



## Roots 406 RAM-J

Part Number – 81978020



Patented WHISPAIR™ blowers reduce noise and power loss by utilizing an exclusive wrap-around plenum and proprietary WHISPAIR jet to control pressure equalization-feeding backflow in the direction of impeller movement, thereby aiding rotation. This design results in longer bearing life, lower vibration, and reduces noise up to 5 dBA pressure or vacuum.

- 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.
- Hydrodynamic seal on the drive shaft prevents oil leaks
- Splash oil lubricated gears on drive and gear ends
- Detachable steel mounting feet
- Horizontal and vertical configurations available

### Also Available in:

- RAM
- RAM-GJ (Gas Whispair)
- RAM-DPJ (High Pressure Whispair)
- RAM-DVJ (Dry Exhauster Whispair)
- RAM-DVJ-G (Dry Exhauster Gas Whispair)
- RAM-VJ (Water Sealed Exhauster Whispair)
- **Equivalent to:**  
*Tuthill M-D AcousticAir 4706*



816-741-0282



### Quick Specs

Flow Range	to 601 CFM
Max ΔPressure	18 PSI
Max ΔVacuum	16" Hg
Maximum RPM	4000
Minimum RPM	850
Max ΔT	240°F
Connection Size	4" FPT
Shaft Dia.	1.5"
Min Sheave Dia.	7.1"
Drive End Lubrication	Oil
Gear End Lubrication	Oil
Oil Sump Horiz Config	~55 oz
Oil Sump Vert Config	~27 oz
Bare Unit Weight	335 lbs
Container	Wood Skid
Skid Size (L x W x H)	32" x 29" x 26"
Shipping Weight on Skid	~375 lbs
Recommended to Ship Via	Truck



816-741-0282

**RAM™, RAM™-J Series Parts List -  
4" and 6" Gear Diameter  
(Refer to drawing #81881023)**

Item #	Part Name	Qty.
1	Headplate	2
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	Breather	2
22	Plug, Pipe	12
23	Screw, Cap Hex Hd.	*
27	Seal, lip headplate	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	Sight Plug - Oil Level	2
38	Sleeve, Shaft	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

\*Quantity varies by blower.

**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 524574RK)  
P/N 524573RK Kit for 400 AIR RAM/RAM-J/RCS/RCS-J/DVJ/DPJ**

Item	Qty	Kit Description	P/N
		ASSY Slinger 400/600	TK10002
7	2	Gasket 400 RCS Gearbox/Cover	52381021
7	2	Gasket 400 RAM Gearbox/Cover	78365021
10	1	Shim Set 400 RAM/Roots-Flo	52378020
14	4	Bearing, Roller	T30054020
55	2	Plug, Vent 3/8"	13005003
21	2	Breather, Mini MB Style 1	T20013004
27	4	Seal, Lip(Viton),Main	10460030
28	4	Piston, Ring Seal	12283001
29	2	Washer, Spring, Wavy	10135018
31	2	Nut, Hex ESNA 1-1/4"-12	10319019
33	1	Seal, Lip, Drive	10460034
37	2	Sight, Plug Oil Level,1/2"	12066003
38	4	Sleeve, Piston Ring	52418020
40	1	DRIVE END SLINGER	54710020
46	1	GEAR END OIL SLINGER	T20029001
60/87	3	CAP SCREW 1/2-13x1	12800001
70	1	Shim (0.035) 400 RAM	10619141
88	4	Anti Rotation Ball	T20001001
91	2	BUSH ING STL	T20031001
93	1	GEAR END WASHER	90185020



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.**

RAM™, RAM™-J Approximate Oil Sump Capacities				
Orientation	Gearbox		Drive End	
	Fl. Oz.	Liters	Fl. Oz.	Liters
400 (Horizontal)	36	1.06	19	0.56
400 (Vertical)	18	0.52	9	0.27
600 (Horizontal)	95	2.81	50	1.48
600 (Vertical)	55	1.63	28	0.83

**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

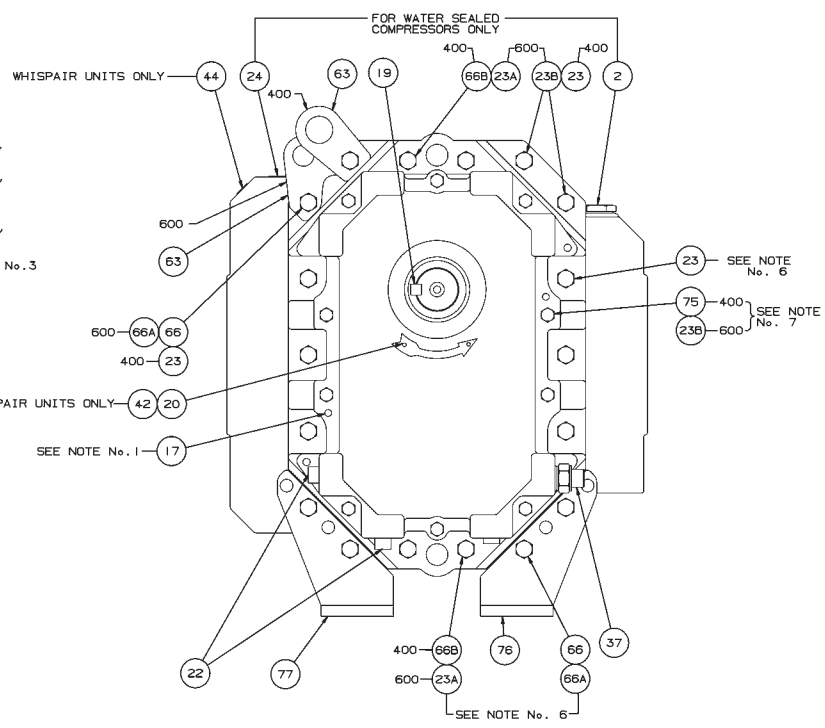
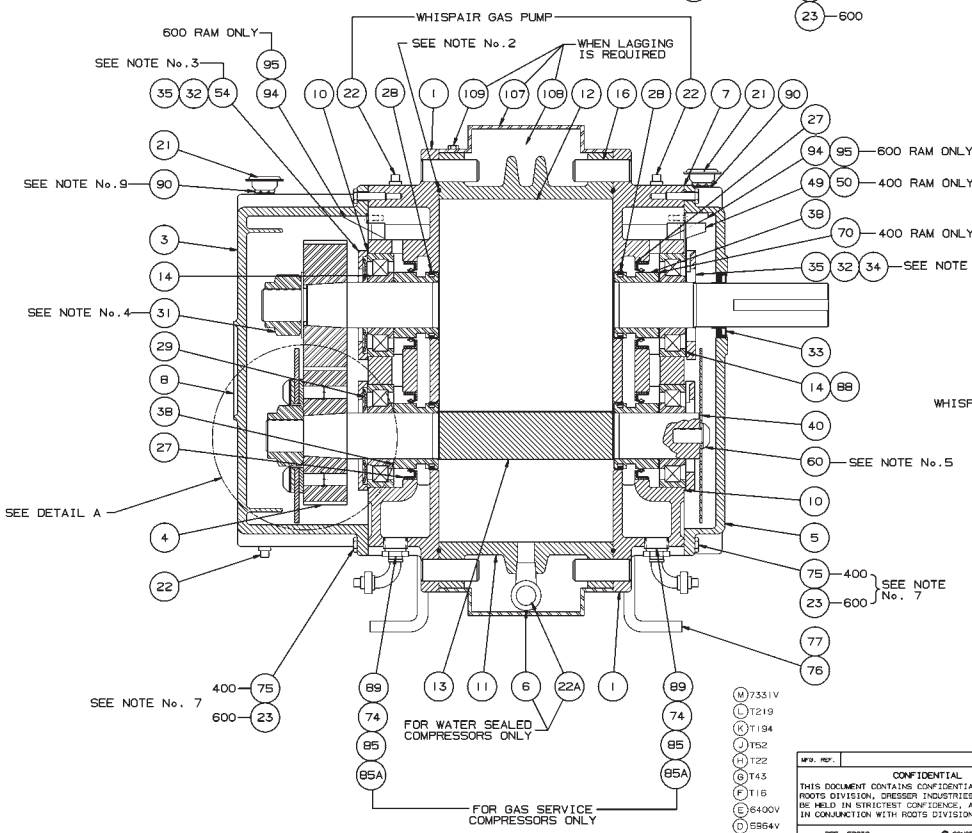
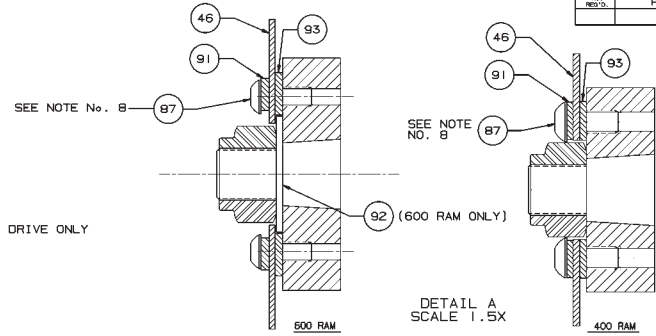
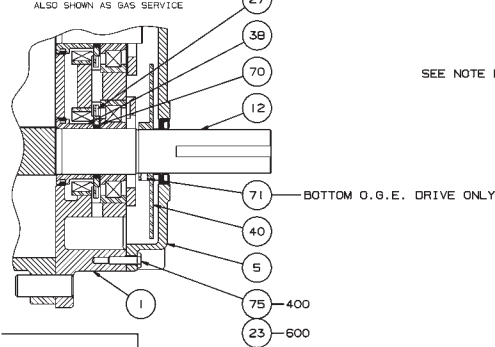
**ROOTS® Synthetic Oil: ISO-VG-100 Grade**

	Part Number
Quart	13106011
Gallon	13106012
Case (12 qts)	13106014
5 Gallon Pail	13106013
55 Gallon Drum	13106016

NOTES:

1. DRIVE END COVER TO BE PINNED TO HEADPLATE AFTER ALIGNING SEAL BORE WITH SHAFT WITHIN .001
2. USE TEFLON SEALANT ON ALL PIPE THREADS & CYLINDER TO HEADPLATE FLANGE FOR WHISPAIR GAS PUMP UNITS ONLY.
3. ITEMS 34 & 54 MUST BE INSTALLED WITH OIL GROOVE AT TOP.
4. TORQUE TO 400 FT.LBS. -400  
TORQUE TO 630 FT.LBS. -600
5. TORQUE TO 75 FT.LBS. -400  
TORQUE TO 140 FT.LBS. -600  
APPLY LOCKTITE TO SCREW THREADS & BOTH FACES OF WASHER & SLINGER.
6. TORQUE TO 35 FT.LBS. (HEADPLATE)
7. TORQUE TO 10 FT.LBS. (GEARBOX/END COVER)
8. LOCKTIGHT AND TORQUE TO FT.LBS. -75
9. TWO 1/2 X 3/4 BUSHINGS FOR BREATHERS ON 600 RAM SERIES ONLY

**BOTTOM DRIVE OPTION**  
ALSO SHOWN AS GAS SERVICE



- (M) 7331V
- (L) T219
- (K) T194
- (J) T52
- (H) T22
- (G) T15
- (F) T16
- (E) 6400V
- (D) 5964V
- (C) 5757V
- (B) 5560V
- (A) 5048V

REV.	DATE	BY	CHKD.	APP.	DESCRIPTION
S	7/18/67	DAB	B203V		DR. NER 1/10/66
R	1-26-68	AMP	7654V		DRG. BMS 1/10/66
G	9-1-68	AMP	7591V	RCA	APP. RDA 1/12/66
B	1-15-69	AMP	7430V	RDA	
D	3-6/69	RGR	7412V	RDA	
N	2-22/69	YC	7331V	RDA	

RAM/RAM-J/RAM-GJ/RAM-VJ  
400/600 RAM

SECTIONAL ASSEMBLY

81881023

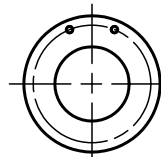
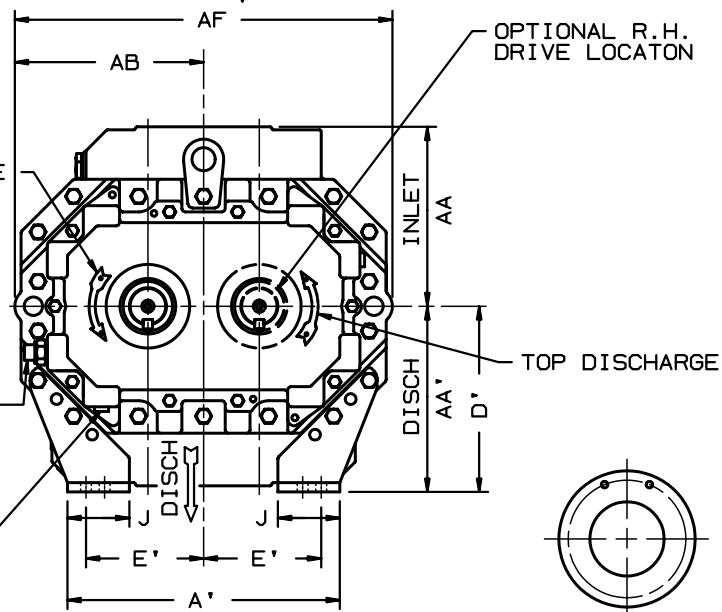
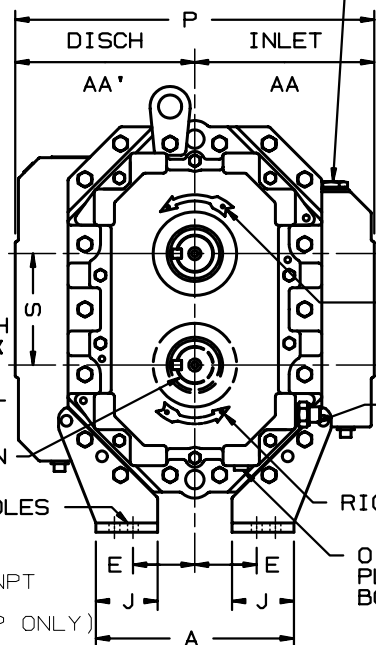
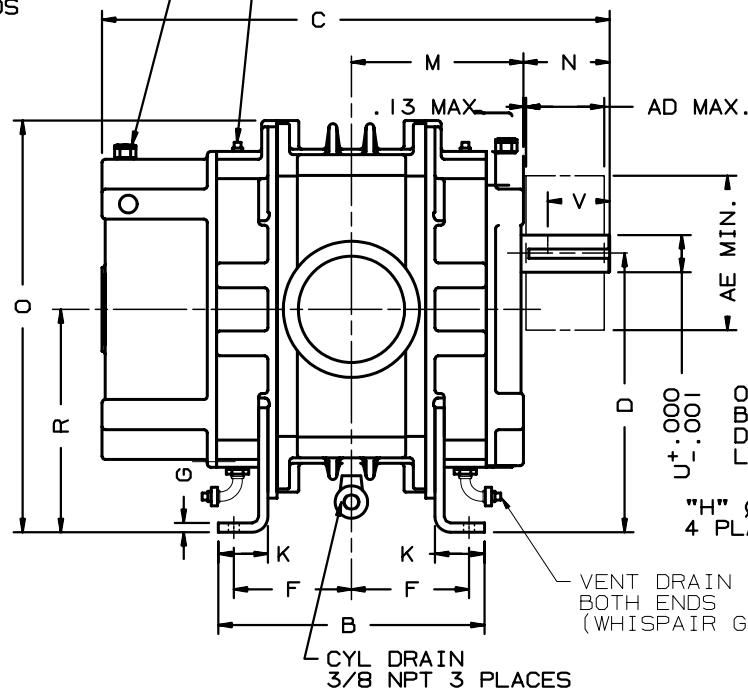
REV S

Assembly of RAM Series - Air & Gas Blowers

OIL FILL/ BREATHER  
1/2 NPT  
BOTH ENDS

VENT PURGE CONN. - 1/2 NPT  
BOTH ENDS  
(WHISPAIR GAS PUMP ONLY)

1/2 NPT CONNECTION  
SEAL WATER  
4.5 G.P.M. MAX  
(WHISPAIR WATER SEALED  
VAC. PUMP ONLY)



W - INLET  
W' - DISCHARGE  
AD - MAXIMUM SHEAVE WIDTH  
(SEE OVERHUNG LOAD LIMIT K-24102)  
AE - MINIMUM SHEAVE DIAMETER  
(SEE OVERHUNG LOAD LIMIT K-24102)  
ALL DIMENSIONS IN INCHES

INLET & DISCHARGE FLANGES TO  
MATE FLUSH & SQUARE WITH  
FLAT FACE FLANGE ONLY.  
USE FULL FACE GASKETS.  
V-BELT DRIVEN UNITS: MOTOR  
TO BE LOCATED ON INLET SIDE  
OF BLOWER.

A 5048V C 5420V D 5560V E 5767V  
F 5986V

FLG	5"	6"	8"	10"
OPENING	5"	6"	8"	10"
BOLT CIRCLE	8.50	9.50	11.75	14.25
FLANGE O.D.	10.00	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	1.13

FRAME SIZE	A	A'	B	C	D	D'	E	E'	F	G	H	J	K	M	N	O	P	R	S	U	V	KEYWAY	W	W'	INLET AA	DISCH AA'	AB	AD	AE	AF	APPROX WEIGHT
404	8.00	11.00	8.75	18.50	11.25	7.50	2.50	4.75	3.75	.38	.44	2.50	2.00	5.95	3.48	16.63	14.50	9.00	4.50	1.50	2.75	.375x.188	3"NPT	3"NPT	7.25	7.25	7.63	3.06	7.10	15.25	260
406	"	"	10.75	20.50	"	"	"	"	4.75	"	"	"	"	6.95	"	"	"	"	"	"	"	"	4"NPT	4"NPT	"	"	"	"	"	"	300
409	"	"	13.75	23.50	"	"	"	"	6.25	"	"	"	"	8.45	"	"	"	"	"	"	"	"	5"NPT	5"NPT	"	"	"	"	"	"	350
412	"	"	16.75	26.50	"	"	"	"	7.75	"	"	"	"	9.95	"	13.00	"	"	"	"	"	"	6"FLG	5"FLG	6.00	7.00	"	"	"	"	400
418	"	"	22.75	32.50	"	"	"	"	10.75	"	"	"	"	12.95	"	14.00	"	"	"	"	"	"	8"FLG	6"FLG	7.00	"	"	"	"	"	500
616	9.00	15.00	20.75	32.19	15.00	9.00	3.50	6.50	9.75	.38	.56	2.50	2.00	12.41	4.30	22.00	16.25	12.00	6.00	2.00	3.63	.500x.250	8"FLG	6"FLG	7.50	8.75	10.00	4.44	8.50	20.00	700
624	"	"	28.75	40.19	"	"	"	"	13.75	"	"	"	"	16.41	"	17.50	"	"	"	"	"	"	10"FLG	8"FLG	8.75	"	"	"	"	"	910

MFG. REF.

DATE

DO NOT SCALE FOR DIMENSIONS  
ALL DIMENSIONS SHOWN IN BRACKETS [ ] ARE MILLIMETERS

ORDER No.

CONFIDENTIAL

THIS DOCUMENT CONTAINS CONFIDENTIAL INFORMATION OF  
ROOTS DIVISION, DRESSER INDUSTRIES, INC. IT SHALL  
BE HELD IN STRICTEST CONFIDENCE, AND BE USED ONLY  
IN CONJUNCTION WITH ROOTS DIVISION BUSINESS.

L ADDED NIPPLE & ELBOW VC 11/17/00 T16 RK

K ADDED "INLET" & "DISCH" RDR 6484V DBV

J REV DIM "H" ON 600 RDR 6294V BMS AGP

H REV DIM "AF" ON 600 RDR 6260V BMS AGP

G REV DIM "M" ON 624 RDR 6186V BMS DB

REVISIONS

BY

DATE

CHANGE NOTICE

CHKD.

APP

DR. RDR

CHKD. BMS

APP. RDA

DBV

SCALE

78389A21 XXAD

CAD FILE / DIRECTORY

**DRESSER ROOTS**

ROOTS DIVISION  
DRESSER, INC.  
HOUSTON, TX USA

DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED  
FINISHED DIMENSIONS  
TWO PLACE DECIMALS (.XX)---±.015 FRACTIONAL---±1/64  
THREE PLACE DECIMALS (.XXX)---±.005

78389021

REV L

## ROOTS™ RAM™ WHISPAIR™ Rotary Positive Blowers

Frames 404J thru 624J

**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

RAM™ WHISPAIR™ rotary blowers are heavy-duty units designed with integral-shaft ductile iron impellers having an involute profile. WHISPAIR blowers reduce noise and power loss by utilizing an exclusive wrap-around plenum and proprietary WHISPAIR jet to control pressure equalization-feeding backflow in the direction of impeller movement, thereby aiding rotation.

The headplates and rigid, one-piece casing 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 used.

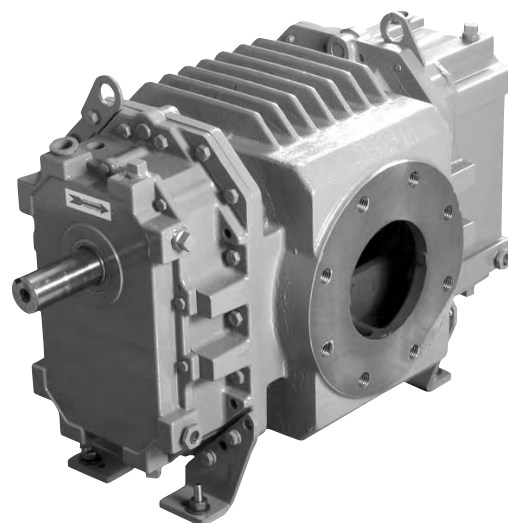
Piston rings reduce air leakage through the shaft openings in the headplates, and lip-type oil seals prevent lubricant from entering the air chamber. RAM rotary blowers incorporate thrust control, with splash oil lubrication at both ends of the blower. A hydrodynamic seal on the drive shaft prevents shaft seal oil leaks.

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

The top shaft is extended for drive on side outlet blowers, and either shaft can be extended for drive on top or bottom outlet blowers.

### WARRANTY PERIOD

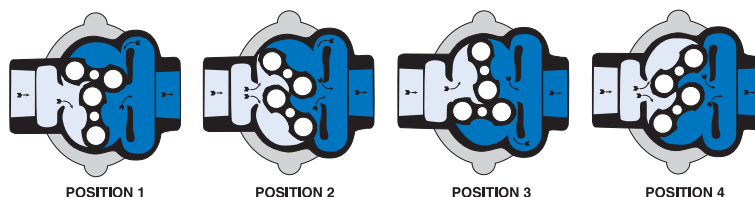
Twenty-Four (24) months from date of original unit start-up or 30 months from date of original shipment, whichever occurs first.



### DESIGN AND CONSTRUCTION FEATURES

1. Low noise level, less operating power required
2. Improved volumetric efficiency and reduced operating temperatures
3. Alloy steel timing gears
4. Cylindrical roller bearings
5. Piston ring air seals
6. Lip-type, hydrodynamic drive shaft seal
7. Splash oil lubrication
8. Horizontal and vertical configurations available

### OPERATING PRINCIPLE



Incoming air is trapped by the impellers. Simultaneously, pressurized air (right) is being discharged. As the lower impeller passes wrap-around flange, Whispair jet equalizes pressure between trapped air and discharge area, aiding impeller movement and reducing power. Impellers move air into the discharge area (right). Backflow is controlled, resulting in reduction of noise relative to conventional blowers.



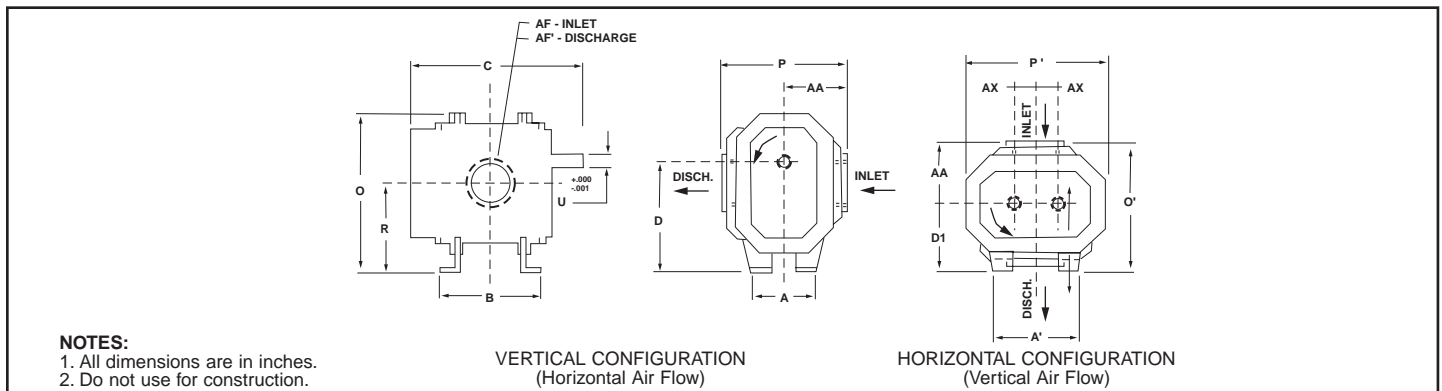


## PERFORMANCE TABLE

FRAME SIZE	SPEED RPM	4 PSI		6 PSI		8 PSI		10 PSI		12 PSI		15 PSI		18 PSI		MAX. VACUUM		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	"Hg	CFM	BHP
404J	1750	149	3.6	139	5.3	130	7.0	123	8.7	116	10.4					14.0	115	5.9
	2950	281	7.0	271	9.8	262	12.6	255	15.4	248	18.2	239	22.4			15.0	240	11.2
	4000	396	8.3	386	14.2	378	17.9	370	21.6	364	25.3	355	30.9	347	37.0	16.0	353	15.9
406J	1750	225	5.4	210	8.0	198	10.5	187	13.0	177	15.6					14.0	173	9.0
	2950	426	10.5	411	14.7	398	18.9	387	23.1	377	27.3	363	33.6			15.0	365	16.9
	4000	601	15.0	586	20.1	574	26.0	562	31.9	552	37.0	539	46.5	526	54.0	16.0	531	23.6
409J	1750	338	8.5	315	12.0	296	15.8	279	20.0	264	23.5					14.0	259	13.5
	2950	638	15.2	615	21.5	596	27.8	579	34.1	564	40.4	544	49.8			15.0	546	24.8
	4000	900	24.0	878	30.0	859	38.1	842	46.8	827	55.0	806	67.9	788	79.0	16.0	795	35.1
412J	1750	450	11.0	420	16.0	394	21.0	372	26.0	352	32.0					14.0	343	17.9
	2950	849	19.9	819	28.3	794	36.6	772	45.0	752	53.4	724	66.0			15.0	728	32.7
	4000	1199	28.8	1169	39.9	1144	51.0	1121	62.2	1101	73.3	1074	90.0			16.0	1059	46.5
418J	1750	675	16.5	630	24.0	592	31.7	559	39.0							14.0	515	26.8
	2950	1275	29.5	1230	42.1	1192	54.7	1159	67.3							15.0	1092	48.9
	4000	1800	42.9	1755	59.7	1717	73.4	1684	93.1							16.0	1590	69.7
616J	1170	718	16.9	672	24.9	633	32.9	599	40.9	568	49.0					13.0	579	25.9
	1750	1176	26.2	1130	38.2	1091	50.1	1056	62.0	1025	73.9					14.0	1013	42.0
	3000	2162	48.9	2116	68.7	2077	88.5	2043	108.3	2012	128.0	1970	157.7			16.0	1946	81.7
624J	1170	1077	25.4	1008	37.5	950	49.5	899	61.5							13.0	869	39.0
	1750	1764	39.9	1695	57.8	1637	75.7	1585	93.6							14.0	1519	63.4
	3000	3244	77.6	3175	107.3	3117	137.0	3065	166.7							16.0	2920	124.6

**Notes:** 1. Pressure ratings based on inlet air at standard pressure of 14.7 psia, standard temperature of 68° F, and specific gravity of 1.0.  
2. Vacuum ratings based on inlet air at standard temperature of 68°F, discharge pressure of 30" Hg and specific gravity of 1.0.

## OUTLINE DRAWING & DIMENSIONAL TABLE



FRAME SIZE	A	A'	B	C	Drive Shaft Location		O	O'	P	P'	R	U	Keyway	AF Inlet Diameter	AF' Discharge Diameter	AA	AX	Approx. NetWt (lbs)
					D	D1												
404J	8.00	11.00	8.75	18.50	11.25	7.50	16.63	14.75	14.50	15.25	9.00	1.500	.375 x .188	3.0 NPT	3.0 NPT	7.25	2.25	270
406J	8.00	11.00	10.75	20.50	11.25	7.50	16.63	14.75	14.50	15.25	9.00	1.500	.375 x .188	4.0 NPT	4.0 NPT	7.25	2.25	300
409J	8.00	11.00	13.75	23.50	11.25	7.50	16.63	14.75	14.50	15.25	9.00	1.500	.375 x .188	5.0 NPT	5.0 NPT	7.25	2.25	350
412J	8.00	11.00	16.75	26.50	11.25	7.50	16.63	13.50	13.00	15.25	9.00	1.500	.375 x .188	6.0 FLG	5.0 FLG	6.00	2.25	400
418J	8.00	11.00	22.75	32.50	11.25	7.50	16.63	14.50	14.00	15.25	9.00	1.500	.375 x .188	8.0 FLG	6.0 FLG	7.00	2.25	500
616J	9.00	15.00	20.75	32.19	15.00	9.00	22.00	16.50	16.25	20.00	12.00	2.000	.500 x .250	8.0 FLG	6.0 FLG	7.50	3.00	700
624J	9.00	15.00	28.75	40.19	15.00	9.00	22.00	17.75	17.50	20.00	12.00	2.000	.500 x .250	10.0 FLG	8.0 FLG	8.75	3.00	910

**Dresser, Inc.**



**Roots**

Dresser ROOTS  
2135 Hwy 6 South  
Houston, TX 77077  
PH: 281-966-4700  
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Toll Free: 1-877-363-ROOT(S)

Dresser ROOTS - Connersville  
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Connersville, IN 47331  
PH: 765-827-9200  
FX: 765-827-9266

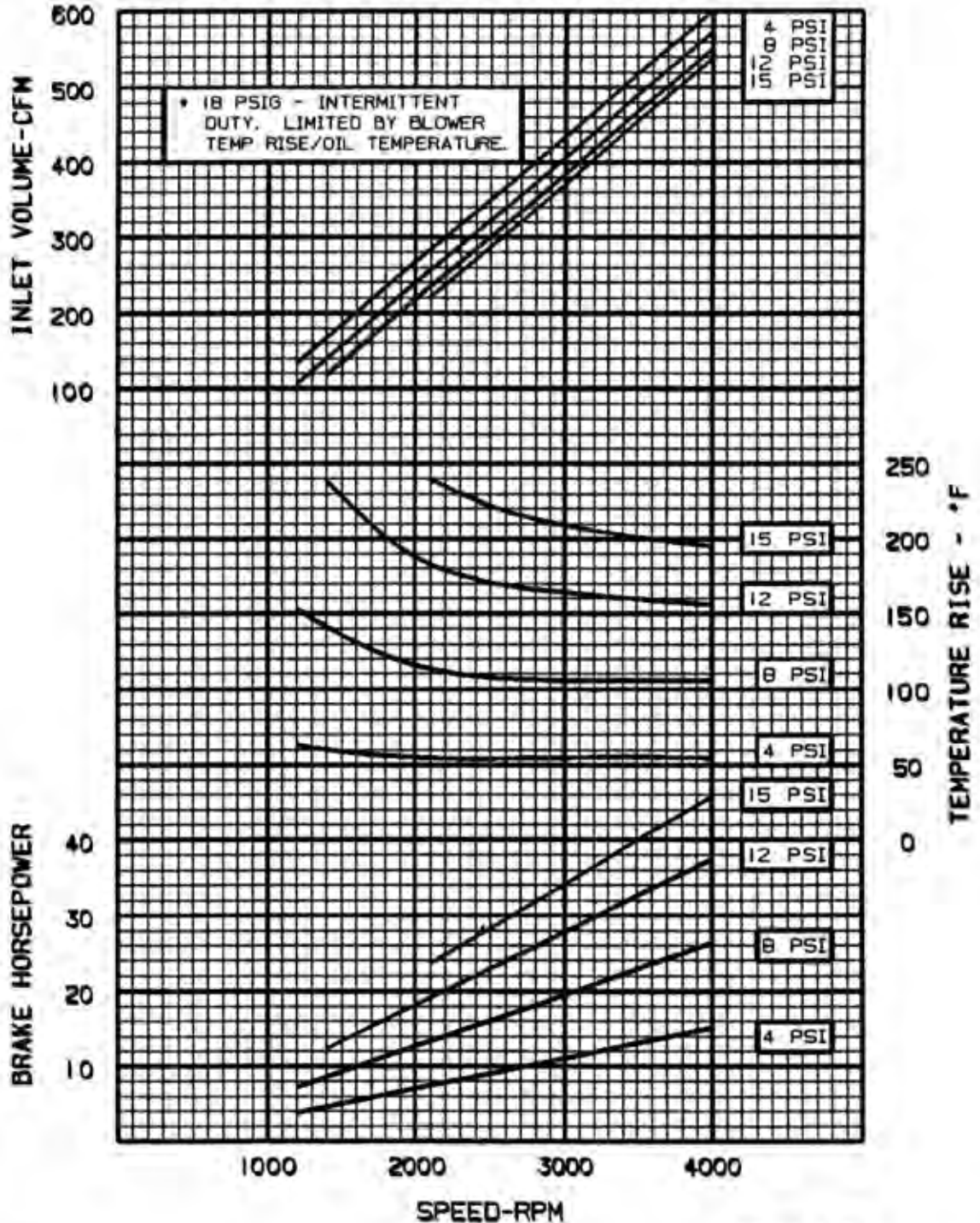
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website: [www.rootsblower.com](http://www.rootsblower.com) • email: [ROOTS@dresser.com](mailto:ROOTS@dresser.com)

**PRESSURE PERFORMANCE**  
**FRAME 406 RAM WHISPAIR & WHISPAIR GAS PUMP**  
 MAXIMUM PRESSURE RISE=18 PSI •  
 MAXIMUM SPEED=4000 RPM





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

PERFORMANCE BASED ON  
 INLET AIR = 68°F  
 DISCHARGE PRESSURE = 30" HG ABS.  
 MAY, 1997

VACUUM PERFORMANCE  
 FRAME 406 RAM WHISPAIR & WHISPAIR GAS PUMP  
 MAXIMUM VACUUM=15 IN. HG  
 MAXIMUM SPEED=4000 RPM

