UNDERHOOD™
AIR COMPRESSORS

UNDERHOOD 70 and UNDERHOOD 150 Air Compressor Owner's Manual

www.vmacair.com

Table of Contents

Revision	Revision Details	Revised by	Checked by				Implemented
			Eng.		Tech.	Qual.	
			Mech.	Elec.			
K	ECN: 21-091 Add shut down instructions	MSP	KRM	N/A	MSP	N/A	11 May 2021
L	ECN: 23-087 Update DTC calibration and service kit instructions	MSP	CAM	ASE	MSP	TPK	1 Jun. 2023
M	ECN: 23-247 Update interlock operation	MSP	N/A	ASE	MSP	N/A	13 Dec. 2023

Registered Trademarks

All trademarks mentioned in this manual are the property of their respective owners. VMAC's use of manufacturers' trademarks in this manual is for identification of the products only and does not imply any affiliation to, or endorsement of said companies.

Important Information

The information contained in this manual is based on sound engineering principles, research, and extensive field experience. Information is constantly changing with the addition of new models, assemblies, service techniques and unannounced OEM changes. If a discrepancy is found in this manual, contact VMAC prior to initiating or proceeding with installation, service, repair or operation. Current information may clarify the issue. Any person with knowledge of such discrepancies, who proceeds to perform service and repair assumes all risks.

Only proven service procedures are recommended. Anyone who departs from the specific instructions provided in this manual must first assure that their safety and that of others is not being compromised and that there will be no adverse effects on the operational safety or performance of the equipment.

VMAC will not be held responsible for any liability, consequential damages, injuries, loss or damage to individuals or to equipment as a result of the failure of any person to properly adhere to standard safety practices or the procedures set out in this manual. Safety should be the first consideration when operating, or performing any service to the equipment. If there are any questions concerning the procedures in this manual, or more information is required, please contact VMAC before beginning repairs.

Notice

Printed in Canada

General Information

Introduction

This manual provides operating instructions, specifications, adjustment, maintenance and warranty information for VMAC Direct Transmission Driven Air Compressor systems. Read this manual prior to servicing or operating the compressor system.

Follow all safety precautions when servicing or operating the VMAC system as moving drive belts, fan blades and other rotating components pose an extreme hazard.

Proper service and repair are important to the safety of the operator and the safe, reliable operation of the equipment. Always use genuine VMAC parts.

The procedures described in this manual are the only approved methods of service and operation.

Optional Equipment Compatibility

While VMAC strives to design systems compatible with optional OEM equipment (such as running boards), it is impractical to develop systems that accommodate every OEM and aftermarket option or add-on. Whenever possible, VMAC endeavors to advise of compatibility issues in the "Additional Application Information" section of the specific installation manual. Even when specific optional equipment is determined by VMAC to be incompatible, it does not preclude the vehicle upfitter or end user from modifying the optional equipment to make it compatible with the installed VMAC system. VMAC does not warranty or accept responsibility or liability for the fitment, function or safety of any products modified in any way not expressly outlined in the installation manual.

Ordering Parts

To order parts, contact a VMAC dealer. The dealer will ask for the VMAC System ID (see page 11), part number, description and quantity. Locate the nearest dealer online at www.vmacair.com/dealer-locator or call 1-877-912-6605.

Additional Support

Additional resources such as installation manuals, illustrated parts lists, the VMAC Knowledge Base, air tool consumption guides, etc. are available at https://www.vmacair.com/support/.

Safety

Safety Messages

This manual contains various warnings, cautions and notices that must be observed to reduce the risk of personal injury during operation or service, and the possibility that improper operation or service may damage the equipment or render it unsafe.

This symbol is used to call attention to instructions concerning personal safety. Watch for this symbol; it points out important safety precautions, it means, "Attention, become alert! Your personal safety is involved". Read the message that follows and be aware of the possibility of personal injury or death. As it is impossible to warn of every conceivable hazard, common sense and industry standard safety practices must be observed.

This symbol is used to call attention to instructions on a specific procedure that if not followed may damage or reduce the useful life of the compressor or other equipment.

This symbol is used to call attention to additional instructions or special emphasis on a specific procedure.

Safety Precautions

As the VMAC compressor system is an industrial grade compressor, it is assumed that the operator has been trained in industry specific safety practices.

Read this information before operating the compressor for the first time. Follow the information and procedures in this manual for operation, maintenance and repair.

Follow all safety precautions for safe operation or service. Moving belts and rotating components are an extreme hazard. Stay clear of all moving parts when the system is operating. Only qualified personnel should perform maintenance and repair on system components and only while the system is properly shut down and depressurized.

Proper service and operation are important to the safety of the operator and the safe, reliable operation of the equipment. Always use genuine VMAC parts.

The procedures described in this manual are effective methods of service and repair. Some procedures may require the use of special tools designed for a specific purpose. Anyone using a replacement part, service procedure or tool must ensure that neither their safety, nor the safe operation of the equipment will be compromised by the replacement part, service procedure or tool selected.

Harmful Vapours

Breathing fuel vapours or engine exhaust can expose you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

- Always start and operate the engine in a well ventilated area.
- Do not breathe engine exhaust, internal combustion engines produce carbon monoxide, a poisonous odorless gas which can cause death. Do not start or operate this compressor in an enclosed area.
- If in an enclosed area, vent the exhaust to the outside and ensure there is adequate access to fresh breathable air..

Burn Hazard

- The compressor system gets very hot during operation, contact with the components or the oil can cause serious injury. Allow sufficient time for the system to cool before performing service.
- Never allow any part of your body to contact the engine or compressor components.
- Do not attempt to service the compressor until it has sufficiently cooled.



Personal Safety

- Follow all safe work practices.
- Do not breathe the compressor air. Vaporized oil is a respiratory hazard.
- Service should only be performed by qualified personnel.
- Always use the appropriate personal protective equipment, particularly eye and hearing protection when operating or servicing air powered equipment.
- Do not leave the vehicle unattended.


Fire and Explosion Hazard

- Vaporized oil propelled by high pressure air is a potentially explosive mixture.
- Fire in the compressor can cause an explosion and flame projection. Should this occur, there is potential for serious injury or death.
- Operate the compressor system in a well ventilated area free of flammable vapors, dust, or other combustible materials.
- Never place objects against or near the compressor components.
- Never expose the AOST or compressor to extreme heat.
- Serious injury or death may result from an air tank explosion.
- Never exceed manufacturer's maximum air pressure rating.
- Do not repair components, only replace with approved parts.
- Do not tamper with or disable factory safety equipment.

Compressor Air and Oil Hazard

- The compressor system is under sufficient pressure that a leak could force the air/oil mixture through the skin directly into the bloodstream. This could cause serious injury or death.
- Ensure the system is completely depressurized before attempting maintenance or repair.
- Do not use compressed air to clean off clothing or skin, compressed air can penetrate the skin causing serious injury or death.
- Do not service the compressor while it is pressurized or operating.
- Components and hoses under pressure could separate suddenly, causing serious injury or death. If equipped, the air receiver tank must be drained before servicing any components in the compressor system.
- Never adjust or attempt to make any repairs to the system while the engine is running.

Moving Parts Hazard

- Before performing service, disconnect the negative battery cable.
- Avoid contact with drive belts and other moving parts while the system is in operation.

General Warnings

- Be attentive for unexplained changes in operation and record any changes.
- Check the compressor oil level and condition before starting the system. Do not add or change oil while the system is running. Use only approved oil.
- Keep hoses and wiring away from hot, sharp, or moving components.
- Use only approved hoses and replacement parts.
- Do not modify the equipment.
- Do not operate the air compressor when fatigued or under the influence of alcohol or drugs.
- Know how to operate the compressor, read this manual prior to operation.
- Inspect equipment before every use.
- Never bypass or disable any of the safety equipment.
- Never adjust or attempt to make any repairs to the compressor system while the engine is running or the air system pressurized. Components and hoses under pressure could fail and cause serious injury or death.
- The vehicle must be in "Park" (for automatic transmissions) or "Neutral" (for manual transmissions) with the park brake fully applied before starting the compressor and at all times during compressor operation.
- Use a regulator in the output line to precisely control the final air delivery pressure.
- Run the system at idle speed under no-load conditions for 1 minute before turning the system off, to allow system cooling and lubrication.

Warranty

VMAC Standard Warranty (Limited)

For complete warranty information, including both VMAC Standard Warranty (Limited) and VMAC Lifetime Warranty (Limited) requirements, please refer to our current published warranty located at: **www.vmacair.com/warranty**

If you do not have access to a computer, please contact us and we will be happy to send you our warranty.

VMAC's warranty is subject to change without notice.

VMAC Lifetime Warranty (Limited)

A VMAC Lifetime Limited Warranty is offered on the base air compressor only and only on UNDERHOOD, Hydraulic Driven, Transmission Mounted, Gas and Diesel Engine Driven Air Compressors, Multifunction Power Systems, and other products as defined by VMAC, provided that (i) the purchaser fully completes and submits a warranty registration form within 3 months of purchase, or 200 hours of operation, whichever occurs first; (ii) services are completed in accordance with the Owner's Manual; (iii) proof of purchase of applicable service kits are made available to VMAC upon request.

The VMAC Lifetime Warranty is applicable to new products shipped on or after 1 October, 2015.

Warranty Registration

The VMAC warranty registration form is located near the back of this manual. This warranty registration form must be completed and sent to VMAC at the time of installation for any subsequent warranty claim to be considered valid.

There are 4 ways the warranty can be registered with VMAC:

www.vmacair.com/warranty

warranty@vmacair.com

(877) 740-3202

VMAC - Vehicle Mounted Air Compressors
1333 Kipp Road, Nanaimo, BC, Canada V9X 1R3

VMAC Warranty Claim Process

VMAC warranty work must be pre-authorized by VMAC. Claims are processed via our dealer network. If you are not a VMAC dealer, please select one to work with via our Dealer Locator:
https://www.vmacair.com/dealer-locator/

1) Communicate with VMAC Technical Support at 1-888-241-2289 or tech@vmacair.com to help diagnose/troubleshoot the problem prior to repair. VMAC technical support will require the VMAC System ID, hours on the compressor and mileage on the vehicle.
2) VMAC will provide direction for repair or replacement of the failed components.
3) If requested, failed parts must be returned to VMAC for evaluation.
4) Dealers may login to the VMAC website to view the "VMAC Labour Time Guide" (under "Agreements") to see the allowable warranty labour times.
5) Warranty invoices must include the Service Ticket number, VMAC System ID#, hours on the compressor, and a detailed description of the work performed.
6) VMAC Warranty does not cover consequential damages, overtime charges, mileage, travel time, towing/recovery, cleaning or shop supplies.
7) Dealers submit warranty claims on behalf of the Vehicle Owner/End User affected by the defective part(s). The dealer ensures that all warranty credits are refunded back to the Vehicle Owner/End User who made the initial warranty claim.

In order to qualify for Lifetime Warranty (Limited), the completed warranty registration form must be received by VMAC within 3 months of the buyer receiving the Product(s), or 200 hours of operation, whichever occurs first.

If the completed warranty registration form has not been received by VMAC within 3 months of the buyer receiving the Product(s), or 200 hours of operation, the warranty period will be deemed to commence 30 days from the date of shipment from VMAC.

Failure to follow the warranty claim process may result in denial of the warranty claim.

VMAC Product Warranty Policies & Warranty Registration can be found on the VMAC website (see previous page for URL).

System Specifications

Model
- UNDERHOOD 70, and UNDERHOOD 150 air compressors.

Compressor Type
- Flooded lobe, rotary screw.

Drive System
- Front End Auxiliary Drive (FEAD).

Control
- Electric on/off 12 V control.

Maximum Air Delivery
- UNDERHOOD 70: Up to 70 cfm and 175 psi (1207 kPa).
- UNDERHOOD 150: Up to 150 cfm and 175 psi (1207 kPa).

Pressure Regulation
- Mechanical inlet control valve which modulates flow in response to demand.

Engine Control (electronic throttle control)
- Variable engine speed modulates between base idle and upper limit rpm to maintain air requirements.

Some vehicles have onboard computers that must be programmed by the OEM to permit operation of the electronic throttle control.

Safety Features
- 200 psi (1380 kPa) pressure relief valve in the Air Oil Separation Tank (AOST).
- Thermal monitoring and electronic control.
- Rapid blowdown valve to relieve system pressure on shutdown.
- Drive Disable Circuit.

Use only genuine VMAC parts to maintain the system.

Genuine VMAC parts are designed to work with the high pressure and heat generated by the compressor. Substituting genuine VMAC parts may void the warranty and could cause equipment damage, injury, or death.

Lubrication
- VMAC High Performance Compressor Oil.

Filters
- Air filter: Paper element.
- Oil filter: High pressure spin-on.
- Coalescing separator element (in AOST).

Identifying Your System

The System ID will be requested any time that parts are ordered, when calling for technical support, or submitting a warranty claim.

The system ID is the preferred method of identifying the system as it serves as a master record of all of the components in the system. The system ID plate is generally found on the radiator cross member, or in some instances, the inner fender or firewall (Figure 1).

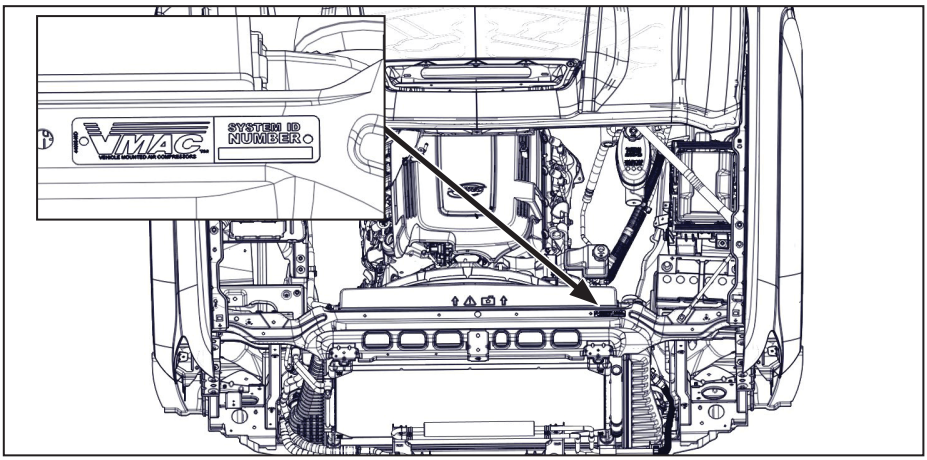


Figure 1 — System ID location

An alternative method of identifying the system is via the compressor serial number, which is found on a plate attached to the compressor.

This is a less desirable method of identifying the system as it may not link back to the original system if it has been replaced.

System ID breakdown

The system ID provides specific information about the system such as the model, revision, production date and the unique identifier (Figure 2).

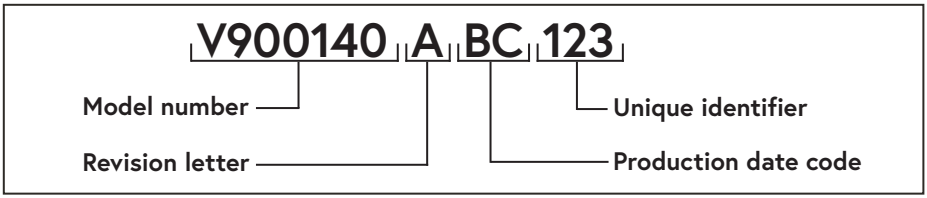


Figure 2 — System ID breakdown

System Components

The UNDERHOOD Compressor system consists of the following components:

- Air Oil Separator Tank (AOST).
- Compressor.
- Oil return, Air/Oil discharge hoses.
- PTFE oil scavenge and pressure control tubes.
- Digital control box.
- Throttle control (Analog or Digital).
- Liquid to liquid oil cooler.

AOST

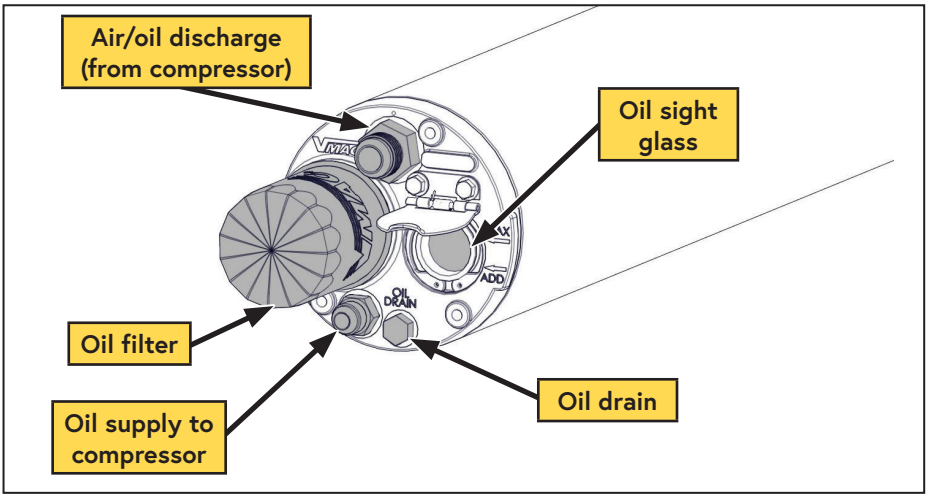


Figure 3 — AOST (front)

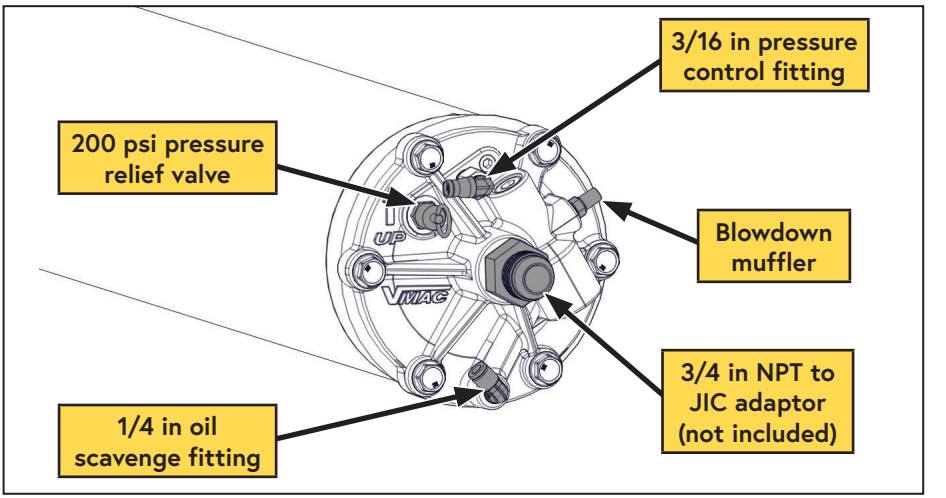


Figure 4 — AOST blowdown cap (back)

Compressor

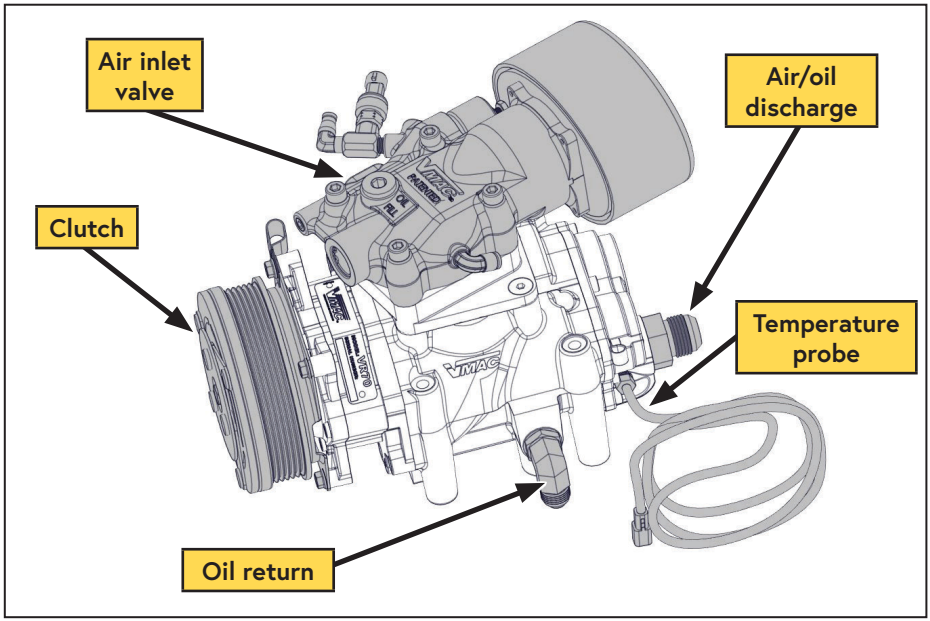


Figure 5 — Compressor assembly

Inlet

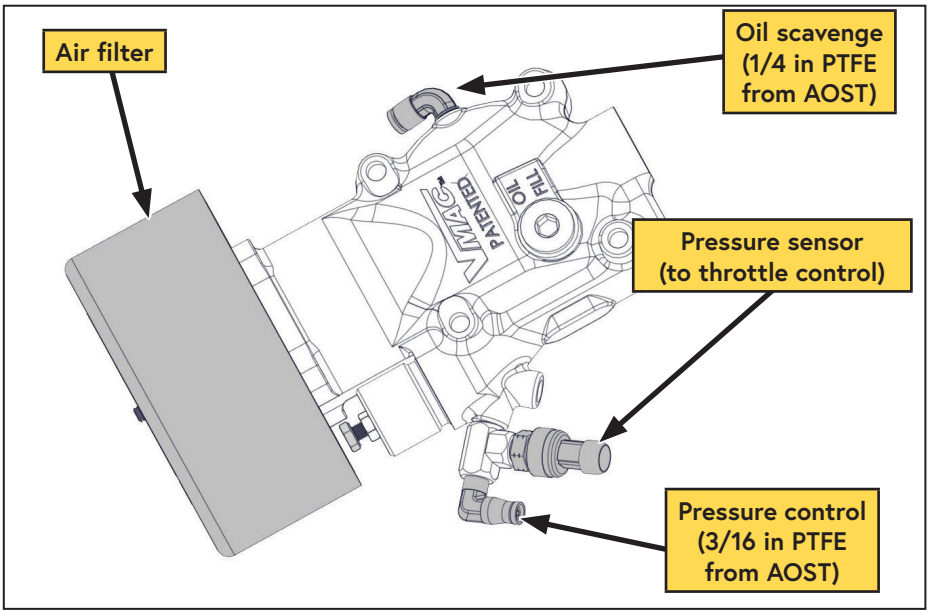


Figure 6 — Compressor assembly
(fitting configuration may vary dependent upon specific system)

Throttle Control (Analog / Digital)

The throttle control responds to signals from the pressure sensor and commands the vehicle's throttle to increase or decrease engine speed in response to air demand.

The throttle control also allows the operator to configure the vehicle's engine speed (when air is demanded) to their needs (maximum cfm, specific tool requirements, fuel efficiency, or a combination of these factors).

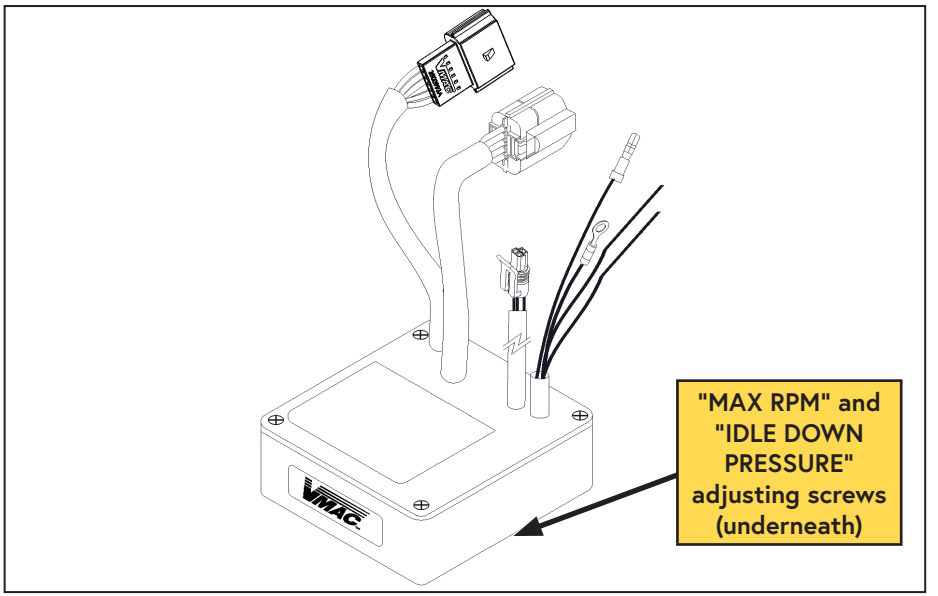


Figure 7 — Analog throttle control

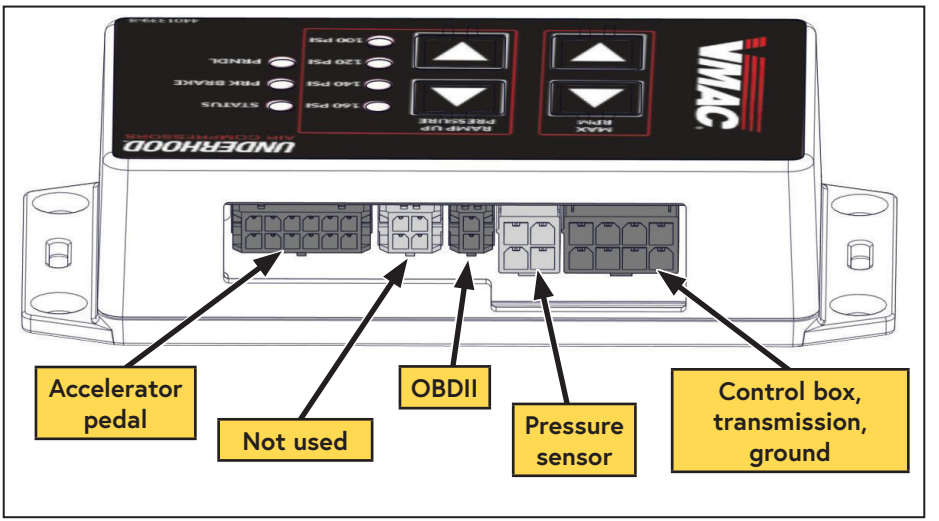


Figure 8 — Digital throttle control

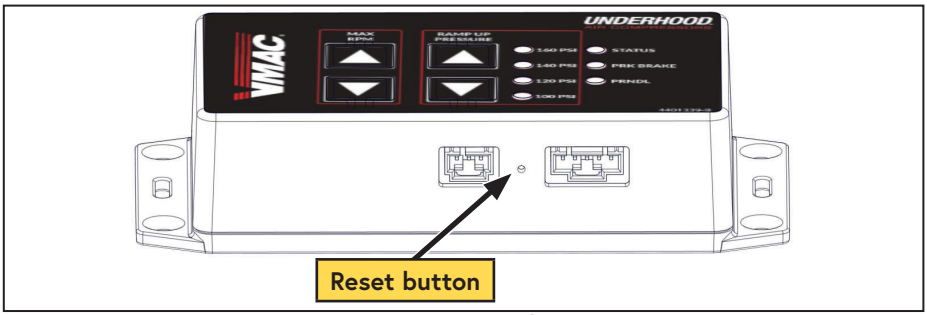


Figure 9 — Reset button

Liquid to Liquid Oil Cooler

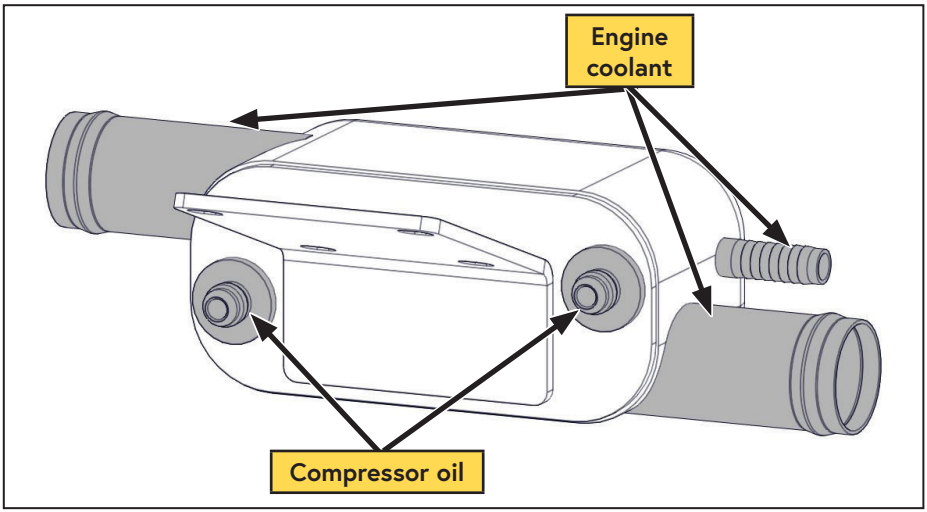


Figure 10 — Oil cooler
(UNDERHOOD 70 cooler shown)

Hoses / Tubes

The hoses used in VMAC compressor systems have an AQP inner liner that is compatible with VMAC compressor oil. The PTFE tubes used in VMAC systems are rated for the high temperatures VMAC compressors generate. Use of hoses or tubes other than those supplied or recommended by VMAC may cause compressor damage and may void your warranty. Please contact VMAC for replacement hoses/ tubes or for further information.

- Hoses must have an AQP liner.
- Oil scavenge tubes must be PTFE (or equivalent heat rating).

VMAC Compressor oil will degrade rubber lined hoses, use only hoses with an AQP elastomer type liner. Contact VMAC Technical Support at 1-888-241-2289 for further information.

Digital Control Box

The control box serves as the operator's control panel and contains the "ON/OFF" button, "READY" and "WARNING" lights, and the display LED which includes information such as compressor hours, service reminders, warning messages, error codes, and diagnostic information.

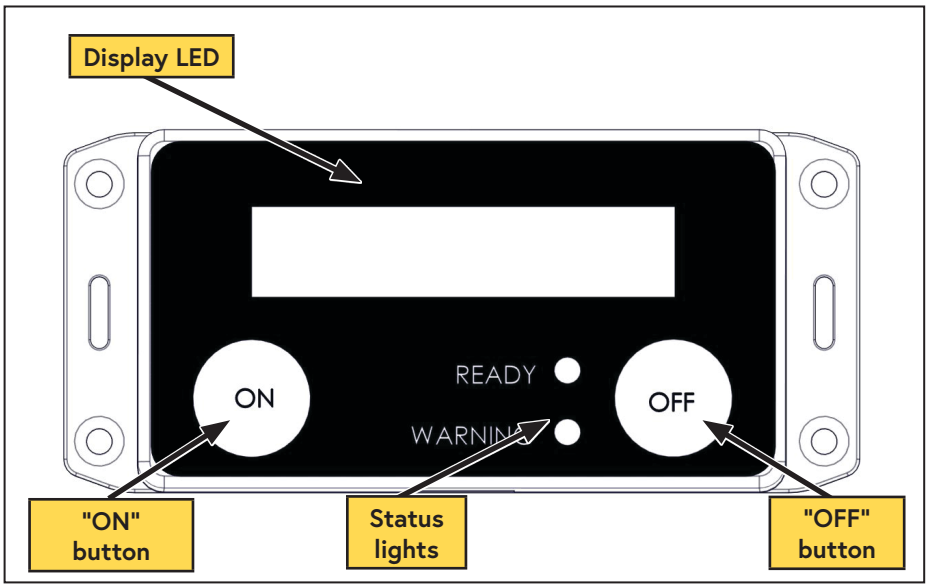


Figure 11 — Control box

Digital Control Box Features and Operation

In addition to turning the compressor on and off, the digital control box also:

- Monitors compressor system temperature.
- Monitors battery voltage.
- Monitors the park brake signal.
  Note: *Some systems developed for 2023+ model year vehicles will monitor the gear selector as opposed to the park brake. Refer to the installation manual.*
- Monitors the clutch current.
- Logs errors.
- Displays error messages.
- Provides 200 hour and 400 hour service reminders.

Component Placement Overview

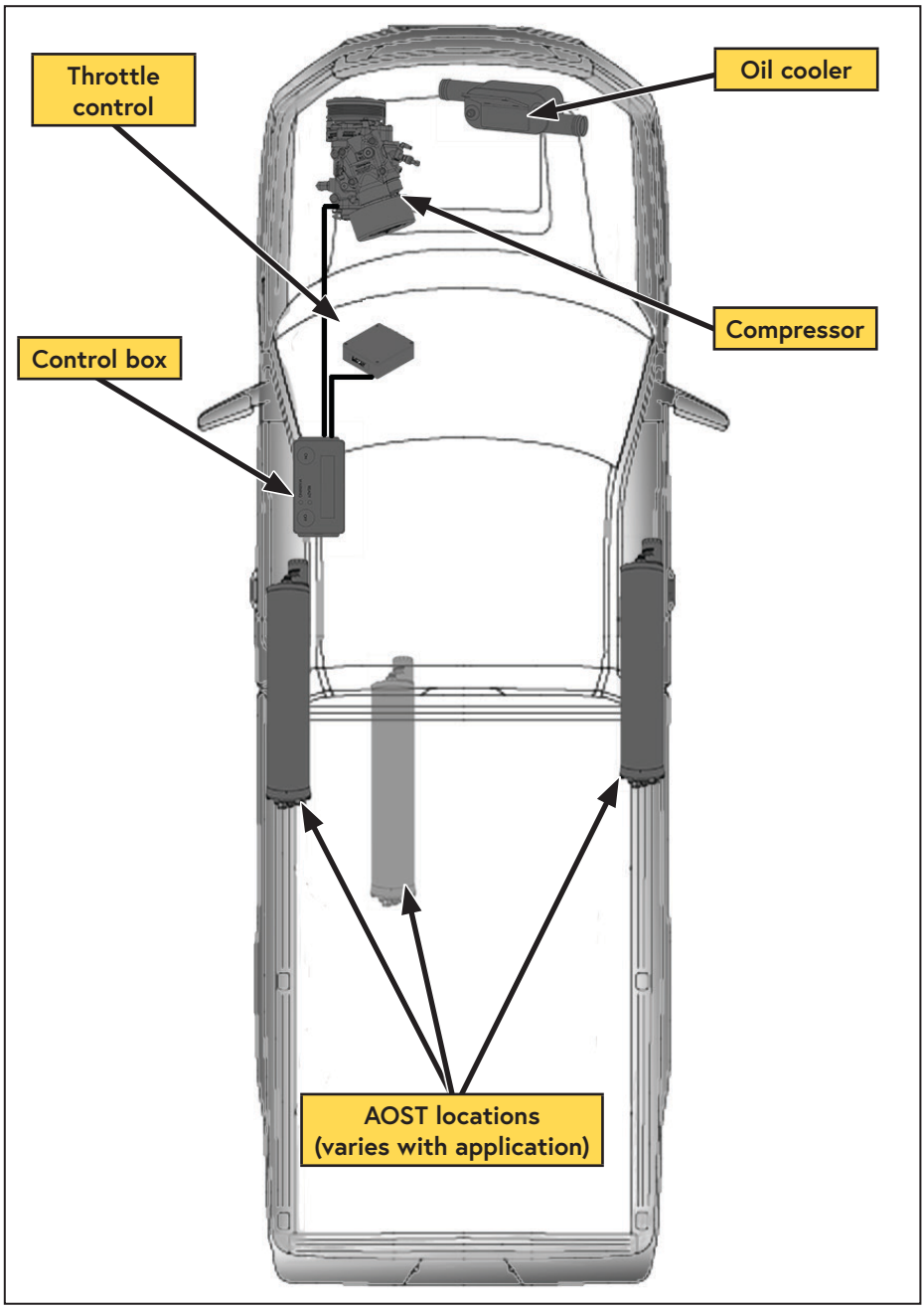


Figure 12 — General component overview
(Actual installation locations may vary)

Operating Principles

Air Compression

At the heart of VMAC's UNDERHOOD Air Compressor systems is a flooded lobe, rotary screw compressor.

Compression occurs when filtered air, at normal atmospheric pressure, enters the chamber where it is trapped between meshing rotor lobes. Cooled oil is injected into the compressor housing during compression to seal the rotor lobes for maximum compression efficiency. The oil also lubricates the rotors and bearings and absorbs some of the heat generated during compression. As the rotors rotate, the meshing lobes compress the volume of air before sending the air/oil mixture down the discharge hose to be separated and cooled by the AOST.

Oil Separation and Cooling

The system uses a proprietary 2 stage air/oil separator. The hot air/oil mixture from the compressor enters the first stage of the AOST and is mechanically separated with baffles. The second stage uses an integral coalescing element to remove the remainder of the oil from the air stream.

The hot compressor oil is directed to VMAC's liquid to liquid cooler (which is tied into the vehicle's engine coolant system) before being returned to the compressor.

The small amount of oil recovered from the coalescing filter is returned directly to the compressor via the 1/4 in PTFE scavenge tube.

Filtration

VMAC rotary screw compressors are designed and machined to exacting standards. Foreign particles entering the compressor can damage components such as rotors, bearings, seals, and the housing resulting in performance, efficiency loss, and reduced system life.

The system is equipped with a replaceable paper element air filter, a high pressure spin-on oil filter, scavenge screen and a coalescing filter.

Pressure Regulation and Engine Speed Control

When shut down, the VMAC system "blows down" or discharges all air stored in the AOST. When the system is started, the compressor clutch engages and signals the throttle control to increase engine speed. Once the system has built to full system pressure (150 psi/1030 kPa), the pressure regulator signals the inlet to close and the engine speed will reduce to base idle. The mechanical pressure regulator detects air use and will send a signal to open the inlet as necessary to maintain full system pressure. By default, the engine speed will increase once a 10 psi drop in pressure is detected; this is referred to as "Idle Down Pressure" (IDP) (analog throttle control) or "RAMP UP PRESSURE" (digital throttle control).

The VMAC control system offers the following benefits:

- Reduced fuel consumption when not using air.
- Reduced load on the compressor cooling system.
- Reduced noise when not using air.
- Quick response to airflow demands.

The elevated engine speed, and maximum pressure are adjustable. Higher engine speeds will yield higher compressor output (cfm) but will generate more noise and consume more fuel. See the "Performance Testing and System Adjustments" chapter on page 31 for instructions.

An external regulator is recommended for operation at pressures lower than 145 psi (1,000 kPa).

Safety Features

A 200 psi (1380 kPa) pressure relief valve is installed in the AOST to prevent over pressurization. The AOST is also equipped with an integrated rapid blow down system that automatically discharges pressure from the AOST upon shutdown.

The UNDERHOOD Air Compressor system's control logic utilizes built in safety circuits, in addition to OEM safety controls (if present), to prevent increasing engine rpm when certain conditions are not met. This helps to protect both the operator/ occupants, and the vehicle should the VMAC system be inadvertently activated at an inappropriate time.

In the event that the air/oil temperature increases above a safe temperature, the digital control box will disengage the compressor clutch and signal the throttle control to return the engine speed to base idle. The "WARNING" light on the digital control box will also illuminate and the error message will be logged.

Do not disable or bypass the over-temperature shutdown circuit. Failure of the shutdown system could result in equipment damage, injury or death.

VMAC recommends connecting to fused circuits that are adequate to our requirements. In installations where VMAC directs the installer to connect directly to the battery, an inline fuse is included.

If alternate power connections are used, VMAC recommends installation on a fused circuit rated for 10 A.

System Operation

Before Running the UNDERHOOD Air Compressor

- Ensure the vehicle is not parked on grades exceeding 15° as this will affect lubrication and air/oil separation (Figure 13).

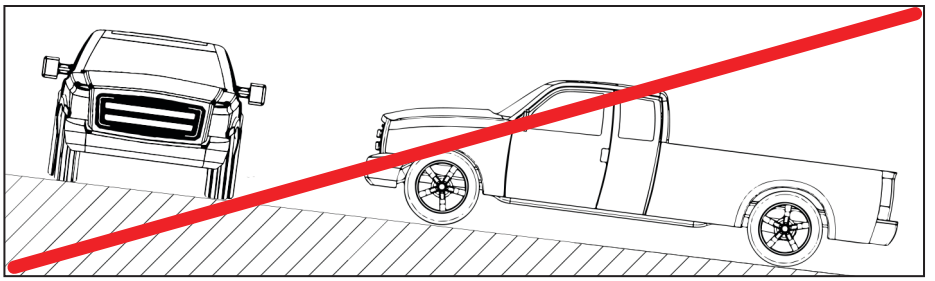


Figure 13 — Do not exceed 15° grade

- Place the vehicle transmission in "PARK" and fully apply the parking brake.
- Start the engine and allow the vehicle to reach operating temperature.
- Ensure the oil level in the AOST is above the "ADD" line (this should be checked while parked on level ground).
- Ensure the vehicle hood is closed.
- Ensure all compressor outlets are closed.

Starting the Compressor / Normal Operation

- Turn on the compressor using the "ON" button on the control box.
- *If configured, the system can be turned on via the remote start stop wires tucked into the sheath of the digital control box.

Once the compressor is turned on, the engine speed will increase while the compressor system builds pressure.

The system will continue to build pressure until it reaches full system pressure (150 psi factory setting). Once system pressure is achieved, the inlet will close and the engine speed will reduce to base idle.

Shutting Down the Compressor

- Close all open air valves/tools and allow the system to build to full pressure (factory default: 150 psi).
- Allow the engine speed to reduce to VMAC base idle for at least 10 seconds.
- Press the "OFF" button on the control box.

Once the system is shut down, the digital control box will delay restart for 20 seconds to prevent the system from restarting under pressure.

Ensure the blowdown muffler is not blocked as this may prevent the system from completing the blowdown within 30 seconds.

Remote Operation (Optional)

The VMAC compressor can be started, and shut down remotely using the remote start/stop wires.

The remote wires are tucked into the heat shrink tubing at the base of the control box (Figure 14).

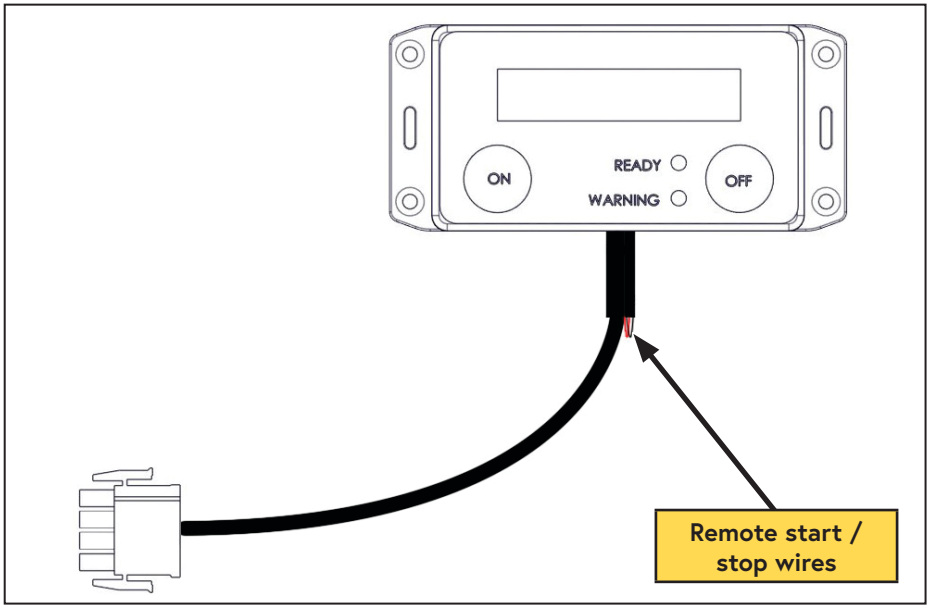


Figure 14 — Remote start / stop wires

Installation

☐ Connect the red wire (ON) to a switch that will apply a momentary ground when activated.

☐ Connect the black wire (OFF) to a switch that will apply a momentary ground when activated.

Starting the Compressor via Remote Start

- Place the vehicle transmission in "PARK" and fully apply the parking brake.
- Start the engine and allow the vehicle to reach operating temperature.
- Ensure the oil level in the AOST is above the "ADD" line (this should be checked while parked on level ground).
- Ensure the vehicle hood is closed.
- Ensure all compressor air valves/tools are closed.
- Turn on the compressor using the remote momentary "ON" switch.

Shutting Down the Compressor via Remote Shutdown

- Close all open air valves/tools and allow the system to build to full pressure (factory default: 150 psi).
- Allow the engine speed to reduce to VMAC base idle for at least 10 seconds.
- Turn the compressor off using the remote momentary "OFF" switch.

Digital Throttle Control (DTC) Operation

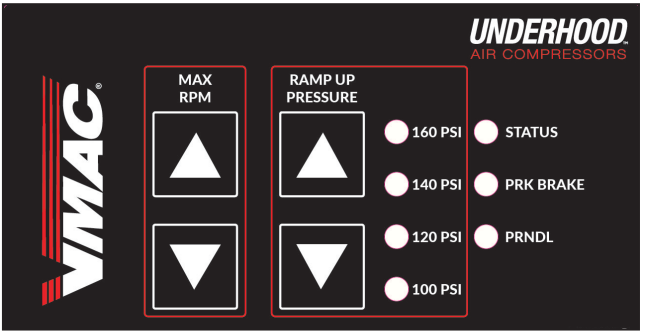


Figure 15 — Throttle control

Indicator LED	LED State	Description
RAMP UP PRESSURE	Green	Indicates the ramp up pressure setting.
STATUS	Green	Throttle controller is active and the system is operating normally.
	Red	Throttle control is not operating normally (throttle control is deactivated until the issue is resolved (See "Digital Throttle Control (DTC) Error Codes" on page 26).
	Off	Indicates the vehicle is not in park or neutral and/or the park brake is not engaged (throttle control is deactivated).
PRK BRAKE	Green	Park brake is engaged.
PRNDL	Green	Gear selector is in "PARK" or "NEUTRAL".
	Off	Vehicle is in gear (throttle control is deactivated).

If the vehicle is placed into gear the "STATUS" LED and the "PRNDL" will turn off and the throttle control will deactivate. This will reduce engine speed to OEM base idle.

In order to activate the system again, re-engage the appropriate lockout and turn the VMAC "OFF" then "ON" via the control box.

Safety features

The throttle control has built in safety features that will disable the system if an unsafe condition is detected, or either of the lock out parameters is not met (the vehicle must be in "PARK" and the park brake must be engaged).

If an unsafe condition is detected, the "STATUS" LED will turn off, and engine speed will return to idle. Once all unsafe conditions have been removed, the system must be cycled off, then on again to reset it. Once the system powers up, the "STATUS" LED will illuminate, and the system will operate normally.

Cold Environment Operation

If operating the system in temperatures below -10 °C (14 °F), ensure the following conditions are met prior to starting the system:

- Allow the vehicle to reach operating temperature.
- Run the vehicle an additional 15 minutes to allow the radiant heat to warm the compressor system.
- Turn on the compressor system and operate as normal.

On vehicles that are consistently used in cold climates, the VMAC De-Icer Kit (VMAC P/N: A700031) is recommended. The VMAC De-Icer Kit is installed on the pressure control PTFE tube.

Diesel Particulate Filter (DPF) Warning

When engine driven equipment is run on vehicles with a DPF for extended periods of time, particulates may build up in the filter. All vehicles with a DPF have a warning light on the instrument panel or notification in the message center.

It is impossible to make recommendations regarding run time before the DPF system will require a "regeneration" cycle as this is affected by many variables. It is therefore the responsibility of the operator to monitor and take the necessary action to maintain the DPF system.

It is suggested that if equipment is run for extended periods of time (over 1 hour) without driving, the vehicle DPF warning system is checked after 1 hour and every 15 min thereafter. If the DPF warning light/message appears, refer to the vehicle owner's manual for methods of cleaning or regenerating.

Engine Shut Down Timers

Some newer vehicle's are equipped with automatic engine shut down timers. These systems are designed to shut the engine off under certain conditions (generally after a set length of time without operator input).

As the VMAC system is designed to only operate while the vehicle is in "PARK", some manufacturers' shut down timers may be trigged while the VMAC is in use.

For more information related to engine shut down timers, refer to the vehicle owner's manual or dealer.

Diagnostics and Trouble Shooting

Read the "Maintenance and Repair Safety" section prior to performing any work on the system (beginning on page 46).

Wear appropriate Personal Protective Equipment and follow all industry standard safety practices.

For the following tests, isolate the AOST from all downstream (customer supplied) equipment.

If the UNDERHOOD Air Compressor system is still within the warranty period, see the warranty claim process on page 9 prior to commencing with any diagnostics or repairs.

Problem diagnosis should follow sound, recognized practices. Quick and accurate diagnosis of problems should involve the following:

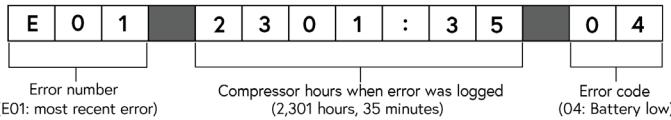
- Follow industry standard safety practices.
- Accurately identify the problem by operating the system (provided it is safe to do so).
- Determining the possible causes for the problem by understanding how the system operates.
- Isolating the potential causes by accurate testing using the correct and recognized procedures.
- Performing proper repairs using the correct procedures and the recommended replacement parts.
- Performing proper post repair testing to ensure that the repairs were effective.
- Electrical testing should be performed according to the processes described in the troubleshooting charts and in conjunction with any documentation provided by VMAC.

Accessing Diagnostic Mode and Retrieving Logged Error Messages

- ☐ Turn the vehicle ignition "ON" but do not start the engine.
- ☐ Press and hold the "OFF" button on the control box until "DIAGNOSTICS" is displayed.
- ☐ Press the "OFF" button to scroll down, press the "ON" button to scroll up.
- ☐ When the end is reached, "NO SVC NEEDED" will be displayed.
- ☐ To exit diagnostic mode, press both the "OFF" and "ON" buttons simultaneously.

Digital Control Box Information and Warning Messages

Warning/Information Message	Warning/Information Description	Compressor State
HRS:XXXX:XX	Main screen hour meter.	On/Off.
"PARK BRAKE" ***or*** "OUT OF PARK"	Park brake is not applied or bad signal ***or*** Gear selector not in PARK or bad signal.	Off.
HRS:XXXX200HRSVC	200HR service is needed.	On/Off.
HRS:XXXX400HRSVC	400HR service is needed.	On/Off.
COMP TOO COLD	Compressor too cold for operation.	On.
TEMP XXXF/XXXC	Displays elevated temperature 130°C (266°F) to 150°C (300°F).	On/Off.
Wait xx Seconds	A 30 second delay to allow for compressed air blow down.	Off.



Error Code	Display	Fault	Possible Problem(s)
01	OVER TEMP	Compressor is too hot.	• Low compressor oil level. • Faulty or crushed cooler hoses. • Exceeded cooling capacity of the compressor cooling system. • OEM changes in cooling. • Non-standard application.
02	TEMP PROBE SHORT	Compressor temperature probe wires shorted or failed.	• Faulty temperature probe. • Crushed temperature probe wires. • Pinched or bare wires that are grounded.
03	TEMP PROBE OPEN	Compressor temperature probe disconnected or failed.	• Disconnected temperature probe. • Faulty temperature probe. • Broken temperature probe wires.
04	BATTERY LOW.	Vehicle battery voltage detected is less than 11 V.	• Faulty power wire connection. • Bad fuse. • Broken or poorly crimped electrical connectors. • Vehicle charging system issues.
05	CLUTCH HIGH	Current draw on the clutch is too high (5 A – 10 A).	• Faulty clutch. • Broken or pinched clutch wire.
06	CLUTCH LOW	Current draw on the clutch is too low (below 2 A).	• Faulty clutch. • Broken or pinched clutch wire. • Disconnected clutch wire.
07	CLUTCH SHORT	Current draw on the clutch is too high (above 10 A).	• Faulty clutch. • Clutch wire shorted to ground or pinched.

Digital Throttle Control (DTC) Error Codes

If an error is encountered, the "STATUS LED" will blink a set number of pulses corresponding to the respective error code. If multiple error codes exist, the throttle controller will cycle through all error codes repeatedly. To clear an error code, turn the system OFF, fix the problem, and then turn the system ON again.

The DTC is located under the dashboard panel near the steering wheel.

Error Number	Error	Description	Possible causes
2	Rpm error.	No rpm detected via the OBD II port.	• DTC connected to the incorrect OBD II harness wires. • Poor crimp between the DTC and the OBD II harness. • Faulty or damaged DTC.
3	Pressure sensor error.	Pressure sensor signal is either too high or too low.	• Faulty or damaged pressure sensor harness. • Pressure sensor damaged • Poor crimp between the DTC and the pressure sensor harness. • Faulty or damaged DTC.
4	Rpm too high.	The DTC rpm threshold has been exceeded.	• Compressor clutch not engaging. • Attempting to engage the VMAC system when the engine speed is high. • Incorrect DTC for vehicle application. • DTC not calibrating to vehicle engine. • Faulty or damaged DTC.
5	Voltage too high/ low.	The battery voltage is either too high or too low (The system will continue to operate with this error). The normal operating range for the DTC is between 9.8 V and 16 V.	• Vehicle battery is discharged, damaged, or worn. • Alternator is damaged and voltage output is too low or too high • Faulty or damaged DTC.

Automatic Shutdown

If the compressor oil gets too hot, the over-temperature circuit will disengage the clutch, preventing operation of the system. The red indicator light on the control box will illuminate, indicating a problem.

- ☐ Press the "OFF" button on the control box.
- ☐ Allow a few minutes for the system to vent pressure and for the oil to drain back to the tank, then check the oil level through the sight-glass on the tank. The oil level must be checked with the vehicle on a level surface.
- ☐ If the oil level is low, check for and repair any leaks, then add oil until the correct level is reached.

Limp Mode

Limp mode was created to provide a way to bypass the temperature sensor in case of a sensor failure. This mode is an emergency mode and should be used with extreme caution.

How to activate

Press and hold the "OFF" button on the control box until the "DIAGNOSTICS" screen appears (approximately 5 seconds). Release the "OFF" button and the screen will display "E01 xxxx xx xx". Press the "OFF" button again. The screen "NO TEMP PROBE?" will appear. To disable the temperature probe, press the "ON" button. "TEMP PROBE DIS" will appear. This indicates that the temperature probe has been disabled. Press both the "ON" and "OFF" buttons simultaneously to exit.

While in "Limp Mode", the main menu screen will display "NO TEMP PROBE?" with a red LED then "CHECK OIL" and the green LED and then the hours. The display will toggle between these messages approximately every second. The clutch and throttle will be on for 1 minute then off for 1 minute while in "Limp Mode". Once the system is shut off via the "OFF" button, the control box will operate normally.

Diagnostic charts

Symptom	Possible Cause	Corrective Action
Compressor does not run.	Oil temperature too high.	Turn compressor off, allow to cool for 30 minutes, retry.
	Oil level too low.	Add oil as necessary. See page 41.
	No power to clutch.	• Repair wiring according to diagram. • Check/replace fuse.
	Poor clutch ground.	Apply 12 V to the clutch and check for voltage between the clutch stator housing and the engine. If voltage is present, ground the stator
	Faulty clutch stator windings.	With the compressor button "OFF" check the resistance between the clutch wire and ground. Resistance should be between 2.5 Ω – 3 Ω. If outside of this range, replace the clutch.

Symptom	Possible Cause	Corrective Action
Vehicle engine speed does not increase when compressor is engaged.	Throttle control adjusted incorrectly.	Adjust throttle control. See Performance Testing and System Adjustments chapter starting on page 31.
	Throttle control not connected properly.	Repair wiring according to diagram.
	Throttle control not functioning.	Replace throttle control.
	SEIC restart delay (Ford only).	Turn off compressor, allow to blowdown, restart compressor.

	Pressure sensor detects system is already pressurized.	• Test system blowdown function. See:
		  ○ 70 system page 51.
		  ○ 150 system page 67.
		• Connect pressure sensor.
		• Replace pressure sensor.

	Mechanical throttle control receiving power (throttle housing is acting as a chassis ground).	Repair wiring according to diagram.

Symptom	Possible Cause	Corrective Action
Vehicle engine speed does not return to base idle once system pressure is reached.	Wiring fault.	Repair wiring according to installation instructions.
	Throttle control not adjusted correctly.	Adjust throttle control. See Performance Testing and System Adjustments chapter starting on page 31.

Symptom	Possible Cause	Corrective Action
Vehicle engine overspeeds when compressor is engaged.	Throttle control not connected properly.	Repair wiring according to diagram.
	Throttle control not adjusted correctly.	Adjust throttle control. See Performance Testing and System Adjustments chapter starting on page 31.
		Recalibrate DTC. See page 37.
	Pressure sensor disconnected or defective.	• Connect pressure sensor. • Replace pressure sensor.

Symptom	Possible Cause	Corrective Action
Vehicle engine speed excessive on initial start up and during operation.	Maximum rpm setting is too high.	Reduce maximum rpm setting throttle control.
	Idle-down pressure is too high.	Reduce idle-down setting of the throttle control.

Symptom	Possible Cause	Corrective Action
Vehicle engine speed stays at VMAC maximum rpm.	Idle-down setting is too high.	Reset idle-down pressure.

Symptom	Possible Cause	Corrective Action
Low air pressure.	Air demand too high.	• Reduce air consumption. • Install air receiver tank. See accessories on page 81.
	Engine speed too low.	Adjust throttle control. See Performance Testing and System Adjustments chapter starting on page 31.
	Pressure regulator set too low.	Adjust pressure regulator to 150 psi. See page 32.

Symptom	Possible Cause	Corrective Action
Excessive air pressure (significantly greater than 175 psi.)	Pressure regulator set too high.	Reduce system pressure by adjusting pressure regulator. See page 32.
	Pressure control tube blocked or frozen.	• Clear PTFE tube. • Install VMAC De-icer kit (A700031).

Symptom	Possible Cause	Corrective Action
System pressure higher than tool requires.	No downstream pressure regulator installed.	Install downstream pressure regulator. See accessories on page 81.
	Aftermarket pressure regulator set too high.	Adjust pressure regulator to desired pressure.

Symptom	Possible Cause	Corrective Action
Power fuse blows.	Short to ground in the control circuit.	• Locate and correct short. • Replace control system components.
	Incorrectly rated fuse.	Install the proper fuse.
	System wired incorrectly.	Repair wiring according to installation instructions.

Symptom	Possible Cause	Corrective Action
Oil drips from clutch after shutdown.	Front shaft seal leaking	Contact a VMAC dealer or VMAC Technical Support.

Symptom	Possible Cause	Corrective Action
Oil blows out of compressor air filter on compressor shutdown.	Shutting the engine off before system has built to full system pressure.	Stop air demand and allow the engine speed to drop to base idle prior to turning the compressor off
	Normal operation (remote mounted air filters only).	It is normal for a small amount of oil to be present in the remote air filter hose once the compressor is shut down. This oil will be drawn back into the compressor upon startup.
	Missing, damaged, or dislodged inlet poppet O-ring.	Contact a VMAC dealer or VMAC Technical Support.

Symptom	Possible Cause	Corrective Action
Excessive oil in the air stream (oil carry over).	Compressor was shut down while building air.	Stop air demand and allow engine speed to drop to base idle prior to turning the compressor off.
	Vehicle parked on grade greater than 15°.	Level the vehicle and run the system. Oil carry over may take up to 40 minutes to dissipate.
	High oil level.	Correct oil level.
	Failed coalescing filter.	Replace coalescing filter.
	Clogged scavenge screen.	Clean scavenge screen. See page 61.
	Poor fit between coalescing filter and AOST/poor seal at O-rings.	Replace parts as necessary.

Symptom	Possible Cause	Corrective Action
Vehicle engine stalls when compressor is activated.	System is under pressure.	Allow sufficient time for blow-down.
	Blowdown valve not working.	Replace blow-down valve.
	Engine rpm setting too low or throttle not set correctly.	Readjust rpm and throttle settings for optimum operation.
	Throttle control not connected properly at foot pedal.	Check for proper connections.

Performance Testing and System Adjustments

If insufficient airflow is developed under high demand conditions, check the engine rpm. Some applications may require adjustments to provide the necessary airflow and pressure.

Engine rpm adjustments can be made to match the amount of air delivered by the system to the requirements of the tools or equipment that will be used.

Airflow and system pressure are related. If airflow demands on the system are low, the operating pressure will remain high. As airflow demands increase, the operating pressure will decrease. Adjustments to engine rpm affect cfm while maximum system pressure is adjusted via the pressure regulator.

By making adjustments to the engine speed while operating a specific tool, optimum performance will be achieved.

If the system must be set-up without knowing the demands on the system, make engine speed adjustments by using an orifice in the outlet to simulate tool use.

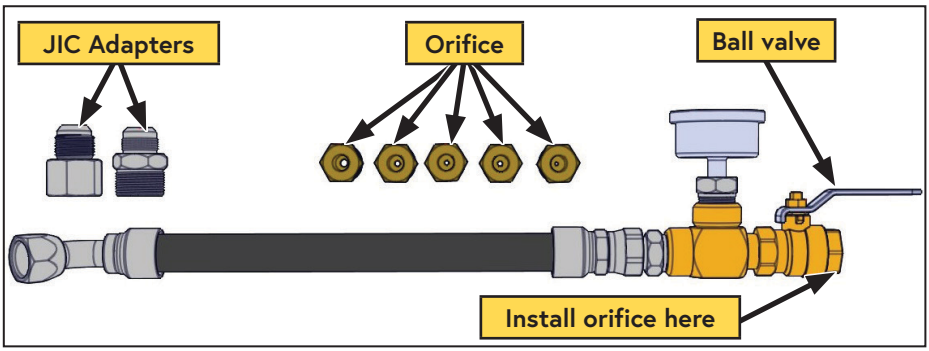


Figure 16 — A700052 VMAC Air Test Tool

Adjusting the Pressure Regulator

Never adjust the pressure cutout to exceed 175 psi (1205 kPa). The pressure relief valve on the AOST will activate at 200 psi (1379 kPa) and rapid air loss will occur which may cause component damage, injury or death.

In applications that require pressures below 150 psi, VMAC recommends leaving the maximum pressure set at 150 psi and installing a regulator downstream to regulate pressure to the desired amount. This will provide optimum performance and response time when air is demanded.

The pressure regulator is adjusted to limit maximum air pressure to a safe level. As air pressure and flow are related, this adjustment is also very important for optimum performance.

- ☐ Install the test tool in the tank outlet with the ball valve closed.
- ☐ Ensure that the oil level is correct and the system is at operating temperature.
- ☐ Operate the system until it reaches full pressure. Observe the pressure on the gauge.
- ☐ Loosen the lock nut on the regulator.
- ☐ Pressure can be adjusted within a range of 145 psi (999.7 kPa) – 175 psi (1205 kPa), dependent upon requirements.

Prolonged operation above 175 psi / 1205 kPa may damage the pressure regulator.

- ☐ Rotate the setting bolt clockwise to increase pressure. Rotate counter clockwise to decrease pressure. Tighten the lock nut once adjustments are complete.
- ☐ Open the ball valve to allow air to flow and the pressure to drop, (engine speed should increase). Close the valve and observe the pressure to ensure that the adjustment is correct.

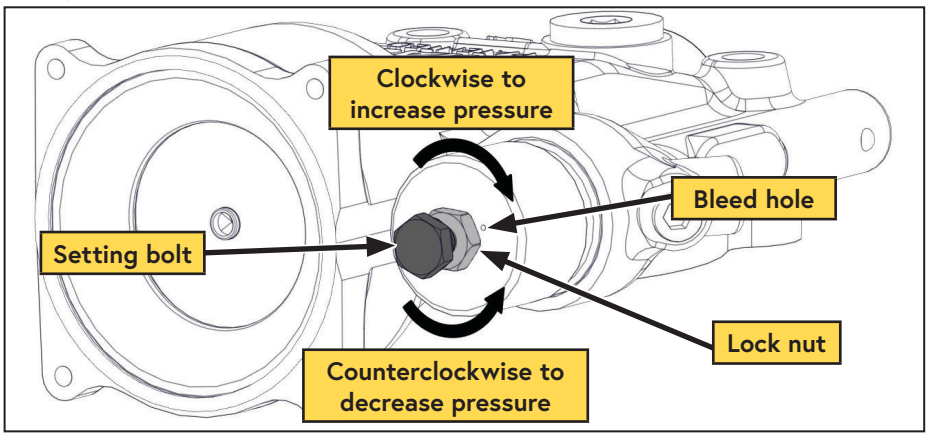


Figure 17 — Adjusting the pressure regulator

Throttle Control Operating Principles and Adjustments

When system air pressure is low, the throttle control will signal the engine to increase rpm to generate more air. As the air pressure approaches maximum system pressure (150 psi factory default), the throttle control will signal the engine to start decreasing rpm.

Maximum RPM (MAX RPM)

The cfm produced by the system is directly related to engine speed. The "MAX RPM" on the throttle control is set from the factory provide optimum cfm (not necessarily maximum cfm) when the throttle is engaged. See the specific VMAC installation manual for default rpm settings as it will vary dependent upon vehicle manufacture as well as the engine type and size).

Ramp Up Pressure / Idle Down Pressure (IDP)

The idle down pressure refers to the amount of air that can be used before the throttle control signals the engine to increase rpm. VMAC recommends setting idle down pressure at 10 psi – 15 psi (69 kPa – 103 kPa) below maximum system pressure (e.g. if maximum system pressure is set to 150 psi, the rpm would start to increase when system pressure drops to 135 psi). This prevents the engine from responding to small amounts of air use or nominal air leaks such as those found at quick connect couplings.

The throttle control is normally located under the dashboard panel near the steering wheel.

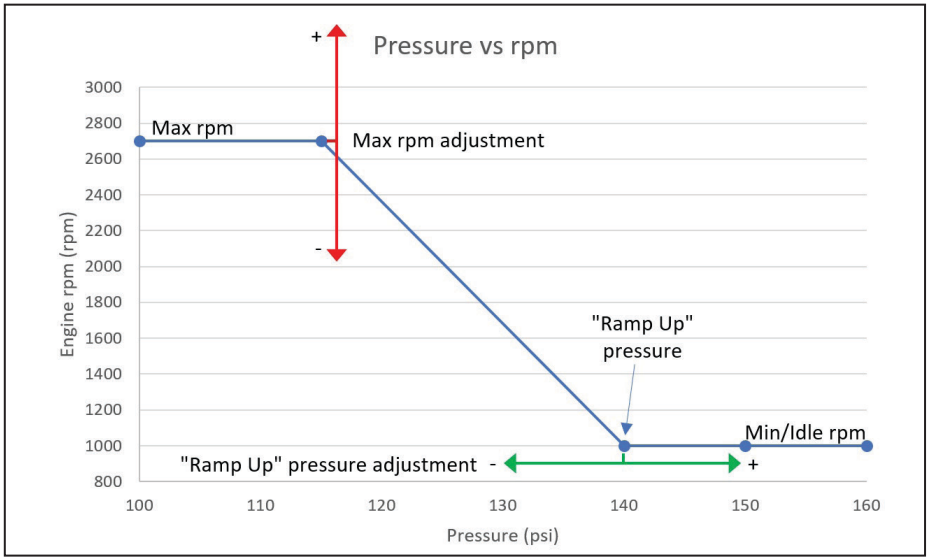


Figure 18 — Throttle control operation graph

Adjusting the Analog Throttle Control

Turn the screws counterclockwise to decrease engine speed or IDP, or clockwise to increase engine speed or IDP. The throttle control uses 20 turn adjustment screws, turning the screws past this point will not damage the throttle control (Figure 19).

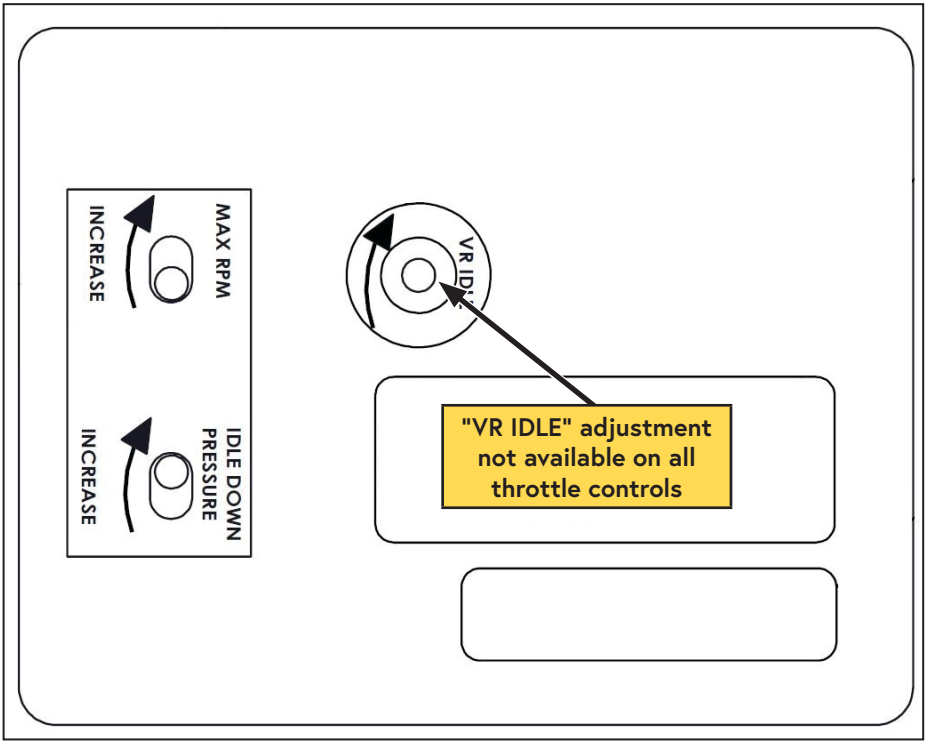


Figure 19 — Analog throttle control adjustments

Certain VMAC systems include throttle controls with a third adjustment screw for adjusting the VMAC base idle (engine idle once maximum system air pressure is reached and engine rpm is reduced).

Some models of throttle control may ship with the "VR IDLE" adjustment screw covered by a decal.

The "MAX RPM" must be set prior to adjusting the "IDLE DOWN PRESSURE".

Setting "MAX RPM"

- ☐ Place the manual transmission in "Neutral" or the automatic transmission in "PARK" and fully apply the park brake.
- ☐ Install the VMAC test tool (P/N: A700052) (***do not install any orifice***).

Disconnect all downstream equipment (hose reels, etc.) and connect the test tool directly to the discharge fitting on the AOST.

Ensure there are no leaks in the test tool. The system may not idle down if there are leaks in the lines or fittings.

- ☐ Allow the vehicle to run until the engine is at operating temperature.
- ☐ Operate the air compressor system until the oil is warm.
- ☐ Slowly open the ball valve on the test tool until 90 psi is maintained, and observe the engine tachometer.

When making adjustments to the throttle control, count the turns on the adjustment screws in case the procedure needs to be reversed.

- ☐ Turn the "MAX RPM" adjustment screw clockwise to increase engine speed and counterclockwise to decrease engine speed (Figure 19).
- ☐ Slowly close the ball valve and allow the system to build to full system pressure.

Setting "IDLE DOWN PRESSURE"

Ensure the "MAX RPM" has been set prior to adjusting the "IDLE DOWN PRESSURE".

- ☐ Ensure the system has built to full system pressure (150 psi / 1035 kPa) and the engine speed has reduced to base VMAC idle.
- ☐ Slowly open the ball valve on the test tool until the pressure is approximately 10 psi (69 kPa) below full system pressure. Engine speed should start to ramp up in response to the air use.
- ☐ Adjust the "IDLE DOWN PRESSURE" as necessary so that engine speed starts to respond at approximately 10 psi (69 kPa) below full system pressure.

Adjusting the Digital Throttle Control (DTC)

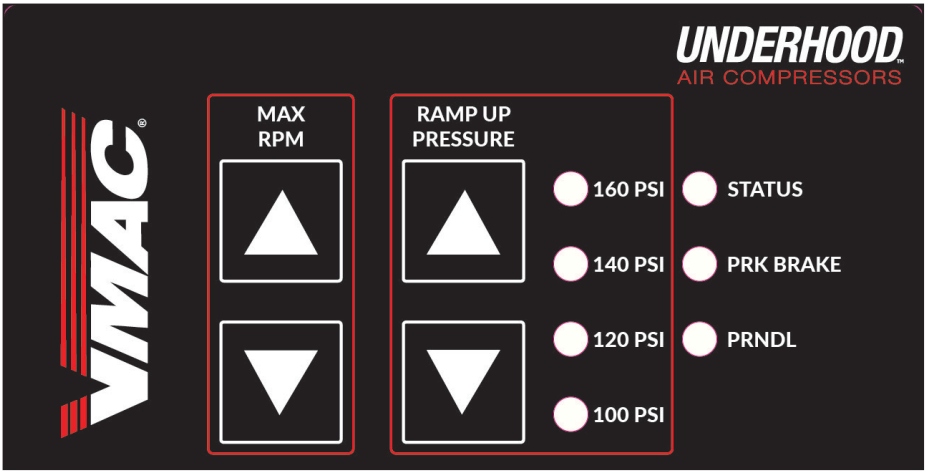


Figure 20 — Throttle control

Adjusting the rpm

The cfm produced by the system is directly related to engine speed; by default, the DTC is programmed to provide the following cfm when the throttle is engaged (the default rpm setting is VMAC kit specific as it varies dependent upon vehicle manufacture and engine type/size):

UNDERHOOD 70: 70 cfm.

UNDERHOOD 150: See the specific install manual for factory default cfm and maximum cfm values.

The DTC is located under the dashboard panel near the steering wheel.

If maximum cfm is not required, the operator may wish to reduce the "MAX RPM" to save fuel, as well as reduce the engine noise.

- See the system specific installation manual for the rpm value required to achieve maximum cfm.
- If the system is unable to "keep up" with a specific tool, the engine speed may be too low. Try increasing the engine speed gradually, until the desired performance is obtained.
- If the system is cycling on and off rapidly when using a particular tool, the engine speed is likely higher than necessary for that tool. Try reducing the engine speed and observe the performance.

Maximum rpm

Maximum VMAC rpm can be adjusted via the "MAX RPM" "▲" and "▼" buttons (in 50 rpm increments). On some early models, after pressing one of the buttons, the throttle will temporarily jump up to the new maximum rpm. After 4 seconds of inactivity, the throttle will store the new "Max RPM" value and resume normal operation.

Ramp Up Pressure

"RAMP UP PRESSURE" is the amount of pressure the system will drop before the engine speed is increased to generate air; as air continues to be used and the pressure drops, engine speed will increase until maximum VMAC rpm is achieved.

"RAMP UP PRESSURE" is set to 140 psi (10 psi below the factory default maximum system pressure of 150 psi). This allows for a small amount of air use without the need to increase engine speed.

"RAMP UP PRESSURE" should only be adjusted if the maximum system pressure is changed (via the inlet regulator). To maintain proper performance, and rapid response to air demand, ensure the "RAMP UP PRESSURE" is set at no more than 20 psi below the maximum system pressure.

The "RAMP UP PRESSURE" can be set to "100 PSI", "120 PSI", "140 PSI", or "160 PSI via the "▲" or "▼" buttons in the "RAMP UP PRESSURE" column; an LED will illuminate beside the setting that has been selected.

Minimum rpm

If the idle rpm is not optimal, it can be adjusted between 1,000 rpm and 1,500 RPM.

☐ With the vehicle running and the system at full system pressure, press and hold the "▲" and "▼" buttons in the "RAMP UP PRESSURE" column for several seconds until all of the LEDs turn on. Then release the buttons.

The DTC is now in "Idle adjust mode". While in "Idle adjust mode" the engine speed will remain at VMAC base idle until the system is turned off. Once the system is turned on again, it will operate as normal.

☐ Use the "▲" or "▼" buttons in the "MAX RPM" column to adjust the VMAC base idle (in increments of 50 rpm).

☐ Once the desired base idle has been set, turn the system off.

DTC Auto Calibration

The VMAC digital throttle is equipped with an auto calibration and engine learning routine that will assist with maintaining accurate and stable engine speeds. No user input is required unless the DTC is replaced or reset.

Operators may however notice that while the system is at full system pressure and the vehicle is at base VMAC idle, the vehicle engine speed may drop by a few hundred rpm and then return to normal VMAC base idle as the VMAC digital throttle control auto calibrates. This is normal and should only occur once each time the system is being operated.

VMAC systems are installed on a wide range of vehicles from many different manufacturers. Some systems require the DTC to be manually calibrated the first time the system is installed, or when the DTC is reset, or replaced.

In the event that the DTC has been factory reset, or replaced, refer to the "Digital Throttle Control Operation and Adjustments" chapter in the system installation manual for any specific DTC calibration instructions.

Factory Reset

The throttle control can be reset to factory default values via a button inside the throttle control box.

To perform a factory reset, turn the system on and allow the engine speed to drop to VMAC base idle (approximately 1,000 rpm). Using a paper clip (or similar object), push and hold the factory reset button for 5 seconds. All of the LED lights will illuminate for several seconds while the settings revert to their defaults. Once the LED's return to their normal state, the system is ready for use again.

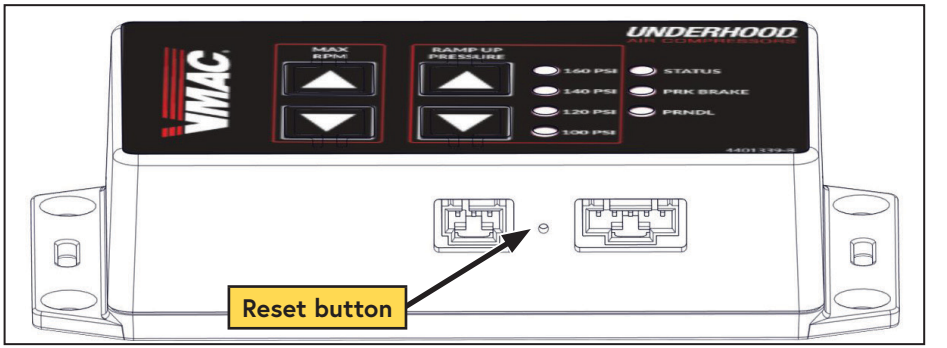


Figure 21 — Reset button

In the event that the DTC has been factory reset, or replaced, refer to the "Digital Throttle Control Operation and Adjustments" chapter in the system installation manual for any specific DTC calibration instructions.

Air Receiver Tank

If an air receiver tank will be used with this system, a check valve (not supplied) must be installed to prevent damage to the system.

Once a check valve is installed, pressure in the air receiver tank will not be relieved when the compressor system blows down. This is normal operation.

Prior to performing any service work on the system, discharge any stored air in the air receiver tank.

If an air receiver tank will be used with this system, the following installation procedure must be used to prevent damage to the system.

The VMAC compressor system will automatically depressurize when it is shutdown, therefore the hose from the VMAC AOST to the air receiver tank must have a check valve installed; this prevents blow back and moisture from the receiver tank entering the AOST

While the air receiver tank can be installed at any height in relation to the AOST, the discharge hose running from the AOST must be installed as high as possible on the air receiver tank to prevent problems with condensation that may have accumulated in the receiver tank (Figure 22).

Drain the condensed water from the receiver tank daily.

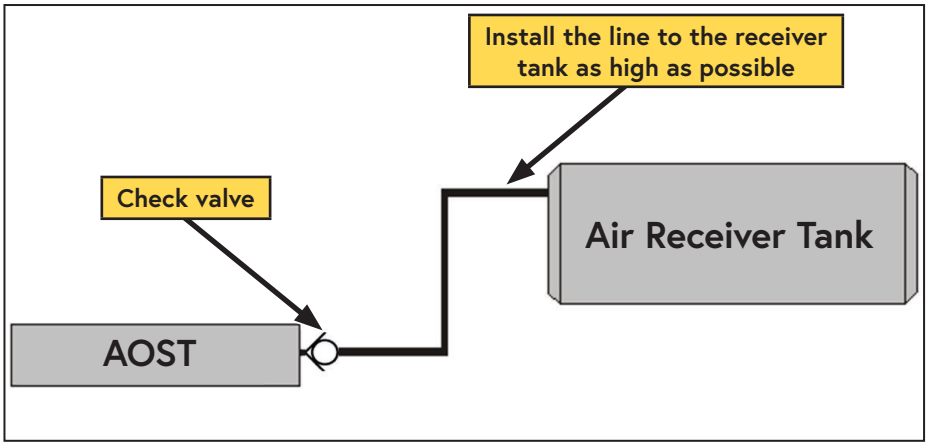


Figure 22 — Air receiver tank

Recommended Accessories

While the compressor system will function without the following accessories, VMAC strongly recommends their use for optimal performance.

See the "Accessory Product" section of the VMAC this manual on page 40 for a list of products available for purchase through VMAC.

Receiver Tank

An air receiver tank provides a buffer as it gives the compressor time to react by increasing the engine speed and producing air before the tool stalls. It also has the advantage of lowering the duty cycle of the compressor system.

Pressure Gauge

While not critical to system performance, a pressure gauge is important for fine tuning the system and simplifies any potential troubleshooting.

Install a 200 psi pressure gauge downstream of the air discharge valve.

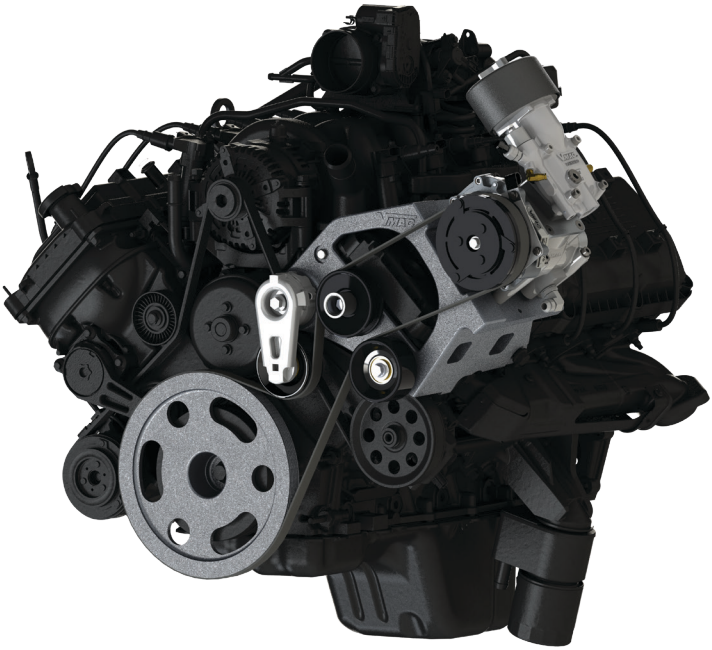
Pressure Regulator and/or Lubricator or FRL

The compressor can produce air pressures up to approximately 175 psi

(1035 kPa). It is the responsibility of the user to know the pressure and air flow requirements of the tools powered by the air compressor system.

An appropriate air pressure regulator and lubricator can be installed downstream of the air discharge valve. Failure to regulate the air pressure may cause damage to the tool.

UNDERHOOD™
AIR COMPRESSORS



Service and Maintenance Procedures

General Maintenance Information

Routine Maintenance

In order to maintain the VMAC warranty, VMAC's maintenance schedule must be followed. Only genuine VMAC parts can be used to maintain the system.

With proper maintenance, the likelihood of premature failure or component replacement can be drastically reduced.

The most critical aspect of maintenance is proper air filtration and clean oil. If any particles enter the compressor, they can score the rotors and contaminate the roller bearings in the compressor. Any contamination will cause rapid and severe damage to components.

The compressor system must be run a minimum of once every 30 days for at least 30 minutes to provide lubrication and to prevent premature bearing failure in the compressor due to vibration from the vehicle. Regularly running the system will also help to vaporize and exhaust any water that has condensed and accumulated in the AOST.

Torque Specifications

All fasteners must be torqued to specifications. Use manufacturers' torque values for OEM fasteners.

The torque values supplied in Table 1 are intended for VMAC supplied components, or for use as a guide in the absence of a torque value provided by an OEM.

Apply Loctite 242 (blue) to all fasteners (except nylon lock nuts) unless otherwise stated.

Torque values are with Loctite applied unless otherwise specified.

Standard Grade 8 National Coarse Thread								
Size (in)	**1/4**	**5/16**	**3/8**	**7/16**	**1/2**	**9/16**	**5/8**	**3/4**
Foot pounds (ft•lb)	9	18	35	55	80	110	170	280
Newton meter (N•m)	12	24	47	74	108	149	230	379

Standard Grade 8 National Fine Thread					
Size (in)	**3/8**	**7/16**	**1/2**	**5/8**	**3/4**
Foot pounds (ft•lb)	40	60	90	180	320
Newton meter (N•m)	54	81	122	244	434

Metric Class 10.9						
Size (mm)	**M6**	**M8**	**M10**	**M12**	**M14**	**M16**
Foot pounds (ft•lb)	4.5	19	41	69	104	174
Newton meter (N•m)	6	25	55	93	141	236

Table 1 — Torque Table

The following instructions are general in nature, and cover a wide range of models; as such, your components may appear different than those in this manual. For specific component placement, please refer to the specific installation manual for your UNDERHOOD model.

Installation Manuals and Illustrated Parts Lists (IPL)

The installation manual and illustrated parts list are an invaluable resource for when inspecting, diagnosing or repairing the system. The installation manuals and IPL's are available free of charge from VMAC.

VMAC Installation Manuals

https://www.vmacair.com/support/manuals/

VMAC IPLs

https://www.vmacair.com/support/ipl/

Maintenance Schedule

The following maintenance schedule must be observed to maintain both the "Standard" and "Lifetime" VMAC warranties and to assure proper performance and long service life of the system. In the event of a warranty claim, VMAC may request service records.

The hours indicated are those displayed on the Control Box. Service should be performed at the indicated hours, or the semi-annual schedule (whichever occurs first).

To order service kits, see the ordering information on page 3.

In order to maintain the warranty on the UNDERHOOD Air Compressor, use only genuine VMAC parts to service the system.

Check the Illustrated Parts List for replacement part numbers or contact VMAC for more information.

Daily	
• Check compressor oil level. • Check pressure relief valve condition.	• Check the FEAD belt for wear. • Check system for leaks.

Every 6 months or 200 hours	

• Change compressor oil.
• Change compressor oil filter.
• Check hoses for wear and proper routing.
• Check wires and harnesses for wear and proper routing.
• Change compressor air filter.
	• Check pressure relief valve condition.
	• Check blowdown muffler for normal operation. The system should blowdown in approximately:
	  ○ UNDERHOOD 70: 10 - 15 seconds
	  ○ UNDERHOOD 150: 30 - 40 seconds

Every 12 months or 400 hours	
• Change compressor oil. • Change compressor oil filter. • Change compressor air filter. • Change thimble screen. • Check hoses for wear and proper routing. • Check wires and harnesses for wear and proper routing.	• Change pressure relief valve. • Change coalescing filter element. • Change blowdown muffler. • Change blowdown cap seal. • Change the blowdown cap O-ring.

Maintenance and Repair Safety

Prior to performing any service, ensure the transmission is in "PARK" with the parking brake applied and the wheels chocked.

It is impossible to warn of all the possible hazards that may result from operating, servicing, or repairing this system.

Wear all appropriate Personal Protective Equipment and follow all industry standard safety practices.

Confirm that the system is depressurized and has cooled prior to performing any service work.

Never use flammable solvents to clean any components. If a flammable solvent has been used, rinse the component thoroughly with water and dry it before reinstalling it to prevent the possibility of explosion.

Use only genuine VMAC parts to maintain the system.

Genuine VMAC parts are designed to work with the high pressure and heat generated by the compressor. Substituting genuine VMAC parts may void the warranty and could cause equipment damage, injury, or death.

This information is intended for people with mechanical trade certification who have the tools and equipment to properly and safely perform the service or repair. Do not attempt to service or repair this system without the appropriate mechanical training, knowledge and experience.

Follow all safety precautions and industry standard "best practices".

Safety Check List

- ☐ Open the ball valve or connect an air tool to the system to ensure all the stored air is released.
- ☐ Gently pull up on the ring on the pressure relief valve to confirm the system is depressurized.

Do not use the pressure relief valve as a means of depressurizing the compressor system. Doing so will prematurely wear the internal spring or the seat, preventing the valve from maintaining normal system pressure.

Inspecting the Hoses and PTFE Tubes

Read the "Maintenance and Repair Safety" section prior to performing any work on the system (beginning on page 46).

Wear appropriate Personal Protective Equipment and follow all industry standard safety practices.

All hoses, tubes and wires that are replaced, rerouted or shifted must be secured so that they do not contact any hot, sharp or moving parts. Use rubber coated P-clips wherever possible.

Ensure there is sufficient slack in the hose routing to allow for normal engine movement.

☐ Inspect all hoses and tubes for damage and wear.

☐ Ensure the hoses and tubes have not shifted and remain secured away from hot, sharp, or moving parts.

If any hoses or tubes need to be replaced, see "Hoses / Tubes" on page 15 for important information related to VMAC hoses.

PTFE Tubing, Loom, and Push-To-Connect Fittings

- PTFE tubing should only be cut using proper tubing cutters. Side cutters, utility knives, etc. will deform the tube, preventing a proper seal (or leave sharp edges which cut the internal O-ring).
- When applying loom to the PTFE tube, leave approximately 1 in between the loom and the fitting.
- Ensure the tube is clean, cut at 90° and that there are no sharp edges.
- Lubricate the tube and firmly push it into the fitting so that the tube fully seats in the fitting.
- Slide the collet out, away from the body of the fitting to lock the tubing in place.
- Ensure the tube does not have any "play" to prevent the O-ring from wearing.

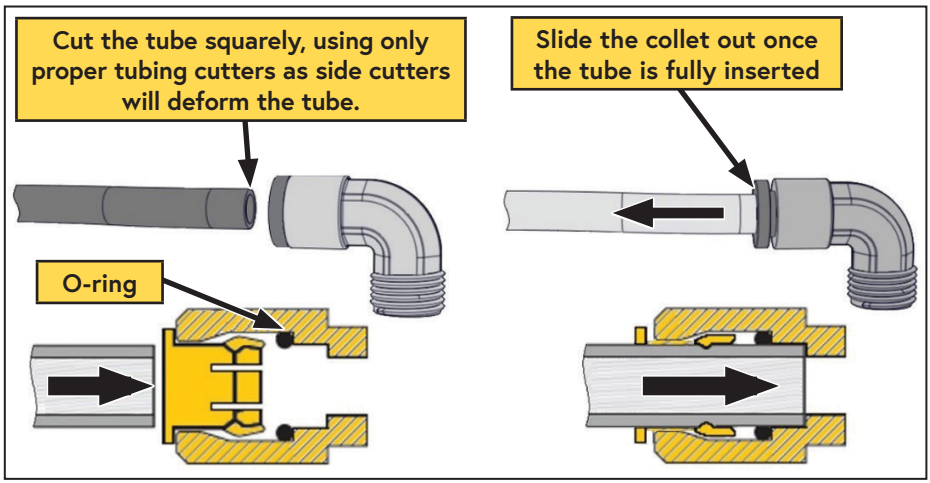


Figure 23 — Push-to-connect fittings

UNDERHOOD 70

Service Kit Parts List

200 Hour / 6 Month (A700019)		
QTY	**Part #**	**Description**
1	3600037	Air Filter
1	4400631	"Next Service Due" Decal
1	9200039	Oil Filter
1	A700091	VR High Performance Oil – 1 L
1	A700094	VR High Performance Oil – 4 L

The A700020 (400 hour / 1 year service kit) is compatible with earlier AOST's but dependent upon the model and revision installed, some parts may not be needed.

400 Hour / 1 Year (A700020)		
QTY	**Part #**	**Description**
1	3600037	Air Filter
1	4400631	"Next Service Due" Decal
1	9200039	Oil Filter
1	A700091	VR High Performance Oil – 1 L
1	A700094	VR High Performance Oil – 4 L
1	A700152	Coalescing Filter Assembly
1	3800587	Fast Pack (Contents listed below)
1	3600054	Valve, safety, 200 psi
1	3600064	Tank Seal
1	3600090	Thimble Screen
1	4400631	"Next Service Due" Decal
1	4500104	Muffler, Sintered Exhaust, 1/8
1	5830007	O-ring, Viton, 4 1/2 ID X 1/8
1	5830066	O-ring, Viton, 4 3/4 ID X 1/8
1	5830080	O-ring, Viton, 1/4 ID X 1/16
1	5830106	O-ring, Viton, 7/16 ID X 1/16
1	5840069	Spring

†The VMAC Universal Flush Kit (A700214) (sold separately) consists of 4 L (1.0 USG) VMAC Compressor oil (P/N: A00094) and (x2) VMAC oil filters (P/N: 9200039).

Inspecting and Adding Compressor Oil

Read the "Maintenance and Repair Safety" section prior to performing any work on the system (beginning on page 46).

Wear appropriate Personal Protective Equipment and follow all industry standard safety practices.

The VMAC supplied and approved compressor oil must be used in this system. Failure to use this special oil will result in damage to the compressor and will void warranty.

Do not overfill the system. Overfilling the system with oil can flood the sight glass window and make the system appear empty.

- ☐ Ensure the vehicle is parked on level ground and that the compressor system is depressurized and cool to the touch.
- ☐ Check the oil level in the sight glass and ensure that it is between the "MAX" arrow and the "ADD" arrow.

If the level is below the "ADD" mark, perform the following steps*:

- ☐ *Remove the fill cap from the inlet (this will be mounted on the compressor). On some compressor designs it may be easier to disconnect the air oil discharge hose from the compressor and pour oil directly into the hose in order to add oil to the system.
- ☐ *While adding the oil, rotate the compressor clutch clockwise (by hand, do not use power tools) to speed the process. *
- ☐ Allow 5 minutes for the oil to drain into the tank, then check th oil level via the sight glass.
- ☐ *Replace the fill cap and tighten securely.

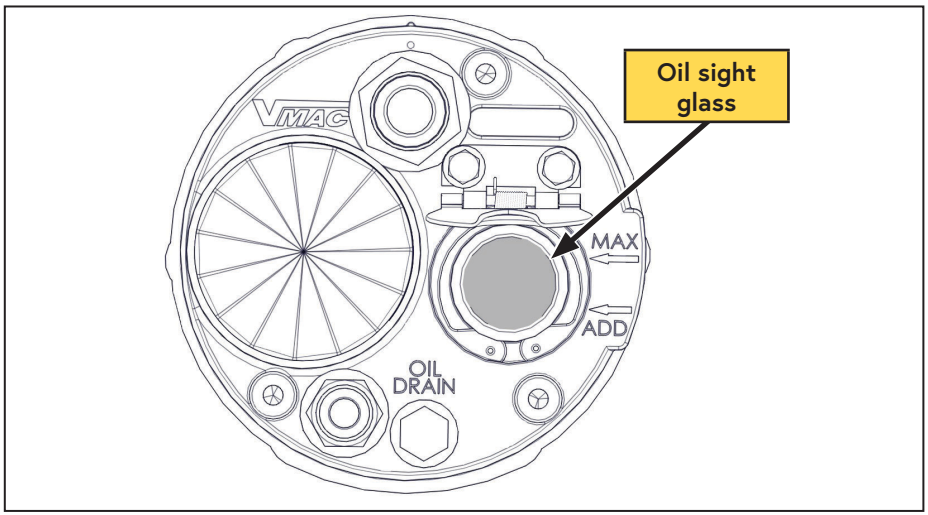
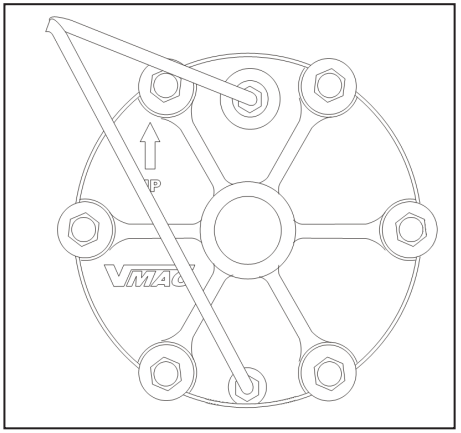


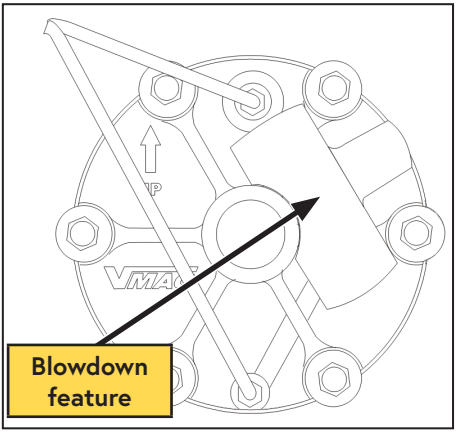
Figure 24 — Inspecting the oil

Identify AOST End Cap Style

If the AOST does not have a rapid blowdown end cap, ensure there is no residual pressure in the system. If a pressure gauge is fitted, ensure the gauge indicates "0", or attach a tool or air nozzle to the air outlet to ensure there is no residual pressure, prior to commencing service,



Tank without rapid blow-down end cap



Tank with rapid blow-down end cap

Figure 25 — AOST end cap identification

- ☐ If the system is cold, bring the engine to operating temperature and then operate the compressor system for a few minutes to bring the compressor oil to operating temperature. This will help to suspend contaminants in the oil so that they can be removed from the system along with the old oil.
- ☐ Observe all safety procedures relating to moving belts, hot oil and compressed air. Use all safety equipment to protect yourself.
- ☐ In some applications, to access the back of the AOST for the 400 hour / 1 Year service, it may be necessary to remove the tank from its brackets and lower the back end.
- ☐ Check the old oil (on 200 hour / 6 month service) and the inside of the tank (on 400 hour / 1 year service) for any evidence of metal filings or contaminants; if found, flush the tank, hoses and cooler. Metal filings and/or contaminants will damage the compressor.

Read the "Maintenance and Repair Safety" section prior to performing any work on the system (beginning on page 46).

Wear appropriate Personal Protective Equipment and follow all industry standard safety practices.

Inspect the Muffler

Visually inspect the blowdown muffler for evidence of corrosion or loss of functionality. Ensure the muffler allows the system to depressurize. To test the blowdown system and muffler:

- ☐ Turn the system on and allow it reach full system pressure (factory setting 150 psi).
- ☐ Turn off the system.
- ☐ Listen for the pressurized air to blowdown through the muffler on the AOST. Blowdown should be completed in approximately 10 – 15 seconds.
- ☐ If the muffler is showing signs of blockage, contact a local VMAC dealer for a replacement.

It is normal for a tiny amount of air to bleed out of the blowdown muffler when the system is running and the blowdown is working correctly.

If the blowdown muffler is venting a lot of air while the compressor is running, ensure the scavenge line is not kinked, collapsed or blocked.

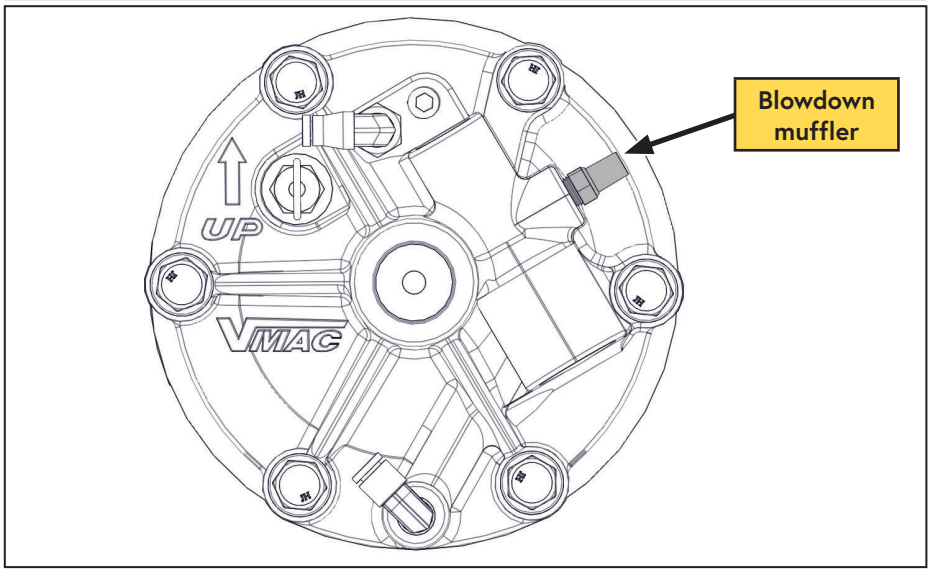


Figure 26 — Blowdown muffler

Inspecting and Replacing the Pressure Relief Valve

Do not use the pressure relief valve as a means of depressurizing the compressor system. Doing so will prematurely wear the internal spring or the seat, preventing the valve from maintaining normal system pressure.

The Pressure Relief Valve is a regular service item, and must be replaced every 400 hours or 1 year, whichever interval occurs first.

- ☐ Visually inspect the valve and ensure it is not corroded and that the vent holes are not plugged.
- ☐ Turn the system on and allow it reach full system pressure (factory setting 150 psi).
- ☐ Ensure that air does not leak out of the valve. Air leaking from the pressure relief valve when system pressure is at or below 150 psi indicates that the spring or seat in the valve is worn and the valve must be replaced.
- ☐ If the pressure relief valve is showing loss of functionality, contact a local VMAC dealer for a replacement.

A replacement pressure relief valve is included with the VMAC 400 hour service kit.

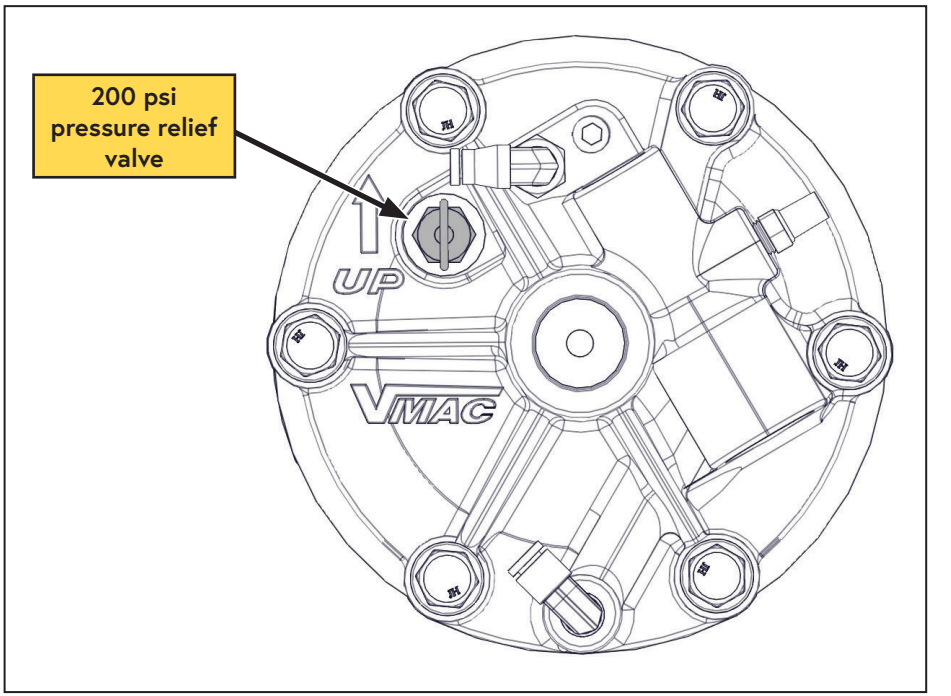


Figure 27 — Pressure relief valve

Replacing the Air Filter

⚠	***To avoid any possibility of contamination, ensure the air inlet is covered with masking tape or a clean cloth whenever the air filter cover is removed.***
⚠	***Do not attempt to clean the filter element, or use compressed air to perform any tasks around the compressor until the filter and cover are replaced.***

- ☐ Clean any loose debris from around the air filter housing to prevent any contamination from entering the system.
- ☐ Remove the filter cover and the filter element.
- ☐ Immediately cover the air inlet opening with masking tape or a clean cloth to prevent any contamination from entering the system.
- ☐ Clean the inside of the filter cover with a clean, dry cloth.
- ☐ Remove the cloth or masking tape from the air inlet and install the new air filter element.
- ☐ Ensure the filter element fits securely over the machined step on the filter plate.

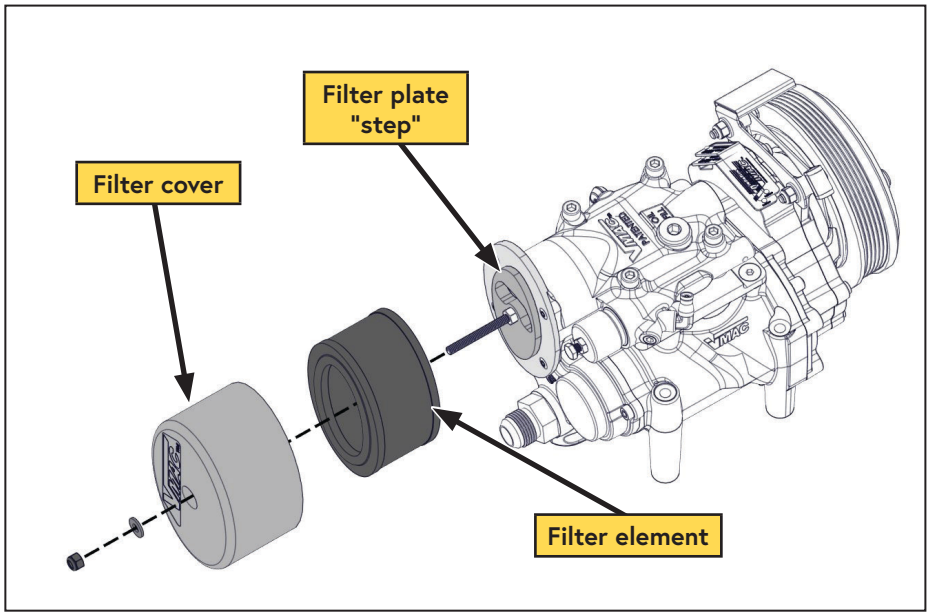


Figure 28 — Install air filter element

- ☐ Replace the air filter cover and secure it.

Inspect the Drive Belt

- ☐ Check the drive belt carefully for evidence of glazing, missing portions of the ribs or damage to the belt edges and surface. If the belt is damaged, install a new drive belt.
- ☐ Inspect all pulleys and idlers for damage. If any component shows cracks, chipping, impact damage or any other indications of physical damage, replace the pulley or idler.
- ☐ If the damage indicates possible misalignment, check pulley alignment. If the pulleys are not properly aligned, check all fasteners to ensure they are properly tightened and that there are no loose components.
- ☐ Inspect the belt tensioner for any signs of misalignment as this will cause the belt to misalign. Ensure the tensioner has smooth motion throughout its travel and is not binding.

Replace the Oil

- ☐ Clean the area around the front of the AOST and the oil filter to prevent contamination.
- ☐ Remove the oil drain plug and drain the oil into a container with a capacity of at least 5 L (1.32 USG) (Figure 29):

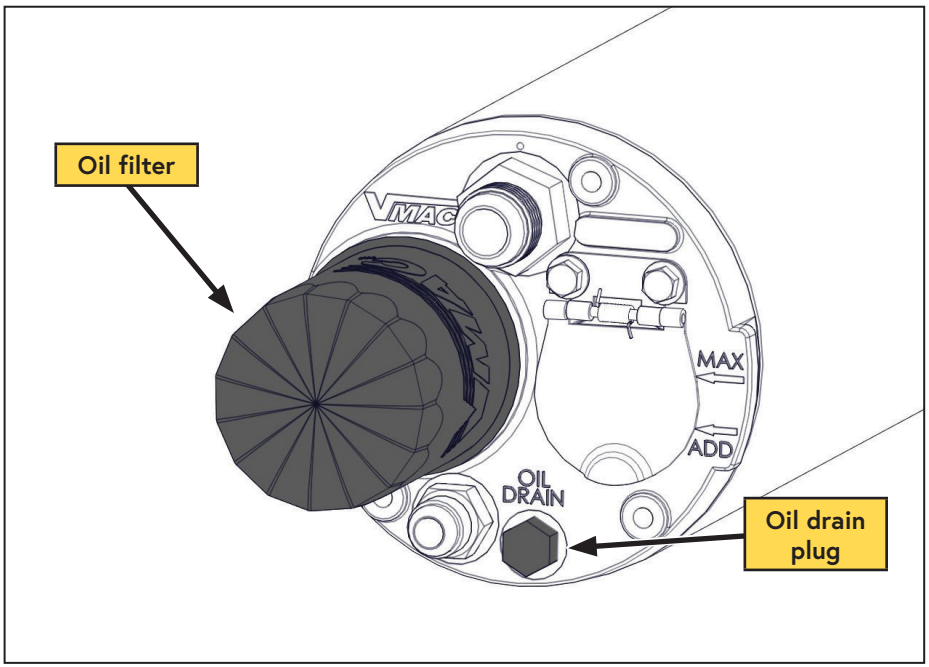


Figure 29 — Compressor oil filter

- ☐ Inspect the Viton® O-ring on the oil drain plug for damage, hardness or defects and replace if necessary.
- ☐ Install and tighten the oil drain plug.
- ☐ Remove the oil filter (Figure 29).

Ensure the threaded nipple did not unscrew with the oil filter*:

- ☐ *If the nipple came out with the oil filter, remove it from the filter, being careful to avoid damaging the threads.
- ☐ *To reinstall the nipple, thoroughly clean the threads and apply Loctite 242 (blue) to the end with the short threads and replace it in the AOST (Figure 30).

☐ Clean the gasket sealing surface on the front of the AOST and inspect it for damage. The surface must be free of old gasket material and smooth to ensure a good seal (Figure 30).

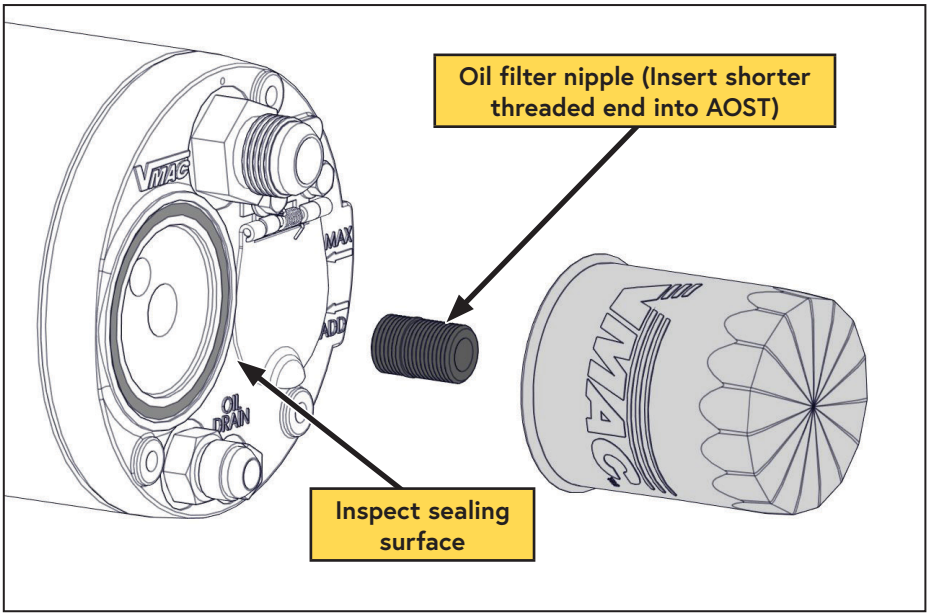


Figure 30 — Compressor oil filter

☐ Apply a thin coat of compressor oil to the rubber gasket on the oil filter.

☐ Spin the filter onto the threaded nipple until the gasket contacts the sealing surface on the tank, then tighten the filter an additional 3/4 to 1 turn to seat the gasket.

☐ Remove the fill cap from the inlet (this will be mounted on the compressor). On some compressor designs it may be easier to disconnect the air oil discharge hose from the compressor and pour oil directly into the hose in order to add oil to the system.

☐ Add 4 L (1.0 USG) of VMAC compressor oil to the AOST.

☐ While adding the oil, rotate the compressor clutch clockwise (by hand, do not use power tools) to speed the process.

☐ Allow 5 minutes for the oil to drain into the tank, then check th oil level via the sight glass (actual level will be corrected later).

☐ Reinstall the fill cap.

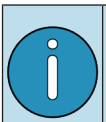
- ☐ Inspect all wire harnesses for any signs of wear. If signs of wear are present, apply protective loom as necessary and secure with rubber coated P-clips or cable ties.
- ☐ Inspect all hoses and tubes for any signs of wear. If signs of wear are present, take appropriate action to prevent further wear.
- ☐ Start the system and check for oil leaks.
- ☐ Allow the system to build to full system pressure (factory setting 150 psi) and for the engine speed to decrease to base idle.
- ☐ Turn the system "OFF".
- ☐ Once the system has sat for 5 minutes, check the oil level through the sight glass and add oil as necessary (the air compressor system holds approximately 4.5 L (1.2 USG) of oil).

Clearing Service Reminders

For systems that show a message "HRSxxx200HRSVC" or "HRSxxx400HRSVC" on the control box*:

- ☐ *Press and hold the "OFF" button for approximately 5 seconds until "DIAGNOSTICS" appears on the display.
- ☐ *Press and hold the "OFF" button (approximately 5 seconds) until "200 HR CLEAR" appears in the display.
- ☐ *Continue holding the "OFF" button until "CLEAR OK" appears in the display.

Clearing Service Reminders on Early 2007 Systems



A limited number of UNDERHOOD systems were manufactured with first generation digital control boxes which require a different button sequence to clear the service reminders. If the above method does not clear the service reminder, perform the following steps.

- ☐ Press and hold the "OFF" button for approximately 5 seconds until "DIAGNOSTICS" appears on the display.
- ☐ Press and hold the "ON" button until E01 XXX XX XX appears, then release the "ON" button.
- ☐ Press the "ON" button repeatedly to scroll through the Error Code records (E01 – E10) and Service records (S01 – S10) until 200HR CLEAR? or 400HR CLEAR? appears.
- ☐ Press and hold the "OFF" button (approximately 5 seconds) until "200 HR CLEAR" appears in the display.
- ☐ Continue holding the "OFF" button until "CLEAR OK" appears in the display.
- ☐ Press the ON and OFF button at the same time to exit diagnostics mode.

400 Hour | 1 Year Service Procedure

Read the "Maintenance and Repair Safety" section prior to performing any work on the system (beginning on page 46).

Wear appropriate Personal Protective Equipment and follow all industry standard safety practices.

☐ Apply thread sealant and replace the blowdown muffler (Figure 31).

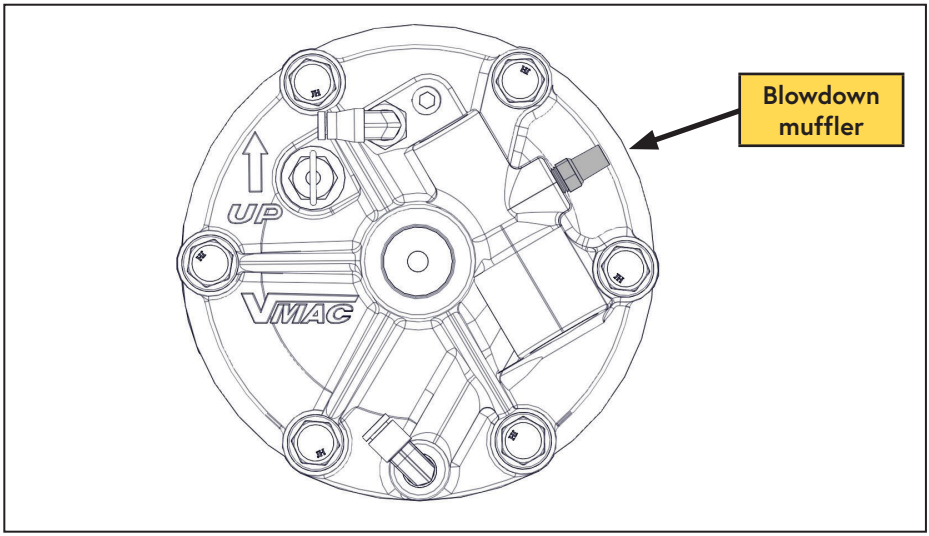


Figure 31 — Blowdown muffler

☐ Apply thread sealant and replace the pressure relief valve (Figure 32).

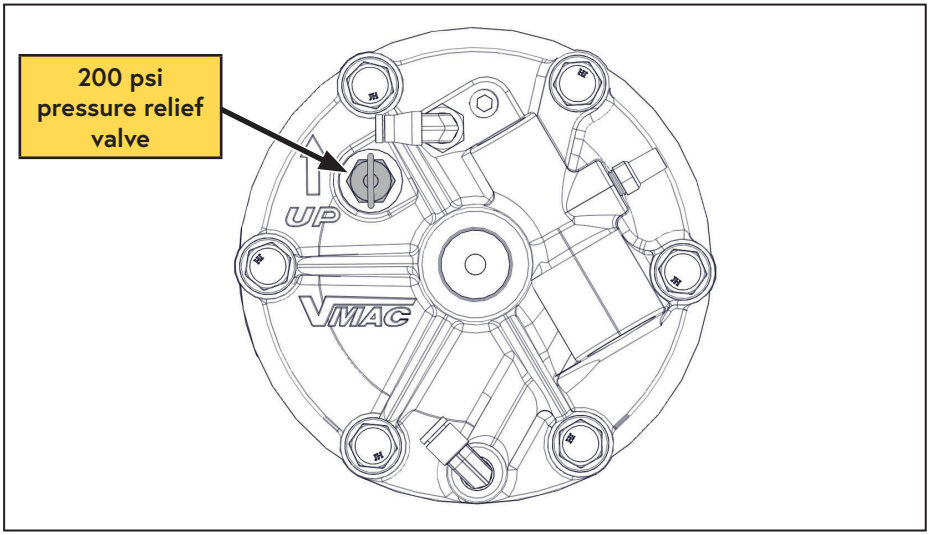


Figure 32 — Pressure relief valve

Replacing the Air Filter

⚠	***To avoid any possibility of contamination, ensure the air inlet is covered with masking tape or a clean cloth whenever the air filter cover is removed.***
⚠	***Do not attempt to clean the filter element, or use compressed air to perform any tasks around the compressor until the filter and cover are replaced.***

- ☐ Clean loose debris from the area around the compressor and the filter cover to prevent contamination entering the compressor.
- ☐ Remove the filter cover retaining nut, the filter cover and the filter element.
- ☐ Immediately cover the air inlet opening by masking with tape or with a clean cloth to prevent contamination.
- ☐ Clean the inside of the filter cover with a clean, dry cloth.
- ☐ Remove the cloth or masking and install a new air filter. Ensure the filter fits over the step on the filter plate.
- ☐ Replace the cover and secure it with the cover nut. Do not over-tighten the nut.

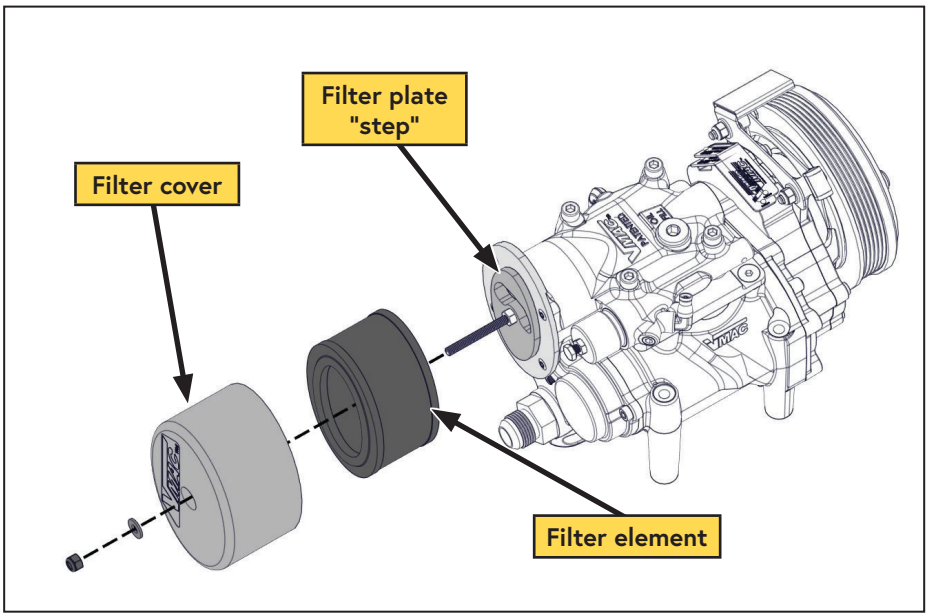


Figure 33 — Install air filter element

- ☐ Replace the air filter cover and secure it.

Inspect the Drive Belt

- ☐ Check the drive belt carefully for evidence of glazing, missing portions of the ribs or damage to the belt edges and surface. If the belt is damaged, install a new drive belt.
- ☐ Inspect all pulleys and idlers for damage. If any component shows cracks, chipping, impact damage or any other indications of physical damage, replace the pulley or idler.
- ☐ If the damage indicates possible misalignment, check pulley alignment. If the pulleys are not properly aligned, check all fasteners to ensure they are properly tightened and that there are no loose components.
- ☐ Inspect the belt tensioner for any signs of misalignment as this will cause the belt to misalign. Ensure the tensioner has smooth motion throughout its travel and is not binding.

Replace the Oil

- ☐ Clean the area around the front of the AOST and the oil filter to prevent contamination.
- ☐ Remove the oil drain plug and drain the oil into a container with a capacity of at least 5 L (1.3 USG) (Figure 34).

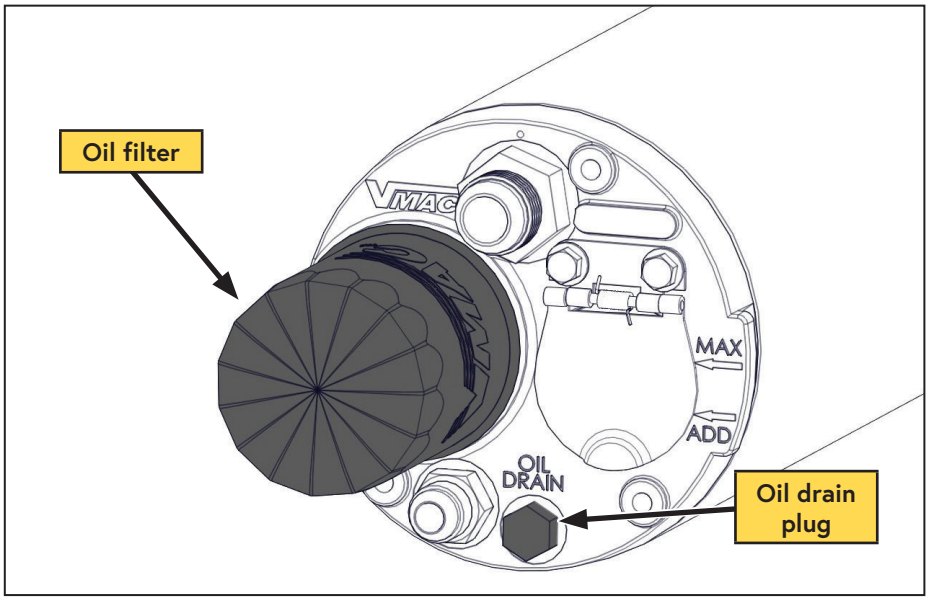


Figure 34 — Compressor oil filter

- ☐ Inspect the Viton O-ring on the oil drain plug for damage, hardness or defects and replace if necessary.
- ☐ Install and tighten the oil drain plug.
- ☐ Remove the oil filter (Figure 34).

Ensure the threaded nipple did not unscrew with the oil filter*:

- ☐ *If the nipple came out with the oil filter, remove it from the filter, being careful to avoid damaging the threads.
- ☐ *To reinstall the nipple, thoroughly clean the threads and apply Loctite 242 (blue) to the end with the short threads and replace it in the AOST (Figure 35).

☐ Clean the gasket sealing surface on the front of the AOST and inspect it for damage. The surface must be free of old gasket material and smooth to ensure a good seal (Figure 35).

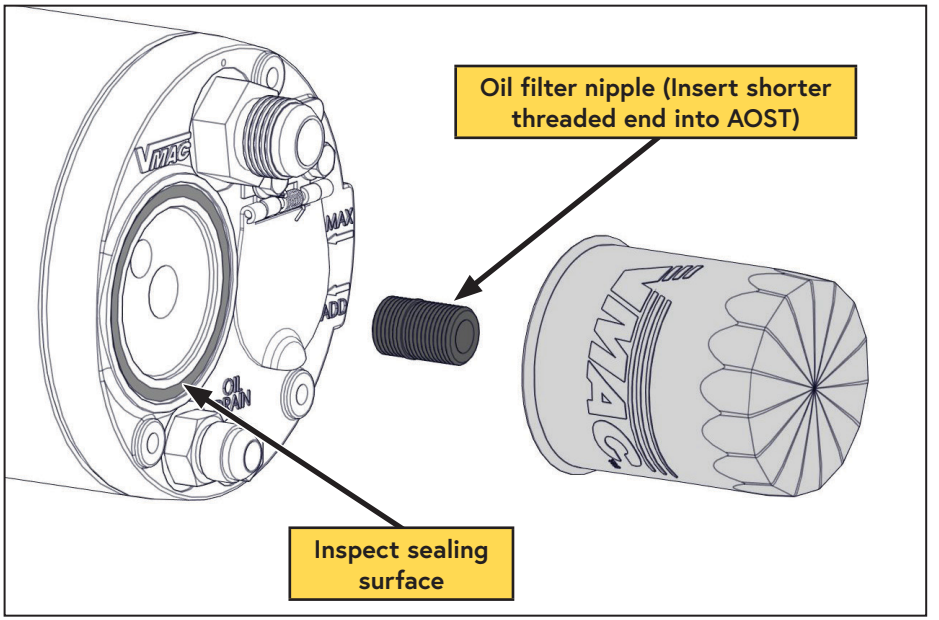


Figure 35 — Compressor oil filter

☐ Apply a thin coat of compressor oil to the rubber gasket on the oil filter.

☐ Spin the filter onto the threaded nipple until the gasket contacts the sealing surface on the tank, then tighten the filter an additional 3/4 to 1 turn to seat the gasket.

☐ Clean the blowdown cap at rear of the AOST to prevent contamination.

☐ Remove the air outlet hose and the PTFE scavenge and system pressure tubes from the blowdown cap. Carefully move the scavenge and system pressure tubes out of the way, ensuring that they do not twist or kink. Cap the air outlet and PTFE fittings to prevent contamination.

The coalescing separator element is spring-loaded against the blowdown cap; to prevent damage to the AOST, remove all of the bolts completely while holding the blowdown cap firmly in place.

☐ Remove the bolts retaining the blowdown cap. Unscrew the bolts evenly to avoid damaging the blowdown cap as the coalescing element is spring-loaded against the inside of the end cap.

☐ Remove the blowdown cap.

☐ Remove the Viton O-ring, coalescing element and wave spring from the AOST (Figure 36).

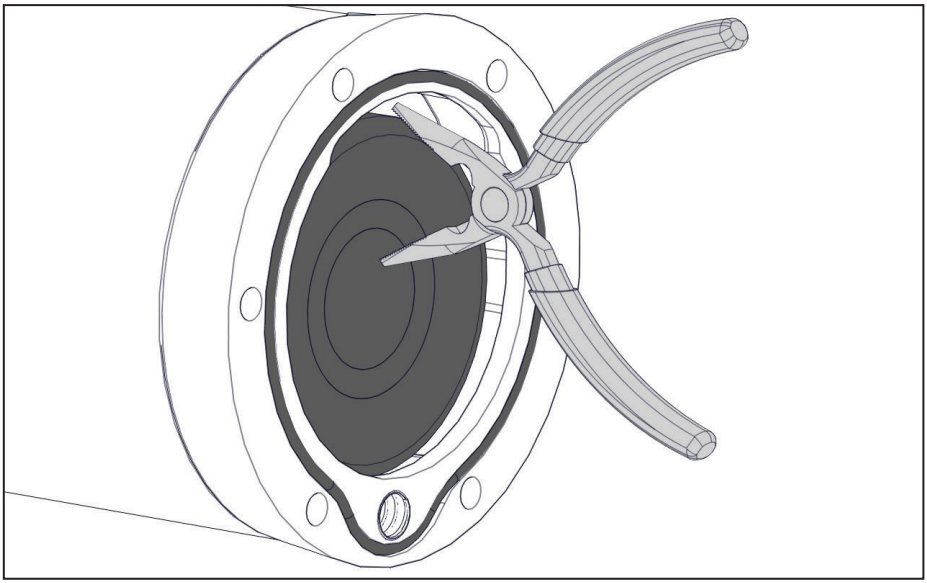


Figure 36 — Replacing the Coalescing filter spring

☐ Remove the small spring and thimble screen. The screen can be removed by carefully pushing it out of the oil scavenge hole from the inside of the AOST (Figure 37).

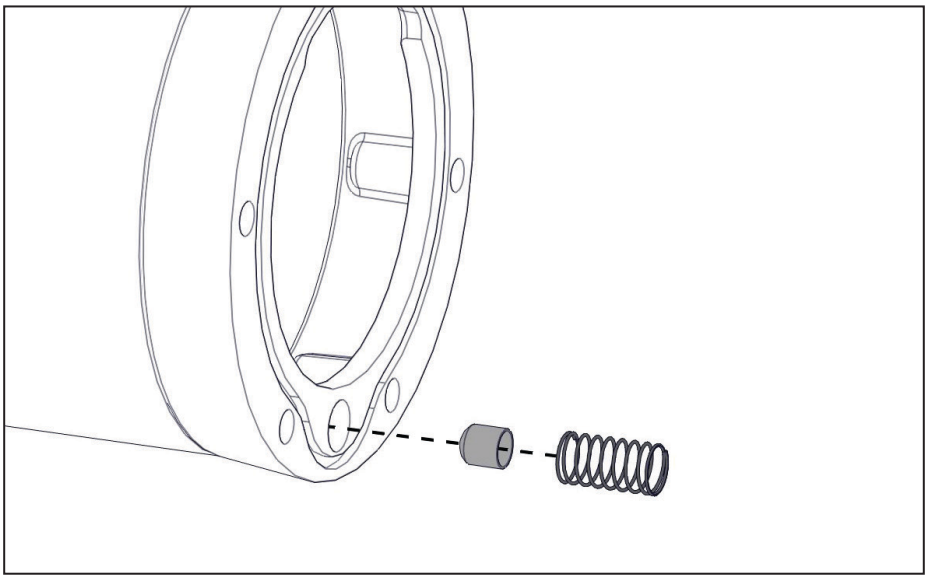


Figure 37 — Remove small spring and thimble screen

☐ Wipe out the inside of the AOST.

☐ Install the new thimble screen and spring (Figure 38).

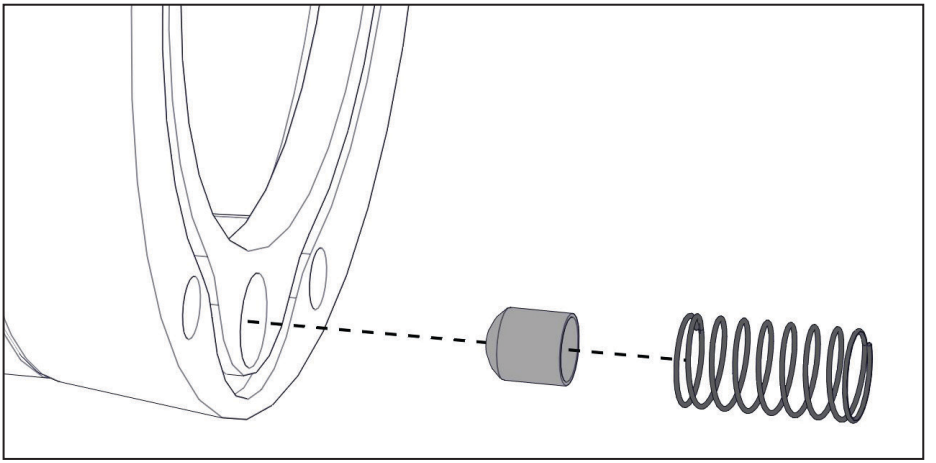


Figure 38 — Install thimble screen and spring

☐ Verify the wave spring is installed on the coalescing element (Figure 39).

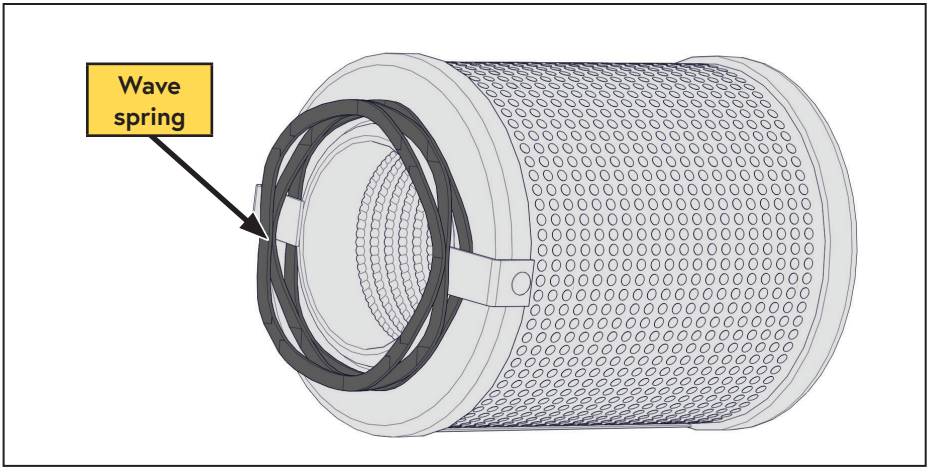


Figure 39 — Install wave spring

In addition to keeping the coalescing filter properly seated, the wave spring also prevents electrostatic buildup by grounding the coalescing filter. Failure to install the wave spring may cause an electric arc which could result in an explosion, tank rupture or fire.

☐ Install the coalescing element into the AOST (Figure 40).

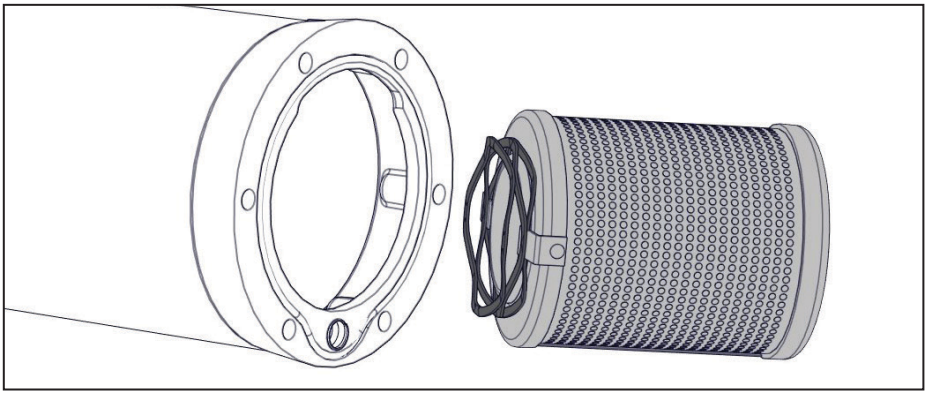


Figure 40 — Install coalescing filter

☐ Install the Blowdown cap seal in the blowdown cap (Figure 41).

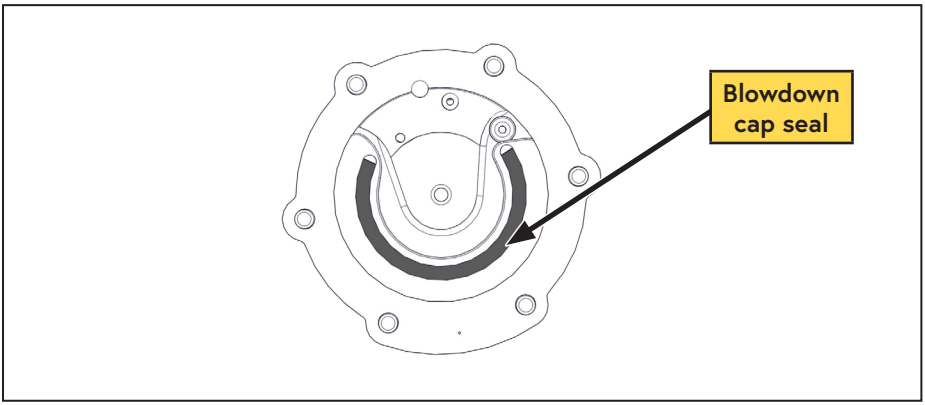


Figure 41 — Rear cap seal

☐ Install the blowdown cap Viton O-ring in the AOST (Figure 42).

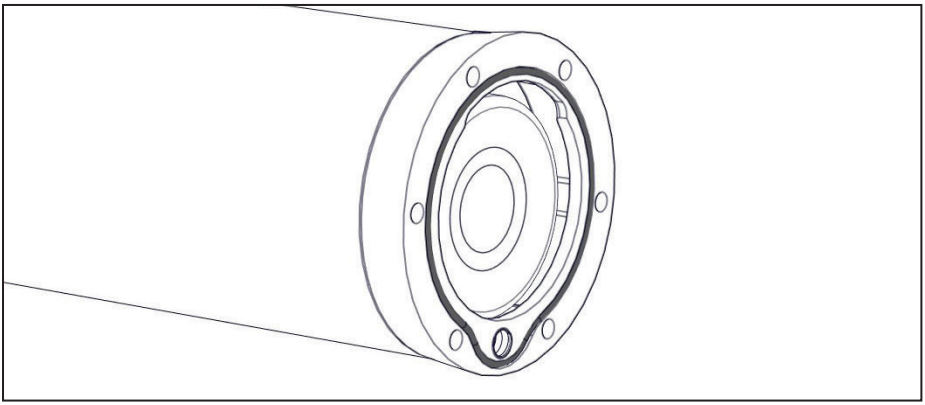


Figure 42 — Blowdown cap O-ring

- ☐ Reinstall the blowdown cap onto the AOST.
- ☐ Install the air outlet hose and the PTFE scavenge and pressure control tubes.
- ☐ Remove the fill cap from the inlet (this will be mounted on the compressor). On some compressor designs it may be easier to disconnect the air oil discharge hose from the compressor and pour oil directly into the hose in order to add oil to the system.
- ☐ Add 4 L (1.0 USG) of VMAC compressor oil to the AOST.
- ☐ While adding the oil, rotate the compressor clutch clockwise (by hand, do not use power tools) to speed the process.
- ☐ Allow 5 minutes for the oil to drain into the tank, then check th oil level via the sight glass (actual level will be corrected later).
- ☐ Reinstall the fill cap.
- ☐ Inspect all wire harnesses for any signs of wear. If signs of wear are present, apply protective loom as necessary and secure with rubber coated P-clips or cable ties.
- ☐ Inspect all hoses and tubes for any signs of wear. If signs of wear are present, take appropriate action to prevent further wear.
- ☐ Start the system and check for oil leaks.
- ☐ Allow the system to build to full system pressure (factory setting 150 psi) and for the engine speed to decrease to base idle.
- ☐ Turn the system "OFF".
- ☐ Once the system has sat for 5 minutes, check the oil level through the sight glass and add oil as necessary (the air compressor system holds approximately 4.5 L (1.2 USG) of oil).

Clearing Service Reminders

For systems that show a message "HRSxxx200HRSVC" or "HRSxxx400HRSVC" on the control box*:

- ☐ *Press and hold the "OFF" button for approximately 5 seconds until "DIAGNOSTICS" appears on the display.
- ☐ *Press and hold the "OFF" button (about 5 seconds) until "400 HR CLEAR" appears in the display.
- ☐ *Continue holding the "OFF" button until "CLEAR OK" appears in the display.

If the Service Reminder does not clear using the above instructions, and the VMAC System is circa 2007, see "Clearing Service Reminders on Early 2007 Systems" on page 19.

UNDERHOOD 150

Service Kit Parts List

200 Hour / 6 Month (A700059)		
QTY	**Part #**	**Description**
1	3600072	Air Filter
1	4400631	"Next Service Due" Decal
1	9200039	Oil Filter
1	A700091	VR High Performance Oil – 1 L
2	A700094	VR High Performance Oil – 4 L

400 Hour / 1 Year (A700060)		
QTY	**Part #**	**Description**
1	3600072	Air Filter
1	4400631	"Next Service Due" Decal
1	9200039	Oil Filter
1	A700091	VR High Performance Oil – 1 L
2	A700094	VR High Performance Oil – 4 L
1	3600071	Coalescing Filter
1	3800588	Fast Pack (Contents listed below)
1	3600073	Valve, safety, 3/8, 200 psi
1	3600090	Thimble Screen
1	4400631	"Next Service Due" Decal
1	4500104	Muffler, Sintered Exhaust, 1/8
1	5830080	O-ring, Viton, 1/4 ID X 1/16
1	5830100	O-ring, Viton, 6 1/2 ID X 1/8
1	5830106	O-ring, Viton, 7/16 ID X 1/16
1	5830123	O-ring, Viton, 7 ID X 1/8
1	3600073	Valve, safety, 3/8, 200 psi
1	3600075	Tank Seal
1	5840069	Spring

†The VMAC Universal Flush Kit (A700214) (sold separately) consists of 4 L (1.0 USG) VMAC Compressor oil (P/N: A00094) and (×2) VMAC oil filters (P/N: 9200039).

Inspecting and Adding Compressor Oil

Read the "Maintenance and Repair Safety" section prior to performing any work on the system (beginning on page 46).

Wear appropriate Personal Protective Equipment and follow all industry standard safety practices.

The VMAC supplied and approved compressor oil must be used in this system. Failure to use this special oil will result in damage to the compressor and will void warranty.

Do not overfill the system. Overfilling the system with oil can flood the sight glass window and make the system appear empty.

☐ Ensure the vehicle is parked on level ground and that the compressor system is depressurized and cool to the touch.

☐ Check the oil level in the sight glass and ensure that it is between the "MAX" arrow and the "ADD" arrow.

If the level is below the "ADD" mark, perform the following steps*:

- ☐ *Remove the fill cap from the inlet (this will be mounted on the compressor). On some compressor designs it may be easier to disconnect the air oil discharge hose from the compressor and pour oil directly into the hose in order to add oil to the system.
- ☐ *While adding the oil, rotate the compressor clutch clockwise (by hand, do not use power tools) to speed the process. *
- ☐ Allow 5 minutes for the oil to drain into the tank, then check th oil level via the sight glass.
- ☐ *Replace the fill cap and tighten securely.

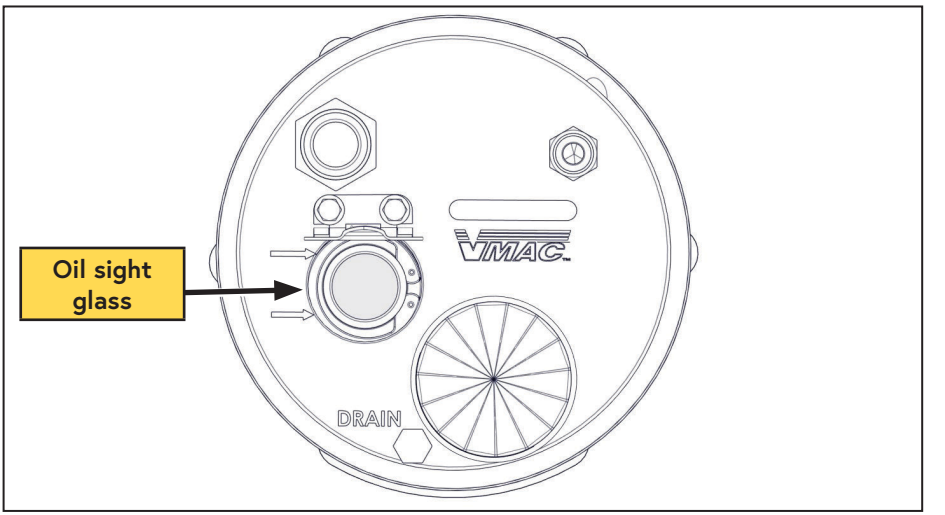


Figure 43 — Inspecting the oil

Read the "Maintenance and Repair Safety" section prior to performing any work on the system (beginning on page 46).

Wear appropriate Personal Protective Equipment and follow all industry standard safety practices.

Inspect the Muffler

Visually inspect the blowdown muffler for evidence of corrosion or loss of functionality. Ensure the muffler allows the system to depressurize. To test the blowdown system and muffler:

- ☐ Turn the system on and allow it reach full system pressure (factory setting 150 psi).
- ☐ Turn off the system.
- ☐ Listen for the pressurized air to blowdown through the muffler on the AOST. Blowdown should be completed in approximately 30 – 40 seconds.
- ☐ If the muffler is showing signs of blockage, contact a local VMAC dealer for a replacement.

It is normal for a tiny amount of air to bleed out of the blowdown muffler when the system is running and the blowdown is working correctly.

If the blowdown muffler is venting a lot of air while the compressor is running, ensure the scavenge line is not kinked, collapsed or blocked.

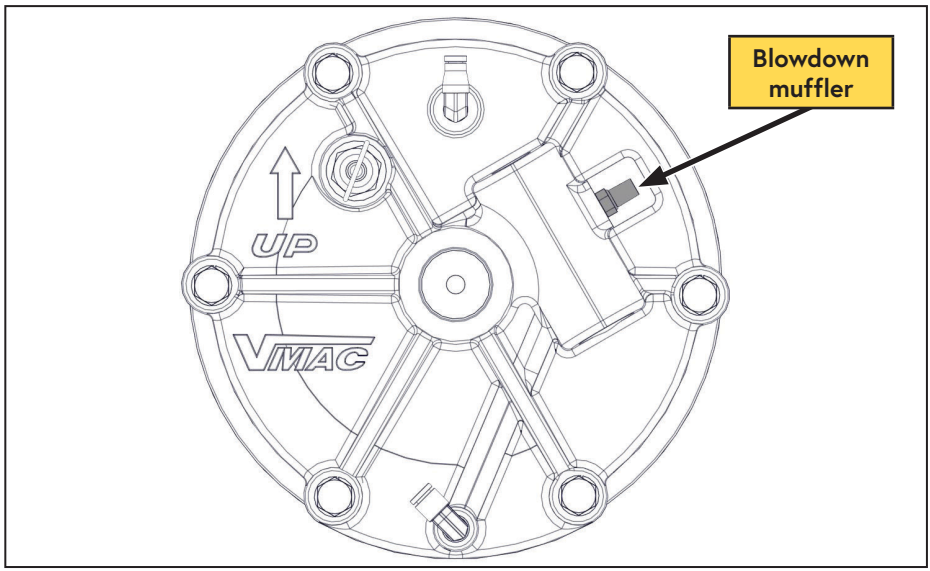


Figure 44 — Blowdown muffler

Inspecting and Replacing the Pressure Relief Valve

Do not use the pressure relief valve as a means of depressurizing the compressor system. Doing so will prematurely wear the internal spring or the seat, preventing the valve from maintaining normal system pressure.

The Pressure Relief Valve is a regular service item, and must be replaced every 400 hours or 1 year, whichever interval occurs first.

- ☐ Visually inspect the valve and ensure it is not corroded and that the vent holes are not plugged.
- ☐ Turn the system on and allow it reach full system pressure (factory setting 150 psi).
- ☐ Ensure that air does not leak out of the valve. Air leaking from the pressure relief valve when system pressure is at or below 150 psi indicates that the spring or seat in the valve is worn and the valve must be replaced.
- ☐ If the pressure relief valve is showing loss of functionality, contact a local VMAC dealer for a replacement.

A replacement pressure relief valve is included with the VMAC 400 hour service kit.

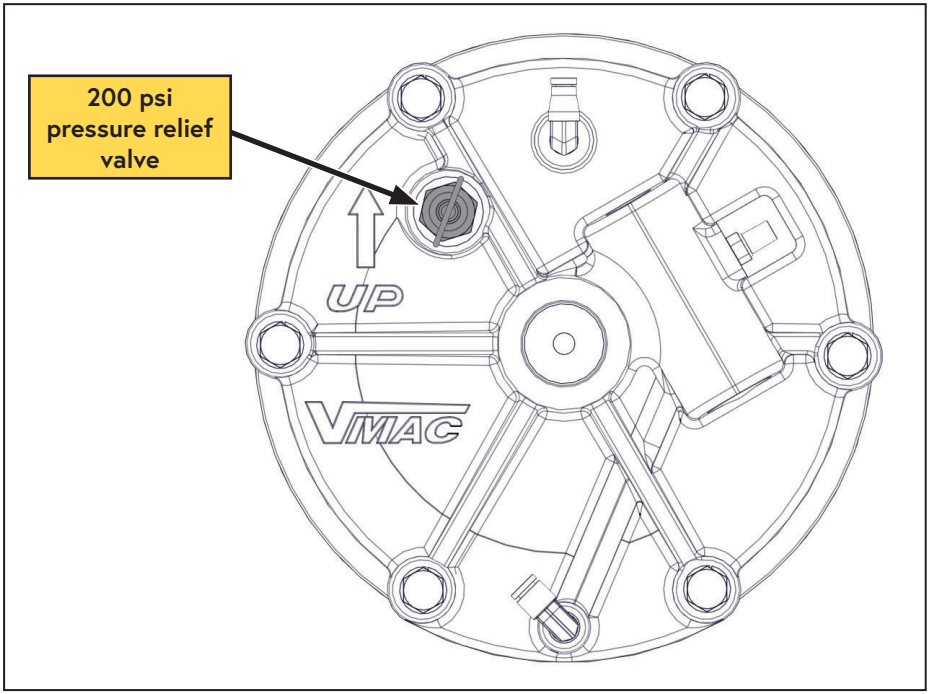


Figure 45 — Pressure relief valve

Replacing the Air Filter

⚠	***To avoid any possibility of contamination, ensure the air inlet is covered with masking tape or a clean cloth whenever the air filter cover is removed.***
⚠	***Do not attempt to clean the filter element, or use compressed air to perform any tasks around the compressor until the filter and cover are replaced.***

- ☐ Clean any loose debris from around the air filter housing to prevent any contamination from entering the system.
- ☐ Remove the filter cover and the filter element.
- ☐ Immediately cover the air inlet opening with masking tape or a clean cloth to prevent any contamination from entering the system.
- ☐ Clean the inside of the filter cover with a clean, dry cloth.
- ☐ Remove the cloth or masking tape from the air inlet and install the new air filter element.
- ☐ Ensure the filter element fits securely over the machined step on the filter plate.

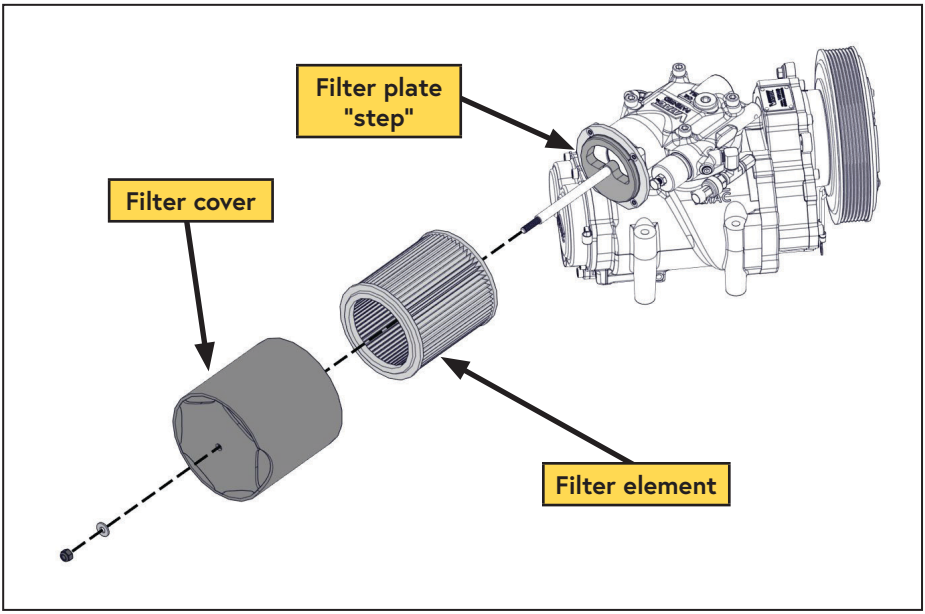


Figure 46 — Install air filter element

- ☐ Replace the air filter cover and secure it.

Inspect the Drive Belt

- ☐ Check the drive belt carefully for evidence of glazing, missing portions of the ribs or damage to the belt edges and surface. If the belt is damaged, install a new drive belt.
- ☐ Inspect all pulleys and idlers for damage. If any component shows cracks, chipping, impact damage or any other indications of physical damage, replace the pulley or idler.
- ☐ If the damage indicates possible misalignment, check pulley alignment. If the pulleys are not properly aligned, check all fasteners to ensure they are properly tightened and that there are no loose components.
- ☐ Inspect the belt tensioner for any signs of misalignment as this will cause the belt to misalign. Ensure the tensioner has smooth motion throughout its travel and is not binding.

Replace the Oil

- ☐ Clean the area around the front of the AOST and the oil filter to prevent contamination.
- ☐ Remove the oil drain plug and drain the oil into a container with a capacity of at least 9 L (2.38 USG) (Figure 47).

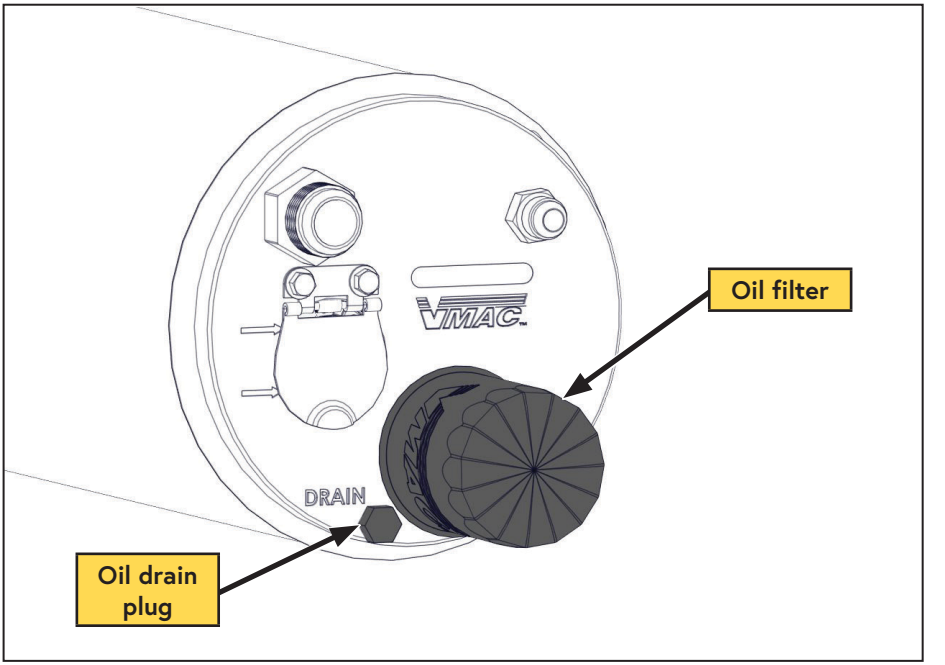


Figure 47 — Compressor oil filter

- ☐ Inspect the Viton O-ring on the oil drain plug for damage, hardness or defects and replace if necessary.
- ☐ Install and tighten the oil drain plug.
- ☐ Remove the oil filter (Figure 47).

Ensure the threaded nipple did not unscrew with the oil filter*:

- ☐ *If the nipple came out with the oil filter, remove it from the filter, being careful to avoid damaging the threads.
- ☐ *To reinstall the nipple, thoroughly clean the threads and apply Loctite 242 (blue) to the end with the short threads and replace it in the AOST (Figure 48).

☐ Clean the gasket sealing surface on the front of the AOST and inspect it for damage. The surface must be free of old gasket material and smooth to ensure a good seal (Figure 48).

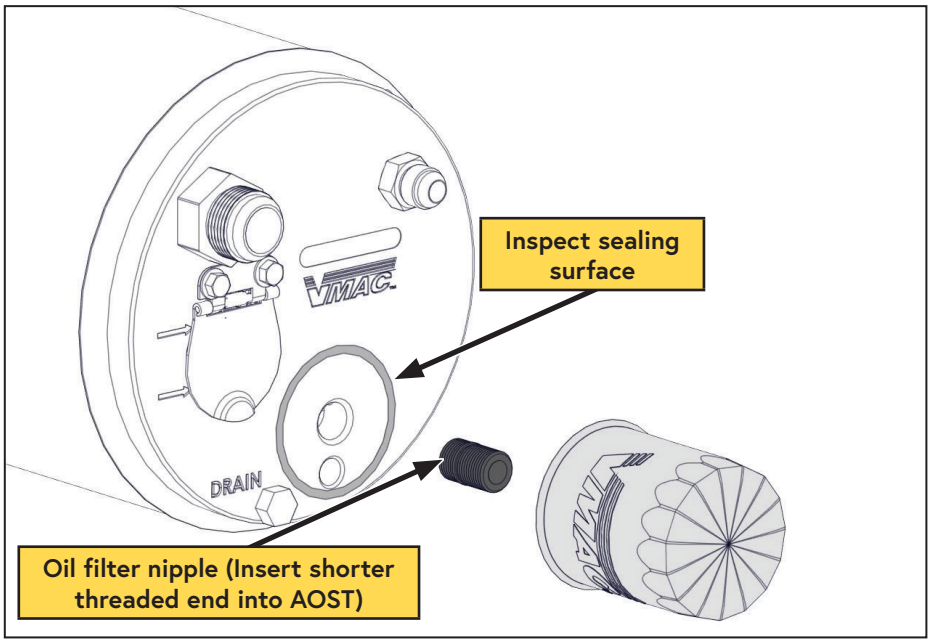


Figure 48 — Compressor oil filter

☐ Apply a thin coat of compressor oil to the rubber gasket on the oil filter.

☐ Spin the filter onto the threaded nipple until the gasket contacts the sealing surface on the tank, then tighten the filter an additional 3/4 to 1 turn to seat the gasket.

☐ Remove the fill cap from the inlet (this will be mounted on the compressor). On some compressor designs it may be easier to disconnect the air oil discharge hose from the compressor and pour oil directly into the hose in order to add oil to the system.

☐ Add 8 L (2.1 USG) of VMAC compressor oil to the AOST.

☐ While adding the oil, rotate the compressor clutch clockwise (by hand, do not use power tools) to speed the process.

☐ Allow 5 minutes for the oil to drain into the tank, then check th oil level via the sight glass (actual level will be corrected later).

☐ Reinstall the fill cap.

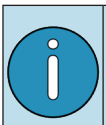
- ☐ Inspect all wire harnesses for any signs of wear. If signs of wear are present, apply protective loom as necessary and secure with rubber coated P-clips or cable ties.
- ☐ Inspect all hoses and tubes for any signs of wear. If signs of wear are present, take appropriate action to prevent further wear.
- ☐ Start the system and check for oil leaks.
- ☐ Allow the system to build to full system pressure (factory setting 150 psi) and for the engine speed to decrease to base idle.
- ☐ Turn the system "OFF".
- ☐ Once the system has sat for 5 minutes, check the oil level through the sight glass and add oil as necessary (the air compressor system holds approximately 9 L (2.4 USG) of oil).
- ☐ Verify there are no oil leaks.

Clearing Service Reminders

For systems that show a message "HRSxxx200HRSVC" or "HRSxxx400HRSVC" on the control box*:

- ☐ *Press and hold the "OFF" button for approximately 5 seconds until "DIAGNOSTICS" appears on the display.
- ☐ *Press and hold the "OFF" button (approximately 5 seconds) until "200 HR CLEAR" appears in the display.
- ☐ *Continue holding the "OFF" button until "CLEAR OK" appears in the display.

Clearing Service Reminders on Early 2007 Systems



A limited number of UNDERHOOD systems were manufactured with first generation digital control boxes which require a different button sequence to clear the service reminders. If the above method does not clear the service reminder, perform the following steps.

- ☐ Press and hold the "OFF" button for approximately 5 seconds until "DIAGNOSTICS" appears on the display.
- ☐ Press and hold the "ON" button until E01 XXX XX XX appears, then release the "ON" button.
- ☐ Press the "ON" button repeatedly to scroll through the Error Code records (E01 – E10) and Service records (S01 – S10) until 200HR CLEAR? or 400HR CLEAR? appears.
- ☐ Press and hold the "OFF" button (approximately 5 seconds) until "200 HR CLEAR" appears in the display.
- ☐ Continue holding the "OFF" button until "CLEAR OK" appears in the display.
- ☐ Press the ON and OFF button at the same time to exit diagnostics mode.

400 Hour | 1 Year Service Procedure

Read the "Maintenance and Repair Safety" section prior to performing any work on the system (beginning on page 46).

Wear appropriate Personal Protective Equipment and follow all industry standard safety practices.

☐ Apply thread sealant and replace the blowdown muffler (Figure 49).

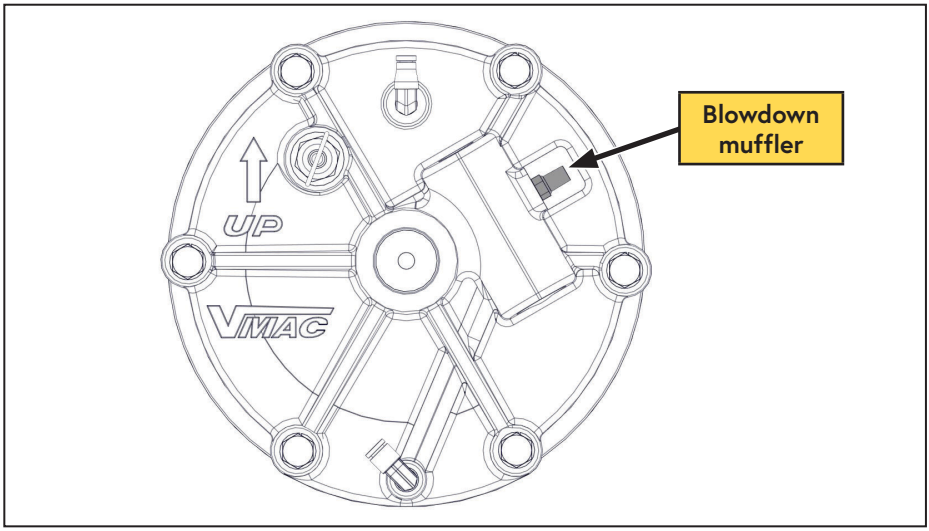


Figure 49 — Blowdown muffler

☐ Apply thread sealant and replace the pressure relief valve (Figure 50).

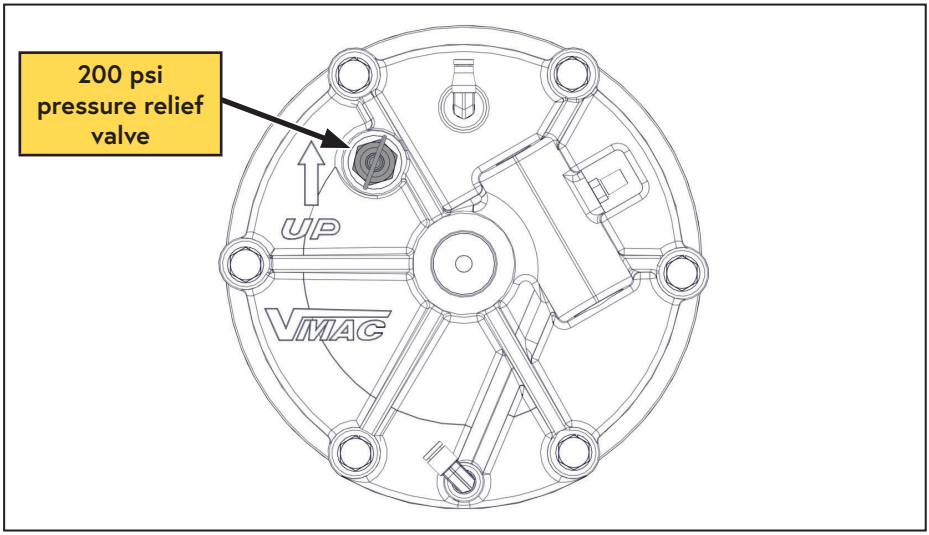


Figure 50 — Pressure relief valve

Replacing the Air Filter

	***To avoid any possibility of contamination, ensure the air inlet is covered with masking tape or a clean cloth whenever the air filter cover is removed.***
	***Do not attempt to clean the filter element, or use compressed air to perform any tasks around the compressor until the filter and cover are replaced.***

- ☐ Clean loose debris from the area around the compressor and the filter cover to prevent contamination entering the compressor.
- ☐ Remove the filter cover retaining nut, the filter cover and the filter element.
- ☐ Immediately cover the air inlet opening by masking with tape or with a clean cloth to prevent contamination.
- ☐ Clean the inside of the filter cover with a clean, dry cloth.
- ☐ Remove the cloth or masking and install a new air filter. Ensure the filter fits over the step on the filter plate.
- ☐ Replace the cover and secure it with the cover nut. Do not over-tighten the nut.

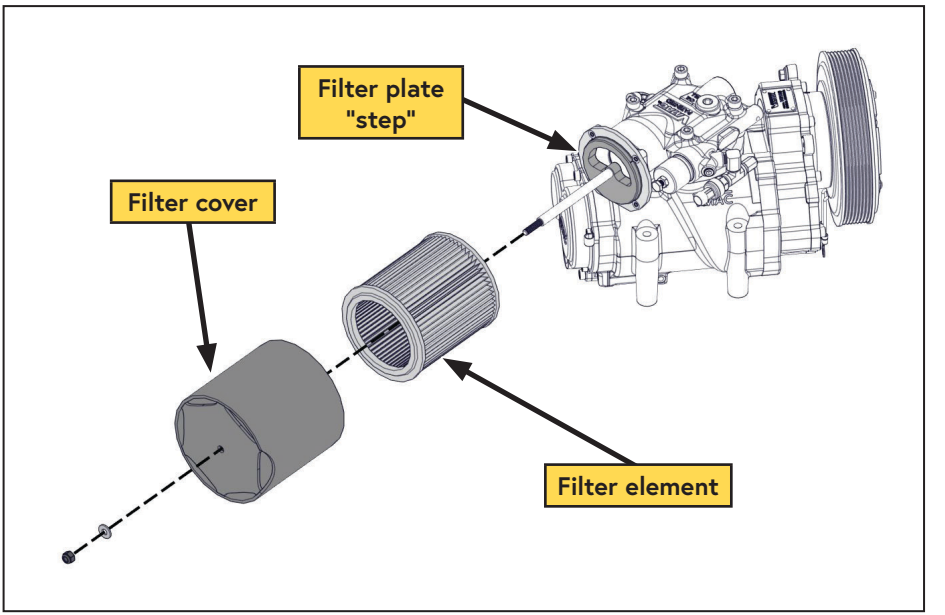


Figure 51 — Install air filter element

- ☐ Replace the air filter cover and secure it.

Inspect the Drive Belt

- ☐ Check the drive belt carefully for evidence of glazing, missing portions of the ribs or damage to the belt edges and surface. If the belt is damaged, install a new drive belt.
- ☐ Inspect all pulleys and idlers for damage. If any component shows cracks, chipping, impact damage or any other indications of physical damage, replace the pulley or idler.
- ☐ If the damage indicates possible misalignment, check pulley alignment. If the pulleys are not properly aligned, check all fasteners to ensure they are properly tightened and that there are no loose components.
- ☐ Inspect the belt tensioner for any signs of misalignment as this will cause the belt to misalign. Ensure the tensioner has smooth motion throughout its travel and is not binding.

Replace the Oil

- ☐ Clean the area around the front of the AOST and the oil filter to prevent contamination.
- ☐ Remove the oil drain plug and drain the oil into a container with a capacity of at least 9 L (2.38 USG) (Figure 52).

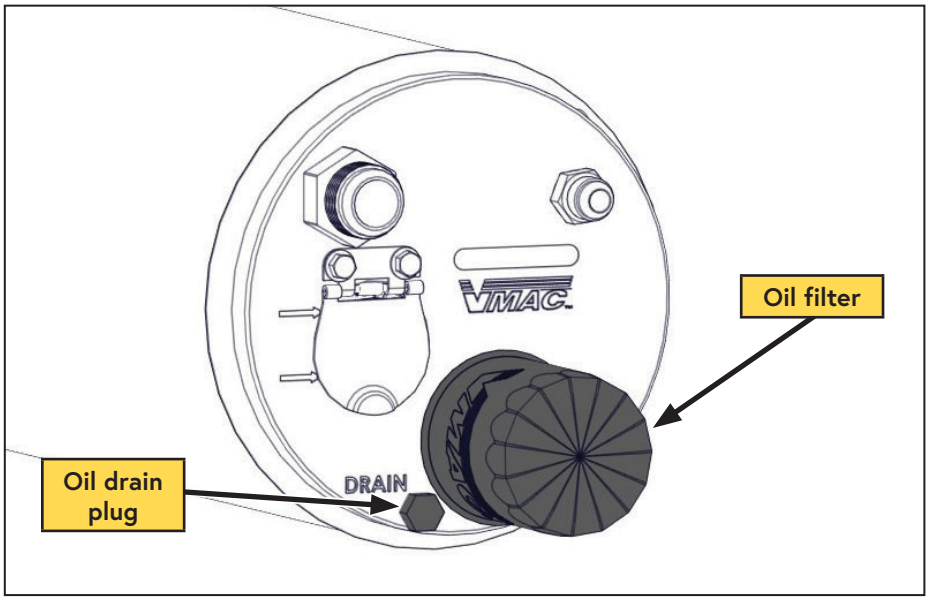


Figure 52 — Compressor oil filter

- ☐ Inspect the Viton O-ring on the oil drain plug for damage, hardness or defects and replace if necessary.
- ☐ Install and tighten the oil drain plug.
- ☐ Remove the oil filter (Figure 52).

Ensure the threaded nipple did not unscrew with the oil filter*:

- ☐ *If the nipple came out with the oil filter, remove it from the filter, being careful to avoid damaging the threads.
- ☐ *To reinstall the nipple, thoroughly clean the threads and apply Loctite 242 (blue) to the end with the short threads and replace it in the AOST (Figure 53).

☐ Clean the gasket sealing surface on the front of the AOST and inspect it for damage. The surface must be free of old gasket material and smooth to ensure a good seal (Figure 53).

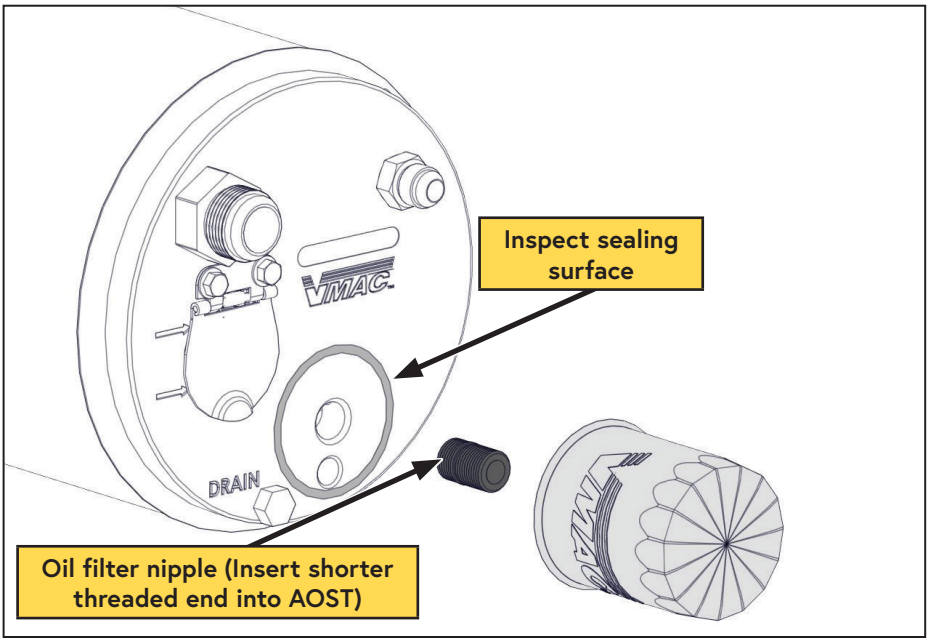


Figure 53 — Compressor oil filter

☐ Apply a thin coat of compressor oil to the rubber gasket on the oil filter.

☐ Spin the filter onto the threaded nipple until the gasket contacts the sealing surface on the tank, then tighten the filter an additional 3/4 to 1 turn to seat the gasket.

☐ Clean the blowdown cap at rear of the AOST to prevent contamination.

☐ Remove the air outlet hose and the PTFE scavenge and system pressure tubes from the blowdown cap. Carefully move the scavenge and system pressure tubes out of the way, ensuring that they do not twist or kink. Cap the air outlet and PTFE fittings to prevent contamination.

The coalescing separator element is spring-loaded against the blowdown cap; to prevent damage to the AOST, remove all of the bolts completely while holding the blowdown cap firmly in place.

☐ Remove the bolts retaining the blowdown cap. Unscrew the bolts evenly to avoid damaging the blowdown cap as the coalescing element is spring-loaded against the inside of the end cap.

☐ Remove the blowdown cap.

☐ Remove the Viton O-ring, coalescing element, and spring from the AOST (Figure 54).

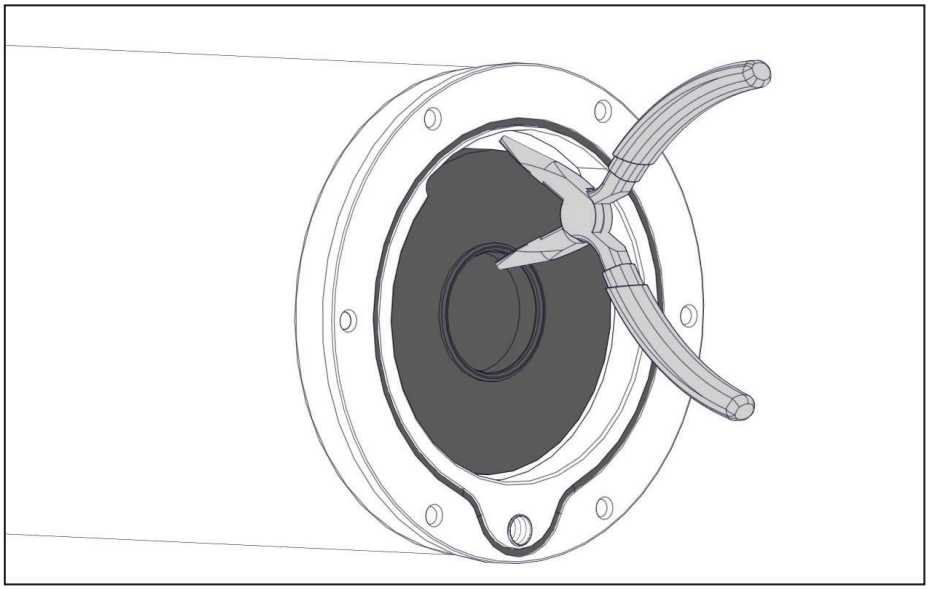


Figure 54 — Replacing the Coalescing filter spring

☐ Remove the small spring and thimble screen. The screen can be removed by carefully pushing it out of the oil scavenge hole from the inside of the AOST (Figure 55).

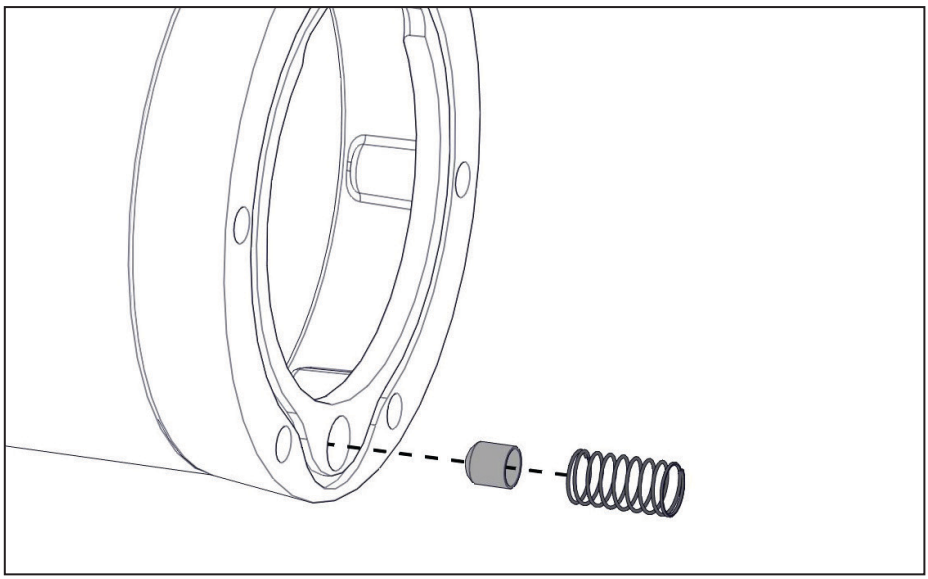


Figure 55 — Remove small spring and thimble screen

☐ Wipe out the inside of the AOST.

☐ Install the new thimble screen and spring (Figure 56).

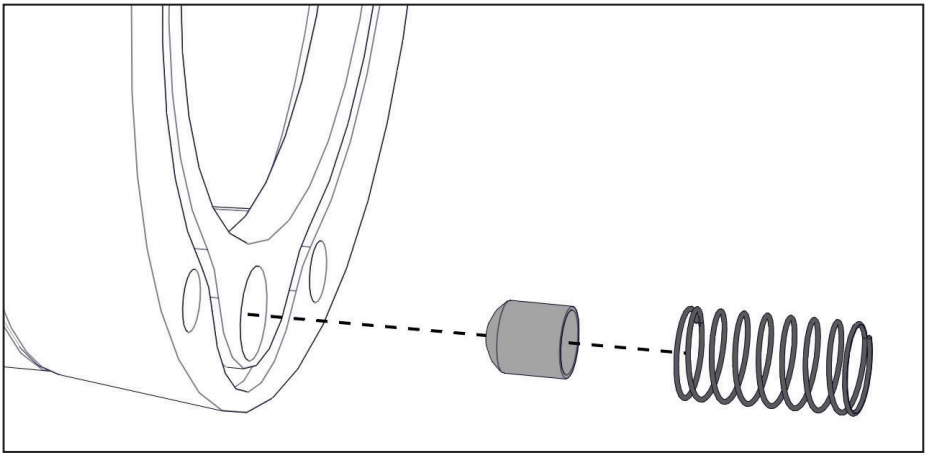


Figure 56 — Install thimble screen and spring

In addition to keeping the coalescing filter properly seated, the coil spring also prevents electrostatic buildup by grounding the coalescing filter. Failure to install the coil spring may cause an electric arc which could result in an explosion, tank rupture or fire.

☐ Install the spring plate, spring, and coalescing filter into the AOST (Figure 57).

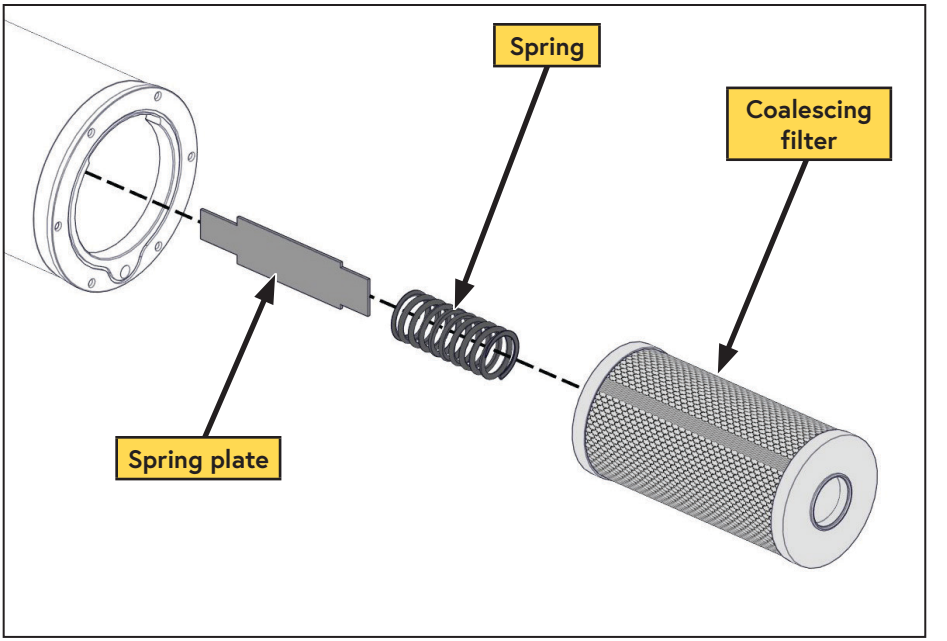


Figure 57 — Install coalescing filter

☐ Install the Blowdown cap seal in the blowdown cap (Figure 58).

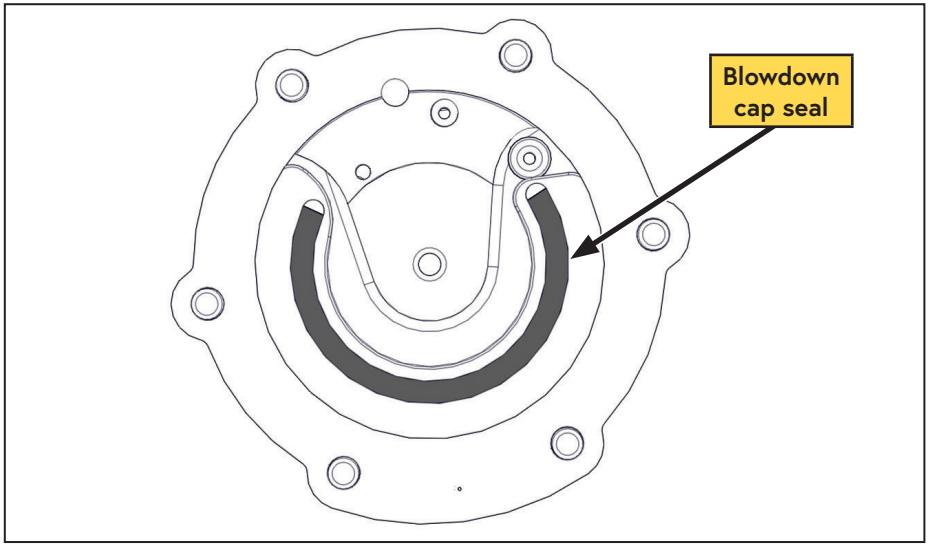


Figure 58 — Rear cap seal

☐ Install the blowdown cap Viton O-ring in the AOST (Figure 59).

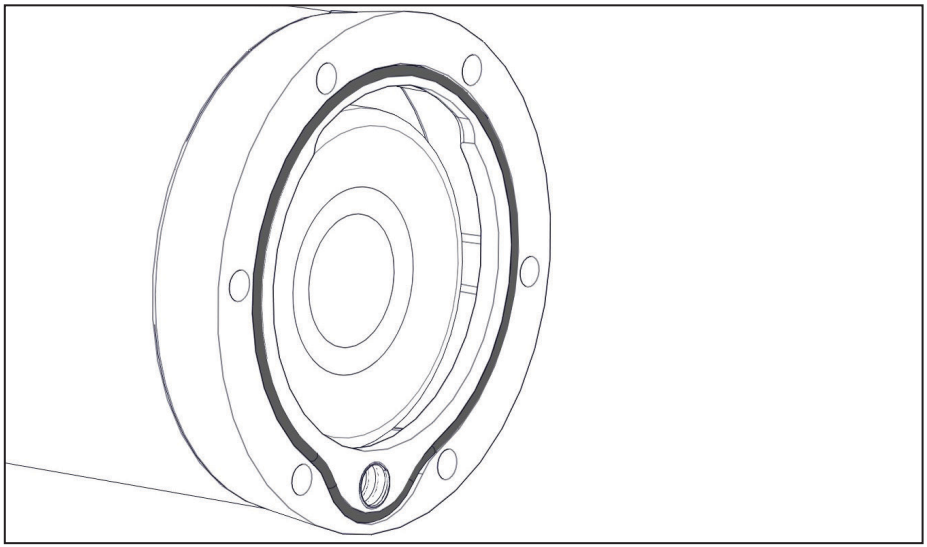


Figure 59 — Blowdown cap O-ring

☐ Reinstall the blowdown cap onto the AOST.

☐ Install the air outlet hose and the PTFE scavenge and pressure control tubes.

☐ Remove the fill cap from the inlet (this will be mounted on the compressor). On some compressor designs it may be easier to disconnect the air oil discharge hose from the compressor and pour oil directly into the hose in order to add oil to the system.

- ☐ While adding the oil, rotate the compressor clutch clockwise (by hand, *do not* use power tools) to speed the process.
- ☐ Allow 5 minutes for the oil to drain into the tank, then check th oil level via the sight glass (actual level will be corrected later).
- ☐ Inspect all wire harnesses for any signs of wear. If signs of wear are present, apply protective loom as necessary and secure with rubber coated P-clips or cable ties.
- ☐ Inspect all hoses and tubes for any signs of wear. If signs of wear are present, take appropriate action to prevent further wear.
- ☐ Start the system and check for oil leaks.
- ☐ Allow the system to build to full system pressure (factory setting 150 psi) and for the engine speed to decrease to base idle.
- ☐ Turn the system "OFF".
- ☐ Once the system has sat for 5 minutes, check the oil level through the sight glass and add oil as necessary (the air compressor system holds approximately 9 L (2.4 USG) of oil).
- ☐ Verify there are no oil leaks.

Clearing Service Reminders

For systems that show a message "HRSxxx200HRSVC" or "HRSxxx400HRSVC" on the control box*:

- ☐ *Press and hold the "OFF" button for approximately 5 seconds until "DIAGNOSTICS" appears on the display.
- ☐ *Press and hold the "OFF" button (approximately 5 seconds) until "200 HR CLEAR" appears in the display.
- ☐ *Continue holding the "OFF" button until "CLEAR OK" appears in the display.

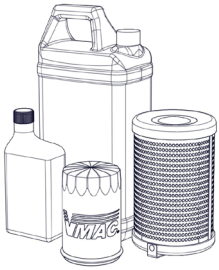
Clearing Service Reminders on Early 2007 Systems

A limited number of UNDERHOOD systems were manufactured with first generation digital control boxes which require a different button sequence to clear the service reminders. If the above method does not clear the service reminder, perform the following steps.

- ☐ Press and hold the "OFF" button for approximately 5 seconds until "DIAGNOSTICS" appears on the display.
- ☐ Press and hold the "ON" button until E01 XXX XX XX appears, then release the "ON" button.
- ☐ Press the "ON" button repeatedly to scroll through the Error Code records (E01 – E10) and Service records (S01 – S10) until 200HR CLEAR? or 400HR CLEAR? appears.
- ☐ Press and hold the "OFF" button (approximately 5 seconds) until "200 HR CLEAR" appears in the display.
- ☐ Continue holding the "OFF" button until "CLEAR OK" appears in the display.
- ☐ Press the ON and OFF button at the same time to exit diagnostics mode.

Accessory Products from VMAC

Compressor Service Kits



200 Hour or 6 Month Service Kit -
Part number: A700019
Includes 5 L VMAC high performance compressor oil, oil filter, air filter, and next service due decal.

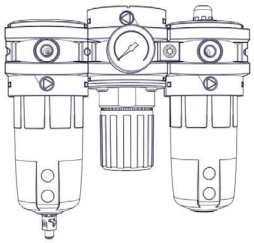
400 Hour or 1-Year Service Kit -
Part number: A700020
Includes 5 L VMAC high performance compressor oil, oil filter, air filter, coalescing filter, pressure relief valve, muffler, and next service due decal.

Compressor Service Kits

200 Hour or 6 Month Service Kit -
Part number: A700059
Includes 9 L VMAC high performance compressor oil, oil filter, air filter, and next service due decal.

400 Hour or 1-Year Service Kit -
Part number: A700060
Includes 9 L VMAC high performance compressor oil, oil filter, air filter, coalescing filter, pressure relief valve, muffler, and next service due decal.

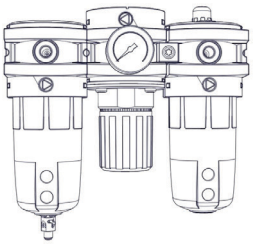
Filter Regulator Lubricator (FRL) — 70 cfm



Part number: A700151
Extends the life of air tools; filter removes contaminants from the compressed air, adjustable regulator can reduce air pressure going to tools, lubricator adds atomized tool oil to the air stream to lubricate air tools (Tool oil not included).

- Max air flow: up to 70 cfm / 150 psi
- Port size: 3/4 in NPT inlet and outlet

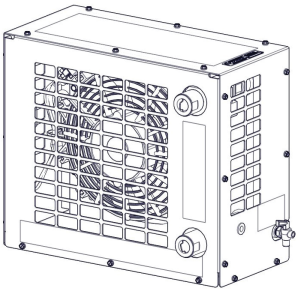
Filter Regulator Lubricator (FRL) — 185 cfm



Part number: A700221
Extends the life of air tools; filter removes contaminants from the compressed air, adjustable regulator can reduce air pressure going to tools, lubricator adds atomized tool oil to the air stream to lubricate air tools (Tool oil not included).

- Max air flow: up to 185 cfm / 200 psi
- Port size: 3/4 in NPT inlet and outlet

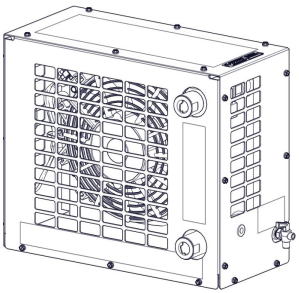
Air Aftercooler — 70 cfm



Part number: A800070
Improves tool performance and extends the life of air tools; removes up to 80% of water from compressed air; includes automatic water drain.

- Max air flow: 70 cfm / 175 psi.
- Port size: 3/4 in NPT inlet and outlet.
- Electrical: 12 V.
- Dimensions: 17 in (43.2 cm) L × 8.0 in (20.3 cm) W. × 14.5 in (36.8 cm) H.
- Weight: 35 lb (15.8 kg).

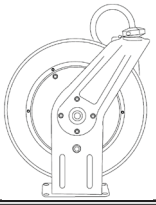
Air Aftercooler — 185 cfm



Part number: A800185
Improves tool performance and extends the life of air tools; removes up to 80% of water from compressed air; includes automatic water drain and A700221 (Filter Regulator, Lubricator).

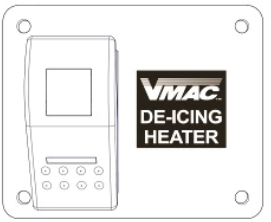
- Max air flow: 185 cfm / 200 psi.
- Port size: 1 in NPT inlet and outlet.
- Electrical: 12 V.
- Dimensions: 17 in (43.2 cm) L × 8.0 in (20.3 cm) W. × 14.5 in (36.8 cm) H.
- Weight: 35 lb (15.8 kg).

1/2 in × 50 ft Hose Reel



Part number: A700007
Spring-loaded 1/2 in × 50 ft hose reel; steel construction; full flow shaft and swivel for maximum performance.

VMAC De-icer Kit



Part number: A700031
Cold climate heater package for operating VMAC compressors in cold climates; proven at temperatures of -30 °C (-22 °F). Requires 12V DC at 10A.

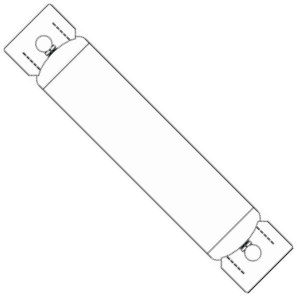
10 Gallon Air Receiver Tank w/ Mounting Feet

Part number: A300047

Air receiver tanks are used for lowering compressor duty cycle and removing water from compressed air. Recommended for optimum operation of VMAC Hydraulic Air Compressors, VMAC Diesel Driven Air Compressors, UNDERHOOD40, UNDERHOOD70 – Green Series Air Compressors, and VMAC Multifunction Power Systems, which include standby mode; ASME certified; includes fittings, 200 psi pressure relief valve, tank drain, and 200 psi pressure gauge.

- Max pressure: up to 200 psi.
- Dimensions: 30 in (76.2 cm) L × 10 in (25.4 cm) D.
- Weight: 33 lb (15 kg).

35 Gallon Air Receiver Wing Tank



Part number: A300010

Air receiver tanks are used for lowering compressor duty cycle and removing water from compressed air. Recommended for optimum operation of VMAC Diesel Air Compressors, Hydraulic Air Compressors, UNDERHOOD40, UNDERHOOD70 – Green Series Air Compressors, and VMAC Multifunction Power Systems, which include standby mode; ASME certified; includes fittings, 200 psi pressure relief value, tank drain, and 200 psi pressure gauge.

- Max pressure: up to 200 psi.
- Dimensions: 73 3/4 in (187.3 cm) L × 14 in (35.6 cm) D.
- Weight: 95 lb (43.1 kg).

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Warranty Registration

This form must be fully completed and returned to VMAC at the time the vehicle is put into service. Warranty may be void if this form is not received by VMAC within 3 months of receiving the vehicle, or 200 hours of operation, whichever occurs first.

VMAC's Warranty policy and registration can be viewed online at:
www.vmacair.com/warranty

Product Information

System Identification Number: **V** _ _ _ _ _ _ _ _ _ _ _ _ _
Compressor Serial Number: **P** _ _ _ _ _ _ _ _ _ _ _ _ _

Owner / End User Information

Company Name: _____

City: _____ State / Province: _____

Phone: (____) ____–_____

Email Address: _____

Date vehicle was put into service: ____/____/____
Day Month Year

Installer Information

Installer Company Name: _____

City: _____ State / Province: _____

Submitted by

Name: _____ Phone: (____) ____–_____

Email: _____

Vehicle Information (Optional)

Unit: _____ Year: _____

Make: _____ Model: _____

Vehicle Identification Number: _____

Manufactured by

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