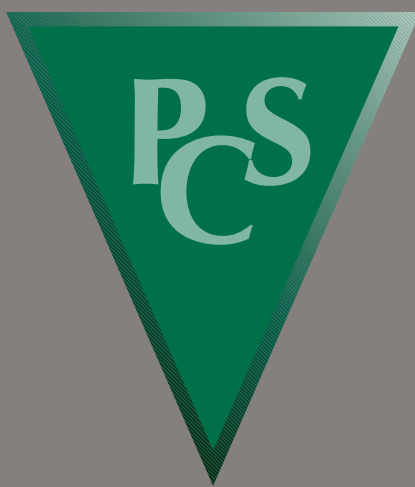




Building The World's Infrastructure



TM

Professional Contractors SeriesTM

HDD Downhole Tools



800-328-2424
www.ballantineinc.com

Ballantine, Inc., headquartered in Anoka, Minnesota, has been manufacturing and supplying product to the underground construction industry since 1959. Ballantine's foremost commitment is to the success and growth of our customers and their business. We support this commitment throughout every aspect of our business. High quality raw materials, unmatched craftsmanship, innovative technological advances and new products, extremely competitive prices, fast and dependable service, ISO 9001:2000 Certification and a dedicated factory sales force and internal customer service support team with hundreds of years of experience continue to exemplify our commitment to you, the customer. Ballantine, Inc. is constantly striving to meet and exceed the ever-changing needs of our customers and we aspire to be a partner in your success.



**Vermeer®
Firestick II
Drill Pipe
and
Tooling
Now Available**

Table of Contents

Drill String Diagram	Page 2-3
----------------------	----------

Drill Pipe Specifications	Page 4-5
---------------------------	----------

Case/Astec Drills

6010 Turbo	Page 6
6030 Turbo	Page 7-8

Ditch Witch® Drills

Jet Trac® 920, 921	Page 9
Jet Trac® 920L, 1210	Page 10
Jet Trac® 1220M1	Page 11
Jet Trac® 1720/1720M1	Page 12
Jet Trac® 2720	Page 13-14
Jet Trac® 2720M1	Page 15

Vermeer® Drills

Navigator® D7X11/A	Page 16-17
Navigator® D10X15	Page 18
Navigator® D16X20/A, D18X22, D20X22	Page 19-20
Navigator® D18X22, D20X22, D24/D24X26	Page 21
Navigator® D24X40/A	Page 22-23

Pilot Bits

Application Chart	Page 24
Part Number Identification Chart and Bolts	Page 25
Features & Benefits, Part Numbers	Page 26-30
Railhead® Endurance Bits	Page 31

Backreamers

Application Chart	Page 32
Features & Benefits, Part Numbers	Page 33-36
Railhead® Reamers	Page 37
Backreamer Teeth	Page 38

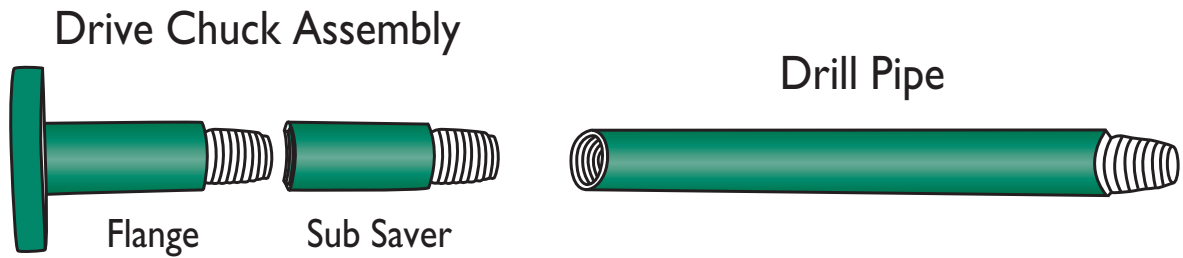
Railhead® Components	Page 39-41
----------------------	------------

Pulling Accessories

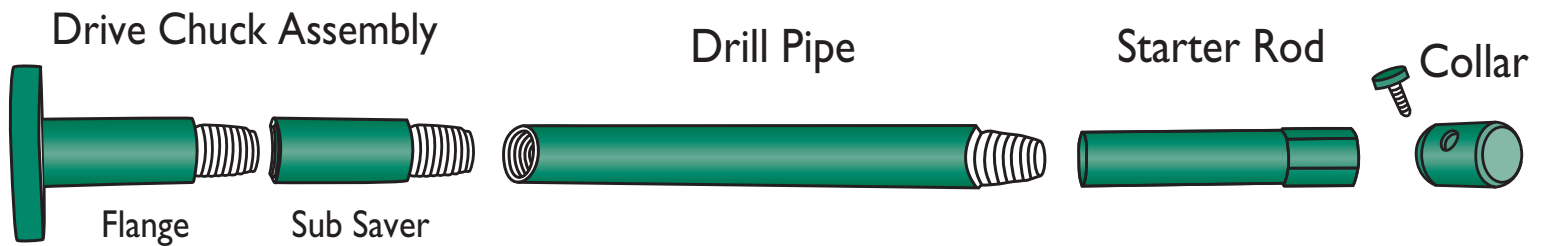
Swivels	Page 42-44
Pulling Eyes	Page 45-49
Pulling Harnesses, Connectors	Page 50-51
Pull Grips	Page 52-53

Jet Lube: Specialty Lubricants & Compounds	Page 54
--	---------

HDD Pilot Bore Dr

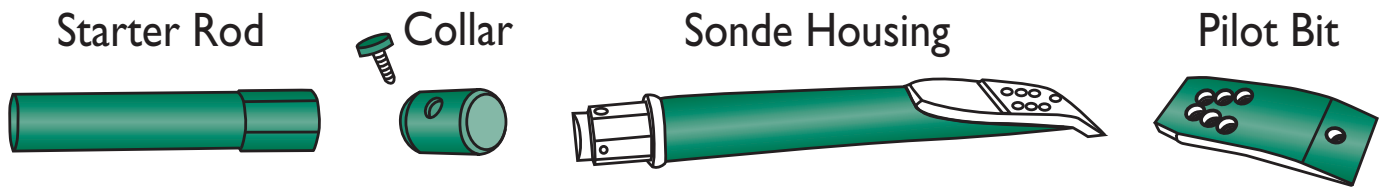


HDD Backreaming D

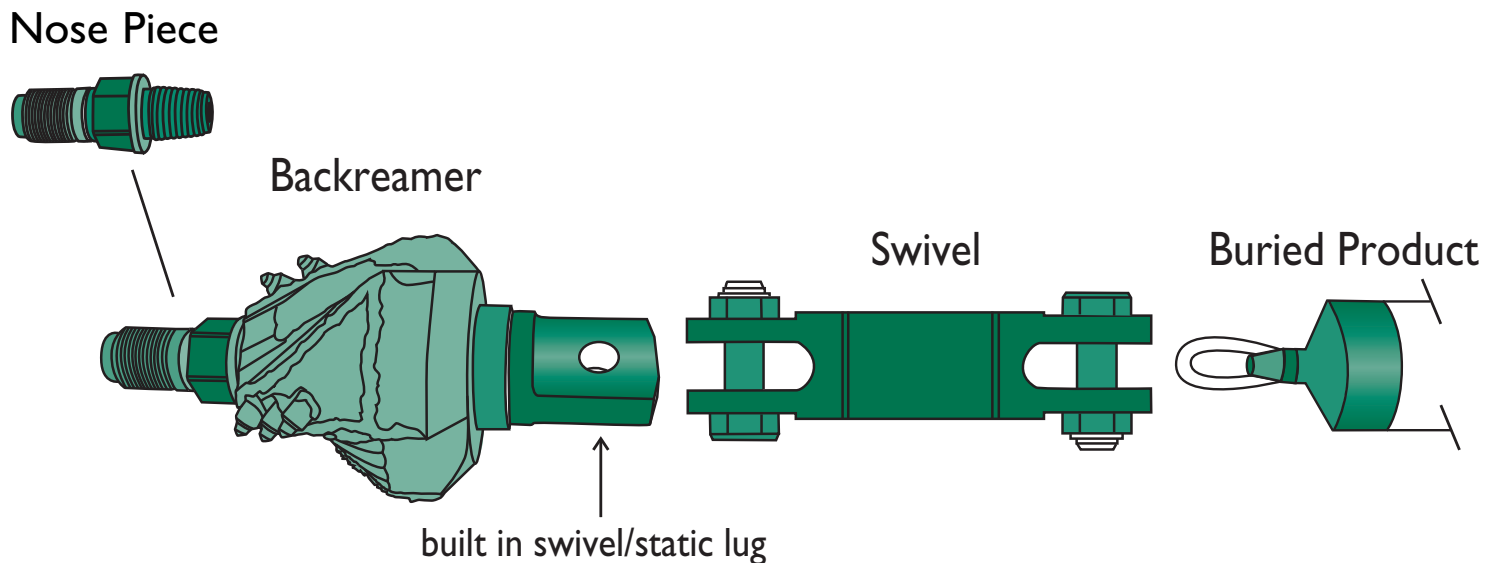


* Representation only

ill String Diagram



rill String Diagram



The above diagrams are designed as a reference guide only. Drill string configurations may vary depending on the drill manufacturer. Contact your local Ballantine, Inc. dealer or Ballantine direct for specific details on drill string components and assemblies.

Vermeer® - Compatible Rod Specifications

Rod Size	D6/D7x11	D10 x15	D16x20	24x26/D24a
Forged / Inertia Weld	Forged	Forged	Forged	Forged
Plain-End / Upset-End	N/A	N/A	N/A	N/A
Reference Tech. Spec.	API 5D/Spec. 7	API 5D/Spec. 7	API 5D/Spec. 7	API 5D/Spec. 7
Pipe Body O.D.	1.660" +/-0.031"	1.660" +/-0.031"	1.90" +/-0.031"	2.063" +/-0.031"
Wall Thickness	.228"/.240"	.240"	.240"	.270"
O.A.L (S/S)	72.0" +/-0.250"	120.0" +/-0.250"	120.0" +/-0.250"	120.0" +/-0.250"
Bend Radius	98.1'	98.1'	112.1'	121.9'
Steel Chemistry	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130
Type	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.
Quench & Temper	S-135	S-135	S-135	S-135
Tensile Strength	145,000 Min.	145,000 Min.	145,000 Min.	145,000 Min.
Yield Strength	135 Min./165 Max.	135 Min./165 Max.	135 Min./165 Max.	135 Min./165 Max.
Charpy 10x5	22ft-lb Avg./19 Min.	22ft-lb Avg./19 Min.	22ft-lb Avg./19 Min.	22ft-lb Avg./19 Min.
Pipe & Upset Testing	Mag. Particle	Mag. Particle	Mag. Particle	Mag. Particle
Inertia Weld Testing	N/A	N/A	N/A	N/A
Tool Joints				
Tool Joint O.D.	1.880"	1.880"	2.125"	2.250"
Tool Joint I.D.	0.750"	0.750"	0.750"	0.875"
Steel Chemistry	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130
Heat Treat	S-135	S-135	S-135	S-135
Weight	21 Lbs.	35 Lbs.	49 Lbs.	56 Lbs.

Ditch Witch® - Compatible Rod Specifications

Rod Size	PT 1010	JT520	JT820/JT920	JT920L	JT1220
Forged / Inertia Weld	Inertia Welded	Forged, Inertia Welded	Inertia Welded	Inertia Welded	Forged, Inertia Welded
Plain-End / Upset-End	Plain-End	Forged Upset	Plain-End	Plain-End	Forged Upset
Reference Tech. Spec.	API 5D/Spec. 7	API 5D/Spec. 7	API 5D/Spec. 7	API 5D/Spec. 7	API 5D/Spec. 7
Pipe Body O.D.	1.660" +/-0.031"	1.315" +/-0.031"	1.660" +/-0.031"	1.660" +/-0.031"	1.900" +/-0.031"
Wall Thickness	.240"	.179"	.240"	.240"	.240"
O.A.L (S/S)	24.0" +/-0.250"	59.0" +/-0.250"	78.75" +/-0.250"	118.11" +/-0.250"	118.0" +/-0.250"
Bend Radius	98.1'	77.1'	98.1'	98.1'	112.3'
Steel Chemistry	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4128M
Type	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.
Quench & Temper	P-110	P-110	P-110	P-110	S-135
Tensile Strength	130,000 Min.	130,000 Min.	130,000 Min.	130,000 Min.	145,000 Min.
Yield Strength	110 Min./135 Max.	110 Min./135 Max.	110 Min./135 Max.	110 Min./135 Max.	135 Min./165 Max.
Charpy 10x5	22 ft-lb Avg./19 Min.	22 ft-lb Avg./19 Min.	22 ft-lb Avg./19 Min.	22 ft-lb Avg./19 Min.	22 ft-lb Avg./19 Min.
Pipe & Upset Testing	Mag. Particle	Mag. Particle	Mag. Particle	Mag. Particle	Mag. Particle
Inertia Weld Testing	Wet Mag. Particle	Wet Mag. Particle	Wet Mag. Particle	Wet Mag. Particle	Wet Mag. Particle
Tool Joints					
Tool Joint O.D.	2.0"	1.750"	2.000"	2.000"	2.375"
Tool Joint I.D.	.375"	.3125"	0.375"	0.375"	0.500"
Steel Chemistry	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130
Heat Treat	P-110	P-110	P-110	P-110	S-135
Weight	12 Lbs.	17 Lbs.	29 Lbs.	39 Lbs.	56 Lbs.

Vermeer® - Compatible Rod Specifications

D24x40	D24x40 IW	D40x40	D50x100	D80x100
Forged	Forged, Inertia Welded	Forged	Forged	Forged, Inertia Welded
N/A	Forged Upset	N/A	N/A	Forged Upset
API 5D/Spec. 7	API 5D/Spec. 7	API 5D/Spec. 7	API 5D/Spec. 7	API 5D/Spec. 7
2.375" +/-0.031"	2.375" +/-0.031"	2.375" +/-0.031"	2.875" +/-0.031"	3.500" +/-0.031"
.280"	.254"/.280"	.280"	.362"	.368"
120.0" +/-0.250"	120.0" +/-0.250"	180.0" +/-0.250"	180.0" +/-0.250"	180.0" +/-0.250"
140.4'	140.4'	140.4'	170'	206.9'
4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130
Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.
S-135	S-135	S-135	S-135	S-135
145,000 Min.	145,000 Min.	145,000 Min.	145,000 Min.	145,000 Min.
135 Min./165 Max.	135 Min./165 Max.	135 Min./165 Max.	135 Min./165 Max.	135 Min./165 Max.
22ft-lb Avg./19 Min.	22ft-lb Avg./19 Min.	22ft-lb Avg./19 Min.	22ft-lb Avg./19 Min.	22ft-lb Avg./19 Min.
Mag. Particle	Mag. Particle	Mag. Particle	Mag. Particle	Mag. Particle
N/A	Wet Mag. Particle	N/A	N/A	Wet Mag. Particle
2.625"	2.625"	2.625"	3.250"	3.625"
0.875"	0.8125"	0.875"	1.250"	1.500"
4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4125 Mod./4130
S-135	S-135	S-135	S-135	S-135
78 Lbs.	78 Lbs. (.280" wall)	100 Lbs.	156 Lbs.	232 Lbs.

Ditch Witch® - Compatible Rod Specifications

JT1720	JT2020	JT2720	JT2720Mach I	JT4020	JT7020
Forged, Inertia Welded	Forged, Inertia Welded	Forged, Inertia Welded	I.W.	Forged, Inertia Welded	Forged, Inertia Welded
Forged Upset	Forged Upset	Upset-End	Forged Upset	Forged Upset	
API 5D/Spec. 7	API 5D/Spec. 7	API 5D/Spec. 7	API 5D	API 5D/Spec. 7	API 5D/Spec. 7
2.063" +/-0.031"	2.063" +/-0.031"	2.375" +/-0.031"	2.375" +/-0.031"	2.875" +/-0.031"	3.500" +/-0.031"
.260"/.270"	.270"	.254"/.280"	.280"	.362"	.368"
118.11" +/-0.250"	118.0 +/-0.25"	118.11" +/-0.250"	118.1" +/-0.250"	177.2" +/-0.250"	177.2" +/-0.250"
121.9'	121.9'	140.4'	140.4'	170'	207'
4125 Mod./4130	4128 Mod.	4125 Mod./4130	4125 Mod.	4125 Mod./4130	4125 Mod./4130
Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.	Seamless Hot Roll.
S-135	S-135	S-135	S-135	S-135	S-135
145,000 Min.	145,000 Min.	145,000 Min.	145,000 Min.	145,000 Min.	145,000 Min.
135 Min./165 Max.	135 Min./165 Max.	135 Min./165 Max.	135 Min./165 Max.	135 Min./165 Max.	135 Min./165 Max.
22 ft-lb Avg./19 Min.	22 ft-lb Avg./19 Min.	22 ft-lb Avg./19 Min.	22 ft-lb Avg./19 Min.	22 ft-lb Avg./19 Min.	22 ft-lb Avg./19 Min.
Mag. Particle	Mag. Particle	Mag. Particle	Mag. Particle	Mag. Particle	Mag. Particle
Wet Mag. Particle	Wet Mag. Particle	Wet Mag. Particle	Wet Mag. Particle	Wet Mag. Particle	Wet Mag. Particle
2.500"	2.625"	2.750"	3.0"	3.250"	4.0"
0.625"	0.875"	0.625"	0.875"	1.125"	1.500"
4125 Mod./4130	4125 Mod./4130	4125 Mod./4130	4137H	4125 Mod./4130	4125 Mod./4130
S-135	S-135	S-135	S-135	S-135	S-135
59 Lbs.	59 Lbs.	78 Lbs.	85 Lbs.	176 Lbs.	238 Lbs.

Case/Astec 6010 Turbo

Ref. No. Part No. Description

DRILL PIPE

1	B10019000	1.9" OD X 10' O.A.L. Standard Upset Pipe Also Fits 200TX & 400TX
2	B10020630	2.06" OD X 10' O.A.L. Standard Upset Pipe Also Fits 200TX, 400TX & 750TK



THRUST/PULL BACK CHAIN

NS	328800A2	50-3, 48 Pitch Conn Link and Roller Link
NS	341004A2	60-3, 643 Pitch Conn Link Each End

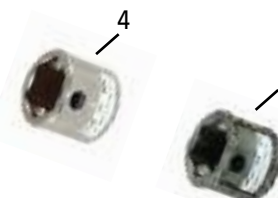
LEAD BARS

NS	396916A1	Case 1.9"/2.06" To 2" UNC Hex
3	406161A1	Case 1.9"/2.06" To 2.062" Vermeer Hex
NS	406165A1	Case 1.9"/2.06" To 1.609" Vermeer Hex
NS	1250	Railhead 2 1/16th" Case Box To 2" UNJ Box



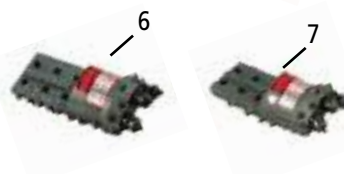
COLLAR

4	1107	Railhead Hex Collar 3 1/2" OD 1/2" Wall
5	1111	Railhead Hex Collar 3 1/2" OD 1/2" Wall W/Carbide Buttons



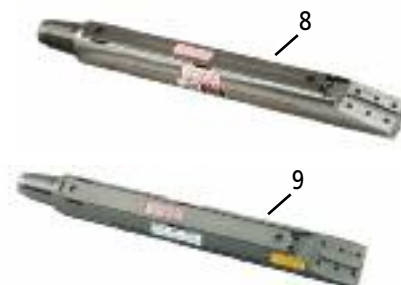
INCREDIBITS

6	1526	3" Standard, Medium Rock & Cobble
7	1528	3" Aggressive, Hard Rock & Layered Rock



SONDE HOUSINGS

8	1830	3" Incredibit Sonde Housing 3" Rotolock <i>*Requires Housing Saver</i> <i>*Requires Sonde Block Set, p. 40</i>
9	2830	3" Endurance Sonde Housing 3" Rotolock <i>*Requires Housing Saver</i> <i>*Requires Sonde Block Set, p. 40</i> <i>*Requires Water Nozzle, p. 40</i>



HOUSING SAVER

10	4356	2" UNJ Pin 2 1/2" Hex (Railhead Connection)
----	------	--



Case/Astec 6030 Turbo

Ref. No. Part No. Description

DRILL PIPE

1	B393755A1	2.375" OD X 10' O.A.L. Standard Upset
---	-----------	---------------------------------------

THRUST/PULL BACK CHAIN

NS	338595A1	80-3, 491 Pitch Roller Link Each End
NS	338597A1	80-3, Connector Link
NS	362224A1	80-6, 51 Pitch
NS	348171A1	80-6 Connector Link
NS	325871A2	T80C17 Drive Sprocket **Made to Order

LEAD BARS

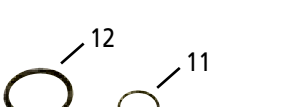
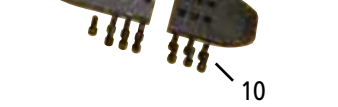
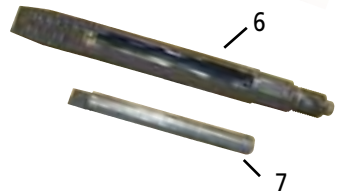
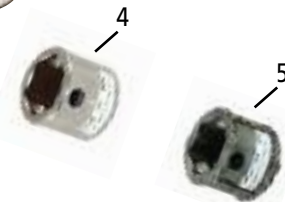
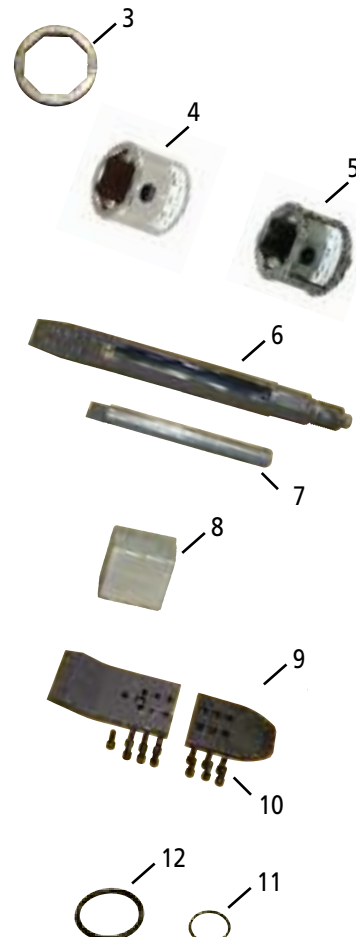
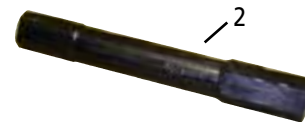
NS	404964A1	Case 2.375" To 2.5" BSW Octagone
NS	396917A1	Case 2.375" To 2" UNC Hex
2	406163A1	Case 2.375" To 2.062" Vermeer Hex
1237		Railhead 2 3/8" Case Box To 2 1/2" Ramon Box

COLLARS

NS	411403A1	2.5" BSW Case Octagon
3	403889A1	2.5" BSW Case Octagon Wear Collar (Ring)
4	1108	Hex W/5/8" Wall
5	1113	Hex W/5/8" Wall, Hard-Surfaced

SONDE HOUSINGS

NS	403891A1	2.5" BSW HD Octagonal Assembly
6	403890A1	Sonde Housing
7	411505A1	Cover
NS	03850556	Sonde Index Plate
8	03850525	Spacer
9	07704025	Extension
NS	238-6113	O-Ring
10	61-33816	Bolt
NS	01320712	Nozzles .7MM - 1/16"
NS	01321012	Nozzles 1.0MM - 1/16"
NS	01321512	Nozzles 1.5MM - 1/16"
NS	01322312	Nozzles 2.3MM - 1/16"
11	2386126	O-Ring Small
12	2396331	O-Ring Large



Case/Astec 6030 Turbo

Ref. No. Part No. Description

SONDE HOUSINGS, CONTINUED

13	1860	Railhead® 3 1/2" Incredibit Housing 3 1/2" Rotolock <i>*Requires Housing Saver</i> <i>*Requires Sonde Block Set, p. 40</i>
14	2860	Railhead® 3 1/2" Endurance Housing 3 1/2" Rotolock <i>*Requires Housing Saver</i> <i>*Requires Sonde Block Set, p. 40</i> <i>*Requires Water Nozzle, p. 40</i>



INCREDIBITS

15	1554	3 1/2" Standard, Medium Rock & Cobble
16	1555	3 3/4" Aggressive, Hard Rock & Layered Rock



HOUSING SAVER

17	4309	2 1/2" Ramon Pin 3" Hex (Railhead® Quick Connect)
NS	4389	2 1/2" BSW Pin (MFG Easy Connect)



Ditch Witch® JT920, JT921

Ref. No. Part No. Description

DRILL PIPE

1	BJT920DT	Drill Pipe 1.660" OD X 6.5' O.A.L
---	----------	-----------------------------------

SAVER SUBS

2	BJT920DC	Saver Sub
NS	B106081	BOLT M10-1.50 X 35MM, 12.9

EZ CONNECT 2

	BJT920EZ2	EZ Connect 2 Assy - JT920 Pin X EZ Conn 2 Pin Assy. Includes Ref. No. 3, 4, 5, & 6
3	B400067	Tran Sub 163.6 M, EZ 2 1.41-6 M
4	B157192	O - Ring
5	B400069HF	Collar Octagon 2" ID Hard Faced
	B400069	Collar Octagon 2" ID
6	B107540	Screw

THRUST/PULL BACK CHAIN

NS	120RC-171	120 Roller Chain 171 Pitches (Serial No. 2PO770 and Above, Also Converted Models.)
----	-----------	--

ROD WIPER

NS	PWF9-150	Rod Wiper
----	----------	-----------

SONDE HOUSINGS

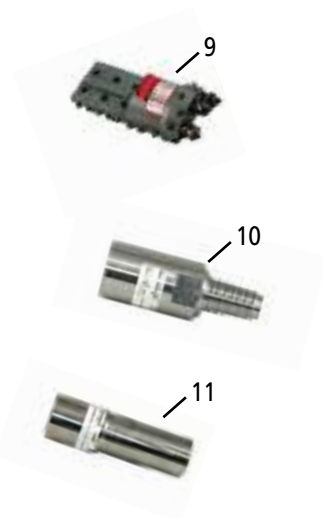
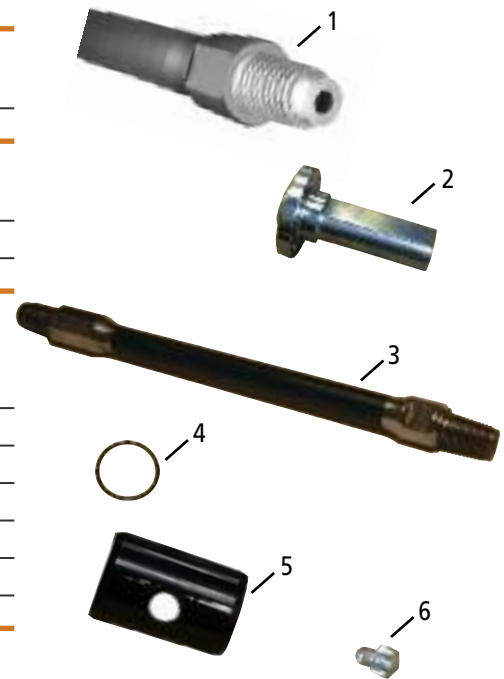
7	1810	2 3/4" Incredibit (Subsite Only) Sonde Housing 2 3/4" Rotolock <i>*Requires Housing Saver</i> <i>*Does Not Require Sonde Blocks</i>
8	3200	2 3/4" Ram Ditch Witch® 5 Bolt (12mm) (Subsite only) Sonde Housing 2 3/4" Rotolock <i>*Requires Housing Saver</i> <i>*Does Not Require Sonde Blocks, p. 40</i> <i>*Requires Water Nozzle, p. 40</i>

INCREDIBIT

9	1503	2 3/4" Standard, Medium Rock & Cobble for Sonde Housing 1810
---	------	---

HOUSING SAVER

10	4308	JT920 1.41 Fluid Miser Pin (Direct) (1800 Series SH) <i>*Requires Ditch Witch® Transition</i> <i>Sub # 369-326</i>
11	4415	JT920 1.63 EZ 2 Box (MFG Easy Connect) <i>*Requires Ditch Witch® Transition</i> <i>Sub # 400-067</i>



Ditch Witch® JT920, JT921

Ditch Witch® JT920L, JT1210

Ref. No. Part No. Description

DRILL PIPE

1	BJT920LDT	Drill Pipe 1.660" OD X 10' O.A.L.
---	-----------	-----------------------------------

SAVER SUBS

2	BJT920DC	Saver Sub
NS	B106081	BOLT M10-1.50 X 35MM, 12.9

EZ CONNECT 2

	BJT920EZ 2	EZ Connect 2 Assy - JT920 Pin X EZ Conn 2 Pin Assy. Includes Ref. No. 3, 4, 5 & 6
3	B400067	Tran Sub 163.6 M, EZ 2 1.41-6 M
4	B157192	O - Ring
5	B400069	Collar Octagon 2" ID
	B400069HF	Collar Octagon 2" ID Hard Faced
6	B107540	Screw

THRUST/PULL BACK CHAIN

NS	120RC-215	120 Roller Chain 215 Pitch
----	-----------	----------------------------

ROD WIPER

NS	PWF9-150	Rod Wiper
----	----------	-----------

SONDE HOUSINGS

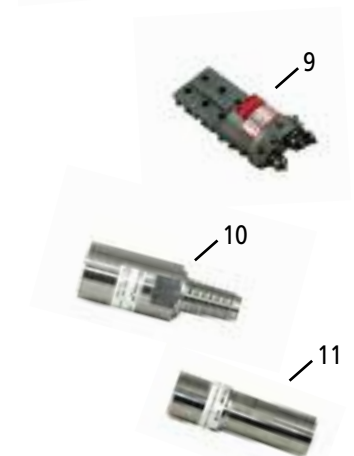
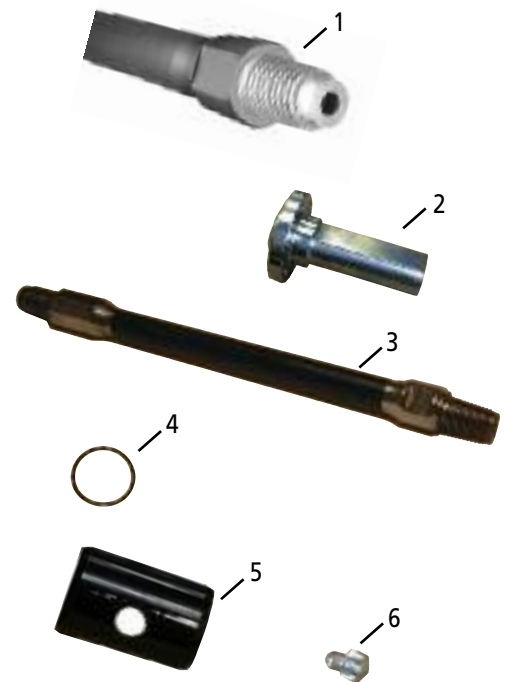
7	1810	2 3/4" Incredibit (Subsite Only) Sonde Housing 2 3/4" Rotolock <i>*Requires Housing Saver</i> <i>*Does Not Require Sonde Blocks</i>
8	3200	2 3/4" Ram Ditch Witch® 5 Bolt (12mm) (Subsite only) Sonde Housing 2 3/4" Rotolock <i>*Requires Housing Saver</i> <i>*Does Not Require Sonde Blocks</i> <i>*Requires Water Nozzle, p. 40</i>

INCREDIBIT

9	1503	2 3/4" Standard, Medium Rock & Cobble for Sonde Housing 1810
---	------	---

HOUSING SAVER

10	4308	JT920 1.41 Fluid Miser Pin (Direct) (1800 Series SH) <i>*Requires Ditch Witch® Transition Sub # 369-326</i>
11	4415	JT920 1.63 EZ 2 Box (MFG Easy Connect) <i>*Requires Ditch Witch® Transition Sub # 400-067</i>



Ditch Witch® JT1220 Mach 1

Ref. No. Part No. Description

DRILL PIPE

NS BJT1220DTM1 Drill Pipe

SAVER SUBS

NS BJT1220M1DC Saver Sub

EZ CONNECT 3

BJT1220EZ3 Assembly (coming soon)

B400019 Transition Sub 1.47-4/1.88-6 m

SONDE HOUSINGS

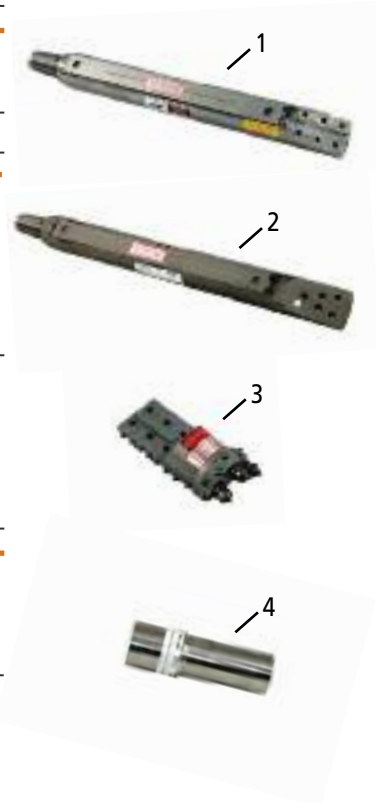
- | | | |
|---|------|--|
| 1 | 1810 | 2 3/4" Incredibit (Subsite Only)
Sonde Housing 2 3/4" Rotolock
<i>*Requires Housing Saver</i>
<i>*Does Not Require Sonde Blocks</i> |
| 2 | 3200 | 2 3/4" Ram Ditch Witch® 5 Bolt (12mm)
(Subsite only) Sonde Housing 2 3/4" Rotolock
<i>*Requires Housing Saver</i>
<i>*Does Not Require Sonde Blocks</i>
<i>*Requires Water Nozzle, p. 40</i> |

INCREDIBIT

- | | | |
|---|------|---|
| 3 | 1503 | 2 3/4" Standard, Medium Rock & Cobble
For Sonde Housing 1810 |
|---|------|---|

HOUSING SAVER

- | | | |
|---|------|--|
| 4 | 4416 | JT1220 2.06" Fluid Miser Box (Direct)
(1800 Series SH)
<i>*Requires Ditch Witch® Transition Sub 401-005</i>
<i>*EZ Connect 2 Use Ditch Witch® Adaptor # 400-920</i> |
|---|------|--|



Ditch Witch® JT1720, JT1720 Mach 1

Ref. No. Part No. Description

DRILL PIPE

1	BJT1720DT	Drill Pipe 2.063" OD X 10' O.A.L. <i>*Forged Upset Ends, Inertia Welded</i>
---	-----------	--

SAVER SUB

2	BJT1720DC	Saver Sub
NS	B106081	Bolt (M10-1.50X35MM,12.9)

EZ CONNECT 2

	BJT1720EZ2	EZ Connect 2 Assy. JT1720 Pin X EZ Conn 2 Pin Assy. Includes Ref. No. 3, 4, 5 & 6
3	B369998	Trans Sub 2.00-6M EZ2/1.69-6M
4	B157194	O-Ring
5	B369154HF	Collar Hard Faced 2.5" ID Octagon
	B369154	Collar 2.5" ID Octagon
6	B107521	Bolt (M12-1.75X20MM)

THRUST CHAIN

NS	RC120H-225	#120 Heavy Riveted Roller Chain 225 Pitches <i>*Requires 2 Conn Links</i>
NS	RC140H-193	#140 Heavy Riveted Roller Chain 193 Pitches <i>*Requires 2 Conn Links</i>

ROD WIPER

NS	PWF9-187	Rod Wiper
----	----------	-----------

SONDE HOUSINGS

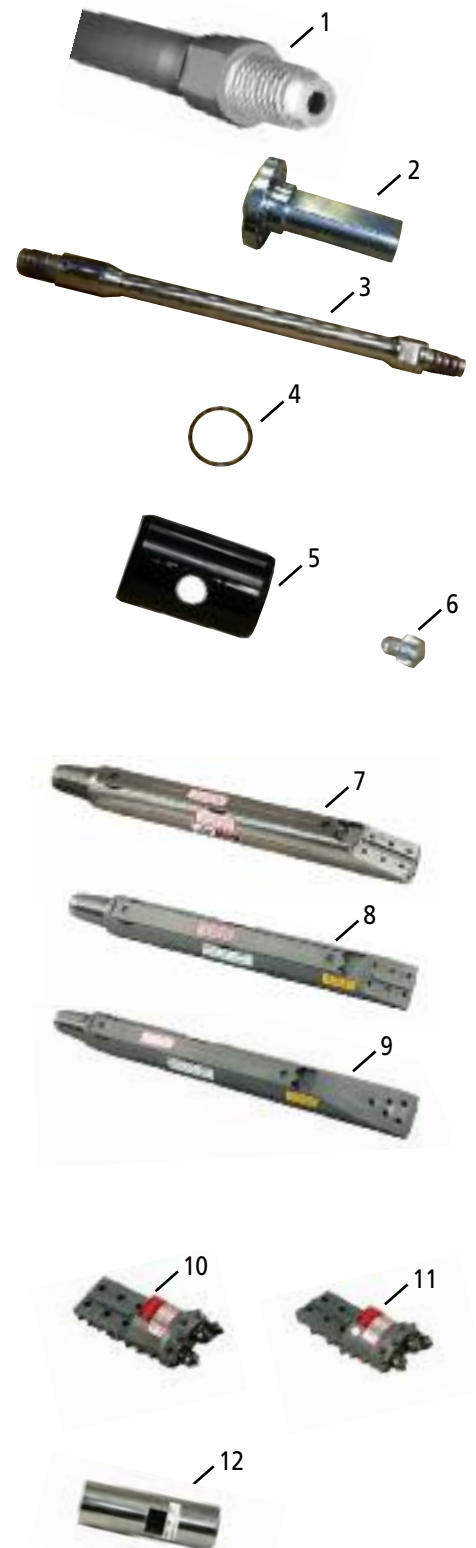
7	1830	3" Incredibit Sonde Housing 3" Rotolock <i>*Require Housing Savers</i> <i>*Requires Sonde Block Set, p. 40</i>
8	2830	3" Endurance Sonde Housing 3" Rotolock <i>*Require Housing Savers</i> <i>*Requires Sonde Block Set, p. 40</i> <i>*Requires Water Nozzle, p. 40</i>
9	3230	3" Ram Ditch Witch® 5 Bolt (12MM) Sonde Housing 3" Rotolock <i>*Requires Housing Savers</i> <i>*Requires Sonde Block Set, p. 40</i> <i>*Requires Water Nozzle, p. 40</i>

INCREDIBITS

10	1526	3" Standard, Medium Rock & Cobble
11	1528	3" Aggressive, Hard Rock & Layered Rock

HOUSING SAVERS

12	4364	2.06" Fluid Miser Box (Direct Connect) <i>*Requires Ditch Witch® Connector # 368-264</i>
NS	4395	2.00" EZ 2 Box (MFG Easy Connect) <i>*Requires Ditch Witch® Transition Sub # 369-998</i>



Ditch Witch® JT2720

Ref. No. Part No. Description

DRILL PIPE

1 BJT2720DT Drill Pipe 2.375" Mid Body OD X 10' O.A.L.

**Forged Upset End, Inertia Welded*



SAVER SUB

2 BJT2720DC Drive Chuck 2.06-4FM DS

NS B106797 Bolt (M12-1.75 X 35MM, SOC)



EZ CONNECT 2

BJT2720EZ2 EZ Connect 2 Assy JT2720 Pin X EZ Conn 2 Pin
Assy. Includes Ref. No. 3, 4, 5 & 6

3 B400134 Transition Sub 1.95-4 M/2.00-6M EZ2

4 B157194 O-Ring (032 D90, Polyurethane)

5 B369154HF Collar Hard Faced 2.5" ID Octagon

B369154 Collar 2.5" ID Octagon

6 B107521 Bolt M12-1.75 X 20MM



ROD WIPER

NS PWF9-187 Rod Wiper



SONDE HOUSINGS

7 1860 3 1/2" Incredibit Sonde Housing 3 1/2" Rotolock

**Requires Housing Saver*

**Requires Sonde Block Set, p. 40*

8 2860 3 1/2" Endurance Sonde Housing 3 1/2" Rotolock

**Requires Housing Saver*

**Requires Sonde Block Set, p. 40*

**Requires Water Nozzle, p. 40*

9 3260 3 1/2" Ram Ditch Witch® 6 bolt Sonde Housing
3 1/2" Rotolock

**Requires Housing Saver*

**Requires Sonde Block Set, p. 40*

**Requires Water Nozzle, p. 40*

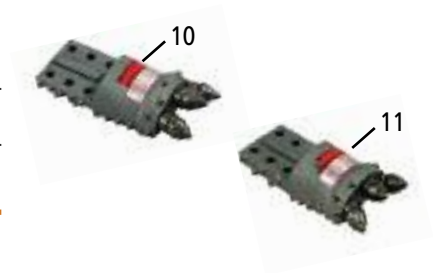


Ditch Witch® JT2720, continued

Ref. No. Part No. Description

INCREDIBITS

10	1554	3 1/2" Standard, Medium Rock & Cobble
11	1555	3 3/4" Aggressive, Hard Rock & Layered Rock



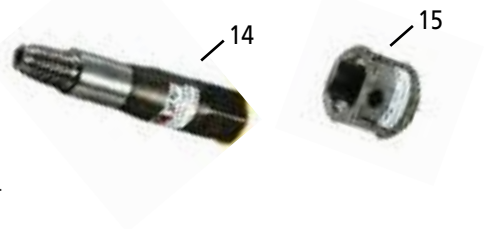
HOUSING SAVERS

12	4309	2 1/2" Ramon Pin 3" Hex (Railhead® Quick Connect) <i>*Use Lead Rod #1233 Direct to Drill Pipe</i>
NS	4357	2.06" Fluid Miser Box (Direct Connect) <i>*Requires Ditch Witch® Connector # 368-261</i>
13	4396	2.00" EZ 2 Box (MFG Easy Connect)



RAILHEAD® QUICK CONNECT

14	1233	Lead Rod 2.06" Fluid Miser Pin to 2 1/2" Ramon Box
NS	1108	Hex Collar 5/8" Wall Boring Collar
15	1113	Hex Collar Hard Faced 5/8" Wall Boring Collar



Ditch Witch® JT2720 Mach 1

Ref. No. Part No. Description

DRILL PIPE

1	BJT2720DTM1	Drill Rod 2.375" OD X 10' O.A.L. <i>*Forged Upset End, Inertia Welded</i>
---	-------------	--



SONDE HOUSINGS

2	1860	3 1/2" Incredibit Sonde Housing 3 1/2" Rotolock <i>*Requires Housing Saver</i> <i>*Requires Sonde Block Set, p. 40</i>
3	2860	3 1/2" Endurance Sonde Housing 3 1/2" Rotolock <i>*Requires Housing Saver</i> <i>*Requires Sonde Block Set, p. 40</i> <i>*Requires Water Nozzle, p. 40</i>
4	3260	3 1/2" Ram Ditch Witch® 6 bolt Sonde Housing 3 1/2" Rotolock <i>*Requires Housing Saver</i> <i>*Requires Sonde Block Set, p. 40</i> <i>*Requires Water Nozzle, p. 40</i>



INCREDIBITS

5	1554	3 1/2" Standard, Medium Rock & Cobble
6	1555	3 3/4" Aggressive, Hard Rock & Layered Rock



HOUSING SAVERS

NS	4397	2.25" EZ 2 Box (JT2720M1 Easy Connect) <i>Requires Ditch Witch® Transition Sub # 369-812</i>
NS	4379	2.59" Fluid Miser Box (JT2720M1/AT Direct Connect) <i>*Requires Ditch Witch® Transition Sub # 400-231</i> <i>*AT Requires Ditch Witch® Transition Sub 369-410 or 400-057</i>

Vermeer® D7X11/A Navigator

Ref. No. Part No. Description

DRILL PIPE

1	BD7x11DT	Forged 1.660" OD X 6' O.A.L.
	BD7X11DTIW	Forged, Inertia Welded 1.660" OD X 6'

DRIVE CHUCK

	BD7X11DC-2	Dr Chuck 1.66" OD Pipe includes Ref # 2 & 3
2	BD7X11SS	Sub Saver
3	BD7X11DCF	Flange 5" OD
4	V235737001	Bolt Dr/Chuck 1/2"-13x11/4"
5	V72897001	O - Ring, Dr Chuck

STARTER ROD

6	BD7X11SR	2" OD Hex X 20" O.A.L.
7	BD7X11HCHF	Hex Collar 2" ID Hard Faced 6" OAL
NS	BD7X11HC	Hex Collar 2" ID 6" OAL
8	V44778003	Capscrew – Collar – 3/8"
NS	V240591001	Capscrew – Collar – 1/2"

ROD WIPER

NS	PWF9-150	Rod Wiper 7x11A 1.66" ID
----	----------	--------------------------

INCREDIBIT

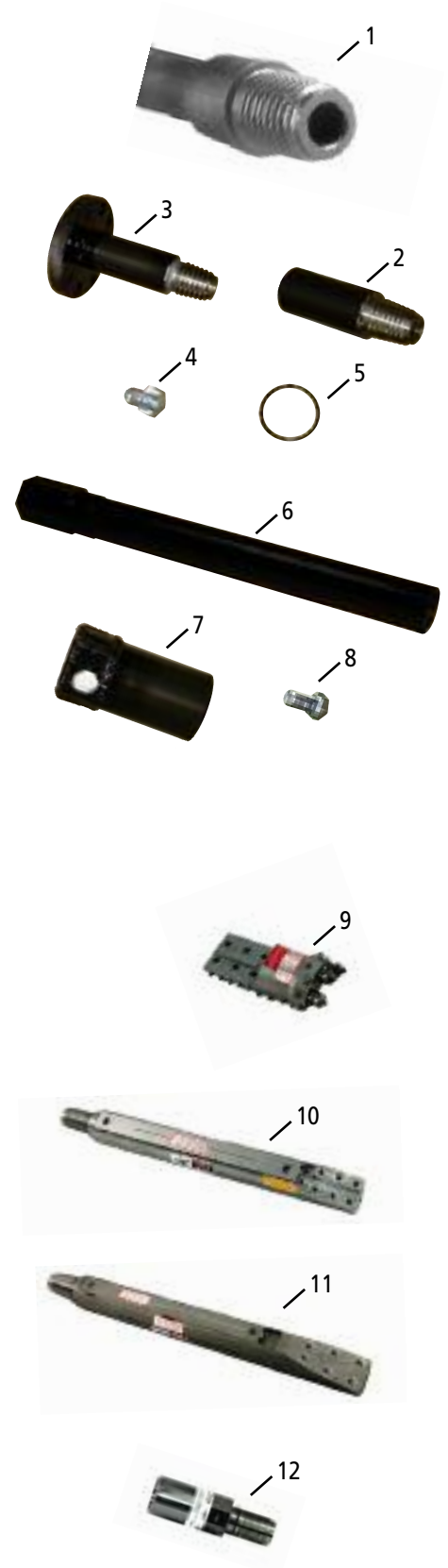
9	1503	2-3/4" Standard Medium Rock & Cobble
---	------	--------------------------------------

SONDE HOUSING

10	1800	2 3/4" Incredibit Sonde Housing 2 3/4" Rotolock <i>*Requires Housing Savers</i> <i>*Requires Sonde Block Set, p. 40</i>
11	3100	2-3/4" Vermeer 7 Bolt (1/2") Sonde Housing, 2-3/4" Rotolock <i>*Requires Housing Savers</i> <i>*Requires Sonde Block Set, p. 40</i> <i>*Requires Water Nozzle, p. 40</i>

HOUSING SAVERS

12	4301	HS - 1-5/8" Vermeer® Low Profile Pin - 2" Hex (MFG Easy Connect)
NS	4304	HS - 1.66 Firestick Box (Direct Connect)



Vermeer® D7X11/A Navigator, continued

Ref. No. Part No. Description

BREAKOUT JAWS

NS	B9874	Jaws for D7x11, D7x11A, D7x11SII, D10x15
NS	B9874C	Jaws for D7x11, D7x11A, D7x11SII, D10x15

THRUST/PULL BACK CHAIN

7X11

13	BL644-147	Leaf Chain BL644 147 Pitches W/Male Ends
	BL644-223	Leaf Chain BL644 223 Pitches W/Male Ends
	BL644-CL	Conn Link BL644
	60-2HR	RC60-2H, 32P W/C.L.
	60-2HCL	RC60-2H Conn Link
	60-2HRL	RC60-2H Roller Link

7x11A

13	BL666-147	Leaf Chain BL666 147 Pitches
	BL666-223	Leaf Chain BL666 223 Pitches
NS	60-2HR	RC60-2H, 32P W/C.L.
NS	60-2HCL	RC60-2H, 32P W/C.L.
NS	60-2HRL	RC60-2H Roller Link



Vermeer® D10X15 Navigator

Ref. No. Part No. Description

DRILL PIPE

1	BD10x15DT	Drill Pipe, 1.66" O.D.x 10' O.A.L.
---	-----------	------------------------------------

DRIVE CHUCK

	BD10X15DC2	Drive Chuck FST 1 1.66" 2 Piece
2	BD10X15SS	Sub Saver 1.66"
3	BD10X15DCF	Flange FST 1 1.66"
NS	V235737-001	12-13X1 1/2" Bolt for Dr Chuck
NS	V72898-001	O Ring #24 Flange

STARTER ROD

4	BD10X15SR	1.66" Hex
5	BD7X11HCHF	Collar, 2" Hex, Long HF
	BD7X11HC	Collar, 2" Hex
6	V44778003	Capscrew – Collar – 3/8"
NS	V240591001	Capscrew – Collar – 1/2"

ROD WIPER

NS	PWF9-150	Rod wiper, 1.66"
----	----------	------------------

THRUST/PULL BACK CHAIN

7	BL844-170	Leaf Chain, BL844, 170 pitches
7	BL844-254	Leaf Chain, BL844, 254 pitches
7	BL844-CL	Conn Link, BL844

INCREDIBIT

8	1503	2-3/4" Standard Medium Rock & Cobble
---	------	--------------------------------------

SONDE HOUSING

9	1800	2 3/4" Incredibit Sonde Housing 2 3/4" Rotolock
---	------	---

**Requires Housing Savers *Requires Sonde Block Set, p. 40*

SONDE HOUSING VERMEER BOLT PATTERN

10	3100	2-3/4" Vermeer® 7 Bolt (1/2") Sonde Housing, 2-3/4" Rotolock
----	------	--

**Requires Housing Savers *Requires Sonde Block Set, p. 40*
**Requires Water Nozzle, p. 40*

HOUSING SAVERS

11	4301	HS - 1-5/8" Vermeer® Low Profile Pin - 2" Hex (MFG Easy Connect)
NS	4304	HS - 1.66 Firestick Box (Direct Connect)

BREAKOUT JAWS

NS	B9874	Jaws for D7x11, D7x11A, D7x11SII, D10x15
NS	B9874C	Jaws for D7x11, D7x11A, D7x11SII, D10x15



Vermeer® D16X20/A, D18X22*, D20X22* Navigator

Ref. No. Part No. Description

DRILL PIPE

1	BD16X20DT	1.90" O.D. X 10' O.A.L.
---	-----------	-------------------------

DRIVE CHUCK

	BD16X20DC2	Drive Chuck Assy. 1.90" O.D. (coming soon)
--	------------	--

**Assy. Includes Ref. No's. 2 & 3*

2	BD16X20SS	Sub Saver 1.90" O.D.
---	-----------	----------------------

3	BD16X20DCF	Flange
---	------------	--------

4	V235737001	Bolt 1/2 - 13 X 1 1/4" Gr 8
---	------------	-----------------------------

5	V72897001	O-Ring # 24 Flange
---	-----------	--------------------

STARTER ROD

6	BD16X20SR	Hex 1.90" O.D.
---	-----------	----------------

7	BD16x20HCHF	Collar Hex, 2 1/2" ID Hard Faced
---	-------------	----------------------------------

8	V4478003	Capscrew – Collar – 3/8"
---	----------	--------------------------

NS	V240591001	Capscrew – Collar – 1/2"
----	------------	--------------------------

NS	1235	Lead Rod 1.900" Firestic Box X 2" UNJ Box
----	------	---

9	1107	Hex Collar 3 1/2" O.D. 1/2" Wall Boring Collar
---	------	--

THRUST/PULL BACK CHAIN

10	BL844-170	Chain - Leaf, BL844 At 170 Pitches
----	-----------	------------------------------------

10	BL844-254	Chain - Leaf, BL844 At 254 Pitches
----	-----------	------------------------------------

10	BL844-CL	Conn Link BL844
----	----------	-----------------

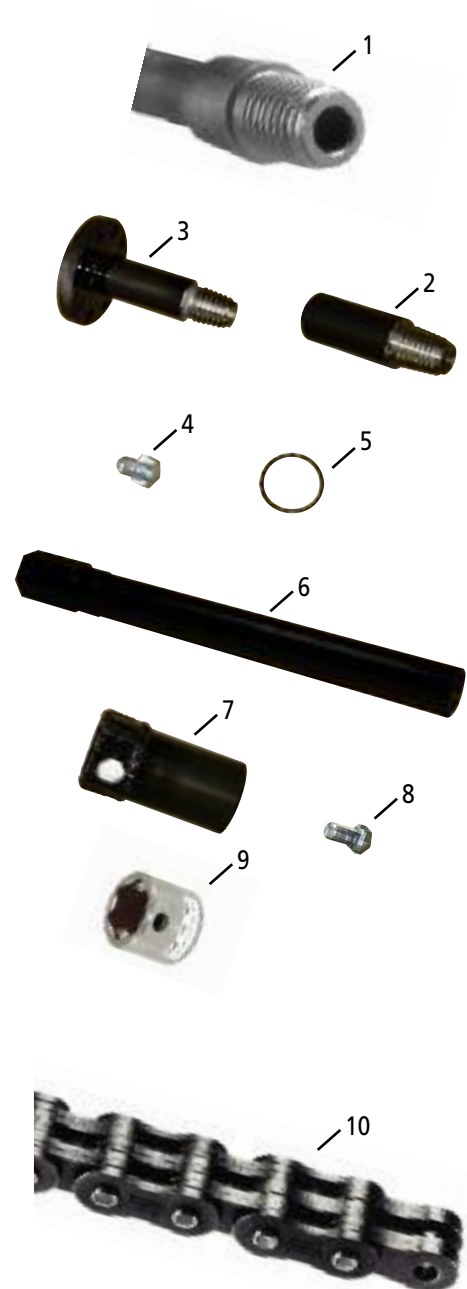
ROD WIPER

NS	PWF9-175	Rod Wiper 1.90"
----	----------	-----------------

BREAKOUT JAWS

NS	B9875	Jaws for D16x20, D16x20A
----	-------	--------------------------

NS	B9875C	Jaws for D16x20, D16x20A
----	--------	--------------------------



* D18x22 and D20x22 can use either 1.90" or 2.06" drill pipe and corresponding sized tools.

Vermeer® D16X20/A, D18X22, D20X22 Navigator, continued

Ref. No. Part No. Description

INCREDIBIT

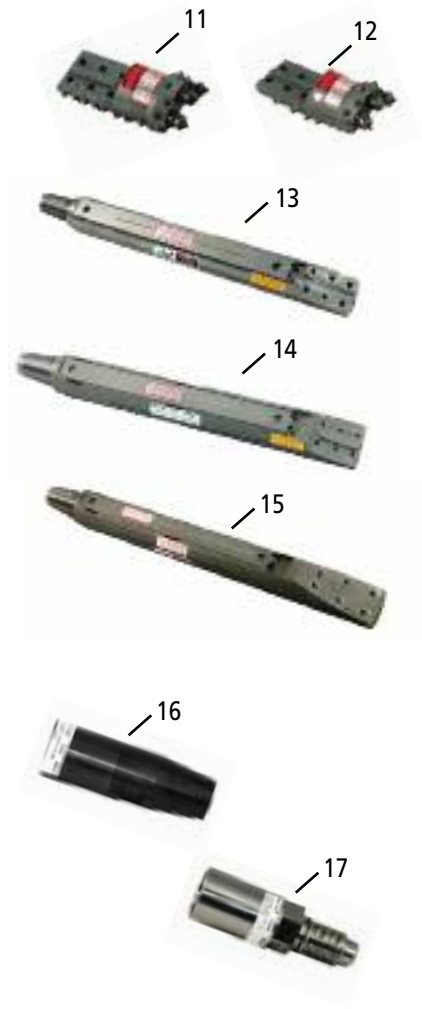
11	1526	3" Standard, Medium Rock & Cobble
12	1528	3" Aggressive, Hard Rock & Layered Rock

SONDE HOUSING

13	1830	3" Incredibit Sonde Housing - 3" Rotolock <i>*Requires Housing Saver * Requires Sonde Block Set, p. 40</i>
14	2820	3" Endurance Sonde Housing 3" Rotolock <i>*Requires Housing Saver * Requires Sonde Block Set</i> <i>*Requires Water Nozzle, p. 40</i>
15	3120	3" Vermeer® 7 Bolt (1/2") Sonde Housing - 3" Rotolock, <i>*Requires Housing Saver</i> <i>* Requires Sonde Block Set *Requires Water Nozzle, p. 40</i>

HOUSING SAVER

NS	4305	2 1/8" Vermeer® Low Profile Pin X 2 1/2" Hex (MFG Easy Conn.)
16	4354	2.06" Firestick Box (Direct Connect)
NS	4355	1.90" Firestick Box (Direct Connect)
17	4356	2" UNJ Pin X 2 1/2" Hex (Railhead® Connection)



Vermeer® D18X22*, D20X22*, D24/D24X26 Navigator

Ref. No. Part No. Description

DRILL PIPE

1 BD24/24X26DT 2.063" O.D. X 10' O.A.L.

DRIVE CHUCK

BD24/24X26DC Drive Chuck Assembly (Assy Includes Ref. No. 2 & 3)

2 BD24/24X26DCF Flange

3 BD24/24X26SS Sub Saver

NS V42897-001 O Ring for Drive Chuck

NS V235737-001 Bolt 1/2"-13 X 1 1/4"

STARTER ROD

5 BD24/D24X26SR Hex 2.06" O.D. Pipe

6 BD24X26HCHF Collar Hex, 2 1/2" ID HF

7 V44780003 Capscrew – Collar – 3/8"

NS V240591001 Capscrew – Collar – 1/2"

ROD WIPER

NS PWF9-187 Rod Wiper, 2.06"

THRUST/PULL BACK CHAIN

8 BL866-164 Chain-Leaf, BL866 164 Pitches

8 BL866CL Conn Link, BL866

8 BL866-253 Chain-Leaf, BL866 253 Pitches

INCREDIBITS

9 1526 3" Standard, Medium Rock & Cobble

10 1528 3" Aggressive, Hard Rock & Layered Rock

SONDE HOUSING

11 1830 3" Incredibit Sonde Housing - 3" Rotolock

**Requires Housing Saver & Sonde Block Set*

12 2820 3" Endurance Sonde Housing 3" Rotolock

**Requires Housing Saver, Sonde Block Set & Water Nozzle*

13 3120 3" Vermeer® 7 Bolt (1/2") Sonde Housing - 3" Rotolock

**Requires Housing Saver, Sonde Block Set & Water Nozzle*

HOUSING SAVER

NS 4305 2 1/8" Vermeer® Low Profile Pin X 2 1/2" Hex (MFG Easy Conn.)

14 4354 2.06" Firestick Box (Direct Connect)

NS 4355 1.90" Firestick Box (Direct Connect)

15 4356 2" UNJ Pin X 2 1/2" Hex (Railhead Connection)

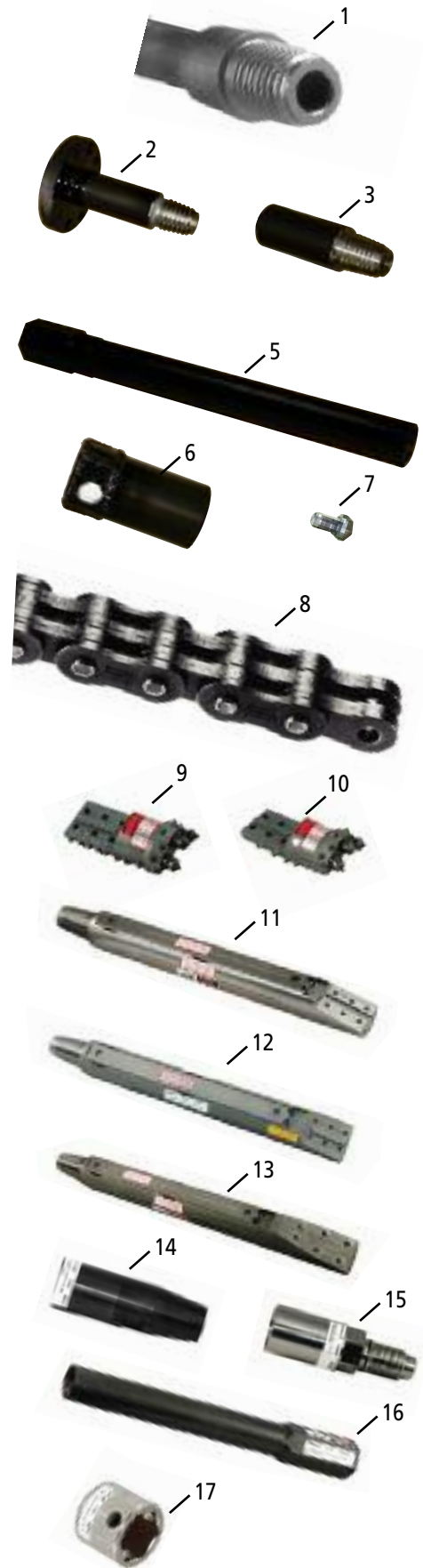
BREAKOUT JAWS

NS B9879 Jaws for D24A, D24x26

RAILHEAD® CONNECTIONS

16 1239 Lead Rod, 2.06" Firestick Box 2" UNJ Box

17 1107 Hex Collar 3 1/2" O.D. 1/2" Wall Boring Collar



* D18x22 and D20x22 can use either 1.90" or 2.06" drill pipe and corresponding sized tools.

Vermeer® D18X22, D20X22, D24/D24X26

Vermeer® D24X40/A Navigator

Ref. No. Part No. Description

DRILL PIPE

1	BD24X40DT	Drill Pipe 2.375" OD x 10', O.A.L
NS	BD24X40DTIW	Drill Pipe 2.375" OD x 10', O.A.L 2.635" collar Forged Upset Ends Inertia Welded

DRIVE CHUCK

	BD24x40DC-S	Drive Chuck Assy (includes Ref #2 & 3; SN 383 & Below)
	BD24x40DC-L	Drive Chuck Assy (includes Ref #2 & 3; SN 384 & Above)
	BD24X40DCSII	Drive Chuck Assy (includes Ref #2 & 3; Series II only)
2	BD24x40SSS	Sub Saver, SN 383 & Below
2	BD24X40SSL	Sub Saver, SN 384 & Above
2	BD24X40SSII	Sub Saver, Series II only
3	BD24X40DCF	Flange
NS	V24033-001	Bolt 1/2-13 x 1 3/4 Dr Chuck
NS	V485025	Washer 1/2 Dr Chuck
NS	V72898-001	O Ring #24 Flange Dr Chuck

STARTER ROD

4	BD24X40SR	2.38" HEX FST 1
5	V240591001	Capscrew – Collar – 1/2"
6	BD24X40HCHF	Collar Hex 2 1/2" ID HF

ROD WIPER

NS	PWF9-225	Rod Wiper 2.375" Drill Stem
----	----------	-----------------------------

THRUST/PULL BACK CHAIN

24x40A

7	BL866-165	Chain Leaf, BL866, 165 pitches
	BL866CL	Conn Link, BL866
	BL866-257	Chain Leaf, BL866, 257 Pitches

24X40

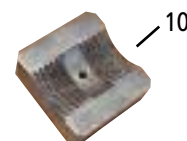
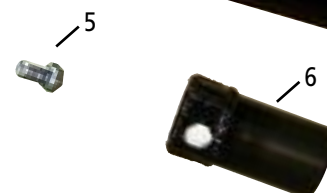
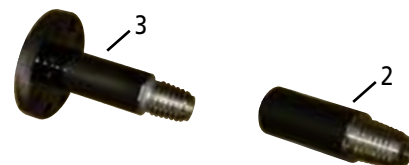
7	BL866-253	Chain Leaf, BL866, 253 Pitch
	BL866CL	Conn Link, BL866
	BL866-163	Chain Leaf, BL866, 163 Pitches

INCREDIBITS

8	1554	3 1/2" Standard, Medium Rock & Cobble
9	1555	3 3/4" Aggressive, Hard Rock & Layered Rock

BREAKOUT JAWS

10	B9872	Jaws for D24x40/A, D24x40SII
----	-------	------------------------------



Vermeer® D24X40/A Navigator, continued

Ref. No. Part No. Description

SONDE HOUSINGS

11	1860	3 1/2" Incredibit Sonde Housing 3 1/2" Rotolock <i>*Requires Housing Saver *Requires Sonde Block Set, p. 40</i>
12	2860	3 1/2" Endurance Sonde Housing 3 1/2" Rotolock <i>*Requires Housing Saver *Requires Sonde Block Set, p. 40</i> <i>*Requires Water Nozzle, p. 40</i>
13	3160	3 1/2" Ram Vermeer® 7 Bolt (1/2") Sonde Housing 3 1/2" Rotolock ; <i>*Requires Housing Saver</i> <i>*Requires Sonde Block Set *Requires Water Nozzle, p. 40</i>

HOUSING SAVERS

14	4309	2 1/2" Ramon Pin 3" Hex (Railhead® Quick Connect)
NS	4352RH	2 3/8" Firestick Box (Direct Connect)
15	4358	2 1/8" Vermeer® Low Profile Pin 2 1/2" Hex (MFG Easy Connect)

RAILHEAD QUICK CONNECT

16	1249	2 3/8" Firestick Box 2 1/2" Ramon 3" Hex
NS	1259	Special Vermeer® Part For 33X44 3" Hex
17	1108	Hex Collar 5/8" Wall Boring Collar
18	1113	Hex Collar Hard Surfaced 5/8" Wall Boring Collar



Breakout Jaws for Large Vermeer® Drills

Ref. No. Part No. Description

BREAKOUT JAWS FOR EQUIPMENT NOT LISTED INDIVIDUALLY

NS	B9871	Jaws for DD50X100
NS	B9870	Jaws for D50X100, D80X100

Pilot Bit Application Chart

Ballantine, Inc. offers a full line of Professional Contractor Series HDD Pilot Bits that, when matched correctly to the specific application, will maximize your drill rig's production capabilities. All of our bits are constructed of premium abrasion resistant alloy steels. Many of these bits feature our robotically applied Terminator® weave tungsten carbide-mesh hardfacing which has proven to extend tool life up to 30% longer than competitors' hardfacing.

	Soil type	Sandy	Light	Medium	Hard	Rocky	Soft Rock	Medium Rock	Hard Rock
B I T S T Y L E	Duckbill Hardfaced	1	1	2	3	4	5	5	5
	Steep Taper Hardfaced	5	3	2	1	1	3	5	5
	Carbide Claw	3	2	1	1	4	4	5	5
	Dura Bit	2	2	1	2	4	5	5	5
	Chevron	3	2	1	1	4	5	5	5
	Continual Radius	3	2	1	1	3	4	5	5
	Tough Bit	4	2	1	1	2	2	4	5
	Power Tip	3	2	2	1	3	2	4	5
	Bear Claw	3	4	2	1	2	2	3	5
	Incredibit Standard	3	2	2	1	2	1	3	5
	Incredibit Aggressive	3	2	2	1	2	1	3	5
	Direct Bore I	3	2	2	1	2	1	4	5
	Direct Bore II	3	1	2	3	3	4	5	5
	Direct Bore III	3	2	2	1	1	3	5	5

1 = Best

2 = Good

3 = Fair

4 = Less Recommended

5 = Not Recommended

Soil Type Definitions:

Sandy Loose Sand, Sandy Loams or any soil that is predominately comprised of sand

Light Loams, Clay, Silt, Soft to medium soils that contain moisture

Medium Consolidated Loams & Clays, Semi-compacted soils

Hard Hardpan, Gumbo, Compacted Soils

Rocky Cobble, Chunk Rock, Gravel, Glacial Till (any non-consistent type of rock)

Soft Rock Caliche, Slate, Soft Limestone, Sandstone, Shales, Certain Corral (0-9,000 psi)

Medium Rock Certain Limestone, Sandstone, Some Dolomite, Shales, Coral, (9,000-16,000 psi)

Hard Rock Hard Limestone, Granite, Schist, Trap Rock, Quartzite (Above 16,000 psi)

* The above chart is designed as a reference guide only. Soil conditions often vary throughout a pilot bore which may affect actual performance in the field. Contact your local Ballantine, Inc. dealer or Ballantine direct for specific recommendations regarding soil conditions and pilot bit selection.

HDD Pilot Bit Part Number Identification Chart

Part Numbering Example

Pilot Bit Description: Ditch Witch, 5/8" Thick, 5 Hole, Duckbill Hardfaced, 4" Wide Cut

Part Number Example:

D 5 5 DH 40 *

1st Position	2nd Position	3rd Position	4th Position	5th Position	6th Position*
Drill Manufacturer	Bit Thickness	Hole Pattern	Type of Bit – Description	Width of Cut	Length Designation
V = Vermeer®	5 = 5/8"	4 = 4 Hole	DH = Duckbill Hardfaced ST = Steep Taper	30 = 3"	S = Short 10 3/8" Long
D = Ditch Witch®	6 = 3/4"	5 = 5 Hole	CC = Carbide Claw DB = Dura Bit	35 = 3 1/2"	
C = Astec/Case	8 = 1"	6 = 6 Hole	CB = Chevron Bit CR = Continual Radius	40 = 4"	L = Long 11 5/8" Long
A = American Auger	0 = 1 1/4"	7 = 7 Hole	TB = Tough Bit PT = Power Tip SG = Sewer Grade BC = Bear Claw	45 = 4 1/2" 50 = 5" 55 = 5 1/2"	

* The 6 Position is used for Vermeer® pilot bits only. The short designation is for Vermeer® D10X15 and smaller drills. The long designation is for Vermeer® drills between models D16X20 and D40X40.

- Custom Bits Available Upon Request
- One Inch Thick Blades Available for Vermeer®, Upon Request

Pilot Bit Bolts

Drill Rig	Number of Bolt Holes per Bit	Bolt Size	Part No.
Ditch Witch® JT920, JT920L, JT1220, JT1720, JT2020, JT2720*	5	12mm	B107277
Ditch Witch® JT2720*, JT4020	6	16mm	B106681
Vermeer® - All Models up to D40x40	7	1/2" - 13"	V129667010

- JT2720 & JT4020 can use multiple beacon housings; refer to # of holes per bit to determine bolt size

Pilot Bit Part Numbers, Features and Benefits

All of Ballantine's Professional Contractors Series (PCS) Pilot Bits are manufactured with the following features. These features provide benefits such as: Extended Wear Life, Increased Production and Improved Steering Capabilities.

- Precision Machined Bodies
- Heavy-Duty Abrasion-Resistant Alloy Steel
- Terminator® Tungsten Carbide Hardfacing
- Complex Three Stage Heat Treat Process
- State-of-the-Art Brazing Process

DUCKBILL HARDFACED

Feature

- PCS Body
- Pullback Hole
- Hardfacing Placement

Benefit

- Top Performing Tool
- Quick & Easy Product Installation when Backreaming not Required
- Positioned in All High Wear Areas for Extended Life

Part No.	Hole Pattern	Width
V67DH30S	Vermeer® 7-Hole	3"
V67DH35S	Vermeer® 7-Hole	3 1/2"
V67DH40S	Vermeer® 7-Hole	4"
V67DH45S	Vermeer® 7-Hole	4 1/2"
V67DH40L	Vermeer® 7-Hole	4"
V67DH45L	Vermeer® 7-Hole	4 1/2"
V67HD50L	Vermeer® 7-Hole	5"
D55DH40	Ditch Witch® 5-Hole	4"
D55DH50	Ditch Witch® 5-Hole	5"
D66DH40	Ditch Witch® 6-Hole	4"
D66DH50	Ditch Witch® 6-Hole	5"
418569A1	Case 7-Hole	4"
418575A1	Case 7-Hole	5"
07703525	Case 3 1/2" Extension	3 1/2"
07704025	Case 4" Extension	4"
07705025	Case 5" Extension	5"



STEEP TAPER HARDFACED

Feature

- PCS Body
- Arrowhead Design
- Hardfacing Placement

Benefit

- Top Performing Tool
- Ability to Burrow in Tough Cobble & Light Rock Conditions
- Positioned in All High Wear Areas for Extended Life

Part No.	Hole Pattern	Width
V67ST40	Vermeer® 7 Hole	4"
V67ST50	Vermeer® 7 Hole	5"
D55ST40	Ditch Witch® 5 Hole	4"
D55ST50	Ditch Witch® 5 Hole	5"
D66ST40	Ditch Witch® 6 Hole	4"



Pilot Bit Part Numbers, Features and Benefits

CARBIDE CLAW

Feature

- PCS Body
- Claw Design
- Hardfacing Placement

Benefit

- Top Performing Tool
- Quick Penetration in Clays & Sand without Balling Up or Plugging of Bit
- Positioned on Claws and All High Wear Areas for Extended Life

Part No.	Hole Pattern	Width
V67CC40	Vermeer® 7 Hole	4"
V67CC45	Vermeer® 7 Hole	4 1/2"
V67CC50	Vermeer® 7 Hole	5"
D55CC40	Ditch Witch® 5 Hole	4"
D55CC45	Ditch Witch® 5 Hole	4 1/2"
D55CC50	Ditch Witch® 5 Hole	5"
D66CC50	Ditch Witch® 6 Hole	5"



DURA BIT

Feature

- PCS Body
- Unibody Design
- Premium Grade Tungsten Carbide
- Individual Indexed Pockets
- Dual Point Center Cutter
- Center Dirt Relief
- Multiple Carbide Cutting Points
- 7 Degree Relief
- 11 Degree Bevel
- Pullback Hole

Benefit

- Top Performing Tool
- No Weakened Weld point
- Extremely Durable Cutting Points
- Securely placed Carbide
- Twice the Cutting Action
- Passes Spoils Off Cutting Face
- Increased Production With Consistent Tracking
- Allows Reaming Edge to Pass Spoil Efficiently
- Allows Cutting Head to Effectively Pass & Steer Through Ground Conditions
- Quick & Easy Product Installation when Backreaming is Not Required

Part No.	Hole Pattern	Width
V67DB40	Vermeer® 7 Hole	4"
V67DB50	Vermeer® 7 Hole	5"
D55DB40	Ditch Witch® 5 Hole	4"
D55DB45	Ditch Witch® 5 hole	4 1/2"
D55DB50	Ditch Witch® 5 Hole	5"
D66DB40	Ditch Witch® 6 Hole	4"
D66DB50	Ditch Witch® 6 Hole	5"
418564A1	Case 7 Hole	3 1/2"
418565A1	Case 7 Hole	4"
418567A1	Case 7 Hole	5"



Pilot Bit Part Numbers, Features and Benefits

CHEVRON

Feature

- PCS Body
- Dual Point Center Cutter
- Center Dirt Relief
- Premium Grade Tungsten Carbide
- Multiple Carbide Cutting Points

Benefit

- Top Performing Tool
- Twice the Cutting Action
- Passes Spoils Off Cutting Face
- Extremely Durable Cutting Points
- Increased Production With Consistent Tracking

Part No.	Hole Pattern	Width
V67CB40	Vermeer® 7 Hole	4"
V67CB45	Vermeer® 7 Hole	4 1/2"
V67CB50	Vermeer® 7 Hole	5"
D55CB40	Ditch Witch® 5 Hole	4"
D55CB50	Ditch Witch® 5 Hole	5"
D66CB50	Ditch Witch® 6 Hole	5"



CONTINUAL RADIUS

Feature

- PCS Body
- Unibody Design
- 7 Degree Relief
- 11 Degree Bevel
- Center Dirt Relief
- Individual Indexed Pockets
- Continual Radius Design
- OffSet V-Faced Carbide
- Pullback Hole

Benefit

- Top Performing Tool
- No Weakened Weld point
- Allows Reaming Edge to Pass Spoil Efficiently
- Allows Cutting Head to Effectively Pass & Steer Through Ground Conditions
- Passes Spoils Off Cutting Face
- Securely placed Carbide
- Precise Bore Path tracking
- Optimum Cutting Action, Absorbs Additional Impact
- Quick & Easy Product Installation when Backreaming is Not Required

Part No.	Hole Pattern	Width
V67CR40	Vermeer® 7 Hole	4"
V67CR45	Vermeer® 7 Hole	4 1/2"
V67CR50	Vermeer® 7 Hole	5"
D55CR40	Ditch Witch® 5 Hole	4"
D55CR45	Ditch Witch® 5 Hole	4 1/2"
D55CR50	Ditch Witch® 5 Hole	5"
D66CR50	Ditch Witch® 6 Hole	5"
418561A1	Case 7 Hole	3 1/2"
418562A1	Case 7 Hole	4"
418563A1	Case 7 Hole	5"



Pilot Bit Part Numbers, Features and Benefits

TOUGH BIT

Feature

- PCS Body
- OffSet V-Faced Carbide
- Pullback Hole
- Unibody Design

Benefit

- Top Performing Tool
- Optimum Cutting Action, Absorbs Additional Impact
- Quick & Easy Product Installation when Backreaming not Required
- No Weakened Weld Point

Part No.	Hole Pattern	Width
V67TB40	Vermeer® 7 Hole	4"
V67TB45	Vermeer® 7 Hole	4 1/2"
V67TB50	Vermeer® 7 Hole	5"
D55TB40	Ditch Witch® 5 Hole	4"
D55TB45	Ditch Witch® 5 Hole	4 1/2"
D55TB50	Ditch Witch® 5 hole	5"
D66TB50	Ditch Witch® 6 Hole	5"



POWER TIP

Feature

- PCS Body
- Premium Grade Tungsten Carbide
- Press Fit & Brazed Carbide Points
- Available with Additional Carbide Segments

Benefit

- Top Performing Tool
- Extremely Durable Cutting Points
- Exceptionally Secure Carbide Setting
- Extended Body Life and Enhanced Cutting Action

Part No.	Hole Pattern	Width
V67PT40	Vermeer® 7 Hole	4"
V67PT45	Vermeer® 7 Hole	4 1/2"
V67PT50	Vermeer® 7 Hole	5"
D55PT40	Ditch Witch® 5 Hole	4"
D55PT45	Ditch Witch® 5 Hole	4 1/2"
D55PT50	Ditch Witch® 5 Hole	5"
D65PT40	Ditch Witch® 5 Hole	4"
D65PT45	Ditch Witch® 5 Hole	4 1/2"
D65PT50	Ditch Witch® 5 Hole	5"
D66PT40	Ditch Witch® 6 Hole	4"
D66PT45	Ditch Witch® 6 Hole	4 1/2"
D66PT50	Ditch Witch® 6 Hole	5"



Pilot Bit Part Numbers, Features and Benefits

BEAR CLAW

Feature

- PCS Body
- Offset Conical Carbide Teeth
- Angled Conical Carbide Teeth
- Impregated Carbide Hardfacing
- Unibody Design

Benefit

- Top Performing Tool / Abrasion & Impact Resistant
- Full Coverage Cutting Action / Optimum Bore Path Tracking
- Improved Impact Resistant Teeth / Bores thru the hardest Soils
- Extended Wear Life in High Wear Areas
- Additional Strength - No Weakened Weld Zones

<i>Part No.</i>	<i>Hole Pattern</i>	<i>Width</i>
V67BC40	Vermeer® 7 Hole	4"
V67BC45	Vermeer® 7 Hole	4 1/2"
V67BC50	Vermeer® 7 Hole	5"
D65BC40	Ditch Witch® 5 Hole	4"
D65BC45	Ditch Witch® 5 Hole	4 1/2"
D65BC50	Ditch Witch® 5 Hole	5"
D66BC40	Ditch Witch® 6 Hole	4"
D66BC45	Ditch Witch® 6 Hole	4 1/2"
D66BC50	Ditch Witch® 6 Hole	5"



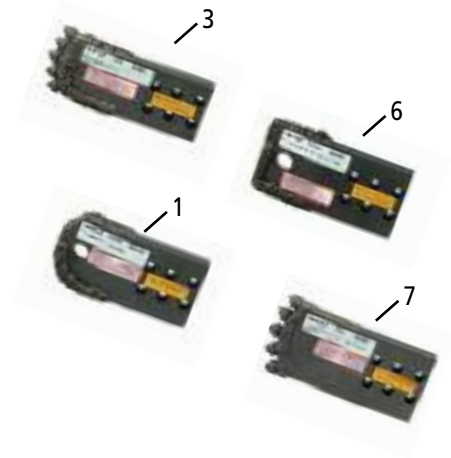
ENDURANCE DIRT BITS

ADD "H" INDICATOR TO PART NUMBER FOR PULL BACK HOLE

* ALL INCREDIBIT AND ENDURANCE SOUND HOUSINGS REQUIRE A WATER NOZZLE WHEN USING AN ENDURANCE BIT

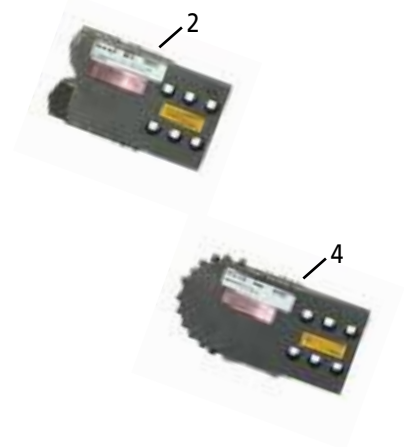
FOR 2-3/4" & 3" SONDE HOUSINGS

Ref. No.	Part #	Description
	2210	3-1/2" SHARPSHOOTER
1	2211	3-1/2" SILVER BULLET
2	2212	3-1/2" HOLLOW POINT
3	2213	3-1/2" IRON CLAW
	2214	3-1/2" TAPER BIT
4	2215	3-1/2" BUTTON BIT
6	2220	4" SHARPSHOOTER
1	2221	4" SILVER BULLET
2	2222	4" HOLLOW POINT
7	2223	4" IRON CLAW
	2224	4" TAPER BIT
4	2225	4" BUTTON BIT



FOR 3-1/2" SONDE HOUSINGS

Ref. No.	Part #	Description
6	2230	4" SHARPSHOOTER
1	2231	4" SILVER BULLET
2	2232	4" HOLLOW POINT
3	2233	4" IRON CLAW
	2234	4" TAPER BIT
4	2235	4" BUTTON BIT
6	2240	5" SHARPSHOOTER
1	2241	5" SILVER BULLET
2	2242	5" HOLLOW POINT
3	2243	5" IRON CLAW
	2244	5" TAPER BIT
4	2245	5" BUTTON BIT



FOR 4-1/8" SONDE HOUSING

Ref. No.	Part #	Description
6	2250	5" SHARPSHOOTER
3	2253	5" IRON CLAW
5	2255	5" BUTTON BIT
6	2260	6" SHARPSHOOTER
3	2263	6" IRON CLAW
5	2265	6" BUTTON BIT



Backreamer Application Chart

Ballantine, Inc. Offers a full line of Professional Contractors Series HDD Backreamers, when matched correctly to the specific application, will maximize your drill rig's production capabilities.

	Soil type	Sandy	Light	Medium	Hard	Rocky	Soft Rock	Medium Rock	Hard Rock
B A C K R E A M E R S T Y L E	Fluted	2	2	3	3	3	4	5	5
	Solid Plate	4	3	3	2	1	2	3	5
	Turbo Flow	2	1	2	3	4	4	5	5
	Taper Wing Fly Cutter	2	2	1	2	5	4	5	5
	Impeller	2	1	1	2	3	5	5	5
	TW Rock	5	4	3	2	1	2	3	5
	EXTream	5	5	4	3	2	2	1	1
	Sidewinder	2	2	1	1	3	4	5	5
	Mauler	4	4	3	2	1	3	5	5

1 = Best

2 = Good

3 = Fair

4 = Less Recommended

5 = Not Recommended

* Backreamers Require Nose Piece

Soil Type Definitions:

Sandy Loose Sand, Sandy Loams or any soil that is predominately comprised of sand

Light Loams, Clay, Silt, Soft to medium soils that contain moisture

Medium Consolidated Loams & Clays, Semi-compacted soils

Hard Hardpan, Gumbo, Compacted Soils

Rocky Cobble, Chunk Rock, Gravel, Glacial Till (any non-consistent type of rock)

Soft Rock Caliche, Slate, Soft Limestone, Sandstone, Shales, Certain Corral (0-9,000 psi)

Medium Rock Certain Limestone, Sandstone, Some Dolomite, Shales, Coral, (9,000-16,000 psi)

Hard Rock Hard Limestone, Granite, Schist, Trap Rock, Quartzite (Above 16,000 psi)

The above chart is designed as a reference guide only. Soil conditions often vary throughout the backreaming operation which may affect actual performance in the field. Contact your local Ballantine, Inc. dealer or Ballantine direct for specific recommendations regarding soil conditions and backreamer selection.

Backreamer Part Numbers, Features and Benefits

FLUTED REAMER WITH BUILT IN SWIVEL

Design Features

- Compact Design
- Oversized Flutes
- Solid Body
- Multiple Fluid Ports
- Rear-Facing Fluid Ports
- Terminator Hardfacing
- Low Energy Profiled Teeth
- Built In Swivel

Design Benefits

- Aggressive Attack Angle, Reduced Weight
- Pumps Fluids to Products, Increased Pressure & Fluid Control
- Extends life expectancy
- Accelerates Hole Development
- Lubricate Product, Reduces Stress on Drill String
- Added wearability
- Optimal Cutting & Packing
- Protects Swivel & shortens Drill String
- Excellent choice for Widest Variety of Soil Conditions

Part No.	Description
BFLR6WS	6" Fluted Reamer (25,000 lbs swivel)
BFLR8WS	8" Fluted Reamer (25,000 lbs swivel)
BFLR10WS	10" Fluted Reamer (30,000 lbs swivel)
BFLR12WS	12" Fluted Reamer (30,000 lbs swivel)
BFLR14WS	14" Fluted Reamer (50,000 lbs swivel)



*** Backreamers Require Nose Piece**

Part No.	Description
1211022	Vermeer 2.06" Low Profile
1211012	Vermeer 1.609" Low Profile
1211072	2" UNC Pin
1221031	Ditch Witch EZ Connect 2 920, 921 & 922
1221051	Ditch Witch EZ Connect 2 1720, 2020 & 2720

FLUTED REAMER WITH STATIC LUG

Design Features

- Gradual Taper
- Large Packing Surface
- Solid Body
- Multiple Fluid Ports
- Rear-Facing Fluid Ports
- Terminator Hardfacing
- Static Lug
- Low Energy Profiled Teeth

Design Benefits

- Allows for More Cutting Position
- Aid in Bore Wall Development
- Extends life expectancy
- Accelerates Hole Development
- Lubricate Product, Reduces Stress on Drill String
- Added wearability
- Versatility
- Optimal Cutting & Packing

Part No.	Description
417831A1	6" Fluted Reamer
417834A1	8" Fluted Reamer
418553A1	10" Fluted Reamer



*** Backreamers Require Nose Piece**

Part No.	Description
2211022	Vermeer 2.06" Low Profile
2211012	Vermeer 1.609" Low Profile
2221031	Ditch Witch EZ Connect 2 920, 921 & 922
2221051	Ditch Witch EZ Connect 2 1720, 2020 & 2720
2211072	2" UNC Pin

Backreamer Part Numbers, Features and Benefits

SOLID PLATE WITH BUILT IN SWIVEL 3 1/4" SHAFT

Design Features

- Internal Swivel
- Plates Welded to Shaft
- Fluid Port Placements by every Cutter

Design Benefits

- Shortens Drill String
- Durability & Relieves Plate Separation
- Maximum Fluid at Cutting Stations

Part No.	Description
HDS-306	6" Solid Plate Reamer
HDS-308	8" Solid Plate Reamer
HDS-310	10" Solid Plate Reamer
HDS-312	12" Solid Plate Reamer
HDS-314	14" Solid Plate Reamer



*** Backreamers Require Nose Piece**

TURBO FLOW

Design Features

- Forward Swept Blade
- Three Blades
- Angled Blades
- Offset Cutters
- Multiple cutters at Widest Point
- Solid Body Core
- Complete Coverage of Fluid Ports
- 12" & Larger Reamers

Design Benefits

- Immediately Cuts the Face of the Hole
- Optimum Cutting & Mixing
- Pumps Fluids Back to Product
- Entire Surface Gets Cut thus Suited for a Wide Variety of Ground Conditions
- Consistent Bore-Wall
- No Additional Stress Points
- Superior Slurry Development
- Packing & Stabilizing Ring

Part No.	Description
BTFR6	6" Turbo Flow Reamer
BTFR8	8" Turbo Flow Reamer
BTFR10	10" Turbo Flow Reamer
BTFR12	12" Turbo Flow Reamer
BTFR14	14" Turbo Flow Reamer



*** Backreamers Require Nose Piece**

Part No.	Description
1211022	Vermeer 2.06" Low Profile
1211012	Vermeer 1.609" Low Profile
1211072	2" UNC Pin
1221031	Ditch Witch EZ Connect 2 920, 921 & 922
1221051	Ditch Witch EZ Connect 2 1720, 2020 & 2720

Backreamer Part Numbers, Features and Benefits

TAPERED WING FLY CUTTER

Design Features

- Long Tapered Wing
- OffSet Cutters
- Strategic Placement of Wings
- Multiple Fluid Ports
- Packing & Stabilizing Ring

Design Benefits

- More Cutter Positions
- Complete Cutter Coverage
- Provides Pumping Action to aid in Slurry Development
- Distributes Fluids at cutting Points Through Entire Wing
- Added Strength for Wings & Superior Bore-Wall Formation

Part No.	Description
BTWFC6	6" Tapered Wing Fly Cutter
BTWFC8	8" Tapered Wing Fly Cutter
BTWFC10	10" Tapered Wing Fly Cutter
BTWFC12	12" Tapered Wing Fly Cutter
BTWFC14	14" Tapered Wing Fly Cutter



*** Backreamers Require Nose Piece**

Part No.	Description
2211022	Vermeer 2.06" Low Profile
2211012	Vermeer 1.609" Low Profile
2221031	Ditch Witch EZ Connect 2 920, 921 & 922
2221051	Ditch Witch EZ Connect 2 1720, 2020 & 2720
2211072	2" UNC Pin

TW ROCK WING 3 1/4" SHAFT

Design Features

- Gradual Long Taper
- Multiple Fluid Ports (between Cutters)
- Gusset Supported Wings (Deflector)

Design Benefits

- Excellent Tracking, Ability to stay on Grade
- Superior Fluid placement
- Extended Tool Life

Part No.	Description
TWR308	8" TW Rock Wing Reamer
TWR310	10" TW Rock Wing Reamer
TWR312	12" TW Rock Wing Reamer
TWR314	14" TW Rock Wing Reamer
TWR316	16" TW Rock Wing Reamer



*** Backreamers Require Nose Piece**

Backreamer Part Numbers, Features and Benefits

IMPELLER

Design Features

- Offset Cutters
- Fluid Distributed Through Each Blade
- Terminator Hardfacing
- Gusset Supported Paddles

Design Benefits

- Complete Hole Coverage
- Correctly Placed Fluids
- Extended Life of Tool
- Increased Paddle Durability

<i>Part No.</i>	<i>Description</i>
BVTX6	6" Impeller Reamer
BVTX8	8" Impeller Reamer
BVTX10	10" Impeller Reamer
BVTX12	12" Impeller Reamer
BVTX14	14" Impeller Reamer
BVTX16	16" Impeller Reamer
BVTX18	18" Impeller Reamer
BVTX20	20" Impeller Reamer
BVTX24	24" Impeller Reamer



*** Backreamers Require Nose Piece**

<i>Part No.</i>	<i>Description</i>
2211022	Vermeer 2.06" Low Profile
2211012	Vermeer 1.609" Low Profile
2221031	Ditch Witch EZ Connect 2 920, 921 & 922
2221051	Ditch Witch EZ Connect 2 1720, 2020 & 2720
2211072	2" UNC Pin



Railhead® Backreamers

EXTREAM

Part No.	Description
1340	8" Reamer 3 1/2" Housing Saver Shaft
1350	12" Reamer 3 1/2" Housing Saver Shaft
1360	12" Reamer 4 1/8" Housing Saver Shaft
1370	16" Reamer 4 1/8" Housing Saver Shaft

ENDURANCE REAMER SHAFT

The three section shaft is designed for use of any hex cutter size configurations. This reamer configuration requires three hex cutters and a lock collar, or use a spacer and two cutters. A pull-tab designed for a 30K in-line swivel is on the shaft.

Part No.	Description
6001	3 Sections 3" Hex Shaft – 3" Rotolock® <i>*Requires Housing Saver</i>
6156	3 Section 3" Hex Shaft – 2 1/2" Ramon Pin <i>*No Housing Needed</i>

LOCK COLLAR

The Endurance reamer uses a lock collar to lock all the cutters in place on the shaft. This part is required to complete the Endurance reamer.

Part No.	Description
6002	6002 3" Rotolock – 3" Hex Shaft
6003	2 1/2" RAMON Pin – 3" Hex Shaft

SIDEWINDER CUTTER SECTION ON 3" HEX

Part No.	Description
6020	8" Cutter
6021	10" Cutter
6022	12" Cutter
6023	14" Cutter
6024	16" Cutter
6025	18" Cutter
6026	20" Cutter
6027	24" Cutter
6028	28" Cutter
6029	30" Cutter

MAULER CUTTER SECTION ON 3" HEX

Part No.	Description
6040	8" Cutter
6041	10" Cutter
6042	12" Cutter
6043	14" Cutter
6044	16" Cutter
6045	18" Cutter
6046	20" Cutter
6047	24" Cutter
6048	28" Cutter
6049	30" Cutter



Premium Grade Tungsten Carbide Tipped Backreamer Teeth

Ref. No.	Part No.	Description
1	SSSC	Reamer tooth: 3.5" long x .5" square
2	SCCLH	Reamer tooth: 3.5" long x .5" square
3	SSCRH	Reamer tooth: 3.5" long x .5" square
4	SCCP	Reamer tooth: 3.75" long x 1.0" wide x 5" thick
5	BD1065-50	Reamer tooth: 1.065" tall x .735" long x .500" thick
6	TT1654LP	Reamer tooth: 1.25" tall x 1" long x .500" thick
7	TT1654S	Reamer tooth: 1.80" tall x 1.305" long x .500" thick
8	TT1654	Reamer tooth: 1.75" tall x 1.69" long x .562" thick
9	T20034LP	Reamer Tooth: 1.50" tall x 1.435" long x .750" thick
10	T20078	Reamer tooth: 2.25" tall x 2.875" long x .750" thick
11	TT45D24	Reamer tooth: .813" long x .750" in diameter
12	TTRB	Reamer tooth: 1.25" long x .750" in diameter
13	TT99045D	Reamer tooth: 1.25" long x 1.070" in diameter
14	550HDBLK	Reamer tooth: 1.50" tall x 1.01" wide x 1" base weld length
15	550NP24SF	Reamer tooth: 2.17" long x .550" wide
16	550NP24S	Reamer tooth: 2.04" long x .550" wide
NS	550HS	Reamer tooth
17	B1710	Reamer tooth: 1.31" tall x .95" wide x .687" base weld length
18	B17D	Locking ring
19	B17	Reamer tooth: 2.56" long x .563" wide
20	765HDBLK	Reamer tooth: 2.25" tall x 1.69" wide x 1.25" base weld length
21	765CRFN	Reamer tooth: 3.95" long x .765 wide
22	765CB	Reamer tooth: 3.38" long x .765" wide



Railhead® Components

Railhead® Hand Tools

Ref. No.	Part #	Description
PULLERS/DRIVERS		
	5515	Rock Point Puller/Driver (1526 & 1528 Rock Bits)
	5516	Reamer Rock Point Puller (8", 12", & 16" Reamers)
	5520	Rock Point Puller/Driver (1554 & 1555 Rock Bits)
	5525	Rock Point Puller/Driver (1561, 1562 & 1565 Rock Bits)

HAND TOOLS

	5530	Standard Tool Kit (Torque Wrench, Ratchet, 3/8" * 5/16" Hex Drive Tool Box)
	5521	Standard Ratchet 1/2" Drive, Long Handle
	5522	Standard Torque Wrench 1/2" Drive, 25-250 ft lb
	5523	Standard 3/8" Hex Drive, 1/2" Drive
	5524	Standard 5/16" Hex Drive, 1/2" Drive
	5529	Standard 12mm Hex Drive, 1/2" Drive

End Load Incredibit Adapters

Ref. No.	Part #	Description
1	1750	2-7/8" API Rock Bit Adapter (1561, 1562, & 1565 Rock Bits)
	1751	2-3/8" API Rock Bit Adapter (1561, 1562, & 1565 Rock Bits)
	1754	3-1/2" API Rock Bit Adapter (1561, 1562, & 1565 Rock Bits)
	1760	2-3/8" API Rock Bit Adapter (1554 & 1555 Rock Bits)
	1780	2-7/8" API Rock Bit Adapter (1581 Rock Bit)
	1782	3-1/2" API Rock Bit Adapter (1581 Rock Bit)



Railhead® Components

Tool Adapters

Ref. No.	Part #	Description
	1401	2-7/8" Firestick* Pin 2-1/2" RAMON* Pin 3" Hex
	1402	3-1/2" Firestick* Pin 2-1/2" RAMON* Pin 3" Hex
	1403	2-7/8" IF* Pin 2-1/2" RAMON* Pin 3" Hex
	1404	3.27" Fluid Miser* Pin 2-1/2" RAMON* Pin - 3" Hex
	1407	1.81" Fluid Miser* Box (2"FM) 2-1/2" RAMON * Pin 3" Hex
	1409	2.06" Fluid Miser* Pin (2-3/8"FM) 2-1/2" RAMON * Pin 3" Hex
	1410	2-38" Mayhew Jr* Pin 2-1/2" RAMON* Pin 3" Hex
2	1413	2-1/2"RAMON* Pin 2-1/8 Vermeer* Low Profile 2-1/2"
	1412	2" IF* Pin 2-1/2" RAMON* Pin
	1414	2-1/2" RAMON* Pin 2" UNJ 2-1/2" Hex
	1426	2" UNJ Pin 2-1/8" Vermeer®* Low Profile Box 2-1/2" Hex
	1436	2-5/8" QD-65 Box 2-1/2" RAMON* Pin 3" Hex
	1437	2.52 Fluid Miser* Pin 2-1/2" RAMON* Pin 3" Hex
	1438	2-3/8" Firestick* Pin 2-1/2" RAMON* Pin 3" hex



Rock Points

Ref. No.	Part #	Description
	5013	9/16" Shank DCT Carbide (1501,1503,1525 ROCK BIT)
	5019	5/8" Shank DCT Carbide (1526,1528 ROCK BIT)
	5020	1.094 Shank CT Carbide (1561,1562 ROCK BIT)
	5021	5/8" Shank CT Carbide (1526, 1528 ROCK BIT)
	5022	27/32" Shank CT Carbide (1554, 1555 ROCK BIT)
	5023	1.094 Shank DCT Carbide (1561/1562 ROCK BIT)
	5024	29/32" Shank DCT Carbide (1565 ROCK BIT)
	5026	27/32" Shank DCT Carbide (1554, 1555 ROCK BIT)
	5029	29/32" Shank DCT Carbide (1565 ROCK BIT)
	5030	27/32" Shank Ball Carbide (EXTREAM REAMER)
	5031	5/8" Shank Ball Carbide (EXTREAM REAMER)
	5032	1.259" Shank CT Carbide -1581

Endurance Bit Key for Incredibit Sonde Housing

Ref. No.	Part #	Description
	2201	Key - Dirt Bit to 2 3/4" or 3" Incredibit Sonde Housing
	2202	Key - Dirt Bit to 3 1/2" Incredibit Sonde Housing

Incredibit Rock Bit Adapter

Ref. No.	Part #	Description
	1760	3-1/2" Incredibit Rock Bit Adapter 2-3/8" API Pin
3	1750	4-1/8" Incredibit Rock Bit Adapter 2-7/8" API Pin
	1751	4-1/8" Incredibit Rock Bit Adapter 2-3/8" API Pin
	1754	4-1/8" Incredibit Rock Bit Adapter 3-1/2" API Pin
	1780	5" Incredibit Rock Bit Adapter 2-7/8" API Pin
	1782	5" Incredibit Rock Bit Adapter 3-1/2" API Pin



Railhead® Components

Sonde Housing Replacement Doors

Ref. No.	Part #	Description
	4405	SHD Door Single Block Sonde Housings
	4406	SHD Door Daul Block Sonde Housings
	4408	SHD Door 1810, 3200 Sonde Housings

Pulling Eyes

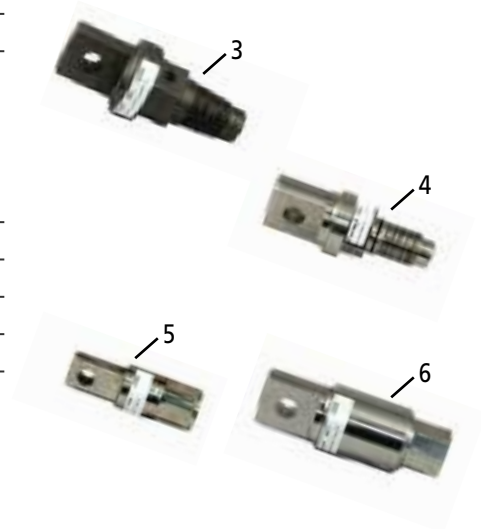
Ref. No.	Part #	Description
3	3003	Pulling Eye 2 1/2" Ramon Pin
4	3004	Pulling Eye 2" UNJ Pin
	3005	Pulling Eye Ditch Witch® 1.63 EZ 2 Box
5	3006	Pulling Eye Ditch Witch® 1.88 EZ 2 Box
6	3007	Pulling Eye Ditch Witch® 2.0 EZ 2 Box

Water Nozzles

Ref. No.	Part #	Description
	2150	BLANK ORIFICE (2-3/4 to 3-1/2" sh)
	2156	3X.064 ORIFICE (2-3/4 to 3-1/2" sh)
	2157	2X.096 ORIFICE (2-3/4 to 3 1/2" sh)
	2158	1X.250 ORIFICE (2-3/4"to 3-1/2" sh)
	2160	1X.250 ORIFICE (4-18" sh)

Sonde Block Set

Ref. No.	Part #	Description
	4716	SB Set DCI for 1800 SH
	4717	SB Set DCI for 1820 2820 SH
	4721	SB Set Radiodetection for 1800 SH
	4722	SB Set Radiodetection for 1820 & 2820 SH
	4726	SB Set McLaughlin 1800 SH
	4727	SB Set McLaughlin 1820 & 2820 SH
	4704	SB Set Subsite 86B/BH Dual Block SH
	4735	SB Set DCI dual Block SH
	4736	SB Set Radiodetection Dual Block SH
	4737	SB Set McLaughlin Dual Block SH



Ballantine Swivels

- 15,000 lb Swivel With a 4 to 1 Safety Factor Rating
- 3" Diameter with Recessed Holes for Pins
- Close Tolerance Lug Design to Match Ballantine Reamers
- Tapered Roller Bearing
- Includes Clevis Pins



<i>Part No.</i>	<i>Working Load</i>	<i>Body Dia.</i>	<i>Jaw Opening</i>	<i>Pin Dia.</i>
Ballantine				
B15KSVL	15,000 LB	3"	1 1/4"	1 1/8"

Extreme Duty Swivels

Extreme duty swivels are designed for underground as well as overhead applications that require a reliable, high quality swivel. All swivels in this series use a side mounted grease fitting for easy lubrication and feature a multiple seal system to retain lubrication and repel external contaminants.

Swivels are manufactured from high strength, quenched and tempered, chromolly steel. Their unique spindle design and bearing configuration give the extreme duty swivel outstanding side load capabilities with a minimum safety factor rating of 3 times the working load.



<i>Part No.</i>	<i>Working Load</i>	<i>Body Dia.</i>	<i>Jaw Opening</i>	<i>Pin Dia.</i>
Extreme Duty				
10910	9,000 LB	1 5/8"	3/4"	5/8"
10912	12,000 LB	2"	13/16"	3/4"
10914	15,000 LB	2 1/4"	7/8"	3/4"
10916	22,000 LB	2 1/2"	1"	7/8"
10918	32,000 LB	3"	1 3/8"	1 1/8"

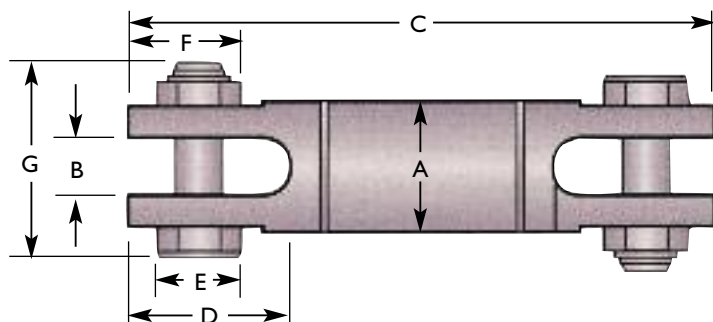
D.Drill® Directional Drilling Swivels

Designed specifically for directional drilling, the Condux 819 D.Drill Swivels prevent boring equipments' rotational torque from interfering with the product (cable or conduit) being pulled. The D.Drill Swivels are greasable and double sealed to keep contaminants out. Clevis pins with hex nuts allow for installation and removal from either side of the swivel. There is a 90 day warranty on the directional drill swivels.

CAUTION: To be used for directional drilling only.

CAUTION: Condux requires the use of a calcium based lubricant only.

Other lubricants may have adverse reactions when exposed to bentonite products. Condux requires that the swivels be flushed with grease after each use to purge any contaminants that may have penetrated past the seals into the swivel while boring. See next page for calcium based lubricants.



Part Number	Working Load Tension (lbs)	A (in)	B (in)	C (in)	D (in)	E (in)	F (in)	G (in)
08190016	8,500	1 ⁵ / ₈	.63	6.85	1.59	.56	.78	2.36
08190020	10,000	2	.75	7.83	1.81	.63	.75	2.89
08190025	20,000	2 ¹ / ₂	1.00	10.93	2.84	.88	1.25	3.67
08190030	30,000	3	1.31	12.75	3.56	1.13	1.37	4.50
08190040	45,000	4	1.63	15.25	4.00	1.25	1.84	5.58
08190045	60,000	4 ⁵ / ₈	1.75	17.48	4.62	1.50	2.13	6.31
08190060	90,000	6	2.00	18.27	4.50	1.75	2.18	6.59
08190080	120,000	8	2.25	21.71	5.25	2.00	2.50	8.25

Break-Away Swivels for Directional Drilling

Avoid overstressing cable or conduit being pulled in during directional drilling operations. The Condux Break-Away Swivels for directional drilling are designed exclusively to provide both the swivel and the break link for product pull-back. Eliminate the use of two or more components and shorten the gap between the reamer and pulling eye. No need to use "weak link" pipe sections or wire when using the Condux Break-Away Swivel.

Six different diameter swivels are available to accommodate various pulling needs. Break loads range from 1,900 lbs. (8,451 N) to 22,000 lbs. (97,856 N) and are designed to separate at $\pm 10\%$ of their rated break load. Order Replacement Pins as needed.

Note: D. Drill Swivels come with a 90 day limited warranty.

* Warning: These swivels to be used while Directional Drilling only – Severe personal injury could result if used with rope or steel winch lines in cable pulling applications.

1-1/4" Swivel (32 mm)

Part #	Break Load	
	(lbs)	(N)
08019400*	1,900	8,451
08019500*	2,000	8,896
08019600*	2,500	11,120
08019700*	3,000	13,344
08076100*	3,400	15,123
08019800*	4,000	17,792

1-3/8" Swivel (35 mm)

08019900*	4,500	20,016
08021300*	5,000	22,240
08022100*	5,500	24,464
08024200*	6,000	26,688
08024400*	6,500	28,912

1-5/8" Swivel (41 mm)

08024500*	7,000	31,136
08025500*	7,500	33,360
08027900*	8,000	35,584
08028400*	8,500	37,808

2" Swivel (51 mm)

08029200*	9,000	40,032
08029400*	10,000	44,480

2-1/2" Swivel (64 mm)

08029600*	12,000	53,376
08029700*	14,000	62,272

3" Swivel (76 mm)

08075600*	18,500	82,288
08075800*	22,000	97,856



Break-Away D.Drill® Swivel
1 1/4"–1 3/8"

U.S. Patent No. 4,687,365.



Break-Away D.Drill® Swivel
1 5/8"–3"

U.S. Patent No. 4,687,365.

U.S. Patent No. 5,607,248.

PE & PVC Pulling Eyes

Condux PE & PVC Pulling Eyes provide optimum gripping power and a watertight design. The watertight pulling eyes feature a multiple o-ring configuration, an extremely rigid center rod to prevent bending and a steel tapered lead cone with the same OD as the conduit. These design features protect the outer leading edge of the conduit and form a watertight seal. Condux PE & PVC Pulling Eyes also feature split gripping segments with aggressive gripping threads coupled with a steel expander plug that better grips the full range of conduit I.D.s.

Installation of the PE & PVC Pulling Eyes simply requires the leading eye to be tightened. The pulling eyes come standard with attachment eyes at both ends for connecting rope or steel lines. Pull-out strengths generally exceed the tensile capacity of the conduit.

See Ordering Information page 59.

Note: PE & PVC Pulling Eyes come with a 90 day limited warranty.



PE & PVC Pulling Eyes, O-Rings & O-Rings in Sleeve

<i>Eye Part No.</i>	<i>O-Ring Part No.</i>	<i>O-Rings in Sleeve Part No.</i>
08220600	02269636	02288994
08220601	08010414	02288920
08220602	02269625	02288921
08220609	02269633	02288993
08220603	02269624	02288922
08220604	02269621	02288888
08220605	02269626	02288927
08220606	02269622	02288890
08220608	02269631	02288923



PE & PVC Pulling Eyes

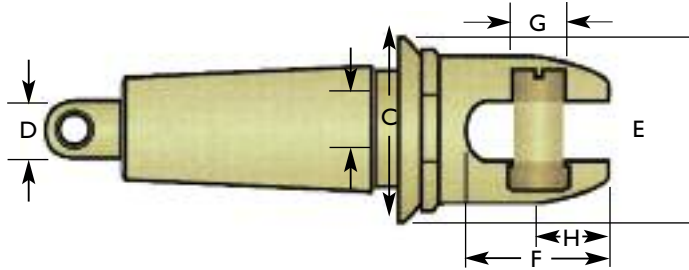
Part No.	Size in (mm)	Length in (mm)	Conduct ID in (mm)		Lean Cone O.D.	Duct Type	Nom. Duct I.D. in (mm)
			Min.	Max.			
08220600	1 1/4 (32)	6.23 (158)	1.25 (32)	1.50 (38)	2.00 (51)	1.25 SDR 11.0	1.33 (34)
						1.25 Sch 40	1.38 (35)
						1.25 SDR 13.5	1.39 (35)
						1.25 SDR 15.5	1.43 (36)
						1.25 SDR 17.0	1.44 (37)
						1.25 SDR 21.0	1.50 (38)
08220601	1 1/2 (38)	6.23 (158)	1.50 (38)	1.75 (44)	2.25 (57)	1.5 SDR 11.0	1.53 (39)
						1.5 SDR 13.5	1.60 (41)
						1.5 SDR 40	1.61 (41)
						1.5 SDR 15.5	1.63 (41)
						1.5 SDR 17.0	1.66 (42)
						1.5 SDR 21.0	1.72 (44)
08220602	2 (51)	8.18 (208)	1.88 (48)	2.15 (55)	2.75 (70)	2.0 SDR 11.0	1.92 (49)
						2.0 SDR 13.5	2.00 (51)
						2.0 SDR 15.5	2.05 (52)
						2.0 Sch 40	2.07 (53)
						2.0 SDR 17.0	2.08 (53)
						2.0 SDR 21.0	2.15 (55)
08220609	2 1/2 (64)	8.80 (224)	2.31 (48)	2.56 (55)	3.31 (70)	2.5 SDR 11.0	2.32 (59)
						2.5 SDR 13.5	2.42 (61)
						2.5 Sch 40	2.47 (63)
						2.5 SDR 15.5	2.49 (63)
						2.5 SDR 17.0	2.51 (64)
08220603	3 (76)	11.89 (302)	2.69 (68)	3.13 (79)	4.00 (102)	3.0 SDR 11.0	2.83 (72)
						3.0 SDR 13.5	2.95 (75)
						3.0 SDR 15.5	3.02 (77)
						3.0 SDR 17.0	3.06 (78)
						3.0 Sch 40	3.07 (78)
08220604	4 (102)	14.11 (358)	3.50 (89)	4.06 (103)	5.00 (127)	4.0 SDR 11.0	3.63 (92)
						4.0 SDR 13.5	3.79 (96)
						4.0 Sch 80	3.83 (97)
						4.0 SDR 15.5	3.89 (99)
						4.0 SDR 17.0	3.94 (100)
						4.0 Sch 40	4.03 (102)
*08220610	4 (102)	14.11 (358)	3.50 (89)	4.06 (103)	5.00 (127)	4.0 SDR 21.0	4.05 (103)
						4.0 SDR 11.0	3.63 (92)
						4.0 SDR 13.5	3.79 (96)
						4.0 Sch 80	3.83 (97)
						4.0 SDR 15.5	3.89 (99)
						4.0 SDR 17.0	3.94 (100)
08220605	5 (127)	18.45 (469)	4.25 (108)	5.06 (129)	5.00 (152)	4.0 Sch 40	4.03 (102)
						4.0 SDR 21.0	4.05 (103)
						5.0 SDR 11.0	4.49 (114)
						5.0 SDR 13.5	4.69 (119)
						5.0 SDR 15.5	4.80 (122)
						5.0 SDR 17.0	4.87 (124)
08220606	6 (152)	19.60 (498)	5.06 (129)	6.00 (152)	7.13 (181)	5.0 SDR 21.0	5.00 (127)
						5.0 Sch 40	5.05 (128)
						6.0 SDR 11.0	5.35 (136)
						6.0 SDR 13.5	5.58 (142)
						6.0 SDR 15.5	5.72 (145)
08220608	8 (203)	21.53 (547)	6.63 (168)	7.69 (195)	9.25 (235)	6.0 SDR 17.0	5.80 (147)
						6.0 SDR 21.0	5.96 (151)
						8.0 SDR 11.0	6.96 (177)
						8.0 SDR 13.5	7.27 (185)
						8.0 SDR 15.5	7.45 (189)
						8.0 SDR 17.0	7.55 (192)

*Non-sleeved

Swivel Head Innerduct Pulling Eye

The Innerduct Pulling Eye is a hybrid tool that combines features from standard innerduct pulling eyes and Condux swivels. A swivel head prevents twisting and binding of the innerduct as it is installed. It eliminates the need for a separate swivel on each pulling eye when installing single innerducts into individual conduits or multiple innerducts into a single conduit. Its short length is an advantage on tight bends compared to using a separate swivel and pulling eye. Easily installed using a 1³/₈" deep socket or adjustable wrench.

Note: To determine correct pulling eye size, obtain the actual innerduct inside diameter (I.D.). The I.D. measurement must be greater than dimension A and smaller than dimension B.

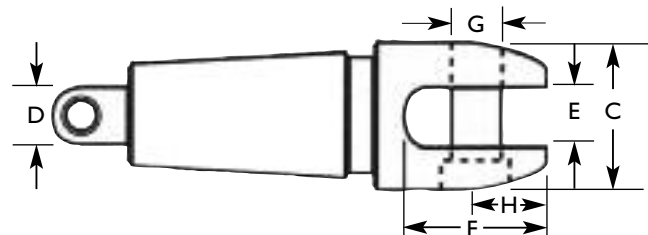


Part Number	Normal Size (in) (mm)	Innerduct I.D. Range A-B (in) A-B (mm)	Max O.D. C (in) (mm)	Hole Dia. D (in) (mm)	Slot Width E (in) (mm)	Slot Depth F (in) (mm)	Pin Dia. G (in) (mm)	Pin Center H (in) (mm)
08960712*	1-1 ¹ / ₄ 25-32	1.06-1.43 27-37	1.75 44	.44 11	.56 14	1.31 33	.44 11	.56 14
08960715*	1 ¹ / ₂ 38	1.37-1.68 35-43	2.00 51	.44 11	.56 14	1.31 33	.44 11	.56 14
08960720*	2 51	1.93-2.12 49-54	2.44 62	.44 11	.56 14	1.31 33	.44 11	.56 14

Clevis Head Innerduct Pulling Eye

Same tapered threads as the standard innerduct pulling eye, these pulling eyes feature a slotted head with clevis pin to permit direct attachment to any Condux multiple pulling harness leg ends. When properly sized and installed, these eyes will not pull out of the innerduct until the pulling tensions have greatly exceeded the maximum pulling tensions recommended by the innerduct manufacturers.

Note: To determine correct pulling eye size, obtain the actual innerduct inside diameter (I.D.). The I.D. measurement must be greater than dimension A and smaller than dimension B.



Part Number	Nominal Size (in) (mm)	Innerduct I.D. Range A-B (in) A-B (mm)	Max O.D. C (in) (mm)	Hole Dia. D (in) (mm)	Slot Width E (in) (mm)	Slot Depth F (in) (mm)	Pin Dia. G (in) (mm)	Pin Center H (in) (mm)
08913525*	3/4 19	.71-.87 18-22	1.25 32	.25 6	.56 14	1.34 34	.38 9	.59 15
08913502*	1 25	.93-1.06 24-27	1.38 35	.25 6	.56 14	1.31 33	.44 11	.56 14
08913535*	1 ¹ / ₄ 32	1.06-1.43 27-37	1.75 44	.38 9	.75 19	1.88 47	.63 16	.81 21
08913536*	1 ¹ / ₂ 38	1.37-1.68 35-43	2.00 51	.38 9	.75 19	1.78 45	.63 16	.72 18

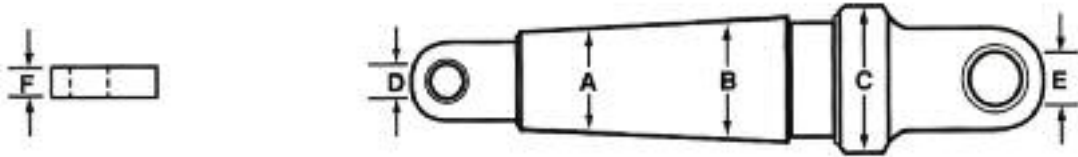
Fixed Head Innerduct Pulling Eye

Tapered buttress threads thread into the innerduct for maximum pulling strength. These eyes connect directly to a Condux swivel. When properly sized and installed, these eyes will not pull out of the innerduct until the pulling tensions have greatly exceed the maximum pulling tensions recommended by the innerduct manufacturers.

Note: To determine correct pulling eye size, obtain the actual innerduct inside diameter (I.D.). The I.D. measurement must be greater than dimension A and smaller than dimension B.



Fixed Head Innerduct Pulling Eye, continued



Part Number	Innerduct Range (in)	SDR	Innerduct I.D. Range A-B (in)	A-B (mm)	Max O.D. C (in) (mm)	Hole Dia. D (in) (mm)	Eye Dia. E (in) (mm)	Thickness F (in) (mm)
08913400	3/4	7-15	.71-.87	18-22	1.25 32	.25 6	.50 13	.45 10
08913401	1-1 1/8	7-15	.88-1.20	22-30	1.50 38	.38 10	.50 13	.45 10
08913402	1 1/4	9-15	1.21-1.41	31-36	1.75 44	.38 10	.50 13	.45 10
08913403	1 1/2	9-15	1.42-1.62	36-41	2.00 51	.38 10	.50 13	.45 10
08913404	2	9-15	1.78-2.03	45-52	2.50 64	.38 10	.50 13	.45 10

Reusable Power Cable Pulling Eyes

Condux non-crimp Reusable Cable Pulling Eyes waste virtually no cable and all components are completely reusable. These eyes will remain firmly secured on the cable for a confident pull. No special tools or crimpers are required for installation.

Three designs of Reusable Power Pulling Eyes are available: Clevis Head, Standard Head, and Swivel Head.

Note: When properly installed, all Condux Reusable Power Pulling Eyes will exceed the recommended maximum pulling tensions for single conductor power cable as specified by the cable manufacturer.

Note: All Reusable Eyes are color coded for ease of use.



Reusable Power Pulling Eyes, Clevis Head

The Clevis Head Power Pulling Eyes feature a slotted head with clevis pin to allow direct attachment to the Condux multiple pulling harness. When pulling multiple cables into a single conduit, the conductors can be attached to a harness and installation is simplified to a single pull of one assembly. Each Clevis Head Power Pulling Eye includes a clevis socket, sleeve nut, and plug.



Part Number	Cable Size	Color	Max Conductor Diameter (in) (mm)	Max Eye O.D. A (in) (mm)	Slot Width B (in) (mm)	Slot Depth C (in) (mm)	Pin Dia. D (in) (mm)	Pin Center E (in) (mm)
08918150+	2500 kcmil	Green	1.824 46	3.00 76	1.00 25	2.80 71	.88 22	1.23 31
08918050+	2000 kcmil	Red	1.601 41	2.50 64	1.00 25	2.80 71	.88 22	1.23 31
08917750+	1750 kcmil	Yellow	1.526 39	2.50 64	1.00 25	2.80 71	.88 22	1.23 31
08917950*	1500 kcmil	Black	1.412 36	2.38 60	.75 19	1.78 45	.63 16	.72 18
08917850*	1250 kcmil	Blue	1.289 33	2.25 57	.75 19	1.78 45	.63 16	.72 18
08917150*	1000 kcmil	Orange	1.152 29	2.06 52	.75 19	1.78 45	.63 16	.72 18
08917250*	750 kcmil	Brown	.998 25	1.75 44	.63 16	1.59 40	.56 14	.78 20
08917350*	700 kcmil	Gray	.964 24	1.75 44	.63 16	1.59 40	.56 14	.78 20
08917450*	500 kcmil	Yellow	.813 21	1.44 37	.59 15	1.41 36	.44 11	.59 15
08917550*	350 kcmil	White	.681 17	1.25 32	.56 14	1.34 34	.38 10	.59 15
08960350**	250 kcmil	Blue	.575 15	1.13 29	.38 10	1.06 27	.31 8	.53 13
08960450**	4/0 AWG	Green	.528 13	1.00 25	.38 10	1.06 27	.31 8	.53 13
08960850**	2/0 AWG	Black	.419 11	1.00 25	.38 10	1.06 27	.31 8	.53 13
08960550**	1/0 AWG	Red	.373 9	.88 22	.38 10	1.06 27	.31 8	.53 13

+ - Will fit 3/8" (9.5 mm) and 1/2" (13 mm) cable pulling harnesses.

* - Will fit all Condux pulling harnesses.

** - Will fit the 1/8" (3 mm) and 1/4" (6 mm) cable pulling harnesses.

Reusable Power Pulling Eyes, Standard Head

The Standard Head Power Pulling Eyes are an excellent alternative when pulling multiple cables into a single conduit. Single conductors can be attached to a Condux Multiple Pulling Harness with links or with Condux swivels. Installation is then simplified to a single pull of one assembly. Each Standard Power Pulling Eye includes an eye socket, sleeve nut, and plug.



Part Number	Cable Size	Color	Max Conductor Diameter		Max Eye O.D.		Hole Dia. D		Eye Thickness T	
			(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)
08918120	2500 kcmil	Green	1.824	46	3.00	76	1.00	25	.50	13
08918020	2000 kcmil	Red	1.601	41	2.50	64	1.00	25	.50	13
08917720	1750 kcmil	Yellow	1.526	39	2.50	63	1.00	25	.50	13
08917920	1500 kcmil	Black	1.412	36	2.38	60	1.00	25	.50	13
08917820	1250 kcmil	Blue	1.289	33	2.25	57	1.00	25	.50	13
08917120	1000 kcmil	Orange	1.152	29	2.06	52	1.00	25	.50	13
08917220	750 kcmil	Brown	.998	25	1.75	44	.60	15	.43	11
08917320	700 kcmil	Gray	.964	24	1.75	44	.60	15	.43	11
08917420	500 kcmil	Yellow	.813	21	1.50	38	.81	21	.50	13
08917520	350 kcmil	White	.681	17	1.25	32	.75	19	.50	13
08960320	250 kcmil	Blue	.575	15	1.13	29	.63	16	.50	13
08960420	4/0 AWG	Green	.528	13	1.00	25	.50	13	.34	9
08960820	2/0 AWG	Black	.419	11	1.00	25	.50	13	.34	9
08960520	1/0 AWG	Red	.373	9	.88	22	.50	13	.34	9

Reusable Power Pulling Eyes, Swivel Head

The Swivel Head Power Pulling Eye is a hybrid tool that combines features from standard reusable power pulling eyes and Condux swivels for superior performance. A swivel head prevents twisting and binding of the cable as it is installed. It eliminates the need for a separate swivel on each pulling eye when installing single cables into individual conduits or multiple cables into a single conduit. Each Swivel Head Power Pulling Eye includes a swivel head, sleeve nut, and plug.



Part Number	Cable Size	Color	Max Conductor Diameter		Max Eye O.D. A		Slot Width B		Slot Depth C		Pin Dia. D		Pin Center E	
			(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)
08918175*	2500 kcmil	Green	1.824	46	3.00	76	1.00	25	2.80	71	.88	22	1.23	31
08918075*	2000 kcmil	Red	1.601	41	2.50	64	1.00	25	2.80	71	.88	22	1.23	31
08917775*	1750 kcmil	Yellow	1.526	39	2.50	64	1.00	25	2.80	71	.88	22	1.23	31
08917975*	1500 kcmil	Black	1.412	36	2.38	60	.75	19	1.78	45	.63	16	.72	18
08917875*	1250 kcmil	Blue	1.289	33	2.25	57	.75	19	1.78	45	.63	16	.72	18
08917175*	1000 kcmil	Orange	1.152	29	2.06	52	.75	19	1.78	45	.63	16	.72	18
08917275*	750 kcmil	Brown	.998	25	1.75	44	.63	16	1.59	40	.56	14	.78	20
08917375*	700 kcmil	Gray	.964	24	1.75	44	.63	16	1.59	40	.56	14	.78	20
08917475*	500 kcmil	Yellow	.813	21	1.44	37	.56	14	1.31	33	.44	11	.56	14
08917575*	350 kcmil	White	.681	17	1.25	32	.56	14	1.34	34	.38	10	.59	15
08960375**	250 kcmil	Blue	.575	15	1.13	29	.38	10	1.06	27	.31	8	.53	13
08960475**	4/0 AWG	Green	.528	13	1.00	25	.38	10	1.06	27	.31	8	.53	13
08960875**	2/0 AWG	Black	.419	11	1.00	25	.38	10	1.06	27	.31	8	.53	13
08960575**	1/0 AWG	Red	.373	10	.88	22	.38	10	1.06	27	.31	8	.53	13

* - Will fit 3/8" (9.5 mm) and 1/2" (13 mm) cable pulling harnesses.

* - Will fit all Condux pulling harnesses.

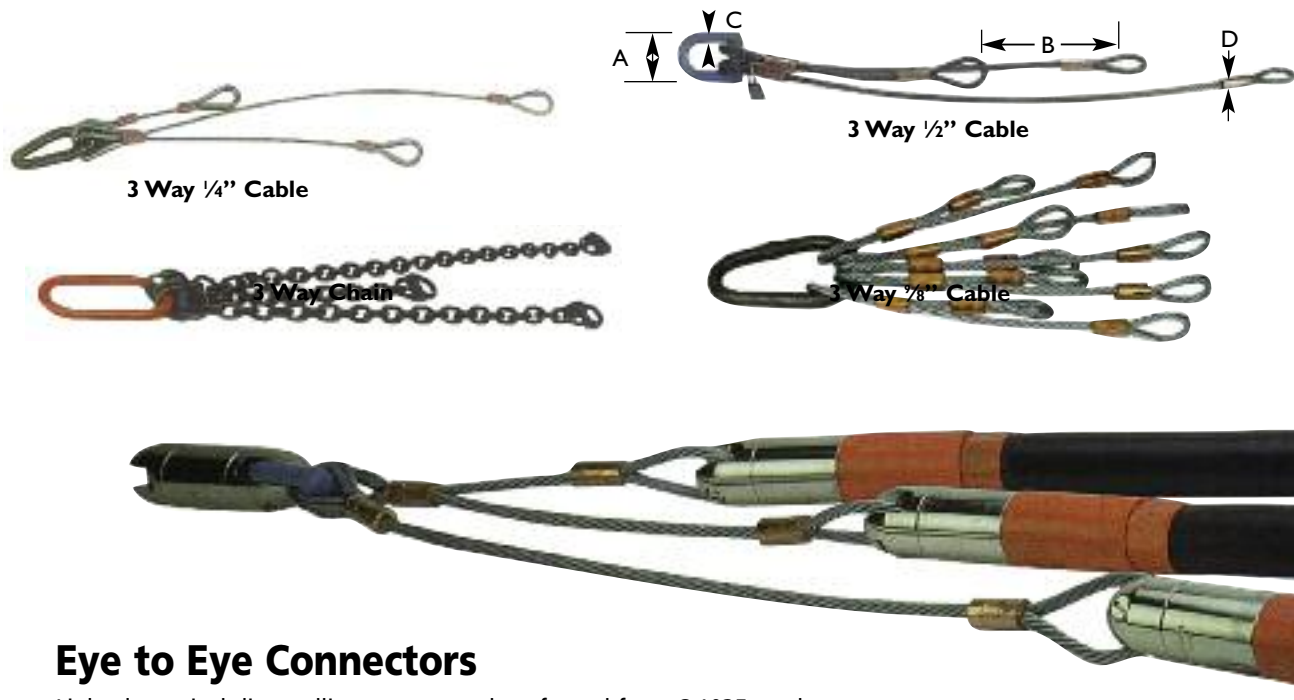
** - Will fit the 1/8" (3 mm) and 1/4" (6 mm) cable pulling harnesses.

Multiple Pulling Harness

Allows staggered attachment to cable or innerduct when pulling through conduit systems or during directional drilling pull-back operations. Choice of steel cable or chains (varies by model). Other harness combinations available upon request. Contact factory for details.

Part Number	Description	Working Load Per Leg		Working Load Combined		Max. Width A		Separation Between Legs B		Lead Ring Dia. C		Leg Dia. D	
		(lbs)	(N)	(lbs)	(N)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)
08549200	3 Way 1/8" (3 mm) Cable	550	2,446	1,600	7,117	2.25	57	14	356	.37	10	.12	3
08549230	3 Way 1/4" (6 mm) Cable	1,400	6,228	2,900	12,899	3.00	76	14	356	.50	13	.25	6
08549325	4 Way 1/4" (6 mm) Cable	1,400	6,228	4,200	18,682	3.75	95	14	356	.62	16	.25	6
08569910	5 Way 1/4" (6 mm) Cable	1,400	6,228	4,200	18,682	3.75	95	14	356	.62	16	.25	6
08549326	6 Way 1/4" (6 mm) Cable	1,400	6,228	4,200	18,683	3.75	95	14	356	.63	16	.25	6
08549333	3 Way 3/8" (10 mm) Cable	4,800	21,350	9,000	40,032	2.63	67	10	254	.62	16	.38	10
08549329	4 Way 3/8" (10 mm) Cable	4,800	21,350	9,000	40,032	2.63	67	10	254	.62	16	.38	10
08549330	10 Way 3/8" (10 mm) Cable	4,800	21,351	6,000	26,689	4.50	114	6	152	.75	19	.38	10
08549334	12 Way 3/8" (10 mm) Cable	4,800	21,351	6,000	26,689	4.50	114	6	152	.75	19	.38	10
08549342	16 Way 3/8" (10 mm) Cable	4,800	21,351	6,000	26,689	4.50	114	6	152	.75	19	.38	10
08549331	2 Way 1/2" (13 mm) Cable	7,000	31,136	10,000	44,480	2.50	64	12	305	.50	13	.50	13
08549332	3 Way 1/2" (13 mm) Cable	7,000	31,136	15,000	66,720	3.75	95	12	305	.87	22	.50	13
08549340	4 Way 1/2" (13 mm) Cable	7,000	31,136	15,000	66,720	3.75	95	12	305	.87	22	.50	13

Note: 10 & 12 Way 3/8" (10 mm) harnesses only have a single stagger. All other harnesses are sequentially staggered.



Eye to Eye Connectors

Light duty winch line pulling connector drop forged from C-1035 steel. Hot dip galvanized.

Part Number	Size		Working Load	
	(in)	(mm)	(lbs)	(N)
08050300	3/8	10	2,200	9,786
08050500	1/2	13	3,600	16,013
08050501	5/8	16	5,200	23,130

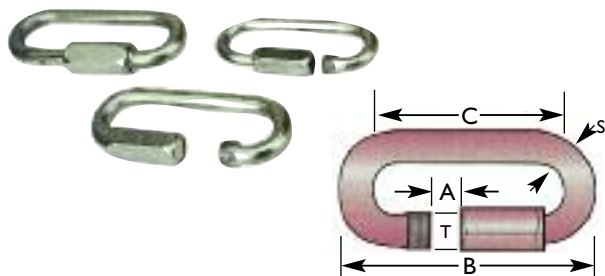
Note: To be used for cable stringing or pulling only.



Threaded Chain Connectors

Offer a quick and easy way to connect pulling eyes or swivels to winch lines, harnesses or rope. To close, simply screw the nut onto the threaded end. Connectors are reusable.

Note: To be used for cable stringing or pulling only.

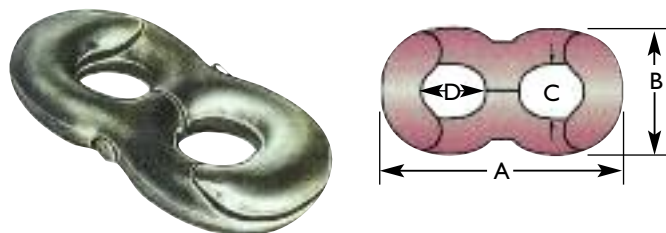


Part Number	Work Load Limit		Stock Diameter S		Threaded Shaft T		A		B		C	
	(lbs)	(N)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)
08581212	200	890	0.125	3.2	0.20	5	0.375	9.5	1.813	46.0	1.563	40
08581218	550	2,446	0.188	4.8	0.27	7	0.500	12.7	2.438	61.9	2.063	52
08581225	770	3,425	0.250	6.4	0.35	9	0.563	14.3	2.750	69.9	2.313	59
08581231	1,430	6,361	0.313	7.9	0.43	11	0.688	17.5	3.438	87.3	2.813	71
08581237	1,760	7,828	0.375	9.5	0.47	12	0.750	19.1	3.750	95.3	3.000	76
08581250	2,755	12,254	0.500	12.7	0.60	15	0.938	23.8	4.875	123.8	3.938	100
08581256	4,410	19,616	0.563	14.3	0.67	17	1.063	27.0	5.563	141.3	4.500	114
08581262	5,510	24,508	0.625	15.9	0.74	19	1.125	28.6	6.313	160.3	5.063	129
08581268	6,615	29,424	0.688	17.5	0.86	22	1.250	31.8	6.938	176.2	5.500	140
08581278	7,935	35,295	0.781	19.8	0.93	24	1.375	34.9	7.813	198.4	6.250	159

Threaded Chain Connector Compatibility Chart						
Chain Connector Part Number	Size in (mm)	Pulling Eye Size Range		Eye to Eye Connectors Size	Pulling Harnesses	
		Standard Head Reusable Power Pulling Eyes Cable Size	Fixed Head Innerduct Pulling Eyes Duct I.D. in (mm)		Separate Leg Ends	Large Front Link
08581212	1/8 (3)	1/8-4/8 AWG	—	—	1/8, 1/4	—
08581218	3/16 (5)	1/8-4/8 AWG, 700, 750 kcmil	All	3/8	1/8, 1/4, 3/8	1/8
08581225	1/4 (6)	1/8-4/8 AWG, 350, 700, 750 kcmil	All	3/8, 1/2	1/8, 1/4, 3/8	1/8
08581231	5/16 (8)	All	All	All	All Cable	1/8, 3 x 1/4, 2 x 1/2, Chain
08581237	3/8 (10)	All	All	All	All Cable	1/8, 1/4, 3/8, 2 x 1/2, Chain
08581250	1/2 (13)	250-2,500 kcmil	—	All	All	All
08581256	9/16 (14)	350, 500, 1,000-2,500 kcmil	—	All	All	All
08581262	5/8 (16)	350, 500, 1,000-2,500 kcmil	—	All	All	All
08581268	11/16 (17)	1,000-2,500 kcmil	—	All	All	All
08581278	7/8 (22)	1,000-2,500 kcmil	—	All	All	All

Swing Link

For quick connections to winch line or pulling harnesses.



Part Number	Size		Working Load		A Length		B Width		C Eye ID		D Eye ID	
	(in)	(mm)	(lbs)	(N)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)
08580825	1/4	6	540	2,402	1.94	49	.94	24	.38	10	.50	13
08580837	3/8	10	900	4,003	2.90	74	1.31	33	.50	13	.63	16
08580850	1/2	13	1,620	7,206	3.25	83	1.63	41	.69	18	.75	19
08580875	3/4	19	3,600	16,013	5.00	127	2.50	64	.94	24	1.13	29
08580899	1	25	8,100	36,029	6.50	165	3.25	83	1.25	32	1.5	38

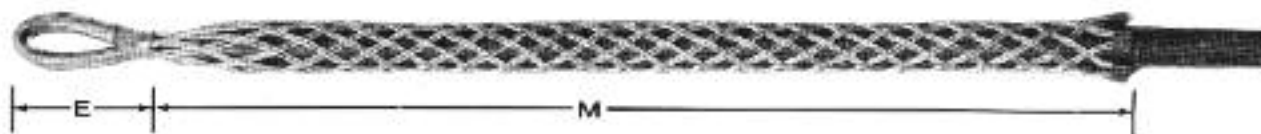
Swing Link Compatibility Chart						
Swing Link Part Number	Size in (mm)	Pulling Eye Size Range Standard Head Reusable Power Pulling Eyes Cable Size	Fixed Head Innerduct Pulling Eyes Duct I.D. in (mm)	Eye to Eye Connectors Size	Pulling Harnesses	
					Separate Leg Ends	Large Front Link
08580825	1/4 (6)	—	—	—	1/8, 1/4	—
08580837	3/8 (10)	500, 700, 750 kcmil	—	3/8	1/8, 1/4, 3/8, Chain	—
08580850	1/2 (13)	350, 500, 1,000-2,500 kcmil	—	3/8, 1/2	All Cable	2 x 1/2
08580875	3/4 (19)	1,000-2,500 kcmil	—	All	All Cable	1/8, 1/4, 3/8, 2 x 1/2, Chain
08580899	1 (25)	—	—	1/2, 5/8	All Cable	All

Wire Mesh Pulling Grips

Sizes and styles for all applications

- Manufactured from Hi-Fatigue Plastic Coated Aircraft Strand Steel Cable
- Available in Single Weave, Double Weave, Triple Weave, Quadruple Weave for all Standard or Heavy-Duty Applications
- Any Size—Any Strength Available

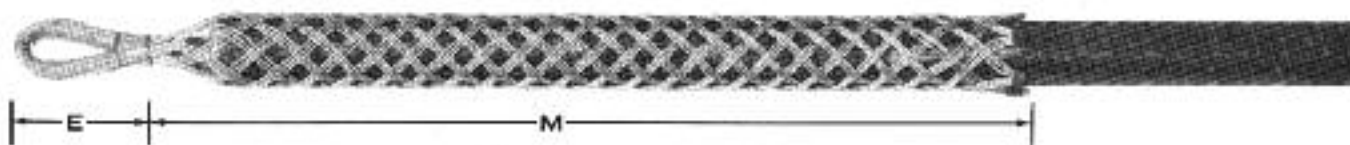
Model A Single Weave or Double Weave – 3/4" to 1-1/4"



Size	Work Load	Weight	Weave	Mesh Length	Eye
3/4" - 1-1/4"	1,000 lbs.	5 1/2 oz.	Single	18"	3"
	2,000 lbs.	8-1/2 oz.	Double	24"	

Part No.	Description
A-SW-18	3/4" - 1 1/4" Single Weave Grip 18" Mesh Length
A-DW-18	3/4" - 1 1/4" Double Weave Grip 18" Mesh Length
A-SW-24	3/4" - 1 1/4" Single Weave Grip 24" Mesh Length
A-DW-24	3/4" - 1 1/4" Double Weave Grip 24" Mesh Length

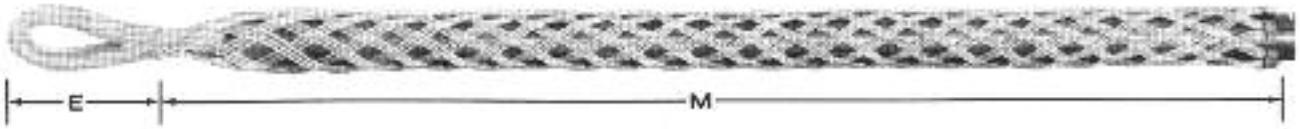
Model B Triple Weave – 1-1/4" to 2"



Size	Work Load	Weight	Weave	Mesh Length	Eye
1-1/4" - 2"	2,500 lbs.	13 oz.	Triple	26"	3-1/4"
	3,500 lbs.	1 lb. 1 oz.		32"	

Part No.	Description
B-TW-26	1 1/4" - 2" Triple Weave Grip 26" Mesh Length
B-TW-32	1 1/4" - 2" Triple Weave Grip 32" Mesh Length

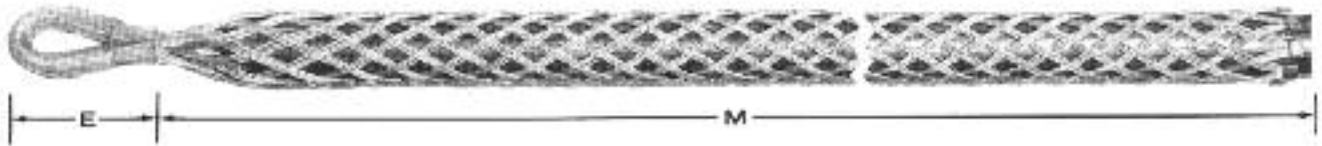
Model C Triple Weave – 2" to 2- 3/4"



Size	Work Load	Weight	Weave	Mesh Length	Eye
2" - 2-3/4"	3,500 lbs.	1 lb. 4 oz.	Triple	32"	3-1/2"
	4,500 lbs.	1 lb. 11 oz.		38"	

Part No.	Description
C-TW-32	2" - 2 3/4" Triple Weave Grip 32" Mesh Length
C-TW-38	2" - 2 3/4" Triple Weave Grip 38" Mesh Length

Model D Triple Weave – 2-3/4" to 3-1/2"



Size	Work Load	Weight	Weave	Mesh Length	Eye
2-3/4" - 3-1/2"	4,500 lbs.	1 lb. 12 oz.	Triple	38"	3-3/4"
	5,500 lbs.	2 lbs. 2 oz.		46"	

Part No.	Description
D-TW-38	2 3/4" - 3 1/2" Triple Weave Grip 38" Mesh Length
D-TW-46	2 3/4" - 3 1/2" Triple Weave Grip 46" Mesh Length

Jet Lube

Ref No	Part No.	Product	Description
1	37341	769 Lubricant & Penetrant	Multi-purpose penetrant, lubricant, moisture displacing, corrosion preventative.
2	61542	Clean Up Degreaser/ Safety solvent	A heavy duty, nonflammable, chlorinated solvent. Excellent brake and electric motor cleaner. 29 KV Dielectric Strength.
3	31050	CB-2Super-Lith Grease 14 oz	Lithium-based product provides the superior lubricity of PTFE*.
4	37750	Alco EP 73 Plus	Premium MP Grease
5	34041	WRL Wire Rope & chain Lube	Quickly penetrates to the wire rope core or between pin and roller bushing for maximum rope and chain lubrication.
6	10923	Jet-Lube 21Drill Pipe Compound 1 Gal.	Formulated and blended from the same ingredients as KOPR-KOTE, JET-LUBE 21 is specifically designed for intermediate drilling conditions such as softer formations. Environmentally, preferred, lead-free product can be used throughout the entire drill string "from the swivel to the bit," on drill collars, tool joints, etc. *Zinc available upon request.
7	170	Thread Lock Compound 1/2 lb.	Secure threaded connections and other tool joints; heat to 1800 degrees to break out.
8	10050	Thread Protector	14 oz. Cartridge Kopr-Kote
NS	03000	Dope Brush	Brush to apply thread protectant

JET-LUBE 21 is a medium priced compound and the professional product of choice for all intermediate drilling applications.





Take full advantage of Ballantine's professionally trained, experienced and knowledgeable sales and customer service departments. Our full time factory direct field sales staff works hand-in-hand with our customer service staff to serve our customers as efficiently as possible. Our commitment to quality (ISO 9001:2000 Certification) demonstrates that we have processes in place that assures consistent superior quality products and service. Ballantine is committed to serving the HDD industry and all of our customers and we aspire to be a significant contributor to you and your company's profitability, growth and success.

Toll Free Customer Service Support: 1.800.328.2424

www.ballantineinc.com

parts@ballantineinc.com

All major credit cards accepted

For terms and conditions of sale, see Ballantine's Master Price List



Warning

Use Care To Prevent Injury Comply with the Following to Avoid Serious Personal Injury

1. Guards must be provided on all chain and sprocket installations in accordance with provisions of ANSI/ASME B15.1 - 1996 "Safety Standards for Mechanical Power Transmission Apparatus," and ANSI/ASME B20.1 - 1996 "Safety Standards for Conveyors and Related Equipment," or other applicable safety standards. When revisions of these standards are published, the updated edition shall apply.
2. Always lock out power switch before installing, removing, lubricating or servicing a chain system.
3. When connecting or disconnecting chain:
 - a. Eye protection is required. Wear safety glasses, protective clothing, gloves, and safety shoes.
 - b. Support the chain to prevent uncontrolled movement of chain and parts.
 - c. Use of pressing equipment is recommended. Tools must be in good condition and properly used.
 - d. Determine correct direction for pin/rivet removal or insertion.

NOTES

ALL MANUFACTURER'S NAMES, SYMBOLS, AND DESCRIPTIONS ARE USED FOR REFERENCE PURPOSES ONLY AND
NONE OF THE PARTS LISTED ARE THE PRODUCTS OF THESE MANUFACTURERS.

Anoka, Minnesota

Atlanta, Georgia

Ontario, California

Toll Free Customer Service: 800/328-2424

w w w . b a l l a n t i n e i n c . c o m