



Venturi Jet Junk Basket

3.125 inch

MAN-TTT-320-3125 (R01)

Thru-Tubing Technology

A Division of Owen Oil Tools LP

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3.125 Venturi Jet Junk Basket

Description/Operation

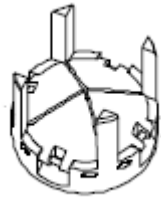
The Venturi Jet Junk Basket is used to retrieve junk from the wellbore. When fluid is pumped through the coil tubing to the Venturi, nozzles direct the flow to the OD of the tool toward the bottom, a vacuum is created in the Venturi chamber and fluid and debris is drawn into the bottom of the tool. A debris screen is located between the Venturi chamber and the cages that will hold the debris inside the tool. The cages are used to trap the debris from falling out, and the screen prevents it from recirculating around the ports. The volume of the debris chamber may be enlarged by the addition of extensions between the cage housing and the screen housing. The nozzles are replaceable to achieve any possible ratio of flow rate and psi combination. The Cage Housing on the bottom of the tool can also be dressed with carbide for milling or washing over a fish. The housings are also available with CS threads. An important feature of the Venturi is that it is not dependant on the hole size to work. The rate of the Venturi action is much higher than the pump rate, no matter the hole size and nitrogen can be used without damaging the tool. The Venturi can be run with or without a mud motor.



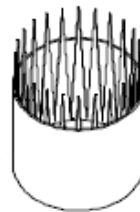
Note: Unless otherwise indicated, all the strength figures given in this manual, are the result of calculations based on the yield strength of the material used in the manufacture of this product. These strength calculations are considered accurate within plus or minus 20% and are to be used only as a guide. They do not constitute a guarantee, actual or implied. In use, appropriate allowance should be made as a safety factor.

Finger and Flutter cages - open and closed.

Finger Cage size 2-1/32 in. and Flutter Cage size 2-7/16 in.



Finger Cages



Flutter Cages

3.125 Venturi Jet Junk Basket

Nozzle Flow Chart, Water

Size and Quantity of Nozzles						Capacity in Gallons Per Minute at psi						
10	15	25	40	70	90	500 psi	600 psi	700 psi	800 psi	1,000 psi	1,500 psi	2,000 psi
3						10.5	11.7	12.6	13.5	15	18.3	21.3
2	1					12.3	13.6	14.7	15.7	17.5	21.4	24.8
1	2					14.1	15.5	16.8	17.9	20	24.5	28.3
	3					15.9	17.4	18.9	20.1	22.5	27.6	31.8
2		1				15.9	17.5	18.9	20.1	22.5	27.6	31.8
1	1	1				17.7	19.4	21	22.4	25	30.6	35.4
	2	1				19.5	21.3	23.1	24.6	27.5	33.7	38.9
1		2				21.3	23.3	25.2	26.9	30	36.7	42.5
2			1			21.3	23.3	25.2	26.9	30	36.7	42.5
	1	2				23.1	25.2	27.3	29.1	32.5	39.8	46
1	1		1			23.1	25.2	27.3	29.1	32.5	39.8	46
	2		1			24.7	27.1	29.3	31.3	35	42.4	49.2
		3				26.7	29.1	31.5	33.6	38	45.9	53.1
1		1	1			26.7	29.1	31.5	33.6	37.5	45.9	53.1
	1	1	1			28.3	31	33.5	35.8	40	48.5	56.3
		2	1			31.9	34.9	37.7	40.3	45	54.6	63.4
1			2			31.9	34.9	37.7	40.3	45	54.6	63.4
2				1		31.9	34.9	37.7	40.3	45	54.6	63.4
	1		2			33.5	36.8	39.7	42.5	47.5	57.2	66.6
1	1			1		33.5	36.8	39.7	42.5	47.5	57.2	66.6
	2			1		35.6	38.6	41.6	44.4	50	61.4	70.2
1		1		1		37.4	40.7	43.9	47	52.5	63.3	73.7
		1	2			37.1	40.7	43.9	47	52.5	63.3	73.7
	1	1		1		39.2	42.5	45.8	48.9	55	67.5	77.3
2					1	39.2	42.5	45.8	48.9	55	67.5	77.3
1	1				1	40.8	44.7	48.5	51.2	57.5	70.3	81.7

Note: All of the above flow rates & pressures are based on fresh water as a fluid.

Weight of Solution	Specific Gravity	Conversion Factor
7.0 lbs. per gallon	0.84	1.09
8.0 lbs. per gallon	0.96	1.02
8.34 lbs. per gallon	1.00	1.00
9.0 lbs. per gallon	1.08	0.96
10.0 lbs. per gallon	1.20	0.91
11.0 lbs. per gallon	1.32	0.87
12.0 lbs. per gallon	1.44	0.83
14.0 lbs. per gallon	1.68	0.77

To calculate flow rates for other fluids than fresh water, multiply the tabulated capacities by the conversion factor that applies to the specific gravity of the desired liquid from the chart at the left.

Nozzle capacities vary with different pressures. As a rule of thumb to the relationship between GPM & Pressure is as follows:

$$\frac{GPM_1}{GPM_2} = \frac{\sqrt{psi_1}}{\sqrt{psi_2}}$$

3.125 Venturi Jet Junk Basket

Nozzle Flow Chart, Water cont.

Size and Quantity of Nozzles						Capacity in Gallons Per Minute at psi						
10	15	25	40	70	90	500 psi	600 psi	700 psi	800 psi	1,000 psi	1,500 psi	2,000 psi
			3			42.3	46.5	50.1	53.7	60.0	72.0	84.0
1			1	1		42.3	46.5	50.1	53.7	60.0	72.0	84.0
	2				1	42.3	46.5	50.1	53.7	60.0	72.0	84.0
	1		1	1		44.4	48.3	52.0	55.6	62.5	76.2	87.6
1		1			1	44.4	48.3	52.0	55.6	62.5	76.2	87.6
	1	1			1	46.2	50.5	54.8	57.9	65.0	79.5	92.3
		1	1	1		48.0	52.2	56.2	60.1	67.5	82.3	94.7
		2			1	49.8	54.4	59.0	62.4	70.0	85.6	99.4
1			1		1	49.8	54.4	59.0	62.4	70.0	85.6	99.4
	1		1		1	51.4	56.3	61.0	64.6	72.5	88.2	102.6
			2	1		53.2	58.0	62.4	66.8	75.0	91.0	105.0
1				2		53.2	58.0	62.4	66.8	75.0	91.0	105.0
	1			2		55.3	59.8	64.3	68.7	77.5	95.2	108.6
		1	1		1	55.3	59.8	64.3	68.7	77.5	95.2	108.6
		1		2		58.9	63.7	68.5	732.0	82.5	101.3	115.7
	1		2		1	60.2	66.0	71.4	75.8	85.0	103.0	120.0
1				1	1	60.2	66.0	71.4	75.8	85.0	103.0	120.0
	1			1	1	62.3	67.8	73.3	77.7	87.5	107.2	123.6
			1	2		64.1	69.5	74.7	79.9	90.0	110.0	126.0
		1		1	1	65.9	71.7	77.5	82.2	92.5	113.3	130.7
1					2	67.5	73.9	80.2	84.5	95.0	116.1	135.1
	1				2	69.3	75.8	82.3	86.7	97.5	119.2	138.6
			1	1	1	71.1	77.5	83.7	88.9	100.0	122.0	141.0
		1			2	72.9	79.7	86.5	91.2	102.5	125.3	145.7
				3		75.0	81.0	87.0	93.0	105.0	129.0	147.0
			1		2	78.1	85.5	92.7	97.9	110.0	134.0	156.0
				2	1	82.0	89.0	96.0	102.0	115.0	141.0	162.0
				1	2	89.0	97.0	105.0	111.0	125.0	153.0	177.0
					3	96.0	105.0	114.0	120.0	135.0	165.0	192.0

Note: All of the above flow rates and pressures are based on fresh water as a fluid.

Weight of Solution	Specific Gravity	Conversion Factor
7.0 lbs. per gallon	0.84	1.09
8.0 lbs. per gallon	0.96	1.02
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12.0 lbs per gallon	1.44	0.83
14.0 lbs. per gallon	1.68	0.77

To calculate flow rates for other fluids than fresh water, multiply the tabulated capacities by the conversion factor that applies to the specific gravity of the desired liquid from that chart at the left.

Nozzle capacities vary with different pressures. As a rule of thumb to the relationship between gpm and pressure is as follows:

$$\frac{GPM_1}{GPM_2} = \frac{\sqrt{psi_1}}{\sqrt{psi_2}}$$

3.125 Venturi Jet Junk Basket

Nozzle Flow Chart, Gas

Using a Gas at 80°F with a Specific Gravity of 0.9 67

Nozzle Number/Size	Capacity in Standard Cubic Feet Per Minute at psi													
	200 psi	300 psi	400 psi	500 psi	600 psi	700 psi	800 psi	900 psi	1,000 psi	1,100 psi	1,200 psi	1,300 psi	1,400 psi	1,500 psi
10-10-10	63	93	126	150	180	210	240	270	297	327	357	387	417	444
10-10-15	75	110	145	178	213	248	284	319	352	387	442	457	492	526
10-15-15	87	127	167	206	246	286	328	368	407	447	487	527	567	608
10-10-25	89	131	173	213	254	296	338	380	420	462	504	545	587	527
15-15-15	99	144	189	234	279	324	372	417	462	507	552	597	642	690
10-15-25	101	148	195	241	287	334	382	429	475	522	569	615	662	709
10-10-40	111	163	216	266	318	370	423	475	525	577	629	682	734	784
15-15-25	113	167	217	269	320	372	426	478	530	582	634	685	737	791
10-25-25	115	169	223	276	328	382	436	490	543	597	651	703	757	810
10-15-40	123	180	238	294	351	408	467	524	580	637	694	752	809	866
15-25-25	127	186	245	304	361	420	480	539	598	657	716	773	832	892
15-15-40	135	197	260	322	384	446	511	573	635	697	759	822	884	948
10-25-40	137	201	266	329	392	456	521	585	648	712	776	840	904	967
25-25-25	141	207	273	339	402	468	534	600	667	732	798	861	927	993
15-25-40	149	218	288	357	425	494	565	634	703	772	841	910	979	1,049
10-10-70	151	222	293	362	433	504	574	645	714	785	856	927	998	1,066
10-40-40	159	233	309	382	456	530	606	680	753	827	901	977	1,051	1,124
10-15-70	163	239	315	390	466	542	618	694	769	845	921	997	1,073	1,148

Note: The above results are calculated and are not taken from actual test flow rates. Actual flow rates will vary from calculated results. The above calculated results do not constitute a guarantee, actual or implied as to the flow rate actually achieved through the nozzles when in use.

To calculate flow rates for a gas at a different temperature or a different specific gravity gas (S.G.G.), use the following formula to estimate the new standard cubic feet per minute (S.C.F./Min.) rate for the above nozzle at the given pressures.

$$\frac{23.2379 \times (\text{S.C.F./Min.})^*}{\sqrt{\text{S.G.G.} \times (\text{Gas Temp. @ } ^\circ\text{F.} + 460^\circ\text{F.})}} = \text{Adjusted S.C.F./Min. for New Temperature/Gas}$$

* Rate from above chart

3.125 Venturi Jet Junk Basket

Nozzle Flow Chart, Gas - cont.

Using a Gas at 80°F with a Specific Gravity of 0.9 67

Nozzle Number/Size	Capacity in Standard Cubic Feet Per Minute at psi													
	200 psi	300 psi	400 psi	500 psi	600 psi	700 psi	800 psi	900 psi	1,000 psi	1,100 psi	1,200 psi	1,300 psi	1,400 psi	1,500 psi
25-25-40	163	239	316	392	466	542	619	695	771	847	923	998	1,074	1,150
15-40-40	171	250	331	410	489	568	634	729	808	887	966	1,047	1,126	1,206
15-15-70	175	256	337	418	499	580	662	743	824	905	986	1,067	1,148	1,230
10-25-70	177	260	343	425	507	590	672	755	837	920	1,003	1,085	1,168	1,249
10-10-90	178	261	345	426	509	593	676	759	841	924	1,007	1,091	1,174	1,255
25-40-40	185	271	359	445	530	616	704	790	876	962	1,048	1,135	1,221	1,307
15-25-70	189	277	365	453	540	628	716	804	892	980	1,068	1,155	1,243	1,331
10-15-90	190	278	367	454	542	631	720	808	896	984	1,072	1,161	1,249	1,337
10-40-70	199	292	386	478	571	664	757	850	942	1,035	1,128	1,222	1,315	1,406
15-15-90	202	295	389	482	575	669	764	857	951	1,044	1,137	1,231	1,324	1,419
25-25-70	203	298	393	488	581	676	770	865	960	1,055	1,150	1,243	1,338	1,432
10-25-90	204	303	395	489	583	679	774	869	964	1,059	1,154	1,249	1,344	1,438
40-40-40	207	303	402	498	594	690	789	885	981	1,077	1,173	1,272	1,368	1,464
15-40-70	211	309	408	506	604	702	801	899	997	1,095	1,193	1,292	1,390	1,488
15-25-90	216	316	418	517	616	717	818	918	1,019	1,119	1,219	1,319	1,419	1,520
25-40-70	225	330	436	541	645	750	855	960	1,065	1,170	1,275	1,380	1,485	1,589
10-40-90	226	331	438	542	647	753	859	964	1,069	1,174	1,279	1,386	1,491	1,595
25-25-90	230	337	445	552	657	765	872	979	1,087	1,194	1,301	1,407	1,514	1,621

Note: The above results are calculated and are not taken from actual test flow rates. Actual flow rates will vary from calculated results. The above calculated results do not constitute a guarantee, actual or implied as to the flow rate actually achieved through the nozzles when in use.

To calculate flow rates for a gas at a different temperature or a different specific gravity gas (S.G.G.), use the following formula to estimate the new standard cubic feet per minute (S.C.F./Min.) rate for the above nozzle at the given pressures.

$$\frac{23.2379 \times (S.C.F. / Min.)^*}{\sqrt{S.G.G. \times (Gas Temp. @ ^\circ F. + 460^\circ F.)}} = \text{Adjusted S.C.F./Min. for New Temperature/Gas}$$

* Rate from above chart

3.125 Venturi Jet Junk Basket

Nozzle Flow Chart, Gas - cont.

Using a Gas at 80°F with a Specific Gravity of 0.9 67

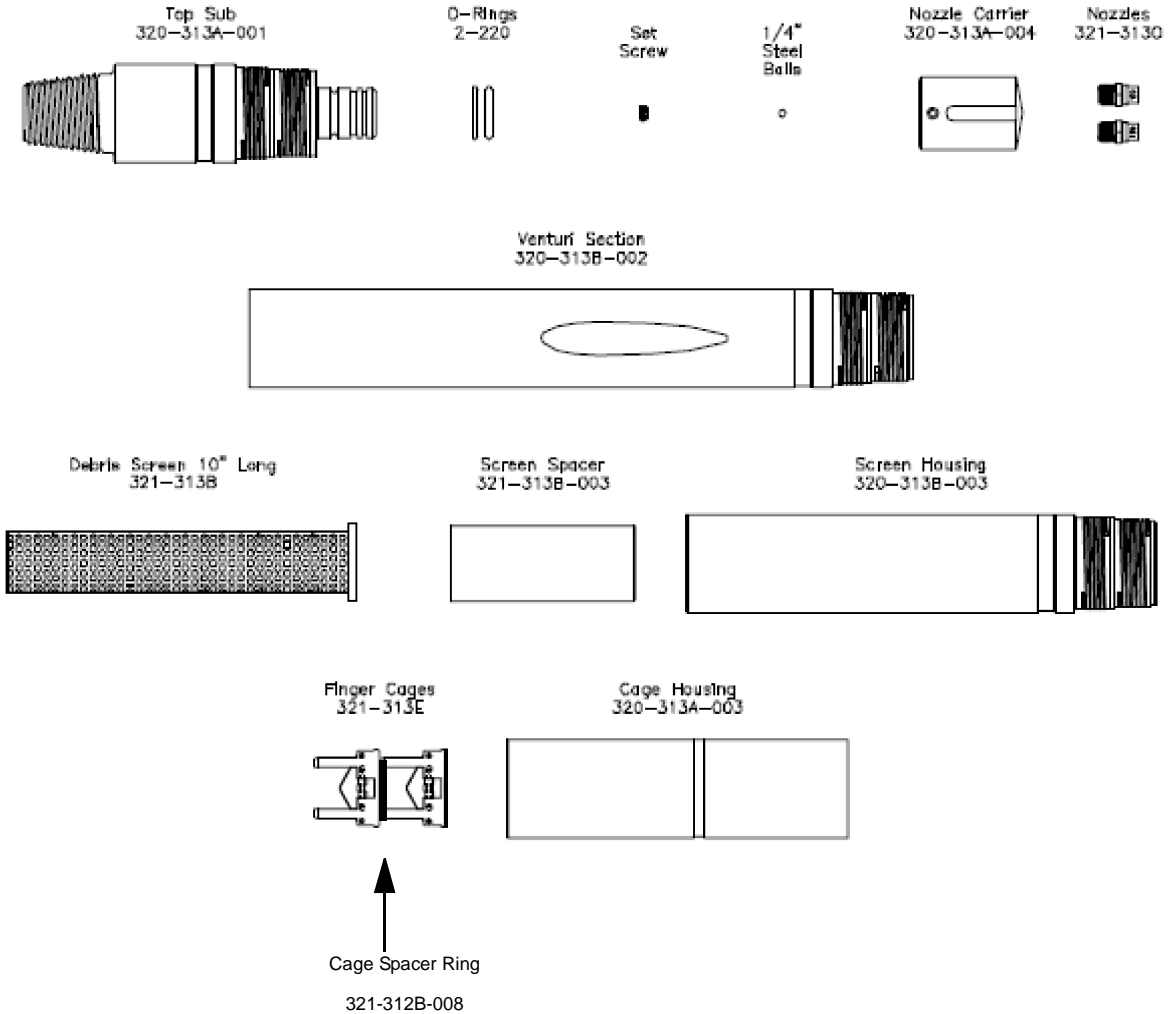
Nozzle Number/Size	Capacity in Standard Cubic Feet Per Minute at psi													
	200 psi	300 psi	400 psi	500 psi	600 psi	700 psi	800 psi	900 psi	1000 psi	1100 psi	1200 psi	1300 psi	1400 psi	1500 psi
15-40-90	238	348	460	570	680	791	903	1,013	1,124	1,234	1,344	1,456	1,566	1,677
10-70-70	239	351	463	574	686	798	908	1,020	1,131	1,243	1,355	1,467	1,579	1,688
40-40-70	247	362	479	594	709	824	940	1,055	1,170	1,285	1,400	1,517	1,632	1,746
15-70-70	251	368	485	602	719	836	952	1,069	1,186	1,303	1,420	1,537	1,654	1,770
25-40-90	252	369	488	605	721	839	957	1,074	1,192	1,309	1,426	1,544	1,661	1,778
25-70-70	265	389	513	637	760	884	1,006	1,130	1,254	1,378	1,502	1,625	1,749	1,871
10-70-90	266	390	515	638	762	887	1,010	1,134	1,258	1,382	1,506	1,631	1,755	1,877
40-40-90	274	401	531	658	785	913	1,042	1,169	1,297	1,424	1,551	1,681	1,808	1,935
15-70-90	278	407	537	667	795	925	1,054	1,183	1,314	1,442	1,571	1,701	1,830	1,959
40-70-70	287	421	556	690	824	958	1,091	1,225	1,359	1,493	1,627	1,762	1,896	2,028
25-70-90	292	428	565	701	836	973	1,108	1,244	1,381	1,517	1,653	1,789	1,925	2,060
10-90-90	293	429	567	702	838	976	1,112	1,248	1,385	1,521	1,657	1,795	1,931	2,066
15-90-90	305	446	589	730	891	1,014	1,156	1,297	1,440	1,581	1,722	1,865	2,006	2,148
40-70-90	314	460	608	754	900	1,047	1,193	1,339	1,486	1,632	1,778	1,926	2,072	2,217
25-90-90	319	467	617	765	912	1,062	1,210	1,358	1,508	1,656	1,804	1,953	2,101	2,249
70-70-70	327	480	633	786	939	1,092	1,242	1,395	1,548	1,701	1,854	2,007	2,160	2,310
40-90-90	341	499	660	818	976	1,136	1,295	1,453	1,613	1,771	1,929	2,090	2,248	2,408
70-70-90	354	519	685	850	1,015	1,181	1,344	1,509	1,675	1,840	2,005	2,171	2,336	2,499
70-90-90	381	558	737	914	1,091	1,270	1,446	1,623	1,802	1,979	2,156	2,335	2,512	2,688
90-90-90	408	597	789	978	1,167	1,359	1,548	1,737	1,929	2,118	2,307	2,499	2,688	2,877
<p>Note: The above results are calculated and are not taken from actual test flow rates. Actual flow rates will vary from calculated results. The above calculated results do not constitute a guarantee, actual or implied as to the flow rate actually achieved through the nozzles when in use.</p>														
<p>To calculate flow rates for a gas at a different temperature or a different specific gravity gas (S.G.G.), use the following formula to estimate the new standard cubic feet per minute (S.C.F./Min.) rate for the above nozzle at the given pressures.</p>														
$\frac{23.2379 \times (S.C.F./Min.)^*}{\sqrt{S.G.G. \times (Gas Temp. @ ^\circ F. + 460^\circ F.)}} = \text{Adjusted S.C.F./Min. for New Temperature/Gas}$														
<p>* Rate from above chart</p>														

Nozzle Size Chart

Nozzle Number	Nozzle ID	
	(inches)	(mm)
10	0.086	2.184
15	0.107	2.718
25	0.129	3.277
30	0.141	3.581
35	0.147	3.734
40	0.156	3.962
50	0.172	4.369
60	0.188	4.775
70	0.196	4.978
80	0.203	5.156
90	0.219	5.563
100	0.234	5.944
110	0.242	6.147
120	0.250	6.350
130	0.272	6.909
140	0.281	7.137
150	0.297	7.544
160	0.302	7.671
170	0.313	7.950
180	0.316	8.026

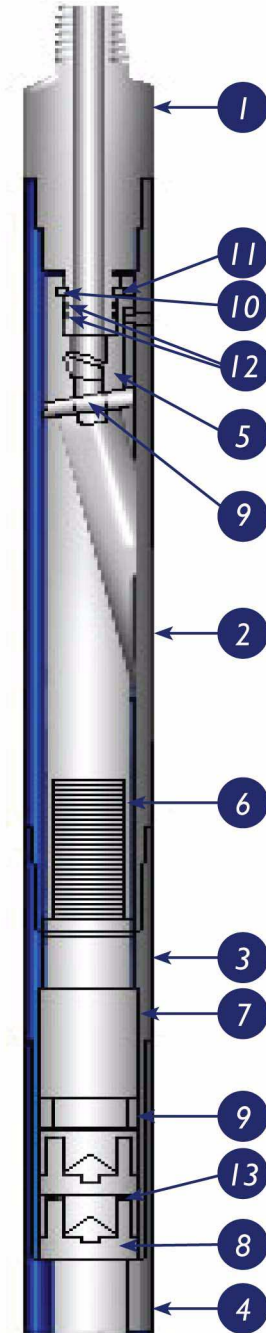
3.125 Venturi Jet Junk Basket

Parts Identification Sheet



3.125 Venturi Jet Junk Basket

TT0320-313B BOM, Schematic and Specs



ITEM	QTY	TOOL PARTS DESCRIPTION	PART NUMBER
1	1	Top Sub	TT0320-313A-001
2	1	Venturi Section	TT0320-313B-002
3	1	Screen Housing	TT0320-313B-003
4	1	Cage Housing	TT0320-313A-003
5	1	Nozzle Carrier	TT0320-313A-004
6	1	Debris Screen	TT0321-313
7	1	Screen Spacer Sleeve	TT0321-313B-003
8	2	Finger Style Cages	TT0321-313E
9	1	Nozzle Kit	TT0321-313O
10	2	Brass Slotted Shear Screws 3/8-24 x .219"	PUR-TBSS241-014
11	20	Steel Ball Bearings 1/4"	PUR-TSBC000-016
12	2	2-220 O-Rings 1 3/8" x 1 5/8" x 1/8"	PUR-TORV000-220
13	1	Cage Spacer Ring	TT0321-312B-008

Tool Name: 3.125 in. OD Venturi Jet Junk Basket

Product Code: TT0320-313B **Tool OD:** 3.125 in. **Tool ID:** 2.03 in.

Material: AISI 4140 HT 285-341 Bhn **Tool Length:** 42 in.

Minimum Yield: 100,000 psi

Strength Properties of Tool:

Minimum Yield Point and Load to Yield: 3-1/8 in. CWP Box Connection at 141,081 lbs (top connection of tool is not taken into consideration, since the top connection varies as per customer request.)

Burst Point and Burst Pressure: Top Sub and Nozzle Carrier Rotational Connection - 16,933 psi, 3-1/8 in. CWP Box Connection - 5,091 psi.

Torsional Weak Point and Ft-Lbs to Yield: CWP Connections at 4,825 ft-lbs.

Recommended Make Up Torque:

1st Connection: Top Sub and Venturi Section CWP Connection - 1,206 ft-lbs.

2nd Connection: Venturi Section and Screen Housing CWP Connections - 1,206 ft-lbs.

3rd Connection: Screen Housing and Cage Housing CWP Connection - 1,206 ft-lbs.

3.125 Venturi Jet Junk Basket

1.0 Pre-Assembly



Warning: *Make sure all tool parts and components have been thoroughly cleaned or serious damage and/or injury could occur!*



Note: *Verify that the correct O-ring redress kit and quantities are used as specified on the Bill Of Materials (for example, 5 each etc....). Lay out all redress kit components on a clean surface.*



Note: *Make sure to lubricate all O-rings and threaded surfaces.*



Note: *Visually inspect all parts for damage or wear. Thread parts together without the O-rings to check fit. Repair or replace damaged parts.*



Caution: *Always file wrench marks or burrs and clean off debris!*



Caution: *This tool should be disassembled, cleaned thoroughly, inspected and reassembled after each run in the well bore!*

2.0 Assembly

2.1 Install the 2 O-rings (item #12), onto the Top Sub (item#1). Grease the O-rings, the pin threads near the O-rings, the entire ID of the Top Sub, and then place in a vise.

2.2 Grease the entire ID of the Nozzle Carrier (item #5) and then install it onto the Top Sub until the carrier holes line up with the groove on the Top Sub.



Note: *You may need to tap the carrier over the O-rings with a rubber mallet.*

2.3 Install 1 Brass Shear Screw (item #10).

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2.4 Turn the carrier 180°, then insert 20 Steel Ball Bearings (item #11). Now install the other Brass Shear Screw.

2.5 Move the tool down in the vise to the Nozzle Carrier



Caution: *Do not vise on the Nozzle Carrier slot, as it could damage the tool!*

2.6 Put the required 3 Nozzles (item #9), as per the flow chart, into the holes in the bottom of the Nozzle Carrier and make wrench tight.



Note: *It is recommended to use Teflon tape on the NPT thread.*

2.7 Move the tool back in the vise to Top Sub (item #1).

2.8 Grease the entire ID of the Venturi Section (item #2). Look in the box end of the Venturi Section and find the alignment lug. Now match it with the slot on the Nozzle Carrier and screw the section onto the Top Sub, making it wrench tight.

2.9 Grease the entire ID of the Screen Housing (item #3). Insert the Screen Spacer Sleeve (item #7), ring end first, then the Debris Screen, ring end first, into the Screen Housing.



Note: *If you are using the optional Hollow Magnetic Insert, it will replace the Screen Spacer Sleeve in this step.*

2.10 Screw the Screen Housing onto the Venturi Section wrench tight.

2.11 If needed, grease and make up the required length of Debris Catchers/Extensions. Standard lengths come in 1-6 ft sections.

2.12 Grease the entire ID of the Cage Housing (item #4) and then insert one of the Finger Cages/Flutter Cages (item #8), fingers up, into the housing. Next, insert the Cage Spacer Ring (item #13, not used with Flutter Cages), then the other Finger Cage/Flutter Cage.



Note: *Finger Cages come standard with the tool, however, Flutter Style Cages can be used and are optional.*

2.13 Move the tool in the vise to the Screen Housing/Venturi Section connection.

2.14 Screw on the Cage Housing and make wrench tight.

3.0 Disassembly

3.1 Place the tool in a vise on the either the Debris Catcher/Extension or Screen Housing (item #3) and remove the Cage Housing (item #4). Unscrew the Cage Housing and drop it, box end first, on a wood block to remove the 2 Finger Cages/Flutter Cages (item #9).

3.2 Remove any installed Debris Catchers/ Extensions.

3.3 Move the tool down in the vise to the Venturi Section and vise near the Screen Housing (item #3).



Caution: *Do not vise on the Venturi nozzle slot, as it could damage the tool!*

3.4 Remove the Screen Housing, then remove the Screen (item #6). Drop the housing, box end first, on a wood block to remove either the Screen Spacer Sleeve (item #7) or Hollow Magnetic Insert.

3.5 Move the tool down in the vise to the Top Sub (item #1). Now unscrew the Venturi Section (item #2) from the Top Sub.

3.6 Move the tool down in the vise to the Nozzle Carrier (item #5).



Caution: *Do not vise on the Nozzle Carrier slot, as it could damage the tool!*

3.7 Remove the 3 Nozzles (item #9) from the carrier.

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3.8 Move the assembly in the vise to the Top Sub.

3.9 Remove both of the Brass Shear Screws (item #10).

3.10 To remove the Steel Ball Bearings, hold your hand underneath the carrier and rotate it back and forth until all 20 balls have been removed.



Note: *You may have to use de-greaser, a small length of plastic cord or a magnet to remove all of the ball bearings.*

3.11 Remove the Nozzle Carrier from the Top Sub.

3.12 Finally, remove the Top Sub from the vise.



Note: *Remove and discard all O-rings. Replace O-rings after each use. Thoroughly clean tool parts in a cleaner approved by state and/or local laws.*



Note: *Visually inspect tool for swelling after each use. Damaged or swelled components must be replaced.*



Note: *It is recommended that a Magnetic Particle Inspection (MPI) be completed on all components after each job.*