VMAC®

VEHICLE MOUNTED AIR COMPRESSORS

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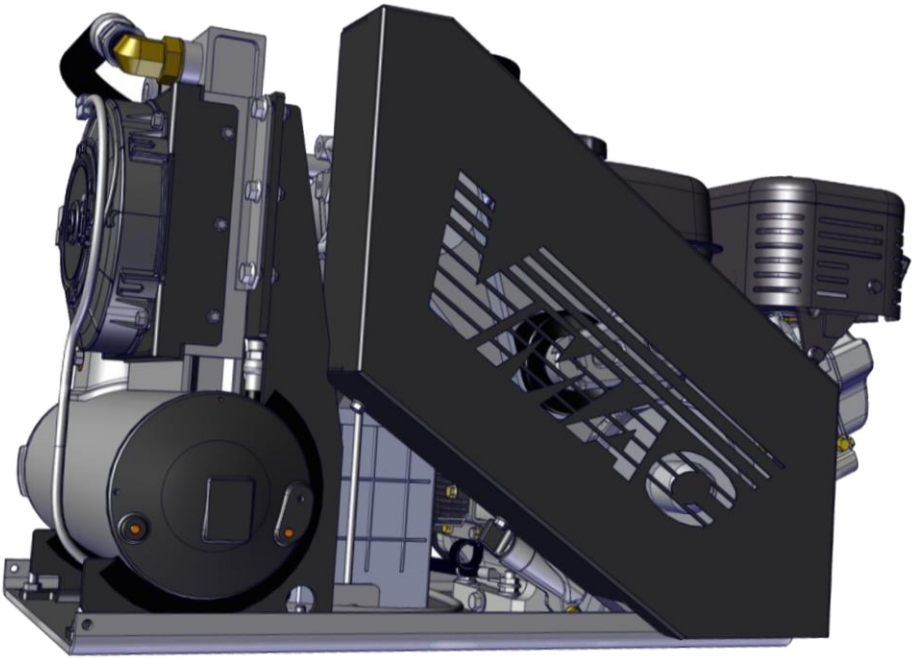

RAPTAIR-G30 Gas Drive Air Compressor Installation, Owner's and Service Manual G300002

www.vmacair.com

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VMAC – ***Vehicle Mounted Air Compressors***
Toll Free: 1-888-241-2289
Fax: 1-250-740-3201

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Important Information

The information in this manual is intended for certified VMAC installers who have been trained in installation procedures and for people with mechanical trade certification who have the tools and equipment to properly and safely perform the installation. Do not attempt this installation if you do not have the appropriate mechanical training, knowledge and experience.

Follow all safety precautions for mechanical work. Any grinding, bending or restructuring operations for correct fit in modified trucks must follow standard shop practices.

Notice

Manuals are subject to change without notice.

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KEEP THIS MANUAL WITH THE GAS DRIVE ROTARY SCREW COMPRESSOR UNIT FOR USER REFERENCE

VMAC – ***Vehicle Mounted Air Compressors***
Toll Free: 1-888-241-2289
Fax: 1-250-740-3201

General Information

Read this

Read this manual as well as the “Subaru Engine Manual” before beginning the installation, or operating the system so that you can understand the requirements. This will ensure the successful installation and proper operation of the Gas Drive Rotary Screw Compressor.

This manual provides maintenance, repair and troubleshooting instructions for the Gas Drive Rotary Screw Compressor system. Proper and regular servicing provides continued high performance and long life.

Limited Lifetime Warranty

The Compressor Assembly (excluding Inlet and Clutch, where applicable) is warranted against manufacturer defects in materials and workmanship for the lifetime of the Compressor Assembly. Restrictions apply – refer to VMAC Warranty Policy and VMAC Limited Lifetime Warranty for full details.

http://vmacair.com/support/warranty/

Warranty Registration

The VMAC warranty form is located at the back of this manual. This warranty 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 warranty forms can be submitted to VMAC:

Online

http://vmacair.com/support/warranty/

Email

tech@vmacair.com

Fax

1-(250) 740-3202

Mail

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

Important Safety Notice

The information contained in 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 installation, service or repair. Current information may clarify the issue. Any person with knowledge of such discrepancies who performs service and/or 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 performance or the operational safety 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 the procedures set out in this manual or standard safety practices. Safety should be the first consideration when performing service operations. If you have any questions concerning the procedures in this manual or require any more information on details that are not included in this manual, please contact VMAC before beginning repairs.

Safety Messages

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

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, be alert! Your personal safety is involved”. Read the message that follows and be alert to the possibility of personal injury or death. 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 or special emphasis on a specific procedure.

Safety Precautions

Warning

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

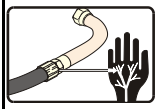
- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.

Personal Safety

- Do not breathe the compressor air. Vaporized oil is a respiratory hazard.
- Do not breathe engine exhaust, gasoline engines produce carbon monoxide, a poisonous odorless gas which can cause death. Do not start or operate this compressor in an enclosed area.
- Always use the appropriate personal protective equipment, particularly eye and hearing protection when operating air-powered equipment.

Fire and Explosion Hazard

- Vaporized oil propelled by high-pressure air is an 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 compressor in a well ventilated area free of flammable vapors, dust, or other combustible materials.
- Do not fill the fuel tank while the system is running or hot.
- Do not refuel in an enclosed space or area with poor ventilation.
- If fuel is spilled clean area and wait for it to dry before starting the engine.
- Never place objects against or on top of the compressor.
- Never expose the tank or compressor to extreme heat.



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 your bloodstream. This could cause serious injury or death.
- Ensure the system is completely depressurized before attempting maintenance or repair.
- Do not use compressor air to clean off clothing or skin, compressed air can penetrate the skin causing serious injury or death.
- Do not move or service the compressor while it is pressurized or operating.
- Do not move the compressor by pulling on any hoses.
- Components and hoses under pressure could separate suddenly, fly out and cause serious injury or death. If equipped, the receiver air 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. Components and hoses under pressure could fail and cause serious injury or death.

Burst Hazard

- 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.

Burn Hazard

- The engine, exhaust and the compressor system get 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.

Lead Acid Battery Hazard

Working near Lead-acid batteries is dangerous. Batteries may generate sulphuric acid and explosive gasses during regular operation. Lead-acid batteries may explode if exposed to a spark.

- Follow all safety precautions when jump starting or charging a battery.
- Never attempt to jump-start a frozen battery.
- Never over-charge a battery.

Moving Parts Hazard

- Before performing service, disconnect the battery and disconnect the spark plug wire to prevent unexpected engine start.
- Do not operate the compressor without guards in place. If the guards are damaged or missing, replace them before operating the equipment.

General Warnings

- Disconnect Spark plug wire before attempting any repair or service.
- Be attentive for unexplained changes in operation parameters and record any changes.
- Check compressor oil level and condition before starting the system. Do not add or change oil while the system is running. Use only approved oil.
- The compressor operates anytime the engine is running. Avoid contact with the compressor, hoses, or engine during operation.
- Keep hoses and wiring away from sharp edges 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, fully read the manual.
- Check 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. Components and hoses under pressure could fail and cause serious injury or death.

Be aware that it is impossible to warn of all the possible hazardous consequences that might result from operating or servicing this system. You must use your own judgement.

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 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.

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.

Safety Features

Do not disable or bypass any safety components, disabling or bypassing safety components could result in equipment damage, injury or death.

Gas Drive Safety Components

- 200 psi pressure relief valve in separation manifold.
- Blow-down valve to discharge system pressure on shut down.
- Temperature safety switch in compressor oil cooler.
- A 15A fuse protects the electrical system.

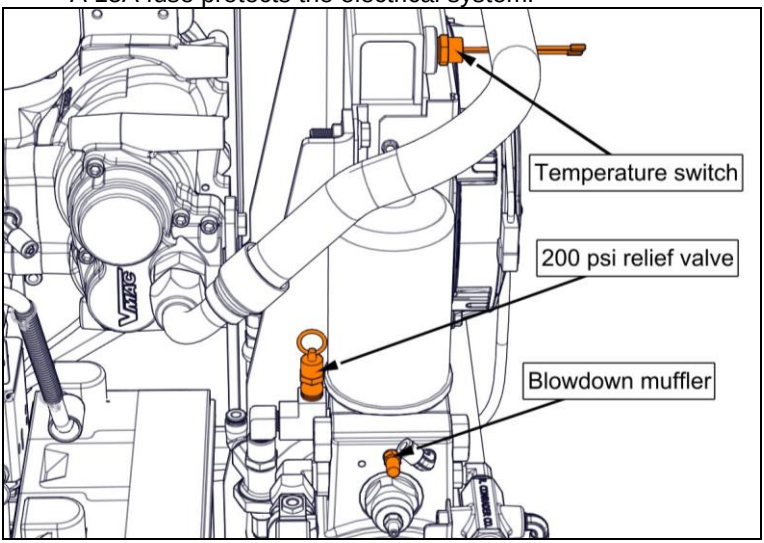


Figure 1 - Safety components (Shroud removed for clarity)

Automatic Overheat Shut down

If the compressor oil temperature exceeds 140 °C (290 °F), the thermostatic switch will disable the engine, the cooling fan will remain running as long as the key switch is in the “On” position.

The engine will not be able to be restarted until the system has cooled and the temperature switch has closed.

Operating Principles

Air Compression

The Gas Drive uses a VMAC designed and manufactured 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 meshing rotor lobes. Cooled oil is injected into the rotors during compression to lubricate the rotors and bearings, absorb the heat of compression, and seal the rotor lobes to allow for efficient compression. As the rotors rotate, the meshing lobes compress the volume of the trapped air/oil mixture before sending it down the discharge line to be cooled and separated by the WHASP tank.

Oil Separation and Cooling

The system uses a WHASP (Waste Heat Air Separation Package) tank combined 2-stage air/oil separator and oil cooler. The hot air/oil mixture from the compressor enters the cooler on the top of the tank, where the mixture is cooled, the majority of the oil separates from the air (first stage separation), and settles into the reservoir tank below the cooler. The cooled oil then passes through a high-pressure oil filter before being returned to the compressor via the oil return line. The remaining oil mist and fine droplets are removed from the air by passing the air through a coalescing filter (second stage separation). Oil removed by the coalescing filter is collected and returned to the compressor via the 1/4" scavenge tube.

A liquid-to-air cooler with electric fan maintains operating temperatures which increases system durability and reduces the temperature of the compressed air.

Minimum Pressure Check Valve

The WHASP tank has a built-in minimum pressure check valve (MPCV) to maintain a minimum pressure of approximately 60 psi (410 kPa) in the WHASP tank. This ensures compressor lubrication and cooling, as well as oil separation in the coalescing filter. Air will not flow out of the WHASP tank until around 60 psi of air pressure is reached. The MPCV is factory set and requires no adjustment or servicing.

No separate check valve is required or recommended when connecting the WHASP tank output to a receiver tank.

Filtration

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

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

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

Compressor Drive, Belt and Tensioning

The compressor is directly driven by a six rib belt, anytime the engine is running the compressor is running. The system has an automatic belt tensioner (no adjustment is required).

Pressure Regulation

Pressure regulation is achieved with a mechanical unloader valve and discharge valve. Use a Filter Regulator Lubricator (FRL) to set the final tool pressure.

System Pressure Unload

Internal system pressure is controlled with a mechanical unloader valve. When downstream air pressure reaches 150psi (air pressure seen at air tools), the mechanical unloader valve activates and sends a signal to the mechanical discharge valve to open. When open, the mechanical discharge valve sends internal system pressure (pressure seen inside the compressor and WHASP tank) to the inlet valve and closes the compressor air intake poppet. Internal air pressure is then vented to a nominal value.

Engine Speed Control

The engine speed is controlled mechanically by a pneumatic throttle, which raises and lowers engine rpm according to air demand. No operator input is required on the throttle lever.

Spark Arrester

The gas drive is equipped from the factory with a spark arrester.

For more information regarding the spark arrester refer to the “Subaru Engine Manual" supplied with the system (VMAC part number: 1901022).

Extreme Climates and Elevation

The Gas Drive has been designed to operate in moderate climates of 0 °C to +35 °C (32 °F to +90 °F) and at elevations below 2500 feet. Operating outside of this range can result in performance issues with the engine and compressor.

Cold Environment Operation

The Gas Drive compressor system is not designed or recommended for use in cold climates (below 0 °C (32 °F)).

When operating in temperatures below 0 °C (32 °F) ensure the choke is used and the unloader valve is actuated during start up and the system is warmed up before air use is started.

Cold Environment Recommendations

If operating the system below 0 °C (32 °F) ambient temperature, ensure the following conditions are met before starting the compressor:

- Use the pull-choke in cold environments, or for first start of the engine.
- Compressor system components must all be at or above 0 °C (32 °F). Starting the system while any of the components are below 0 °C (32 °F) may damage the compressor. Storing the system indoors, and starting it while the components are still warm is the only possible solution.
- For engine oil recommendations in temperatures below 0 °C (32 °F) refer to the “Subaru Engine Manual” supplied with the system. (VMAC part number: 1901022). Not following the Subaru Engine manual supplied can result in poor engine performance or engine damage.
- The system pressure unloader valve can be activated manually to aid in cold weather start up; this will reduce the load on the compressor resulting in less load on the engine during warm up. (Figure 2)

NOTE

While the unloader valve is manually opened, the compressor will only produce approximately 40 psi. Once the engine has warmed to normal operating temperature, close the unloader valve to allow the system to build to full system pressure.

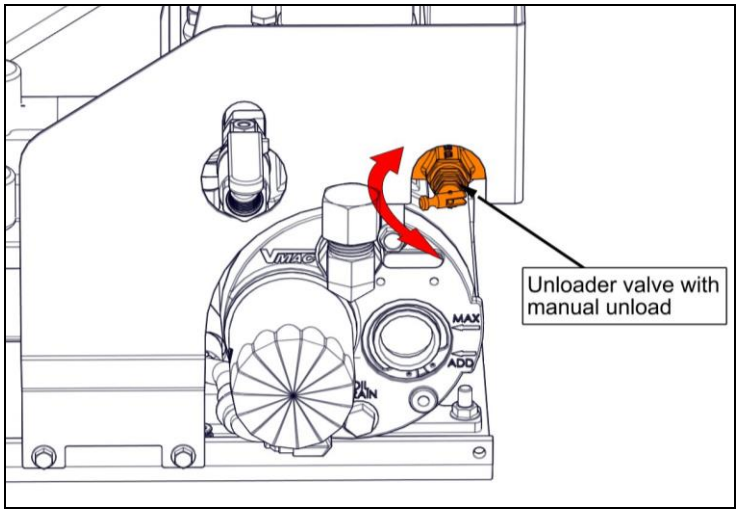


Figure 2 - Unloader Valve (Shroud removed for clarity)

Hot Environment Operation

For operating in temperatures above 35 °C (90 °F) compressor use may be limited. As the Gas Drive is a 100% duty cycle compressor high ambient air temperatures may result in compressor overheat.

The compressor system is protected by a compressor oil temperature switch that opens at 143 °C (290 °F) and disables the engine. The cooling fan will operate anytime the key switch is in the run position.

If the gas drive shuts off due to overheat allow the system to cool before restarting.

For engine oil recommendations in temperatures above 35 °C (90 °F) refer to the “Subaru Engine Manual” supplied with the system. (VMAC part number: 1901022). Not following the “Subaru Engine Manual" supplied can result in poor engine performance or engine damage.

Hot Environment Recommendations:

- Adequate supply of cool ambient air to the unit.
- Exhaust and hot air can vent from the system with no restrictions.
- WHASP radiator fins and engine recoil start are clear of debris.
- Install an external fan to direct cool air towards the engine and air compressor.
- Engine and compressor serviced at correct intervals.

In certain situations, a receiver tank can help prevent overheating issues by lowering the duty cycle of the compressor.

High Altitude operation

The Gas Drive has been designed to operate from 0 to 2500 feet above sea level. Operation at high altitude may limit the compressor output and may cause the engine to stall.

For operation above 2500 feet lowering the compressor air pressure to 100 psi is recommended. For further information, please contact VMAC Technical Support at 1-(888) 241-2289.

For information regarding high altitude operation refer to the “Subaru Engine Manual” supplied with the system. (VMAC part number: 1901022). Not following the “Subaru Engine Manual" supplied can result in poor engine performance or engine damage.

Engines equipped with a high altitude kit will not be able to run at low elevations.

Serial Number

The serial number is located near the top of the belt guard. Please have this number ready when ordering parts, or when calling in for technical support (Figure 3).

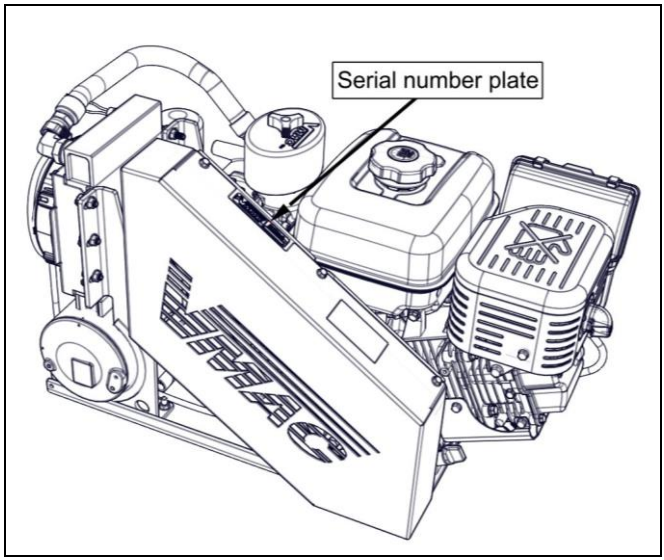


Figure 3 - Serial number plate and location

Support and Parts

To order parts call at 1-(800) 738-8622 or email sales@vmacair.com

For technical support call 1-(888) 241- 2289 or email tech@vmacair.com

System Overview

The compressor is directly driven by a belt, anytime the engine is running the compressor is running.

System Components

- WHASP tank (Waste Heat Air Separation Package).
- Rotary Screw Compressor.
- Control panel.
- 12V Battery.
- Subaru EX40 Engine.

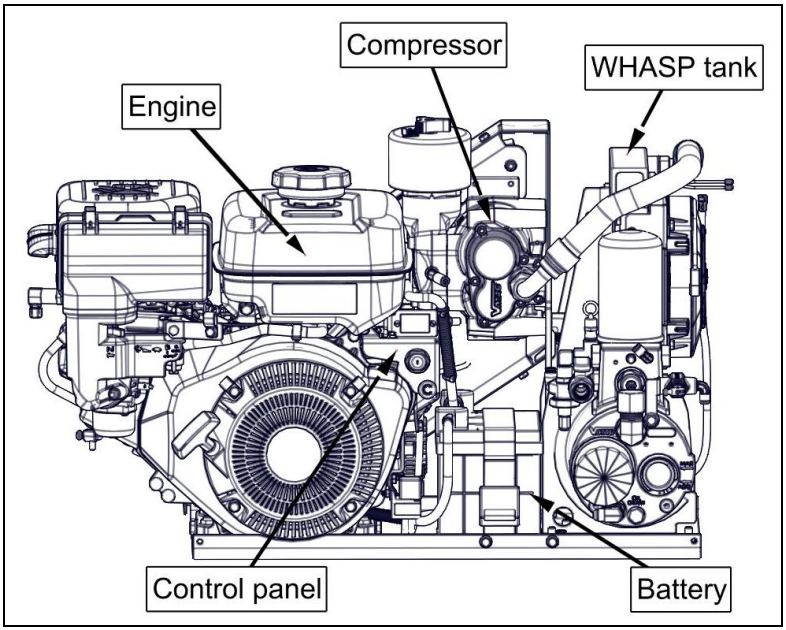


Figure 4 - System overview (Shroud removed for clarity)

System Controls

The system has a control panel that features an hour meter, key switch and choke. The hour meter and fan will be running when the key is in the “Run” position, whether the engine is running or not.

There are two options for the control panel:

Control Panel

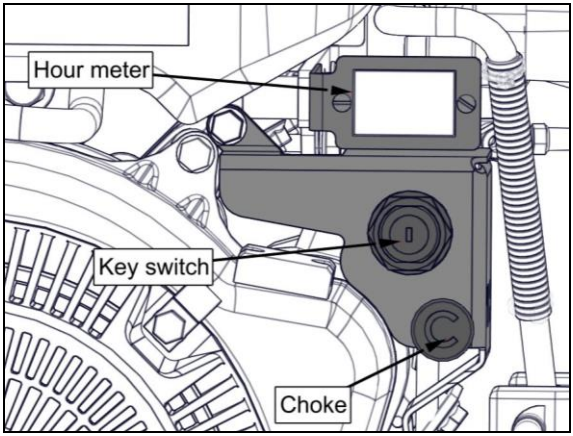


Figure 5 - Control panel

Remote Control Panel

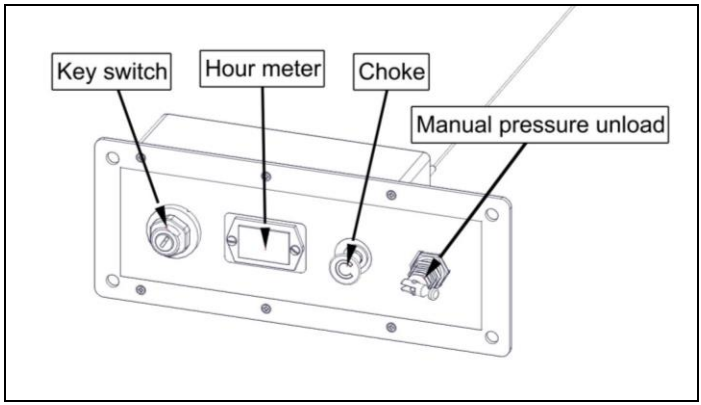


Figure 6 - Remote Control Panel (Optional Accessory)

Control System Features

- Electric key start with back up recoil pull start.
- Manual choke.
- Compressor overheat switch (disables the engine).
- Automatic idle (idles up and down based on air demand).
- Automatic system pressure unload with manual override.
- Hour meter (runs anytime the key switch is on).
- Electric cooling fan (runs anytime the key switch is on).
- Compressor depressurization on shut down (blowdown system).

NOTE ***The electric fan on the WHASP tank will run anytime the key switch is in the "On" position. This is normal operation.***

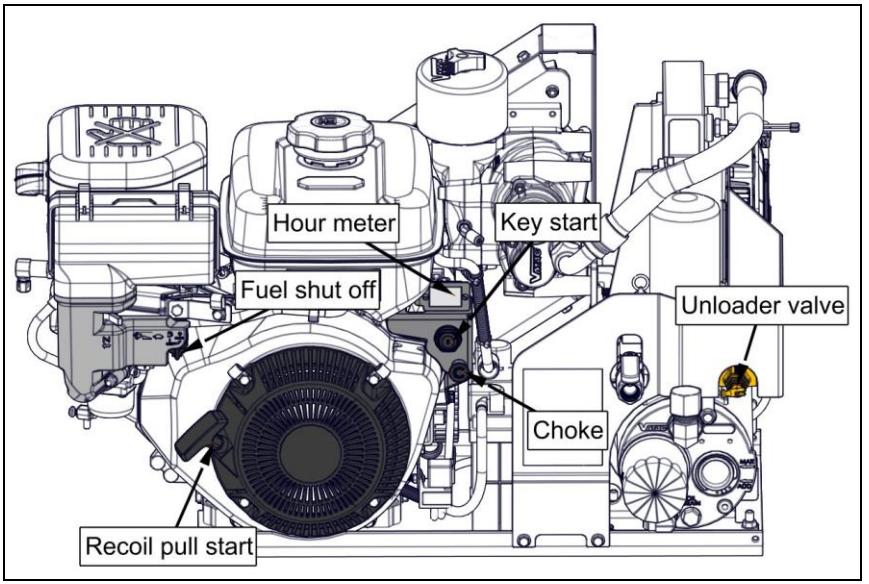


Figure 7 - Control overview

Installation Requirements

The information in this section is very important for proper operation of the compressor. Read these requirements before beginning installation

Before installing the Gas Drive, examine the possible locations and consider the following factors when selecting a location:

- Sight glass, oil drain and filters on the WHASP tank can be easily accessed for service.
- Belt guard is accessible and can be removed for service.
- Engine oil drain, oil fill, fuel fill, and air filter can be easily accessed for service.
- Sufficient clearance around the unit for good air circulation and effective cooling.
- Mounted in a position where hot air and exhaust will not recirculate back into the system.
- Protected from excessive exposure to the elements and possible incidental damage from other operations.
- Away from heat sources such as engines, exhaust systems or other components that generate heat.
- Not in a location where it will be exposed to high contamination levels, including combustible gases.
- Exhaust can be routed away to open air and not orientated in a way that it will fill up with rain (or exhaust flapper installed).

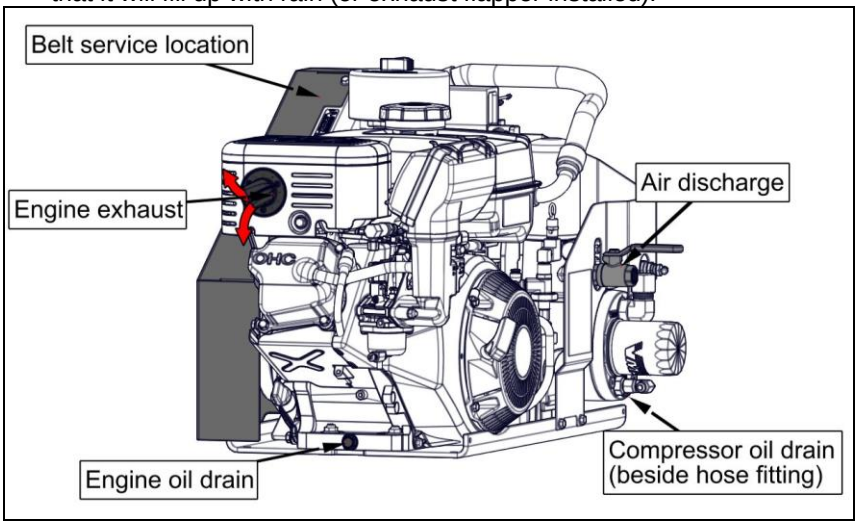


Figure 8 - Installation considerations

Ventilation Requirements

- **Proper ventilation is vital for proper operation and safety. When a system is not properly cooled it can lead to oil deterioration, increased oil consumption, power loss and reduced life or failure of the engine or compressor.**
- **Compressor overheat will disable the engine.**

During operation, the Gas Drive can develop considerable heat. As the engine used on the Gas Drive is air cooled, special attention must be taken to ensure adequate air flow to the engine.

Ensure there is a minimum of 6 in (150mm) clearance between engine air intake (recoil starter area) and the WHASP cooler and any other components mounted on the vehicle. Direct the engine exhaust to vent to atmosphere and in a safe location (Figure 9).

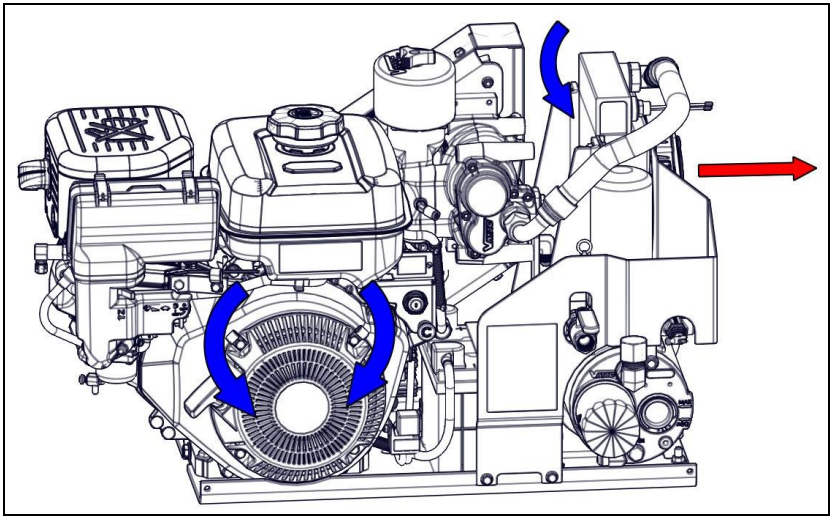


Figure 9 - Airflow diagram

Exhaust Extension

When adding an exhaust extension, ensure the following requirements are met (Table 1):

Exhaust Pipe Length	Diameter
Exhaust pipe less than 10 feet (3 meters)	1.18 in (30 mm)
Exhaust pipe 10 ft (3 meters) to 16 ft (5 meters)	1.3 in (33 mm)

Table 1 - Exhaust Extension Diameter Table

Mounting Locations

Top Mounting

This is the preferred mounting location. Placing the unit on top of the service body provides the best access to ambient air, and provides the best cooling. Maintain a minimum of 6 in between the sides of the Gas Drive and all other solid objects (Figure 10).

Enclosed Mounting

Enclosed mounting is not recommended due to the significant heat generated. As the engine used on the Gas Drive is air cooled special attention must be taken to ensure adequate air flow to the engine.

Mounting the Gas Drive in an enclosure will limit access to ambient air, restrict the escape of hot air from around the unit and have an adverse effect on cooling. Make sure that adequate ventilation is provided so the cooling system will function properly. VMAC recommends mounting the unit on a pull-out drawer.

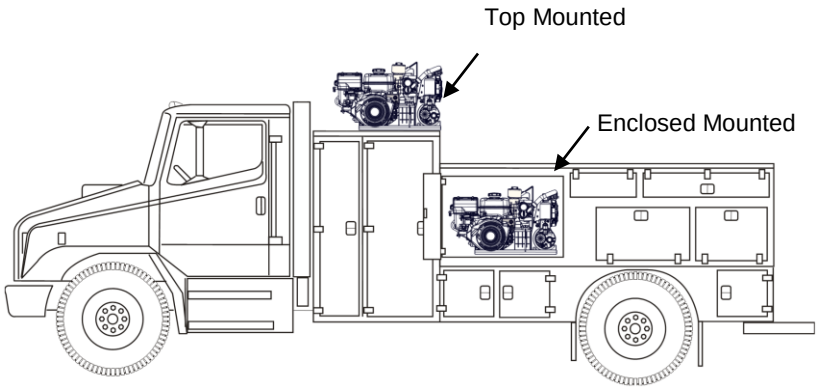


Figure 10 - Mounting locations

It is not possible to make absolute recommendations regarding ventilation because of the widely differing circumstances that are possible. Duty cycle, ambient temperature and enclosure shape are some of the important variables.
Ideal ventilation will provide good airflow through the unit with no restrictions. Cool ambient air ducted to the gas engine air intake, compressor air intake, compressor cooler and installing an exhaust fan to remove hot air is recommended.

Ensure exhaust gas and hot air from the gas engine is routed in a way to prevent recirculation back into the unit.

Mounting the Compressor

External dimensions with the base plate

☐ Locate a suitable mounting position for the Gas Drive. Place the unit and check for clearances to any other objects (Figure 11).

NOTE ***All dimensions are in inches.***

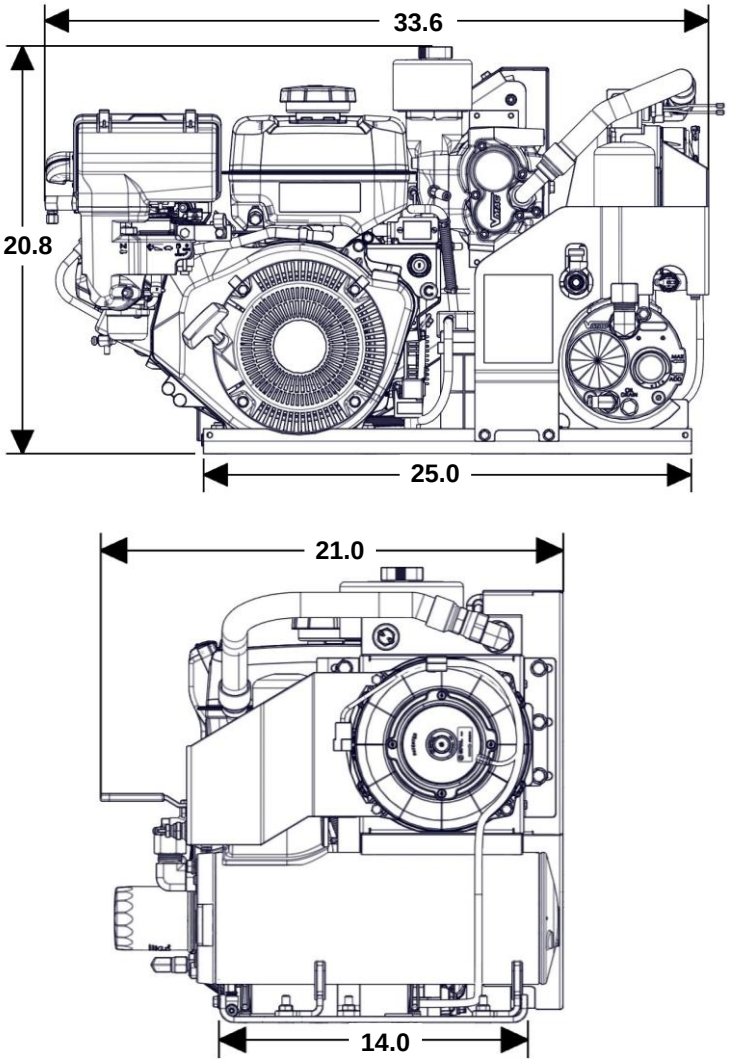


Figure 11 - External dimensions

Mounting with the base plate

☐ There are four holes, near the four corners of the base plate which can be used as mounting bolt locations. Holes can also be drilled through the bottom of the base plate if alternate locations are required (Figure 12).

☐ Drill four holes in the mounting surface and secure the Gas Drive to the vehicle. Use a minimum of four 3/8 in (10 mm) bolts. Use bolts, washers, and locknuts or Loctite.

☐ Remove the #8 cap from the air outlet, found near the pressure relief valve on the WHASP tank, to the right of the battery. Connect to the air delivery system.

☐ There are two optional M8 Bolt holes, shown by the grey outlines (Figure 12).

NOTE ***All dimensions are in inches.***

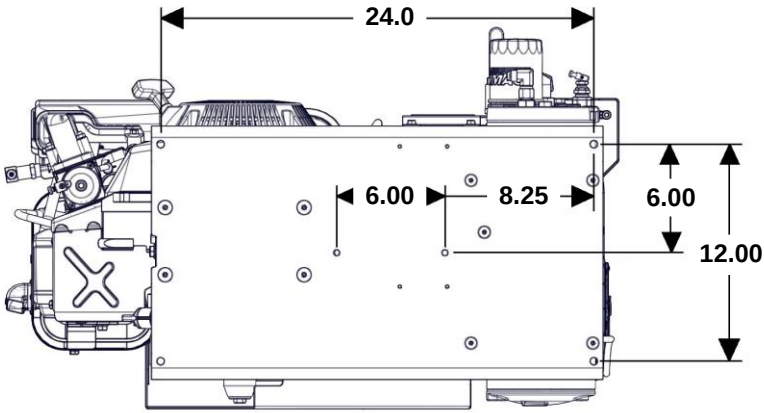


Figure 12 - Mounting with base plate

Mounting without the base plate

The Gas Drive engine and WHASP tank can be mounted in separate locations if removed from the stand-alone base plate.

- ☐ Locate a suitable mounting position for the Gas Drive engine and WHASP tank. Place the components and check for clearances to any other objects.
- ☐ There are four holes on the base of the engine, use the most-outer holes for mounting (two at the front, and two slotted) (Figure 13).
- ☐ There are 4 outer bolt holes on the WHASP tank which can be used as mounting bolt locations (Figure 13).
- ☐ Drill 4 holes in mounting surface and secure the Gas Drive engine and WHASP tank to the vehicle. Use bolts, washers and locknuts or Loctite.
- ☐ Remove the #8 cap from the air outlet, found near the pressure relief valve on the WHASP tank, to the right of the battery. Connect to the air delivery.

NOTE ***All dimensions are in inches.***

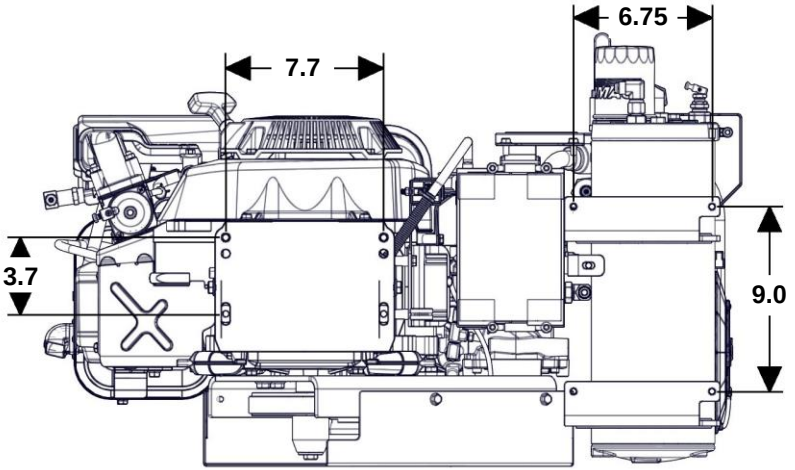


Figure 13 - Mounting without baseplate (dimensions in inches)

If the Gas Drive is not mounted on the stand alone base plate and the WHASP tank is relocated to another location, ensure that the hose lengths will be the shortest possible and a minimum number of 90 degree fittings will be used, this will ensure optimal performance. See the hose requirements on the following page.

System Hoses

- **Read the “Maintenance and Repair” safety section before working on the system.**
- **Compressor oil will degrade rubber lined hoses, use only hoses with an AQP Elastomer type liner.**
- **PTFE tube must be used with this system (300°F temperature rating).**

There are two different types of hoses used with the Gas Drive compressor:

Braided oil hoses

VMAC braided hoses have an AQP elastomer liner for compatibility with the compressor oil. Two braided hoses are used:

- #12 (3/4 in ID) x 19 in discharge hose
- #6 (3/8 in ID) x 17 in oil return hose

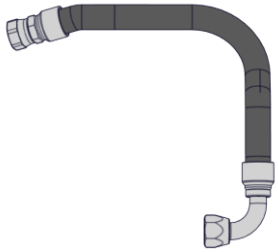


Figure 14 - Braided hose

PTFE tube

Three PTFE tubes are used:

- 1/4 x 42 in Throttle tube
- 1/4 x 14 in Scavenge tube
- 1/4 x 23 in Pressure control tube

Figure 15 - PTFE tube

Electrical Connections

External Electrical Connections

The Gas Drive runs on a 12 V system. If mounted on the stand-alone base plate the Gas Drive will come with a battery. In this case no electrical connections are required. However, if the Gas Drive is removed from the stand-alone base plate external electrical connections may be required.

If desired the Gas Drive can be wired into an external power supply and the key switch can be relocated.

Battery relocation

Use appropriate gauge cable and ground wire to connect to battery source (Table 2).

Battery wire connections cable length (total length of power wire plus ground wire)	Suggested Gauge
Less than 5 ft (1.5 m)	4 AWG
5 ft (1.5 m) to 8 ft (2.5 m)	2 AWG
8 ft (2.5 m) to 13 ft (4.5 m)	1 AWG

Table 2 - Battery extension gauge

Key switch relocation

If desired the key switch can be relocated away from the Gas Drive engine.

Use appropriate gauge wire to extend the key switch (Table 3).

Key switch wire connection cable length	Suggested Gauge
Less than 5 ft (1.5 m)	14 AWG
5 ft (1.5 m) to 8 ft (2.5 m)	12 AWG
8 ft (2.5 m) to 13 ft (4.5 m)	10 AWG

Table 3 - Key switch extension gauge

The supplied key switch is weather resistant. However, the drain hole in the key switch housing must be mounted facing down.

Electronic Fuel Pump

The use of an electronic fuel pump is not recommended or supported by VMAC. Contact a Subaru Industrial Power Product dealer for information regarding external fuel pumps.

Before Starting the Gas Drive

Make sure that the following has been completed before operating the Gas Drive:

1) Check the compressor oil level and condition, (the compressor has been filled to the correct level prior to shipping). **Note:** The oil is clear and can be difficult to see in the sight glass.
2) Check the engine oil level and condition.
3) Inspect the engine and compressor air filter.
4) Check fuel level.
5) Do a final inspection to ensure that all fasteners and connections are tight.
6) Check that all hoses and wiring are secure and adequately protected.
7) Check for any fluid leaks around the unit.
8) Ensure the fuel switch is in the “OPEN” position (Figure 16).

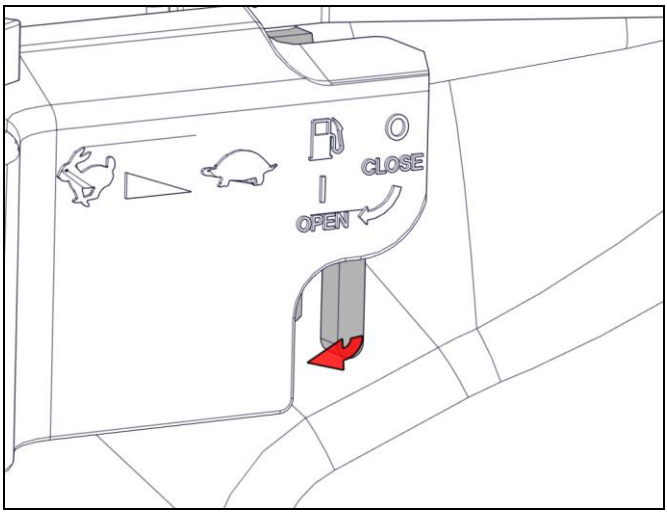


Figure 16 - Fuel switch

9) Ensure pneumatic equipment is securely connected and discharge valve is closed.
10) The choke provides the proper fuel mixture when the engine is cold, it is operated manually by pulling out or pushing in the knob. Pull the choke out for cold starting. As the engine warms push the choke in.

If the system has been run, ensure the compressor system has depressurized. The engine will not be able to start if the system is still under pressure

Starting and Stopping the Gas Drive

Starting the Gas Drive with the Key Switch

1) Pull the choke to the “ON” position (Figure 17).

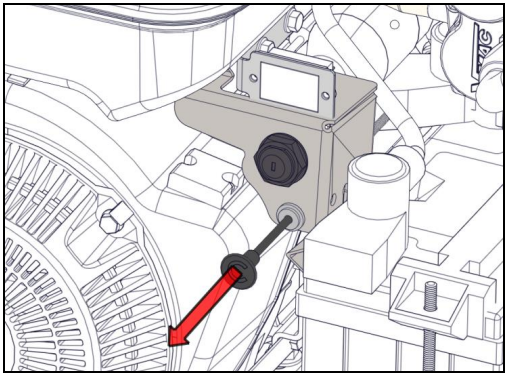


Figure 17 - Choke

If the ambient temperature is below 0 °C, the unloader valve can be opened to reduce load on the engine while it warms up. Pull out or rotate the handle to “unload” the compressor, release tension to “load” the compressor and build full system pressure. (Figure 18)

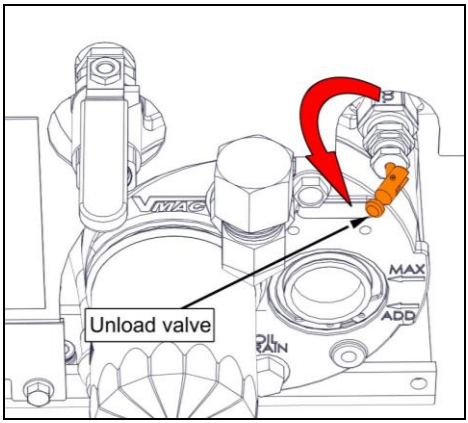


Figure 18 - Unloader valve

While the unloader valve is actuated the system will only build to 40 psi. Once the engine has warmed up, close the unloader valve to allow the system to build to full system pressure.

2) Turn the key switch to the “START” position (Figure 19).

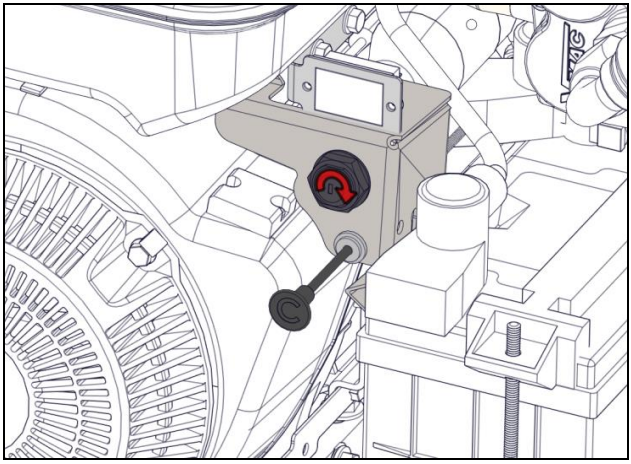


Figure 19 - Key switch

Do not operate the electric starter continuously for more than 5 seconds, even if the engine does not start. If the engine fails to start wait 10 seconds before trying to restart.

3) Once running, push the choke to the “OFF” position (Figure 20).

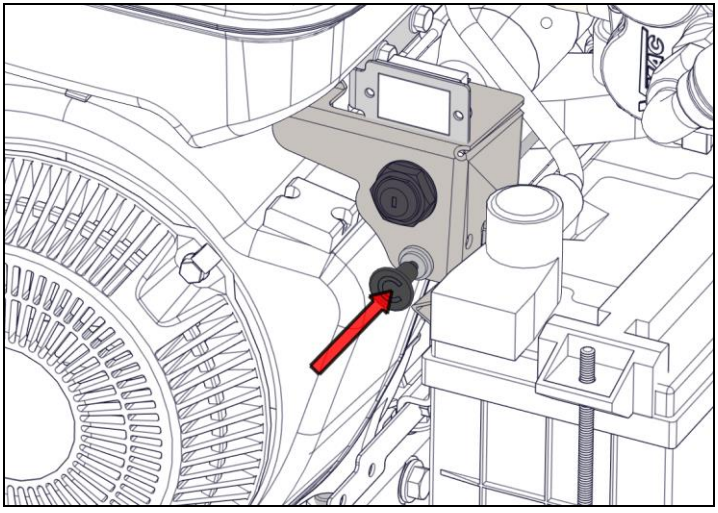


Figure 20 - Choke

NOTE ***The choke may not be required if the ambient air temperature is high or if the engine has already been warmed up.***

Starting the Gas Drive with the Pull Start

1) Turn the key switch to the “RUN” position (Figure 21).

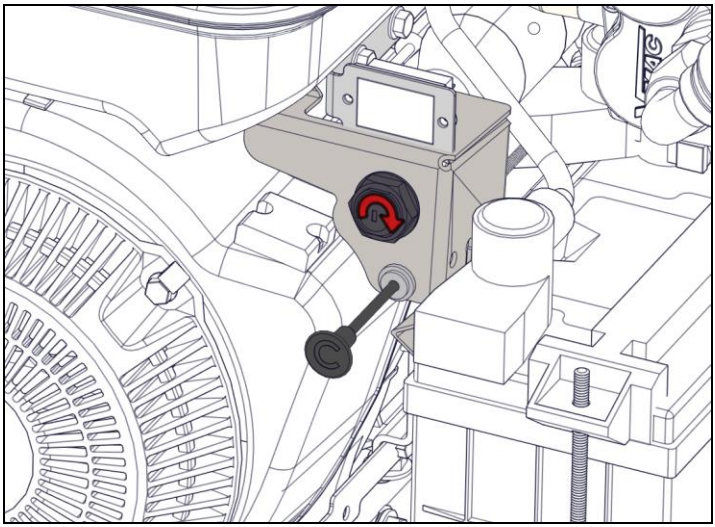


Figure 21 - Key switch

2) Pull the choke to the “ON” position (Figure 22).

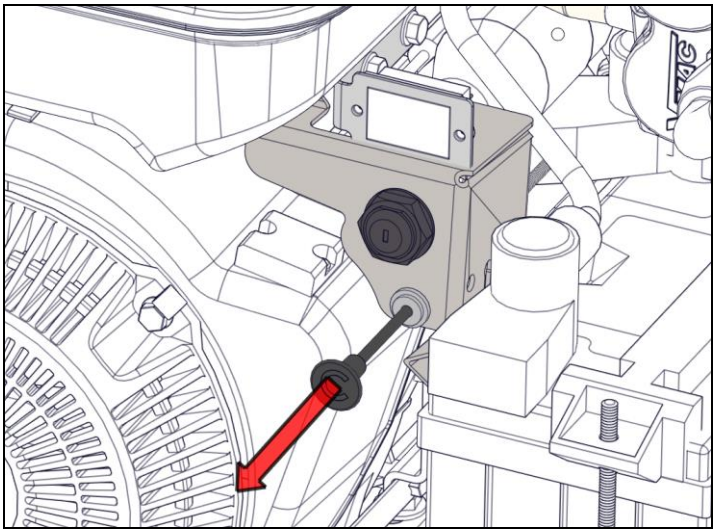


Figure 22 – Choke

3) Pull the recoil starter handle gently until resistance is felt, allow the handle to return to its original position then pull swiftly. Do not pull

out the cord all of the way. Once the engine has started gently return the handle to its original position (Figure 23).

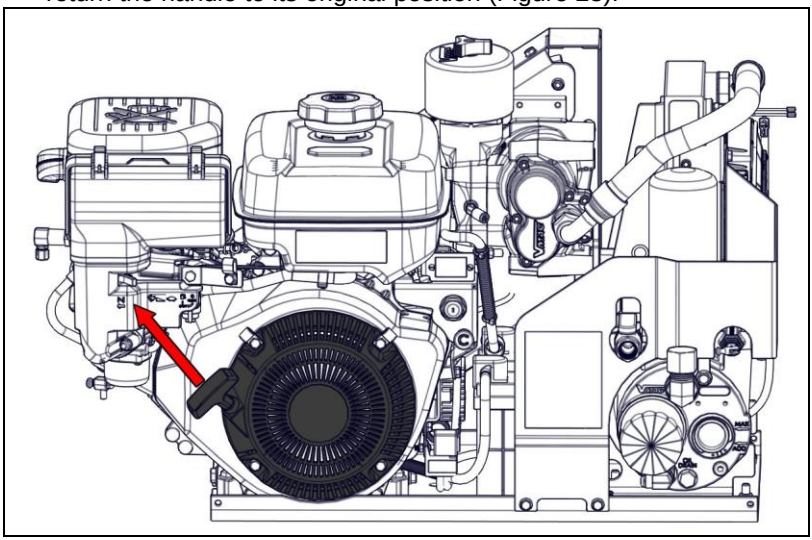


Figure 23 - Recoil starter

4) Once running, push the choke to the off position (Figure 24).

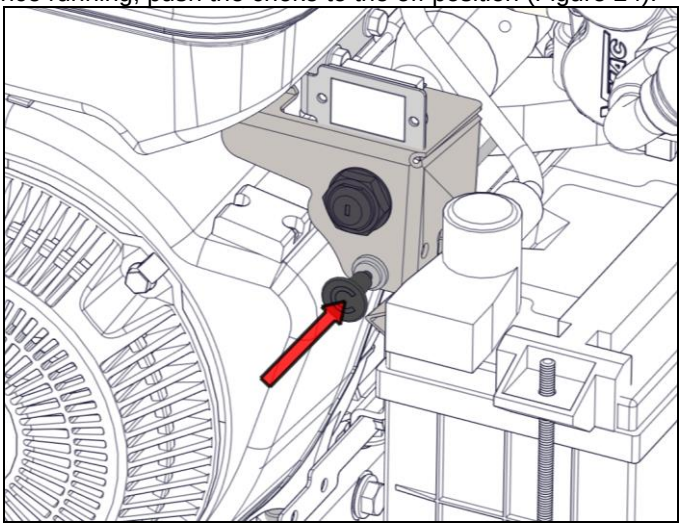


Figure 24 - Choke

Stopping the Gas Drive

The Gas Drive engine may experience a backfire if it is shut off while the engine speed is above idle and the compressor is building air pressure. This is normal and is caused by the load on the engine during shut down.

The Exhaust system is equipped with a spark arrester.

To properly shut off the Gas Drive:

1) Close the air discharge valve or stop use of the air tool.
2) Allow the system to build to full air pressure (factory setting 150 psi) so that the intake valve in the compressor inlet valve closes. At this point the engine will idle down.
3) Allow the engine to run at low idle for 30 seconds.
4) Turn the key to the “OFF” position to fully power-off all electronics.

Improper shut down may cause compressor oil to come out of the compressor air filter.

Ensure the fuel switch is in the “CLOSE” position when the unit is not being run or before moving to a different site. Failure to do this may allow fuel to overfill the carburetor float bowl and flow into the engine’s crank case and/or cylinder causing the engine to hydraulically lock.

Setup, Performance Testing and Adjustments

This system has been adjusted at the factory for general operation. Only the air pressure can be adjusted (explained later in this section).

System operation can be tested using the tools that will be operated by the system or by using an orifice (Figure 25) to simulate tool use. Use a 1/8 in orifice to test for 30 cfm.

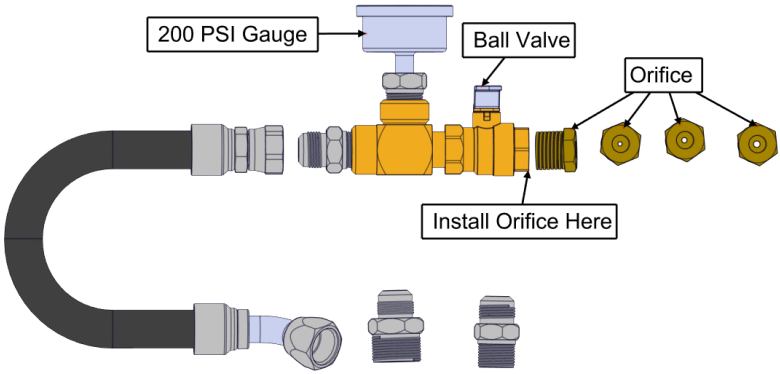


Figure 25 - A700052 Test Tool

1) Install the test tool to the WHASP tank air outlet.

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

Hose reels, etc. should be temporarily disconnected and the test tool connected directly to the outlet of the receiver tank. Long and/or undersized air lines will result in loss of performance.

2) Ensure that the ball valve on the test tool is closed.
3) Start the compressor system and allow the engine to run until it is at operating temperature.
4) Operate the air compressor system until the oil is warm.
5) Observe the pressure gauge. Pressure should be approximately 150 psi (factory setting).
6) Slowly open the ball valve on the test tool and observe the operation. The engine should idle up when the pressure drops to 130 psi (20 psi below system pressure).
7) With the ball valve fully open, the pressure should stabilize at approximately 100 psi (this simulates a tool operating at 30 cfm).
8) Close the ball valve to allow the system pressure to rise.

Engine rpm Adjustment

- **Adjusting the engine speed is not an approved procedure, any damage or performance issues will not be covered under warranty.**
- **Lowering the engine rpm will decrease the cfm output and may cause the engine to stall.**
- **Raising the engine rpm may damage the engine.**

The engine “low idle” and “high idle” screws are set at the factory and do not require adjustment. The cfm output of the compressor is controlled by the engine rpm, and the throttle actuator will automatically raise and lower the engine speed depending on air demand.

NOTE **No operator input is required on the throttle lever.**

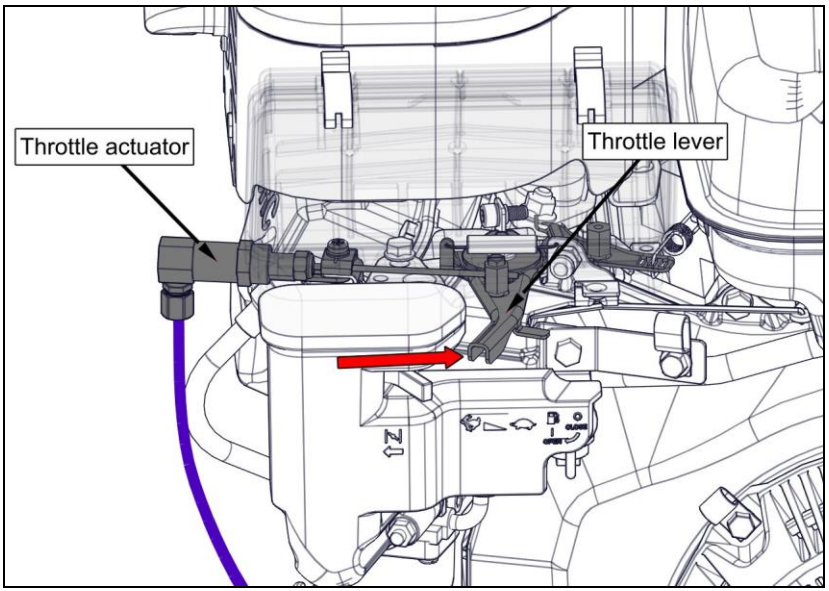


Figure 26 - Throttle Actuator

Recommended Accessories

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

Receiver Tank

The separator/cooler tank (WHASP tank) automatically depressurizes on compressor shut down to protect the compressor from damage that may occur if the compressor starts while pressurized. The use of a receiver tank provides a buffer so that tools may be used immediately upon system startup. The addition of a receiver tank will also reduce the duty cycle of the compressor, and can help the Gas Drive run tools with higher cfm requirements.

For information on installing a receiver tank see the “Air Receiver Tank” section of this manual.

Receiver tanks are available for purchase through VMAC. See the “Accessory Product” page of this manual for more information.

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 VMAC tank outlet.

Pressure regulator and/or lubricator

The compressor can produce air pressures up to approximately 150 psi (1205 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 externally installed to the outside of the pressure supply valve. Failure to regulate the air pressure may cause damage to the tool.

Air Receiver Tank

- **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, relieve the pressure in the air receiver tank.**
- **If an air receiver tank is used with this system, the following installation procedure must be used to prevent damage to the system.**

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

If the plumbing downstream from the Gas Drive has no leaks, a 6 gallon air receiver tank is adequate. If an air receiver tank is used with this system, the line to the air receiver tank must be installed as high as possible (not in the bottom of the tank) to prevent water from filling the line (Figure 27).

Failure to observe these requirements will result in damage to the system.

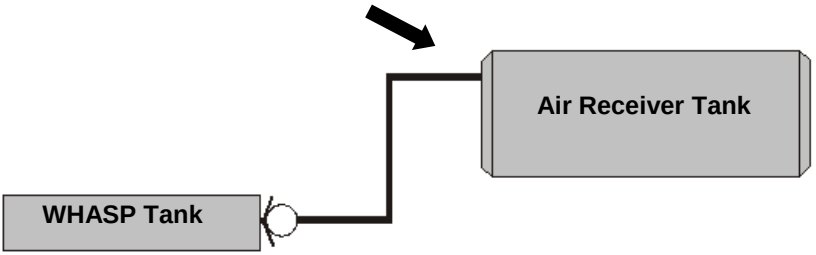


Figure 27 - Receiver Tank

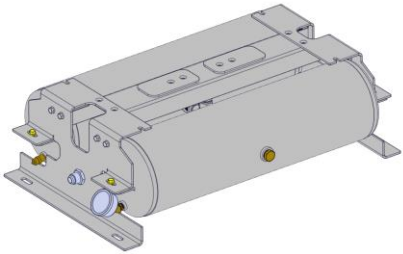
The VMAC WHASP tank has a built-in check valve at the outlet port, an additional check valve is not required for use with an air receiver tank. Use of an additional check valve may cause erratic performance.

Accessory Products from VMAC

Remote Control Panel

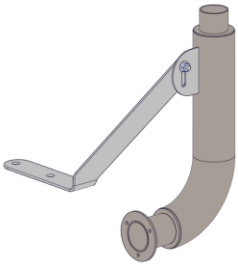
Part number: A500182
Remote panel with a 10 ft extension for key switch, hour meter, choke and unloader valve.

Low Profile Air Receiver Tanks



Part number: A500037 / A500183
Dual 6-gallon air receiver tanks with G30 mounting frame that includes gauge, fittings, hose, drain and pressure relief valves.

Exhaust Resonator



Part number: A500035
Is available

Eliminator Aftercooler

Part number: A800070
Removes up to 80% of moisture from compressed air. Quick installation, automatic drain and compact design.

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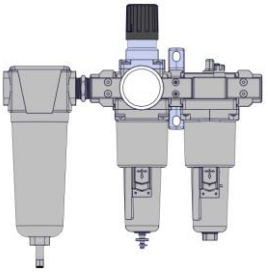
Fax: 1-250-740-3201

Filter Regulator Lubricator



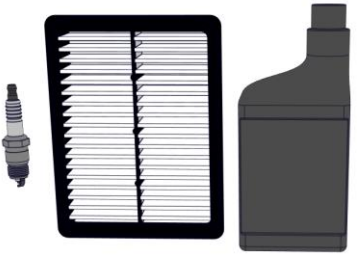
Part number: A700151
Removes water from the air stream. Adds atomized tool oil to lubricate tools. Regulates pressure for longer tool life.

Compressor Service Kits

200 Hour - Part number: A700219
Includes compressor oil, oil filter and air filter.

400 Hour - Part number: A700220
Includes compressor oil, oil filter, air filter, blow-down muffler, and pressure relief valve.

Engine Service Kit



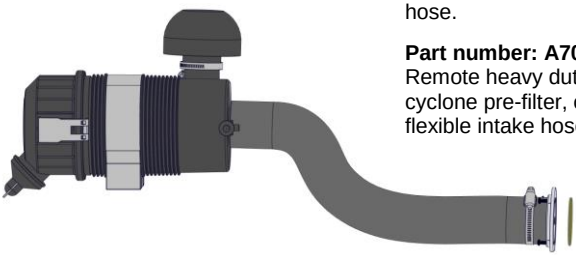
Part number: A500039

100 hour engine service kit includes oil, air filter and spark plug. Using OEM service products will extend the life of the system.

Remote Blowdown Muffler

Part number: A700224
The A700224 WHASP remote mount muffler kit is designed to relocate the blowdown muffler to an external location to reduce operating noise and to ensure that any oil vapor will be safely discharged.

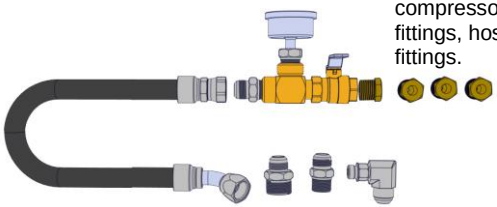
Remote Heavy Duty Compressor Air Filter



Part number: A700136
Remote heavy duty air filter body with compressor adapter and flexible intake hose.

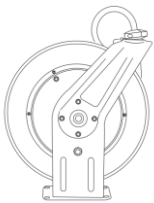
Part number: A700138
Remote heavy duty air filter body with cyclone pre-filter, compressor adapter and flexible intake hose.

Test Tool



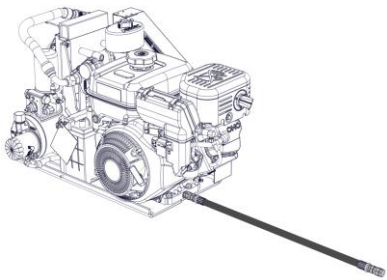
Part number: A700052
Tool to test the output of VMAC air compressor systems, comes with adapter fittings, hose, 200 psi gauge and orifice fittings.

Hose Reel



Part number: A700007
Secure, compact, retractable hose storage in a sturdy reel.

Remote Oil Drain



Part number: A700036
Extends the G30 crank case oil drain to make engine service easier when gas drive is mounted on a service body.

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Maintenance Information

Routine Maintenance

In order to maintain the VMAC warranty the maintenance schedule must be followed. In addition, only genuine original VMAC replacement parts can be used to maintain the system.

The compressor system does not contain reed-valves or other easily fouled, fatigue-prone components. With proper maintenance, the need for premature repair 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 contaminate roller bearings and the rotors in the compressor. Contamination will cause severe, rapid damage to components.

If the compressor is not operated on a regular basis, impact damage and premature bearing failure may occur in the compressor due to vibrations from the vehicle. Operate the system with no air usage (closed system) at least once every 30 days for at least 15 minutes to ensure bearing lubrication and rotation.

Torque Specifications

All fasteners must be torqued to specifications. Use manufacturer's torque values for OEM fasteners. **Apply Loctite 242 or equivalent on all engine-mounted fasteners.** Torque values are with Loctite applied unless otherwise specified.

STANDARD GRADE 8 NATIONAL COARSE THREAD								
Size	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4
Foot-pound (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	3/8	7/16	1/2	5/8	3/4
Foot-pound (ft-lb)	40	60	90	180	320
Newton meter (N•m)	54	81	122	244	434

METRIC CLASS 10.9						
Size	M6	M8	M10	M12	M14	M16
Foot-pound (ft-lb)	4.5	19	41	69	104	174
Newton meter (N•m)	6	25	55	93	141	236

Table 4 - Torque Table

The battery and spark plug wire must be disconnected before attempting any repair or service. Turning the crankshaft may cause the engine to start and cause serious injury.

4) Disconnect the negative battery terminal (Figure 28).

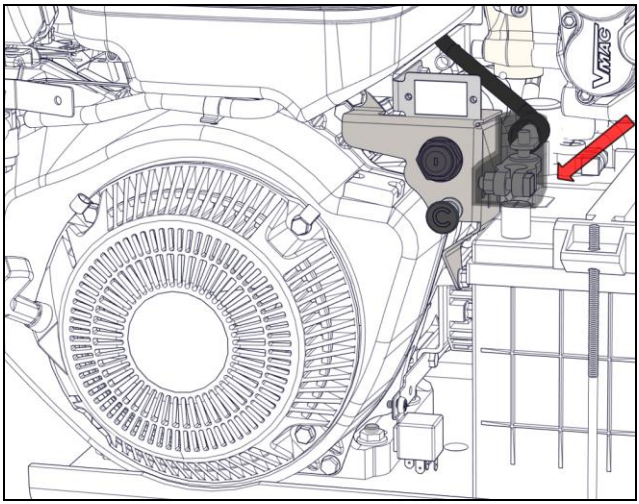

Figure 28 - Negative battery terminal

5) Disconnect the spark plug wire (Figure 29).

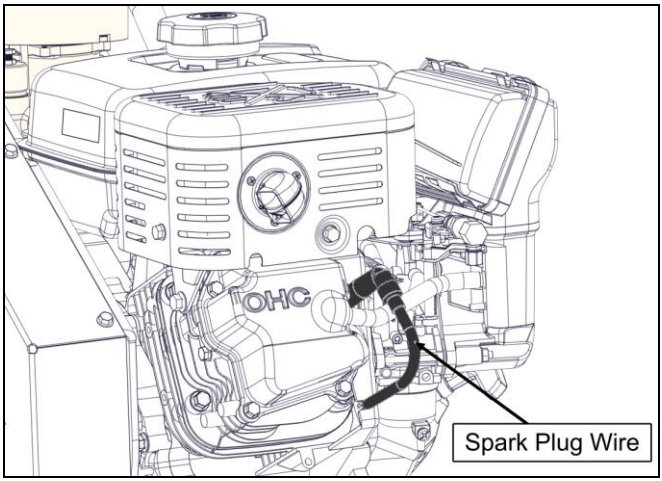

Figure 29 - Spark plug wire

It is impossible to warn of all the possible hazardous consequences that might result from operating or servicing this system. Use your own judgement!

6) Pull on the pressure relief valve ring to ensure the system is depressurized (Figure 30).

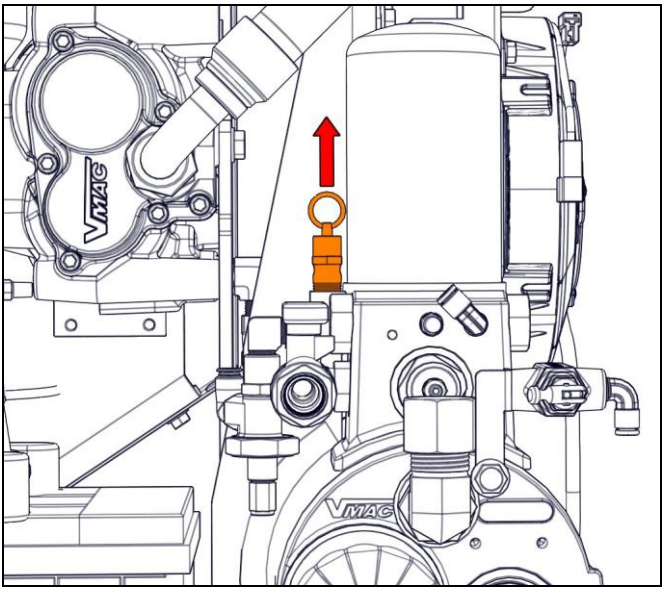

Figure 30 - Pressure relief valve (Shroud removed for clarity)

7) Ensure the engine and compressor system has cooled.

8) Use appropriate personal protective equipment, particularly gloves and eye protection.

9) Wash skin with soap and clean water after performing repair or service. Compressor and engine oil may cause skin irritation.

10) Fill out the appropriate maintenance and repair section of this manual.

11) Test the system after completing any repair or service.

Maintenance Schedule

Use only VMAC recommended service or replacement components.

To ensure good performance and long service life, the following maintenance schedule should be adhered to.

The hours indicated are those displayed on the hour meter. Service should be performed at whichever interval occurs first.

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

Every time before start up:

- Check engine and compressor air filter.
- Check level and condition of compressor oil.
- Check level and condition of engine oil.
- Check hoses and tubes for damage or wear.
- Inspect drive belt.
- Inspect blow-down muffler.

Every 6 months or 200 hours as shown on the hour meter:

- Change compressor oil.
- Change compressor oil filter.
- Change compressor air filter.
- Inspect pressure relief valve.

Every 12 months or 400 hours as shown on the hour meter:

- Change compressor oil.
- Change compressor oil filter.
- Change compressor air filter.
- Change coalescing filter.
- Change pressure relief valve.

Component	Part Number	Interval	Extreme Conditions
Air Filter	3600037	200 hours / 6 months	100 hours
Compressor Oil (4L)	A700094	200 hours / 6 months	100 hours
Oil Filter	9200039	200 hours / 6 months	100 hours
Coalescent Filter	3600088	400 hours / 1 year	500 hours

Table 5 - Service intervals

NOTE **Service intervals are shorter if the equipment is used in dusty or extreme working conditions.**

Inspecting and adding Compressor Oil

	• **Read the Maintenance and Repair safety section before working on the system.** • **Do not attempt to change the oil filter until the oil has cooled. Hot oil can cause severe burns.**
	• **VMAC supplied and approved compressor oil must be used in this system. Failure to use this oil may result in damage to the compressor and will void the warranty.** • **Do not overfill the system. Overfilling the system with oil can flood the sight glass window, make the system appear empty and may cause oil to come out of the blow-down muffler or oil to carry-over.**

1) Ensure the vehicle is parked on level ground and that the compressor system is de-pressurized and cool to the touch.

2) Check the oil level in the sight glass, and ensure that it is between the “MAX” arrow and the “ADD” arrow.

3) If the level is below the “ADD” arrow:
   a) Remove the fill cap on the tank (above the sight glass).
   b) Using a funnel, pour oil into the fill fitting until the oil level in the sight glass reaches the “MAX” arrow.
   c) Replace the fill cap and tighten securely.

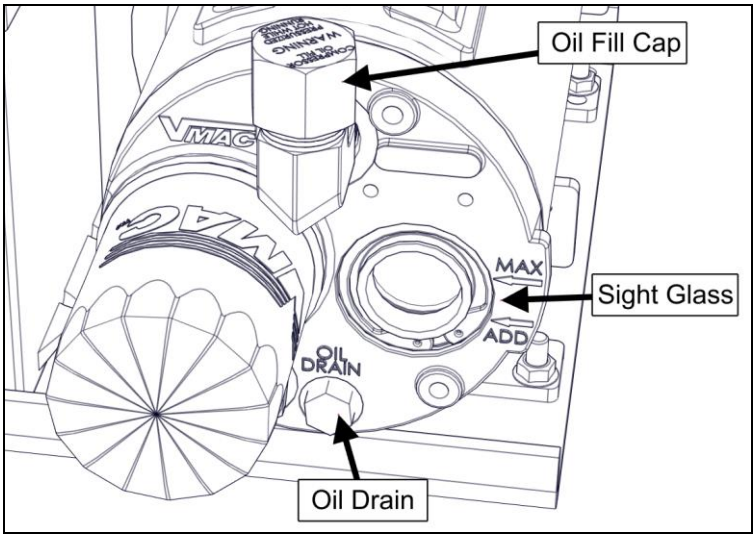

Figure 31 - Oil maintenance

Inspecting the Drive Belt

Read the Maintenance and Repair safety section before working on the system.

Check the drive belt carefully for evidence of glazing, cracks, missing portions of the ribs or damage to the belt edges and surface. If the drive 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 component.

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.

1) Stop the engine, disconnect the negative battery cable and disconnect the spark plug wire.

2) Remove the 5 bolts from the belt guard and remove the belt guard. Use a 3/8 in drive to remove belt tension, install new drive belt.

3) Install belt guard, use blue Loctite on the 5 bolts.

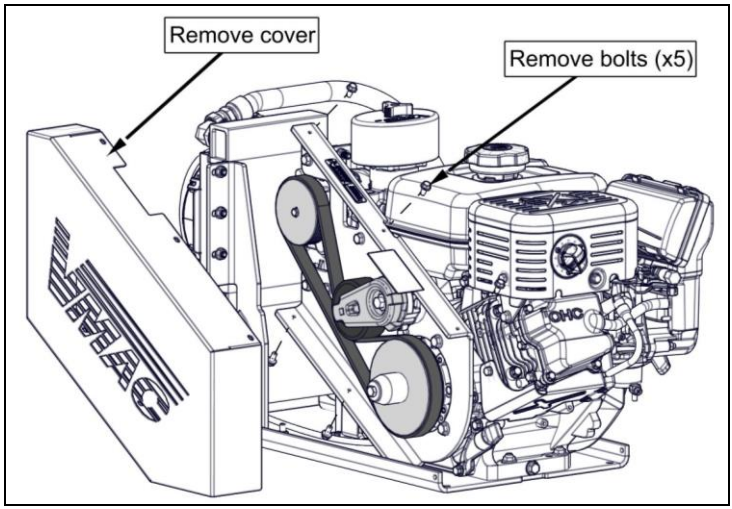

Figure 32 - Belt and cover

Description	Part Number
Tensioner (Ford part number 7C3Z-6B209-D)	3300036
Belt (Gates part number K040438)	1620365

Table 6 - Belt part numbers and tension

Inspecting the Blowdown Muffler

Read the "Maintenance and Repair" safety section before working on the system.

The Blowdown Muffler is a regular service item and must be replaced every 400 hours or one year, whichever interval occurs first.

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

1) Turn the system on and have it reach operating pressure (factory setting 150 psi).
2) Turn the system off and listen for the pressurized air to blow-down through the muffler.
3) If the muffler is showing signs of blockage, contact a local authorized VMAC dealer for a replacement part.

NOTE ***A replacement blow-down muffler is included with the VMAC 400 hour service kit.***

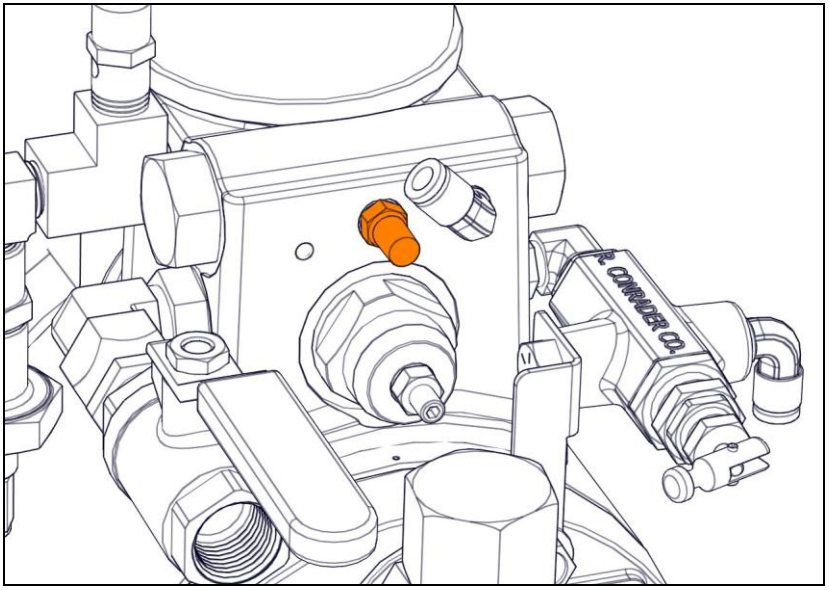

Figure 33 - Blow-down muffler (Shroud removed for clarity)

Inspecting the Pressure Relief Valve

⚠	• **Read the "Maintenance and Repair" safety section before working on the system.** • **Relief valve failure can result in air/oil tank over-pressurization leading to system failure or rupture.**

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

Inspect the pressure relief valve for signs of corrosion or loss of functionality. To test the pressure relief valve functionality:

1) Visually inspect the valve and ensure it is not corroded and that the vent holes are not plugged.
2) Turn the system on and bring it up to operating pressure (factory setting 150 psi). Ensure that no air leaks out of the valve.
3) If the pressure relief valve is showing loss of functionality, contact a local authorized VMAC dealer for a replacement part.

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

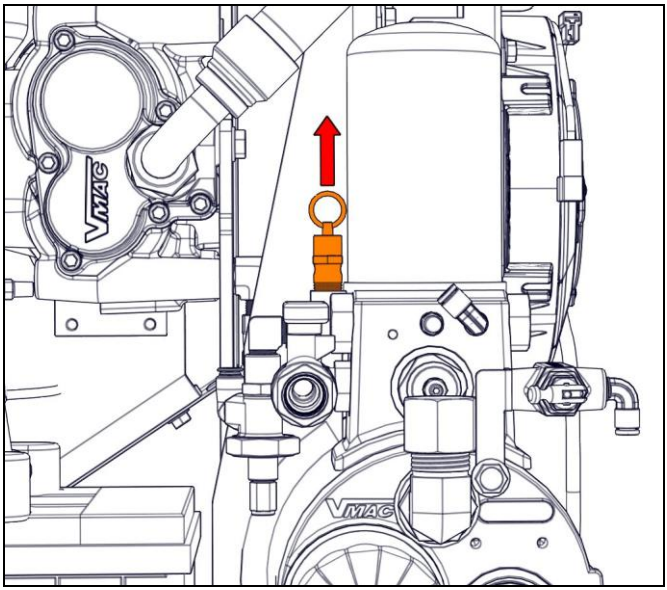

Figure 34 - Pressure relief valve (Shroud removed for clarity)

Replacing the Compressor Air Filter

- **Read the "Maintenance and Repair" safety section before working on the system.**
- **Never run the compressor, drive the vehicle or even allow the vehicle to sit parked without the recommended air filter and filter cover installed.**

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 screw (rotate counter-clockwise), the filter cover and the filter element.
3) Immediately cover the compressor 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.
5) Remove the cloth or masking and install a new air filter. Ensure that the filter fits over the step on the filter plate.
6) Replace the cover and secure it with the cover bolt (rotate clockwise). Do not over-tighten the bolt.

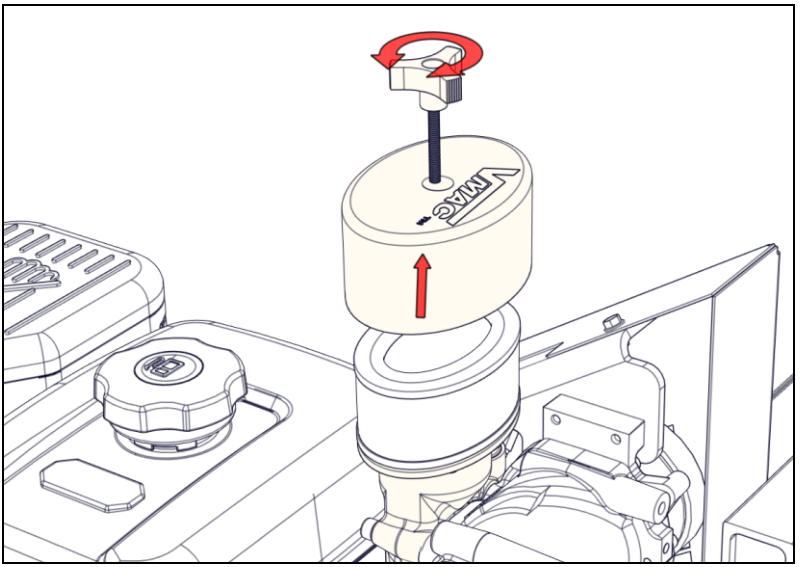

Figure 35 - Compressor air filter and cover

Replacing the Compressor Oil Filter

	• **Read the "Maintenance and Repair" safety section before working on the system.** • **Do not attempt to change the oil filter until the oil has cooled. Hot oil can cause severe burns.**
	• **Always use a VMAC oil filter. VMAC oil filters are designed to work properly at system pressure. Standard automotive oil filters are NOT capable of withstanding system pressure.** • **Never over-tighten the filter, as this may damage the seal or the filter.** • **Ensure the new filter is a genuine VMAC filter, part number 9200039. This oil filter is a high pressure oil filter, not an automotive oil filter, which will rupture under high pressure.**

1) Clean the area around the tank and the filter to prevent contamination.

2) Remove the filter by turning it counterclockwise. Before discarding the filter, ensure 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 (Figure 36,Figure 37).

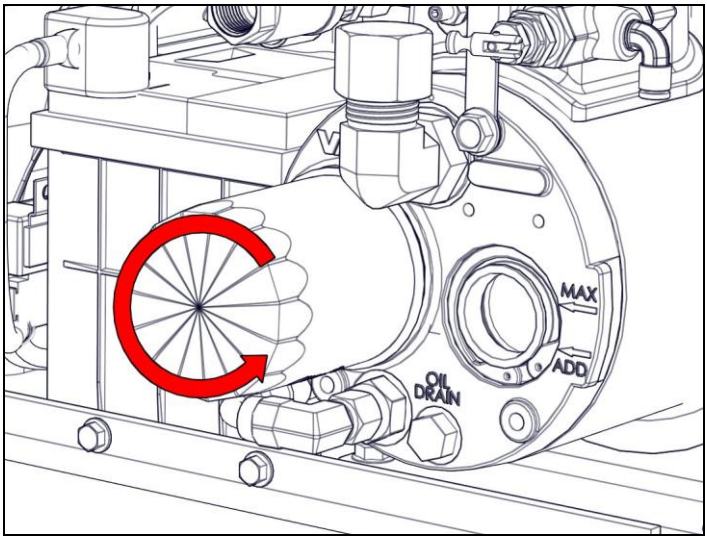

Figure 36 - Compressor oil filter

3) Check the gasket-sealing surface on the front of the tank for contamination, old gasket material, or damage (Figure 37).

NOTE

Check the filter to ensure that the threaded nipple did not unscrew with the filter. If it is in the filter, remove it carefully to avoid thread damage, coat the threads that go into Separator Tank Base with a small amount of blue Loctite and install it into the Tank Base (*Figure 37*).

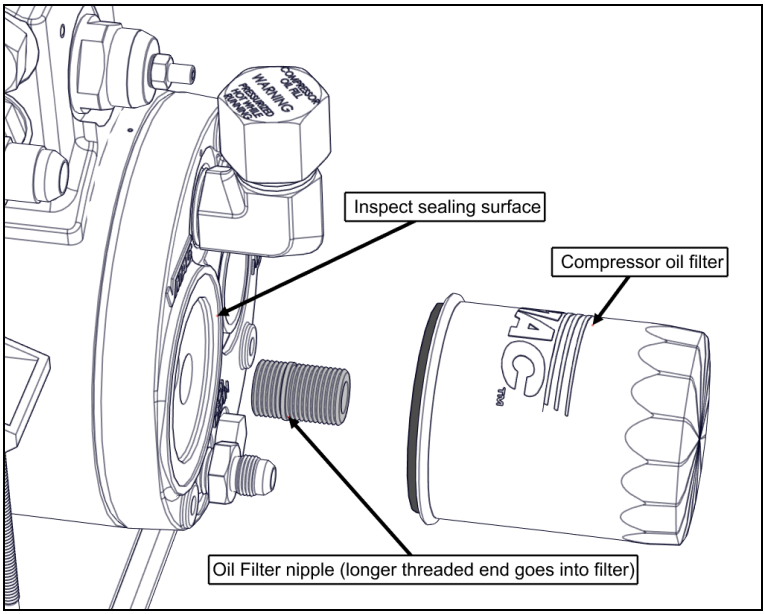

Figure 37 - Compressor oil filter

4) Apply a thin coating of compressor oil to the filter-sealing gasket and fill the filter with VMAC compressor oil.

5) Spin the filter clockwise 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.

Changing the Compressor Oil

	• **Read the "Maintenance and Repair" safety section before working on the system.** • **Do not attempt to change the oil until the oil has cooled. Hot oil can cause severe burns.**
	• **VMAC certified and approved compressor oil must be used. Failure to use this oil may result in damage to the compressor and will void the warranty.** • **Overfilling the compressor oil may cause oil to come out of the blow-down muffler or into the discharge air stream.**

1) Clean the area around the tank and filter to prevent contamination.
2) Remove the drain plug by turning it counter-clockwise and drain the oil into a container large enough to hold at least 4 liters (1 U.S. gal.)
3) Inspect the oil plug Viton O-ring for damage, hardness or defects.
4) Install and tighten the plug.
5) If replacing the oil filter, follow filter replacement procedures.

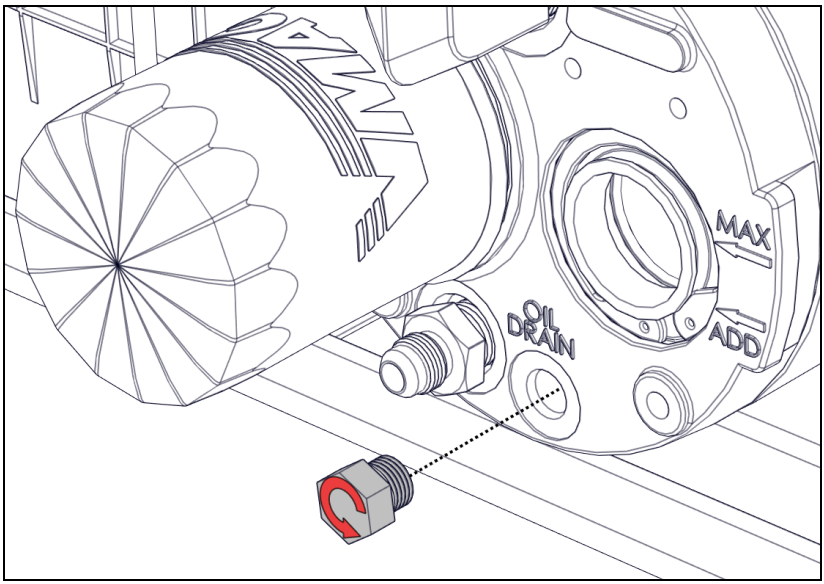

Figure 38 - Compressor oil drain plug

6) Remove the filler cap by turning it counter-clockwise to remove it from the fill fitting and pour VMAC compressor oil into the oil fill fitting on the tank. The air compressor system holds approximately 3 liters of oil (including enough to fill the oil filter). The filter holds 0.3 liters of oil. The compressor holds about 0.5 liters of oil.

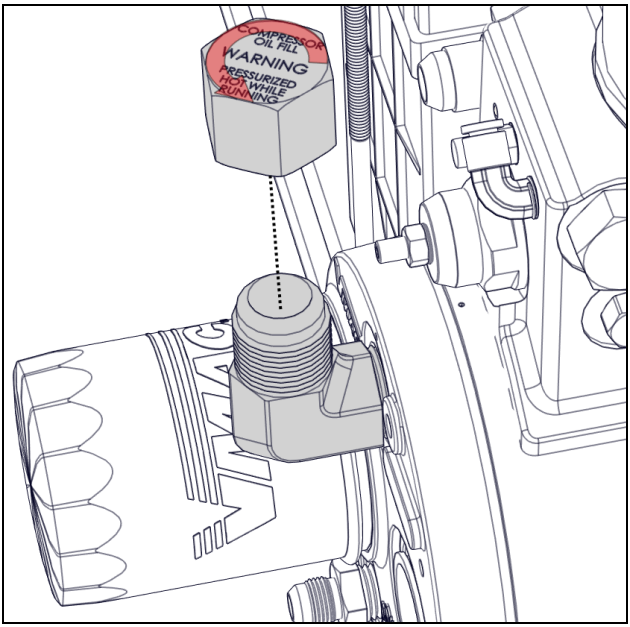

Figure 39 - Compressor oil fill

Do not overfill the system. Overfilling the system with oil can flood the sight glass window and make the system appear empty and may cause oil to come out of the blow-down muffler or oil to carry-over.

7) Check the level at the sight glass at the filter end of the tank. Continue adding oil until the level is correct.

8) Reinstall the fill cap.

9) Start the engine, allow the system to build to pressure (factory setting 150 psi) and go to low idle speed.

10) Turn off the engine.

11) 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. Check for oil leaks.

Changing the Compressor Coalescing Filter

- **Read the "Maintenance and Repair" safety section before working on the system.**
- **Ensure the new filter is a VMAC filter, part # 3600088. This is a high-pressure filter. Use of other filters not rated to the required pressure may cause the filter to rupture.**

NOTE ***The oil does not need to be drained to change the coalescing filter.***

1) Clean the tank in the area of the coalescing filter to prevent contamination.
2) Remove the spin-on type coalescing filter by turning it counterclockwise.
3) Check the gasket-sealing surface of the manifold block for contamination, old gasket material or damage.
4) Apply a thin coating of compressor oil to the filter-sealing gasket.
5) Spin the filter clockwise 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.
6) Operate the system and check for leaks.

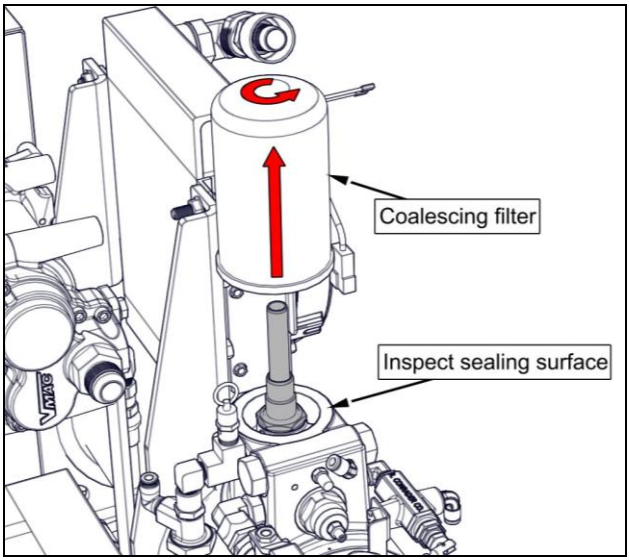

Figure 40 - Coalescing filter

Engine Maintenance Schedule

The VMAC gas drive compressor uses the Subaru EX40 engine. For engine service intervals refer to the “Subaru Engine Manual" supplied with the system. (VMAC P/N: 1901022). Not following the “Subaru Engine Manual" can result in poor engine performance or engine damage***. The following information is provided as a guide only, refer to the “Subaru Engine Manual" for service intervals and instructions.***

After first 20 hours:

- Change engine oil.

Every 100 hours:

- Change engine oil.
- Change spark plug.
- Change air filter.

VMAC sells a 100 hour engine tune-up kit (Part number A500039). See Table 7 for contents.

Description	Part Number	Quantity
Engine oil 10W30 1L	5400729	2
Engine air filter	5800144	1
Engine spark plug	5800145	1

Table 7 - A500039 Contents

Spark Arrester

The gas drive is equipped from the factory with a spark arrester. The spark arrester must be cleaned regularly for optimal engine performance (Figure 41).

For information on servicing the spark arrester refer to the “Subaru Engine Manual" supplied with the system. (VMAC P/N: 1901022). Not following the “Subaru Engine Manual" supplied can result in poor engine performance or engine damage.

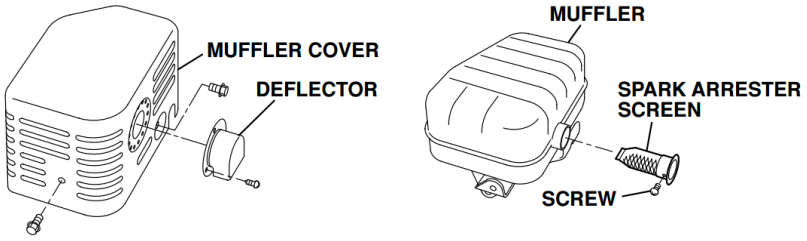

Figure 41 - Spark arrestor
(Image taken from Subaru Owner’s Manual)

Changing the Engine Air Filter

- **Read the “Subaru Engine Manual" before working on the system.**
- **Never run the compressor, drive the vehicle or even allow the vehicle to sit parked without the recommended air filter and filter cover installed.**

1) Clean loose debris from the area around the filter cover to prevent contamination entering the engine.
2) Undo the two latches on the air filter box, remove the filter cover and the filter element.
3) Immediately cover the engine filter 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 engine 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.
5) Remove the cloth or masking and install a new air filter.
6) Replace the cover and secure it with the two latches.

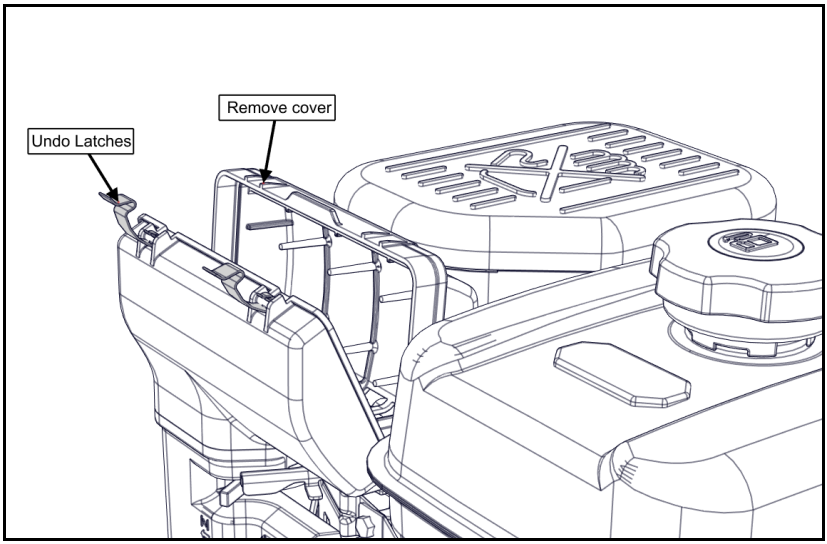

Figure 42 - Engine air filter

Changing the Engine Oil

- **Read the “Subaru Engine Manual" before working on the system.**
- **Do not attempt to change the oil until the oil has cooled. Hot oil can cause severe burns.**

1) Locate the engine oil drain (or drain hose if equipped with optional oil drain extension).
2) Clean the area around the drain plug to prevent contamination.
3) Remove the plug to drain the oil into a container large enough to hold at least 1½ US Gallons (6 liters). After the oil has drained, replace the plug.

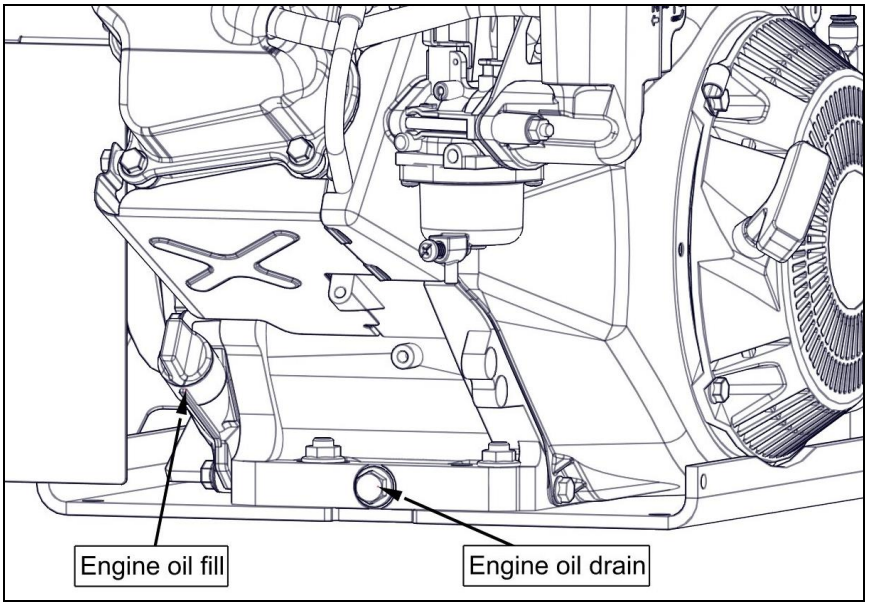

Figure 43 - Engine Oil Drain

Adding Engine Oil

1) Locate the oil fill cap. The oil fill cap is located adjacent to the oil drain.
2) Clean the area around the fill cap to prevent contamination.
3) Add Oil, using an accordion funnel (engine oil capacity is 1.2L).

Problem Diagnostics

- **Read the “Maintenance and Repair” safety section before working on the system.**
- **Read the “Subaru Engine Manual" before working on the system.**
- **Do not use test practices that are potentially harmful to people or the equipment.**

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

- Accurately identifying the problem by operating the system, following safety practices.
- Determining possible causes for the problem by understanding how the system operates.
- Isolating the potential causes by accurate testing using the correct, 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 the manuals provided by VMAC.

Troubleshooting Table

Please isolate the G30 gas drive from all downstream equipment for the following tests.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Compressor building above set pressure (Verified by pressure gauge) or pressure relief valve venting at 200 psi.	Pressure control tube plugged or frozen.	Remove and clear the tube.
	Defective Inlet or Poppet O-ring.	Replace O-ring.
	Defective inlet valve.	Replace inlet assembly.
	Plugged or restricted Pressure Control Tube.	Replace components as needed.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Pressure relief valve venting below 200 psi.	Defective pressure relief valve.	Replace pressure relief valve.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Compressor will not build to set pressure (Verified by pressure gauge).	Pressure relief valve leaking.	Replace pressure relief valve.
	Excessive leakage through Blowdown muffler.	Replace muffler.
	Plugged or dirty compressor air filter.	Replace air filter.
	Drive belt slipping.	Check belt.
	Leaks in air lines.	Replace components as needed.
	Defective downstream equipment (Filter Regulator Lubricator, fittings, hose reel.	Replace as required with suitable components.
	Unloader valve manually activated.	Manually disengage unloader valve.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Engine overheat	Low oil level.	Check oil level with equipment on level ground.
	Cooling intake plugged.	Correct problem.
	High ambient temperatures.	Reduce duty cycle.
	Insufficient ventilation.	Correct problem.
	Spark arrester fouled.	Clean spark arrester.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Engine Stalls	Compressor pressure set too high.	Lower compressor air pressure to factory settings Pressure cannot be set above 150 psi.
	Starting compressor under pressure.	Ensure system is depressurizing on shut down.
	Operating at too high of an elevation.	See section on elevation.
	Low oil in engine.	Add oil to engine.
	Low fuel in engine.	Add fuel to engine.
	Spark plug gap.	Replace spark plug.
	Spark arrester.	Clean spark arrester.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Excessive vibration	Loose fasteners.	Torque fasteners, use appropriate thread locking compound.
	Belt or pulley worn.	Replace components as needed.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Engine does not decrease idle	Throttle tube frozen, plugged or obstructed.	Clean tube.
	Throttle actuator failure.	Replace actuator.
	Discharge valve failure.	Replace discharge valve.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Engine does not increase idle	Throttle actuator failure.	Replace actuator.
	Discharge valve failure.	Replace discharge valve. .
	Unloader valve manually activated.	Manually disengage unloader valve.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Blowdown does not function	Scavenge tube frozen, plugged or obstructed.	Clean tube.
	Blowdown muffler plugged or obstructed.	Replace muffler.
	Blowdown valve failure.	Replace blowdown valve.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Oil comes out of blowdown muffler	Oil level overfilled, system operating at excessive angle.	Check oil level with equipment on level ground.
	Blowdown valve failed or internally contaminated.	Replace blowdown valve assembly.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Excessive oil in the air	Coalescing separator failure.	Replace coalescing filter.
	Clogged scavenge tube or fitting.	Clean or replace.
	High oil level.	Check oil level with equipment on level ground.
	Operating angle in excess of 15 degrees from horizontal.	Reduce operating angle.
	Incorrect start-up/ shut down procedures.	Observe start-up/ shut down procedures detailed in this manual.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Compressor overheat	Low compressor oil level.	Check oil level with equipment on level ground.
	Wrong compressor oil used.	Use VMAC approved compressor oil.
	Oil condition.	Service compressor.
	Plugged compressor oil filter.	Replace oil filter.
	WHASP Cooler not functioning or plugged.	Replace or clean oil cooler.
	WHASP Cooling fan not functioning.	Repair or replace.
	High ambient temperatures.	Reduce duty cycle.
	Oil temperature switch failure.	Replace if defective.
	Restricted oil lines.	Check for kinked or pinched lines.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Engine will not start	Starting with pressure in the compressor.	Check blow-down function.
	Compressor temperature too high.	Diagnose and repair.
	Compressor temperature switch.	Replace switch.
	Compressor temperature relay.	Replace relay.
	Low oil in engine.	Add oil to engine.
	Low fuel in engine.	Add fuel to engine.
	Spark plug gap.	Replace spark plug.
	Engine air intake restricted.	Remove restriction / replace air filter.
	Engine exhaust system plugged or restricted.	Clean or replace exhaust / spark arrester.
	Fuel bowl/filter plugged or restricted.	Clean or replace.
	Battery dead.	Charge or replace.
	Starter failure.	Replace starter or use recoil pull start.
	Fuel switch off.	Turn switch on.

SYMPTOM	POSSIBLE CAUSE	CORRECTIVE ACTION
Engine will not crank.	Fuel switch left on during transport, fuel flooded crank case and cylinder	Remove spark plug. Use recoil starter to drain cylinder. Change oil and filter.

Mechanical Components and Testing

VMAC Test Tool

To properly diagnose the system a VMAC test tool (part number A700052) or equivalent is required. Use a 1/8 in orifice to test the gas drive, the purpose of this orifice is to simulate a tool operating at 30 cfm. Do not run the system without an orifice (Figure 44).

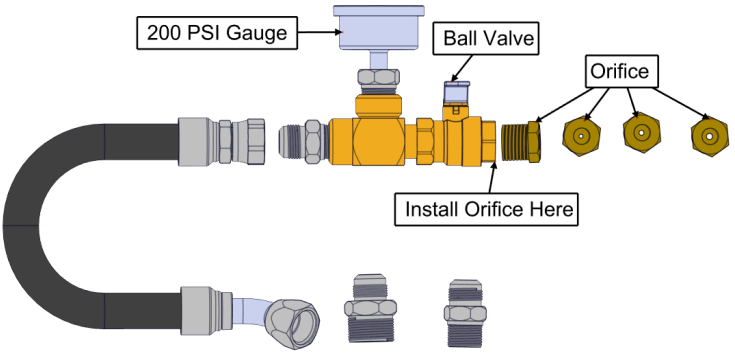

Figure 44 - A700052 Test Tool

PTFE test tool

Construct a test tool with two 1/4 in fittings, a “T” fitting and a 200 psi gauge. This can be used to test the unloader valve and throttle actuator function (Figure 45).

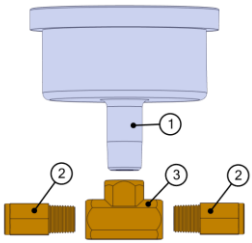

Figure 45 - PTFE Test Tool

Item	Description	Quantity
1	200 psi Gauge	1
2	1/4 in Quick Connect fittings	1
3	T fitting	1

Compressor Regulation and Throttle Actuator Testing

The air pressure (inlet valve control) and engine rpm (throttle actuator) are controlled by the unloader valve. As air pressure from the unloader valve increases, it forces the throttle actuator to reduce engine rpm. Once the system has built to full system pressure (150 psi) the force from the unloader valve will set the throttle to base idle.

NOTE ***The following testing is for systems set at factory pressure (150 psi).***

With the system off and depressurized:

1) Remove the WHASP shroud.
2) Remove the ball valve fitting to accommodate the test tool.
3) Install a test tool on the system outlet (Figure 46).
4) Use a “T” fitting to install a 200 psi gauge on the 1/4 in throttle tube. (Figure 46).

Start the gas drive, and monitor both pressure gauges:

5) As the pressure indicated on the VMAC test tool gauge reaches 150 psi, the gauge connected to the1/4 in PTFE tube should read 150 psi. *If the pressure on the gauge connected to the1/4 in PTFE tube does not rise, confirm the manual unloader valve has not been adjusted. If the unloader valve has not been adjusted the discharge valve needs to be replaced.*
6) As the pressure indicated on the gauge connected to the1/4 in PTFE tube reaches 150 psi, the throttle actuator rod should move outwards and the engine rpm should decrease. *If the throttle actuator rod does not move, diagnose or replace the throttle actuator.*
7) When the system pressure (indicated on the VMAC test tool) reaches 150 psi, the pressure indicated on the gauge connected to the 1/4 in PTFE should hold steady at 150 psi. *If the pressure does not hold, check for air leaks, or a defective throttle actuator.*
8) Slowly open the test tool ball valve, the pressure on both gauges should drop at approximately the same rate. *If the pressures do not drop at the same rate, the air bleed muffler (the muffler connected to the compressor inlet) may be plugged.*

NOTE

To better familiarize yourself with compressor components, completely read through this section of the manual.

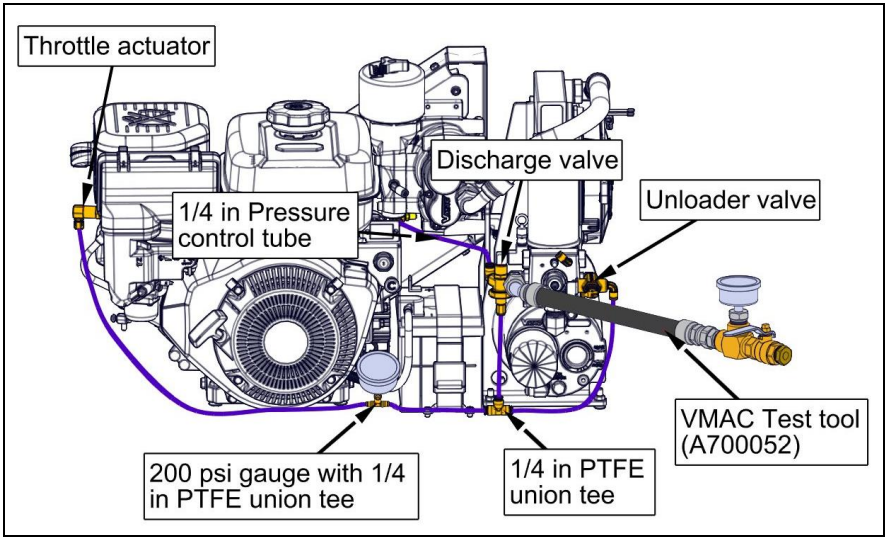

Figure 46 - Test equipment installed

(Air Receiver Tank not shown)

Compressor Connections

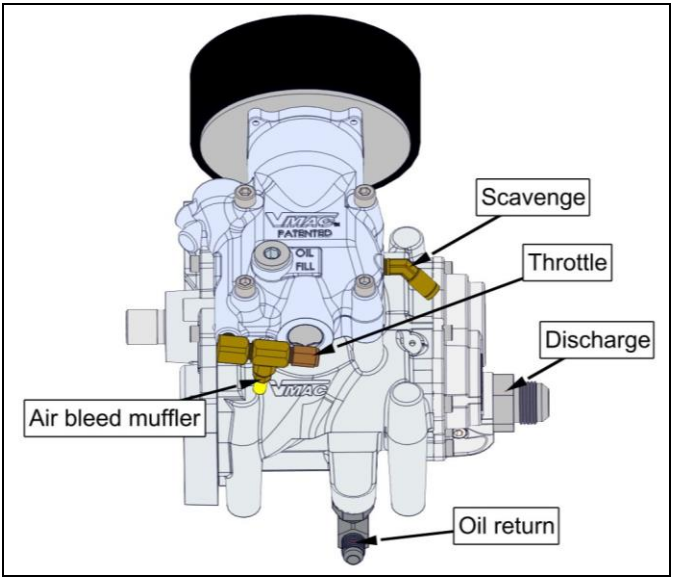

Figure 47 - Compressor connections

Pressure Control Tube

A 1/4 in PTFE tube (shown in “blue”) connects a fitting on the discharge valve to a fitting on the side of the compressor intake, this provides the system air pressure (factory setting 150 psi) to operate the unloader valve and discharge valve, inlet poppet valve, and throttle actuator (Figure 48).

Scavenge Tube

A 1/4 in PTFE tube (shown in “orange”) connects a fitting on the WHASP tank to the side of the inlet. Vacuum from the compressor pulls the separated oil from the coalescing filter, recirculating the oil in the system (Figure 48).

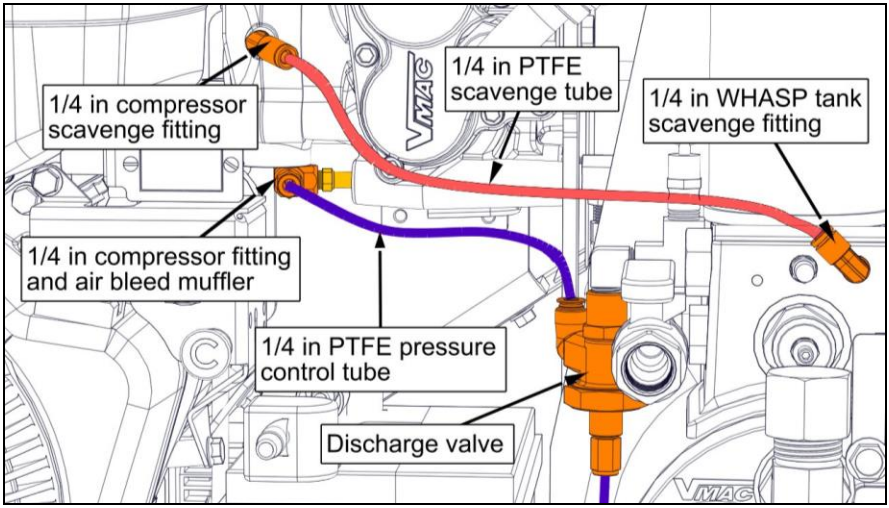

Figure 48 – Pressure control and scavenge tube

Throttle Tube

A 1/4 in PTFE tube (shown in “blue”) connects the 1/4 in fitting on the inlet valve over to the discharge valve. A second 1/4 in PTFE tube connects the discharge valve, the unloader valve and the throttle actuator via a tee fitting (Figure 49).

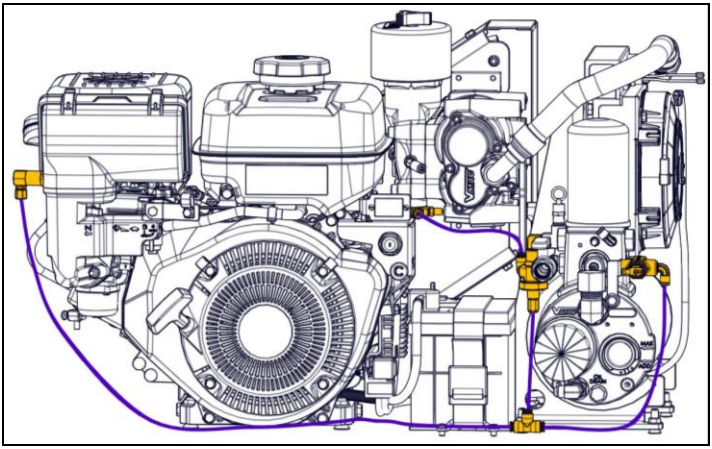

Figure 49 - Throttle tube (Mounting plate removed for clarity)

Throttle Control

The engine rpm is controlled by the throttle actuator which is operated by an air pressure signal from the unloader valve.

As the unloader valve activates and sends a signal to close the mechanical discharge, air pressure travels from the unloader valve to the throttle, signaling an increase in engine speed. As the air pressure reaches 150psi, the unloader valve sends a signal to open the discharge valve, closing the air intake poppet and allowing the throttle control to reduce the engine speed accordingly.

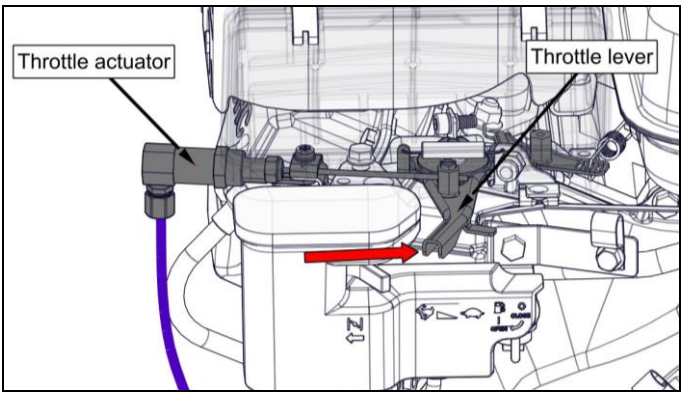

Figure 50 - Throttle actuator

Inlet Poppet Valve

If the Inlet or Poppet O-ring is damaged or missing, the compressor may overpressurize and may cause a compressor oil leak.

The air pressure (built by the compressor) is controlled mechanically by the compressor inlet poppet valve.

- If the poppet valve is open the compressor will build air pressure (Figure 51).

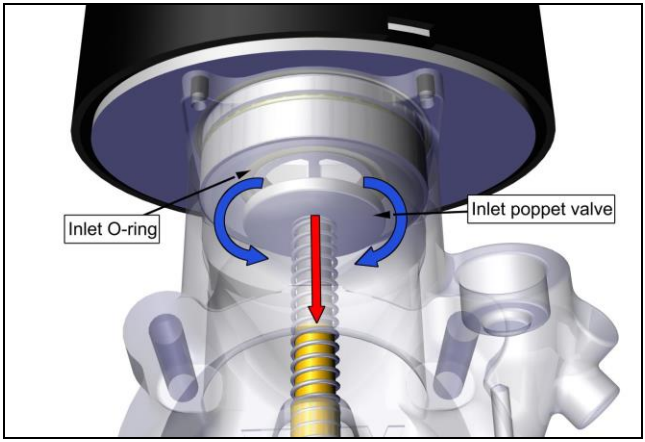

Figure 51 - Poppet valve open

- If the poppet valve is closed the compressor will not build air pressure (Figure 52).

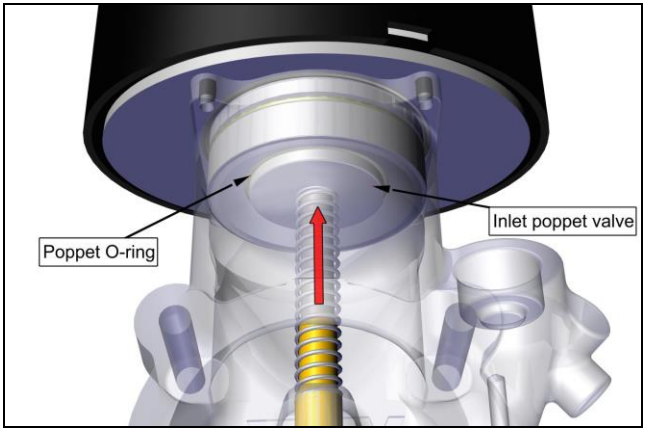

Figure 52 - Poppet valve closed

A 15 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.

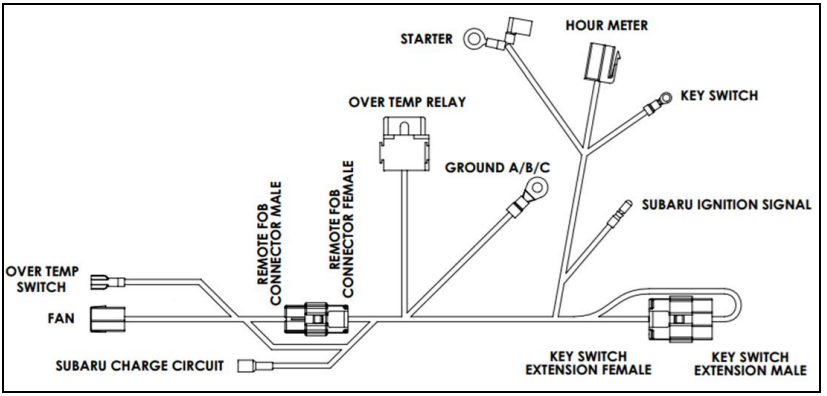

Figure 53 - Electrical schematic

Electrical Components

- Over-temperature switch.
- Over-temperature relay.
- Electric Fan.
- Key Switch.
- Hour meter.
- Starter.
- Engine igniter.

Fuse

A 15 A fuse protects the Gas Drive electrical system; the fuse holder is located in the wiring harness behind the over-temperature relay next to the battery (Figure 57).

Temperature switch

The temperature switch on the VMAC gas drive is normally closed and becomes an open circuit at 140 °C (290 °F). The temperature switch is located in the top of the WHASP tank cooler (Figure 54).

If the compressor oil temperature exceeds 140 °C (290 °F), the thermostatic switch will disable the engine ignition system, but the cooling fan will remain running as long as the key switch is in the “On” position.

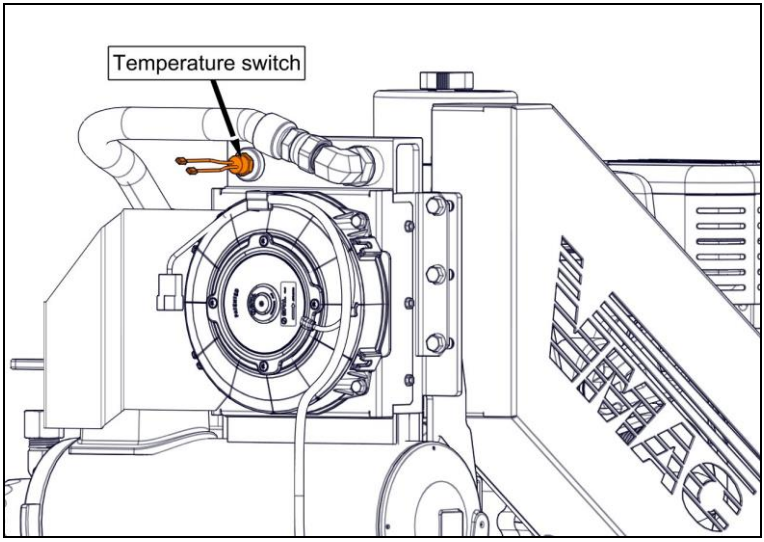

Figure 54 - Temperature switch location

NOTE ***The engine will not run until the temperature switch is closed (the compressor system has cooled).***

Testing

1) Disconnect the two spade wire connectors from the temperature switch (Figure 55).

2) Use a multimeter to measure the resistance through the switch, at room temperature the multimeter should display 0 Ω, or very little resistance.

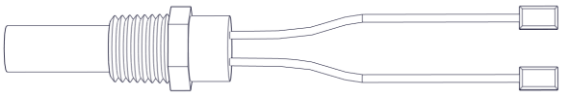

Figure 55 - Temperature switch

Electric Fan

The electric fan should run anytime the key switch is in the run position.

1) Disconnect the fan electrical connector.
2) Use a multimeter to measure the resistance through the fan, the reading should be around 1.4 Ω.
3) With the key switch on the blue wire should have battery voltage (+12 V).
4) Measure resistance on the green wire yellow stripe to the battery negative terminal, resistance should be 0 Ω or extremely low resistance.

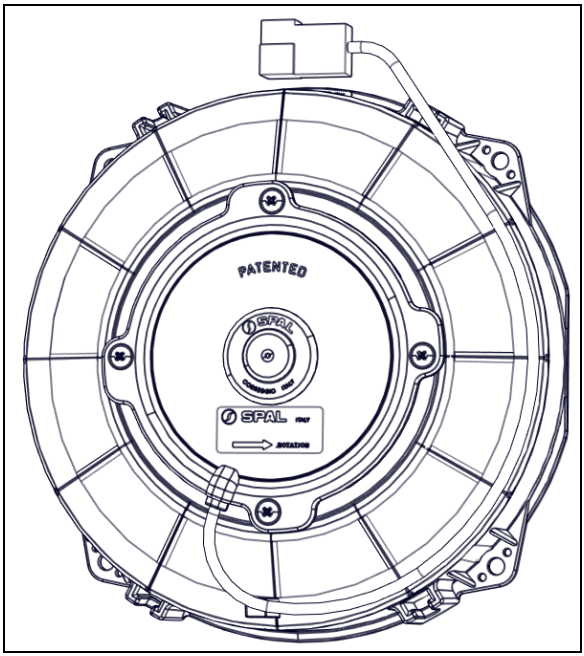

Figure 56 - Electric fan

Over-Temperature Relay

There is only one relay on the Gas Drive located next to the battery, this is used for the over temperature protection circuit. The temperature switch on the VMAC gas drive is normally closed and becomes an open circuit at 140 °C (290 °F).

When the over-temperature switch opens, it de-energizes the over-temp relay coil and grounds the engine ignition circuit, disabling the engine from running or starting, the engine starter will still function.

Relay Pin Connections

- 30 – Ground
- 87A - Ignition (will be an open circuit with the key switch in the run position, and will be grounded with key switch in off position)
- 86 - Key Switched 12V
- 85 - Temperature Switch (normally closed)

Relay Testing

1) Remove the relay from the holder.
2) Use a multimeter to measure the resistance across pin 30 and 87A, this should measure 0 Ω.
3) Apply +12 V to pin 86 and a ground to pin 85, the solenoid should audibly click.
4) Keep +12 V applied to pin 86 and a ground to pin 85. Use a multimeter to measure resistance across pin 30 and pin 87 on the relay. This should measure 0 Ω.

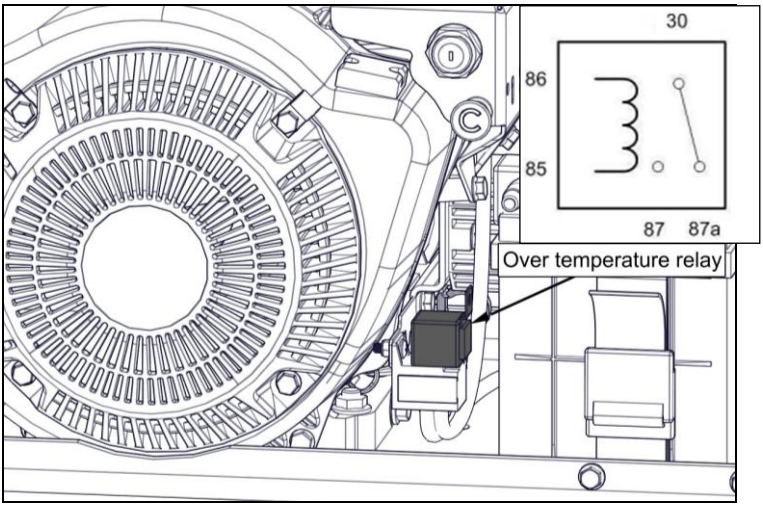

Figure 57 - Temperature relay location and diagram

Battery Replacement

1) Remove the shroud and disconnect the negative battery cable. Undo the nut on the top of the battery hold down and lift the hold down off of the battery, remove the front metal hook (Figure 58).

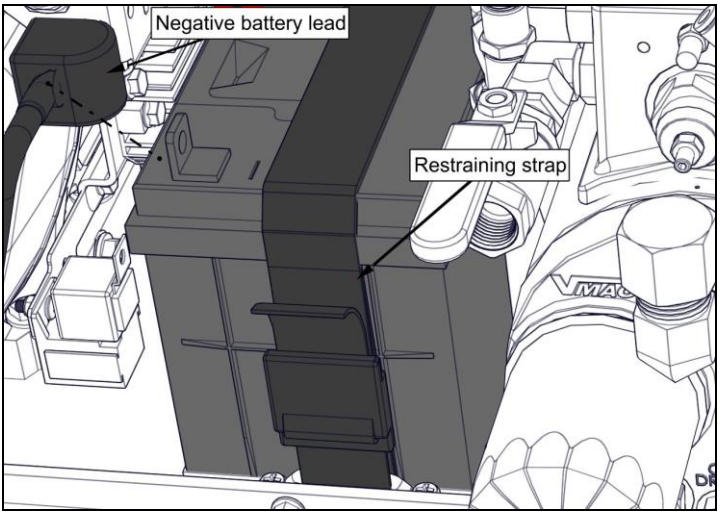

Figure 58 - Battery hold down

2) Pull the battery out of the front of the unit, once it is clear, disconnect the positive battery terminal (Figure 59).

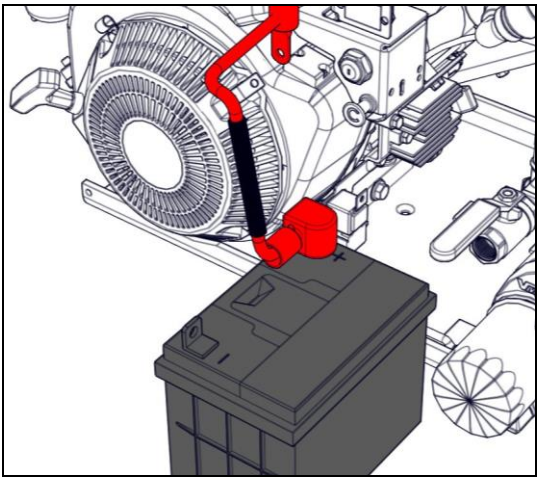

Figure 59 - Battery removal

Compressor Removal

- **Read the “Maintenance and Repair” safety section before working on the system.**
- **Disconnect the battery prior to performing any service. Reconnect the battery once the service has been completed.**

1) Remove the 5 bolts holding the belt guard, remove the belt guard.
2) Remove belt.

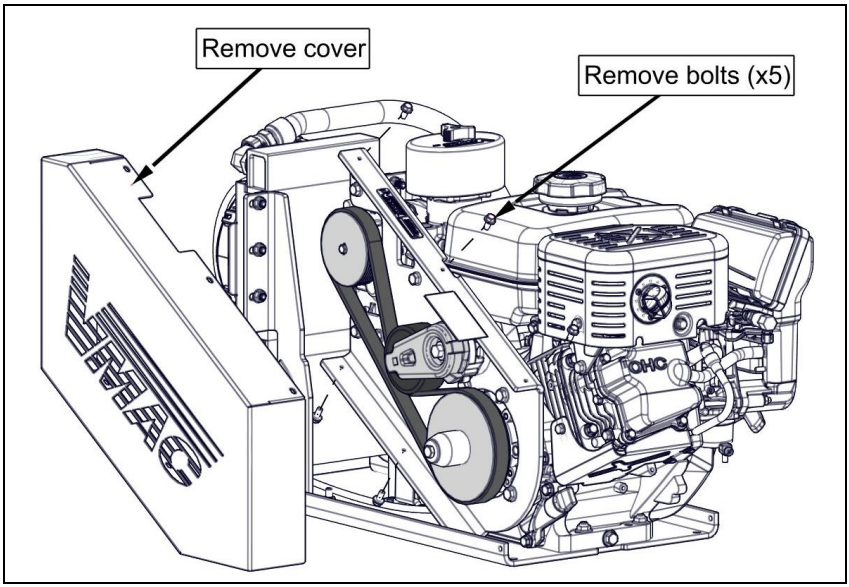

Figure 60 - Belt guard

3) Disconnect the 3/4 in hose from the rear of the compressor.
4) Disconnect the 1/2 in hose from the side of the compressor.
5) Disconnect the 3 clear PTFE tubes from the compressor.

NOTE ***When disconnecting hoses, plug the ends so that contaminants do not enter the system during the repair.***

6) Remove the bolt from the side of the compressor (Figure 61).

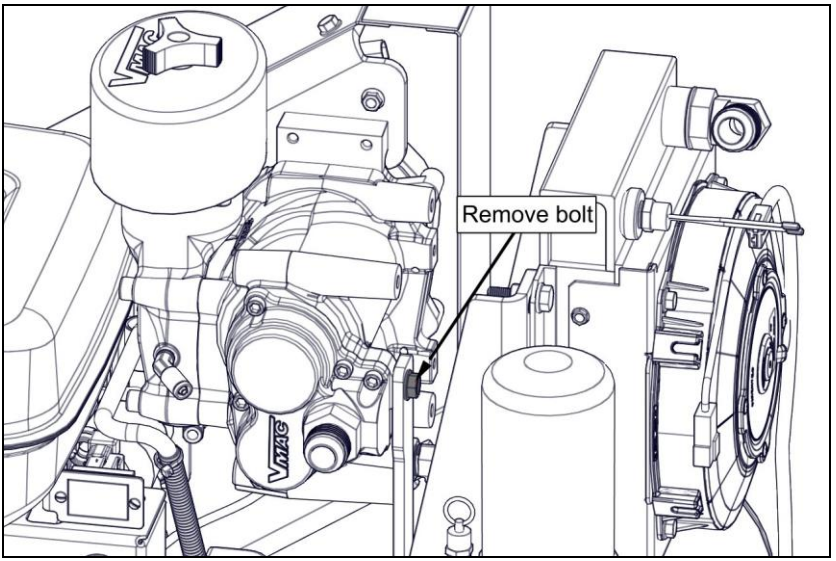

Figure 61 - Compressor side bolt

7) Remove center bolt from the compressor pulley and remove the pulley (Figure 62).

8) Remove 4 compressor bolts from the belt guard (Figure 62).

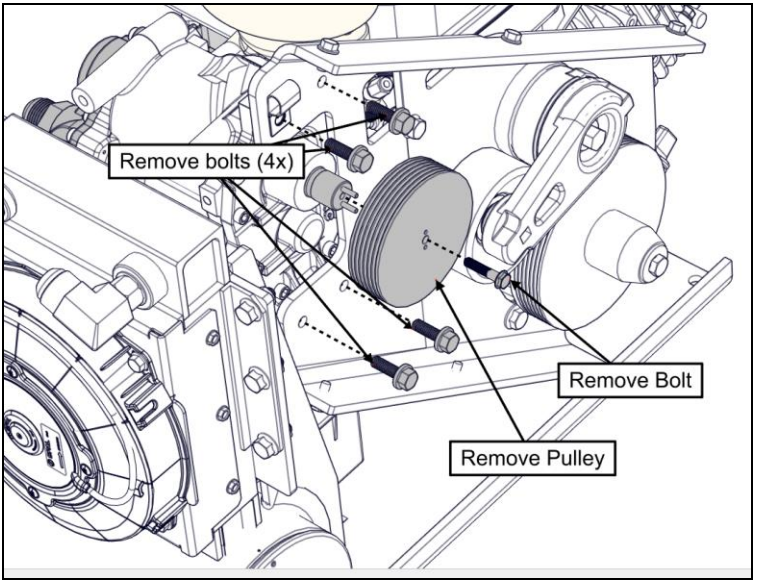

Figure 62 - Compressor front bolts

9) Lift the compressor back and up to remove it (Figure 63).

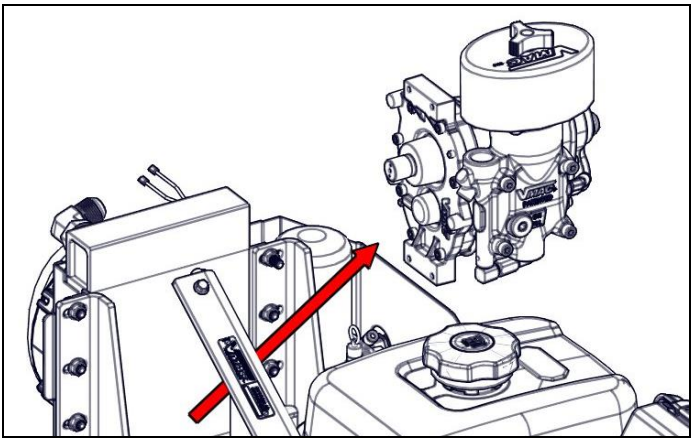

Figure 63 - Compressor removal

Inlet Valve

The compressor inlet valve uses 2 different length bolts. The Longer bolts are 55 mm long and the shorter ones are 50 mm long. Ensure the bolts are installed in the correct position.

Installing the inlet bolts in the wrong location may severely damage the compressor. (Figure 64)

1) Remove and place the compressor assembly on a bench.
2) Remove 4 socket head bolts.
3) Ensure O-ring is not defective or damaged.

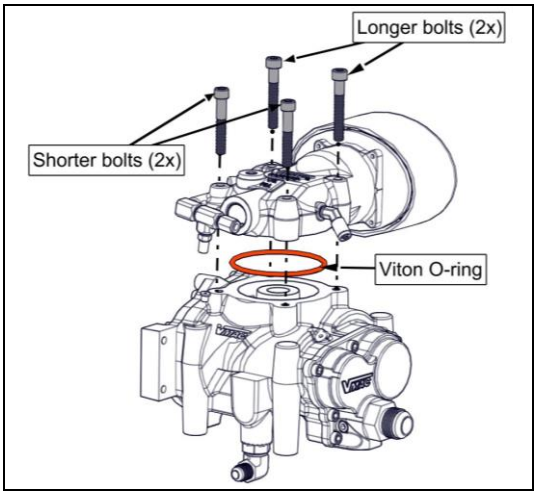

Figure 64 - Inlet valve

Electric Fan

- **Read the “Maintenance and Repair” safety section before working on the system.**
- **Disconnect the battery prior to performing any service. Reconnect the battery once the service has been completed.**

1) Disconnect fan electrical plug.
2) Remove 4 bolts.
3) Use blue Loctite and install the new fan with the 4 bolts.
4) Reconnect fan electrical connector.
5) Test system.

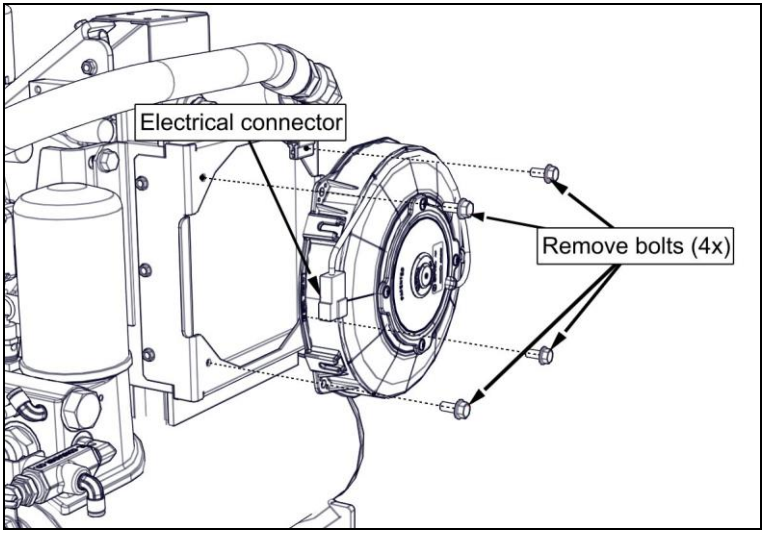

Figure 65 - WHASP fan removal

Temperature Switch Replacement

- **Read the “Maintenance and Repair” safety section before working on the system.**
- **Disconnect the battery prior to performing any service. Reconnect the battery once the service has been completed.**

1) Disconnect the 2 spade terminals from the temperature switch.
2) Remove the temperature switch by rotating it counter-clockwise.
3) Apply thread sealing compound to the new temperature switch.
4) Reconnect the 2 spade terminals to the new temperature switch.
5) Connect battery.
6) Test system.

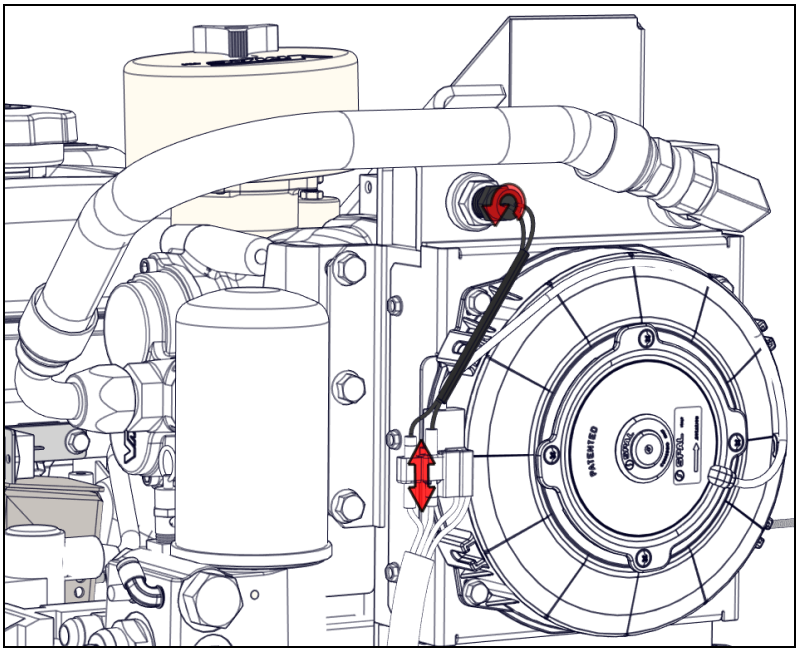

Figure 66 - Temperature switch removal

WHASP Tank Replacement

- **Read the “Maintenance and Repair” safety section before working on the system.**
- **Disconnect the battery prior to performing any service. Reconnect the battery once the service has been completed.**

1) Remove the shroud.
2) Remove the battery.
3) Drain the compressor oil from the WHASP tank.
4) Disconnect the 3/4 in and 1/2 in braided hoses.
5) Disconnect the 1/4 in PTFE tubes.
6) Disconnect fan and temperature switch electrical connectors.
7) Remove 4 nuts from bottom of WHASP brackets.
8) Remove WHASP tank.

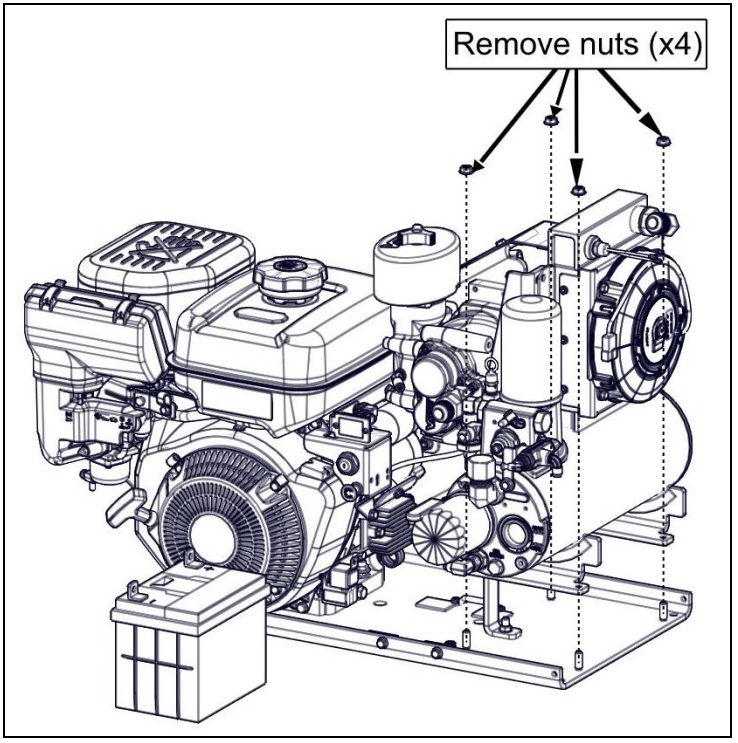

Figure 67 - WHASP removal

Service Records

Engine and Compressor must be serviced as per manufacturer's specifications for the warranty to be considered valid.

Maintenance and Repair Records

System Installation

System ID number: _____

Compressor Serial Number: _____

System Installed by: _____

Address: _____

_____

Date Installed: _____

20 Hour Inspection

Date: _____

Performed by: _____

Address: _____

_____

Parts replaced: _____

or notes: _____

50 Hour Inspection

Date:

Performed by:

Address:

Parts replaced:

or notes:

200 Hour or 6 month service

Date:

Performed by:

Address:

Parts replaced

or notes:

400 Hour or 12 month service

Date:

Performed by:

Address:

Parts replaced

or notes:

600 Hour or 18 month service

Date:

Performed by: _____

Address: _____

_____

Parts replaced _____

or notes: _____

800 Hour or 24 month service

Date: _____

Performed by: _____

Address: _____

_____

Parts replaced _____

or notes: _____

1000 Hour or 30 month service

Date: _____

Performed by: _____

Address: _____

_____

Parts replaced _____

or notes: _____

See note in the Subaru Engine manual supplied with the system. (VMAC P/N: 1901022) at 1000 Engine hours.

Additional service log

Date: _____

Hours: _____

Performed by: _____

Address: _____

Parts replaced _____

or notes: _____

Additional service log

Date: _____

Hours: _____

Performed by: _____

Address: _____

Parts replaced _____

or notes: _____

Additional service log

Date: _____

Hours: _____

Performed by: _____

Address: _____

Parts replaced _____

or notes: _____

Additional service log

Date: _____

Hours: _____

Performed by: _____

Address: _____

Parts replaced _____

or notes: _____

Additional service log

Date: _____

Hours: _____

Performed by: _____

Address: _____

Parts replaced _____

or notes: _____

Additional service log

Date: _____

Hours: _____

Performed by: _____

Address: _____

Parts replaced _____

or notes: _____

Repair Records

Part Replacement or Adjustment Record

Record #1

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #2

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #3

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #4

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #5

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #6

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #7

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #8

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #9

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #10

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #11

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Record #12

Date: _____

Performed by: _____

Part or Adjustment: _____

Reason: _____

Warranty Registration

This form must be **fully** completed and returned to VMAC at the time of installation. Warranty may be void if this form is not received by VMAC within **30 days** of installation.

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

VMAC Dealer Information

Company Name: _____

City: _____ State / Province:_____

Installer Information

Company Name: _____

City: _____ State / Province:_____

Installation Date: _____/_____/_____
Day Month Year

Owner Information

Company Name: _____

Address: _____

City: _____ State / Province:_____

Zip/Postal: _____ Phone #: (____) ____ - _____

Email Address: _____

Vehicle Information

Year: _____ Make: _____

Vehicle Identification Number: _____

Unit #: _____

Product Information

System Identification Number: **G** _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

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Fax: 1-250-740-3201

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