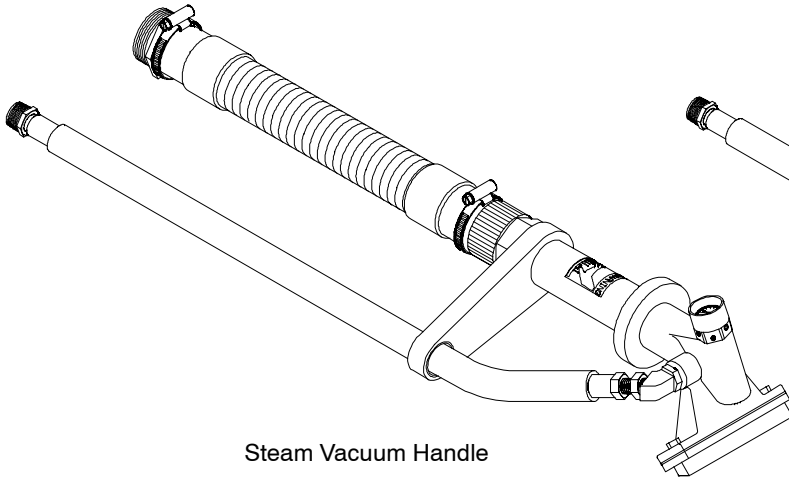
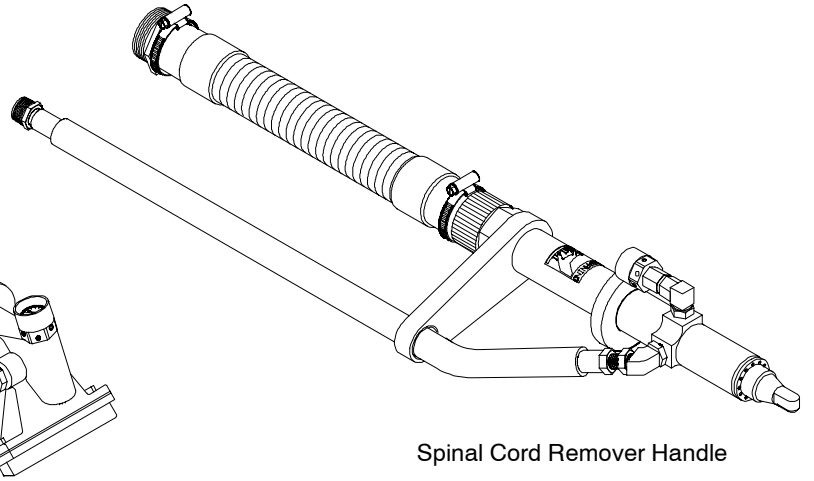




Model CV-1 Steam Vacuum System Steam Spinal Cord Remover



Steam Vacuum Handle



Spinal Cord Remover Handle

U. S. Patent No. 5,632,670

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Steam Spinal Cord Remover System (10 Hp)	
460/230/208V, 60Hz (pork 2 hd) 4039033	
460/230/208V, 60Hz (beef 2 hd) 4039028	
Balancer 4042015	
Optional Sanitizer 4038016	

JARVIS®

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PRODUCTS CORPORATION

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UNITED STATES OF AMERICA

TEL. 860-347-7271 FAX. 860-347-6978



SAFETY MESSAGES TO EMPLOYER AND SAFETY DIRECTOR

AVOID INJURY

1. **Ensure** that all employees who use this equipment are trained in it's proper use and are aware of the dangers that may arise if they do not follow procedures outlined in this brochure.
2. **Enclosed** are four (4) copies of "NOTICE TO OPERATORS, MAINTENANCE AND CLEANUP PERSONNEL." Post one copy on the employees' bulletin board; give one copy to operator(s); give one copy to the maintenance foreman; and give one copy the sub-contract cleanup / internal cleanup foreman. *Additional copies will be provided upon request.*
3. This equipment utilizes pressurized steam that can cause serious burns. This fact should be obvious to your employees, but you must emphasize it to them.
4. **Always** disconnect the equipment from it's electrical and steam supply when it is not in use.
5. **Ensure** that proper procedures are established for all equipment in accordance with OSHA's lockout/tagout procedures (29 CFR 1910.147) to prevent accidental startup or release of stored energy.
6. **Never** make modifications or alterations to the equipment. *Replace any missing or illegible labels.*
7. **Remove** and **repair** any tool that malfunctions. **All** personnel must be instructed to remove any malfunctioning equipment.
8. **Follow** our installation and maintenance instructions for proper installation and care of the equipment.
9. **Avoid** injury. Do not permit the equipment to be misused.
10. **If you resell or distribute** a Jarvis product, you must provide the purchaser with the appropriate safety sheets and tool brochure. *Additional copies of safety sheets and tool brochures will be provided upon request.*



SAFETY MESSAGES TO OPERATORS, MAINTENANCE AND CLEANUP PERSONNEL

***REMOVE ANY MALFUNCTIONING TOOL FROM SERVICE
REPORT ANY PROBLEMS TO YOUR SUPERVISOR***

Steam Cleaner Handle

1. **Never** put fingers, hands, or other parts of the body on the metal portion of the steam vacuum handle or in the steam discharge path.
2. **Opening** the steam valve will cause a high temperature fluid to flow continuously through the tool handle and out the steam nozzle. Be sure to look around the area where the handle is situated to prevent accidental scalding.
3. **Never** open the steam valve unless you want to use the tool.
4. **Never** make any alterations to the handle.

Steam Cleaner System

5. **Shut off** the steam supply and allow time for the metal to cool before touching the vacuum head.
6. **Shut off** the steam supply before performing any repairs or maintenance.
7. **Shut off** the steam supply before performing any cleanup.
8. **Shut off** the steam supply and vacuum pump when the tool is not in use.

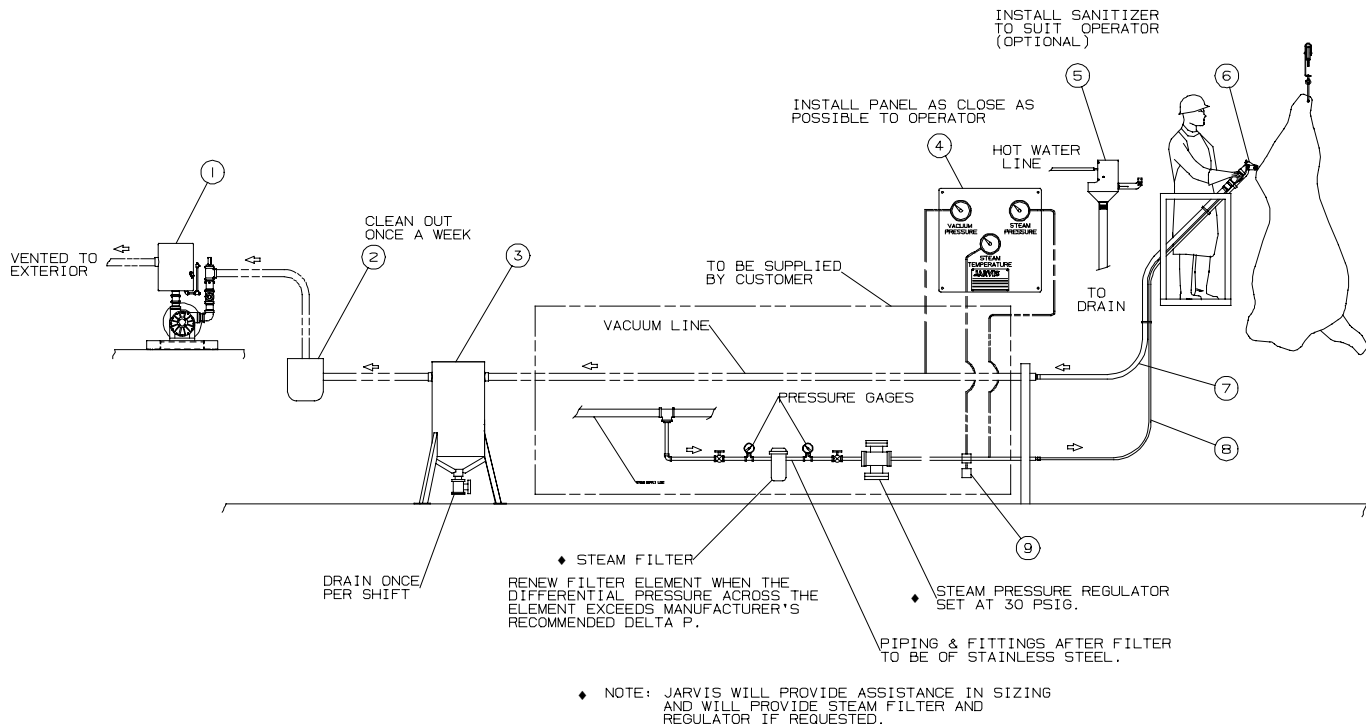
Sanitizer

9. **Before** activating the sanitizer, fully insert the vacuum handle into the sanitizer cavity.
10. **Do not** remove the vacuum handle from the sanitizer until the water is turned off and stops flowing.

Vacuum Pump

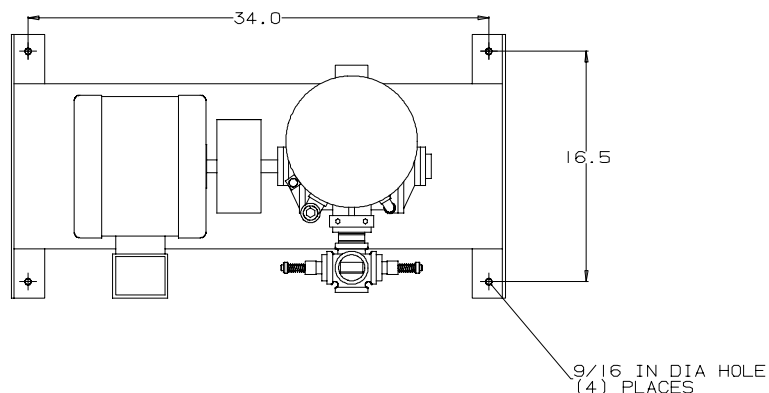
11. **Disconnect** the electric power supply before performing any repairs or maintenance.
12. **To prevent** an explosion hazard, **never** use combustible liquids to clean the rotor assembly.
13. **Use caution** when removing rotor from housing. The rotor is heavy and awkward to handle.

Figure A
System Overview



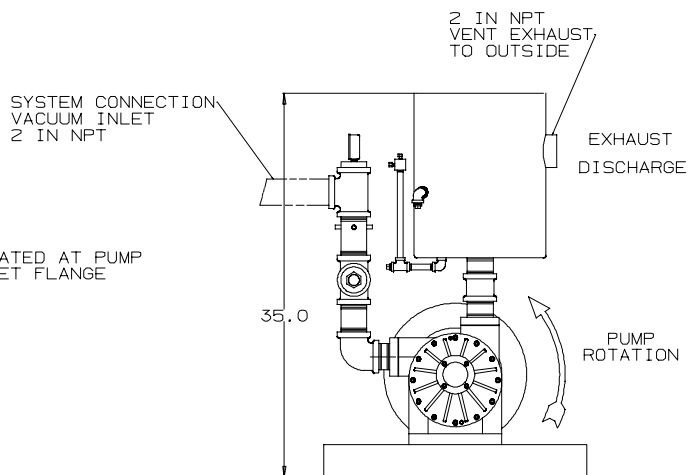
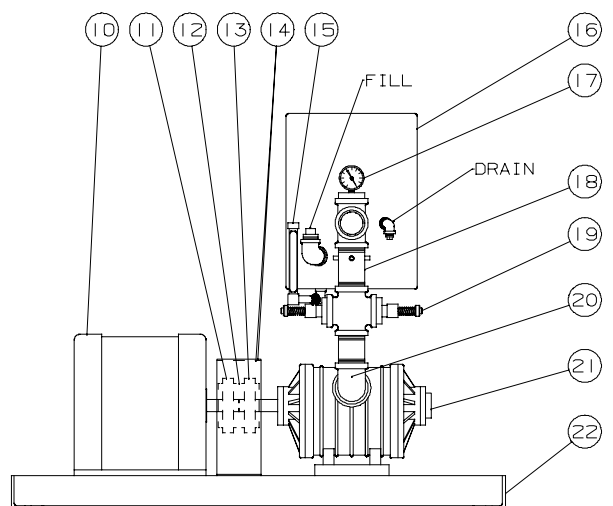
ITEM	PART NO.	PART NAME	QTY
1		Pump and Motor Assy 7.5 hp:	1
	3008203	575V/60Hz	
	3008199	460/230/208V/60Hz	
	3008202	415/380/220V/50Hz	
	3008205	380/220V/60Hz	
2		Pump and Motor Assy 10 hp:	1
	3008219	460/230/208V/60Hz	
	3008232	415/380/220V/50Hz	
	3034007	Vacuum Filter Assy See page 7 for parts	
3	3034009	Vacuum Filter Assy, Duplex	1
	1034053	Duplex Filter Element only	
	see pg 7	Vacuum Sediment Tank	

ITEM	PART NO.	PART NAME	QTY
4	see pg 8	Gauge Panel Assembly	1
5	see pg 8	Sanitizer	1
6	see pg 9	Vacuum Handle Assembly (includes items 7 and 8)	1
7	see pg 9	Vacuum Hose Assembly	1
8	see pg 9	Steam Hose Assembly	1
9	1005120	Temperature Switch	1
	3034020	Steam Filter Assy, Carbon	
	1034073	Filter Element, Carbon 3/4 in	
	1034077	Filter Element, Carbon 1 in	
	1034050	Filter Element, St. Steel	
	1035533	Housing O-ring, St. Steel	
	1035532	Filter O-ring, St Steel	



**Figure B
Pump Assembly**

NOTE:
ALL PIPE CONNECTIONS TO BE
CHECKED FOR TIGHTNESS PRIOR
TO START-UP



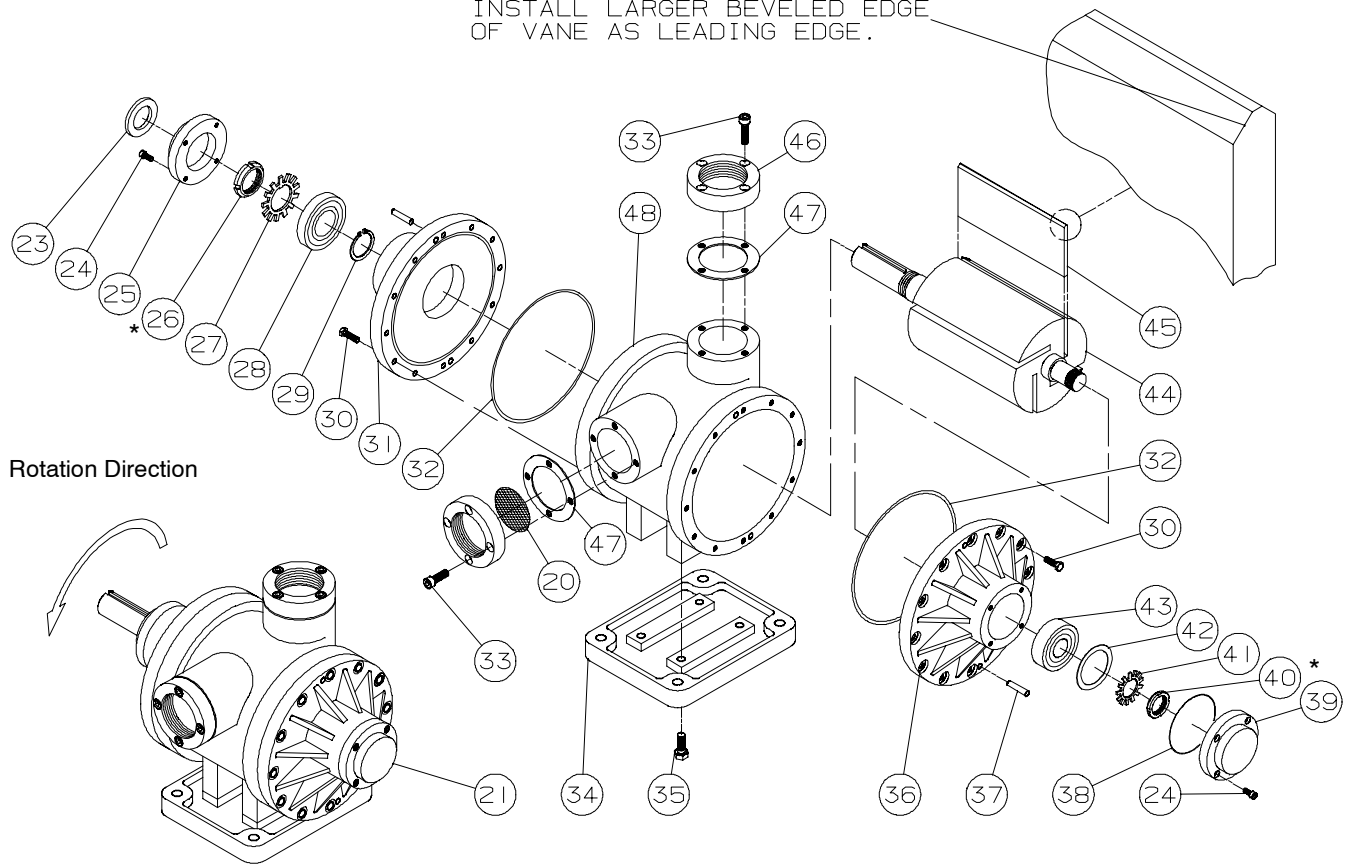
ITEM	PART NO.	PART NAME	QTY
10	1008185	Motor, Direct Drive 7.5 hp: 575V/60Hz	1
	1008183	460/230/208V/60Hz 415/380/200V/50Hz	
	1008186	380/220V/60Hz	
	1008189	Motor, Direct Drive 10 hp: 460/230/208V/60Hz or 415/380/200V/50Hz	
	1021432	Motor Bearing 7.5 and 10 hp	
	1022215	Vacuum Relief Valve, 1 1/4 in	
11	1011316	Coupling Hub, Motor End	1
12	1011318	Coupling Insert	1
13	1011317	Coupling Hub, Pump End	1
14	1024186	Coupling Guard	1
15	1025043	Oil Level Gauge	1
16	1061686	Oil Reservoir Assembly	1
17	1061257	Vacuum Gauge	1
18	1022214	Check Valve	1
19	1022216	Vacuum Relief Valve, 3/4 in	2

◆ Not supplied in current systems.

ITEM	PART NO.	PART NAME	QTY
20	1034049	Strainer	1
21	1008182	Vacuum Pump, 7.5 hp	1
	1008188	Vacuum Pump, 10 hp	
22	1041038	Base Assy 18 x 36 in	1
	3022069	Lubrication Manifold Assy	
	1009154	Lubricator Glass Sleeve	
	3054017	Lube Manifold Screw Assy	
		items for Belt Drive Units:	
	1041039◆	Base Assy 26 x 36 in 7.5 hp	
	1041040◆	Base Assy 26 x 36 in 10 hp	
	1061693	Drive Belt	1
	1024188◆	Belt Guard	1
	1057068◆	Motor Pulley	1
	1057069◆	Pump Pulley	1
	1036231◆	Motor Pulley Bushing	1
	1008190◆	Motor, Belt Drive, 7.5 hp 460/230/208V-60Hz	1

Figure C
Vacuum Pump

INSTALL LARGER BEVELED EDGE
OF VANE AS LEADING EDGE.

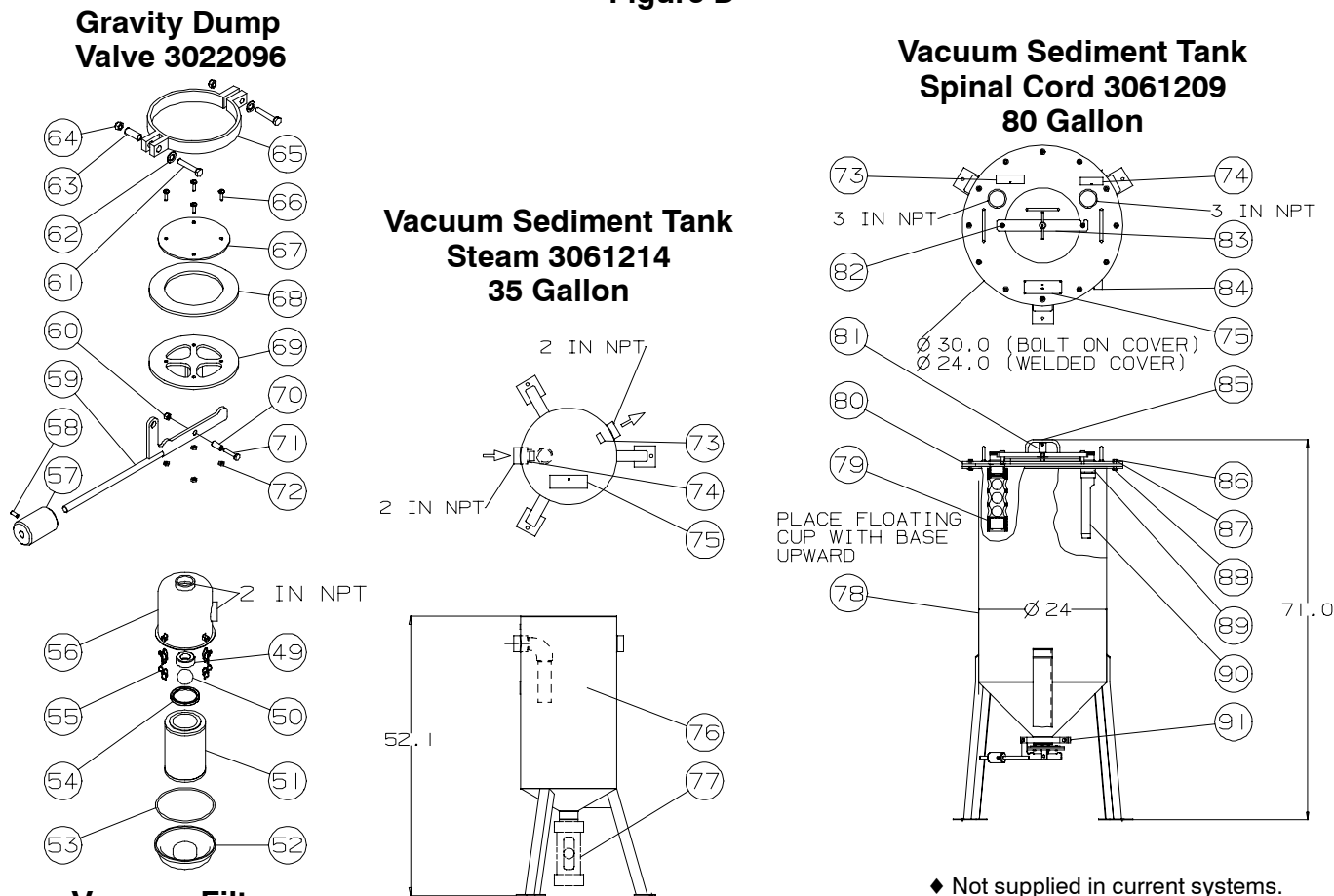


* Optional tools available

ITEM	PART NO.	PART NAME	QTY
23	1035509	Shaft Seal	1
24	1055094	Socket Head Cap Screw	8
25	1016488	Seal Housing	1
26	1007308	Shaft End Lock Nut	1
27	1004310	Shaft End Lock Washer	1
28	1021501	Shaft End Bearing	1
29	1035510	Retainer Ring	1
30	1055304	Hex Head Screw	24
31	1002379	Shaft End Cylinder Cap	1
32	1035641	O-ring (with item 31 or 36)	2
33	1055035	Socket Head Cap Screw	8
34	1041037	Base	1
35	1055281	Hex Head Screw	4
36	1002380	Blind End Cylinder Cap	1
37	1010410	Taper Pin	4
38	1035642	O-ring (with item 39)	1
39	1044062	End Cap	1
40	1007307	Blind End Lock Nut	1
41	1004309	Blind End Lock Washer	1
42	1014158	Wave Spring	1

ITEM	PART NO.	PART NAME	QTY
43	1021388	Blind End Bearing	1
44	1064041	Rotor and Shaft, 7.5 hp	1
	1064042	Rotor and Shaft, 10 hp	
45	1040014	Vane, 7.5 hp	4
	3040001	Vane Set, 7.5 hp (4)	
	1040015	Vane, 10 hp	8
	3040002	Vane Set, 10 hp (8)	
46	1044061	Flange	2
47	1035508	Flange Gasket	2
48	1016487	Cylinder, 7.5 hp	1
	1016490	Cylinder, 10 hp	
	1050863	Lubrication Fitting, Bearing	2
	1050864	Lubrication Fitting, Vanes	1
		Spare Parts Kit	
	3008204	for 7.5 hp Pump	
	3008201	for 10 hp Pump	
		(includes items 23, 26-29, 32, 38, 40-43 and 45)	
		Special Tools	
	8039145*	Optional Wrench (for item 26)	
	8039144*	Optional Wrench (for item 40)	

Figure D



◆ Not supplied in current systems.

Gravity Dump Valve 3022096

**Vacuum Sediment Tank Steam 3061214
35 Gallon**

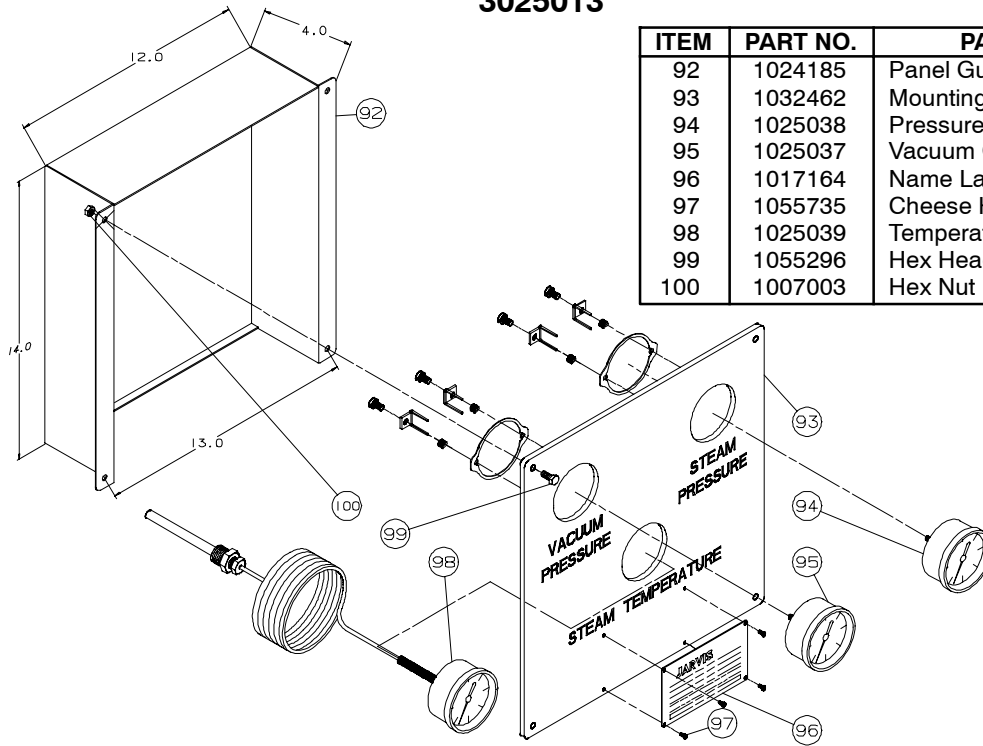
**Vacuum Sediment Tank Spinal Cord 3061209
80 Gallon**

Vacuum Filter 3034007

ITEM	PART NO.	PART NAME	QTY
49	1061866	Ball Seat	1
50	1022232	Ball Check	1
51	1034047	Filter Element	1
52	1002509	Filter Cover	1
53	1035535	Cover O-ring	1
54	1035536	Butterfly Gasket	1
55	1012095	Spring Clip	4
56	1016653	Filter Housing	1
57	1071034	Weight	1
58	1055849	Socket Set Screw, Cup Pt.	1
59	1028135	Arm	1
60	1007297	Hex Lock Nut	1
61	1055417	Hex Head Screw	2
62	1004207	Washer	2
63	1036315	Bushing	1
64	1007252	Hex Lock Nut	2
65	1012136	Clamp	1
66	1055271	Truss Head Screw	4
67	1032632	Top Plate	1
68	1035644	Gasket	1
69	1032631	Bottom plate	1
70	1036316	Bushing	1

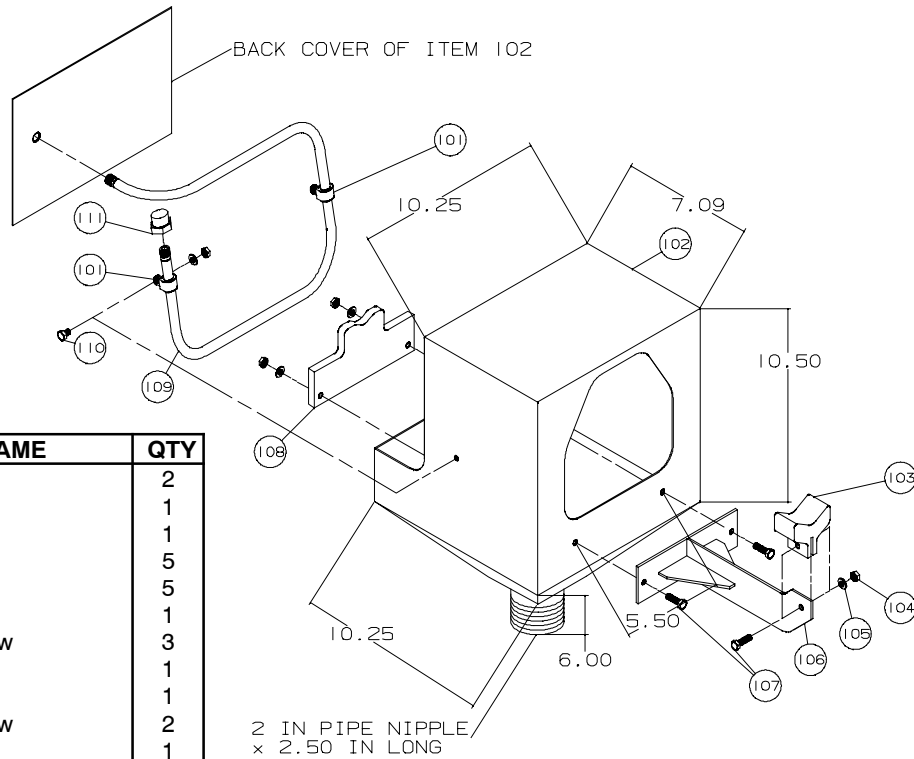
ITEM	PART NO.	PART NAME	QTY
71	1055326	Hex Head Screw	1
72	1007043	Hex Lock Nut	4
73	1017276	"OUT" Label	1
74	1017275	"IN" Label	1
75	1017072	Caution Label, Vacuum only	1
76	1061682	Tank (includes items 73-76)	1
77	1022217	Ball Valve	1
78	1061662	Tank with welded cover	1
79	3022065	Float Valve and Cup	1
	1061724	Cup	
	1061725	Cannister	
80	1002385◆	Tank Cover (bolted on)	1
81	3006009	Clamping Knob	1
82	1055955	Shoulder Bolt	2
83	1018138	Arm Lever	1
84	1050682	Pipe Cap	1
85	1002381	Tank Cap	1
86	1007140◆	Hex Nut	12
87	1004224◆	Washer	24
88	1055464◆	Hex Head Screw	12
89	1050742◆	Coupler, 2 in pipe	1
	1050784	Coupler, 3 in pipe	
90	1050743◆	Deflector, 2 in pipe	1
	1050786	Deflector, 3 in pipe	
91	3022096	Gravity Dump Valve Assy	1
	3046053	Wall Mtg. Frame (35 gallon)	

Figure E
Gauge Panel Assembly
3025013



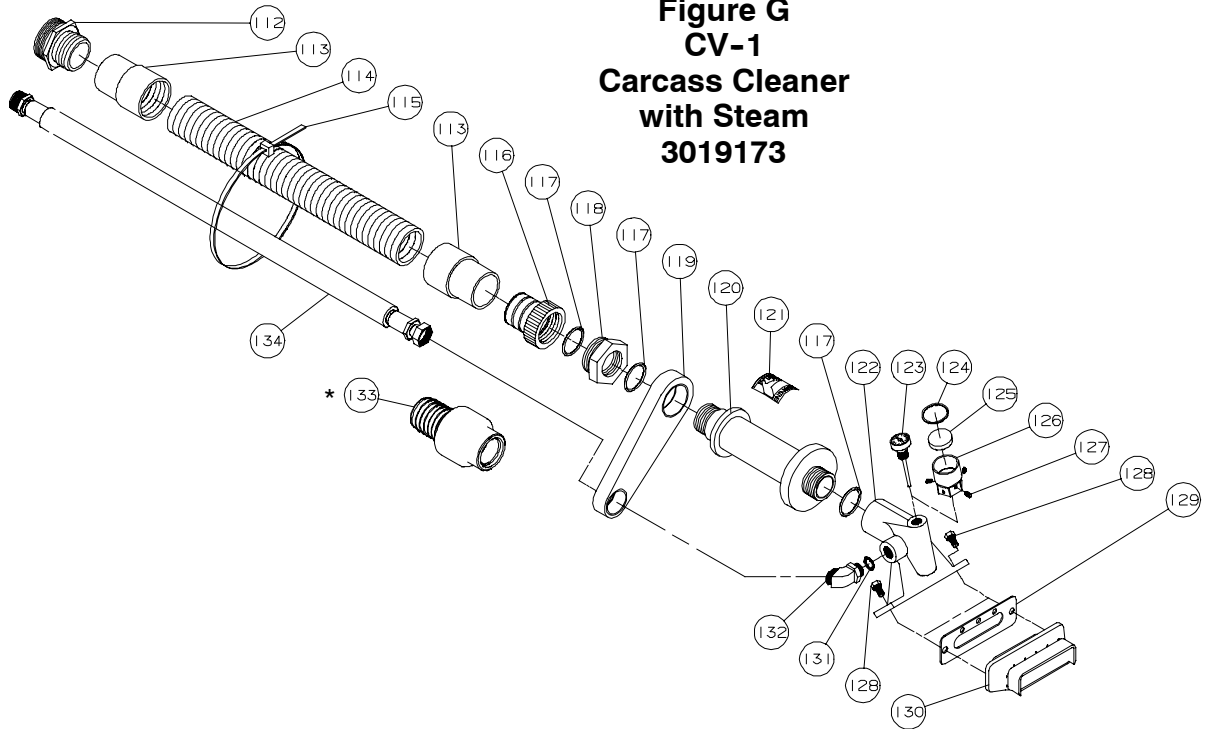
ITEM	PART NO.	PART NAME	QTY
92	1024185	Panel Guard	1
93	1032462	Mounting Plate	1
94	1025038	Pressure Gauge	1
95	1025037	Vacuum Gauge	1
96	1017164	Name Label	1
97	1055735	Cheese Head Screw	4
98	1025039	Temperature Gauge	1
99	1055296	Hex Head Screw	4
100	1007003	Hex Nut	4

Figure F
Sanitizer
4038016

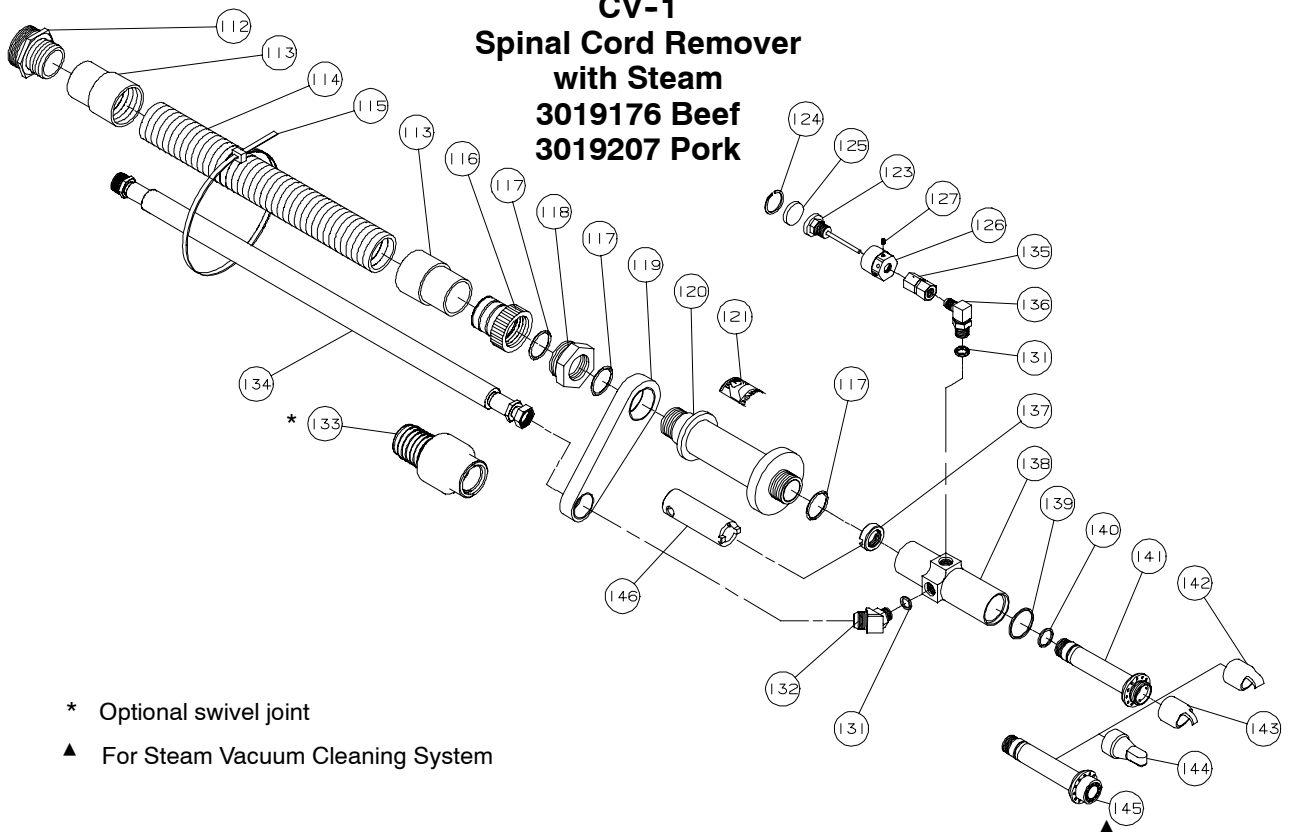


ITEM	PART NO.	PART NAME	QTY
101	1012056	Conduit Clamp	2
102	1061679	Sanitizing Tank	1
103	1061680	Saddle	1
104	1007274	Hex Nut	5
105	1004262	Washer	5
106	1042354	Bracket	1
107	1055785	Hex Head Screw	3
108	1032467	Rest Plate	1
109	1061678	Tubing	1
110	1055609	Hex Head Screw	2
111	1050524	Pipe Cap	1

**Figure G
CV-1
Carcass Cleaner
with Steam
3019173**

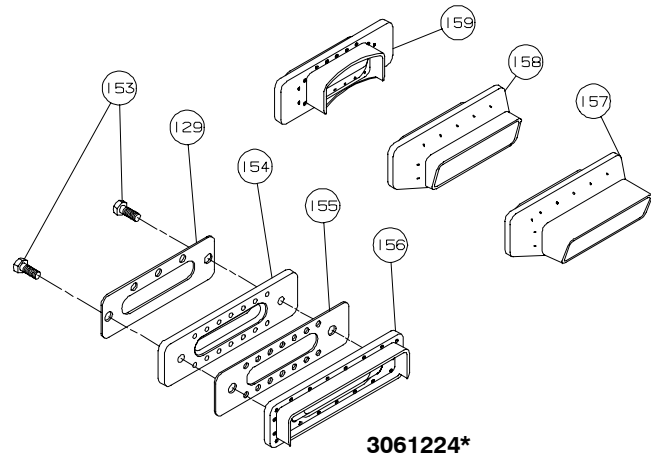
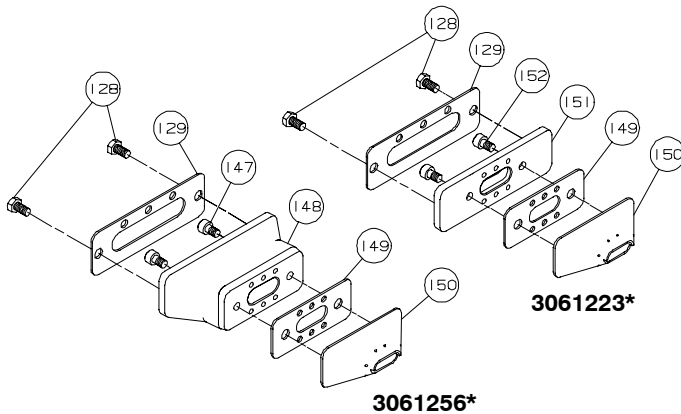


**Figure H
CV-1
Spinal Cord Remover
with Steam
3019176 Beef
3019207 Pork**



- * Optional swivel joint
- ▲ For Steam Vacuum Cleaning System

Figure I
Optional Nozzles
For Steam Cleaning System



*Optional

•For Spinal Cord Remover System

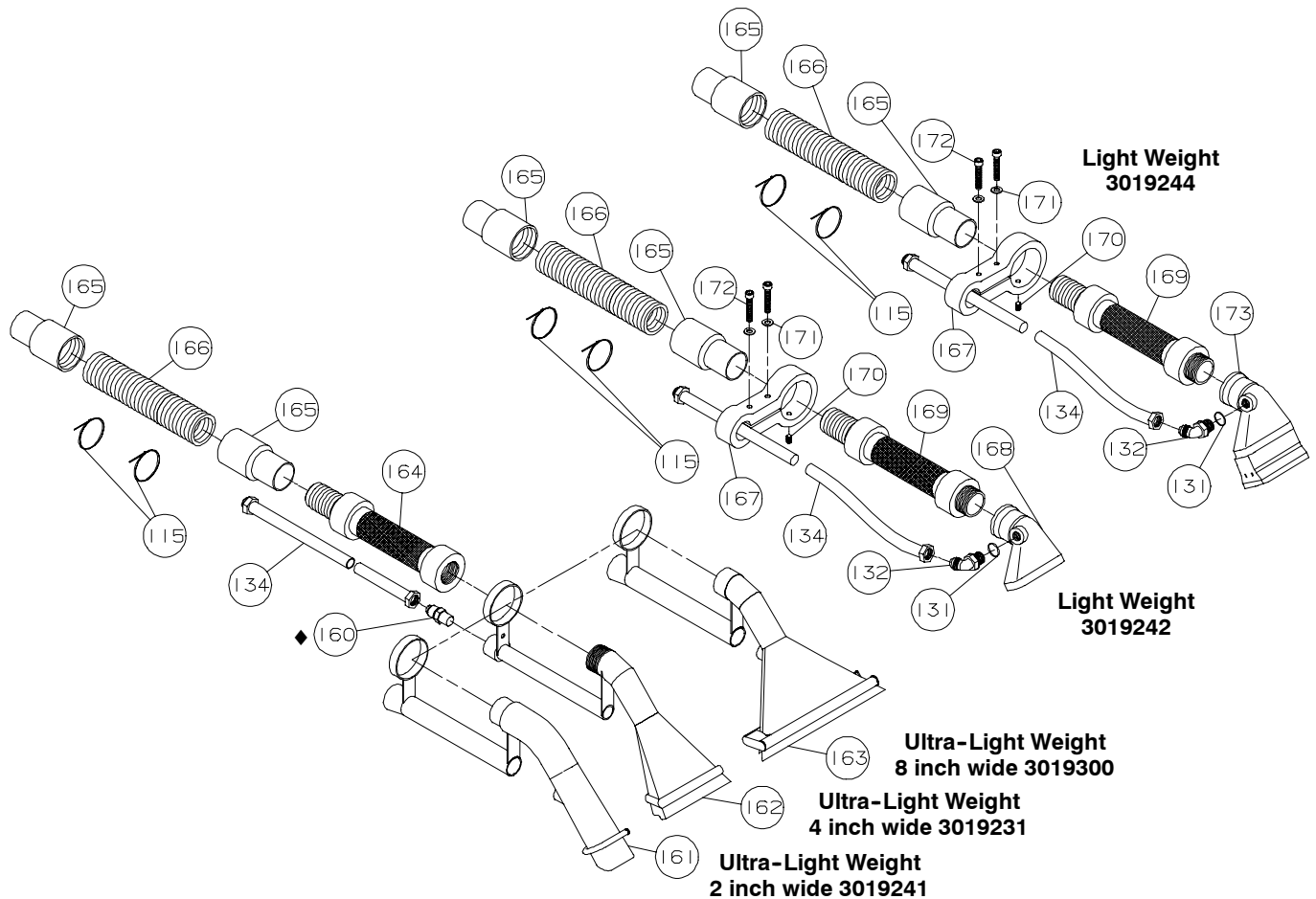
◆Not used in current tools

▲For Steam Vacuum Cleaning System

ITEM	PART NO.	PART NAME	QTY
112	1050621	Fitting	1
113	1050638	Swivel Cuff	2
114	1059084	Vacuum Hose	10 ft
115	1012092	Cable Tie	4
116	1050656	Adapter	1
	1050616◆	Adapter	1
117	1035505	O-ring	3
118	1050614	Reducing Bushing	1
119	1042362	Handle Bracket	1
120	1019169	Handle with item 121	1
121	1017285	Danger Label	1
122	1016484	Steam and Vacuum Head	1
123	1025036	Temperature Gauge	1
124	1013255	Retaining Ring	1
125	1024193	Plastic Window Guard	1
126	1024184	Gauge Guard	1
127	1055743	Set Screw	3
128	1055945	Hex Head Screw	2
129	1035504	Gasket	1
130	1061727	Steam Nozzle Cap, Long	1
131	1035506	O-ring	2
132	1050755	Elbow, 3/8 JIC with item 131	1
	1050660◆	Elbow, 1/2 JIC with item 131	1
133	1050659*	Swivel Connector	1
134	1059106	Steam Hose	1
	1050762◆	Adapter, 3/8 to 1/2 JIC	1
135	1050632	Adapter	1
136	1050631	Elbow Adapter w/ item 131	1
137	1007310	Nut	1

ITEM	PART NO.	PART NAME	QTY
138	1016493	Housing	1
139	1035515	O-ring	1
140	1035514	O-ring	1
141	1061703	Steam Nozzle Adapter	1
142	1061745*	Scraping Finger	1
143	1061704*	Scraping Finger	1
144	1061746	Scraping Finger (Beef)	1
	1061786	Scraping Finger (Pork)	1
145	1061696*▲	Steam Nozzle Cap	1
146	8030055*	Wrench for item 137	1
147	1055746*	Socket Head Cap Screw	1
148	1061737*	Adapter	2
149	1035511*	Gasket	1
150	1061688*	Steam Nozzle Cap	1
151	1061691*	Adapter	1
152	1055742*	Socket Head Cap Screw	2
153	1055613*	Socket Head Cap Screw	2
154	1061692*	Adapter	1
155	1035512*	Gasket	1
156	1061690*	Steam Nozzle Cap	1
157	1061730*	Steam Nozzle Cap	1
158	1061728*	Steam Nozzle Cap	1
159	1061687*	Steam Nozzle Cap	1
	3059032	Vacuum Hose Assy, 10 ft (includes items 113 and 114)	
	3019173▲	Handle Assembly (includes items 112-132 and 134)	
	3019176•	Handle Assy, Beef (incls 112- 121, 123-127, 131, 132, 134, 135-141 and 144)	
	3019207•	Handle Assy, Pork (incls 112- 121, 123-127, 131, 132, 134, 135-141 and 144)	
	3061256*	Nozzle Assembly (includes items 128, 129 and 147-150)	
	3061223*	Nozzle Assembly (includes items 128, 129 and 149-152)	
	3061224*	Nozzle Assembly (includes items 129 and 153-156)	

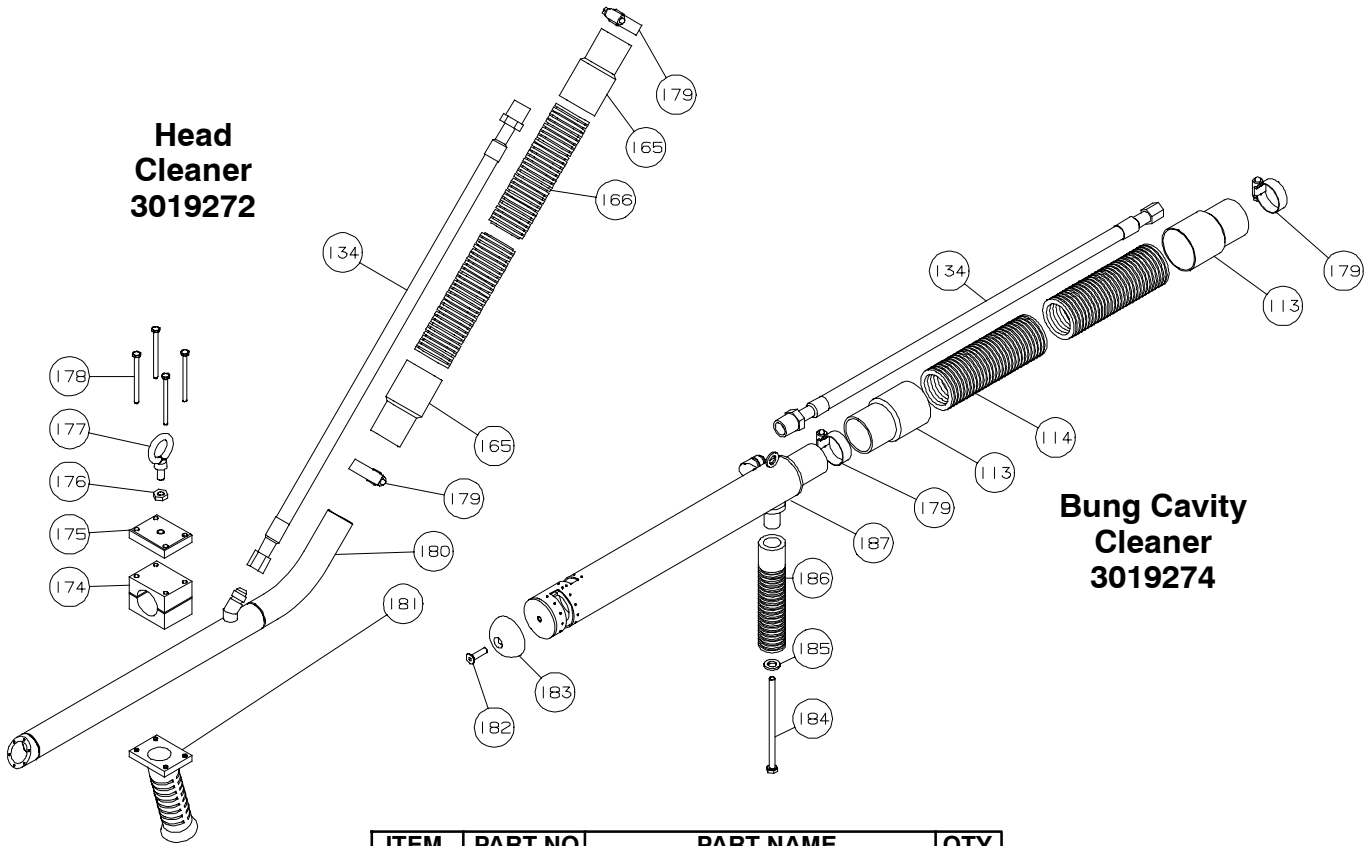
Figure J
Optional Handles
for Steam Cleaning



◆ Not used in current tools

ITEM	PART NO.	PART NAME	QTY
160	1050869◆	Adapter	1
161	1061869	Nozzle, 2 inch wide	1
162	1061863	Nozzle, 4 inch wide	1
163	1071095	Nozzle, 8 inch wide	1
164	3019239	Handle And Swivel Assembly	1
165	1059105	Hose Cuff	2
166	1059104	Vacuum Hose	10 ft
167	1012149	Clamp	1
168	1016586	Steam and Vacuum Housing	1
169	3019238	Handle And Swivel Assembly	1
170	1055087	Socket Set Screw, Cup Point	1
171	1004262	Washer	2
172	1055752	Socket Head Cap Screw	2
173	3016388	Housing Assembly	1

**Figure K
Optional Handles
for Hogs**



ITEM	PART NO.	PART NAME	QTY
174	1061986	Mounting Block	1
175	1032609	Mounting Plate	1
176	1007021	Hex Jam Nut	1
177	1054145	Eye Bolt	1
178	1055212	Hex Head Screw	4
179	1012075	Hose Clamp	4
180	3061321	Tube Assembly	1
181	1019230	Handle Assembly	1
182	1055025	Flat Head Socket Cap Screw	1
183	1071062	Cap	1
184	1055126	Hex Head Screw	1
185	1004154	Washer	1
186	1019229	Handle	1
187	1019227	Tube Assembly	1
	3019269	Handpiece Assembly (includes items 182-187)	

SPECIFICATIONS

Vacuum Pump Motor	7.5 hp	5600 W
Overall Dimensions (l x w x h)	36 x 18 x 35 in	914 x 457 x 889 mm
Weight	600 lb	272 kg
Operating Voltage		
	575/460/380/230/208 V, 3 phase, 60 Hz	
	415/380/220/200 V, 3 phase, 50 Hz	
Steam Capacity	200 lb/hr	at 30 psi
	90 kg/hr	at 2.1 kg/cm ²
Operating Steam Pressure	17 to 50 psi	
	1.2 to 3.5 kg/cm ²	
Operating Vacuum Pressure	11-20 in Hg	
	37-68 kPa	
Nozzle Size	4.63 x 1.5 in	117.6 x 38.1 mm
Sediment Tank Size		
Vacuum Cleaning System	35 gal	132.5 L
Weight (empty)	125 lb	56.7 kg
Spinal Cord Remover System	80 gal	302.8 L
Weight (empty)	350 lb	158.8 kg

INSTALLATION INSTRUCTIONS

ALWAYS DISCONNECT THE POWER SUPPLY IN ACCORDANCE WITH OSHA'S LOCKOUT/TAGOUT PROCEDURES (29 CFR 1910.147) BEFORE PERFORMING ANY MAINTENANCE OR REPAIRS.

ALL WIRING MUST BE DONE IN ACCORDANCE WITH NATIONAL, STATE AND LOCAL ELECTRICAL CODES.

Refer to system overview, Figure A on page 4, for referenced items and as a general guide for installing the steam vacuum and spinal cord remover system.

1 Vacuum Pump Assembly

- 1.1 Locate the equipment in a clean, dry area and provide adequate space on all sides of the unit for cooling and accessibility for maintenance of all components. The area should be cool (approximately 70°F, 21°C) with a minimum ambient temperature of 40°F, 4°C and a maximum ambient temperature of 100°F, 38°C. Provisions must be made for adequate cross air circulation to remove the heat of

compression (2550 BTU's per horsepower) from the area.

- 1.2 All connection piping must be self supporting to prevent stressing of the vacuum pump.
- 1.3 The unit must be securely bolted to a solid, stable floor or housekeeping pad utilizing all of the mounting holes provided in the unit frame. Shims or spacers are recommended to bring the unit frame or supports level with the mounting area. The objective is to make the unit frame tight and level on the mounting surface to absorb and eliminate transient vibrations. There should not be any overhang of the unit frame to the mounting surface. The use of spring type mounting devices between the unit and the mounting surface is not recommended. If the unit is to be installed on upper floors of a structure, use of an inertia base system should be considered. If an inertia base is used, all of the mounting procedures described above are required.
- 1.4 It is preferable to mount the unit above the sediment tank to preclude the possibility of siphoning fluid back into the vacuum pump.
- 1.5 Electrical service must be the same as motor and control panel nameplate data. Should an emergency circuit be provided to the equipment, it must be in phase with the normal supply circuit.
- 1.6 Connecting piping, either for intake or discharge, must be in strict accordance with local codes and the engineering drawings of the architects and engineers for the project. Flexible connectors must be used on all intake and discharge lines at the equipment ports for vibration control and serviceability of the vacuum pump. Discharge lines must be piped to outside atmosphere in accordance with Compressed Gas Association (CGA) Standard P2.1 and National Fire Protection Association (NFPA) Standard 99.
- 1.7 The size of the discharge line must never be less than the equipment porting. The sizing must be such that maximum allowable back pressure will not exceed a three inch water column on the vacuum pump.
- 1.8 Make sure piping that is to be connected to the unit is clean and free of dirt and scale.

- 1.9 The drive coupling or pulleys must be checked for proper alignment. Misalignment most often occurs during shipment and while the equipment is being set in place. It is also required to rotate the vacuum pump by hand to check for free turning. *Do not operate the equipment electrically until this step has been completed.*
- 2 Vacuum Filter Assembly
 - 2.1 Mount vacuum filter assembly (item 2) in piping between vacuum pump (item 1) and sediment tank assembly (item 3). Provide adequate space to access vacuum filter assembly for removing canister cover to inspect or replace filter element.
- 3 Sediment Tank
 - 3.1 Locate sediment tank (item 3) over drain or provide piping to permit discharge to run freely into the appropriate drain.
- 4 Steam Supply
 - 4.1 Provide a steam shutoff valve within access of the operator in case of piping or hose failure.
 - 4.2 Install a filter in steam line with pressure gauges on both inlet and outlet sides (or a delta "p" gauge). Follow manufacturer's installation instructions.
 - 4.3 Install a steam pressure regulator (0-50 psi / 0-3.4 bar) after the steam filter.
 - 4.4 Run stainless steel piping between steam filter and steam / vacuum handle hose.
- 5 Gauge Panel
 - 5.1 Locate gauge panel (item 4) as close as possible to the operator work station. Keep in mind that the steam temperature bulb must be located within six feet / 1.8 meters of the steam supply temperature bulb well.
 - 5.2 Install the steam temperature gauge bulb in the appropriate steam well (1/2 inch NPT union).
 - 5.3 Run piping from the regulated steam pressure line to the steam pressure gauge on the panel.
 - 5.4 Run piping between the vacuum line and the vacuum gauge on the panel.
- 6 Temperature Switch
 - 6.1 Install the temperature switch (item 9) in the steam line in the immediate vicinity of the gauge panel steam temperature bulb. Wire the switch into your annunciation device which must activate when the steam temperature drops below 180°F / 82 °C.
- 6.2 Test the switch periodically by lowering the steam pressure slowly until the steam temperature drops below 180°F / 82 °C. Below this temperature the annunciation device must energize a beacon, an audible alarm or drop out the vacuum pump starter coil.
- 6.3 The output of the switch can carry a 15 ampere, 125 or 250 volt load.
- 7 Sanitizer
 - 7.1 Install sanitizer (item 5) in the immediate vicinity of the operator. **Jarvis** part number 4038016 is recommended.
 - 7.2 Run hot water and water discharge piping to the sanitizer.
- 8 Steam / Vacuum Handle
 - 8.1 Attach steam hose assembly (item 8) and vacuum hose assembly (item 7), hoses supplied by **Jarvis**, to the vacuum handle assembly (item 6) and to the steam and vacuum supplies.

START UP INSTRUCTIONS

Refer to Figure B on page 5 for referenced items.

ALWAYS DISCONNECT THE POWER SUPPLY IN ACCORDANCE WITH OSHA'S LOCKOUT/TAGOUT PROCEDURES (29 CFR 1910.147) BEFORE PERFORMING ANY MAINTENANCE OR REPAIRS.

- 1 Use a 30 weight, non-detergent, turbine grade oil such as *Citgo Pacemaker 60* or equivalent to fill the oil reservoir (item 16). The oiler will operate automatically when vacuum is above 5 in. hg. / 17 kPa. **Jarvis** offers the correct oil for the rotary vane pump in quart, gallon or five gallon containers.
- 2 Jog the vacuum pump motor (item 10) to insure correct rotation.
 - 2.1 As viewed from the input shaft end of the pump (item 21), the correct rotation is clockwise. If the rotation is not correct, switch any two of the three electrical service lines coming into the motor.
- 3 While the pump is running and drawing 11 in. hg. / 37.3 kPa or more, adjust the three oiler drip controls. Set each drip rate at 8 to 12 drops per minute.
 - 3.1 Excessive lubrication can be as harmful as lack of lubrication. If a large quantity of oil is collected in the pump, the rotor or vanes could fracture upon start-up because of the physical limitations of compressing a liquid.

- 4 While the pump is running, adjust the vacuum relief valve(s) (item 19) for the desired amount of vacuum. A setting of 15 in. hg. / 50.8 kPa with the steam / vacuum handle (item 6) dead headed or blocked is a good starting point.
- 5 Open the steam shut-off valve and adjust the pressure regulator for the desired steam pressure. A setting of 30 psi / 36.5 bar is a good starting point.

MAINTENANCE INSTRUCTIONS

ALWAYS DISCONNECT THE POWER SUPPLY IN ACCORDANCE WITH OSHA'S LOCKOUT/TAGOUT PROCEDURES (29 CFR 1910.147) BEFORE PERFORMING ANY MAINTENANCE OR REPAIRS.

HANDLE AND DISPOSE OF SOLVENTS AND WASTE IN ACCORDANCE WITH OSHA'S HAZARDOUS MATERIAL PROCEDURES (29 CFR 1910.120) AND NATIONAL AND STATE REGULATIONS.

IMPORTANT: SHUT OFF STEAM AND HOT WATER SUPPLY AND ALLOW THE COMPLETE SYSTEM TO COOL DOWN BEFORE PERFORMING ANY REPAIRS OR MAINTENANCE.

1 DAILY:

- 1.1 Check the lubrication level of the vacuum pump/oil reservoir assembly on the oil level gauge (item 15). The oil reservoir has two compartments, each with a capacity of 1.5 gallons / 5.7 liters. The lower compartment is for clean SAE 30 weight oil per the operating instructions. The upper compartment collects the oil and condensates from the pump exhaust. Drain this compartment at frequent intervals, or whenever clean oil is added. *Never transfer the liquid from the exhaust compartment to the clean oil supply because the condensates will damage the pump.*
- 1.2 Check setting of oiler drip rates to vacuum pump (item 21). Set all three drip rates at 8 to 12 drops per minute with vacuum above 11 in. hg. / 37.3 kPa.
- 1.3 Open ball valve (item 77) on bottom of sediment tank (item 3) and drain the collected waste after each shift.
 - 1.3.1 Remove pipe cap (item 84). With power to the vacuum pump off and ball valve (item 77) open, flush the sediment tank (item 3) with hot water.

- 1.4 Check condition of steam hose assembly (item 8) and vacuum hose assembly (item 7) and repair or replace as necessary.
- 2 WEEKLY:
 - 2.1 Open vacuum filter canister (item 2) and clean or replace foam and or pleated filter element (item 51).
 - 2.2 Clean and inspect ball check (item 50).
 - 2.3 Check setting of oiler drip rates to vacuum pump (item 21). Set all three drip rates at 8 to 12 drops per minute with vacuum above 11 in. hg. / 37.3 kPa.
 - 2.4 Flush sediment tank (item 3) with hot water.
- 3 WHEN NECESSARY:
 - 3.1 Renew steam filter element when pressure drop across filter exceeds manufacturer's recommended delta "p". Follow manufacturer's recommendations for sterilization of filter.
 - 3.2 Replace vanes (item 45) on vacuum pump (item 21) when performance deteriorates.
 - 3.3 Clean and inspect strainer (item 20) located in pump inlet.
- 4 GENERAL TROUBLESHOOTING HINTS:

Note: Most failures to produce the required vacuum are due to leaks in a connecting line, a dirty inlet filter or strainer, sticking of the pump vanes, loose belt or pulley, or electrical problems.

- 4.1 To clean pump interior, allow a few tablespoons of safety solvent (*do not use kerosine or other flammable solvents*) to be drawn into the pump intake to flush out the dirt and viscous oil. *WD-40 or Loctite* non flammable solvents are recommended.
 - 4.2 Continue to add small amounts of solvent until pump is running free.
 - 4.3 Re-lubricate per the start-up instructions.
- ### 5 SERVICING ROTARY VANE PUMP:

Note: Always service the pump from the shaft end. Do not disturb the blind end cylinder cap (item 36) unless replacement of the bearing is required.

Note: Before servicing pump it is advisable to have a spare parts kit available. *Refer to parts list on page 6.*

- 5.1 After removing the drive coupling hub (item 13) from the shaft, check for any nicks or burrs that could damage the shaft seal (item 23). Use emery cloth or a file to smooth the shaft surface.

- 5.2 Remove the four screws (item 24) and the seal housing (item 25) from shaft end cylinder cap (item 31).
- 5.3 Use a sharp pointed tool to bend back the finger of the lock washer (item 27) from the slot of the lock nut (item 26).
- 5.4 Use a spanner wrench in one of the slots of the lock nut (item 26) to rotate the nut in a counter-clockwise direction. Remove the lock nut and lock washer from the shaft. **Jarvis** offers a special wrench for this application. *Refer to parts list on page 6.*
- 5.5 Remove the twelve screws (item 30) holding the cylinder cap (item 31) to the cylinder (item 48). Re-insert three screws (item 30) into the three tapped holes in the cylinder cap. Turn the screws clockwise to separate the cap from the cylinder. Take an equal number of turns on each screw in sequence, keeping cylinder cap parallel to the shaft.
- 5.6 After removing the cylinder cap, check the edge where the three jack screws made contact with the cylinder and remove any burrs or high spots.
- 5.7 Before removing the vanes (item 45) from the rotor slots, carefully observe the position of the leading edge of the vane. The vanes are not symmetrical and must be reinstalled in the same orientation as now observed. *See illustration on page 6.* Remove the vanes from the rotor slots and examine them for wear and broken edges. Replace as necessary.
- 5.8 Remove the four screws (item 24) from end cap (item 39) and remove end cap from blind end cylinder cap (item 36). Note the location of wave spring (item 42) in the cylinder cap for use in assembly. Check the condition of bearing (item 43) by rotating the rotor (item 44). Unless the bearing requires replacement, do not disassemble the pump any further. Go to step 5.14.
- 5.9 If the bearing needs replacement, remove the twelve screws (item 30) and lift out the rotor and shaft assembly (item 44) with the blind end cylinder cap still attached to the cylinder. ***Use caution while removing the rotor. It is heavy and awkward to handle.***
- 5.10 Support the rotor and shaft assembly with the keyway end of the shaft projecting down. Remove lock nut (item 40) and lock washer (item 41) as detailed in step 5.3 and 5.4. **Jarvis** offers a special wrench for this application. *Refer to parts list on page 6.* Lift blind end cylinder cap (item 36) from rotor and shaft assembly.
- 5.11 Remove bearing (item 43) by tapping with a brass rod. Push bearing from inside surface of cylinder cap toward outside surface. If a shim was installed between bearing and cylinder cap, it must be reinstalled on assembly.
- 5.12 Install new bearing by tapping with a brass rod that covers the full diameter of the bearing. ***Important: seat the bearing to the fullest depth possible, as the internal clearance between the rotor and cylinder end caps is determined by the position of the blind end bearing.***
- 5.13 Support the rotor and shaft assembly with the keyway end of the shaft projecting down. Install lock washer (item 41) and lock nut (item 40) on blind end of shaft. Stake over a finger of the lock washer into a slot in the lock nut after the lock nut has been tightened securely.
- 5.14 Reinstall wave spring (item 42), end cap (item 39), o-ring (item 38) and four screws (item 24).
- 5.15 Replace cylinder cap o-rings (item 32)
- 5.16 Install rotor and shaft assembly with blind end cylinder cap into the cylinder (item 48). Insert two tapered pins (item 37) and secure blind end cylinder cap to cylinder with twelve screws (item 30).
- 5.17 Place the vanes (item 45) in the rotor slots with the leading edge of the vanes toward the rotation of the rotor. *See illustration on page 6 for proper orientation of vanes.*
- 5.18 Place the shaft end cylinder cap (item 31) on the cylinder (item 48). Insert two tapered pins (item 37) and secure cylinder cap to cylinder with twelve screws (item 30).
- 5.19 Install new retaining ring (item 29), bearing (item 28), lock washer (item 27) and lock nut (item 26) on keyway end of shaft. Stake over a finger of the lock washer into a slot in the lock nut after the lock nut has been tightened securely.
- 5.20 Install shaft seal (item 23) and seal housing (item 25), and secure them to the cylinder cap with four screws (item 24).