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ITS, NEW & REMAN GREASE PACK SPINDLE

ITS spindles are super precision components that require the highest level of care and handling. Our spindles are manufactured and assembled to the highest quality having passed inspection, testing and run-in procedures prior to shipment. Compliance with the recommended care and handling procedures will ensure long spindle life, reliability and the highest quality of performance when placed into service.

FEATURES:

GREASE LUBRICATION is widely used in a precision spindle assembly since it provides the simplest and most economical method of lubricating bearings while providing some degree of protection against the ingress of coolant and contaminants. Grease lubrication provides:

- ◆ Maintenance-free operation
- ◆ Does not require re-lubrication
- ◆ Spindles are permanently grease lubricated
- ◆ Lubricated for life.

IMPORTANT! - WARRANTY REQUIRES A RUN-IN BEFORE FULL SPEED OPERATION!

This spindle has been precision balanced and run-in to the original specification but it does require a short run-in prior to machining; see Page 5 for instructions.

Following the CARE AND HANDLING as well as the daily RUN-IN procedures will greatly extend the life of the spindle!

IMPORTANT! - COOLANT THROUGH ATTACHMENT

This spindle requires CNT-0015, CNT-0150 or CNT-0286 seal kit, properly installed before using. Improper installation will damage spindle grease and void warranty. **NOTE: CNT-0015, CNT-0150 or CNT-0286 is not included with this spindle; customer must supply. See page 13 for seal kit drawing.**

TABLE OF CONTENTS

DISCLAIMER-----	2
SAFETY PRECAUTION-----	2
GENERAL SAFEGARDS-----	3
UNPACKING THE SPINDLE-----	3
REMOVAL PROCEDURE-----	4
INSTALLATION PROCEDURE-----	5
*CARE AND HANDLING PROCEDURES-----	6
*START UP AND RUN-IN PROCEDURE-----	7
FIRST TIME START UP AND RUN-IN PROCEDURE-----	7
START UP PROCEDURE FOR AN IDLE SPINDLE 1-WEEK OR MORE-----	7
DAILY START UP PROCEDURE-----	7
DRAWBAR AND BELLEVILLE SPRING REPLACEMENT-----	8
BELLEVILLE SPRINGS - QUANTITY CHART-----	9
SPINDLE ASSEMBLY DRAWINGS-----	10
COOLANT THRU SEALS-----	12
LIMITED WARRANTY-----	13
POLICY INFORMATION-----	13

DISCLAIMER:

This document is based on information available at the time of its publication. While efforts have been made to be accurate, the information contained herein does not intend to cover all details or variations of the products, nor to provide for every possible contingency in connection with handling, installation, operation, or maintenance. Features may be described herein, which are not present in or on all products. ITS assumes no obligation of notice to holders of this document with respect to changes subsequently made.

ITS makes no representation or warranty, expressed, implied, or statutory with respect to, and assumes no responsibility for the accuracy, completeness, sufficiency, or usefulness of the information contained herein. No warranties of merchantability or fitness for purposes shall apply.

SAFETY PRECAUTION:

WARNING: DISCONNECT ELECTRICAL POWER WHEN PERFORMING MAINTENANCE OR SERVICE ON EQUIPMENT! THIS INCLUDES:

- ◆ WHEN ADJUSTING OR CHANGING TOOLS
- ◆ WHEN MAKING MECHANICAL ADJUSTMENTS
- ◆ WHEN PERFORMING MAINTENANCE WORK OR PERFORMING ANY SERVICE TO THE SPINDLE
- ◆ WHEN REMOVING ANY GUARD
- ◆ WHEN REMOVING ANY BELTS OR PULLEYS

TO AVOID INJURY, ELECTRICAL POWER MUST BE OFF WHEN PERFORMING MAINTENANCE OR SERVICE ON EQUIPMENT!



SERIOUS PERSONAL INJURY IS ALWAYS A HAZARD IN AN INDUSTRIAL ENVIRONMENT. EXTREME CAUTION, IN ALL FACETS OF SAFETY, SHALL BE MAINTAINED. ALL COMPANY SAFETY STANDARDS, PRECAUTIONS AND REGULATIONS OF O.S.H.A. SHALL BE MAINTAINED DURING TRAINING, ASSEMBLY, AND DISASSEMBLY OF PRECISION SPINDLES.



GENERAL SAFEGUARDS:

- DO NOT OPERATE THE SPINDLE ASSEMBLY AND/OR ITS COMPONENTS UNLESS YOU HAVE READ THIS DOCUMENT.
- RETAIN FOR FUTURE REFERENCE.
- FOLLOW ALL WARNINGS AND INSTRUCTIONS IN THIS DOCUMENT AND/OR THE VMC.

1. Read and Follow Instructions

Read all the safety and operating instructions supplied by Fadal prior to operating the spindle and/or its components

2. Attachments and Equipment

Never add any attachments and/or equipment to the spindle assembly without approval of the manufacturer as such additions may result in spindle failure, personal injury and/or voiding of the warranty.

3. Servicing

Do not attempt to service the spindle and/or its components yourself as opening or removing covers and/or guards may expose you to dangerous hazards. Refer all servicing to qualified service personnel.

4. Power

Disconnect all power to the machine before any maintenance.

5. Protection

Always wear proper eye, foot and head protection when lifting, transporting and/or operating any machinery.

6. Water and Moisture

Do not use the precision spindle and/or its components where they become immersed in water (coolant). The spindle assembly and/or its components are designed to function in moderate coolant applications.

7. Accessories

Any mounting of the spindle assembly and/or its components should follow the manufacturer's instructions, and should use a mounting accessory recommended by Fadal, if applicable.

8. Handling the Spindle

Do not place the spindle assembly and/or its components on an unstable cart, stand, tripod, bracket or table. The spindle assembly and/or its components may fall, causing serious personal injury and serious damage to the spindle assembly and/or its components.

9. Damage Requiring Service

Disconnect all power to the spindle assembly and/or its components and refer servicing to qualified service personnel under the following conditions:

- a. If the spindle assembly and/or its components do not operate normally by following the operating instructions.
- b. If the spindle assembly and/or its components have been dropped or the shipping crate has been damaged.
- c. When the spindle assembly and/or its components exhibit a distinct change in performance.
- d. If the spindle assembly and/or its components have been crashed and exhibit a distinct change in performance.
- e. If the spindle assembly exhibits a rapid change in operating temperature.
- f. If the spindle assembly exhibits a rapid change in vibration level.
- g. If the spindle assembly exhibits a distinct audible change; bearing noise.
- h. If the spindle assembly locks-up and cannot rotate.

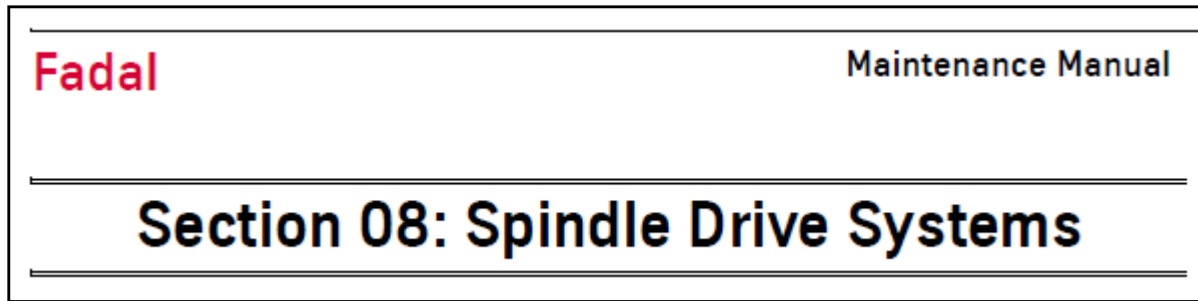
UNPACKING THE SPINDLE:

Each precision spindle assembly ships in a highly stable shipping container to prevent damage to the spindle assembly during shipment.

Prior to uncrating do the following:

1. Inspect the shipping container for damage.
2. Document any damage with photographs.
3. Report any damage to the trucking company and to your distributor, supplier or the ITS's Service Team.

SPINDLE CARTRIDGE REMOVAL PROCEEDURE:



Follow the recommended procedures in your Fadal Maintenance manual. Section 8 has complete documentation for all components of the Spindle Drive System besides the Spindle itself and is very useful to have as a reference.

It is recommended to download the PDF file at <http://www.vmcelectric.com/spindle.pdf>

Spindle Removal:

- 1) Disconnect the air supply from the VMC and remove the head cover.
- 2) Disconnect the electrical connection to the orientation bridge assembly at the six pin connector plug.
- 3) Label and disconnect the two 1/4" air lines from the orientation bridge assembly.
- 4) Remove the draw bar cylinder plate by removing the six 1/4" hex head bolts and set them aside.
- 5) Remove the orientation bridge assembly and the front belt guide by removing the three 3/8" socket head cap screws.
- 6) To swing the spindle motor forward, loosen the 1/2" hex bolt on the left side of the spindle motor and loosen the two 1/2" hex bolts on the right side of the spindle motor.
- 7) Remove the spindle drive belt.
- 8) Before removing the pulley, measure and record the distance from the top of the head casting to the bottom of the spindle pulley. This distance needs to be maintained when attaching the pulley to the new spindle. Machine a spacer at the measured thickness to support the heated pulley when installing on the new spindle shaft.

Record the pulley/spindle scribe marks for reassembly (see picture on following page). The spindle and pulley have scribe marks used to adjust the orientation of the spindle drive keys to the indent lock on the spindle pulley for the tool changer engagement.

- 9) **WARNING** – The pulley is attached using a Sweat-Fit method. To remove, it requires heating the pulley to approximately 350 degrees. Use heavy duty work gloves when handling the heated spindle and pulley. Using a propane torch, direct the flame at the spindle pulley for approximately 6-10 minutes while slowly rotating the spindle. Maintain an even amount of heat throughout the pulley. The spindle pulley will drop down when it has expanded enough to remove it from the spindle shaft.
- 10) Label and disconnect the upper and lower spindle cooling lines from the spindle. Disconnect the 5/32" air seal line from the lower spindle flange. This will be reused later as the air supply to the vacuum pump.
- 11) Loosen the upper spindle retainer clamping screw.
- 12) Remove the six 1/2" hex bolts and lock washers from the upper spindle retainer and lift the retainer from the spindle. Ensure that the cooling line O-ring and the spindle O-ring are removed.
- 13) Remove the coolant supply manifold by removing the 1/4" socket head cap screw. Move it out of the work area and support it so that the lines are not crimped.
- 14) Jog the Z Head down so the bottom of the spindle rests on a wooden block. Then remove the six 3/8" socket head cap screws holding the spindle flange to the head casting.
- 15) Jog the Z Head up and carefully remove the old spindle.

INSTALLATION PROCEEDURE:

The installation is basically the reverse order of removal procedure as described on the proceeding page.

Install Notes:

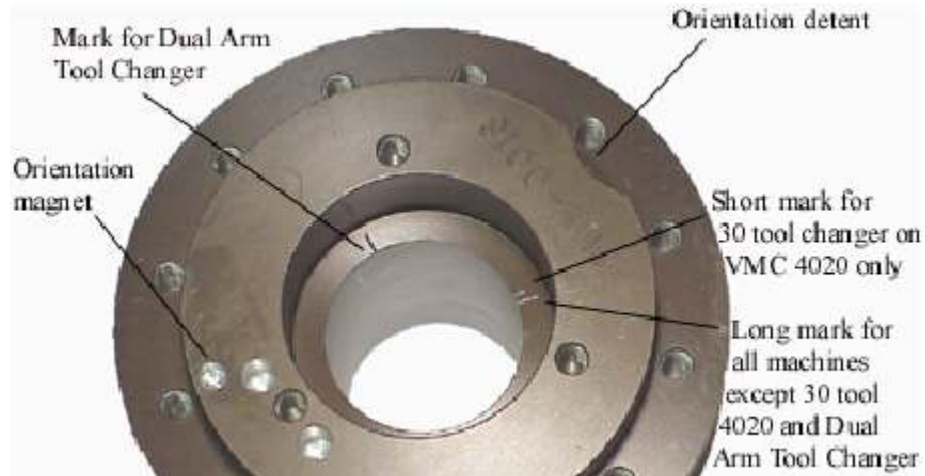
Before sweating the pulley onto the new spindle, it helps to have the spindle shaft pressing onto a wood block with just enough pressure to keep the spindle shaft from rotating while lining up the scribe marks for the pulley orientation to the spindle keys.

Fadal Spindle Pulleys have lines for the orientation alignment of the spindle. To achieve proper alignment, the line on the top of the spindle must be aligned with one of the three lines on the spindle pulley.

- The Long Line, which is for all Machines except for VMC 4020 with 30 tool ATC, and the Dual Arm ATC.
- The Short Line, which is for VMC 4020 machines with 30 tool ATC.

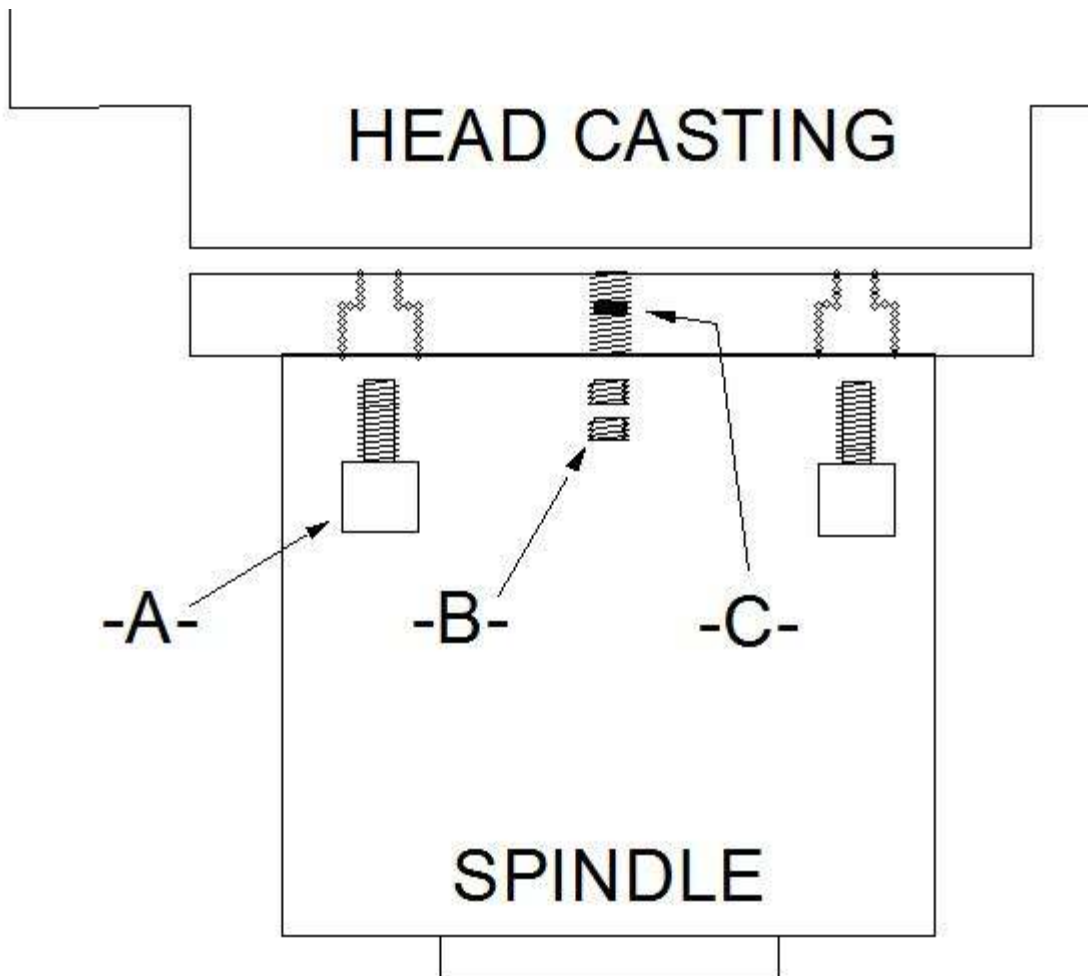
The Long and Short Lines are next to one another.

- The new pulleys will also have a Third Line, which is for the Dual Arm ATC.



SPINDLE ADJUSTMENT PROCEDURE (NEW ITS SPINDLE ONLY)

1. Install(6) aluminum crush washers on top of the(6) 5/16-24 adjustment screws before installing spindle in VMC. Making sure set screws are backed off enough so crush washers will not touch head casting once installed.
2. Install spindle in VMC using (6) 3/8-16 cap screws tighten to 55ft/lbs
3. Check tram at this time. If tram is more than .001" off check to make sure set screws are loose and crush washers are not touching head casting. If tram is still off more than .001" head adjustment or scraping will have to be done before proceeding.
4. If tram is within .0005" and head is adjusted properly now the tram can be adjusted.
5. Find low spot error in tram. With indicator still on spindle rotated to low spot loosen (2) 3/8-16 cap screws closest to error, and tighten set screw in between (2) 3/8-16 cap screws to approximately .001" past 0 now tighten (2) 3/8-16 cap screws until 0 is achieved with 55ft/lbs torque
(3) 3/8-16 cap screws and (2) 5/16-24 set screws can also be used to adjust tram.



ATTN: Adjustment screw's cannot be used for more than .0005" SPINDLE TRAM ERROR. If adjusted more than .0005" warranty may be voided.

CARE AND HANDLING PROCEDURES:

It's an engineering fact that there are two important aspects that will directly affect the life of any spindle and that is Heat and Contamination.

- 1) The less heat, the longer the bearings will last! A simple warm-up procedure will greatly extend the life of your new spindle and probably would have increased the life of your last spindle.
- 2) Contamination kills bearings simply because it interferes with the lubrication of the bearings. Any contamination to the grease inside the spindle will reduce the life of the spindle bearings. Especially important is the machine coolant; oil or water soluble coolant immediately breaks down the grease and will cause a bearing failure. Water causes the grease to turn "milky" and lowers the viscosity of the grease which quickly causes spindle failure (and will void the warranty).

IMPORTANT! - COOLANT THROUGH ATTACHMENT

This spindle requires CNT-0015, CNT-0150 or CNT-0286 seal kit, properly installed before using. Improper installation will damage spindle grease and void warranty. **NOTE: CNT-0015, CNT-0150 or CNT-0286 is not included with this spindle; customer must supply. See page 13 for seal kit drawing.**

How to avoid excessive Heat:

- Maintain the spindle cooler system. Check level, circulation pump pressure periodically.
- Monitor the spindle temperature inside the spindle taper, temporarily reduce rpm if needed.
- Use the simple spindle start-up procedures described below.
- Do not adjust the spindle preload without first consulting ITS Inc.
- Leaving the machine in High Range can cause excessive load on the upper bearings. The idlers keep "settling" inwards, increasing the belt tension and pulling forces between the spindle and the motor. If most of your operation is in high range, simply changing ranges and the end of the cycle by coding a S2000 will shift idlers and reduce the belt tension. This will also tremendously improve your belt life.

How to avoid Contamination:

All CNC spindles are vulnerable at the spindle nose between the spindle shaft and housing. A 100% sealed spindle would generate too much friction (heat) at high speeds. There are many techniques to seal high speed spindles between the shaft and housing. Commonly a labyrinth maze, an air shield or positive pressure inside the cartridge are used but any of these techniques can be overcome and contamination can get by the seal.

Simple preventive steps can avoid contamination and greatly improve the life of a spindle.

- Take caution when blowing with an air hose near the end of spindle.
- Avoid washing near the end of spindle, especially with high pressure.
- Avoid coolant nozzles directed at the spindle or splashing back at the spindle.
- Do not submerge the spindle in coolant while machining (use a longer tool/holder if possible)
- Immediately discontinue use if "Coolant Thru Spindle" seals are leaking

IMPORTANT! - SPINDLE START UP AND RUN-IN PROCEDURES:

Although each spindle is broke-in prior to shipment, you must do the Initial Run-In prior to being placing in operation. This will ensure proper channeling of the bearing lubrication which could have been affected by shipping or storage and prevents excessive bearing temperatures which could result in immediate bearing failure.

Prior to spindle start-up; check the spindle cooling system for proper flows, pressures, and temperatures. It's very important that the spindle coolant flow into the bottom of the cartridge and out the top. It's easy to get it backwards and significantly reduce the cartridge cooling potential.

It's a fact that the spindle life of all grease pack lubricated spindles can be greatly improved by a simple warm up procedure prior to running the spindle at full rpm.

The following guidelines must be adhered to in order to ensure proper channeling of the bearing grease lubrication. Improper spindle start-up could result in reduced spindle life or failure.

FIRST TIME START UP AND RUN-IN PROCEDURE

1. Run the spindle at 25% of the rated speed for approximately 1/2 hour.
2. Monitor the temperature of the bottom bearings. This can be done by taking temperature readings with a pyrometer at various locations around bottom of the spindle and inside the spindle taper. See Note Below If the temperature does not reach 140 degrees Fahrenheit move to the next step.
3. Increase the operating speed of the spindle to 50% of the rated speed for approximately 1/2 hour and repeat the temperature check.
4. Increase the operating speed of the spindle to 75% of the rated speed for approximately 1/2 hour and repeat the temperature check.
5. Increase the operating speed of the spindle to the full rated speed for approximately 1/2 hour and repeat the temperature check.
6. Start the machine for normal operation.

START UP PROCEDURE FOR AN IDLE SPINDLE 1-WEEK OR MORE

1. Follow the initial start-up procedure (above).

DAILY START UP PROCEDURE

1. Run the spindle at 50% of the rated speed for ten (10) minutes and check temperature at various locations around bottom of the spindle and inside the spindle taper. See Note Below
2. Start the machine for operation.

ABBREVIATED START UP PROCEDURE FOR A SPINDLE WITH 1/2 - 2 HOURS OF IDLE TIME

1. Run the spindle at 50% of the rated speed for approximately 3-5 minutes and monitor at various locations around bottom of the spindle and inside the spindle taper. See Note Below
2. Start the machine for operation.

START UP NOTE!

IF THE BEARING TEMPERATURE REACHES 140 DEGREES FAHRENHEIT, OR HIGHER AT ANY TIME DURING THE RUN-IN PROCEDURE, OR THE TEMPERATURE INCREASES MORE THAN 5 DEGREES FAHRENHEIT IN (1) MINUTE, IMMEDIATELY SHUT THE SPINDLE OFF AND ALLOW IT TO COOL TO ROOM TEMPERATURE. ONCE AT ROOM TEMPERATRE, RE-START THE PROCEDURE.

SPINDLE DRAWBAR AND BELLEVILLE SPRING REPLACEMENT

Drawbar Removal

- 1) Remove the Drawbar Cylinder Assembly.
- 2) Remove the Orientation Bridge Assembly.
- 3) Place a long 3/8 inch drive extension or similar item in the spindle and jog the head down until the extension is under slight tension between the drawbar and the table.
Caution: Do not place high tension on the extension; it only needs to support the drawbar. Place a piece of wood between the extension and the table, if needed.
- 4) Remove the Knock out cap (on locking drawbars only).
- 5) Place pilot tool on spring pilot.
- 6) Use wheel puller to depress the spring pilot.
- 7) Remove spring retainers.
- 8) Remove wheel puller.
- 9) Jog head up and remove the extension and the drawbar. Be careful not to drop the ball bearing.
- 10) Now remove the belleville springs or the floater.
- 11) To reinstall, reverse the above steps.

Replace Belleville Springs

- 1) Remove drawbar (See Above).
- 2) Using a spring hook or a magnet remove the Belleville springs (Be sure to remove any broken pieces).
- 3) Install replacement springs starting with first one cupped downward and reverse every other one. The quantity will vary depending on the spindle pocket size (See the spring quantity chart on the next page).
- 4) Reinstall drawbar.

Remove Floater (This will rarely be necessary.)

- 1) Remove the drawbar (See Above).
- 2) The floater has two ball bearings that hold it in place. Using a floater removal tool or a magnet pull the ball bearing toward the center and the floater should come out. If badly damaged the floater can be difficult to remove.

SPINDLE BELLEVILLE SPRINGS - QUANTITY CHART

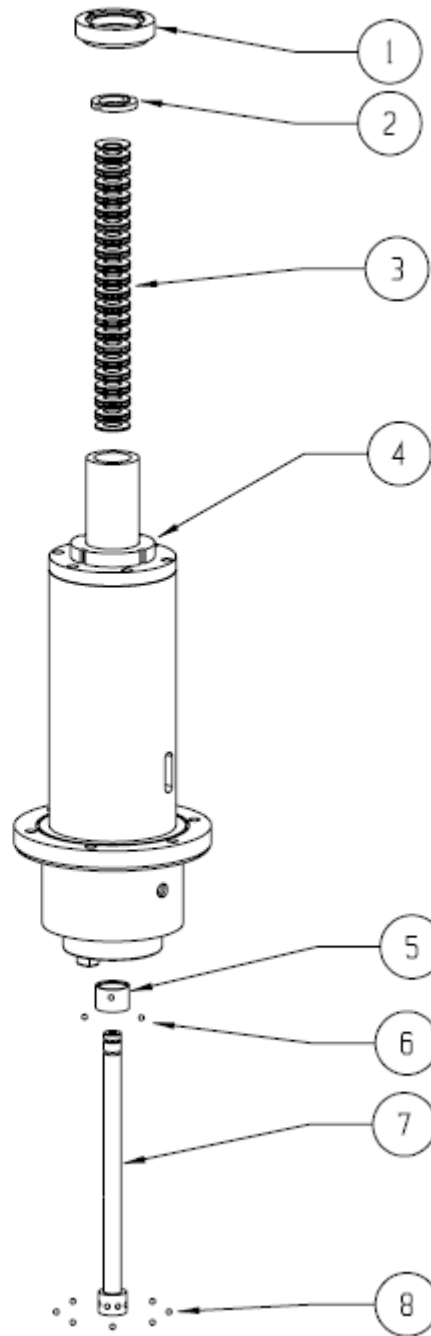
There have been many spindle and spring retainer combinations over the years. To determine the number of Belleville Springs in a spindle, three factors have to be considered: The depth of the spring pocket in the spindle, the depth of the spring retainer and the width of the Belleville springs. The following chart is a guide line for the number of springs and may vary slightly from spindle to spindle. This chart covers the most common depths of spindles. In most cases the deeper spring retainers will use one less spring then number in the chart.

Spindle Type	Spindle Depth	Number of springs	Remarks
10K Non-Locking	2.00	19	
10K Non-Locking	3.00	30	
10K Non-Locking	4.25	43	
7.5K & 15K Non-Locking	4.326	44	
7.5K & 15K Non-Locking	4.627	47	
10K Locking	2.00	18	
10K Locking	3.00	29	
10K Locking	4.25	42	
10K Locking	4.326	40	
10K Locking	4.627	44	

GREASE PACK SPINDLE ASSEMBLY - 7,500 and 10,000 RPM

7500 RPM SPINDLE ASSEMBLY

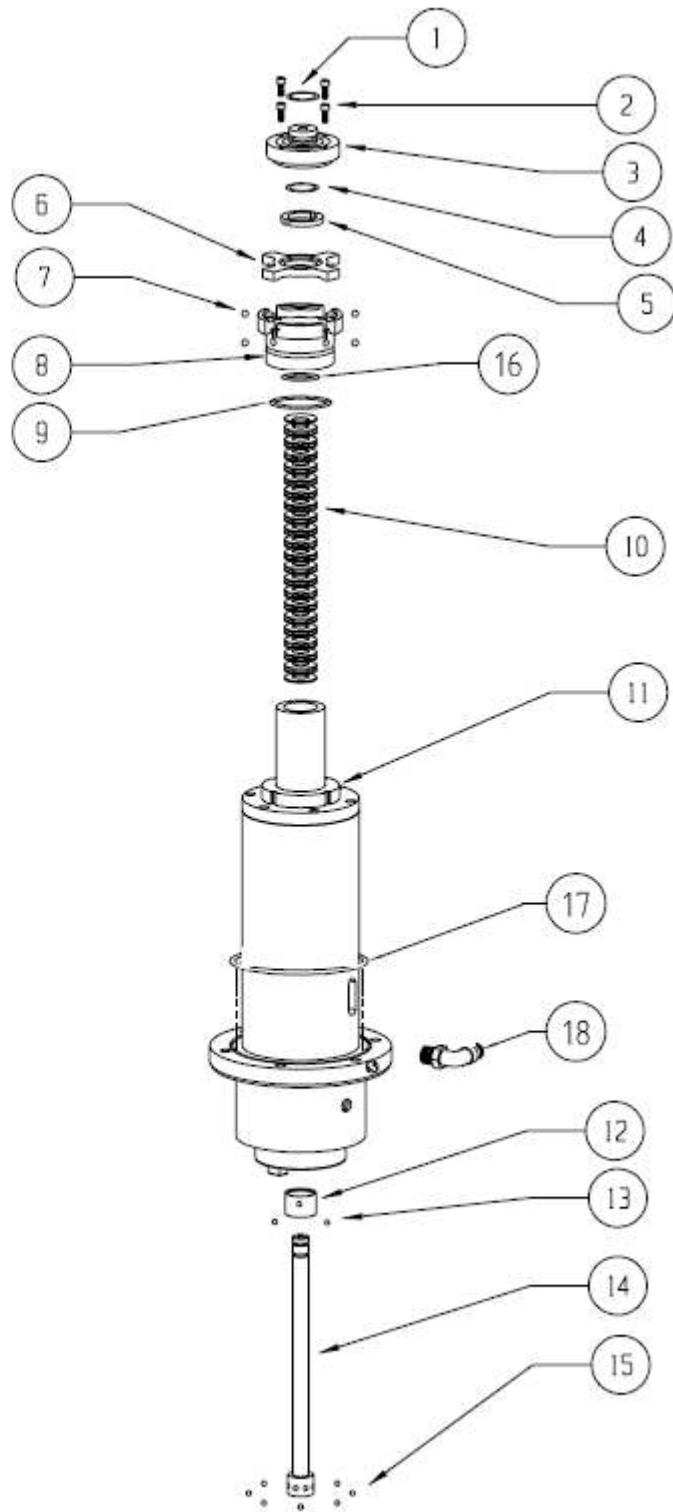
	PART #
1	SPN-0079
2	DRB-0019
3	HDW-0195
4	SPN-0084
5	DRB-0004
6	BRG-0005
7	DRB-0028 ⁽¹⁾
8	BRG-0005
ASSY SPN-0037 ⁽²⁾	



- 1 SPN-0079 ----- SPRING PILOT, NON-LOCKING DRAW BAR; NON-COOLNANT THRU
- 2 DRB-0019 ----- RETAINER, DRAWBAR; NON-LDB/LDB [2 REQ]
- 3 HDW-0195 ----- SPRINGS, BLVL-DRB ; PACK 44 W/ GREASE
- 4 SPN-0084 ----- NUT; GREASE PACK SPINDLE
- 5 DRB-0004 ----- FLOATER RING, NON-LDB AND LDB
- 6 BRG-0005 ----- BALL, CHROME-PRECISION; 3/16 G25
- 7 DRB-0028 ----- DRAWBAR/PILOT, NON-LOCKING
- 8 BRG-0005 ----- BALL, CHROME-PRECISION; 3/16 G25

10,000 RPM SPINDLE ASSEMBLY

	PART #
1	HDW-0177
2	HDW-0307
3	DRB-0015
4	HDW-0180
5	DRB-0019
6	DRB-0014
7	BRG-0004
8	DRB-0016
9	HDW-0158
10	HDW-0195
11	SPN-0084
12	DRB-0004
13	BRG-0005
14	DRB-0026 ⁽¹⁾
15	BRG-0005
16	HDW-0155
17	HDW-0181
18	PLM-0034
ASSY SPN-0007 ⁽²⁾	

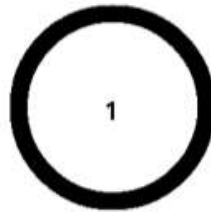


- 1 HDW-0177-----O'RING,-111; .437 X .093 CS
- 2 HDW-0307-----SCREW, SOCAP; 8-32 X 1/2
- 3 DRB-0015 -----KNOCK OUT CAP, LOCKING DRAWBAR
- 4 HDW-0180 -----O'RING, -011; .312 X .062 CS
- 5 DRB-0015 -----KNOCK OUT CAP, LDB
- 6 DRB-0014 -----SPIDER, LOCKING DRAW BAR STD
- 7 BRG-0004 -----BALL, CHROME-PRECISION; 1/4 GR25
- 8 DRB-0016 -----LOCKING DRAWBAR ASY, 10K-CT
- 9 HDW-0158 -----O'RING, -122; 1.125 X .093 CS

- 10 HDW-0195 -----SPRINGS, BLVL-DRB; PK/44 W/ GREASE
- 11 SPN-0084 -----NUT; GP SPINDLE
- 12 DRB-0004 -----FLOATER RING, NON-LDB AND LDB
- 13 BRG-0005 -----BALL, CHROME-PRECISION; 3/16 G25
- 14 DRB-0026 -----LOCKING DRAWBAR ASY, 10K-CT
- 15 BRG-0005 -----BALL, CHROME-PRECISION; 3/16 G25
- 16 HDW-0155 -----O'RING, Q4114 BUNA; DOUBLE SEAL
- 17 HDW-0181 -----O'RING, -160; 5.250 X .093 CS
- 18 PLM-0034 -----FITTING, 5/32 QD X 1/8 MIPT

COOLANT THROUGH SPINDLE

CNT-0015, Coolant-thru Seal Conversion Kit
 CNT-0150, Seal Repair Kit



HDW-0158



HDW-0177



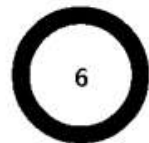
HDW-0150



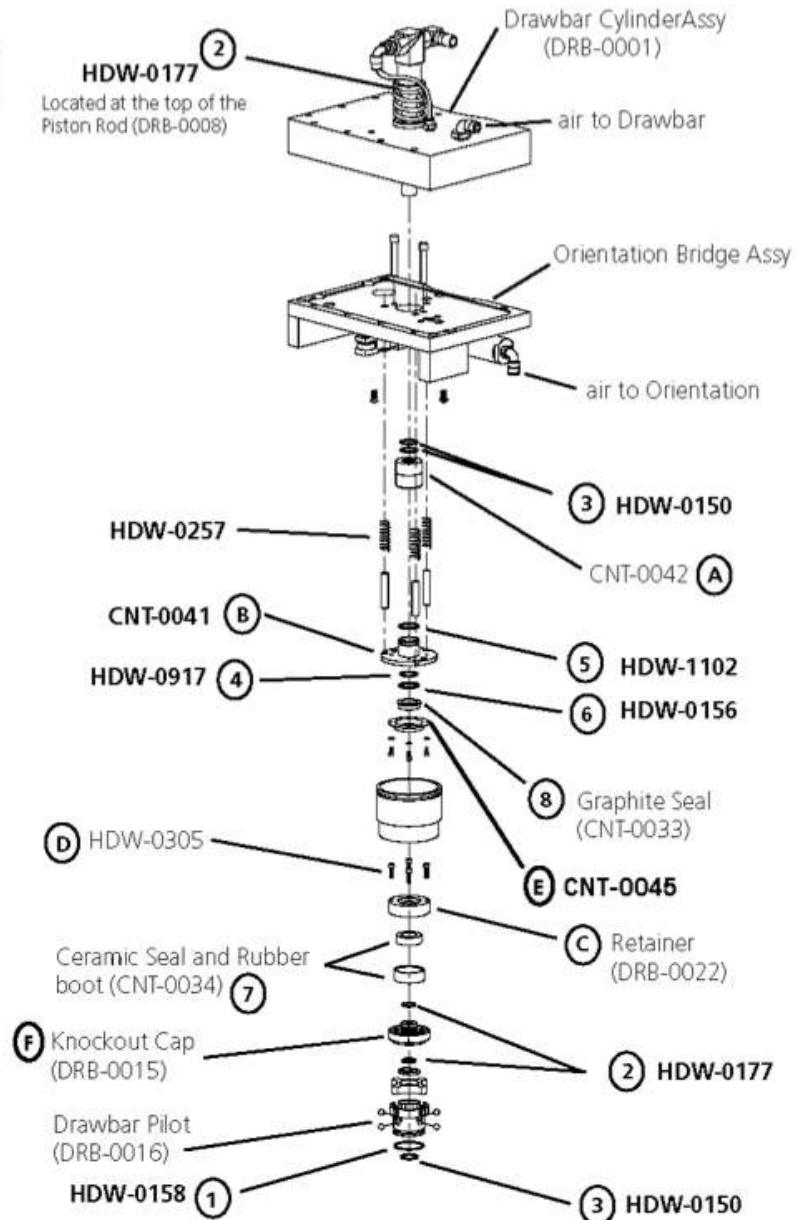
HDW-0917



HDW-1102



HDW-0156



CNT-0150 O-RINGS AND SEALS ONLY (1-8)
 CNT-0015 FOR CONVERTING OLDER MODELS (1-8
 AND A-F)

NOTE – HDW-0158 and HDW-0150 is not included with this spindle. Customer must supply.

LIMITED WARRANTY:

Any spindle, or part thereof, sold by Independent Technology Service Inc., which, under normal operating conditions in the plant of the original purchaser thereof, proves defective in material or workmanship within specified time (two years) from the date of shipment by us, as determined by an inspection by us, will be repaired or replaced, at our discretion, free of charge for repair. Customer is responsible for the shipping costs.

Provided that you promptly send to us notice of the defect and establish that the spindle has been properly installed, maintained, and operated within the limits of rated and normal usage, and that no factory adjustments have been tampered with or damage has occurred from contamination; i.e. water, coolant, any foreign material such as chips or dust. **We cannot warranty a spindle that has failed due to contamination of the bearings, grease lubrication or failure to follow the start up procedures.**

Independent Technology Service Inc. or agents liability is limited to repair or replacement of defective parts as examined and determined by us. Repaired items will carry a 90-day warranty or until fulfillment of original warranty time; whichever is greater.

All expressed and implied warranties, including the implied warranties of merchantability and fitness for a particular purpose are limited in duration to the warranty period, and no warranties, whether expressed or implied, will apply after this period.

Under no circumstances shall Independent Technology Service Inc. or any of our affiliates have any liability whatsoever for claims or damages arising out of the loss of use of any product or part sold to you. Nor shall we have any liability to yourself or anyone for any indirect or consequential damages such as injuries to person and property caused directly or indirectly by the product or part sold to you, and you agree in accepting our product or part to save us harmless from any and all such claims or damages that may be initiated against us by third parties.

POLICY INFORMATION:

CORE RETURNS:

A CORE is defined as a used or broken part, capable of being repaired at a reasonable cost as determined by Independent Technology Service Inc. A credit is given to parts specific and defined by us. Upon reception of spindle and if is determine by us to be repairable, we will issue a "Core Credit" for the amount determined at the initial sale of the replacement spindle less the cost of unusable parts of the spindle assembly. The core credit will be \$800.00 if its only needs bearings replaced. Spindle core returns not considered repairable by us with either be returned or destroyed according to the customer's instructions.

RESTOCKING:

We cannot receive a return part that has been damaged or in a condition that makes it unable to resale as originally sold. Parts being returned must be returned in the same packaging and in the same condition (as determined by us) as it was originally received. Spindles returned to us that are not under a warranty repair will be subject to a 15% restock fee. We will contact the customer to discuss returns considered unusable or damaged for possible solutions.

SHIPPING:

Customer is responsible for all shipping unless determined by us to be our fault; i.e. the wrong part was shipped. ITS will pay UPS Ground shipping on warranty replacements.