Cummins

SINGLE CYLINDER AIR COMPRESSOR

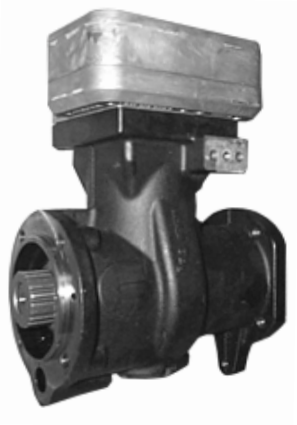
SERVICE AND MAINTENANCE PROCEDURES

Cummins Engine Company
Columbus, IN

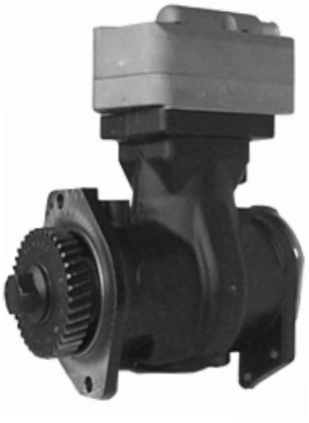
Cummins Engine Applications

Signature
ISX

N14
ISM



ISB



ISC
ISL

January 2000
P/N 3666467 Rev 3

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Introduction

Features

The Cummins compressors represent the most recent change in compressor technology to better performance, longer durability, and lower weight. It has reed valve technolgy, better exhaust air cooling, higher efficiency, and an internal pressure relief valve. It can be used with conventional dryers without the need for special valves for pressure feed back.

Air Dryers and Plumbing

AEB 21.39 has been published that describes the requirements and plumbing necessary for a successful system. It lists dryers that can be used and fully describes the type of system needed for most vehicle applications. Contact Cummins Application Engineering for a copy.

Operation

The Cummins air compressor is an engine-driven, piston-type compressor which supplies compressed air to operate air powered actuators on vehicles. The compressor is geared directly to the engine which serves to operate the compressor and any accessory that is connected on the rear flange. The compressor will deliver air out of the exhaust port when the unloader port is at atmospheric pressure and will stop air delivery when the unloader port is pressurized to system pressure(100 to 125 psi). A governor determines the “cut-in”(start of pumping) and “cut-out”(termination of pumping) of the compressor by supplying the proper control signal to the unloader port. The governor is sensing the pressure in the air supply tank or “wet tank”. If the output air pressure is inadvertantly blocked or required to exceed 250 psi, the compressor will stop air delivery. The air will be recycled within the compressor and no mechanical harm will be done.

How to use this manual

- Identify the compressor by knowing the part number and serial number.
- Collect any information on time in service, miles, hours, and basic vehicle application.
- Visually compare the compressor to the pictures on the cover or in the text to relate it to an engine model.
- Review the trouble shooting guide to help identify the basic problem.

- Review the statement of allowable field repairs to determine if the repair can be done in the field, is covered by warranty, or should be done by an authorized repair facility.
- If it is field repairable, proceed to the repair kit section to see what kits and parts are available.
- Proceed to the disassembly, cleaning, inspection and reassembly sections.

Identification of compressors

- Find and record the part number and serial number located on an aluminum tag attached to the crankcase just under the head of the compressor.
- Compare it's visual appearance to the pictures on the cover or in the text of this manual to know the related engine model.

This will easily enable you to identify the repair kits for your compressor and help guide you through the disassembly process.

Statement of allowable field repairs

Repair kits are available for field work. These include the removal and replacement of normal maintenance parts. These parts are the head assy and gaskets. Damage to other parts will require that the compressor be rebuilt by an authorized repair location.

Attempted repairs to other than kit repairs may invalidate any warranty that may be applicable.

Data Tag Information

The top row of numbers is the Cummins part number.

The middle row of number is the date followed by a serial number.

The bottom row is a WABCO part number.

Returning Compressors

Compressors returned to a rebuilder should include name, address, phone no., problem description and have freight prepaid.

Trouble Shooting Guide

The assumption is that the air system on the vehicle is working properly.

- The governor is pressurizing and depressurizing the unloader port.
- Exhaust line in not frozen or blocked.
- Exhaust line is not leaking.
- Dryer operation is correct and functioning with the governor.
- Lines and tanks downstream of the dryer are functioning and leakproof.

Problem:	Solution:
Compressor will not pump any air	
Unloader valve is stuck open	Install Head kit
Exhaust valve is broken	Install Head kit
Exhaust valve is lodged open	Install Head kit
Inlet valve is lodged open	Install Head kit
Compressor is slow to build air	
Exhaust valve leakage	Install Head kit
Inlet valve leakage	Install Head kit
Excessive ring wear	Return to Auth'r Rebuilder
Head gasket leakage	Install Head kit
Relief valve leaking	Install Head kit
Compressor exceeds cut-out pressure	
Unloader fails to operate	Install Head kit
Air is getting into the water system	
Internal gasket leakage	Install Head kit
Internal casting porosity	Install Head kit
Water is getting into the air system	
Internal gasket leakage	Install Head kit
Internal casting porosity	Install Head kit

Excessive blowby

- Worn rings ..... Return to Auth'r Rebuilder
- Worn bore ..... Return to Auth'r Rebuilder
- Scored bore ..... Return to Auth'r Rebuilder

Excessive noise

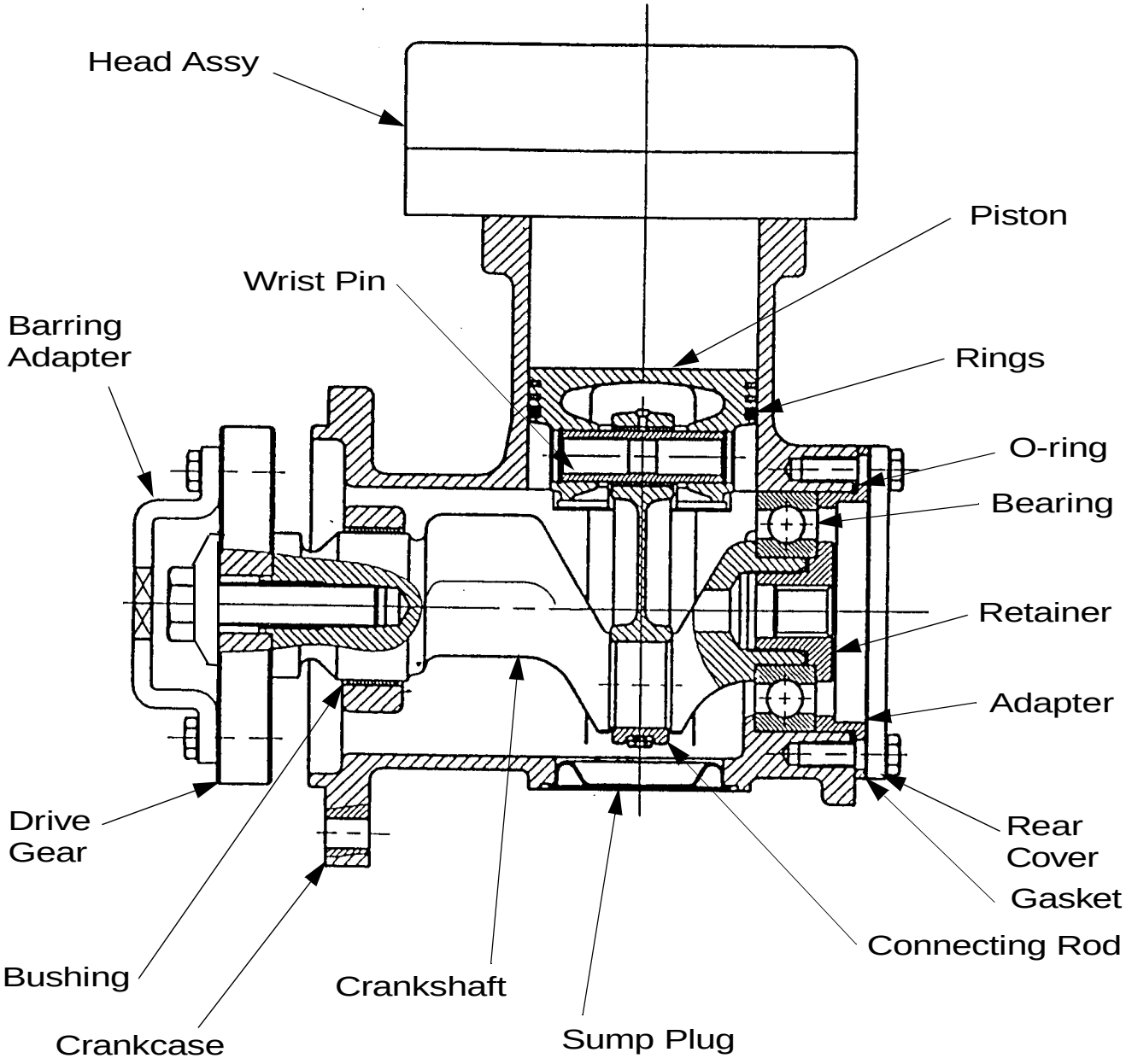
- Excessive piston wear ..... Return to Auth'r Rebuilder
- Carbon build up on head and piston ..... Clean and reuse
- Piston wrist pin wear ..... Return to Auth'r Rebuilder
- Wrist pin wear ..... Return to Auth'r Rebuilder
- Rod wear(top or bottom bearing) ..... Return to Auth'r Rebuilder
- Loose rod bearing bolts ..... Return to Auth'r Rebuilder
- Excessive crank throw pin wear ..... Return to Auth'd Rebuilder
- Crank bearing wear(front bushing or rear ball) ..... Return to Auth'r Rebuilder
- Excessive crank journal wear ..... Return to Auth'd Rebuilder
- Excessive gear noise ..... Check and reset gear timing

Excessive oil consumption

- Worn rings ..... Return to Auth'r Rebuilder
- Worn bore ..... Return to Auth'd Rebuilder
- Restriction in the inlet passage ..... Install Head kit
- Excessive duty cycle ..... Repair air system
- Excessive high pressure operation ..... Repair air system

External oil leakage

- Gasket leakage ..... Install Gasket kit
- Porous casting ..... Return to Auth'd Rebuilder
- Bottom cover leakage ..... Return to Auth'r Rebuilder


Head Assy
Piston
Wrist Pin
Barring Adapter
Rings
O-ring
Bearing
Retainer
Adapter
Drive Gear
Rear Cover
Gasket
Connecting Rod
Bushing
Crankshaft
Crankcase
Sump Plug

Engine/Compressor Matrix

Engine	Single Model	
Signature	18.7	
ISX	18.7	
N14	18.7	
ISM	18.7	
ISL	18.7	
ISC	18.7	
ISB	15.4	

Repair Kits

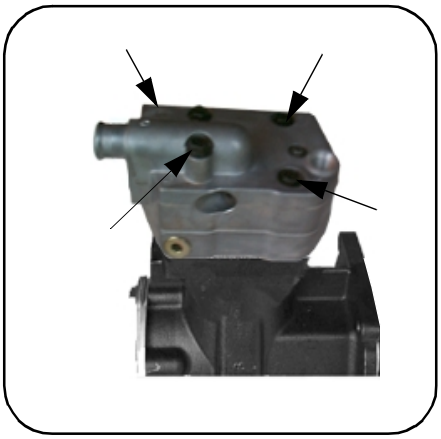
Kit Name	P/N	For Cummins engine models
Head Assy Kit	3800820	Signature, ISX
Head Assy Kit	3800821	N14, ISM, ISC, ISL
Head Assy Kit	3800822	ISB
Rear Gasket Kit	3800827	Signature, ISX, N14, ISM, ISC, ISL, ISB

Kit Name	Contents
Head Assy Kit	Cylinder Head Assy, Head Bolts
Rear Gasket Kit	O-ring, Gasket

Disassembly

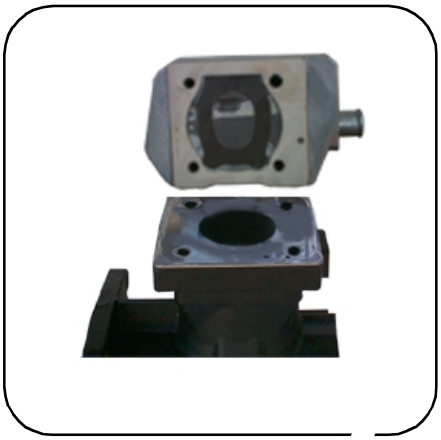
1. Remove the four (4) M8(13 mm across flats) head bolts. Discard the bolts.

2. Remove the head, valve, and gasket. Note the position of the ports in respect to the crankcase for reassembly.



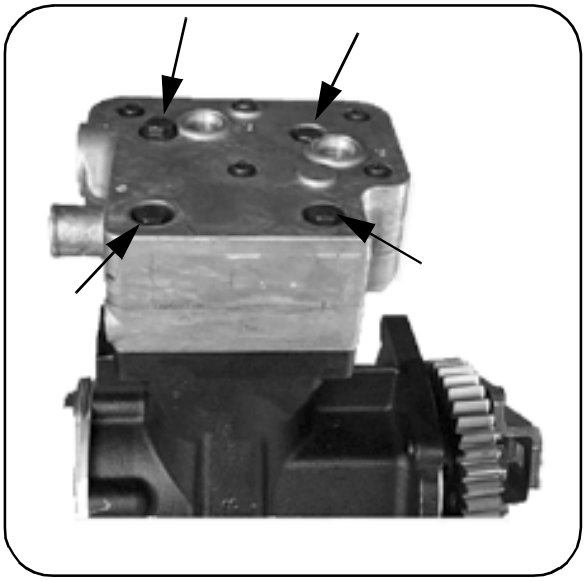
Cleaning

Rotate the crankshaft until the piston is at the top of the cylinder bore. Remove any accumulated carbon and varnish by carefully scraping and light application of solvents. Avoid getting debris and solvents into the clearance between the piston and bore. Avoid the use of abrasive products similar to “Scotch Brite” because of damage and abrasive grit left behind.

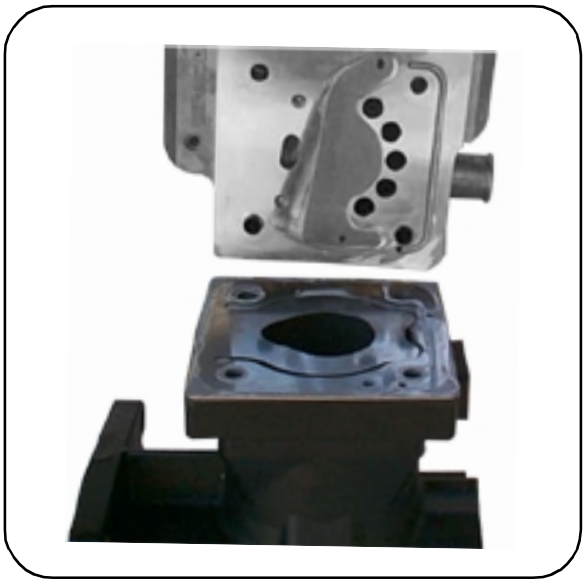


Disassembly

1. Remove four (4) 13 mm head bolts. Discard the bolts.



2. Remove the head, valve, and gasket. Note the position of these parts in respect to the crankcase for reassembly(paint marker can be used).



Cleaning

Cleaning of parts can be done by most commercial methods used for cleaning ferrous metals and aluminum parts.

Warning: When using solvents, acids, or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles or face shield and protective clothing.

Soak the parts in a kerosene emulsion based cleaner designed to remove carbon. The cleaner must have a pH of 9.5 or less to avoid turning aluminum parts black. The cleaner manufacturer or supplier can be contacted about solution concentration, temperature, and soak time. If using a hot caustic cleaning process, do not immerse aluminum parts.

Note: Do not use a scraper to remove carbon and scale. The sealing surfaces can be damaged. The parts can be scrubbed with a stiff non-metallic brush. Avoid the use of abrasive products similar to "Scotch Brite" because of damage and abrasive grit left behind.

Inspection

General

Any evidence of heavy wear or deformation on any component as if it was over stressed, disqualifies the part for reuse.

Useful conversion factors.

1 mm = .03937 inches

1 Nm = .738 lb-ft = 8.85 lb-in

Head

Inspect the valve elements for breakage and cracks. Any signs of damage renders the parts unusable.

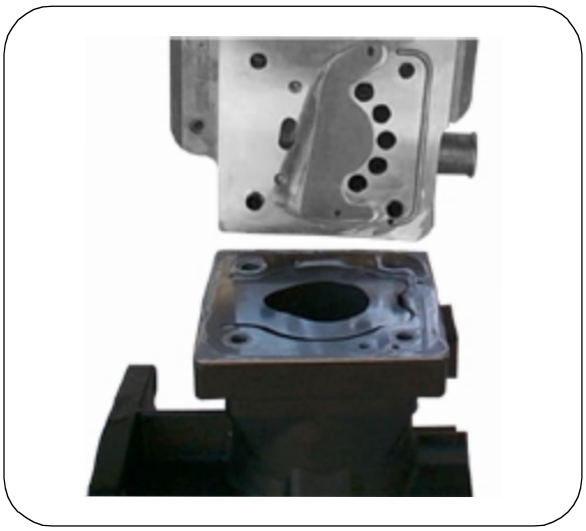
Inspect the sealing seats for wear and deformations due to debris. Anything more that a polishing of the seat renders the part unusable.

Crankcase

Inspect the top crankcase surface. It should be smooth and free of scratches to enable resealing on reassembly.

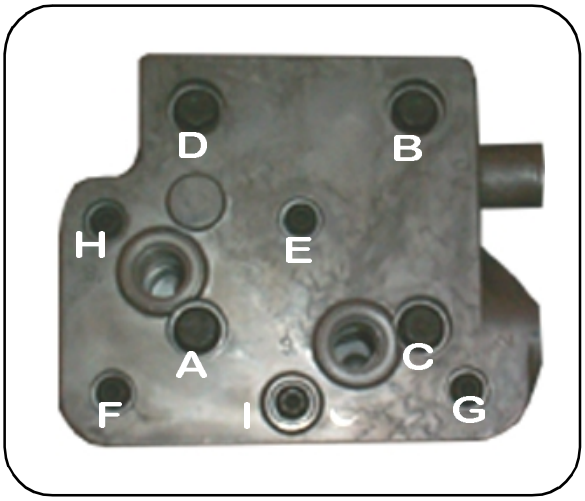
Reassembly

1 Assemble the gasket/valve assembly and head to the crankcase. Insure the guide pins are in the correct direction to enter the larger diameters in the valve and crankcase. If orientation marks were applied on disassembly, simply align them and procede. Assemble and tighten the four(4) head bolts and the five(5) head cover bolts following the following steps.

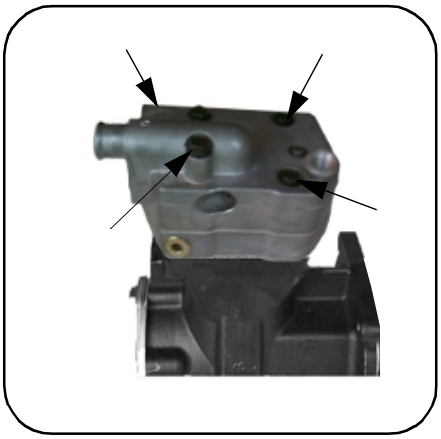


Bolt Tightening Sequence

Step	Bolt	Torque Nm	Rotation Degrees
1	A	25^{+0}_{-5}	
2	B	25^{+0}_{-5}	
3	C	25^{+0}_{-5}	
4	D	25^{+0}_{-5}	
5	A		$90°^{+15}_{-5}$
6	B		$90°^{+15}_{-5}$
7	C		$90°^{+15}_{-5}$
8	D		**60°** $^{+15}_{-5}$
9	E	$6^{+.6}_{-.6}$	
10	F	$6^{+.6}_{-.6}$	
11	G	$6^{+.6}_{-.6}$	
12	H	$6^{+.6}_{-.6}$	
13	I	$6^{+.6}_{-.6}$	
14	E		$90°^{+15}_{-5}$
15	F		$90°^{+15}_{-5}$
16	G		$90°^{+15}_{-5}$
17	H		$90°^{+15}_{-5}$
18	I		$90°^{+15}_{-5}$

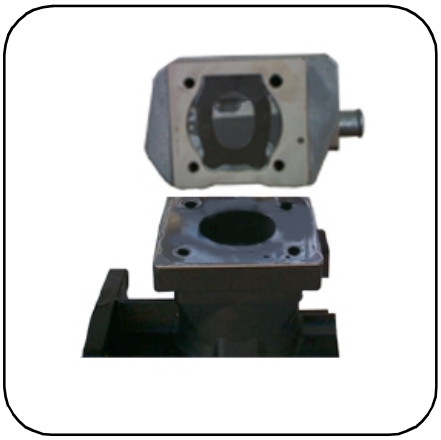


Cummins Single Cylinder Air Compressor



Cleaning

Rotate the crankshaft until the piston is at the top of the cylinder bore. Remove any accumulated carbon and varnish by carefully scraping and light application of solvents. Avoid getting debris and solvents into the clearance between the piston and bore. Avoid the use of abrasive products similar to “Scotch Brite” because of damage and abrasive grit left behind.

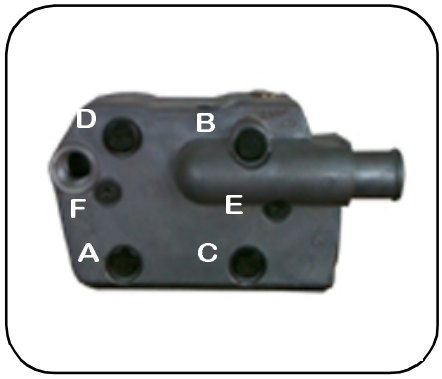


Reassembly

Insure the sliding valve is in place, assemble the gasket/ valve assembly and head to the crankcase. Insure the guide pins are in the correct direction to enter the larger diameters in the valve body and crankcase. Assemble and tighten the four(4) head bolts and the two(2) head cover bolts following the following steps.

Bolt Tightening Sequence

Step	Bolt	Torque Nm	Rotation Degrees
1	A	15 ± 1.5	
2	B	15 ± 1.5	
3	C	15 ± 1.5	
4	D	15 ± 1.5	
5	A	25 ± 2	
6	B	25 ± 2	
7	C	25 ± 2	
8	D	25 ± 2	
5	A		180° ± 10
6	B		270° ± 10
7	C		180° ± 10
8	D		180° ± 10
9	E	6 ± .6	
10	F	6 ± .6	
11	E		90° $^{+15}_{-5}$
12	F		90° $^{+15}_{-5}$



Aug 9,1999

1. Assemble the o-ring seal, flange, flat-head screws, cover gasket and cover(if it came with a cover). Torque the bolts to 20 ±2 Nm. Insure the alignment of the flange matches all holes.

Testing

Bench Testing

Turning the compressor over(with a wrench) while on the bench can be used to insure:

- moving parts are not binding,
- intake port will draw some vacuum indicating the inlet valve is seating,
- exhaust port will pass some air demonstrating that the exhaust valve is seating.

Pressurizing the exhaust port with a volume of pressurized air with very small pressure decay can help insure good exhaust valve seating.

Using shop air (80 to 120 psi) and a blow gun can be used to cycle the unloader piston.

Applying a tank with a vacuum can be used to insure the seating of the inlet valve. A vacuum level of 20 to 30 inches Hg can be used. Again a small drop in vacuum indicates good seating.

Pressurizing a water port (other port plugged) with a volume of pressurized air with very small pressure decay can help insure gaskets and castings are leak proof.

Vehicle Testing

Installation of the compressor on a vehicle is the best method of test. The parameters to observe are:

- Will the air system build the system pressure from 85 to 100 psi in 25 seconds or less.
- Does the compressor unload as the system pressure comes up to 120 psi.
- By bleeding the air down with the brakes, does the compressor load again at approximately 100 psi.
- Check the compressor for audible air leaks during the load cycle (soapy water can be used to deteck very small leaks)
- Check the compressor for any coolant leakage.
- Check the compressor for any oil leaks.