements.

Fort Worth, TX
Corvaer
Sales & Service Center
3133 South Grove St.
Fort Worth, TX 76110
Tel: 817 274 7418

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Corvaer SAS
Sales & Service Center
Zone Industrielle
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