



Pipe Recovery Equipment

Exhibit 2

Jet Research Center offers a variety of field-proven, reliable pipe recovery equipment to satisfy the high demands in the oilfield industry. The equipment supplied by JRC undergoes extensive research and development prior to field release. Through continuous research and engineering efforts, JRC has achieved industry recognition as the innovator and leader in explosives technology equipment for pipe recovery. Throughout JRC's development of pipe recovery equipment, innovation has resulted in patented techniques and methods. One such patent is a method to attenuate shock from resulting detonation of a downhole cutting device (US patent 5,117,911). This device continues to be the preferred method for running tubing and casing cutters in our industry today. The following equipment is detailed in this section:

- Coiled Tubing Cutters
- Tubing Cutters
- Casing and Drillpipe Cutters
- C-4 Casing Cutters
- Drill Collar Severing Tools
- Junk Shots

Centralization is critical to the successful application of many of the explosive products offered in this section. Jet Research Center always recommends that effective centralization is employed for optimum results. For electric wireline operations, JRC recommends the following equipment. At least two centralizer assemblies are generally required for effective centralization. The Centralizer is supplied with 1 ³/₁₆-in. box/pin connections suitable for mating directly with the JRC 1¹/₂-in. Firing Head.

Description	Part No.
Centralizer Body, 1 11/16 in.	72364
Bow Spring Max Open 13 1/4 in.	72363
Bow Spring Max Open 9 1/2 in.	114520
Bow Spring Max Open 6 1/4 in.	72362
Redress Kit, 1 11/16 in. Centralizer	133004

Note: 6 Bow Springs are required per assembled Centralizer.

Available Cutters Reference Table

Exhibit 2

Available Cutters Reference Table

Description	Part No.	Explosive Weight (g)	Housing Material	OD	Rating (psi / °F)	Shipping Class
0.718" Coiled Tubing Cutter	100118388	1	S	0.718	10,000/325	1.4S UN0441
0.948" Coiled Tubing Cutter	100118389	2.9	S	0.948	10,000/325	1.4S UN0441
1-3/16" Coiled Tubing Cutter	100000429	4.7	S	1.188	10,000/325	1.4S UN0441
1-3/8" Tubing Cutter	100000569	4	S	1.400	15,000/400	1.4S UN0441
1-9/16" Super Cutter	100005493	40	S	1.563	20,000/400	1.4S UN0441
1-11/16" Tubing Cutter	100000352	8.5	C	1.688	20,000/400	1.4S UN0441
1-11/16" Tubing Cutter - Cast Iron	101288527	8.5	CI	1.688	12,500/400	1.4S UN0441
1-23/32" Tubing Cutter	100000570	8.5	C	1.719	20,000/400	1.4S UN0441
1-13/16" Tubing Cutter	100000353	8.5	C	1.813	20,000/400	1.4S UN0441
1-13/16" Tubing Cutter - Cast Iron	101290400	8.5	CI	1.813	12,500/400	1.4S UN0441
1-13/16" Super Cutter	100008057	40	S	1.813	20,000/400	1.4S UN0441
2-1/32" Tubing Cutter	100000354	15.4	C	2.031	20,000/400	1.4S UN0441
2-1/8" Tubing Cutter	100000355	15.4	C	2.125	20,000/400	1.4S UN0441
2-1/8" Tubing Cutter - Cast Iron	101290402	15.4	CI	2.125	12,500/400	1.4S UN0441
2-1/8" Hastelloy Tubing Cutter	100000430	33	C	2.125	20,000/400	1.1D UN0059
2-1/4" Tubing Cutter	100000356	13	C	2.250	20,000/400	1.4S UN0441
2-1/4" Tubing Cutter - Cast Iron	101290405	13	CI	2.250	12,500/400	1.4S UN0441
2-1/2" Tubing Cutter - Cast Iron	101290406	22	CI	2.500	12,500/400	1.4S UN0441
2-19/32" Tubing Cutter	100116367	22.5	C	2.594	20,000/400	1.4S UN0441
2.70" Tubing Cutter	100011034	22.5	C	2.700	20,000/400	1.4S UN0441
2.70" Hastelloy Tubing Cutter	100000431	46	C	2.700	20,000/400	1.1D UN0059
2-3/8" Drill Pipe Cutter	100116368	22	S	2.375	12,500/400	1.4S UN0441
2-15/16" Drill Pipe Cutter	100127821	47.4	S	2.938	12,500/400	1.1D UN0059
3-5/16" Drill Pipe Cutter	100000140	61	S	3.313	12,000/400	1.1D UN0059
3-5/8" Casing Cutter	101293449	54	A	3.625	7,500/400	1.1D UN0059
4" Casing Cutter	101293457	110	A	4.000	9,000/400	1.1D UN0059
4-1/2" Casing Cutter	100014494	100	A	4.500	9,000/400	1.1D UN0059
4-3/4" Casing Cutter	101293484	100	A	4.750	9,000/400	1.1D UN0059
5-3/8" Casing Cutter	101293491	240	A	5.375	9,000/400	1.1D UN0059
5-1/2" Casing Cutter	101293515	253	A	5.500	9,000/400	1.1D UN0059
6" Casing Cutter	101293536	280	A	6.000	9,000/400	1.1D UN0059
6-1/8" Casing Cutter	101293544	253	A	6.125	9,700/400	1.1D UN0059
7-1/4" Casing Cutter	101293553	373	A	7.250	8,000/400	1.1D UN0059
8-3/16" Casing Cutter	101293555	407	A	8.188	8,000/400	1.1D UN0059

Housing Materials:

S = Steel
 A = Aluminum
 S/A = Steel/Aluminum

C = Ceramic
 CI = Cast Iron

Notes:

1. Refer to Cutter Selection Tables for recommended targets.

Exhibit 2

Jet Research Center's Coiled Tubing Cutters are designed to cleanly sever common sizes of tubing quickly and economically. These proven design cutters are widely used and have an unsurpassed performance record.

Applications

- Cuts common sizes and makes of coiled tubing
- Compatible with industry standard wireline accessories
- Can be designed with high temperature explosives for special applications

Features

- High strength steel components allow successful trip inside the coiled tubing.
- Corrosion resistant components

Options

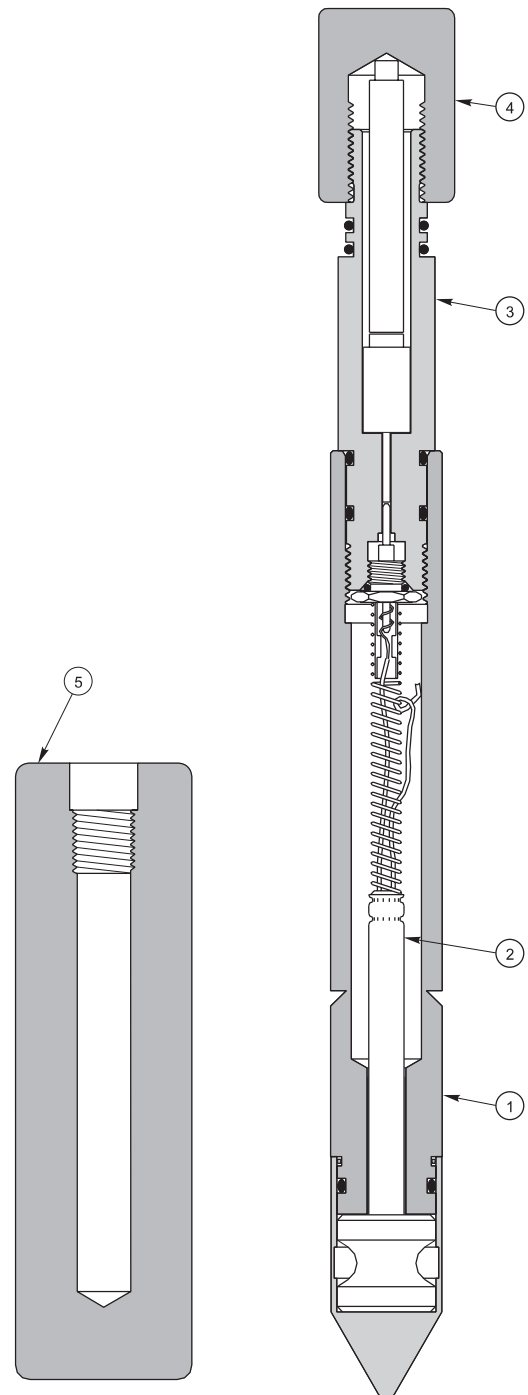
- Cutter sizes available for 1-, 1 1/4-, 1 1/2-, 1 3/4-in. coiled tubing
- 1 3/8-in. cutter suitable for cutting 1 1/2-in (1.900) NU API tubing

Benefits

- Designed for use with industry-leading safe arming equipment
- Superior reliability
- Most frequently used cutter for coiled tubing application

Coiled Tubing Cutter Accessories

Item	Description	Part No.
1	0.718 in. Coiled Tubing Cutter	100118388
	0.948 in. Coiled Tubing Cutter	100118389
	1 3/16 in. Coiled Tubing Cutter	100000429
	1 3/8 in. Coiled Tubing Cutter	100000569
2	Detonator Assembly, Resistorized	100010855
Contact Sub Options		
3	5/8-in. OD Cont Sub(1.59 cm)	100005498
	3/4-in. OD Cont Sub (1.91 cm)	100158243
	1-in. OD Cont Sub (2.54 cm)	100014497
Shunt Plug/Thread Protector Options		
4	5/8 in. Shunt Plug	100158235
	3/4 in. Shunt Plug	120042542
	1-in. Shunt Plug	120042541
5	Safety Tube for Detonator	100158234
Contact Sub Thread Specifications		
5/8 in.	0.5-20 UNF-2A	
3/4 in.	0.555-28P-36-SA	
1 in.	0.812-16 UN-2A	



Coiled Tubing Cutters

Coiled Tubing Cutters Selection Table

Exhibit 2

Coiled Tubing Cutters Selection Table

Description	Part No.	Explosive Weight (g)	Housing Material	Cutter OD (in)	Rating (psi / °F)	Shipping Class	RECOMMENDED TARGET TUBING			
							in.	Grade	Wall Th.	Weight (Incl Coupl.) lb/ft
0.718" Coiled Tubing Cutter	100118388	1	S	0.718	10,000/325	1.4S UN0441	1.00	N80	0.081	0.786
0.948" Coiled Tubing Cutter	100118389	2.9	S	0.948	10,000/325	1.4S UN0441	1.25	N80	0.095	1.172
1-3/16" Coiled Tubing Cutter	100000429	4.7	S	1.188	10,000/325	1.4S UN0441	1.50	N80	0.109	1.619
1-3/8" Tubing Cutter	100000569	4	S	1.375	15,000/400	1.4S UN0441	1.75	N80	0.134	2.313
							1.90	P105	0.145	2.900

Housing Materials:

S= Steel

Notes:

1. Always run effective centralization for optimum results.
2. Undersized cutters may not make a full cut.
3. When more than one cutter is available for the specification, always select the largest diameter cutter.

Exhibit 2

Jet Research Center's Tubing Cutters are designed to cleanly sever a wide range of tubing quickly and efficiently. These proven design cutters are the world's most widely used and have a performance record that is unsurpassed. The tubing cutter range includes industry-leading ceramic cap designs for minimum debris to economic cast iron versions for cost-effective solutions. JRC Tubing Cutters offer high reliability in field applications with a minimum amount of set-up or configuration based on well parameters. JRC Tubing Cutters and method of assembly are patented technology (US Patent 5,129,322). Tubing Cutters can be used with JRC's Proprietary Rig Environment Detonator - RED[®] - offering a high level of protection against stray voltage or inadvertent RF-initiation.

Features

- High strength ceramic cap provides 20,000 psi pressure rating.
- Breakup characteristic of the ceramic design leaves minimal debris in the well.
- Cutter design features minimum flare characteristic for ease of recovery

Options

- Extensive cutter range offers selection based on well conditions
- Cutters available for high strength and chrome material
- Special designs available to match unique well conditions.
- Detonator options available to satisfy all applications

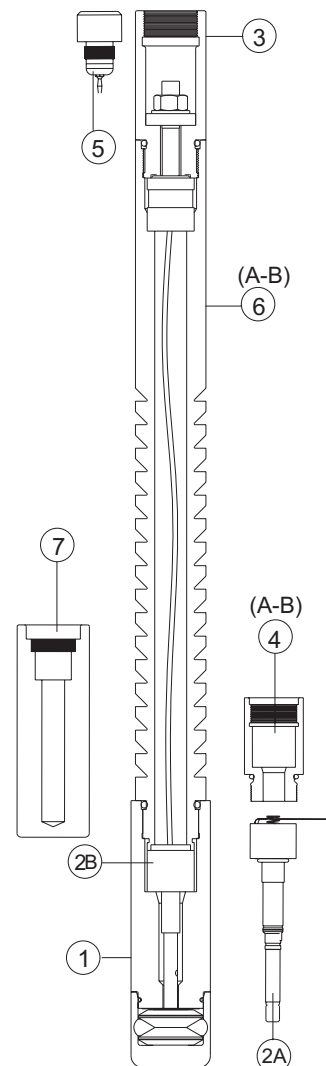
Benefits

- Tubing cutting performance based on leading technology
- Technical customer support always available

Tubing Cutters Accessories

Item	Description	Part No.
1	1-9/16" Tubing Cutter	100083086
	1-11/16" Tubing Cutter	100000352
	1-11/16" Tubing Cutter	101288527
	1-23/32" Tubing Cutter	100000570
	1-13/16" Tubing Cutter	100000353
	1-13/16" Tubing Cutter	101290400
	2-1/32" Tubing Cutter	100000354
	2-1/8" Tubing Cutter	100000355
	2-1/8" Tubing Cutter	101290402
	2-1/8" Hastelloy Tubing Cutter	100000430
	2-1/4" Tubing Cutter	100000356
	2-1/4" Tubing Cutter	101290405
	2-1/2" Tubing Cutter	101290406
	2-19/32" Tubing Cutter	100116367
	2.70" Tubing Cutter	100011034
2.70" Hastelloy Tubing Cutter	100000431	
2A	Detonator - RED [™]	101272595
2B	Detonator - Resistorized	100000432
3	Firing Head , 1 1/2-in. OD	100000434
4A	Adapter for RED [™] Detonator	101293676
5	Shunt Plug	100010861
6A	Extension Mandrel	100008258
7	Safety Tube	100010862
HP Accessories		
4B	Adapter for RED [™] - Steel	101293230
6B	Extension Mandrel - Steel	101293227

Note: For High Pressure application, in excess of 15,000 psi, JRC recommends the use of high pressure rated accessories.



Tubing Cutters

Tubing Cutters Selection Table

Exhibit 2

Tubing Cutters Selection Table

Description	Part No.	Explosive Weight (g)	Housing Material	Cutter OD (in.)	Rating (psi / °F)	Shipping Class	RECOMMENDED TARGET TUBING			
							OD in.	Grade	Wall Th.	Weight (Incl coupl.) lb/ft
1-11/16" Tubing Cutter	100000352	8.5	C	1.688	20,000/400	1.4S UN0441	2-3/8	P105	0.190 - 0.254	4.70 - 5.95
1-11/16" Tubing Cutter - Cast Iron	101288527	8.5	CI	1.688	12,500/400	1.4S UN0441	2-3/8	P105	0.190 - 0.254	4.70 - 5.95
1-23/32" Tubing Cutter	100000570	8.5	C	1.719	20,000/400	1.4S UN0441	2-3/8	P105	0.190 - 0.254	4.70 - 5.95
1-13/16" Tubing Cutter	100000353	8.5	C	1.813	20,000/400	1.4S UN0441	2-3/8	P105	0.190 - 0.254	4.70 - 5.95
1-13/16" Tubing Cutter - Cast Iron	101290400	8.5	CI	1.813	12,500/400	1.4S UN0441	2-3/8	P105	0.190 - 0.254	4.70 - 5.95
2-1/32" Tubing Cutter	100000354	15.4	C	2.031	20,000/400	1.4S UN0441	2-7/8	P105	0.308	8.70
2-1/8" Tubing Cutter	100000355	15.4	C	2.125	20,000/400	1.4S UN0441	2-7/8	P105	0.217	6.50
2-1/8" Tubing Cutter - Cast Iron	101290402	15.4	CI	2.125	12,500/400	1.4S UN0441	2-7/8	P105	0.217	6.50
2-1/8" Hastelloy Tubing Cutter	100000430	33	C	2.125	20,000/400	1.4S UN0441	2-7/8	Chrome	0.276	7.90
2-1/4" Tubing Cutter	100000356	13	C	2.250	20,000/400	1.4S UN0441	2-7/8	P105	0.217	6.50
2-1/4" Tubing Cutter - Cast Iron	101290405	13	CI	2.250	12,500/400	1.4S UN0441	2-7/8	P105	0.217	6.50
2-1/2" Tubing Cutter - Cast Iron	101290406	22	CI	2.500	12,500/400	1.4S UN0441	3-1/2	P105	0.254 - 0.449	9.3 - 15.50
2-19/32" Tubing Cutter	100116367	22.5	C	2.594	20,000/400	1.4S UN0441	3-1/2	P105	0.254 - 0.289	9.30 - 10.30
2.70" Tubing Cutter	100011034	22.5	C	2.700	20,000/400	1.4S UN0441	3-1/2	P105	0.254 - 0.289	9.30 - 10.30
2.70" Hastelloy Tubing Cutter	100000431	46	C	2.700	20,000/400	1.1D UN0059	3-1/2	Chrome	0.254 - 0.289	9.30 - 10.30

Housing Materials:

C = Ceramic Bottom
CI = Cast Iron Bottom

Notes:

1. Always run effective centralization for optimum results.
2. Undersized cutters may not make a full cut.
3. When more than one cutter is available for the specified target, always select the largest diameter cutter.

Exhibit 2

Jet Research Center's Super Tubing Cutters are designed where well conditions prevent the use of a conventional tubing cutter based on unexpected or severe restrictions. In this situation, a specially designed cutting charge is used. The cutter is based on a conventionally shaped charge assembly but has additional explosive in the form of a pelletized charge in the base of the cutter. It is a smaller diameter than a conventional charge for the pipe to be cut. The cutter can easily pass through tight restrictions and still achieve severance. Based on the design constraints, some tubing deformation at the cut point is likely with this cutter. Super Tubing Cutters can be used with JRC's Proprietary Rig Environment Detonator - RED® - offering a high level of protection against stray voltage or inadvertent RF-initiation.

Features

- High strength steel cap provides 20,000 psi pressure rating.
- Reduced diameter easily passes wellbore restrictions
- Detonator options available to satisfy all applications

Options

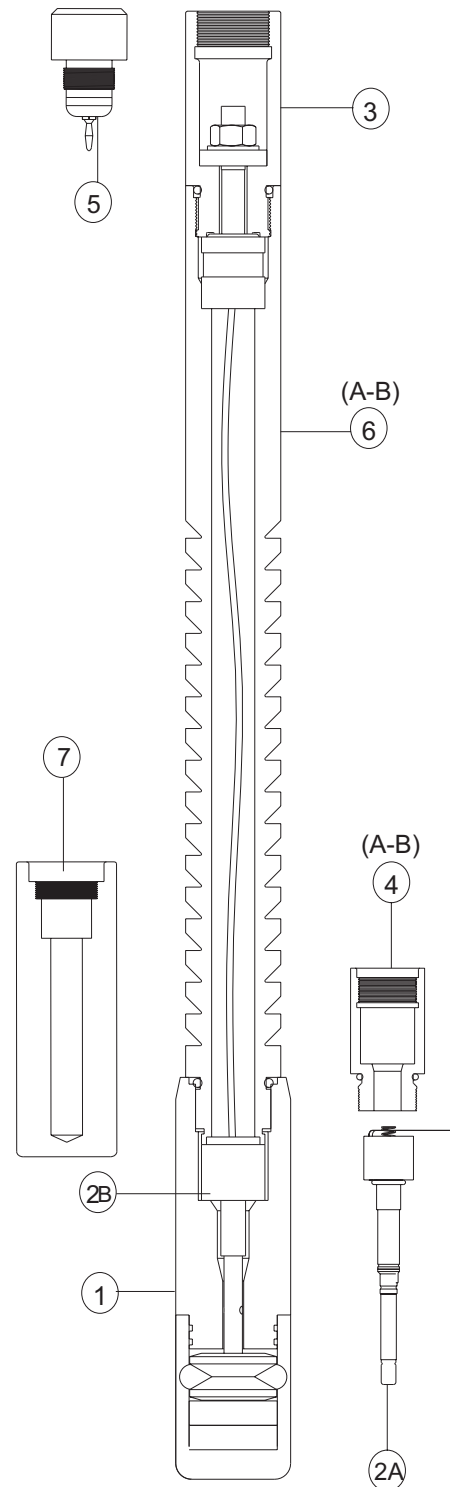
- Two cutter sizes for common tubing sizes
- Special designs available to match unique well conditions

Benefits

- Field assembly support always available
- Technical customer support always available

Super Tubing Cutter Accessories

Item	Description	Part No.
1	1 9/16 in. Super Cutter	100005493
	1 13/16 in. Super Cutter	100008057
2A	Detonator - RED™	101272595
2B	Detonator - Resistorized	100000432
3	Firing Head , 1 1/2-in. OD	100000434
4A	Adapter for Cutter RED™	101293676
5	Shunt Plug	100010861
6A	Extension Mandrel	100008258
7	Safety Tube	100010862
HP Accessories		
4B	Adapter for RED™ - Steel	101293230
6B	Extension Mandrel - Steel	101293227



Super Tubing Cutters

Note: For High Pressure application, in excess of 15,000 psi, JRC recommends the use of high pressure rated accessories.

Super Tubing Cutters Selection Table

Exhibit 2

Super Tubing Cutters Selection Table

Description	Part No.	Explosive Weight (g)	Housing Material	Cutter OD (in)	Rating (psi / °F)	Shipping Class	RECOMMENDED TARGET TUBING			
							in.	Grade	Wall Th.	Weight (Incl Coupl.) lb/ft
1-9/16" Super Cutter	100005493	40	S	1.563	20,000/400	1.4S UN0441	2-3/8	N80	0.190 - 0.254	4.70 - 5.95
1-13/16" Super Cutter	100008057	40	S	1.813	20,000/400	1.4S UN0441	2-7/8	N80	0.217 - 0.308	6.50 - 8.70

Housing Materials:

S = Steel

Notes:

1. Undersized cutters may not make a full cut.
2. Always run effective centralization for optimum results.
3. Field assembly required due to shipping features.
4. **CAUTION: Not recommended for casing sizes less than 7".**

Exhibit 2

Jet Research Center's Casing and Drillpipe Cutters feature the same level of engineering detail and design as the industry-leading JRC tubing cutters. They are designed to cleanly sever a wide range of casing efficiently, using a minimum amount of explosive. The designs feature high specification aluminum alloy case material that breaks up substantially upon detonation. JRC Casing and Drillpipe Cutters offer high levels of safety and reliability in field applications with a minimum amount of set-up or configuration based on well parameters. JRC developed the industry standard shock attenuating mandrel for use with the range of Casing and Drillpipe Cutters and patented this technology (US patent 5,117,911). Casing and Drillpipe Cutters can be used with JRC's Proprietary Rig Environment Detonator - RED[®] - offering a high level of protection against stray voltage or inadvertent RF-initiation.

Casing Cutter Accessories

Item	Description	Part No.	
1	2-3/8" Drill Pipe Cutter	100116368	
	2-15/16" Drill Pipe Cutter	100127821	
	3-5/16" Drill Pipe Cutter	100000140	
	3-5/8" Casing Cutter	101293449	
	4" Casing Cutter	101293457	
	4-1/2" Casing Cutter	100014494	
	4-3/4" Casing Cutter	101293484	
	5-3/8" Casing Cutter	101293922	
	5-1/2" Casing Cutter	101293515	
2A	6" Casing Cutter	101293536	
	6-1/8" Casing Cutter	101293923	
	7-1/4" Casing Cutter	101293553	
	8-3/16" Casing Cutter	102193555	
	2A	Detonator - RED [™]	101272595
	2B	Detonator - Resistorized	100000432
	3	Shunt Plug	100010861
	4	Firing Head , 1-1/2 in. OD	100000434
5A	Extension Mandrel	100008258	
6A	Adapter for RED [™] Detonator	101293676	
7A	Adapter for Resistorized Detonator	100014468	
8	Protective Detonator Holder	100010862	
HP Accessories			
5B	Extension Mandrel - Steel	101293227	
6B	Adapter for RED [™] - Steel	101293230	
7B	Adapter for Resistorized Detonator	101293240	
7C	Adapter w/o Shear Groove	101812902	

Note:

- Item 6 is used in place of Item 7 when running RED.
- For High Pressure application, in excess of 15,000 psi, JRC recommends the use of high pressure rated accessories.
- Item 7C does not include o-ring.

Features

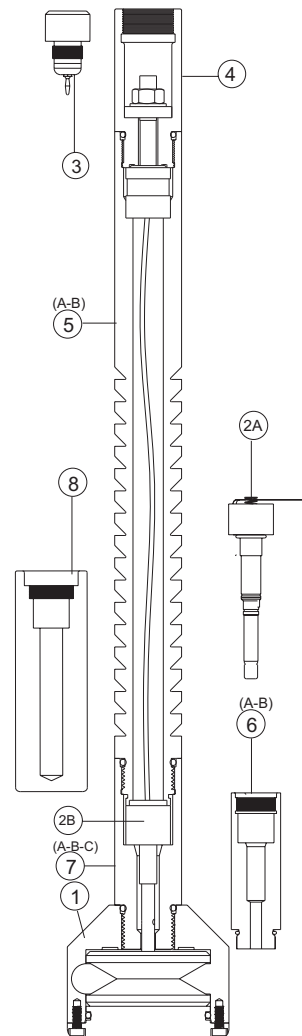
- Shock attenuating mandrel helps protect associated wireline tools
- Cutter designed for minimum pipe flare

Options

- Extensive cutter range offers selection based on well conditions
- Cutters available for high-strength and chrome pipes
- Special designs available to match unique well conditions
- Detonator options available to satisfy all applications

Benefits

- Field assembly support always available
- Technical customer support always available



Casing and Drillpipe Cutters

Casing and Drillpipe Cutters Selection Table

Exhibit 2

Casing and Drillpipe Cutters Selection Table

Description	Part No.	Explosive Weight (g)	Housing Material	Cutter OD in	Rating (psi / °F)	Shipping Class	RECOMMENDED TARGET CASING			
							OD in.	Grade	Wall Th.	Weight (Incl coupl.) lb/ft
2-3/8" Drill Pipe Cutter	100116368	22	S	2.375	12,500/400	1.4S UN0441	3-1/2 DP	G105	0.254 - 0.449	9.5 - 15.5
2-15/16" Drill Pipe Cutter	100127821	47.4	S	2.938	12,500/400	1.1D UN0059	4	L80	0.262 - 0.380	11.85 - 15.7
							4-1/2 DP	G105	0.271 - 0.430	13.75 - 20.00
3-5/16" Drill Pipe Cutter	100000140	61	S	3.313	12,000/400	1.1D UN0059	4-1/2 DP	G105	0.430	20.00
							5 DP	G105	0.296 - 0.500	16.25 - 25.60
3-5/8" Casing Cutter	101293449	54	A	3.625	7,500/400	1.1D UN0059	4-1/2	L80	0.205 - 0.337	9.50 - 15.10
4" Casing Cutter	101293457	110	A	4.000	9,000/400	1.1D UN0059	5	L80	0.253 - 0.437	11.50 - 21.40
							5 DP	G105	0.296 - 0.362	16.25 - 19.50
4-1/2" Casing Cutter	100014494	100	A	4.500	9,000/400	1.1D UN0059	5-1/2	L80	0.304 - 0.415	17.00 - 23.00
4-3/4" Casing Cutter	101293484	100	A	4.750	9,000/400	1.1D UN0059	5-1/2	L80	0.244 - 0.304	14.00 - 17.00
							5-3/4	L80	0.330 - 0.430	19.50 - 25.20
5-3/8" Casing Cutter	101293491	240	A	5.375	9,000/400	1.1D UN0059	6	L80	0.224 - 0.275	14.00 - 17.00
							6-5/8	L80	0.475	32.00
5-1/2" Casing Cutter	101293515	253	A	5.500	9,000/400	1.1D UN0059	6-5/8	L80	0.228 - 0.417	20.00 - 28.00
							7	L80	0.408 - .0540	29.00 - 38.00
6" Casing Cutter	101293536	280	A	6.000	9,000/400	1.1D UN0059	7	L80	0.317 - 0.408	23.00 - 29.00
6-1/8" Casing Cutter	101293544	253	A	6.125	9,700/400	1.1D UN0059	7-5/8	L80	0.375 - 0.500	29.70 - 39.00
7-1/4" Casing Cutter	101293553	373	A	7.250	8,000/400	1.1D UN0059	8-5/8	L80	0.400 - 0.595	36.00 - 52.00
8-3/16" Casing Cutter	101293555	407	A	8.188	8,000/400	1.1D UN0059	9-5/8	L80	0.435 - 0.545	43.50 - 53.50

Housing Materials:

Notes:

S/A = Steel/Aluminum
A = Aluminum

1. Always run effective centralization for optimum results.
2. Undersized cutters may not make a full cut.
3. When more than one cutter is available for the specified target, always select the largest diameter cutter.

Exhibit 2

Jet Research Center's C-4 Casing Cutters are designed to allow air transportation (via commercial aircraft) of the explosives in individual packages. Air freight allows for rapid shipment of urgently needed cutters and is considerably less expensive than transportation by sea. Upon arrival at the location, the explosive can then be placed in the cutter body and run in the well. The C-4 Cutters then function as traditional cutters, except for their reduced temperature limitation. This product line uses the same safe-arming procedures as the popular tubing, drillpipe and normal casing cutters. It allows the detonator to be electronically connected safely before the detonator is placed in proximity to the cutting charge.

Applications

- Emergency situation where the cutter must be flown to wellsite
- Temperature limitation of 225 °F
- Pressure limitations depend on the size of the cutter

Features

- Patented shock absorber mandrel helps protect CCLs and other associated hardware
- Aluminum case components allow easy breakup of components into debris
- Detonation options available to satisfy all applications

C-4 Casing Cutter Accessories

Item	Description	Part No.
1	C-4 Casing Cutter	See Back Page
2A	Detonator - RED®	101272595
2B	Detonator - Resistorized	100000432
3	Firing Head, 1-1/2 in. OD	100000434
*4A	Extension Mandrel	100008258
5A	Adapter for RED® Detonator	101295128
*6A	Adapter for Resistorized Detonator	100014468
7	Shunt Plug	100010861
8	Protective Detonator Holder	100010862
HP Accessories		
4B	Extension Mandrel - Steel	101293227
5B	Adapter for RED® - Steel	101295134
6B	Adapter for Resistorized Detonator - Steel	101293240

Note:

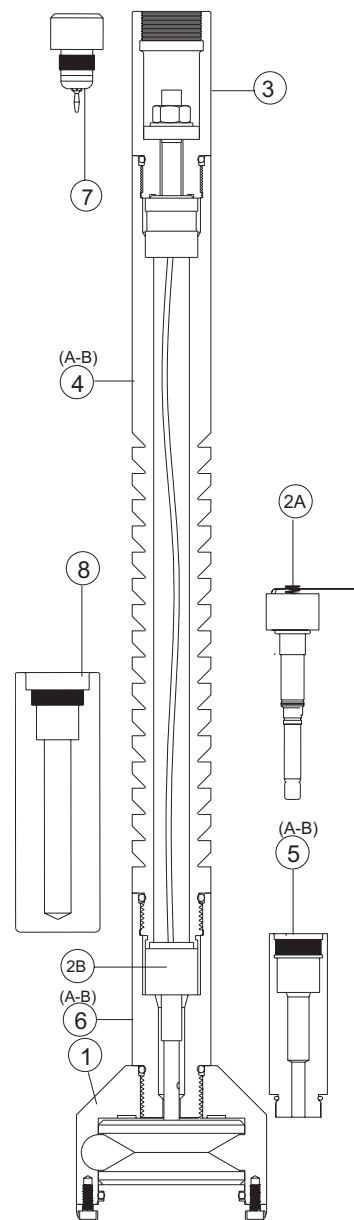
1. For High Pressure application, in excess of 15,000 psi, JRC recommends the use of high pressure rated accessories.
2. Item 6 is used in place of Item 7 when running RED®.

Options

- Available in sizes to cut 4 1/2-in. to 9 5/8-in. casing
- Upon request, test shots can be made in special pipe to verify performance

Benefits

- Backed by JRC's research and engineering technology
- Economical because of lower shipping costs (commercial airfreight vs. sea or air charter)



C-4 Casing Cutters

C-4 Casing Cutter Accessories

Exhibit 2

3 ⁵/₈ in.

Description	Part No.
Hardware Kit	100158064
Booster Pellet (1 ea. req.)	100158222
C-4 Cartridge (7 ea. req.)	100141897
Booster Rod (1 ea. req.)	100158155

5 ¹/₂ in.

Description	Part No.
Hardware Kit	100158068
Booster Pellet (1 ea. req.)	100158222
C-4 Cartridge (15 ea. req.)	100141897
Booster Rod (1 ea. req.)	100158223

4 in.

Description	Part No.
Hardware Kit	100158065
Booster Pellet (1 ea. req.)	100158222
C-4 Cartridge (7 ea. req.)	100141897
Booster Rod (1 ea. req.)	100158152

6 in.

Description	Part No.
Hardware Kit	100158069
Booster Pellet (1 ea. req.)	100158222
C-4 Cartridge (16 ea. req.)	100141897
Booster Rod (1 ea. req.)	120021223

4 ¹/₂ in.

Description	Part No.
Hardware Kit	100158066
Booster Pellet (1 ea. req.)	100158222
C-4 Cartridge (6 ea. req.)	100141897
Booster Rod (1 ea. req.)	100158153

6 ¹/₈ in.

Description	Part No.
Hardware Kit	120021659
Booster Pellet (1 ea. req.)	100158222
C-4 Cartridge (15 ea. req.)	100141897
Booster Rod (1 ea. req.)	100158223

4 ³/₄ in.

Description	Part No.
Hardware Kit	100158067
Booster Pellet (1 ea. req.)	100158222
C-4 Cartridge (6 ea. req.)	100141897
Booster Rod (1 ea. req.)	100158153

7 ¹/₄ in.

Description	Part No.
Hardware Kit	101289693
Booster Pellet (1 ea. req.)	100158222
C-4 Cartridge (22 ea. req.)	100141897
Booster Rod (1 ea. req.)	100158154

5 ³/₈ in.

Description	Part No.
Hardware Kit	101289681
Booster Pellet (1 ea. req.)	100158222
C-4 Cartridge (14 ea. req.)	100141897
Booster Rod (1 ea. req.)	101293552

8 ³/₁₆ in.

Description	Part No.
Hardware Kit	100158217
Booster Pellet (2 ea. req.)	100158222
C-4 Cartridge (24 ea. req.)	100141897
Booster Rod (1 ea. req.)	100158155

Exhibit 2

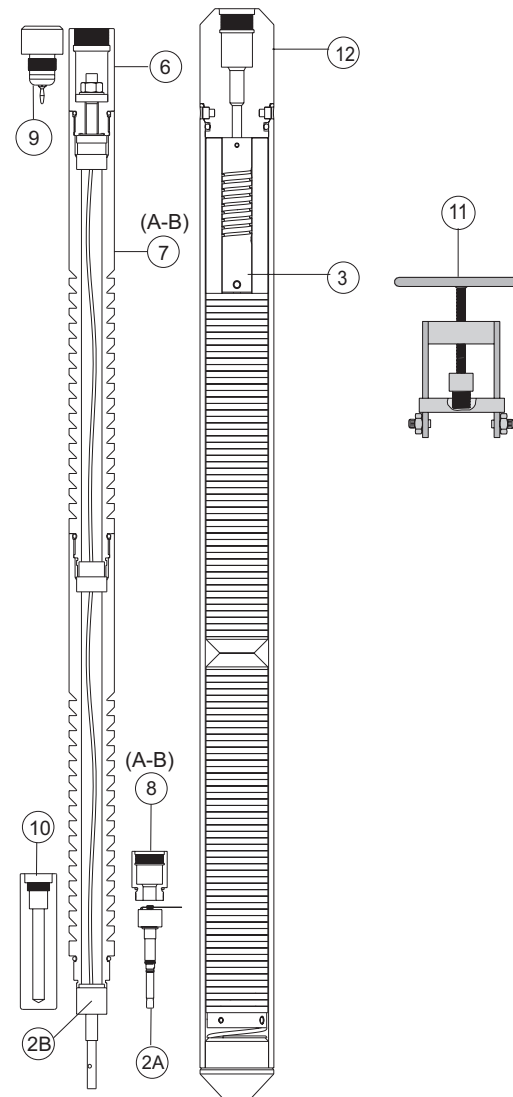
Jet Research Center developed the Dual End Severing Tool for severing thick wall tubulars in the 1980's. The technique is based on the Colliding Shock Wave Principle. Since its inception, the Drill Collar Severing Tool has been continuously refined, resulting in the industry-leading severance device for cutting drill collars and drillpipe in a wide variety of stuck pipe scenarios. The latest refinement to the tool has resulted in a standard explosive column length with superior performance. The secret to the success of the tool lies in the precisely-timed detonation of two equal and opposing shock fronts. The colliding shock is matched to a cartridge assembly at the mid-point of the assembly, designed to help focus the energy transmitted to the target. JRC developed the industry standard shock attenuating mandrel for use with Drill Collar Severing Tools and patented this technology (US patent 5,117,911). Drill Collar Severing Tools can be used with JRC's Proprietary Rig Environment Detonator - RED® - offering a high level of protection against stray voltage or inadvertent RF-initiation.

Features

- New design introduced in 2002 for maximum performance
- Full range of sizes for virtually any severing requirement
- Standard tool is rated for 15,000 psi at 400°
- Use special HP accessories for well conditions 15,000 to 20,000 psi
- Higher temperature tools available for extreme temperature application
- Shock attenuating mandrel helps protect wireline tools

Benefits

- Rapid assembly and deployment saves rig time
- Industry standard connections can be run on any wireline unit
- Proven track record with unmatched performance
- Air freight classification (1.4s) provides rapid mobilization



Drill Collar Severing Tool

Drill Collar Capability Chart

Tool OD	1 3/8 in. (3.5cm)	1 3/4 in. (4.4cm)	2 in. (5.1cm)	2 5/8 in. (6.7cm)
Temperature and Pressure Rating	HMX - 400°F (204°C) 20,000 psi (138 Mpa) for 1 hour			
	HNS - 460°F (238°C) 20,000 psi (138 Mpa) for 1 hour			
Length	36 in.	36 in.	36 in.	36 in.
Designed to Sever up to	3 1/2 in. OD DC's	6 1/2 in. OD DC's	8 in. OD DC's	11 in. OD DC's
Explosive pellet weight	20.7g	22.7g	22.7g	22.5g
Cartridge Assy Explo. wt	4.8g	12.7g	17.5g	22.7g
Loaded tool wt	589.2g	842g	1488g	2520.4g

Drill Collar Severing Tool Accessories

Exhibit 2

Drill Collar Severing Tool

Item	Description	1 3/8-in. OD	1 3/4-in. OD	2-in. OD	2 5/8-in. OD
*1	Hardware Kit	100118390	101292915	101292956	101292957
2A	Detonator - RED®	101272595	101272595	101272595	101272595
2B	Detonator - Resistorized	100000432	100000432	100000432	100000432
3	MDF	100118417	100118417	100118417	100118417
*4	Explosive Kit (HMX) Pellets and Cartridges	101214053	101293167	101293168	101293152
*5	Explosive Kit (HNS) Pellets and Cartridges	101237459	101293207	101293234	101293235
6	Firing Head	100118430	100000434	100000434	100000434
7A	Extension Mandrel	100158260	100008258	100008258	100008258
8A	Adapter for RED® Detonator	120042268	101293676	101293676	101293676
9	Shunt Plug	100118431	100010861	100010861	100010861
10	Protective Holder	100010862	100010862	100010862	100010862
11	Loading Tool	100118432	100118432	100118432	100118432

* Not Shown In Drawing

Notes:

1. Hardware Kit includes all items required for a standard tool, including 2 each of item 7.
2. Items 6, 8, 9, 10 & 11 must be ordered separately, as required.
3. An additional shock mandrel (Item 7) may be used for added shock protection.
4. For High Pressure application, in excess of 15,000 psi, JRC recommends the use of high pressure rated accessories.

HP Accessories

Item	Description	1 3/8-in. OD	1 3/4-in. OD	2-in. OD	2 5/8-in. OD
7B	Ext Mandrel - Steel	101293225	101293227	101293227	102193227
8B	Adapter for RED® - Steel	N/A	101293230	102193230	101293230
12	DCST Adapter - Steel	N/A	101293169	101293187	101293220

Capability Chart - High Pressure Drill Collar Serving Tool

Tool OD:	2.125-in. (5.3975 cm)
Temperature and Pressure Rating:	HMX 400 F/1 hr. (204°C) 26,000 PSI/1 hr. (179.3 Mpa) HNS 460 F/1 hr. (238°C) 26,000 PSI/1 hr. (179.3 Mpa)
Tool Assembly Length:	37.78" (95.9612 cm) (less Steel Shock Mandrel)
Designed to Sever up to:	8-in. OD (20.32 cm) Drill Collars
Explosive Pellet Wt.	22.7 g x 64 Pellets each
Explosive Cartridge Wt.	17.0 g x 2 each
Net Explosive Wt.	1487.8 g (not including MDF and D1208)
Hardware Kit Part Number	101604779

Exhibit 2

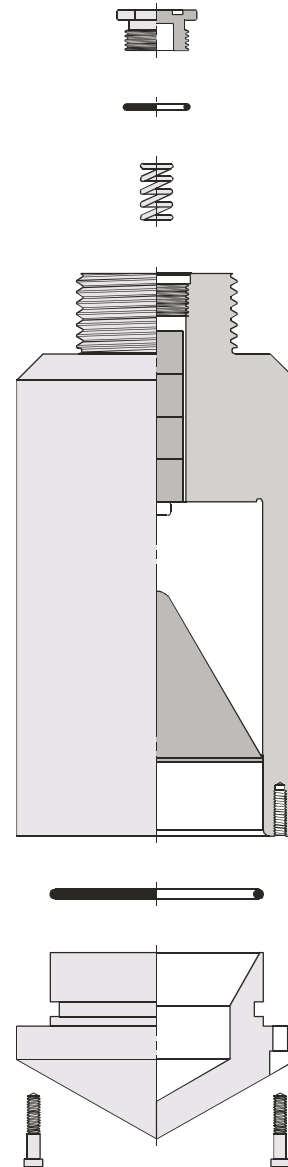
Jet Research Center's Junk Shots have been field-proven time after time in a wide variety of applications all over the world. The Junk Shot charge has been used to overcome some of the most challenging fishing operations encountered, ranging from breaking up complete drilling bits to underreamer arms. The Junk Shot is a large downward shooting shaped charge secured inside a pressure housing. When placed on top of the junk, it functions in a similar manner as a perforating charge, but the explosive effect is substantially greater, with the ability to destroy large targets. In almost any situation, the use of the Junk Shot charge to break up obstacles downhole reduces costly fishing time, returning the rig to full operation.

Features

- Main charge can be run on wireline, drillstring, or tubing with a secondary wireline initiator for maximum effect.
- Two sizes of charge available -- 5 1/4 in. OD and 7 3/4 in. OD
- The tools may be clustered for special applications.
- Can be transported via air charter or standard ground services
- Pressure rated to 18,000 psi
- Temperature rated to 400 °F for one hour

Benefits

- Substantially reduces costly fishing and rig time
- Removes the need for complicated fishing/milling tools
- Offers a high degree of safety due to its two-stage deployment
- Offers a safe assembly method through the use of JRC's safe arming equipment
- Can be run on wireline or tubing
- Can be fired electronically or hydraulically



Junk Shot

Junk Shot Accessories

Description	Part No.
5 1/4-in. OD Junk Shot	
Hardware Kit	100118436
Charge Assy. - Junk Shot, HMX	100157003
Initiating Charge	101293561
Detonator Assy.	100000432
7 3/4-in. OD Junk Shot	
Hardware Kit	100118439
Charge Assy. - Junk Shot, HMX	100157002
Initiating Charge	101293561
Detonator Assy.	100000432

Note: Junk Shot Hardware Kit includes all items required for assembly of Junk Shot onto drillstring (including circulating crossover) and assembly of initiating charge for wireline deployment.

Exhibit 2