

Reference Number	Bulletin 01 – 2019*
Affected Product	Potential failure of motor grader front wheel spindles in mining applications
Risks Identified	Failure to apply the recommendations in this Equipment Safety Bulletin may increase the risk of spindle failure
Release Date	18 January 2019 (Revised 06 November 2019 and 25 August 2020)

*\*This bulletin replaces Bulletin 013 2013 which has been cancelled.*

## Problem Overview

Fractures have occurred in front wheel spindles on Motor Graders used in mining applications, surface, and underground mines. The images below demonstrate damage from the two failure modes observed.



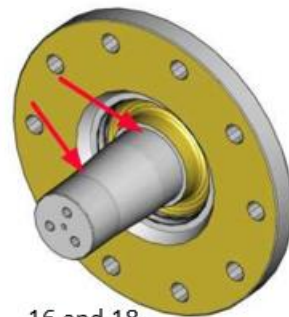
If a front wheel spindle fractures, the front wheel assembly may separate from the machine resulting in loss of control by the operator. A failure of this nature has the potential to cause personal injury and/or property damage. The separated wheel also has the potential to impact property or personnel in its path.

Caterpillar have provided the following advice and released publications to assist with the management of this potential issue:

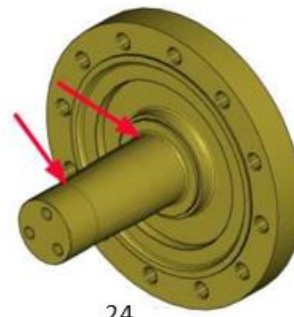
- **“The front wheel spindles will fail in certain applications due to impact or overload conditions. Actual life achieved will vary according to outside influences such as site conditions, machine operation, machine application, and optional attachments fitted to the specific machines.”**
- Service Magazine media number [SEPD1533](#)\* advises of the availability of a more robust 383-1185 front wheel spindle assembly which is adaptable to the following 24H and 24M machines: 7KK1-UP, B9K1-UP, B931-UP.
- Service Magazine media number [M0085269](#)\* advises of the availability of a more robust 437-8983 front wheel spindle assembly which is adaptable to the following 16G, 16H, and 16M machines: 93U1-UP, 6ZJ1-UP, ATS1-UP, B9H1-UP, R9H1-UP.

- Service Magazine media number [M0082055](#)\* advises of an updated inspection procedure for front wheel spindles on the following 16, 16G, 16H, 16M, 16M3, 18, 18M3, 24, 24H and 24M machines: EN51-UP, NN51-UP, 93U1-UP, 6ZJ1-UP, ATS1-UP, B9H1-UP, R9H1-UP, E9Y1-UP, N9Y1-UP, EN61-UP, NN61-UP, N9A1-UP, E9W1-UP, E9Z1-UP, N9Z1-UP, 7KK1-UP, B931-UP and B9K1-UP.
- Special Instruction [M0068684](#)\* – Procedure for Ultrasonic Inspection of Large Motor Grader front wheel spindles.

Front wheel spindle fractures have occurred at the base of the spindle behind the outer tapered roller bearing, and near the bottom of the retainer bolt holes. Current part number spindles have a radius at bottom of bolt holes and an improved hardening process to make the spindle more durable.



16 and 18  
Front Spindle



24  
Front Spindle

To reduce the risk of an unexpected spindle failure, this bulletin outlines recommendations for additional inspection for the spindle and replacement of the spindle. It is recommended to record the outcome of all inspections performed in accordance with this bulletin in the machine's maintenance log.

PowerPoint presentation [16H-16M Front Wheel Spindle Part Number Identification](#)\* assists with identifying the various features of the three (3) spindles available for these models.

## Recommendations

One axle life for 24 series machines is 12,000 hours. 24/ 24H/ 24M FRONT spindles are designed for one axle life.

The design life of a new 16 or 18 series motor grader spindle is the equivalent of two axle lives. Reman spindles are designed for one axle life.

On 16 and 18 series machines, remove and inspect the front wheel spindles at 12,000 spindle hours or first life overhaul. Perform visual inspection and 100% magnetic particle examination of the spindle. Also perform ultrasonic testing in the area around the retaining bolt holes. Do not reuse spindles that have crack indications at any location. Do not reuse spindles where the service life cannot be reliably established.

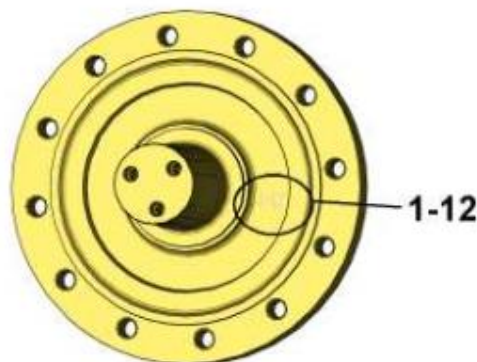
At second life overhaul on applicable machines, replace the spindles with new parts. A crack inspection is not required at the second life overhaul.

In accordance with the criteria outlined in Service Magazine [M0082055](#)\*, Hastings Deering recommends that Motor Graders used in mining applications should have inspections performed immediately and then per the schedule in the O&MM and also after any of the following events:

- When a wheel and spindle are involved in a collision or high impact event, immediately inspect the wheel and spindle before returning to service.
- High-speed operation on uneven or rough roads resulting in frequent high impacts to the tire or wheel.
- Frequent operation during which the front and rear axles are contacting the oscillation stops. Visible deformation of the oscillation stops is a good indicator of this type of operation.
- Frequent operation where mounds of spoil or dump material exceeding one third of the tyre diameter are traversed or knocked down. Front axle housing abrasive wear or impact is a good indicator of travel over large mounds or dump piles.
- Frequent steering in deep ruts or against wind rows or ridges resulting in high machine steering effort or pressure. Wear on tire sidewalls and wheel rims are indicators of high steering and spindle loads.

Immediately remove machines from service that have crack indications in the locations identified in Special Instruction [M0068684](#)\*. Discard the front wheel spindle and replace with new, using the latest part available. Replace any other damaged parts. Operation of a machine with a cracked spindle can lead to catastrophic failure and result in property damage and injury.

If no cracks are detected, mark the front wheel spindle as an acceptable reusable part with an air engraver or steel stamp set. Mark all front wheel spindles on the inboard face of the rim flange as per the illustration below.



If "1 - 12" was marked on a front wheel spindle, the "1" would indicate the first inspection, and the "12" would indicate that there were 12,000 hours on the part at the time of inspection.

If you have any queries regarding the contents of this bulletin or for any machine used in Mining Applications that is not 16 to 24 sized, please contact your Mining Support Representative.

*\* Always check Cat SIS (Service Information System) to ensure the latest version of this document is referenced. A copy of each document (current at last revision date of this bulletin) is attached.*

*This bulletin is to inform you of the recommendations of the supplier in respect of issues dealt with in the bulletin and should not be used as specific advice in respect of any particular events. Advice from a qualified repairer should be sought in respect of any particular events and Hastings Deering (Australia) Ltd accepts no responsibility for any loss or damage occasioned by a party using this bulletin.*

2012/10/16

**A New Spindle Assembly for the Front Axle Group is Now Used On Certain 24H and 24M Motor Graders {4205}  
(SEPD1533)**

**SMCS - 4205**

i05146051

**Motor Grader:**

**24H (S/N: 7KK1-UP)**

**24M (S/N: B9K1-UP)**

**Description of Change:** A new spindle assembly with improved induction-harden heat process improves the service life of the spindle. A new spindle assembly with improved manufacturing process increases the service life of the front axle group.

**Adaptable To:**

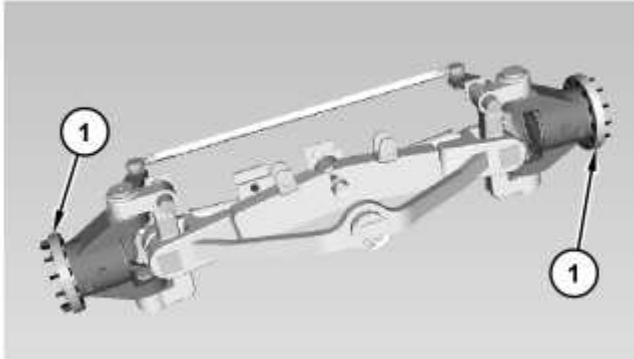


Illustration 1

g03320064

The new **383-1185** Spindle As is part of the **8X-8974** Front Axle Gp on the 24H Motor Graders and the **266-5908** Front Axle Gp on the 24M Motor Graders.

The new **383-1185** Spindle As is a direct replacement for the **162-4228** Spindle As for the 24H Motor Graders and the **281-0074** Spindle As for the 24M Motor Graders.

The new **383-1185** Spindle As is adaptable to machines 7KK1-UP and B9K1-653.

The new **383-1185** Spindle As is effective in production with machines B9K654-UP.



SMCS - 4205,4313

i07890093

Motor Grader

16H (S/N: 6ZJ1-UP; ATS1-UP)

16M (S/N: B9H1-UP; R9H1-UP)

A change has been made to Service Magazine, SEPD1701, 27, November 2013 , "New Spindle for the Front Axle Group Is Now Used On Certain 16H and 16M Motor Graders". Please disregard this Service Magazine article and see the article that follows.

**Description Of Change:** The new spindle with improved design of tapped holes will better withstand high stress and increases the service life of the front axle group.

Adaptable To:

Required Parts				
Item	Qty	New Part Number	Part Name	Former Part Number
1	2	437-8984	Cover	5T-0908
2	6	7D-1649	Hard Washer	
3	2	437-8982	Retainer	8D-1822
4	6	426-4334	Shim	2G-3868
5	2	437-8983	Spindle	264-1161

Table 1

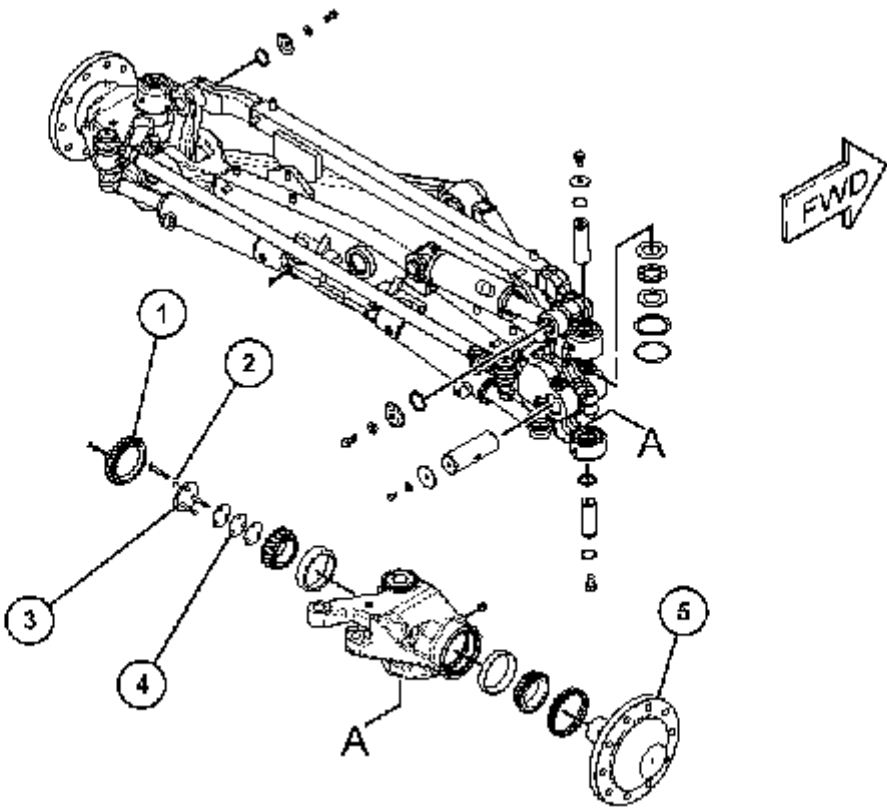


Illustration 1

g06310781

(1) 437-8984 Cover

(2) 7D-1649 Hard Washer

(3) 437-8982 Retainer

(4) 426-4334 Shim

(5) 437-8983 Spindle

New **437-8983** Spindle (5) is a direct replacement of **264-1161** Spindle.

New **437-8983** Spindle (5) is a direct replacement of **147-3402** Spindle.

The new **437-8983** Spindle is adaptable to machines **S/N:**6ZJ1-UP, ; **S/N:**ATS1-78001, ; **S/N:**B9H1-866 and ; **S/N:**R9H1-892.

The new **437-8983** Spindle is effective in production with machines **S/N:**ATS78002-UP, ; **S/N:**B9H867-UP and ; **S/N:**R9H893-UP.





**SMCS - 3020,3282,4303,4305,5225**

**Motor Grader**

**16 (S/N: EN51-UP; NN51-UP)**

**16H (S/N: 6ZJ1-UP; ATS1-UP)**

**16M (S/N: B9H1-UP; R9H1-UP)**

**16M Series 3 (S/N: E9Y1-UP; N9Y1-UP)**

**18 (S/N: EN61-UP; NN61-UP)**

**18M Series 3 (S/N: N9A1-UP; E9W1-UP)**

**24 (S/N: E9Z1-UP; N9Z1-UP)**

**24H (S/N: 7KK1-UP)**

**24M (S/N: B931-UP; B9K1-UP)**

## Introduction

The front wheel spindles of the listed Motor Graders may be inspected without disassembly. Refer to either Reuse and Salvage Guidelines, SEBF9317, "Reusability Guidelines & Crack Inspection for Front & Rear Wheel Spindles on 16, 18, & 24 Motor Graders Used in Mining Applications" or Special Instruction, M0068684 for the required procedure.

## Inspection Procedure

Front and rear wheel spindles should be inspected every 12,000 operating hours. Follow the procedures identified in either Reuse and Salvage Guidelines, SEBF9317, "Reusability Guidelines & Crack Inspection for Front & Rear Wheel Spindles on 16, 18, & 24 Motor Graders Used in Mining Applications" or Special Instruction, M0068684.

Some applications and operations require more frequent front spindle inspections every 3000 operating hours. Inspect the front spindles using either Reuse and Salvage Guidelines, SEBF9317, "Reusability Guidelines & Crack Inspection for Front & Rear Wheel Spindles on 16, 18, & 24 Motor Graders Used in Mining Applications" or Special Instruction, M0068684. The following list of events or operating conditions are causes for more frequent inspections.

- When a wheel and spindle are involved in a collision or high impact event, immediately inspect the wheel and spindle before returning to service.
- High-speed operation on uneven or rough roads resulting in frequent high impacts to the tire or wheel.
- Frequent operation while the front and rear axles are contacting the oscillation stops. Visible deformation of the oscillation stops is a good indicator of this type of operation.
- Frequent operation where mounds of spoil or dump material exceeding one third of the tire diameter are traversed or knocked down. Front axle housing abrasive wear or impact is a good indicator of travel over large mounds or dump piles.
- Frequent steering in deep ruts or against wind rows or ridges resulting in high machine steering effort or pressure. Wear on tire sidewalls and wheel rims are indicators of high steering and spindle loads.

Immediately remove machines from service that contain cracks in the locations identified in the inspection and reuse procedure. Operation of a machine with a cracked spindle can lead to catastrophic failure and result in loss of control by the operator.

Front Spindles with over 24,000 hours of use should be replaced.



SMCS - 4305,4313,5225

i08159476

Motor Grader

16 (S/N: EN51-UP; NN51-UP)

16H (S/N: 6ZJ1-UP; ATS1-UP)

16M (S/N: B9H1-UP; R9H1-UP)

16M Series 3 (S/N: E9Y1-UP; N9Y1-UP)

18 (S/N: EN61-UP; NN61-UP)

18M Series 3 (S/N: N9A1-UP; E9W1-UP)

24 (S/N: E9Z1-UP; N9Z1-UP)

24H (S/N: 7KK1-UP)

24M (S/N: B931-UP; B9K1-UP)

Revision History:

Revision	Summary of Changes
06	Information updated for 24 Motor graders
05	Information updated and prefix added
04	Republished to SIS
03	Added additional prefixes

Table 1

## Introduction

Do not perform any procedure in this Special Instruction until you have read the information and you understand the information.

## Reference Section

**Reference:** Refer to Reuse & Salvage Guidelines, SEBF9317, "Reusability and Crack Inspection of Front and Rear Wheel Spindles on 14, 16, 18, and 24 Motor Graders Used in Mining Applications". Information contained in this Special Instruction is made available for customers that do not have access to the Reuse & Salvage Guidelines.

**Reference:** Refer to Operation Maintenance Manual (OMM) or discuss with dealer, for recommended spindle inspection and replacement intervals,

The design life of a new motor grader spindle is the equivalent of two axle lives. Reman spindles are designed for one axle life. The exception is 24H/24M/ and 24 FRONT spindles, which are designed for one axle life.

## Approved Inspection Methods

Ultrasonic inspection (UT) is required for this procedure. This inspection method should be conducted and reported by qualified personnel. Examples of qualified personnel are as follows: UT-ASNT (American Society of Nondestructive Testing) Level I, minimum.

## Requirements for Ultrasonic (UT) Testing

The following criteria for personnel, apparatus, sample preparation, and test procedure must be met.

### Personnel

Personnel performing the inspections will be at least Level I Certified Technicians in the Ultrasonic Testing Method, as defined by ASNT SNT-TC-1A, ASNT CP-189, or other equivalent international standard.

Personnel performing the inspections will be trained by a Level II or Level III, until personnel show proficiency and understanding of procedures and rejection criteria.

### Apparatus

The following criteria for certain test apparatus must be met.



## Ultrasonic (UT) Instrument

The UT flaw detection instrument shall be capable of generating, receiving, and amplifying high-frequency electrical pulses at such frequencies and energy levels required to perform a meaningful examination and provide suitable readouts.

Preferred functions and features include, but are not limited to: inspection program recording, signal gating system, measurement data display, DAC/TCG recording, and 0Db Reference.

UT instrument certification and qualification should be performed annually according to ASTM E317 or equivalent. Verify key performance characteristics, such as horizontal limit and linearity, vertical limit and linearity, resolution - entry surface and far surface, sensitivity and noise, and accuracy of calibrated gain controls.

## Straight Beam or Longitudinal Wave Search Unit

The ultrasonic transducer (probe, or search unit) shall be capable of transmitting and receiving ultrasound at the required frequencies and energy levels necessary for discontinuity detection in the material being examined.

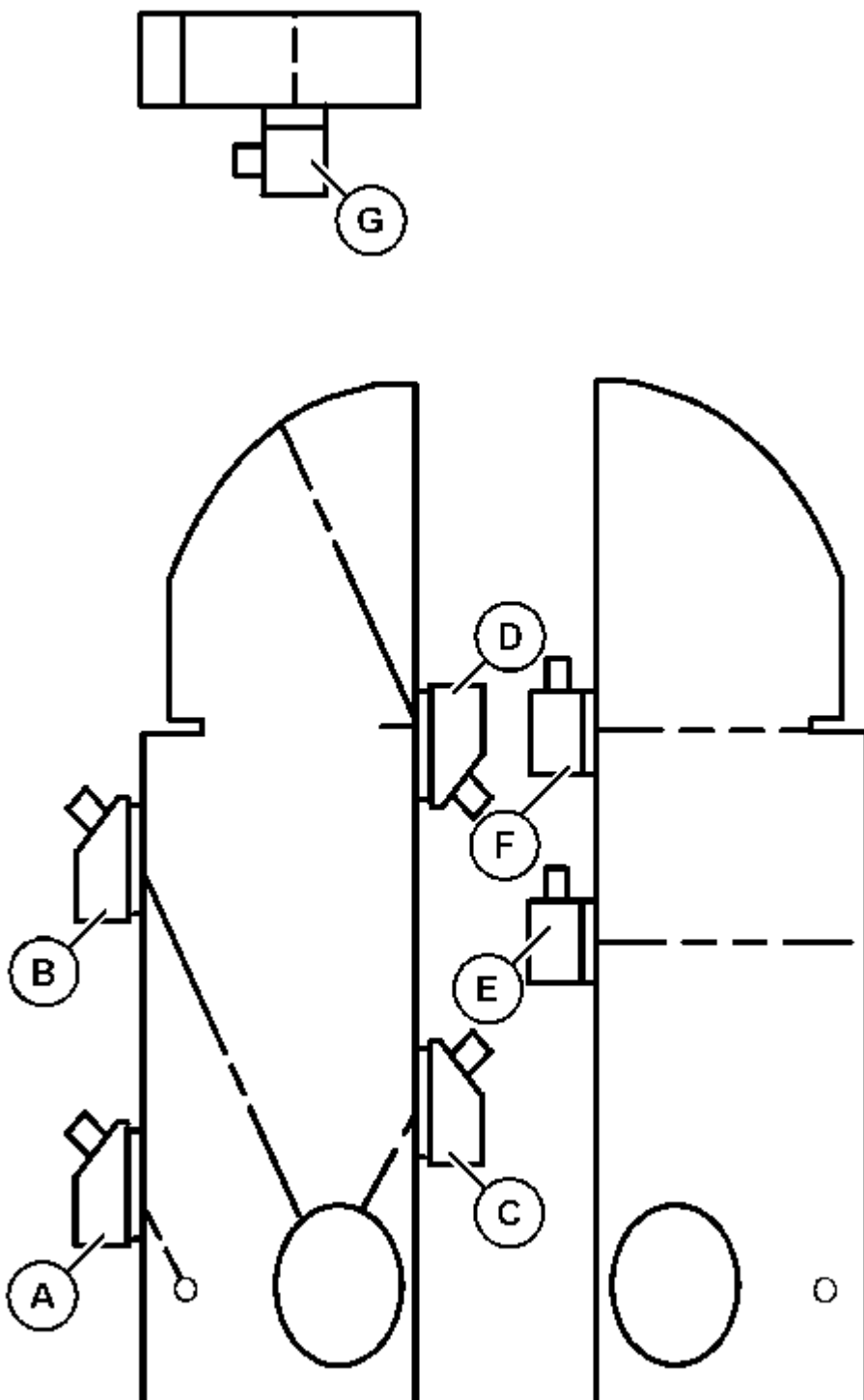
Frequencies of 4 MHz to 5 MHz shall be employed for straight beam longitudinal wave inspection. Transducer crystal can be round, square, or rectangular. Crystal size recommended for examination shall be 25 mm (1.0 inch). Caterpillar® recommended transducer info : (Olympus® Model-V107 5MHZ - 1inch).

## Couplant

Couplant is required between the face of the search unit and the examination surface. Couplant permits the transmission of ultrasonic waves from the search unit into the material under examination.

Typical couplants include cellulose gel, glycerin, and light machine oil. Corrosion inhibitors or wetting agents may be added. Couplants must be selected that are not detrimental to the product or the process. Special couplant and search unit may be required at temperatures above 52° C (125° F).

## Distance and Sensitivity Calibration Checks





## Sample Preparation

The following criteria for sample preparation must be met.

## Surface Preparation

The surface must have contour allowing the close coupling between the search unit and scanning surface. The inspection surface shall be free of loose scale, loose paint, weld spatter, dirt, excessive roughness, or other foreign objects that would interfere with the transmission of sound energy from the search unit into the part. Cleaning or grinding may be needed. Paint removal is not required.

## Test Procedure

The following criteria for test procedure must be met.

## Equipment Calibration

In addition to the annual UT equipment certification or qualification, periodic calibration or standardization is required to verify that UT equipment is performing as intended for day-to-day usage.

## Straight Beam Calibration

The distance and sensitivity calibration should be verified by the UT operator.

Recalibration shall be made a minimum of every 8 hours or process change, such as changing operator, search unit, cable, battery, testing weld, and recoupling of search unit.

To ensure the accuracy of locating discontinuities, the distance shall be calibrated through the entire sound path used during the specific examination.

With the Range set to 300 mm (12 inch), use the 25 mm (1 inch) (see illustration 1, position (G)) and 100 mm (4 inch) (see illustration 1, position (E)) thicknesses on the IIW-type reference block for distance calibration in straight beam applications.

To obtain meaningful readings, other instrument settings such as probe angle, gate, and gain level shall be properly selected.

## Sensitivity Calibration

The 100 mm (4 inch) thicknesses on the IIW-type reference block shall be used as the calibration target. Refer to Illustration 1, position (E).

**Reference Reject Threshold:** The signal from the 100 mm (4 inch) (position (E), Illustration 1 thicknesses on the IIW-type reference block should be adjusted to be 100% full screen height (FSH). The gain setting to obtain the indication at 100% FSH will be increased by 24 dB for 14, 16, and 18 front spindles and +36 dB for 24 front spindles, to set the reference sensitivity level. The Gate "A" shall be set to start at 75.0 mm (3.0 in), Width of 150.0 mm (6.00 inch) for 14, 16, and 18 front spindles and 275.0 mm (11.00 inch), Width of 75.0 mm (3.00 inch) for 24 and a Threshold of Gate 15% FSH and relevant indications that meet or exceed this threshold are rejectable.

## Scan Pattern, Scan Distance, and Scan Speed

Scanning in raster pattern, ensure 10% overlap on each scan path for full inspection area coverage. Scanning should cover the entire outlined area created by tracing the provided template or manually drawing an Ø 70.0 mm (2.75 inch) diameter circle on center for 14 front spindles and Ø 80.0 mm (3.15 inch) diameter circle for 16 and 18 front spindles shown in Illustration 2 and Ø 100.0 mm (4.00 inch) for 24 front spindles shown in Illustration 13. Finding the center point of the spindle can be accomplished by aligning a straight edge on the center of the stud bolts directly 180° across the spindle and making two reference marks to find the center point. Scanning Speed shall not exceed 150.0 mm (6.00 inch) per second.

## Initial Surveillance Scanning

For initial scanning, extra gain (6 dB or 12 dB) may be required to facilitate detection of potential discontinuities. The evaluation of the indication shall be performed back to the reference sensitivity.

## Accept and Reject Criteria and Sizing

Indications found breaking the 15% Gate A threshold in the area of interest for any length shall be considered rejectable.

A complete loss of the back wall with no relevant reflections crossing the Gate A threshold that exceeds 30% of the 80 mm (3.15 inch) diameter inspection area for 16 and 18 front spindles and Ø 100 mm (4.00 inch) for 24 front spindles, shall also be deemed rejectable. Some cracking may be at such an angle that the crack may not reflect the sound well.



14, 16, and 18 Front Spindles Non-Destructive Evaluation (NDE) Inspection Areas and Part Detail



Illustration 2 g06039999  
(H) Diameter of Scan Area Ø 70.0 mm (2.75 inch) 14 and Ø 80.0 mm (3.15 inch) for 16 and 18 models  
(I) Outline Marking Template



Illustration 3 g06040021  
Scan Pattern and Area  
(H) Diameter of Scan Area Ø 70.0 mm (2.75 inch) 14 and Ø 80.0 mm (3.15 inch) for 16 and 18 models  
Inspections can be conducted on built machines with no need to disassemble and remove front spindles.

After marking the inspection area outline and correctly calibrating the UT instrument, scan the entire area highlighted in Illustration 3. The nominal through spindle thickness is 240.0 mm (9.50 inch) 14 and 273.0 mm (10.75 inch) 16 and 18.

The center point of the transducer shall be used as a reference to judge if the transducer is inside or outside of the inspection area.



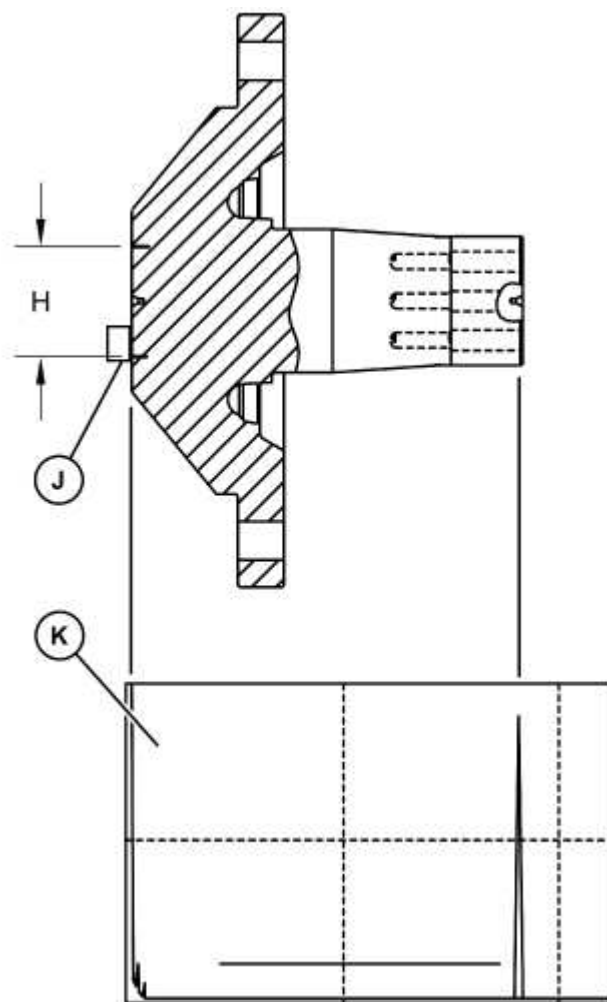


Illustration 4

g06076208

Normal back wall and bolt hole UT indications

(H) Diameter of Scan Area  $\varnothing$  70.0 mm (2.75 inch) 14 and  $\varnothing$  80.0 mm (3.15 inch) for 16 and 18 models

(J) UT Transducer

(K) UT Scan Indication Graph

Illustration 4 shows a large indication at the back wall thickness of the spindle. This back wall indication will be present and consistent throughout the inspection area on acceptable spindles. The transducer position is within the inspection area highlighted. Generally no indications, or low amplitude indications will be present from the drilled and tapped holes on the spindle end because of the drill taper.

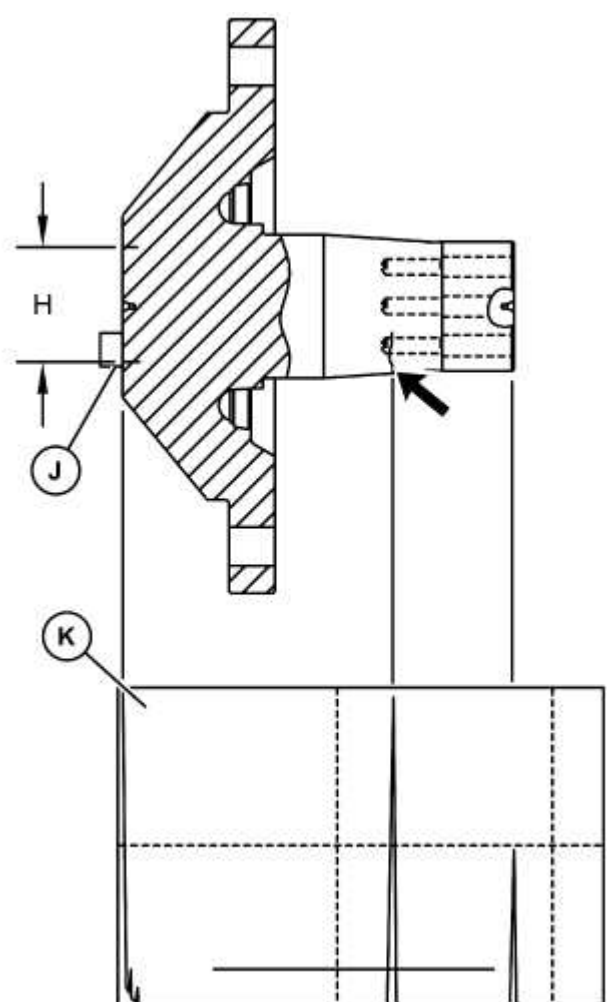


Illustration 5

g06076215

UT indication from a crack in the spindle

(H) Diameter of Scan Area  $\varnothing$  70.0 mm (2.75 inch) 14 and  $\varnothing$  80.0 mm (3.15 inch) for 16 and 18 models

(J) UT Transducer

(K) UT Scan Indication Graph

Illustration 5 shows that an indication is found between the back wall indication and the front surface indication. The transducer position is within the inspection area highlighted and the indication location is within the area of interest. This spindle is rejectable.



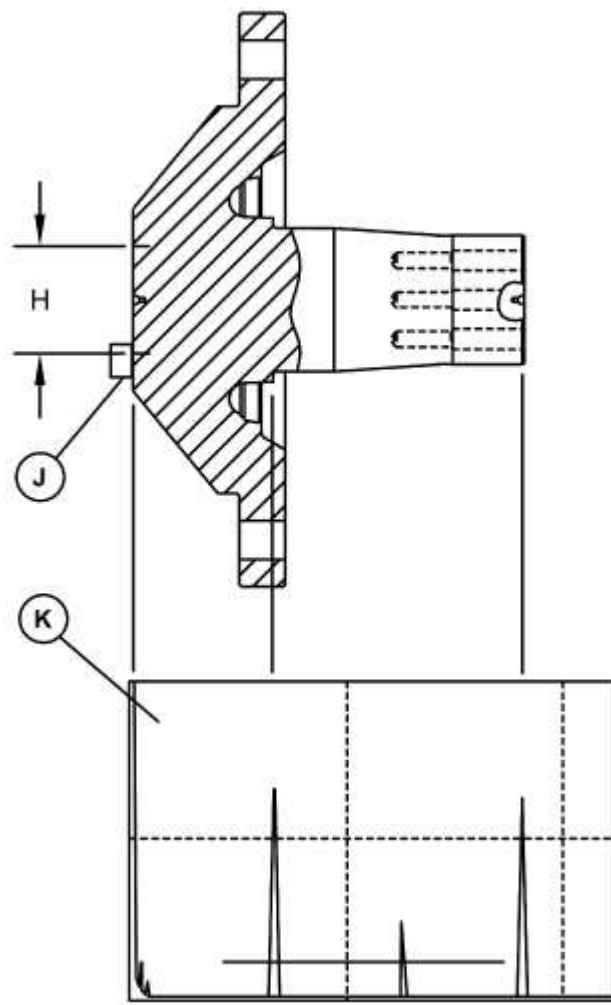


Illustration 6

g06076220

False UT indications from geometry scanning outside of the inspection area.

(H) Diameter of Scan Area Ø 70.0 mm (2.75 inch) 14 and 80.0 mm (3.15 inch) for 16 and 18 models

(J) UT Transducer

(K) UT Scan Indication Graph

Illustration 6 shows false indications from geometry indications that are present outside the scanning inspection area of interest. These indications may show indications over the reject threshold but should be disregarded because the transducer position is outside the highlighted area.

## Non-Destructive Evaluation (NDE) Inspection Areas and Part Detail



Illustration 7

g06039999

(H) Diameter of scan area 80 mm (3.15 inch)

(I) Outline marking template







Illustration 8  
Scan pattern and area  
(H) Diameter of scan area 80 mm (3.15 inch)

After marking the inspection area outline and correctly calibrating the UT instrument, scan the entire area highlighted in Illustration 8. The nominal through spindle thickness is 273 mm (10.75 inch).

The center point of the transducer shall be used as reference to judge if the transducer is inside or outside the inspection area

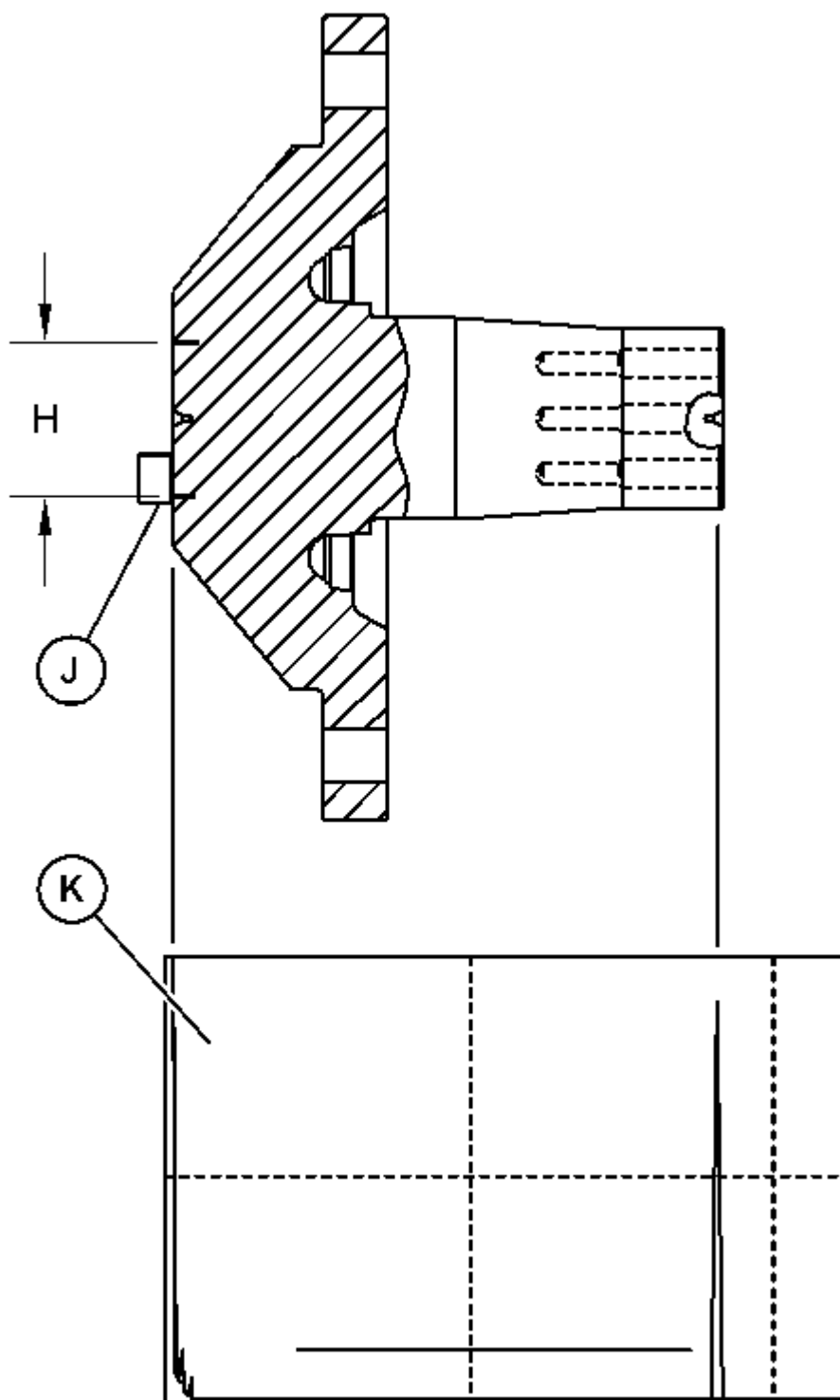


Illustration 9  
Normal back wall UT scan indication  
(H) Diameter of scan area 80 mm (3.15 inch)  
(J) UT transducer  
(K) UT scan indication graph

g06039706

Illustration 9 shows a large indication at the back wall thickness of the spindle. This back wall indication will be present and consistent throughout the inspection area on acceptable spindles. The transducer position is within the inspection area highlighted. Generally no indications, or low amplitude indications will be present from the drilled and tapped holes on the spindle end because of the drill taper.





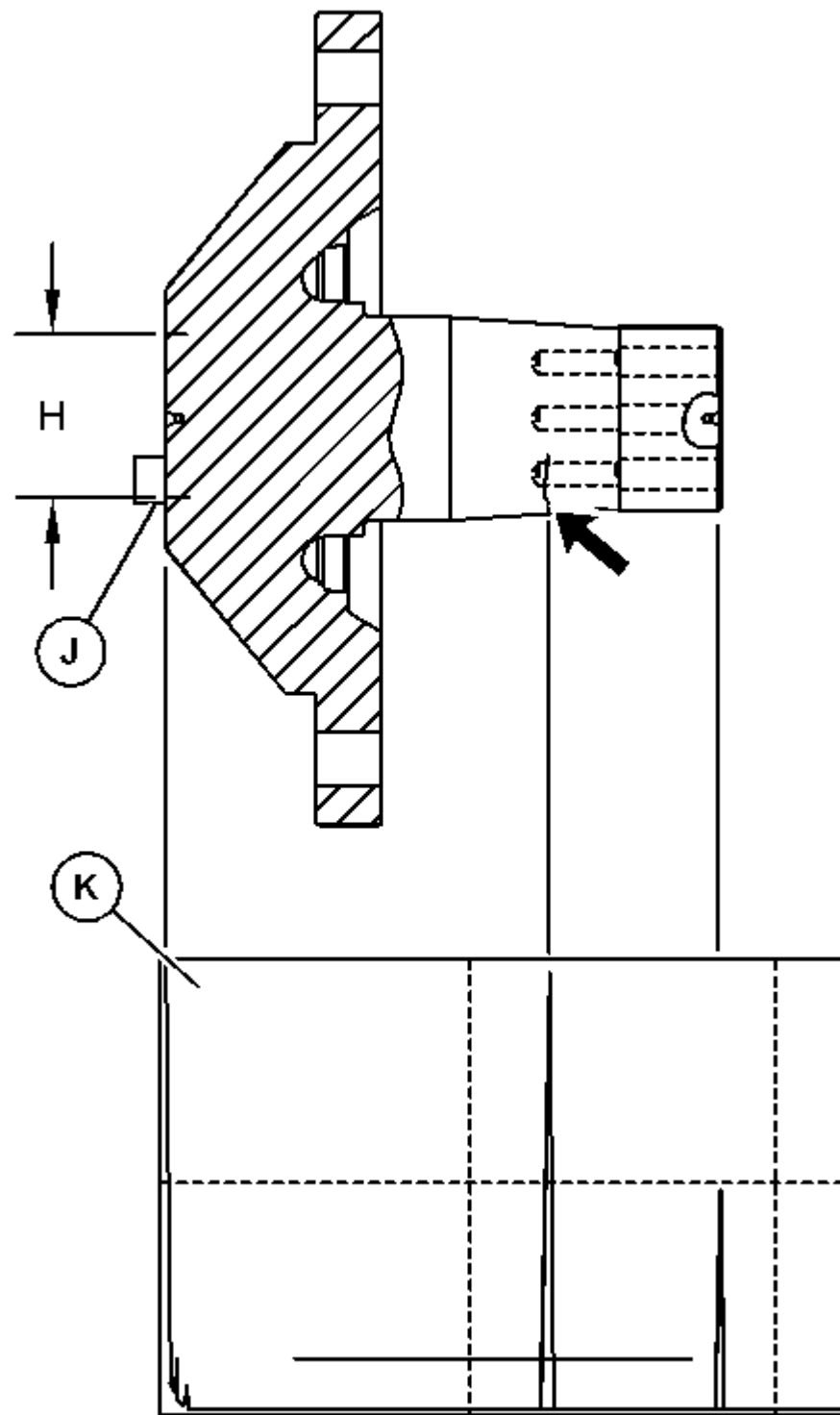


Illustration 10  
 Indication from a material defect  
 (H) Diameter of scan area 80 mm (3.15 inch)  
 (J) UT transducer  
 (K) UT scan indication graph

g06039710

Illustration 10 shows that an indication is found between the back wall indication and the front surface indication. The transducer position is within the inspection area highlighted and the indication location is within the area of interest. This spindle is rejectable.

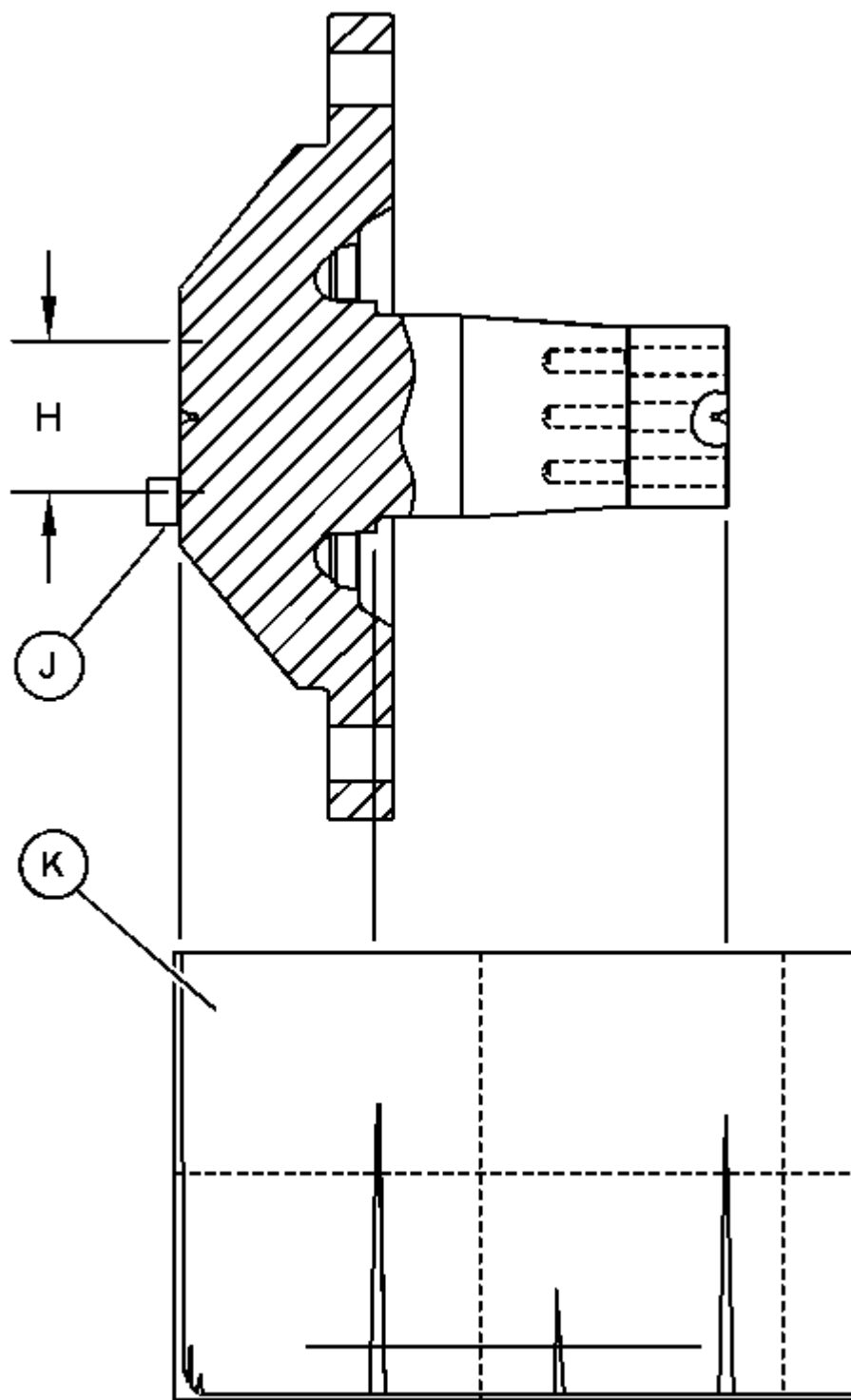


Illustration 11  
False UT scan indication caused by measuring outside of scan area  
(H) Diameter of scan area 80 mm (3.15 inch)  
(J) UT transducer  
(K) UT scan indication graph

g06039724

Illustration 11 shows false indications from geometry indications that are present outside the scanning inspection area of interest. These indications and their multiples may show indications over the reject threshold but should be disregarded because the transducer position is outside the highlighted area.

## Reporting

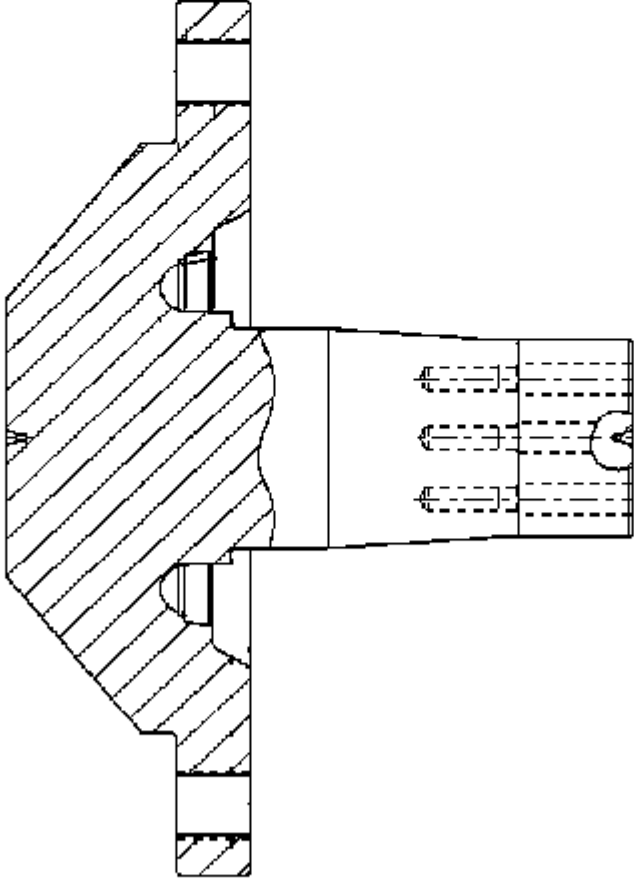
After the ultrasonic (UT) inspection is completed, documentation of inspection and acceptance shall be recorded. A copy should be provided to the Customer, Dealer, and the appropriate Caterpillar product support representative. Use the following recording sheet.



# CATERPILLAR®

## REPORT OF ULTRASONIC INSPECTION OF SPINDLE

DEALER / CUSTOMER LOCATION		DATE	MACHINE SERIAL NUMBER
ADDRESS		PART NUMBER 437-8883, 264-1161, or 147-3402	MACHINE HOURS
PART IDENTIFICATION / SERIAL NUMBER		MATERIAL THICKNESS 273mm (10.75 inch)	CALIBRATION BLOCK TYPE
PART DESCRIPTION Spindle 16M, 16M 3, or 16H		BUILT ON MACHINE (LEFT OR RIGHT / LOOSE PART)	CALIBRATION BLOCK SERIAL NUMBER
QUALITY REQUIREMENTS - SECTION NO. 15% Threshold- Relevant		PROCEDURE / REV.	COUPLANT
INSTRUMENT		TRANSDUCER: LONGITUDINAL	SHEAR
MANUFACTURER		FREQUENCY	ns
MODEL		SIZE	ns
SERIAL NO.		MANUFACTURER	ns
CAL. DATE		ANGLE 0°	ns
NOTES		SERIAL NO.	ns



Inspector: \_\_\_\_\_ NDT Level: \_\_\_\_\_  
Customer: \_\_\_\_\_ Date: \_\_\_\_\_

Illustration 12

g06039788

## 24H, 24M, and 24 Front Spindle Non-Destructive Evaluation (NDE) Inspection Areas and Part Detail

Inspections can be conducted on built machines with no need to disassemble and removed front spindles.

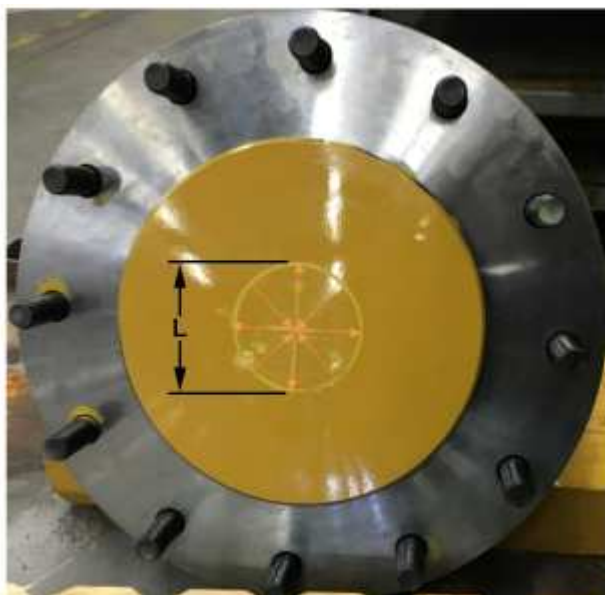


Illustration 13

g06117956

Scan pattern and area  
(L) Diameter of scan area 100.0 mm (4.0 in)



After marking the inspection area outline and correctly calibrating the UT instrument. Scan the entire area highlighted in Illustration 13. The nominal through spindle thickness is 365.0 mm (14.4 inch).

The center point of the transducer shall be used as reference to judge if the transducer is inside or outside the inspection area.

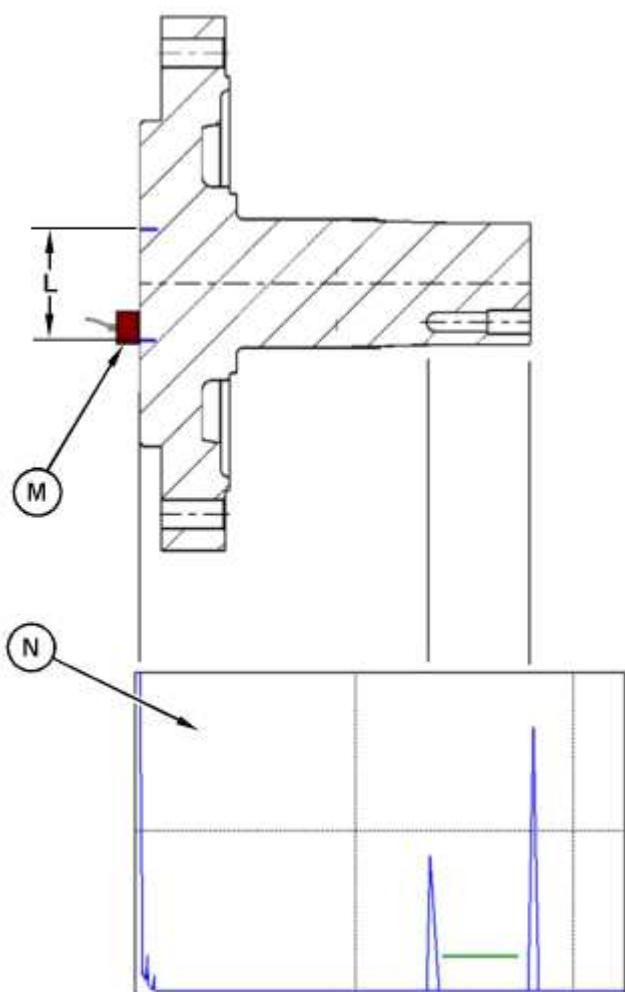


Illustration 14 g06118013  
Normal back wall and bolt hole UT indications.  
(L) Diameter of scan area 100.0 mm (4.0 in)  
(M) UT transducer  
(N) UT scan indication graph

Illustration 14 shows a large indication at the back wall thickness of the spindle. This back wall indication will be present and consistent throughout the inspection area on acceptable spindles. The transducer position is within the inspection area highlighted. Generally no indications, or low/mid amplitude indications will be present from the drilled and tapped holes on the spindle end because of the drill radius.

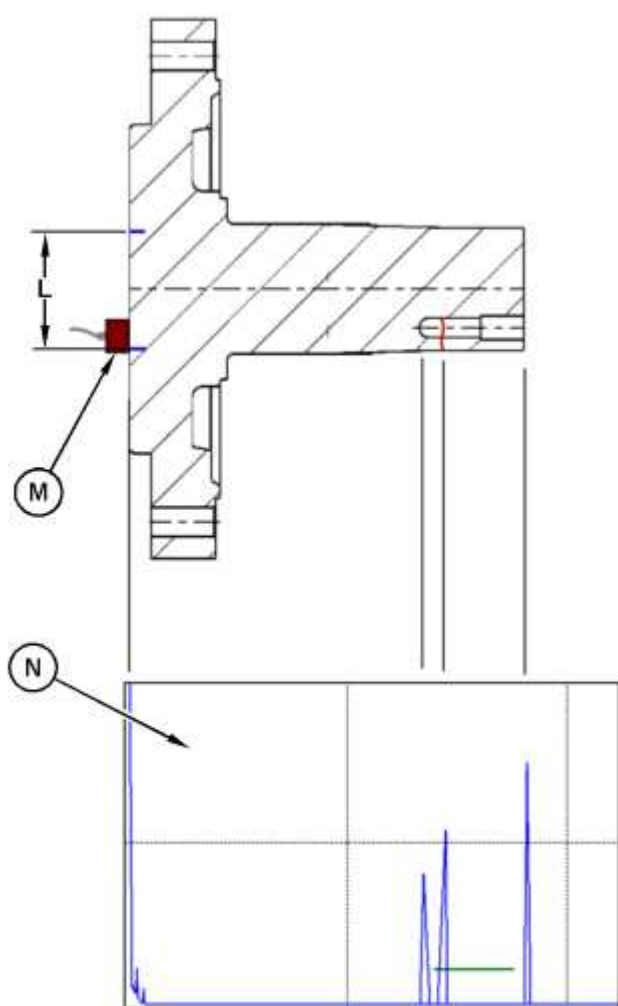


Illustration 15 g06118024  
UT indication from crack in spindle.  
(L) Diameter of scan area 100.0 mm (4.0 in)  
(M) UT transducer  
(N) UT scan indication graph



Illustration 15 shows that an indication is found in Gate A between the back wall indication and the bolt hole end indication. The transducer position is within the inspection area highlighted and the indication location is within the area of interest. This spindle is rejectable.

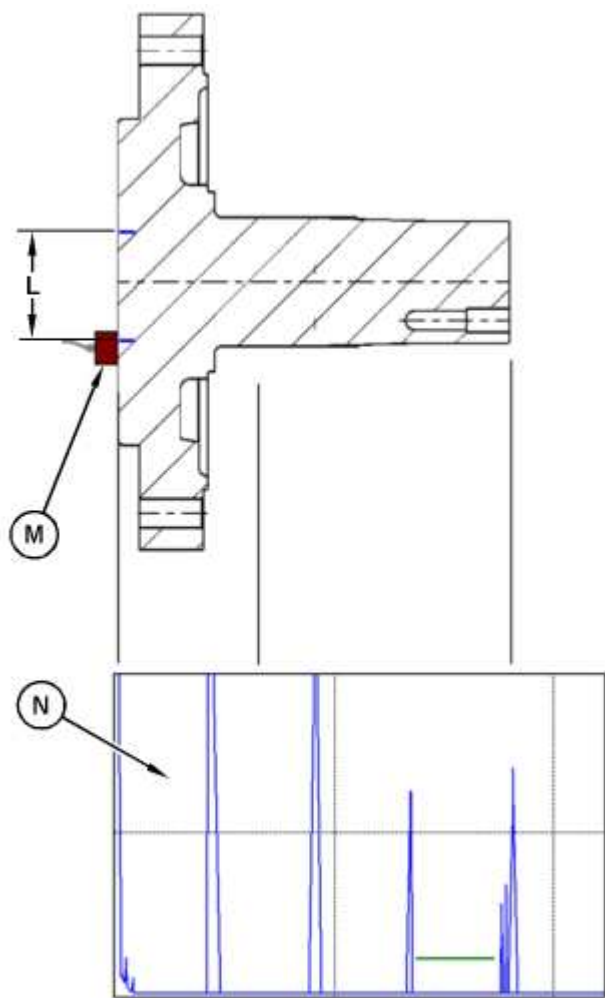


Illustration 16 g06118031  
False UT indications from geometry scanning outside of inspection area.  
(L) Diameter of scan area 100.0 mm (4.0 in)  
(M) UT transducer  
(N) UT scan indication graph

Illustration 16 shows false indications from geometry indications that are present outside the scanning inspection area of interest. These indications may show indications over the reject threshold but should be disregarded because the transducer position is outside the highlighted area.

## Reporting

After the ultrasonic (UT) inspection is completed, documentation of inspection and acceptance shall be recorded. A copy should be provided to the Customer, Dealer, and the appropriate Caterpillar product support representative. Use the following recording sheet.







# Report of Ultrasonic Inspection of Spindle

Dealer/Customer Location		Date	Machine Serial Number
Address		Part Number <b>383-1185, 382-9940</b>	Machine Hours
Part Identification/Serial Number		Material Thickness <b>365mm (14.4 inch)</b>	Calibration Block Type
Part Description <b>Spindle 24M</b>		Built on Machine (Left or Right)/Loose Part	Calibration Block Serial No.
Quality Requirements - Section No. <b>15% Threshold- Relevant</b>		Procedure / Rev.	Couplant
Instrument		Transducer: Longitudinal	Shear
Manufacturer		Frequency	na
Model		Size	na
Serial No.		Manufacturer	na
Cal. Date		Angle 0°	na
Notes		Serial No.	na

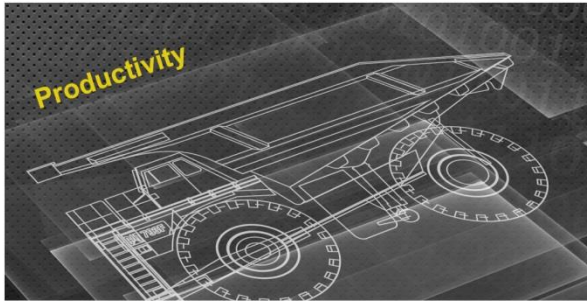
Inspector: \_\_\_\_\_ NDT Level: \_\_\_\_\_

Customer: \_\_\_\_\_ Date: \_\_\_\_\_

Illustration 17

g06118047





# 16H-16M Front Wheel Spindle Part Number Identification

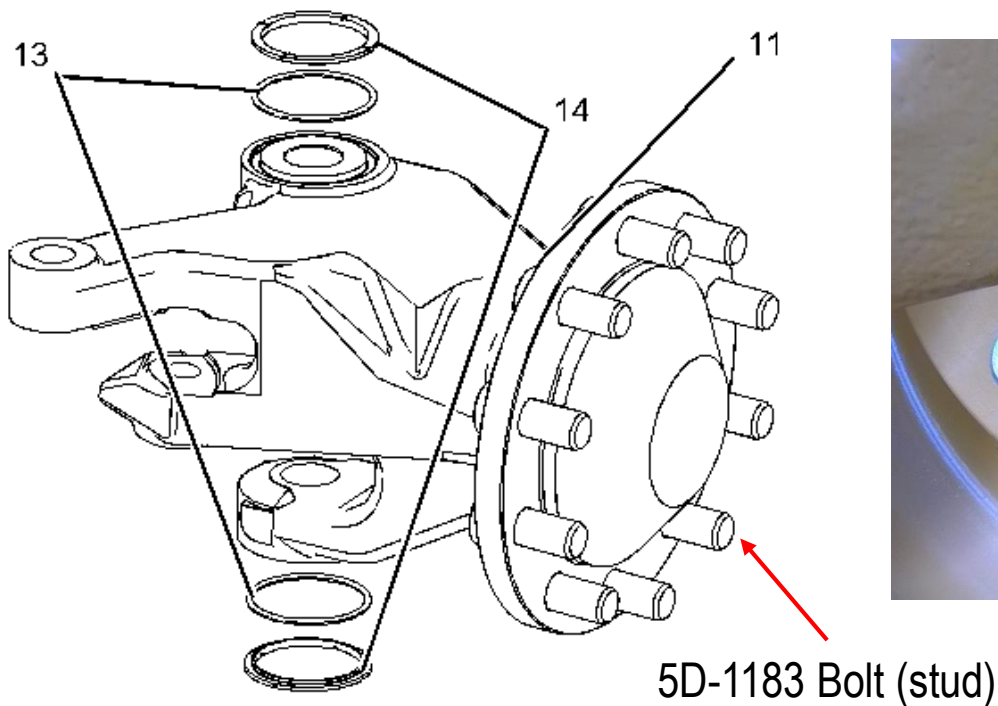
Hastings Deering



# 147-3402 Spindle Identification

The 147-3402 Spindles may be found installed on 16H Motor Graders and can be identified by the following features:

- 147-3402 Part Number
- Press in 5D-1183 Bolt (stud), 5D-0765 Nut-Full and 5D-0764 Washer
- Retaining Bolt PCD of 63.51mm.



Location of spindle part number

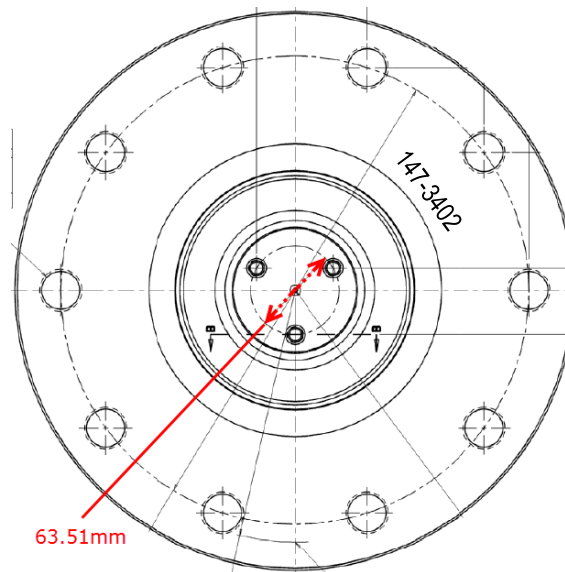
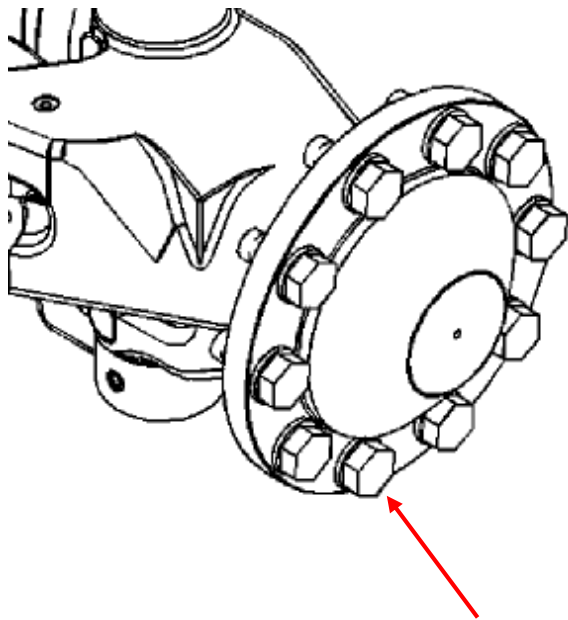




# 264-1161 Spindle Identification

The 264-1161 Spindle replaced the previous 147-3402 Spindle and was made effective in production from B9H1-UP and R9H1-892 as per SEPD1701. The 264-1161 Spindle can be identified by the following features:

- 147-3402 Part Number
- 7Y-5232 Bolt and 9X-8258 Washer.
- Retaining Bolt PCD of 63.51mm.



Location of spindle part number



7Y-5232 Bolt and 9X-8258 Washer

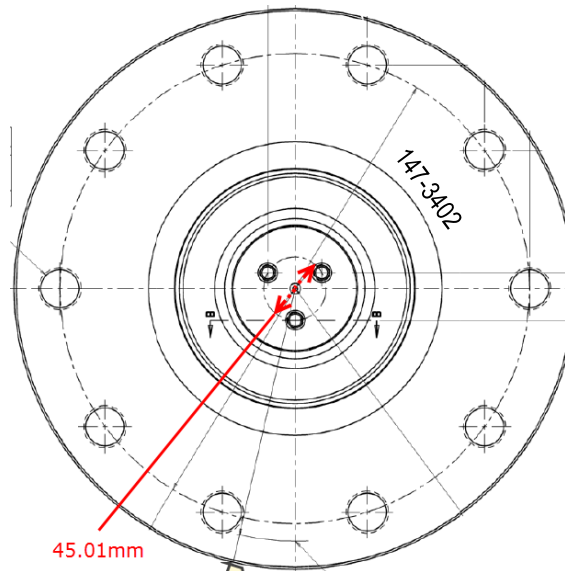
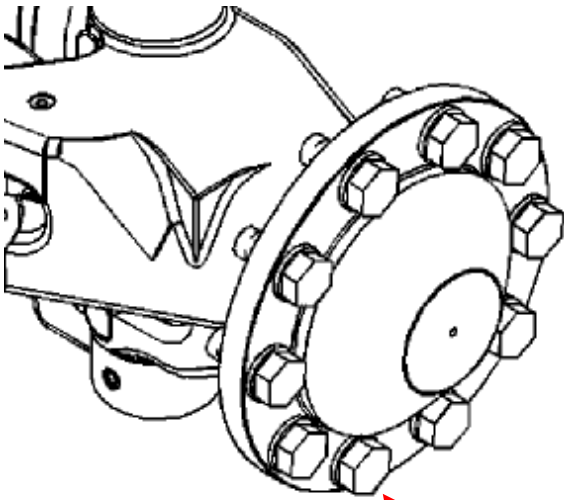


# 437-8983 Spindle Identification

The latest 437-8983 Spindle replaced the previous 264-1161 Spindle and was made effective in production from R9H893-UP as per SEPD1701. The 437-8983 Spindle can be identified by the following features:

- 147-3402 Part Number
- 7Y-5232 Bolt and 9X-8258 Washer.
- Retaining Bolt PCD of 45.01mm.

Location of spindle part number



7Y-5232 Bolt and 9X-8258 Washer

