



**Roots**

## 616 RAM-DVJ

Part Number – call 816-741-0282



RAM DVJ WHISPAIR Dry Exhausters have an exclusive discharge jet plenum design which allows cool, atmospheric air to flow into the cylinder. This unique design permits continuous operation at vacuum levels to blank-off with a single stage unit.

The RAM™ vacuum exhauster's integral cooling design eliminates the problems caused by high discharge temperatures at vacuum levels beyond 16" Hg. Standard dry vacuum exhausters are limited to approximately 16" Hg vacuum because operation at higher vacuum levels can cause extreme discharge temperatures resulting in casing and impeller distortion and possible failure.

- Can operate in two and three stage systems to achieve vacuum levels down to 1 Torr.
- Heavy-duty unit with integral-shaft ductile iron impellers with an involute profile
- Rigid one-piece casing and headplates are grey iron
- Drive end cover and end cover are aluminum
- Carburized and ground alloy steel spur timing gears
- Cylindrical roller bearings
- Piston rings reduce air leakage
- Lip type oil seals prevent lubrication from entering the air chamber. Optional mechanical seals available.
- Splash oil lubricated gears on drive and gear ends
- Detachable steel mounting feet
- Horizontal and vertical configurations available



816-741-0282

### Also Available in:

- RAM-DVJ-G (Dry Exhauster Gas Whispair)
- RAM-VJ (Water Sealed Exhauster Whispair)



### Quick Specs

Flow Range	to 2367 CFM
Max ΔVacuum	27" Hg
Maximum RPM	3000
Minimum RPM	1750
Max ΔT	300°F
Jet Inlet Connection Size	8" Flange
Discharge Connection Size	10" Flange
System Air Inlet Size	6" Flange
Shaft Dia.	2.0"
Min Sheave Dia.	8.5"
Drive End Lubrication	Oil
Gear End Lubrication	Oil
Oil Sump Horiz Config	~145 oz
Oil Sump Vert Config	~83 oz
Bare Unit Weight	975 lbs
Container	Wood Skid
Skid Size (L x W x H)	54" x 32" x 48"
Shipping Weight on Skid	~1025 lbs
Recommended to Ship Via	Truck



816-741-0282

## Repair Kits

Repair kits are bundled with the parts you need to complete a standard repair. It is more cost effective to buy a repair kit than to purchase individual parts. However, if you need parts not listed in the kit, it is recommended that you call Pathfinder Systems for parts pricing.

**Top, Left, or Right Drive Shaft (Bottom Shaft order P/N 854692RK)**

**P/N 854691RK Kit for 600 AIR RAM/RAM-J/RCS/RCS-J/DVJ/DPJ**

Item	Qty	Kit Description	P/N
		ASSY Slinger 400/600	TK10002
7	2	Gasket 600 RCS Gearbox/Cover	52484021
7	2	Gasket 600 RAM Gearbox/Cover	84534021
10	1	Shim Set	52485020
14	4	Bearing, Roller	T30055020
21	2	Plug, Vent 3/8"	13005003
55	2	Breather, Mini MB Style 1/2	T20013004
27	4	Seal, Lip (Viton)	10460031
28	4	Piston, Ring Seal	12283002
29	2	Washer, Spring, Wavy	10135006
31	2	Nut, Hex ESNA 1-1/4"-12	10319018
33	1	Seal, Lip, Drive	10460038
37	2	Sight, Plug Oil Level, 3/4	12066001
38	4	Sleeve, Piston Ring	52486020
40	1	DRIVE END SLINGER	55067020
46	1	GEAR END OIL SLINGER	T20027001
60	1	CAP SCREW	12800002
70	1	Shim (0.035)	106191412
87	2	CAP SCREW	T20030001
88	4	Anti Rotation Ball	T20001001
90	2	Bushing, RDCC	11779005
91	2	PLAIN FLAT WASHER	10181004
92	2	PLAIN FLAT WASHER	10181045
93	1	GE OIL SLINGER WASHER	90181020

**RAM series parts list 4" & 6" gear diameter  
for Gas, DVJ, DPJ & JV**  
(Refer to drawing #81881023)

Item #	Part Name	Qty.
1	Headplate	2
2	Spray nozzle assembly	1
3	Gearbox	1
4	Timing Gears	2
5	End Cover	1
7	Gasket – Gearbox/Cover	2
10	Shims	Lot
11	Cylinder	1
12	Impeller & Shaft Drive	1
13	Impeller & Shaft Driven	1
14	Bearing Roller	4
16	Pin, Dowel (Pull Out)	4
17	Pin, Dowel	2
19	Key Square	1
21	Plug - Vent	2
22	Plug, Pipe	12
23	Screw, Cap Hex Hd.	*
27	Seal, Lip Headplate DVJ, DPJ, VJ	4
27	Seal-Mech-Viton Gas	4
28	Piston, Ring-Seal	4
29	Washer, Wavy Spring	2
31	Gear Nut	2
32	Scr, Cap Hex Hd.	16
33	Seal, Lip Drive	1
34	Brg. Clamp Plate - D. E.	2
35	Lock Washer - Spring	16
37	Oil Level Gauge	2
38	Sleeve, Shaft DVJ, DPJ, JV	4
38	Sleeve - Gas	4
40	Slinger - D.E. (Top Drive)	1
46	Slinger - G.E.	1
49	Oil Leader L/S	1
50	Oil, Leader-R/S	1
54	Brg Clamp Plate - G. E.	2
60	Screw, Cap Butt. HD.	1
64	Pin, Spring	1
66	Screw, Cap Hex HD.	*
66.1	Whispair, Spring Lock 3/8M	*
70	Shims D.E. Brg.	1
75	Screw, Cap - Hex HD.	*
76	Blower Foot - RH	2
77	Blower Foot - LH	2
85	Elb, Pipe-Black	2
85.1	Plug, Pipe	2
87	Scr, Cap BH	2
88	Anti Rotation Ball	4
90	BSHG-RDCG	2
91	Washer, Plain Flat	2
92	Washer, Plain Flat	2
93	Washer	2
94	Oil Leader	2
95	Cap Screw	4



816-741-0282

**Table 2 - Recommended Oil Grades**

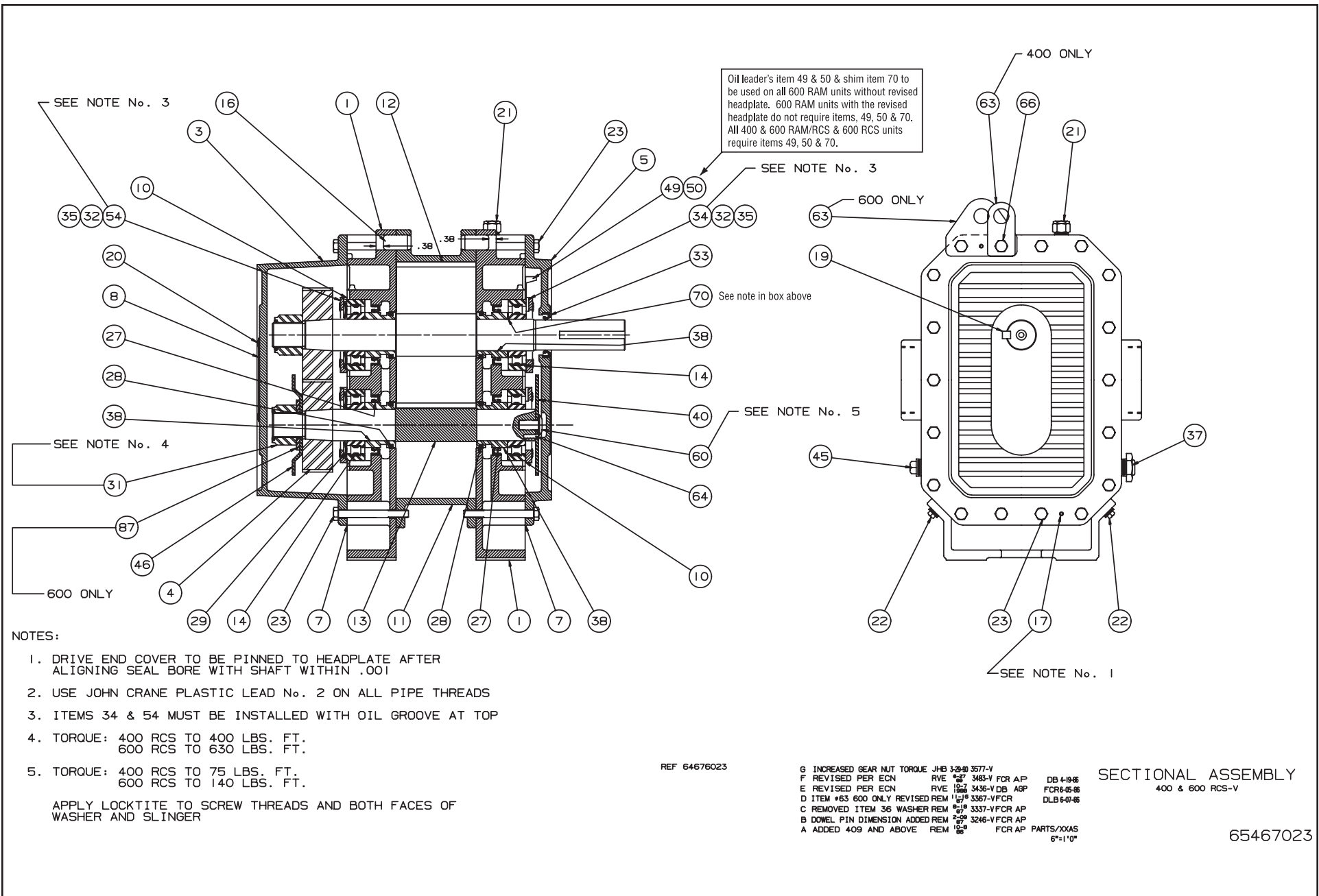
Ambient* Temperature °F (°C)	ISO Viscosity No.
Above 90° (32°)	320
32° to 90° (0° to 32°)	220
0° to 32° (-18° to 0°)	150
Below 0° (-18°)	100

\*Ambient temperature is defined as the temperature of the space in which the blower and drive are located.

Use a good grade of **industrial type** non-detergent, rust inhibiting, anti-foaming oil and of correct viscosity per Table 2. Roots synthetic oil (Roots P/N 813-106-) is **specified and recommended**. Roots does not recommend automotive type lubricants, as they are not formulated with the properties mentioned above.

**Due to sludge build-up and seal leakage problems, Roots recommendation is DO NOT USE Mobil SHC synthetic oils in ROOTS blowers.**

ROOTS® Synthetic Oil: ISO-VG-320 Grade	
	Part Number
Quart	13106004
Gallon	13106005
Case (12 qts)	13106007
ROOTS® Synthetic Oil: ISO-VG-220 Grade	
	Part Number
Quart	13106001
Gallon	13106002
Case (12 qts)	13106008
ROOTS® Synthetic Oil: ISO-VG-150 Grade	
	Part Number
Quart	13106020
Gallon	13106021
Case (12 qts)	13106023
5 Gallon Pail	13106022
55 Gallon Drum	13106025
ROOTS® Synthetic Oil: ISO-VG-100 Grade	
	Part Number
Quart	13106011
Gallon	13106012
Case (12 qts)	13106014
5 Gallon Pail	13106013
55 Gallon Drum	13106016



Oil leader's item 49 & 50 and shim item 70 to be used on all 600 RAM units without revised headplate. 600 RAM units with the revised headplate do not require items, 49, 50 & 70. All 400 & 600 RAM/RCS & 600 RCS units require items 49, 50 & 70.

SEE NOTE No. 3

SEE NOTE No. 4

NOTES:

1. DRIVE END COVER TO BE PINNED TO HEADPLATE AFTER ALIGNING SEAL BORE WITH SHAFT WITHIN .001
2. USE JOHN CRANE PLASTIC LEAD No. 2 ON ALL PIPE THREADS
3. ITEMS 34 & 54 MUST BE INSTALLED WITH OIL GROOVE AT TOP
4. TORQUE: 400 RCS TO 400 LBS. FT.  
600 RCS TO 630 LBS. FT.
5. TORQUE: 400 RCS TO 75 LBS. FT.  
600 RCS TO 140 LBS. FT.

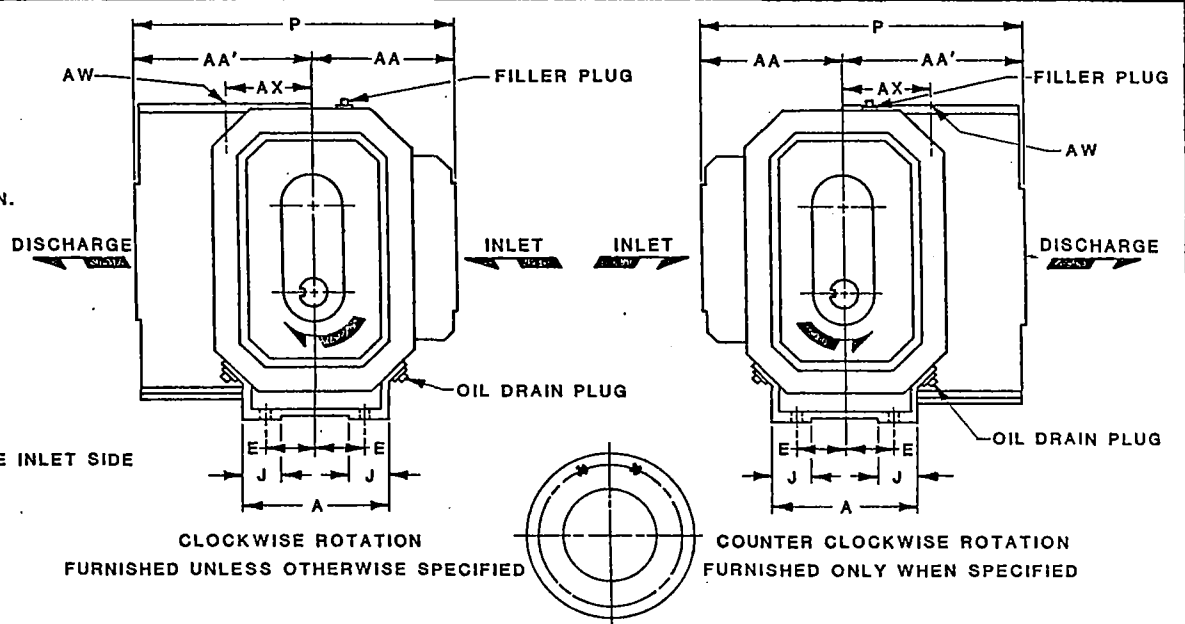
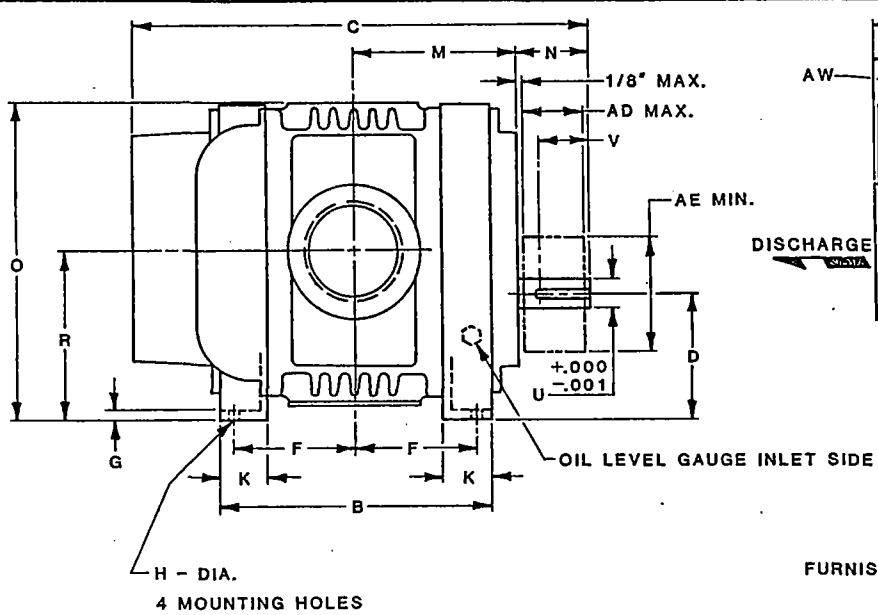
APPLY LOCKTITE TO SCREW THREADS AND BOTH FACES OF WASHER AND SLINGER

REF 64676023

G INCREASED GEAR NUT TORQUE JHB 3-29-90 3577-V  
 F REVISED PER ECN RVE 027 3483-V FCR AP DB 4-19-86  
 E REVISED PER ECN RVE 1203 3436-V DB AGP FCR 6-05-86  
 D ITEM #63 600 ONLY REVISED REM 11/21/83 3367-VFCR DLB 6-07-86  
 C REMOVED ITEM 36 WASHER REM 02/19 3337-VFCR AP  
 B DOWEL PIN DIMENSION ADDED REM 2/25/83 3246-VFCR AP  
 A ADDED 409 AND ABOVE REM 10/14 625 FCR AP PARTS/XXAS  
 6\*110\*

SECTIONAL ASSEMBLY  
400 & 600 RCS-V

65467023



INLET AND DISCHARGE FLANGES TO MATE  
 FLUSH AND SQUARE WITH FLAT FACE  
 FLANGE ONLY. USE FULL FACE GASKET.

FOR V-BELT DRIVEN UNITS, MOTOR  
 TO BE LOCATED ON INLET SIDE OF  
 OF BLOWER.

	5" FLG.	6" FLG.	8" FLG.	10" FLG.
OPENING	5.00	6.00	8.00	10.00
BOLT CIRCLE	8.50	9.50	11.75	14.25
FLANGE O.D.	10.30	11.00	13.50	16.00
NO. TAPPED HOLES	8	8	8	12
SIZE HOLES	3/4-10	3/4-10	3/4-10	7/8-9
TAP DEPTH	1.13	1.13	1.13	1.31

W - INLET  
 W' - DISCHARGE  
 AD - SHEAVE WIDTH  
 AE - SHEAVE DIAMETER  
 AW - JET INLET

**DVJ DRY VACUUM WHISPAIR BLOWER-BOTTOM DRIVE**

SIZE	A	B	C	D	E	F	G	H	J	K	M	N	O	P	R	U	V	KEYWAY	W	W'	AA	AA'	AD	AE	AW	AX	OIL CAPACITY	APPROX. WEIGHT
406 JV	7.50	10.88	20.38	6.75	2.50	4.75	.50	.44	2.00	2.44	7.13	3.31	16.63	17.75	9.00	1.50	2.75	.375 x .188	4" NPT	5" NPT	7.25	10.50	3.53	6.50	4" NPT	6.75	32.5 FL.OZ.	365
412 JV	7.50	16.88	26.38	6.75	2.50	7.75	.50	.44	2.00	2.44	10.13	3.31	16.63	17.75	9.00	1.50	2.75	.375 x .188	6" FLG.	6" FLG.	6.00	11.75	3.53	6.50	5" FLG.	6.50	32.5 FL.OZ.	575
616 JV	10.00	21.44	32.50	9.00	3.50	9.75	.63	.56	2.50	2.75	12.56	4.19	21.63	21.25	12.00	2.00	3.63	.500 x .250	8" FLG.	10" FLG.	7.50	13.75	4.44	8.50	8" FLG.	6.75	70 FL.OZ.	975

ALL DIMENSIONS IN INCHES

CERTIFIED CORRECT FOR  
 CUSTOMER ORDER NO. \_\_\_\_\_  
 ROOTS ORDER NO. \_\_\_\_\_  
 DATE \_\_\_\_\_

V-BELT DRIVE DATA

BELTS \_\_\_\_\_  
 DRIVE SHEAVE \_\_\_\_\_  
 DRIVEN SHEAVE \_\_\_\_\_  
 CENTER DISTANCE \_\_\_\_\_



DRESSER INDUSTRIES, INC.  
 ROOTS DIVISION  
 900 WEST MOUNT STREET,  
 CONNERSVILLE, INDIANA 47331

REM 9/17/86  
 FCR

**865-637-021**

## ROOTS™ RAM™-DVJ WHISPAIR™ Dry Vacuum Exhausters

Frames 406J, 412J & 616J

**RAM™** stands for Reliability, Availability and Maintainability. Today, more than ever, ROOTS is committed to supplying our customers with reliable products manufactured with state-of-the-art CNC machine tools. Production and inventory are being scheduled and controlled to ensure these units will be available when you need them. Design improvements such as repositionable rugged steel mounting feet and die-cast aluminum drive end covers and gear covers help to reduce installation costs and make normal maintenance easier.

### BASIC BLOWER DESCRIPTION

ROOTS™ RAM™-DVJ WHISPAIR™ dry exhausters have an exclusive discharge jet plenum design which allows cool, atmospheric air to flow into the cylinder. This unique design permits continuous operation at vacuum levels to blank-off with a single stage unit.

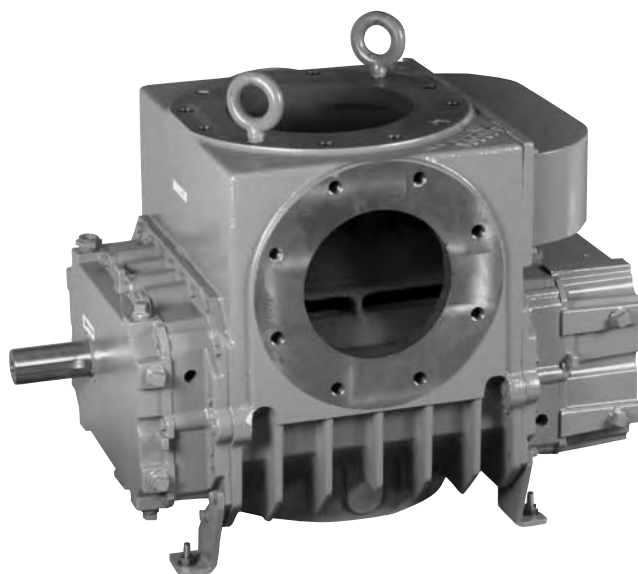
Standard dry vacuum exhausters are limited to approximately 16" Hg vacuum because operation at higher vacuum levels can cause extreme discharge temperatures resulting in casing and impeller distortion and possible failure. The RAM™ vacuum exhauster's integral cooling design eliminates the problems caused by high discharge temperatures at vacuum levels beyond 16" Hg.

The basic model is designed using integral-shaft ductile iron impellers with an involute profile. The casing and headplates are grey iron, while the drive end cover and gear cover are aluminum. Carburized and ground alloy steel spur timing gears are taper mounted on the shafts, secured with a locknut. Cylindrical roller bearings are splash lubricated at both the gear end and the drive end.

Piston rings reduce air leakage through the headplate bores and lip-type oil seals prevent lubricants from entering the air chamber. Units can be equipped with mechanical seals for gas applications.

All units are designed with rugged steel mounting feet which permit in-field adaptability to either vertical or horizontal installation requirements.

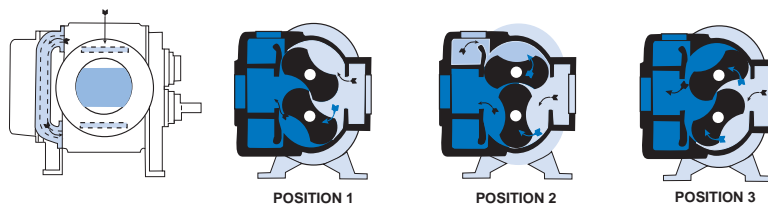
ROOTS™ DVJ WHISPAIR™ exhausters can be arranged to operate in two and three stage systems to achieve vacuum levels down to 1 Torr.



### DESIGN AND CONSTRUCTION FEATURES

1. Single stage operation to 27" HgV
2. No valves, vanes or Teflon rings to wear
3. Alloy steel timing gears
4. Cylindrical roller bearings
5. Piston ring air seals
6. Lip-type oil seals (optional mechanical seal)
7. Splash oil lubrication
8. Horizontal and vertical configurations available

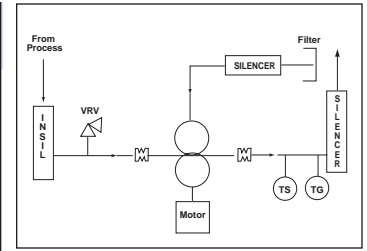
### OPERATING PRINCIPLE



**Position 1:** Incoming air is trapped between the impellers. Simultaneously, pressurized air is being discharged. **Position 2:** As the upper impeller passes the jet plenum, cooled, pressurized air flows into the space between the impeller and cylinder. This cools the trapped air, helps control thermal growth and allows higher discharge pressures. **Position 3:** The trapped air is then moved into the discharge flange (left). Backflow is reduced, resulting in lower operating noise level and reduced shock loading on the impellers.

## PERFORMANCE TABLE

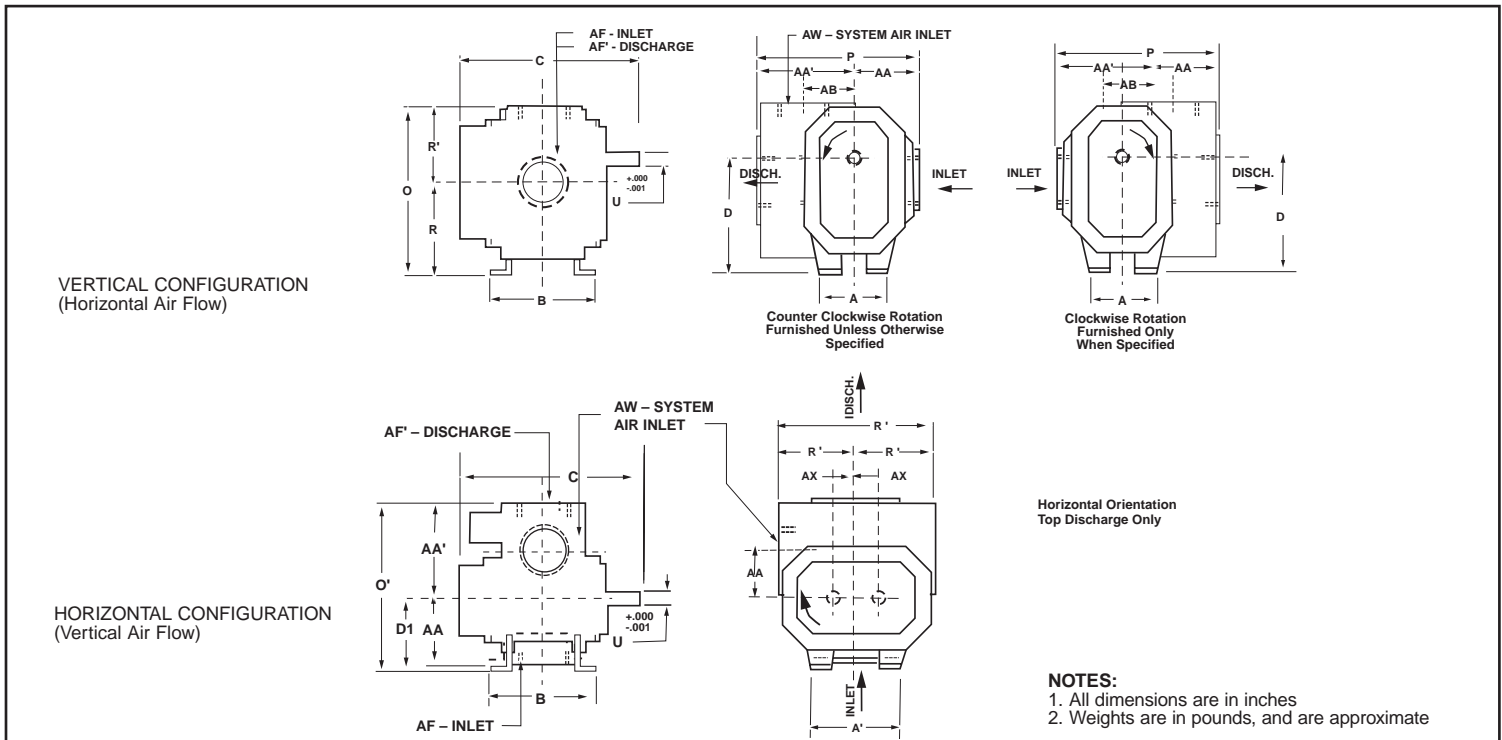
FRAME SIZE	SPEED RPM	Maximum Free Air CFM	12" HgV		16" HgV		20" HgV		24" HgV		27" HgV	
			CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
406J	2320	668	266	10.3	228	13.5	177	16.7	78	20.0	*	22.4
	2695		329	12.2	291	15.9	240	19.5	140	23.2	*	26.0
	3564		474	16.7	436	21.5	385	26.2	286	30.9	38	34.5
	4000		547	19.2	509	24.4	458	29.6	358	34.9	111	38.8
412J	2320	1332	530	20.2	456	26.7	353	33.2	155	39.7	*	44.5
	2695		655	23.6	580	31.1	478	38.6	280	46.1	*	51.8
	3564		945	32.0	870	41.7	767	51.5	569	61.3	77	68.6
	4000		1090	36.3	1015	47.2	912	58.0	715	68.9	222	77.0
616J	1750	2367	1015	35.8	902	47.5	747	59.1	448	70.8	*	79.6
	2124		1310	43.7	1197	57.8	1042	71.9	743	86.0	*	96.6
	2437		1557	50.5	1444	66.6	1289	82.7	990	98.8		
	2860		1891	59.8	1777	78.6	1622	97.4	1323	116.2	579	130.2
	3000		2001	63.0	1888	82.6	1733	102.3	1434	121.9	689	136.7



### NOTES:

- Vacuum ratings based on inlet and jet air at standard temperature of 68°F, discharge and jet pressure of 30" Hg and specific gravity of 1.0.
  - Refer to Factory for performance guarantee above 24" HgV.
- \* Denotes blank-off.

## OUTLINE DRAWING & DIMENSIONAL TABLE



### NOTES:

- All dimensions are in inches
- Weights are in pounds, and are approximate

FRAME SIZE	A	A'	B	C	Drive Shaft Location		O	O'	P	P'	R	R'	U	Keyway	AA	AA'	AB	AF	AF'	AW	AX	WGT.
					D	D1																
406J	8.00	11.00	10.75	20.50	11.25	7.50	16.38	18.00	17.75	14.75	9.00	7.38	1.500	.375x .188	7.25	10.50	6.75	4 NPT	5 NPT	4 NPT	2.25	365
412J	8.00	11.00	16.75	26.50	11.25	7.50	16.63	19.25	17.75	15.25	9.00	7.63	1.500	.375 x .188	6.00	11.75	6.50	6 FLG	6 FLG	5 FLG	2.25	575
412J	10.00	16.00	21.44	32.50	15.00	9.00	21.63	22.75	21.25	19.25	12.00	9.63	2.000	.500 x .250	7.50	13.75	6.75	8 FLG	10 FLG	8 FLG	3.00	975

## WARRANTY PERIOD

Twelve (12) months from date of original unit start-up or  
18 months from date of original shipment, whichever occurs first.

**Dresser, Inc.**



**Roots**

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DRESSER INDUSTRIES INC.  
**ROOTS DIVISION**  
 900 WEST MOUNT STREET  
 CONNERSVILLE, INDIANA 47331  
 PRINTED IN U.S.A.

**VACUUM PERFORMANCE**  
**FRAME 616 RAM DRY**  
**VACUUM PUMP**  
 MAX. VACUUM = 27" HG  
 MAX. SPEED = 3000 RPM

PERFORMANCE BASED ON AIR,  
 INLET AND JET AT 68°F,  
 DISCH. AND JET AT 30" HGA  
 AUGUST, 1998

