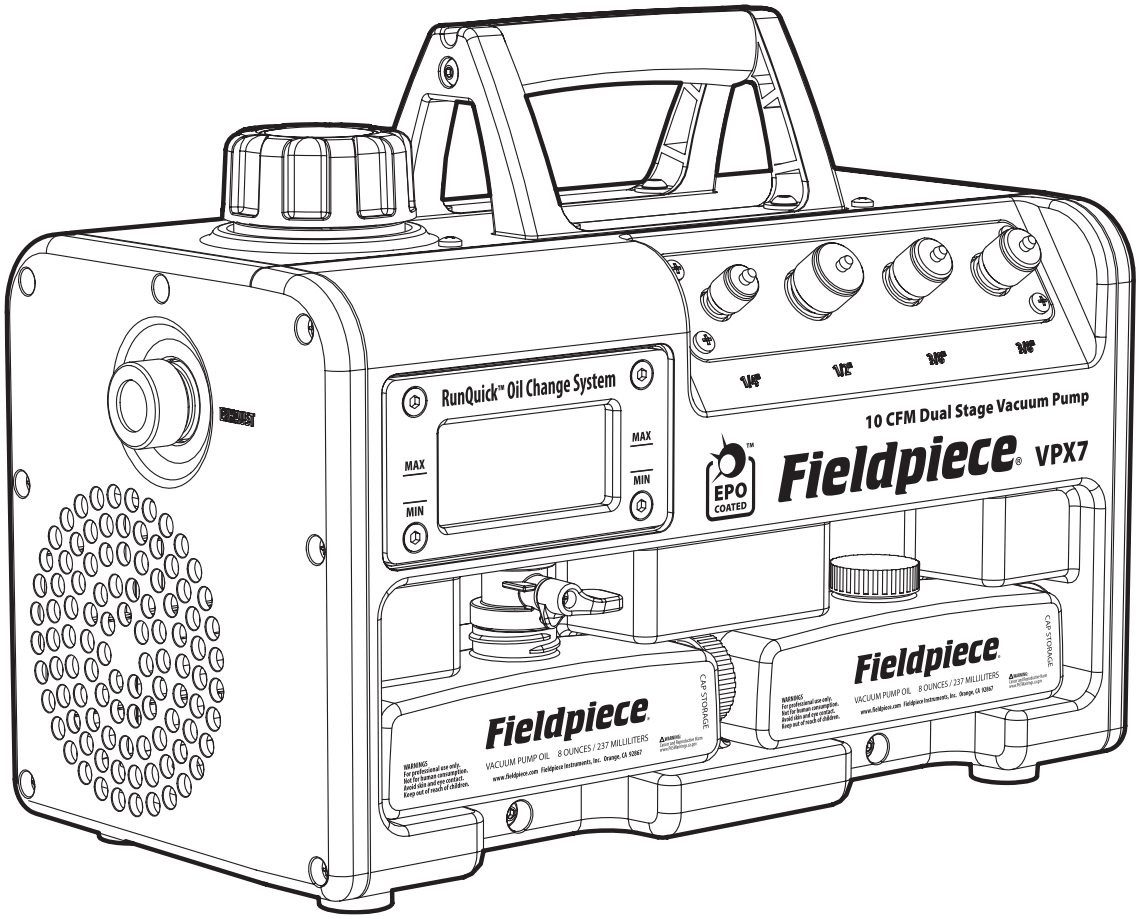
Fieldpiece®

Vacuum Pump with RunQuick™ Oil Change System

OPERATOR'S MANUAL

Models VPX7, VP87, VP67,
VPX7UK, VP87UK



Contents

Important Notice

This is not a consumer machine. Only qualified personnel trained in service and installation of A/C and/or refrigeration equipment shall use this vacuum pump.

This vacuum pump is used for evacuating (drying) refrigerant lines. Fieldpiece model MR45 is available for recovering refrigerant.

Read and understand this operator's manual in its entirety before using to prevent injury or damage to you or equipment.

⚠ WARNINGS

Ensure proper equipment grounding, electrical shock risk.
Do not expose to rain, electrical shock risk. Store indoors.
Do not connect or disconnect when energized, explosion risk.
Do not use to pump liquid refrigerant, explosion risk.
Do not use to pump flammable media, explosion risk.
Inhalation of high concentrations of refrigerant vapor can block oxygen to the brain causing injury or death.
Exposure to refrigerant can cause frostbite.
Oil from the vacuum pump can be hot. Handle with caution.
This machine should only be used for evacuation of refrigerant systems after refrigerant has been removed from the system and the system has been opened to atmosphere. This machine is not to be used as a transfer pump for liquids or any other media; doing so can damage the product.

What's Included

- VP67/VP87/VPX7 Vacuum Pump
- IEC Power Cord
- (2) 8 Ounce Vacuum Pump Oil
- Operator's Manual
- 1 Year Warranty

Certifications

WEEE
Do not dispose through typical waste streams.

C US 601177

UL 1450, CSA 68
UL 121201, CSA 213

CE (VP87/VPX7)

UKCA (UK models)

Description

Performing a proper system evacuation prior to charging directly increases the expected life and efficiency of the system. Fieldpiece vacuum pumps provide a new view at system evacuation.

Good oil is the lifeblood of every evacuation. You need to know the condition of the oil. You need to change the oil easily with no mess. Clearly view the oil condition through the huge oil tank window. The oil backlight helps to see the condition of the oil and if the fill level is correct.

With the RunQuick™ oil change system, you can replace the oil in under 20 seconds without losing vacuum, even while the pump is running. The extra wide base helps prevent tipping and spilling oil. Four inline ports in three different sizes give you tidy hose routing and hose options. Place the power cord on the handle for tangle free storage. Carry the machine to and from the job site easily and well protected.

Features

- **10CFM (VPX7), 8CFM (VP87), 6CFM (VP67)**
- **A2L Ready Safety Certified**
- **RunQuick™ Oil Change System**
  - **Easy View Window and Oil Backlight**
  - **Change Oil Quickly, Even with the Pump Running**
  - **Extra Oil Bottle Storage**
  - **Elevated Oil Drain Ball Valve**
  - **Wide Mouth Fill Port**
  - **Oil Bottle Cap Storage**
  - **Precision Oil Circulator**
- **4 Inline Ports**
  - **(1) 1/4″**
  - **(2) 3/8″**
  - **(1) 1/2″**
- **Two Stage Pump**
- **Gas Ballast Switch**
- **Oil Window LED Indicators**
- **Remote Exhaust Port**
- **Quiet Fan-Cooled Operation**
- **DC Motor (VPX7,VP87)**
- **Operation Down to 95VAC (VPX7,VP87)**
- **Cord Storage Integrated into Rubber Handle**
- **IEC Power Cord and Lock**
- **EPO Coated Aluminum Pump (VPX7)**
  - **Super Lightweight**
  - **Enhanced Durability**

Specifications

Flow Rate: 10CFM (VPX7), 8CFM (VP87), 6CFM (VP67)
Oil Capacity: 8oz (237mL)
Oil Compatibility: Fieldpiece Vacuum Pump Oil
(Highly refined and optimized for proper sealing and lubrication)
Fieldpiece part numbers: OIL8X3, OIL32, OIL128
Oil Backlight: Blue LED
Oil Drain: Ball valve
Port Sizes: (1) 1/4", (2) 3/8", (1) 1/2"
Compressor: Rotary vane, two stage
Motor: 3/4 HP Brushless DC (VPX7/VP87), 1/2 HP AC (VP67)
RPM: 2500 (VPX7/VP87), 3440 (VP67)
Power Source: 120 VAC @ 50/60 Hz 1 phase
Nominal Current Draw: 6 AAC (VPX7/VP87), 5 AAC (VP67)
Ultimate Vacuum at Input Ports: 15 microns
Dimensions: 7.9 inch x 11.7 inch x 16.0 inch
(201 mm x 296 mm x 406 mm)
Weight Empty: 24 lb / 10.9 kg (VPX7), 27 lb / 12.3 kg (VP87),
29 lb / 13.2 kg (VP67)
Operating Environment: 30°F to 122°F (-1.1°C to 50°C)
Hazardous Location: Class I, Division 2, Group D, T4

Safety Information

General

1. This machine is only intended for use by qualified personnel trained in servicing and installation of A/C/Refrigeration equipment.
2. Read and understand this operator's manual in its entirety before using to prevent injury or damage to you or equipment.
3. Always dispose of oil according to local jurisdiction.

Environmental

1. Use only within operating environment specification.
2. Ensure fan opening is clear of debris.
3. Explosion and fire risks:
   Do not use near sewer lines.
   Do not use in poorly ventilated enclosed areas.
   Do not use near gasoline, acetylene, or other flammable gases.
   Do not use to pump hydrocarbons.
   Do not use near flames or sparks.
   Assume all components are pressurized.

Personal Protection

1. Frostbite danger. Be careful using hoses.
2. Use personal protective equipment:
   Wear safety goggles.
   Wear earplugs if using for long durations.
   Wear protective gloves.
3. Oil from the vacuum pump can be hot.
   Use caution while handling.
4. Do not use in poorly ventilated enclosed areas.

Vaccum Pump Protection

1. Ensure clean oil is added to a level between MIN and MAX lines.
2. Do not use to remove refrigerant from a system. Use a recovery machine and filter to remove refrigerant and particles from the system before using VPX7/VP87/VP67 to evacuate the system.
3. Do not use on pressurized systems. Doing so may damage or contaminate your vacuum pump.
4. Do not use on ammonia or salt water systems. Doing so may damage or contaminate your vacuum pump.
5. Store with ports capped to prevent dust from entering.
6. Drain oil after every job and store VPX7/VP87/VP67 empty to prevent spillage and reduced oil life.

Setup

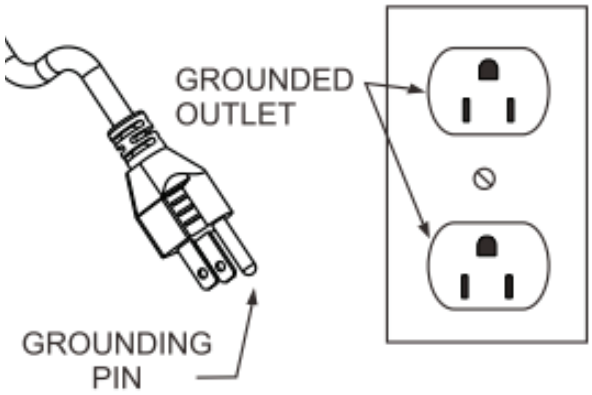
1. Inspect the machine and repair any damaged parts before using.
2. Ensure motor power is switched OFF (left) before connecting or disconnecting power.
3. Ensure power cord is not damaged.
4. Ensure all equipment is grounded.
5. Extension cord options:
   14 AWG or thicker, up to 50 feet (15 m)
   DO NOT USE 18 AWG!
   NOTICE: Risk of Property Damage. The use of an undersized extension cord will cause voltage to drop resulting in power loss to the motor and overheating.
6. Ensure extension cord is grounded, 3 conductor, and is not damaged.

Grounding Instructions

This product must be grounded. In the event of an electrical short circuit, grounding reduces the risk of electric shock by providing an escape wire for the electric current. This product is equipped with a cord having a grounding wire with an appropriate grounding plug. The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

WARNING – Improper installation of the grounding plug is able to result in a risk of electric shock. When repair or replacement of the cord or plug is required, do not connect the grounding wire to either flat blade terminal. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.

Check with a qualified electrician or serviceman when the grounding instructions are not completely understood, or when in doubt as to whether the product is properly grounded. Do not modify the plug provided; if it does not fit the outlet, have the proper outlet installed by a qualified electrician.



Tech Tips

General

1. Vacuum pumps are not refrigerant recovery machines and should not be used for recovering refrigerant.
2. Purge the A/C system with a few psi of dry nitrogen before evacuation to pre-dry the system. This extra step actually saves time overall because it quickly removes a great amount of moisture, oil, and other contaminants before you even connect your pump.
3. Performing a triple evacuation is a great way to ensure a system is dry. The nitrogen flow can help carry moisture with it out of the system. A triple evacuation is as follows:

   1. Purge with nitrogen
   2. Evacuate down to 2000 microns
   3. Purge with nitrogen
   4. Evacuate down to 1000 microns
   5. Purge with nitrogen
   6. Evacuate down to below 500 microns

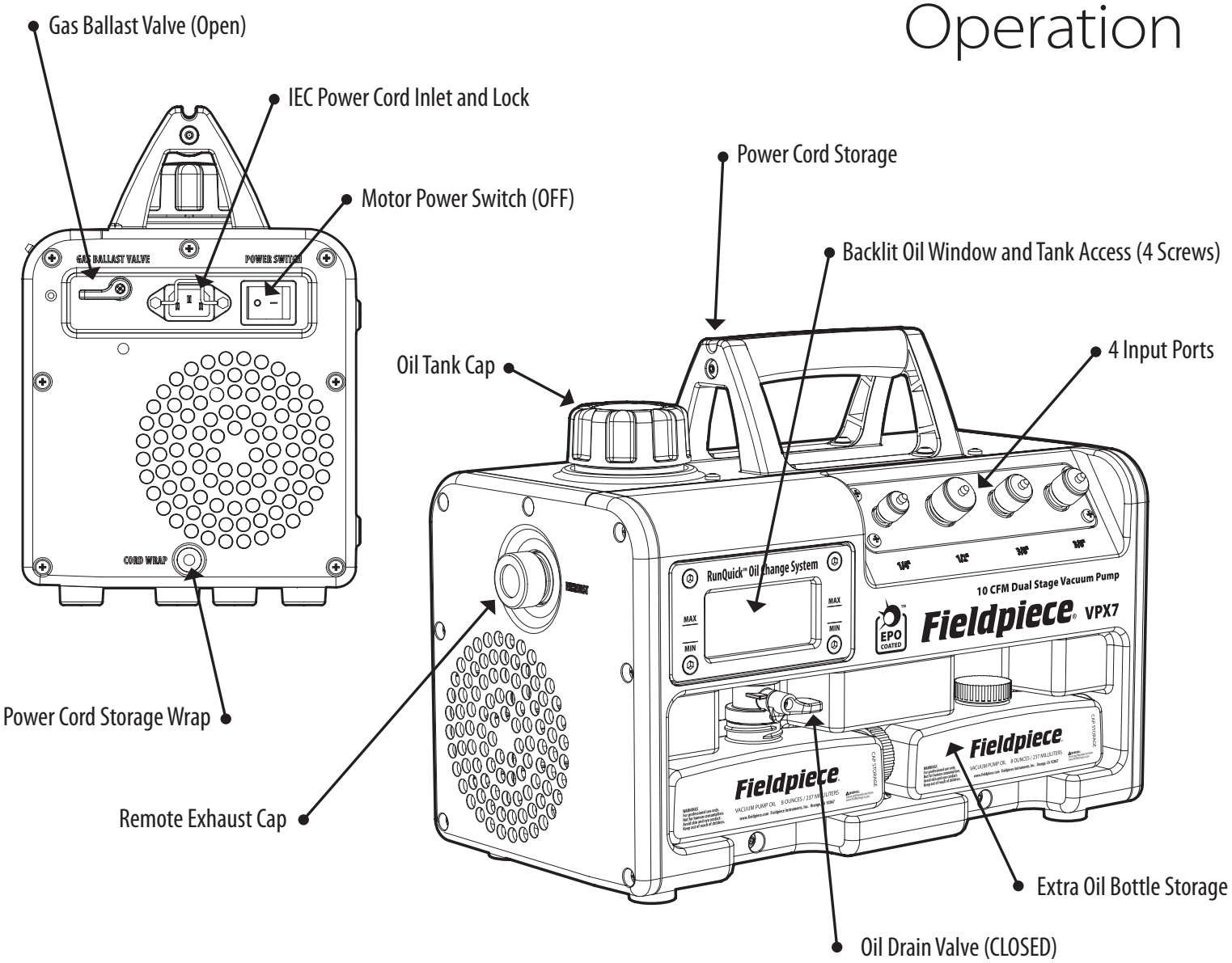
Cold Weather Starts

1. Open an unused input port to ambient for a few seconds until the pump is running.
2. Warm the pump in your truck/home by letting it sit in a warm environment. You can warm the oil in your truck/home before adding it to the pump.

Setup

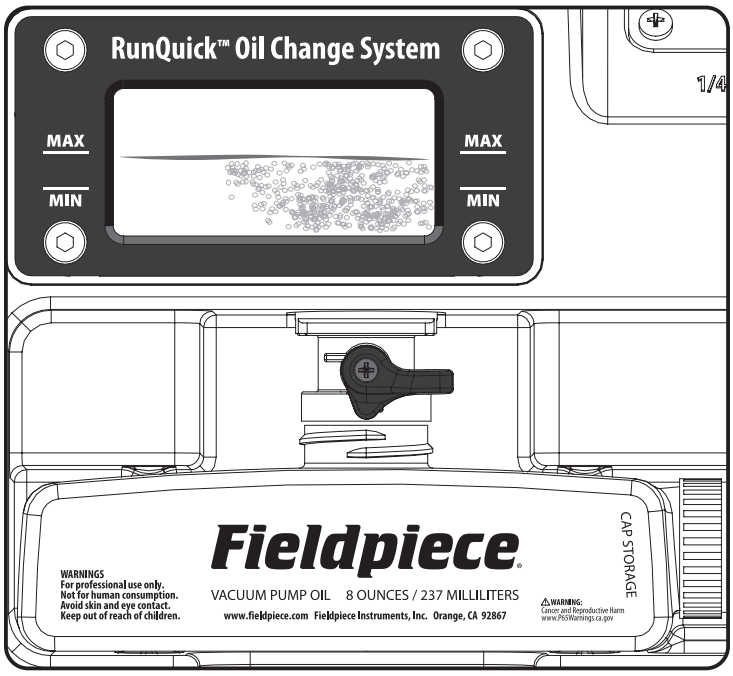
1. Always use fresh Fieldpiece vacuum pump oil. If oil is left in the pump for more than a week, the oil may have absorbed enough moisture from ambient air to affect performance.
2. Refrigerant manifolds can be convenient to charge the system after evacuation, but their hoses and valves can limit or slow evacuation. It's best to use vacuum rated hoses, directly connected to core removal tools at the service ports.
3. If you want to use a manifold, it's best to use a 4 port manifold. 4 port manifolds typically have a larger bore to increase flow. They also isolate the pump from the system and micron gauge without the need of a shut-off valve on the hose.
4. Hoses:
   Short as possible.
   Widest diameter as possible.
   Vacuum rated.
   Core depressors removed.
   Ball valve shut-offs instead of low loss fittings.
   Good seals.
   Replace if worn.
5. Use a vacuum rated Schrader valve core removal tool to temporarily remove valve cores from service ports.
6. Connect multiple hoses to the inline ports on VPX7/VP87/VP67 to further decrease hose restriction and increase air flow.

Operation



RunQuick™ Oil Change System

The only way to create a deep vacuum is to evacuate with fresh oil, especially at the end of the job. The RunQuick oil change system makes this old chore a breeze.



Easy View Window and Oil Backlight

There are a few signs that remind you to change your oil. The visual condition is one of them. If it looks old, change it. You will see tiny air bubbles with fresh oil. Saturated oil will look more opaque.

Elevated Oil Drain Ball Valve

By elevating the oil reservoir and utilizing a fast opening ball valve, we made it easy to drain old oil into the empty bottle without a drop spilled.

Oil Bottle Cap Storage

When you open a fresh bottle of oil, put the cap on the side of the bottle so you can cap the bottle after you drain old oil into it.

Wide Mouth Fill Port

It is easy to hit your target with the wide mouth fill port.

Change Oil Quickly with the Pump Running

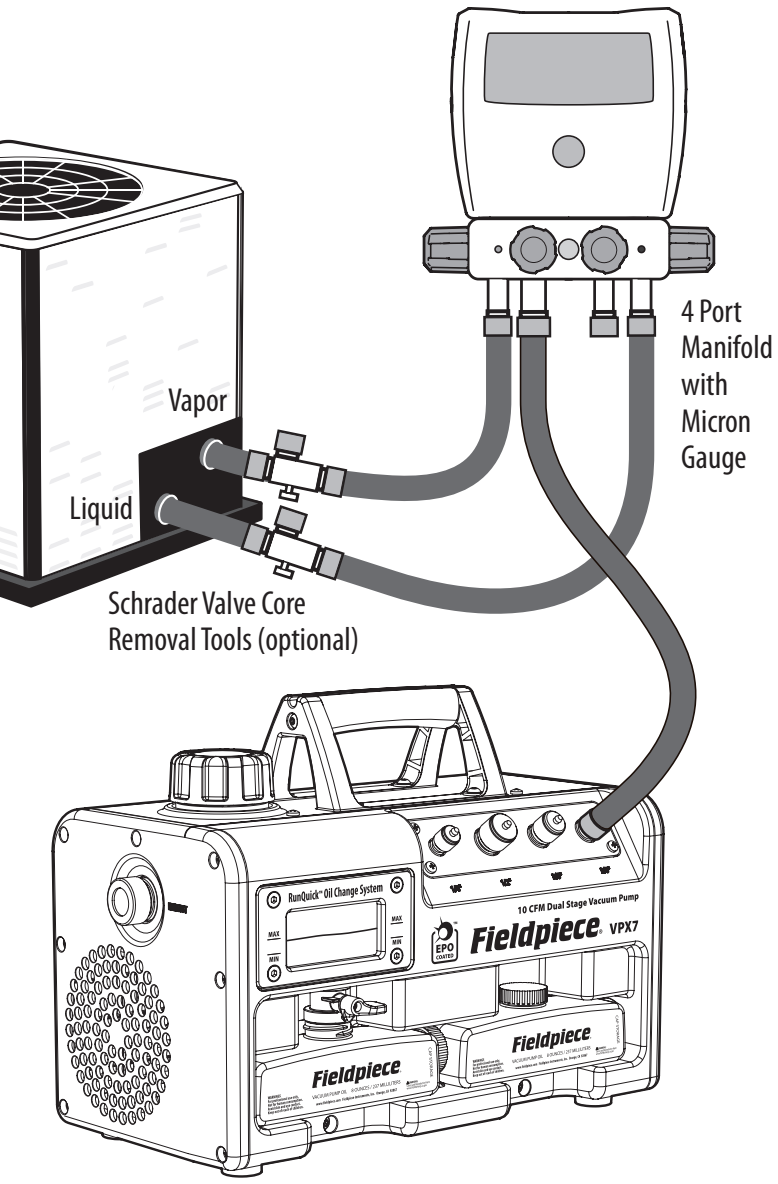
Towards the end of the evacuation is when you need fresh oil the most. The RunQuick system maintains a vacuum for about 30 seconds after you drain the oil so you can drain and pump without any loss of vacuum.

Precision Oil Circulator and Fan

Instead of submerging the pump in excess oil, a small oil pump constantly lubricates targeted sealing zones. The quiet high speed fan cools the heat sinks of the motor and pump.

Spare Oil Bottle Storage

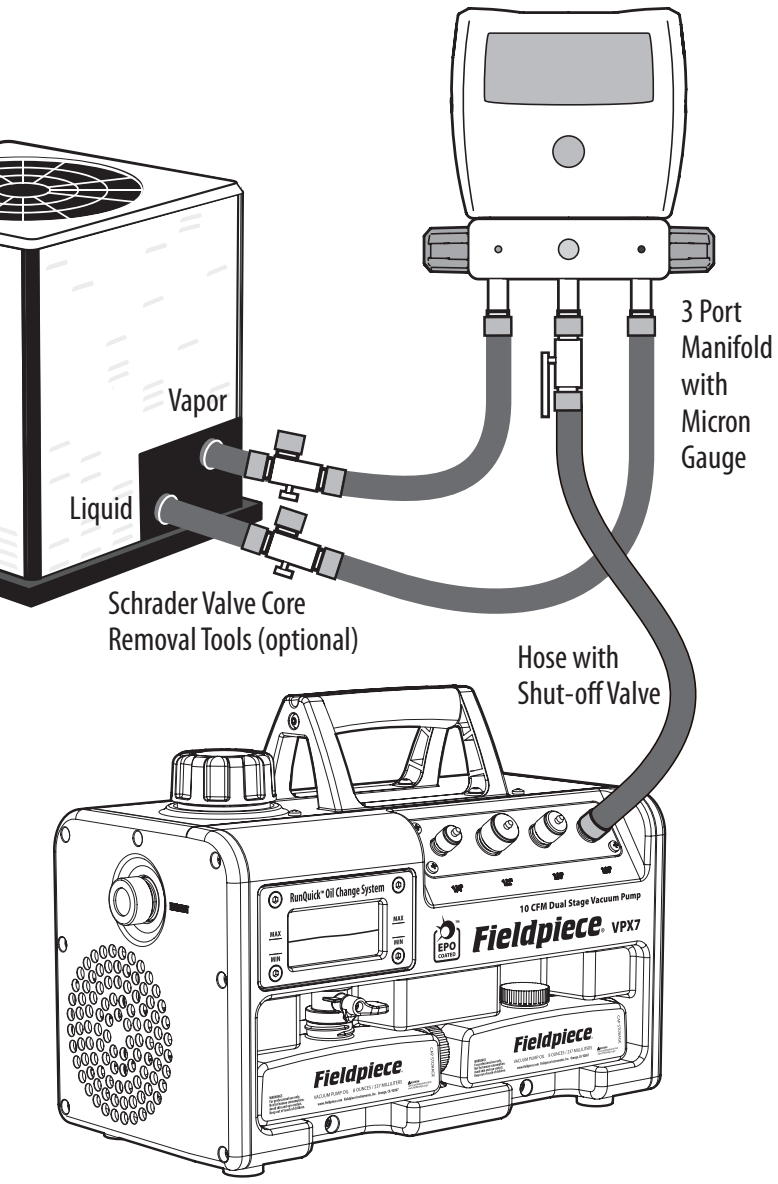
Take an extra bottle to and from the job site so you always have that fresh oil performance bump at the end of the job.



Evacuation with a 4 Port Manifold

This is the most common evacuation method. Read the tech tips (page12) for optimum gauge placement and variations to reduce recovery times.

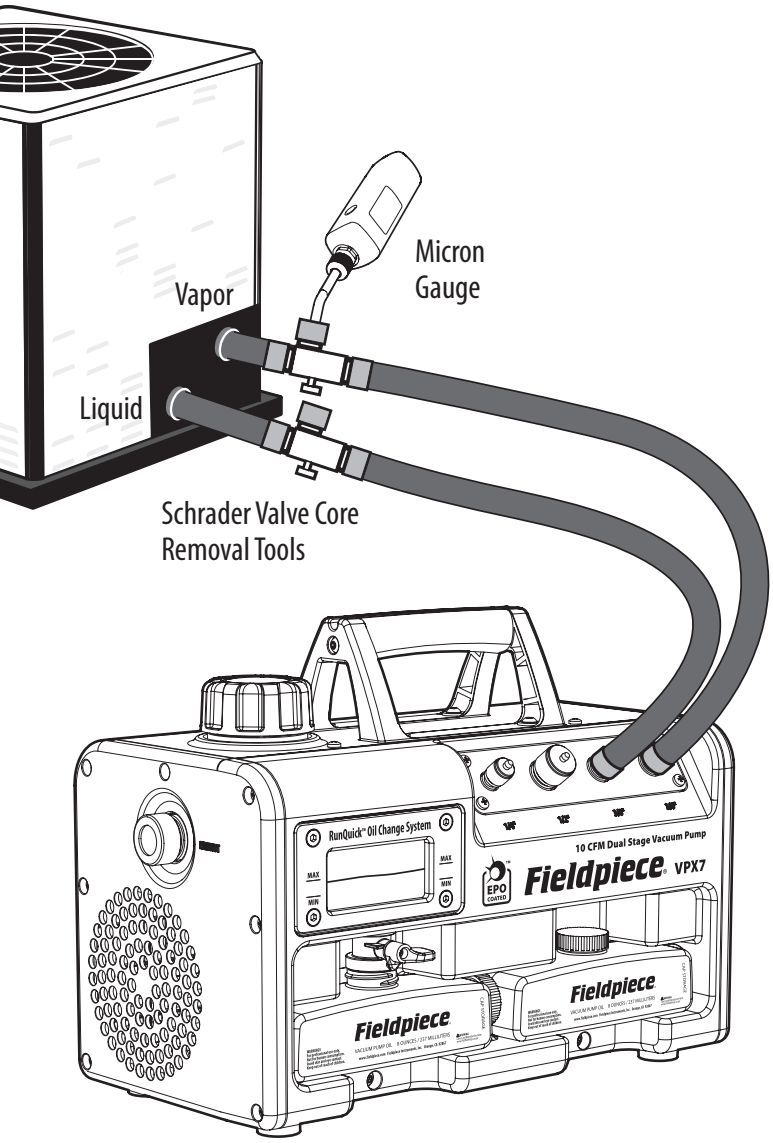
1. Always fill with fresh Fieldpiece Vacuum Pump Oil (page 24).
   Running the pump without oil will damage the pump and void the warranty. Oil can be drained while the pump is running if refilled within 3 minutes (within 30 seconds to maintain your vacuum).
2. Ensure the motor power switch is turned OFF (left).
3. Plug into an outlet (oil backlight should illuminate).
4. Ensure the gas ballast is closed (vertical) (page 26).
5. Connect to the empty, depressurized A/C system.
6. Turn the motor power switch to ON (right).
7. Open line set (hoses, manifolds, removal tools, etc.) to expose the pump to the system.
   To reduce oil contamination early in the job, open the gas ballast until the sound of the pump quiets down (about 3000 microns). The yellow LED in the oil window shines if the ballast is open.
8. After the appropriate vacuum is reached, isolate the system from the pump. You can check the system for potential leaks at this time by monitoring your micron gauge.
   Your vacuum pump has a unique oil suck back prevention feature to keep your hoses clear of oil. Still, it's good practice to release the vacuum at the input port before turning off the pump.
9. Turn the motor power switch to OFF (left), remove your hoses, and cap the ports to keep components free of contaminants.
10. Disconnect from the system and unplug from power at the outlet.
11. Drain the contaminated oil while the oil is still warm to keep the pump as clean as possible when stored.



Evacuation with a 3 Port Manifold

This is a common, but less than ideal evacuation method. Read the tech tips (page 12) for optimum gauge placement and variations to reduce recovery times.

1. Always fill with fresh Fieldpiece Vacuum Pump Oil (page 24).
   Running the pump without oil will damage the pump and void the warranty. Oil can be drained while the pump is running if refilled within 3 minutes (within 30 seconds to maintain your vacuum).
2. Ensure the motor power switch is turned OFF (left).
3. Plug into an outlet (oil backlight should illuminate).
4. Ensure the gas ballast is closed (vertical) (page 26).
5. Connect to the empty, depressurized A/C system.
6. Turn the motor power switch to ON (right).
7. Open line set (hoses, manifolds, removal tools, etc.) to expose the pump to the system.
   To reduce oil contamination early in the job, open the gas ballast until the sound of the pump quiets down (about 3000 microns). The yellow LED in the oil window shines if the ballast is open.
8. After the appropriate vacuum is reached, isolate the system from the pump. You can check the system for potential leaks at this time by monitoring your micron gauge.
   Your vacuum pump has a unique oil suck back prevention feature to keep your hoses clear of oil. Still, it's good practice to release the vacuum at the input port before turning off the pump.
9. Turn the motor power switch to OFF (left), remove your hoses, and cap the ports to keep components free of contaminants.
10. Disconnect from the system and unplug from power at the outlet.
11. Drain the contaminated oil while the oil is still warm to keep the pump as clean as possible when stored.



Direct Evacuation

This is usually the fastest evacuation method. Read the tech tips (page 12) for optimum gauge placement and variations to reduce recovery times.

1. Always fill with fresh Fieldpiece Vacuum Pump Oil (page 24).
   Running the pump without oil will damage the pump and void the warranty. Oil can be drained while the pump is running if refilled within 3 minutes (within 30 seconds to maintain your vacuum).
2. Ensure the motor power switch is turned OFF (left).
3. Plug into an outlet (oil backlight should illuminate).
4. Ensure the gas ballast is closed (vertical) (page 26).
5. Connect to the empty, depressurized A/C system.
6. Turn the motor power switch to ON (right).
7. Open line set (hoses, manifolds, removal tools, etc.) to expose the pump to the system.
   To reduce oil contamination early in the job, open the gas ballast until the sound of the pump quiets down (about 3000 microns). The yellow LED in the oil window shines if the ballast is open.
8. After the appropriate vacuum is reached, isolate the system from the pump. You can check the system for potential leaks at this time by monitoring your micron gauge.
   Your vacuum pump has a unique oil suck back prevention feature to keep your hoses clear of oil. Still, it's good practice to release the vacuum at the input port before turning off the pump.
9. Turn the motor power switch to OFF (left), remove your hoses, and cap the ports to keep components free of contaminants.
10. Disconnect from the system and unplug from power at the outlet.
11. Drain the contaminated oil while the oil is still warm to keep the pump as clean as possible when stored.

Oil Change Procedure

Changing oil is easy and visible. Start each job with fresh oil. Change as needed during the job.

DRAINING OLD OIL

1. For extended pump life, drain the oil immediatly after the job instead of waiting until the beginning of the next job.
2. Ensure the pump oil inside is warm enough, >75°F (>24°C), for proper drainage. Run the pump for 10 minutes if ambient temp is low.
3. Ensure the motor power switch is turned OFF (right). *Running the pump for longer than 3 minutes without oil will damage the pump and void the warranty.*
4. Plug into power to activate the oil backlight.
5. Ensure your old empty oil bottle is located under the oil drain.
6. Open the oil drain valve clockwise (vertical) to empty the oil reservoir of old oil.
7. Close the valve counter clockwise (horizontal).
8. Remove and cap the old oil for disposal.

ADDING FRESH OIL

9. Ensure the drain valve is closed (horizontal).
10. Unscrew the pump's oil fill cap 1/4 turn counter clockwise.
11. Open a new 8 ounce bottle of Fieldpiece Vacuum Pump Oil (OIL8X3). Put the bottle cap on the side of the bottle (CAP STORAGE).
12. Pour the entire 8 ounce bottle of fresh oil into the oil port and ensure the oil level is between the MIN and MAX lines indicated on the window bezel. Replace oil fill cap.
13. Place the empty bottle under the drain valve so it's ready to gather used oil during the next oil change.
14. Your vacuum pump is now ready to operate.

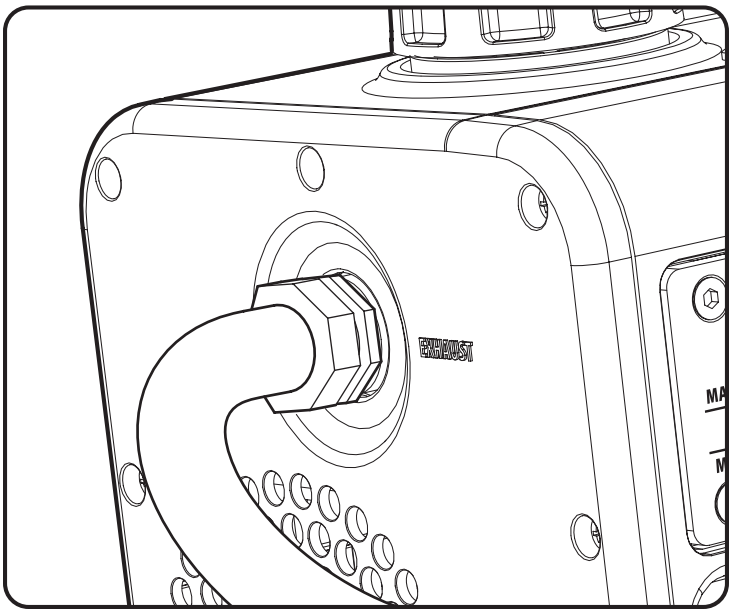
Dynamic Vacuum Measurement

During the pull down, the system's vacuum level drops faster at the front of the system, near the vacuum pump.

To ensure that your full system achieves the target micron level, place the vacuum gauge as far to the back of the system, away from the pump, as possible.

Remote Exhaust

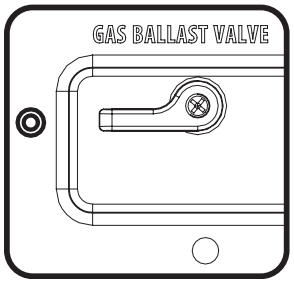
Unscrew the brass EXHAUST cap and connect an obstruction-free garden hose if you need to exhaust oil mist and vapor remotely to the outside of a building structure.



Gas Ballast Valve Switch

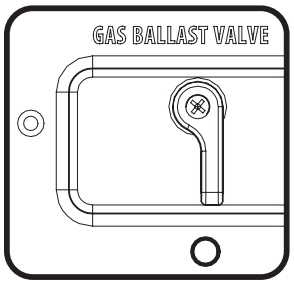
Much of the air and moisture in a system are removed before reaching 3000 microns. For wet systems, you should open the gas ballast during this initial pull down. Doing so helps the pump run smoothly and keeps the oil in good condition for when you need it most -- towards the end of the evacuation.

At about 3000 microns, when the sound of the pump quiets down, the gas ballast should be closed so that a deep vacuum can be generated.



Open

- Set here for initial pumping down (above 3000 microns) of wet systems.
- Yellow window LED shines.
- Discharge stroke exposed to ambient.

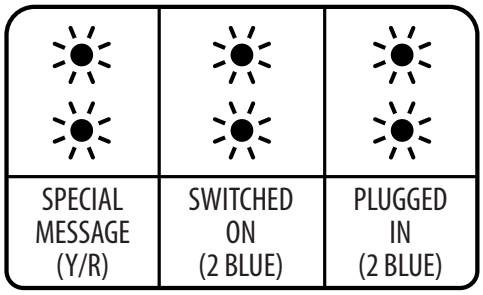


Closed

- Normal operating position.
- Yellow window LED off.
- Discharge stroke isolated from ambient.

LED Indicators

Three columns of LEDs in the oil window indicate various states. The blue lights of the right column indicate power is connected. The blue lights of the middle column shine when the pump is switched on. The LEDs of the left column typically indicate the gas ballast valve is open.



Special Messages

Yellow Blink (Solid yellow LED on VP67):
Gas ballast valve open.

Yellow Blink + Red Blink (VPX7/VP87):
Low voltage detected.

Red Blink (VPX7/VP87):
High voltage detected.

Red Solid (VPX7/VP87):
Internal fault detected.

Maintenance

General

Wipe with damp cloth to clean the exterior. Do not use solvents.

Storage

Empty or replace oil at the end of every job. Don't leave old oil in the machine. Store the pump and oil in dry clean areas for longest life.

Oil can lose its sealing properties if left uncovered. Keep oil sealed until it's ready for use.

Vacuum Isolation Test

Perform this test to ensure your vacuum pump and your micron gauge are working properly.

1. Connect your vacuum gauge *directly* to a port on your pump.
2. Seal the 3 other ports.
3. Ensure the gas ballast is closed (page 26).
4. Switch your pump ON to create a vacuum at your gauge.

If your gauge measures below 200 microns within 1 minute, you know your vacuum pump *and* micron gauge are working correctly.

If your gauge does not reach 200 microns, there is a problem with your gauge, vacuum pump, or both.

Oil Window Cleaning

It's important to see the condition of your oil as well as the LED indicators located in the oil reservoir.

The large oil drain ball valve will typically drain solids and sludge when changing the oil. When it becomes hard to see through the window, you can remove the oil window for easy cleaning.

1. Ensure oil is drained from the reservoir.
   To reduce residual oil spillage, do not lay the pump on its side.
2. While holding the black bezel (frame) in place, use a hex key (Allen wrench) to remove the 4 hex socket screws.
3. While holding the glass oil window in place, remove the black bezel and notice the o-ring located behind the window.
4. Slowly remove the glass oil window while making sure to locate and remove the o-ring seal.
5. Wipe away any spilt oil, but leave a bit of oil on the o-ring to ensure a good seal.
6. Clean the glass oil window and set aside to dry.
7. If desired, you can use a light bristle brush clean out the oil reservoir itself, but performance is rarely affected by a dirty reservoir.
8. Place the o-ring back into its groove.
9. Place the glass oil window over o-ring and hold in place.
10. Reinstall the bezel over the glass oil window using the 4 hex socket screws. *To avoid breaking the window, start all 4 screws before hand-tightening any of them. Do not overtighten.*

Troubleshooting

Appropriate vacuum is never reached.

Ensure the gas ballast is closed (vertical position, yellow LED off).
Ensure oil is fresh.
Ensure oil level is between MIN and MAX lines.
Ensure all port caps are closed and have working seals.
Limit amount of connections. Check for leaks at connections.
Use vacuum rated hoses.
Check for blockages between the pump and the system.
Check for a system leak.
Verify your vacuum gauge is in the correct location and is accurate.
Use the right pump for the job, 6CFM up to 10CFM (over 50 tons).
Perform a triple evacuation to carry moisture out of the system by purging the system with dry nitrogen.

Vacuum rises when isolating the system.

Ensure your micron gauge is located on the system side of the shut-off valve. The micron gauge of a 3 port (2 valve) manifold cannot measure a system's vacuum if the valves are closed. Use a shut-off valve at the third port to isolate the pump from the system (page 20).
Check for a system leak.

Oil backlight does not turn on when plugged in.

Ensure power cord and outlet are functional. If backlight does not shine and the pump turns on, the oil backlight LED module may need to be replaced.

Pump makes excessive noise.

The pump may be experiencing a high load.
Loose objects may be vibrating in the case.
Motor bearings may be bad. Motor needs to be replaced.
Motor may have come loose. Tighten motor mount bolts.
Oil level or condition may be bad. Change the oil.
Leaks may be present. Tighten or fix all connections.

Oil mist is coming out of the exhaust.

Some slight oil mist is normal due to airflow carrying oil as it passes through, and out of the pump. You can attach a garden hose to the exhaust port to control oil misting (page 25).
For larger systems with long evacuation times, extended high pressure conditions can cause excessive misting to occur. Add oil as needed if excessive oil loss occurs.

Motor does not start when switched ON.

Models VPX7/VP87 have a soft-start feature that slowly increases speed during startup. Slow startup in cold temperatures is normal.
Oil in the pump may have become overly viscous due to contamination or low temperature. Use fresh Fieldpiece Vacuum Pump Oil within the pump's operating temperature.
The pump may be cold. Warm the pump in your truck/home by letting it sit in warm environment. You can warm the oil in your truck/home before adding it to the pump.
The pump may be cold. Open an unused input port to ambient for a few seconds until the pump is running.
Voltage is incorrect. Ensure proper voltage and cord length.
Motor may be damaged. Motor needs to be replaced.
Motor thermal protection activated. Wait for the machine to cool down to operating range and determine why it may have overheated. Loading may be excessive.

Oil is leaking around base.

Oil likely fell into the housing from around the fill port and is now dripping through the internal housing. Wipe clean and make sure oil is not spilled when adding to the wide mouth oil fill port.

Limited Warranty

This machine is warranted against defects in material or workmanship for one year from date of purchase from an authorized Fieldpiece dealer. Fieldpiece will replace or repair the defective unit, at its option, subject to verification of the defect.

This warranty does not apply to defects resulting from abuse, neglect, accident, unauthorized repair, alteration, or unreasonable use of the machine.

Any implied warranties arising from the sale of a Fieldpiece product, including but not limited to implied warranties of merchantability and fitness for a particular purpose, are limited to the above. Fieldpiece shall not be liable for loss of use of the machine or other incidental or consequential damages, expenses, or economic loss, or for any claim of such damage, expenses, or economic loss.

State laws vary. The above limitations or exclusions may not apply to you.

Obtaining Service

Visit **website** for the latest information on how to obtain service.

Warranty for products purchased outside of the U.S. should be handled through local distributors. Visit our website to find your local distributor.

VP67

VP87

VPX7

ACCUTOOLS®

TruBlu Evacuation Tools

Steps to a Proper Evacuation

How to get the most out of the TruBlu Evacuation rig, quickly and safely achieve deep, dry and tight systems. This manual subject to change without notice.

TruBlu Quick Start and User Instructions

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Safety

Caution: TruBlu hoses and hose assemblies are only intended and designed for sealed system evacuation. TruBlu hoses are not intended (or rated) to be used for pressure or refrigerant transport. The O-rings used for the vacuum seal will dislodge under positive pressure and may expose the operator to refrigerant liquid or vapor, if present in the hose. Refrigerant can cause burns or eye damage/loss. Always where gloves and goggles when working on or around refrigerants.

Introduction

Thank you for buying TruBlu! TruBlu hoses are dedicated evacuation hoses that dramatically improve evacuation times; reducing in many cases what typically takes hours to minutes when compared to 1/4" charging hose. TruBlu uses the same robust technology found in industrial and scientific vacuum applications with components modified to meet the demands of the HVAC/R field use and application. Your TruBlu kit is compatible with most KF-16 fittings. Parts and accessories are available through your distributor.

TruBlu hoses are dedicated evacuation hoses and should never be used as refrigerant transport hoses or for positive pressure application. Oils used in refrigeration applications also have an affinity for moisture. Moreover, oil coating the hose lining significantly impacts the evacuation speed due to desorption of moisture which occurs in vacuum.

Buy a BluVac+ Micron Gauge and Use the Free BluVac App!

TruBlu hoses work with most any vacuum gauge, however we strongly recommend the Accutools BluVac+ models to take advantage of the free BluVac App. The BluVac App offers guidance, education, reporting, and diagnostics to assist and document the evacuation process.

The BluVac Application supports BluVac+ Pro, BluVac+ LTE, and the BluVac+ Micro.

How Does TruBlu Work?

If you want the short answer, pretty darn good and freaky fast! If you want to know the science, and the math read below. If you hate math and just want to believe us, skip to the Getting Started section following this section.

The Science and the Math (+%#-++/+%??)

The first principle to remember is that evacuation accomplishes two key things; degassing, and dehydration. Degassing is the removal of air and other gasses. Dehydration is the removal of water and water vaper. Degassing happens fairly quickly, while dehydration requires a much deeper vacuum and more time. TruBlu hoses accomplish both in a fraction of the time of typical hoses. What's the secret sauce? Trublu hoses actually achieve lower evacuation targets than our competitors' hoses. The deeper the evacuation, the faster the job.

To have flow in a line, there has to be a pressure difference. When evacuating atmosphere from a system, the pressures become so small that the flow becomes minute. If the pressure at your vacuum pump inlet for example is 500 microns (.009 psi), and in your system outlet 700 microns (.013 psi) the pressure difference across the hose is .004 psi or 4/1000th of a psi. With pressures so small, the friction created by small lines can have a huge impact on flow.

The friction created by the connecting lines is measured by "Conductance Speed". Conductance is simply the maximum attainable flow through a hose at a stated average pressure. Where in a pressure system we refer to pressure losses as "Pipe Friction Loss" in vacuum we refer to these losses as Pressure Drop. Specifically, we are referring to the pressure drop created by the friction in the connecting hoses. As can be seen by the quote below, Conductance Speed in evacuation is nothing new. As an industry, it is something we simply seem to forget.

> The conductance speed of 1/4" OD refrigeration tubing is too small to be useful as a connecting line in a system; so small we will not even discuss it. Never use it if you can avoid it as it is too costly in excessive pump-down time. *Review of Vacuum for Service Engineers*, Saunders and Williams Copyright 1959, Revised 1988, p. 60.

Mathematically it is important to understand that increasing the diameter of a hose does not have a linear effect but rather that to a ratio of its diameter to the third or fourth power. By diameter, we're talking ID not OD.

Comparing 1/4" ID hose to TruBlu 3/4" ID hose shows a Conductance Speed increase of approximately 96 times faster! ($.25^4$ = .00331) vs. ($.75^4$ = .31972) or (.31972/.00331 = 96.5)

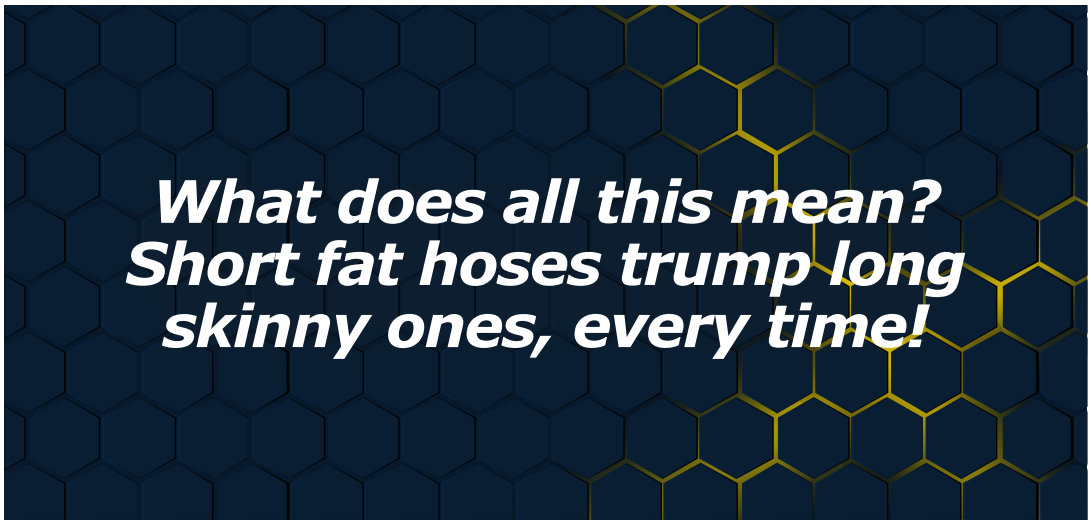
In addition to higher conductance, we need to consider the type of flow. In vacuum there are three types of flow to consider: viscous, laminar, and molecular. Viscous flow means we have a steady stream of molecules flowing through the pipe. As we get to laminar and molecular flow things really slow down, so staying in the viscous flow region is critical for quick evacuation times (and hence, our focus!).

Viscous flow ends where the microns are approximately 100/d" or 100/internal diameter of the tubing in inches. When comparing viscous flow in various diameters, again you can see that 3/4" tubing has a huge advantage. Viscous flow stops in 1/4" tubing at 400 microns (100/.25" = 400 Microns) where 3/4" viscous flow continues to 133 microns (100/.75" = 133 microns). This is important because with a larger diameter we get a 3X deeper vacuum in the viscous flow region (400/133= 3.00). A deeper vacuum means faster degassing and much better dehydration. Dehydration is critical more than ever for systems contaminated with POE oils since moisture breaks-down the oil forming sludge and acids.

So how much faster is a 5 foot, 3/4" ID hose than 1/4" ID at 500 microns? Approximately 80 times faster.

The conductance for air at 68°F is expressed as 520 x d^4 x P/L where P is the pressure in mm Hg Absolute and length is expressed in feet of hose.

Where 500 microns = .5 mm Hg abs
(520 x $.25"^4$ x .500)/5' = .2 CFM
(520 x $.75"^4$ x .500)/5' = 16 CFM
16 CFM/.2 CFM = 80 CFM faster at 500 microns of Hg



Getting Started with TruBlu

Cautions/Safety

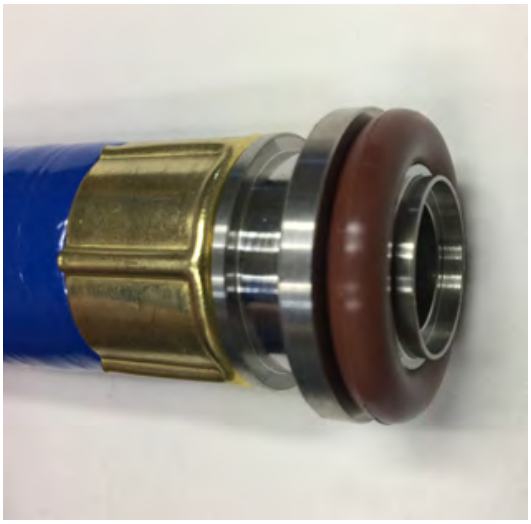
TruBlu hoses are intended for use by professionally trained HVAC technicians. TruBlu hoses are not intended for pressure. They are designed for vacuum only the same as your vacuum pump. Pressurizing a vacuum hose could cause displacement of the O-ring seal which leads to pressure loss, refrigerant loss, and could cause bodily injury.

Always wear gloves and goggles and other required PPE when working on or around refrigerants.

Product Use

TruBlu hoses use KF or Quick Flange fittings. KF fittings allow for one hose to be used in multiple applications with a variety of end configurations. The hose can also be connected to a tee 'T' or wye 'Y' fitting to further expand the system flexibility. KF fittings use a taper lock flange and clamp connection that is sealed with an O-ring. Unlike typical KF fittings used in industrial vacuum service, TruBlu hoses have the centering ring built into the flange to prevent the centering O-ring from falling on the ground when end changing fittings in the field (patent pending).

Once an end fitting is installed on a hose there is no need to remove it unless you want to change the hose configuration. Leaving the fittings on the hoses prevents damage to the O-rings and protects the flanges from damage. A plastic cap is included with each end connection, and it is advised that end connections that are not in use the flange is capped. This will prevent the sealing surface from getting scratched, nicked, or marred. The flat surface is the sealing surface, and care should be taken that it is not damaged.



KF Fitting with Integrated O-Ring

Hose-end Flange Face

There are two types of clamps provided in your kit, a stainless low-profile type (p. 6 left) and a larger aluminum clamp (p.6 right). These are standard KF style clamps. Clamp wing nuts only need to be finger tight. The connection is actually self-sealing under vacuum. The low-profile clamp is intended to be used on the hose end that connects to the Schrader core removal tool and intern the equipment, the larger clamps are intended to be used where space is not limited.

Low Profile Stainless Clamp (left)
Standard Aluminum (right)

Clamp Assembly

When connecting the TruBlu hoses to the equipment, ensure that you relieve all the pressure on the system. Removing the Schrader cores provide the fastest evacuation. The 1/4" hose-end is to be connected directly to the back of the AccuTools Schrader Core Removal Tool. *If the cores cannot be removed, connect the AccuTools Schrader Core Depressor to the service valve, and depress the core with the thumb screw to fully open the Schrader port. Removing the cores significantly decreases the evacuation time, and the core tool can be used to reinsert the core even after the system refrigerant charge as been released and the system is under pressure.

Vacuum and Pressure Rated Valve
Core Removal Tool

Vacuum and Pressure Rated
Schrader Core Depressor

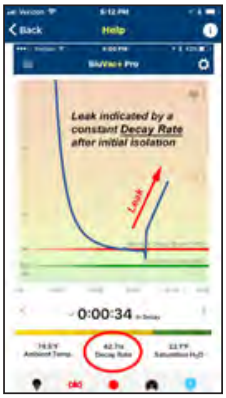
Core Tool with Vacuum Gauge
Installed on Side Port

Core Tool with Vacuum Gauge Installed on Side
Port and Schrader Core Depressor/Angle Valve

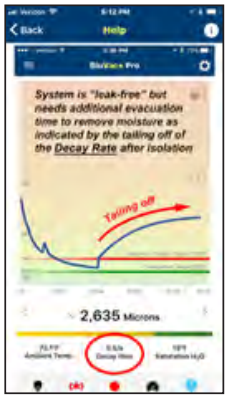
Steps to Assure a Fast Evacuation

An accessory tee fitting is included in the Pro and Standard Kits to permit an additional hose to be connected. This is sometimes helpful to get from the vacuum pump to the service ports. Reducing the two ports to a single port will not significantly affect the evacuation times as each hose is rated at 16 CFM conductance speed at 1,000 microns.

1. Always purge the system with dry nitrogen while assembling the tubing.
2. Sweep the system with dry nitrogen by purging from the suction to the liquid side of the system to carry out any moisture or particulates.
3. After a nitrogen sweep, pressurize the system with nitrogen and allow it to stand at the manufacture's recommend test pressure for at least the minimum recommend time to assure a leak free system.
4. Vent the nitrogen and remove the Schrader cores form the system.
5. Whenever practical, it is always advisable to evacuate from both sides of the system using two of the 1-meter lengths of hose connected directly to the system and the vacuum pump. Pulling from both sides assures a fast evacuation as you are not pulling through the metering device which can have rather small porting. Pulling from both sides also aids in faster and better dehydration as a deeper vacuum is often achievable.
6. Start the vacuum pump with the gas ballast open and shut the ballast at 10,000 to 12,000 microns. The system may drop very quickly, so pay close attention to the vacuum readings. A vacuum pump cannot typically achieve full vacuum with the ballast open.
7. Close the gas ballast and evacuate to the target pressure. The target pressure is typically 200 to 300 microns below the maximum allowable decay pressure. For adequate system dehydration, leave the vacuum pump running below the target for 1 to 60 minutes.
8. Isolate the system from the vacuum pump by SLOWLY closing the core tools to remove any gas trapped in the ball valve and watch the rate of system rise. This is called a decay or leak test. The below graphs are available free from the AccuTools BluVac Application.
9. A slight rise followed by slowing of the leak rate assures that the system is dry and tight. If the vacuum rise rate does not slow it indicates a potential leak in the system. If the systems rises and levels off near 2,000 to 3,000 microns the system is likely tight but still wet and needs further evacuation time.
10. With core tools closed, release the refrigerant charge into the system and reinstall the valve cores after attaching the valve core to the stem, attaching it loosely to the back of the core tool and venting the air from the core compartment to prevent any air from being introduced into the system.



Rapid rise indicates a leak that needs to be repaired and pressure tested before continuing evacuation.



Rise with curving tail indicates tight but wet system that needs further evacuation.

Checking Your TruBlu Hose Rig for Leaks

Let's start with the statement, "everything leaks!" What concerns us is the leak rate. The pump and vacuum rig have to overcome the leaks in the hoses or connections, so a low leak rate is critical for good evacuations. TruBlu hoses have a very low leak rate and low water adhesion properties. This means that TruBlu hoses effectively move all the work that your vacuum pump is doing at the pump inlet to the end of your hose where it should be.

To check your rig for significant leaks it is first prudent to check the vacuum pump. Vacuum pumps used for HVAC work should be capable of pulling at least 50 microns, ideally below 20 microns of mercury. To test the ultimate pull of your pump, start with fresh clean high-quality vacuum pump oil, cap the hose ports and attach a micron gauge directly to the 1/4" port on the pump with a brass coupling.

Test the Pump

Start the pump, close the gas ballast, and allow the pump to run for at least 10 minutes. The vacuum may slightly decrease over time as the pump oil warms and the vapor pressure of the oil decreases – this is normal. Record the vacuum level after 10 minutes. We recommend that you jot the level down on a piece of tape and attach it to the pump for future reference. If your pump will not pull below 50 microns, you may need to service the pump or replace it.

Attach the TruBlu Vacuum Rig

Now test the vacuum rig. Attach your vacuum rig or a vacuum and core tools to a (user supplied) brass tee fitting and in turn to your micron gauge at the end of the rig forming a continuous loop.

Degas and Dehydrate

Start the pump and allow it to run for at least 10 minutes to degas and dehydrate the hoses. Brand new hoses may require more time to degas, perhaps as much as 10 minutes the first time use.

Performance Test

After 10 minutes, isolate the pump by closing the blocking valve or shutting off the vacuum pump. Break the vacuum by loosening a connection on the rig. The hoses should be dry. Retighten the connection and immediately restart the vacuum pump and evacuation. Let the pump run an additional 5 minutes and confirm that you can pull below 100 microns at the far end of the rig. This is a dynamic test meaning the we are testing the pump, vacuum rig, to assure that we can achieve the desired vacuum at the system inlet.

Note: After 5 minutes your vacuum rig should be able to achieve 100 microns or less. TruBlu will typically achieve near the following results.

Performance Expectations

Pump ultimate pulldown = 50 microns ------- TruBlu Rig 100 microns or lower
Pump ultimate pulldown = 25 microns ------- TruBlu Rig 50 microns or lower
Pump ultimate pulldown = 10 microns ------- TruBlu Rig 30 microns or lower

ACCUTOOLS®

BluVac+ Pro

Wireless
Digital Vacuum Gauge

Bluetooth® SMART

User's Guide

U.S. Pat. Nos. 8,504,313, 8,768,633, 8,976,939

Introduction

Thank you for your purchase of the **AccuTools® BluVac+ Pro Digital Vacuum Gauge** with **Bluetooth Smart**Ò wireless technology. The **BluVac+ Pro** is the most accurate and precise vacuum instrument available today with patented technology that cannot be found anywhere else.

With the **BluVac+ Pro**, you can accurately measure vacuum pressure in Microns, Pascals, Millibar, Millitorr, mmHg, PSI, and inHg with resolution down to 0.1 micron. Ideal for the HVAC/R, Industrial, and Scientific professionals, the **BluVac+ Pro** is small, lightweight, rugged and easy to use. It is programmable, allowing for unattended evacuation and rise-time testing of HVAC/R systems of all sizes.

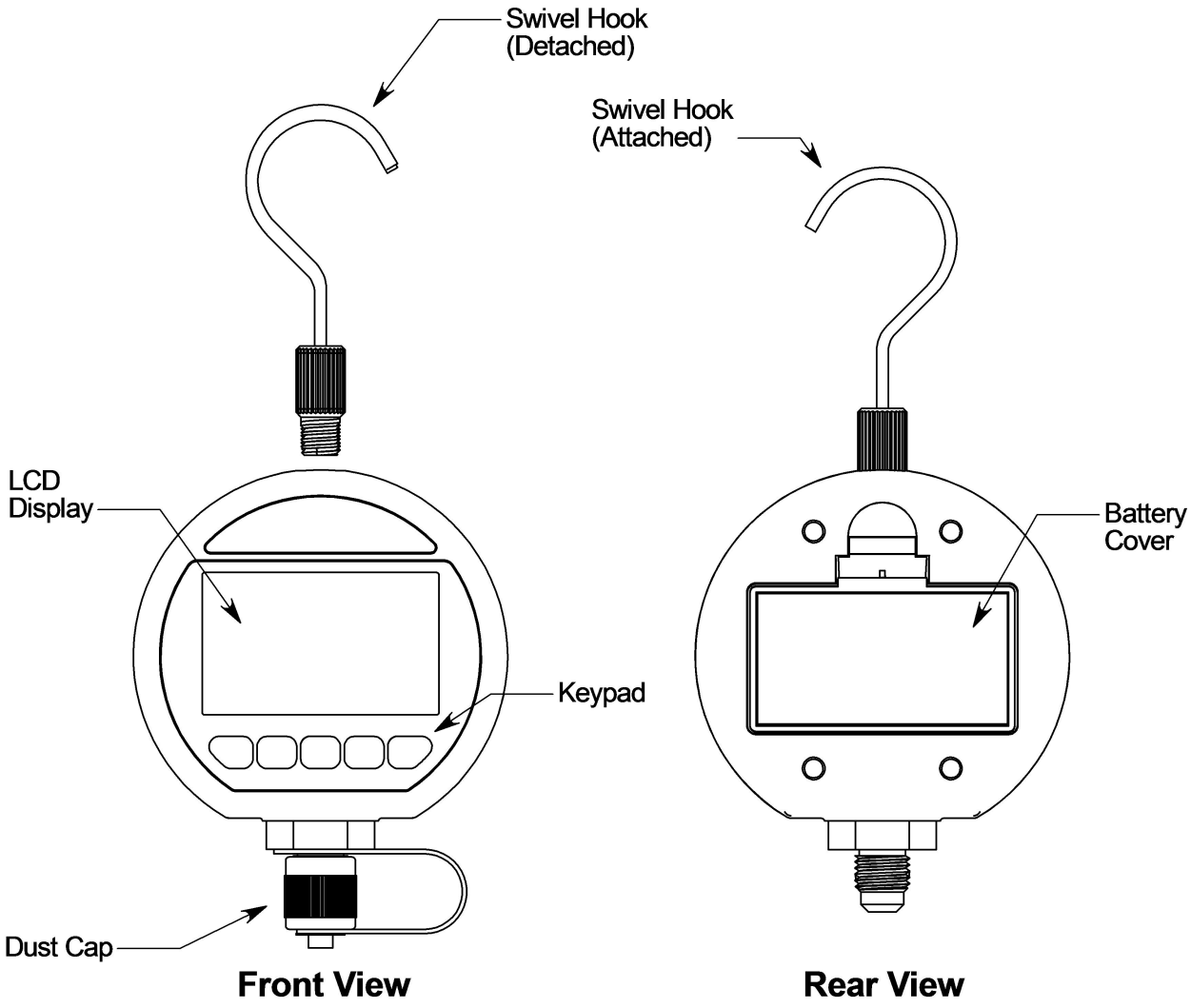
Features

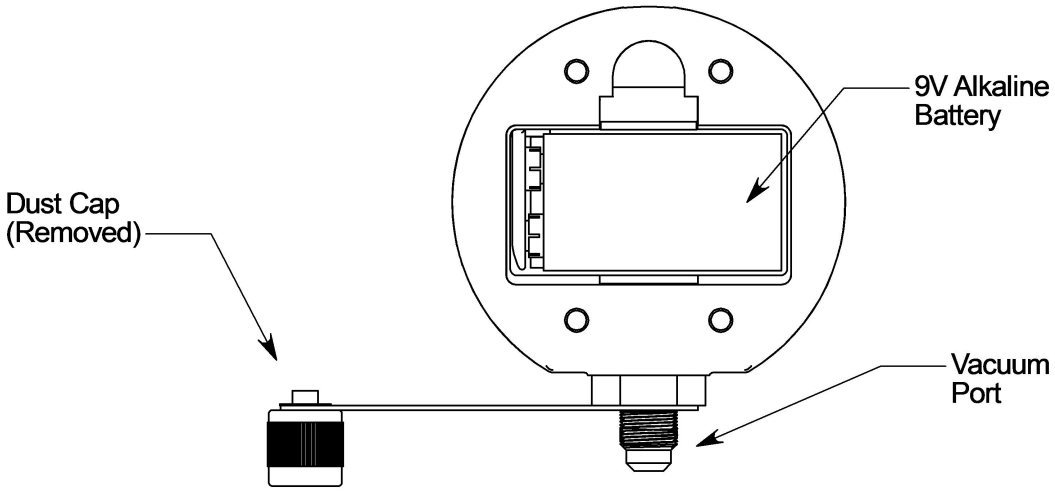
- Large, high-visibility back-lit LCD display
- Measures Vacuum in Microns, Pascals, Millibar, Millitorr, mmHg, PSI, and inHg
- 0 to 25,000 Micron Range with 0.1 Micron Resolution less than 10,000 Microns
- "Analog" Vacuum Level Bar Graph
- Evacuation Progress Indicator shows Vacuum between 25,000 Microns and ATM
- Vacuum Leak Rate, Ambient Temperature, and Saturation Temperature Indicator
- Automatic Oil Sensor
- Measures Ambient and Saturation Temperature in Fahrenheit and Celsius to 0.1°
- Built-in memory retains all previous settings
- Rugged, Compact Design with Protective Silicone Rubber Boot
- Long Battery Life
- Programmable Automatic Evacuation and Rise-Time Testing
- Calibration Self Test -- Can be field calibrated with no special equipment
- Ideal for HVAC/R Service, Industrial Use, and Scientific Measurement

Specifications

Range:	0 – 25,000 Microns (3333.1 Pa, 33.331 mBar, 25,000 mTorr, 25.000 mmHg, 0.48341 PSI, -28.037 inHg)
Vacuum Accuracy:	5% of Reading +/- 5 Microns
Vacuum Resolution:	0.1 Micron (@ 0.0 to 9999.9 Microns)
Temperature Accuracy:	0.2°F (0.1°C)
Temperature Resolution:	0.1°
Warm-up Time:	Instant
Response Time:	Instant
Power:	9V Alkaline Battery (9V Lithium recommended for low temperature operation)
Battery Life:	Up to 300 Hours (Bluetooth disabled)
Operating Temperature:	10°F – 122°F (-12°C – 50°C)
Vacuum Port Fitting:	¼" Male Flare – Anodized Aluminum with Dust Cap
Maximum Overpressure	500 PSI
Weight:	6 oz. (170g) including Battery and Swivel Hook
Dimensions:	3.5" x 3" x 1.25" (9cm x 7.5cm x 3cm)
Wireless Technology:	Bluetooth Smart®
Wireless Range:	Up to100m (328') Line-of-Sight

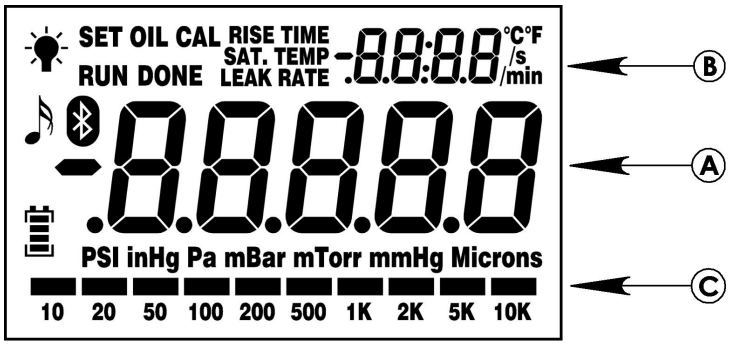
Parts Diagram





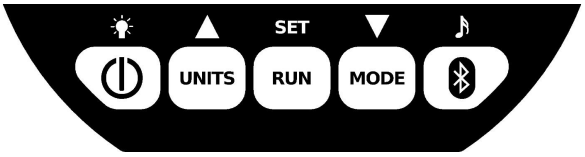
Rear View (Battery Cover Removed)

LCD Display



Item	Function
A	Main Numeric Display
B	Alternate Numeric Display
C	"Analog" Vacuum Level Bar Graph and Evacuation Progress Indicator
	Backlight Indicator. Flashing: Temporary, Solid: Always On
	Sound Indicator
	Bluetooth® Indicator. Flashing: Advertising, Solid: Connected
	Battery Level Indicator
SET	Set Mode Indicator
RUN	Indicates Programmed Evacuation or Rise Time Analysis in Progress
DONE	Indicates Programmed Evacuation or Rise Time Analysis is Complete
OIL	Oil Sensor Indicator
CAL	Calibration Mode Indicator
TIME	Indicates that Evacuation Time is Displayed on the Alternate Numeric Display
RISE TIME	Indicates that Rise Time is Displayed on the Alternate Numeric Display
TEMP	Indicates that Ambient Temperature is Displayed on the Alternate Numeric Display
SAT. TEMP	Indicates that Saturation Temperature is Displayed on the Alternate Numeric Display
LEAK RATE	Indicates that the Vacuum Leak Rate is Displayed on the Alternate Numeric Display
°C °F	Indicates either Celsius or Fahrenheit Degrees are Displayed
/s /min	Indicates that the Vacuum Leak Rate is Displayed in UNITS/second or UNITS/minute.
PSI	Pound per Square Inch Units Indicator
inHg	Inches of Mercury Units Indicator (Gauge Pressure Referenced to –29.921 inHg)
Pa	Pascal Units Indicator
mBar	Millibar Units Indicator
mmHg	Millimeters of Mercury Units Indicator
mTorr	Millitorr Units Indicator
Microns	Micron Units Indicator

Keypad



Item	Function
⏻	Press to Turn Power On. Press and Hold to Turn Power Off. While power is off, Press and Hold for Calibration Test.
UNITS	Press and Release to Change Display Units. Press and Hold to Change Temperature Display Units (°F or °C).
RUN	Press and Release to Start *RUN Mode* (Evacuation or Rise Time Analysis). Press and Hold to Cancel *RUN Mode* .
MODE	Press to Switch Between Ambient Temperature, Leak Rate, and Saturation Temperature on Alternate Display. Upon Initiating *RUN Mode*, Press to switch between Evacuation and Rise Time Analysis.
ᛒ	Press and Release to Activate/Deactivate Bluetooth Wireless Functionality
☀	Press and Release to Activate Backlight.
▲▼	Press or Press and Hold to Change Programmed Pressure or Time in *SET Mode*.
SET	Press and Hold to Enter *SET Mode.* Press and Release to Switch to Next Setting. Press and Hold to Exit *SET Mode.*
♪	Press and Hold to Mute/Un-mute Sound.

Quick Start

To operate the BluVac+ Pro as a basic vacuum gauge:

1. Install the battery as described in the "Battery Installation" section below.
2. Turn the power on by pressing ⏻. The display will show HI-P to indicate pressure greater than 25,000 Microns.
3. Select the desired units by repeatedly pressing UNITS.
4. Attach the BluVac+ Pro to the system to be evacuated with a high quality vacuum hose or brass coupler. Start the vacuum pump. Read the vacuum level from the Main Display.
5. Turn the power off by pressing and holding ⏻.

WARNING: To avoid damaging the BluVac+ Pro, only hand-tighten the sensor connection. If greater torque is required, support the sensor body with a ¾" wrench. Do not use gauge body for leverage.

NOTE: To assist in the use of this gauge and the interpretation of vacuum information, please refer to the *Frequently Asked Questions* Section at the end of this guide.

Battery Installation & Replacement

1. If installed, remove the protective boot.
2. Remove the battery cover from the rear of the BluVac+ Pro by compressing tab at the base of the battery cover.
3. If necessary, remove and detach old battery from battery clip.
4. Attach battery clip to new battery and insert into battery compartment. Replace battery cover by aligning tab and snapping back into place.
5. Reinstall the protective boot.

IMPORTANT: TO PREVENT DAMAGE FROM LEAKING BATTERIES, DO NOT LEAVE A DEAD BATTERY INSIDE THE BluVac+ Pro. REMOVE BATTERY IF THE BluVac+ Pro IS NOT TO BE USED FOR AN EXTENDED PERIOD OF TIME.

Battery Level Indicator

The battery level indicator shows the relative strength of the battery. Four bars indicate full power. As the battery is depleted, the number of bars displayed decreases, until no bars are left. At this point, the battery must be replaced (refer to the Battery Installation section above). If the battery power drops to the point where the BluVac+ Pro can no longer function accurately, the alarm will beep 10 times and the power will turn off automatically. When the battery is replaced, and the BluVac+ Pro is turned back on, the BluVac+ Pro will resume operation with all previous setting intact.

Units

Change the displayed units by pressing and releasing the UNITS key on the keypad. The appropriate units indicator on the LCD display will cycle through **PSI, inHg, Pa, mBar, mTorr, mmHg, or Microns** with each press. The units cannot be changed in the *Set Mode* or the *Run Mode* (see corresponding sections below).

Hi-Pressure Indication

If the sensed vacuum pressure exceeds 25,000 Microns (0.48342 PSI, -28.937 inHg, 3333.1 Pa, 33.331 mBar, 25,000 mTorr, or 25.000 mmHg), the display will show HI-P.

Sleep Mode

Unlike lesser Digital Vacuum Gauges, the BluVac+ Pro conserves battery life through advanced power management. After 5 minutes of displaying HI-P, the BluVac+ Pro will enter *Sleep Mode* in which the sensor and backlight are turned off, thus reducing the load on the battery and extending the battery life up to 300 hours or more. While in this mode, the display will show SLEEP. Approximately every 35 seconds, the gauge will automatically check the pressure and exit *Sleep Mode* if the pressure is less than 25,000 Microns. The gauge can be manually brought out of *Sleep Mode* by pressing any key on the keypad. While in Sleep, the gauge will beep twice every 5 minutes to remind you that it is on. The BluVac+ Pro will not sleep in the *Set Mode* or the *Calibration Mode* (see the corresponding sections below), or if the wireless function is activated and a connection is active.

Auto Power-Off

After 1 hour in "Sleep Mode" the BluVac+ Pro will automatically turn itself off to further conserve battery power. The BluVac+ Pro will not auto power-off if an Evacuation or Rise Time Test program is running.

Oil Sensor

Prevent oil from being drawn into the Vacuum Sensor. For HVAC/R service, always recover refrigerant prior to attaching the gauge. If possible, always close the blank-off valve on the vacuum pump prior to turning the vacuum pump off. Over time, oil vapor and other materials may contaminate the sensor. The BluVac+ Pro has a built in Oil Sensor that will detect this condition. If the **OIL** indicator on the display illuminates, this is an indication that the vacuum sensor has been contaminated and is no longer functioning accurately. If the sensor becomes completely saturated with oil to the extent that it cannot function properly at all, the message -OIL- will show on the display. Prior to further use of the BluVac+ Pro, clean the sensor as describe in the "Cleaning the Vacuum Sensor" section below.

Backlight

To activate the Backlight temporarily, press once. The indicator on the display will flash, and the backlight will turn off automatically after 1 minute. To activate the Backlight permanently, press again. The indicator on the display will show solid. Turn off the backlight by pressing repeatedly until the indicator turns off. The Backlight is turned off temporarily during Sleep Mode.

Sound

The BluVac+ Pro has an internal speaker that will emit a beep for each valid key press, and also functions as an alarm in the Programming and Calibration modes (see corresponding sections below). It will also beep every 5 minutes in Sleep Mode. For silent operation, pressing and holding the ♪ key will mute the sound. The alarm is not affected by the mute status. The ♪ indicator on the LCD display indicates that the sound is on (not muted).

Range and Resolution

The BluVac+ Pro has a broad vacuum pressure measurement range, and the highest resolution of any gauge. The display range and resolution depends upon the units displayed and the vacuum pressure reading, according to the table below:

Units	Vacuum Range	Vacuum Pressure Reading	Resolution
PSI	0 — 0.48342	0 – 0.48342	0.00001 PSI
inHg*	-29.921 — -28.937	-29.921 — -28.937	0.001 inHg
Pa	0 — 3,333.1	1,000.0 — 3,333.1	0.1 Pa
		0 — 999.99	0.01 Pa
mBar	0 — 33.331	10.000 — 33.331	0.001 mBar
		0 — 9.9999	0.0001 mBar
mTorr	0 — 25,000	10,000 — 25,000	1 mTorr
		0 — 9,999.9	0.1 mTorr
mmHg	0 — 25.000	10.000 — 25.000	0.001 mmHg
		0 — 9.9999	0.0001 mmHg
Microns	0 — 25,000	10,000 — 25,000	1 Micron
		0 — 9,999.9	0.1 Micron

*** NOTE**: **inHg** is displayed as Gauge Pressure, referenced to a Standard Atmosphere (-29.921 inHg).

"Analog" Vacuum Level Bar Graph

The Vacuum Level Bar Graph has two modes:

Evacuation Progress Indicator

When the pressure is above 25,000 microns (when the display shows HI-P), the Bar Graph indicates evacuation progress. The bars progressively drop as the pressure drops between ATM and 25,000 microns.

Vacuum Level Indicator

Below 25,000 microns, the Bar Graph allows for a quick visual determination of the vacuum level achieved. Each bar corresponds to a vacuum pressure range depending on units according to the following table:

	Units					
Bar Value	**Microns**	**Pa**	**Millibar**	**Millitorr**	**mmHg**	**PSI**
10K	10,000 — 25,000	1,000 — 3,333.1	10 — 33.331	10,000 — 25,000	10 — 25	0.2 — 0.48342
5K	5,000 — 10,000	500 — 1,000	5 — 10	5,000 — 10,000	5 — 10	0.1 — 0.2
2K	2,000 — 5,000	200 — 500	2 — 5	2,000 — 5,000	2 — 5	0.04 – 0.1
1K	1,000 — 2,000	100 — 200	1 — 2	1,000 — 2,000	1 — 2	0.02 — 0.04
500	500 — 1,000	50 — 100	0.5 — 1	500 — 1,000	0.5 — 1	0.01 — 0.02
200	200 — 500	20 — 50	0.2 — 0.5	200 — 500	0.2 — 0.5	0.004 — 0.01
100	100 — 200	10 — 20	0.1 — 0.2	100 — 200	0.1 — 0.2	0.002 — 0.004
50	50 — 100	5 — 10	0.05 — 0.1	50 — 100	0.05 — 0.1	0.001 — 0.002
20	20 — 50	2 — 5	0.02 — 0.05	20 — 50	0.02 — 0.05	0.0004 — 0.001
10	10 — 20	1 — 2	0.01 — 0.02	10 — 20	0.01 — 0.02	0.0002 — 0.0004

NOTE: The pressure bars indicate Microns when **inHg** units are selected.

Alternate Numeric Display

The BluVac+ Pro has an Alternate Numeric Display that can indicate Vacuum Leak Rate, Ambient Temperature, Saturation Temperature, or Programming Time/Progress. Please refer to the "Programming" section below for programming instructions. During normal operation, the Alternate Numeric Display may show Vacuum Leak Rate, Ambient Temperature, or Saturation Temperature.

Select the display mode by pressing the MODE key to cycle between **LEAK RATE**, **TEMP**, and **SAT. TEMP**.

Vacuum Leak Rate Indicator

The Vacuum Leak Rate Indicator displays the rate of change of vacuum *per second* or *per minute* in the selected units when the **LEAK RATE** indicator is illuminated. The reading is positive for increasing pressure and negative for decreasing pressure. The Leak Rate Indicator is useful for determining the size of a vacuum leak, if one exists, or the presence of moisture or outgassing. Under high-pressure conditions (HI-P), the leak rate indicator shows ----.

Press and hold the UNITS key while the **LEAK RATE** indicator is showing to switch between *per second* and *per minute*, as indicated by /**s** and /**min** on the display.

Ambient Temperature Indicator

Internally, the BluVac+ Pro uses a very high accuracy temperature sensor to maintain proper calibration throughout the entire operating temperature range. This temperature is shown on the Alternate Numeric Display when the **TEMP** indicator is illuminated. The accuracy of the temperature sensor is 0.2°F or 0.1°C.

Saturation Temperature Indicator

The saturation temperature of water (i.e. the temperature at which water boils at the measured pressure) is computed and displayed on the Alternate Numeric Display when the **SAT. TEMP** indicator is illuminated. Under high-pressure conditions (HI-P), ---- is shown on the Alternate Numeric Display.

Press and hold the UNITS key while the **TEMP** or **SAT. TEMP** indicator is showing to switch between *Celsius* and *Fahrenheit*, as indicated by **°C** and **°F** on the display.

Protective Boot

The protective boot provides additional protection for the BluVac Pro+. The BluVac+ Pro may be operated with or without the boot installed. For moisture protection, the boot is provided with a sealed cap where the swivel hook would normally be attached. To attach the hook with the boot in place, carefully cut the cap from the boot with a sharp blade.

Swivel Hook

The BluVac+ Pro's removable stainless steel swivel hook enables hanging of the gauge and will allow it to swivel freely in any direction. The gauge may be operated with or without the hook attached. When fastening the hook to the gauge, turn it finger tight only. Use of a tool to tighten the hook may result in damage to the BluVac+ Pro case.

Wireless Operation

Press and release to turn the Bluetooth radio on and off. When turned on, the icon will flash in the display. This is an indication that the radio is on and advertising (i.e. waiting for a connection from a mobile app). When a connection is made by a mobile app, the icon will illuminate solid (not flashing).

For mobile application operating instructions, please refer to the instructions and help material included with the application.

For a list of mobile applications compatible with the AccuTools BluVac+ Pro, please refer to the scan directly with your mobile device:

App Store (iOS)

Google Play (Android)

Programming

As a special feature, the BluVac+ Pro includes two related programs: the Evacuation Program and the Rise Time Testing (RTT) Program.

The Evacuation Program allows for unattended evacuation of large systems, and will sound an audible/visual alarm when the evacuation procedure is complete, based upon both an Evacuation Target Pressure and Evacuation Target Time. For example, a procedure may call for evacuating a system to at least 500 microns, and maintaining that pressure (or less) for at least 15 minutes.

Following a successful evacuation, the RTT Program can consistently ensure proper evacuation by analyzing the rate-of-rise of pressure vs. time, and automatically signal a PASS or FAIL indication based upon an RTT Target Pressure and RTT Target Time. Advantageously, a clean, dry, and tight system can successfully PASS a Rise Time Test in as little as 15 seconds, eliminating the need to wait for the RTT Target Time to elapse. For example, a procedure may call for ensuring that a system evacuated to 500 microns or less will not exceed 1000 microns after the vacuum pump has been blanked off over 10 minutes.

Each program consists of both a target pressure (vacuum level) and a time period. There are 16 possible target pressures, depending upon the units displayed, as shown in the following table:

Units						
Microns	**Pascal**	**Millibar**	**Millitorr**	**mmHg**	**PSI**	**inHg**
50	5.0	0.050	50	0.050	0.0010	-29.919
75	10.0	0.100	75	0.075	0.0015	-29.918
100	15.0	0.150	100	0.100	0.0020	-29.917
150	20.0	0.200	150	0.150	0.0030	-29.915
200	30.0	0.300	200	0.200	0.0050	-29.913
300	50.0	0.500	300	0.300	0.0075	-29.910
500	75.0	0.750	500	0.500	0.0100	-29.900
750	100.0	1.000	750	0.750	0.0150	-29.890
1000	150.0	1.500	1000	1.000	0.0200	-29.880
1500	200.0	2.000	1500	1.500	0.0300	-29.060
2000	300.0	3.000	2000	2.000	0.0500	-29.850
3000	500.0	5.000	3000	3.000	0.0750	-29.800
5000	750.0	7.500	5000	5.000	0.1000	-29.700
7500	1000.0	10.000	7500	7.500	0.1500	-29.600
10000	1500.0	15.000	10000	10.000	0.2000	-29.500
15000	2000.0	20.000	15000	15.000	0.3000	-29.300

The time periods may be programmed between 0 seconds and 100 minutes. The BluVac+ Pro can be programmed easily through the mobile app. To program the BluVac+ Pro manually, the Set Mode must be activated:

Programming (Set Mode)

1. Turn the power on by pressing  .
2. Select the desired units by repeatedly pressing  .
3. Activate the Program Set Mode by pressing and holding **SET**. The **SET** and **TIME** indicators will show on the display, as well as the currently programmed Evacuation Target Pressure and Time.
4. While the pressure display is flashing, press and/or hold the ▲ or ▼ keys to increase or decrease the Evacuation Target Pressure. When compete, press and release the **SET** key.
5. While the minutes display is flashing, press and/or hold the ▲ or ▼ keys to increase or decrease the Evacuation Target Time minutes. When compete, press and release the **SET** key.
6. While the seconds display is flashing, press and/or hold the ▲ or ▼ keys to increase or decrease the Evacuation Target Time seconds. When compete, press and release the **SET** key.
7. The display will now show the currently programmed RTT Target Pressure and Time, and the **RISE TIME** indicator will illuminate

8. While the pressure display is flashing, press and/or hold the ▲ or ▼ keys to increase or decrease the RTT Target Pressure. When compete, press and release the **SET** key.
9. While the minutes display is flashing, press and/or hold the ▲ or ▼ keys to increase or decrease the RTT Target Time minutes. When compete, press and release the **SET** key.
10. While the seconds display is flashing, press and/or hold the ▲ or ▼ keys to increase or decrease the RTT Target Time seconds. When compete, press and release the **SET** key.
11. The gauge will beep three times (if sound is enabled), and return to normal mode. The new program is now saved.
12. At any point in the Program Set Mode, pressing and holding the **SET** key will result in saving the current program and returning to normal mode.
13. Once programmed, the BluVac+ Prowill remember the settings until changed again, even if the power is turned off or the battery removed.

NOTE: The units cannot be changed while in the Set Mode.

Executing a Program (Run Mode)

Press and release RUN. The **RUN** indicator will illuminate and EVAC (EVAC) or rISE (RISE), indicating the current program execution mode, will flash on the main display.

Press the MODE key to select the desired execution mode. The main display will toggle between EVAC and rISE with each press of the key.

Executing the Evacuation Program

1. Ensure EVAC is flashing on the display. Press MODE to select EVAC, as above, if not.
2. Press RUN to start the program.
3. The **RUN** and **TIME** indicators will illuminate on the display. **RUN** will flash to indicate the program is running.
4. Start the vacuum pump.
5. When the vacuum pressure drops to less than the target evacuation pressure, the timer will start. Subsequently, if the pressure exceeds the target evacuation pressure, the timer will stop and resume counting when the pressure again drops to less than the target evacuation pressure.
6. When the timer expires, the BluVac+ Pro will sound an alarm, flash the backlight, and blink the **DONE** indicator. Press any key to silence the alarm. The program is complete.
7. Blank-off and stop the vacuum pump.

Executing the Rise Time Test Program

1. Ensure the vacuum pump is blanked-off and stopped.
2. Ensure rISE is flashing on the display. Use the MODE to select rISE, as above, if not.
3. Press RUN to start the program.
4. The **RUN** and **RISE TIME** indicators will illuminate on the display. **RUN** will flash to indicate the program is running.
5. Immediately, the BluVac+ Pro will begin monitoring the rise rate of pressure, though the clock will remain stopped until the pressure exceeds the Evacuation Target Pressure.
6. If a determination is made that the pressure will not exceed the Rise Time Pressure Target within the allotted time, the BluVac will alarm and indicate PASS regardless of the time remaining. The analysis is performed, and a PASS can be achieved, even if the clock is not running (i.e. the Evacuation Target Pressure has not yet been achieved.

7. If the pressure exceeds the RTT Target Pressure before the RTT Target Time is achieved, the BluVac+ Pro will alarm and show FAIL to indicate that the test has failed.
8. In either case, pressing any key will silence the alarm. In the case of a PASS, the clock will continue counting for further manual analysis. This can be stopped by pressing the RUN key. In the case of a FAIL, normal operation will immediately resume.

While in the Run Mode, the gauge may sleep after 5 minutes of high pressure. The gauge will wake and continue the program normally once the pressure drops below 25,000 Microns. The gauge may be manually wakened from sleep by pressing any key. **In the Run Mode, the Auto Power-Off feature is disabled.**

Stopping a Program

At any time during the Run Mode, the program can be canceled by pressing and holding RUN.

NOTE: The units cannot be changed while in the Run Mode. Pressing the Mode key during the run mode will toggle between leak rate and time.

Maintenance

The BluVac+ Pro should provide many years of service with no maintenance required. When not in use, the dust cap should remain in place over the sensor port. Clean the plastic enclosure with a damp (not wet) rag. Mild detergent is acceptable, but use no solvents. Take care not to expose the vacuum sensor to oil. If the Oil Sensor (described above) indicates a contaminated sensor, follow the Sensor Cleaning Procedure below.

Cleaning the Vacuum Sensor

If the vacuum sensor becomes contaminated with oil (as indicated by the Oil Sensor), carefully follow this procedure:

1. Power off the BluVac+ Pro.
2. Shake the gauge to remove any large quantities of oil from the sensor.
3. Using an eyedropper or syringe, carefully apply a few drops of rubbing alcohol inside the sensor vacuum port. **DO NOT INSERT ANY OBJECT INTO THE PORT, AS THIS WILL PERMANENTLY DAMAGE THE SENSOR**.
4. Place your finger over the port and shake for a few seconds.
5. Remove your finger and shake out the alcohol.
6. Repeat steps (3) – (5) at least three times.
7. Allow the sensor to air dry over at least an hour, or pull a vacuum on the sensor to dry it more quickly (a few seconds).
8. Power on the gauge. The -OIL- message and **OIL** indicator should be off. If it is still on, repeat the cleaning procedure.
9. If, after repeated cleaning, the -OIL- message or the **OIL** indicator is still illuminated, or, if full accuracy is desired, perform a calibration cycle as detailed in the Calibration section below.

NOTE: It is important to remove all alcohol vapors from the sensor, either through air-drying or via vacuum. Any remaining vapors will cause an incorrect vacuum reading.

Calibration Test

The BluVac+ Pro should rarely require recalibration, though it may be necessary to know that your gauge is calibrated properly for full accuracy. The Calibration Test mode assures you that the BluVac+ Pro is calibrated to factory specifications. Test the calibration as follows:

1. Power off the BluVac Pro+.
2. **Important:** Expose the BluVac+ Pro to atmospheric pressure.
3. Press and hold (do not release) the ⏻ key for about 5 seconds.
4. The display will show **CAL** Good if the instrument is calibrated properly.
5. The display will show **CAL** Soon if the instrument requires calibration. Please see the Calibration section below.

Calibration

If the Calibration Test indicates recalibration is required, the gauge may be recalibrated. Unlike other vacuum gauges, the BluVac+ Pro can be easily recalibrated to factory specifications without any special equipment, with the following procedure:

1. For best results, clean the sensor with alcohol prior to calibration. Ensure the sensor is completely dry before proceeding.
2. Power off the BluVac Pro+. If necessary, install a fully charged battery into the gauge.
3. Place the dust cap over the vacuum fitting.
4. Hold RUN while pressing ⏻. As soon as the power turns on, release RUN and then press it quickly at least three times. The **CAL** indicator should illuminate, and Lo Id should show on the Main Numeric Display. If not, turn the power off again and repeat.
5. Place the BluVac+ Pro in a clear Ziploc® (resealable zipper storage) bag, press out any extra air, and seal.
6. Place the bagged BluVac+ Pro into a freezer with a temperature of less than –5°C (23°F).
7. Allow the BluVac+ Pro to cool to below -2°C (28.4°F). At this point, the alarm will sound and the display will change to Hot.
8. Remove from freezer and press any key to silence the alarm.
9. Place the BluVac+ Pro undisturbed in an area with a room temperature of at least 23°C (73.4°F) but no greater than 30°C (86°F).
10. Allow the BluVac+ Pro to warm to 20°C (68°F). At this point, the alarm will sound, and HI-P will show on the display.
11. Press any key to silence the alarm. The BluVac+ Pro is now calibrated to factory specifications.

Note: For accurate calibration, allow the BluVac+ Pro to warm slowly. Attempting to accelerate the warming by using a heat source will not provide satisfactory results. During the cooling/warming process, the temperature will be indicated on the Alternate Numeric Display in degrees Celsius. The calibration process may be canceled at any time by turning off the BluVac+ Pro or by pressing and holding RUN. The previous calibration will be unchanged.

Low Temperature Operation

The BluVac+ Pro can operate accurately at temperatures as low as 10°F (-12°C). While operating below freezing (32°F/0°C), the display update rate will slow from 3.5 readings every second to one reading every two seconds.

For satisfactory battery life at low temperatures, a 9V Lithium battery is recommended.

Troubleshooting

Under certain conditions, the display may read -0 IL- or Error. Please use the table below to determine and fix the problem:

Display	Mode	Possible Problem	Solution
-0 IL-	Normal Operation or Run Mode	Sensor Contaminated	Clean the Vacuum Sensor
		Ambient Temperature too Low	Turn the BluVac+ Pro off, warm the vacuum port with your hand, turn the BluVac+ Pro back on.
	Calibration	Sensor Contaminated	Clean the Vacuum Sensor and Restart Calibration
Error	Normal Operation or Run Mode	Sensor Failure	Contact Customer Service
	Calibration	Gauged Warmed too Quickly	Restart Calibration. Allow the Gauge to Warm Slowly
		Gauge Disturbed During Calibration	Restart Calibration. Leave the Gauge Undisturbed During Warming Phase.

Frequently Asked Questions

Q. How often must I calibrate the BluVac+ Pro?

A. Calibration of the BluVac+ Pro is only necessary when the Calibration Test indicates that calibration is required. Regardless, frequent cleaning and/or calibration will not adversely affect the long-term reliability of the instrument. For best results, ensure the sensor is clean and dry, and the dust cap is in place, prior to calibration.

Q. Can I use the BluVac+ Pro to check the proper operation of my vacuum pump?

A. Yes. Attach the BluVac+ Pro directly to the pump with a short hose or coupler. Turn the pump on, open the blank-off valve, and close the ballast. A good pump with clean and dry oil will typically pull very quickly to less than 100 microns (generally around 25 microns for a two-stage pump). Always close the blank-off valve and/or disconnect the BluVac+ Pro prior to turning off the pump so as to avoid oil contamination of the sensor.

Q. The BluVac+ Pro does not indicate acceptably low pressure when I test my pump.

A. Ensure the pump oil is clean and dry (it should be completely clear when viewed through the pump's sight glass). Replace the oil. Ensure the pump ballast is completely closed and the blank-off valve is completely open, and all fittings are tight and seals are not damaged. If low pressure is still not achieved, the pump may be damaged or worn.

Q. I've attached the BluVac+ Pro directly to my pump with a short hose or coupler. As soon as I blank off the pump, the indicated pressure rises rapidly. Is the BluVac+ Pro's sensor leaking?

A. No. There will always be molecular-sized leaks, outgassing, and/or permeation in any hose or fitting, and the pump's blank-off valve may not be entirely gas tight. The indicated pressure will rise due to the small internal volume of the hose or coupler.

Q. What is the recommended method for attaching the BluVac+ Pro for evacuation service?

A. Ideally, the BluVac+ Pro should be as close to the internals of the system under evacuation, and as far from the vacuum pump as possible. Attaching the BluVac+ Pro to the auxiliary port of a vacuum-rated core removal tool (CRT) connected directly to a service port is the best method. The ball-valve of the CRT can be closed to completely isolate the system from the pump and hoses, thereby allowing for an accurate rise-time test at the completion of evacuation. Additionally, removing the Schrader core(s) via the CRT and using **TruBlu Evacuation Hoses** will greatly speed the evacuation process.

Q. I accidentally exposed the BluVac+ Pro to high-pressure refrigerant. Did I damage the BluVac+ Pro?

A. No. The BluVac+ Pro's sensor is rated to 1,000 PSI overpressure, and can be directly exposed to gas/liquid refrigerant. At worst, the sensor may be exposed to oil, in which case the oil indicator will activate and cleaning/calibration may be required.

Q. I removed the BluVac+ Pro from the system under vacuum, but the indicated pressure rises slowly and/or the gauge does not return to Hi-P. Is the BluVac+ Pro damaged?

A. No. The slow rise in pressure is due to residual refrigerant gas captured in the sensor. Gently blowing air into the sensor to remove the residual gas will effect an immediate rise to Hi-P.

Q. How do I use the leak rate indicator?

A. The leak-rate indicator is especially useful for system diagnostics during a rise-time test. If the indicated leak rate is stable and constant, this usually indicates a physical vacuum leak. If the leak rate is stable, but decreases as the pressure rises, this usually indicates evaporating moisture or outgassing. If the leak rate is unstable (bouncing between different numbers), this usually indicates liquid water boiling off inside the system. Since the resolution of the BluVac+ Pro is so high, it may be difficult to achieve a zero leak-rate. This is not a problem as long as the system meets the manufacturer's recommended vacuum rise-time performance.

Q. Why does the ambient temperature indicator show a different temperature than my room thermometer?

A. The ambient temperature indicator actually measures the temperature of the metal sensor housing and the gas contained within the sensor. This temperature may be a few degrees different than room temperature. The temperature sensor itself is inherently accurate within 0.2°F (0.1°C) and requires no calibration.

Q. My BluVac+ Pro reads a different pressure than my other vacuum gauge from another manufacture. Which gauge is correct?

A. Unlike all other micron gauges, the BluVac+ Pro's accuracy is independent of temperature and pressure. Therefore, you can be confident that the BluVac+ Pro's reading is correct. Other gauges are calibrated at a specific temperature and pressure (i.e. 500 microns and 77°F (25°C)). The accuracy of those gauges is necessarily derated when operated at pressures and temperatures different than the calibration values.

Q. I've started a Rise Time Test Program, but the clock doesn't run. Why?

A. For consistency of rise time testing, the Rise Time Clock does not begin counting until the pressure has risen above the Evacuation Target Pressure. On a very clean, dry, and tight volume, this may not happen before a PASS result is achieved. Regardless, a PASS result ensures that the pressure would not have risen between the Evacuation Target Pressure and the Rise Time Target Pressure within the allowed Rise Time Target Time Period.

Q. I am still having problems using the BluVac+ Pro and/or understanding the readings it is giving me. What should I do?

Notes

Warranty and Repair

1 Year Limited Warranty

Core Enterprises, Inc. warrants that this AccuTools® product conforms to Core Enterprises, Inc. published specifications and will be free from defects in material and workmanship. The duration is for a period of one year from the date of purchase. Core Enterprises, Inc., at its option, will repair or replace this product or any component of the product found to be defective during the warranty period. Replacement will be made with a new or remanufactured product or component. This is your sole warranty.

This warranty is valid for the original retail purchaser from the date of initial retail purchase and is not transferable. Keep the original sales receipt. Proof of purchase is required to obtain warranty performance. Core Enterprises, Inc. dealers, service centers, or retail stores selling Core Enterprises, Inc. products do not have the right to alter, modify or any way change the terms and conditions of this warranty.

This warranty does not cover batteries or any other normal wear of parts or damage resulting from any of the following: negligent use or misuse of the product, damage caused by use of the product for purposes other than those for which was designed, use contrary to the operating instructions, disassembly, repair or alteration by anyone other than Core Enterprises, Inc. or an authorized Core Enterprises, Inc. service center. Further, the warranty does not cover: Acts of God, such as fire, flood, lightning, hurricanes and tornadoes.

THE FOREGOING WARRANTIES ARE IN LIEU OF ALL OTHER WARRANTIES, CONDITIONS OR REPRESENTATIONS, EXPRESS, IMPLIED, STATUTORY OR OTHERWISE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITTNESS FOR A PARTICULAR PURPOSE

Core Enterprises, Inc. shall not be liable for any incidental or consequential damages caused by the breach of any express, implied or statutory warranty or condition.

Except to the extent prohibited by applicable law, any implied warranty or condition of merchantability or fitness for a particular purpose is limited in duration to the duration of the above warranty.

Core Enterprises, Inc. shall not be liable for any damages of any kind resulting from the purchase, use or misuse of, or inability to use the product including incidental, special, consequential or similar damages or loss of profits, or for any breach of contract, fundamental or otherwise, or for any claim brought against purchaser by any other party.

Some states or jurisdictions do not allow the exclusion or limitation of incidental or consequential damages or limitations on how long an implied warranty lasts, so the above limitations or exclusion may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights that vary from state to state or jurisdiction to jurisdiction.

How to Obtain Warranty and Repair Service

To obtain warranty or repair service, please call (954) 227 0781 to obtain a RMA number. For warranty service, a legible copy of the original receipt must be sent along with the RMA Form. Any package received without this RMA number will be refused. The returned product must be properly packaged and insured against shipping damage. Any shipping damage resulting from improper packaging shall be the responsibility of the Purchaser. The repaired or replaced product will be returned to Purchaser, freight prepaid via UPS ground only. Repaired or replaced units carry an additional 90 days warranty.

Contains Transmitter Module FCC ID: T9JRN4020

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Contains transmitter module IC: 6514A-RN4020

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux con- ditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

P/N 10525-05 Rev. B