

PIONEER
OIL TOOLS LIMITED

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PACKER MILLING
&
RETRIEVAL SYSTEMS



PACKER MILLING AND RETRIEVAL SYSTEMS

INTRODUCTION

The Pioneer range of Packer Milling and Retrieval systems provides a simple and effective method of retrieving drillable production packers. Manufactured from high quality alloy steels, these tools are designed to give maximum performance whilst operating under the most arduous and rugged conditions.

The Pioneer Packer Milling and Retrieval systems offer three types of packer retriever: the Rotatable Packer Retriever for general use, the Hydraulically Released Packer Retriever with a reusable disengagement feature and the Slick Bore Packer Retriever for use with packers with tail pipe assemblies.

The mill components of the system come in two flavours: a solid mill to remove the complete section of a packer and a washover (burning) shoe to simply mill away the packer slips. Extension subs are available to suit the packer length.

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“When time is of the essence, Pioneer delivers”



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TYPE PR ROTATABLE PACKER RETRIEVER

The Pioneer Rotatable Packer Retriever forms a fundamental part of a single trip Packer Milling and Retrieval system. Designed to safely recover production packers without slick bore tailpipe assemblies, the packer retriever is configured so that the grapple can be positioned below the bottom of the packer before beginning to mill the packer (using a solid mill) or packer slips (using a washover mill). This position ensures that the grapple will catch the packer if it drops on completion of the milling operation.

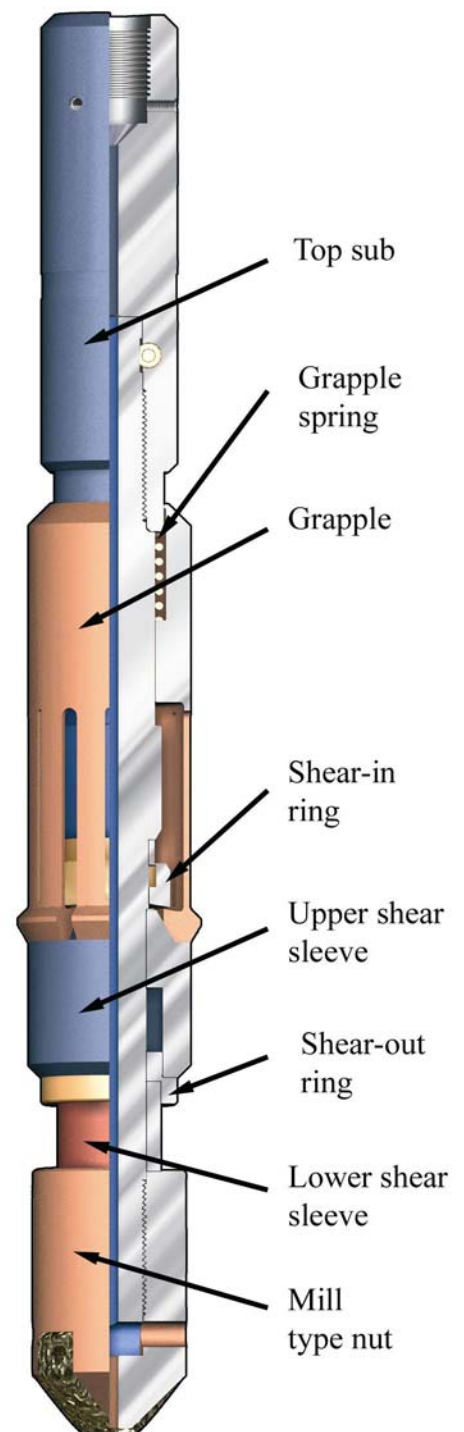
Features:

- Catches packers ranging from 1.9375" bore to 6" bore.
- Cannot be disengaged accidentally.
- Upper shear ring mechanism to identify when the grapple enters the packer bore.
- Lower shear ring mechanism to allow removal of the retriever from a stuck packer.
- Non-rotating grapple to facilitate mill operations.
- Simple to operate.

List of parts

Part	Part No
Mandrel	01
Top sub	02
Grapple	03
Mill type nut	04
Shear-out ring	05
Lower shear sleeve	06
Upper shear sleeve	07
Shear-in ring	08
Grapple spring	09
* Cotter clamp (lower)	10
* Cotter clamp (upper)	11
* Cap screw	12
* Set screw set	13

* Supplied as standard with the top sub.





TYPE PR ROTATABLE PACKER RETRIEVER

OPERATION

Determine the assembly composition based on whether a washover or complete milling operation is planned.

Milling packer slips:

- Retriever assembly.
- Extensions.
- Washover (burning) shoe.
- Washover shoe sub.
- Mill body (drive sub).

Milling the complete packer:

- Retriever assembly.
- Extensions.
- Solid mill.
- Mill body (drive sub).

Attach the completed assembly to the fishing string and lower it into the hole, until the retriever grapple sits on the top face of the packer. Any spacing-out can now be carried out.

Increase the weight on the string until the shear-in ring shears. The grapple will collapse, enabling it to pass down through the packer.

Continue lowering the string until the mill makes contact with the top of the packer.

Start the circulation pump, commence rotating the string and then mill the packer to the pre-determined depth.

Pick-up string until the grapple landing shoulder contacts the bottom face of the packer. Increase the pick-up load and pull packer.

If for any reason the retriever needs to be removed completely from the packer, this can be done by overpulling until the shear-out ring shears, enabling the grapple to collapse and be pulled up through the packer.

The loads to shear the rings are indicated by the suffix numbers in the assembly no:

Eg for assembly PR475600 - 25/150 (shear-in ring shears at 25000 lbf, shear out ring at 150000 lbf)

It will be necessary to replace rings that are sheared before re-using the assembly.

Note: the PR Rotatable Packer Retriever can be used without a shear-in ring at the option of the operator (typically when the location of the packer is definitively known) in this case it is important that the retriever assembly should be spaced out from the mill such that the grapple will pass through the hole in the packer before milling starts.

TYPE PR ROTATABLE PACKER RETRIEVER



MAINTENANCE & ASSEMBLY

The assembly should be thoroughly cleaned after use. The grapple should be checked for excessive wear and all components subjected to non-destructive testing to identify any cracking. Worn/cracked components should be replaced.

Assembly procedure:

- Lubricate all moving parts and threads prior to assembly of the tool.
- Assemble the grapple with the mandrel.
- Fit the grapple spring in the top recess formed between the grapple and the mandrel.
- Secure the top sub in a vice, then screw the mandrel into the top sub. Fit the cotter clamps, securing the top sub to the mandrel.
- Add the shear-in ring to the lower end of the mandrel and follow with the dismantling sleeve, then attach the dismantling locknut to the bottom of the mandrel.
- Wind the locknut, sleeve and shear-in ring up the mandrel. The shear ring will expand the grapple petals and slide up into position.
- Remove the locknut and the dismantling sleeve.
- Fit the upper shear sleeve, the shear out ring and the lower shear sleeve onto the mandrel.
- Fit the nut onto the mandrel.

NB Ensure that the upper and lower shear sleeves are free to rotate when fully assembled.

Disassembly procedure:

- Secure the top sub in a vice.
- Remove the mill type nut, lower shear sleeve, shear-out ring and upper shear sleeve from the assembly.
- Remove cotter clamp and partially break out the mandrel from the top sub (approx half the thread length) to provide room for the grapple to be pushed back.
- Fit the dismantling sleeve and dismantling locknut onto the mandrel. Wind the dismantling locknut up the mandrel until the dismantling sleeve has expanded the grapple petals enough to slide over the shear ring.
- Push the grapple up the mandrel until it clears the shear-in ring.
- Remove the dismantling locknut, dismantling sleeve and shear-in ring.
- Fully unscrew the mandrel and remove the grapple spring and grapple

Tool kit optionally supplied with assembly:

- Dismantling locknut.
- Dismantling sleeve.



PIONEER PRH HYDRAULICALLY RELEASED PACKER RETRIEVER

The Pioneer Hydraulically Releasable Packer Retriever is an alternative to the Rotatable Packer Retriever, featuring a repeatable hydraulic release for pulling out of a stuck packer. Designed to safely recover production packers without slick bore tailpipe assemblies, the packer retriever is configured so that the grapple can be positioned below the bottom of the packer before beginning to mill the packer (using a solid mill) or packer slips (using a washover mill). This ensures that the grapple will catch the packer if it drops on completion of the milling operation.

Features:

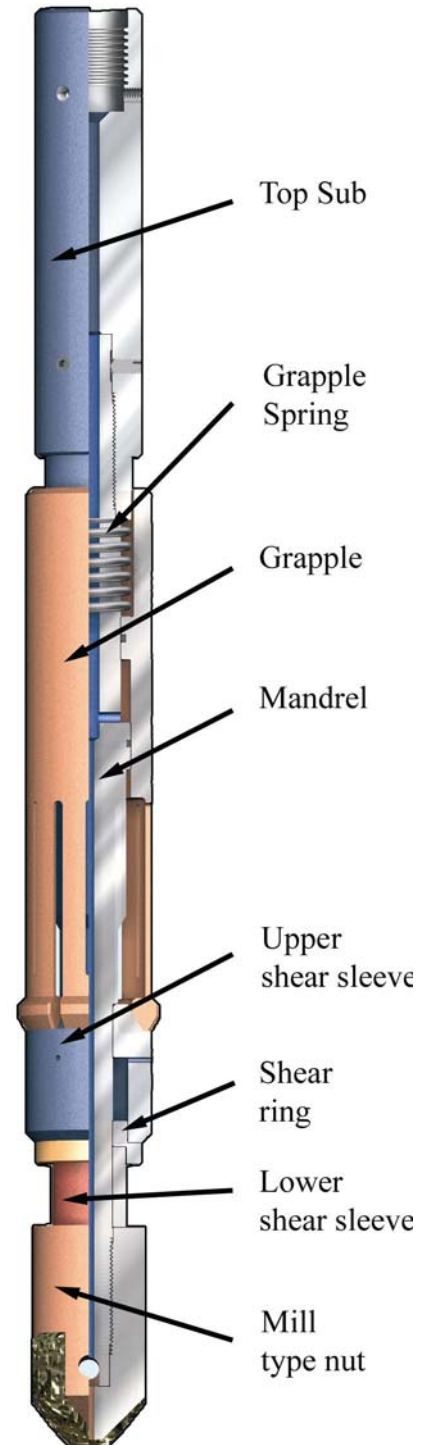
- Catches packers ranging from 1.9375" to 6" bore.
- Cannot be disengaged accidentally.
- Hydraulically released grapple.
- Shear ring mechanism to allow removal of retriever from a stuck packer.
- Non-rotating grapple facilitates milling operations.
- Simple to operate.

List of parts

Part	Part No
Mandrel	01
Top sub	02
Grapple	03
Mill type nut	04
Shear ring	05
Lower shear sleeve	06
Shear sleeve	08
Grapple spring	09
* Set screw set	13
* Set Screw set	14
** O ring	15
** O ring	16

* Supplied as standard with the top sub.

** Supplied as standard with the grapple.



PIONEER PRH HYDRAULICALLY RELEASED PACKER RETRIEVER



OPERATION

Determine the assembly composition based on whether a washover or complete milling operation is planned.

Milling packer slips:

- Retriever assembly.
- Extensions.
- Washover (burning) shoe.
- Washover shoe sub.
- Mill body (drive sub).

Milling the complete packer:

- Retriever assembly.
- Extensions.
- Solid mill.
- Mill body (drive sub).

The retriever assembly should be spaced out from the mill, such that the grapple will pass through the hole in the packer before milling starts.

Attach the completed assembly to the fishing string and lower it into the hole.

The grapple will collapse, enabling it to pass down through the packer.

Continue lowering the string until the mill makes contact with the top of the packer.

Lift the string to just clear the packer top.

Start the circulation pump and commence rotating the string then mill the packer to the pre-determined depth.

Pick up the string until the landing shoulder on the grapple contacts the bottom face of the packer. Increase the pick up load and pull packer.

If the packer remains stuck, lower the string and continue milling until the packer is free enough to pull.

If for any reason the retriever needs to be removed from the packer, increase pump pressure to place the grapple in the release position and pull while maintaining pressure. If for any reason the hydraulic release should fail the shear ring may be sheared by overpull and the assembly removed from the packer.

The loads to shear the shear ring are indicated by the suffix numbers in the assembly no:

e.g. For assembly PRH 250325A - 60
Shear ring shears at - 60,000lbs

It will be necessary to replace sheared shear rings before re-using the assembly.



PIONEER PRH HYDRAULICALLY RELEASED PACKER RETRIEVER

MAINTENANCE & ASSEMBLY

The assembly should be thoroughly cleaned after use. The grapple should be checked for excessive wear and all components subjected to non-destructive testing to identify any cracking. Worn/cracked components should be replaced.

Assembly procedure:

- Generously lubricate all moving parts and threads prior to assembly of the tool.
- Fit the o-rings onto the mandrel and grapple and then assemble the grapple with the mandrel.
- Fit the grapple spring in the top recess formed between the grapple and the mandrel.
- Secure the top sub in a vice, then screw the mandrel into the top sub.
- Fit the set screws, securing the top sub to the mandrel.
- Fit the upper shear sleeve, the shear ring and the lower shear sleeve onto the mandrel.
- Fit the mill type nut onto the mandrel.
- Fit the set screws, securing the mill type nut to the mandrel.

NB Ensure that the upper and lower shear sleeves are free to rotate when fully assembled.

Disassembly procedure:

- Secure the top sub in a vice.
- Remove the mill type nut's set screws.
- Unscrew the mill type nut and remove from the assembly.
- Remove the lower shear sleeve, shear ring and upper shear sleeve from the assembly.
- Remove the top sub's set screws.
- Break out and remove the mandrel.
- Remove the grapple spring and grapple.
- Examine the o-rings on the mandrel and grapple: replace them if there are signs of wear.



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PIONEER PRS SLICK BORE PACKER RETRIEVER

This is a development of the Pioneer Rotatable Packer Retriever and is designed to catch packers with slick bore tailpipe assemblies where there is no shoulder to lift on at the base of the packer.

Features:

- Catches packers ranging from 2⁵/₁₆" to 6" bore.
- Suitable to catch packers with tail pipe assemblies.
- Cannot be disengaged accidentally.
- Shear ring mechanism to allow removal of retriever from stuck packer.
- Non-rotating grapple to facilitate mill operations.
- Simple to operate.

List of parts

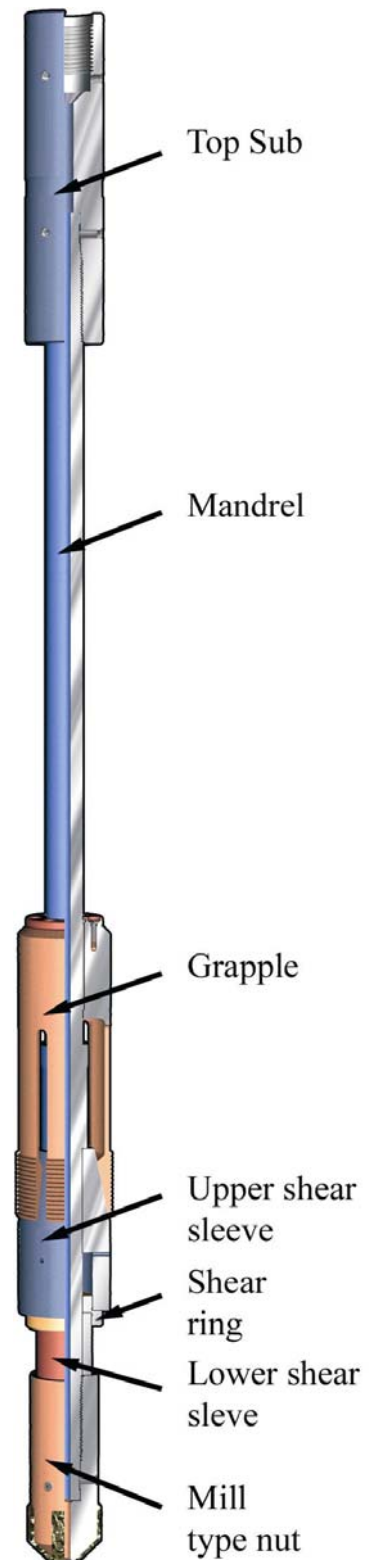
Part	Part No
Mandrel	01
Top sub	02
Grapple	03
Mill type nut	04
Shear ring	05
Lower shear sleeve	06
Upper shear sleeve	07
* Radial bearing	08
* Bearing retaining ring	09
* Bearing ring screw set	14
** Set screw set	15
** Set screw set	16
*** Set screw set	16

* Supplied as standard with the grapple.

** Supplied as standard with the top sub.

*** Supplied as standard with the mill type nut.

A heavy-duty variant of this design is available, contact the sales office for details.





PIONEER PRS SLICK BORE PACKER RETRIEVER

OPERATION

Determine the assembly composition based on whether a washover or complete milling operation is planned.

Milling packer slips:

- Retriever assembly.
- Extensions.
- Washover (burning) shoe.
- Washover shoe sub.
- Mill body (drive sub).

Milling the complete packer:

- Retriever assembly.
- Extensions.
- Solid mill.
- Mill body (drive sub).

The retriever assembly should be spaced out from the mill such that the grapple will pass through the hole in the packer before milling starts.

Attach the completed assembly to the fishing string and lower it into the hole.

When the grapple contacts the packer it will travel up the stroke length of the mandrel and then collapse, enabling it to pass down through the packer.

Continue lowering the string until the mill makes contact with the top of the packer.

Lift the string to clear the packer top (taking care not to exceed the stroke length of the retriever as that would prematurely set the grapple).

Start the circulation pump and commence rotating the string. Mill the packer to the pre-determined depth. As the milling progresses, the grapple moves down inside the packer, but does not rotate.

When milling is completed, simply pull on the string, engage the grapple and remove the packer.

If the packer is stuck, lower the string and continue milling until the packer is free enough to pull. If the packer remains stuck, an overpull will shear out the Packer Retriever's shear ring (customer to specify the shear value) allowing the retriever to be pulled.

The loads to shear the rings are indicated by the suffix numbers in the assembly no:

e.g. For assembly PRS 325388 - 60
Shear ring shears at - 60,000lbs

It will be necessary to replace a sheared shear ring before re-using the assembly.

PIONEER PRS SLICK BORE PACKER RETRIEVER



MAINTENANCE & ASSEMBLY

The assembly should be thoroughly cleaned after use. The grapple should be checked for excessive wear and all components subjected to non-destructive testing to identify any cracking. Worn/cracked components should be replaced.

Assembly procedure:

- Lubricate all moving parts and threads prior to assembly of the tool.
- Fit radial bearing to grapple.
- Fit scraper to the bearing retaining cap.
- Fit bearing retainer cap to grapple and secure with screw set.
- Fit grapple to mandrel.
- Secure the top sub in a vice, then screw the mandrel into the top sub.
- Fit the set screws securing the top sub to the mandrel.
- Fit the upper shear sleeve, the shear ring and the lower shear sleeve onto the mandrel.
- Fit the mill type nut onto the mandrel.
- Fit the set screws, securing the mill type nut to the mandrel.

NB Ensure that the upper and lower shear sleeves are free to rotate when fully assembled.

Disassembly procedure:

- Secure the top sub in a vice.
- Remove the mill type nut's set screws.
- Unscrew the mill type nut and remove from the assembly.
- Remove the lower shear sleeve, shear ring and upper shear sleeve from the assembly.
- Remove the top sub's set screws.
- Break out and remove the mandrel.
- Remove the grapple spring and grapple.
- Remove the bearing retaining ring from the grapple.
- Remove the scraper from the bearing retaining ring and examine for wear, replace if required.



TYPE PR-EX EXTENSION SUBS TYPE PR-XS CROSSOVER SUBS

Pioneer Oil Tools provide the PR-EX series Extension Subs to properly space out Packer Milling systems. Of robust construction throughout, extensions are available in length of one foot to six feet.

For use where a packer has a small bore in relation to the casing OD, the Pioneer PR-XS series of crossover subs is available to connect larger mill assemblies to smaller packer retrievers.



Type PR-EX extension sub



Type PR-XS crossover sub

TYPE PRM PACKER MILL



The Pioneer PRM series mills are available in two forms: the bladed type packer mill and the washover (burning) shoe type packer mill. Both forms use a drive sub that connects to the tool string, an extension that connects to the packer retriever (or to more extensions) and a bladed mill or washover shoe (with washpipe extension/adaptor). In both cases the outside of the mills are smooth in order to avoid damaging the casing.

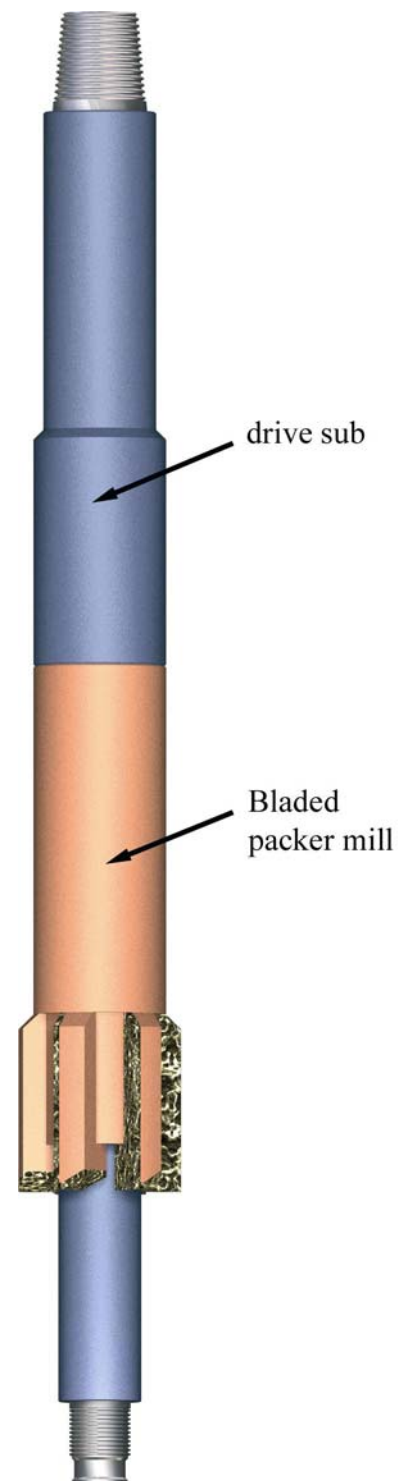
The bladed mill has been designed to mill the entire packer up to the point where the slips (and indeed the rest of the packer) have been milled away.

The bladed mill is equipped with tough, radially-arranged inclined blades coated liberally with Pioneer's own TC alloy to form a superior, hard-wearing cutting structure. This tool is particularly suited to smaller OD packers where the saving in terms of milled material by using a washover shoe is small.

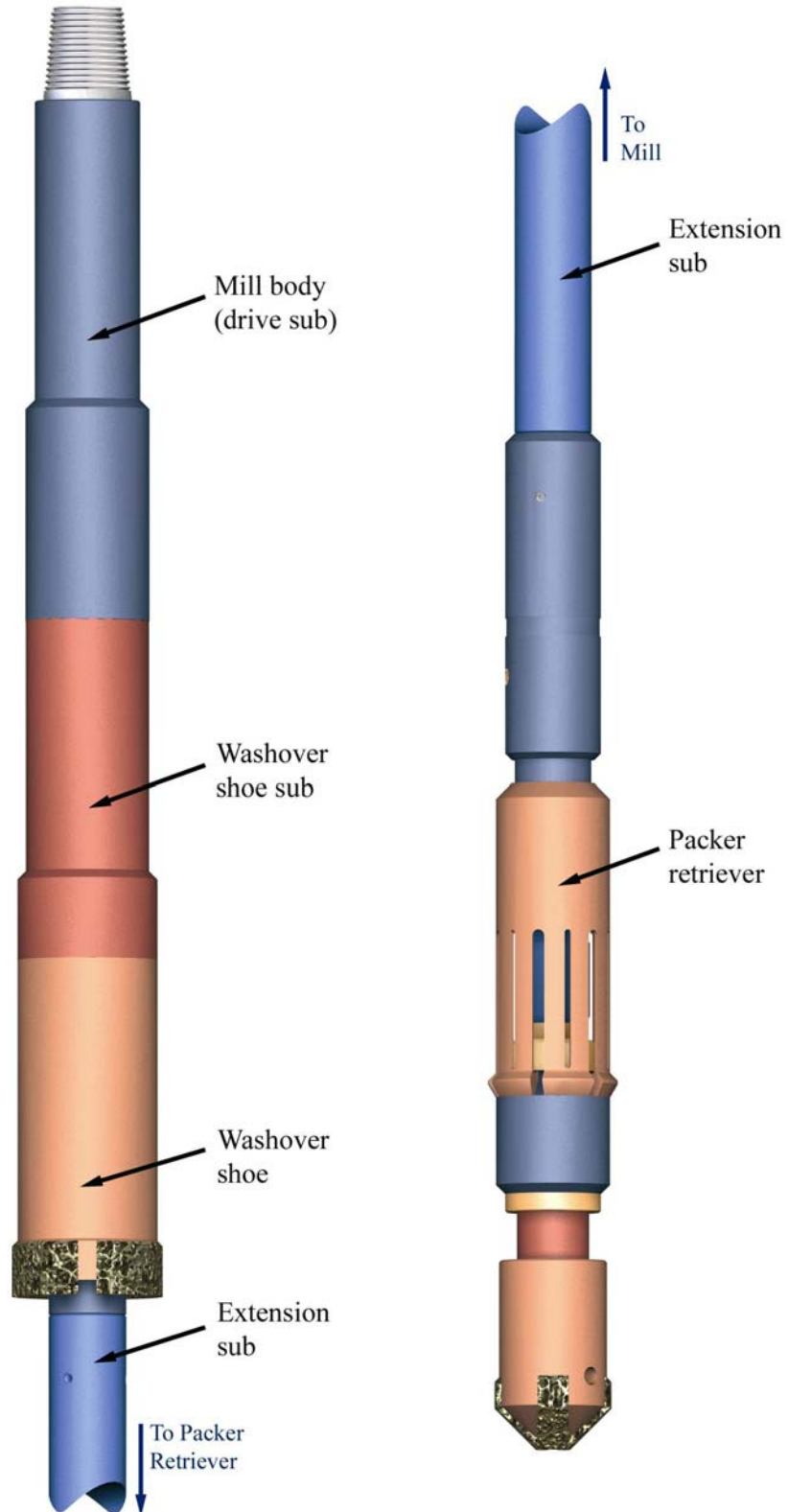
The washover (burning) shoe comes in two components (adaptor and shoe) that attach to the drive sub to form the milling system. Washover extensions are available in one to six foot lengths. The shoes are available in various forms, toothed, wavy etc to be used depending on down hole conditions. The washover operation itself mills around the exterior of the packer in order to remove the slips.

Both mills are available in various sizes. Mills can be optionally equipped with Pioneer's Speed Cut tungsten carbide inserts (backed by TC Alloy) for heavy duty/speed cutting.

After use, particularly sustained heavy use, the cutting structures may eventually need to be refaced. Pioneer Oil Tools would be happy to perform this service for its customers. Contact our sales office for details.



TYPE PR PACKER MILLING SYSTEM



PACKER MILLING AND RETRIEVAL SYSTEMS



ORDERING ADVICE

Pioneer Packer Retrievers may be dressed to catch a variety of packers, within the limits of their individual catch range. They are available with a series of shear rings to suit the majority of applications. The charts following this page detail the various dressing and shear combinations available for each type of packer retriever.

When enquiring, please specify:

- Packer description and ID.
- Top connection.
- Shear-out.
- Shear-in (type PR only)
- Stroke (type PRS only)

Additionally, for a complete milling and retrieving system:

- Casing size and weight.
- Type of mill.
- Extension sub lengths.

Recommended spare parts:

- Two grapples.
- Two mill type nuts.
- Four shear-in rings (type PR only).
- Four o-rings of each type (four plus four, PRH only)
- Four scrapers (bearing retaining ring sub component, PRS only).

NB should your requirements not be covered by this brochure please contact our sales office, who will be glad to discuss your specific desiderata.



Rotatable Packer Retrievers

Catch range (ID)	Assembly number	Top box connection	Tensile yield strength	Shear-out value (lbf)	Shear-in value (lbf)	Dressing configuration Grapple – Nut – Upper shear sleeve – Shear-in ring	Grapple catch
					▽		
1 ¹³ / ₁₆ " – 2 ⁵ / ₁₆ "	PR194231	1 ¹³ / ₁₆ " PRT	62600 lbf	18K, 30K	▽ 8K	▽ 03A-04A-07A-08A	▽ 1 ¹⁵ / ₁₆ "
2 ⁵ / ₁₆ " – 2 ¹¹ / ₁₆ "	PR231269	2 ¹ / ₄ " PRT (NC16)	76300 lbf	30K, 40K, 50K	▽ 10K, 12K	▽ 03A-04A-07A-08A	▽ 2 ⁵ / ₁₆ "
					10K, 12K	03B-04B-07B-08B	2 ⁵ / ₈ "
					10K, 12K	03C-04C-07C-08C	2 ¹ / ₂ "
					10K, 12K	03D-04D-07A-08A	2 ³ / ₈ "
2 ¹ / ₂ " – 3 ¹ / ₄ "	PR250325	2 ¹ / ₄ " PRT (1 ¹ / ₄ " Reg) (2 ³ / ₈ " Reg)	101100 lbf	40K, 60K	▽ 10K, 15K	▽ 03A-04A-07A-08A	▽ 2 ¹ / ₂ "
					10K, 15K	03B-04B-07B-08B	3"
					10K, 15K	03C-04C-07C-08C	2 ¹¹ / ₁₆ "
					10K, 15K	03D-04D-07D-08D	2 ³ / ₄ "
					10K, 15K	03E-04E-07E-08E	3 ¹ / ₄ "
					10K, 15K	03F-04F-07F-08F	2 ³¹ / ₃₂ "
3 ¹ / ₄ " – 4"	PR325388	3 ¹ / ₈ " PRT (2 ³ / ₈ " Reg)	162800 lbf	50K, 60K, 80K 100K 120K	▽ 10K, 20K	▽ 03A-04A-07A-08A	▽ 3 ¹ / ₄ "
					10K, 20K	03B-04B-07B-08B	3 ⁷ / ₈ "
					10K, 20K	03C-04C-07C-08C	4"
3 ¹ / ₂ " – 4 ¹ / ₄ "	PR350425	3 ¹ / ₈ " PRT (2 ⁷ / ₈ " Reg)	245200 lbf	60K, 80K, 100K 120K, 125K, 150K	▽ 10K, 20K	▽ 03A-04A-07A-08A	▽ 3 ¹ / ₂ "
					10K, 20K	03B-04B-07B-08B	3 ¹³ / ₁₆ "
					10K, 20K	03C-04C-07C-08C	4"
					10K, 20K	03D-04B-07B-08B	3 ⁷ / ₈ "
					10K, 20K	03E-04C-07B-08B	3.920
4" – 4 ⁷ / ₈ "	PR400488	3 ¹ / ₈ " PRT (2 ⁷ / ₈ " Reg)	348000 lbf	60K, 80K, 90K, 100K 120K, 150K, 175K	▽ 10K, 20K	▽ 03A-04A-07A-08A	▽ 4"
					10K, 20K	03B-03B-07B-08B	4 ³ / ₄ "
					10K, 20K	03C-04C-07C-08C	6"
					10K, 20K	03E-04E-07E-08E	4.850"
					10K, 20K	03F-04F-07F-08F	4.4"
					10K, 20K	03G-04G-07G-08G	4 ¹ / ₈ "
					10K, 20K	03H-04H-07H-08H	4 ¹ / ₂ "
					▽	▽	▽
4 ³ / ₄ " – 6"	PR475600	4 ¹ / ₄ " PRT 3 ¹ / ₂ " Reg	562500 lbf	100K, 115K, 120K, 125K 150K, 175K, 200K	▽ 10K, 25K	▽ 03A-04A-07A-08A	▽ 5"
					10K, 25K	03B-04B-07B-08B	6"
					10K, 25K	03C-04C-07C-08C	4 ³ / ₄ "

Hydraulically Releasable Packer Retrievers

Catch range (ID)	Assembly number	Top box connection	Tensile yield strength	Shear value (lbf)	Dressing configuration	
					Grapple – Nut – Upper shear sleeve	Grapple catch
1 ¹³ / ₁₆ " – 2 ⁵ / ₁₆ "	PRH194231	1 ¹³ / ₁₆ " PRT	62600 lbf	18K, 30K	▽ 03A-04A-07A	▽ 1 ¹⁵ / ₁₆ "
2 ⁵ / ₁₆ " – 2 ¹¹ / ₁₆ "	PRH231269	2 ¹ / ₄ " PRT (NC16)	76300 lbf	30K, 40K, 50K	▽ 03A-04A-07A 03B-04B-07B 03C-04C-07C 03D-04D-07D	▽ 2 ⁵ / ₁₆ " 2 ⁵ / ₈ " 2 ¹ / ₂ " 2 ³ / ₈ "
2 ¹ / ₂ " – 3 ¹ / ₄ "	PRH250325	2 ¹ / ₄ " PRT (1 ¹ / ₄ " Reg) (2 ³ / ₈ " Reg)	101100 lbf	40K, 60K	▽ 03A-04A-07A 03B-04B-07B 03C-04C-07C 03D-04D-07D 03E-04E-07E 03F-04F-07F	▽ 2 ¹ / ₂ " 3" 2 ¹¹ / ₁₆ " 2 ³ / ₄ " 3 ¹ / ₄ " 2"
3 ¹ / ₄ " – 4"	PRH325388	3 ¹ / ₈ " PRT (2 ³ / ₈ " Reg)	162800 lbf	50K, 60K, 80K, 100K 120K	▽ 03A-04A-07A 03B-04B-07B 03C-04C-07C	▽ 3 ¹ / ₄ " 3 ⁷ / ₈ " 4"
3 ¹ / ₂ " – 4 ¹ / ₄ "	PRH350425	3 ¹ / ₈ " PRT (2 ⁷ / ₈ " Reg)	245200 lbf	60K, 80K, 100K, 120K, 125K, 150K	▽ 03A-04A-07A 03B-04B-07B 03C-04C-07C 03D-04D-07D 03E-04E-07E	▽ 3 ¹ / ₂ " 3 ¹³ / ₁₆ " 4" 3 ⁷ / ₈ " 3.920
4" – 4 ⁷ / ₈ "	PRH400488	3 ¹ / ₈ " PRT (2 ⁷ / ₈ " Reg)	348000 lbf	60K, 80K, 90K, 100K, 120K, 150K 175K	▽ 03A-04A-07A 03B-03B-07B 03C-04C-07C 03E-04E-07E 03F-04F-07F 03G-04G-07G 03H-04H-07H	▽ 4" 4 ³ / ₄ " 4 ⁵ / ₁₆ " 4.850" 4.4" 4 ¹ / ₈ " 4 ¹ / ₂ "
4 ³ / ₄ " – 6"	PRH475600	4 ¹ / ₄ " PRT 3 ¹ / ₂ " Reg	562500 lbf	100K, 115K, 120K, 125K, 150K 175K, 200K	▽ 03A-04A-07A 03B-04B-07B 03C-04C-07C	▽ 5" 6" 4 ³ / ₄ "



Slick Bore Packer Retrievers

Catch Range (ID)	Assembly Number	Top Box Connection	Tensile Yield Strength	Shear value (lbf)	Dressing configuration Grapple – Nut – Upper shear sleeve	Grapple catch
2 ⁵ / ₁₆ " – 2 ¹¹ / ₁₆ "	PRS231269	2 ¹ / ₄ " PRT	76300 lbf	30K, 40K, 50K	▽ 03-04-07 03A-04A-07A	▽ 2 ⁵ / ₁₆ " 2 ⁵ / ₈ "
2 ¹ / ₂ " – 3 ¹ / ₄ "	PRS250325	2 ¹ / ₄ " PRT	101100 lbf	40K, 60K	▽ 03-04-07 03A-04A-07A 03B-04B-07B	▽ 2 ¹ / ₂ " 3 ¹ / ₄ " 2 ¹¹ / ₁₆ "
3 ¹ / ₄ " – 4"	PRS325388	3 ¹ / ₈ " PRT (2 ³ / ₈ " Reg)	162800 lbf	50K, 60K, 80K, 100K 120K	▽ 03-04-07 03A-04A-07A 03B-04B-07B 03(325400)-04-07	▽ 3 ¹ / ₄ " 4" 3 ⁷ / ₈ " 3.90"
4" – 4 ⁷ / ₈ "	PRS400488	3 ¹ / ₈ " PRT (2 ³ / ₈ " Reg) (2 ⁷ / ₈ " Reg)	348000 lbf	60K, 80K, 90K, 100K, 120K, 150K 175K	▽ 03-04-07 03A-04A-07A	▽ 4" 4 ³ / ₄ "
4 ³ / ₄ " – 6"	PRS475600	4 ¹ / ₄ " PRT	562500 lbf	100K, 115K, 120K, 125K, 150K 175K, 200K	▽ 03-04-07 03C-04C-07 03A-04A-07 03B-04A-07	▽ 4 ³ / ₄ " 5" 6" 6 ³ / ₁₆ "

Packer Retriever Crossovers

Crossover Part No	Top Connection	Bottom Connection	Crossover Length Shoulder/Shoulder
PR100002XS	4 ¹ / ₄ " PRT Box	3 ¹ / ₂ " Reg Box	36"
PR100004XS	4 ¹ / ₄ " PRT Box	3 ¹ / ₂ " Reg Pin	36"
PR100005XS	4 ¹ / ₄ " PRT Box	3 ¹ / ₈ " PRT Pin	36"
PR100006XS	2 ³ / ₈ " Reg Box	3 ¹ / ₈ " PRT Pin	36"
PR100007XS	3 ¹ / ₂ " Reg Box	4 ¹ / ₄ " PRT Pin	36"
PR100008XS	3 ¹ / ₂ " IF Box	1 ¹³ / ₁₆ " PRT Pin	16"
PR100009XS	3 ¹ / ₂ " IF Pin	2 ¹ / ₄ " PRT Pin	16"
PR100010XS	3 ¹ / ₈ " PRT Box	2 ⁷ / ₈ " PRT Pin	12"
PR100011XS	3 ¹ / ₂ " IF Box	4 ¹ / ₄ " PRT Pin	36"
PR100012XS	4 ¹ / ₄ " PRT Box	3 ¹ / ₂ " IF Pin	36"
PR100013XS	3 ¹ / ₈ " PRT Box	4 ¹ / ₄ " PRT Pin	36"

**PACKER MILLING SYSTEMS
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Packer Retriever Mills

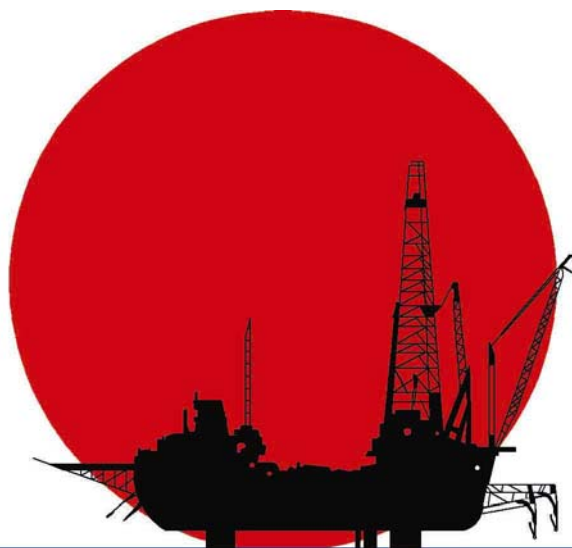
Drive Sub (Mill Body)	Drive Sub OD	Top Pin Connection	Bottom Pin Connection	Overall Length	Bladed Mill	Washover Shoe Sub	Washover Shoe	Crossover Length Shoulder/Shoulder
PRM288181-01	3.750"	2 ⁷ / ₈ " Reg	1 ¹³ / ₁₆ " PRT	46.1"	PRM288181-02	PRM288181-03	PRM288181-04	36"
PRM350255-01	4.250"	3 ¹ / ₂ " Reg	2 ¹ / ₄ " PRT	45.9"	PRM350255-02	PRM350255-03	PRM350255-04	36"
PRM350313-01	5.000"	3 ¹ / ₂ " Reg	3 ¹ / ₈ " PRT	49.1"	PRM350313-02	PRM350313-03	PRM350313-04	36"
PRM450313-01	6.500"	4 ¹ / ₂ " Reg	3 ¹ / ₈ " PRT	58.0"	PRM450313-02	PRM450313-03	PRM450313-04	36"

Packer Retriever Extensions

Extension Part No	Top Box Connection	Bottom Pin Connection	Extension Length Shoulder/Shoulder
PR10001EX	4 ¹ / ₄ " PRT	4 ¹ / ₄ " PRT	12"
PR10002EX	4 ¹ / ₄ " PRT	4 ¹ / ₄ " PRT	24"
PR10003EX	4 ¹ / ₄ " PRT	4 ¹ / ₄ " PRT	36"
PR10004EX	4 ¹ / ₄ " PRT	4 ¹ / ₄ " PRT	48"
PR10005EX	4 ¹ / ₄ " PRT	4 ¹ / ₄ " PRT	60"
PR10006EX	4 ¹ / ₄ " PRT	4 ¹ / ₄ " PRT	72"
PR10007EX	3 ¹ / ₈ " PRT	3 ¹ / ₈ " PRT	12"
PR10008EX	3 ¹ / ₈ " PRT	3 ¹ / ₈ " PRT	24"
PR10009EX	3 ¹ / ₈ " PRT	3 ¹ / ₈ " PRT	36"
PR100010EX	3 ¹ / ₈ " PRT	3 ¹ / ₈ " PRT	48"
PR100011EX	3 ¹ / ₈ " PRT	3 ¹ / ₈ " PRT	60"
PR100012EX	3 ¹ / ₈ " PRT	3 ¹ / ₈ " PRT	72"
PR100014EX	2 ¹ / ₄ " PRT	2 ¹ / ₄ " PRT	12"
PR100015EX	2 ¹ / ₄ " PRT	2 ¹ / ₄ " PRT	24"
PR100016EX	2 ¹ / ₄ " PRT	2 ¹ / ₄ " PRT	36"
PR100017EX	2 ¹ / ₄ " PRT	2 ¹ / ₄ " PRT	48"
PR100018EX	2 ¹ / ₄ " PRT	2 ¹ / ₄ " PRT	60"
PR100019EX	2 ¹ / ₄ " PRT	2 ¹ / ₄ " PRT	72"
PR100020EX	1 ¹³ / ₁₆ " PRT	1 ¹³ / ₁₆ " PRT	12"
PR100021EX	1 ¹³ / ₁₆ " PRT	1 ¹³ / ₁₆ " PRT	24"
PR100022EX	1 ¹³ / ₁₆ " PRT	1 ¹³ / ₁₆ " PRT	36"
PR100023EX	1 ¹³ / ₁₆ " PRT	1 ¹³ / ₁₆ " PRT	48"
PR100024EX	1 ¹³ / ₁₆ " PRT	1 ¹³ / ₁₆ " PRT	60"
PR100025EX	1 ¹³ / ₁₆ " PRT	1 ¹³ / ₁₆ " PRT	72"
PR100030EX	4 ¹ / ₄ " PRT	4 ¹ / ₄ " PRT	10.2"
PR100031EX	4 ¹ / ₄ " PRT	4 ¹ / ₄ " PRT	22.3"

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