

**LWD 1**

**Spacer Stack Calculations**

# Spacer Stack Calculations Objectives

**At the completion of this presentation you should be able to:**

- 1. Describe the purpose of the spacer stack.**
- 2. Describe the measurements that are required.**
- 3. Select the correct length of spacer stack within the tolerance of the system.**

# What's a Spacer Stack?

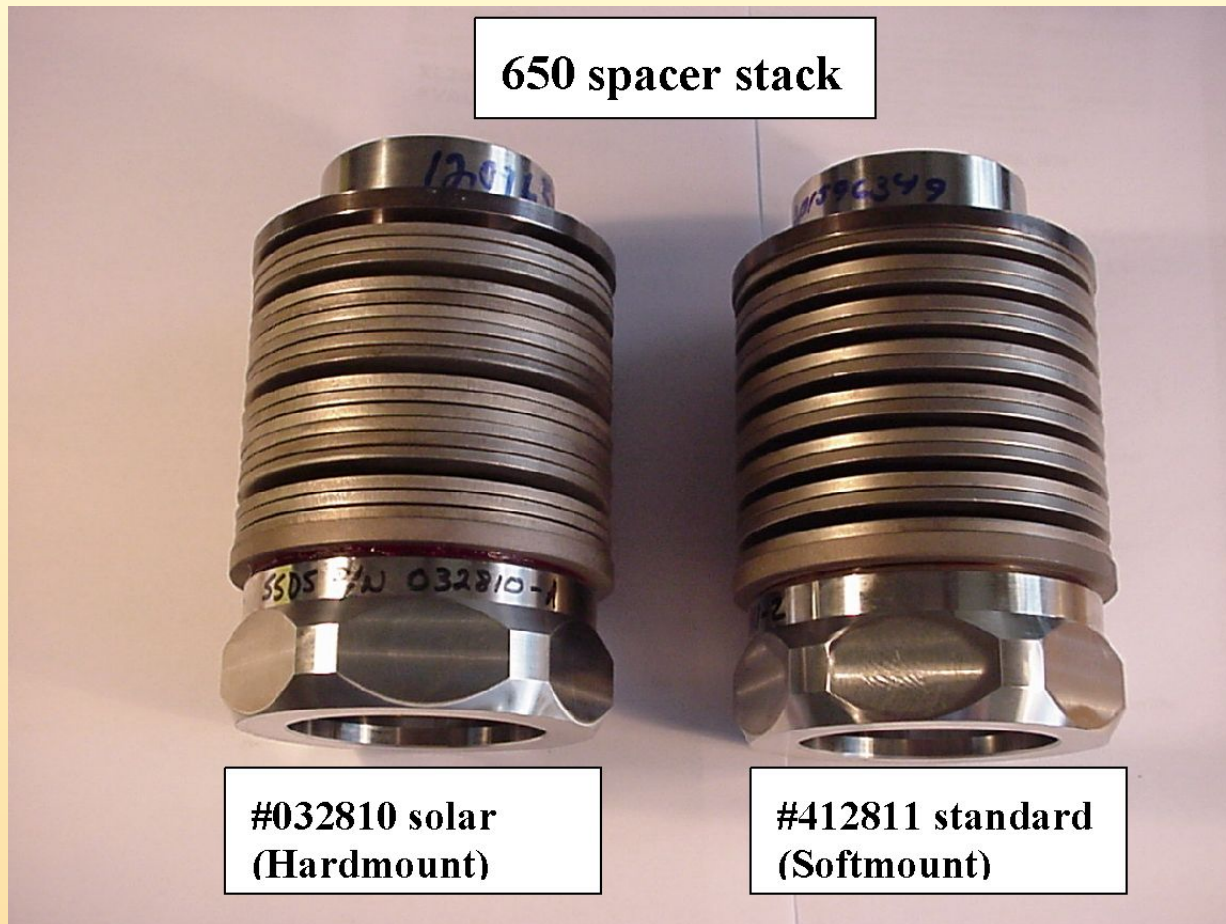
- **A series of washers that fill the space between the top of spring carrier and the pin of the drill collar above the tool.**

# What's a Spring Carrier?

**A series of springs that apply pressure to the top of the flow tube to stop it vibrating axially.**



# Two types of Spring Carriers



# What makes up a Spacer Stack?

## Spacers

–5 sizes

–1, 0.5, 0.25, 0.1, 0.05  
inch



# What makes up a Spacer Stack?

Spacers

**2" Baffle Plate**



# What does it do?

- **Applies the correct compression to the top of the flow tube (1200, 650 & Slimhole only) when the collar above is installed.**
  - Too much compression will crush the flow tube
  - Too little compression allows axial movement
- **Superslim uses an adjustable spacer.**



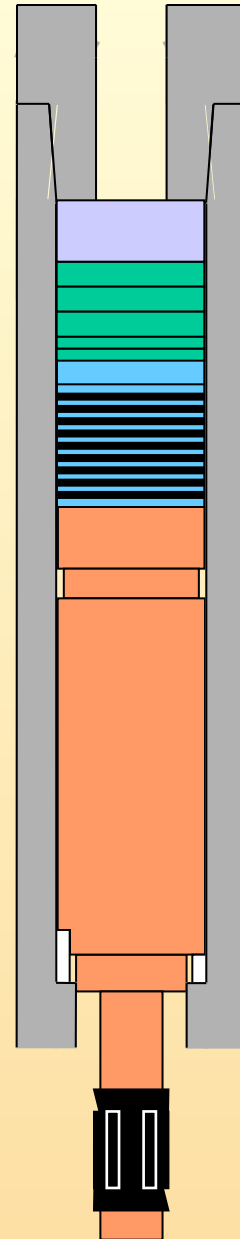
# Where does it go?

Spacer Stack

Spring Stack

Flow Tube

HOS/HOC



# What happens when it's the right length?

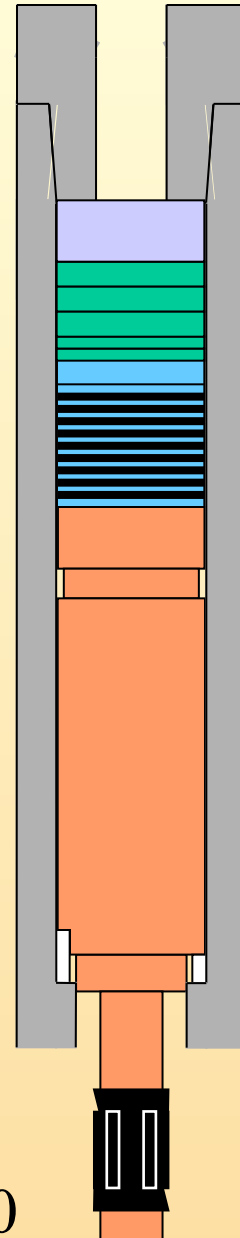
- **Correct compression applied to the flow tube assembly.**

Spacer Stack

Spring Stack

Flow Tube

HOS/HOC



# What happens if it's too short?

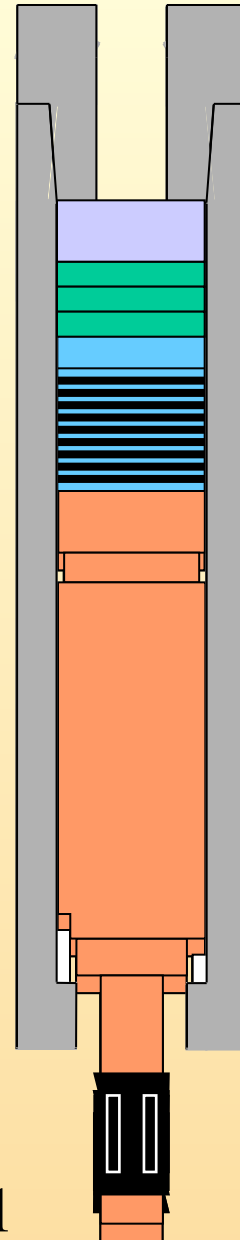
- Flow tube assembly can move up and down axially
- Vibration damages tool
- Tool failure

Spacer Stack

Spring Stack

Flow Tube

HOS/HOC



# What happens if it's too long?

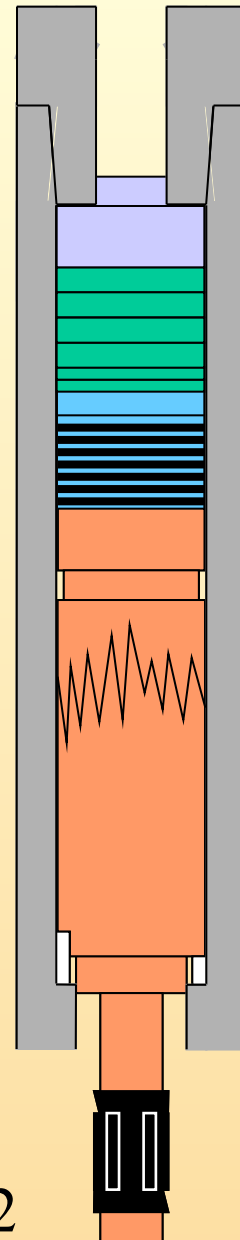
- Flow tube can be crushed
- Tool failure

Spacer Stack

Spring Stack

Flow Tube

HOS/HOC

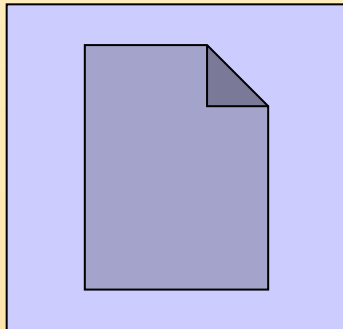


# Measurements

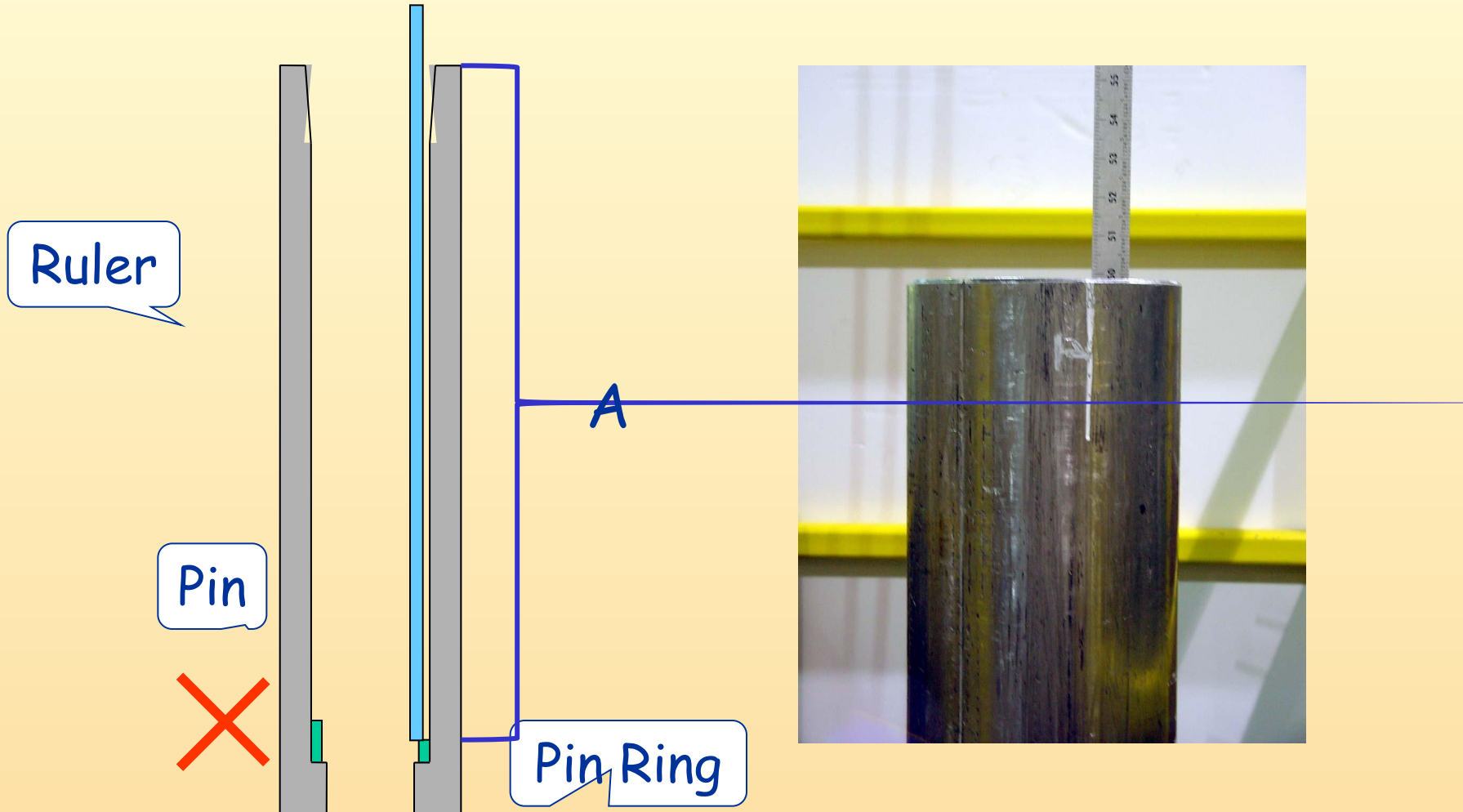
- **Measure**
  - **HOS/HOC bore depth from connection face to pin ring**
  - **Flow Tube length from bottom ring shoulder to face of Fish Neck**
  - **Spring stack length and type**
  - **Drill collar pin length**

# What Do I Do With The Measurements?



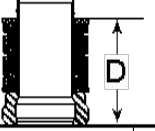
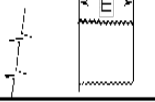
- **Fill in the Spacer Stack Calculation Form (to view click link below)**



# HOC/HOS Bore Depth

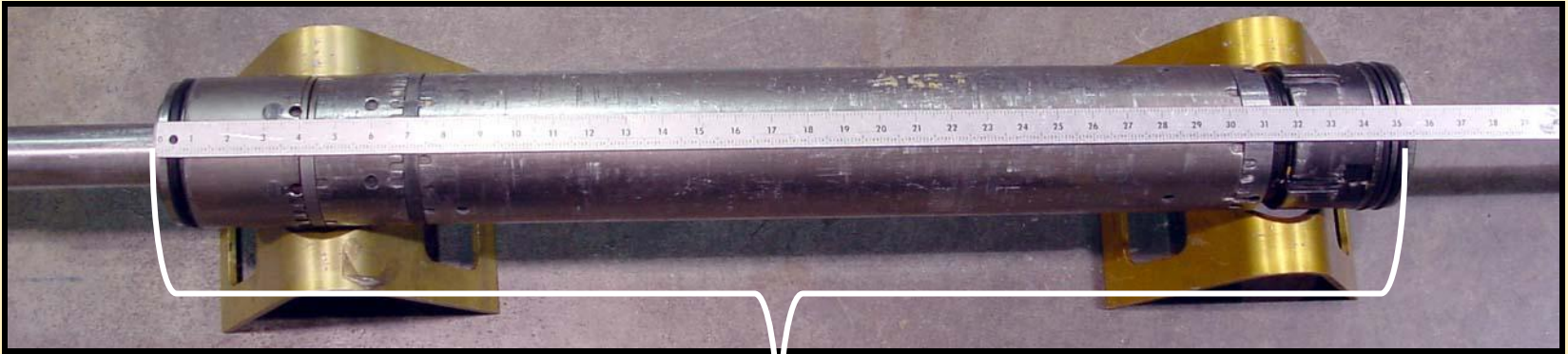


# HOC/HOS Bore Depth

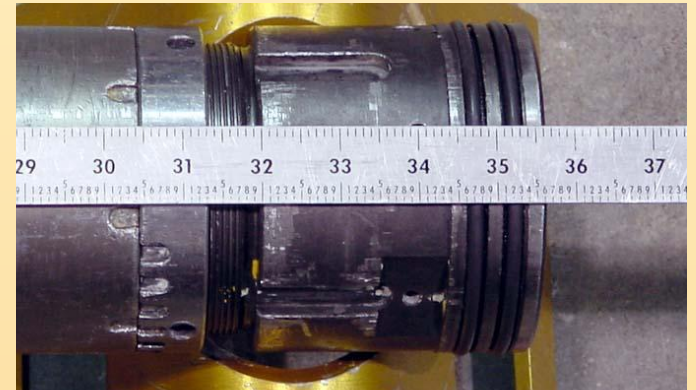
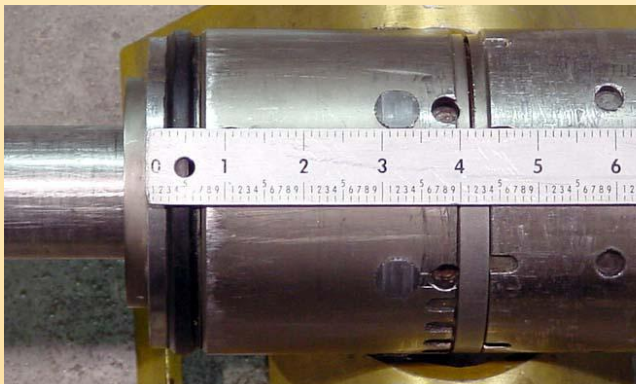
		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring 	A		<b>50.35</b>	
Flow Tube Length 	B	-	-	-
Check Dimension C = A - B	C =	=	=	=
Spring Stack Length 	D	-	-	-
Top Pin Length 	E	-	-	-
Compression		+0.325"	+0.625"	+0.625"
Spacer Stack Height = C - D - E + Compression	=	=	=	=
Top Pin Length	E			
Compression		-0.325"	-0.625"	-0.625"
Check Dimension F = E - Compression	F =	=	=	=
Installation Tolerance		±0.05"	±0.1"	±0.1"



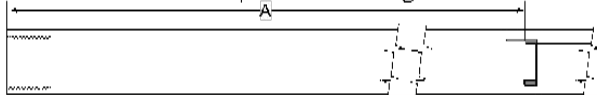
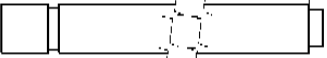
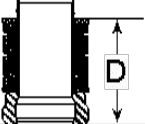
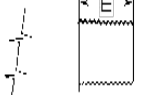
# Flow Tube Length



B



# Flow Tube Length

		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring		A	50.35	
Flow Tube Length		B	-35.65	-
Check Dimension C = A - B		C =	=	=
Spring Stack Length		D	-	-
Top Pin Length		E	-	-
Compression		+0.325"	+0.625"	+0.625"
Spacer Stack Height = C - D - E + Compression		=	=	=
Top Pin Length		E		
Compression		-0.325"	-0.625"	-0.625"
Check Dimension F = E - Compression		F =	=	=
Installation Tolerance		±0.05"	±0.1"	±0.1"

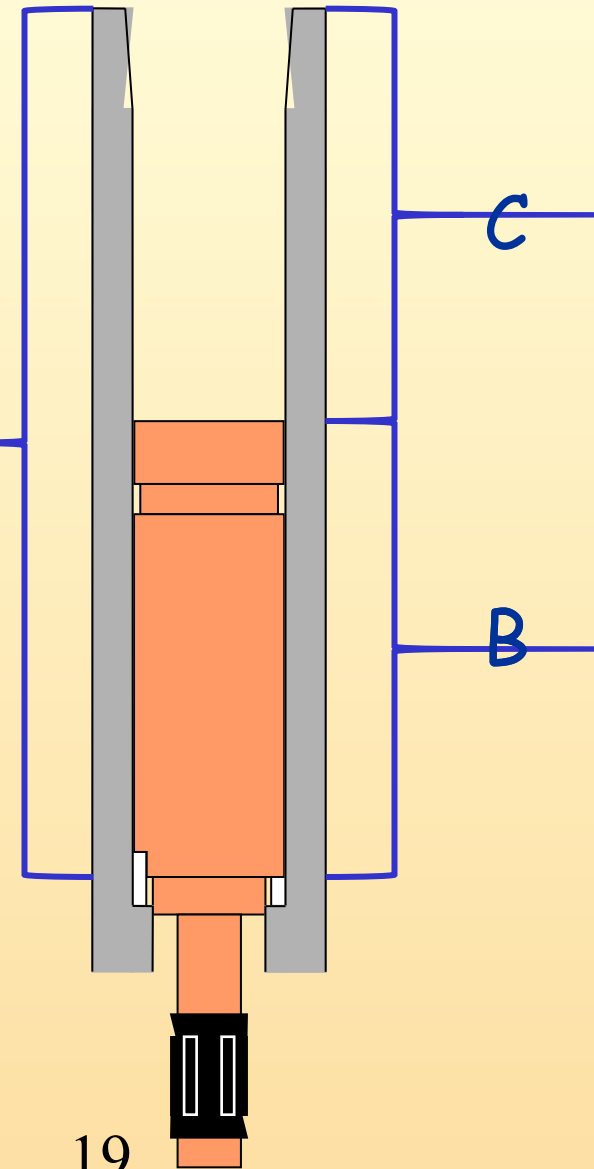
# Calculations

## Check Dimension C

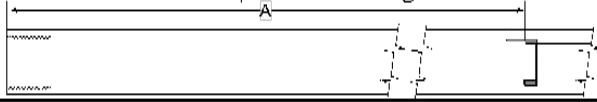

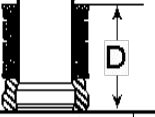
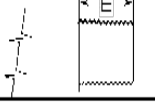
$$C = A - B$$

After installing the flow tube assembly, measure from the face of the HOS/HOC connection to the top of the fish neck.

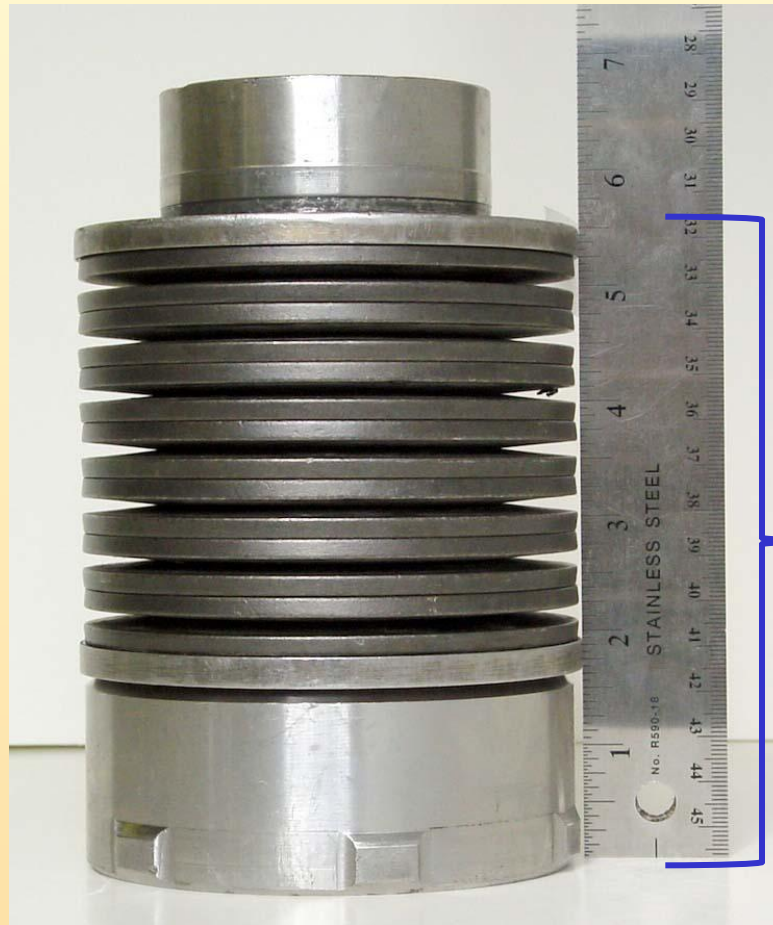
If this measurement equals C the flow tube assembly is properly seated.



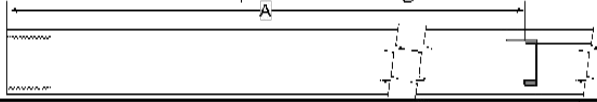

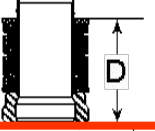
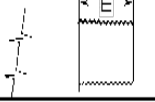
# Calculations

		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring 	A		<b>50.35</b>	
Flow Tube Length 	B	-	- <b>35.65</b>	-
Check Dimension C = A - B	C =	=	= <b>14.7</b>	=
Spring Stack Length 	D	-	-	-
Top Pin Length 	E	-	-	-
Compression		+0.325"	+0.625"	+0.625"
Spacer Stack Height = C - D - E + Compression	=	=	=	=
Top Pin Length	E			
Compression		-0.325"	-0.625"	-0.625"
Check Dimension F = E - Compression	F =	=	=	=
Installation Tolerance		±0.05"	±0.1"	±0.1"

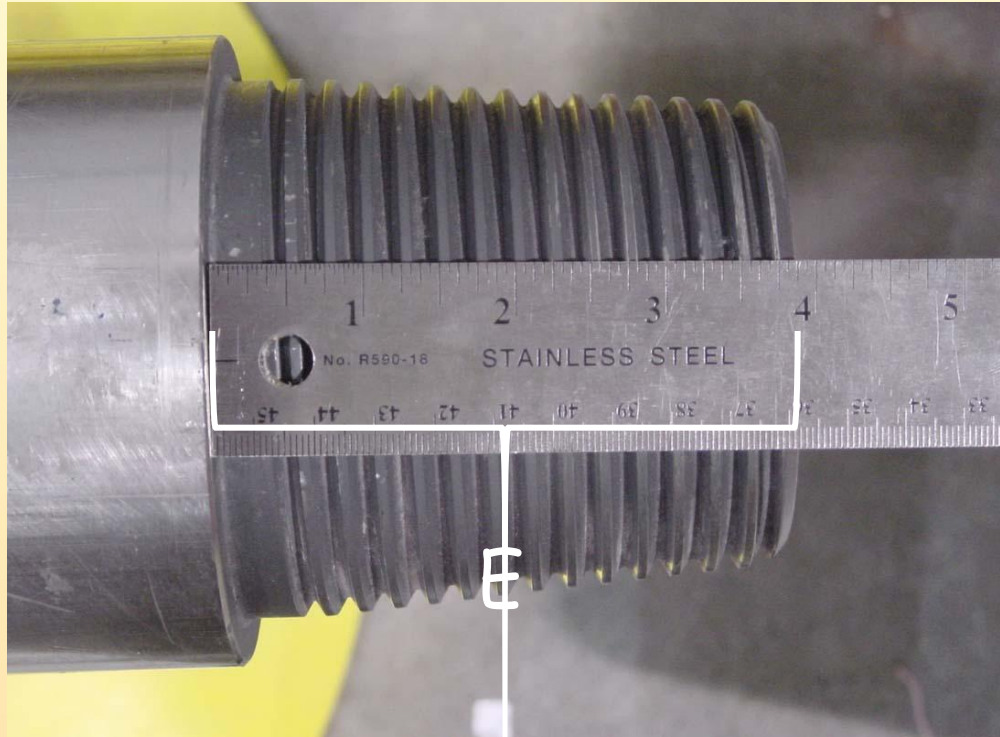
# Spring Stack Length and Type



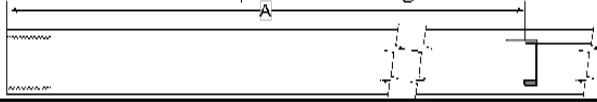

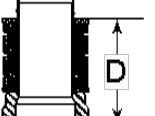
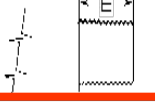
# Spring Stack Length

		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring 	A		<b>50.35</b>	
Flow Tube Length 	B	-	- <b>35.65</b>	-
Check Dimension C = A - B	C =	=	= <b>14.7</b>	=
Spring Stack Length 	D	-	- <b>5.60</b>	-
Top Pin Length 	E	-	-	-
Compression		+0.325"	+0.625"	+0.625"
Spacer Stack Height = C - D - E + Compression	=	=	=	=
Top Pin Length	E			
Compression		-0.325"	-0.625"	-0.625"
Check Dimension F = E - Compression	F =	=	=	=
Installation Tolerance		±0.05"	±0.1"	±0.1"

# Pin Length



# Pin Length

		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring 	A		<b>50.35</b>	
Flow Tube Length 	B	-	- <b>35.65</b>	-
Check Dimension C = A - B	C	=	= <b>14.7</b>	=
Spring Stack Length 	D	-	- <b>5.60</b>	-
Top Pin Length 	E	-	- <b>4.40</b>	-
Compression		+0.325"	+0.625"	+0.625"
Spacer Stack Height = C - D - E + Compression		=	=	=
Top Pin Length	E			
Compression		-0.325"	-0.625"	-0.625"
Check Dimension F = E - Compression	F	=	=	=
Installation Tolerance		±0.05"	±0.1"	±0.1"



# Calculations

## Exact Height

(No spring stack compression)

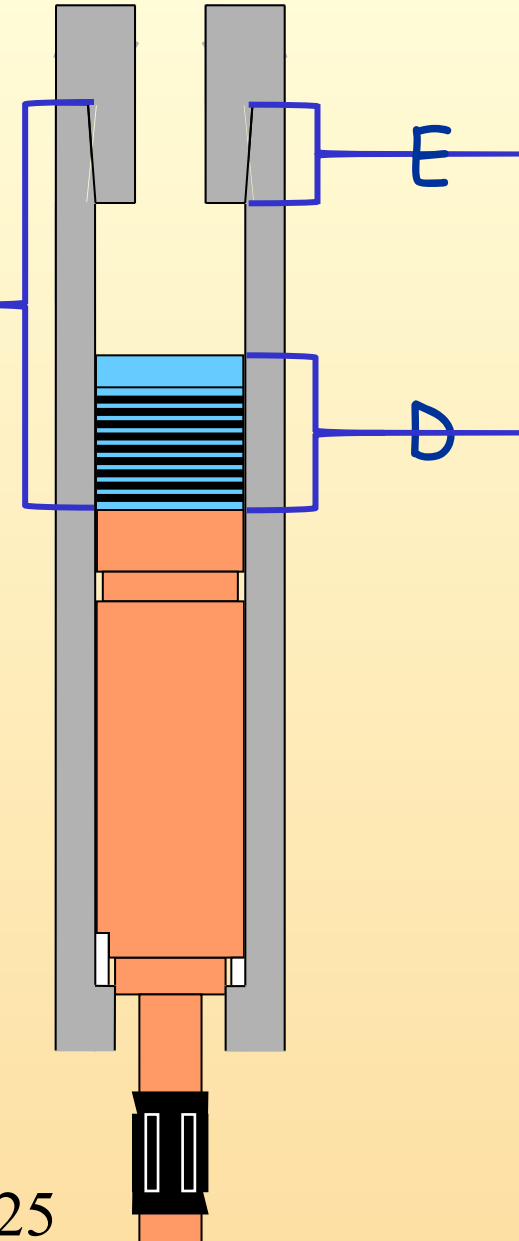
$$= C - D - E$$

However, we must compress the spring stack. The amount of compression must be added.

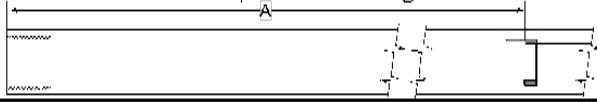

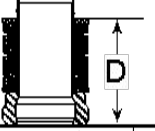
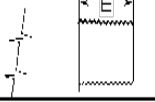
## Spacer Stack Height

$$= C - D - E + \text{Compression}$$

Spring Stack



# Calculations

		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring 	A		<b>50.35</b>	
Flow Tube Length 	B	-	- <b>35.65</b>	-
Check Dimension C = A - B	C =	=	= <b>14.7</b>	=
Spring Stack Length 	D	-	- <b>5.60</b>	-
Top Pin Length 	E	-	- <b>4.40</b>	-
Compression		+0.325"	+0.625"	+0.625"
<b>Spacer Stack Height = C - D - E + Compression</b>	<b>=</b>	<b>=</b>	<b>= 5.325</b>	<b>=</b>
Top Pin Length	E			
Compression		-0.325"	-0.625"	-0.625"
Check Dimension F = E - Compression	F =	=	=	=
Installation Tolerance		±0.05"	±0.1"	±0.1"

# Calculations

2" Baffle Plate

## Final Check Dimension F

$$F = E - \text{Compression}$$

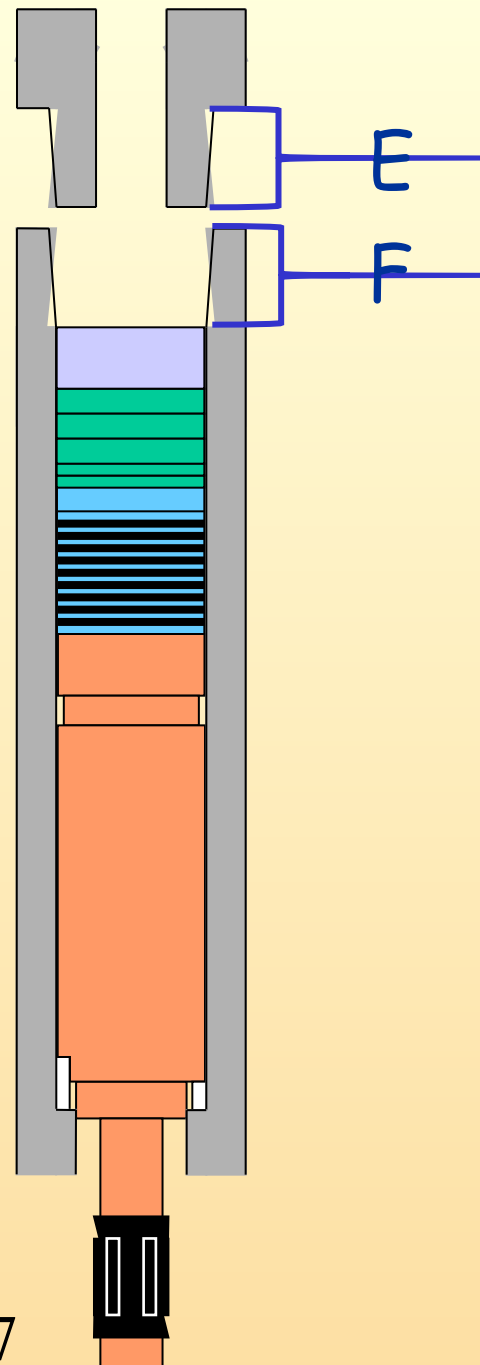
Spacers

After installing the flow tube, spring stack, and spacer stack (includes 2" baffle plate), measure from the face of the HOS/HOC connection to the top of the 2" baffle plate.

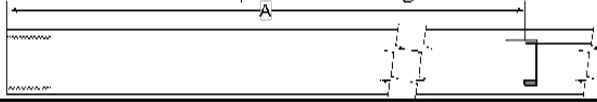

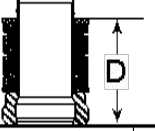
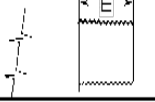
If this measurement is different from F by more than the installation tolerance

**STOP.**

Spring Stack



# Calculations

		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring 	A		<b>50.35</b>	
Flow Tube Length 	B	-	- <b>35.65</b>	-
Check Dimension C = A - B	C =	=	= <b>14.7</b>	=
Spring Stack Length 	D	-	- <b>5.60</b>	-
Top Pin Length 	E	-	- <b>4.40</b>	-
Compression		+0.325"	+0.625"	+0.625"
Spacer Stack Height = C - D - E + Compression	=	=	= <b>5.325</b>	=
Top Pin Length	E		<b>4.40</b>	
Compression		-0.325"	-0.625"	-0.625"
Check Dimension F = E - Compression	F =	=	= <b>3.775</b>	=
Installation Tolerance		±0.05"	±0.1"	±0.1"

# How much Compression?

- **Softmount 1200 and 650 System**
  - 0.625 inch or 16 mm
- **Softmount Slimhole System**
  - 0.400 inch or 10 mm

# How much Compression?

- **Hardmount 1200 System**
  - 0.450 inch or 11 mm
- **Hardmount 650 System**
  - 0.200 inch or 5 mm
- **Hardmount Slimhole System**
  - 0.300 inch or 8 mm

# How accurate do I need to be?

- **Softmount 1200 and 650 System Installation Tolerance**
  - +/- 0.1 inch or +/- 3.0 mm
- **Softmount Slimhole System Installation Tolerance**
  - +/- 0.05 inch or +/- 1.0 mm

# How accurate do I need to be?

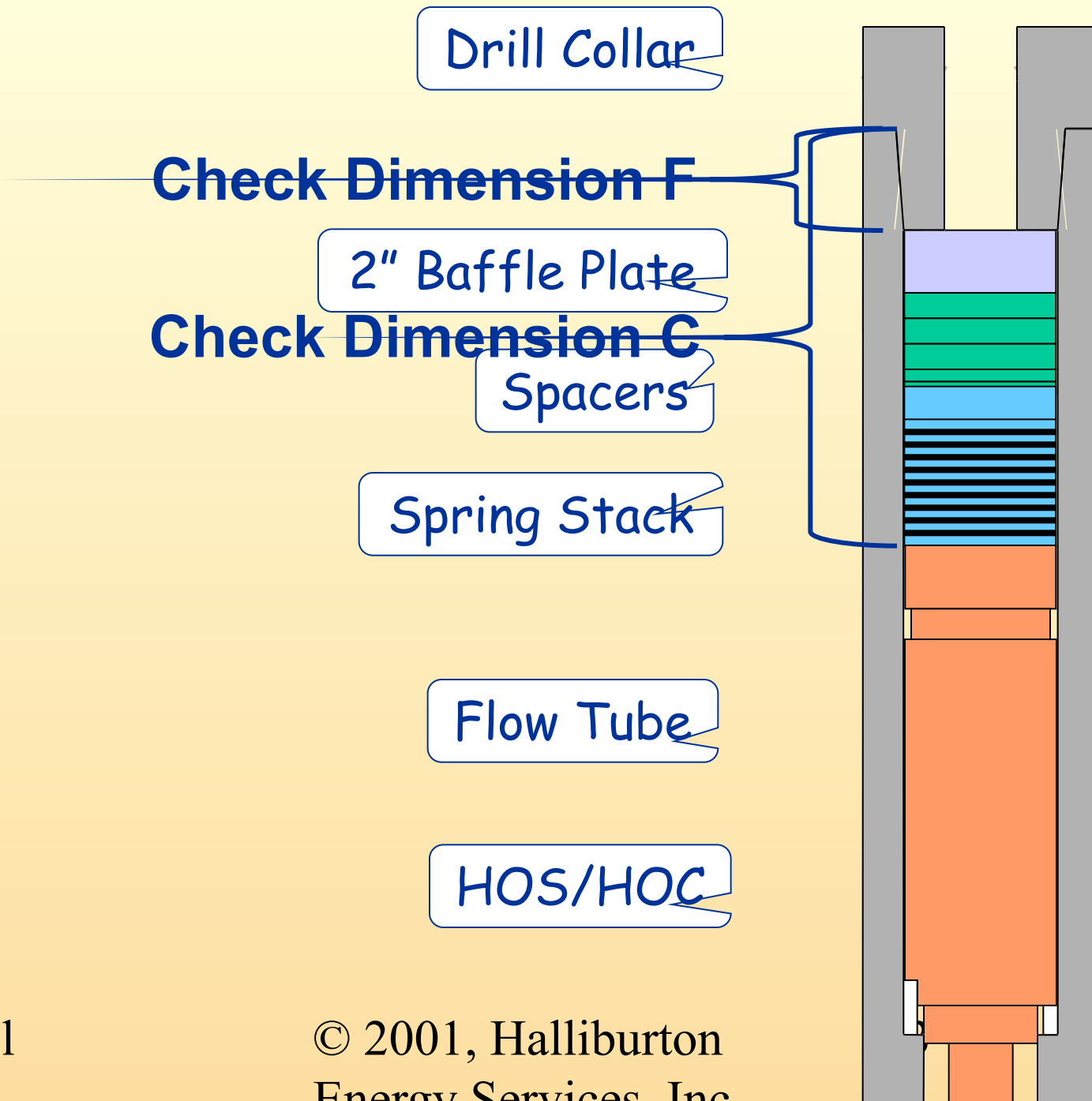
- **Hardmount**

## **Installation Tolerance**

### **Slimhole, 650, 1200 Systems**

– **+ 0.05 / - 0.0 inch or + 1.0 / - 0.0 mm**





# Spacer Stack Calculations Objectives

**At the completion of this presentation you should be able to:**

- 1. Describe the purpose of the spacer stack.**
- 2. Describe the measurements that are required.**
- 3. Select the correct length of spacer stack within the tolerance of the system.**