Pneumatic Division
Richland, Michigan USA
www.parker.com/pneumatics

TEC DOCUMENTS

	Bulletin Number	Bulletin Description
☐	TEC-1	Date Code System
☐	FRL-TEC-3	Polycarbonate Compatibility
☐	TEC-4	Delrin/Celcon Compatibility
☐	FRL-TEC-5	Nylon Compatibility
☐	FRL-TEC-6	Polyamide Compatibility
☐	FRL-TEC-07	FRL Conversion / Combination Assembly Instruction
☐	TEC-13	Guidelines & Rules of Thumb
☐	TEC-14	Gas Laws
☐	TEC-15	Pipe Flow Curves
☐	Safety Guide	PDN Safety Guide



Visit www.pdnplu.com for
additional instruction sheets.

Pneumatic Division North America
Richland, Michigan 49083

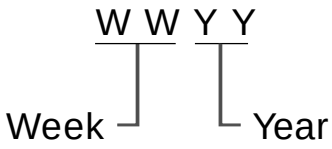
TEC-1
Date Code System

ISSUED: January, 2003
Supersedes: December, 2000

All components manufactured by the Pneumatic Division North America have date codes indicating their time of manufacture.

The date code consists of 4 numbers. The first 2 indicate the week of the year, the second 2 indicate the year (*Example:* 1501 indicates the 15th week of 2001).

Code letter may be stamped on the product, or appear on the product label.



Parker Pneumatic

Pneumatic Division North America
Richland, Michigan 49083

FRL-TEC-3
Polycarbonate Compatibility

ISSUED: October, 1998
Supersedes: March, 1991

CHEMICALS NOT COMPATIBLE WITH POLYCARBONATE BOWLS & SIGHT DOMES

CHEMICAL COMPOUNDS

ACETALDEHYDE
ACETIC ACID
ACETIC ANHYDRIDE
ACETONE
ACRYLONITRILE
AMMONIA
AMMONIUM CARBONATE
AMMONIUM FLORIDE
AMMONIUM SULFIDE
AMMONIUM HRDROX.
BENZENE
BENZOIC ACID
BENZYL ALCOHOL
BROMOBENZENE
BUTYRIC ACID
CALCIUM CHLORIDE
CARBOLIC ACID
CARBON DISULFIDE
CARBON TETRACHLORIDE
CAUSTIC POTASH SOLUTION (5%)
CAUSTIC SODA SOLUTION (5%)
CHLOROBENZENE
CHLOROFORM
CRESOL
CYCLOHEXANOL
CYCLOHEXANONE
CYCLOHEXENE
DIMETHYL FORMAMIDE
DIOXANE
ETHANE TETRACHLORIDE
ETHYL ACETATE
ETHYL ALCOHOL
ETHYL ETHER
ETHYLAMINE
ETHYLENE CHLOROHYDRIN
ETHYLENE DICHLORIDE
FORMIC ACID
FREON (REFRIGERANT & PROPELLANT)
GASOLENE (HIGH AROMATIC)
HILGARD CO'S HIL-PHENE
HYDRAFLOURIC ACID
HYDROCHLORIC ACID
METHYL ALCOHOL
METHYLENE CHLORIDE
MILK OF LIME (CaOH)
NITRIC ACID
NITROCELLULOSE LACQUER
OZONE
PERCHLORETHYLENE
PHENOL
PHOSPHORUS HYDROXY CHLORIDE
PHOSPHORUS TRICHLORIDE
POLYVINYL CHLORIDE
POTASSIUM ACETATE
PROPIONIC ACID
PYRIDINE
SODIUM HYDROX.
SODIUM NITRATE
SODIUM SULFIDE
STYRENE
SULFURIC ACID
SULPHURAL CHLORIDE
TETRAHYDRONAPHTHALENE
THIOPHENE
TOLUENE
TURPENTINE
XYLENE

COMMERCIAL PRODUCTS

1MS-SPEC NEUTRAL OIL
3-M #EC847
3-M #EC866
ACCELOGLOS-134099 BL
AD DETERGENT
ADHESIVE FOR FILM
ADHESIVE PROD CO MYTEX 182
ADHESIVE PROD CO PLASTIC 3058
ADHESIVE PROD CO PLASTIC 3059
ADHESIVE PROD CO POLYSTIC 3720
ADHESIVE PROD CO STIXGRIP 482
ALADDIN CLEANERS
ANDEROL 500
ANDEROL L-826
ANSTAC 2M
ANSTAC M
ARDCO 0323B
ARDCO NS 35 AL. CLEANERS
ATLANTIC ALPHAOIL
BB SOAK CLEANER
BEACON 325
BENZYL BENZOATE
BISSELL RUG SHAMPOO
BONDMASTER M777
BUTON ENAMEL LOW BAKE-ENJAY
CASTER OIL HYDROGEN
CATANAC SN. ANTISTAT
CELL. ACETO BUTYRATE
CELLULUBE 150
CHECICAL CO. LIC NY REZ-N-BOND
CHEER DETERGENT
CHEMTOOL 500-JP (COOLANT)
CHLOROTHENE
CHRYLSER BRAKE FLUID
COLD DUST
CONVEYOR LUBRICANT
CORNELIUS SOLUTION
COSMOLUBE 615
DELCO ELETROLYTE
DOW-SILLICONE 510
DOWGARD ANTIFREEZE
DREW #10 ALL PURPOSE

NOTE: This is only a partial list of all harmful substances. Check with Mobay Chemical or General Electric for further information on polycarbonate compatibility with other chemicals.

CHEMICALS NOT COMPATIBLE WITH POLYCARBONATE BOWLS & SIGHT DOMES

COMMERCIAL PRODUCTS (Continued)

DREW CAUSTICLEAN
DREW CHLOR-TROI
DREW COL-UEEL
DUPONT 4678
DUPONT KRYTOX
DUPONT THINNER 3336
DUTCH CLEANER
DUTCH RED LITHO INK
EC 1022 COATING - 3N
ELCO GEAR SAFETY 28
ELECTRO COIL 405A
ELECTROLUBE #1
ELECTROLUBE #2
ENTH ACID 82
ESSCO 335 PRIMOL SS301
ESSCO EXTRA QUALITY
ESSCO FAXUM 35 OIL
ESSCO HITEST
ESSCO LIGHT BLUE
ESSCO REGULAR
ESSCO TRANSMISSION FLUID
ESSCO-CARUM 325
FELS NAPTHA
FERTILIZER-GOLD MEDAL
FIEND GUN OIL
FIRERETARD AWPAP 1054
FLEXCRAFT #1321
FLUOROCARDON S-122
FREON REFRIG. OIL
GENERAL MOTORS 11HDT
GLAMORENE RUG CLEANERS
GLYPTAL PAINT 8167 HW.
HIGRADE 350 FLUXREM
HOLLAND DUTCH RED INK
HOPPE GUN OIL
HOPPE NITRO SOLV.9
HOUGHTON ANTISEP
HOUTOSAFE 1000
HYAMINE 10X
HYAMINE 2389
HYDR FLUID MIL-05606
HYDR FLUID MIL-H5606
INGLIS XP621265 B1-COATING
INTERCHEMICAL 671 WH.
INTERCHEMICAL 711 WH.
INTERCHEMICAL E11876
INTERCHEMICAL E82539
INTERCHEMICAL E94628
INTERCHEMICAL THINNER
INTERNAT COMPOUND 231
IVORY SNOW 1.5% SOL
JET FUEL OIL-JP4
KEEGO DETERGENT
KELOY ANTIFREEZE
KESTER FLUX 1544
KESTER FLUX 1577
KESTER THINNER
KODAK DEVELOPER D41
KODAK X-OMAT DEVELOPER
KODAK X-RAY DEVELOPER
KOLLIE COOLANT
KRA-LITE LACQUER- J.F. RIDDELL
LACQUER THINNER
LACQUER M7003 DULL-HOWE-FRENCH
LESTOIL
LIKE MAGIC
LOGO R-2154
LOGOSTAT R-192-31248
LONCO FLUX REMOVER 65
MAID EASY
MARKEM HXN7251 BL.
MESAMOLL L-235
METHYL SALICYLATE
MIL-05606A
MIL-G-3278A BEACON 325
MIL-L-46000
MYSTIC 622B
NEOPRENE PRIMER N11
NEWBECK-DEXTER. OIL
NPACO 1296
ODA OIL
OIL-ES-OIL (AEROSOL)
OIL-ES-OIL (ESSENCE)
PAX CREME SOAP 24021
PAX HAND CLEAN 17752
PAX HAND CLEANS CREAM
PAX LANOLIN LOTION
PAX PHG HAND CLEANER
PAX SILICONE LOTION
PAX SOLVENT HAND CLEANER
PAX SOLVENT SUPER 2561
PLATING SENSITIZER
PLURONIC L62
PRESTIONE ANTIFREEZE
PYDRAUL
PYRANOIL 1470
PYON CAN CLEANER
ROCKFORD PAINT 11123A
SALASOL
SANTOMERSE 3
SILICONE EMULS SM55
SILICONE EMULS SM61
SILICONE EMULS SM2040
SILICONE OIL SF92
SILVER PAINT 6216
STEROX CD
SUNOCO GREASE
TANNERGAS
TERPINEOL
TERPINOL
TEXACO-FANDO AA
TEXACO DIALA OIL
TEXAMATIC TRANSMISSION FLUID
TIDE
TRIPLE CLEANER
TUFON 7473
UCON OIL (NEW)
UCON OIL-LB140XY26
ULTRA-VIOLET RAYS
UNION INK A4060
UNION PASTE 522
UNION PASTE 1281
UNION PASTE 1538
UNION PASTE L606X244
UNION PASTE M512 SPEC
UNION PASTE M705
UNION PASTE M731B
UNION PASTE M753
UNION PASTE M777
UNIRAMIC INK A4060
VANILLIN
VARNISH V-687-STERLING VARNISH CO
VYTON CUTTING OIL
WAGNER BRAKE FLUID
WESSON OIL
WINSOR LUBE OIL L245
WIPE 50-50
WIPE IT PAINT THINNER
WISCONSIN PAINT 13365

NOTE: This is only a partial list of all harmful substances. Check with Mobay Chemical or General Electric for further information on polycarbonate compatibility with other chemicals.

Pneumatic Division North America
Richland, Michigan 49083

TEC-4
Delrin/Celcon (Acetal)
Compatibility

ISSUED: October, 1998
Supersedes: March, 1991

CHEMICALS NOT COMPATIBLE WITH DELRIN/CELCON COMPOUNDS

- The generic name of these materials is acetal.
- Delrin is a Registered Trademark of E.I. DuPont.
- Celcon is a Registered Trademark of Celanese Corporation.

CHEMICAL COMPOUNDS

ACETIC ACID
AMMONIUM HYDROXIDE
BUTYLAMINE
FORMIC ACID
HYDROCHLORIC ACID
HYDROGEN PEROXIDE
NITRIC ACID
PHENOL
PHOSPHORIC ACID
SODIUM BISULFITE
SODIUM HYDROXIDE
SODIUM HYPOCHLORITE
STANNOUS CHLORIDE
SULFURIC ACID

COMMERCIAL PRODUCTS

ALKYLARYL SULFONATE (QUAKER)
DIANOL #11 CLEANER
IGEPAL - (HAIRWAVING & NEUTRALIZING SOLUTION)

NOTE: This is only a partial list of all harmful substances. Contact DuPont or Celanese Corporation for further information on acetal compatibility with other chemicals.

Parker Pneumatic

Pneumatic Division North America
Richland, Michigan 49083

FRL-TEC-5
Nylon Compatibility

ISSUED: October, 1998
Supersedes: July, 1991

CHEMICALS NOT COMPATIBLE WITH NYLONS

ACETIC ACID
ALCOHOL, BENZYL
ALLYL CHLORIDE
AMMONIA, GASEOUS
ANNILINE
ANTIMONY TRICHLORIDE
BENZENE SULFONIC ACID
BENZOIC ACID
BLEACHING LYE
BORON TRIFLUORIDE
BROMINE
BROMINE WATER
CALCIUM CHLORIDE IN ALCOHOL
CALCIUM HYPOCHLORITE
CHLORACETIC ACID
CHLORAL HYDRATE
CHLORINE
CHLORINE WATER
CHLOROSULFONIC ACID
CHROMIC ACID
CITRIC ACID
CRESOLS
CRESYLIC ACIDS
ETHYLENE CHLORHYDRIN
FERRIC CHLORIDE
FLUORINE
FLUOROSILICIC ACID
FORMIC ACID
HYDROBROMIC ACID
HYDROCHLORIC ACID
HYDROFLUORIC ACID
HYDROGEN PEROXIDE
IODINE IN ALCOHOL
IODINE IN KL SOLUTION
LACTIC ACID
MERCURIC CHLORIDE
METHYLENE CHLORIDE
NITRIC ACID
NITRO-ALCOHOLS
NITROBENZENE
OLEUM
OXALIC ACID
PERCHLORIC ACID
PHENOL
PHOSPHORIC ACID
POTASSIUM DICHROMATE
POTASSIUM HYDROXIDE
POTASSIUM PERMANGANATE
RESORCINOL
SODIUM HYDROXIDE
SODIUM HYPOCHLORITE
SODIUM CHLORIDE
STANNIC CHLORIDE
STANNIC SULFATE
SULFUR DIOXIDE
SULFUR ACID
SULFUROUS ACID
THIONYL CHLORIDE
VINEGAR
XYLENOL
ZINC CHLORIDE

NOTE: This in only a partial list of all harmful substances. Check with the Celanese Corporation or E.I. DuPont for further information on nylons compatibility with other chemicals.

Parker Pneumatic

Pneumatic Division North America
Richland, Michigan 49083

FRL-TEC-6
Polyamides Compatibility

ISSUED: October, 1998
Supersedes: June, 1998

CHEMICAL RESISTANCE INFORMATION FOR POLYAMIDES
(GRILAMID TR 55 & TROGAMID T)

Chemicals known to be Incompatible with Bowls, Sight Domes or Sight Gauges:

ACETALDEHYDE
ACETIC ACID (CONCENTRATED)
ACETONE
ALLY ALCOHOL
AMBRIC ACID (SATURATED)
AMMONIA WATER (APPROX. 25%)
AMMONIUM IRON SULPHATE (10%)
AMMONIUM SULPHIDE (40%)
AMYL ALCOHOL
ANILINE
ANTIMONY CHLORIDE (40%)
BASIC CLEANING AGENT (HENKEL)
BENZALDEHYDE
BENZOIC ACID (SATURATED)
BENZYL ALCOHOL
BRAKE FLUID, NORMAL
BRAKE FLUID, TYPE H
BROMINE, LIQUID
BUTANEDIOL
BUTYL ALCOHOL
BUTYLENE GLYCOL
BUTYRIC ACID
CALCIUM HYPOCHLORITE WASH
CHLOROFORM
CHLOROSULPHONIC ACID
CHROMIUM TRIODIDE (50%)
COMPRESSED - AIR FLUID NO. 560/M 92 (ESSO)
COOLING LUBRICANT (2% - FRIGULUX BO)
CROTONALDEHYDE (CONCENTRATED)
CYCLOHEXANE
DEXTRINE (SATURATED)
DIAMINE HYDRATE (80%)
1, 2-DICHORETHANE
1, 2-DICHORETHYLENE
1, 4-DOIXANE
DI-FLUORO-CHLOROMETHANE
DIFLUOROMONOCHLOROMETHANE
DIGLYCOLIC ACID (30%)
DIMETHYLORMAMIDE
DISINFECTANT AND CLEANSING AGENT (TEGO-DIOCTO)
ENSOLINE 952
ETHYL ALCOHOL (96%)
ETHYL AMINE (33%)
ETHYL METHYL KETONE
ETHYLENE CHLOROHYDRINE
ETHYLENE DIAMINE
ETHYLENE GLYCOL
FERROUS SULPHATE (10%)
FORMALINE (37%)
FORMIC ACID, CONCENTRATED
FURFURYL ALCOHOL
GUN OIL (BALLIDOL)
HYDRAULIC FLUID
(PYDRAUL 150A, 230A, 500A)
(SKYDROL 500A, 7000)
HYDRAZINE HYDRATE (80%)
HYDROCHLORIC ACID (32%)
HYDROFUORIC ACID (10%)
IRON AMMONIUM II SULPHATE (10%)
IRON AMMONIUM III SULPHATE (10%)
ISOAMYL ALCOHOL
ISOPROPANOL
LATIC ACID (98%)
METHYL ALCOHOL
METHYL ETHYL KETONE
METHYLENE CHLORIDE
MONOFLUORODICHLOROMETHANE
NITIC ACID (30%)
PETROL - METHANOL MIX (95:5 PARTS)
PHENOL
PHOSPORIC ACID, CONCENTRATED N-PROPANOL
POTASSIUM CHLORATE (SATURATED)
POTASSIUM HYDROXIDE (10%)
PROPYLENE GLYCOL
PYRIDINE
SULPHURIC ACID (96%)
TARTARIC ACID (SATURATED)
TETRAHYFROFURANE
TIGU SOLUTION (20%)
UREA (10%)
WATER, 158 °F
WATER CONDITIONER (10% - CHOLRAMINE)

GENERAL RULE:

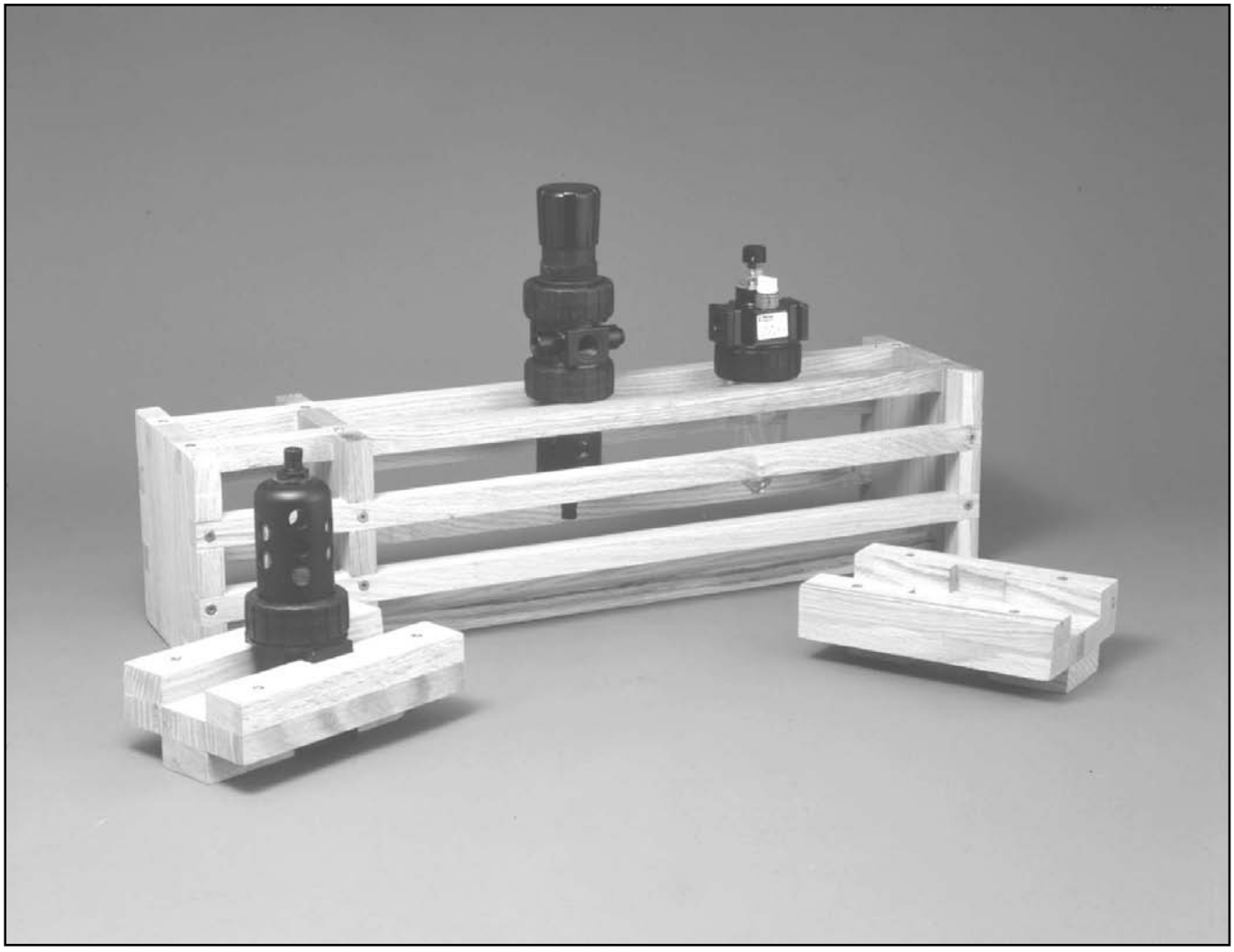
1. Any and all solvents, such as Carbon Tetrachloride, Mineral Spirits and Trichloroethyle are not to be used as media, or as a cleansing agent (degreaser) diluted or otherwise. Use mild soap and water for cleaning.
2. For compatibility of chemical not shown, consult factory.

Pneumatic Division North America
Richland, Michigan 49083

FRL-TEC-07
FRL Conversion / Combination Assembly Instructions
ISSUED: April, 2000

FRL

Conversion / Combination Assembly Instructions



Change Bowl on

14 Series
05/06/07 Series

Change Element on

14 Series
05/06/07 Series
P3N Series

Change Drain on

14 Series
05/06/07 Series
P3N Series

Change Regulator Spring on

14 Series
05/06/07 Series
P3N Series

Modular Changes on

05/06/07 Series – Assembly
P3N Series – Assembly

Miscellaneous Changes on

05/06/07 Series – Add Body Pressure Fill Adapter Kit
06/07 Series – Reverse Flow Option
P3N Series – Port Blocks

Change Bowl on 14 Series

1. Loosen and remove bowl (Use strap wrench if necessary)

   DO NOT use a pipe wrench on polycarbonate bowl



2. Thread new bowl onto body

   (Torque bowl to bottom of body then back off 1/8 turn)

3. Change product label to new part number
4. Pressurize and check for leaks

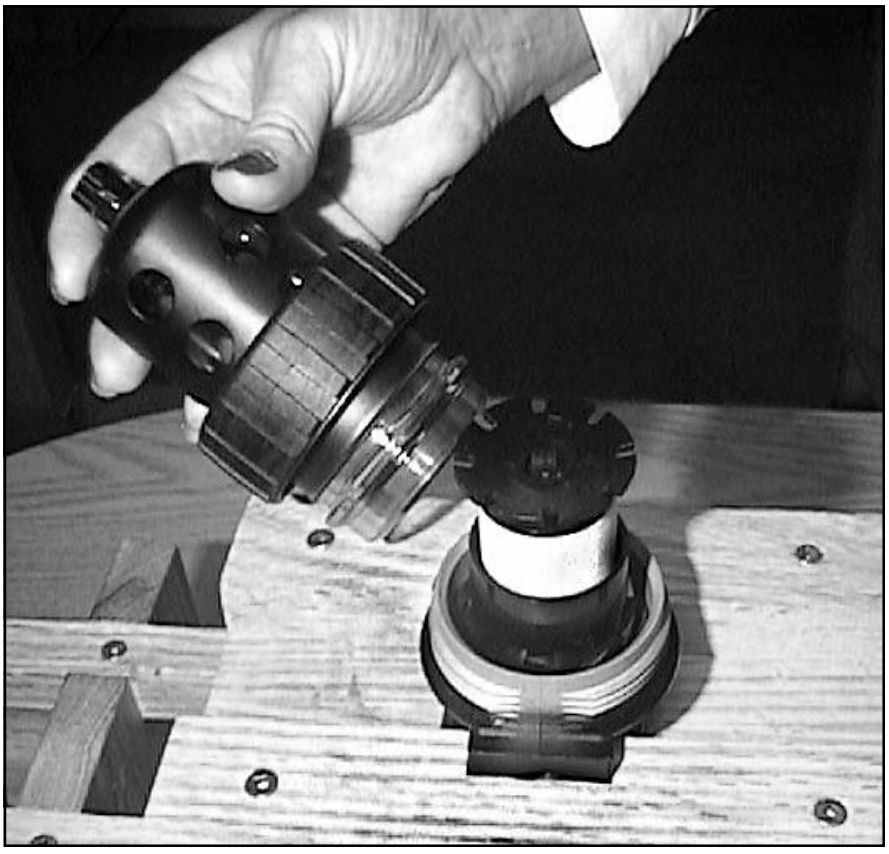


Change Bowl on 05/06/07 Series
(Filter, Piggyback, Lubricator)

1. Loosen collar (use strap wrench if necessary)



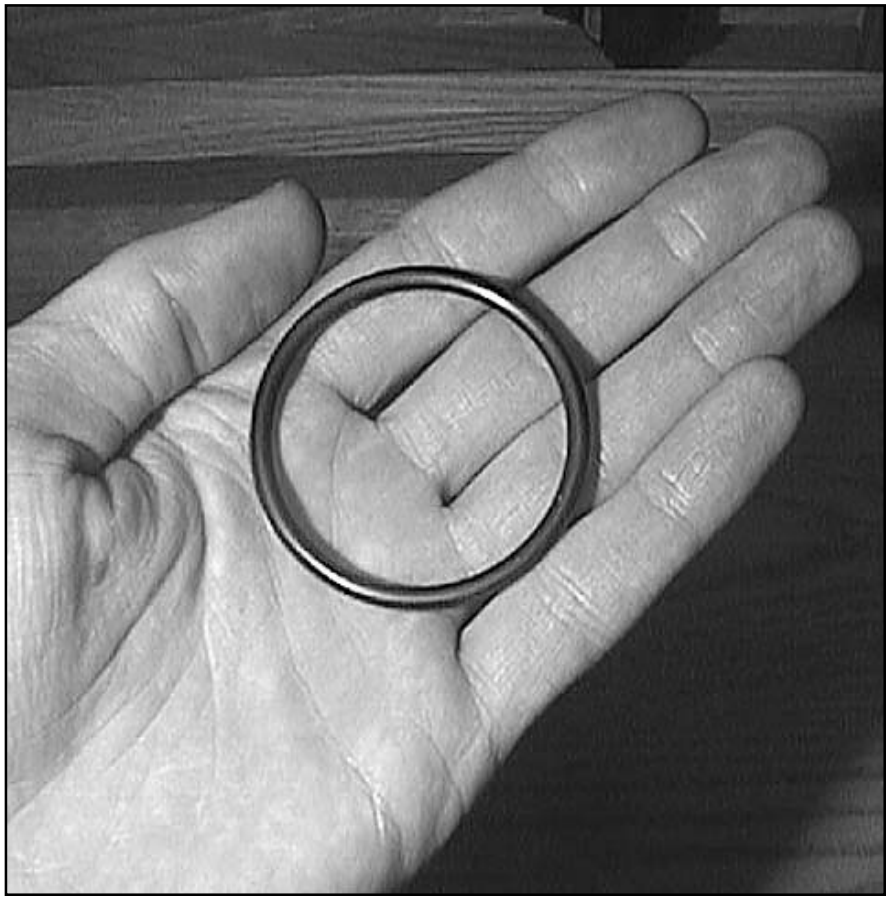
2. Remove collar and bowl



3. Place collar over new bowl
   - If bowl kit contains a collar then use the new collar, otherwise use original collar
   - If only removing a bowl guard from a poly bowl then remove collar from bowl, remove bowl guard, then replace collar on bowl

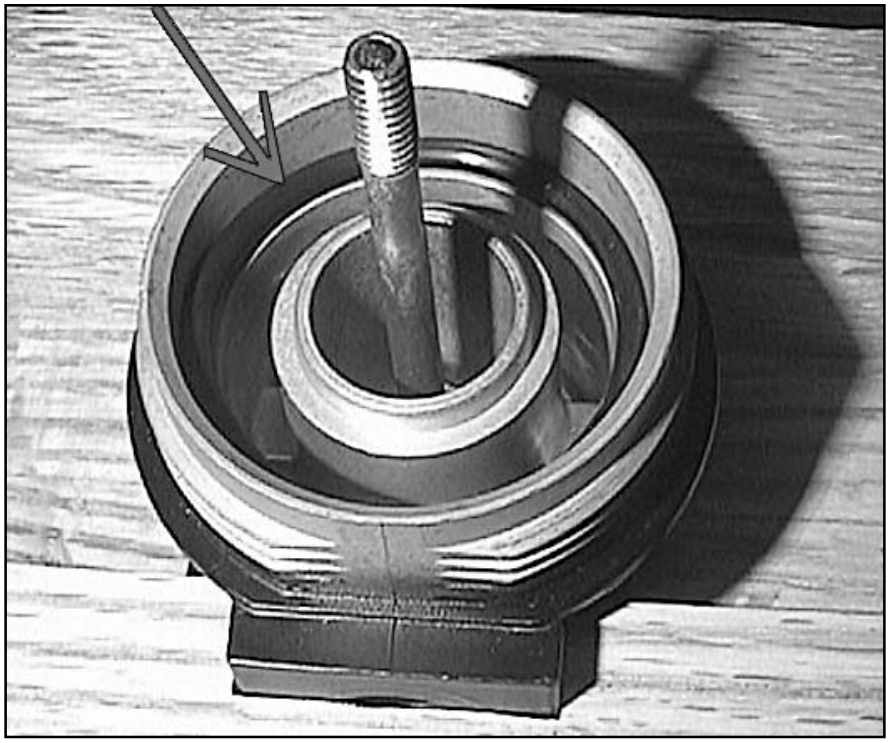


4. Lightly lubricate the new seal with provided grease included in the kit

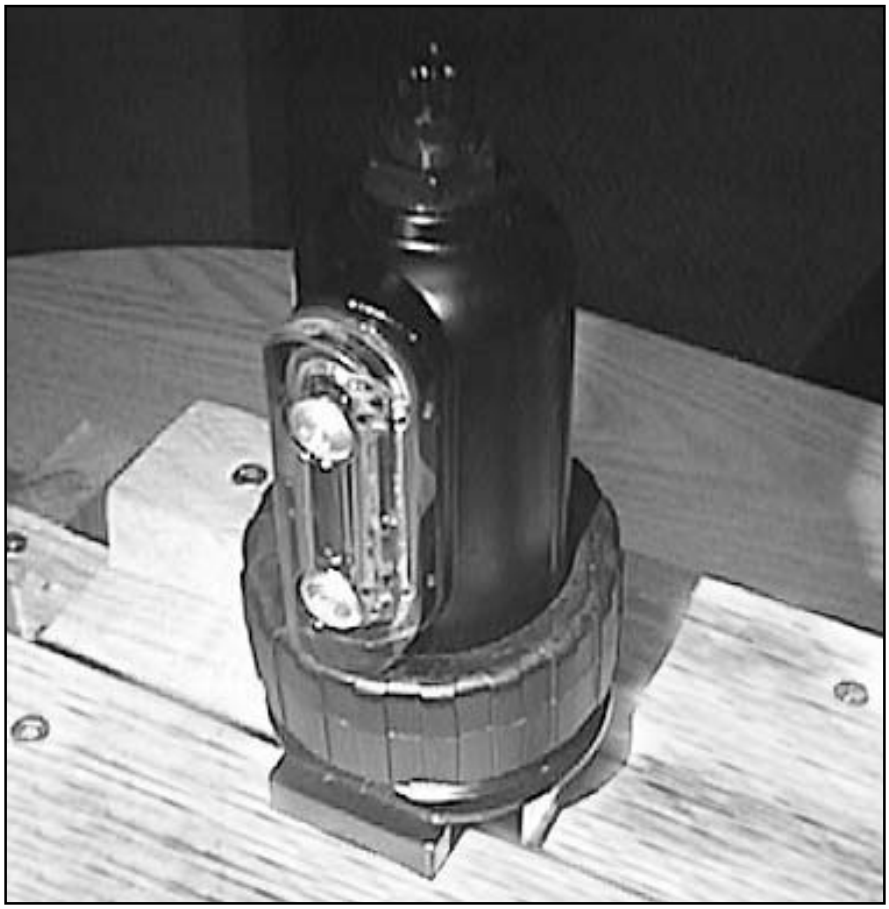


Change Bowl on 05/06/07 Series
(Filter, Piggyback, Lubricator)

5. Remove old seal and place new bowl seal in body



6. Place collar and bowl on body



7. Tighten collar (Torque hand tight plus ¼ turn)
8. Change product label to new part number
9. Pressurize and check for leaks



Change Filter Element on 14 Series

1. Loosen and remove bowl

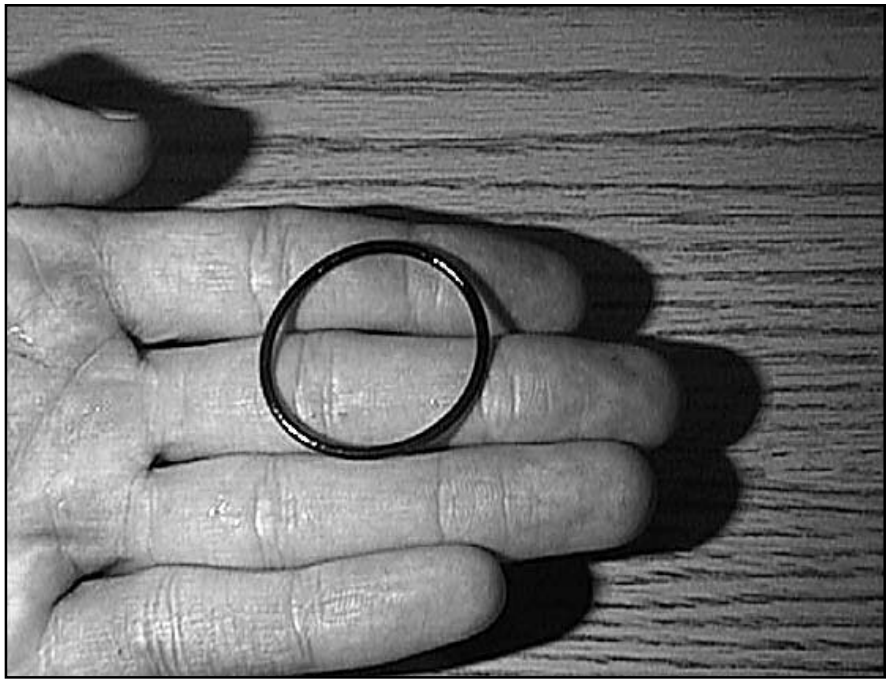
   DO NOT use a pipe wrench on polycarbonate bowl



2. Remove filter holder



3. Lightly lubricate the new bowl seal included in the kit and replace the old seal



4. Exchange element



5. Replace filter holder



6. Thread bowl onto body (Torque bowl to bottom of body then back off 1/8 turn)
7. Change product label to new part number
8. Pressurize and check for leaks



Change Filter Element on 05/06/07 Series

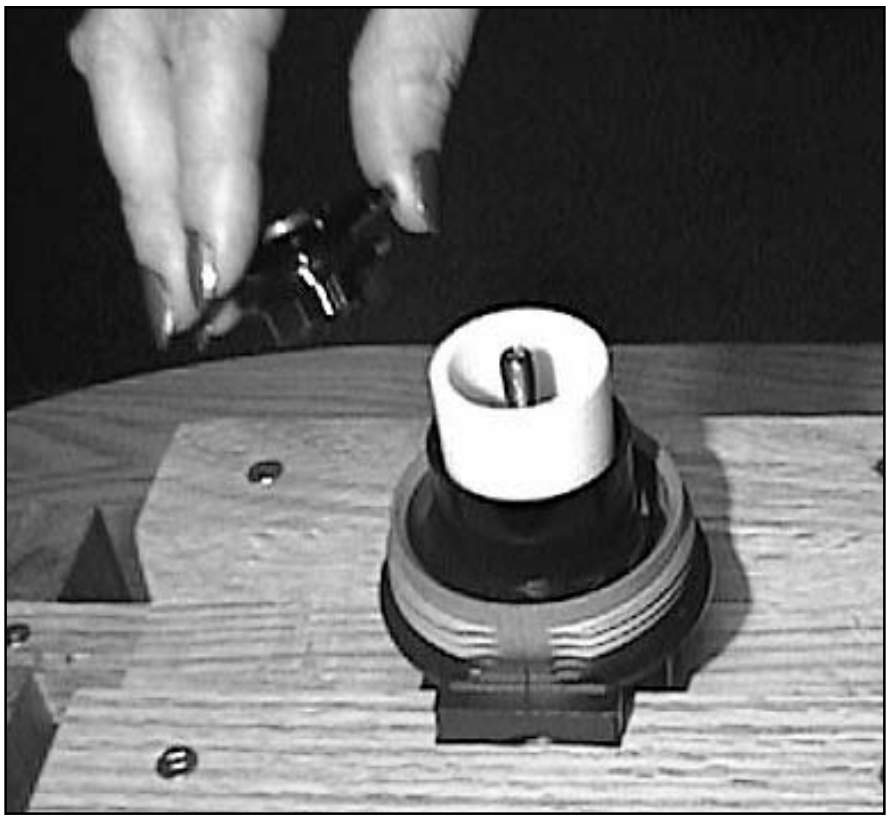
1. Loosen collar (use strap wrench if necessary)



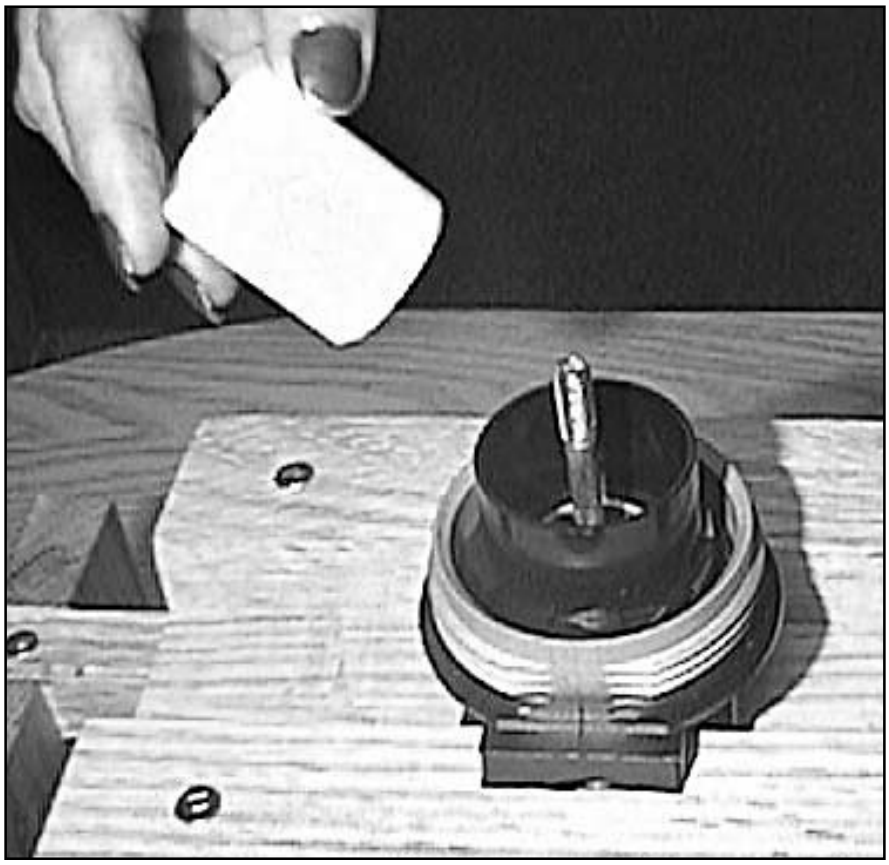
2. Remove collar and bowl



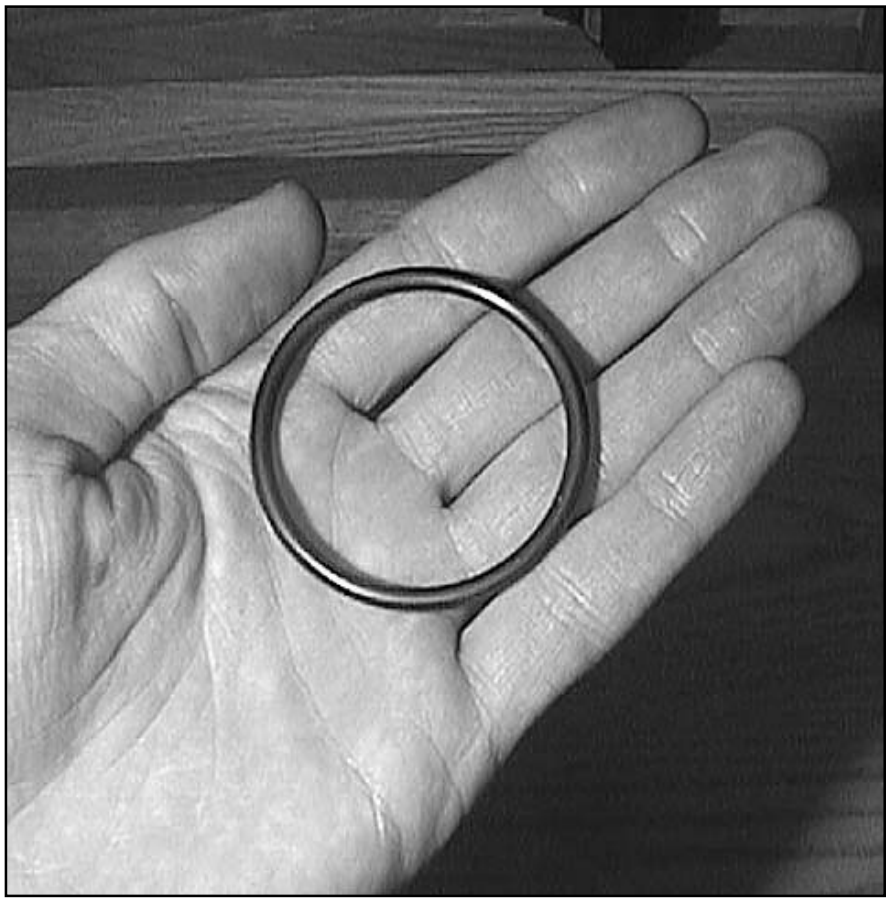
3. Remove baffle



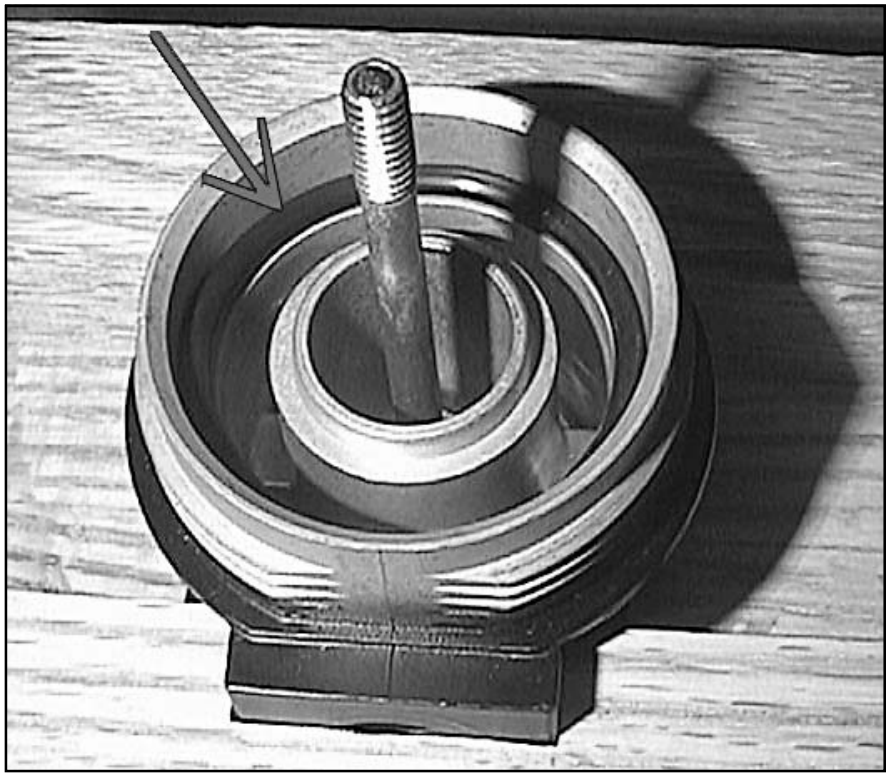
4. Remove filter element



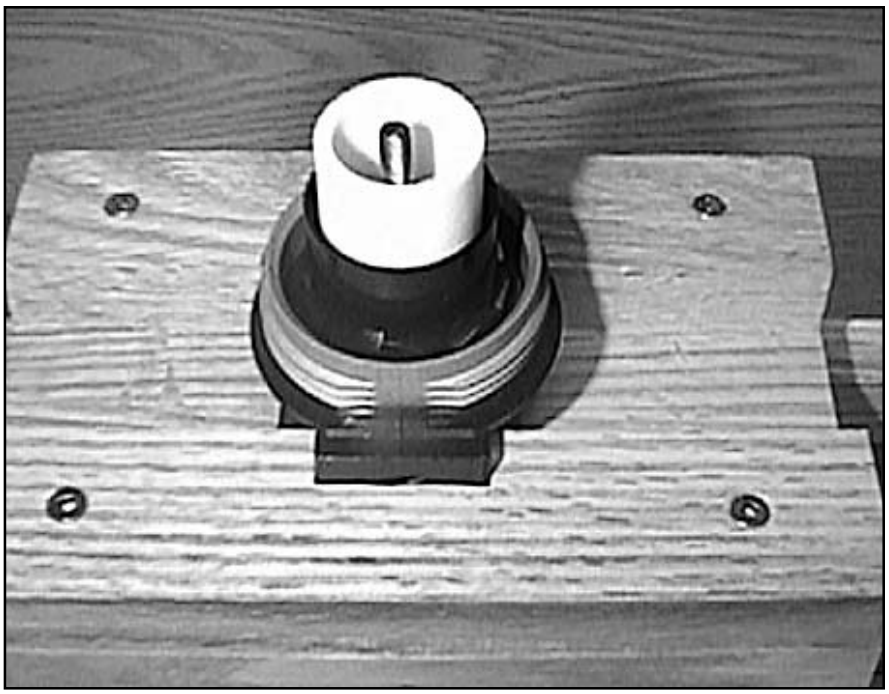
5. Lightly lubricate the new bowl seal included in the kit with provided grease packet



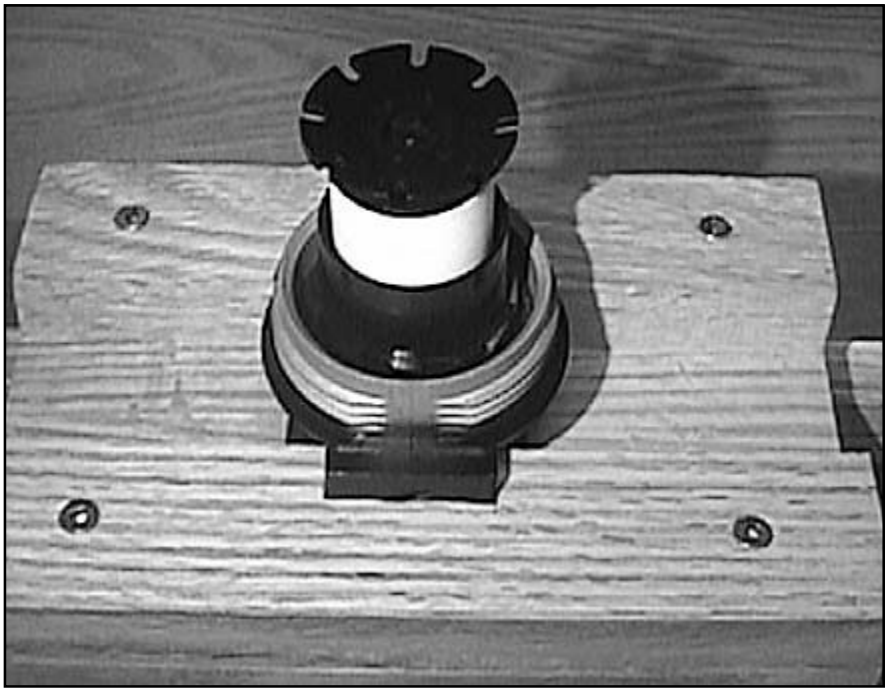
6. Remove old seal and place new bowl seal in body



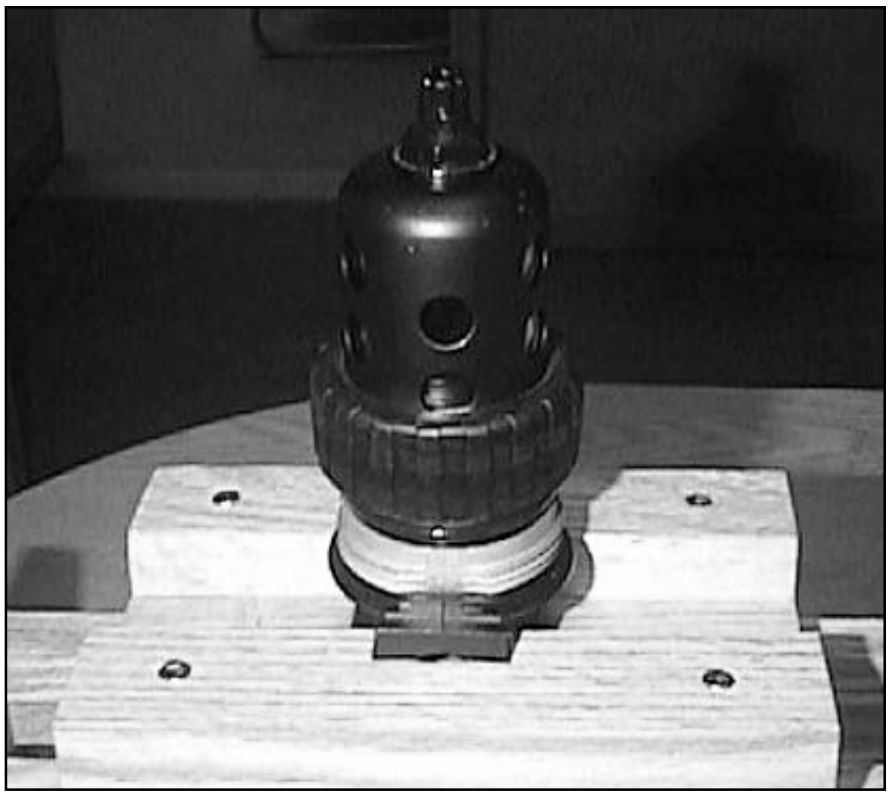
7. Place new filter element over stem



8. Replace baffle (Torque 4 to 6 in-lbs.)



9. Replace bowl and collar on body



10. Tighten collar (Torque hand tight plus ¼ turn)
11. Change product label to new part number
12. Pressurize and check for leaks

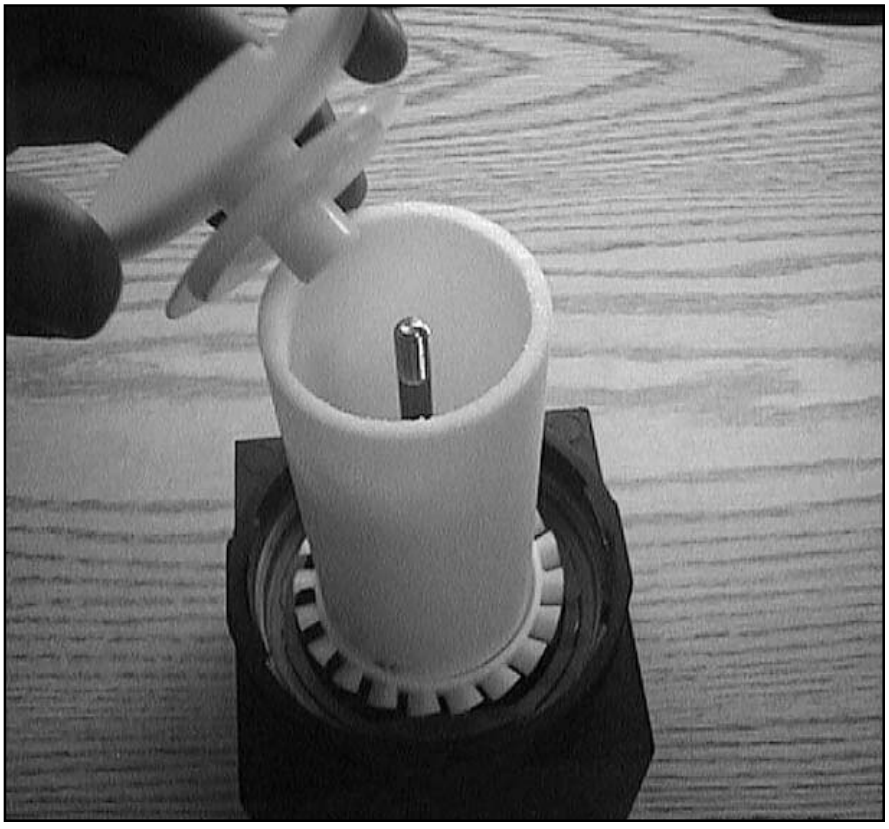


Change Element on P3N Series

1. Push in the bowl detent, rotate 1/8 turn and pull to remove bowl



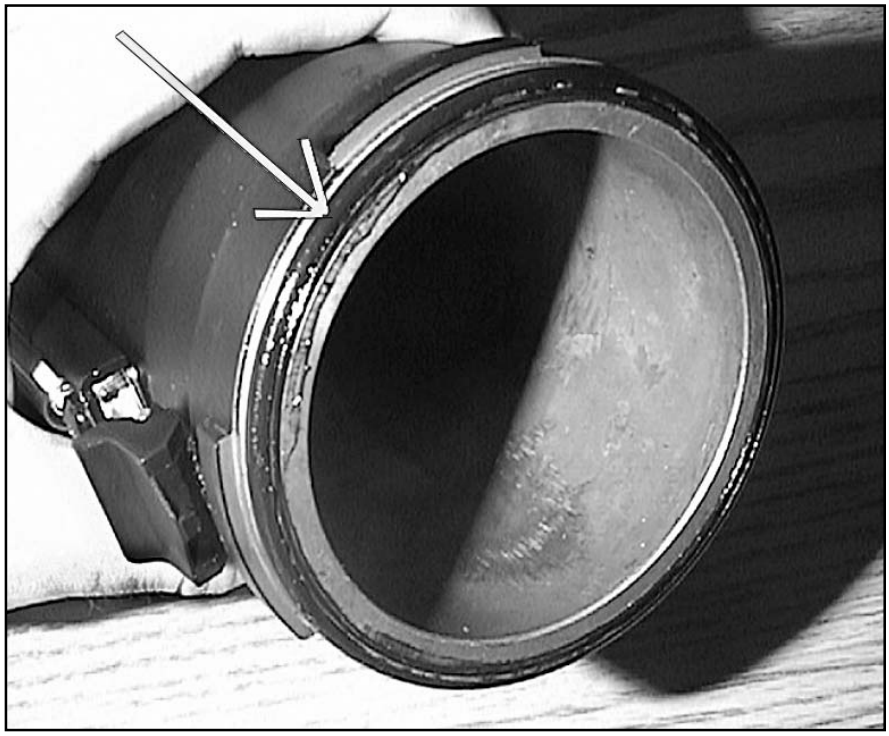
2. Remove baffle



3. Exchange elements



4. Lightly lubricate the provided new seal and replace the old bowl seal making sure the seal's groove is facing up



5. Replace the bowl making sure that the detent correctly snaps into place
6. Change product label to new part number
7. Pressurize and check for leaks

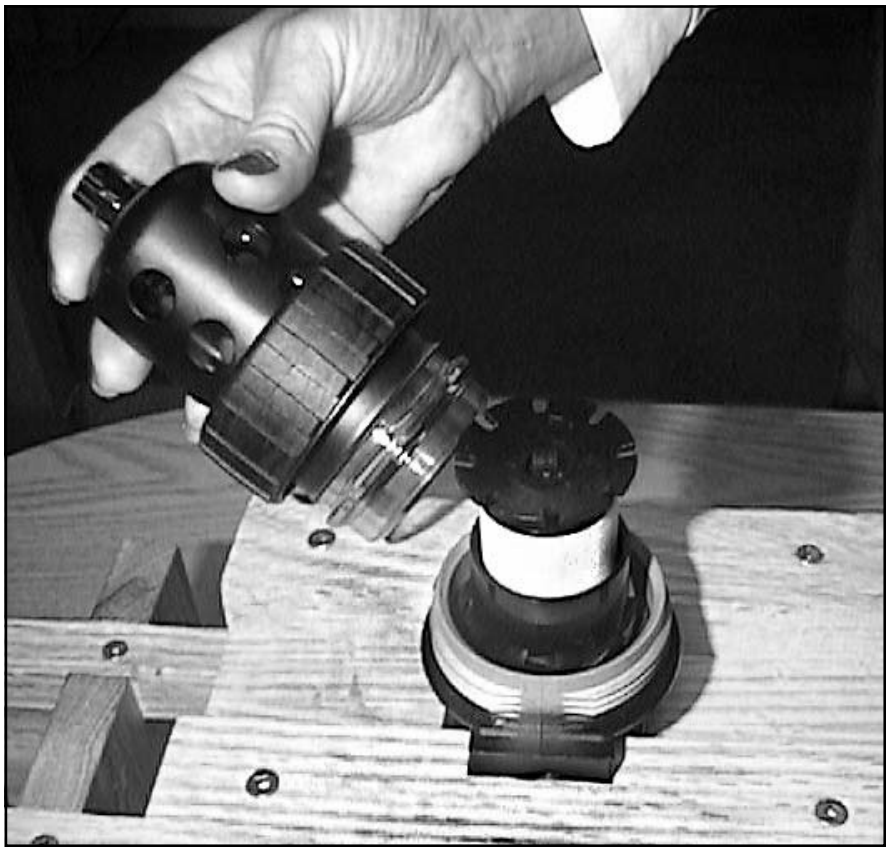


Change Drain on 05/06/07 Series
(Filter, Piggyback, Lubricator)

1. Loosen collar (use strap wrench if necessary)



2. Remove collar and bowl



3. Open Twist Drain



4. Remove nut from bottom of drain using 3/4" wrench



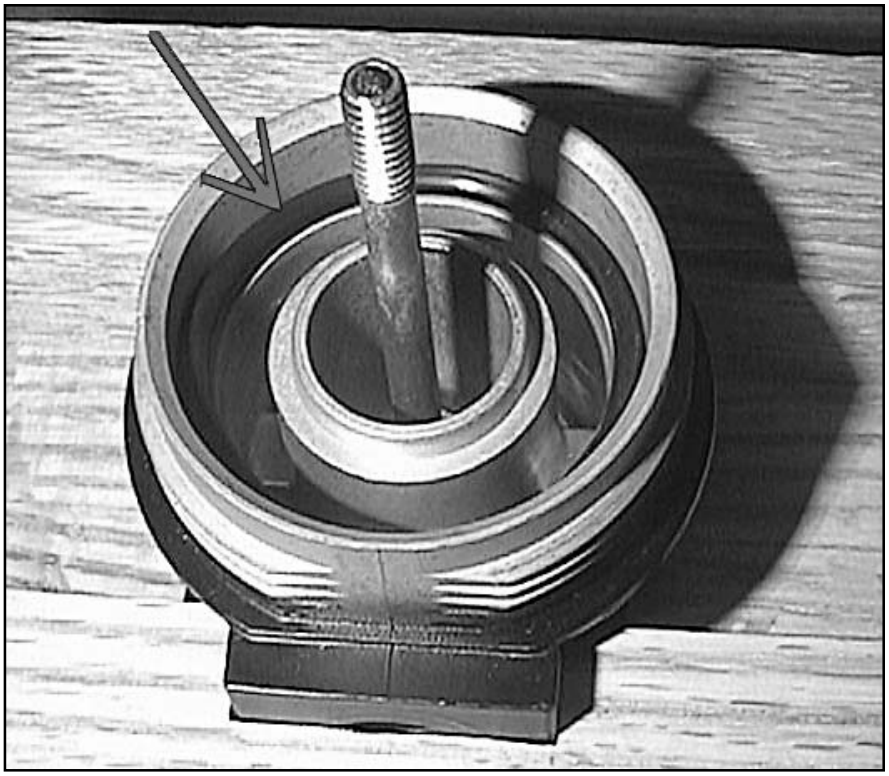
5. Exchange drains



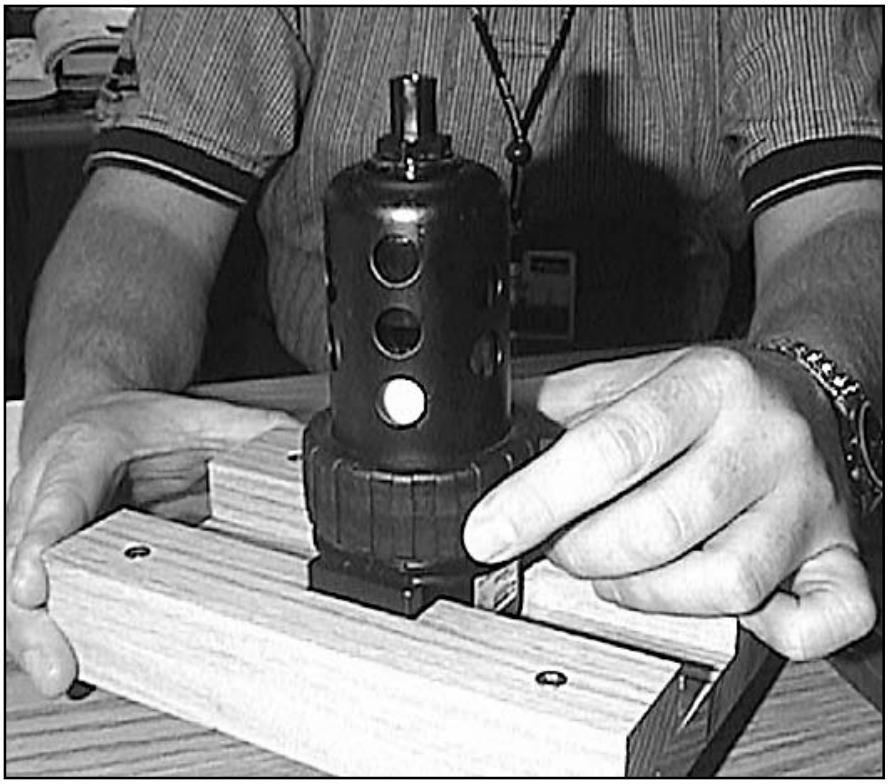
6. Place nut on drain and tighten (Torque 10 to 15 in.-lbs.)



7. Replace bowl seal in body



8. Place collar and bowl on body then tighten (Torque hand tight plus ¼ turn)
9. Change product label to new part number
10. Pressurize and check for leaks



Change Drain on P3N Series

1. Push in the bowl detent, rotate 1/8 turn and pull to remove bowl



2. Open the twist drain



3. Remove nut from bottom of drain using 3/4" wrench



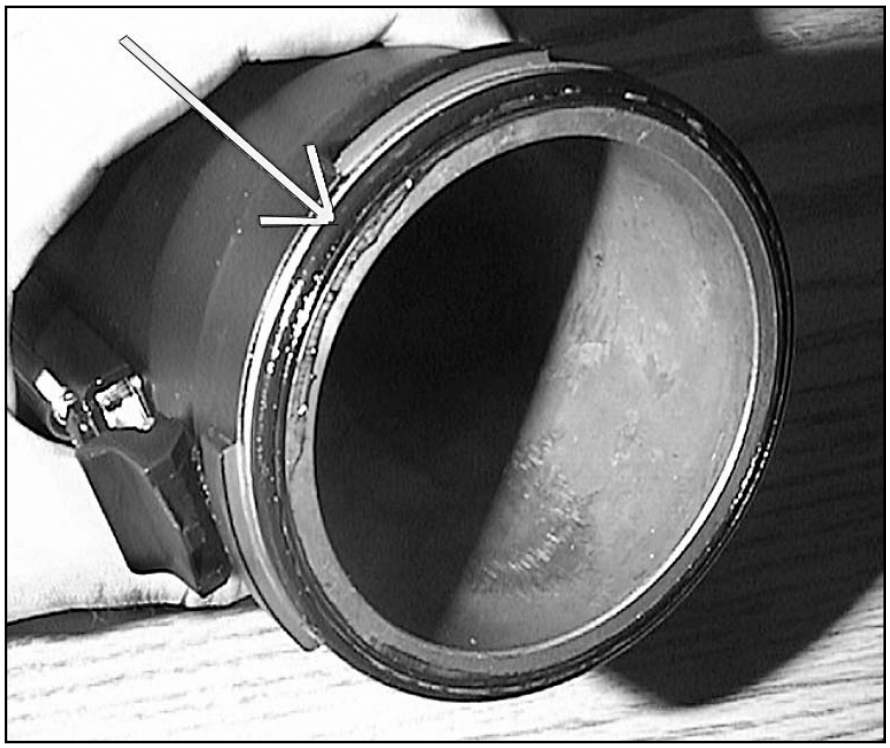
4. Exchange drains



5. Replace nut on drain and tighten (Torque 10 to 15 in. lbs.)



6. Lightly lubricate the provided new seal and replace the old bowl seal making sure the seal's groove is facing up



7. Replace the bowl, making sure that the detent correctly snaps into place
8. Change product label to new part number
9. Pressurize and check for leaks



Change Regulator Spring on 14 Series

1. Turn adjustment knob counter-clockwise to relieve spring load



2. Unscrew bonnet and remove using 1" open end wrench



3. Turn adjusting knob clockwise until diaphragm can be removed



4. Remove diaphragm



5. Remove spring and turn adjusting knob fully counter-clockwise



6. Insert new spring into bonnet



7. Insert diaphragm into body with the cupped end toward the spring



8. Thread bonnet into body

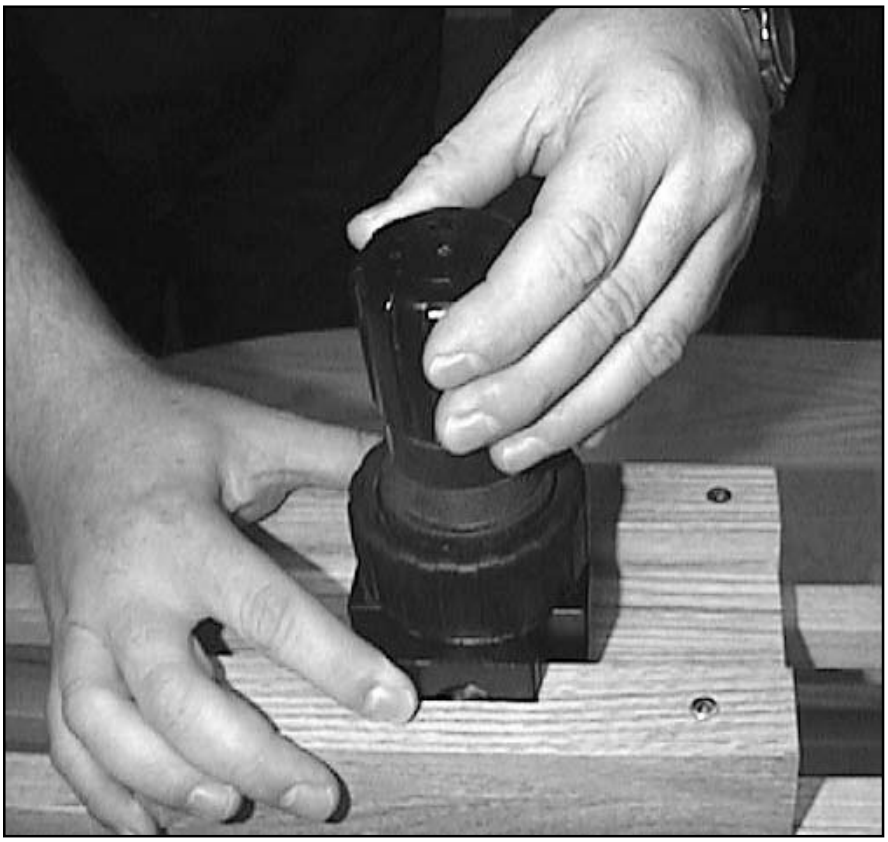


9. Tighten bonnet (Torque 50 to 60 in.-lbs.)
10. Change product label to new part number
11. Pressurize and check for leaks

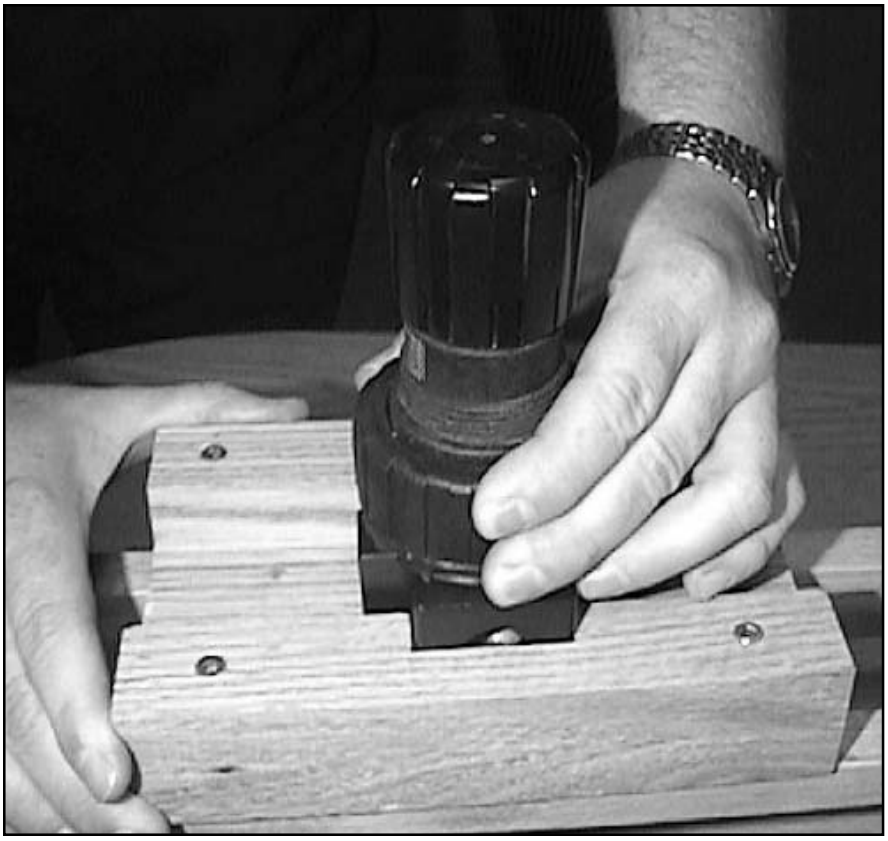


Change Regulator Spring on 05/06/07 Series

1. Turn adjustment knob counter-clockwise to relieve spring load



2. Loosen collar (use strap wrench if necessary)



3. Remove collar and bonnet



4. Turn adjustment knob clockwise until diaphragm becomes unseated



5. Remove diaphragm



6. Exchange springs



7. Turn adjustment knob fully counterclockwise



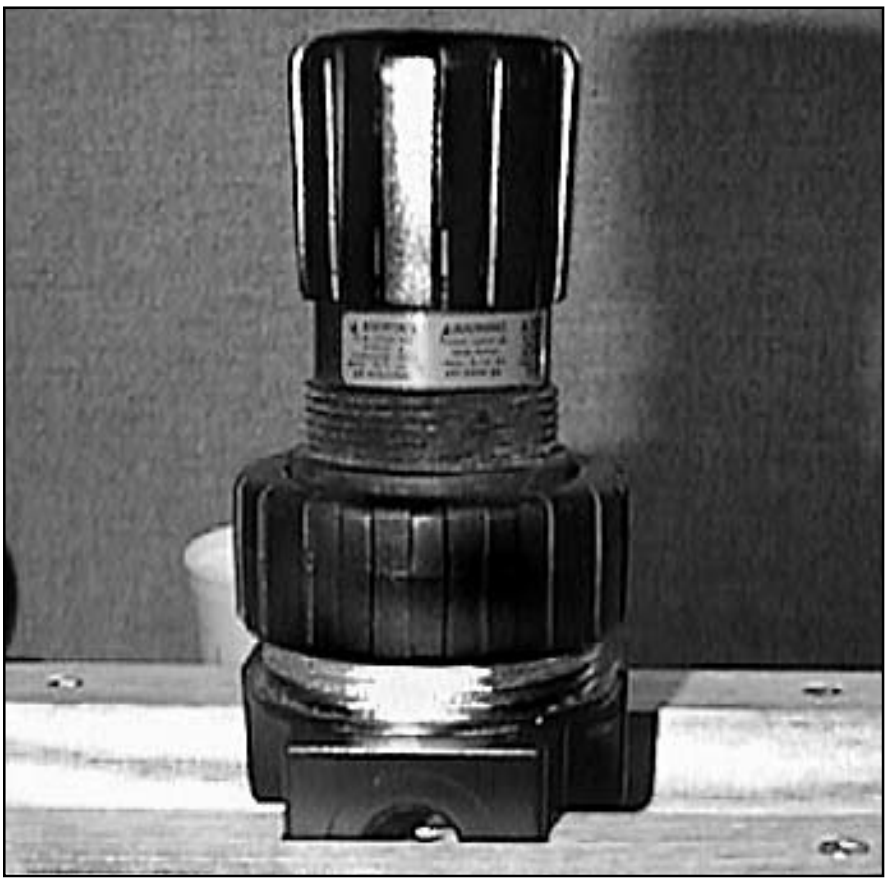
8. Place diaphragm in bonnet



9. Seat the diaphragm in bonnet by pressing on a flat surface



10. Place bonnet and collar on body



11. Tighten collar (Torque 150 to 200 in.-lbs.)
12. Change product label to new part number
13. Pressurize and check for leaks



Change Spring on P3N Series

1. Turn adjustment knob fully counter clockwise in order to relieve spring load



2. Loosen and remove all four bonnet to body bolts, using 4mm allen wrench



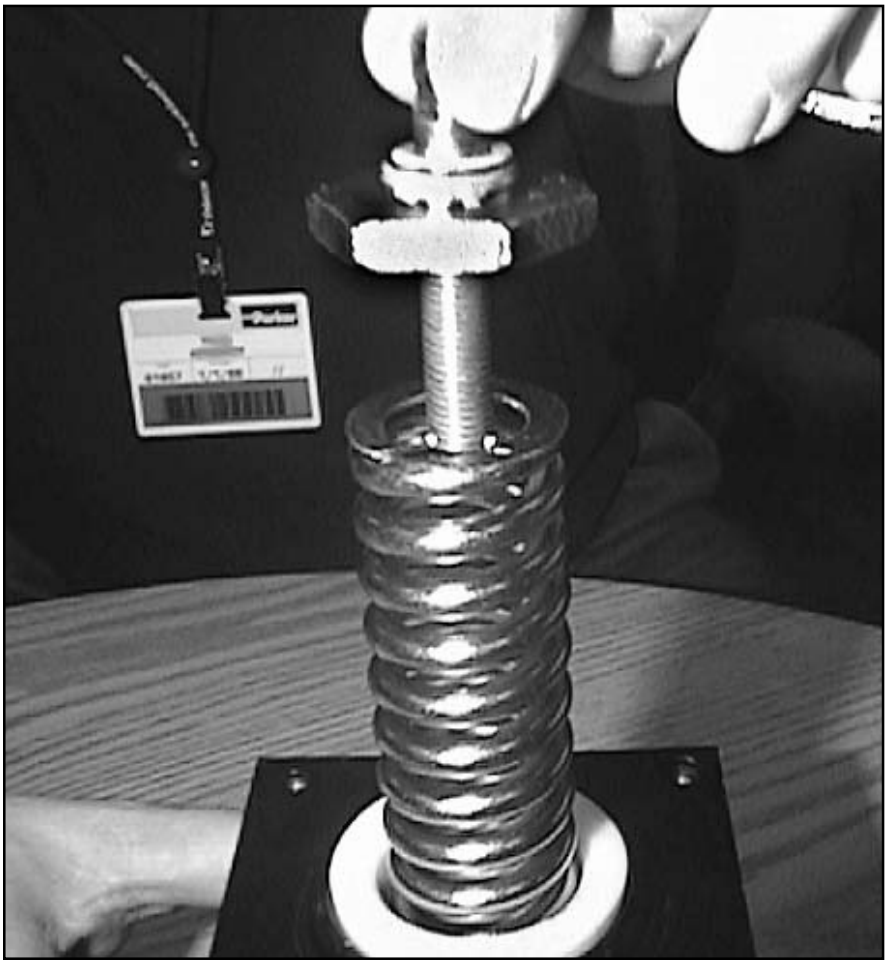
3. Remove bonnet and adjustment assembly



4. Exchange springs



5. Replace adjustment assembly



6. Replace bonnet, make sure that the arrow on the bonnet is pointing to the right when looking at the label

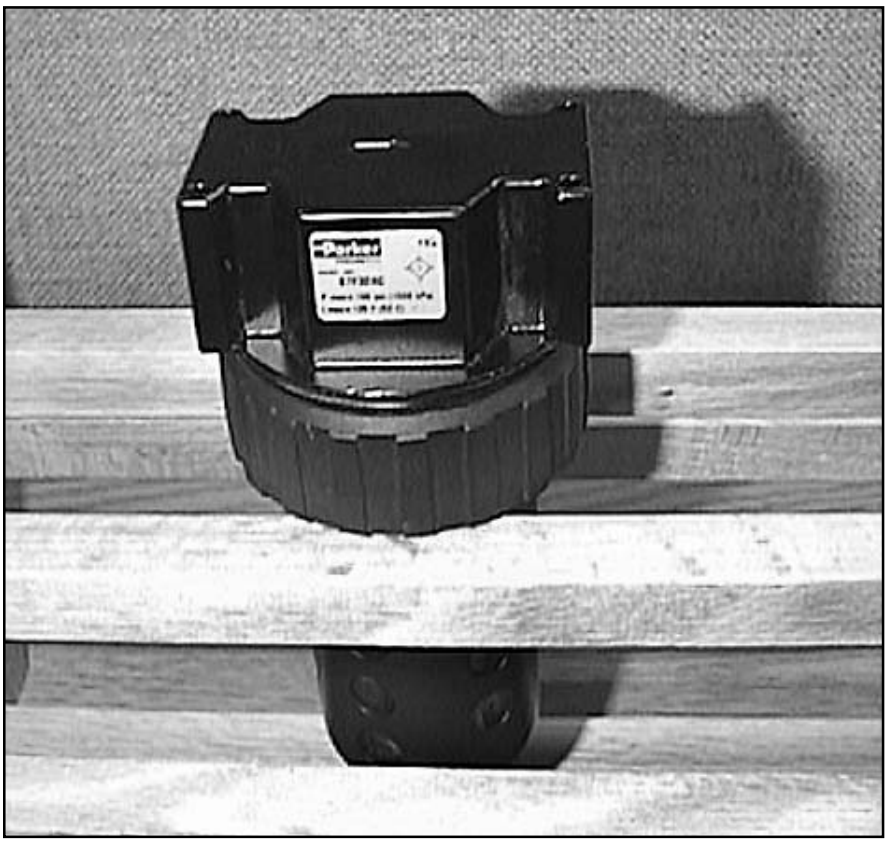


7. Replace and tighten the “bonnet to body” bolts (Torque 13 to 17 in. lbs.)
8. Change product label to new part number
9. Pressurize and check for leaks

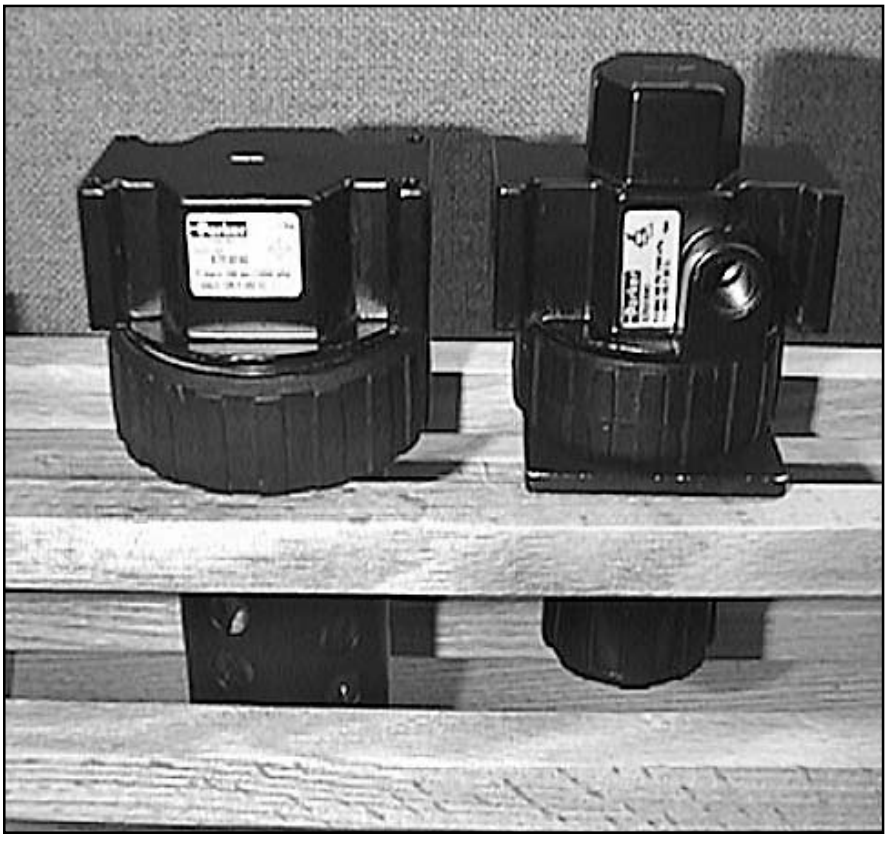


05/06/07 Combos

1. Place the Filter or Piggyback in the provided fixture with the arrow on the body pointing to the right and the bowl pointing down



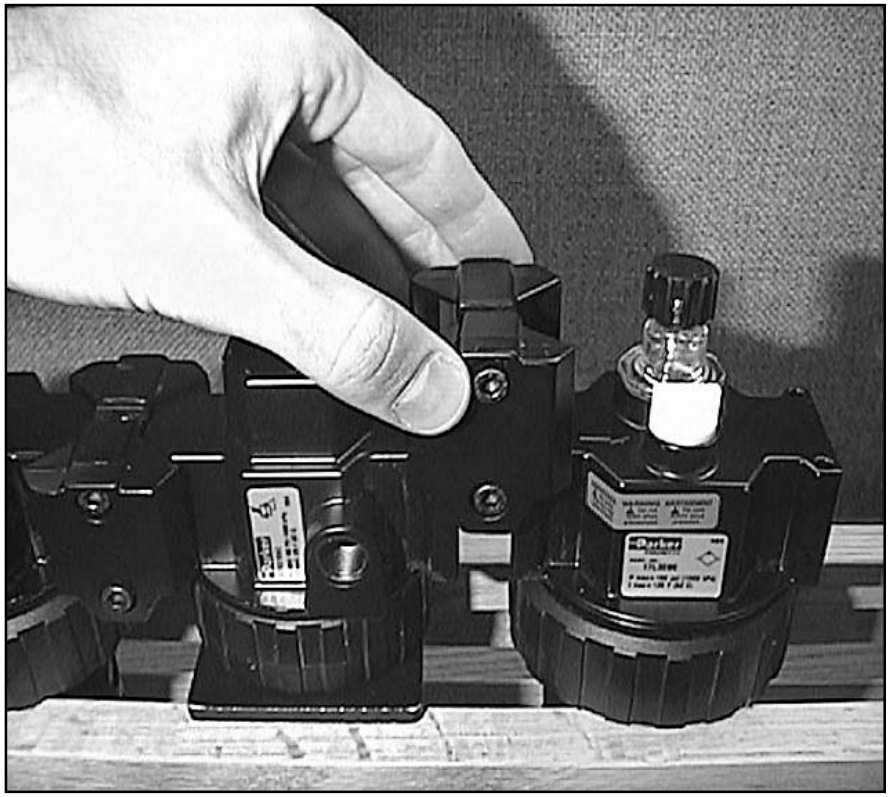
2. If three piece combo, place the Regulator to the right of the Filter and align the ports (07R requires the use of the provided spacer to adequately align the ports)



3. Place the Lubricator to the right of the Regulator or Piggyback and align the ports



4. Place a body connector between each body



5. Starting with the bottom screw, tighten the clamp screws alternating between the two screws per connector until both connector screws are snug.
   - Series 05
     Torque 25 to 30 in.-lbs. with 3mm allen wrench
   - Series 06/07
     Torque 30 to 40 in.-lbs. with 4mm allen wrench



6. Check the alignment of each body to verify fit between body and connector, the bottom flange of the inner and outer clamp must be positioned below the bottom edge of the body



7. If required, attach port blocks to bodies in similar fashion as body connectors, on 06/07 make sure that the two bumps on the port blocks are facing down
   - Series 05
     Torque 25 to 30 in.-lbs.
   - Series 06/07
     Torque 30 to 40 in.-lbs.
8. Pressurize the unit and check for leaks



P3N Combos

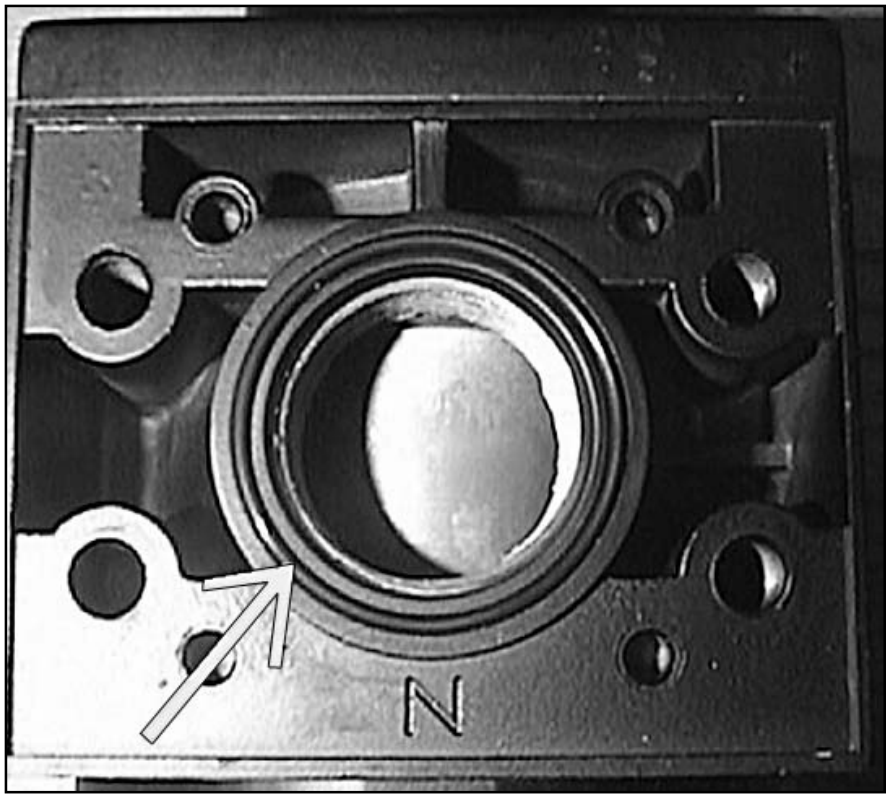
1. If the unit is a three piece combo, place regulator to the right of filter



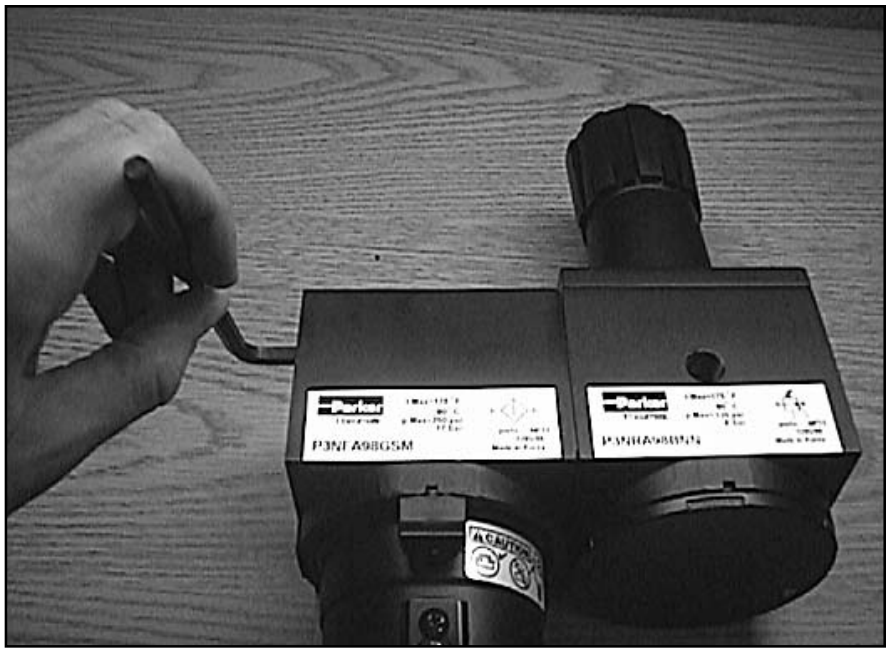
2. Place lubricator to the right of the regulator or the piggyback



3. Lightly lubricate the provided o-ring(s) and place in the groove between each body

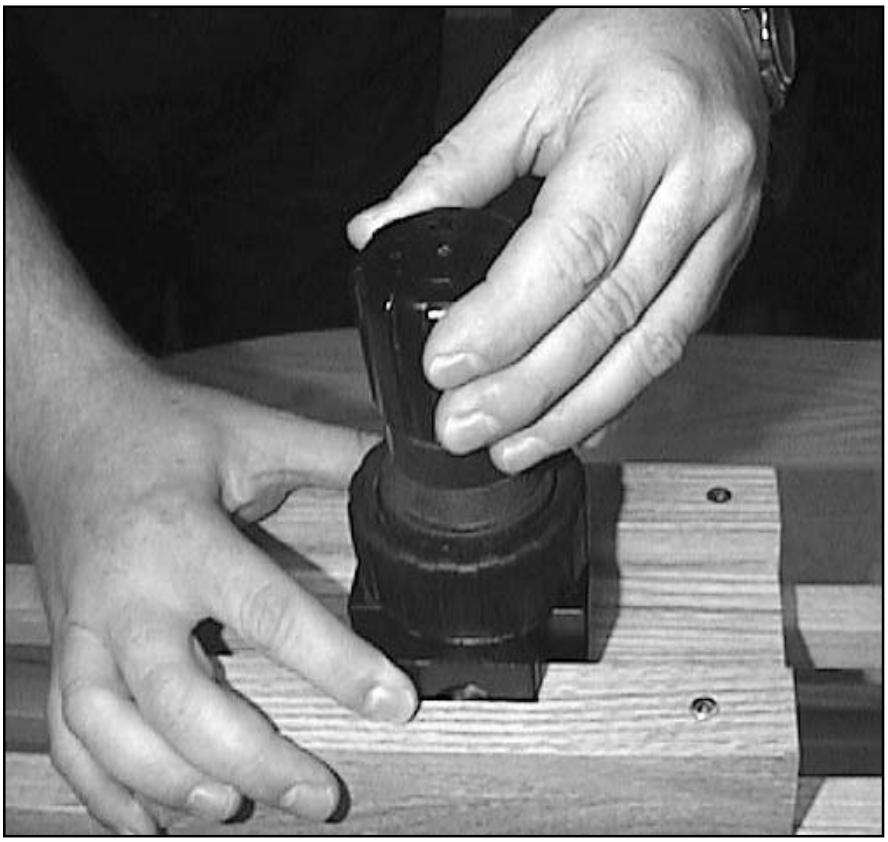


4. Assemble bodies together using the provided bolts using 6mm allen wrench (torque 48 to 52 in. lbs.)
5. Pressurize and check for leaks

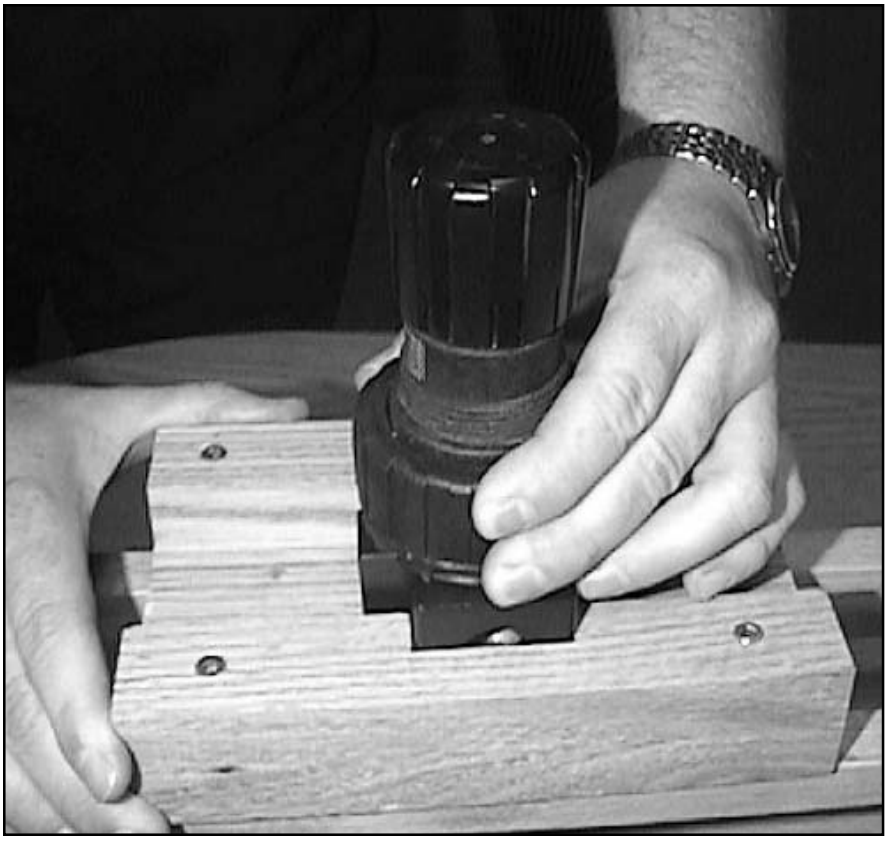


Convert to Reverse Flow Option on 06/07 Series

1. Turn adjusting knob counter-clockwise to relieve spring load



2. Loosen collar (use strap wrench if necessary)



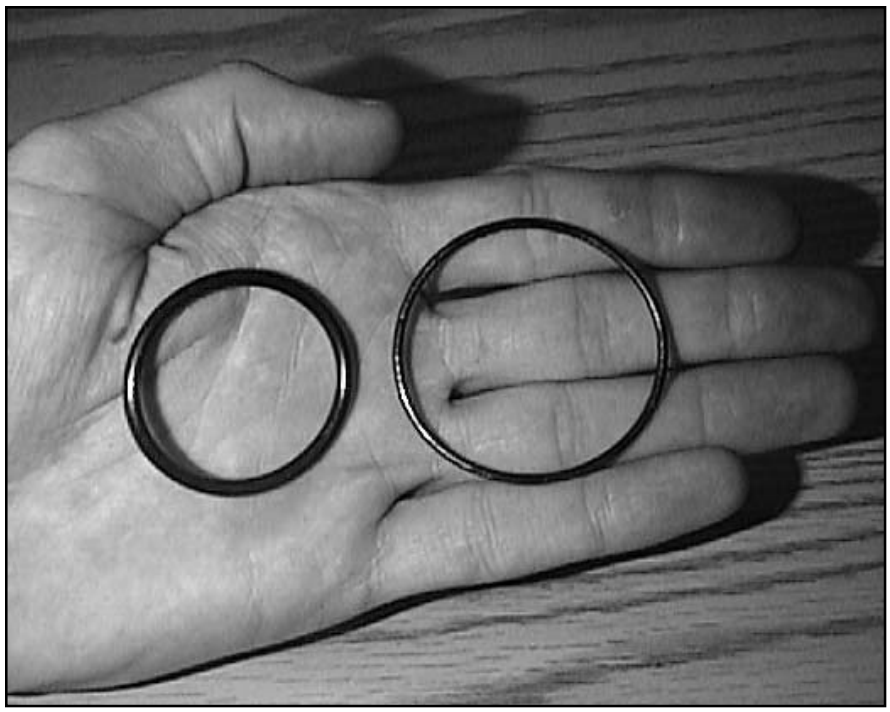
3. Remove collar and bonnet

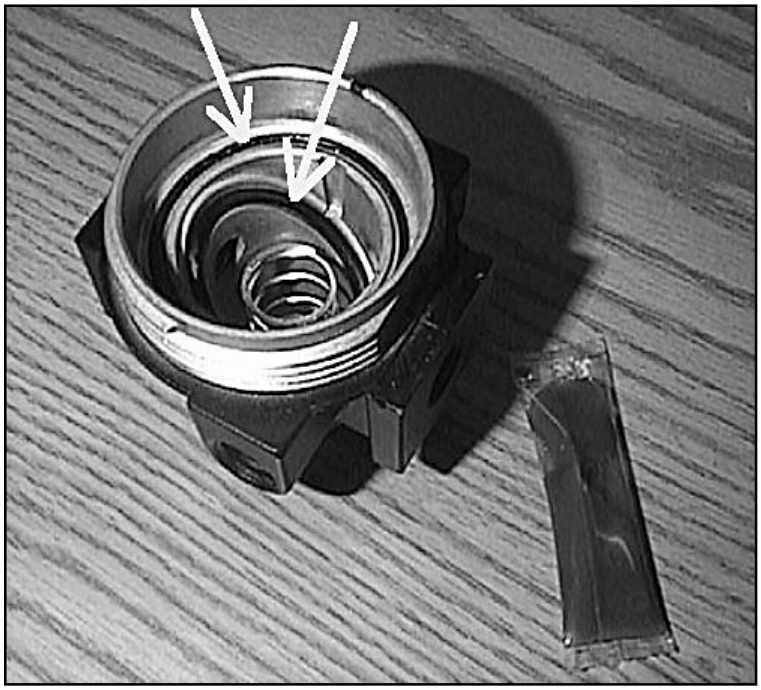


4. Remove insert and poppet from body



5. Lightly grease seals with provided lubricant and place in body





6. Lightly grease new poppet stem with provided lubricant



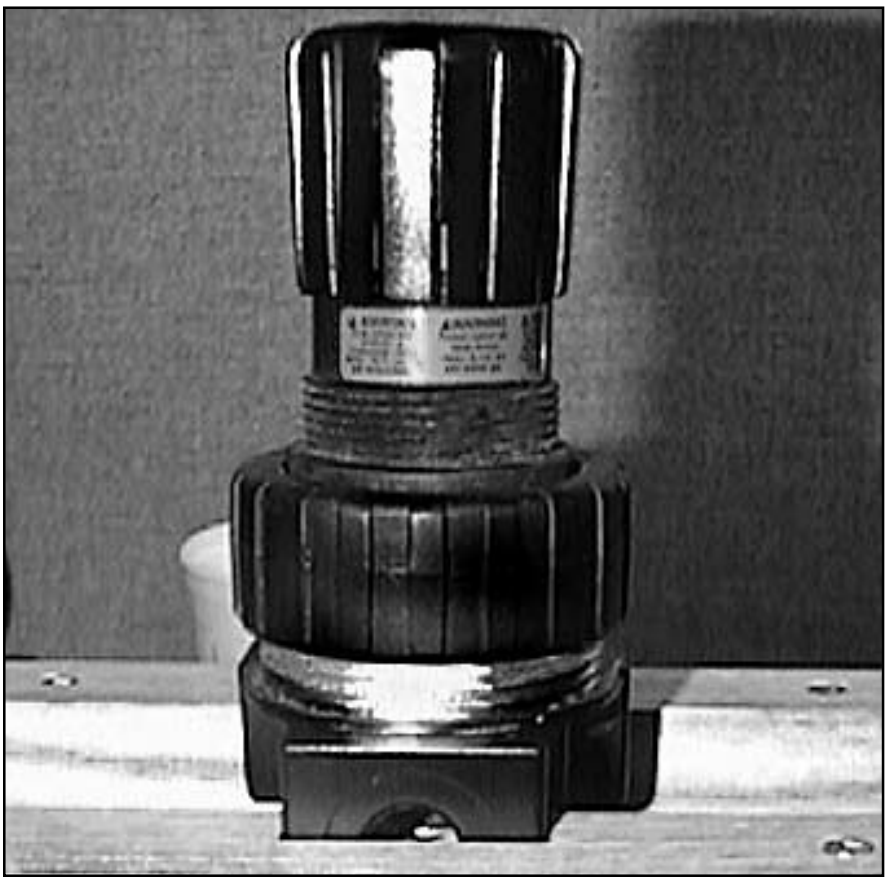
7. Place new poppet assembly into the insert assembly
   - Use new insert for 07R
   - Use original insert for 06R



8. Place insert and new poppet in body, making sure that the poppet is positioned correctly in the spring



9. Place bonnet and collar on body



10. Tighten collar (Torque 150 to 200 in.-lbs.)
11. Change product label to new part number
12. Pressurize and check for leaks

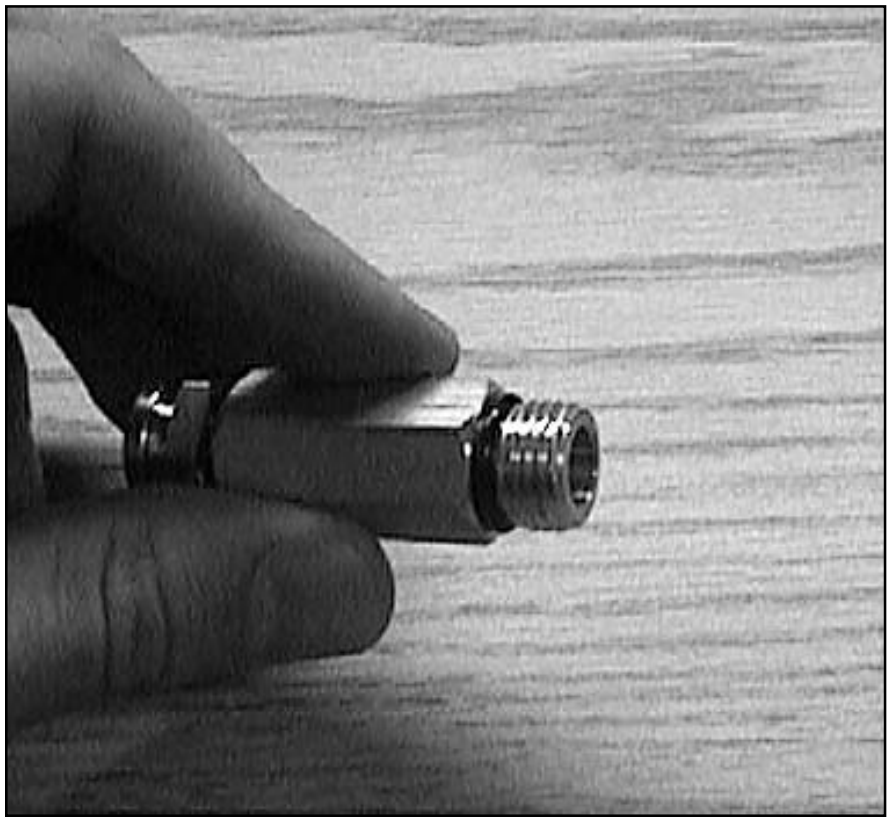


Add Body Pressure Fill Adapter Kit on 05/06/07 Series

1. Loosen fill plug and remove from body



2. Make sure that the O-Ring is properly installed on fill plug adapter

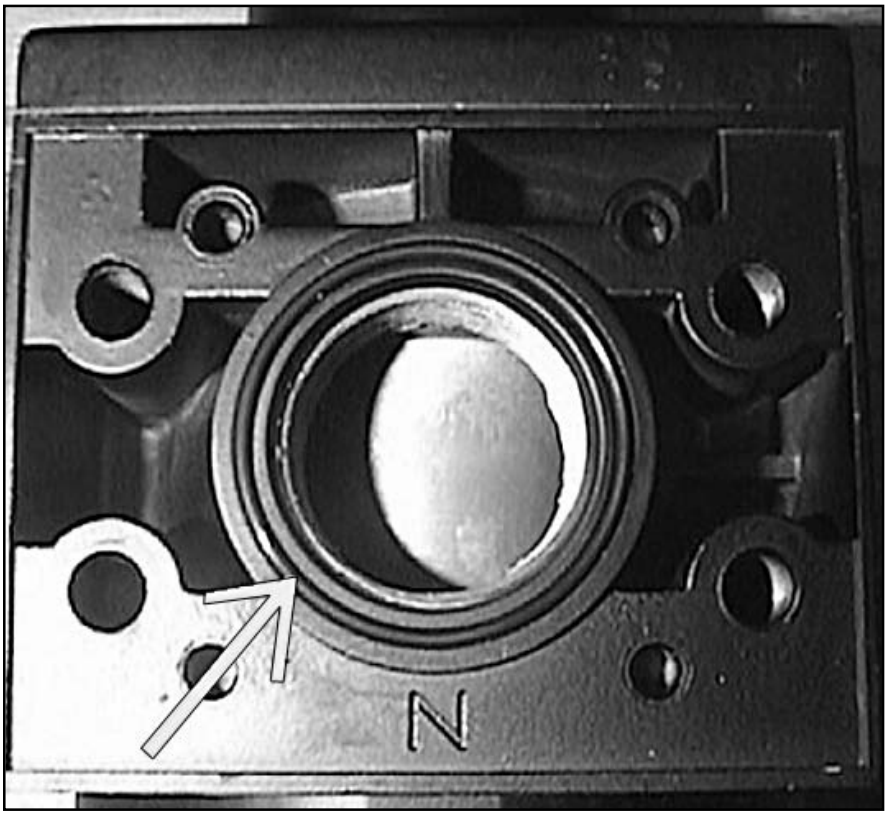


3. Thread adapter in fill plug port and tighten using 5/8" wrench (Torque 25 to 30 in.-lbs.)
4. Change product label to new part number
5. Pressurize and check for leaks

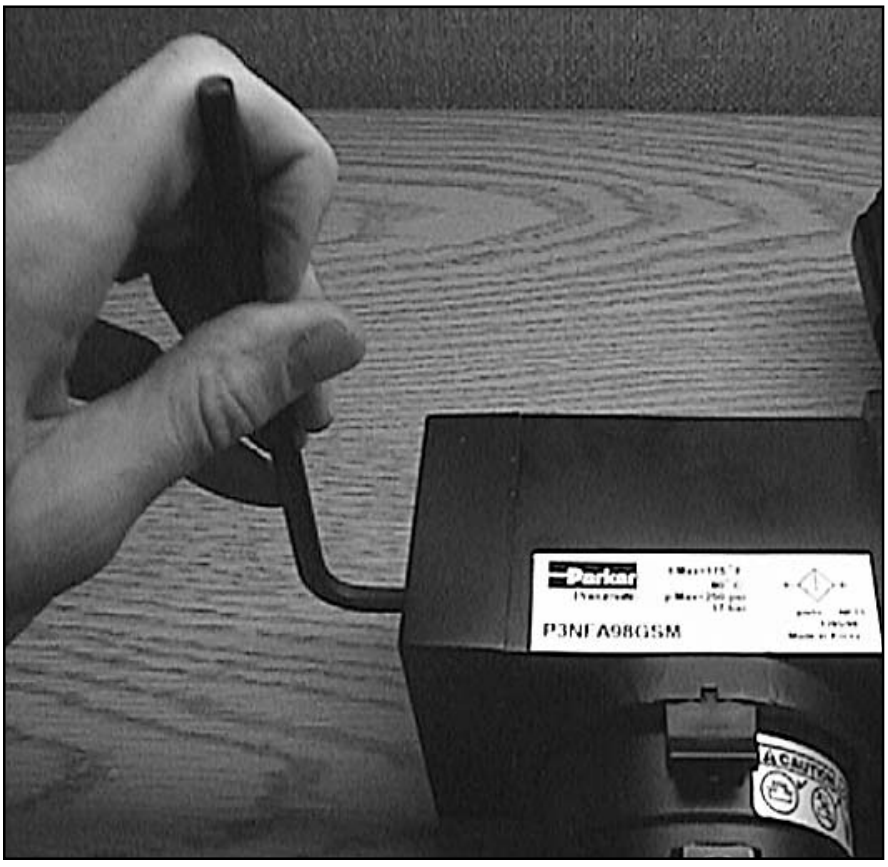


Port Blocks for P3N Series

1. Lightly lubricate one of the provided o-rings and place in the groove on the body

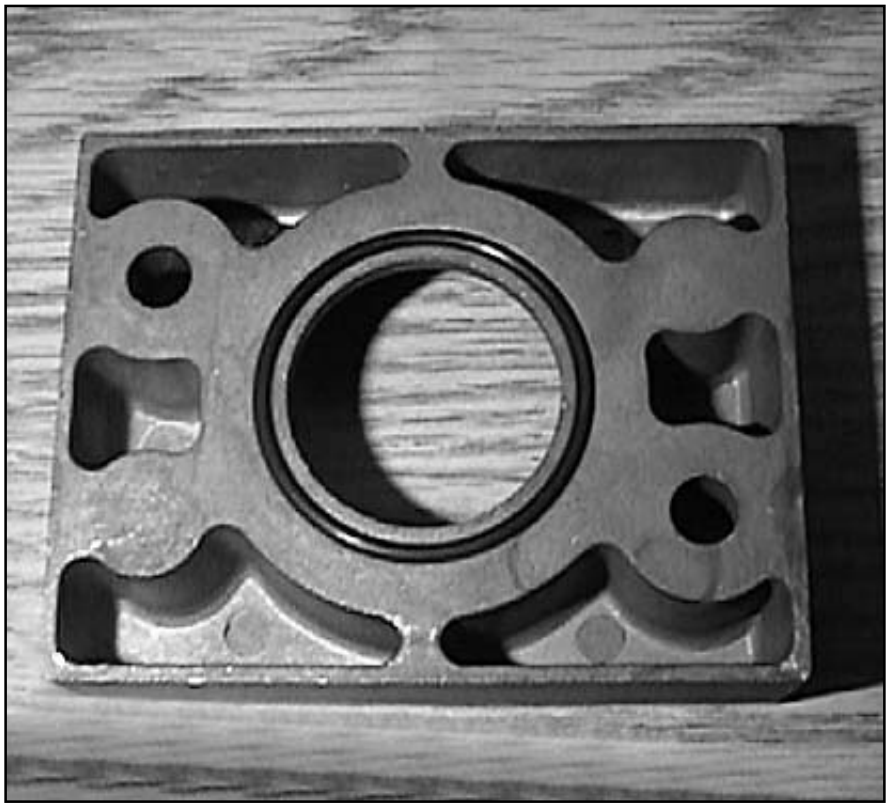


2. Place the port block without a groove on the body and o-ring then, use the provided bolts using 6mm allen wrench to assemble (Torque 48 to 52 in. lbs.)

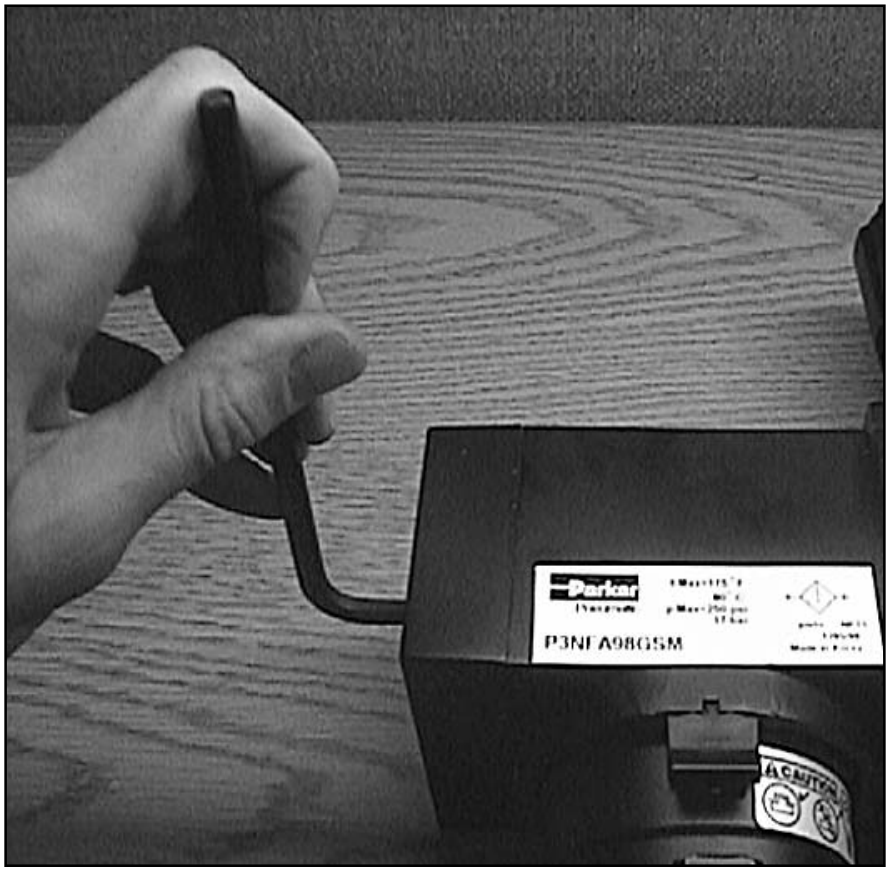


Miscellaneous Changes

3. Lightly lubricate the other provided o-ring and place in the groove on the remaining port block



4. Place the port block and o-ring on the body then, use the provided bolts to assemble (Torque 48 to 52 in. lbs.)
5. If it is a single unit then, change product label to new part number
6. Pressurize and check for leaks



Notes

Notes

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Pneumatic Division North America
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E-mail: PDNMKTG@parker.com

FRL-TEC-07 4/00 15M IGS Printed in U.S.A.

Parker Pneumatic

Pneumatic Division North America
Richland, Michigan 49083

TEC-13
General Guidelines and Rules of Thumb

ISSUED: November, 2006
Supersedes: October, 1998

1. When to use Electric vs. Pneumatic vs. Hydraulic Power; if the required horsepower at the actuator or drive component is:
   0 to 1/4 HP ..... Use Electric Motors
   1/4 to 1-1/2 HP ..... Use Pneumatics
   1-1/2 and up HP .... Use Hydraulics

2. Compressor Capacity (HP) to Flow Capacity (SCFM) 1 HP $\simeq$ 4 SCFM.

3. A standard cubic foot of air is specified as 14.7 PSIA, at 68°F and 36% relative humidity to set conditions for air density and moisture content.

4. At sea level, atmospheric pressure is 14.696 PSIA, for every 1000 ft. in elevation gained, atmospheric pressure decreases by approximately 1/2 PSIA.

5. Receiver tank size should be sized at 3 times compressor output volume, so that the compressor is off twice as long as it is on.

6. Compressor to be sized for average flow demand, and the receiver tank sized to accommodate peak demand.

7. Air temperatures at compressor outlets can exceed 450°F. Hot air holds more moisture than cooler air. Relative humidity increase is proportional to compression factor. (Example: 36% relative humidity @ compressor inlet x 7.8:1 compression factor for 100 PSIG = 280% relative humidity @ outlet).

7A. Compressor Oils:
Varnish (tar) develops because hydrocarbon based oils break down at temperatures over 150°F. Synthetic oils (diester base) are sometimes used because they will not breakdown at temperature as readily, but they may not be compatible with other components in the system. Typically a New reciprocating compressor will pass 2 oz. of oil into the air stream. As the compressor wears, more oil will pass into the airstream. CAUTION: Diester based oils will cause a reaction with some common cleaning solvents (such as kerosine), fumes of which may be toxic or fatal.

8. Galvanized pipe should never be used in an air system. Reaction with oil residue causes electrolytic corrosion and will form sulfuric acid.

9. Solenoids (General)
   A. $\frac{\text{TIME OFF}}{\text{TIME ON}} \geq 3$ FOR STANDARD DUTY CYCLE
   Applications otherwise solenoid should be continuous duty cycle rated.

   B. Continuous Duty Pilots
   Continuous duty pilots are designed for applications where cycling is infrequent and the pilot is to be energized for indefinite periods of time . . . hours, days or weeks. Typical uses include fail-safe or emergency shutdown circuits where the pilot is to be energized and the valve open as long as the main control is "live" in order to shut off air to equipment in the event of power failure.

   Applications with pilot valves energized for ten (10) minutes or longer with a duty cycle greater than 70% are considered to be continuously energized.

   $$\text{Duty Cycle} = \frac{\text{Time energized}}{\text{Time energized + time off}} \times 100\% = \%\ \text{Duty Cycle}$$

   C. A solenoid can pull-in (complete magnetic field) in approximately .008 to .010 seconds depending upon mass of armature and strength of field.

   D. D.C. voltages are faster than A.C. voltages relative to solenoid pull-in time, because A.C. lags with sign-wave phase transition.

   E. D.C. voltage coils may experience up to 2-1/2 times the life of A.C. voltage coils.

   F. M.O.P.D. stands for Maximum Operating Pressure Differential.

   Example:

   If inlet (P_1) = 100 PSIG and
   the outlet (P_2) = 0 PSIG,
   Then the M.O.P.D. is 100 - 0 = 100
   If (P_1) = 100 PSIG and (P_2) = 80 PSIG,
   Then M.O.P.D. = 20 PSIG

   M.O.P.D. must be calculated to insure proper orifice size and maximize flow.

   G. Coil designs generally allow a +10%, -15% of rated voltage.

   Mobile coil designs generally allow a +25%, -30% if rated voltage.

H. Insulation Rating (class) of coils.

Class A Coil Construction:
Paper wound-impregnated with oil
Temperature Class 105°C (221°F)
Max. Allowable Heat Rise:
65°C by thermocouple method;
85°C by resistance method

Class B Coil Construction:
Epoxy Encapsulated
(moisture resistant)
Temperature Class 130°C (226°F)
Max. Allowable Heat Rise:
85°C by thermocouple method;
95°C by resistance method

Class F Coil Construction:
Epoxy or Polysufone Encapsulated
(moisture resistant)
Temperature Class 155°C (311°F)
Max. Allowable Heat Rise:
95°C by thermocouple method;
115°C by resistance method

Class H Coil Construction:
Epoxy or Polysulfone Encapsulated
(moisture resistant)
Temperature Class 180°C (356°F)
Max. Allowable Heat Rise:
115°C by thermocouple method;
135°C by resistance method

I. Hazardous Duty Solenoid Listing
Valves with solenoid operators designed for hazardous locations are UL & CSA Approved as follows:

National Electric Code	Ambient Conditions	NEMA Classification
Class I Div. 1 Group C	Ethyl, Ether, Etc. Gases & Vapors	VII (7)
Class I Div. 1 Group D	Gasoline, Etc. Gases & Vapors	VII (7)
Class I Div. 2 Group B	Butadiene, Etc., Liquid, Fluid or Vapor Normally Contained, or Atmosphere Ventilated	VII (7)
Class II Div. 1 Group E	Metal Dust	IX (9)
Class II Div. 1 Group F	Coal, Coke, Carbon Black Dust	IX (9)
Class II Div. 1 Group G	Flour, Starch, Grain Dust	IX (9)

See Article 500 – Hazardous (Classified) Locations, National Electric Code.

J. The combination of maximum heat rise and ambient temperature can not exceed temperature class of coil or coil will burn out.

10. **Typical port size to C_V to response time relationships for valves:**

PORT SIZE	C_V RANGE	RESPONSE TIME (SECONDS) TO PRESSURE OR EXHAUST SPECIFIED VOLUME		
		12 Cu.In.	100 Cu.In.	1000 Cu.In.
1/8 Pipe	.2 to .8	.100	—	—
1/4 Pipe	.5 to 2.0	.060	.300	—
3/8 Pipe	1.5 to 3.5	.040	.090	—
1/2 Pipe	2.5 to 5.0	.035	.070	—
3/4 Pipe	4 to 9	.030	.075	.550
1 Pipe	6 to 16	—	.065	.400
1-1/4 Pipe	11 to 28	—	.030	.200
1-1/2 Pipe	20 to 30	—	—	.170

11. **ISO Valve to C_V Ranges** (PDN Target)

ISO 01 C_V = 1.0
ISO 02 C_V = 0.5
ISO 1 C_V = 1.2 – 1.5
ISO 2 C_V = 2.6 – 3.1
ISO 3 C_V = 5.2 – 6.0
ISO 4 C_V = 7.1 – 7.5

12. **Sensor Terminology**

NPN
NPN type open collector transistor outputs are solid state circuits that provide sinking output capabilities. When the transistor is on, the current for the load flows into the transistor. This output “sinks” toward 0VDC, 0mA.

PNP
PNP type open collector transistor outputs are solid state circuits that provide sourcing output capabilities. When the transistor is on, the current for the load flows out of the transistor. This output “sources” toward 24VDC, 125mA.

13. **SCFM to C_V Equivalents for 100 PSI Inlet Pressure @ Various Pressure Drops:**

1 C_V = 14.7 SCFM @ 2 Δp
1 C_V = 22.9 SCFM @ 5 Δp
1 C_V = 31.7 SCFM @ 10 Δp
1 C_V = 42.6 SCFM @ 20 Δp
1 C_V = 55.6 SCFM @ 50 Δp

14. **International ISO Standards**
Notification as specified in ISO8573 - 1

	Solid			Water		Oil	
Class	**Maximum particle size* (um)**	**Maximum Concentration** mg/m3**	**(ppm)**	**Maximum Pressure Dewpoint °F**	**(°C)**	**Maximum Concentration** mg/m3**	**(ppm)**
1	0.1	0.1	(.08)	-94	(-70)	0.01	(.008)
2	1	1	(0.8)	-40	(-40)	0.1	(.08)
3	5	5	(4.2)	-4	(-20)	1	(.83)
4	15	8	(6.7)	37	(+3)	5	(4.2)
5	40	10	(8.3)	45	(+7)	25	(21)
6	-	-	-	50	(+10)	-	-

* Particle size is based on a filtration ratio β 20. The minimum accuracy of the measuring method used is 20% of the limiting value of the class.

** At 14.7 PSI (1 bar) absolute pressure, +70°F (+20°C) and a relative humidity of 60%.

It should be noted that at pressures above atmospheric, the contaminant concentration is higher.

Notes:

1. The quality of the air delivered by non-lubricated compressors is influenced by the quality of the intake air and the compressor design.
2. The minimum accuracy of the measuring method used is 20% of the limiting value of the class.

A. 78% of particles in air are 2 microns or smaller.

B. Average cost to produce compressed air at 100 PSI is $.30 / 1000 ft^3

15. **Cylinder Bore Size to Pipe Thread Size**
For industrial interchangeable cylinders.

BORE SIZE	TAPERED PIPE THREAD
1"	1/4"
1-1/2"	3/8"
2"	3/8"
2-1/2"	3/8"
3-1/4"	1/2"
4"	1/2"
5"	1/2"
6"	3/4"
7"	3/4"
8"	3/4"
10"	1"
12"	1"
14"	1-1/4"

Parker Pneumatic

Pneumatic Division North America
Richland, Michigan 49083

TEC-14

ISSUED: November, 1998

Supersedes: None

Gas Laws

Boyles Law;

The pressure of a given mass of gas at a constant temperature is inversely proportional to its volume.

Example:

At constant temperature T

If V increases, P decresses

If V decreases, P increases

Charles Law and Gay Lussac's Law;

If the pressure remains constant, a given mass of gas will increase in its volume proportional to an increase in temperature. For every 1°C rise in temperature, a volume initially at 0°C will increase by 1/273, keeping the pressure constant.

Example:

At constant temperature P

If T increases, V increases

If T decreases, V decreases

Perfect (Ideal) Gas Law;

By combining the relationships found in Boyles and Charles Laws, the Perfect Gas Law is developed:

$$PV = nRT$$

Where;

P = Pressure (Absolute)

V = Volume

R = Gas Constant (Air = 639.6)

n = Molecular Weight of Gas (Moles)

T = Temperature of Gas (Absolute)

Pascals Law;

The ability of a gas to transmit equal pressure in all directions, at right angles to the wall of its container, regardless of the containers shape. Force is equal to Pressure (PSIG) times Area (cubic inches).

Conversions and Equivalents

Commonly Used in Fluidpower

Conventional U.S. Conversion Factors

To Convert → Into	← To Convert Into	Multiply By ← Divide By
atmospheres	in. of mercury (at 0°C)	29.92
atmospheres	kgs./sq.cm.	1.0332
atmospheres	pounds/sq.in.	14.7
atmospheres	bars	1.0332
bars	atmospheres	.9869
bars	pounds/sq.in.	14.5
Btu	foot-lbs.	778.3
Btu/hr.	foot-lbs./sec.	.2162
Btu/hr.	horsepower-hrs.	3.929×10^{-4}
Btu/hr.	watts	.2931
Btu/min.	foot-lbs./sec.	12.96
Btu/min.	horsepower	.02356
Btu/min.	kilowatts	.01757
Btu/min.	watts	17.57
centimeters	inches	.3937
centimeters/sec.	feet/min.	1.1969
centimeters/sec.	feet/sec.	.03281
cubic centimeters	cu. inches	.06102
cubic feet	cu. inches	1.728
cubic feet/min.	cu.cms./sec.	472
cubic feet/min.	gallons/sec.	.1247
cubic feet/min.	liters/sec.	.4720
cubic inches	cu.cms.	16.39
cubic inches	cu. feet	5.787×10^{-4}
cubic inches	liters	.01639
diameter of circle	circumference	3.1416
diameter of circle	area	$.7854\ D^2$
feet	centimeters	30.48
feet	meters	.3048
feet	millimeters	304.8
feet/min.	cms./sec.	.508
feet/min.	feet/sec.	.01667
foot-pounds	Btu	1.286×10^{-3}
foot-pounds/min.	foot-pounds/sec.	.01667
foot-pounds/min.	horsepower	3.03×10^{-5}
gallons	cu. feet	.1337
gallons	cu. inches	231
gallons	liters	3.785
gallons/min.	cu. ft./sec.	2.228×10^{-3}
grams	kilograms	.001
horsepower	Btu/min.	42.44
horsepower	foot-lbs./min.	33,000
horsepower	foot-lbs./sec.	550
horsepower	kilowatts	.7457
horsepower	watts	745.7
horsepower (metric) (542.5 ft. lb./sec.)	horsepower (550 ft. lb./sec.)	.9863
horsepower (550 ft. lb./sec.)	horsepower (metric) (542.5 ft. lb./sec.)	1.014
inches	centimeters	2.54
inches	millimeters	25.40
inches of mercury	atmosphere	.03342
inches of mercury	kgs./sq. cm.	.03453
inches of mercury	pounds/sq. in.	.4912
joules	foot-pounds	.7376
kilograms	grams	1,000
kilograms	joules/meter (newtons)	9.807
kilograms	pounds	2.205
kilowatts	horsepower	1.341
liters/min.	cu.ft./sec.	5.886×10^{-4}
liters/min.	gals./sec.	4.403×10^{-3}
meters	centimeters	100
meters	feet	3.281
meters-kilograms	pound-feet	7.233
millibars	lbs./sq. in.	.0145
millimeters	inches	.03937
milimeters	meters	.001
ounces (fluid)	cu. inches	1.805
ounces (fluid)	liters	.02957
pounds	joules/meter (newtons)	4.448
pounds	kilograms	.4536
pounds/sq. in.	atmospheres	.06804
pounds/sq. in.	inches of mercury	2.036
pounds/sq. in.	kgs./sq. meter	703.1
pounds/sq. in.	pounds/sq. ft.	144
pounds/sq. in.	millibars	68.9
quarts (liquid)	gallons	.25
quarts (liquid)	liters	.9463
square feet	sq. cms.	929
square feet	sq. inches	144
temperature (°C) + 273	absolute temerature (Kelvin)	1
temperature (°C) + 17.78	temperature (°F)	1.8
temperature (°F) + 460	absolute temperature (Rankine)	1
temperature (°F) - 32	temperature (°C)	5 / 9
watts	Btu/hr.	3.4192
watts	horsepower	1.341×10^{-3}
watts	kilowatts	.001

Other Conversions And Equivalent

QUANTITY MEASURE	SI UNIT	U.S. UNIT	CONVERSION
Flow	Cubic Decimeters Per Second; dm^3_n/S	Standard Cubic Feet Per Minute; SCFM	$1dm^3_n/S$ = 2.12 SCFM
Force	Newton (N)	Pound Force-Feet (Foot Pounds)	4.44N = 1 lb.-Feet (Foot Pounds)
Torque	Newton - Meter (N•m)	Pound Force-Inches (Inch Pounds)	1 N•m = 8.88 lb.-Inches (Inch Pounds)
Pressure	Kilopascal (kPa)	PSIG	1 PSIG = 6.895 kPa

1 Millibar = .0145 bar
1 kPa = 10 Millibar (.145 bar)
1 Micro-meter = 1 millionth of a meter (micron)
= .000001 Meter
= .000039 Inches
1 Cu. Ft. = 1728 Cu. Inches
1 Cu. In. ≃ 330 drops of oil
1 Fluid Ounce (Oz) ≃ 600 drops of oil

Common Formulae

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$F = PA$$

$$\text{SCFM (Standard Cubic Feet Per Minute)} = \frac{\text{Volume (Cubic Inches)}}{\text{Time (Seconds)}} \times \frac{\text{Compression Factor}}{28.8}$$

(28.8 is the conversion factor for cubic inches per second to cubic feet per minute.)

$$\text{Compression Factor} = \frac{\text{Atmospheric Pressure + Gauge Presure}}{\text{Atmospheric Pressure}}$$

$$\text{SCFM} = \text{CFM} \times \frac{\text{Atmospheric Pressure + Gauge Pressure}}{14.7} \times \frac{528}{\text{Air Temperature (°F)} + 528}$$

Absolute Temperature (°R) = Gauge Temperature (°F) +528

Absolute Pressure (PSIA) = Gauge Pressure (PSIG) + Atmospheric Pressure

$$\text{Power} = \frac{\text{Work}}{\text{Time}}$$

Work = Force x Distance

Area of a Circle = .7854 x Diameter^2

Diameter of Circle = $1.128 \sqrt{\text{Area}}$

$$C_v = \frac{Q}{22.48} \sqrt{\frac{GT}{(P_1 - P_2)P_2}}$$

Where:

C_v = Dimensionless Number
Q = Flow (SCFM)
G = Ratio of molecular weight of gas of that of air. For air =1
T = Absolute Temperature (°R)
P_1 = Absolute inlet pressure (PSI)
P_2 = Absolute Secondary Pressure (PSI)
P_2 must be greater than $.53P_1$

Parker Pneumatic

Pneumatic Division North America
Richland, Michigan 49083

TEC-15
Pipe Air Flow

ISSUED: January, 1999
Supersedes: June, 1998

Pipe Air Flow

The following pages contain 6 sets of curves for schedule 40 pipe that can be used to help select the appropriate pipe size for pneumatic systems, or given a system, allow system performance to be estimated.

Generally accepted practice for sizing piping for pneumatic systems is to use a pressure drop of 10% of gage for nominal pipe sizes up to and including 1/2", and 5% of gage for nominal pipe sizes of 3/4" and larger. The following curves allow the use of these guidelines for selecting piping sizes and include other pressure drop percentages for evaluating existing systems. Generally, curves of this type are shown only for 100 feet pipe lengths, but theoretic calculations show the curves for 10 feet are also valid.

Below is a listing of the charts involved with their identification:

Pipe Size Range	**Pressure Drop** (Percentage of Inlet Gage Pressure)					
1/8" - 1/2"	5	10	15	5	10	15
3/4" - 3"	2.5	5	7.5	2.5	5	7.5
Pipe Length (Feet)	100	100	100	10	10	10
Chart	A	B	C	D	E	F

Generally accepted practice.

Perhaps the best way to explain the use of these curves is by example.

Example 1

Given a system with desired airflow of 700 SCFM and a supply pressure of 60 PSIG and a header length of 100 feet, what size pipe should be used? The generally accepted practice of 10% pressure drop for pipes up to 1/2" and 5% for 3/4" and larger should be used.

The above table indicates, Chart B should be used (Step 1). Along the bottom horizontal axis locate the 60 PSIG vertical line (Step 2). On the left vertical axis locate the 700 SCFM horizontal line (Step 3). Follow both of these lines to the point of intersection. This occurs between the sloping lines for the 2" and 2-1/2" pipes. The larger pipe size (2-1/2") should be selected (Step 4). Further evaluation of this chart shows that for the conditions given, the pipe will flow over 800 SCFM at 60 PSIG inlet and 3 PSI (5%) pressure drop. (The intersection of the 60 PSIG primary pressure line and the 2-1/2" pipe size line).

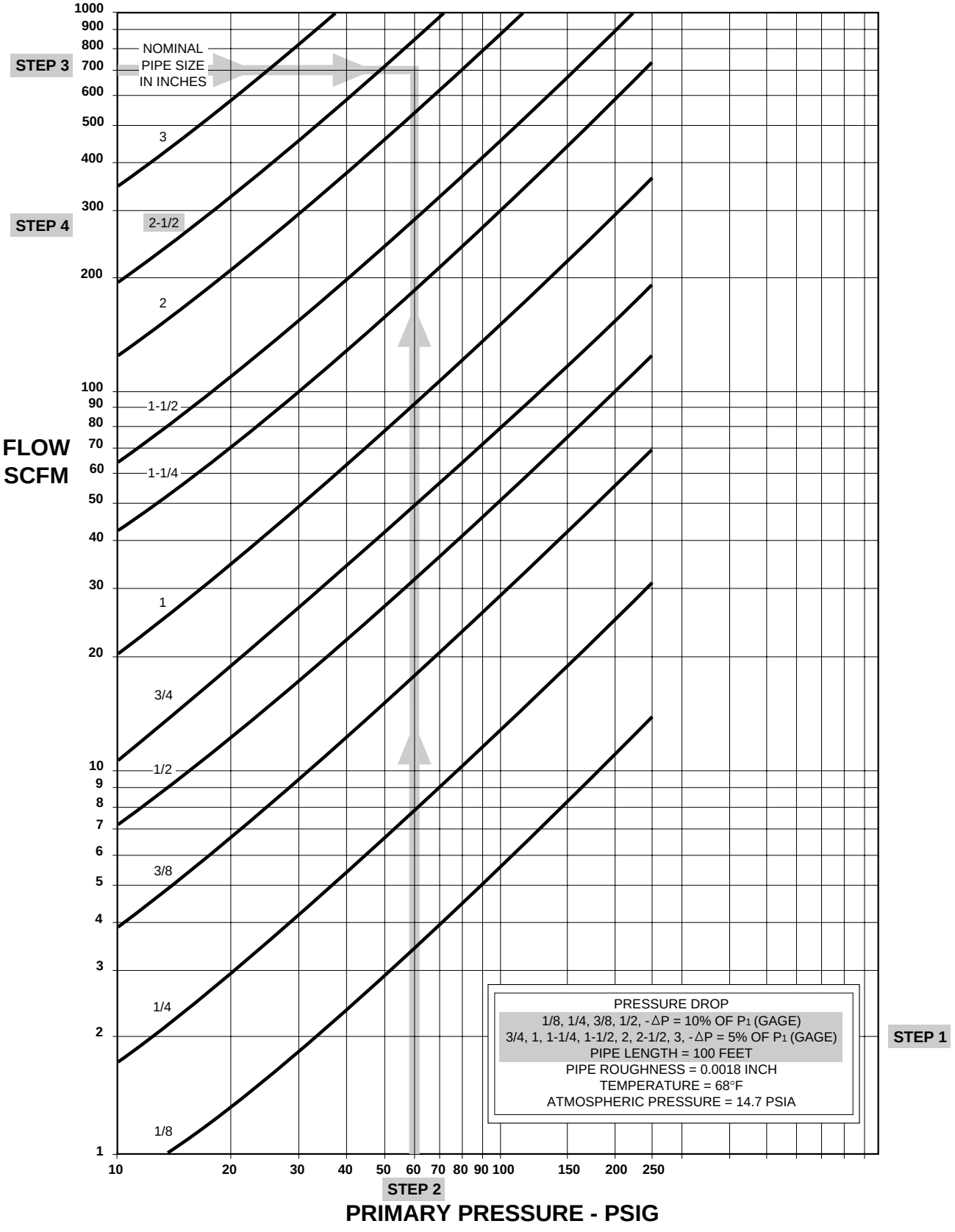
Further uses of the curves would be to compare the size pipe required at the other sets of pressure drops for 100 feet of pipe length. Using Chart A shows that if a more conservative pressure drop were used, the pipe size would increase to 3". Using Chart C shows that if a more aggressive pressure drop were allowed, perhaps a 2" pipe could be used.

Using the curves for 10 feet of pipe length, it can be seen because of the shorter length, much smaller pipe diameters could be used than if the length were at 100 feet.

These curves should only be used as general guidelines for selecting piping systems. Also, these curves are based on using schedule 40 steel pipe. Different types of plumbing with different internal roughness will have different results. If more detailed or precise information is required, the system should be designed by a competent professional.

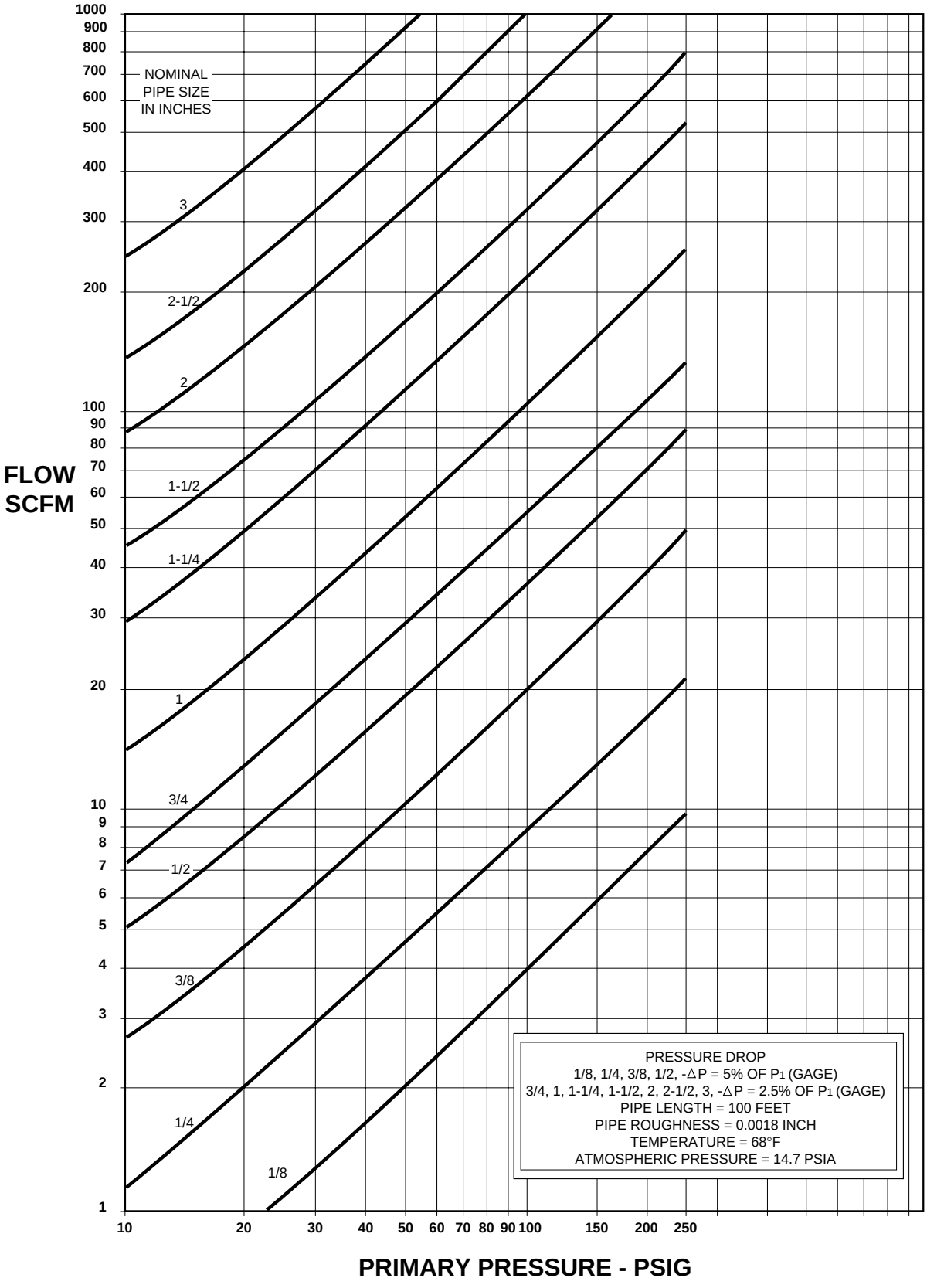
Flow of Air Through a Pipe

Chart B (Example)



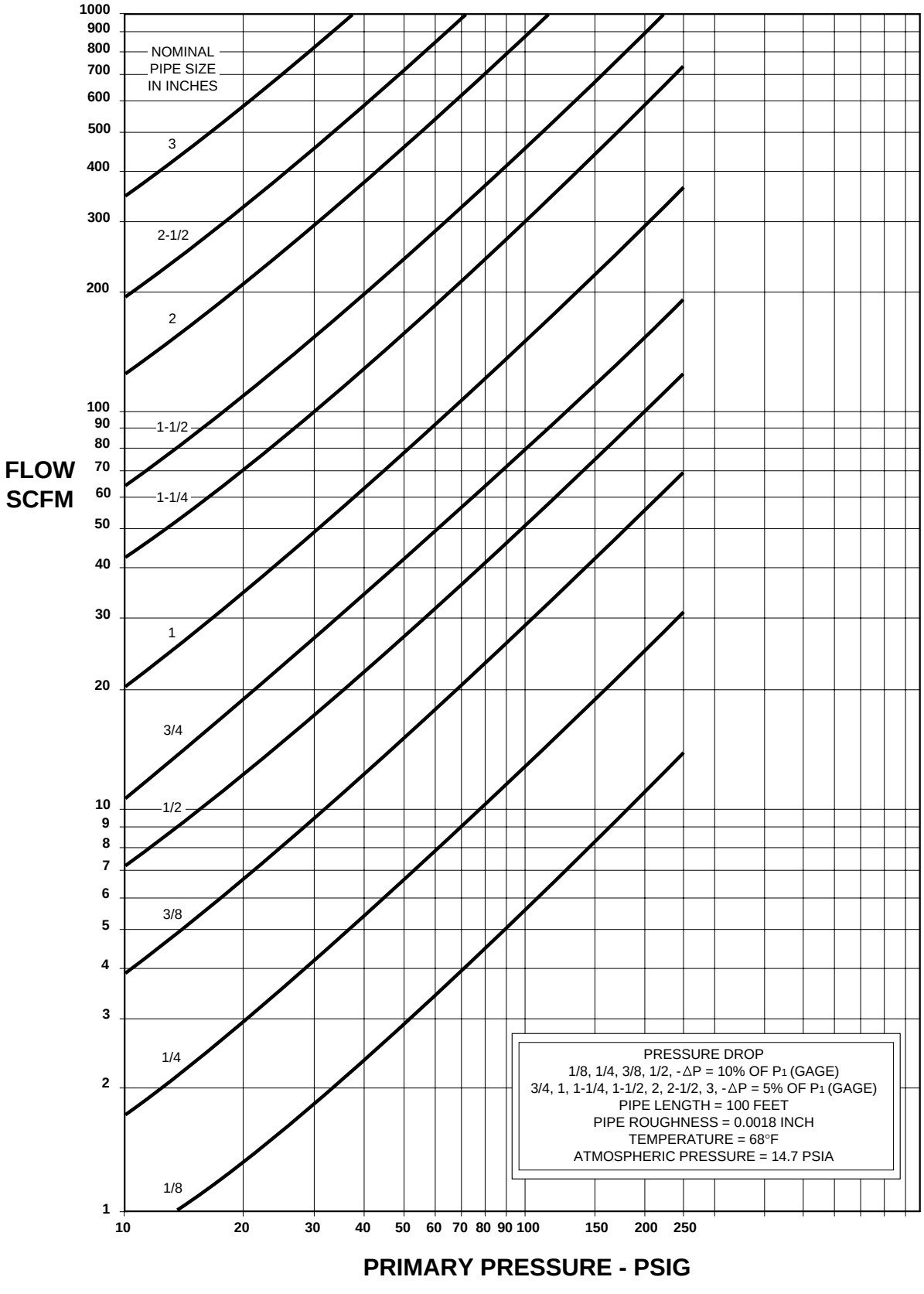
Flow of Air Through a Pipe

Chart A



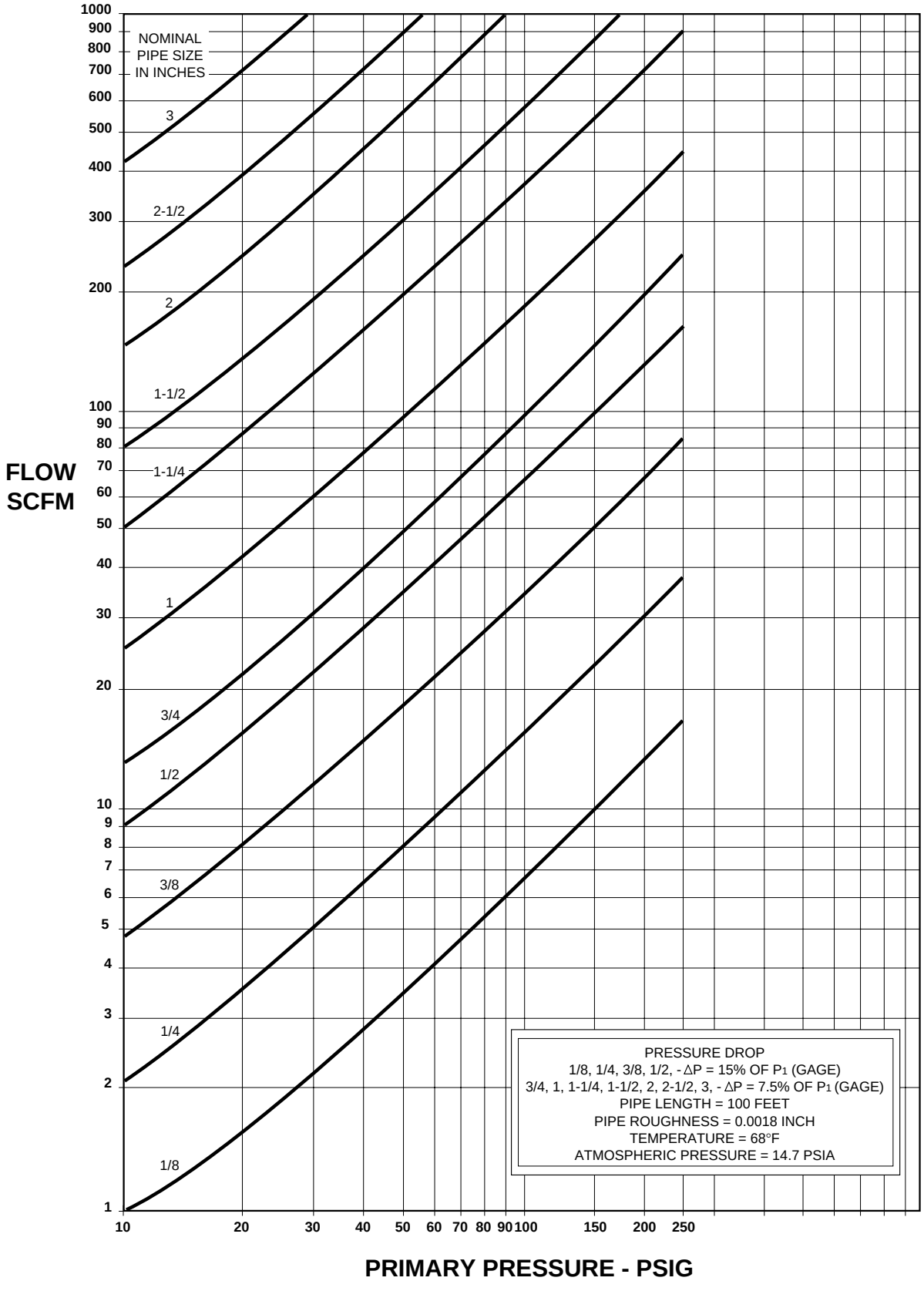
Flow of Air Through a Pipe

Chart B



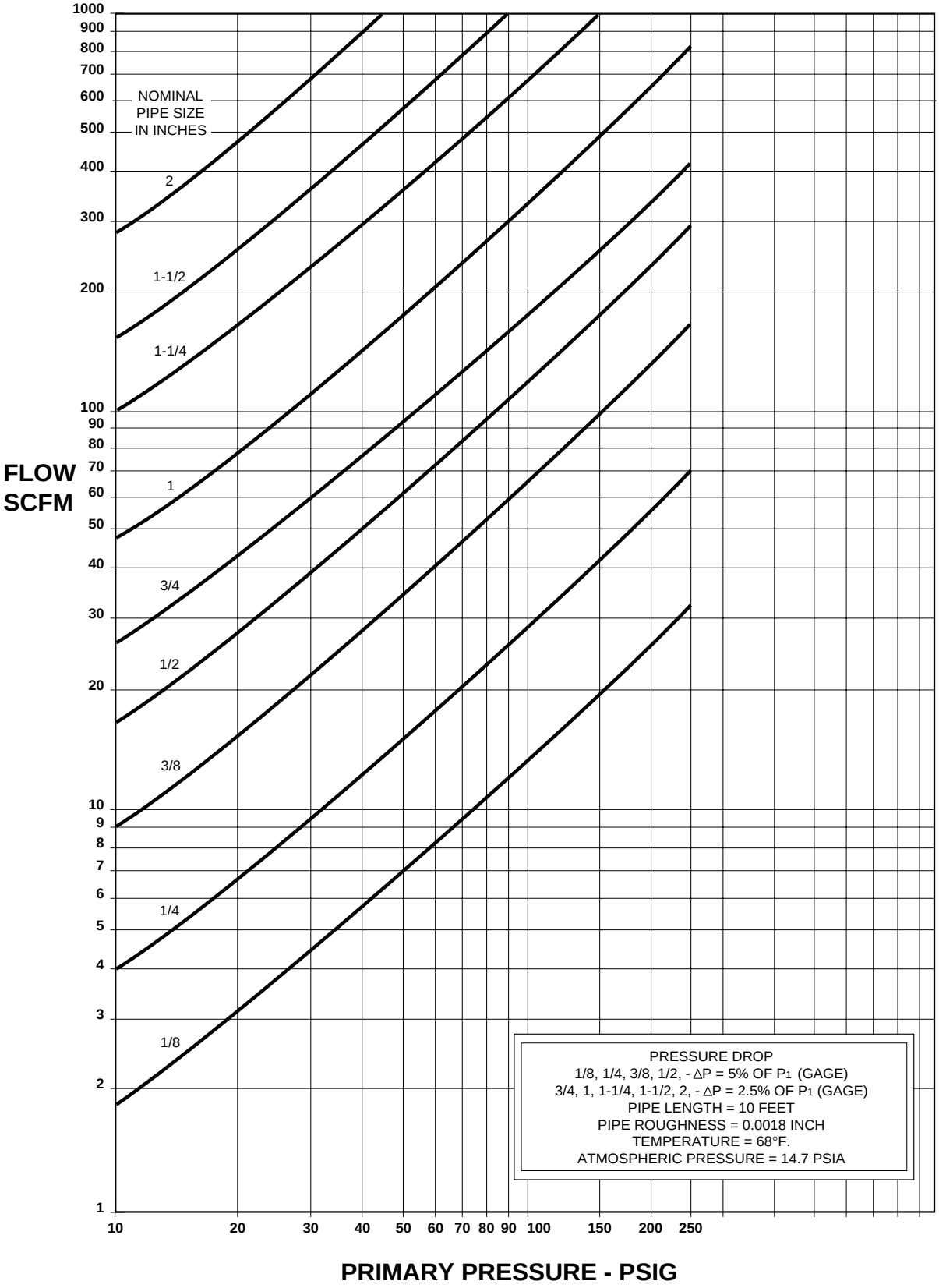
Flow of Air Through a Pipe

Chart C



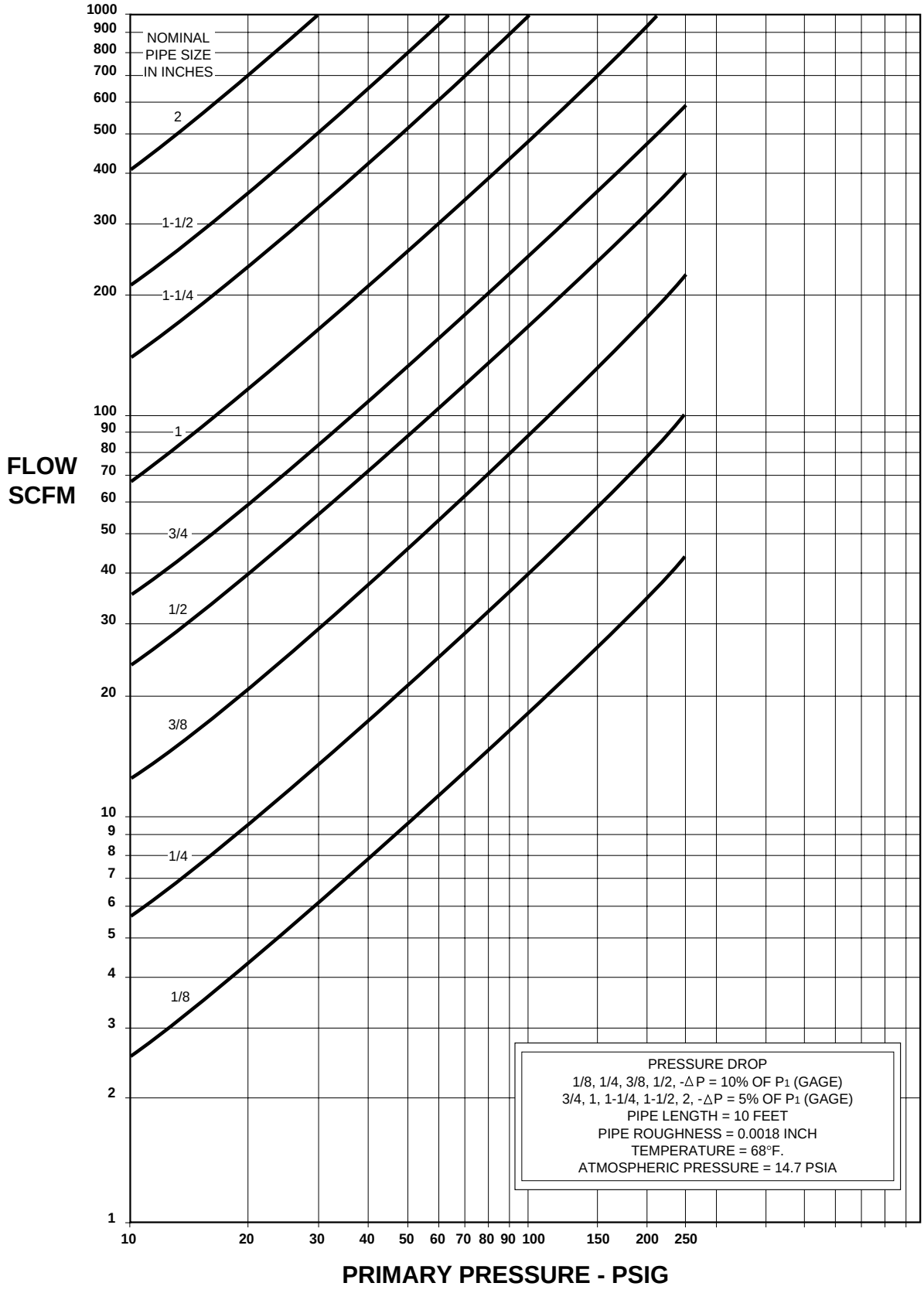
Flow of Air Through a Pipe

Chart D



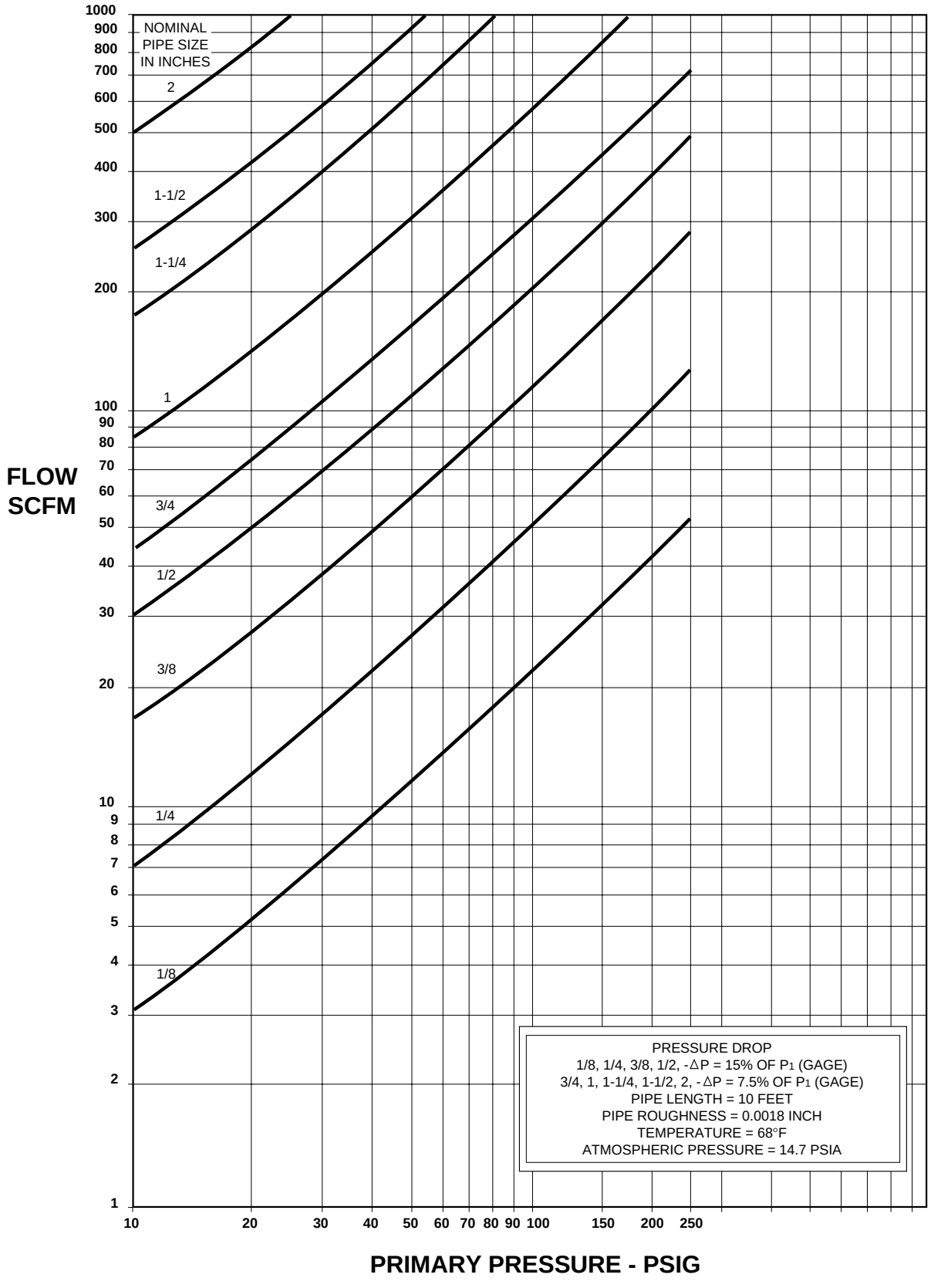
Flow of Air Through a Pipe

Chart E



Flow of Air Through a Pipe

Chart F



Pneumatic Division
Richland, Michigan 49083
269-629-5000

PDNSG-1
Pneumatic Division Safety Guide
ISSUED: August 1 , 2006
Supersedes: June 1, 2006

Safety Guide For Selecting And Using Pneumatic Division Products And Related Accessories

⚠ WARNING:

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF PNEUMATIC DIVISION PRODUCTS, ASSEMBLIES OR RELATED ITEMS ("PRODUCTS") CAN CAUSE DEATH, PERSONAL INJURY, AND PROPERTY DAMAGE. POSSIBLE CONSEQUENCES OF FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THESE PRODUCTS INCLUDE BUT ARE NOT LIMITED TO:

- Unintended or mistimed cycling or motion of machine members or failure to cycle
- Work pieces or component parts being thrown off at high speeds.
- Failure of a device to function properly for example, failure to clamp or unclamp an associated item or device.
- Explosion
- Suddenly moving or falling objects.
- Release of toxic or otherwise injurious liquids or gasses.

Before selecting or using any of these Products, it is important that you read and follow the instructions below.

1. GENERAL INSTRUCTIONS

1.1. Scope: This safety guide is designed to cover general guidelines on the installation, use, and maintenance of Pneumatic Division Valves, FRLs (Filters, Pressure Regulators, and Lubricators), Vacuum products and related accessory components.

1.2. Fail-Safe: Valves, FRLs, Vacuum products and their related components can and do fail without warning for many reasons. Design all systems and equipment in a fail-safe mode, so that failure of associated valves, FRLs or Vacuum products will not endanger persons or property.

1.3 Relevant International Standards: For a good guide to the application of a broad spectrum of pneumatic fluid power devices see: ISO 4414:1998, Pneumatic Fluid Power – General Rules Relating to Systems. See www.iso.org for ordering information.

1.4. Distribution: Provide a copy of this safety guide to each person that is responsible for selection, installation, or use of Valves, FRLs or Vacuum products. Do not select, or use Parker valves, FRLs or vacuum products without thoroughly reading and understanding this safety guide as well as the specific Parker publications for the products considered or selected.

1.5. User Responsibility: Due to the wide variety of operating conditions and applications for valves, FRLs, and vacuum products Parker and its distributors do not represent or warrant that any particular valve, FRL or vacuum product is suitable for any specific end use system. This safety guide does not analyze all technical parameters that must be considered in selecting a product. The user, through its own analysis and testing, is solely responsible for:

- Making the final selection of the appropriate valve, FRL, Vacuum component, or accessory.
- Assuring that all user's performance, endurance, maintenance, safety, and warning requirements are met and that the application presents no health or safety hazards.
- Complying with all existing warning labels and / or providing all appropriate health and safety warnings on the equipment on which the valves, FRLs or Vacuum products are used; and,
- Assuring compliance with all applicable government and industry standards.

1.6. Safety Devices: Safety devices should not be removed, or defeated.

1.7. Warning Labels: Warning labels should not be removed, painted over or otherwise obscured.

1.8. Additional Questions: Call the appropriate Parker technical service department if you have any questions or require any additional information. See the Parker publication for the product being considered or used, or call 1-800-CPARKER, or go to www.parker.com, for telephone numbers of the appropriate technical service department.

2. PRODUCT SELECTION INSTRUCTIONS

2.1. Flow Rate: The flow rate requirements of a system are frequently the primary consideration when designing any pneumatic system. System components need to be able to provide adequate flow and pressure for the desired application.

2.2. Pressure Rating: Never exceed the rated pressure of a product. Consult product labeling, Pneumatic Division catalogs or the instruction sheets supplied for maximum pressure ratings.

2.3. Temperature Rating: Never exceed the temperature rating of a product. Excessive heat can shorten the life expectancy of a product and result in complete product failure.

2.4. Environment: Many environmental conditions can affect the integrity and suitability of a product for a given application. Pneumatic Division products are designed for use in general purpose industrial applications. If these products are to be used in unusual circumstances such as direct sunlight and/or corrosive or caustic environments, such use can shorten the useful life and lead to premature failure of a product.

2.5. Lubrication and Compressor Carryover: Some modern synthetic oils can and will attack nitrile seals. If there is any possibility of synthetic oils or greases migrating into the pneumatic components check for compatibility with the seal materials used. Consult the factory or product literature for materials of construction.

2.6. Polycarbonate Bowls and Sight Glasses: To avoid potential polycarbonate bowl failures:

- Do not locate polycarbonate bowls or sight glasses in areas where they could be subject to direct sunlight, impact blow, or temperatures outside of the rated range.
- Do not expose or clean polycarbonate bowls with detergents, chlorinated hydro-carbons, keytones, esters or certain alcohols.
- Do not use polycarbonate bowls or sight glasses in air systems where compressors are lubricated with fire resistant fluids such as phosphate ester and di-ester lubricants.

2.7. Chemical Compatibility: For more information on plastic component chemical compatibility see Pneumatic Division technical bulletins Tec-3, Tec-4, and Tec-5

2.8. Product Rupture: Product rupture can cause death, serious personal injury, and property damage.
- Do not connect pressure regulators or other Pneumatic Division products to bottled gas cylinders.
- Do not exceed the maximum primary pressure rating of any pressure regulator or any system component.
- Consult product labeling or product literature for pressure rating limitations.

3. PRODUCT ASSEMBLY AND INSTALLATION INSTRUCTIONS

3.1. Component Inspection: Prior to assembly or installation a careful examination of the valves, FRLs or vacuum products must be performed. All components must be checked for correct style, size, and catalog number. DO NOT use any component that displays any signs of nonconformance.

3.2. Installation Instructions: Parker published Installation Instructions must be followed for installation of Parker valves, FRLs and vacuum components. These instructions are provided with every Parker valve or FRL sold, or by calling 1-800-CPARKER, or at www.parker.com.

3.3. Air Supply: The air supply or control medium supplied to Valves, FRLs and Vacuum components must be moisture-free if ambient temperature can drop below freezing

4. VALVE AND FRL MAINTENANCE AND REPLACEMENT INSTRUCTIONS

4.1. Maintenance: Even with proper selection and installation, valve, FRL and vacuum products service life may be significantly reduced without a continuing maintenance program. The severity of the application, risk potential from a component failure, and experience with any known failures in the application or in similar applications should determine the frequency of inspections and the servicing or replacement of Pneumatic Division products so that products are replaced before any failure occurs. A maintenance program must be established and followed by the user and, at minimum, must include instructions 4.2 through 4.10.

4.2. Installation and Service Instructions: Before attempting to service or replace any worn or damaged parts consult the appropriate Service Bulletin for the valve or FRL in question for the appropriate practices to service the unit in question. These Service and Installation Instructions are provided with every Parker valve and FRL sold, or are available by calling 1-800-CPARKER, or by accessing the Parker web site at www.parker.com.

4.3. Lockout / Tagout Procedures: Be sure to follow all required lockout and tagout procedures when servicing equipment. For more information see: OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – (Lockout / Tagout)

4.4. Visual Inspection: Any of the following conditions requires immediate system shut down and replacement of worn or damaged components:
- Air leakage: Look and listen to see if there are any signs of visual damage to any of the components in the system. Leakage is an indication of worn or damaged components.
- Damaged or degraded components: Look to see if there are any visible signs of wear or component degradation.
- Kinked, crushed, or damaged hoses. Kinked hoses can result in restricted air flow and lead to unpredictable system behavior.
- Any observed improper system or component function: Immediately shut down the system and correct malfunction.
- Excessive dirt build-up: Dirt and clutter can mask potentially hazardous situations.

Caution: Leak detection solutions should be rinsed off after use.

4.5. Routine Maintenance Issues:
- Remove excessive dirt, grime and clutter from work areas.
- Make sure all required guards and shields are in place.

4.6. Functional Test: Before initiating automatic operation, operate the system manually to make sure all required functions operate properly and safely.

4.7. Service or Replacement Intervals: It is the user's responsibility to establish appropriate service intervals. Valves, FRLs and vacuum products contain components that age, harden, wear, and otherwise deteriorate over time. Environmental conditions can significantly accelerate this process. Valves, FRLs and vacuum components need to be serviced or replaced on routine intervals. Service intervals need to be established based on:
- Previous performance experiences.
- Government and / or industrial standards.
- When failures could result in unacceptable down time, equipment damage or personal injury risk.

4.8. Servicing or Replacing of any Worn or Damaged Parts: To avoid unpredictable system behavior that can cause death, personal injury and property damage:
- Follow all government, state and local safety and servicing practices prior to service including but not limited to all OSHA Lockout Tagout procedures (OSHA Standard – 29 CFR, Part 1910.147, Appendix A, The Control of Hazardous Energy – Lockout / Tagout).
- Disconnect electrical supply (when necessary) before installation, servicing, or conversion.
- Disconnect air supply and depressurize all air lines connected to system and Pneumatic Division products before installation, service, or conversion.
- Installation, servicing, and / or conversion of these products must be performed by knowledgeable personnel who understand how pneumatic products are to be applied.
- After installation, servicing, or conversions air and electrical supplies (when necessary) should be connected and the product tested for proper function and leakage. If audible leakage is present, or if the product does not operate properly, do not put product or system into use.
- Warnings and specifications on the product should not be covered or painted over. If masking is not possible, contact your local representative for replacement labels.

4.9. Putting Serviced System Back into Operation: Follow the guidelines above and all relevant Installation and Maintenance Instructions supplied with the valve FRL or vacuum component to insure proper function of the system.