Hand-held vacuum pump

VACUUM/PRESSURE OUMP AND BRAKE BLEEDING KIT

- Checks vacuum operated automotive cimponents
- Can be used to bleed hydraulic systems or siphon fluids
- Includes integrated vacuum/pressure gauge
- Special vacuum/pressure release mechanism
- includes assorted and hydraulic fluid reservoir

INTRODUCTION

The power built Vacuum/Pressure Pump may be used for many different tasks. Listed below are some examples

1. Testing vacuum–operated components(door locks,actuators, etc)
2. Engine mechanical testing(valves,cam timing,head gasket, etc
3. Brake and clutch hydraulic system bleeding
4. Mwasurement of vacuum supplied by boosters resercoirs solenoids or the engine

DESCRIPTION

The Power built Vacuum Pump Kit consists of the following items

- Vacuum Pup Unit
- Fluid Reservoir
- Fully Sealing Cap for spare Fluid Reservoir(for temporary storage)
- Long vinyl Hose
- Assorted Small Sections of Viny l Hose
- Assorted Adapters.Tees.Caps and Suction Cup

The vacuum pump consists of the following parts.See Figure: Legend

1. Vacuum/Pressure Gauge–A21/2"gauge calibrated in PSI,BAR and inches of mercury
2. Vacuum Fitting–This barbed fitting is for attachment of the supplied hose.It can also be directly attached to vehicle vacuum lines or components
3. Vacuum/Pressure Release Collar–The external collar on the pump slides back ang forth on the pump body.The forward position is for pressure.The rearward position is for pressure. The rearward position is for vacuum.Moving the collar from one and then released.See Figure:Worn Piston Rings.

Air/Fuel(Idle)Mixture:An air/fuel mixture that is either too rich or too lean creats lower than normal vacuum,often fluctuating.See Figure:improper idle mixture.

Late Valce Timing:When cam timing is off.vacuum will float between8–15"1–2in.Hg at idle.This can happeb after a timing belt change if belt is installed incorrectly.See Figure:Late Valce Timing.

Valve Seating:An intake valve that is not sealing will cause a momentary drop in manifold vacuum.As the pressure in the cylinder starts to rise,it will leak past the intake valve.This will result in a large pressure increase in the intake manifold.These pressures will cause the needle on the vacuum gauge to drop1–2in.Hg erch time the cylinder fires.See Figure:Leaky Intake Valve.

An exhaust valve that is not sealing will dilute the incoming mixture and cause a misfire.The vacuum gauge will display a lower manifold vacuum without any fluctuation.

Broken Valve Spring:If the valve stays open too long as the result of a broken spring,a positive pressure is creates.This can be seen on the vacuum gauge as substantial needle fluctuations erch time the valve attempts to see.

Sticking Valve:A sticking valve will cause the neodle to drop erch time the offending valve hangs open.This is similar to a leaking valve,except that the vacuum reading will not drop at regular intervals.See Figure:Lerky Intake Valve.
Heaf Gasket Leak:When the head gasket is leaking,engine vacuum will float between 5–19 1–2in.Hg.Sww Figure Blown Head Gasket.

Forinstance zero on your vacuum gauge would represent 14.7–psi at sea level.As the engine is cranked,the piston of each cylinder will increase manifold pressure.A cylinder that is not sealing properly will not produce sufficient compreeion pressures.WE need to raise combustion chamber pressures and tje resulting temperatures for reliable ignltion.

An engine in good mechanical condition.depending on its size.will typically develop somewhere between 17and 21 in.HG at 1000rpm.

Low Vacuum.A low steady vacuum reading at idle could indicate a problem with an external vacuum leak.Another cauce could be late ignition or valve timing.If adjusting the ignition to specification dose not increase the vacuum gauge reading,the valve timing should be checked.
Cranking:During cranking speeds,we should develop between 3 to 5 in. Hg with the throttle closed.This is a good teat for an engine that will not start.A reading of zero would indicate there is an internal problem.A quick test here can save a lot of diagnostic time.

Base Idle:A quick to see if the base idle sorew of a fuel–injected vehicle has been tampered with is as follows.
Hook up youe vacuum gauge to ported vacuum on the throttle body at idle.There should be almost zero vacuum.

Restricted Exhaust (Catalytic Converter):When the engine is unable to exhale properly,a positive pressure will develop inside the cylinder each time each time the exhaust valve opens.This increases inside,manifold as the intake valne opens. the end result is lower manifold vacuum.See Figure:Restricted Exhaust. Run the engine at 1000 rpm and record the vacuum reading. Increase engine sprrd slowly to 25000rpm.Exhaust backpressure,depending on the amount of restriction,will increase with engine rpm.IF the vacuum reading at 2500rpm should drop more then 3 in.Hg from the reading taken at 1000rpm,theexhaust system is most likely restricted.

Worn Piston Rings:When piston rings are sealing properly,manifold vacuum will increase above a normal level whenever the throttle is quickly snapped clsed.The closed throttle with high piston speed will create a large pressure differential in the intake manifold.If rings areworm out,the gauge should drop to zero,then rise to 22 in.Hg when the throttle is rapidly depressed

position to the other postition will release stored pressure or vacuum to the atmosphere.
4. Handles–Comfort grip handles are designed so that they can be easily squeezed together to create vacuum or pressure.
5. Pumr Body–Pump body includes pisston.Cylinder and vale assembly.

REPLACING PARTS:
When replacing the vacuum or vacuum fitting.It is important to wrap the threads with Teflon plumber's tape bedore threading the pieces together.A good seal must be maintained.

CAUTIONS AND WARNINGS REGARDING USE OF THE VACUUM PUMP
Handling–The Power bulit vacuum pump is precision instrument. Handle it with the same care you would with any other precision. tool.Do NOT drop it,handle it on hot manifolds or other engine parts.Avoid Letting flulds Enter the pump itself.If using sa a fluid pump,make sure to use the fluid reservoir included.
Lubricetion&Cleaning–The vacuum pump is lubecates with silicone oil at the factory.If you find it necessary to lubricate your pump,usesilicone oil;or a silicone based brake fluid(Dot5).Do NOT use petroleum based lubricants such as WD–40,motor oil, penetrating oil,etc.).Do NOT nsed cleaners such as carburetou cleaner or brake cleaner sprays in the pump mechanism.

USING THE PUMP
The power built vacuum pump can be used for a variety of automtive testing and diagnosis tasks.Examples are listed below:
1. Engine mechanical testing,such sa testing of engine vacuum, testing intake and exhaust valves,testing manifolds and manifold gaskets for leaks,rtc.),air/fuel mixture.cylinder leakage,turbocharger wastegate and mechanicl and electris vacuum pumps.
2. Testing of vacuum–poerated mechanical components,including transmission modulators,heater and air conditionerdoors, cruise control modulators,headliight doors,etc.
3. Fuel system testing,such as fuel tank testing,and testing of fuel lines,pumps,and pressure regulators.
4. Ignition system testing,such as distributor advance mechanisms,spark delay valve testing.,vacuum delay valve testing,etc.
5. Emission control system testing,such as EGR valves.PCV valves,ported vacuum switches,thermostatic air cleaners transducer valves,etc.).

GENERAL USAGE IN STRUCTIONS
Thw Power built vacuum pump is most often used as a vacuum.

pump or test instrument The pump may be connected to a component with the provided vacuum line,connected directly to the component itself.or connected vacuum line,connected directly to the component itself.or connected to an exiting vacuum line directly or with the provided tee connector.

To create vacuum:

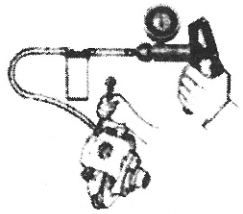
Moce the collar to the rearward position(toward the handles).With the pump connected to the appropriate component or vacuum line, simply squeeze the moveable handle of the pump with your hand. Continue the squeezing motion until the gauge reads the desired level of vacuum.

To check vacuum:

With the pump connected to the appropriate component or vacuum line,read the measured amount of vacuum at the gauge(engine running).Do NOT pump the handle,as this will cause an in correct reading.

RELEASING CACUUM

To release vacuum,slide the collar forward to the release.This allows air to enter the system relieving the vacuum.



PRESSURE:

Move the collar to the forward position(away form the handles), With the pump connected to the appropriate component,simply squeeze the moveable handle of the poump with your hand. Continue the squeezing motion until the gauge reads the desired level of pressure.

To check pressure:

With the pump connected to the appropriate component or vacuum line,read the measured amount of pressure at the gauge.Do NOT pump the handle,as this will cause an incorrect reading.

Releasing pressure:

To release pressure slide the collar rearward to the release.

Bleeding hydraulic components:

The pump may be used to draw hydraulic fluid through hydraulic lines such as brake and clutch lines.See figure:Bleeding Brakes. Attach a short piece of clear plastic line to pimp.Using the fluid reservoir with vacuum nipples,attach the other end of the clear plastic line to one side of the reservoirs cap.Attach a long piece of clear plastic line to the other side of the cap and to the desired hydraulic fitting for bleeding.With the vacuum pump set to vacuum position,open the hydraulic system' s bleeder valve and slowly draw fluid into the reservoir.Take care not to draw fluid Past the reservoir and into the pump.

TROUBLESHOOTING AUTOMOTIVE VACUUM SYSTEMS

Automotive vacuum system consist of a vacuum source. lines hoses and fittings,and vacuum units or components This system must be free from leaks If Leaks occur the air/fuel mixture of the engine may be changed by the additional air entering the engine This may result in poor engine performance and lead to damage to the engine internal components over time

Trouble with vacuum system cam most often be determined to be one of the following problems:

1. Leaks–Leaks occur in hoses,connectors,tees diaohragms and valve.Most often the leak occurs at the end of the vacuum line where it attaches to a component.The hose becomes hard at the hose end anf splits,no longer sealing the connection Often cutting off a small piece at the hose end will temporarily solve the problem The hose should eventually be replaced.
2. Blockage–Blockage occurs when vacuum lines are pinched or full of foreign material.when vales are clogged or stuck or when some other problem occurs that precunts air from flowing. Clearing the line ang/or freeing up stuck valve should solve the problem.
3. Failed component–A visual inspection of vacuum devices can be important to determining their correct operation It is important to have manufacture' s service information available to determine whether a component is leaking,has failed,or is funcyioning properly.

ENGINE MECHANICAL CONDITIONS

Reading the gauge on the vacuum pump can help diagnose a variety of engine conditions.

With the pump connected to the appropriate component or vacuum line,read the measured amount of vacuum at the gauge(engine running).Do NOT pump the handle.as this will cause an incorrect reading.

In order to put the vacuum gauge to good use,we must understand how it works and what the reading can tell us.A vacuum gauge measures the differonce of pressure in the intake manifold and the actual atmospheric pressure Vacuum is a pressure that is below atmospheric pressure.