



Brakemaster® air dryers

The complete fleet guide to operation, trouble-shooting, and service procedures



The problem is moisture and contamination.



The solution is SKF Brakemaster air dryers.

With the ongoing evolution of commercial vehicles, the proliferation of new pneumatic powered accessories has increased demands on vehicles' compressed air systems. From kneeling buses to multi-axle ABS brakes, new applications have raised the requirements for clean, dry air, straining existing technologies and creating a need for more efficient and reliable air dryers.

The SKF Brakemaster family of air dryers is meeting those needs.

In addition to units designed for conventional over-the-road applications, the SKF Brakemaster line includes high performance air dryer units specifically designed to handle the extreme air system demands for such industries as transit and refuse.

From the light duty, maintenance saving Turbo-AC to the state-of-the-art 2000 series air dryers now featuring two styles of the Dual Turbo-2000 – the standard Dual Turbo-2000 and the High Capacity (H.C.) Dual Turbo-2000 – these heavy duty air dryers allow fleets to match air dryer performance to specific application requirements.

This manual provides a detailed technical overview of the SKF Brakemaster line including SKF's Filtration Plus option, which can be retrofitted to the Turbo and HD-2000 air dryers already in service for optimal filtration performance. And with the addition of the H.C. Dual Turbo-2000, the SKF Brakemaster line now can meet the requirements of high output compressors on 2010 and later model transit bus engines. See the table on the back cover to determine which air dryer is best suited to your application.



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Turbo-2000 high duty cycle

The Turbo-2000 is the recommended choice for severe service applications, where the compressor output reaches 30 CFM and duty cycles run as high as 40%! Its ratio of large purge volume to desiccant produces the ideal filtering system and contamination protection for heavy duty service today.

A four-way filtration system, consisting of three filter screens, a unique filtering bag, plus four pounds of high quality molecular sieve desiccant, strips away moisture and traps compressor blow-by. The spin-off cartridge can be serviced in minutes. The compact purge tank can be installed anywhere and provides a full 460 cu. in. of clean purge air.

Improve the overall performance of your air system by upgrading to the Filtration Plus option. Not only does this option reduce overall operating costs of the air dryer by extending the cartridge service life, but it also optimizes the air systems efficiency by reducing compressor burden caused by downstream contaminants.*

For all-weather operation the Turbo-2000 is equipped with a sealed 12 Volt (or optional 24 Volt) 75 watt thermostatically controlled heater.

- The choice for severe stop-and-go operations
- Large purge volume for extended compressor cycles
- Turbo boost protected for all engine applications (Fully compatible with Cummins/Holset)



* Use HD-2000 for naturally aspirated and discharge line unload (DLU) applications.

Turbo-2000 air dryer specifications

- **Unit dimensions:** (see Fig. 1)
- **Weight:** 19.5 Lbs.
- **Connection ports:** (see Fig. 2)
- **Air flow capacity:** 30 SCFM
- **Drying medium:** 4 Lbs. desiccant (spin-on cartridge)
- **Drying medium regeneration:** External purge tank (12" X 7" Dia. Wgt. = 10 Lbs., Volume = 460 Cu. In.)
- **Turbo protection valve:** Internal
- **Safety valve:** 175 psig
- **Heater options:** 12V 75 Watt (6.6 Amps)
24V 75 Watt (3.2 Amps)

* Optional 2-stage filtration system

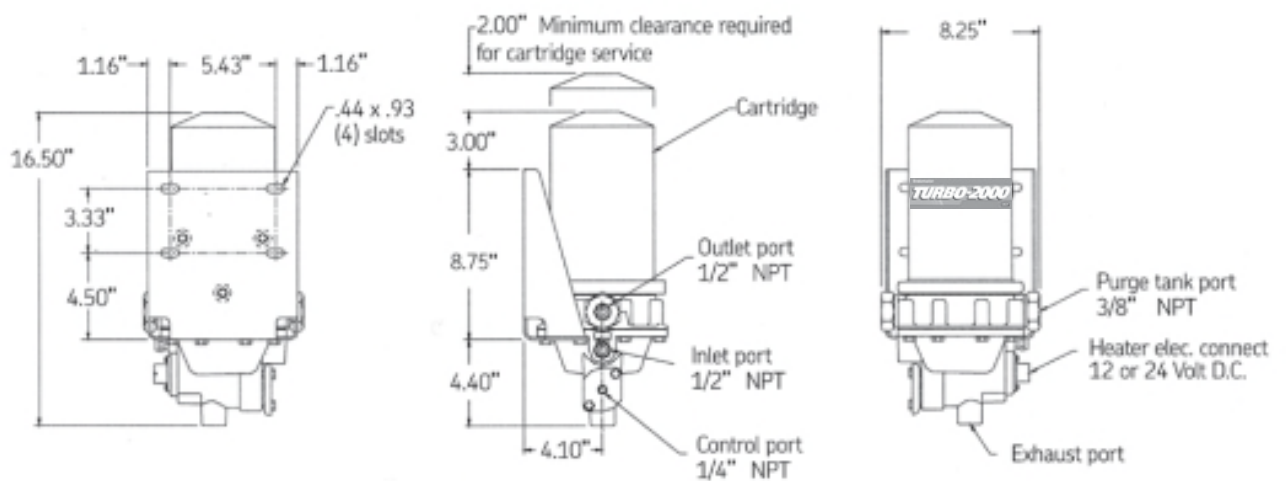


Fig. 1 Unit dimensions

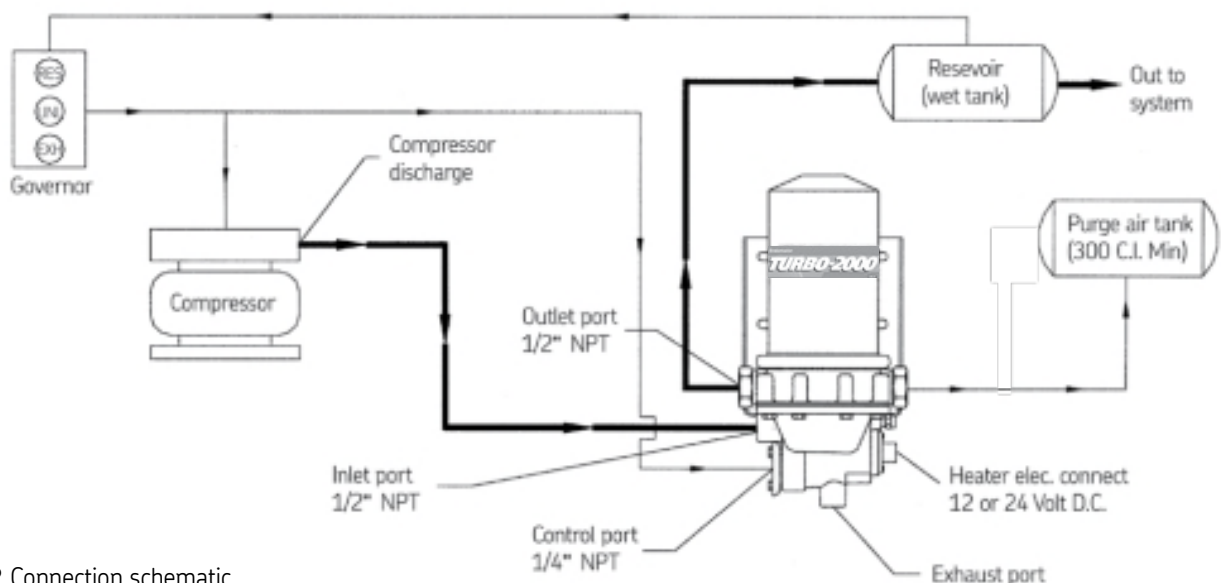


Fig. 2 Connection schematic

Note: Mount purge tank higher than purge tank port on air dryer.
Use the purge tank port that is in the lowest position so that moisture can run down into the air dryer for expulsion.
If it is not possible install a petcock for periodic manual draining.



HD-2000 continuous flow

The SKF Brakemaster HD-2000 is designed to provide optimum protection for naturally aspirated compressors and systems employing continuous pumping compressors (Discharge Line Unload).

A four-way filtration system, consisting of three filter screens, a unique filtering bag, plus four pounds of high quality molecular sieve desiccant, strips away moisture and traps contamination. The spin-off cartridge can be serviced in minutes. The compact purge tank can be installed anywhere and provides a full 460 cu. in. of clean purge air.

Improve the overall performance of your air system by upgrading to the Filtration Plus option. Not only does this reduce the operating costs of the air dryer by extending the cartridge service life, but also optimizes the air system efficiency by reducing compressor burden caused by downstream contaminants.

For all-weather operation the HD-2000 is equipped with a sealed 12 Volt (or optional 24 Volt) 75 watt thermostatically controlled heater.

- Top performance for continuous flow air systems
- Large purge volume and desiccant bed keep the air system clean & dry
- Unique internal pump-through design means cooler running compressors



HD-2000 air dryer specifications

- **Unit dimensions:** (see Fig. 1)
- **Weight:** 19.5 Lbs.
- **Connection ports:** (see Fig. 2)
- **Air flow capacity:** 30 SCFM
- **Drying medium:** 4 Lbs. desiccant (Spin-on cartridge)
- **Drying medium regeneration:** External purge tank (12" X 7" Dia Wgt. = 10 Lbs., Volume = 460 Cu. In.)
- **Safety valve:** 175 psig
- **Heater options:** 12V 75 Watt (6.6 Amps)
24V 75 Watt (3.2 Amps)

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* Optional 2-stage filtration system

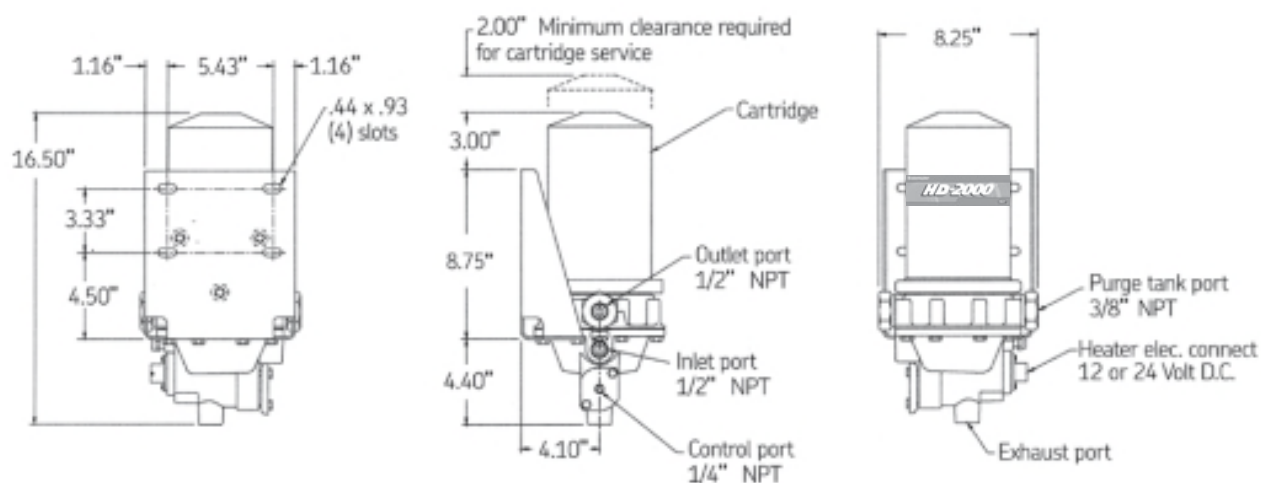


Fig. 1 Unit dimensions

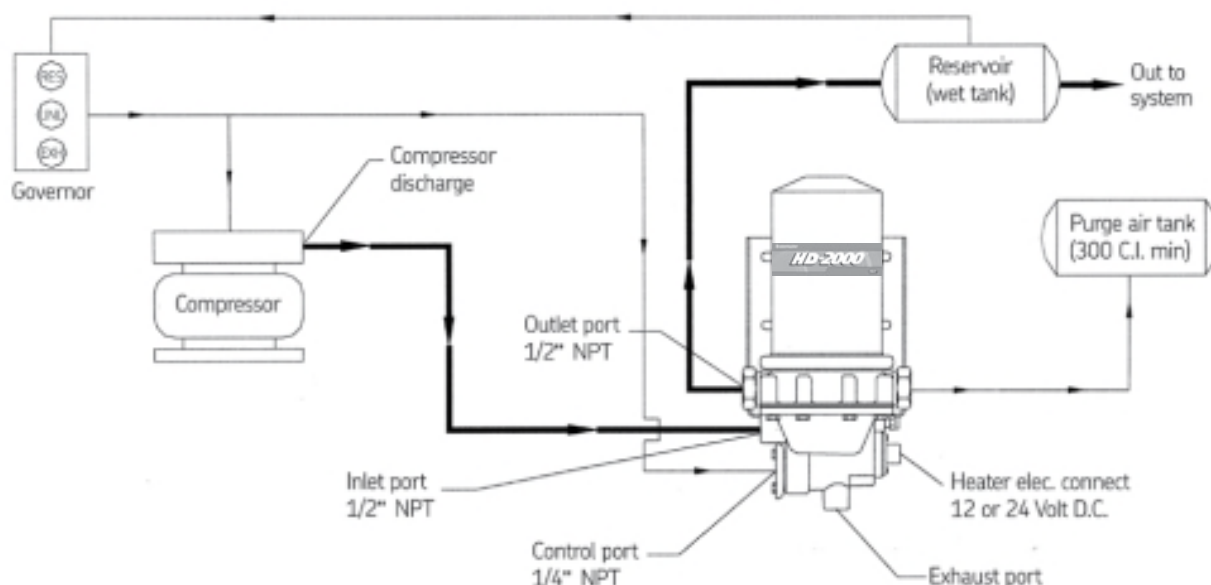


Fig. 2 Connection schematic

Note: Mount purge tank higher than purge tank port on air dryer.
Use the purge tank port that is in the lowest position so that moisture can run down into the air dryer for expulsion.
If it is not possible install a petcock for periodic manual draining.

Dual Turbo-2000 extreme use dryers

- Proven effective by the country's largest and most severe-use municipal fleets.
- Keeps air system clean, keeps air capacity high—even in the most severe use situations requiring 100% compressor duty cycles.
- Integrated filtration system removes compressor blow-by before entering desiccant cartridge - protects downstream components.
- Easy to install and service; reduces fleet downtime.
- Designed to be effective in service use applications such as transit refuse, logging, etc.

Dual Turbo-2000 extreme duty cycle

SKF now has two styles of the Dual Turbo-2000 – the standard Dual Turbo-2000 and the High Capacity (H.C.) Dual-Turbo-2000. Both the Dual Turbo-2000 and the H.C Dual Turbo-2000 can meet the increased demands of tomorrow's vehicles.

The standard Dual Turbo-2000 has been a successful solutions provider for all types of applications, such as articulated buses, kneeling buses, as well as off road applications that use all types of air-actuated valves. The Dual Turbo-2000 offers a compressor air flow output of up to 40 CFM and up to 100 percent compressor duty cycle. The unit requires no purge tank and has an internal timer to control cycles.

With the addition of the H.C. Dual Turbo-2000, the SKF Brakemaster line of dual air dryers now can meet the requirements of the high output compressors required on 2010 and later model transit bus engines. The new H.C. Dual Turbo-2000 is ideal for large compressor output applications and is available in 12V 75W (6.6 amps) and 24V 75W (3.2 amps) options. Additionally, it can withstand compressor air flow out put of up to 80 CFM and up to 40 percent compressor duty cycle. The H.C. Dual Turbo-2000 includes the same internal filtration package as the standard Dual Turbo-2000 air dryer with 99.9 percent efficiency.



H.C. Dual Turbo-2000

Dual Turbo-2000 specifications

Each version of the Dual Turbo-2000 is designed to meet the specific and difficult air quality demands found in high volume applications. Large inlet and outlet ports minimize pressure drop, easing the burden on the compressor and extending its service life.

To learn more about which Dual Turbo-2000 unit is more appropriate for your application, please reference the chart below:

1

Operating parameters	H.C. Dual Turbo-2000	Dual Turbo-2000
Maximum compressor duty cycle	40%	100%
Maximum compressor size	80 CFM	40 CFM
Purge tank requirement	600 cu. in. required ▲	None
	2 #221 purge tank can be used	
D2 Governor controlled	Yes	No – internal timer
Turbo-boost compatible	Yes	Yes
Inlet/Outlet ports	3/4" npt	3/4" npt
Filtration package	6 internal filters per side	6 internal filters per side
24 V 75 Watt	#620984	#620920
	#620986*	
12 V 75 Watt	#620982	#620910
	#620980*	

* Includes two #221 purge tanks @460 Cu. In. volume each.

▲ Separate purge tank @690 Cu. In. available 619228 (7"x18" diameter)



Dual Turbo-2000

Dual Turbo-2000 specifications

- **Unit dimensions:** (see Fig. 1)
- **Weight:** 47 Lbs.
- **Connection ports:** (see Fig. 2)
- **Air flow capacity:** 40 CFM
- **Drying medium:** 8 Lbs. desiccant (Spin-on cartridges, 2 @ 4 lb.)
- **Drying medium regeneration:** System purge (controlled alternating cycle)
- **Safety valve:** 200 psig
- **Heater options:** 12V 75 Watt (6.6 Amps)
24V 75 Watt (3.2 Amps)
- **Filtration:** 6 internal filters per side
- **Duty cycle:** Up to 100%

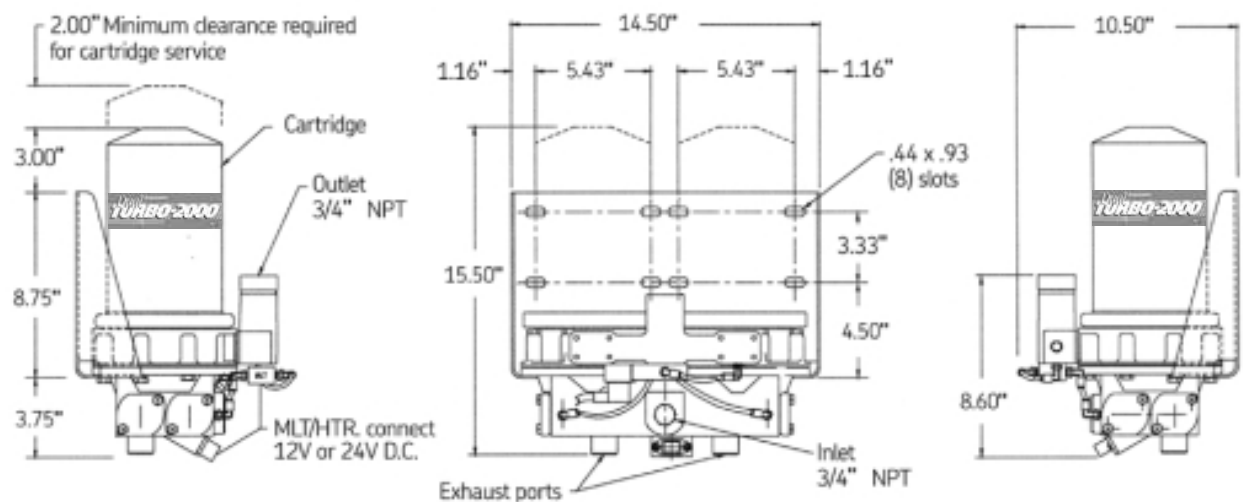


Fig. 1 Unit dimensions

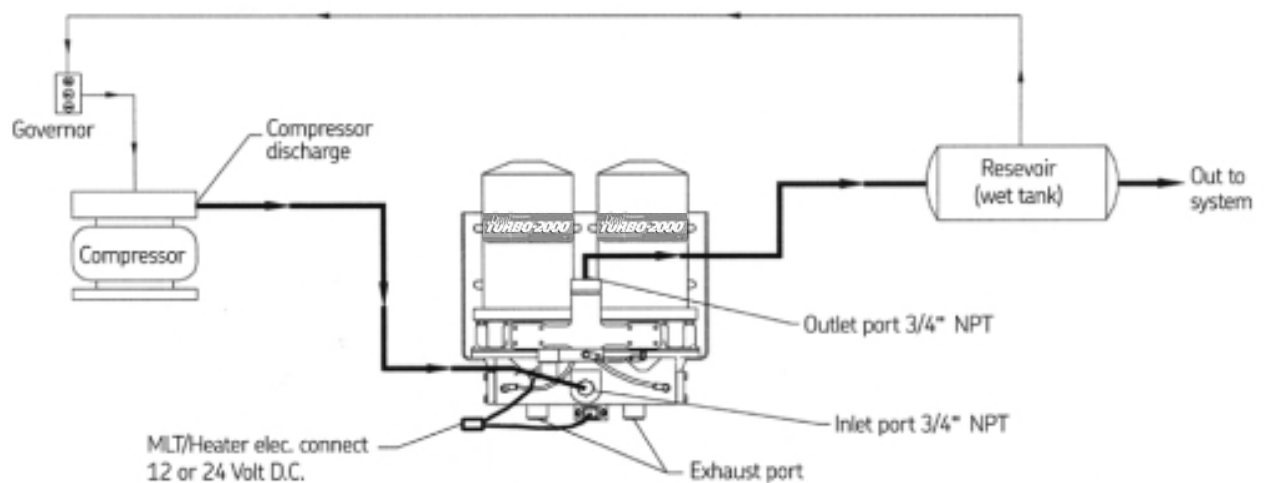


Fig. 2 Connection schematic

H.C. Dual Turbo-2000 specifications

• Unit dimensions:	(see Fig. 1)	• Drying medium regeneration:	Dedicated external purge tank, minimum volume = 600 Cu. In.*
• Weight:	47 Lbs.	• Filtration:	6 internal filters
• Connection ports:	(see Fig. 2)	• Turbo protection valve:	Internal
• Air inlet temperature:	160° F (Max)	• Safety valve:	200 psig
• Air flow capacity:	80 CFM	• Heater options:	12V 75 watt (6.6 amps), 24V 75 watt (3.2 amps)
• Duty cycle capacity:	up to 40%		
• Drying medium:	8 Lbs. dessicant (spin-on cartridges, 2 @ 4Lbs.)		

* Use #619228 with 690 Cu. In. or 2 #221 with 460 Cu. In. volume/each.

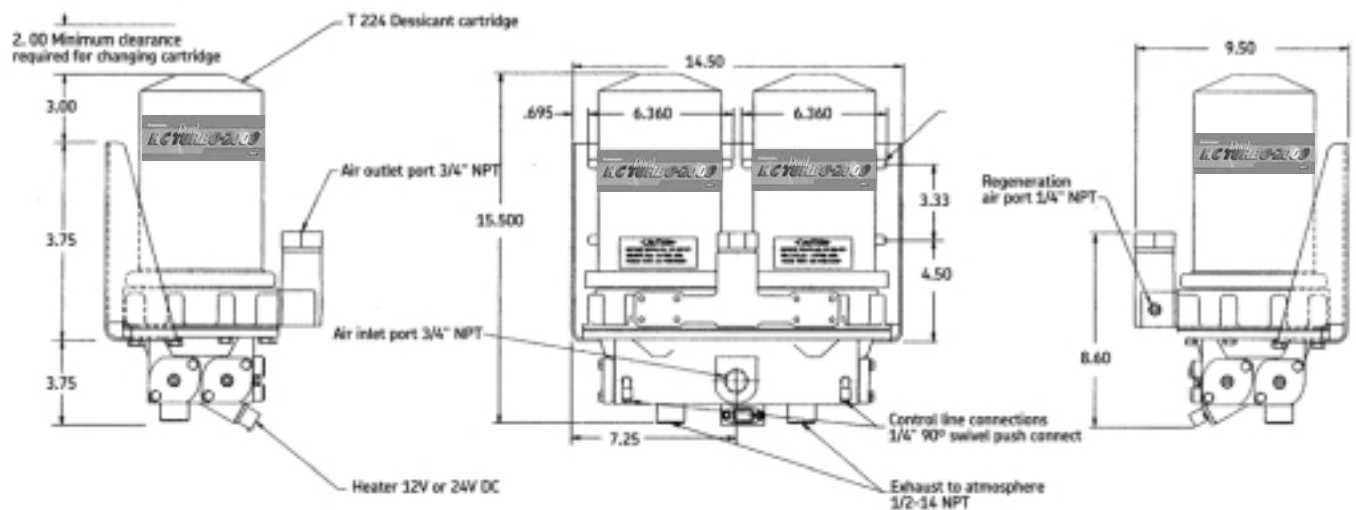


Fig. 1 Unit dimensions

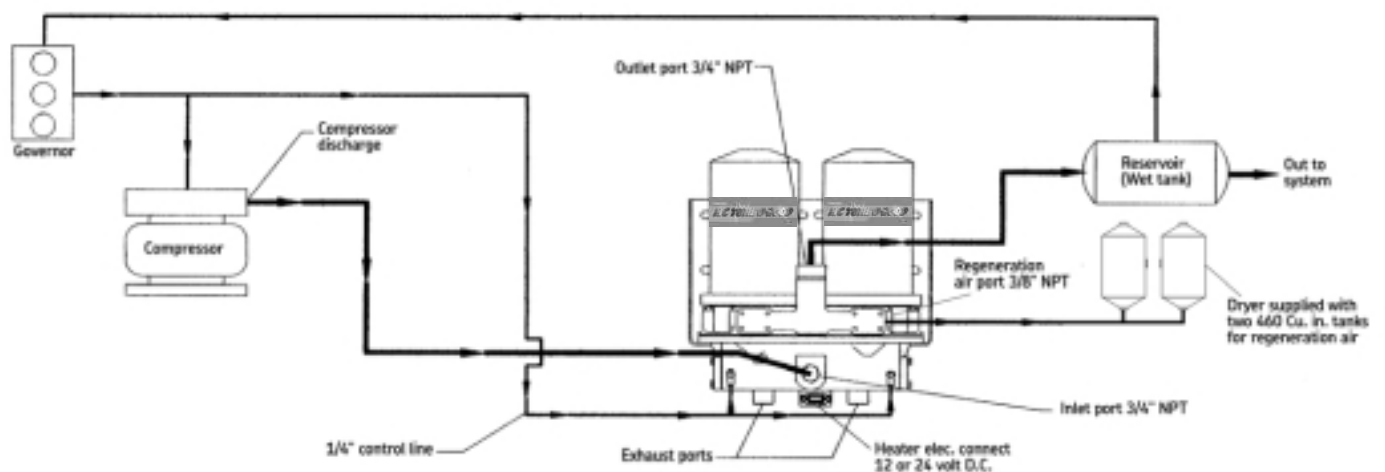


Fig. 2 Connection schematic

Note: Mount purge tank(s) higher than purge tank port on air dryer.
Use the purge tank port that is in the lowest position so that moisture can run down into the air dryer for expulsion.
If it is not possible install a petcock for periodic manual draining.

Turbo-3000 over the road

The unique Turbo-3000 uses a highly efficient new formula to match compressed air to a compact desiccant package. This precise match of desiccant and purge volume reduces both size and weight, while effectively cleaning and drying the air system.

Ease of installation is an added benefit of this compact design. It makes retro-fitting a one-step operation. Ports are easily accessible and clearly marked.

The spin-on cartridge holds both desiccant and purge air and can be serviced in minutes.

For all-weather operation, the Turbo-3000 is equipped with a sealed 12 Volt (or optional 24 Volt) 75 watt thermostatically controlled heater.

- A compact streamlined design for top performance on highway
- Self-contained purge air doesn't steal from brake system
- Turbo boost protected for all engine applications (Fully compatible with Cummins/Holset)



Turbo-3000 air dryer specifications

- | | | | |
|-----------------------------|---|--------------------------------------|------------------------|
| • Unit dimensions: | (see Fig. 1) | • Drying medium regeneration: | Integral purge volume |
| • Weight: | 17.5 Lbs. | • Safety valve: | 175 psig |
| • Connection ports: | (see Fig. 2) | • Heater options: | 12V 75 Watt (6.6 Amps) |
| • Air flow capacity: | 15 SCFM | | 24V 75 Watt (3.2 Amps) |
| • Drying medium: | 2 Lbs. desiccant
(Spin-on cartridge) | | |

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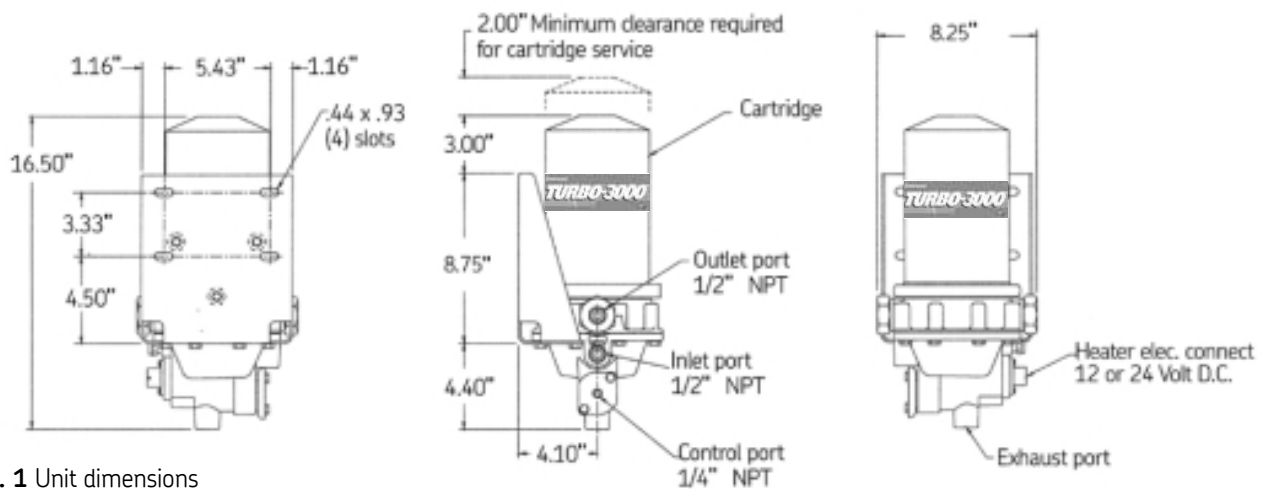


Fig. 1 Unit dimensions

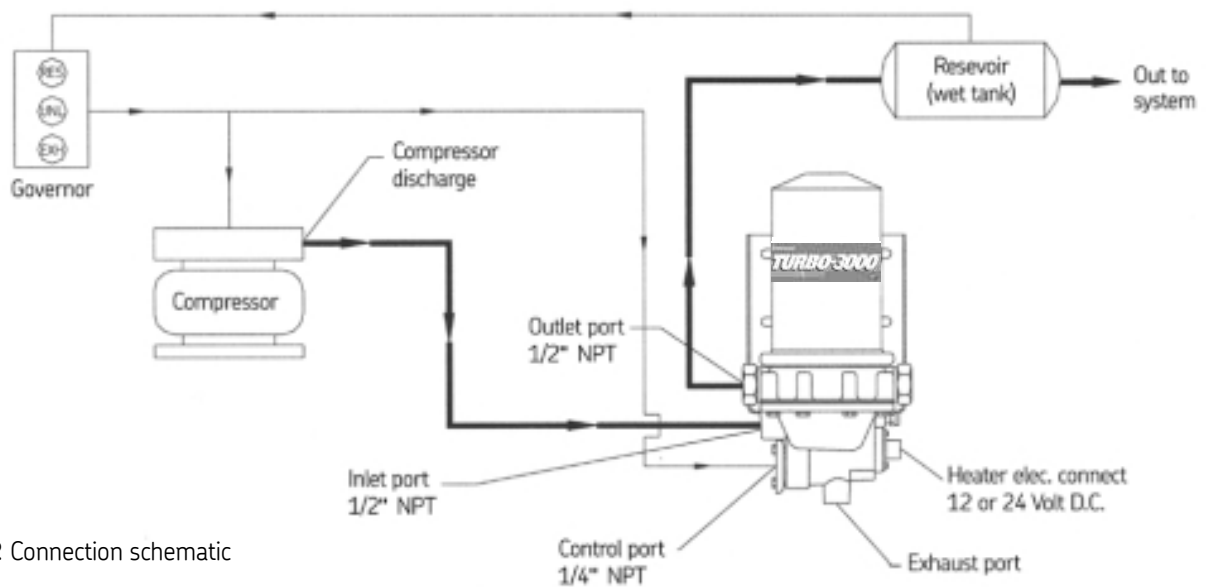


Fig. 2 Connection schematic

Turbo-AC low maintenance

This time tested design pays for itself by protecting the brake system from moisture and contamination, while reducing maintenance practically to zero. With this air dryer, you can often install it and forget it.

A popular choice where there's adequate air flow over the surface of the unit to allow it to cool properly. The Turbo-AC is designed for compressor output of up to 15 CFM and duty cycles of up to 20%.

An internal filter traps compressor blow-by and contaminants, while the large cooling chamber extracts moisture from the air.

For all-weather operation the Turbo-AC is equipped with a sealed 12 Volt (or optional 24 Volt) 75 watt thermostatically controlled heater.

- Ideal for light to medium air compressor duty cycles
- Virtually maintenance-free aftercooler technology
- Turbo boost protected for all engine applications (Fully compatible with Cummins/Holset)



Turbo-AC air dryer specifications

- **Unit dimensions:** (see Fig. 1)
- **Weight:** 19.5 Lbs.
- **Connection ports:** (see Fig. 2)
- **Air flow capacity:** 15 SCFM
- **Drying medium:** Heat exchange
- **Safety valve:** 175 psig
- **Heater options:** 12V 75 Watt (6.6 Amps)
24V 75 Watt (3.2 Amps)

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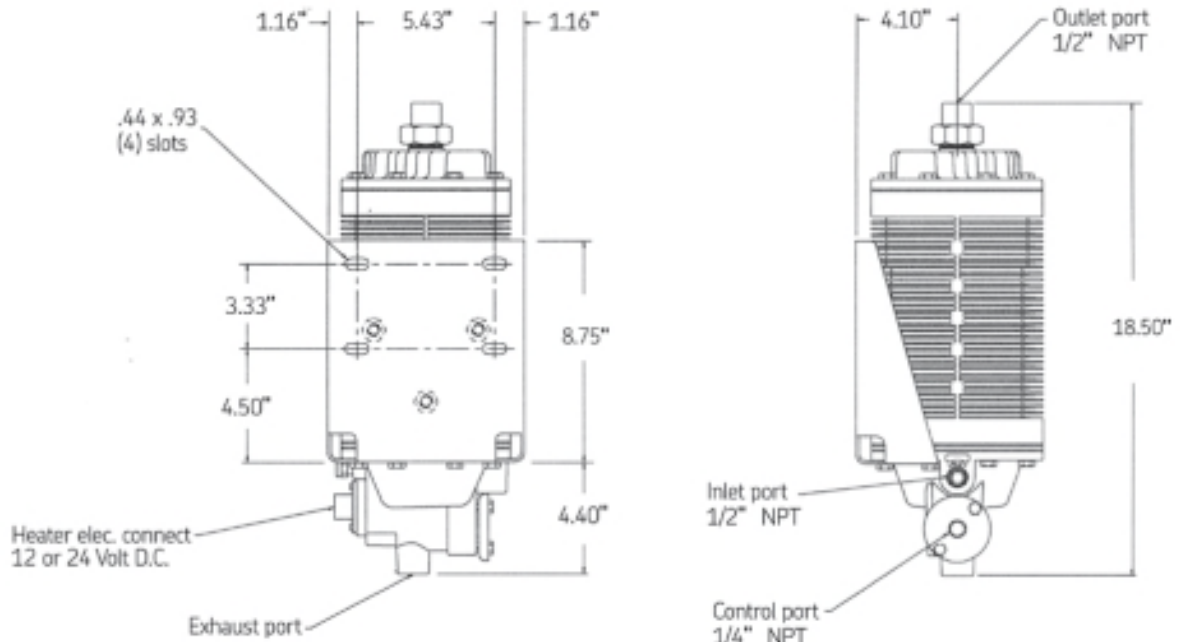


Fig. 1 Unit dimensions

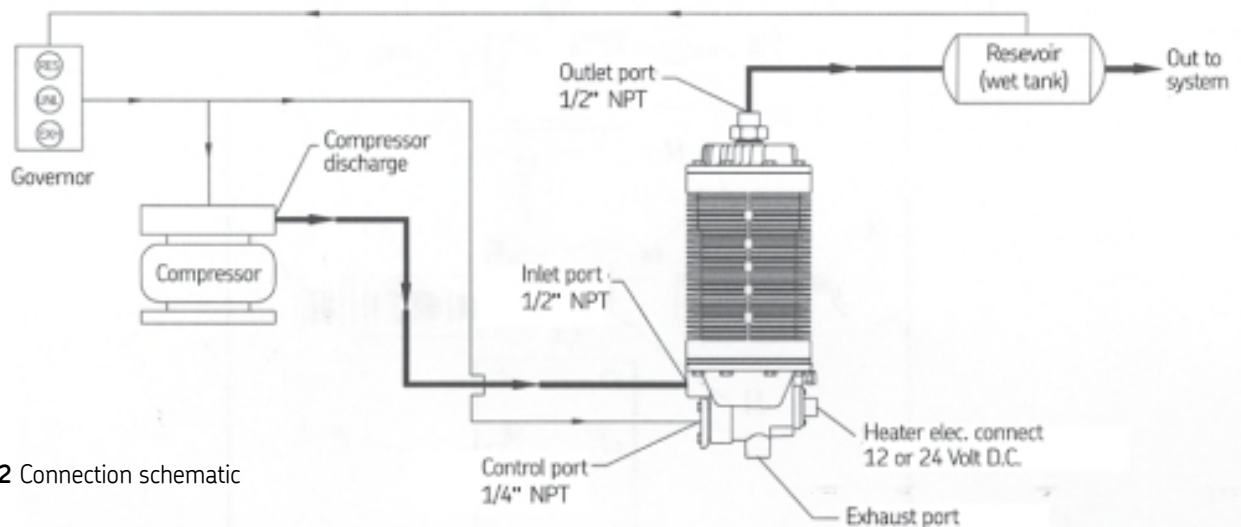


Fig. 2 Connection schematic

Turbo-2000 Filtration Plus option

New from SKF, the leader in high performance air dryers with the Filtration Plus Option

The best just got better! Introducing SKF's new Filtration Plus Option for Turbo-2000 and HD-2000. As more components draw on the vehicle's compressed air system, air quality has become critical. A contaminated air system dramatically adds unwanted operating costs that the new Filtration Plus Option can avoid.

SKF's Turbo-2000 series of air dryers, including the HD-2000 and Dual Turbo-2000, have led the field in it's filtration system. The new H.C. Dual Turbo-2000 also comes standard with the Filtration Plus Option. Now, we have stepped it up a notch with the Filtration Plus cartridge, #T224-P.

The Filtration Plus Option provides the same benefits as the current SKF series of air dryers but adds an additional 2-stage high efficiency filter that removes even the finest oil residue.

The Filtration Plus Option specifically addresses high air volume applications, such as transit, refuse or cement mixers.

Compressors with excessive oil blow-by will also gain great benefit with the Filtration Plus Option. The benefits of the air dryers equipped with the Plus Option are plentiful:

- Protection of down stream valving that gums up with oil contamination.
- Improved air capacity. Compressor charge times increase as oil and water filled wet tanks reduce air capacity.
- Improved compressor service life. Coked up discharge lines cause the compressor to work harder shortening its service life.
- Extends air dryer cartridge service life. The 2-stage filtration system added to the already extensive cartridge filters extends the service intervals.
- The 2-stage Filtration Plus Option is self-cleaning with every purge cycle keeping the performance optimized.
- Easily retrofits and upgrades the filtration system of any existing SKF Turbo series desiccant air dryer with a cartridge Plus kit T224-P.



Safety precautions

1. Before performing any test and/or isolating the air dryer, the vehicle's wheels must be chocked making sure the vehicle will not roll before releasing the brakes.
2. Never work under a unit supported only by a jack. Always support the vehicle with stands.
3. Stop engine when working under a vehicle.
4. Never remove a component or a pipe plug unless you are certain all system air pressure has been exhausted.
5. Never connect or disconnect a hose or line containing air pressure.
6. Never exceed recommended working air pressure.
7. Never attempt to disassemble an air dryer until you have read and understood all recommended procedures.
8. Use only proper tools and observe all precautions pertaining to the use of those tools.

1

Basic mounting guidelines

1. The air dryer must be mounted with the exhaust ports positioned downward.
2. Mount air dryer lower than the air compressor. The compressor discharge line should slope continuously downward from the compressor to the air dryer without any dips which cause water traps.
3. The compressor discharge line size, material, and length must be such that the dryer air inlet temperature is typically no more than 160 degrees F or no less than 45 degrees F above low ambient, (Ref. SAE J2383). An example of a typical discharge line: Total line length 10 ft. to 12 ft. which is a combination of rigid copper (approx. 4 ft. length) and balance of line length being stainless-steel braid sheathed PTFE. Avoid using 90 degree elbow fittings.
4. The air dryer should be mounted in a location with sufficient space around it to facilitate service and to provide visual access for periodic inspection. Allow at least 2.00 inch clearance above air dryer for desiccant cartridge service.
5. The air dryer should be mounted out of direct tire or wheel road splash or protected from splash.
6. The air dryer, with its mounting bracket, lines, and fittings should be mounted in a protected location such that minor mechanical damage to the vehicle will not damage the air system integrity. Use mounting bolts that are Grade 5 or higher.

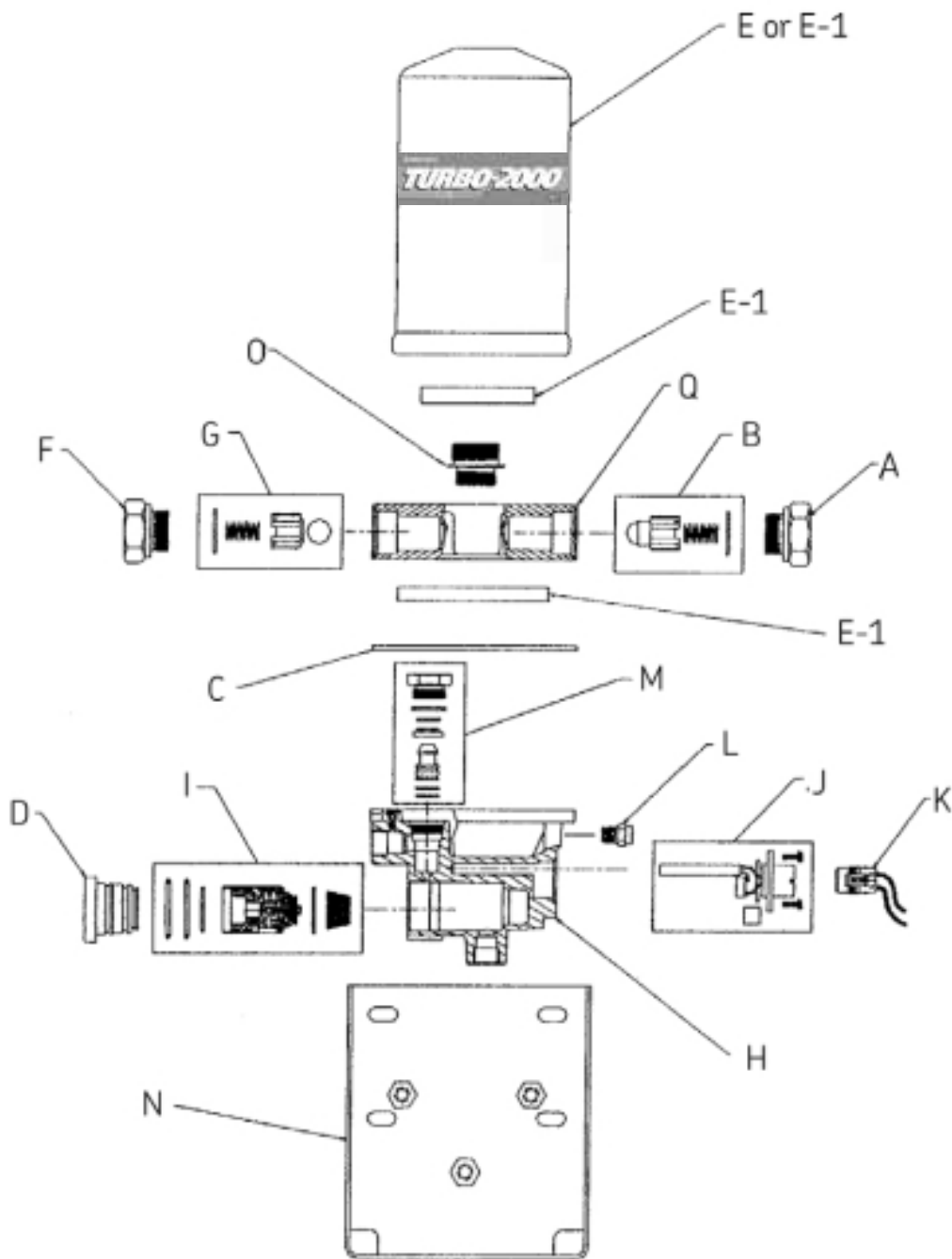
Turbo-2000 parts list

Component identification		
A	610237	Regeneration valve nut
B	223	Regeneration valve kit
C	610077	Body gasket
D	610069	Seal retainer
E	T224	Desiccant cartridge
E-1	T224-P	Desiccant cartridge filtration plus
F	610236	Check valve nut
G	238	Check valve kit
H	619086	Bottom cap assy 12V STD
	619112	Bottom cap assy 12V E-Type
H	619087	Bottom cap assy 24V STD
	619113	Bottom cap assy 24V E-Type
I	235	Purge valve kit
J	248 12V 75W	Heater kit early model
	249 24V 75W	(Orange and blue wires)
J	619110 12V 75W	Heater kit late model
	619111 24V 75W	Plug style connection
K	619900	Wire harness
L	610024	Safety valve 175 psi
M	228	Turbo valve kit
N	619115	Mounting bracket
O	619140	Cartridge stud
Q	619091	Mid-section w/valves STD
Q	619093	Mid-section w/valves E-Type
619340	619340	Service kit contains T224, 228, 235, 238
619360	619360	Service kit contains T224-P, 228, 235, 238
Bold part numbers represent suggested stock service components		

Dryer part number description ▲			
STD	STD-w/filtration plus option	E-Type*	Description
620600	620300	620500	Dryer/tank 12V
620604	620304	620504	Dryer/tank 24V
620602	620302	620502	Air dryer 12V
620606	620306	620506	Air dryer 24V
		620526	Air dryer 12V retrofit w/modified mounting bracket to match T2000 hole pattern
221	221	221	Purge tank
*Holset SS E-Type or QE compressor compatible			

▲For right-hand models see parts list on pages 139 & 140.

Turbo-2000 service schematic

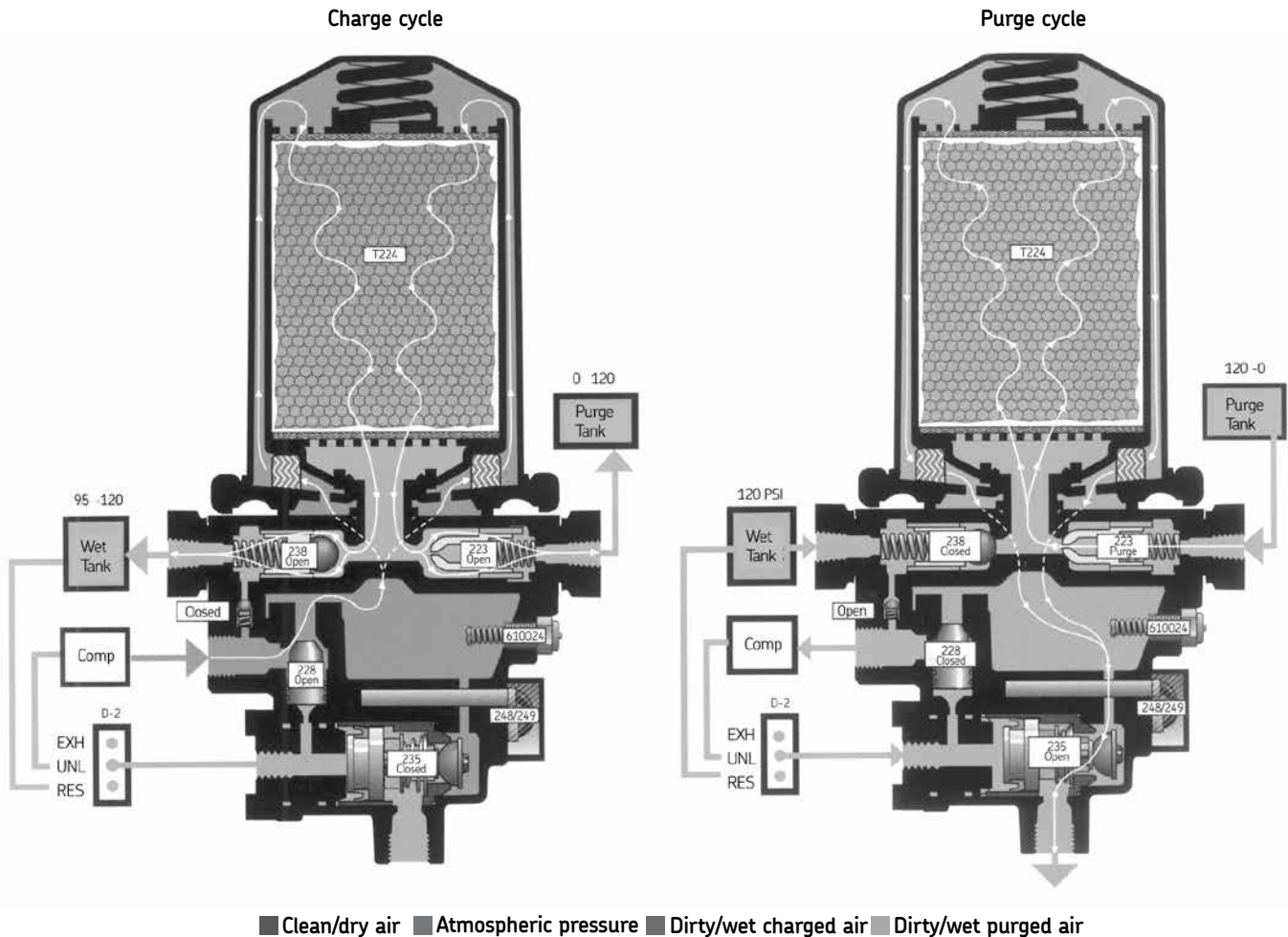


Turbo-2000 normal operation/cycles – use with Turbo boosted compressors

Air flows from the compressor into the air dryer. Air flows past filters and desiccant bed, stripping moisture and contaminants from the air and exits dryer to the purge tank and to the wet tank. The reservoir line from the wet tank to the governor is always pressurized.

When pressure reaches cut-out (typically 120-125 psi), the governor sends an air signal through the governor line to the air dryer opening purge valve and closing turbo valve. The check valve is closed via back pressure from the wet tank. Then, air in the purge tank re-enters the dryer and passes through the desiccant bed taking away moisture, and is expelled out the bottom of the air dryer. Turbo boost from the compressor is checked at inlet of the dryer with closed turbo valve. E-Type dryers provide back pressure to the compressor during stand-by. This feature is not intended for use for any compressor other than Holset E-Type compressors.

When the pressure drops to cut-in (typically 90-95 psi), the air in the UNL line evacuates out the exhaust port of the governor closing purge valve and opening turbo valve and once again flows from the compressor into the air dryer.



Trouble-shooting Turbo-2000

Review Turbo-2000 normal operation / cycles prior to trouble-shooting

Problem: air continually leaks from the exhaust port during compressor standby mode	
Possible cause	Remedy
Worn check valve	Clean cavity and replace check valve assembly #238
Worn turbo valve	Clean cavity and replace turbo valve assembly #228
Worn purge valve seal	Clean cavity and replace purge valve assembly #235

Problem: system air pressure drops rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
Worn turbo valve	Clean cavity and replace turbo valve assembly #228
Worn purge valve seal	Clean cavity and replace purge valve assembly #235

Problem: air compressor moves into the standby mode but cycles rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
Worn turbo valve	Clean cavity and replace turbo valve assembly #228
D2 governor malfunctioning	Replace governor
Worn purge valve seal	Clean cavity and replace purge valve assembly #235

Problem: air leaks from the exhaust port during compressor charge mode	
Possible cause	Remedy
Worn purge valve	Clean cavities and replace purge valve assembly #235
Dirt/foreign material is stuck in the purge valve	Clean cavity and replace valve assembly #235
D2 governor malfunctioning	Replace D2 governor
Heater assembly malfunctioning (>32 degrees)	Replace heater assembly #246(12V), 247(24V), 248(12V, 249(24V), 619110(12V) or 619111(24V)

Problem: air compressor runs continuously (system pressure will not build)	
Possible cause	Remedy
Fittings are loose or damaged	Tighten or replace loose or damaged fittings
Air reservoir, tubing, or hoses are damaged	Repair or replace damaged items
The air compressor needs to be serviced or replaced	Rebuild or replace the air compressor
Worn purge valve	Clean cavity and replace the purge valve assembly #235
The air compressor capacity is too low for vehicle	Install larger air compressor
Line between governor and air compressor is blocked	Replace the line or remove the blockage
The safety valve is malfunctioning	Replace the safety valve #610024
Ice has formed in the purge valve	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)
D2 governor malfunctioning	Replace D2 governor

Problem: air dryer does not exhaust during compressor standby mode	
Possible cause	Remedy
The line between the air governor and the air dryer control port is missing, leaking, or damaged	Install or replace the air line, or tighten the fittings
Worn purge valve	Clean cavity and replace purge valve assembly #235
Ice has formed in the purge valve	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)
Heater is malfunctioning	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)
Purge valve sleeve is misaligned	Align purge valve sleeve

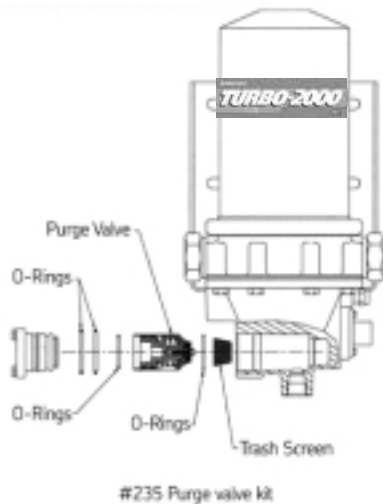
Problem: safety valve opens	
Possible cause	Remedy
Air dryer check valve is blocked	Clean cavity and replace check valve assembly #238
Air brake system is blocked down stream of air dryer	Remove blockage or replace the necessary components
Air compressor governor malfunctioning	Replace compressor D2 governor
Blocked desiccant cartridge	Replace cartridge #T224 and upgrade to filtration plus option T224-P*
The safety valve is malfunctioning	Replace the safety valve #610024

*Air compressor service may be required to address excessive oil blow-by.

Problem: water accumulation in air system (tanks)	
Possible cause	Remedy
Desiccant is contaminated	Replace desiccant cartridge #T224 or upgrade to T224-P for optimal filtration performance
The air compressor capacity is too low for vehicle	Install larger air compressor and replace desiccant cartridge #T224
Malfunctioning regeneration valve	Clean cavity and replace regeneration valve assembly #223
The line between the purge tank and the air dryer control port is missing, leaking, or damaged	Install or replace the air line, or tighten the fittings
Line between the compressor and air dryer too short	Fit new line with a minimum length of 6 feet copper line or (insufficient pre-cool) 12 feet of steel braided Teflon®*

Refer to vehicle manufacturer for specific test procedures for non related air dryer components.

* Teflon® is a registered trademark of E.I. DuPont.



Purge Valve Service Kit #235

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer won't exhaust
2. Air leak at exhaust port during the:
 - a) Charge mode
 - b) Stand-by mode
3. Pressure slow or no build
4. Compressor cycles rapidly

Operational check

Symptom #1:

Start engine and build to cutout pressure. If dryer does not exhaust proceed as follows:

1. Check for air pressure in line connecting D2 governor to control port of air dryer. If no pressure is present in line, service D2 governor.
2. Check for blockage at exhaust port of air dryer.
3. If items 1 and 2 are OK, replace purge valve #235.

Symptom #2A & #3:

Start engine and build air pressure. During the charge cycle, check for air leaking at exhaust port of dryer. If air is leaking from exhaust port proceed as follows:

1. No air pressure should be present in line connecting D2 governor and dryer purge valve during charge cycle. If there is, service D2 governor.
2. If item 1 is OK, replace purge valve #235

Symptom #2B & #4:

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace purge valve #235.

Note: Air discharge could also be due to worn check valve or turbo valve. Refer to pages 27 and 28 for service procedures on these valves.

Purge valve replacement

1. Disconnect air line at control port.
2. Remove the two fasteners that attach the purge valve retainer. Remove the retainer.
3. Remove the purge valve assembly from the purge cavity and discard.

Note: If there is excessive oil in the cavity, compressor may require servicing.

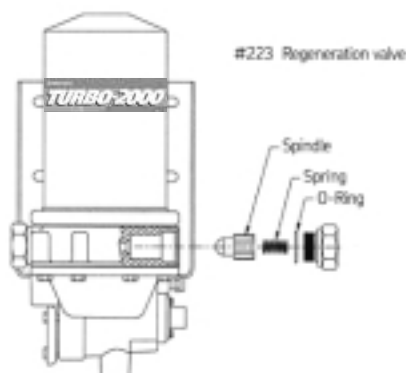
4. Clean the cavity thoroughly.
5. Remove the three (3) o-rings from retainer and discard.
6. Using lubricant supplied, lightly grease the new o-rings.
7. Install on the retainer the two- (2) thickest o-rings then install the third (thinner) o-ring.
8. Install the new filter screen in the purge cavity open end out.

Note: If air dryer is equipped with oil separator DO NOT install filter screen.

9. Apply a light coating of grease around the o-ring seat on valve assembly. Install the thin o-ring on the purge valve seat.
10. Aligning the valve exhaust port with the air dryer exhaust port, install the purge valve assembly. Use care not to dislodge the o-ring from its seat.

Warning: If the air dryer purge valve port does not align with air dryer exhaust port, air dryer will not exhaust!

11. Install retainer.
12. Apply a light coating of grease on the threads of the two retainer bolts.
13. Install two retainer bolts. Tighten to 10-15 ft. lb.
14. Reconnect the control line to air dryer control port.



Regeneration Valve Service Kit #223

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Water in tanks.
2. No purge air flow.

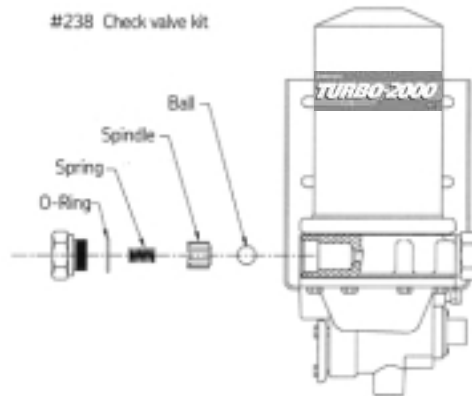
Operational check

Symptom #1 & #2:

Start engine and build to cut-out pressure. Stop engine. After initial exhaust, air should flow with decreasing intensity out the exhaust port for approximately 45 seconds. If air fails to flow, replace regeneration valve kit #223.

Regeneration valve replacement

1. Drain the air system.
2. Disconnect the air line at air dryer purge tank port.
3. Remove regeneration valve nut.
4. Remove and discard o-ring, spring and spindle.
5. Clean nut and cavity.
6. Position new spindle in the cavity with spring pocket side out.
Install spring.
7. Using grease supplied, apply a light coating on o-ring.
Install o-ring on nut.
8. Apply light coating of grease on nut threads.
Install nut and tighten to 60 ft. lb.
9. Re-connect air line to air dryer purge tank port.



Check Valve Service Kit #238

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer frequently exhausts.
2. Air continually flows from exhaust port when compressor is in standby mode.
3. Wet tank pressure drops rapidly.

Note: The above symptoms could also lead to turbo valve replacement. A malfunctioning turbo valve will tend to allow pressure to drop to cut-in pressure within seconds on E-Type dryers.

Operational check

Symptom #1, #2, & #3:

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace check valve #238.

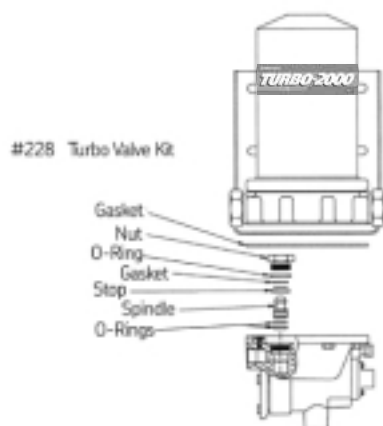
Note: Air discharge could also be due to worn purge valve or check valve.

Turbo valve replacement

1. Drain air system.
2. Disconnect air line from outlet port.
3. Remove check valve nut.
4. Remove and discard o-ring, spring, spindle, and ball.

Note: If there is excessive oil in the check valve cavity, compressor may require servicing.

5. Clean nut and cavity area.
6. Install new ball in cavity. Next, position spindle with spring pocket facing out. Install spring.
7. Using grease supplied, apply a light coating on o-ring. Install o-ring on nut.
8. Apply a light coating of grease to threads of nut. Install nut and tighten to 60 ft. lb.
9. Re-connect air line to air dryer outlet port.



Turbo Valve Service Kit #228

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer frequently exhausts.
2. Air continually flows from exhaust port when compressor is in standby mode.
3. System pressure drops very rapidly.

Note: The above symptoms could also lead to Check valve replacement.

Operational check

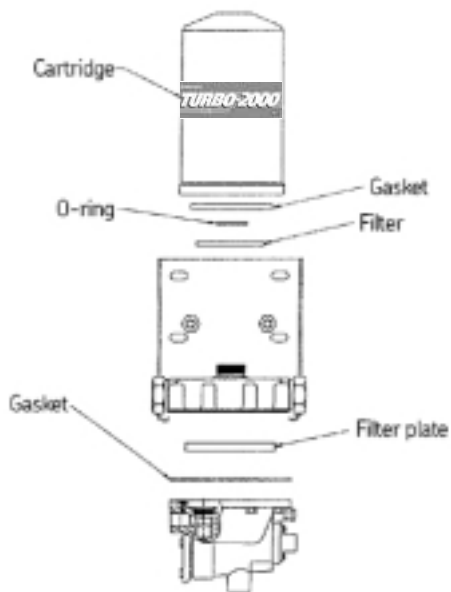
Symptom #1, #2, & #3:

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace turbo valve #228.

Note: Air discharge could also be due to worn purge valve or check valve.

Turbo valve replacement

1. Drain the air system.
2. Disconnect the heater wiring.
3. Disconnect the inlet and control lines from their respective ports.
4. Remove 8 bolts from bottom cap and set aside. Discard gasket.
5. Remove turbo nut, valve stop and valve and discard.
6. Clean cavity area thoroughly.
7. Lightly coat the 2 (small) o-ring surfaces and install on piston. Carefully install valve in cavity with tapered side up.
8. Place valve stop on top of valve concave side down.
9. Lightly lube (large) o-ring and place on nut. Install flat seal into nut.
10. Install nut and tighten to 40-45 ft. lb.
11. Place gasket on bottom cap aligning all holes. Locate bottom cap so that inlet port is directly below outlet port. Install the 8 bolts. Tighten bolts to 20-25 ft. lb. or 25-30 ft. lb. if equipped with oil separator.
12. Re-connect inlet and control lines to their respective ports.
13. Re-connect heater wiring.



Desiccant Cartridge Service Kit #T224 & #T224-P

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Regular service interval.
2. Water or contamination in tanks.

Operational check

Symptom #1 & #2

Desiccant cartridge requires regular servicing at intervals determined by compressor duty cycle or type of driving conditions. Typical service intervals are:

Line haul	3 years
Inner city	2 years
Refuse/transit	1 year
Off highway	1 year

Using T224-P with extra filtration will protect desiccant longer and lengthening service intervals. Add 1 year to above chart. The above is a guideline only. Drain tanks on regular basis. If moisture exists, replace cartridge.

Desiccant cartridge replacement

* Steps required for service kit T224-P only.

1. Relieve all system air pressure.
2. * Disconnect heater lead wire from air dryer.
3. * Disconnect inlet and control lines from their respective ports.
4. Using a strap wrench, turn the desiccant cartridge counterclockwise and remove. Discard.
 - 4a. If cartridge spins without loosening, place a thin blade between cartridge gasket and base to break seal. If not,
 - 4b. strike cartridge with a center punch or ball nose at the lower end where the diameter is slightly larger. This binds components together.
5. Remove and discard o-ring from adapter plate stud and filter element (if present).
6. * Remove eight (8) 3/8" hex head bolts from bottom cap and set aside.
7. * Remove bottom cap assembly.

8. * Remove filter plate (if present) and gasket(s) from bottom cap and discard.
9. * Clean bottom cap sump cavity, gasket surface and inside of adapter plate castings of oil and contaminants.
10. * Service of turbo valve is recommended at this time also. Refer to service procedures on page 25.
11. * Place new gasket on bottom cap bolt flange.
12. * Place new filter plate into bottom cap cavity. Position filter plate cavity, as shown in Fig. 1, with arrow pointed toward inlet port of bottom cap.
13. * Re-install bottom cap assembly to adapter plate casting.
14. * Torque (8) bolts to 25-50 ft. lbs.
15. Clean top surface of adapter plate and threaded stud.
16. * Position a new filter element around cartridge stud and onto adapter plate.
17. Using grease supplied, apply a light coating of grease onto o-ring. Install o-ring onto threaded stud.
18. **Important for easy removal:** Apply a generous coat of grease on the new desiccant cartridge gasket surface.
19. Thread new cartridge onto stud turning clockwise. When gasket contacts adapter plate, tighten cartridge 1/2 turn. **Do not overtighten!**
20. * Re-connect airlines to air dryer inlet and control ports.
21. * Re-connect heater lead wire.

Note: Cartridge Stud Kit #619140 available if stud needs replacing.

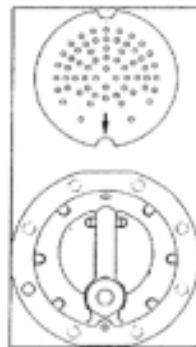
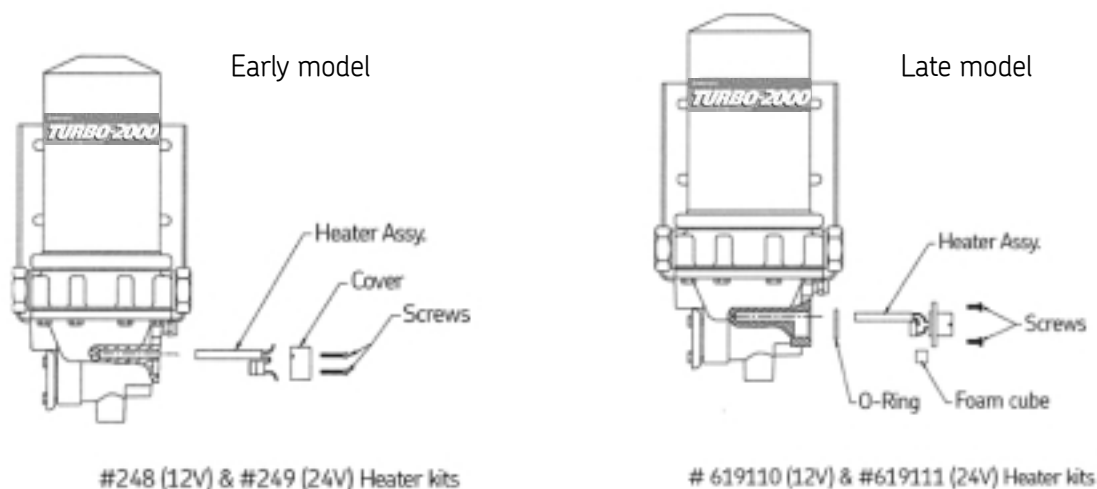


Fig. 1
Kit #T224-P



Heater Service Kit #248, #249, #619110, #619111

Warning: Read and follow safety precautions found on page 17 before proceeding.

Symptom

1. Dryer won't exhausts
2. Exhaust port leak.
3. Cannot build pressure.

Operational check

Note: Thermostat must be cooled to at least 35 degrees F to check.

1. Closed ohmmeter circuit indicates heater is functioning.
2. Open ohmmeter circuit indicates faulty heater assembly.

Heater assembly replacement

1. Disconnect heater leads.
2. Remove set screw (if present) holding heater element in casting.
3. Remove two screws attaching heater cover and/or thermostat to casting.
4. Remove heater/thermostat assembly and discard.
5. Thoroughly clean entire heater/thermostat area.
6. Apply a light coating of anti-seize to the heater element and thermostat cavity.

7. Insert heater element into hole and twist slightly to spread anti-seize.

7.1 Early Models (#248 or #249; orange and blue wires)

- 7..1.1 Install new set screw (if required) until snug **(DO NOT OVER TIGHTEN)** Screw will protrude from bottom cap about 1/8".
- 7..1.2 Insert thermostat into position in thermostat cavity.
- 7..1.3 Coil lead wires around heater cover posts allowing wires to protrude through slots in cover.
- 7..1.4 Place two (2) 6-32 x 1-1/8 screws in heater cover and attach the thermostat.

Note: If heater cover is not used, use short screws and wire clamps to secure thermostat and wires.

- 7..1.5 Fill heater cover through 1/4" hole with non-corrosive RTV.
- 7..1.6 Connect blue heater wire to a good chassis ground.
- 7..1.7 Connect orange wire to ignition switch.
- 7..1.8 Seal and route heater wires carefully.

7.2.11 Late Models (#619110 or #619111); plug style connection

- 7.1.2.1. Slide o-ring over heater and thermostat into position around connector flange.
- 7.1.2.2. Slide heater and thermostat into position in cavity.
- 7.1.2.3. Ensure thermostat sits flat in cavity.
- 7.1.2.4. Place foam cube on top of thermostat and bring heater connector into position over heater.
- 7.1.2.5. Secure heater assembly using the (2) 8-32 x 1/2" screws.
- 7.1.2.6. Reconnect Metri-Pak connector to male plug.

Note: If heater lead wire with male plug needs to be replaced or is not in vehicle wire harness it is available in Kit #619900.

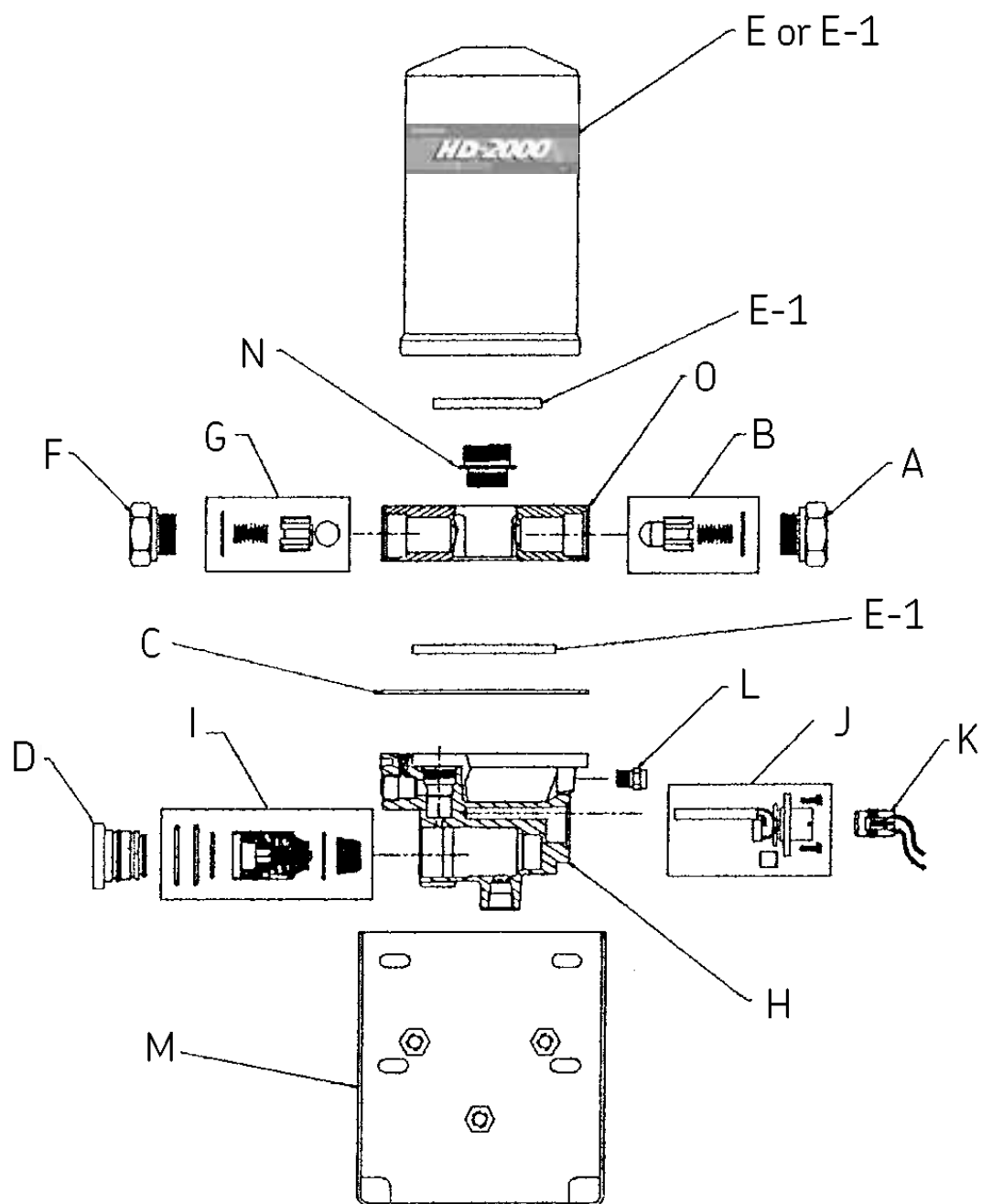
Turbo-2000 Notes:

HD-2000 parts list

Component identification		
A	610237	Regeneration valve nut
B	223	Regeneration valve kit
C	610077	Body gasket
D	610110	Seal retainer
E	T224	Desiccant cartridge
E-1	T224-P	Desiccant cartridge filtration plus
F	610236	Check valve nut
G	238	Check valve kit
H	619089	Bottom cap assy 12V
	619090	Bottom cap assy 24V
I	235	Purge valve kit
J	248 12V 75W 249 24V 75W	Heater kit early models (Orange and blue wires)
J	619110 12V 75W	Heater kit late models
	619111 24V 75W	(Plug style connection)
K	619900	Wire harness
L	610024	Safety valve 175 psi
M	619115	Mounting bracket
N	619140	Cartridge stud
O	619091	Mid-section with valves
Bold part numbers represent suggested stock service components		

Air dryer part number description ▲		
HD	HD w/ filtration plus option	Description
620550	620350	Dryer/tank 12V
620554	620354	Dryer/tank 24V
620552	620352	Air dryer 12V
620556	620356	Air dryer 24V
221	221	Purge tank

▲For right-hand models see parts list on pages 139 & 140.

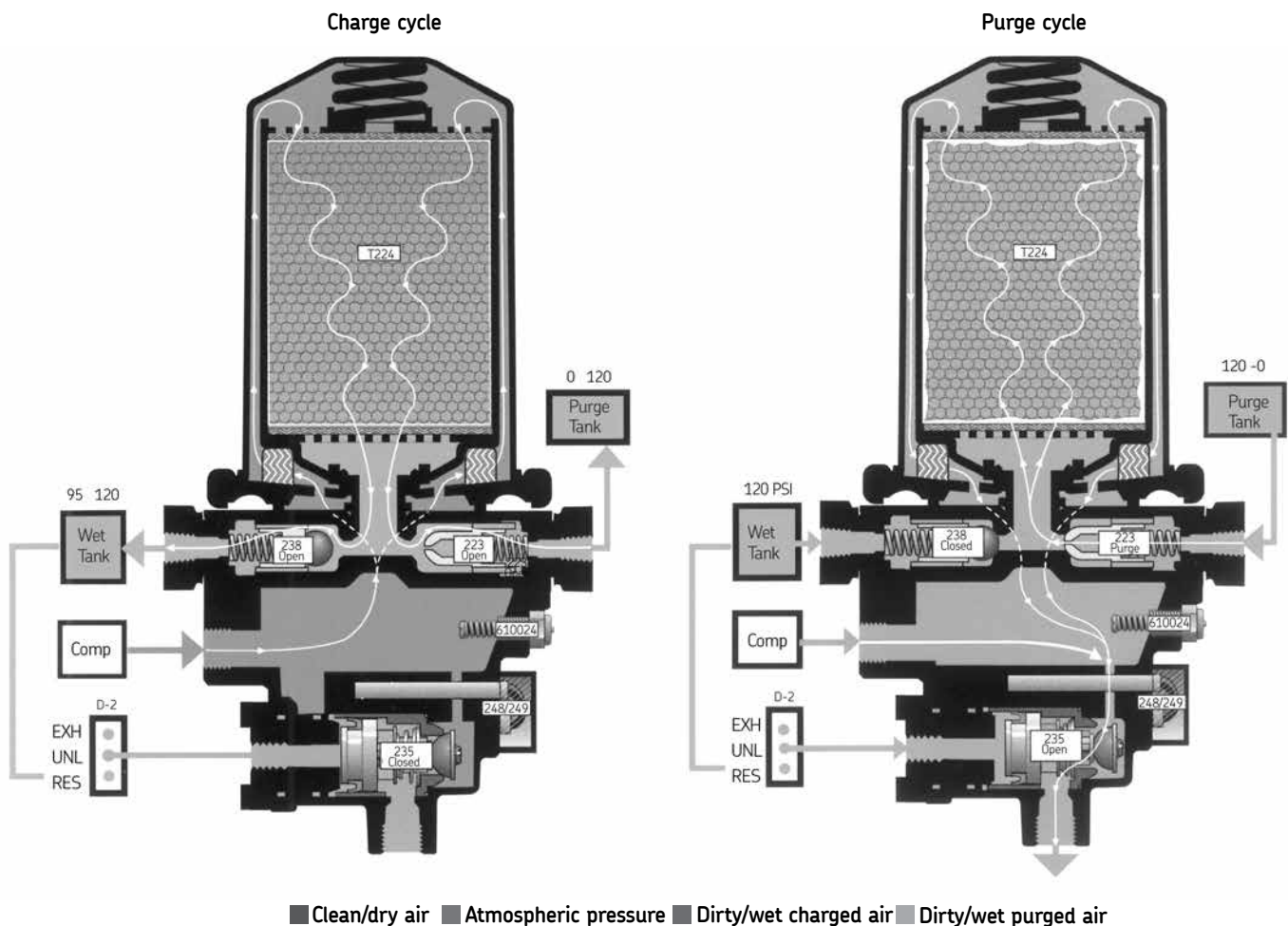


HD-2000 normal operation/cycles – use with naturally aspirated and Discharge Line Unload compressors

Air flows from the compressor into the air dryer. Air flows past filters and desiccant bed, stripping moisture and contaminants from the air and exits the dryer to the purge tank and to the wet tank. The reservoir line from the wet tank to the governor is always pressurized.

When pressure reaches cut-out (typically 120-125 psi), the governor sends air signal through the governor line to the air dryer opening purge valve. The check valve is closed via back pressure from the wet tank. Then, air in the purge tank re-enters the dryer and passes through the desiccant bed taking away moisture, and is expelled out the bottom of the air dryer.*

When the pressure drops to cut-in (typically 90-95 psi), the air in the UNL line evacuates out the exhaust port of the governor closing purge valve and once again flows from the compressor into the air dryer.



*DLU compressors will continue to pump into air dryer and out exhaust port.

Trouble-shooting HD-2000

Review HD-2000 normal operation / cycles prior to trouble-shooting

Problem: air continually leaks from the exhaust port during compressor standby mode	
Possible cause	Remedy
Worn check valve	Clean cavity and replace check valve assembly #238
Worn purge valve seal	Clean cavities and replace purge valve assembly #235

Problem: system air pressure drops rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
Worn purge valve seal	Clean cavities and replace purge valve assembly #235

Problem: air leaks from the exhaust port during compressor charge mode	
Possible cause	Remedy
Worn purge valve	Clean cavities and replace the purge valve assembly #235
Dirt/foreign material is stuck in the purge valve	Clean cavities and replace the purge valve assembly #235
D2 governor malfunctioning	Replace D2 governor
Heater assembly malfunctioning (>32 degrees)	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)

Problem: air compressor runs continuously (system pressure will not build)	
Possible cause	Remedy
Fittings are loose or damaged	Tighten or replace loose or damaged fittings
Air reservoir, tubing, or hoses are damaged	Repair or replace damaged items
Air compressor needs to be serviced or replaced	Rebuild or replace the air compressor
Worn purge valve	Clean cavities and replace the purge valve assembly #235
The air compressor capacity is too low for vehicle	Install larger air compressor
Line between governor and air compressor is blocked	Replace the line or remove the blockage
The safety valve is malfunctioning	Replace the safety valve #610024
Ice has formed in the purge valve	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)
D2 governor malfunctioning	Replace D2 governor

Problem: air dryer does not exhaust during compressor standby mode	
Possible cause	Remedy
Line between the air governor and the air dryer	Install or replace the air line, or control port is missing, leaking, or damaged. Tighten the fittings.
Worn purge valve	Clean cavities and replace the purge valve assembly #235
Ice has formed in the purge valve	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)
Heater is malfunctioning	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)
Purge valve sleeve is misaligned	Align purge valve sleeve

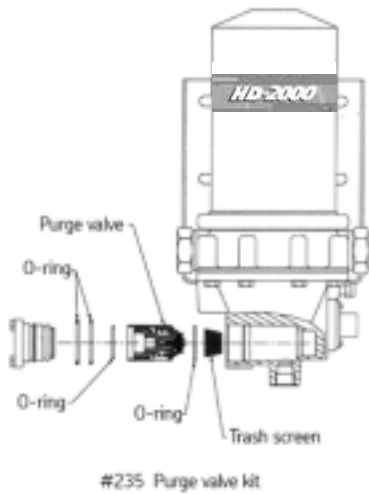
Problem: safety valve opens	
Possible cause	Remedy
Air dryer check valve is blocked	Clean cavity and replace the check valve assembly #238
Air brake system is blocked down stream from the air dryer	Remove blockage or replace the necessary components
Air compressor governor is malfunctioning	Replace the compressor D2 governor
Blocked desiccant cartridge	Replace cartridge #T224 and upgrade to filtration plus T224-P**
The safety valve is malfunctioning	Replace the safety valve #610024

Problem: water accumulation in air system (tanks)	
Possible cause	Remedy
Desiccant is contaminated	Replace desiccant cartridge #T224
Air compressor capacity is too low for vehicle	Install larger air compressor and replace desiccant cartridge #T224
Malfunctioning regeneration valve	Clean cavity and replace regeneration valve assembly #223
Line between the purge tank and the air dryer control port is missing, leaking, or damaged	Install or replace the air line, or tighten the fittings
Line between the compressor and air dryer too short line	Fit new line with a minimum length of 6 feet copper (insufficient pre-cool) or 12 feet of steel braided Teflon®.*

Refer to vehicle manufacturer for specific test procedures for non-related air dryer components.

*Teflon® is a registered trademark of E.I. DUPONT

**Air compressor service may be required to address excessive oil blow-by



Purge Valve Service Kit #235

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer won't exhaust.
2. Air leak at exhaust port during the:
 - a) Charge mode
 - b) Stand-by mode
3. Pressure slow or no build.
4. Compressor cycles rapidly.

Operational check

Symptom #1:

Start engine and build to cutout pressure. If dryer does not exhaust proceed as follows:

1. Check for air pressure in line connecting D2 governor to control port of air dryer. If no pressure is present in line, service D2 governor.
2. Check for blockage at exhaust port of air dryer.
3. If items 1 and 2 are OK, replace purge valve #235.

Symptom #2A & #3:

Start engine and build air pressure. During the charge cycle, check for air leaking at exhaust port of dryer. If air is leaking from exhaust port, proceed as follows:

1. No air pressure should be present in line connecting D2 governor and dryer purge valve during charge cycle. If there is, service D2 governor.
2. If item 1 is OK, replace purge valve #235

Symptom #2B & #4:

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace purge valve #235.

Note: Air discharge could also be due to worn check valve. Refer to page 42 for service procedure. On "Discharge Line Unload" systems air will flow from exhaust port of dryer when engine is running and compressor is in stand-by mode.

Purge valve replacement

1. Disconnect air line at control port.
2. Remove the two fasteners that attach the purge valve retainer.
Remove the retainer.

**Note: If there is excessive oil in the cavity,
compressor may require servicing.**

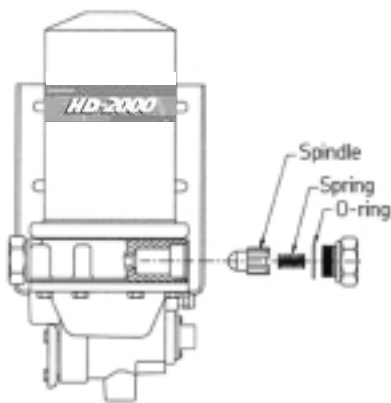
3. Remove the purge valve assembly from cavity and discard.
4. Clean the cavity thoroughly.
5. Remove the three (3) o-rings from retainer and discard.
6. Using lubricant supplied, lightly grease the new o-rings.
7. Install on the retainer the two- (2) thickest o-rings then
install the third (thinner) o-ring.
8. Install the new filter screen in the purge cavity open end out.

**Note: If air dryer is equipped with oil separator
DO NOT install filter screen.**

9. Apply a light coating of grease around the o-ring seat
on valve assembly. Install the thin o-ring on the purge
valve seat.
10. Aligning the valve exhaust port with the air dryer exhaust port,
install the purge valve assembly. Use care not to dislodge the
o-ring from its seat.

**Warning: If the air dryer purge valve port does not align with
air dryer exhaust port, air dryer will not exhaust!**

11. Install retainer.
12. Apply a light coating of grease on the
threads of the two retainer bolts.
13. Install two retainer bolts. Tighten to 10-15ft.lb.
Re-connect air line to control port.



#223 Regeneration valve

Regeneration Valve Service Kit #223

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Water in tanks.
2. No purge air flow.

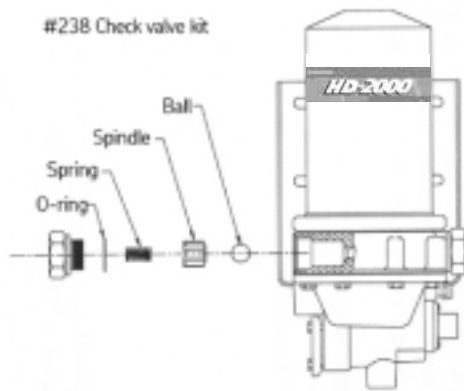
Operational check

Symptom #1 & #2:

Start engine and build to cut-out pressure. Stop engine. After initial exhaust, air should flow with decreasing intensity out the exhaust port for approximately 45 seconds. If air fails to flow, replace regeneration valve kit #223.

Regeneration valve replacement

1. Drain the air system.
2. Disconnect the air line at air dryer purge tank port.
3. Remove regeneration valve nut.
4. Remove and discard o-ring, spring and spindle.
5. Clean nut and cavity.
6. Position new spindle in the cavity with spring pocket side out. Install spring.
7. Using grease supplied, apply a light coating on o-ring. Install o-ring on nut.
8. Apply light coating of grease on nut threads. Install nut and tighten to 60 ft. lb.
9. Re-connect air line to air dryer purge tank port.



Check Valve Service Kit #238

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer frequently exhausts.
2. Air continually flows from exhaust port when compressor is in standby mode.
3. Wet tank pressure drops rapidly.

Operational check

Symptom #1, #2, & #3:

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace check valve #238.

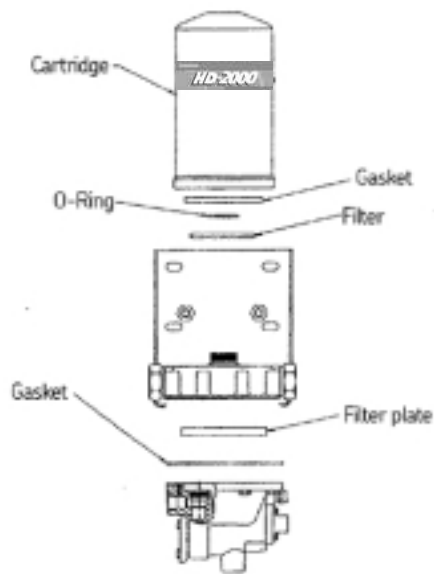
Note: Air discharge could also be due to worn purge valve.

Check valve replacement

1. Drain air system.
2. Disconnect air line from outlet port.
3. Remove check valve nut.
4. Remove and discard o-ring, spring, spindle, and ball.

Note: If there is excessive oil in the check valve cavity, compressor may require servicing.

5. Clean nut and cavity area.
6. Install new ball in cavity. Next, position spindle with spring pocket facing out. Install spring.
7. Using grease supplied, apply a light coating on o-ring. Install o-ring on nut.
8. Apply a light coating of grease to threads of nut. Reinstall nut and tighten to 60 ft. lb. Re-connect air line to air dryer outlet port.



Desiccant Cartridge Service Kit #T224 & # T224-P

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Regular service interval.
2. Water or contamination in tanks.

Note: If there is excessive oil present, compressor may require servicing to T224-P upgrade.

Operational check

Symptom #1 & #2

Desiccant cartridge requires regular servicing at intervals determined by compressor duty cycle or type of driving conditions. Typical service intervals are:

Line haul	3 years
Inner city	2 years
Refuse/transit	1 year
Off highway	1 year

Using T224-P with extra filtration will protect desiccant longer and lengthening service intervals. Add 1 year to above chart. The above is a guideline only. Drain tanks on regular basis. If moisture exists, replace cartridge.

Desiccant cartridge replacement

* Steps required for service kit T224-P only.

1. Relieve all system air pressure.
2. * Disconnect heater lead wire from air dryer.
3. * Disconnect inlet and control lines from their respective ports.
4. Using a strap wrench, turn the desiccant cartridge counterclockwise and remove. Discard.
 - 4a. If cartridge spins without loosening, place a thin blade between cartridge gasket and base to break seal. If not,
 - 4b. strike cartridge with a center punch or ball nose at the lower end where the diameter is slightly larger. This binds components together.
5. Remove and discard o-ring from adapter plate stud and filter element (if present).
6. * Remove eight (8) 3/8" hex head bolts from bottom cap and set aside.
7. * Remove bottom cap assembly.

8. * Remove filter plate (if present) and gasket(s) from bottom cap and discard.
9. * Clean bottom cap sump cavity, gasket surface and inside of adapter plate castings of oil and contaminants.
10. * Place new gasket on bottom cap bolt flange.
11. * Place new filter plate into bottom cavity. Position filter plate in cavity, as shown in Fig. 1, with arrow pointed toward inlet port of bottom cap.
12. * Re-install bottom cap assembly to adapter plate casting.
13. * Torque (8) bolts to 25-30 ft. lbs.
14. Clean top surface of adapter plate and threaded stud.
15. * Position a new filter element around cartridge stud and onto adapter plate.
16. Using grease supplied, apply a light coating of grease onto o-ring. Install o-ring onto threaded stud.
17. **Important for easy removal:** Apply a generous coat of grease on the new desiccant cartridge gasket surface.
18. Thread new cartridge onto stud turning clockwise. When gasket contacts adapter plate, tighten cartridge $\frac{1}{2}$ turn. **Do not overtighten.**
19. * Re-connect airlines to air dryer inlet and control ports.
20. * Re-connect heater lead wire.

**Note: Cartridge Stud Kit #619140
available if stud needs replacing.**

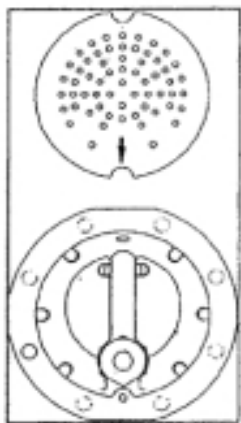
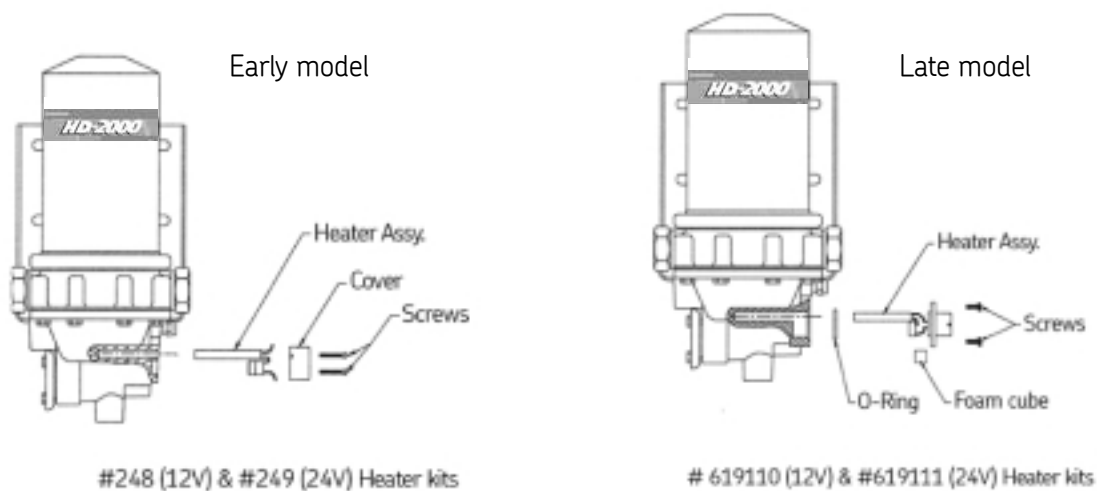


Fig. 1
Kit # T224-P



Heater Service Kits #248, #249, #619110, #619111

Warning: Read and follow safety precautions found on page 17 before proceeding.

Symptom

1. Dryer frequently exhausts.
2. Air continually flows from exhaust port when compressor is in standby mode.
3. Wet tank pressure drops rapidly.

Operational check

Note: Thermostat must be cooled to at least 35 degrees F to check.

1. Closed ohmmeter circuit indicates heater is functioning.
2. Open ohmmeter circuit indicated faulty heater assembly.

Heater assembly replacement

1. Disconnect heater leads.
2. Remove set screw (if present) holding heater element in casting.
3. Remove two screws attaching heater cover and/or thermostat to casting.
4. Remove heater/thermostat assembly and discard.
5. Thoroughly clean entire heater/thermostat area.
6. Apply a light coating of anti-seize to the heater element and thermostat cavity.
7. Insert heater element into hole and twist slightly to spread anti-seize.

7.1 Early models (#248 or #249; orange and blue wires)

- 7..1.1 Install new set screw (if required) until snug **(DO NOT OVER TIGHTEN)**
Screw will protrude from bottom cap about 1/8".
- 7..1.2 Insert thermostat into position in thermostat cavity.
- 7..1.3 Coil lead wires around heater cover posts allowing wires to protrude through slots in cover.
- 7..1.4 Place two (2) 6-32 x 1-1/8" screws in heater cover and attach the thermostat.

**Note: If heater cover is not used,use short screws
and wire clamps to secure thermostat and wires.**

- 7..1.5 Fill heater cover through 1/4" hole with non-corrosive RTV.
- 7..1.6 Connect blue heater wire to a good chassis ground.
- 7..1.7 Connect orange wire to ignition switch.
- 7..1.8 Seal and route heater wires carefully.

7.2.11 Late Models (#619110 or #619111 plug style connection)

- 7.1.2.1. Slide o-ring over heater and thermostat
into position around connector flange.
- 7.1.2.2. Slide heater and thermostat into position in cavity.
- 7.1.2.3. Ensure thermostat sits flat in cavity.
- 7.1.2.4. Place foam cube on top of thermostat and bring heater connector into
position over heater.
- 7.1.2.5. Secure heater assembly using the
(2) 8-32 x1/2" screws.
- 7.1.2.6. Reconnect Metri-Pak connector to male plug.

**Note: If heater lead wire with male plug needs to be
replaced or is not in vehicle wire harness, it is
available in kit #619900**

HD-2000 Notes:

Dual Turbo-2000 dryer parts list

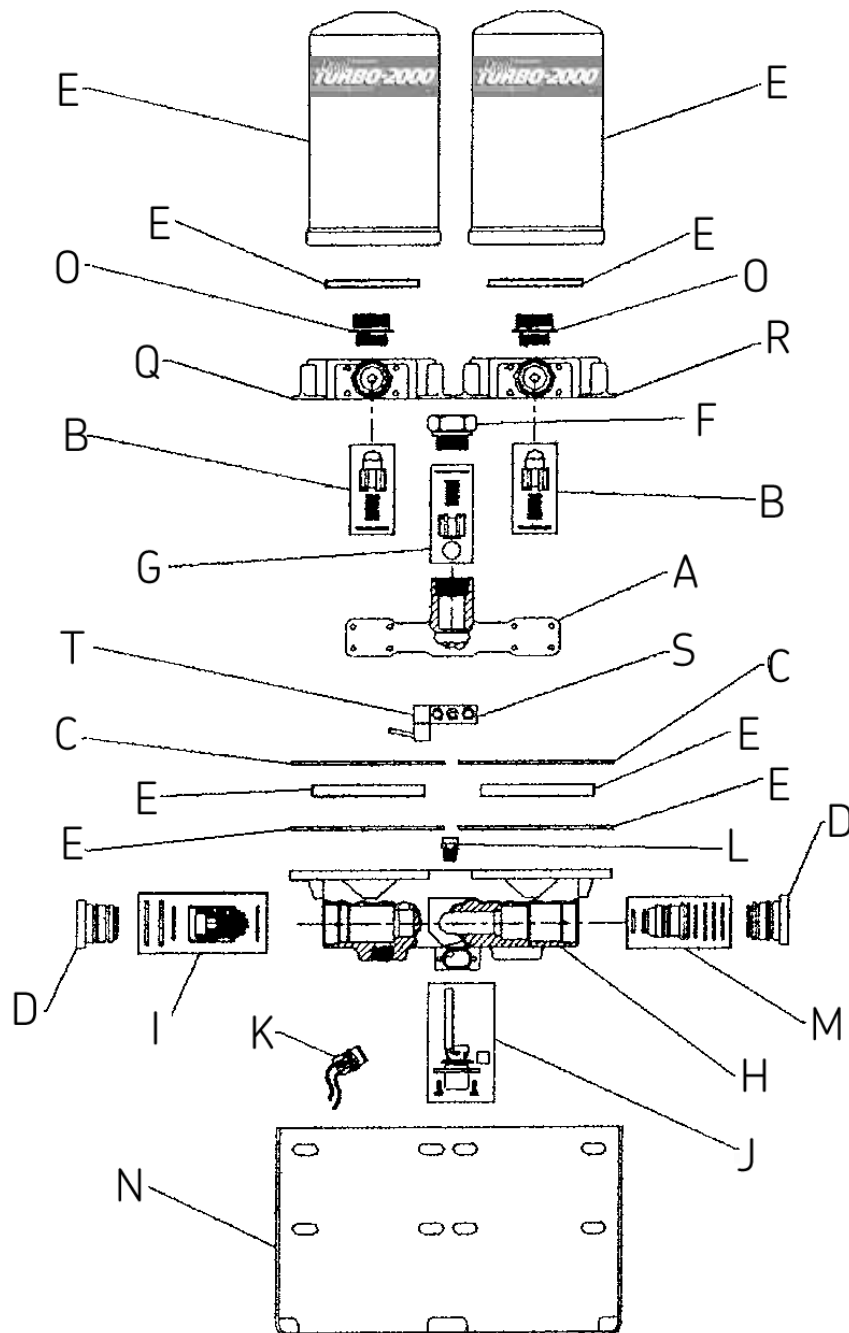
*H.C. Dual Turbo-2000 dryer parts list may be found on page 68.

Component identification		
A	619930	Manifold
A	619922	Manifold w/valves & fitting for 2-line version
B	619911	Regeneration valve kit
C	610077	Body gasket
D	610069	Seal retainer Note: four retainers per dryer, two on either side/1 per box
E	T224-P	Desiccant cartridge with filtration plus package
F	619928	Check valve nut
G	238	Check valve kit
H	619932	Valve housing, complete with valves & 12V heater
H	619934	Valve housing, complete with valves & 24V heater
I	235	Purge valve kit note: two valves per dryer, one on either side/1 per box
J	619110 12V 75W 619111 24V 75W	12 Volt heater kit 24 Volt heater kit
K	619935	Wire harness
L	619740	Safety valve (200 psi)
M	619938	Inlet check valve kit note: two valves per dryer, one on either side/1 per box.
N	619980	Mounting bracket
O	619140	Cartridge stud
Q	619920	Mid-section L.H.
R	619921	Mid-section R.H.
S	619910	Air control valve - 3 fitting design
S	619925	Air control valve - 2 fitting design
T	619912	MLT 12 Volt
T	619924	MLT 24 Volt
Bold part numbers represent suggested stock service components		

Air dryer part number description	
620910 (620912*)	12V w/cartridges (w/o cartridges*)
620920 (620924*)	24V w/cartridges (w/o cartridges*)
620922	24V w/12V MLT & Special Mounting Bracket

* Use 2 T224-P cartridges

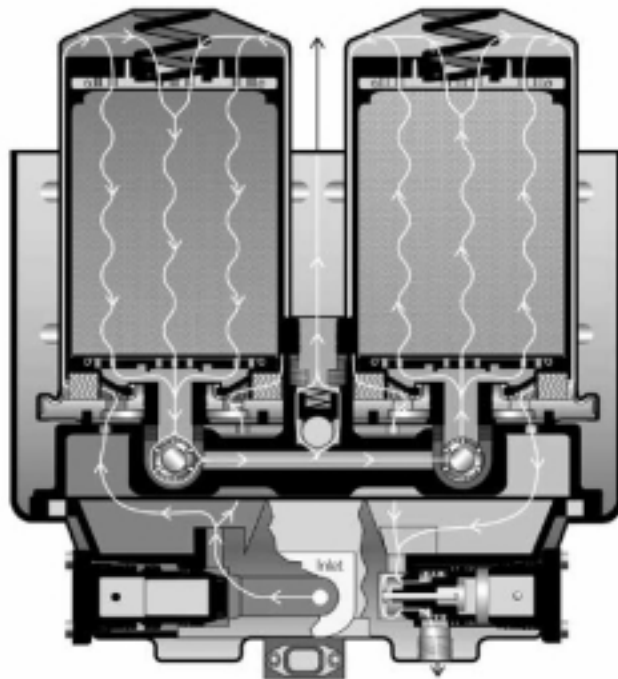
Dual Turbo-2000 service schematic



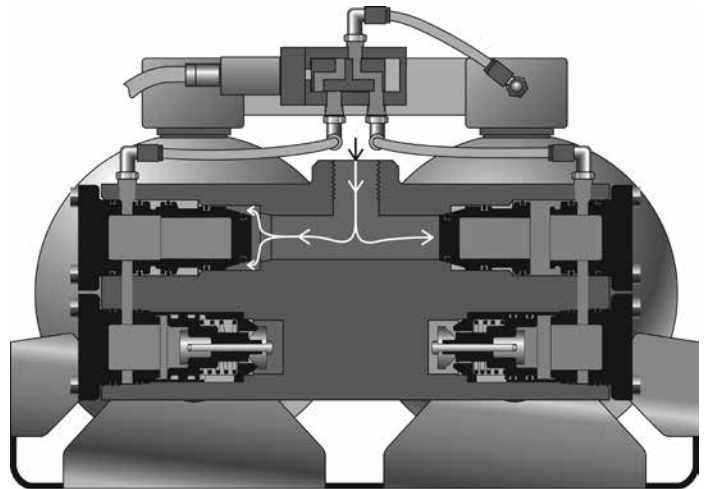
Normal Dual Turbo-2000 air dryer operation/cycle

1. The Micro Logic Timer (MLT) controls drying and regeneration cycles of the Dual Turbo-2000 air dryer by energizing and de-energizing the Air Control Valve of air dryer at 90-second intervals. An indicator light on MLT will be "on" during energized cycle and "off" during the de-energized cycle. *
2. The air dryer's Air Control Valve controls air flow direction through the dryer during the compressor's charge mode (pumping). During this charge mode, one dryer cartridge is drying air and other cartridge is being regenerated.
3. During the compressor charge mode there will be a light flow of air from ONE exhaust port of air dryer. **This is normal, regeneration air flow and should be present ONLY when the compressor is in charge mode (pumping).** The air flow will alternate (every 90-seconds) from one exhaust port to the other in conjunction with the MLT cycles. When the air dryer cycle alternates during the compressor charge mode (pumping), there will be a momentary burst of air from one of the air dryer exhaust ports. This is normal.

***MLT is polarity sensitive and will not operate if power (+) and ground (-) leads are switched**



Side View



Bottom View

- Clean/dry air
- Atmospheric pressure
- Dirty/wet charged air
- Dirty/wet purged air

Trouble-shooting Dual Turbo-2000

See H.C. Dual Turbo-2000 trouble-shooting for H.C. Dual Turbo-2000 on page 71

Review Dual Turbo-2000 normal operation / cycles prior to trouble-shooting on page 50

Problem: air continually flows from the exhaust port during compressor standby mode	
Possible cause	Remedy
Worn check valve	Clean cavity and replace check valve assembly #238

Problem: system/wet tank air pressure drops rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
D2 governor malfunctioning	Replace governor

Problem: air compressor moves into the standby mode but cycles rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
D2 governor malfunctioning	Replace governor

Problem: heavy air flow from one or both exhaust ports during compressor charge mode.	
Note: alternating "light" air flow from exhaust ports during compressor charge mode is normal, regeneration air flow	
Possible cause	Remedy
Worn purge valve or dirt/foreign material is stuck in the purge valve	Clean cavities and replace purge valve assembly #235
Worn inlet check valve	Clean cavity and replace valve assembly #619915
Ice has formed in purge and/or inlet check valves, heater assembly malfunctioning	Replace heater assembly #619110(12V) or valves 619111(24V)

Problem: air compressor runs continuously (system pressure will not build)	
Possible cause	Remedy
Fittings are loose or damaged	Tighten or replace loose or damaged fittings
Air reservoir, tubing, or hoses are damaged	Repair or replace damaged items
The air compressor needs to be serviced or replaced	Rebuild or replace the air compressor
Worn purge valve or dirt/foreign material is stuck in the purge valve	Clean cavity and replace the purge valve assembly #235
The air compressor capacity is too low for vehicle	Install larger air compressor
Line between governor and air compressor is blocked	Replace the line or remove the blockage
The safety valve is malfunctioning	Replace the safety valve #610024
Worn inlet check valve	Clean cavity and replace valve assembly #619915
Ice has formed in purge and/or inlet check valves, heater assembly malfunctioning	Replace heater assembly #619110(12V) or 619111(24V)
D2 governor malfunctioning	Replace D2 governor
Air line (tubing) connecting dryer manifold and air control valve missing or damaged	Repair/replace air line (tubing)

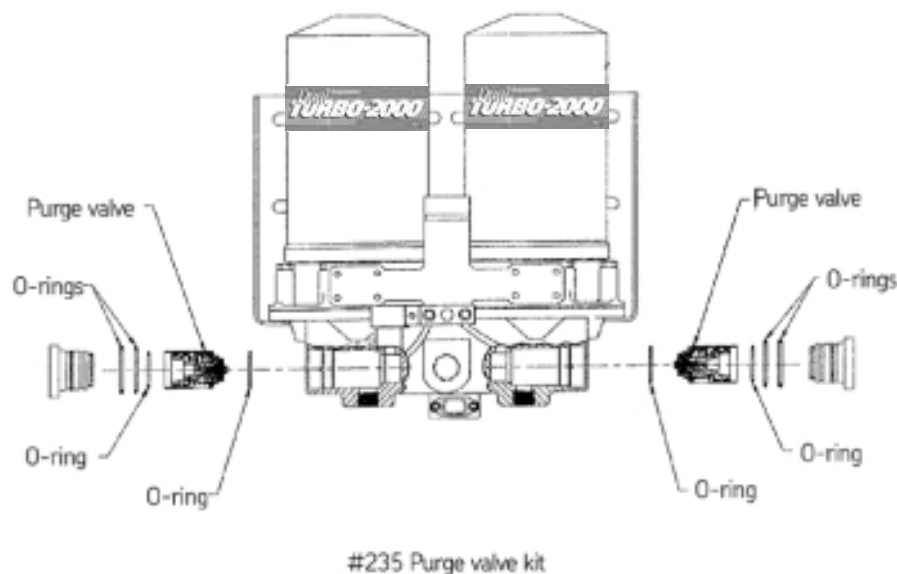
Problem: air dryer does not exhaust during compressor charge mode	
Possible cause	Remedy
Micro Logic Timer (MLT) malfunctioning	Replace MLT #619912 (12V) or 619924 (24V)
Air control valve malfunction	Replace air control valve #619910 (3 fittings) or 619925 (2 fittings)
Worn purge valve	Clean cavity and replace the purge valve assembly #235
Exhaust ports in purge valve and valve housing not aligned	Align exhaust ports in purge valve and valve housing
Air line (tubing) connecting air control valve and valve housing and/or manifold damaged or missing	Repair/replace air line(s) (tubing)
Ice has formed in the purge valve	Replace heater assembly #619110(12V) or 619111(24V)
Heater is malfunctioning	Replace heater assembly #619110(12V) or 619111(24V)

Problem: safety valve opens	
Possible cause	Remedy
Air dryer outlet check valve is blocked	Clean cavity and replace the check valve assembly #238.
Air brake system is blocked down stream of air dryer	Remove blockage or replace the necessary components
Air compressor governor malfunctioning	Replace compressor D2 governor
Air compressor unloader valve malfunctioning	Replace compressor unloader valve
Blocked desiccant cartridge(s)	Replace cartridge(s) #T224-P(s)
The safety valve is malfunctioning	Replace the safety valve #610024
Air dryer inlet check valve(s) is blocked	Clean cavity and replace the inlet check valve assembly #619915

Problem: water accumulation in air system (tanks)	
Possible cause	Remedy
Desiccant is contaminated	Replace desiccant cartridge #T224-P Replace both cartridge and filters
Micro Logic Timer (MLT)	Replace MLT #619912 (12V) or #619924 (24V) malfunctioning
Air control valve malfunction	Replace air control valve #619910 (3 fittings) or #619925 (2 fittings)
Malfunctioning regeneration valve(s)	Clean cavity and replace regeneration valve(s) #619911
Air line (tubing) connecting air control valve and valve housing and/or manifold damaged or missing	Repair/replace air line(s) (tubing) copper line or 12 feet of steel braided Teflon®
Line between the compressor and air dryer too short (insufficient pre-cool)	Fit new line with a minimum length of 6 feet

Refer to vehicle manufacturer for specific test procedures for non related air dryer components.

***Teflon® is a registered trademark of E.I. DUPONT.**



Purge Valve Service Kit #235, Note: two (2) valves in dryer/1 per kit

Warning: Before proceeding read and follow safety precautions found on page 17. Review description of "Normal" Dual Turbo-2000 Air Dryer operation/cycle on page 50.

Symptom

1. Dryer won't exhaust during charge cycle.
2. Large air leak at exhaust port(s) during the charge mode.

Note: A light flow of air from one exhaust port during charge cycle is normal, regeneration air flow.

3. Pressure slow or no build.

Operational check

Symptom #1:

Start engine and build system pressure. If dryer does not exhaust, during the charge cycle, proceed as follows:

1. Check for blockage at exhaust port(s) of air dryer.
2. If item 1 OK, check and replace, if necessary, purge valve #235.

Note: Failure of dryer to exhaust could also be due to malfunctioning MLT Valve. Refer to page 64-66 for service procedure on this item.

Symptom #2 & #3:

Start engine and build air pressure. During the charge cycle, check for large air leak at exhaust port(s) of dryer. If large amount of air is leaking from exhaust port proceed as follows:

1. Check and replace, if necessary, purge valve #235.

Note: Large air leak could also be due to worn inlet check valve. Refer to page 56 for service on this valve.

Purge valve replacement (Two places)

1. Remove the two fasteners that attach the purge valve retainer. Remove the retainer.
2. Remove the purge valve assembly and o-ring from the purge cavity and discard.

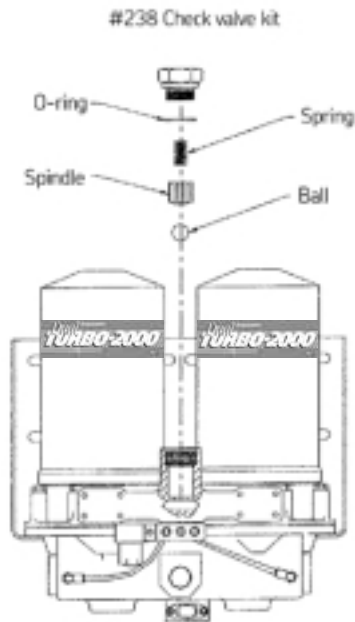
Note: If there is excessive oil in the cavity, compressor may require servicing.

3. Clean the cavity thoroughly.
4. Remove the three (3) o-rings from retainer and discard.
5. Using lubricant supplied, lightly grease the new o-rings.
6. Install on the retainer the two (2) larger o-rings then install the third (smaller) o-ring.
7. Apply a light coating of grease around the o-ring seat on valve assembly. Install the thin o-ring on the purge valve seat.
8. Insert valve assembly into cavity. Insure that valve exhaust port is aligned with air dryer exhaust port. Use care not to dislodge the o-ring from its seat.

Warning: If the air dryer purge valve port does not align with air dryer exhaust port, air dryer will not exhaust!

9. Install retainer.
10. Apply a light coating of grease on the threads of the two retainer bolts.
11. Install two retainer bolts. Tighten to 10-15 ft. lb.

Service procedures Dual Turbo-2000



Check Valve Service Kit #238

Warning: Before proceeding read and follow safety precautions found on page 17. Review description of "Normal" Dual Turbo-2000 Air Dryer operation/cycle on page 50.

Symptom

1. Air continually flows from exhaust port when compressor is in standby mode.
2. System/wet tank air pressure drops rapidly.

Operational check

Symptom #1 & #2

Start engine and build system air pressure to cutout pressure then shut off engine. Allow at least 90 seconds for dryer to cycle through regeneration cycle. Check for air leak at exhaust ports with soap/water solution. If air leak is detected replace check valve #238.

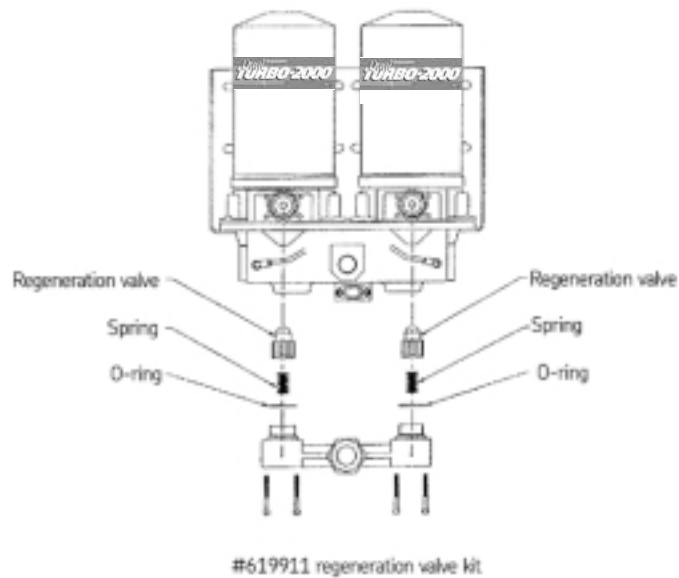
Check valve replacement

1. Relieve all system air pressure.
2. Disconnect air line from dryer outlet port.
3. Remove check valve nut.
4. Remove and discard o-ring, spring, spindle, and ball.
5. Clean nut and check valve cavity thoroughly.

Note: If there is excessive oil in the cavity the desiccant cartridges and filters require servicing.

6. Install new ball into cavity.
7. Install spindle, with spring pocket out, into cavity.
8. Place spring into spring pocket of spindle.
9. Apply a light coating of grease onto o-ring and place onto check valve nut.
10. Apply light coating of grease to nut threads. Install nut and tighten to 60 ft. lbs. torque.
11. Re-connect air line to outlet port.

Service procedures Dual Turbo-2000



Regeneration Valve Service Kit #619911, Note: two (2) valves in dryer/1 per kit

Warning: Before proceeding read and follow safety precautions found on page 17. Review description of "Normal" Dual Turbo-2000 Air Dryer operation/cycle on page 50.

Symptom

1. No purge air flow.

Note: A light flow of air from exhaust port(s) during charge cycle is normal, regeneration air flow.

2. Water in air tanks.

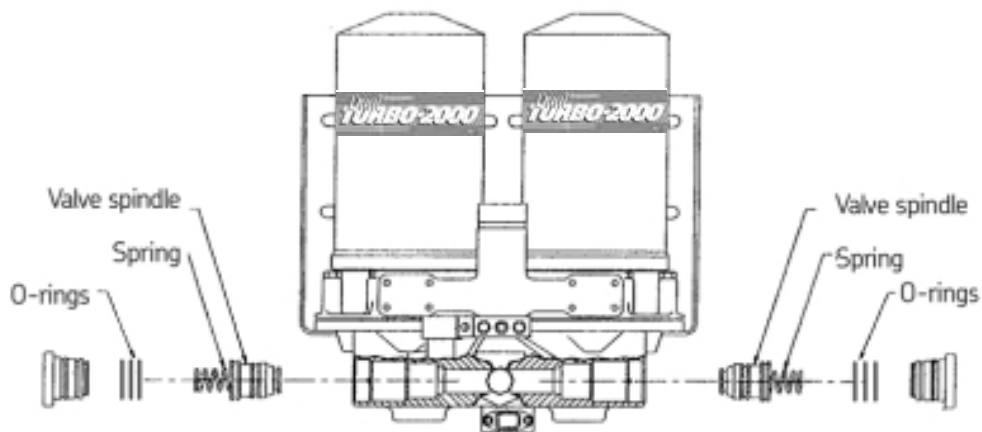
Operational check

Symptom #1 & #2:

Start engine and build air pressure. During the charge cycle (compressor pumping), check for air flow at exhaust port(s) of dryer. If no air flow is present replace regeneration valves #619911.

Regeneration valve replacement (two valves)

1. Disconnect air line from outlet port of air dryer.
2. Remove eight (8) socket head bolts fastening manifold to adaptor castings.
3. Remove manifold from adaptor castings.
4. Remove and discard o-rings, springs and regeneration valves.
5. Clean valve cavities in adaptor castings.
6. Position new valve spindles into cavities with spring pockets out.
7. Position springs into valves.
8. Lubricate new o-rings and install onto manifold bosses.
9. Position manifold onto adaptor castings ensuring o-rings are properly positioned in bores.
10. Install eight (8) socket head bolts and tighten to 50-60 in. lbs. Torque.
11. Reconnect air line to outlet port.



619938 Inlet check valve kit

Inlet Check Valve Service Kit #619938, Note: two (2) valves in dryer/1 per kit

Warning: Before proceeding read and follow safety precautions found on page 17. Review description of "Normal" Dual Turbo-2000 Air Dryer operation/cycle on page 50.

Symptom

1. Large air leak at exhaust port(s) during the charge mode.

Note: A light flow of air from one exhaust port during charge cycle is normal, regeneration air flow.

2. Pressure slow or no build.

Operational check

Symptom #1 & #2:

Start engine and build air pressure. During the charge cycle, check for large air leak at exhaust port(s) of dryer. If large amount of air is leaking from exhaust port, proceed as follows:

1. Check and replace, if necessary, inlet check valve #619915

Note: Large air leak could also be due to worn #235 Purge Valve. Refer to page 55 for service on this valve.

Inlet Check valve replacement (Two places)

1. Remove two 1/4" bolts that fasten the inlet check valve retainer to valve hsg. and removed retainer.
2. Remove the inlet check valve spindle from the inlet cavity and discard.

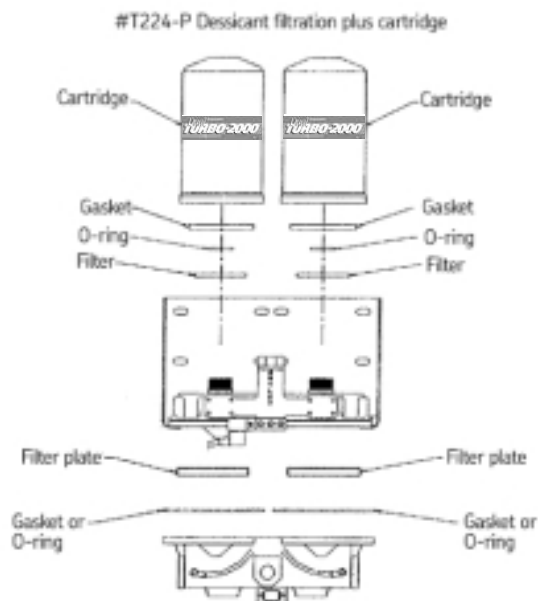
Note: If there is excessive oil in cavity, compressor may require servicing.

3. Clean the cavity thoroughly.
4. Remove two (2) or one (1) o-ring(s) from seal retainer.
5. Install new o-ring on seal retainer.

Note: Only one (1) o-ring is required for proper function. The one (1) o-ring must be in groove located closest to retainer flange.

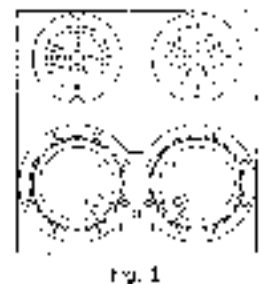
6. Lubricate all o-rings on new valve spindle and seal retainer before installing in housing.
7. Lubricate bores in valve housing.
8. Install valve spindle assembly into housing bore small end first and spring to outside as shown in drawing.
9. Make sure spindle is completely engaged in cavity and moves freely.
10. Install retainer.
11. Apply grease to threads of retainer bolts.
12. Install retainer bolts and tighten to 10-15 ft. lbs.

Service procedures Dual Turbo-2000



Desiccant Cartridge Service Kit #T224-P, Note: two (2) cartridges on dryer/1 per kit

Warning: Before proceeding read and follow safety precautions found on page 17



Operational check

Symptom

1. Regular service interval.
2. Water or contamination in tanks.

Symptom #1 & #2

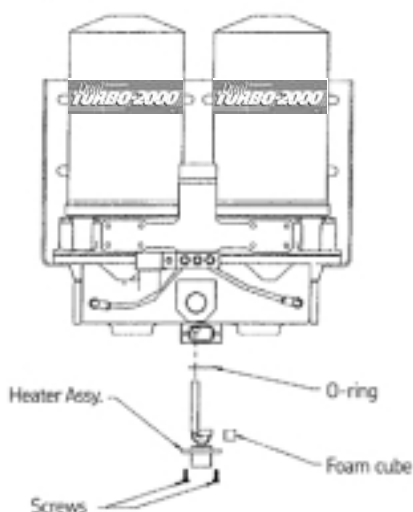
Desiccant cartridge requires regular servicing at intervals determined by compressor duty cycle or type of operating conditions. Typical service intervals are:

Inner City Transit	2 years
Inner City Refuse	2 years
Off Highway	2 years

Desiccant Cartridge, Filter Element and Internal Filter Plate Replacement

1. Relieve all system air pressure.
2. Disconnect heater lead wire from air dryer.
3. Disconnect air line from dryer inlet port.
4. Using a strap wrench, turn the desiccant cartridge counterclockwise and remove. Discard.
 - 4a. If cartridge spins without loosening, place a thin blade between cartridge gasket and base to break seal. If not,
 - 4b. strike cartridge with a center punch or ball nose at the lower end where the diameter is slightly larger. This binds components together.
5. Remove and discard o-ring from adapter plate studs and filter elements (if present).
6. Remove four (4) 3/8" allen head bolts located at top of adapter plate castings.
7. Remove twelve (12) 3/8" hex head bolts attaching bottom valve housing to adapter plate castings.
8. Remove bottom valve housing assembly.

9. Remove two filter plates, gaskets and o-rings (late model version only) and discard.
10. Clean valve housing sump, gasket surface and inside of two (2) adapter plate castings of oil and contaminants.
11. Place new gasket or o-ring at each valve housing bolt flange.
12. Place new filter plate into each valve housing cavity. Position filter plates in cavities, as shown in Fig. 1, with arrows pointed toward front of valve housing.
13. Re-install valve housing assembly to adapter plate castings.
14. Torque (16) bolts to 25-30 ft. lbs.
15. Clean top surface of adapter plates and threaded studs.
16. Position new filter element around each stud and onto adapter plate.
17. Using grease supplied, apply a light coating of grease onto o-ring. Install o-ring onto threaded studs.
18. **Important for easy removal:** Apply a generous coat of grease on the new desiccant cartridge gasket surface.
19. Thread new cartridge onto studs turning clockwise. When gasket contacts adapter plate, tighten cartridge $\frac{1}{2}$ turn. **Do not overtighten!**
20. Re-connect air line top air dryer inlet port.
21. Re-connect heater lead wire.



#619110 (12V) & 619111 (24V) heater kits

Heater Service Kit #619110 (12V) & #619111 (24V)

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer won't exhaust.
2. Exhaust port leak.
3. Cannot build pressure.

Operational check

Note: Thermostat must be cooled to at least 35 degrees F to perform test.

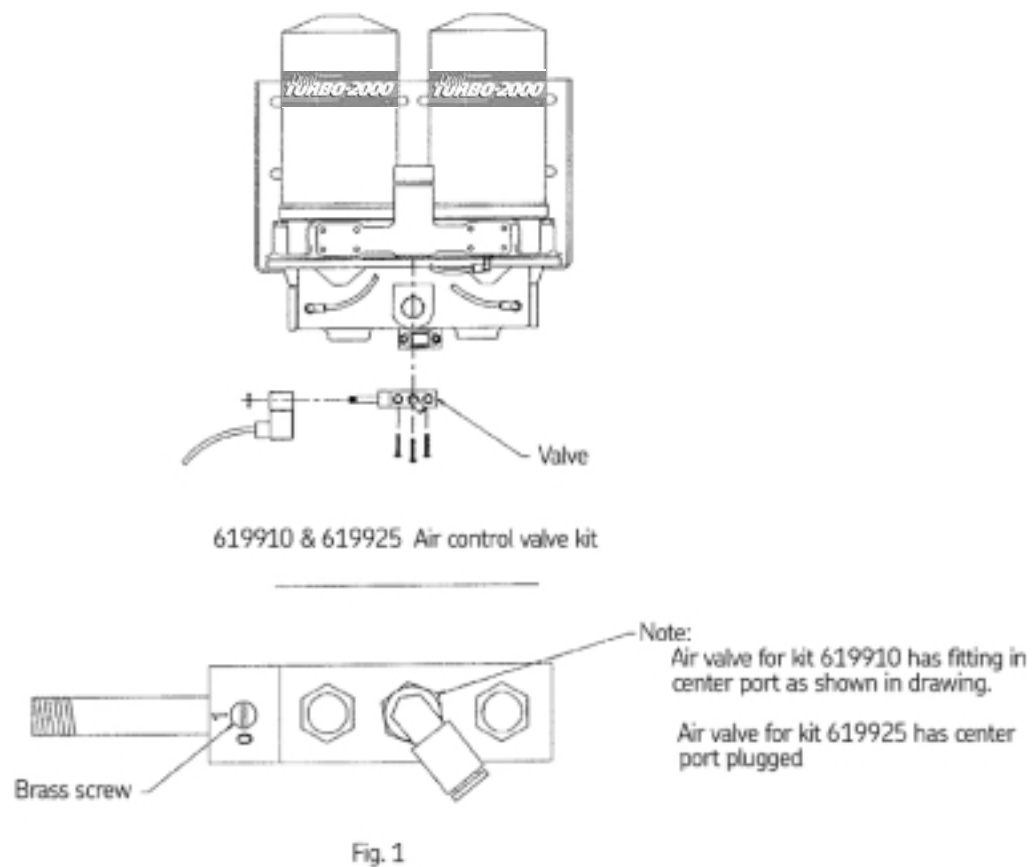
Conduct continuity test by using an Ohmmeter or Test Light. Attach one lead of test device to one terminal of heater connector and other lead of test device to other terminal of heater connector. The test light should light or Ohmmeter indicates continuity. If there is NO continuity, replace heater/thermostat assembly.

Heater assembly replacement

1. Disconnect heater lead wire.
2. Remove two screws attaching heater connector to casting.
3. Remove heater/thermostat assembly and discard.
4. Thoroughly clean entire heater/thermostat area.
5. Slide o-ring over heater and thermostat into position around connector flange.
6. Apply a light coating of anti-seize to the heater element and thermostat cavity.
7. Insert heater element into hole and twist slightly to spread anti-seize.
8. Place thermostat into position in cavity and ensure thermostat sits flat in cavity.
9. Place foam cube on top of thermostat and bring heater connector into position over cavity.
10. Secure heater connector using the (2) 8-32 x 1/2" screws.
11. Reconnect Metri-Pak connector to male plug.

Note: If heater lead wire with male plug needs to be replaced or is not in vehicle wire harness, it is available in Kit #619935.

Service procedures Dual Turbo-2000



Air Control Valve Service Kit #619910 & #619925

Warning: Before proceeding read and follow safety precautions found on page 17. Review description of "normal" Dual Turbo-2000 Air Dryer operation/cycle on page 50.

Symptom

1. Dryer won't exhaust during charge cycle to allow regeneration air flow at 90 second intervals.

Note: A light flow of air from ONE exhaust port during charge cycle is normal regeneration air flow.

2. Water in air tanks.

Operational check:

Drain tanks, check for excessive oil and water

Symptom #1 & #2

Start engine and begin building system air pressure. After approximately 90 seconds into charge cycle, an exhaust burst should occur from one exhaust port. If exhaust does not occur proceed as follows:

1. During the charge cycle, turn the brass screw located on air valve (see Fig. 1 on page 64), to the right (screw slot will be in horizontal position). If exhaust air burst does not occur, replace valve. If exhaust does occur, turn screw back to original position (screw slot must be in vertical position for normal operation) and proceed to step 2.
2. Failure of dryer to exhaust could also be due to malfunctioning purge valve or MLT. Refer to pages 50 & 55 respectively for service of these items.

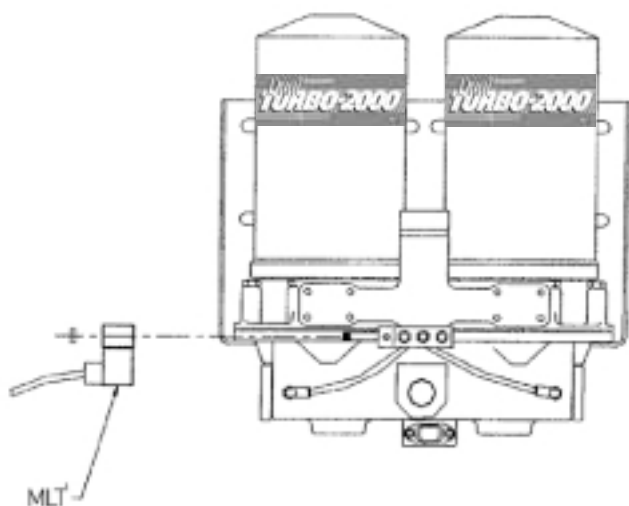
Air control valve replacement

1. Un-plug electrical connector from MLT/Valve.
2. Remove three (3) air lines (Kit #619910) or two (2) air lines (Kit #619925) connected to fittings in air valve (Ref. Fig 1 on page 64).
3. Remove retaining nut holding MLT assembly to valve stem and remove MLT assembly from valve. Set aside nut and MLT for later re-assembly.
4. Remove three (3) screws holding valve to manifold. Remove valve and discard.
5. Install air valve #619910 (three fittings) as follows:
 - a. Install three (3) push connect fittings to open ports of new air valve.
 - b. Secure air valve to manifold with three (3) screws. Torque screws to 15-20 in. lbs.
 - c. Re-connect air line from manifold to front port of air valve.
 - d. Re-connect two remaining air lines to back ports of valve.

OR

5. Install air valve #619925 (two fittings) as follows:
 - a. Install two (2) push connect fittings to open ports of new air valve.
 - b. Place small o-ring at small hole on top of valve body.
 - c. Position air valve against bottom of manifold, insuring the small o-ring fits into counter bore located on bottom of manifold.
 - d. Secure air valve to manifold with three (3) screws. Torque screws to 15-20 in. lbs.
 - e. Re-connect two air lines to back ports of valve.
6. Re-assemble MLT assembly to valve stem and secure with retaining nut.
7. Re-connect electrical plug to MLT.

Service procedures Dual Turbo-2000



Micro logic timer (MLT) kit
#619912 (12V) & # 619924 (24V)

Micro Logic Timer (MLT)

Service Kit: #619912 (12V), #619924 (24V)

Warning: Before proceeding read and follow safety precautions found on page 17. Review description of "normal" Dual Turbo-2000 Air Dryer operation/cycle on page 50.

Symptom

1. Dryer won't exhaust during charge cycle to allow regeneration air flow at 90 second intervals.

Note: A light flow of air from ONE exhaust port during charge cycle is normal regeneration air flow.

2. Water in air tanks.

Operational check

Symptom #1 & #2

Start engine and begin building system air pressure. After approximately 90 seconds into charge cycle, an exhaust air burst should occur from one exhaust port.

Note: No exhaust air burst will occur during compressor stand-by or non charge cycle. If exhaust air burst does not occur during charge cycle, proceed as follows:

1. Insure that power is present at MLT connector and that all electrical connections are properly connected.

Note: MLT is polarity sensitive and will not operate if power (+) and ground (-) leads are switched. The MLT energizes and de-energizes air valve at 90 second intervals. An indicator light on MLT will be on during energize cycle and off during de-energized cycle. If all electrical connections are good replace MLT.

2. Failure of dryer to exhaust could also be due to malfunctioning purge valve and Air Control Valve. Refer to pages 55 and 64 respectively for service of these items.

MLT Replacement

1. Un-plug electrical lead wire from MLT connector.
2. Remove retaining nut holding MLT to valve stem and remove MLT from valve. Set aside nut for later re-assembly.
3. Re-assemble new MLT to valve stem and secure with retaining nut.
4. Re-connect electrical plug to MLT.

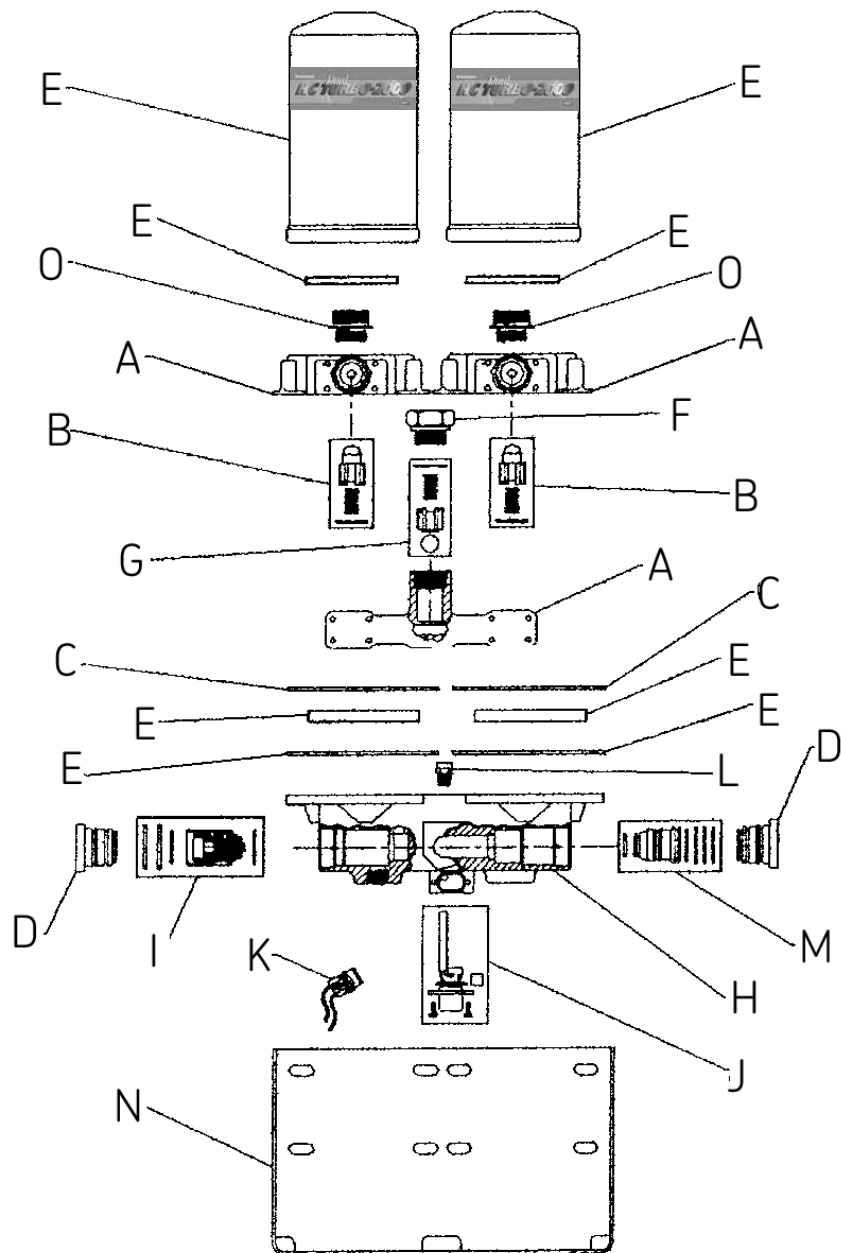
Dual Turbo-2000 Notes:

H.C. Dual Turbo-2000 parts list

Component identification		
A	619933	Manifold/mid-section assembly (with valves)
B	619913	Regeneration valve kit Note: Two valves per dryer, one on either side
C	610077	Body gasket
D	610069	Seal retainer Note: Four retainers per dryer, two on either side
E	T224-P	Desiccant cartridge with Filtration Plus
F	619928	Check valve nut
G	238	Check valve kit
H	619972	Valve housing, complete w/valves, 12V heater & housing bolts
	619974	Valve housing, complete w/valves, 24V heater & housing bolts
I	235	Purge valve kit Note: Two valves per dryer, one on either side
J	619110	12 Volt heater kit
	619111	24 Volt heater kit
K	619900	Wire harness
L	619740	Safety valve (200 psi)
M	619938	Inlet check valve kit Note: Two valves per dryer, one on either side
N	619980	Mounting bracket
O	619140	Cartridge stud
	619973	Control line service kit (not shown)
	619979	Service kit contains (2) T224-P, (2) 235, (2) 619938, (1) 238, (1) 619111, (1) 619740 & (12) housing bolts
Bold part numbers represent suggested stock service components		

Air dryer part number description	
620930	24 V DLU application w/o purge tanks; min 600 cu.in. purge volume required
620980	12 V with 2 #221 purge tanks
620982	12 V without purge tanks; min 600 cu.in. purge volume required
620984	24 V without purge tanks; min 600 cu.in. purge volume required
620986	24 V with 2 #221 purge tanks
619228	Purge tank kit w/690 cu.in. purge volume

H.C. Dual Turbo-2000 service schematic



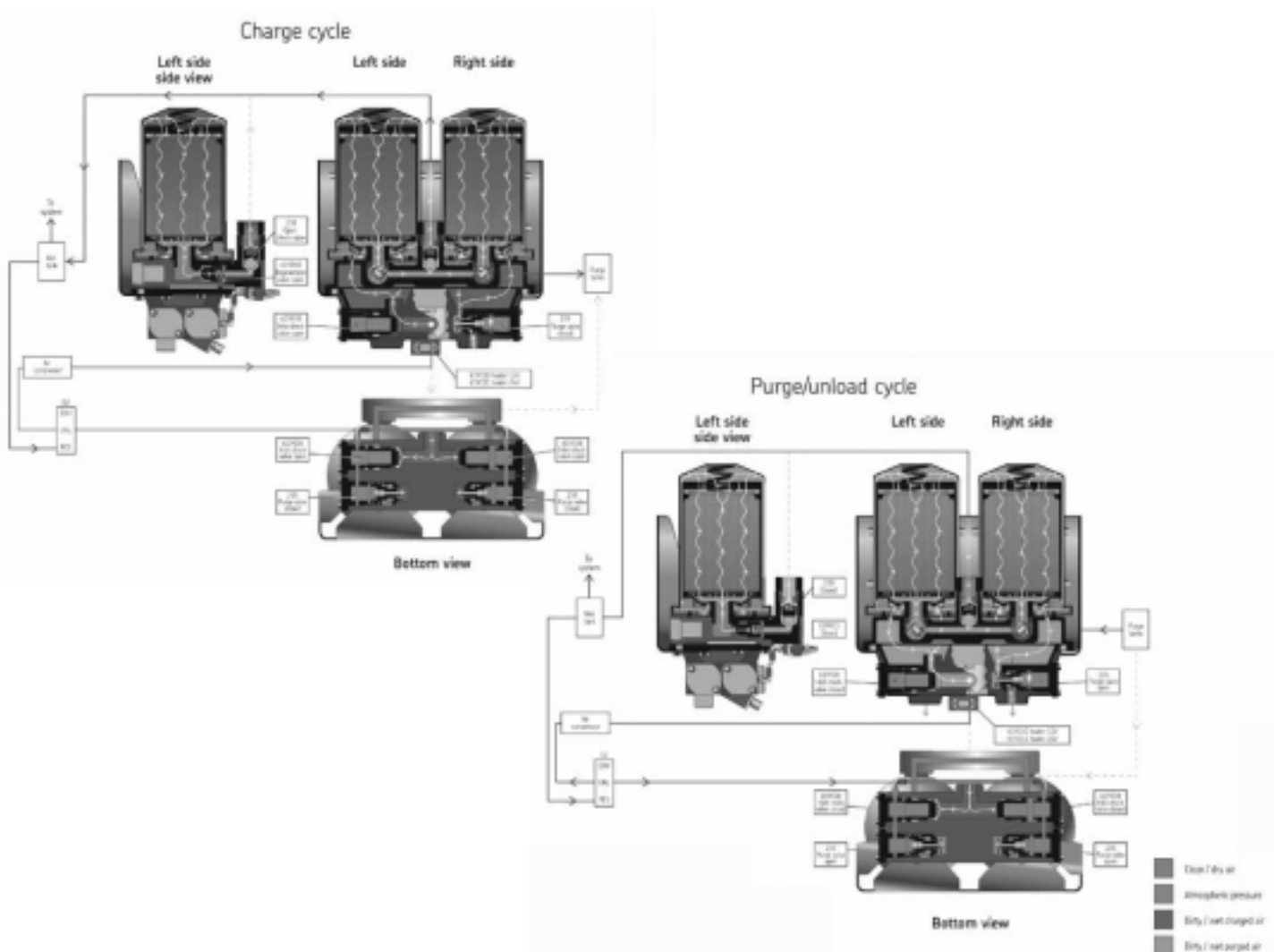
H.C. Dual Turbo-2000 normal operation / cycles – use with high output compressors

Air flows from the compressor into the air dryer. Air flows past filters and both desiccant beds stripping moisture and contaminants from air and exits dryer to the purge tank(s) and to the wet tank. If two purge tanks are used, T air lines to allow air to flow to both tanks simultaneously. The reservoir line from the wet tank to the governor is always pressurized.

When pressure reaches cut-out (typically 120-125 psi), the governor sends air signal through the governor line to the air dryer opening both purge valves and closing both inlet check valves. The check valve is closed via back pressure from wet tank. Then, air in the purge tank(s) re-enters the dryer and passes through both desiccant beds taking away moisture and is expelled out bottom exhaust ports of air dryer. Turbo boost from the compressor is checked at inlet check valve of dryer.

When the pressure drops to cut-in (typically 90-95 psi), the air in the UNL line evacuates out the exhaust port of the governor closing purge valves and opening inlet check valves and once again air flows from the compressor into the air dryer.

SKF Brakemaster® H.C. Dual Turbo-2000 air dryer service schematic



Trouble-shooting H.C. Dual Turbo-2000

See Dual Turbo-2000 trouble-shooting for Dual Turbo-2000 on page 51

Review H.C. Dual Turbo-2000 normal operation / cycles prior to trouble-shooting on page 70

Problem: air continually leaks from the exhaust port during compressor standby mode	
Possible cause	Remedy
Worn check valve	Clean cavity and replace check valve assembly #238
Worn inlet check valves	Clean cavity and replace inlet check valve assemblies #619938
Worn purge valve seals	Clean cavity and replace purge valve assemblies #235

2

Problem: system air pressure drops rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
Worn inlet check valves	Clean cavity and replace inlet check valve assembly #619938
Worn purge valve seals	Clean cavity and replace purge valve assemblies #235

Problem: air compressor moves into the standby mode but cycles rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
Worn inlet check valves	Clean cavity and replace inlet check valve assemblies #619938
D2 governor malfunctioning	Replace governor
Worn purge valve seals	Clean cavity and replace purge valve assemblies #235

Problem: air leaks from the exhaust port during compressor charge mode	
Possible cause	Remedy
Worn purge valves	Clean cavities and replace purge valve assemblies #235
Dirt/foreign material is stuck in the purge valves	Clean cavity and replace valve assemblies #235
D2 governor malfunctioning	Replace D2 governor
Heater assembly malfunctioning (>32 degrees)	Replace heater assembly #619110(12V) or #619111(24V)

Problem: air compressor runs continuously (system pressure will not build)	
Possible cause	Remedy
Fittings are loose or damaged	Tighten or replace loose or damaged fittings
Air reservoir, tubing, or hoses are damaged	Repair or replace damaged items
The air compressor needs to be serviced or replaced	Rebuild or replace the air compressor
Worn purge valves	Clean cavity and replace the purge valve assemblies #235
The air compressor capacity is too low for vehicle	Install larger air compressor
Line between governor and air compressor is blocked	Replace the line or remove the blockage
The safety valve is malfunctioning	Replace the safety valve #619740
Ice has formed in the purge valve	Replace heater assembly #619110(12V) or #619111(24V)
D2 governor malfunctioning	Replace D2 governor

Problem: air dryer does not exhaust during compressor standby mode	
Possible cause	Remedy
The line between the air governor and the air dryer control port is missing, leaking, or damaged	Install or replace the air line, or tighten the fittings
Worn purge valves	Clean cavity and replace purge valve assemblies #235
Ice has formed in the purge valve	Replace heater assembly #619110(12V) or #619111(24V)
Heater is malfunctioning	Replace heater assembly #619110(12V) or #619111(24V)
Purge valve sleeves are misaligned	Align purge valve sleeves

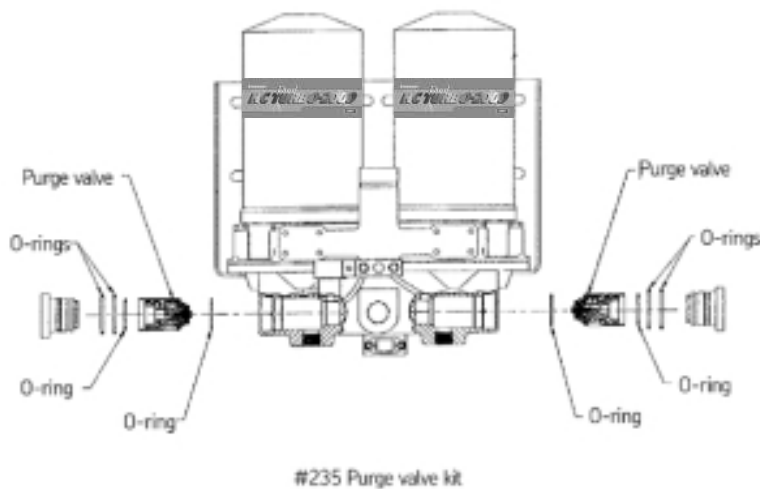
Problem: safety valve opens	
Possible cause	Remedy
Air dryer check valve is blocked	Clean cavity and replace check valve assembly #238
Air brake system is blocked down stream of air dryer	Remove blockage or replace the necessary components
Air compressor governor malfunctioning	Replace compressor D2 governor
Blocked desiccant cartridge	Replace cartridge #T224-P*
The safety valve is malfunctioning	Replace the safety valve #619740

*Air compressor service may be required to address excessive oil blow-by.

Problem: water accumulation in air system (tanks)	
Possible cause	Remedy
Desiccant is contaminated	Replace both desiccant cartridges #T224-P
The air compressor capacity is too low for vehicle	Install larger air compressor and replace desiccant cartridges #T224-P
Malfunctioning regeneration valves	Clean cavity and replace regeneration valve assemblies #619913
The line between the purge tank and the air dryer control port is missing, leaking, or damaged	Install or replace the air line, or tighten the fittings
Line between the compressor and air dryer too short	Fit new line with a minimum length of 6 feet copper line or (insufficient pre-cool) 12 feet of steel braided Teflon®*

Refer to vehicle manufacturer for specific test procedures for non related air dryer components.

* Teflon® is a registered trademark of E.I. DuPont.



Purge Valve Service Kit #235

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer won't exhaust
2. Air leak at exhaust ports during the:
 - a) Charge mode
 - b) Stand-by mode
3. Slow or no pressure build
4. Compressor cycles rapidly

Operational check

Symptom #1:

Start engine and build to cutout pressure. If dryer does not exhaust proceed as follows:

1. Check for air pressure in line connecting D2 governor to T-fitting on air dryer. If no pressure is present in line, service D2 governor.
2. Check for blockage at exhaust ports of air dryer.
3. If items 1 and 2 are OK, replace both purge valves #235.

Note: No exhaust could also be an obstructed regeneration valve #619913.

Symptom #2A & #3:

Start engine and build air pressure. During the charge cycle, check for air leaking at exhaust ports of dryer. If air is leaking from one or both exhaust ports proceed as follows:

1. No air pressure should be present in line connecting D2 governor and dryer purge valve during charge cycle. If there is, service D2 governor.
2. If item 1 is OK, replace one or both purge valves #235

Symptom #2B & #4:

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace one or both purge valves #235.

Note: Air discharge could also be due to worn check valve or inlet check valve. There are two inlet check valves.

Purge valve replacement

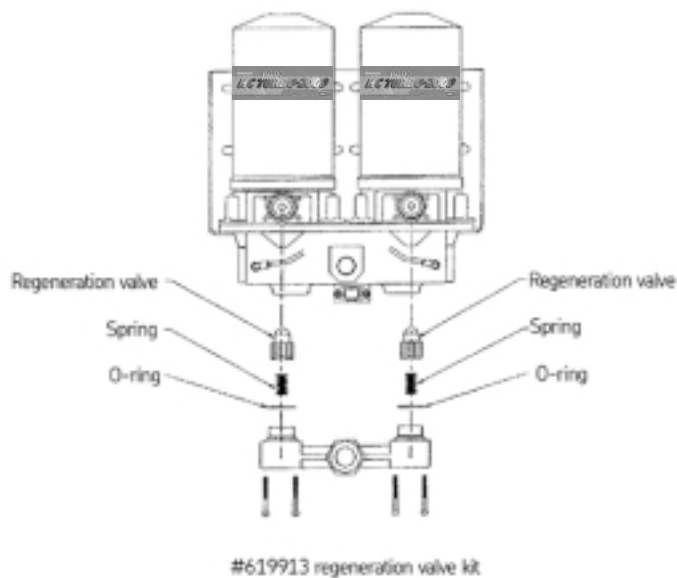
1. Disconnect air line at each control port.
2. Remove the two fasteners that attach the purge valve retainer. Remove the retainer.
3. Remove the purge valve assembly from the purge cavity and discard.

Note: If there is excessive oil in the cavity, compressor may require servicing.

4. Clean the cavity thoroughly.
5. Remove the three (3) o-rings from retainer and discard.
6. Using lubricant supplied, lightly grease the new o-rings.
7. Install on the retainer the two- (2) thickest o-rings then install the third (thinner) o-ring.
8. Install the new filter screen in the purge cavity open end out.
9. Apply a light coating of grease around the o-ring seat on valve assembly. Install the thin o-ring on the purge valve seat.
10. Aligning the valve exhaust port with the air dryer exhaust port, install the purge valve assembly. Use care not to dislodge the o-ring from its seat.

Warning: If the air dryer purge valve port does not align with air dryer exhaust port, air dryer will not exhaust!

11. Install retainer.
12. Apply a light coating of grease on the threads of the two retainer bolts.
13. Install two retainer bolts. Tighten to 10-15 ft. lb.
14. Reconnect the control line to air dryer control port.



Regeneration Valve Service Kit #619913

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Water in tanks.
2. No purge air flow.

Operational check

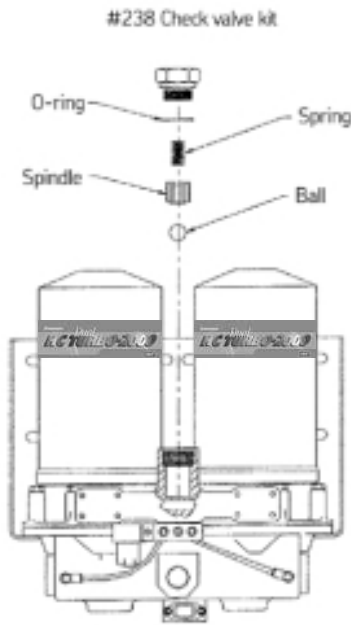
Symptom #1 & #2:

Start engine and build to cut-out pressure. Stop engine. After initial exhaust, air should flow with decreasing intensity out both exhaust ports for approximately 45 seconds. If air fails to flow, replace the affected regeneration valve kit #619913.

Note: Water in tanks could also be due to worn purge valve, or T-224-P dessicant cartridges are ready for service. No purge air could be attributed to governor or purge valve.

Regeneration valve replacement (two valves)

1. Disconnect air line from outlet port of air dryer.
2. Remove eight (8) socket head bolts fastening manifold to adaptor castings.
3. Remove manifold from adaptor castings.
4. Remove and discard o-rings, springs and regeneration valves.
5. Clean valve cavities in adaptor castings.
6. Position new valve spindles into cavities with spring pockets out.
7. Position springs into valves.
8. Lubricate new o-rings and install onto manifold bosses.
9. Position manifold onto adaptor castings ensuring o-rings are properly positioned in bores.
10. Install eight (8) socket head bolts and tighten to 50-60 in. lbs. Torque.
11. Reconnect air line to outlet port.



Check Valve Service Kit #238

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer frequently exhausts.
2. Air continually flows from exhaust port when compressor is in standby mode.
3. Wet tank pressure drops rapidly.

Operational check

Symptom #1, #2, & #3:

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace check valve #238.

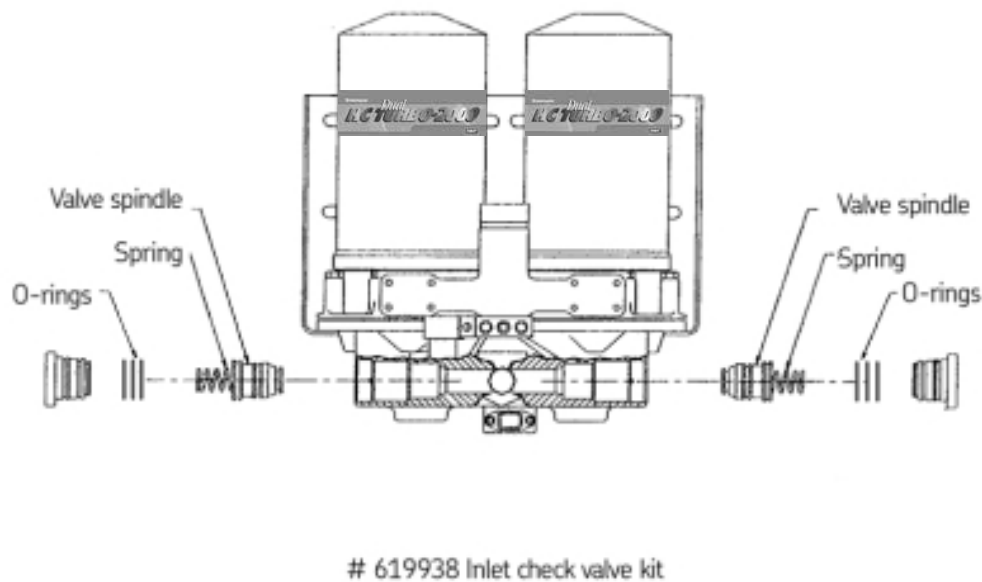
Note: Air discharge could also be due to worn purge valve or inlet check valve. The affected inlet check valve would be located on side of air dryer.

Check valve replacement

1. Drain air system.
2. Disconnect air line from outlet port.
3. Remove check valve nut.
4. Remove and discard o-ring, spring, spindle, and ball.

Note: If there is excessive oil in the check valve cavity, compressor may require servicing.

5. Clean nut and cavity area.
6. Install new ball in cavity. Next, position spindle with spring pocket facing out. Install spring.
7. Using grease supplied, apply a light coating on o-ring. Install o-ring on nut.
8. Apply a light coating of grease to threads of nut. Install nut and tighten to 60 ft. lb.
9. Re-connect air line to air dryer outlet port.



Inlet Check Valve Service Kit #619938, Note: two (2) valves in dryer/1 per kit

Warning: Before proceeding read and follow safety precautions found on page 17.

Symptom

1. Air leak at exhaust port(s) during the charge mode.
2. Pressure slow or no build.

Operational check

Symptom #1 & #2:

Start engine and build air pressure. During the charge cycle, check for air leak at exhaust port(s) of dryer. If air is leaking from exhaust port, proceed as follows:

1. Check and replace, if necessary, inlet check valve #619938

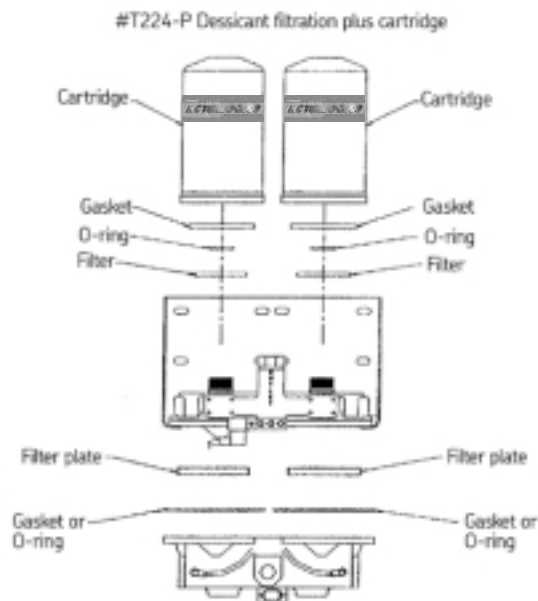
Note: Air leak could also be due to worn #235 Purge Valve. Refer to page 74 for service on this valve.

Inlet Check valve replacement (Two places)

1. Remove two 1/4" bolts that fasten the inlet check valve retainer to valve hsg. and removed retainer.
2. Remove the inlet check valve spindle from the inlet cavity and discard.

Note: If there is excessive oil in cavity, compressor may require servicing.

3. Clean the cavity thoroughly.
4. Remove two (2) or one (1) o-ring(s) from seal retainer.
5. Install new o-rings on seal retainer. Three (3) o-rings are required.
6. Lubricate all o-rings on new valve spindle and seal retainer before installing in housing.
7. Lubricate bores in valve housing.
8. Install valve spindle assembly into housing bore small end first and spring to outside as shown in drawing.
9. Make sure spindle is completely engaged in cavity and moves freely.
10. Install retainer.
11. Apply grease to threads of retainer bolts.
12. Install retainer bolts and tighten to 10-15 ft. lbs.



Desiccant Cartridge Service Kit #T224-P, Note: two (2) cartridges on dryer/1 per kit

Warning: Before proceeding read and follow safety precautions found on page 17



Fig. 1

Operational check

Symptom

1. Regular service interval.
2. Water or contamination in tanks.

Symptom #1 & #2

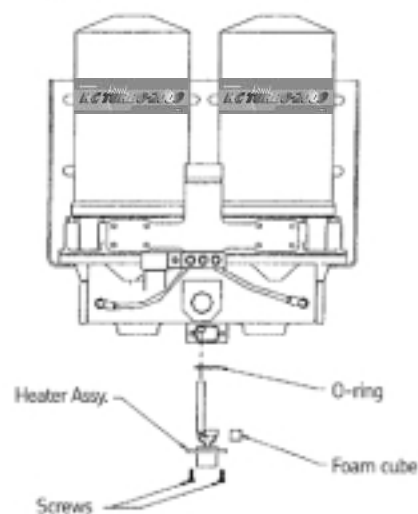
Dessicant cartridge requires regular servicing at intervals determined by compressor duty cycle or type of operating conditions. Typical service intervals are:

Inner City Transit	2 years
Inner City Refuse	2 years
Off Highway	2 years

Desiccant Cartridge, Filter Element and Internal Filter Plate Replacement

1. Relieve all system air pressure.
2. Disconnect heater lead wire from air dryer.
3. Disconnect air line from dryer inlet port.
4. Using a strap wrench, turn the desiccant cartridge counterclockwise and remove. Discard.
 - 4a. If cartridge spins without loosening, place a thin blade between cartridge gasket and base to break seal. If not,
 - 4b. strike cartridge with a center punch or ball nose at the lower end where the diameter is slightly larger. This binds components together.
5. Remove and discard o-ring from adapter plate studs and filter elements (if present).

6. Remove four (4) 3/8" allen head bolts located at top of adapter plate castings.
7. Remove twelve (12) 3/8" hex head bolts attaching bottom valve housing to adapter plate castings.
8. Remove bottom valve housing assembly.
9. Remove two filter plates, gaskets and o-rings (late model version only) and discard.
10. Clean valve housing sump, gasket surface and inside of two (2) adapter plate castings of oil and contaminants.
11. Place new gasket or o-ring at each valve housing bolt flange.
12. Place new filter plate into each valve housing cavity. Position filter plates in cavities, as shown in Fig. 1, with arrows pointed toward front of valve housing.
13. Re-install valve housing assembly to adapter plate castings.
14. Torque (16) bolts to 25-30 ft. lbs.
15. Clean top surface of adapter plates and threaded studs.
16. Position new filter element around each stud and onto adapter plate.
17. Using grease supplied, apply a light coating of grease onto o-ring. Install o-ring onto threaded studs.
18. **Important for easy removal:** Apply a generous coat of grease on the new desiccant cartridge gasket surface.
19. Thread new cartridge onto studs turning clockwise. When gasket contacts adapter plate, tighten cartridge 1/2 turn. **Do not overtighten!**
20. Re-connect air line top air dryer inlet port.
21. Re-connect heater lead wire.



#619110 (12V) & 619111 (24V) heater kits

Heater Service Kit #619110 (12V) & #619111 (24V)

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer won't exhaust.
2. Exhaust port leak.
3. Cannot build pressure.

Operational check

Note: Thermostat must be cooled to at least 35 degrees F to perform test.

Conduct continuity test by using an Ohmmeter or Test Light. Attach one lead of test device to one terminal of heater connector and other lead of test device to other terminal of heater connector. The test light should light or Ohmmeter indicates continuity. If there is NO continuity, replace heater/thermostat assembly.

Heater assembly replacement

1. Disconnect heater lead wire.
2. Remove two screws attaching heater connector to casting.
3. Remove heater/thermostat assembly and discard.
4. Thoroughly clean entire heater/thermostat area.
5. Slide o-ring over heater and thermostat into position around connector flange.
6. Apply a light coating of anti-seize to the heater element and thermostat cavity.
7. Insert heater element into hole and twist slightly to spread anti-seize.
8. Place thermostat into position in cavity and ensure thermostat sits flat in cavity.
9. Place foam cube on top of thermostat and bring heater connector into position over cavity.
10. Secure heater connector using the (2) 8-32 x1/2" screws.
11. Reconnect Metri-Pak connector to male plug.

Note: If heater lead wire with male plug needs to be replaced or is not in vehicle wire harness, it is available in Kit #619935.

H.C. Dual Turbo-2000 Notes:

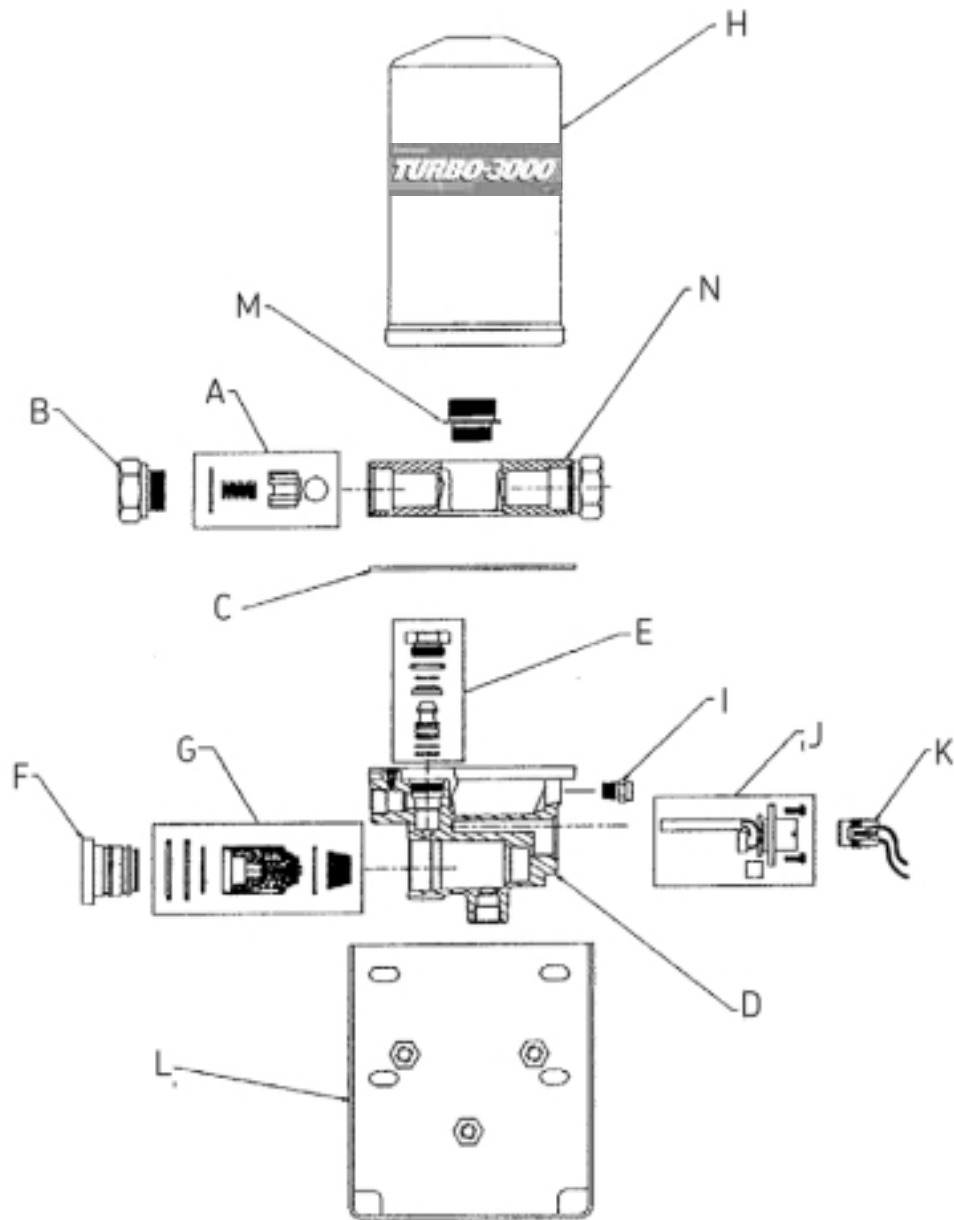
Turbo-3000 parts list

Component identification		
A	238	Check valve kit
B	610236	Check valve nut
C	610077	Body gaskets
D	619086 619112 619087 619113	Bottom cap assembly 12V STD Bottom cap assembly 12V E-Type Bottom cap assembly 24 STD Bottom cap assembly 24 E-Type
E	228	Turbo valve kit
F	610069	Seal retainer
G	235	Purge valve kit
H	T334	Desiccant cartridge kit
I	610024	Safety valve (175 psi)
J	248 12V 75W 249 24V 75W	Heater kit early models (Orange and blue wires)
J	619110 12V 75W 619111 24V 75W	Heater kit late models (Plug style connection)
K	619900	Wire harness
L	619115	Mounting bracket
M	619140	Cartridge stud kit
N	619091 619093	Mid-section with valves STD Mid-section with valves E-Type
Bold part numbers represent suggested stock service components		

Dryer part number description		
STD	E Type*	Description
620640	620540	Dryer 12V
620642	620542	Dryer 24V
*Holset SS E-Type and QE compressor		

▲For right-hand models see parts list on pages 139 & 140.

Turbo-3000 service schematic

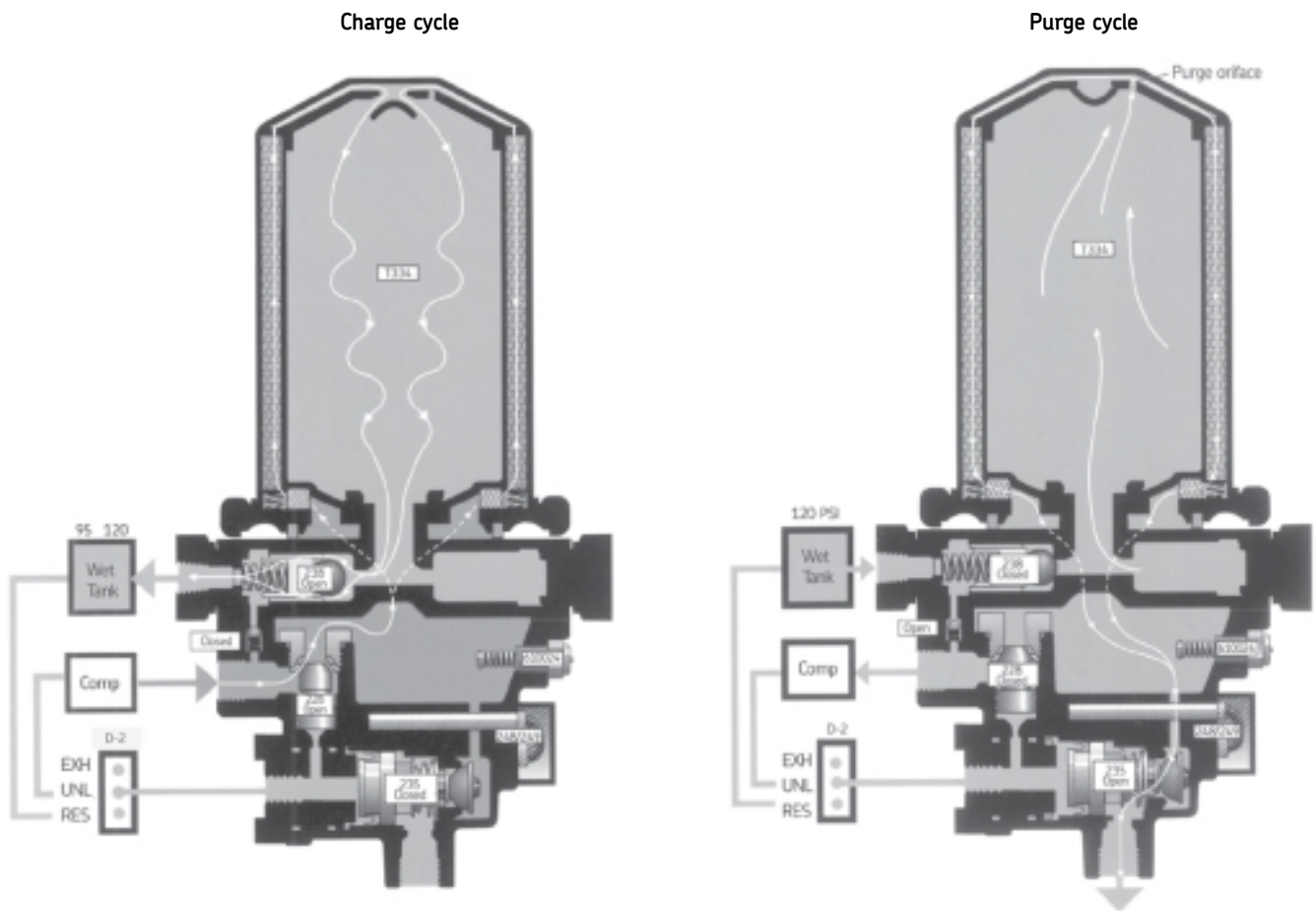


Turbo-3000 normal operation/cycles – light duty applications only

Air flows from the compressor into the air dryer. Air flows past filters and desiccant bed stripping moisture and contaminants from air and exits dryer to the wet tank. The reservoir line from the wet tank to governor is always pressurized.

When pressure reaches cut-out (typically 120-125 psi), the governor sends an air signal through the governor line to the air dryer opening the purge valve and closing the turbo valve. The check valve is closed via back pressure from the wet tank. Then, regeneration air contained in cartridge passes through the desiccant bed taking away moisture and is expelled out bottom of air dryer. Turbo boost from the compressor is checked at inlet of dryer with closed turbo valve. E-Type dryers provide back pressure to the compressor during stand-by. This feature is not intended for use for any compressor other than Holset E-Type compressors.

When the pressure drops to cut-in (typically 90-95 psi), the air in the UNL line evacuates out the exhaust port of the governor closing purge valve and opening turbo valve and once again flows from the compressor into the air dryer.



■ Clean/dry air ■ Atmospheric pressure ■ Dirty/wet charged air ■ Dirty/wet purged air

Note: Approx. 95PSI gov cut in, 120PSI gov cut out

Trouble-shooting Turbo-3000 dryer

Review Turbo-3000 normal operation / cycles prior to trouble-shooting on page 86

Problem: air continually leaks from the exhaust port in compressor standby mode	
Possible cause	Remedy
Worn check valve	Clean cavities and replace check valve assembly #238
Worn turbo valve	Clean cavities and replace turbo valve assembly #228
Worn purge valve seal	Clean cavities and replace purge valve assembly #235

Problem: system air pressure drops rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
Worn turbo valve	Clean cavity and replace turbo valve assembly #228
Worn purge valve seal	Clean cavity and replace purge valve assembly #235

Problem: air compressor goes into the standby mode but cycles rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
Worn turbo valve	Clean cavities and replace turbo valve assembly #228
D2 governor malfunctioning	Replace D2 governor
Worn purge valve seal	Clean cavity and replace the purge valve assembly #235

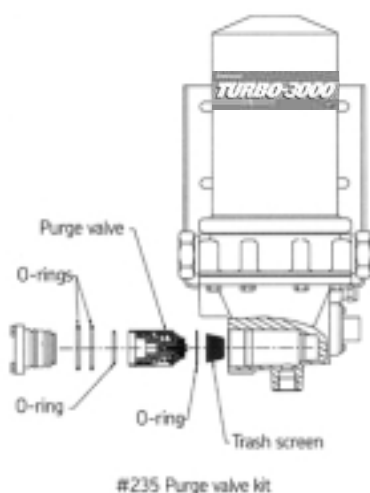
Problem: air leaks from the exhaust port during compressor charge mode	
Possible cause	Remedy
Worn purge valve	Clean cavity and replace the purge valve assembly #235
Dirt/foreign material is stuck in purge valve	Clean cavity and replace the purge valve assembly #235
D2 governor malfunctioning	Replace D2 governor
Heater assembly malfunctioning (>32° F)	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)

Problem: air compressor runs continuously (system pressure will not build)	
Possible cause	Remedy
Fittings are loose or damaged	Tighten or replace loose or damaged fittings
Air reservoir, tubing, or hoses are damaged	Repair or replace damaged items
Air compressor needs to be serviced or replaced	Rebuild or replace the air compressor
Worn purge valve	Clean cavities and replace the purge valve assembly #235
Air compressor capacity is too low for vehicle	Install larger air compressor and upgrade to Turbo-2000
Air line between governor and air compressor is blocked	Replace the line or remove the blockage
The safety valve is malfunctioning	Replace the safety valve #610024
D2 governor malfunctioning	Replace D2 governor
Ice has formed in the purge valve	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)

Problem: air dryer does not exhaust during compressor standby mode	
Possible cause	Remedy
Line between the air governor and the dryer control port is missing, leaking or damaged	Install or replace the air line or tighten the fittings
Worn purge valve	Clean cavity and replace purge valve assembly #235
Ice has formed in the purge valve	Replace heater assembly #246(12V), 247(24V), 248(12V) 249(24V), 619110(12V) or 619111(24V)
Heater is malfunctioning	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)
Purge valve sleeve is misaligned	Align purge valve sleeve

Problem: the safety valve opens	
Possible cause	Remedy
The air dryer check valve is blocked	Clean cavity and replace the check valve assembly #238
The air system is blocked down stream from the air dryer	Remove blockage or replace necessary components
Malfunctioning D2 governor	Replace the D2 governor
Blocked desiccant cartridge	Replace cartridge #T334
The safety valve is malfunctioning	Replace the safety valve #610024

Problem: water accumulation in air system (tanks)	
Possible cause	Remedy
Desiccant is contaminated	Replace desiccant cartridge #T334 or upgrade to Turbo-2000
Air compressor capacity is too low for vehicle	Install larger air compressor and upgrade to Turbo-2000
Line length between the compressor and air dryer (insufficient pre-cool)	Fit new line with a minimum length of 6 feet copper or 12 feet of steel braided Teflon®
Air dryer capacity is too low for compressor	Upgrade to Turbo-2000 Note: Turbo-3000 is rated up to 15 cfm
Refer to vehicle manufacturer for specific test procedures for non related air dryer components.	



Purge Valve Service Kit #235

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer won't exhaust.
2. Air leak at exhaust port during the:
 - a) Charge mode
 - b) Stand-by mode
3. Pressure slow or no build.
4. Compressor cycles rapidly.

Operational check

Symptom #1:

Start engine and build to cutout pressure. If dryer does not exhaust proceed as follows:

1. Check for air pressure in line connecting D2 governor to control port of air dryer. If no pressure is present in line, service D2 governor.
2. Check for blockage at exhaust port of air dryer.
3. If items 1 and 2 are OK, replace purge valve #235.

Symptom #2A & #3:

Start engine and build air pressure. During the charge cycle check for air leaking at exhaust port of dryer. If air is leaking from exhaust port, proceed as follows:

1. No air pressure should be present in line connecting D2 governor and control port during charge cycle. If there is, service D2 governor.
2. If item 1 is OK, replace purge valve #235.

Symptom #2B & #4:

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace purge valve #235.

Note: Air discharge could also be due to worn check valve or turbo valve. Refer to pages 92 and 93 for service procedures on these valves.

Purge valve replacement

1. Disconnect air line at control port.
2. Remove the two fasteners that attach the purge valve retainer. Remove the retainer.
3. Remove the purge valve assembly from the purge cavity and discard.

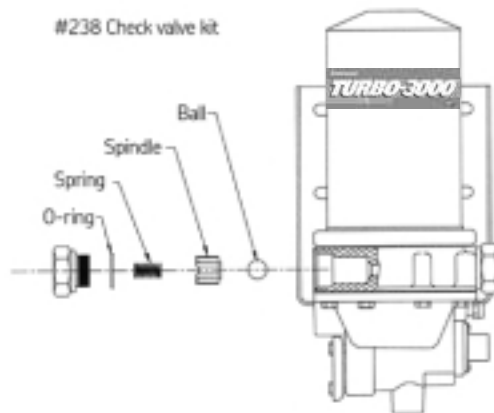
Note: If there is excessive oil in the cavity, compressor may require servicing and/or upgrade to Turbo-2000.

4. Clean the cavity thoroughly.
5. Remove the three (3) o-rings from retainer and discard.
6. Using lubricant supplied, lightly grease the new o-rings.
7. Install on the retainer the two (2) thickest o-rings then install the third (thinner) o-ring.
8. Install the new filter screen in the purge cavity open end out.
9. Apply a light coating of grease around the o-ring seat on valve assembly. Install the thin o-ring on the purge valve seat.
10. Aligning the valve exhaust port with the air dryer exhaust port, install the purge valve assembly. Use care not to dislodge the o-ring from its seat.

Warning: If the air dryer purge valve port does not align with air dryer exhaust port, air dryer will not exhaust!

11. Install retainer.
12. Apply a light coating of grease on the threads of the two retainer bolts.
13. Install two retainer bolts. Tighten to 10-15 ft. lb.
14. Reconnect air line to control port.

Service procedures Turbo-3000



Check Valve Service Kit #238

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer frequently exhausts.
2. Air continually flows from exhaust port when compressor is in standby mode.
3. Wet tank pressure drops rapidly.

Note: The above symptoms could also lead to turbo valve replacement. A malfunctioning turbo valve will tend to allow pressure to drop to cut-in pressure within seconds on E-Type style air dryers.

Operational check

Symptoms #1, #2, #3

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace check valve #238.

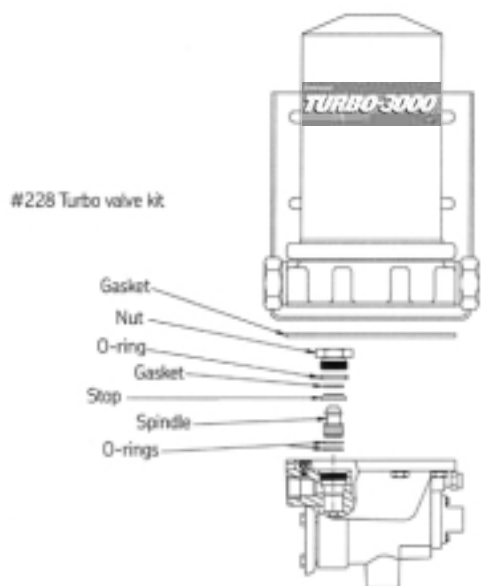
Note: Air discharge could also be due to worn purge valve or turbo valve.

Check valve replacement

1. Drain air system.
2. Disconnect air line from outlet port.
3. Remove check valve nut.
4. Remove and discard o-ring, spring, spindle, and ball.

Note: If there is excessive oil in the check valve cavity, compressor may require servicing.

5. Clean nut and cavity area.
6. Install new ball in cavity. Next, position spindle with spring pocket facing out. Install spring.
7. Using grease supplied, apply a light coating on o-ring. Install o-ring on nut.
8. Apply a light coating of grease to threads of nut. Install nut and tighten to 60 ft. lb.
9. Re-connect air line to air dryer outlet port.



Turbo Valve Service Kit #228

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer frequently exhausts.
2. Air continually flows from exhaust port when compressor is in standby mode.
3. System pressure drops very rapidly.

Note: The above symptoms could also lead to Check valve replacement.

Operational check

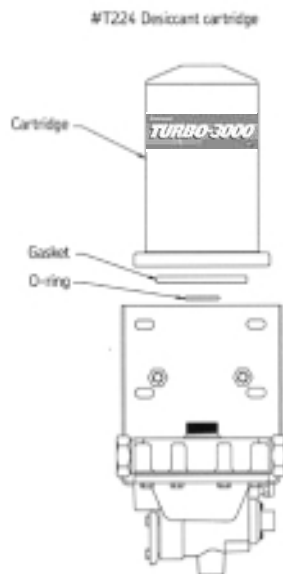
Symptom #1, #2 & #3

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace turbo valve #228.

Note: Air discharge could also be due to worn purge valve or check valve.

Turbo valve replacement

1. Drain the air system.
2. Disconnect the heater wiring.
3. Disconnect the inlet and control lines from their respective ports.
4. Remove 8 bolts from bottom cap and set aside. Discard gasket.
5. Remove turbo nut, valve stop and valve and discard.
6. Clean cavity area thoroughly.
7. Lightly coat the 2 (small) o-ring surfaces and install on piston. Carefully install valve in cavity with tapered side up.
8. Place valve stop on top of valve concave side down.
9. Lightly lube (large) o-ring and place on nut. Install flat seal into nut.
10. Install nut and tighten to 40-45 ft. lb.
11. Place gasket on bottom cap aligning all holes. Locate bottom cap so that inlet port is directly below outlet port. Install (8) bolts. Tighten bolts to 20-25 ft. lb. or 25-30 ft. lb. if equipped with oil separator.
12. Re-connect inlet and control lines to air dryer.
13. Re-connect heater wiring.



Desiccant Cartridge Service Kit #T334

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Regular service interval.
2. Water in tanks.

Operational check

Symptom #1 & #2

Desiccant cartridge requires regular servicing at intervals determined by compressor duty cycle or type of driving conditions.

Check air reservoirs on regular basis opening drain valves. If moisture exists, replace cartridge #T334.

Desiccant cartridge replacement

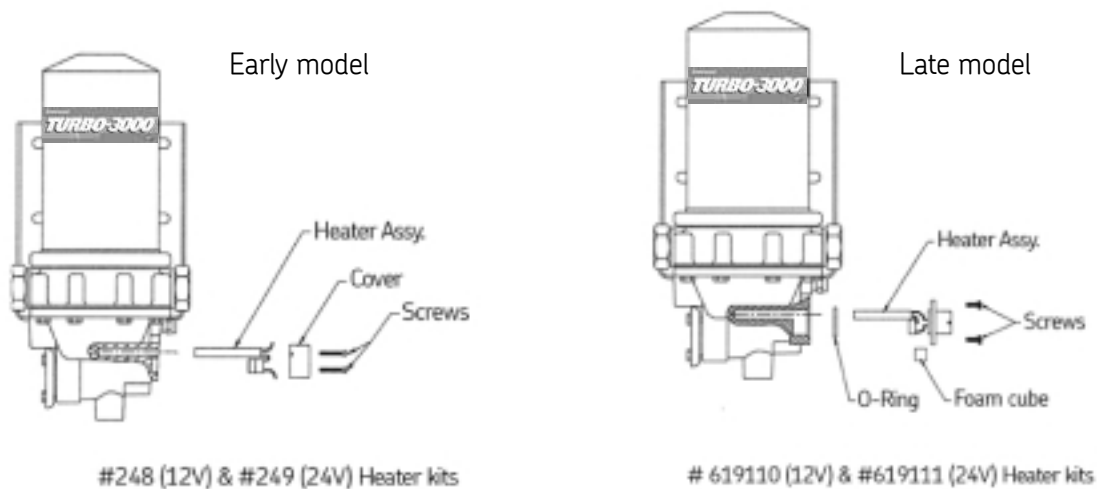
1. Drain the air system.
2. Using a strap wrench, turn the desiccant cartridge counterclockwise and remove it. Discard.
3. Remove and discard o-ring from adapter plate stud.

Note: If there is excessive oil present, compressor may require servicing and/or an oil separator, kit #619650 may be required. Upgrade to Turbo-2000 may also be needed.

4. Clean top surface of adapter plate and threaded stud.
5. Using grease supplied, apply a light coating on o-ring. Install o-ring on stud.
6. Apply a generous coat of grease on the new desiccant cartridge gasket surface.
7. Thread new cartridge onto stud turning clockwise. When gasket contacts adapter plate, tighten cartridge 1/2 turn. **DO NOT OVER-TIGHTEN.**

Note: Cartridge Stud Kit #619140 available if stud needs replacing.

Service procedures Turbo-3000



Heater Service Kits #248, #249, #619110, #619111

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer won't exhaust.
2. Exhaust port leak.
3. Cannot build pressure.

Operational check

Note: thermostat must be cooled to at least 35 degrees F to check.

1. Closed ohmmeter circuit indicates heater is functioning.
2. Open ohmmeter circuit indicates faulty heater assembly.

Heater assembly replacement

1. Disconnect heater leads.
2. Remove set screw (if present) holding heater element in casting.
3. Remove two screws attaching heater cover and/or thermostat to casting.
4. Remove heater/thermostat assembly and discard.
5. Thoroughly clean entire heater/thermostat area.
6. Apply a light coating of anti-seize to the heater element and thermostat cavity.
7. Insert heater element into hole and twist slightly to spread anti-seize.

7.1 Early Models (#248 or #249; orange and blue wires)

- 7..1.1 Install new set screw (if required) until snug (Do not overtighten!) Screw will protrude from bottom cap about 1/8".
- 7..1.2 Insert thermostat into position in thermostat cavity.
- 7..1.3 Coil lead wires around heater cover posts allowing wires to protrude through slots in cover.
- 7..1.4 Place two (2) 6-32 x 1-1/8" screws in heater cover and attach the thermostat.

Note: If heater cover is not used, use short screws and wire clamps to secure thermostat and wires.

- 7..1.5 Fill heater cover through 1/4" hole with non-corrosive RTV.
- 7..1.6 Connect blue heater wire to a good chassis ground.
- 7..1.7 Connect orange wire to ignition switch.
- 7..1.8 Seal and route heater wires carefully

7.2.11 Late Models (#619110 or #619111 plug style connection)

- 7.1.2.1. Slide o-ring over heater and thermostat into position around connector flange.
- 7.1.2.1. Slide o-ring over heater and thermostat into position around connector flange.
- 7.1.2.2. Slide heater and thermostat into position in cavity.
- 7.1.2.3. Ensure thermostat sits flat in cavity
- 7.1.2.4. Place foam cube on top of thermostat and bring heater connector into position over heater.
- 7.1.2.5. Secure heater assembly using the (2) 8-32 x 1/2" screws.
- 7.1.2.6. Reconnect Metri-Pak connector to male plug

Note: If heater lead wire with male plug needs replaced or is not in vehicle wire harness, it is available in Kit #619900.

Turbo-3000 Notes:

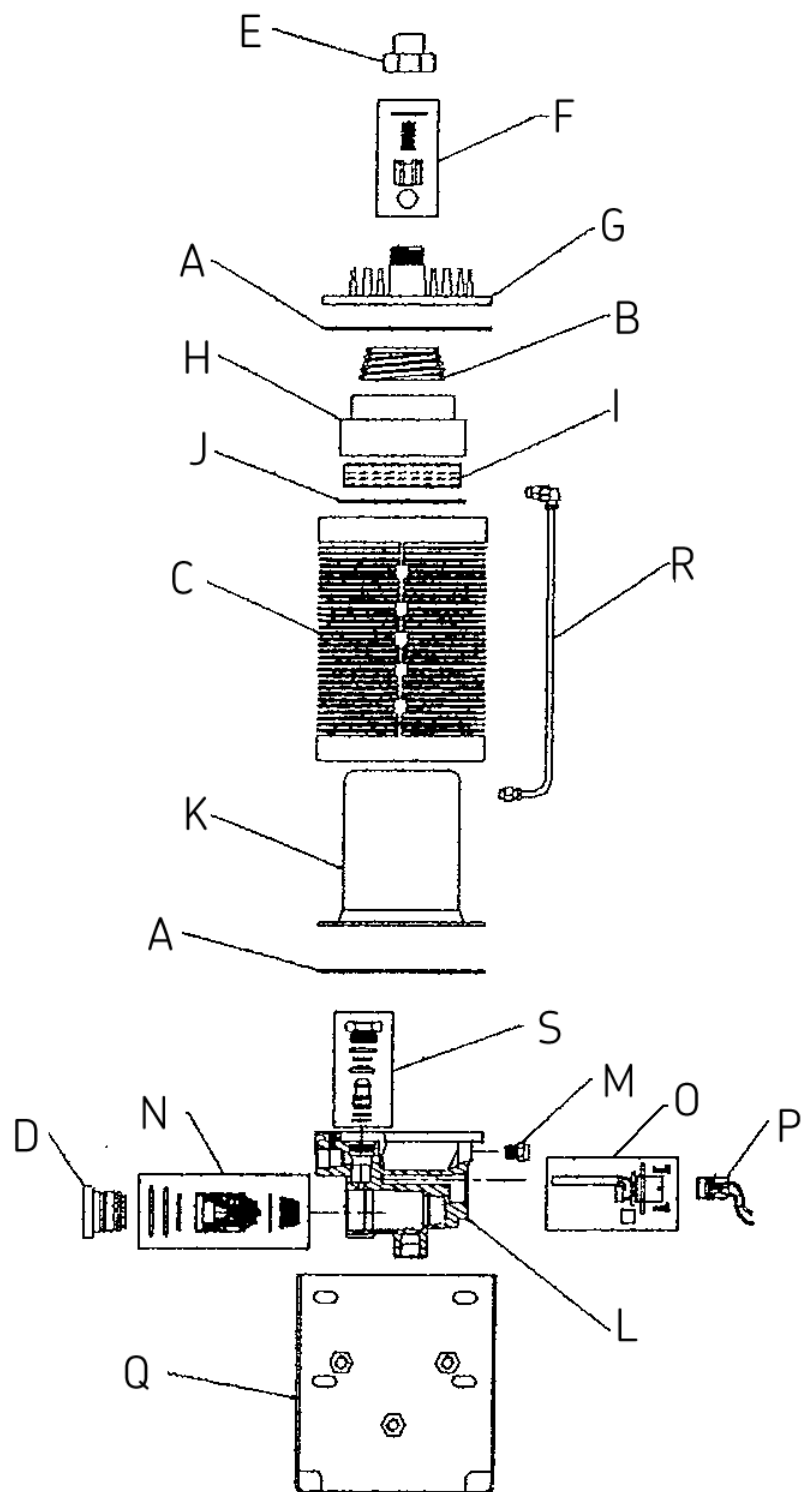
Turbo-AC parts list

Component identification		
A	610077	Body gaskets
B	610271	Large spring
C	610705	Die cast body
D	610069	Seal retainer
E	610029	Top cap nut
F	238	Check valve kit
G	610229	Top cap
H	240	Filter replacement
I	239	Filter service kit
J	610076	Packing ring gasket
K	261	Deflector kit
L	619086 12V 619087 24V	Bottom cap assembly
M	610024	Safety valve (175 psi)
N	235	Purge valve kit
O	246 12V 50W 247 24 V 50W	Heater kit, short elem. Vertical installation
O	248 12V 75W 249 24 V 75W	Heater kit, long elem. Horizontal Installation
O	619110 12V 75W 619111 24 V 75W	Heater kit (shown) (Plug style connection)
P	619900	Wire harness
Q	610851	Bracket assembly (old style, not shown)
Q	619115	Mounting bracket (late model shown)
R	230	Feed-back line, Holset E & QE type compressor
S	228	Turbo valve kit
Bold part numbers represent suggested stock service components		

Dryer part number description	
620570	Turbo-AC, 12V, STD
620572	Turbo-AC, 24V, STD
620580	Turbo-AC, 12V Holset compatible
620578	Turbo-AC, 24V Holset compatible

▲ For right-hand models see parts list on page 140.

Turbo-AC service schematic

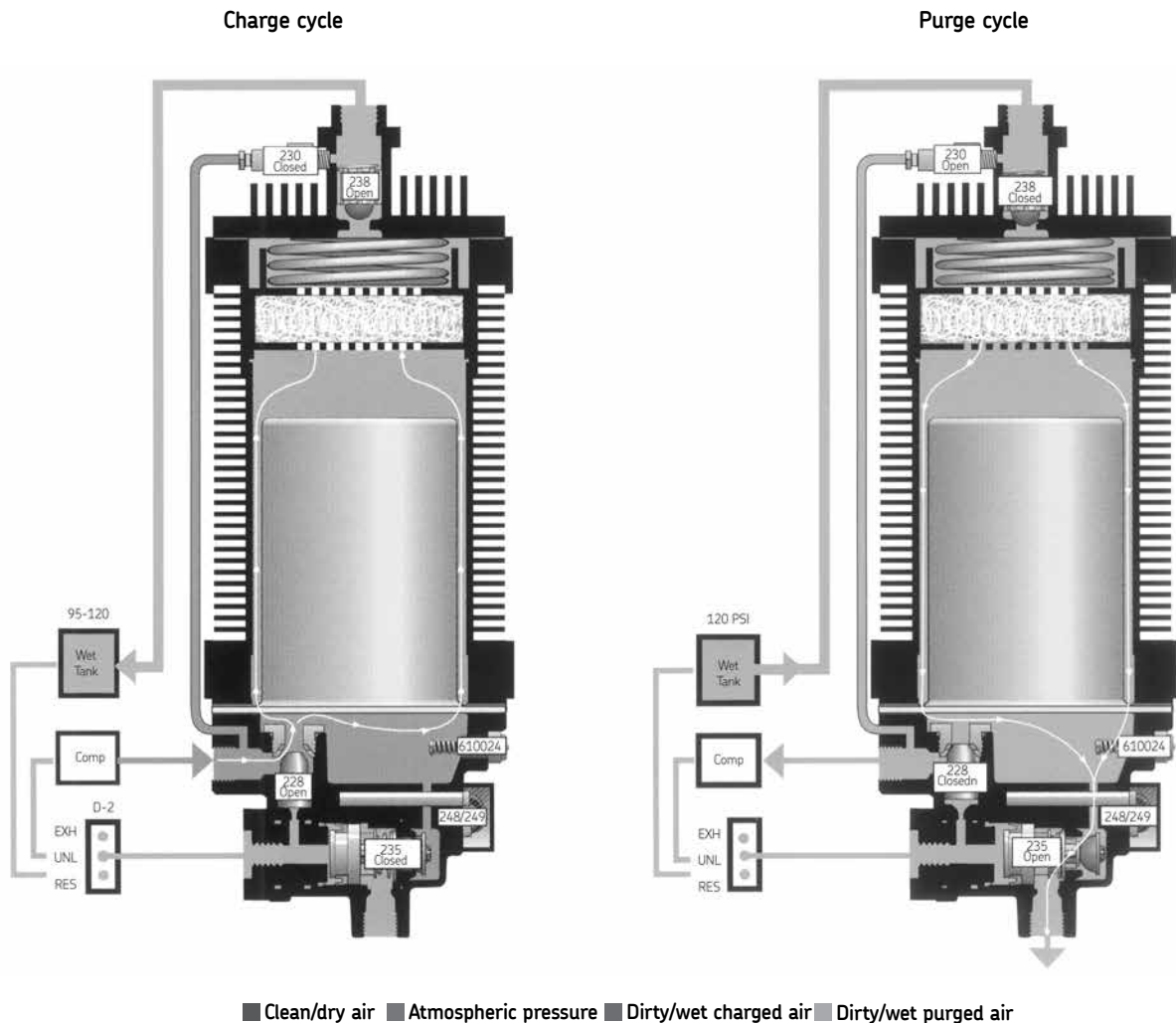


Turbo AC normal operation/cycles

Air flows from the compressor into the air dryer. Air flows up through the body and is cooled by fins. Cooled air releases moisture that accumulates at bottom sump of air dryer. Clean, dry air then exits dryer to the wet tank. The reservoir line from the wet tank to the governor is always pressurized.

When pressure reaches cut-out (typically 120-125 psi), the governor sends air signal through the governor line to the air dryer opening purge valve and closing turbo valve, expelling accumulated moisture and contaminants. The check valve is closed via back pressure from the wet tank. E-Type dryers provide back pressure to the compressor during stand-by. This feature is not intended for use for any compressor other than Holset E-Type compressors.

When the pressure drops to cut-in (typically 90-95 psi), the air in the UNL line evacuates out the exhaust port of the governor closing purge valve and opening turbo valve, and once again flows from the compressor into the air dryer.



Trouble-shooting Turbo-AC dryer

Review the Turbo-AC normal operation / cycles prior to trouble-shooting on page 100

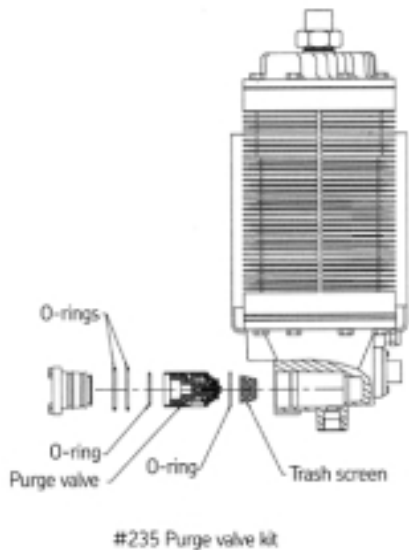
Problem: air leaks from the exhaust port during compressor charge mode	
Possible cause	Remedy
Worn purge valve	Clean cavity and replace the purge valve assembly #235
Dirt/foreign material is stuck in purge valve	Clean cavity and replace the purge valve assembly #235
D2 governor malfunctioning	Replace D2 governor
Ice has formed in purge valve	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)

Problem: air compressor runs continuously (system pressure will not build)	
Possible cause	Remedy
Fittings are loose or damaged	Tighten or replace loose or damaged fittings
Air reservoir, tubing, or hoses are damaged	Repair or replace damaged items
Air compressor needs to be serviced or replaced	Rebuild or replace the air compressor
Worn purge valve	Clean cavity and replace the purge valve assembly #235
The air compressor capacity is too low for vehicle	Install larger air compressor and upgrade to Turbo-2000
Ice has formed in the purge valve	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V) or 619111(24V)
Line between governor and air compressor is blocked	Replace the line or remove the blockage
The safety valve is malfunctioning	Replace the safety valve #610024
D2 governor malfunctioning	Replace D2 governor valve

Problem: air continually leaks from the exhaust port in compressor standby mode	
Possible cause	Remedy
Worn check valve	Clean cavity and replace check valve assembly #238
Worn turbo valve	Clean cavity and replace turbo valve assembly #228
Worn purge valve seal	Clean cavities and replace purge valve assembly #235

Problem: system air pressure drops rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
Worn turbo valve	Clean cavity and replace turbo valve assembly #228
Worn purge valve seal	Clean cavity and replace purge valve assembly #235

Problem: air compressor moves into the standby mode but cycles rapidly	
Possible cause	Remedy
Fittings are loose or damaged	Tighten and/or replace as necessary
Air reservoir, tubing, or hoses are damaged	Repair or replace as necessary
Worn check valve	Clean cavity and replace check valve assembly #238
Worn turbo valve	Clean cavity and replace turbo valve assembly #228
D2 governor malfunctioning	Replace D2 governor
Worn purge valve seal	Clean cavity and replace the purge valve assembly #235
Problem: air leaks from the exhaust port during compressor charge mode	
Possible cause	Remedy
Worn purge valve	Clean cavity and replace purge valve assembly #235
Dirt/foreign material is stuck in purge valve	Clean cavity and replace purge valve assembly #235
D2 governor malfunctioning	Replace D2 governor
Heater assembly malfunctioning (>32 degrees)	Replace heater assembly #246(12V), 247(24V), 248(12V), 249(24V), 619110(12V)



Purge Valve Service Kit #235

Warning: Read and follow safety precautions found on page 17 before proceeding

2

Symptom

1. Dryer won't exhaust.
2. Air leak at exhaust port during
 - a) Charge mode
 - b) Stand-by mode
3. Pressure slow or no build.
4. Compressor cycles rapidly.

Operational check

Symptom #1

Start engine and build to cutout pressure. If dryer does not exhaust, proceed as follows:

1. Check for air pressure in line connecting D2 governor to control port of air dryer. If no pressure is present in line, service D2 governor.
2. Check for blockage at exhaust port of air dryer.
3. If items 1 and 2 are OK, replace purge valve #235.

Symptom #2A & #3:

Start engine and build air pressure. During the charge cycle check for air leaking at exhaust port of dryer. If air is leaking from exhaust port, proceed as follows:

1. No air pressure should be present in line connecting D2 governor and control port during charge cycle. If there is service D2 governor.
2. If item 1 is OK, replace purge valve #235.

Symptom #2B & #4:

Start engine and build to cut out pressure. Stop engine. Allow one minute for purge air to discharge dryer. If air continues to discharge from exhaust port of dryer, replace purge valve #235.

Note: Air discharge could also be due to worn check valve or turbo valve. Refer to pages 105 and 106 for service procedures on these valves.

Purge valve replacement

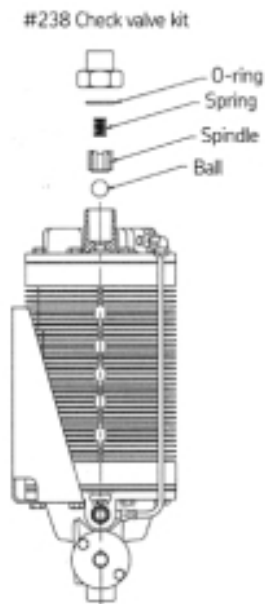
1. Disconnect air line at control port.
2. Remove the two fasteners that attach the purge valve retainer. Remove the retainer.
3. Remove the purge valve assembly from the purge cavity and discard.

Note: If there is excessive oil in the cavity, compressor may require servicing.

4. Clean the cavity thoroughly.
5. Remove the three (3) o-rings from retainer and discard.
6. Using lubricant supplied, lightly grease the new o-rings.
7. Install on the retainer the two (2) thickest o-rings then install the third (thinner) o-ring.
8. Install the new filter screen in the purge cavity open end out.
9. Apply a light coating of grease around the o-ring seat on valve assembly. Install the thin o-ring on the purge valve seat.
10. Aligning the valve exhaust port with the air dryer exhaust port, install the purge valve assembly. Use care not to dislodge the o-ring from its seat.

Warning: If the air dryer purge valve port does not align with air dryer exhaust port, air dryer will not exhaust.

11. Install retainer.
12. Apply a light coating of grease on the threads of the two retainer bolts.
13. Install two retainer bolts. Tighten to 10-15 ft. lb.
14. Reconnect air line to control port.



Check Valve Service Kit #238

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer frequently exhausts.
2. Air continually flows from exhaust port when compressor is in standby mode.
3. Wet tank pressure drops rapidly.

Note: The above symptoms could also lead to turbo valve replacement. A malfunctioning turbo valve will tend to allow pressure to drop to cut-in pressure within seconds on E-Type style air dryers.

Operational check

Symptom #1, #2, & #3:

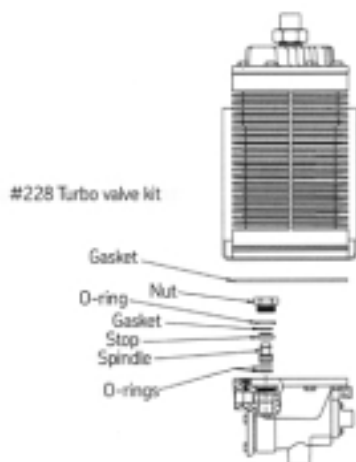
Disconnect line at control port and plug. Start engine and build to cut-out pressure. Stop engine. Apply soapy solution around exhaust port. If soap bubbles exist, replace check valve #238.

Check valve replacement

1. Drain air system.
2. Disconnect air line from outlet port.
3. Remove check valve nut.
4. Remove and discard o-ring, spring, spindle, and ball.

Note: If there is excessive oil in the check valve cavity, compressor may require servicing.

5. Clean nut and cavity area.
6. Install new ball in cavity.
7. Next, position spindle with spring pocket facing out. Install spring.
8. Using grease supplied, apply a light coating on o-ring. Install o-ring on nut.
9. Apply a light coating of grease to threads of nut. Install nut and tighten to 60 ft. lbs.
10. Re-connect air line to air dryer outlet port.



Turbo Valve Service Kit #228

Warning: Read and follow safety precautions found on page 17 before proceeding

Symptom

1. Dryer frequently exhausts.
2. Air continually flows from exhaust port when compressor is in standby mode.
3. System pressure drops very rapidly.

Note: The above symptoms could also lead to check valve replacement.

Operational check

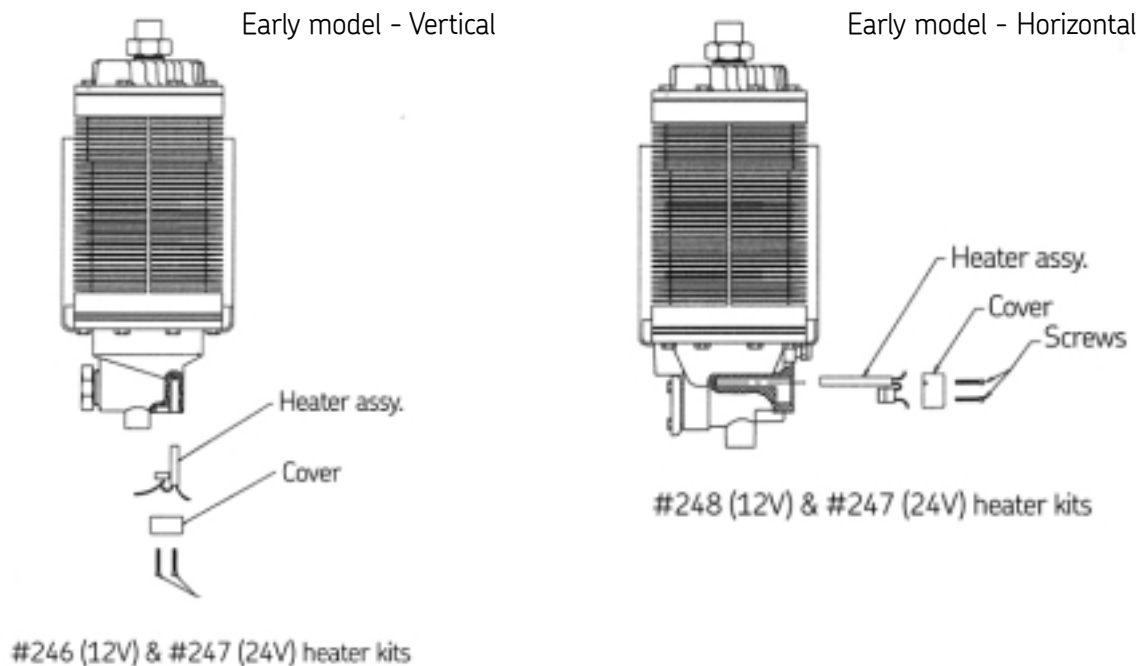
Symptom #1, #2, & #3:

Disconnect line at control port and plug. Start engine and build to cut-out pressure. Stop engine. Apply soapy solution around exhaust port. If soap bubbles exist, replace turbo valve #228.

Turbo valve replacement

1. Drain the air system.
2. Disconnect the heater wiring.
3. Disconnect the inlet and control lines from their respective ports.
4. If air dryer is equipped with external feed-back line, disconnect this line at inlet port of dryer.
5. Remove (8) bolts from bottom cap and set aside. Discard gasket.
6. Remove turbo nut, valve stop and valve and discard.
7. Clean cavity area thoroughly.
8. Lightly coat the (2) (small) o-ring surfaces and install on piston. Carefully install valve in cavity with tapered side up.
9. Place valve stop on top of valve concave side down.
10. Lightly lube (large) o-ring and place on nut. Install flat seal into nut.
11. Install nut and tighten to 40-45 ft. lb.
12. Place gasket on bottom cap aligning all holes. Locate bottom cap so that inlet port is directly below outlet port. Install the 8 bolts. Tighten bolts to 20-25 ft. lb. or 25-30 ft. lb. if equipped with oil separator.
13. Re-connect inlet and control lines to respective ports.
14. Re-connect external feed-back line if air dryer is so equipped.
15. Re-connect heater wiring.

Service procedures Turbo-AC



Heater Service Kits #246, #247, #248, #249, #619110, #619111

Warning: Read and follow safety precautions found on page 17 before proceeding

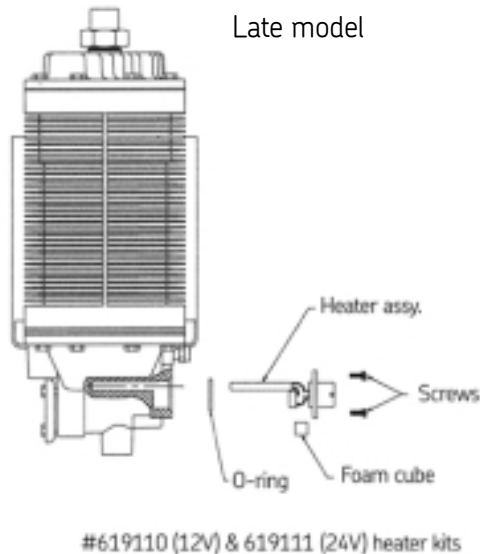
Symptom

1. Dryer won't exhaust.
2. Exhaust port leak.
3. Cannot build pressure.

Operational check

Note: Thermostat must be cooled to at least 35 degrees F to check.

1. Closed ohmmeter circuit indicates heater is functioning
2. Open ohmmeter circuit indicated faulty heater assembly.



Heater assembly replacement

1. Disconnect heater leads.
2. Remove set screw (if present) holding heater element in casting.
3. Remove two screws attaching heater cover and/or thermostat to casting.
4. Remove heater/thermostat assembly and discard.
5. Thoroughly clean entire heater/thermostat area.
6. Apply a light coating of anti-seize to the heater element and thermostat cavity.
7. Insert heater element into hole and twist slightly to spread anti-seize.
- 7.1 Early models (orange & blue lead wires, Kit #246 or #247 vertical mount, Kit #248 or #249 horizontal mount).
 - 7..2.1. Install new set screw until snug **(Do not overtighten!)** Screw will protrude from bottom cap about 1/8".
 - 7..2.2. Coil wires around heater cover posts allowing wires to protrude through slots.
 - 7..2.3. Place two (2) 6-32 x 1-1/8" screws in heater cover and attach the thermostat.

Note: If heater cover is not used, use short screws and wire clamps to secure thermostat and wires.

- 7..2.4. Fill heater cover, through 1/4" hole, with non-corrosive RTV.
- 7..2.5. Connect blue heater wire to a good chassis ground.
- 7..2.6. Connect orange wire to ignition switch.
- 7..2.7. Seal and route heater wires carefully.

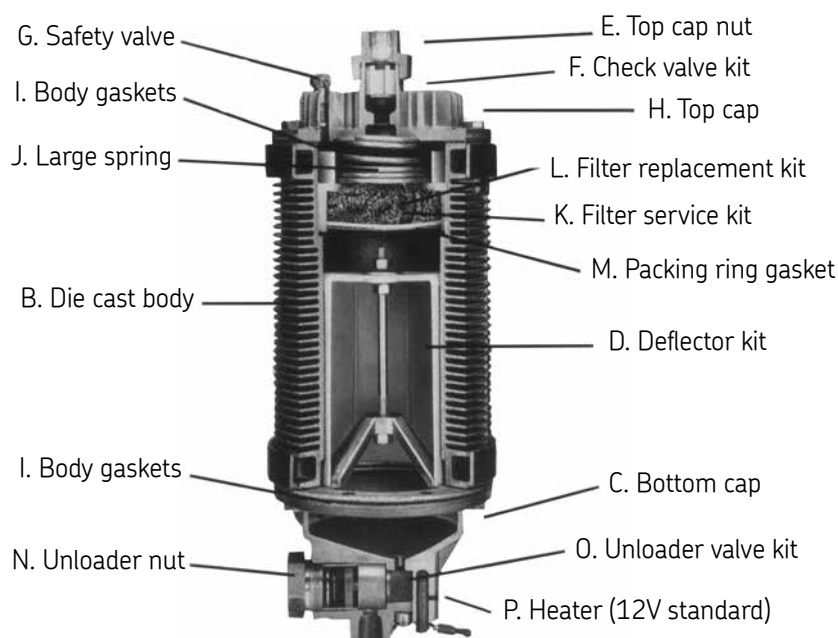
7.2.1. Late Models (#619110 or #619111; plug style connection)

- 7..2.1. Slide o-ring over heater and thermostat into position around connector flange.
- 7..2.2. Slide heater and thermostat into position in cavity.
- 7..2.3. Ensure thermostat sits flat in cavity.
- 7..2.4. Place foam cube on top of thermostat and bring heater connector into position over heater.
- 7..2.5. Secure heater assembly using the (2) 8-32 x 1/2" screws.
- 7..2.6. Reconnect Metri-Pak connector to male plug.

Note: If heater lead wire with male plug needs to be replaced or is not in vehicle wire harness, it is available in Kit #619900.

Turbo-AC Notes:

Original Brakemaster service kit reference



12V heater**	62	63	68	69	70	71	72	73
24V heater**	619013	619014	619015	619016	619017	619018	N/A	619101
A. Bracket assembly*	610851	N/A						
B. Die cast body	610705		N/A					
C. Bottom cap assy. (12V)	619086	N/A	619086	N/A				
(24V)	619087	N/A	619087	N/A				
D. Deflector kit	261		263		265	N/A	265	N/A
E. Top cap nut	610029				N/A			
F. Check valve kit	238				N/A			
G. Safety valve (150 PSI)	610024							
H. Top cap	610229							
I. Body gaskets	610077							
J. Large spring	610271							
K. Filter service kit	239							
L. Filter replacement kit	240							
M. Packing ring gasket	610076							
N. Unloader nut	610030							
O. Unloader valve kit	235							
P. Heater (Standard-12V 60W)	246							
(Optional-24V 60W)	247							

* A not shown in diagram

N/A Not available

** Model 62 superseded to Turbo-AC 620570 (12V) & 620572 (24V). All other models are Obsolete.

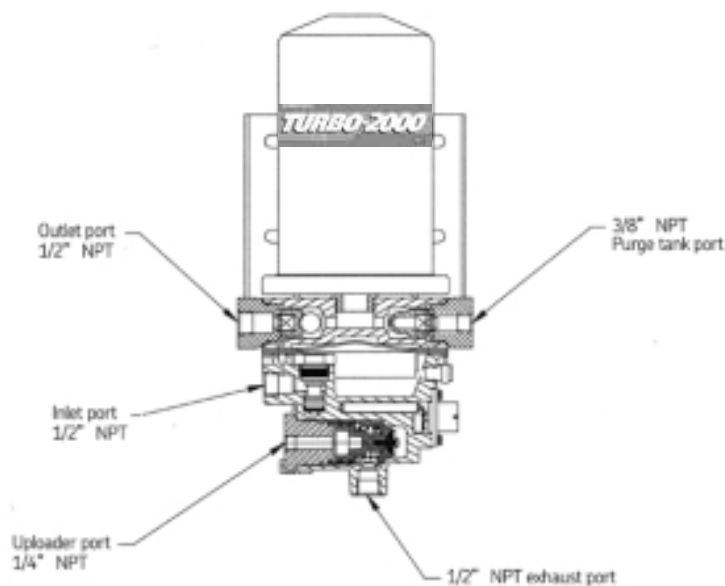
Turbo-2000 air dryer—Leak/valve function test procedure

Warning

1. Never attempt to test or service air dryer until you have read and understand all procedures.
2. Always wear eye protection when testing or servicing air dryer. Never look directly into air dryer ports during test.
3. Never exceed recommended maximum working air pressure (150 psig).
4. Never connect or disconnect a hose/line containing air pressure or remove a component, fitting, or pipe plug unless you are certain all system pressure has been exhausted.
5. Use only proper tools and observe all precautions pertaining to the use of those tools.

3

Fittings/valves required for test		
Qty	Description	Note
1	3/8" shut off valve	1 male & 1 female threads
1	1/2" x 3/8" bushing	
2	3/8" x 1/4" bushing	
1	1/4" shut off valve	1 male & 1 female threads
1	3/8" pipe plug	
2	1/2" pipe plugs	
2	Quick disconnect	Connectors vary at shops



Note: Perform all test steps, in sequence shown, to insure a properly functioning air dryer.

Step 1 - Dryer air flow test

1. Install $\frac{1}{2}$ " x $\frac{3}{8}$ " bushing in "INLET" port of dryer.
2. Attach shut off valve ($\frac{3}{8}$ " male pipe into $\frac{1}{2}$ " bushing)
3. Install $\frac{3}{8}$ " x $\frac{1}{4}$ " bushing into female port of shut off valve.
4. Install quick-disconnect connector to shut off valve.
5. Connect shop air. Open valve. Check for air flow from dryer "OUTLET" and "PURGE TANK" ports. If air does not flow from both ports check for internal blockage of ports, valves, and/or desiccant cartridge.
6. Close shut off valve.

Step 2 - Regeneration (purge tank) air flow test

1. Install $\frac{3}{8}$ " x $\frac{1}{4}$ " bushing into dryer "PURGE TANK" port.
2. Install $\frac{1}{4}$ " shut off valve to "PURGE TANK" port of dryer.
3. Install quick-disconnect connector to shut off valve.
4. Connect shop air to valve. Open valve. Check for air flow from dryer "OUTLET" port.
5. If air flow does not occur, the regeneration valve requires service. (refer to page 23)

Step 3 - Dryer assembly leak test

1. Install $\frac{1}{2}$ " pipe plug in "OUTLET" port of dryer.
2. Remove shut off valve and bushing from "PURGE TANK" port of dryer and install $\frac{3}{8}$ " pipe plug.
3. Open shut off valve at dryer "INLET" port to pressurize dryer.
4. Check for leakage at:
 - 4.1. Exhaust port - Note: if air leaks at dryer exhaust, unloader valve requires service. (Refer to page 21)
 - 4.2. Bolts, gaskets, safety valve, cartridge, etc. Note: Repair any leaks detected.
5. Close shut off valve at dryer "INLET" port.

Step 4 - Dryer exhaust test

1. Install $\frac{1}{4}$ " shut off valve to "UNLOADER" port of dryer.
2. Open shut off valve at dryer "INLET" port to pressurize dryer.
3. Connect shop air to shut off valve at "UNLOADER" port and open valve to pressurize and activate dryer unloader valve.
4. Air should exhaust from "EXHAUST" port of dryer.
5. If air exhaust does not occur, check for the following:
 - 5.1 Unloader valve exhaust port is not aligned and is blocking dryer bottom cap exhaust port.
 - 5.2 Exhaust holes/trash screen inside bottom cap are blocked.
6. Disconnect shop air from dryer "INLET" port.

Step 5 - Unloader valve test

1. With air pressure still applied at "UNLOADER" port, check for leaks at "EXHAUST" port of dryer.
2. If air leaks from "EXHAUST" port, unloader valve is worn and requires service. (Refer to page 21)
3. Disconnect shop air from dryer "UNLOADER" port.

Step 6 - Turbo "O" ring and unloader valve retainer "O" ring test

1. Install 1/2" pipe plug in dryer "EXHAUST" port.
2. Connect shop air to valve at "UNLOADER" port and pressurize unloader valve.
3. If air leaks from dryer inlet, (shut off valve must be open) turbo valve "O" ring seals are worn.
4. If leaking, turbo valve requires service. (Refer to page 25)
5. If air leaks at unloader valve retainer flange, "O" ring seals are worn and require service.

Step 7 - Turbo valve flat seal test

1. Remove 1/2" pipe plug from dryer "EXHAUST" port.
2. With air pressure still applied at "UNLOADER" valve port, apply air pressure to "INLET" port of air dryer.
3. Check for air leaking from "EXHAUST" port of air dryer.
4. If leaking, turbo valve requires service. (Refer to page 25)
5. Disconnect shop air from dryer "INLET" port.

Step 8 - Check valve test

1. Remove 1/2" pipe plug from dryer "OUTLET" port and shut off valve from dryer "INLET" port.
2. Install 1/2" pipe plug in dryer "INLET" port and shut off valve in dryer "OUTLET" port.
3. Connect shop air to valve at dryer "OUTLET" port.
4. With air pressure still applied at "UNLOADER" valve port, open valve at "OUTLET" port to apply air pressure to "OUTLET" port.
5. Check for air leaking at dryer "EXHAUST" port.
6. If air leaks at "EXHAUST" port, dryer check valve is worn and requires service. (Refer to page 24)
7. Disconnect shop air from dryer "OUTLET" and "UNLOADER" ports.

Step 9 - Differential check (poppit) valve test.

This step applies ONLY to Air Dryers compatible with Holset E-Type Compressors.

1. Remove 1/2" pipe plug from dryer "INLET" port.
2. Connect shop air to shut off valve at "UNLOADER" port and open valve to pressurize and activate dryer unloader valve.
3. Connect shop air to valve at dryer "OUTLET" port and open valve.
4. Check for air flow from dryer "INLET" port.
5. If air does not flow from dryer "INLET" port, the differential check valve requires service.
6. Disconnect shop air from dryer "OUTLET" port.
7. Remove shut off valve from dryer "OUTLET" port and install in dryer "INLET" port.
8. Connect shop air to valve at dryer "INLET" port and open valve.
9. Check for air flow from dryer "OUTLET" port.
10. If air flows from dryer "OUTLET" port the differential check valve requires service.

Air dryer thermostat/heater assembly test

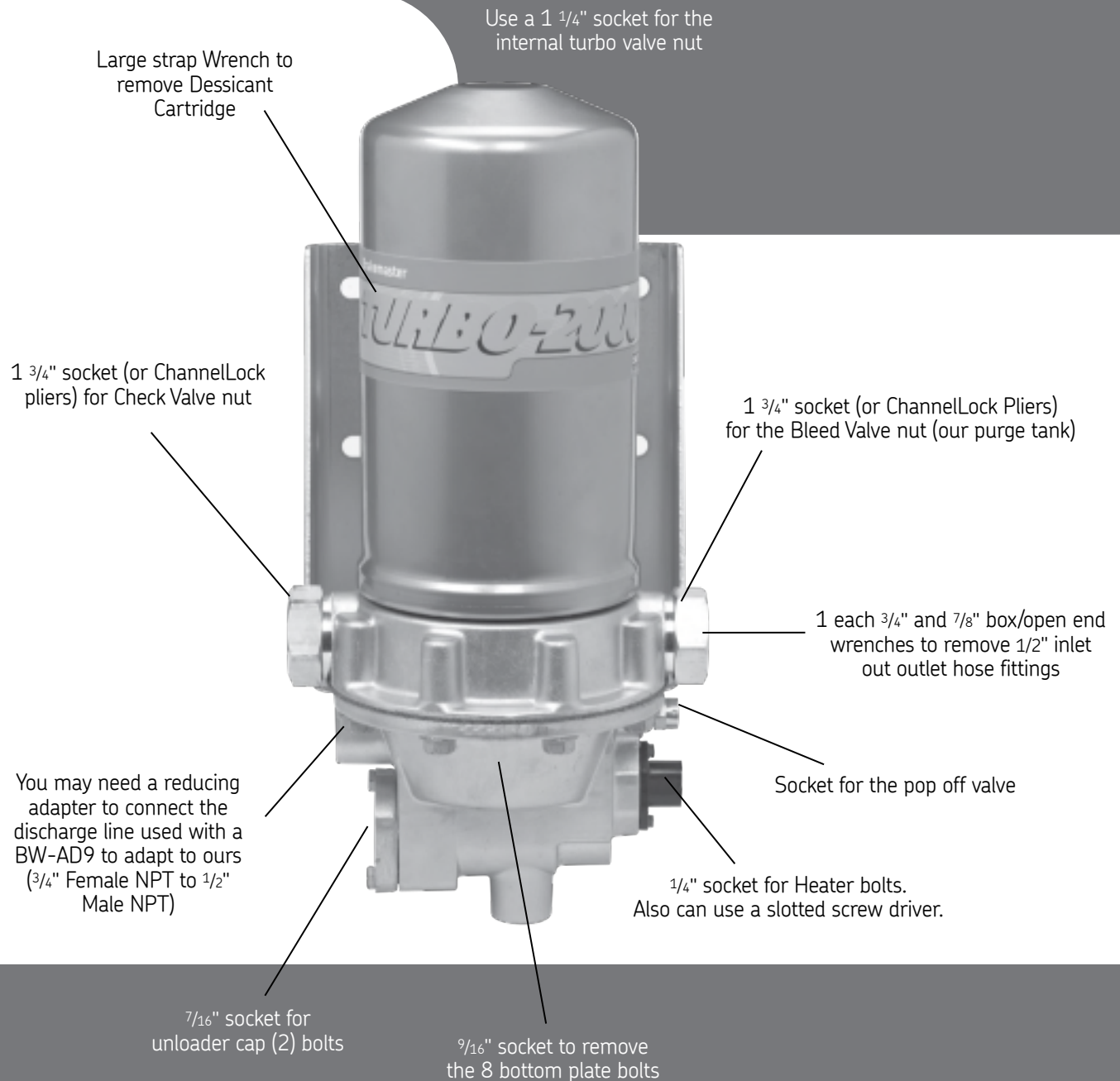
The heater is thermostatically controlled to operate (heat) between temperature range of 35 degrees F and 55 degrees F, which means current flow through heating element is controlled by thermostat internal contacts "closing" at 35 degrees F and "opening" at 55 degrees F.

The thermostat/heater assembly may be removed from the dryer to be tested or checked while still installed in dryer. Whichever method is used, the thermostat must be subjected to a temperature of 35 degrees F or lower and 55 degrees F or higher for proper test. If the heater assembly is removed from dryer for test, visually check that all wire connections between thermostat and heater element are intact. If connections are broken, *replace thermostat/heater assembly.

Perform continuity test as follows:

- A: While thermostat temperature is 55 degrees F or above, conduct continuity test by using an Ohm Meter or Test Light. Attach one lead of test device to one terminal/lead wire of thermostat. Connect other lead of test device to other terminal/lead wire of thermostat. There should be NO continuity. If continuity is indicated, *replace thermostat/heater assembly.
- B: While thermostat temperature is 35 degrees F or below, conduct continuity test by using an Ohm Meter or Test Light. Attach one lead of test device to one terminal/lead wire of thermostat. Connect other lead of test device to other terminal/lead wire of thermostat. There should be continuity. If there is NO continuity, *replace thermostat/heater assembly. (*Refer to pages 31 and 32)

Air dryer socket sizes



Note: It is very difficult to remove the bottom cap bolts with a wrench. Use a socket only with a six (6) inch extension.

Can substitute open or boxed end wrenches for sockets. Carry a long needle nose set of pliers to remove the Turbo valve, a small quantity of anti seize to put on bolt threads, and a small tube of Teflon® pipe sealant for fittings.

Tech Tip #1—Recommended service for Brakemaster family of air dryers

The recommended service of SKF Brakemaster air dryers is based on normal operating conditions, proper application and installation of air dryer. ***Follow all safety precautions specified in service manual #457938.***

Individual component operational checks may be found in service guide #457938 or on website at www.vsm.skf.com.

Monthly

Drain reservoirs. If moisture or oil is present, perform functionality checks. Replace components as needed. Replace cartridge.

Annually

Check air dryer functionality – All dryers except Dual Turbo-2000 (includes HC Dual Turbo-2000)

1. Build up pressure from 0 to cut-out should take less than 3 minutes.
 - a. If it takes longer than 3 minutes, check to see if air is escaping out of exhaust port.
 - i. Yes, check purge valve and governor. Check heater if temperatures below 35°F.
 - ii. No, check for leaks at safety valve, dryer body and air system by applying soapy water spray.
2. Time between dryer unloads should take more than 8 minutes while vehicle is at rest.
 - a. If time is somewhat less than 8 minutes, check for air leaks at safety valve, dryer body and air system by applying soapy water.
 - b. If time is significantly less than 8 minutes, check purge valve, turbo valve (w/E-type design dryers only) and check valve. Also, check at compressor with E-type dryer. This style of dryer re-directs air pressure back to the compressor during stand-by. E-type dryers should only be used with Holset QE compressors. Others may leak and cause a frequent cycle.
3. Check functionality of safety valve.
 - a. Plug outlet of air dryer and install pressure gage at inlet of air dryer. Allow pressure to rise to 180 psi.
 - i. If pressure leaks at 175 psi, replace safety valve.
 - ii. If pressure does not flow at 180 psi, replace safety valve.

Check air dryer functionality – Dual Turbo-2000

1. Build up pressure from 0 to cut-out should take less than 3 minutes. Air should exhaust alternately every 90 seconds while compressor is in charge mode. There will always be a light flow of air while compressor is in charge mode.
 - a. If compressor build time is longer than 3 minutes, check to see if steady stream of air is escaping out of exhaust port. A light flow of air will be present while compressor is in charge mode.
 - i. Yes, check purge valves and inlet check valve. Check heater if temperatures below 35°F.
 - ii. No, check for air leaks at safety valve, dryer body and air system by applying soapy water spray.
2. Check that exhaust is alternating between ports. This will only occur while compressor is charging.
 - a. If one port is exhausting, see if light is flashing when exhaust occurs. If not, check polarity and/or replace Micro logic timer (MLT).
 - b. If one port is exhausting and light is flashing, check purge valves, air control valve regeneration valves.
 - c. If no exhaust occurs every 90 seconds while compressor is in charge mode, check MLT, air control valve, regeneration valve and purge valves. Check heater if temperature is below 35°F.

Preventative maintenance:

Use chart below for interval recommendations.

1. Replace cartridge #T224 for Turbo-2000 and HD-2000 (recommend use T224-P when oil blow-by is present and with Dual Turbo-2000 & HC Dual Turbo-2000). Use T334 for Turbo-3000.
2. Replace purge valves(s) #235
3. Replace check valve #238
4. Replace inlet check valves #619915 (2) Dual Turbo-2000, #619938 HC Dual Turbo-2000.
5. Replace filter #240 for Brakemaster AC only.
6. Replace safety valve every 5 years regardless of model.

Service kit #619340 includes #T224, #235, #228, and #238

Service kit #619360 includes #T224-P, #235, #228, and #238

Preventative maintenance recommended yearly intervals

Vocation	Turbo-2000	Turbo-3000	HD-2000	Turbo-AC	Dual Turbo-2000	HC Dual Turbo-2000
Linehaul	3	1	2	3	3	3
City PU	2	1	2	2	3	3
On-Off hwy	2	1	2	2	3	3
Mixer	1	N/R	1	N/R	2	2
School bus	2	N/R	2	N/R	3	3
Refuse	3	N/R	3	N/R	3	3
Coach	2	N/R	2	N/R	3	3
Transit bus	1	N/R	1	N/R	2	2
Yard jockey	2	N/R	2	N/R	3	3
Fire truck	2	N/R	2	N/R	3	3
Small bus RV	2	N/R	2	N/R	3	3
Air over hydraulic brakes	3	1	3	1	3	3
Central Tire Inflation	N/R	N/R	NR	N/R	1	1
Pump-off trailer	N/R	N/R	N/R	N/R	1	1

N/R = not recommended for application

Tech Tip #2—Servicing Turbo series desiccant cartridge T224

The service of the SKF Turbo series desiccant cartridge T224 is quick and easy especially if you follow the instructions. The cartridge is spin on/spin off similar to an oil filter.

Application:

Turbo-2000, HD-2000, HC Dual Turbo-2000 and Dual Turbo-2000.

Service intervals:

Desiccant life is directly impacted by oil blow-by from the compressor. The compressor will tend to spill more oil when it runs hot from frequent use. In general, a high duty application, such as transit, will experience more oil traveling downstream. Also, as compressors age, the air quality degrades. When enough oil has infiltrated the desiccant bed, moisture will pass on into the air system. Thus, below are typical service life expectations.

Line haul	3 years	Refuse	1 year	Off highway	1 year
Inner City	2 years	Transit	1 year		

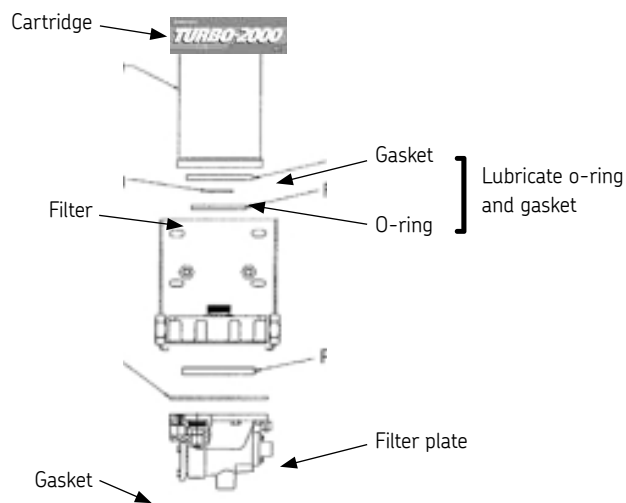
Of important note, using T224-P with extra filtration will protect the desiccant longer from contaminants and result in lengthening the service intervals. Add 1 year to the above for estimated service life's.



Installation tip

Be sure to follow all of the instructions located in box. There are 2 important steps that will allow the next service to also be quick and easy.

1. Lubricate the o-ring and rubber gasket with the lubricant provided. This step will prevent the rubber from sticking to the base making removal easier.



2. **Do not over-tighten** the cartridge while installing. When the rubber gasket contacts the base, only further tighten $\frac{1}{2}$ turn. No more. Over-tightening, even with the gasket and o-ring properly lubricated, can make removal difficult.

Removal tip

Be sure to follow all of the instructions located in box. Once pressure is relieved, use a strap wrench and turn cartridge counter-clockwise. If it is difficult to remove, or if the can spins without loosening, try these tips:

1. Using a thin blade such as a putty knife, slide it between the cartridge gasket and the base. This could release the tight seal of the rubber on the base. Slide the blade as far around as possible and re-attempt to remove cartridge.



2. If above does not help, strike the cartridge with a center punch or a ball nose at the lower end where the diameter is slightly larger. This will bind together the internal components of the cartridge. Re-attempt to remove cartridge.

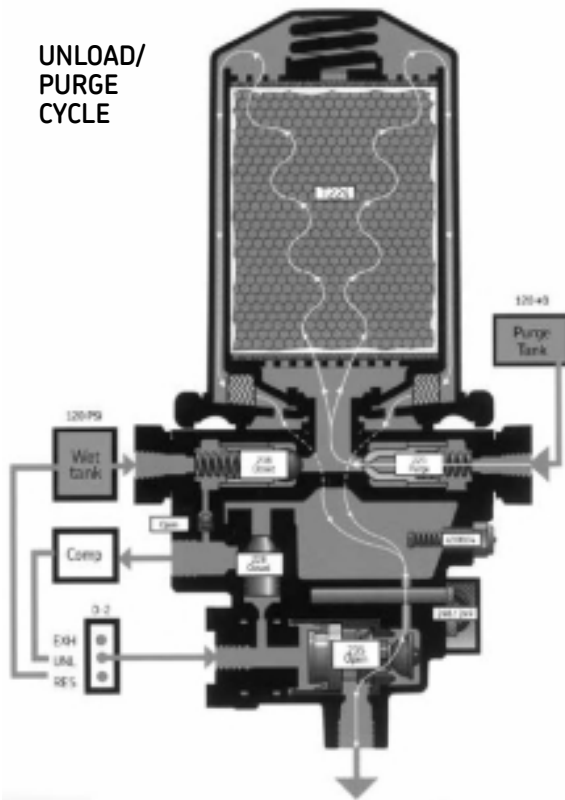


Consider these tips when doing the next preventative maintenance (PM). It could make yours or the next person's job a lot easier.

Tech Tip #3—E-type compatible air dryer

SKF offers E-type air dryers for specific compressor applications. To ensure proper air system functioning, only use an SKF E-type air dryer with a Holset QE (E-type) air compressor. Holset has not manufactured these compressors since 2001, but there are many still in service. The Holset QE air dryer is equipped with special valving that is required for the Holset compressor, so an SKF E-type air dryer should be used as the correct replacement alternative for this application.

The difference in the E-type compatible air dryer is an extra valve (check ball) located on the flange of the bottom cap. There is also an air communication path located between the inlet and the outlet. During unload, the air is directed back from the wet tank through the air dryer, back to the compressor. Other compressors are not designed for this back pressure and can allow air to pass into the compressor, causing a rapid cycle.



SKF E-type air dryers use a 50 in the part number (620502) and have a label specifying its use with E-type compressors.

—WARNING—

This Air Dryer is compatible with Holset QE & SS E-type air compressors.

Air Dryer exhaust at high pressure!
Wear eye protection while servicing.

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Tech Tip #4—Turbo-2000 Fall maintenance recommendations

As a matter of good practices, a fall inspection and preventative maintenance program of the air dryer will prepare your vehicle for the winter ahead. Follow the recommendations below to gain the full benefits from an air dryer designed to handle the most severe conditions.

The function of a Turbo-2000 is to collect and remove solid, liquid and vapor contaminants from the air system and deliver clean, dry air to the reservoir tanks. These tanks provide air to the components of the brake system as well as any other air actuated componentry on the vehicle.

Turbo-2000 comes in two distinct variations. The 500 (ie: 620500) series is designed for Holset E-Type compressors. E-Type compressors have special plumbing considerations that the E-type compatible SKF air dryers contain. The Holset E-Type compressors are mainly found on Cummins engines and some Mack but have not been an OE option for several years. The 600 (ie: 620600) series should be used on all other compressors.

WARNING: Please read and follow these safety instructions.

- Before performing any test and/or isolating the air dryer, the vehicle's wheels must be chocked making sure the vehicle will not roll before releasing brakes.
- Never work under a unit supported only by a jack. Always support the vehicle with stands.
- Stop engine when working under a vehicle.
- Never remove a component or a pipe plug unless you are certain all system air pressure has been exhausted.
- Never connect or disconnect a hose or line containing air pressure.
- Never exceed recommended working air pressure.
- Never attempt to disassemble an air dryer until you have read and understood all recommended procedures.
- Use only proper tools and observe all precautions pertaining to the use of those tools.



Fall maintenance recommendations

System checks should be done regularly and include:

- Check for moisture in air system by opening reservoirs, drain cocks or valves. If moisture is present, replace desiccant cartridge T224. If contaminants are present, use service kit 619340 or 619360 for additional filtration performance and service compressor as needed.
- Check for air leak by building system to cut-out pressure. The air dryer should not unload again while at idle. If it unloads within 4 to 5 minutes, there is a slow leak that needs to be addressed. Spray soapy water at fittings around the air dryer, wet tank and compressor. Repair as needed. Note that an E-Type dryer on a non-Holset compressor could leak air out the intake of the compressor. There is a yellow sticker on the air dryer that indicates E-Type or non-E-Type. A leak less than 4 minutes will likely be the result of a non-functioning valve or major leak in air system. If soapy water does not reveal the leak, replace air dryer unloader valve #235, Turbo valve #228, and check valve #238. Service kit 619340 includes all of these valves plus desiccant cartridge T224. Service kit 619360 includes additional filtration with T224-P.
- Check heater element. Remove heater rod from dryer and with ignition off, use an ohmmeter to check resistance. The resistance for a 12V 75 watt heater is 1.8 watts with 6.6 amp draw and 24V 75 is 7.4 watts with 3.2 amp draw. If no ohmmeter is available, expose air dryer to temperature below 32° F, place hand on bottom portion of air dryer and feel for warmth.

Service intervals

Many factors go into the service interval for an air dryer. Conditions where annual service is needed are:

- Frequent braking – transit, mountainous driving, refuse
- High air volume use – special needs buses, cement mixers, central tire inflation vehicles
- Older compressors – vehicles with old compressors will experience more oil blow-by conditions
- Need for clean air supply – ABS brakes, critical air actuated componentry

Vehicles in vocations with low air use, should be inspected regularly and serviced every 2 – 3 years.

Service to the Turbo-2000 should include:

- Replace Desiccant cartridge T224/upgrade contaminant filtration with T224-P
- Clean port area and replace purge valve #235
- Clean bottom cap and replace turbo valve #228
- Clean port area and replace check valve #238
- All above are included in 619340 or 619360 for T224-P

Tech Tip #5—HC Dual Turbo-2000 High output, aggressive environments Fall maintenance recommendations

Good maintenance practices include the inspection and service of the air system and its components. To facilitate this valuable program, SKF offers service kit #619979 for the HC Dual Turbo-2000 so that all the parts are accounted for and in one easy to access spot.

Follow these guidelines for inspection and service.

Inspection

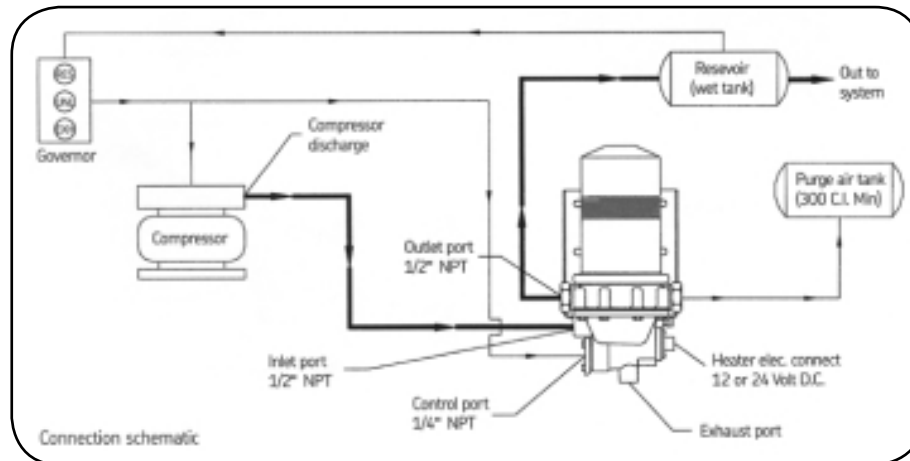
- Check the condition of the air dryer and connections. Look for damage or loose fittings.
- Examine and compare the outlet of BOTH exhausts. If one is excessively dirtier than the other, service is needed.
- Perform a cycle check.
 - Deplete air supply, allow air to build under high idle to cut out (when air dryer exhausts), measuring the time. This should not take more than a couple of minutes from zero.
 - After cut out, measure the time until the next cut out. This should take more than 7 minutes if the vehicle is resting at idle.
 - If either of those conditions is not met, service is required.
- Remove cartridges and look up into center. A filter positioned just inside the air flow exit point will be visible. If that is oily, service is needed.
- Trouble-shooting information is available in SKF Service Manual #457938.

Service

- Under normal operating conditions, the HC Dual Turbo-2000 is designed for at least a 2 year service interval. The newer the compressor and the lighter the duty cycle, the better service life for the cartridges.
- At service interval, be sure to replace:
 - 2 T224-P desiccant cartridges
 - 2 #619938 inlet check valves
 - 2 #235 purge valves
 - 1 #238 outlet check valve
- Check condition of safety valve #619740 and replace as needed.
- Check continuity of heater #619110 (12V) or #619111 (24V) with an ohmmeter. Replace if no continuity is present.
- SKF offers service kit #619979 (24V heater) that includes all of the above along with fresh casting bolts.



Installation Instruction—Brakemaster Turbo-2000, HD-2000 and Turbo-3000



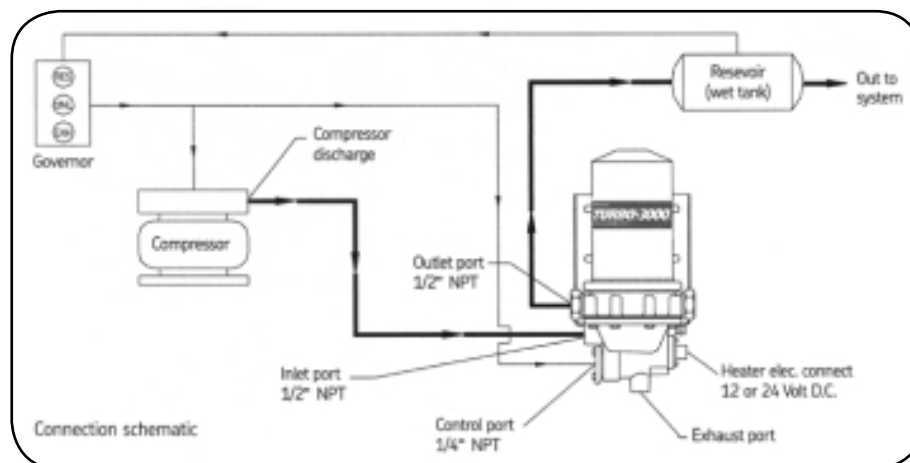
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Turbo-2000

Desiccant air dryer with turbo boost protection. Available with E-Type feed-back feature for Holset compressors. Requires purge tank with minimum 300 cu. in. purge volume.

HD-2000

Desiccant air dryer for DLU (Discharge Line Unload) or continuous pumping compressors and non-turbo boosted compressors. Requires purge tank with minimum 300 cu. in. purge volume.



Turbo-3000

Desiccant air dryer with turbo boost protection. Available with E-type feed-back feature for Holset compressors.



Warning



Safety precautions

1. Before performing any test and/or isolating the air dryer, the vehicle's wheels must be chocked making sure the vehicle will not roll before releasing the brakes.
2. Never work under a unit supported only by a jack. Always support the vehicle with stands.
3. Stop engine when working under a vehicle.
4. Never remove a component or a pipe plug unless you are certain all system air pressure has been exhausted.
5. Never connect or disconnect a hose or line containing air pressure.
6. Never exceed recommended working air pressure.
7. Never attempt to disassemble an air dryer until you have read and understood all recommended procedures.
8. Use only proper tools and observe all precautions pertaining to the use of those tools.
9. Always wear safety glasses when working with air pressure. Never look directly into air dryer ports.

Basic mounting guidelines

1. The air dryer must be mounted with the exhaust ports positioned downward. Use grade 5 or better bolts to mount air dryer and purge tank.
2. Mount air dryer lower than the air compressor. The compressor discharge line should slope continuously downward from the compressor to the air dryer without any dips which cause water traps.
3. The compressor discharge line size, material, and length must be such that the dryer air inlet temperature is typically no more than 160 degrees F or no less than 45 degrees F above low ambient, (Ref. SAE J2383). An example of a typical discharge line: Total line length 10 ft. to 12 ft. which is a combination of rigid copper (approx. 4 ft. length) and balance of line length being stainless-steel braid sheathed PTFE. Avoid using 90° elbow fittings to avoid water traps freeze-ups.
4. The air dryer should be mounted in a location with sufficient space around it to facilitate service and to provide visual access for periodic inspection. Allow at least 2.00 inch clearance above air dryer for desiccant cartridge service.
5. The air dryer should be mounted out of direct tire or wheel road splash or protected from splash.
6. The air dryer, with its mounting bracket, lines, and fittings should be mounted in a protected location such that minor mechanical damage to the vehicle will not damage the air system integrity.

Mounting procedure

Note: Only use E-Type Turbo-2000 and Turbo-3000 versions with Holset E-Type compressors. Use standard dryers for non-Holset compressor applications. A label on bottom cap identifies the version.

1. Drain all air from air reservoirs. Note: The presence of excessive oil is a sign that compressor requires service.
2. Mount air dryer. Tighten nuts to 25-30 ft. lbs. Use the included drilling template to locate and mark the hole locations.
3. Connect the compressor discharge line to air dryer $\frac{1}{2}$ NPT inlet (between outlet and governor ports) port.
4. Connect the air dryer $\frac{1}{2}$ NPT outlet (above inlet port) port to air line leading to wet tank.
5. Connect air line from governor UNL port to the air dryer $\frac{1}{4}$ NPT unloader (directly below inlet port) port. **Note:** For continuous pumping air system, first install a governor if one is not present. Connect governor RES port to wet tank with a $\frac{1}{4}$ NPT line.
6. For Turbo-2000 and HD-2000 only, mount purge tank. A drilling template is included. Turbo-3000 move onto item 8.
7. Connect the 3/8 NPT air dryer purge port (opposite side to outlet) to purge tank. Included with purge tank kit is fittings and 3/8" plastic line. Plug the remaining tank ports.
8. Connect lead wire coming from harness connector terminal "B" to a good chassis ground.
9. Connect lead wire coming from wire harness connector terminal "A" to a 12 (or 24) volt source.
10. Plug in wire harness connector to heater connector on air dryer. Note the connector will plug in only one direction.
 - a. The heater is thermostatically controlled ("on" at 35°F; "off" at 55°F). The heater should be connected to 12 (or 24) volt source which is "hot" only when the ignition key is on. The 12 volt, 75 watt heater will draw 6.6 amps. A 24 volt, 75 watt heater will draw 3.2 amps.

Check for proper operation

1. Double check all hoses and fittings for tightness. Start vehicle and allow system pressure to build.
2. Relieve pressure and cycle several times.
3. No air should flow from exhaust port while the system is building air. If air flow is present, check for air pressure in governor line. This line should be at atmospheric pressure during charge.
4. Dryer should exhaust when compressor reaches cut-out. Air will continue to flow out exhaust port with diminishing intensity as purge air evacuates. This could take 45 seconds and should not cause system pressure to drop. If the compressor goes into charge mode, check for air leaks.

Installation Instruction—Brakemaster Dual Turbo-2000

Warning

Safety precautions

1. Before performing any test and/or isolating the air dryer, the vehicle's wheels must be chocked making sure the vehicle will not roll before releasing the brakes.
2. Never work under a unit supported only by a jack. Always support the vehicle with stands.
3. Stop engine when working under vehicle.
4. Never remove a component or a pipe plug unless you are certain all system air pressure has been exhausted.
5. Never connect or disconnect a hose or line containing air pressure.
6. Never exceed recommended maximum working air pressure.
7. Never attempt to disassemble an air dryer until you have read and understood all recommended procedures.
8. Use only proper tools and observe all precautions pertaining to the use of those tools.
9. Always wear safety glasses when working with air pressure. Never look directly into air dryer ports.

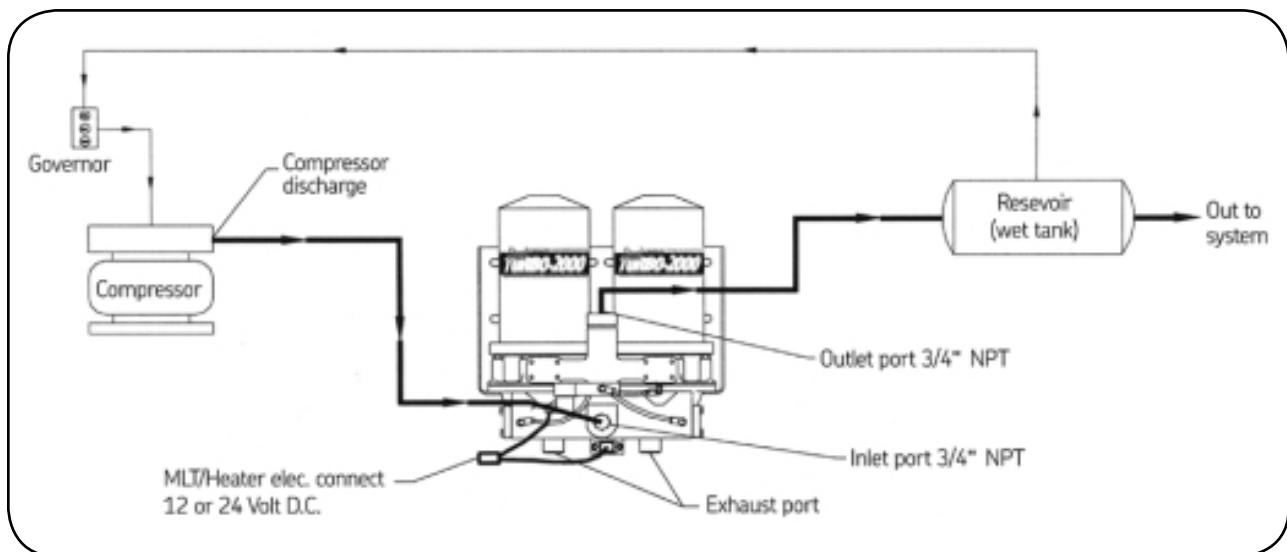


Fig. 1 Connection schematic

Basic mounting guidelines

1. The air dryer must be mounted with the exhaust ports positioned downward. Use grade 5 or better bolts to mount air dryer and purge tank.
2. Mount air dryer lower than the air compressor. The compressor discharge line should slope continuously downward from the compressor to the air dryer without any dips which cause water traps.
3. The compressor discharge line size, material, and length must be such that the dryer air inlet temperature is typically no more than 160 degrees F or no less than 45 degrees F above low ambient, (Ref. SAE J2383). An example of a typical discharge line: Total line length 10 ft. to 12 ft. which is a combination of rigid copper (approx. 4 ft. length) and balance of line length being stainless-steel braid sheathed PTFE. Avoid using 90° elbow fittings to avoid water traps freeze-ups.
4. The air dryer should be mounted in a location with sufficient space around it to facilitate service and to provide visual access for periodic inspection. Allow at least 2.00 inch clearance above air dryer for desiccant cartridge service.
5. The air dryer should be mounted out of direct tire or wheel road splash or protected from splash.
6. The air dryer, with its mounting bracket, lines, and fittings should be mounted in a protected location such that minor mechanical damage to the vehicle will not damage the air system integrity.

Mounting air dryer base assembly

1. After determining proper location for air dryer as instructed in "Basic mounting instructions" section, refer to Fig. 2 drawing for mounting reference dimensions.
2. Mount air dryer base assembly to vehicle before installing desiccant cartridges to base assembly. Make sure there will be at least a 2.00 inch clearance above desiccant cartridges for future installation and removal.
3. Refer to Fig. 2 drawing to position mounting holes properly on vehicle to match mounting slot locations in air dryer mounting bracket. Tighten bolts to 25-30 ft. lbs. torque.

Installing desiccant cartridges

1. After air dryer base assembly is securely mounted, install both desiccant cartridges to base assembly as follows:
 - a. Install o-ring into groove of each center thread adaptor in air dryer base assembly.
 - b. Using grease supplied, lightly lubricate both o-rings and threads.
 - c. Using grease supplied, generously lubricate contact surface of flat gasket.
 - d. Start cartridge onto thread adaptor, being careful not to cross thread. Turn cartridge clockwise until flat gasket contacts casting surface. After gasket contact turn cartridge only 1/2 additional turn.

Note: Do not overtighten cartridge or future removal of cartridge will be extremely difficult.

Connecting air lines

1. Connect the compressor discharge line to the air dryer's lower 3/4" NPT 'INLET' port (see Fig. 2).
2. Connect the air dryer's 3/4" NPT 'OUTLET' port (see Fig. 2) located at top center, to inlet port of #1 air tank (wet tank) of vehicle.

Note: Use appropriate thread sealant on air line fitting threads to prevent air leaks.

Micro Logic Timer (MLT) / Heater electrical connection

1. The air dryer is available in either 12 Volt DC or 24 Volt DC configuration to match the vehicle electrical system. Confirm that voltage of air dryer being installed and vehicle voltage are the same.
2. One (1) triple connector (1-male & 2-female) wire harness and one (1) pig tail lead/connector are supplied with air dryer.
3. Connect lead wire of the pig tail lead/connector coming from connector terminal marked 'B' to a good chassis ground.
4. Connect lead wire of the pig tail lead/connector coming from connector terminal marked 'A' to power source that is powered only when vehicle ignition in 'ON'. The power lead/source should be protected with a 10 Amp fuse.

Note: The MLT unit is polarity sensitive. MLT will not operate if power (+) and ground (-) leads are switched.

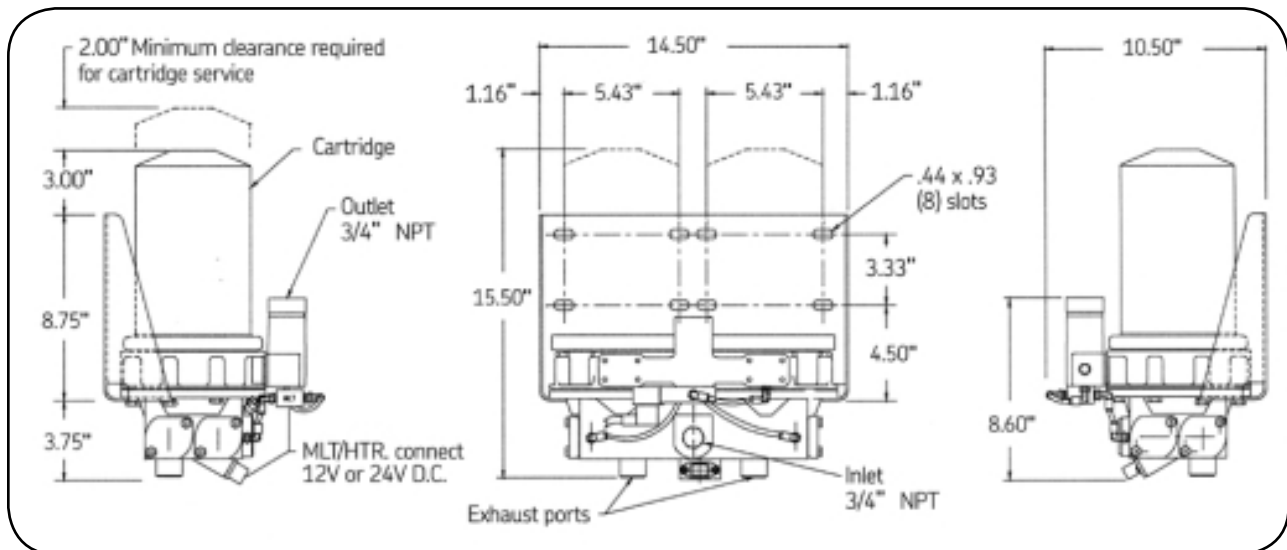


Fig. 2 Unit dimensions

5. Plug one female connector, of the triple connector wire harness, into the air dryer heater receptacle and the other female connector, of the triple connector wire harness, into the receptacle connected to MLT.
6. Connect the male connector, of the triple connector wire harness, to the female connector of the pig tail lead.

Note: The connectors will connect (plug-in) only in one direction.

7. The heater is thermostatically controlled - 'ON' at 35 deg. F and 'OFF' at 55 deg. F
8. To prevent damage, properly secure harness/lead wires and seal any wire splices.

Start-up / Operation check

1. Close drain cocks on all reservoirs.
2. Start engine and allow pressure in air system to build to required (cut-out) pressure.
3. Check air line fittings for leaks and repair any leaks.
4. Allow vehicle air compressor to cycle, a few times, through low (cut-in) and high (cut-out) pressures by applying vehicle brakes to release system air pressure.

Air dryer operation / Cycle

1. The MLT device controls drying and regeneration cycles of air dryer by energizing and de-energizing the 'air control valve' of air dryer at 90 second intervals. An indicator light on MLT will be on during energized cycle and off during the de-energized cycle.
2. The air dryer's 'air control valve' controls air flow direction through the air dryer during the compressor charge cycle (pumping). During the charge cycle one dryer cartridge is drying air and other cartridge is being regenerated.
3. During the compressor charge cycle there will be a light flow of air from ONE exhaust port located at bottom of air dryer base. This is normal, regeneration, air flow and should be present ONLY when the compressor is in charge cycle (pumping). This air flow will alternate from one exhaust port to the other in conjunction with the MLT cycles (ref. step 1). If the air dryer cycle alternates, during the compressor charge cycle (pumping), there will be a momentary burst of air from dryer exhaust port. This is normal and is beginning of the regeneration air flow. Alternately, if the compressor is not in charge cycle, no air will flow from either exhaust. However, the indicator light will go on and off every 90 seconds regardless of compressor cycling.

Warning

Safety precautions

1. Before performing any test and/or isolating the air dryer, the vehicle's wheels must be chocked making sure the vehicle will not roll before releasing the brakes.
2. Never work under a unit supported only by a jack. Always support the vehicle with stands.
3. Stop engine when working under vehicle.
4. Never remove a component or a pipe plug unless you are certain all system air pressure has been exhausted.
5. Never connect or disconnect a hose or line containing air pressure.
6. Never exceed recommended maximum working air pressure.
7. Never attempt to disassemble an air dryer until you have read and understood all recommended procedures.
8. Use only proper tools and observe all precautions pertaining to the use of those tools.
9. Always wear safety glasses when working with air pressure. Never look directly into air dryer ports.

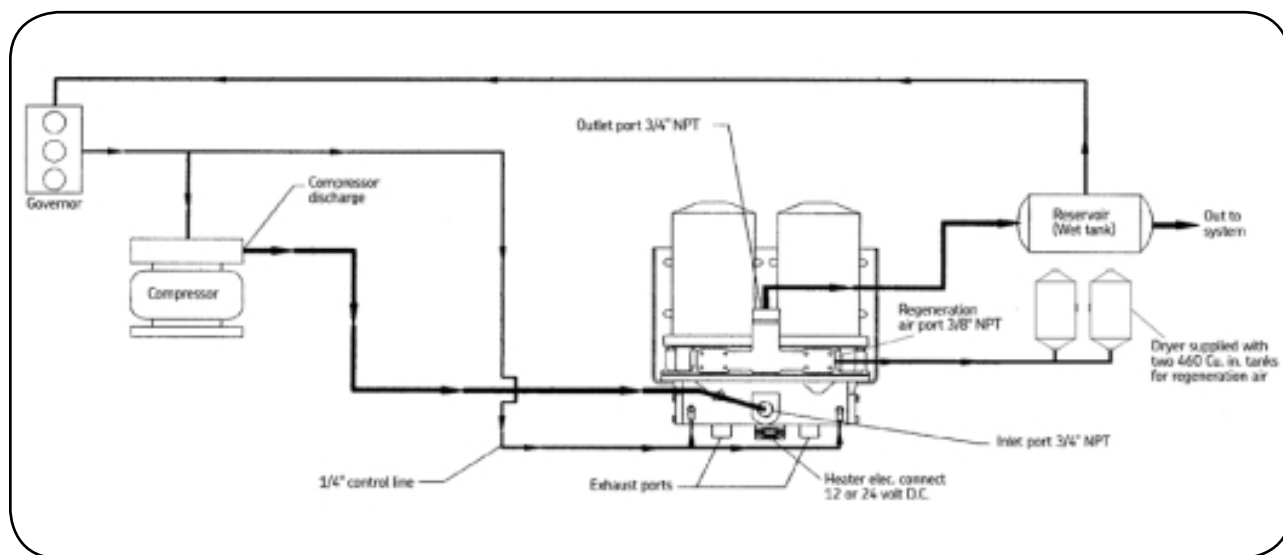


Fig. 1 Connection schematic

Basic mounting guidelines

1. The air dryer must be mounted with the exhaust ports positioned downward. Use grade 5 or better bolts to mount air dryer and purge tank.
2. Mount air dryer lower than the air compressor. The compressor discharge line should slope continuously downward from the compressor to the air dryer without any dips which cause water traps.
3. The compressor discharge line size, material, and length must be such that the dryer air inlet temperature is typically no more than 160 degrees F or no less than 45 degrees F above low ambient, (Ref. SAE J2383). An example of a typical discharge line: Total line length 10 ft. to 12 ft. which is a combination of rigid copper (approx. 4 ft. length) and balance of line length being stainless-steel braid sheathed PTFE. Avoid using 90° elbow fittings to avoid water traps freeze-ups.
4. The air dryer should be mounted in a location with sufficient space around it to facilitate service and to provide visual access for periodic inspection. Allow at least 2.00 inch clearance above air dryer for desiccant cartridge service.
5. The air dryer should be mounted out of direct tire or wheel road splash or protected from splash.
6. The air dryer, with its mounting bracket, lines, and fittings should be mounted in a protected location such that minor mechanical damage to the vehicle will not damage the air system integrity.

Mounting air dryer base assembly

1. After determining proper location for air dryer as instructed in "Basic mounting instructions" section, refer to Fig. 2 drawing for mounting reference dimensions.
2. Mount air dryer base assembly to vehicle before installing desiccant cartridges to base assembly. Make sure there will be at least a 2.00 inch clearance above desiccant cartridges for future installation and removal.
3. Refer to Fig. 2 drawing to position mounting holes properly on vehicle to match mounting slot locations in air dryer mounting bracket.
4. Use at least four (4) 3/8", grade 5 bolts, to attach air dryer to vehicle. Tighten bolts to 25-30 ft. lbs. torque.

Installing desiccant cartridges

1. After air dryer base assembly is securely mounted, install both desiccant cartridges to base assembly as follows:
 - a. Install o-ring into groove of each center thread adaptor in air dryer base assembly.
 - b. Lubricate both o-rings and threads.
 - c. Lubricate contact surface of flat gasket.
 - d. Start cartridge onto thread adaptor, being careful not to cross thread. Turn cartridge clockwise until flat gasket contacts casting surface. After gasket contacts adaptor plate, tighten cartridge only 1/2 additional turn.

Note: Do not overtighten cartridge or future removal of cartridge will be extremely difficult.

Connecting air lines

1. Connect the compressor discharge line to the air dryer's lower 3/4" NPT 'INLET' port.
2. Connect the air dryer's 3/4" NPT 'OUTLET' port, located at top center, to inlet port of #1 air tank (wet tank) of vehicle.

Note: Use appropriate thread sealant on air line fitting threads to prevent air leaks.

3. Connect 1/4" air line from D-2 governor UNL port to 1/4" push connect fitting located on front of dryer.
4. Connect purge air tank(s) (600 cu. in. minimum) to 1/4" port located on air dryer outlet manifold.

Connecting heater / Wire harness

1. The air dryer heater is available in either 12 volt DC or 24 volt DC configuration to match the vehicle electrical system. Confirm that voltage of air dryer being installed and vehicle voltage are the same.
2. Connect lead wire of the pig tail lead/connector coming from connector terminal marked 'B' to a good chassis ground.
3. Connect lead wire of the if tail lead/connector coming from connector terminal marked 'A' to power source that is powered only when vehicle ignition in 'ON'. The power lead/source should be protected with a 10 Amp fuse.
4. Plug female connector, of wire harness, into the air dryer heater receptacle.

Note: The connector will connect (plug-in) only in one direction.

5. The heater is thermostatically controlled - 'ON' at 35 deg. F and 'OFF' at 55 deg. F
6. To prevent damage, properly secure harness/lead wires and seal any wire splices.

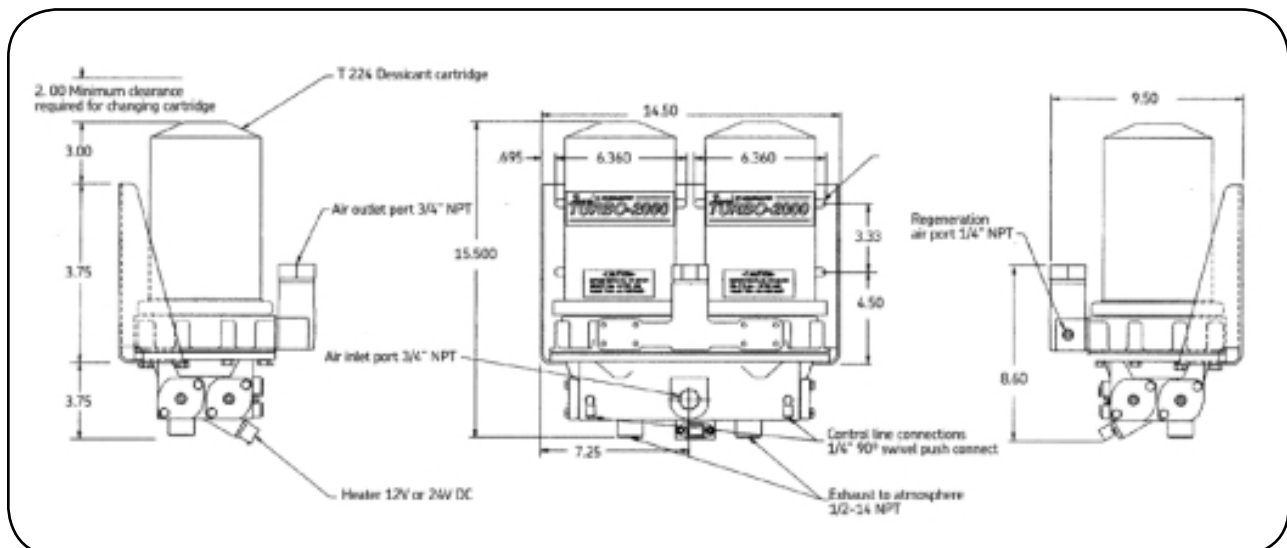
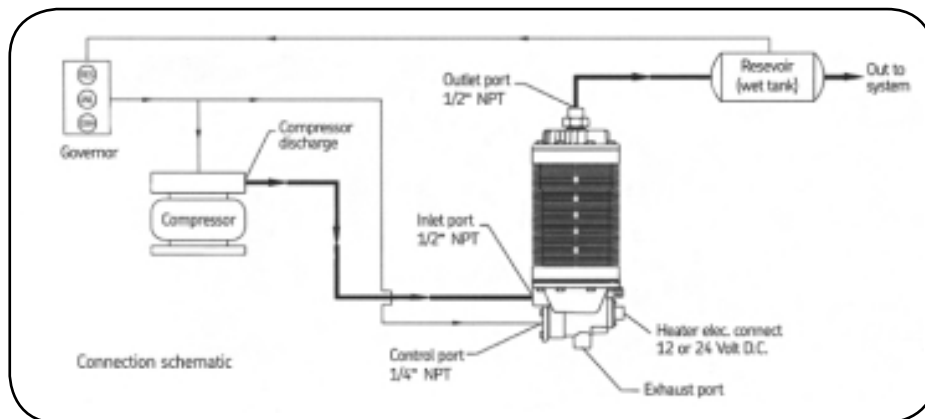


Fig. 2 Unit dimensions

Installation Instruction—Brakemaster Turbo-AC



3

SKF Brakemaster

The SKF Brakemaster is a heat exchanger type air dryer. To properly dry the compressed air, a flow of ambient air across the air dryer is of utmost importance. With the air flow, the SKF Brakemaster can transfer the heat in the compressed air to the atmosphere, thus, condensing moisture from the compressed air.



Warning



Safety precautions

1. Before performing any test and/or isolating the air dryer, the vehicle's wheels must be chocked making sure the vehicle will not roll before releasing the brakes.
2. Never work under a unit supported only by a jack. Always support the vehicle with stands.
3. Stop engine when working under a vehicle.
4. Never remove a component or a pipe plug unless you are certain all system air pressure has been exhausted.
5. Never connect or disconnect a hose or line containing air pressure.
6. Never exceed recommended working air pressure.
7. Never attempt to disassemble an air dryer until you have read and understood all recommended procedures.
8. Use only proper tools and observe all precautions pertaining to the use of those tools.
9. Always wear safety glasses when working with air pressure. Never look directly into air dryer ports.

Basic mounting guidelines

1. The air dryer must be mounted with the exhaust ports positioned downward. Use grade 5 or better bolts to mount air dryer and purge tank.
2. Mount air dryer lower than the air compressor. The compressor discharge line should slope continuously downward from the compressor to the air dryer without any dips which cause water traps.
3. The compressor discharge line size, material, and length must be such that the dryer air inlet temperature is typically no more than 160 degrees F or no less than 45 degrees F above low ambient, (Ref. SAE J2383). An example of a typical discharge line: Total line length 10 ft. to 12 ft. which is a combination of rigid copper (approx. 4 ft. length) and balance of line length being stainless-steel braid sheathed PTFE. Avoid using 90° elbow fittings to avoid water traps freeze-ups.
4. The air dryer should be mounted in a location with sufficient space around it to facilitate service and to provide visual access for periodic inspection. Allow at least 2.00 inch clearance above air dryer for desiccant cartridge service.
5. The air dryer should be mounted out of direct tire or wheel road splash or protected from splash.
6. The air dryer, with its mounting bracket, lines, and fittings should be mounted in a protected location such that minor mechanical damage to the vehicle will not damage the air system integrity.

Mounting procedure

Note: Dryers with a steel line that runs from top to bottom on outside of dryer are for use with Holset E-Type compressors.

1. Drain all air from air reservoirs. **Note:** The presence of excessive oil is a sign that compressor requires service.
2. Mount air dryer. Tighten nuts to 25-30 ft. lbs.
3. Connect the compressor discharge line to air dryer's 1/2" NPT inlet (lower side of dryer) port.
4. Connect the air dryer's 1/2" NPT outlet (top of dryer) port to air line leading to wet tank.
5. Connect air line from governor UNL port to the air dryer's 1/4 NPT unloader (directly below inlet port) port.
6. Connect lead wire coming from harness connector terminal 'B' to a good chassis ground.
7. Connect lead wire coming from wire harness connector terminal 'A' to a 12 (or 24) volt source.
8. Plug in wire harness connector to heater connector on air dryer. Note the connector will plug in only one direction.
 - a. The heater is thermostatically controlled ('ON' at 35°F; 'OFF' at 55°F). The heater should be connected to 12 (or 24) volt source which is "hot" only when the ignition key is on. The 12 volt, 75 watt heater will draw 6.6 amps. A 24 volt, 75 watt heater will draw 3.2 amps.

Check for proper operation

1. Double check all hoses and fittings for tightness. Start vehicle and allow system pressure to build.
2. Relieve pressure and cycle several times.
3. No air should flow from exhaust port while the system is building air. If air flow is present, check for air pressure in governor line. This line should be at atmospheric pressure during charge.
4. Dryer should exhaust when compressor reaches cut-out. There should be no further air flow after burst.
 - a. Check for leaks if air continues to flow and/or compressor goes into charge mode.

Parts listing—Service kits and air dryers

Note: Bold part numbers represent suggested stock service components

Service kits

T224	Desiccant cartridge (T2000 & HD2000)	619086	Complete bottom cap assy. (12V) non-E type
T224-P	Desiccant cartridge w/Filtration Plus (Dual T2000, Dual T2000HC, T2000 & HD2000)	619087	Complete bottom cap assy. (24V) non-E type
T334	Turbo-3000 desiccant cartridge	619089	Complete bottom cap assy. (12V) HD-2000
221	Purge tank kit	619090	Complete bottom cap assy. (24V) HD-2000
223	Bleed valve kit	619091	Turbo-2000, Turbo-3000 & HD-2000 mid-section w/valves standard
228	Turbo valve kit	619093	Turbo-2000, Turbo-3000 & HD-2000 mid-section w/valves E-type
230	Turbo-AC model 62 feedback kit	619109	Muffler - compatible with all SKF dryers
231	Turbo-AC model 68 feedback kit	619110	12V75W Thermostat heater w/plug-in connector
235	Unloader valve kit	619111	24V75W Thermostat heater w/plug-in connector
238	Check valve kit	619112	Complete bottom cap assy. (T2000 & T3000) 12V E-type
239	Filter service kit for aftercoolers	619113	Complete bottom cap assy. (T2000 & T3000) 24V E-type
240	Filter replacement kit for aftercoolers	619114	Complete bottom cap w/poppet valve only
246	12V50W Thermostat heater-short element	619115	Mounting bracket w/industry standard bolt hole pattern
247	24V50W Thermostat heater-vertical	619116	Adaptor plate for T2000 w/valves & bracket
248	12V75W Thermostat heater-long element	619140	Cartridge adaptor stud
249	24V75W Thermostat heater-horizontal	619215	O-ring kit for 619938 (10 ea of 3)
261	Deflector kit (62, 63, T62, 620570)	619218	O-ring kit for 223, 238, 619911 (10 ea of 1)
263	Deflector kit (68, 69, T68)	619220	O-ring kit for 235 (10 ea of 3)
265	Deflector kit (70 & 72)	619222	Hose & fitting kit for purge tank
610024	Safety valve-175 psi	619228	Dual Turbo-2000HC purge tank kit w/690 Cu.In. purge volume
610029	Top cap nut (62, 63, 68, 69, T62, T68)	619238	O-ring kit for T224 (10 ea of 1)
610030	Unloader valve nut	619239	End cap service kit o-rings and bolts
610069	Seal retainer	619240	Manifold service kit o-rings and screws
610076-10	Filter packing ring (Lots of 10 only-price per each)	619241	Inlet check valve service kit
610077	Body gasket w/o-ring	619340	Service kit includes: T224, 228, 235, 238
610107	U-bolt service kit	619360	Service kit includes: T224-P, 228, 235, 238
610110	Seal retainer for HD2000 and Turbo-AC	619500	Filter conversion kit to T224-P (Filter & bolts)
610179-10	Body gasket E-type version w/o o-ring (Lots of 10 only-price per each)	619525	Filter conversion kit to T224-P (Filter only)
610236	Desiccant dryer check valve nut		
610237	Desiccant dryer bleed valve nut		
610271	Filter hold-down spring for aftercoolers		
610705	Die cast body (62 & 63)		
610851	Model 62 bracket		

Service kits - cont.

619740	Safety Valve 200 PSI
619900	Heater wire harness
619905	Universal lead for 12 or 24V applications
619910	Dual Turbo-2000 air control valve (3 air line version) thru March, 2006
619911	Dual Turbo-2000 regeneration valve kit
619912	Dual Turbo-2000 MLT 12V
619913	Regen valve kit (Dual Turbo-2000HC)
619915	Dual Turbo-2000 inlet check valve kit (Superseded to 619938)
619920	Dual Turbo-2000 mid-section left hand
619921	Dual Turbo-2000 mid-section right hand
619922	Dual Turbo-2000 manifold w/valves & fittings for 2-line version
619924	Dual Turbo-2000 MLT 24V
619925	Dual Turbo-2000 air control valve (2 air line version) from April, 2006
619928	Dual Turbo-2000 check valve nut
619930	Dual Turbo-2000 manifold
619932	Dual Turbo-2000 valve housing (includes valves & 12V heater)
619933	Dual Turbo-2000HC manifold w/o MLT, ACV or accessories
619934	Dual Turbo-2000 valve housing (includes valves & 24V heater)
619935	Dual Turbo-2000 heater wire harness
619938	Dual Turbo-2000 inlet check valve kit
619940	10 pack of 619938
619972	619932 w/bottom cap bolts & 12V heater
619973	HC Dual Turbo-2000 control line service kit
619974	619934 w/bottom cap bolts & 24V heater
619976	Dual Turbo-2000HC manifold conversion w/o tanks
619978	Dual Turbo-2000HC manifold conversion w/tanks
619979	Dual Turbo-2000HC complete service kit w/24V heater
619980	Dual Turbo-2000 mounting bracket

Desiccant air dryers

620300	L.H. Turbo-2000 w/Filtration Plus and tank kit/12V heater
620302	L.H. Turbo-2000 w/Filtration Plus dryer only/12V heater
620303	R.H. Turbo-2000 dryer only/12V heater w/Filtration Plus Opt
620304	L.H. Turbo-2000 w/Filtration Plus and tank kit/24V heater
620306	L.H. Turbo-2000 w/Filtration Plus dryer only/24V heater
620350	L.H. HD-2000 w/Filtration Plus and tank kit/12V heater
620352	L.H. HD-2000 w/Filtration Plus dryer only/12V heater
620354	L.H. HD-2000 w/Filtration Plus and tank kit/24V heater
620356	L.H. Turbo-2000 w/Filtration Plus dryer only/24V heater
620357	R.H. HD-2000 w/Filtration Plus dryer only/24V heater
620500	L.H. Turbo-2000 E-type w/tank kit w/12V heater
620501	R.H. Turbo-2000 w/tank kit w/12V heater
620502	L.H. Turbo-2000 E-type dryer only w/12V heater
620503	R.H. Turbo-2000 E-type dryer only w/12V heater
620504	L.H. Turbo-2000 E-type w/tank kit w/24V heater
620505	R.H. Turbo-2000 w/tank kit w/24V heater
620506	L.H. Turbo-2000 E-type dryer only w/24V heater
620525	R.H. Turbo-2000 E-type dryer only w/12V heater
620526	L.H. Turbo-2000 E-type dryer only w/12V heater
620540	L.H. Turbo-3000 E-type w/12V heater
620541	R.H. Turbo-3000 w/12V heater (SAE design)
620542	L.H. Turbo-3000 E-type w/24V heater
620544	L.H. Turbo-3000 E-type w/12V heater & Retrofit bracket

Note: Bold part numbers represent suggested stock service components

Desiccant air dryers - cont.

620550	L.H. HD-2000 w/tank kit w/12V heater
620551	R.H. HD-2000 w/tank kit w/12V heater
620552	L.H. HD-2000 dryer only w/12V heater
620554	L.H. HD-2000 w/tank kit w/24V heater
620556	L.H. HD-2000 dryer only w/24V heater
620557	R.H. HD-2000 dryer only w/24V heater
620559	R.H. Turbo-2000 dryer only/24V w/o bracket
620600	Standard/Non-E-type L.H. Turbo-2000/12V heater w/tank
620602	Standard/Non-E-type L.H. Turbo-2000 dryer only/12V heater
620603	Standard/Non-E-type R.H. Turbo-2000 dryer only/12V heater
620604	Standard/Non-E-type L.H. Turbo-2000/24V heater w/tank
620606	Standard/Non-E-type L.H. Turbo-2000 dryer only/24V heater
620640	Standard/Non-E-type L.H. Turbo-3000/12V heater
620642	Standard/Non-E-type L.H. Turbo-3000/24V heater
620806	L.H. Turbo-2000 E-type dryer only w/24V heater w/Filtration Plus
620910	Dual Turbo-2000 air dryer 12V heater
620912	Dual Turbo-2000 air dryer 12V heater (w/o canisters)

Desiccant air dryers - cont.

620920	Dual Turbo-2000 air dryer 24V heater
620922	Dual Turbo-2000 air dryer 24V w/12V MLT & special mounting bracket
620924	Dual Turbo-2000 air dryer 24V heater (w/o canisters)
620930	Dual Turbo-2000 air dryer 24V heater w/o purge tanks
620950	Dual Turbo-2000 air dryer 110V Non-vehicle w/o tanks
620960	Dual Turbo-2000 air dryer 110V Non-vehicle w/tanks
620980	HC Dual Turbo-2000 air dryer 12V heater w/ purge tanks
620982	HC Dual Turbo-2000 air dryer 12V heater w/o purge tanks
620984	HC Dual Turbo-2000 air dryer 24V heater w/o purge tanks
620986	HC Dual Turbo-2000 air dryer 24V heater w/ purge tanks

Brakemaster aftercooler air dryers

620570	L.H. Turbo-AC 12V heater
620571	R.H. Turbo-AC 12V heater
620572	L.H. Turbo-AC 24V heater
620578	L.H. Turbo-AC 12V heater / Holset QE-compatible
620580	L.H. Turbo-AC 24V heater / Holset QE-compatible

Note: Bold part numbers represent suggested stock service components

NOTES

NOTES



WARNING!

Proper selection of the products listed for sale in this catalog is essential to minimize the risk of any seal, bearing or other product failure. Such failures can result in property damage or severe personal injury to operators of machinery, vehicles or to others. You must carefully evaluate the particular application on or into which you intend to install the products. Products in this catalog require installation by an experienced professional mechanic or qualified maintenance professional.

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Vocational Matrix

Applications	Turbo-2000	Turbo-3000	HD-2000	Turbo-AC	Dual Turbo-2000	H.C. Dual Turbo-2000
Linehaul tractor/trailer	X	X*	X**	X	X	X
City pickup/delivery/emergency rescue	X	X	X**	X	X	X
On-off highway/construction/mining	X	X*	X**	X*	X	X
Concrete mixer	X		X**		X	X
School bus	X		X**		X	X
Refuse - residential	X		X**		X	X
Bus - travel coach	X		X**		X	X
Bus - city transit	X		X**		X	X
Yard spotter/yard jockey	X		X**		X	X
Fire truck	X				X	X
Small bus/RV	X	X*		X*	X	X
Air over hydraulic brakes	X	X		X	X	X
Central tire inflation					X***	X***
Pump-off trailer (engine mounted compressor)					X***	X***

Operating parameters						
Maximum compressor duty cycle	40%	15%	40%	20%	100%	40%
Maximum compressor size	30 CFM	15 CFM	30 CFM	15 CFM	40 CFM	80 CFM

* Max allowable braked axles=5

** For naturally aspirated compressors or DLU (Discharge Line Unload) air systems only

*** Dual dryer application, call for installation details

Note: Filtration Plus option available on Turbo-2000 and HD-2000 air dryers