

# Field Fix: Manometer

How to create a simple U Tube Manometer to test for leaks and set propane system pressure.

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Version 1.0

Version History

V1.0 Initial Release

## 1. Scope

Anyone needing to test a propane system for leaks, set the propane system pressure or troubleshoot a propane/LP/LPG appliance.

## 2. Challenge

Troubleshooting a problem with a propane/LP/LPG appliance often requires discovering and/or setting the propane system pressure, which requires a manometer.

A manometer is also a great way to check for or confirm a propane system leak.

If you find yourself in the field in either of these circumstances, then building a simple U tube manometer from easy to locate materials is your solution. The U tube manometer is very simple and easy to build. If you have access to the propane connection for your stovetop / rangetop burner, then it is also extremely easy to utilize.

## 3. Skill level / difficulty

- Manometer – easy
- Working with propane – moderate due to safety requirements

## 4. Assumptions

This field fix guide assumes you are on your own and out of reach of professional assistance.

**If you can get your expedition vehicle to a qualified propane system repair facility, then do so.**

This field fix guide assumes you are responsible, mature, endowed with common sense and capable of following safety procedures.

If you do not match these criteria, do not attempt this procedure.

## 5. Disclaimer

This field fix guide makes no claims of warranty, guarantee or suitability to purpose. This field fix guide may contain errors of fact or omission.

Use this field fix guide at your own risk.

## 6. Requirements

### 6.1. Manometer Requirements

- Knowledge of propane safety basics
- Ability to follow safety requirements
- Hand tool skills
- Wrenches
- ½" clear hose/tubing
- Permanent marker
- Mounting surface
- Duct tape
- Measuring tape or ruler
- Water
- Material to tint water, e.g. red wine
- Access to propane outlet or fitting
- ½" hose barb connector (plastic or brass)
- Adapters / connectors as required (plastic or brass)
- Mounting surface at least 24" tall by 12" wide
- Optional: small funnel that fits into the end of the ½" hose/tube

### 6.2. Leak Testing Requirements

- Spray bottle
- Soapy water
- Optional: head light
- Optional: inspection mirror

### 6.3. Leak Fixing Requirements

- Required wrenches
- LP rated pipe tape or LP rated pipe joint compound
- Required replacement connectors, including flaring tools

## 7. Propane Safety

Propane / LP / LPG is an explosive, flammable gas. Being careless while working with it can lead to fires, explosions and severe burns. A propane explosion can destroy your overland expedition vehicle and injure or kill you and everyone in the area.

- No smoking
- No open flame
- No sparks
- No potential sparking materials, metals, etc.
- Follow all posted and labeled safety warnings and guidelines
- Work only in open, well ventilated areas
- No children or irresponsible adults in the work area
- Be sober and pay attention to what you are doing
- Think through the process before you begin
- Ensure you have all the required tools and materials before you begin
- Limit the amount of time you have open propane connections / lines

The high pressure side of a propane system, upstream of the regulator, can be over 200 PSI (pounds per square inch) depending on the ambient temperature. Exercise due caution.

Open propane connections can lead to freezing of valves and regulators.

## 8. Background

A manometer is a device used to check the pressure in your propane system. The correct pressure is required to allow the various appliances to operate at their best level of performance. The manometer measures pressure in units of water column inches. It is a simple, yet very accurate device, and one can be constructed for a dollar or two using basic materials.

The propane appliances in your expedition vehicle are designed to operate at 10.5 to 11 " of water column pressure. This is about .5 PSI and is a very low pressure. The job of the regulator is to reduce the tank pressure (up to 250 PSI) down to this operating pressure, regardless of the outside temperature.

The manometer can be used to check and adjust the propane regulator to the proper operating pressure. Also, it is an essential instrument for performing a propane gas leak test.

## 9. Utilization Steps

### 9.1. Identify a propane connection for the test

1. Locate an available propane connection downstream of the propane system regulator to use for the test. The easiest and most common access point is a rangetop / cooktop burner connection. Determine if your rangetop / cooktop has removeable burners. If the burners are not easily removable, locate a gas connection you can access.
2. Check your available supply of connectors / adapters. You need to be able to adapt from your available propane connection to the ½" hose/tube. The hose/tube will require a ½" hose barb connector. Adapt from that connector to your available propane connection.
3. If you do not have the required adapters / connectors, find another propane connection that will work.
4. Tip: mounting the manometer in a position visible from the regulator makes subsequent adjustment much quicker and easier.

### 9.2. Build the manometer

5. Build or identify a mounting surface. If available, you can tape your tube directly to an interior wall or exterior surface. Be careful if mounting to an interior wall as the tape may pull off decorative wall coverings. If desired, mount on a piece of plywood or other material. The mounting surface needs to be at least 24" tall and at least 12" wide.
6. Place a piece of duct tape on the front of the mounting surface along the right edge running vertically from the top to the bottom.
7. Measure down 18" from the top of the mounting surface and make a mark on the duct tape with the permanent marker. Label the mark 0.
8. Measure up from the zero mark and make a mark at 8".
9. Measure up from the zero mark and make a mark every ½" between the zero mark and the 8" mark. (Note: you are making marks every ½" because the manometer measures the pressure differential across both sides of the U - ½" down on the left side and ½" up on the right side equals 1" of water column pressure.)
10. Starting at the zero mark, label the next mark up 1
11. Label the succeeding interval marks 2 to 16.
12. Mount the clear ½" hose/tube in a large U shape, with the right side running next to the 0 to 16 marks. The bottom of the U should extend down to the bottom of the 24" mounting area. The top right side of the U should extend to the top of the 24" mounting area. The left side of the U should extend to the top and off the left side of the mounting area. Do not block the 0 to 16 mark labels when mounting the hose/tube.
13. Tip: Leave plenty of slack on the line forming the left side of the U between the propane connection and the left side of the U. You may need this later to adjust the size of the bottom of the U.
14. If you have one, place the funnel in the end of the tube on the top right side of the U.
15. If you built your manometer on a portable surface, place the manometer in its working position next to the available gas connection.
16. Fill a container with eight to 12 ounces of water.
17. Add a little red wine or other substance to the water to give it some color.
18. Carefully fill the tube with water until the level is exactly on the zero mark. Note: this must be done PRIOR to connecting to the propane connection.
19. Connect the hose/tube to the propane connector.
20. Open all necessary gas valves.

21. Operate all gas appliances, e.g. stovetop, furnace, water heater, grill.
22. Check the propane system pressure water column value by comparing the level of the liquid against your mark labels. Typically, you will be seeking a value of 11" of water column. If required, adjust your regulator.
23. Tip: If the liquid blows out the top of the right side of the U when you connect it to the propane line you need more liquid volume in your U. Dismount the left side of the U and form a larger bottom to the U. Refill the U until the liquid is exactly at the zero mark prior to connecting to the propane connection.

### **9.3. Adjusting the Regulator**

24. Remove the weather cover. It usually snaps in place.
25. Tip: If you had an open propane connection while setting up your manometer, the regulator may be frozen. If so, wait until it thaws out before attempting to remove the adjustment screw cover/plug and adjust the regulator.
26. Remove the adjustment screw cover/plug. It is typically a threaded plug. Remove carefully, as it may be plastic.
27. Using your permanent marker, make a mark across the face of the regulator adjustment screw and the threads in the bore of the adjustment shaft. Your goal is to mark the original, pre-adjustment position.
28. Tip: Ensure all appliances are running before adjusting the regulator.
29. Using the appropriate tool (screwdriver, allen wrench, etc.), slowly and carefully adjust the regulator. Go slow, a little bit of adjustment translates to large changes in pressure.

### **9.4. Testing for a Leak**

1. Attach your manometer to the propane system.
2. Open all relevant propane system valves.
3. Check the manometer to propane system connection with soapy water.
4. Light a burner on your propane stove or use other propane appliance.
5. Establish a steady flame.
6. Shut off the output valve at the propane tank.
7. When the water column pressure drops to 8" turn off the burner or appliance. Burning off the system pressure prevents bleed through at the regulator.
8. Let the system stand for at least 15 minutes.
9. Check your water column pressure. If it has dropped, you have a leak.

## 9.5. Locating the Leak

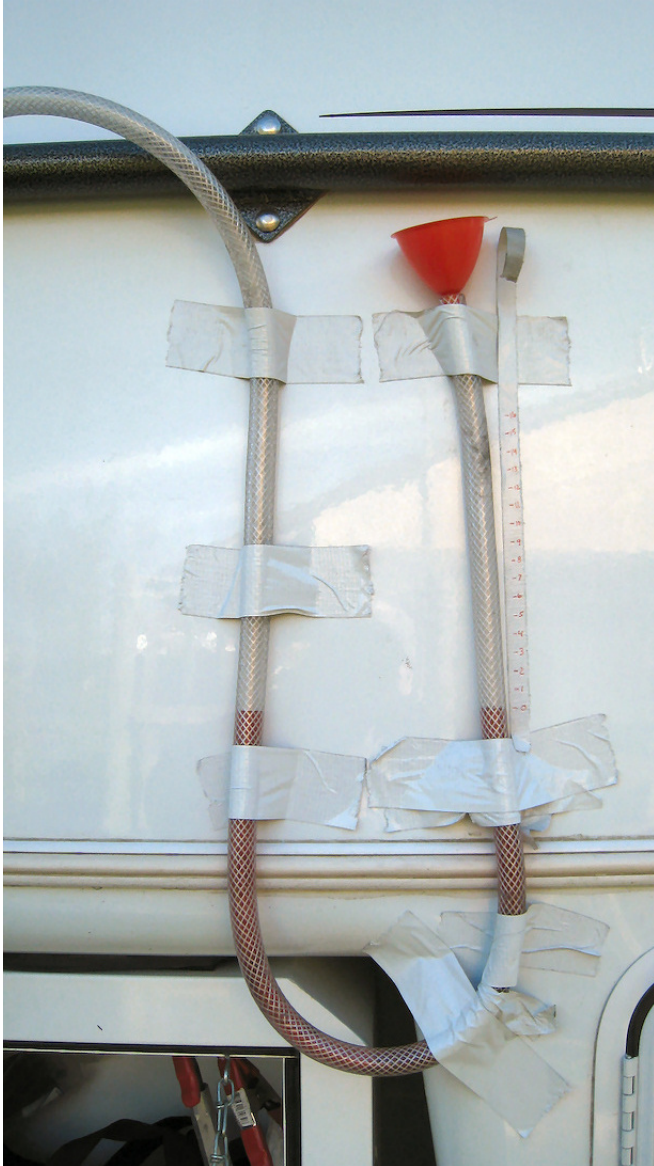
10. Extinguish all open flames.
11. No smoking.
12. Eliminate all potential sources of flame from your person and the area.
13. Eliminate all potential sources of sparks from your person and the area.
14. No children or irresponsible adults in the area.
15. Work only in well ventilated areas. Wait for wind or move the vehicle if possible to do so safely.
16. Open the output valve on the propane tank.
17. Follow your nose. Propane / LP / LPG has a distinctive smell. If you smell it, start there.
18. One by one, spray every connection / joint with soapy water.
19. For each connection / joint, inspect for growing and large popping bubbles. The spray bottle will often create dense, foamy bubbles on the connection / joint as you spray. These are normal. Leak bubbles will be growing and large popping bubbles.

## 9.6. Fixing a Leak

20. Turn off the output valve of the propane tank.
21. Using the appropriate wrenches, tighten the leaking connection. Be careful not to over tighten, strip or destroy the connectors. Propane systems are only running about .5 PSI downstream of the regulator, so you don't need gorilla strength for a tight seal.
22. Retest the connection for a leak.
23. If it is still leaking, disconnect the connector and inspect it.
24. If the connection is an NPT (threaded pipe) connection and uses tape or joint compound, refresh the tape and compound. Carefully clean off all old tape or compound and replace with LP rated tape or joint compound.
25. If the connection is not an NPT (threaded pipe) connection, e.g. a compression or flare, ensure that there is no pipe tape or compound in the connection.
26. Reassemble the connector.
27. Recheck for leaks.
28. If the connector is still leaking, you may have a mismatched connector, in which someone has improperly tried to use one type of propane connector on one side of the connection and a different type on the other. (See the document [Propane Systems for Expedition Vehicles](#) for more information on propane system connector types.) If this is the case, replace one or both connectors so that both are the same type of connector and reassemble the connection.

## 10. Sample Photos

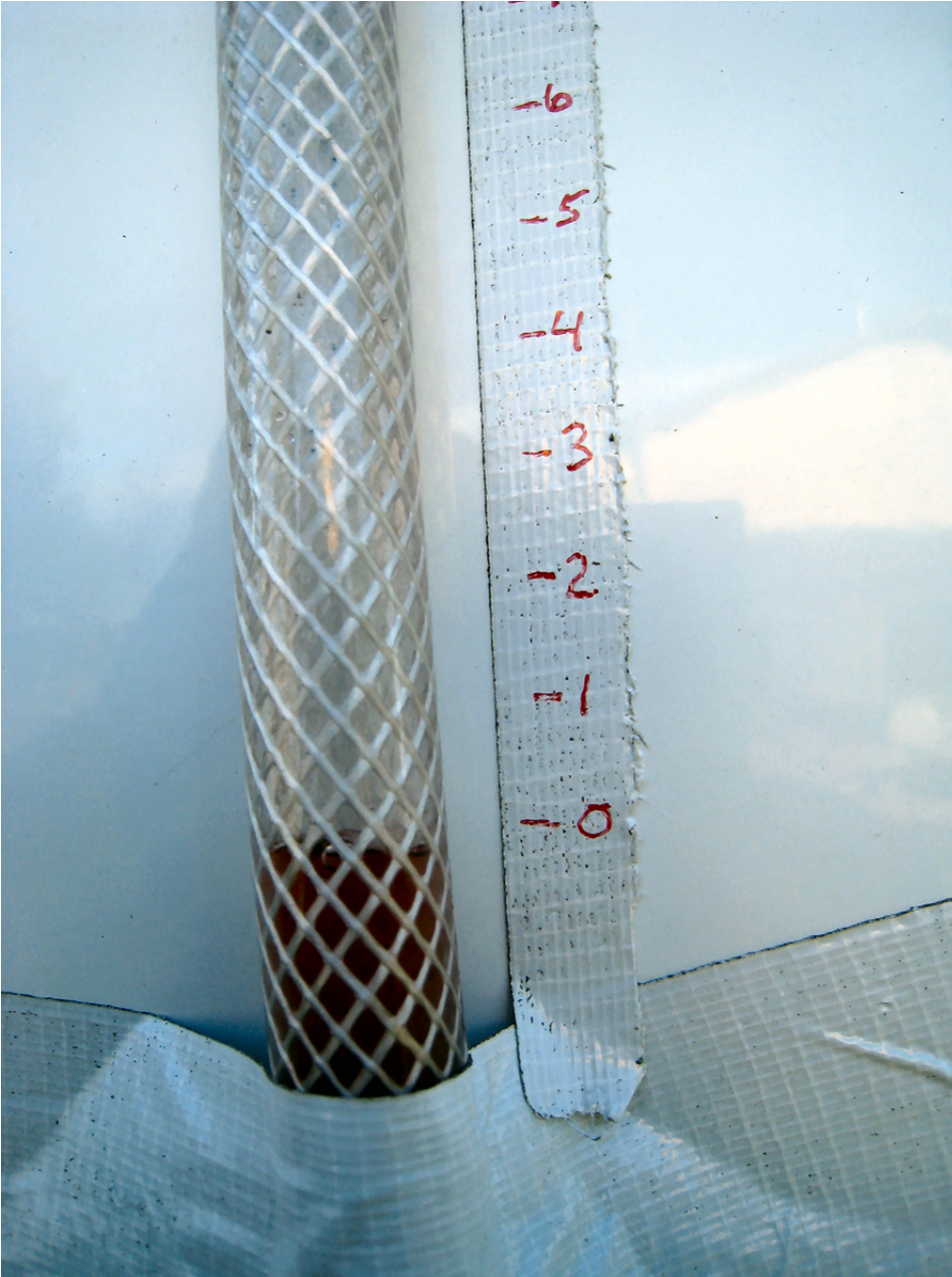
U Tube Manometer mounted on camper exterior.





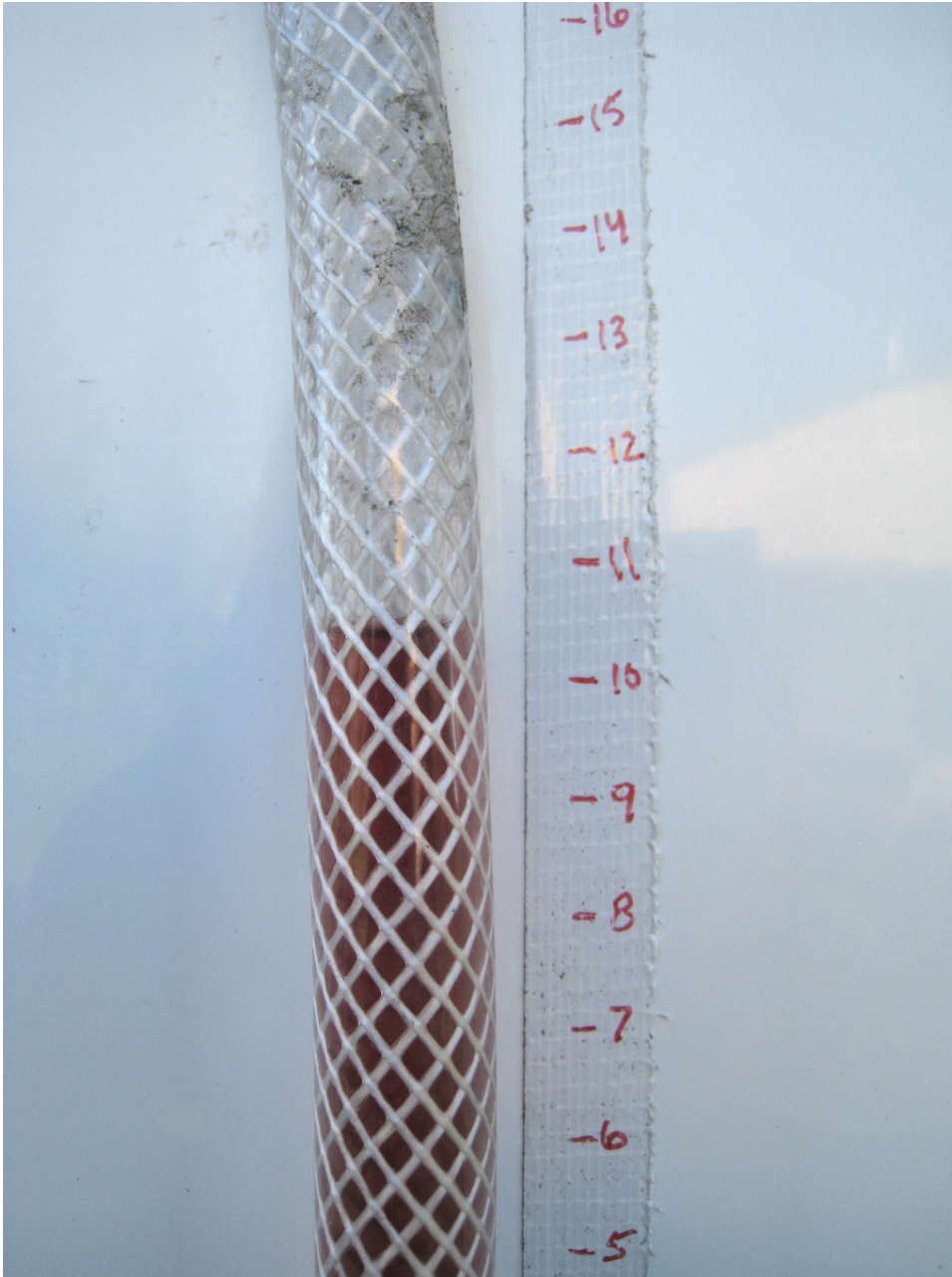
## Field Fix: Manometer

Zero mark detail. Carefully fill until the liquid is at the zero mark. Fill PRIOR to connecting to the propane system.



## Field Fix: Manometer

Water column measurement detail. Operate all appliances to obtain an accurate reading. When adjusting the regulator use small incremental changes.



## Field Fix: Manometer

Manometer connection to the propane system. In this case, it is the flare connector for the furnace.



## Field Fix: Manometer

The manometer requires colored liquid. This example is water with a little bit of red wine.

A funnel small enough to fit into the ½" hose/tube is very handy for this job.



## Field Fix: Manometer

Overall example manometer installation. Note the size of the bottom of the U required in this installation. The system regulator was in the compartment on the lower right, making adjustment quick and easy.



Photos:  
All photos by Douglas Hackney

Sources:  
Portions excerpted from the web page at this address:  
<http://www.rverscorner.com/manometer.html>