



**Roots**

## 404 RAM-J

Part Number – 81979020



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)



816-741-0282



### Quick Specs

|                         |                 |
|-------------------------|-----------------|
| Flow Range              | to 396 CFM      |
| Max ΔPressure           | 18 PSI          |
| Max ΔVacuum             | 16" Hg          |
| Maximum RPM             | 4000            |
| Minimum RPM             | 850             |
| Max ΔT                  | 240°F           |
| Connection Size         | 3" 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        | 270 lbs         |
| Container               | Wood Skid       |
| Skid Size (L x W x H)   | 32" x 29" x 26" |
| Shipping Weight on Skid | ~320 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*<br>Temperature °F (°C) | ISO<br>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    |

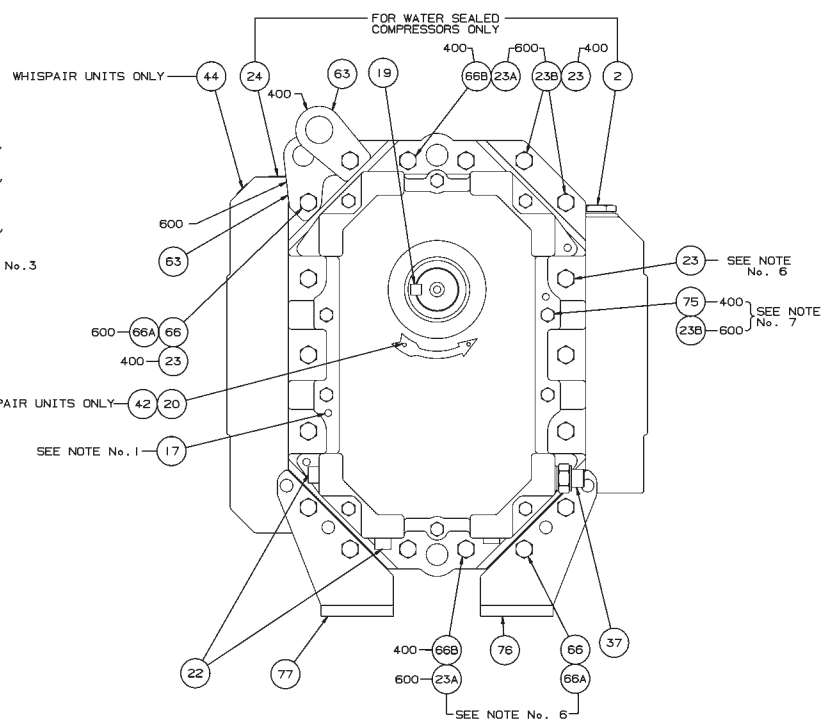
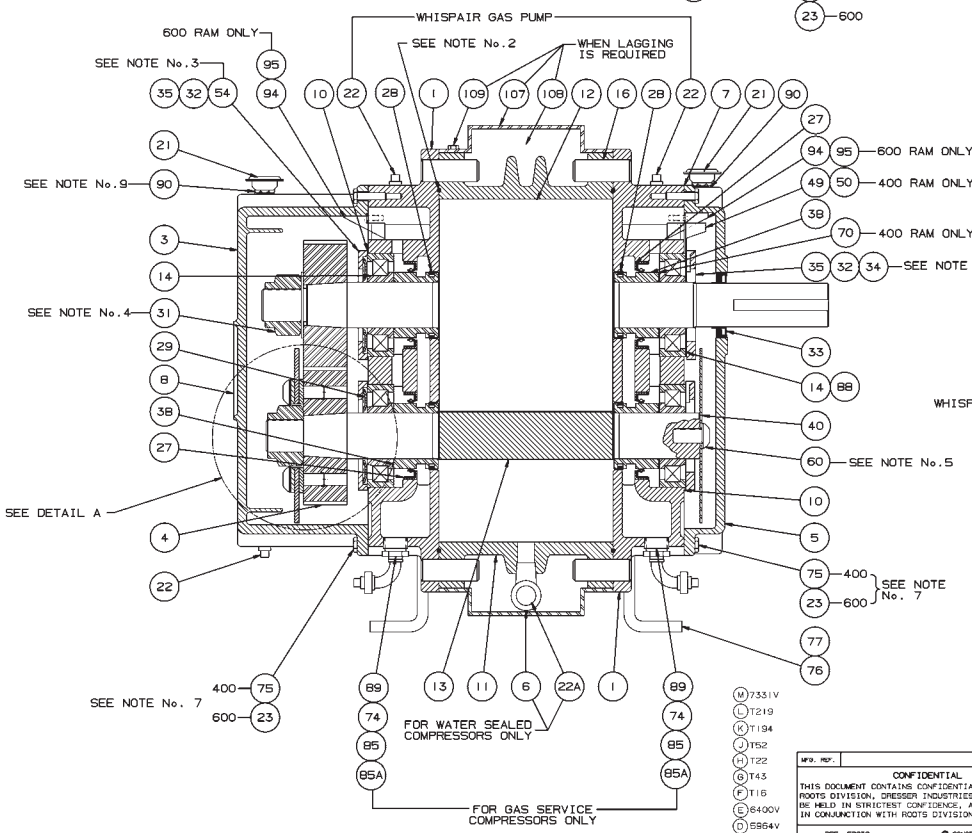
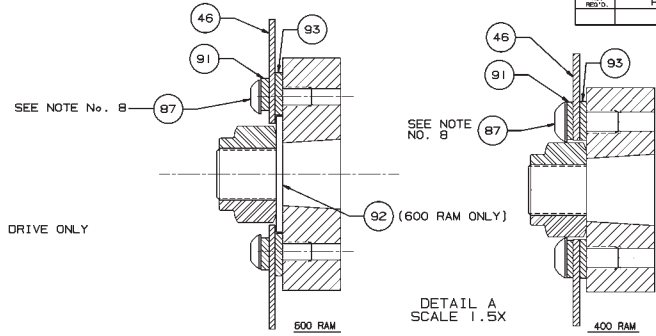
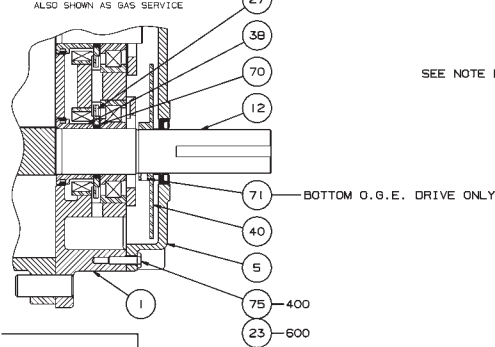
**ROOTS® Synthetic Oil: ISO-VG-100 Grade**

|                | 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 |      | BOTT. DRIVE OPTION SLINGER REVERSED |
| R    | 1-26-68 | AMP | 7654V |      | REVISED GEAR END SLINGERS           |
| G    | 9-1-68  | AMP | 7591V | RCA  | ADDED NOTE TO ITEM 50 & 70          |
| B    | 1-15-69 | AMP | 7430V | RCA  | MOVED LIFTING LUG                   |
| D    | 3-6/69  | RGR | 7412V | RCA  | ADDED SEE                           |
| N    | 2/2/69  | YC  | 7331V | RCA  | ADDED LAGSINS                       |

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

SECTIONAL ASSEMBLY

81881023

REV S

Assembly of RAM Series - Air & Gas Blowers



## 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.

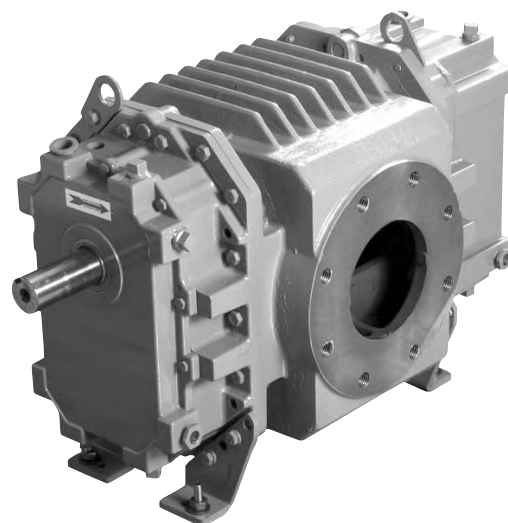
Piston rings reduce air leakage through the shaft openings in the headplates, and lip-type oil seals prevent lubricant from entering the air chamber. RAM rotary blowers incorporate thrust control, with splash oil lubrication at both ends of the blower. A hydrodynamic seal on the drive shaft prevents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

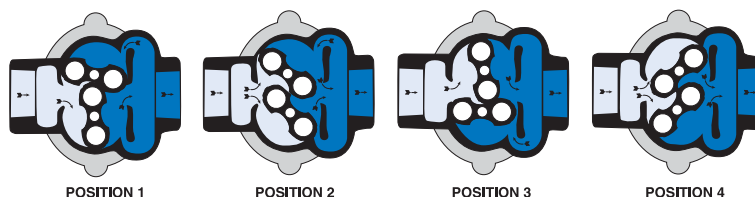
Twenty-Four (24) months from date of original unit start-up or 30 months from date of original shipment, whichever occurs first.



### 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.

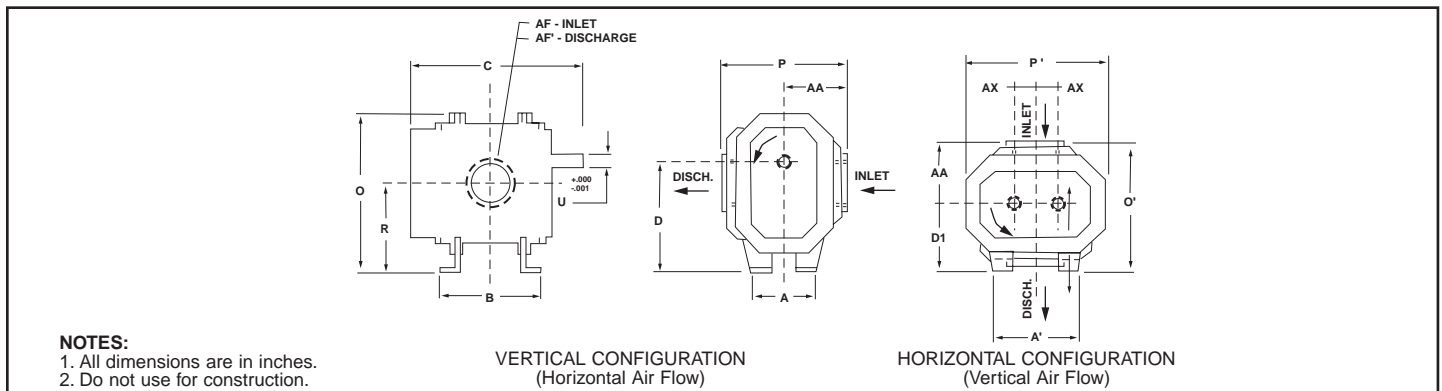


## PERFORMANCE TABLE

| 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  | 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  | 16.0   | 531  | 23.6        | 526 | 54.0 |
| 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  | 16.0   | 795  | 35.1        | 788 | 79.0 |
| 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**

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Houston, TX 77077  
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PH: 765-827-9200  
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Off St. Andrews Rd  
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S-19D97  
February 2004

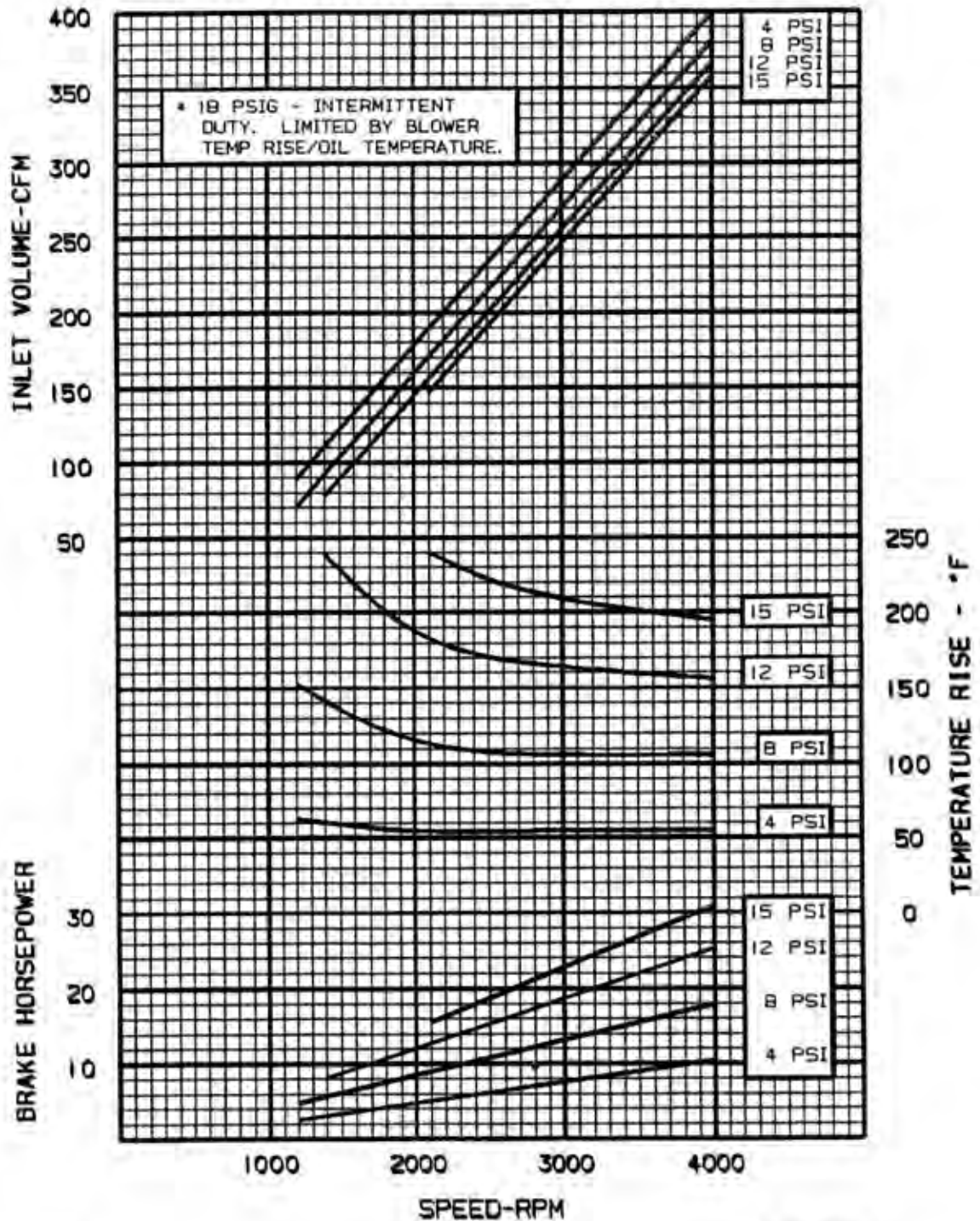
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website: [www.rootsblower.com](http://www.rootsblower.com) • email: [ROOTS@dresser.com](mailto:ROOTS@dresser.com)

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

PERFORMANCE BASED ON  
 INLET AIR AT 14.7 PSIA & 68°F  
 MAY, 1997

**PRESSURE PERFORMANCE**  
**FRAME 404 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 404 RAM WHISPAIR & WHISPAIR GAS PUMP  
 MAXIMUM VACUUM=15 IN. HG  
 MAXIMUM SPEED=4000 RPM

