

# ***WELL PATROLLER® CASING CLEAN-UP TOOL***

## **Description / Application**

The Well Patroller® is a wellbore clean-up tool developed for use in the pre-completion phase of wells where a high degree of cleanliness is required. Until the introduction of the Well Patroller® the only way to try to check that debris - gunk and junk, had been removed from the annulus was by measuring NTU / turbidity / solids content of the fluid returning to surface. This tool has a dual function, firstly performing a cleaning action and secondly, giving a validation of the effectiveness of the clean-up operation.

The Well Patroller® is designed to be run in the clean-up string and completes the clean-up by filtering the remaining debris from the annulus through a wire screen filter. It is usually run in conjunction with the Multi-Function Circulating Tool (MFCT®), the Razor Back® and the Bristle Back®. The Well Patroller® can collect a substantial amount of particulate matter filtered from the annulus.

## **Operation**

The Well Patroller® is run as an integral part of the drill string to wipe the casing as the pipe is run in the hole. It can be run as part of most milling / polishing assemblies and can be rotated and reciprocated without fear of damage to casing or tool. A ball operated Ported By-Pass Sub is normally run above the Well Patroller®.

As the string is RIH the Diverter Cup wipes the ID of the casing removing the film of gunk (OBM, Barite, cement and magnetised steel particles) clinging to it. The clean-up operation is carried out in the normal way, pumping down through the Well Patroller® Mandrel and back up between the Mandrel and the Screen Jacket. When circulation is complete, simply POOH. As the string is pulled the Diverter Cup wipes the ID of the casing and diverts the annular fluid into the tool. The fluid passes through the Screen Jacket and any remaining debris is retained.

In the event that the screen completely fills with impermeable debris, a small differential pressure is created across the Diverter Cup, causing the Rupture Discs to rupture and fluid then by-passes the Screen.

If, for any reason, the Rupture Discs also become plugged, the Ported By-Pass Sub can be opened allowing full communication from the drill pipe and annulus above, to the annulus below the Well Patroller®.

When the Well Patroller® is retrieved, the amount and type of debris should be recorded and samples kept.

If the Well Patroller® is full of debris when it is retrieved from the well, it is strongly recommended to re-run the clean-up string until the Well Patroller® comes out only partially filled.

***Note: When running or pulling the Well Patroller® from a floating rig, ensure that the heave compensator is used when the tool is passing through the BOP/Wellhead area. Ensure also that the Well Patroller® is not in the BOP/Wellhead area when making or breaking a connection on the rig floor. This will avoid any damage to the well or the tool due to rig heave.***



## Well Patroller® Placement & Operating Guidelines when Drilling Cement

- Tool should be positioned at least 30ft above the drill bit / mill.
- Tool should be placed so that it does not pass through any drilled out accessories e.g. Landing Collars, Float Collars.

## Normal Maximum Operational Parameters

Tool Size	RIH / POOH / Reciprocating Speed	Rotating Speed *	Maximum Compression @ tool when Rotating *	Circulating Rates
4.1/2" – 5.1/2"	150 ft/min	60 rpm	5,000 lbs	Limited only by surface Equipment
6.5/8" – 8.5/8"	150 ft/min	90 rpm	10,000 lbs	Limited only by surface Equipment
9.5/8" – 13.3/8"	150 ft/min	90 rpm	15,000 lbs	Limited only by surface Equipment

*\* Note: These parameters are on the basis that the tool Mandrel is similar to a drillpipe pup joint and, as such, excessive loading should not be applied to the tool when rotating / drilling / milling.*

*These are general guidelines only and are subject to review, if required, for individual circumstances.*

## Connection Make Up Torque and Torsional Yield

Connection	Make Up Torque	Internal Connection Make Up Torque	Torsional Yield
2.7/8" Grant TFW HT PAC	5,100 ft.lbs	N/A	7,700 ft.lbs
3.1/2" IF (NC38)	11,000 ft.lbs	3.1/2" Grant Prideco HT 38 15,000 ft.lbs	16,300 ft.lbs (NC 38)
4.1/2" IF (NC50)	27,000 ft.lbs	N/A	41,000 ft.lbs

## Field Handling Guidelines

When a Well Patroller® is sent to the field location, it is adequately protected to ensure that the Screen and Diverter Cup do not get damaged in transit. To ensure the tool is not damaged during operation, the Well Patroller® should be handled as follows:

### Pick Up and Make Up.

1. Screw lifting cap into tool on pipe rack or catwalk. Leave shipping protection in place when tool is being picked up.

#### **Note 1:**

**If other SPS tool(s) are to be immediately run above or below the tool, these tools should be screwed together and a lifting cap screwed into the top of the assembly.**

#### **Note 2:**

**It is recommended that sub assemblies are made up in the workshop prior to being sent to the field location. This will save rig time and prevent damage especially when several tools are to be made up together or with other accessories.**

2. Pick up tool on a tugger attached to the lifting cap (**DO NOT USE A SLING AROUND THE SCREEN OR DIVERTER CUP FOR LIFTING**). Ensure that tool is handled properly to prevent damage during pick-up.
3. When tool is on rig floor, lay it down and use the tugger to lift the tool and latch the elevators directly around the integral handling neck. Remove lifting cap.

**Note: To avoid damage to the Screen, it is not recommended to place the Well Patroller® in the mouse hole.**

4. Pick up tool and make it up in the string. Remove the shipping protection and lower it through the rotary table.
5. Set slips carefully around the integral handling neck.

**Break Out and Lay Down**

The tool or assembly should be broken out and laid down using the same general guidelines used during Pick Up and Make Up except in reverse.

**Protection Prior to Back Loading**

The tool should be protected using the same protection that was supplied when the tool was sent to the field location.



### Checks Before Re-Running a Well Patroller®

The following checks must be performed before re-running a Well Patroller® downhole. Please refer to the drawing on page 7 for component locations.

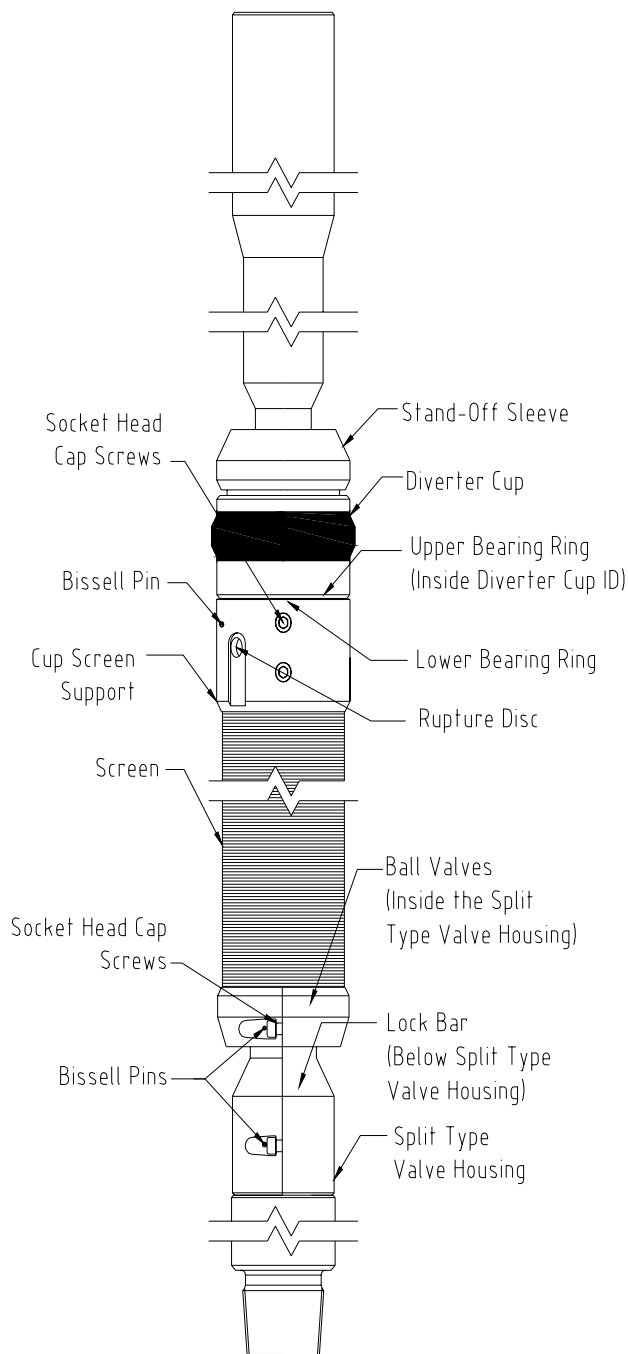
- 1) Check all Bissell Pins in Split Type Valve Housing and in Cup Screen Support are installed correctly and secure.
- 2) Verify that the Ball Valves held within the Split Type Valve Housing can be lifted off their seats.
- 3) Check the Screen is undamaged.
- 4) Check that the Rupture Discs are in place, installed correctly and are not damaged.
- 5) Check the Diverter Cup can be rotated.
- 6) Check OD of Diverter Cup is at least 1/32" larger than the ID of the casing it will be wiping.
- 7) Make sure internal bore of Mandrel is clear of obstructions.

***NOTE: If there is any doubt about the tool's fitness for use, then a replacement should be requested from SPS.***



## Field Emptying and Redress Procedure for Well Patroller®

*This procedure details the actions required to remove debris from the Well Patroller® and to replace the Diverter Cup sub-assembly*



To remove debris from the Well Patroller®:

1. Remove Bissell Pins from Split Type Valve Housing.
2. Loosen and remove Socket Head Cap Screws from the Split Type Valve Housing. Gently knock the side of the Split Type Valve Housing until a gap appears, lever apart and remove.

*(Note 1: When separating the Split Type Valve Housing from the mandrel, it is necessary to lift the ball valves off their seats. Insert a rod into each hole in the Split Type Valve Housing to lift ball valve.)*

*(Note 2: Take care not to lose the Lock Bar, from the Mandrel once the Split Type Valve Housing is removed.)*

3. Remove and record the weight and/or volume of debris in the tool. Collect and label a representative sample of the debris and pass it, together with the weight and volume information, to SPS.
4. Thoroughly wash and clean the exposed area and ensure that the Ball Valves and Springs are functioning correctly.
5. Inspect the Screen for damage. If damage has been sustained remove the Screen and fit the spare.
6. Re-Assemble the Split Type Valve Housing.

**Note:** This procedure is only for taking a sample from the Well Patroller® after it has been run. If the tool is to be run again, then it should be serviced as per the Field Redress Procedure overleaf.

## Field Redress Procedure – Disassembly

1. Remove Socket Head Cap Screws w/Special Undercut from Cup/Screen Support. **(Loosen the screws slightly, drive Bissell Pin through and out of Cup/Screen Support, rotate Stand-Off Sleeve clockwise (looking down the tool from the top (box) end) until it stops against the screws, turn it back 1 – 2 mm to line up the holes exactly and then remove the screws).**
2. Slide off Stand-Off Sleeve c/w Rupture Discs, Cup/Screen Support, Diverter Cup and Bearing Rings.
3. Remove all components from Stand-Off Sleeve.
4. Slide off Screen a sufficient amount to expose the debris inside the tool.
5. Remove and record the weight and/or volume of debris in the tool. Collect and label a representative sample of the debris and pass it, together with the weight and volume information, to SPS.
6. Thoroughly wash and clean the exposed area and ensure that the Ball Valves and Springs are functioning correctly.

## Field Redress Procedure – Assembly

1. Slide Screen over Mandrel and fit the bottom of Screen into Split Valve Housing.
2. Apply multi purpose grease to Stand-Off Sleeve and slide Upper Bearing Ring on to same.
3. Slide Diverter Cup onto Stand-Off Sleeve.
4. Slide Lower Bearing Ring onto Stand-Off Sleeve.
5. Insert Rupture Discs into recessed profiles inside Cup/Screen Support. Apply a little grease to keep discs in place. **(If discs are not securely “glued” in place, there can be problems mounting the sub-assembly in Step 7 below).**
6. Slide Cup/Screen Support c/w Rupture Discs over Stand-Off Sleeve until it is tight against Lower Bearing Ring. Align larger parts of the “keyholes” in Stand-Off Sleeve with holes in Cup/Screen Support.
7. Slide Stand-Off Sleeve sub assembly on to Mandrel (ensuring that all components stay properly together and that Rupture Discs remain properly trapped in recesses. Locate Screen into recess of Cup/Screen Support and align holes in Cup/Screen Support with holes in Mandrel.
8. Apply “Kopr-Kote” or equivalent anti-seize compound to Socket Head Cap Screws w/Special Undercut and partially install these screws into the Mandrel until the Stand-Off Sleeve can be rotated.
9. Rotate Stand-Off Sleeve anti-clockwise (looking down the tool from the top (box) end) to place the undercuts in Socket Head Cap Screws in the smaller parts of the “keyholes” in Stand-Off Sleeve.
10. Tighten Socket Head Cap Screws.
11. Install Bissell Pin through Cup/Screen Support and drive it in flush with OD.  
**Note: If the Well Patroller® is being converted to a different size, the Stand-Off Sleeve, Diverter Cup, Cup/Screen Support and Rupture Disks will normally be supplied as a pre-assembled sub-assembly ready to slide on to the tool.**
12. Ensure that all major OD’s on the tool are suitable for the size and weight of casing into which it will be run.





# Technical Unit

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## Well Patroller® Fax Back Content Report

### To Customer Representative:

To assist us in capturing information on the amount and type of debris retrieved in Well Patrollers®, we would request that the following information is completed when a Well Patroller® is emptied on the rig. Please fax back to the number below. Your assistance is appreciated.

<b>To</b>	Operations Department, SPS International, Aberdeen.
<b>Fax Number (SPS)</b>	+ 44 (0) 1224 742288
<b>Tool and Job Information</b>	
<b>Rig</b>	
<b>Well Patroller Serial Number</b>	SPS

<b>Run 1</b>	<b>Date:</b>		
<b>Well Patroller Application Use - Please Tick (√)</b>	Downhole Wellbore Clean-Up <input type="checkbox"/>	Wellhead / BOP Jetting <input type="checkbox"/>	
<b>Well Patroller Size (Circle)</b>	5" / 5.1/2" / 6.5/8" / 7" / 7.5/8" / 8.5/8" / 9.5/8" / 10.3/4" / 11.3/4"		
<b>Approximate Weight of Contents</b>	<b>Kg</b>		
<b>Description of Contents</b>			
<b>Condition of Rupture Discs</b>	<input type="checkbox"/> Intact	<input type="checkbox"/> One Ruptured	<input type="checkbox"/> Both Ruptured

<b>Run 2</b>	<b>Date:</b>		
<b>Well Patroller Application Use - Please Tick (√)</b>	Downhole Wellbore Clean-Up <input type="checkbox"/>	Wellhead / BOP Jetting <input type="checkbox"/>	
<b>Well Patroller Size (Circle)</b>	5" / 5.1/2" / 6.5/8" / 7" / 7.5/8" / 8.5/8" / 9.5/8" / 10.3/4" / 11.3/4"		
<b>Approximate Weight of Contents</b>	<b>Kg</b>		
<b>Description of Contents</b>			
<b>Condition of Rupture Discs</b>	<input type="checkbox"/> Intact	<input type="checkbox"/> One Ruptured	<input type="checkbox"/> Both Ruptured

<b>Run 3</b>	<b>Date:</b>		
<b>Well Patroller Application Use - Please Tick (√)</b>	Downhole Wellbore Clean-Up <input type="checkbox"/>	Wellhead / BOP Jetting <input type="checkbox"/>	
<b>Well Patroller Size (Circle)</b>	5" / 5.1/2" / 6.5/8" / 7" / 7.5/8" / 8.5/8" / 9.5/8" / 10.3/4" / 11.3/4"		
<b>Approximate Weight of Contents</b>	<b>Kg</b>		
<b>Description of Contents</b>			
<b>Condition of Rupture Discs</b>	<input type="checkbox"/> Intact	<input type="checkbox"/> One Ruptured	<input type="checkbox"/> Both Ruptured

Completed By: (Sign) \_\_\_\_\_ (Print) \_\_\_\_\_ (Date) \_\_\_\_\_

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