

UNDERHOOD 'G' User's Manual

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Underhood Systems with Intelligent Digital Controls
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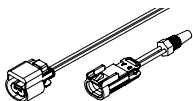
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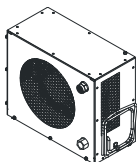
1.0 Accessory Products from VMAC

The following accessory products for your VR compressor system are available from VMAC. For more information or to order these products, call toll free 1-800-738-8622 or local 250-740-3200.



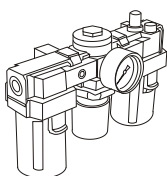
In-Cab Temperature Sensor **Part Number A700185**

Monitors cab temperature with UnderHood-G systems



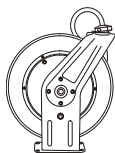
Eliminator Aftercooler **Part Number A800070**

Removes up to 80% of moisture from compressed air. Quick installation, automatic drain and compact design



Filter Regulator Lubricator **Part Number A700151**

Removes lubricants, water and dirt from the air stream. Adds atomized tool oil to lubricate tools. Reduces pressure for longer tool life.



Hose Reel **Part Number A700007**

Secure, compact, retractable hose storage in a sturdy reel.



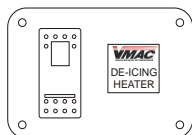
Air Receiver Tank **Part Number A300010**

Thirty-five gallon capacity in a compact tank, complete with fittings and a gauge.



De-icer Kit **Part Number A700031**

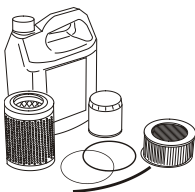
Insulated rope heater prevents freezing of lines in freezing conditions.



Service Kits

VR70 200 hour Part Number A700019

VR70 400 hour Part Number A700020



Using OEM service products will extend the life of your system. Includes oil, filters, seals and O-rings. 200 hour and 400 hour service interval kits are available

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2.0 General Information

This manual provides operation instructions, specifications, adjustment, maintenance, and warranty information for the VMAC 70G underhood air compressor, and VMAC Electronic Throttle Controller.

2.1 Ordering Parts

To order parts, contact your VMAC dealer. Your dealer will ask for the VMAC serial number, part number, a description of the part and the quantity. To locate your nearest dealer, call 1-800-738-8622.

2.2 Important Safety Notice

The information contained within this manual is based on sound engineering principles, research, extensive field experience and technical information. Information is constantly changing with the addition of new models, assemblies and service techniques. If a discrepancy is noted in this manual, contact VMAC prior to initiating or proceeding with service. Current information may clarify the matter. Any person with knowledge of such discrepancies who performs any work on the system, 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 performance or the operational safety of the equipment.

VMAC will not be held responsible for any liability, injuries, loss or damage to individuals or to equipment as a result of the failure of any person to properly adhere to the procedures set out in this manual or standard safety practices. Safety should be your first consideration in performing service operations. If you have any questions concerning the procedures set out in this manual or require any more information on details that are not included in this manual, please contact VMAC before beginning any work.

2.3 Safety Messages



This symbol is used to call your attention to instructions concerning your 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 alert to the possibility of personal injury or death. Be alert; your safety is involved. While it is impossible to warn about every conceivable hazard, let good common sense be your guide.



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



This symbol is used to call your attention to additional instructions involving fire hazards.

2.4 Safety Precautions

Read this information before operating the compressor for the first time. Follow the information and procedures in this manual for operation, maintenance and repair. Observe the following items to reduce the chance of personal injury or equipment damage.

Follow all safety precautions for mechanical work. Moving fan belts and fan blades 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.

Proper service and repair are important to the safety of the service technician and the safe, reliable operation of the equipment. Always use genuine VMAC replacement parts; do not use any substitutes.

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

This manual contains various warnings, cautions and notices that must be observed to reduce the risk of personal injury during service or repair and the possibility that improper service or repair may damage the equipment or render it unsafe. *Be aware that it is impossible to warn of all the possible hazardous consequences that might result from failure to follow these instructions.*

Observe the following general safety rules (continues on next page):

- Pay attention to operations; do not leave the vehicle unattended.
- Follow safe work practices and wear the appropriate safety equipment when operating air-powered equipment, particularly eye and hearing protection.
- Follow all safety precautions for underhood mechanical work.
- Follow safety procedures for the type of work being completed.

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Avoid all contact with pressurized air, because if it penetrates your skin it can enter your bloodstream and cause serious bodily harm or even death.



Fire in the compressor can cause an explosion and flame projection. Should this occur, there is potential for serious injury or death.

To prevent compressor explosion or fire, make sure that the air entering the compressor is free of flammable vapors.

To prevent compressor explosion or fire, make sure that correct servicing procedures and intervals are observed.

Vaporized oil propelled by high-pressure air is an explosive mixture.



Do not breathe the compressor air; vaporized oil is a severe respiratory hazard.

Avoid contact with drive belts and stay clear of all moving parts when the system is operating.

The compressor and the compressor system get very hot during operation, contact with the components or the oil can cause serious burns. Allow sufficient time for the system to cool before performing service.

Components and hoses under pressure could separate suddenly, fly out and cause serious injury or death. If equipped, the auxiliary air tank must be drained before servicing any components in the compressor system.

Observe these rules when operating the compressor:

- Constant vigilance is necessary around high-energy equipment.
- Be attentive for unexplained changes in operation parameters and record any changes.

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- Do not bypass or disable the oil temperature sensor.
- Do not expose the tank or compressor to extreme heat.
- Do not perform any service until the system has been completely blown-down and you have verified that all air has been discharged.
- Do not try to repair or service a pressurized system.
- Maintenance and repair on system components should only be performed by qualified personnel.
- The vehicle must be in park, with the park brake or the air spring 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.
- Do not bypass the park brake or DDC connections.
- Do not operate the compressor while driving.
- Do not tamper with the pressure relief valve.
- Do not attempt to repair or modify any component.
- Use caution when replacing system relay, (if equipped), as certain pins are HOT, (12V), even with the vehicle's key in the off position.

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2.5 Installation Instructions


Detailed information provided in a separate publication, *Installation Manual for VMAC Systems*, which provides specific information for each different application.

This information includes torque tables, recommendations and other important information for correct installation. The information in the installation manual is intended for use by trained, professional technicians with the knowledge, tools, and equipment to do the job properly and safely. Installation should not be performed by persons without the appropriate skills.



Do not attempt to install any of these systems without the appropriate installation manual.

Ensure that the safety and operational instruction decal is affixed in an obvious location so that vehicle operators can easily see it.



**This vehicle is equipped with a
VMAC Air Compressor System.**

OPERATING INSTRUCTIONS

Daily Pre Start Check:

1. Check oil level in tank.
2. Check drive belt system.
3. Check for leaks.

Start Up Procedure:


1. Ensure air system is depressurized.
2. Ensure all air outlets are **CLOSED**.
3. Place vehicle in Neutral or Park and engage park brake.
4. Start engine and bring to operating temperature.
5. Turn ON compressor.

Shutdown Procedure:

1. Ensure discharge valve is **CLOSED**.
2. Allow engine to idle for 1 minute.
3. Turn OFF compressor.
4. Wait for system to depressurize before restarting.

For Technical Support/Parts contact your VMAC Dealer
To locate your nearest dealer call 1-800-738-8622 (250-740-3200)

4400644-A



WARNING
**Always allow system to
depressurize before restarting**

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2.6 System Specifications

Model: Underhood Air Compressor with Intelligent Digital Controls

Type: rotary screw

Drive System: Front End Accessory Drive (FEAD)

Control: electric on/off 12V clutch control

Maximum Air Delivery:

- VR70 70 CFM and 175 PSI / 1207 KPA

Pressure Regulation: electronically controlled solenoid inlet valve
modulates flow in response to demand

Engine Controls: throttle control to modulate between idle and upper
limit RPM to maintain air requirements



NOTE: Some trucks have onboard computers that must be programmed by the OEM dealer to permit operation of the electronic throttle control.

Safety Features:

- 200 PSI / 1379 KPA relief valve in air/oil tank
- temperature safety sensor in compressor
- rapid blow-down valve to discharge system pressure on shutdown (10-15 seconds)
- drive disable circuit (DDC)(Park/Neutral/Interlock)
- park brake engaged/disengaged sensor
- hood sensor to disable system when hood ajar
- LED beacon warning when engine is capable of automatically restarting
- Buzzer warning before engine automatically restarts

Lubrication: VMAC certified synthetic oil

Filters:

- paper-type replaceable air filter
- spin-on type high pressure oil filter
- coalescing separator element

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3.0 Operating Principles

This system uses a flooded-lobe, rotary screw compressor. The oil-filled compressor housing contains two rotors.

Compression occurs when inlet air (at normal atmospheric pressure) enters a chamber where it is trapped between the rotating rotor lobes.

A lubricated pitch line provides sealing. As the lobes mesh, they reduce the volume of the air, compressing it to the desired pressure.

3.1 Oil Separation and Cooling

The system has a two-stage air/oil separator. The first separation stage consists of baffles, which perform mechanical separation. The second stage uses an integral serviceable coalescing element.

A liquid-to-liquid cooler connected to the engine cooling system cools the oil. This maintains the oil temperature in an optimal performance range that increases system durability and reduces the temperature of the compressed air.

3.2 Filtration

The rotary screw compressor is designed and machined to exacting tolerances. Foreign particles entering the system will drastically damage or shorten the life expectancy of the compressor and will result in damage to bearings, gears, rotors and the inside of the housing.

The system is equipped with a replaceable paper element air inlet filter, spin on cartridge type high pressure capable oil filter and a scavenge screen filter.

These system filters enhance performance and extend component life by reducing damage from dust and other debris. Proper filter maintenance is the key to long compressor life.

3.3 Belt Alignment and Tensioning

This system is equipped with automatic belt tensioning and does not require manual adjustment. Always check pulley alignment to ensure proper belt operation. All components are designed and machined for precision, some variation in mounting holes may still occur.

3.4 Pressure Regulation and Engine Speed Control

This system uses two means of controlling system air pressure: inlet valve control and engine speed control.

The inlet valve control consists of an electrical solenoid valve and an inlet valve. The electrical solenoid valve is normally open, but is closed electronically by the control system when the system needs to build pressure.

This solenoid valve determines whether or not the compressor's pressure is able to act on the inlet valve which moves to allow or stop the flow of air (at atmospheric pressure) from entering the compression chamber.

The engine speed controller, referred to more commonly as the throttle controller, adjusts engine RPM to respond to air consumption demand.

These control devices provide the following benefits:

- instant response to air flow demands
- reduction of standby noise
- reduction of cooling system load
- fuel conservation when not using air

For information and adjustment, please refer to the section 4.6 Adjustable System Parameters.

An external regulator is recommended for operation at pressures lower than 145 PSI / 999.7 KPA.

3.5 Safety Devices

A 200 PSI / 1379 KPA pressure relief valve exists in the tank to prevent system over pressure. The system is also equipped with an automatic rapid blow-down system to discharge system pressure on shutdown.

There is a switch which only permits operation when the mechanical or air park brake is applied. Vehicles with automatic transmission are fitted with a "Drive Disable Circuit", (DDC) which disables the throttle control and prevents engine speed increase when the vehicle is in gear.

The compressor is equipped with an oil temperature sensor which stops system operation should the temperature become excessive.

The control system only permits the system to operate if the vehicle's hood is shut.

The beacon module illuminates to inform the operator that the system is able to restart when air-use is detected.

The buzzer module sounds before engine restarts.



A fuse protects the system. If the fuse blows continuously, there is an electrical problem that will not be solved by a higher fuse rating. Exceeding the rating can cause component damage.

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

3.6 Line Protection

To prevent damage to the lines, observe the following:

- Always ensure that the hoses are secure, do not allow the hoses to dangle under the vehicle
- Always ensure that the hoses do not get pinched in steering or suspension components

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- Make sure to keep the hoses away from hot surfaces, such as turbocharger housings or exhaust system components
- Hoses should not be bent tightly around sharp metal edges
- Ensure that hoses are kept away from fan blades or belts
- If the hoses are secured in a bundle, protect them from abrasion by insulating them from each other using rubber padding or plastic loom

3.7 Special Installation Notes

You must use an auxiliary air tank with this system you must observe the following installation procedure. Failure to observe this procedure may result in damage to the system.

The line from the VMAC tank to the auxiliary air tank must have the supplied check valve and pressure sensor assembly installed to prevent VR tank's blow-down from draining the auxiliary tank and to prevent moisture from entering the VMAC tank.

Do not add a secondary check-valve as this will cause issues with the system.

The line to the auxiliary tank must not be installed in the bottom of the tank, but must be installed as high as possible to prevent water from clogging the line.

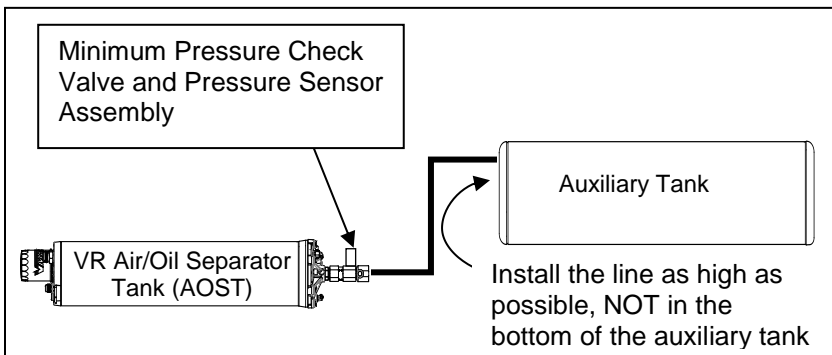


Figure 1 – Integrated minimum pressure check valve

4.0 System Operation

4.1 Control System Features

- ☐ Starting the control system with the Display box or Remote ON wire
- ☐ Stopping the control system with the Display box or Remote ON wire
- ☐ Automatic engine shutdown if no air-use is detected
- ☐ Automatic engine restart when air-use is detected.
- ☐ Multiple adjustable system parameters for delays, pressures and restart options
- ☐ Monitoring the compressor temperature probe connection range
- ☐ Monitoring air pressure for over-pressure or sensor error
- ☐ Monitoring clutch connection and current range
- ☐ Monitoring engine RPM for under-speed, over-speed, running when not expected, and engine-restart failure
- ☐ Monitoring low battery voltage
- ☐ Optional battery-low engine restart
- ☐ Error and warning message logging (data-logging)
- ☐ Operator compressor servicing reminders (200 and 400 hours)
- ☐ Buzzer module to warn before engine restart
- ☐ LED beacon module to identify when the unit is able to restart
- ☐ Hour meter
- ☐ Optional Accessory – In-cab low-temperature engine restart

4.2 Control System Operation

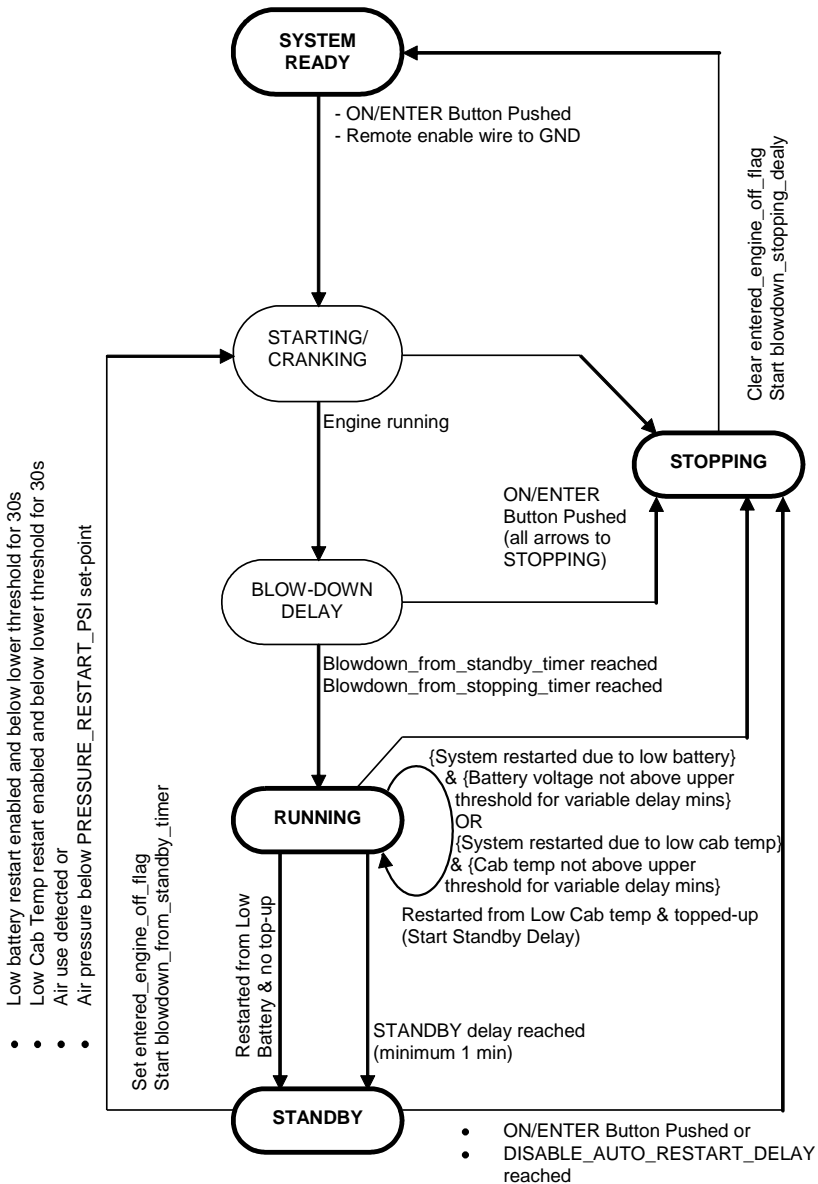


Figure 2 - Control System Flow Diagram

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4.2.1 Control System Terminology

System State: SYSTEM READY

Compressor system is ready for operation and awaiting a start request. A start request can be made by:

- ☐ Pressing ON/ENTER from the Display Box
- ☐ Grounding the REMOTE ON wire

System State: BLOW-DOWN DELAY

The BLOW-DOWN DELAY is implemented by the control system before entering RUNNING mode as a built in safety feature for the system.

This delay is implemented for 10 or 30 seconds only when the system has come out of STANDBY or STOPPING states, respectively. i.e. It is implemented on subsequent restarts from STANDBY or STOPPING states, but not implemented when the system starts for the first time.

System State: RUNNING

When using an air tool, the control system should be in the RUNNING state.

The inlet remains closed when air pressure is at System Pressure. If the air pressure drops below System Pressure minus Top-up Pressure, the inlet opens to build pressure.

Similarly, the engine speed will be at VR-IDLE RPM when air pressure is at System Pressure. If an air tool is used and the air pressure drops below the throttle controller's Idle-Down Pressure, the engine speed will increase to build pressure.

If the air pressure stays above System Pressure minus Top-up Pressure, a timer will start counting down from the STANDBY DELAY value.

Whereas if air pressure drops below System Pressure minus Top-up Pressure, the system will reset this timer back to STANDBY DELAY.

If this timer is able to complete its count down from STANDBY DELAY, the system will switch to the STANDBY state.

While battery voltage is below the adjustable upper threshold the system will remain in the RUNNING state.

If optional in-cab temperature sensor is installed, while the temperature is below the adjustable upper threshold, the system will remain in the RUNNING state.

System State: STANDBY

In STANDBY mode, the control system will shut down the engine as it has detected no further air use, the battery voltage level is in range, and, if installed, the optional in-cab temperature is within its range. The control system is still operating and able to restart the system with air-use, if a low battery voltage is detected, or a low cab temperature is detected. The LED beacon module is enabled to identify that the engine is able to restart.



When the LED beacon module is illuminated, the system (and engine) is able to restart when air-use is detected.

For the system to return to RUNNING mode (via STARTING/CRANKING mode), the operator needs to dump enough air to bring the air pressure below Restart Pressure or dump air at a rate greater than the preset High Air Rate value.



The Disable Auto Restart Delay setting will prevent the system from going to STARTING/CRANKING if the system has spent greater than a preset amount of time in the STANDBY state. By default this time is set to 30 minutes. This feature can be used to prevent the engine from restarting if left unattended.

System State: STARTING/CRANKING

The buzzer module will be enabled to identify that the engine is going to restart. Then the control system will attempt to start the engine.

The control system will allow the engine to attempt to start for 20 seconds. If the engine starts as expected, the system will go to the BLOW-DOWN DELAY state. However, if the engine fails to start, the control system will flag a starting error to the Display Box.

System State: STOPPING

When the control system is running and the ON/ENTER button on the Display Box is pressed, the control system will enter the STOPPING state.



It is important the ON/ENTER button be used to shut down the system. Once the system has completed shutdown, then the vehicle can be turned off fully. Do not use the vehicle key switch to turn off the compressor system.

After the system has completed the stopping sequence, the system will revert back to the SYSTEM READY state.

If the system was started by grounding the REMOTE ON, the system will also enter STOPPING by un-grounding the REMOTE ON wire.

4.3 Display Box Messages

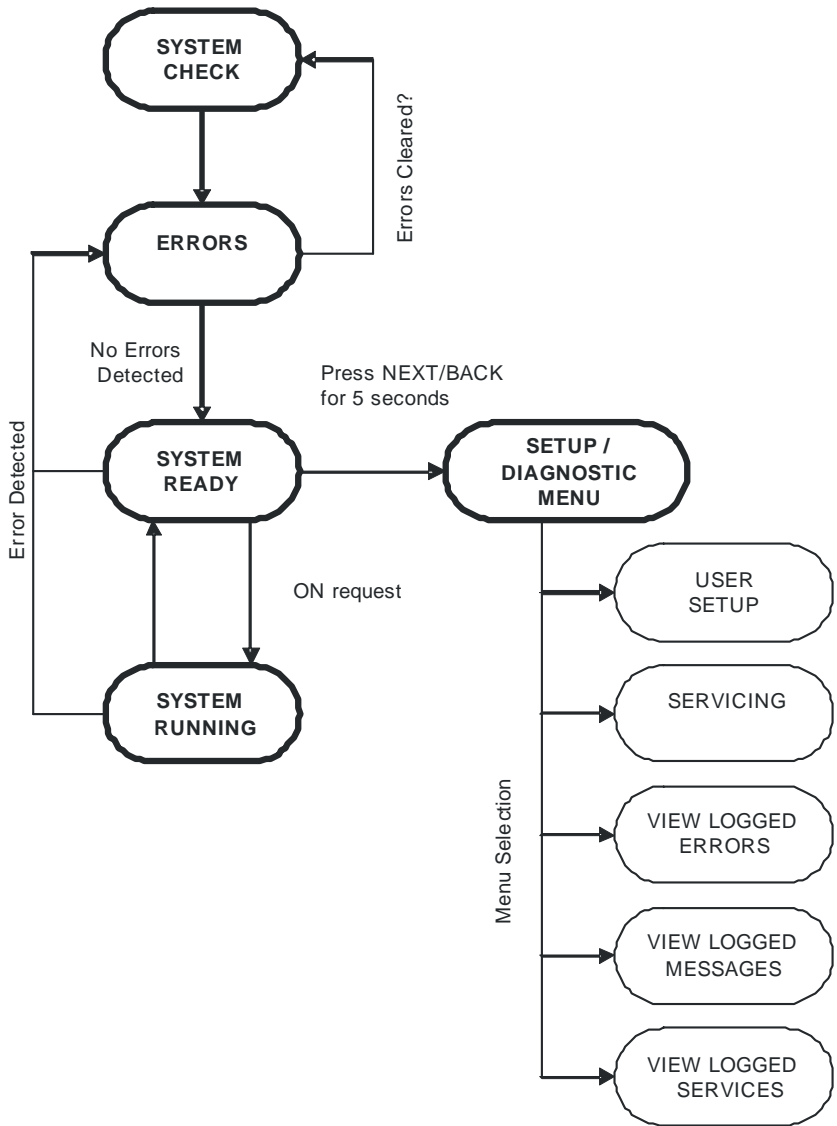


Figure 3 - Display Box Flow Diagram

4.3.1 System Check Menu

Ensure the pneumatic equipment is securely connected and turned off.



During the system check, both the WARNING and READY LEDs remain illuminated and 'SYSTEM CHECK' is displayed.



If any errors are present the WARNING LED will flash on & off, the display will enter the ERRORS menu.

If no errors are present the system will go to SYSTEM READY menu.

4.3.2 System Ready Menu



If any messages are present, the WARNING LED will flash on & off and the messages displayed. The unit will run as normal when messages are present.

If no messages are present, both the READY and WARNING LEDs will be off.

The SYSTEM READY menu will change between the following screens, SYSTEM READY, VMAC PH# 250 740 3200, VMAC WWW.VMACAIR.COM, HOUR METER xxxx.x

Pressing ON/ENTER will initiate the start sequence (see section 4.2 Control System Operation). Once parameters are in the operating range the SYSTEM RUNNING menu is entered.

Pressing and holding both the BACK and NEXT buttons for approximately 5 seconds will bring up the SETUP/DIAGNOSTIC MENU.

4.3.3 System Running Menu



If any messages are present, the WARNING LED will flash on & off, the READY LED will remain on, and the messages will cycle on the display.

If no messages are present, the display will cycle through the SYSTEM RUNNING, AIR PRESSURE, COMPRESSOR TEMP, ENGINE SPEED, TIME TO STANDBY, HOUR METER, and AIR PRESSURE RATE.

Pressing the NEXT or BACK buttons in SYSTEM RUNNING menu will take the user to the additional information menus where specific information about the sensors are displayed.

Pressing the ENTER or EXIT button will initiate the stopping sequence.

4.3.4 Stopping Sequence

To stop the system the user can press the ENTER button at any point during operation.

4.3.5 Additional Information Menu

The additional information menu for the display box allows the user to monitor specific information about the system. The parameters displayed are: AIR PRESSURE, AIR RATE, ENGINE SPEED, COMPRESSOR TEMPERATURE, TIME TO STANDBY, and HOUR METER.

The user can scroll through the screens by pressing the BACK and NEXT buttons.

Pressing the EXIT button will return the display box to SYSTEM RUNNING menu.



The display box will return to the SYSTEM RUNNING menu after three minutes of no buttons being pressed by default.

Pressing the ENTER button will initiate the stopping sequence.

4.3.6 Setup/Diagnostic Menu

SETUP/DIAGNOSTIC MENU can only be reached from the SYSTEM READY menu by holding both the BACK and NEXT buttons for five seconds.

This menu allows the user to define parameters of system operation. User defined parameters include SYSTEM PRESSURE, STANDBY DELAY, TOP-UP PSI, HIGH AIR RATE, RESTART PRESSURE, DISABLE AUTO RESTART DELAY, BATTERY RESTART ENABLE, LOW BATTERY VOLTAGES, LOW CAB TEMPERATURE ENABLE, and LOW CAB TEMPERATURE VALUES. The User may also reset the unit to factory settings from this menu. For more information on these parameters, also see sections 4.2 Control System Operation & 4.6 Adjustable System Parameters.

See section 4.6 Adjustable System Parameters for default parameter values.

Upon entering this menu the user will see information on how to navigate SETUP/DIAGNOSTIC MENU. Specifically the following:

- To scroll through the menu screens press BACK and NEXT.
- To enter or exit a menu screen press the ENTER or EXIT buttons respectively.

The user will then see USER SETUP on the display module

- Press ENTER to see the parameter screens
- To return to SYSTEM READY menu press EXIT

Air System Parameters

The first user defined parameter is SYSTEM PRESSURE. It can be set from 80 to 175PSI with 5 PSI increments.

The second user defined parameter is STANDBY DELAY which can be set as 1 minute, 2 minutes, 5 minutes, 10 minutes, 15 minutes, 30 minutes or never. This parameter determines how long the control system waits before entering STANDBY mode when the air pressure remains above System Pressure minus Top-up Pressure.

Next is TOP-UP PRESSURE, a value below system pressure used to keep tank pressure close to System Pressure. If pressure goes

below System Pressure minus Top-Up Pressure, the inlet will open and will fill to System Pressure.

The next user defined parameter is HIGH AIR RATE, which can be set from -0.5 PSI/Sec to -30 PSI/Sec with 0.5 PSI/Sec increments. This is one of two ways for the system to restart from STANDBY. High-air use is only applicable when the system is in STANDBY, it will detect if an air tool is being used and call the control system to restart the engine. A more negative value (-10PSI/sec rather than -3PSI/sec) is 'less sensitive' to change to call a restart.

- A large Auxiliary tank may require a 'more sensitive' rate change in order to restart (ie. -2PSI/sec).
- A small Auxiliary tank may require a 'less sensitive' rate change as there is no air pressure buffer before a restart is triggered (ie. -5PSI/sec).

The next parameter is RESTART PRESSURE. If air pressure has gone below the Restart Pressure value while in STANDBY mode, the system and engine are restarted. It can be set from 80 to 175PSI with 5 PSI increments.

The next parameter is DISABLE AUTO RESTART DELAY. This parameter allows for disabling the system's ability to restart depending on the time spent in STANDBY mode. It can be set to Always, 30 min, 60 min, 90 min, 120 min, or Never.

Low Battery Restart Parameters

The next parameter is ALLOW LOW BATTERY RESTART. This parameter enables or disables the system's ability to restart when low battery voltage is detected. The factory default is ENABLED.

The next parameter is LOW BATTERY RESTART VOLT. This parameter determines the voltage at which the system will restart. It can be set between 10.0 to 14.0V in 0.1V steps.

The next parameter is LOW BATTERY RESTART LOWER VOLT. This parameter determines the upper level for a fully-charged system. It can be set between 10.0 to 15.0V in 0.1V steps.

The next parameter is LOW BATT RESTART DELAY. This parameter determines the time the system remains in RUNNING once the system has reached its fully-charged level. It can be set to 2, 5, 10, 15, 20, 30 min.

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In-Cab Temperature Restart Parameters (Accy Only)

The next parameter is ALLOW LOW CAB TEMP RESTART. This parameter enables or disables the system's ability to restart when the cab temperature is too cold. This requires an additional temperature probe accessory to be installed. The factory default is DISABLED.

The next parameter is LOW CAB TEMP RESTART LOWER TEMP. This parameter determines the temperature at which the system will restart. It can be set between -10°C to +20°C in 0.1°C steps.

The next parameter is LOW CAB TEMP RESTART UPPER TEMP. This parameter determines the upper level for a fully-warmed cab. It can be set between +10°C to +30°C in 0.1°C steps.

The next parameter is LOW CAB TEMP RESTART DELAY. This parameter determines the time the system remains in RUNNING once the cab has been fully-warmed. It can be set to 2, 5, 10, 15, 20, 30 min.

Factory Reset

The next parameter screen in the USER SETUP menu screen is the FACTORY RESET.

- Pressing ENTER on this screen will display CANCEL
- Pressing NEXT will show CONFIRM RESET? Pressing BACK will display CANCEL again
- Select the desired option and press the ENTER button

The END OF USER SETUP screen informs the user there are no more user defined parameters.

- Pressing EXIT, NEXT or ENTER will bring the user to USER SETUP SCREEN
- Pressing BACK will bring the user to the first user defined parameter (SYSTEM PRESSURE)

4.4 Automatic Shutdown and Restart

The system will enter STANDBY mode and shutdown the vehicle's engine if no air use is detected for a preset amount of time. It will also enter STANDBY mode if the system was restarted for either low-battery or low cab temperature and these have completed their cycle.

The LED beacon module will illuminate when the system is in STANDBY mode and capable of restarting when air-use is detected.

The system can be restarted by using a large amount of air for a short time (air rate) or dropping of air pressure below an adjustable value.

The buzzer module will enable and alert the operator before the engine starts.



The system may not restart due to system parameter configuration. For details, see sections 4.2 Control System Operation and 4.6 Adjustable System Parameters.

When an error is detected, the controls will automatically shut down the system. It will also show and log the error that caused the issue.



***2013MY and newer RAM trucks using Hard-wired Remote Start (ie. V90G126):
A safety feature of remote start mode prohibits driving the vehicle. If you try to drive the vehicle it will turn off. In order to drive the vehicle, you must cycle the key off and turn the vehicle back on. This takes the vehicle out of remote start mode.***

4.5 Checking Messages and Errors

4.5.1 Present Errors

If an error is present, the control systems *WILL NOT* start the compressor until the error is cleared. When an error is present, the display box's WARNING LED will flash on/off and the screen will display 'ERRORS DETECTED' followed by the following list of errors. The user **MUST** scroll through ALL the displayed errors by pressing the NEXT button before the unit can re-try the start sequence.

4.5.2 Viewing Stored Data-logged Errors

1. Turn key ignition ON. Do not start the compressor system.
2. Press the NEXT and BACK buttons on the display box for 5 seconds to enter Diagnostics mode.
3. Use NEXT and BACK to scroll to **VIEW LOGGED ERRORS**. Press ON/ENTER button to view the errors.
4. Use NEXT and BACK to scroll through the errors.

4.5.3 Decoding Stored Errors

Stored error messages are shown on the two lines of the Display Box in the following format:

Line 1: En hhhh.m ee

Line 2: D:dd M:mm Y:yy

The following tables provide information on decoding these error messages to determine when and what kind of error occurred.

ERROR DECODING GUIDE	
E	To show that a stored error is being displayed.
n	Error number 0 to 9.
hhhh.m	Hour-Meter's value at time of error to 1/10 th of an hour.
ee	Error code describing the type of error.
dd mm yy	Error date.

For example:

E9 0004.7 13
D:20 M:10 Y:12

This screen is saying that error 9 occurred at 4.7h on November 20, 2012 and was a code 13. Looking up error code 13, one knows the cause was an over-voltage reading on the pressure transducer.

ERROR MESSAGE TABLE

Error Code	Error Message Displayed	Cause
1	CLUTCH FAILED - OPEN	Clutch is unplugged or wire to control box has been cut. (<1.0A)
2	CLUTCH FAILED - SHORT	Clutch has shorted or wire to control box is shorted. (>10.0A)
3	CLUTCH CURRENT TOO LOW	Under-current reading on clutch. (1.0-2.0A)
4	CLUTCH CURRENT TOO HIGH	Over-current reading on clutch. (5.0-10.0A)
5	COMP TEMP SENSOR FAILED - OPEN	Temperature sensor on the compressor is unplugged or wire to control box has been cut.
6	COMP TEMP SENSOR FAILED - SHORT	Temperature sensor on the compressor is shorted.
7	COMP TOO COLD xx.x°F/xx.x°C	Compressor is too cold to start. The temperature is displayed. (<-40°C)
8	COMP TOO HOT xx.x°F/xx.x°C	Compressor is too hot to start. The temperature is displayed. (>130°C)
9	CAB TEMP SENSOR FAILED - OPEN	Accessory temperature sensor in the cab is unplugged, enabled but not installed, or wire to control box has been cut.
10	CAB TEMP SENSOR FAILED - SHORT	Accessory temperature sensor in the cab is shorted.
12	AIR PRESS SIGNAL VOLTAGE LOW	Low voltage reading on the air pressure transducer. (signal <0.5V)
13	AIR PRESS SIGNAL VOLTAGE HIGH	Over voltage reading on the air pressure transducer. (signal >4.6V)
14	AIR PRESS SENSOR TOO HIGH	Air pressure is higher than expected. (>180PSI)
14	AIR PRESSURE xxx.x PSI	If the previous error is present, the air pressure is displayed.
22	PARK BRAKE NOT ENABLED	Park brake needs to be engaged.
26	ENGINE RPM TOO LOW TO START	Engine RPM is too low to start system.
27	ENGINE RPM DURING OFF STATE	Engine RPM detected during an OFF state.
34	ENGINE RPM NOT DETECTED	Engine RPM is not detected. Wire may be cut.
35	ENGINE CRANK TIME OUT	The engine did not start during the crank cycle.
41	CLOSE HOOD TO START	The truck's hood is open. It must be closed when the unit is run.
-	DISPLAY CANBUS CONN ERROR	A CAN bus error between the Display box and Control box.
-	End of Errors OK to Retry?	End of errors screen. Pressing ENTER will try to restart the system.

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4.5.4 Warning Messages

Listed below are additional messages, which may be displayed. If a message is present, the red WARNING LED will flash on and off. These messages appear in both the SYSTEM READY and SYSTEM RUNNING menus.

WARNING MESSAGE TABLE		
Error Code	Message Displayed	Cause
32	BATTERY VOLTAGE TOO LOW	The battery voltage is too low.
-	200HR/6MTH SERV DUE IN xx HOURS	This warning will show up 10 hours before the 200 hour service interval.
54	COMPRESSOR SERV 200HR/6MTH	The system is due for a service. This warning will show after every 200 hours of running the compressor. Clearing the compressor service reminder is required through the Diagnostic menu.
-	400HR/12MTH SER DUE IN xx HOURS	This warning will show up 10 hours before the 400 hour service interval.
55	COMPRESSOR SERV 400HR/12MTH	The system is due for a service. This warning will show after every 400 hours of running the compressor. Clearing the compressor service reminder is required through the Diagnostic menu.
62	LOW BATT RESTART	The truck failed to start when requested to due to a low battery voltage condition.
63	CAB TEMP RESTART	The truck failed to start when requested to due to the cab temperature getting too cold.

4.5.5 Checking Messages

Stored messages can be checked by following instructions in Section 4.5.2 Viewing Stored Data-logged Errors, except Step 3 should consist of scrolling to VIEW LOGGED MESSAGES.

Stores messages can be decoded using the guide in section 4.5.3 Decoding Stored Errors. However, the first character of line 1 on the Display Box will be 'M' instead of 'E'. This is to clarify that Messages are being shown, and not Errors.

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4.6 Adjustable System Parameters

SYSTEM PARAMETER TABLE			
Setting	Description	Adjustment	Default
Standby Delay	Delay time to standby	1, 2, 5, 10, 15, 30 minutes, Never	10 min
System Pressure	Operating System Pressure	80 to 175PSI @ 5PSI increments	150PSI
Top-up Pressure	PSI below system pressure to allow inlet to open and build pressure	1 to 10PSI @ 1PSI increments	5PSI
High Air Use Rate	Air rate set-point for pressure-based restart	0 to -30PSI @ 0.5PSI increments	-3.0PSI/sec
Restart Pressure PSI	Air pressure set-point for pressure-based restart	80 to 175PSI @ 5PSI increments	120PSI
Disable Auto Restart Delay	Timer for disabling automatic engine restart	Always, 30 min, 60 min, 90 min, 120 min, Never	30 min
Low Battery Restart	Controls if system will restart when battery voltage gets too low	Enable/Disable	Enabled
Batt Lower Thrs	Restart point for battery voltage	10.0 to 14.0V in 0.1V steps	12.1V
Batt Upper Thrs	Fully-charged set point for battery voltage	10.0 to 15.0V in 0.1V steps	12.8V
Low Batt Restart Delay	Time delay before going back to STANDBY after battery fully charged	2, 5, 10, 15, 20, 30 min	2 min
Cab Temp Restart	Controls if system will restart when cab temperature drops too low – Accessory kit required	Enable/Disable	Disabled
Cab Lower Thrs	Restart cab temperature	-10°C to +20°C in 0.1°C steps	10.0°C
Cab Upper Thrs	Fully warmed cab temperature	+10°C to +30°C in 0.1°C steps	20.0°C
Low Cab Restart Delay	Time delay before going back to STANDBY after warming cab	2, 5, 10, 15, 20, 30 min	5 min

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To modify a system parameter (such as Standby Delay):

1. Turn the key ignition ON. Do not start the compressor system.
2. Press and hold the NEXT and BACK buttons on the display box for 5 seconds to enter Setup/Diagnostics Menu.
3. When display box shows `USER SETUP`, press ON/ENTER
4. Use NEXT and BACK to scroll to `STANDBY DELAY`.
5. Press ON/ENTER.
6. Use NEXT and BACK to change Standby Delay parameter value.
7. Press ON/ENTER to select value, or EXIT to cancel change.
8. Verify `STANDBY DELAY` screen shows desired parameter value.
9. Press EXIT to return to `USER SETUP`.
10. Press EXIT to exit Setup/Diagnostics Menu.

For details and an explanation for adjusting system parameters, see section 4.3.6 Setup/Diagnostic Menu

4.7 Operating Instructions

4.7.1 Diesel Particulate Filter Warning (DPF)

When engine driven or PTO driven equipment is run on vehicles with DPF for extended periods of time, particulate may build up in the filter. All vehicles with a DPF have a warning light (or message) on the instrument panel or message center. Run time until filter build-up depends on many variables and is the responsibility of the operator to monitor. It is suggested that if equipment is run for extended periods of time (over 1 hour) without driving, the vehicle DPF warning system must be checked after 1 hour and every 15 min thereafter. If the DPF warning light or message appears, see the vehicle owner's manual for methods of cleaning or regenerating.

4.7.2 Starting the Compressor System

The vehicle must not be parked on grades exceeding 15° in slope as this may affect lubrication and air/oil separation.

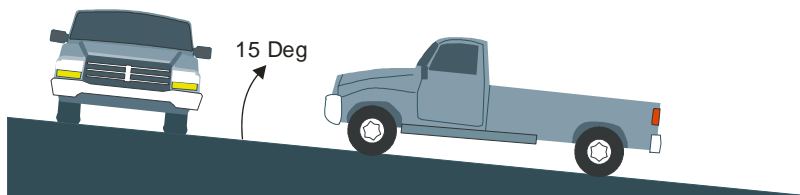


Figure 4 – Maximum truck grade when running compressor

1. Place the automatic transmission in park and fully apply the park brake.
2. Start and run the vehicle long enough for the engine to stabilize at base idle and reach normal operating temperature.
3. Close the hood (if open).
4. Close all compressor air system outlets.
5. Activate the compressor using the ON/ENTER button on the display box.

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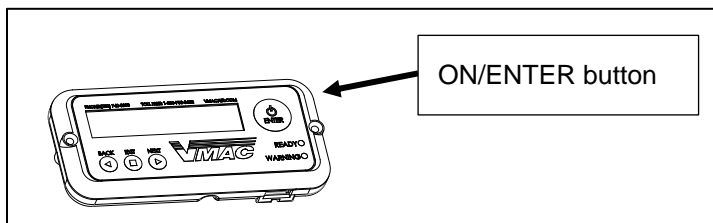


Figure 5 - Display Box

The clutch will engage, and the engine RPM will rise for a few moments while the compressor system comes up to pressure. RPM will settle to the VR Idle RPM. System is now in RUNNING mode and is ready for air use.



Please note that the control box will not allow system restart for 30 seconds.

Check the blow down valve for correct operation. If the blow down valve has failed, 30 seconds will not be adequate time to vent system pressure.

4.7.3 Stopping the Compressor System

1. Ensure the discharge valve is closed.
2. Allow the engine to idle for 1 minute.
3. Press the ENTER/ON button on the display box.
4. Wait until the system has completed shutdown and shows SYSTEM READY on the display screen.
5. (If desired) Turn off the vehicle (and power to electronics) by using the vehicle key switch.



It is important the ON/ENTER button be used to shut down the system. Once the system has completed its shutdown procedure, then the vehicle can be turned off fully. Do not use the vehicle key switch to shut off the compressor system.



Starting the compressor immediately after an improper shutdown will cause the belt to slip and the clutch to burn out.

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4.7.4 Automatic Engine Shutdown and Restart

See Section: 4.4 Automatic Shutdown and Restart

4.8 Cold Climate Operation

1. Place the automatic transmission in park and fully apply the park brake.
2. Start the vehicle engine and allow it to reach normal operating temperature.
3. Allow the vehicle to run for an additional 15 minutes after reaching operating temperature to allow radiant heat transfer throughout the compressor system. If the vehicle is to be used consistently in cold climates the use of a De-icer kit (VMAC part #A700031) is recommended.
4. Activate the compressor by pressing the “ON/ENTER” button.

The clutch will engage, and engine RPM will rise for a few moments while the compressor system comes up to pressure. RPM will settle to the VR Idle RPM. System is now in RUNNING mode and is ready for air use.

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4.9 Adding Oil to the System

1. Remove the fill plug (remote oil fill if equipped), from the inlet control valve.



The oil is clear and the level may be difficult to see in the sight glass. Have someone watch the level as you add oil.

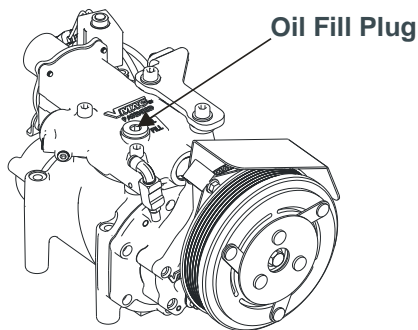


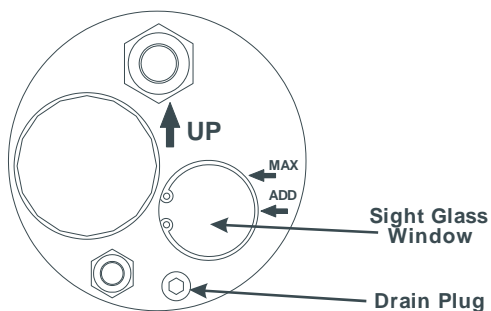
Figure 6 – Compressor (exact appearance varies by application)

2. Pour oil into the oil fill hole on the inlet control valve using a funnel. It is important not to overfill the system. Overfilling the system with oil can flood the sight glass window and make the system appear empty.
3. As you add oil, turn the compressor clutch clockwise with a ratchet and socket using the hex head cap screw at the center of the compressor clutch.
4. Allow five minutes for the oil to drain into the tank, then, check the sight-glass on the tank to ensure that the oil level is correct.
5. Install the fill plug and tighten it securely.

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VR70

Figure 7 – Oil filter end of the Separator tank



You must use VMAC certified and approved synthetic compressor oil. Failure to use this oil will result in damage to the compressor and may void your warranty.

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5.0 Adjusting the System

If insufficient airflow is developed under high demand conditions, check engine RPM. When the inlet control valve is wide open, approximately thirty engine revolutions are required to produce one cubic foot of air flow from the VR70 compressor.

The Throttle Control is adjusted at the factory to provide good results without adjustment in most typical compressor applications. Some applications may require adjustments to provide the necessary airflow and pressure. This may also be required if system pressure is changed in the USER SETUP Menu from the factory setting of 150 PSI. For detailed instructions on adjusting the electronic throttle controller, see section 5.2 Electronic Throttle Control Adjustment.

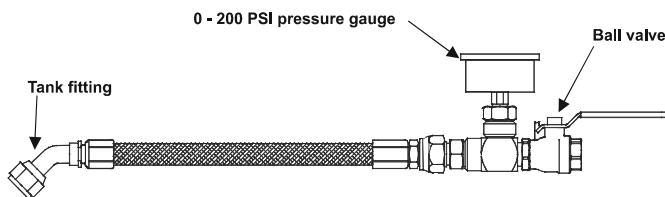
Engine RPM adjustments must be made so that the amount of air delivered by the system matches the requirements of the tools or equipment that you will be using.

Airflow and system pressure are related. If airflow demands on the system are low, operating pressure will remain high. If airflow demands are high, operating pressure will reduce. By making adjustments to the engine speed while operating a specific tool, you will achieve optimum performance.

If you must set up a system without knowing the demands on the system, you can make engine speed adjustments by using an orifice in the outlet to simulate tool use. The diagram below shows a system testing and adjustment tool, (VMAC part # A700052) that you can use to simulate different operating situations. Install this tester to the tank output fitting before making any changes.



Ensure the correct orifice for the VR70 system is used. For 70 CFM application, (VR 70), use a .190 ORIFICE, (part #3200224).



System Testing and Adjustment Tool - A700052

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5.1 Adjusting the Operating Pressure

The operating system pressure can only be adjusted by setting adjustment parameters through the Display Box.

See Section 4.6 Adjustable System Parameters

5.2 Electronic Throttle Control Adjustment

1. Place the automatic transmission in park and fully apply the park brake.
2. Allow the vehicle to run until the engine is at operating temperature.
3. Operate the air compressor system until the oil is warm.
4. Open the ball valve on the test tool and observe the engine tachometer. The pressure should be about 100PSI



Make sure that there are no restrictions to air flow. If the system cannot produce maximum flow from the tank, there will be no change in RPM when you turn the adjusting screw.

5. Turn the maximum RPM adjustment screw clockwise to increase engine speed and counterclockwise to decrease maximum engine speed. Count the turns in case you have to start over.

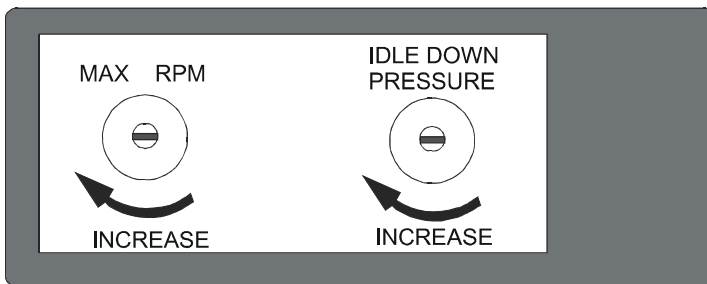


Figure 8 - VR Throttle Controller Adjustment Screws

6. Close the air valve slowly to allow the system pressure to rise.

7. Once the system pressure is at maximum, slowly open the ball valve on the test tool until the pressure is approximately 10 PSI / 68.95 KPA below maximum. Engine speed should start to ramp-up at this point.
8. Adjust the “Idle Down Pressure” up or down so that the engine speed just starts to climb at approximately 10 PSI / 68.95 KPA below maximum system pressure, The adjustment for idle-down pressure must be turned clockwise to increase pressure or counterclockwise to reduce pressure.

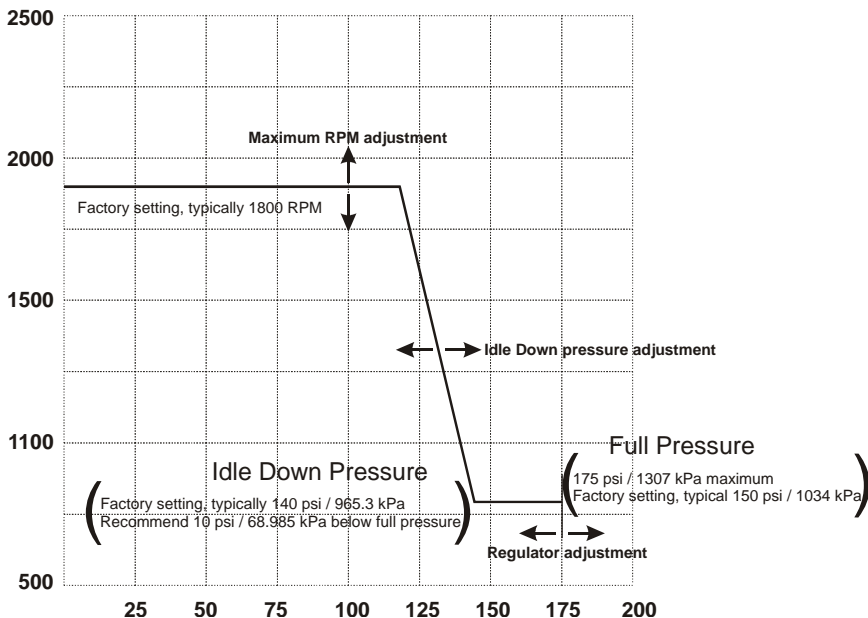


Figure 9 - VR Throttle Controller Pressure vs RPM response

9. Open the ball valve fully with the test tool. The system pressure should be about 100PSI.

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6.0 Routine Maintenance

The compressor system contains no reed-valves or other easily fouled, fatigue-prone components. With proper maintenance, the need for premature repair or component replacement can be drastically reduced.



Impact damage and premature bearing failure may occur in the compressor bearings if the system is not operated on a regular basis due to vibration caused by truck operation. Operate the system at least every 30 days for 15 minutes at no load to ensure bearing lubrication and rotation.

During the warranty period, you must follow the maintenance schedule and use only original genuine VMAC replacement parts to maintain your system and your warranty.

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



Never run the compressor, drive the vehicle or even allow the vehicle to sit parked without the recommended air filter and filter cover installed.

6.1 Maintenance Schedule

The following maintenance schedule should be observed to assure good performance and long service life. The hours indicated are those displayed on the Display Box. Service should be performed at the lesser of the two intervals, whichever occurs first.

For replacement part numbers, please check the appropriate Illustrated Parts List for your application or call a dealer near you.



Always use a VMAC oil filter that is designed to withstand the high pressures, not an automotive filter.

50 hours:

Check the drive belt

200 hours or 6 months:

Replace the air filter, oil filter and change oil

Use service kit #A700019 (VR70)

400 hours or 1 year:

Replace the air filter, oil filter, coalescing element and change oil

Use service kit #A700020 (VR70)

6.2 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 that they are properly torqued and that there are no loose components.

6.3 Replacing the Air Filter

If the system has been just operated, shut off the engine and wait at least 30 seconds for the air pressure to vent before working on the system.

1. Clean loose debris from the area around the compressor and the filter cover to prevent contamination entering the compressor.
2. Remove the filter cover retaining nut, the filter cover and the filter element.
3. Immediately cover the air inlet opening by masking with tape or with a clean cloth to prevent contamination. Do not use compressed air or perform any other tasks around the compressor until the filter and cover are replaced.
4. Clean the inside of the filter cover with a clean, dry cloth. Do not use flammable solvents to clean the inside of the cover. If you do use solvent, rinse the inside of the cover thoroughly with fresh water and dry it before installing the cover.
5. Remove the cloth or masking and install a new air filter. Make sure that the filter fits over the machined step on the housing.
6. Replace the cover and secure it with the cover bolt. Do not over-tighten the bolt.



Never attempt to clean the filter element with compressed air. Replace the filter element.

6.4 Replacing the Oil Filter

If the system has been just operated, shut off the engine and wait at least 30 seconds for the air pressure to vent before working on the system.



Do not attempt to change the oil filter until the oil has cooled. Hot oil can cause severe burns.

1. Clean the area around the tank and the filter to prevent contamination.
2. Remove the drain plug and drain the oil into a container large enough to hold at least 1.32 USG (5 liters) for the VR70.
3. Install and tighten the plug.
4. Remove the filter by turning it counterclockwise. Before discarding the filter, check to make sure that the threaded nipple did not unscrew with the filter. If the nipple is in the filter, remove it carefully to avoid thread damage and replace it in the tank housing.



Install the short-threaded end into the tank. Ensure the nipple does not obstruct the cross-drilling.

5. Check the gasket-sealing surface on the front of the tank for contamination, old gasket material or damage.
6. Apply a thin coating of compressor oil to the filter-sealing gasket and fill the filter with VMAC compressor oil.
7. 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 sealing gasket.



Never over-tighten the filter, as this may damage the seal or the filter.

8. Remove the filler plug from the air inlet control valve and pour VMAC compressor oil into the oil filler hole on the inlet control valve using a funnel.

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You must use the supplied compressor oil in this system. Failure to use this special oil may result in damage to the compressor and may void your warranty.

9. Turn the compressor clutch clockwise to speed the fill process.
10. Allow 5 minutes for the oil to drain into the tank, then check the level at the sight glass at the front of the tank. Continue adding oil until the level is correct.



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

11. Install the fill plug in the inlet control valve and tighten it securely.
12. Place the automatic transmission in park and fully apply the park brake.
13. Start the engine and allow it to reach operating temperature.
14. Press the “ON/ENTER” button on the display box, allow the system to pressurize and return to preset base idle speed.
15. Press the “ON/ENTER” button on the display box to shut down the system.
16. Allow the system to settle for 5 minutes, and then check the oil level through the sight glass. The level must be between the minimum and maximum level indicators.
17. Check for oil leaks.

6.5 Changing Compressor Oil

If the system has just been operated, shut off the engine and wait at least 30 seconds for the air pressure to vent before working on the system. Also allow sufficient time for the oil to cool.

1. Clean the area around the oil drain plug on the front of the air/oil tank to prevent contamination.
2. Remove the drain plug and drain the oil into a container large enough to hold at least 5 litres (1.32 U.S. gal.) for the VR70.
3. Install and tighten the plug.
4. If you are replacing the oil filter, follow filter replacement procedures.
5. Remove the filler plug from the air inlet control valve and pour VMAC compressor oil into the oil filler hole on the inlet control valve using a funnel.



You must use the supplied compressor oil in this system. Failure to use this special oil may result in damage to the compressor and may void your warranty.

6. Turn the compressor clutch clockwise to speed the fill process.
7. Allow 5 minutes for the oil to drain into the tank, then, check the level at the sight glass at the front of the tank. Continue adding oil until the level is correct.



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

8. Install the fill plug in the inlet control valve and tighten it securely.
9. Place the automatic transmission in park and fully apply the park brake.
10. Start the engine and allow it to reach operating temperature.
11. Press the "ON/ENTER" button on the display box, allow the system to pressurize and return to preset base idle speed.

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12. Press the “ON/ENTER” button on the display box to shut down the system.
13. Allow the system to settle for 5 minutes, and then check the oil level through the sight glass. The level must be between the minimum and maximum level indicators.
14. Check for oil leaks.

6.6 Changing the Coalescing Filter

If the system has just been operated, shut off the engine and wait at least thirty seconds for the air pressure to vent before working on the system. Also allow sufficient time for the oil to cool.

In some applications, you may have to remove the tank from the frame and lower the back end to access the back of the tank.

1. Clean the front and back of the tank to prevent contamination.
2. Remove the drain plug and drain the oil into a container large enough to hold at least 5 litres (1.32 U.S. gal.) for the VR70.
3. Install and tighten the plug.
4. If you are replacing the oil filter, follow filter replacement procedures.
5. Disconnect the air outlet line, 1/4 inch and 3/16 inch lines from the back of the tank.
6. Remove the bolts holding the discharge cap from the back of the tank and remove the cap and small spring.
7. Remove the coalescing filter with wave spring attached from inside the tank.

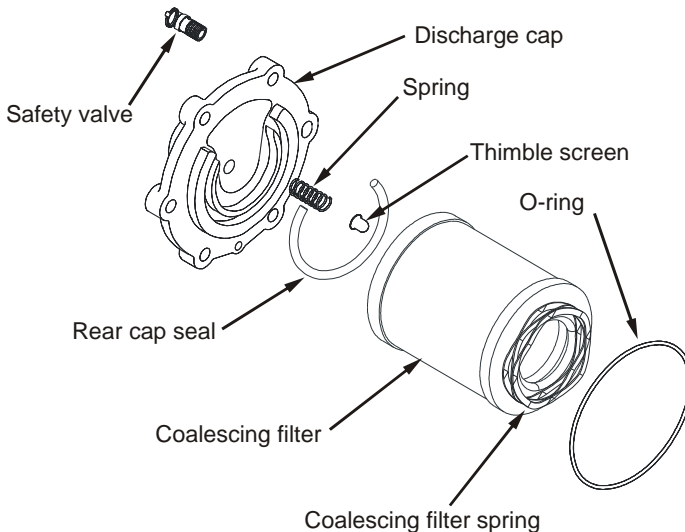


Figure 10 - VR70 Coalescing Filter

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Check the inside of the tank for any evidence of metal filings or contamination; if found, flush the tank, hoses and cooler. Metal filings will damage the compressor.

8. Remove and discard the O-ring seal and the rear cap seal.
9. Wipe out the inside of the tank
10. Remove the thimble screen and spring and clean the discharge cap.



If you use solvents for cleaning, thoroughly rinse the parts with hot water to remove all solvent residues.

11. Clean the thimble screen spring and clean or replace the thimble screen.
12. Install a new O-ring and rear cap seal.
13. Install the wave spring and a new coalescing filter. Make sure that the spring is in place, as it holds the coalescing filter tight against the rear cap seal.



The wave spring also prevents electrostatic buildup by grounding the coalescing filter. If the spring is not installed, an electric arc may occur, which could result in an explosion, potential tank rupture, or fire.

14. Install the discharge cap and torque the bolts to specifications.
15. Install the lines on the back of the tank.
16. Remove the filler plug from the air inlet control valve.
17. Pour compressor oil into the oil filler hole on the inlet control valve using a funnel.



You must use the supplied compressor oil in this system. Failure to use this special oil will result in damage to the compressor and may void your warranty.

18. Turn the compressor clutch clockwise to speed the fill process.

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19. Allow five minutes for the oil to drain into the tank, then, check the level at the sight glass at the front of the tank. Continue adding oil until the level is correct.



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

20. Install the fill plug in the inlet control valve and tighten it securely.
21. Place the automatic transmission in park and fully apply the park brake.
22. Start the engine and allow it to reach operating temperature.
23. Press the “ON/ENTER” button on the display box, allow the system to pressurize and return to preset base idle speed.
24. Press the “ON/ENTER” button on the display box to shut down the system.
25. Allow the system to settle for five minutes, and then check the oil level through the sight glass. The level must be between the minimum and maximum level indicators.
26. Check for oil leaks.

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7.0 Problem Diagnostics / Troubleshooting

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

- accurately identify the problem by operating the system yourself
- determine possible causes for the problem by understanding how the system operates
- isolate the potential causes by accurate testing using the correct, recognized procedures
- perform proper repairs using the correct procedures and the recommended replacement parts
- perform proper post-repair testing to ensure that the repairs were effective
- do not use test practices that are potentially harmful to people or the equipment
- Electrical testing should be performed according to the processes described in the troubleshooting chart. For accurate diagnosis, refer to the electrical circuit diagram in the installation manual.



Always ensure automatic transmissions are in park with the park brake applied before starting the engine or operating the system

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 is too low.	Park on level ground, check level at sight glass, add as necessary.
	Drive belt is broken.	Install new compressor belt. Check alignment of pulleys. Replace automatic tensioner.
	No power to the clutch.	Check for 12 V at the clutch, check fuse, check for broken wires or failed switch.
	Bad clutch ground.	With 12 V applied to the clutch check for voltage between the clutch stator housing and the engine. If voltage is present, ground the stator.
	Open clutch stator windings.	With compressor switch off and clutch wire disconnected, check resistance between the input wire and ground. Resistance (less lead resistance) should be 2.5 ohms to 3.0 ohms. If outside this range replace the stator.
Engine does not restart from Standby state	Disable Auto Restart Delay parameter setting	Modify Disable Auto Restart Delay parameter. Ensure it isn't at 'Always' or at a value smaller than desired time in STANDBY state before system disables the auto restart feature.
	Bad START relay (if equipped)	Replace system's START relay located on control box mount bracket.

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SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Frequent over-temperature shutdowns.	Low oil level.	Check oil on level ground, add as required.
	Restriction in the compressor oil hoses.	Check for kinked or pinched oil hoses.
	Compressor oil filter plugged.	Replace oil filter.
	Heat exchanger not functioning or is fouled with deposits.	Remove and clean or replace heat exchanger.
	Engine cooling system failure (high engine temperature).	Correct engine cooling problems.
	Engine fan clutch slipping.	Replace fan clutch.
	High ambient temperatures.	Reduce duty cycle.
	Oil temperature probe failure.	Replace if defective.
	System needs service	Perform recommended service
Excessive air pressure	System Pressure parameter set too high.	Reduce System Pressure in User Setup Menu.
	System return line blocked or frozen	Clear or replace the line.
	Electrical inlet solenoid stuck closed.	With the system off, apply 12V and Ground to the red and black wires of the inlet solenoid. It should make an audible click and transition from normally open to close state when powered. If behavior not as described, replaced electrical inlet solenoid.
Engine stalls when compressor is activated.	System is under pressure.	Allow sufficient time for blow-down.
	Blow-down valve not working.	Replace blow-down valve.
	RPM setting too low or throttle not set correctly.	Re-adjust RPM and throttle settings for optimum operation.
	Throttle control not connected properly at foot pedal	Check for proper connections.

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SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Belt squeals when compressor switch is activated.	System is under pressure.	Allow sufficient time for blow-down.
	Blow-down valve not working or muffler is plugged.	Replace blow-down valve or clean muffler.
	Improper belt tension.	Check belt tensioner.
	Belt is glazed.	Replace belt.
Frequent relief valve operation.	Electrical inlet solenoid stuck closed.	With the system off, apply 12V and Ground to the red and black wires of the inlet solenoid. It should make an audible click and transition from normally open to close state when powered. If behavior not as described, replaced electrical inlet solenoid.
	Pressure control line plugged or frozen.	Remove the pressure control line and clear any obstructions. (Blow out.)
	Relief valve defective.	Replace relief valve.
Power fuse blows.	Short to ground in the control circuit.	Locate and correct short or replace control panel.
	Incorrect fuse.	Install correct OEM fuse.
	Incorrect wiring.	Repair wiring according to wiring diagram.
Low air pressure.	Air flow is too high.	Reduce consumption.
	System Pressure parameter set too low.	Increase System Pressure in User Setup Menu.
	Throttle control set too low.	Increase maximum RPM settings.
	Electrical inlet solenoid stuck open.	With the system off, apply 12V and Ground to the red and black wires of the inlet solenoid. It should make an audible click and transition from normally open to close state when powered. If behavior not as described, replaced electrical inlet solenoid.
Engine RPM excessive on initial startup and during operation.	Maximum RPM setting is too high.	Reduce maximum RPM setting throttle control or reset cable nipple.
	Idle-down pressure is too high.	Reduce idle-down setting of the throttle control.

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SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Objectionable noise level.	Excessive gear wear.	Contact the nearest dealer to replace compressor/gearbox assembly. Refer to the dealer.
	Maximum RPM setting higher than necessary to meet air demand requirements.	Reduce maximum RPM settings.
Engine RPM stays at base idle when compressor runs.	Throttle control not adjusted properly.	Adjust throttle controls.
	Poor electrical connections.	Test and correct connections.
	Throttle control not functioning.	Replace throttle control.
	Pressure sensor defective or disconnected.	Check connections or replace pressure sensor.
Engine RPM over-revs when compressor is activated.	Throttle controls not connected properly.	Check and correct connections.
	Throttle control not setup properly.	Adjust high idle screw.
	Pressure sensor defective or disconnected.	Check connections or replace pressure sensor.
Engine RPM does not return to base idle.	Wiring fault.	Check and correct wiring according to wiring diagram.
	Throttle not properly adjusted.	Adjust idle down screw.
Engine RPM stays at maximum whenever the compressor is running.	Idle-down setting is too high.	Reset idle-down pressure.
Engine doesn't turn off in Standby state.	Bad STOP relay (if equipped)	Replace STOP relay located on the control box mount bracket.
Truck and VR system power off (fully) instead of entering STANDBY state	Bad HOT 12V relay	Replace HOT 12V relay located on the control box mount bracket
	Blown HOT 12V fuse	Replace 3 Amp fuse. If fuse blows again, check for broken wires and failed parts to find source of fault.

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SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Excessive oil in the air.	Failed coalescing separator element.	Replace element.
	Clogged scavenge line screen.	Clean or replace parts as required.
	High oil level.	Correct oil level.
	Poor fit between coalescing filter and tank – lack of seal at O-rings.	Replace parts as required.
	Vehicle is not within requirements of 15 degrees of level.	Level vehicle and check for oil in the air.
	Compressor was turned off while running at high speed.	Allow engine RPM to drop before turning the compressor off.
	Wing tank – volume shutting down under load.	Clean or replace parts as required.
Oil blows out of compressor air filter on compressor shutdown.	Shutting the engine off while running at high speed.	Allow engine to idle-down before shutting down the compressor. Turn off any air tools before shutting down compressor.
Oil drips from clutch after shutdown.	Seal leaking.	Contact the nearest dealer to replace gearbox input shaft seal.
Cannot drive the vehicle after remote-start operation	RAM truck – remote-start drive interlock	Cycle the key to OFF position then use as desired.

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8.0 VMAC Warranty

1. GENERAL PROVISIONS AND LIMITATIONS

- 1.1 VMAC, Division of Mangonel Investments Corporation, (hereafter "VMAC") warrants to each original retail purchaser (hereafter "Buyer") of its new Underhood Air Compressor Systems (hereafter "Product(s)") from VMAC or its authorized Dealers that such Product(s) are, at the time of delivery to the Buyer, free of manufacturer defects in material and workmanship.
- 1.2 Product Warranty – Underhood Air Compressors applies to Products(s) manufactured on or after January 1, 2005. (System ID numbers ending with TA001 or greater).

2. NO WARRANTY IS MADE WITH RESPECT TO

- 2.1 Any Product(s) which have, in VMAC's judgment, been subject to negligence, accident or improper storage, installation, application, operation or maintenance, or have been repaired or altered in such a way that affects the Product(s) adversely.
- 2.2 Components or accessories manufactured, warranted and serviced by others.
- 2.3 Damages caused from normal maintenance service and repairs and corrections with minimum action, such as adjustments and inspections, or replacement of items, such as service filters, belts, seals and service kits.
- 2.4 Consequential damages caused by Product(s) failure.
- 2.5 Any Product(s) if other than VMAC's genuine components are used in the Product(s).
- 2.6 Normal wear and tear of Product(s).

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3. WARRANTY PERIOD

- 3.1 The warranty period will commence upon installation of the Product(s). The returned warranty registration form marks the date of installation. If the warranty registration form has not been received by VMAC within 6 months from the date of installation of the Product(s), then the warranty period will be deemed to commence 30 days from date of shipment from VMAC. For the full warranty period to apply, installation of Product(s) must be completed within 36 months from the date of shipment of the Product(s) from VMAC.
- 3.2 The following components of Product(s) are warranted against manufacturer defects in materials and workmanship for a period of 24 months or 2,000 hours of operation, whichever expires first: Compressor, Brackets, Air/Oil Separator Tank Oil Cooler, Control Box and Display Box and Throttle Controller.
- 3.3 All other components of Product(s), not listed in 3.2, are warranted against manufacturer defects in materials and workmanship for a period of 12 months or 1,000 hours of operation, whichever expires first.
- 3.4 Replacement components of Product(s) listed in 3.2, excluding VMAC factory rebuilt components, shall be warranted for the remainder of the original warranty period. If the original warranty period has expired, replacement components of Product(s) listed in 3.2 and purchased by Buyer, excluding VMAC factory rebuilt components, shall be warranted for a period of 12 months or 1,000 hours of operation, whichever expires first.
- 3.5 VMAC factory rebuilt components shall be warranted for a period of 6 months from date of shipment from VMAC.
- 3.6 Replacement components of Product(s) listed in 3.3, shall be warranted for the remainder of the original warranty period. If the original warranty period has expired, replacement components of Product(s) listed in 3.3 and purchased by Buyer, shall be warranted for a period of 12 months or 1,000 hours of operation, whichever expires first.

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4. VMAC OBLIGATIONS

- 4.1 VMAC's obligation is limited to repairing or, at VMAC's option, replacing, during normal business hours at an authorized service facility of VMAC, any component, which in VMAC's judgment is proven to be defective as warranted.
- 4.2 VMAC's obligation is limited to Product(s) proven to be warranted. No liability is accepted for any consequential damages, injuries or expenses directly or indirectly related to Product(s) failure.

5. BUYER OBLIGATIONS

- 5.1 Buyer shall notify VMAC of the alleged defect within 10 days of initial discovery and return the allegedly defective component(s) within 30 days of initial discovery.
- 5.2 The Buyer must prepay all costs associated with the warranty claim and submit receipts and/or invoices to VMAC for evaluation.
- 5.3 If required by VMAC, the Buyer must return components claimed under this warranty to a facility designated by VMAC for evaluation, to establish a claim under this warranty.
- 5.4 Buyer shall maintain and service VMAC Product(s) in accordance with the VMAC Product(s) Owner's Manual.

6. WARRANTY REGISTRATION VALIDATION

- 6.1 A warranty registration form is provided to the Buyer with the Product(s). The form must be fully completed by the Buyer and returned to VMAC upon completion of the installation of the Product(s) to validate the warranty. Warranty registration can also be completed online on the VMAC website at <http://www.vmac.ca/index.php?warrantyregistration>. Warranty claims will not be processed unless VMAC has received a fully completed warranty registration form.

7. DISCLAIMER AND WARRANTY SERVICE

- 7.1 Any labor costs claimed in excess of VMAC's set rate and/or times are not provided by this warranty. If applicable, any labor costs in excess of VMAC rate schedules caused by, but not limited to, location or inaccessibility of the equipment, travel time or labor provided by unauthorized service personnel are not provided by this warranty.
- 7.2 This warranty is in lieu of all other warranties or obligations express or implied. VMAC expressly disclaims all implied warranties of merchantability or fitness for a particular purpose.
- 7.3 Warranty claims must be pre-authorized by VMAC, and the components returned via prepaid freight using the designated "Returned Merchandise Authorization" number and form.

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