

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



Two types of Bottom Rings



Slim Spring Carriers



Slim soft spring



Slim Bottom Rings

Slim hard



Slim soft



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.**

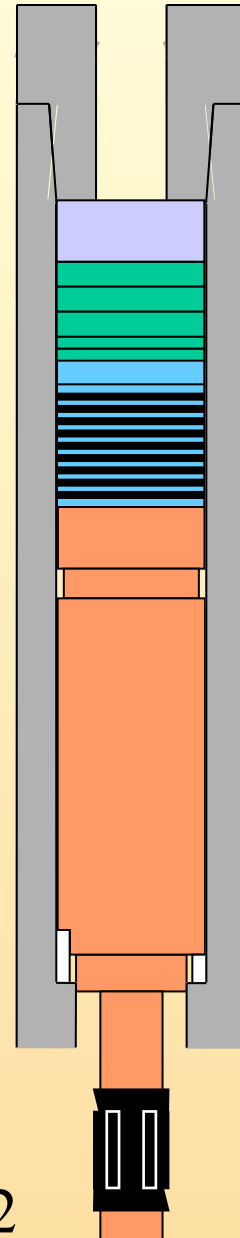
Where does it go?

Spacer Stack

Spring Stack

Flow Tube

HOS/HOC



What happens when it's the right length?

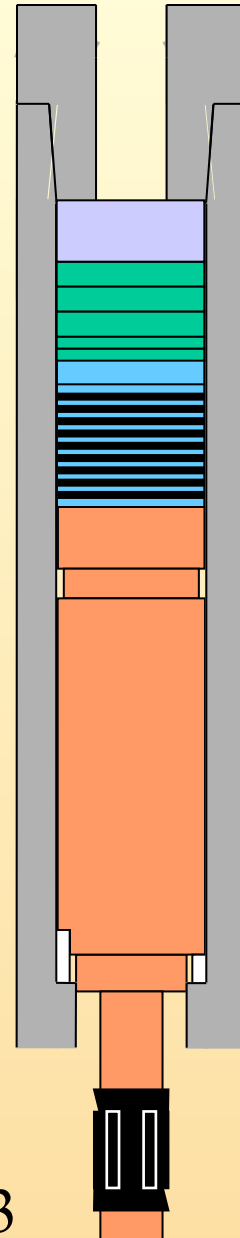
- Correct compression applied to the flow tube assembly.

Spacer Stack

Spring Stack

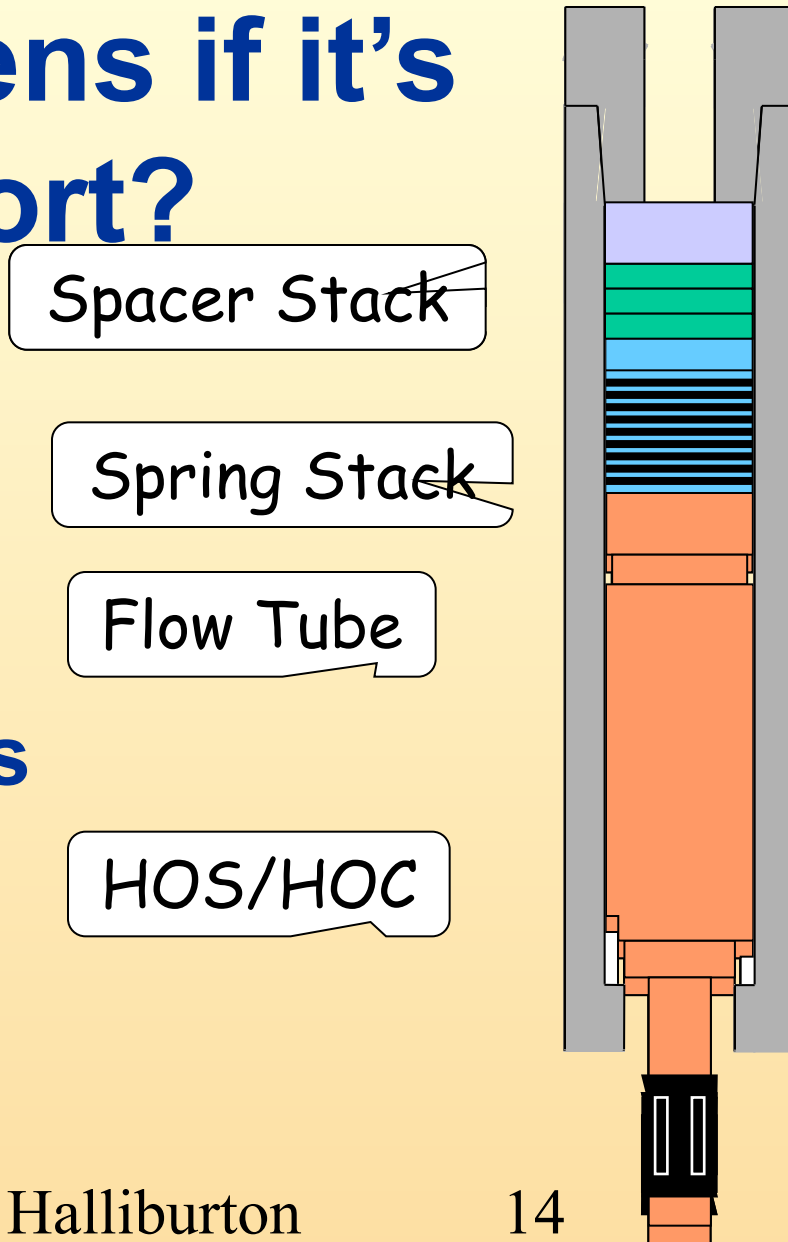
Flow Tube

HOS/HOC



What happens if it's too short?

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



What happens if it's too long?

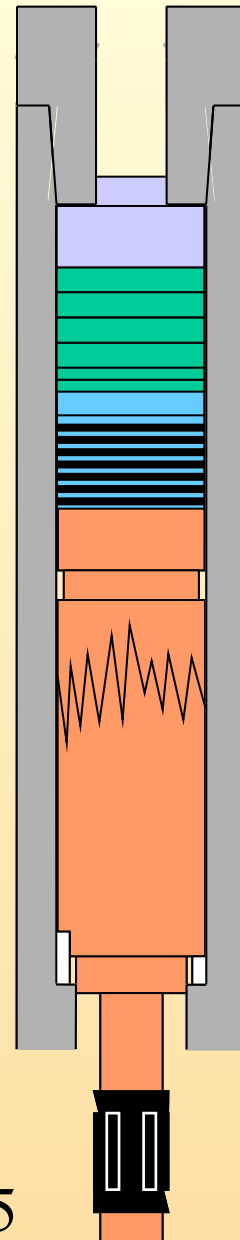
- Flow tube can be crushed
- Tool failure

Spacer Stack

Spring Stack

Flow Tube

HOS/HOC

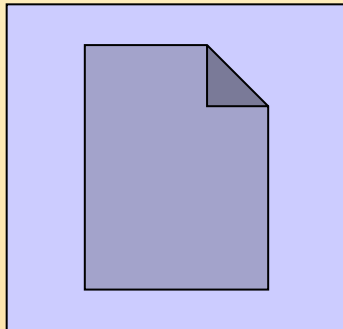


Measurements

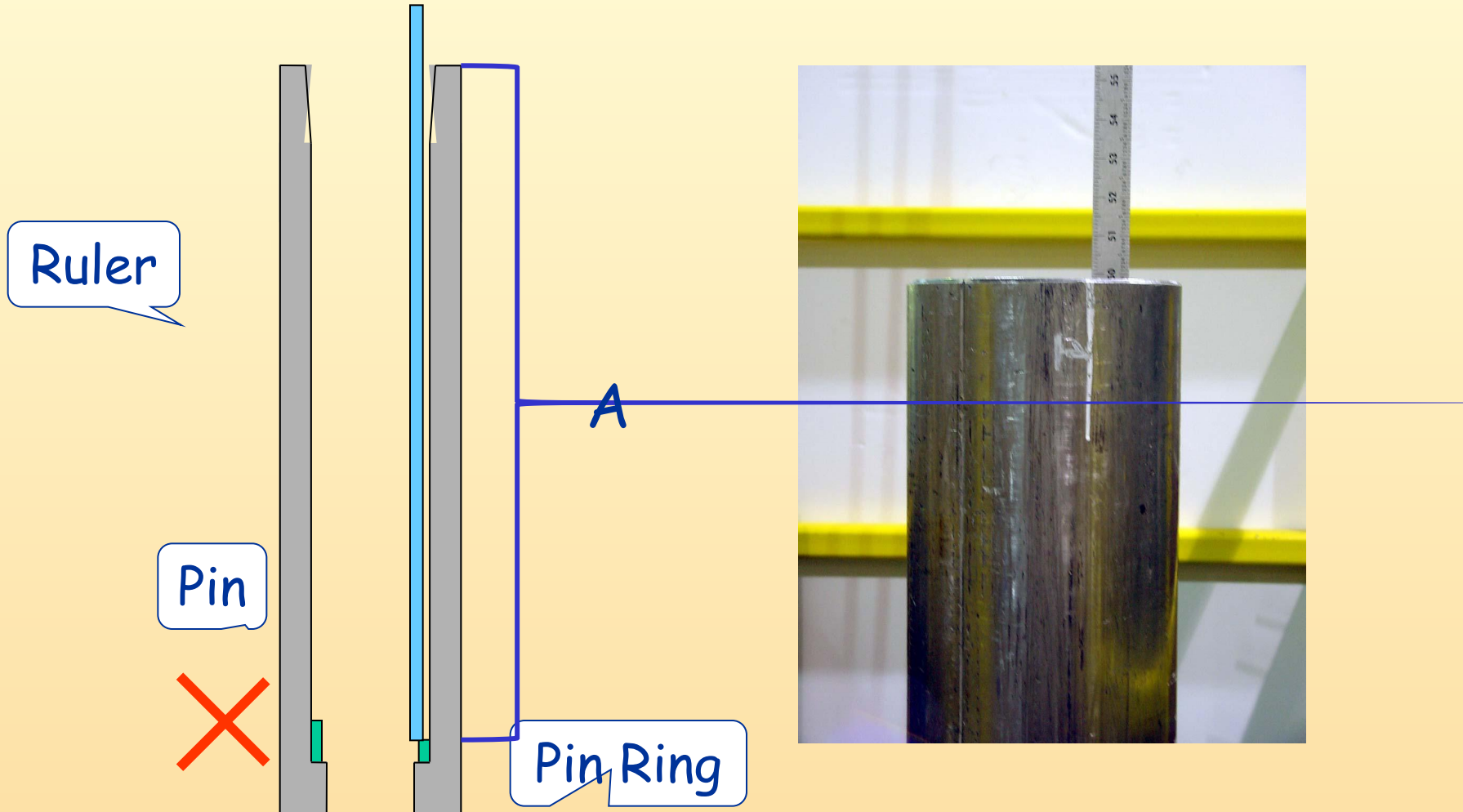
- **Measure**
 - **HOS/HOC bore depth from connection face to pin ring**
 - **Flow Tube length from bottom ring shoulder to face of Fish Neck**
 - **Spring stack length and type**
 - **Drill collar pin length**

What Do I Do With The Measurements?



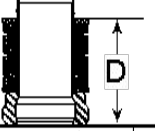
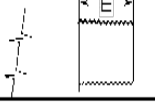
- **Fill in the Spacer Stack Calculation Form (to view click link below)**



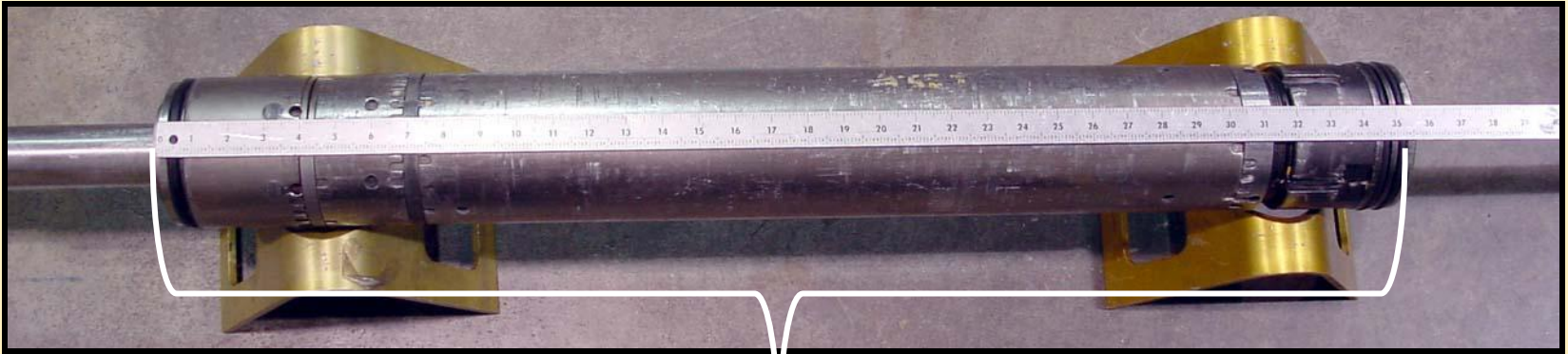
HOC/HOS Bore Depth



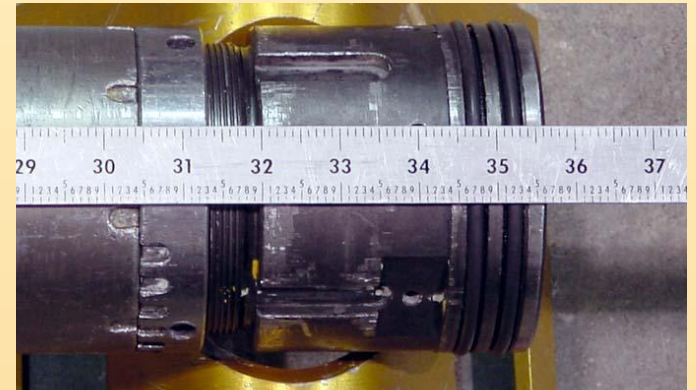
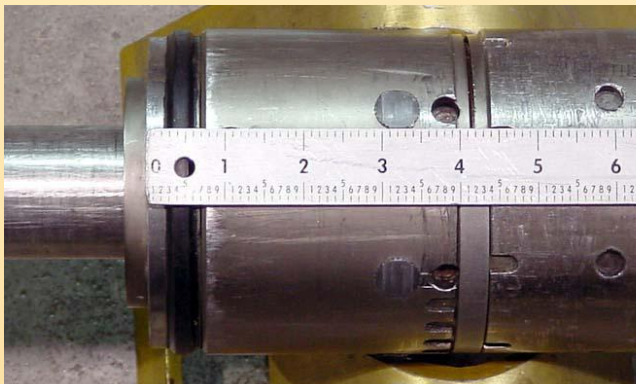
HOC/HOS Bore Depth

		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring 	A		50.35	
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"


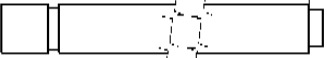
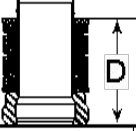
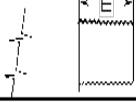
Flow Tube Length



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"

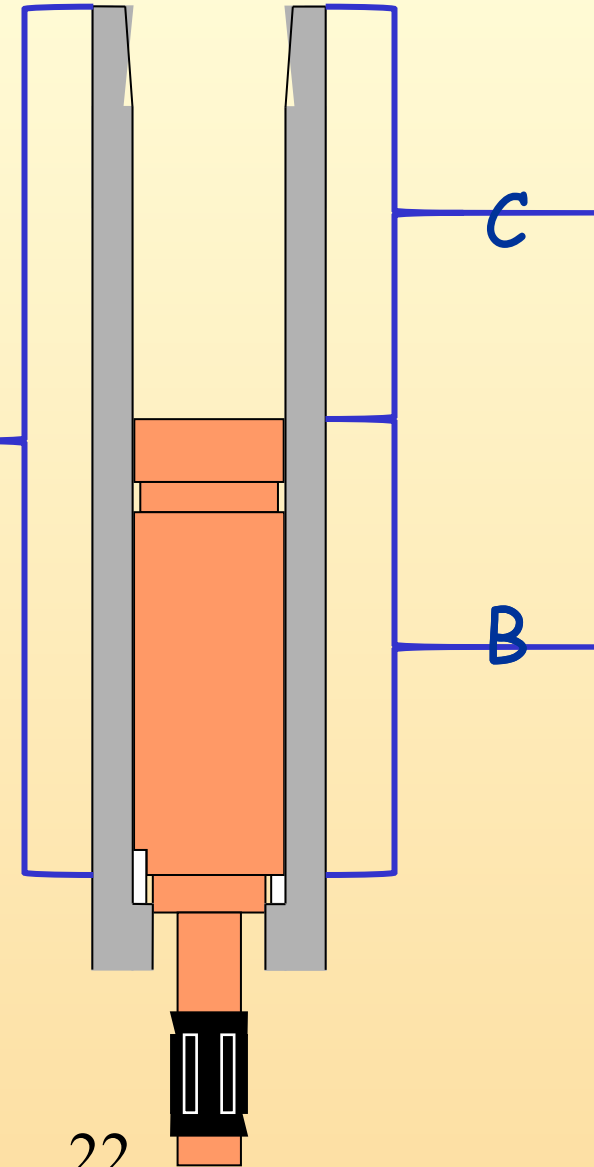
Calculations

Check Dimension C

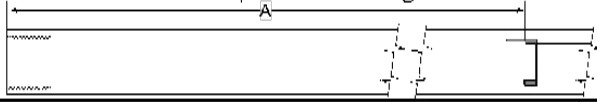

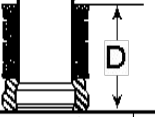
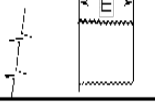
$$C = A - B$$

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

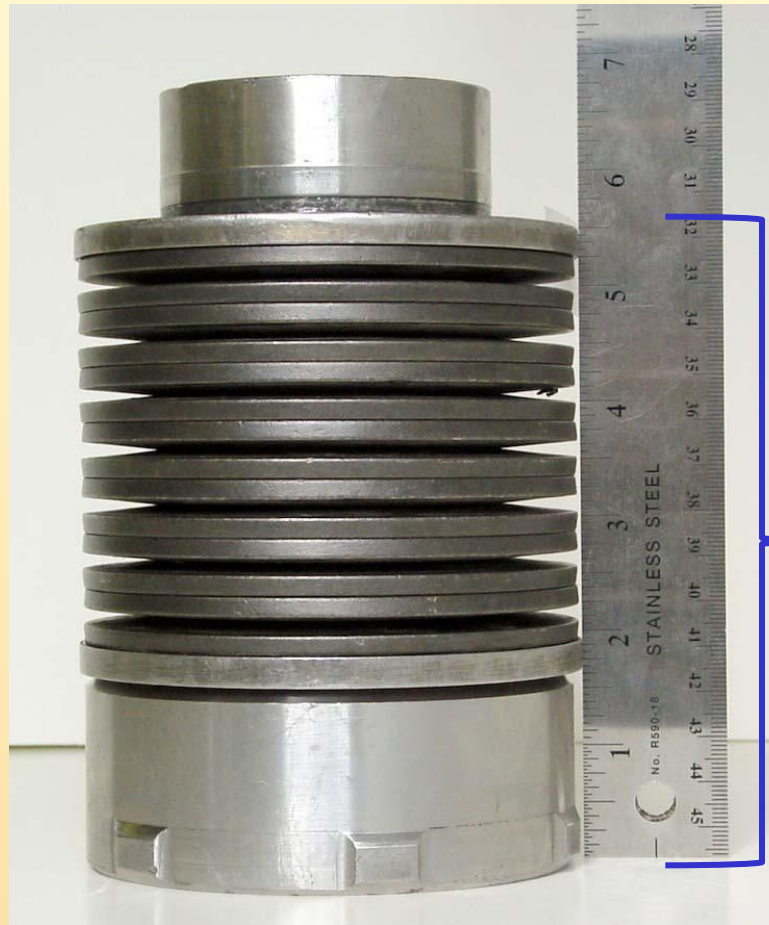
If this measurement equals C the flow tube assembly is properly seated.



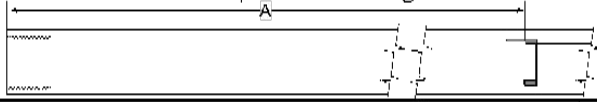

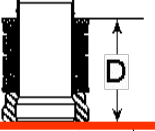
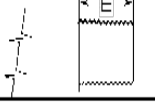
Calculations

		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring 	A		50.35	
Flow Tube Length 	B	-	-35.65	-
Check Dimension C = A - B	C =	=	14.7	=
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"

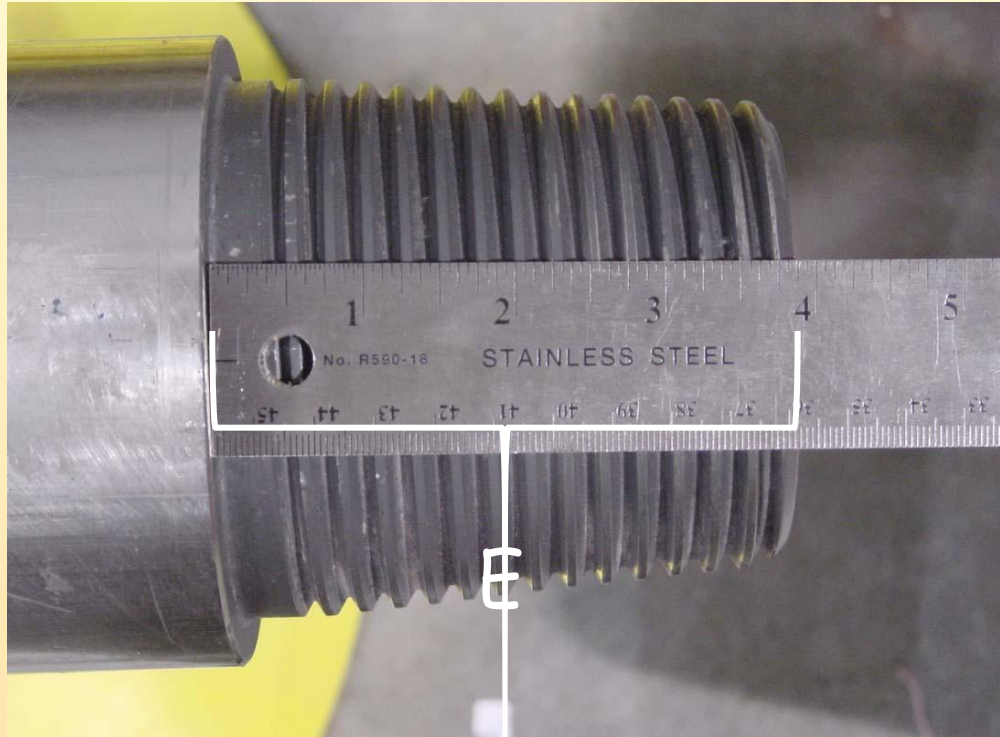
Spring Stack Length and Type



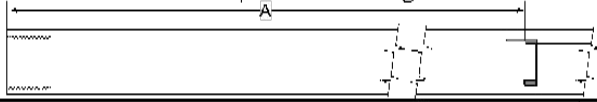

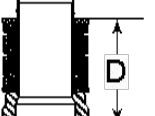
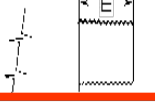
Spring Stack Length

		Slimhole (Hard Mount)	650 System	1200 System
MWD Run No.				
HOS/HOC Serial No.				
HOS/HOC Bore Depth to Pin Ring 	A		50.35	
Flow Tube Length 	B	-	- 35.65	-
Check Dimension C = A - B	C =	=	= 14.7	=
Spring Stack Length 	D	-	- 5.60	-
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		50.35	
Flow Tube Length 	B	-	- 35.65	-
Check Dimension C = A - B	C	=	= 14.7	=
Spring Stack Length 	D	-	- 5.60	-
Top Pin Length 	E	-	- 4.40	-
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)

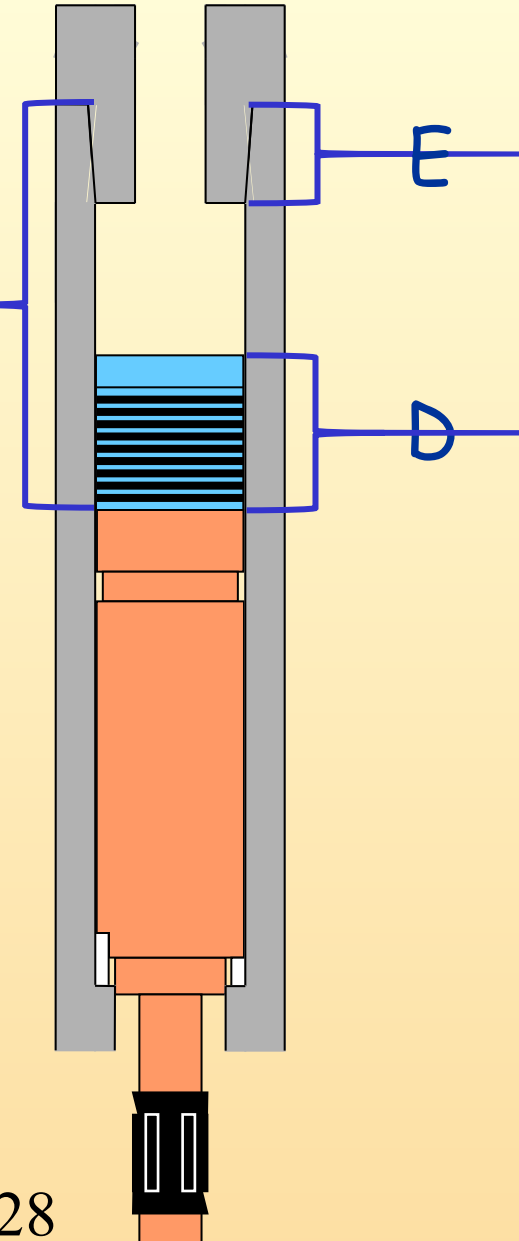
$$= C - D - E$$

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

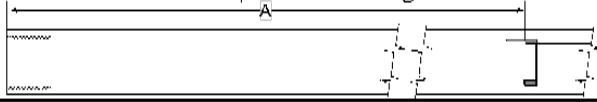
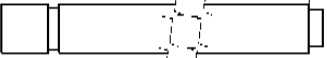
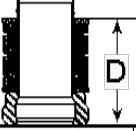
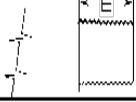
Spacer Stack Height

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

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		50.35	
Flow Tube Length 	B	-	- 35.65	-
Check Dimension C = A - B	C =	=	= 14.7	=
Spring Stack Length 	D	-	- 5.60	-
Top Pin Length 	E	-	- 4.40	-
Compression		+0.325"	+0.625"	+0.625"
Spacer Stack Height = C - D - E + Compression	=	=	= 5.325	=
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

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

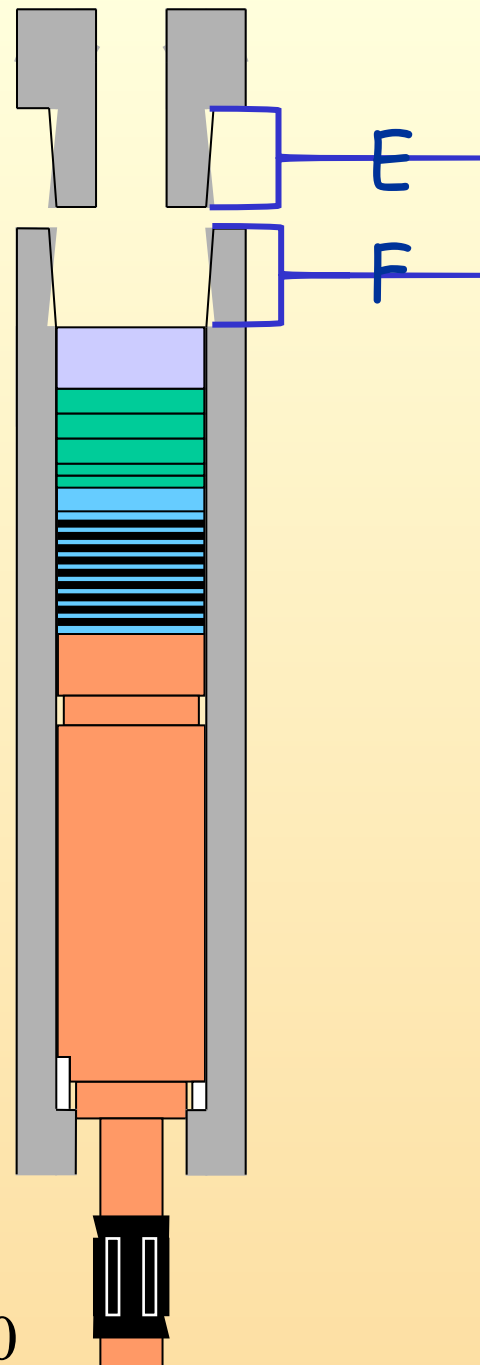
Spacers

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.

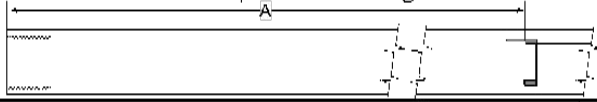

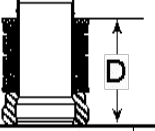
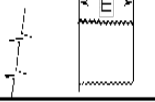
If this measurement is different from F by more than the installation tolerance

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		50.35	
Flow Tube Length 	B	-	- 35.65	-
Check Dimension C = A - B	C =	=	= 14.7	=
Spring Stack Length 	D	-	- 5.60	-
Top Pin Length 	E	-	- 4.40	-
Compression		+0.325"	+0.625"	+0.625"
Spacer Stack Height = C - D - E + Compression	=	=	= 5.325	=
Top Pin Length	E		4.40	
Compression		-0.325"	-0.625"	-0.625"
Check Dimension F = E - Compression	F =	=	= 3.775	=
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

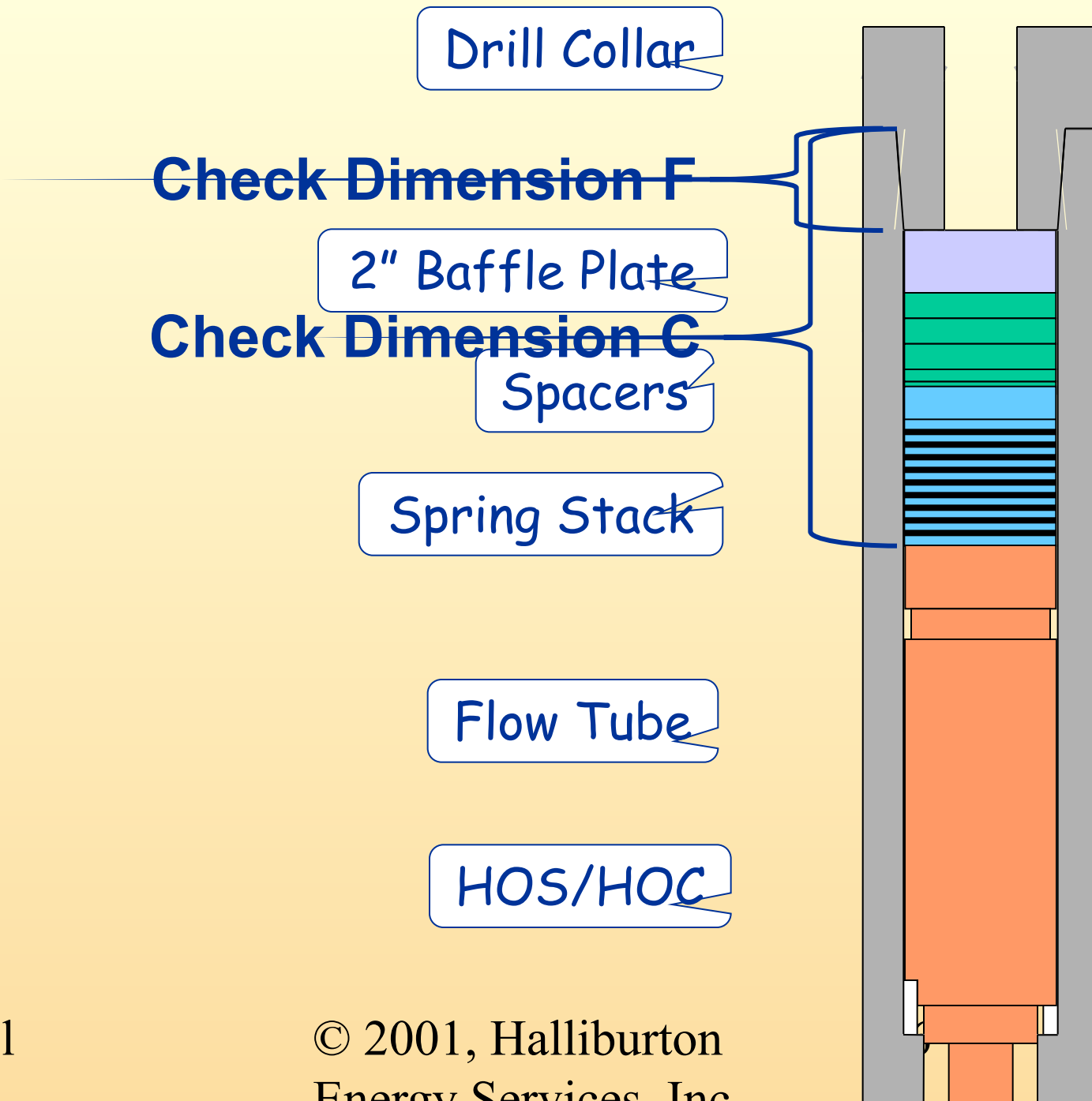
How accurate do I need to be?

- **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.**