



Using the Water Manometer P/N F72951-1 and similar types



Stored position



Ready to use

Important Information on Manometers-

This manometer is designed to be used primarily as a pressure relief system to ensure no damage occurs to the aircraft or component in an over pressure event.

However as with all water manometers it can also be used as a highly accurate pressure gage.

Fill the manometer with plain water only. No alcohols, anti-freezes, or additives are allowed. The formulas used are for the specific gravity of water.

Water manometers do not require calibration; they do have to be zeroed before each use.

This type of manometer cannot be used for more than approximately **2.6 psi** negative pressure checks or approximately **5.2 psi** positive pressure checks. The maximum amount of pressure depends on the length of the tubing.

If at any time a monometer blows over it must be refilled to the correct levels (or zeroed) before further use.

In the event of a negative pressure blow over, the collection pot must also be drained before further use. Close drain when completed.

Make sure to drain the manometer (both drains) after use daily and more frequently when the temperature could drop to freezing.

WARNING

**Do not use when the temperature is at, near,
or especially below freezing.**

CAUTION

Do not use any permanent markers, paints, or nail polishes to mark directly on the tubing. Use masking tape or a grease pencil that is easily removed with out harming or clouding the tubing

WARNING

Using the manometer when filled above the specified relief line will not allow the pressure to dump at the specific pressure point. This could damage the aircraft or component.

General Familiarization of Water Manometers

Below is the most common way to attach the manometer to the aircraft during a positive pressure check.

This method will allow you to pressurize the aircraft with an independent gage attached for additional pressure readings.

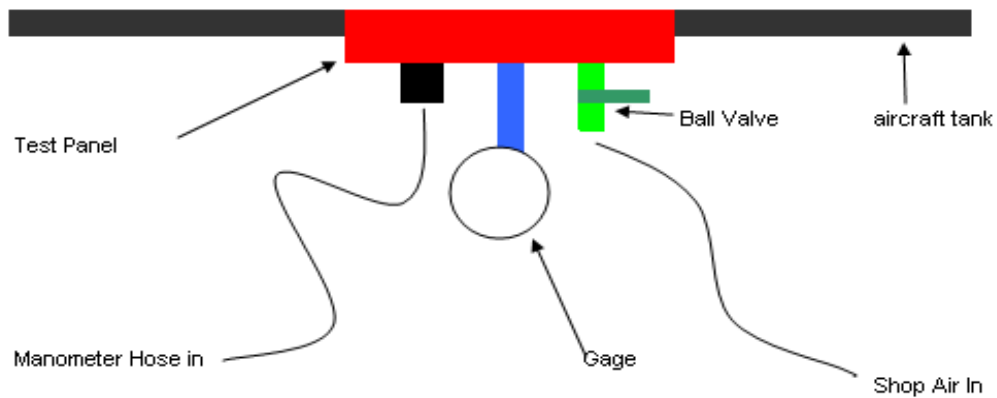
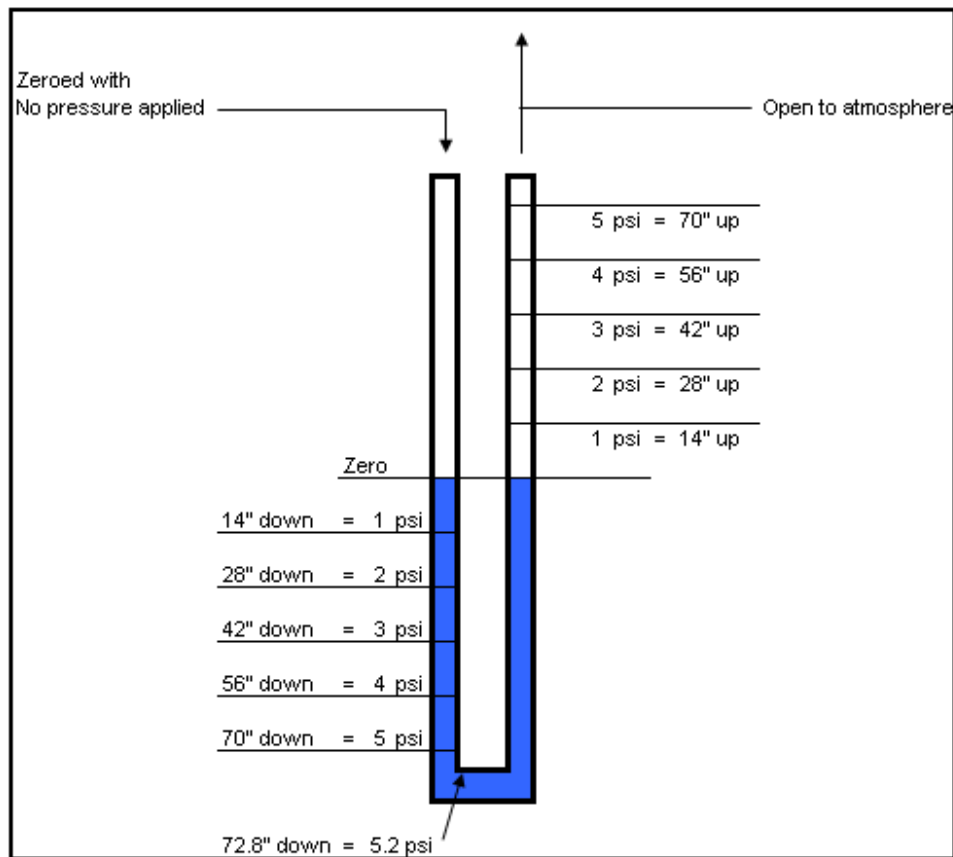


Figure 1 represents a manometer with no pressure applied and filled in preparation to perform a 5 psi pressure check with a 5.2 psi relief. The zero line is set at 72.8 inches above the top of the cross over tube.

Figure 1



WARNING

Using the manometer when filled above the specified relief line will not allow the pressure to dump at the specific pressure point. This could damage the aircraft or component.

Figure 2 represents the same manometer with the water displaced by 1 psi of positive pressure applied to the aircraft as it is being pressurized.

Figure 2

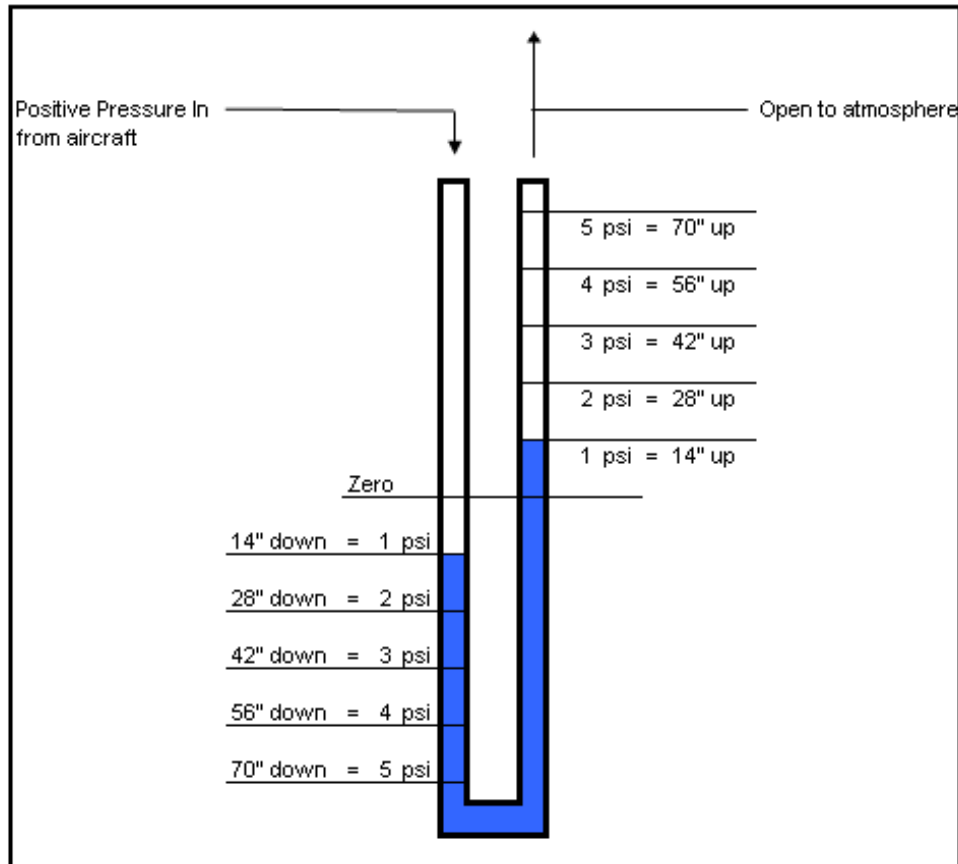
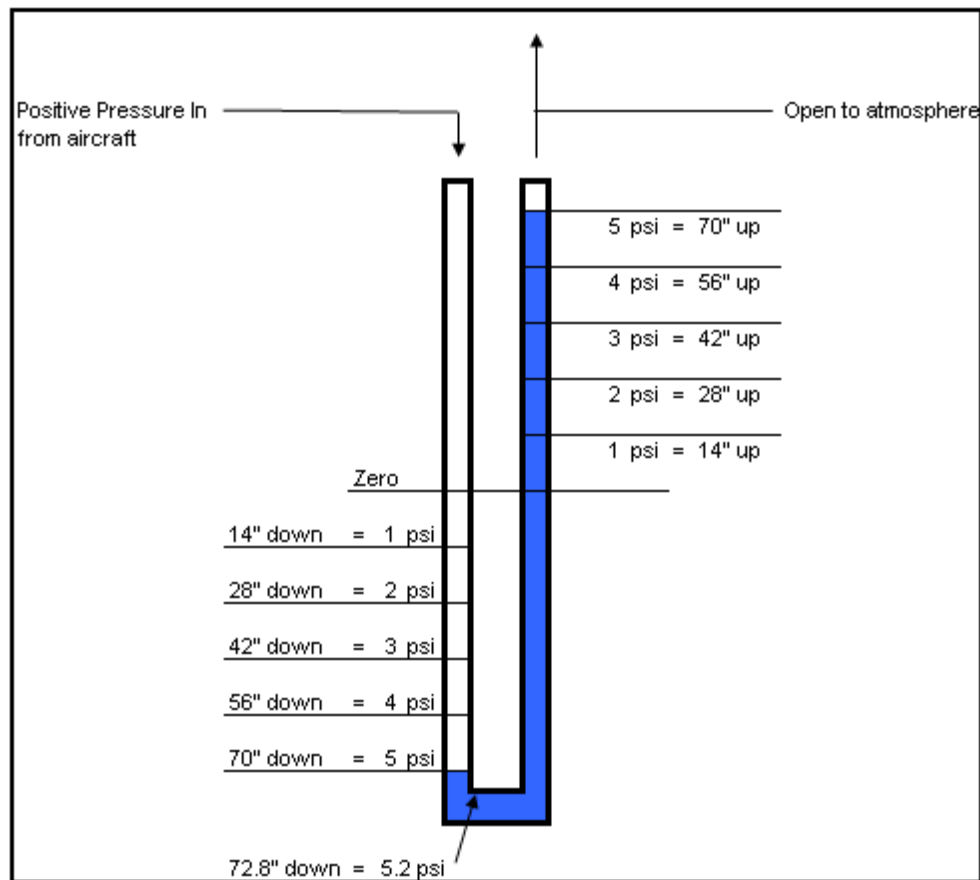


Figure 3 represents the water in the manometer being displaced by 5 psi of positive pressure from the aircraft.

Figure 3



It is VERY important to Notice-
Once the water reaches either the top of the tube or drops below the top of the crossover pipe (at the bottom of the manometer where the 5.2 psi arrow is pointing to) the water will dump out and the pressure on the aircraft will be relieved regardless of the zero line or water level setting.

Figure 4 shows the manometer zeroed to relieve at 2.5 psi. This will allow us to perform a 2 psi pressure check with out blowing over the manometer until 2.5 psi is reached. The zero line is set at 35" above the top of the cross over tube.

Figure 4

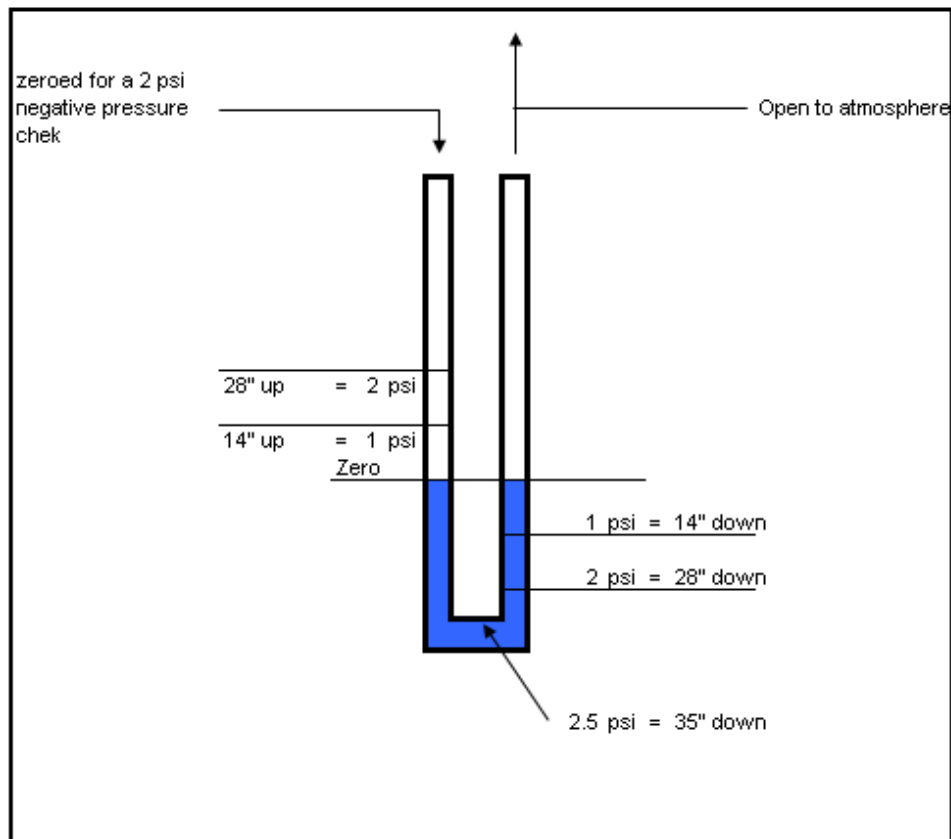
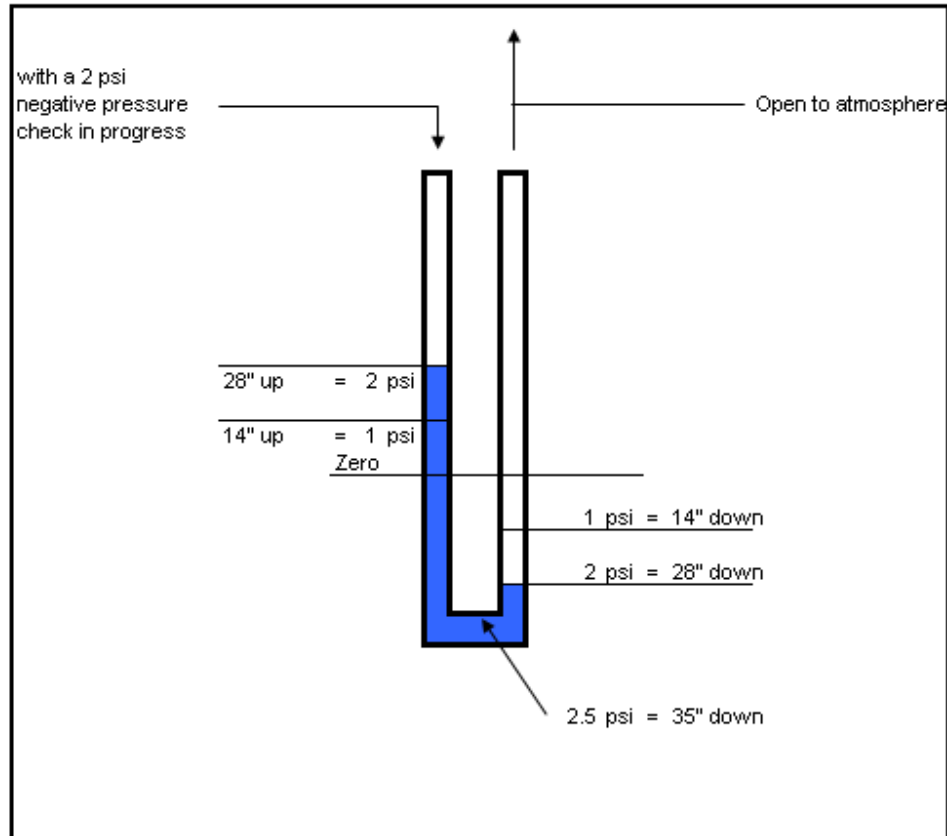


Figure 5 shows how the manometer will read while performing a 2psi **negative** pressure check when set to relieve at 2.5 psi.

Figure 5



Notice-

If the water ever reaches either the top of the tube or drops below the top of the crossover pipe (at the bottom of the manometer) the water will dump out and the pressure on the aircraft will be relieved.

To use a manometer as a pressure relief system

NOTE-

It is recommended to always use an independent gage with the manometer

First determine what type and amount of pressure you will be using the manometer at IAW the aircraft MM.

- A good example is the B757 positive pressure test.
- The manual states-
 - “to pressurize the aircraft to 4 psi”
 - “Not to exceed 5.2 psi”
 - You will need to fill the manometer to the **5.2 relief line** and pressure check the aircraft at **4 psi**
 - When filled to a **relief line** the manometer will dump pressure when that specific psi is reached

Next fill the manometer to the corresponding fill line.

- In this example it will be filled to the 5.2 psi relief line
- ***See instructions at the end on how to fill the manometer***



WARNING-

Using the manometer when filled above the specified relief line will not allow the pressure to dump at the specific pressure point. This could damage the aircraft or component.

Attach the manometer to the test panel

Pressurize the aircraft as required through the test panel

- Use the gage on the test panel to read the applied pressure
- Ensure the gage is set to the correct pressure type
 - Positive or negative

In this scenario if the gage is defective or there are any other issues that prevent the gage from working properly then the manometer will prevent the aircraft from being pressurized above 5.2 psi



A manometer as it starts to blow over

Notice the air bubbles in the right side tube

To calculate pressure using the manometer-

NOTE-

It is recommended to always use an independent gage with the manometer

The basics for calculating pressure with a water monometer are-

- The standard conversion from psi to inches of water is 1 psi is equal to 2.8 inches of water (overall vertical movement)
- When using a "U-Tube" type manometer divide the total inches of water (overall vertical movement) by 2 as the water in each leg of the manometer is moving.
 - i.e. 1 inch down on a leg and 1 inch up on the other leg is 2 inches of total movement
 - therefore 1 psi = 2.8 inches of water divided by 2 (# of legs) = 1.4 inches of movement per leg per pound of pressure
- The tubing size does not matter as you are reading pressure (per square inch) and not volume
 - Tube size must be equal and constant on both legs
 - No restrictions or blockages are allowed

CAUTION

Do not use any permanent markers, paints, or nail polishes to mark with on the tubing.

Use only masking tape or a grease pencil that is easily removed with out harming or clouding the tubing

Example of Use for Pressure Readings-

NOTE-

It is recommended to always use an independent gage with the manometer

We will continue with the B757 positive pressure check example previously discussed that states to “pressurize the aircraft to 4 psi and do not exceed 5.2 psi”.

Convert 4 psi to total inches of water-

- 1 psi = 28 inches of water
- 4 psi = 112 inches of water
 - $4 \times 28 = 112$

Adjust calculations for using a “U-Tube” manometer

- Total inches of water divided by 2 (# of legs)
 - $112 \text{ divided by } 2 = 56 \text{ inches of water per leg}$

Fill the manometer to the 5.2 pressure relief line.

- The manual states “do not exceed 5.2 psi”

Mark the tubing at the water line

- For positive pressure checks use the left side tube



CAUTION

Do not use any permanent markers, paints, or nail polishes to mark with on the tubing.

Use only masking tape or a grease pencil that is easily removed with out harming or clouding the tubing

Measure from the water line down the manometer and mark the tubing at the calculated spot of 56 inches.



Apply pressure to the aircraft

Once the water column is pushed down to the 56 inch mark you are at 4 psi.



NOTE-

This same method can be used to determine any pressure variations or settings.

To use the manometer as both a gage and relief

NOTE-

It is recommended to always use an independent gage with the manometer

For this example we will use a pressure setting that is not stenciled on the manometer. We will use 3 psi as the example

We will set up the manometer so that we can perform a 3 psi positive pressure check and so that it will “Not to Exceed” or relieve at 3.5 psi of pressure. This will give us a ½ psi buffer

First calculate the water level of the max pressure you want to keep from exceeding

- In this case 3.5 psi
- 3.5 psi multiplied by 28 inches of water = 98 total inches of water
- 98 divided by 2 (# of legs) = 49 inches of water movement per leg

This gives us the starting water level (or Zero line) of 49 inches above the top of the cross over tube.

- We know that the water must move down the leg exactly 49 inches; so set the zero level at that measurement.
 - Any more and the manometer will not relieve pressure at the correct setting
 - Any less any the manometer would relieve pressure before we reached the correct setting

Measure from the TOP of the crossover tube up the tube and place a mark on the vertical leg tubing at 49 inches

- This will be the relief fill line for 3.5 psi



CAUTION

Do not use any permanent markers, paints, or nail polishes to mark with on the tubing.

Use only masking tape or a grease pencil that is easily removed without harming or clouding the tubing

Fill the manometer to the 49 inch mark (for this pressure example)



Measure down from the water line and make a mark every 7 inches

- These marks will represent $\frac{1}{2}$ psi increments
 - 1 psi = 28 inches of water
 - 28 inches of water divided by 2 legs = 14 inches per leg per 1 psi
 - $\frac{1}{2}$ psi = 7 inches of water per leg



Make a mark at 42 inches below the zeroed water line to indicate 3 psi

- There will be 7 inches of water (1/2 psi) left between the 3 psi mark and the top of the crossover tube. This will allow for minor pressure fluctuations and adjustments without blowing over the water column until 3.5 psi is reached.



NOTE-

This same method can be used to determine any pressure variations or settings.

**Sample conversions of inches of Water (per leg) to psi
on a U-Tube type Manometer**

<u>Inches per leg</u>	<u>Total PSI</u>
70 inches	5 psi
56 inches	4 psi
42 inches	3 psi
28 inches	2 psi
14 inches	1 psi
7 inches	0.5 psi or ½ psi
3.5 inches	0.25 psi or ¼ psi
1.75 inches	0.125 psi or 1/8 th psi
1.4 inches	0.1 psi or 1/10th psi *****
0.7 inches	0.05 psi or 1/20th psi *****

***** As you can see the manometer is clearly more precise than the average gages.

Only **.05 psi** of pressure will move $\frac{3}{4}$ of an inch of water per leg.

That's almost an inch and a half overall movement for only 5 one hundredths of a pound of pressure.

In fact a water manometer is typically used to calibrate gages

To fill the manometer –

Connect a garden hose to the clear tubing drain valve (gold colored adaptor supplied with manometer or available at Home Depot)



Open valve and fill the manometer a little above the required fill line.

Close drain valve and let the water level out

Disconnect the water hose from the tubing valve

Slowly drain the extra water, via the tubing drain valve, out of the tubing until it is at the required fill line.

WARNING-

Using the manometer when filled above the specified relief line will not allow the pressure to dump at the specific pressure point. This could damage the aircraft or component

