

# BE ORIGINAL



# PURGE VALVE MANUAL

## P/N 2090124

Airflow Performance Inc.  
111 AIRFLOW DRIVE  
SPARTANBURG, SC 29306

(Phone) 864-576-4512  
(Fax) 864-576-0201  
(E-mail) [airflow2@bellsouth.net](mailto:airflow2@bellsouth.net)  
(Web) [airflowperformance.com](http://airflowperformance.com)

## **AIRFLOW PERFORMANCE INC.**

### **PURGE VALVE INSTALLATION AND OPERATION MANUAL**

The following manual is intended to serve as a guide to describe the operation and installation of the Airflow Performance Purge Valve Assembly. The user is responsible for using aircraft approved installation methods and materials to insure correct and safe operation of the engine and aircraft. This Purge Valve is not approved for use on certified aircraft.

#### **Background**

Modern light aircraft fuel injection systems are of the low pressure constant flow type. Fuel is metered and is delivered to air bled nozzles which atomize and spray the fuel at each intake valve. Airflow Performance and Bendix fuel injection systems meter fuel to the engine based on engine air consumption. The fuel regulator in both these types of injection systems do not return any fuel to the tank, therefore only the fuel that is used by the engine flows through the fuel controller. Vapor in these types of metering systems causes the fuel regulator to operate erratically and poor engine performance will result. This is usually evident during hot restarts. Hot restart problems are a typical complaint of pilots operating fuel injected engines. After engine shut down heat in the cowling and engine tends to boil the fuel in the fuel control, fuel pump and related fuel metering components. Some of the fuel expands in the nozzle lines and gets forced through the injection nozzles and into the engine. This leaves hot fuel and fuel vapor through out the complete fuel metering system, engine driven fuel pump included. During an attempted start under this condition usually results in the engine starting for a moment then quitting. The pilot is then faced with decision of how to proceed with the start procedure. Flooding the engine then cranking the engine until it starts is usually done. This procedure is dependent upon battery life which sometimes expires before the engine starts. Engines which use the high pressure diaphragm fuel pump, experience another problem which influences the ease of restarting the engine. By their design the diaphragm fuel pump acts like an accumulator when the engine is shut down. This keeps fuel pressure on the fuel controller, and leakage in the idle cut off circuit of the fuel controller will allow the fuel to bleed off into the engine. This can cause run on in idle cut off and flooding of the engine initially after shut down.

All Airflow Performance, Inc. fuel injection systems come with the purge valve as standard equipment typically installed as an assembly on the flow divider or purge valve. In addition to the above operational issues with this type of injection system, Airflow Performance fuel controls incorporate a rotary mixture control valve. Due to the inherent design of the rotary valve the device does not give zero leakage at ICO. Therefore even though the engine may shut down using the mixture control the purge valve will give a clean ICO under all circumstances.

### **Purge Valve Operation**

During engine shut down the purge valve is pulled into the off or ICO position. This will allow the metered fuel to the engine to be shut off at the flow divider and be diverted back to the tank. This positively shuts the fuel off to the engine and allows the fuel pressure to dump in the system. The fuel controller mixture control is left in the full rich position. During a hot restart, the mixture control is left in the full rich position. Leaving the purge valve in the off position, the boost pump is turned on, and the throttle open. Fuel will then circulate through the engine driven pump, fuel controller, to the flow divider and back to the tank. This will flush the hot fuel and vapor from the system and cool the fuel injection components. Turning the boost pump off, moving the throttle to idle and returning the purge valve to the run or R position, the engine is then started in the normal fashion. The engine will continue to run after it starts since the system is completely purged of vapor and the engine driven pump and fuel controller are filled with cool fuel.

### **Purge Valve Installation**

The purge valve is a manually operated device. It can be actuated by cable or linkage. It should be installed as close to the flow divider or distribution block as possible. Refer to the attached schematic for correct hook up of the purge valve assembly.

NOTE: The purge valve does not need a dedicated return line to a fuel tank.

The purge valve body has three 10-24 UNC threaded holes to facilitate mounting it to a bracket. All ports on the purge valve body are 1/8 NPT. The port stamped "IN" is to be connected to the fuel controller's metered fuel outlet. The port stamped "OUT" is to be connected to the flow divider or distribution block inlet. Make this connection and or hose as short as possible. Use AN-4 fittings and hose for these two connections. The port stamped "RETURN" is to be run back to any tank. This connection can be AN-2 to AN-4. Running this return hose back to the gascolator or fuel pump will reduce the effectiveness of the purge valve as the hot fuel and vapor will only be circulated through the fuel system. It may be possible to return the fuel to a low point in the vent system. Test to insure that during purge the fuel will flow back into the tank and not out the overboard vent. Make sure the actuating control moves the purge valve lever fully to its stops, both "R" and "ICO". The actuating control should be placed in the cockpit where it will not inadvertently be moved during flight. Make sure the actuating control will keep the purge valve in the "R" position during all flight conditions and attitudes.

Leak check all the connections and plumbing before starting engine. Lock wire all hardware. Make sure to lock wire the stop screw.

### **Purge Valve Test**

1. Tie the aircraft down or position it in a suitable run up area.
2. Put the purge valve in the ICO position.
3. Open the throttle and put the mixture control in the Full Rich position.
4. Turn on the boost pump.
5. By disconnecting the return line and pressurizing the system, fuel should flow out the return hose when the purge valve is in the "ICO" position. Likewise with the purge valve in the "R" position fuel should not flow out the return hose. Do not leave the system pressurized in the "R" position for long as fuel will be flowing into the engine.
6. Check full throttle operation of the engine before flying the aircraft. All operating parameters must be in normal range before flight.

### **Airflow Performance Inc.**

**111 Airflow Drive  
Spartanburg, SC 29306**

**864-576-4512 (Phone)**

**864-576-0201 (Fax)**

## OPERATING INSTRUCTIONS FOR USING THE PURGE VALVE

The following instructions are recommended procedures for operating engines with engine driven fuel pumps.

### COLD STARTS

- Purge valve off (“ICO” position).
- Mixture control "FULL RICH".
- Throttle open ½ or more.
- Turn on boost pump. Run for 15-30 seconds
- Reduce throttle to 1/8 or off idle.
- Put purge valve to run (“R” position), count to three then return purge valve to off position.
- Leave the Mixture control in the full rich position and turn the boost pump off. The boost pump can be left on if battery power is not an issue during engine cranking.
- With mags "HOT", crank engine, when engine fires, put the purge valve in the run position and the throttle to idle.

### ENGINE SHUT DOWN

- Bring engine to idle speed.
- Leave mixture control "FULL RICH".
- Put purge valve control to "OFF" position.
- Turn off the ignition.

### HOT STARTS

- Mixture control "FULL RICH".
- Throttle wide open.
- Purge valve "OFF" position.
- Turn on boost pump and let run 30 to 45 seconds. This will purge the hot fuel and vapor from the system, and will cool and fill the fuel system components with cool fuel.
- Leave the boost pump on.
- Set Throttle to 1/8 open.
- Give engine a short prime by putting the purge valve to “run” then back to “off”.
- Leave Mixture control "Full Rich".
- With mags "HOT", crank engine, when engine fires, return throttle to idle and purge valve to “Run”.

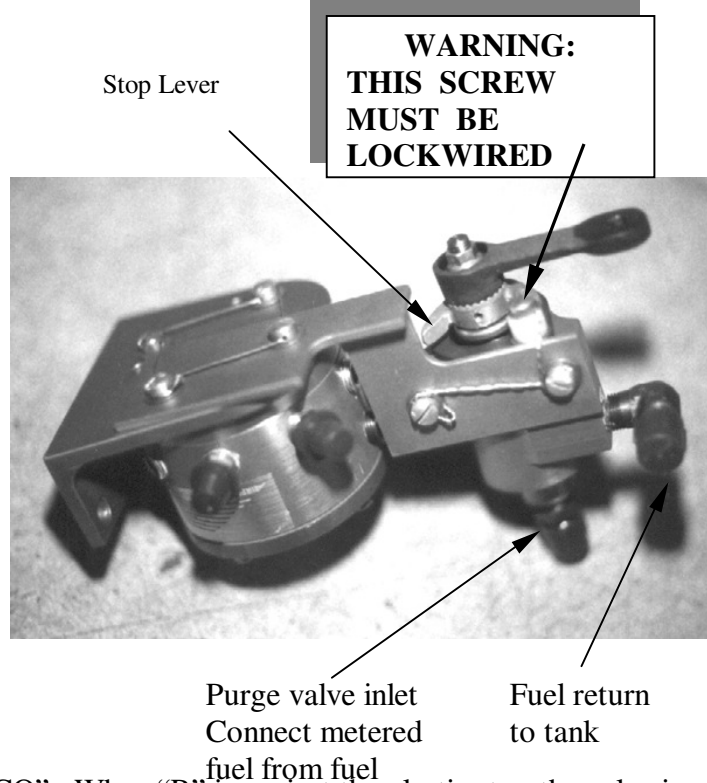
Another method for starting the engine when hot is to leave the mixture “rich” after purging the system. With the purge valve in the ICO position and the throttle at idle, crank the engine while slowly moving the purge valve to the Rich position. The engine will start during this movement to the Rich position.

APPENDIX I  
PURGE VALVE INSTALLATION

The following shows possible purge valve installations. The important thing to consider in the installation is to keep the connection between the purge valve and the flow divider or distribution block as short as possible. The purpose is to purge as much of the metered fuel in the system as possible. Also a fuel return to a fuel tank is necessary to accomplish the purge operation. Returning the fuel to the fuel pump inlet will do nothing but circulate the hot fuel and vapor through the system. This will accomplish nothing. Also capping the return line and using the purge valve, as a shut off valve will not allow correct operation of the valve.

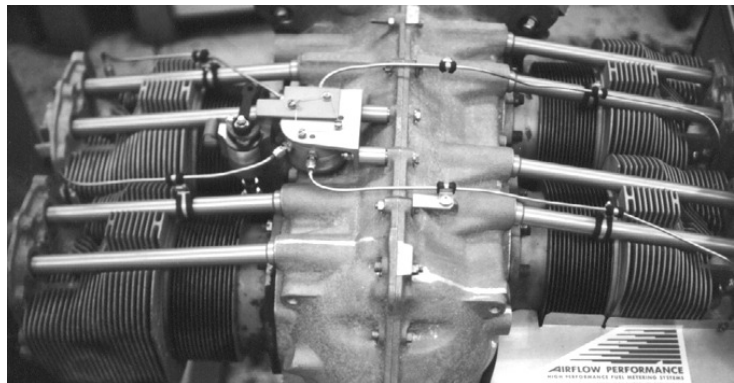
Here the purge valve is connected directly to the flow divider.

**Notice how the purge valve stop and two mounting screws are lock wired together. If removal of the valve is necessary, make sure to re lock wire the purge valve stop screw. Failure to do so will result in sudden stoppage of the engine if the screw backs out.**



The stop lever is marked "R" and "ICO". When "R" is against the plastic stop the valve is in the run position. Likewise when "ICO" is against the plastic stop, the valve is in the purge or bypass return position. There is some valve 'dead band' that means that the valve will not start bypassing as soon as the lever is moved from the "R" position

Purge valve / flow divider assembly mounted to Lycoming engine. The purge valve inlet is between cylinders 1 and 3.



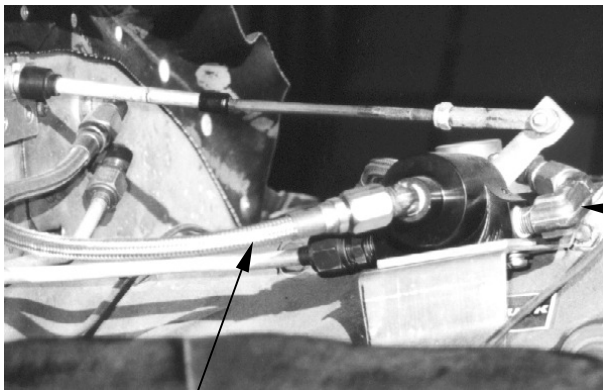
APPENDIX I (Continued)

Purge Valve installation on a Lycoming engine. The purge return is not yet hooked up in this photo. The purge return is typically -4, but a line as small as 1/8" could be used as approximately only 4 to 6 GPH is flowing through the valve during the purge operation.



Purge return

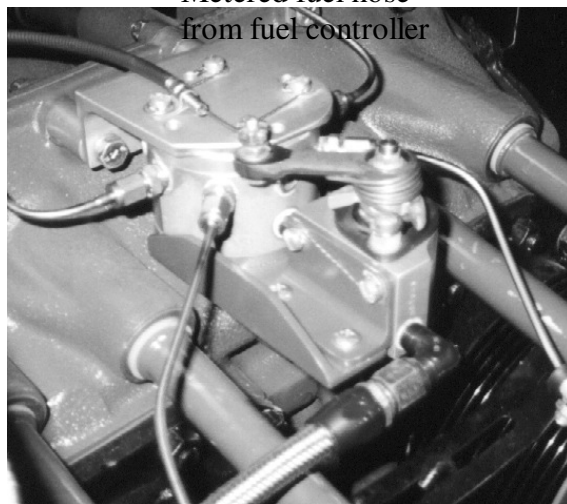
Purge inlet



This is a remote mounted purge valve. Note the short -4 hose from the purge valve outlet to the flow divider.

Purge valve outlet to flow divider

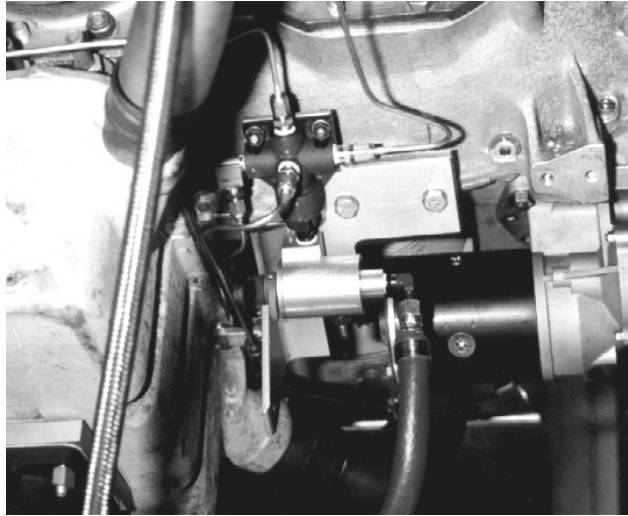
Purge valve inlet.  
Metered fuel hose  
from fuel controller



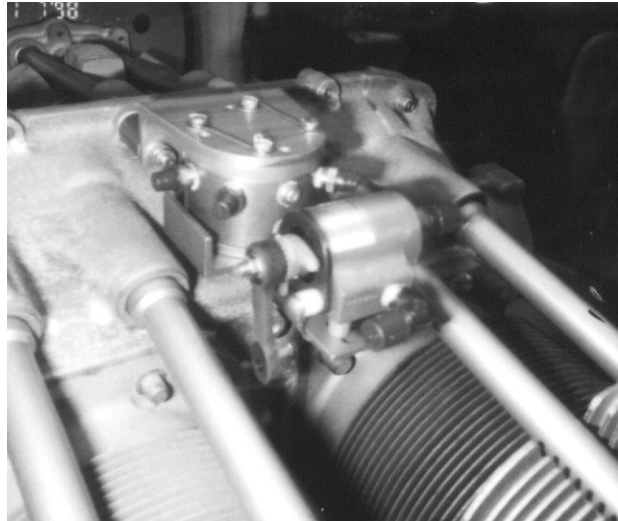
A modification of the purge valve bracket. A return spring has been installed to return the valve to the "R" position in the unlikely event that the cable would fail.

## APPENDIX I (Continued)

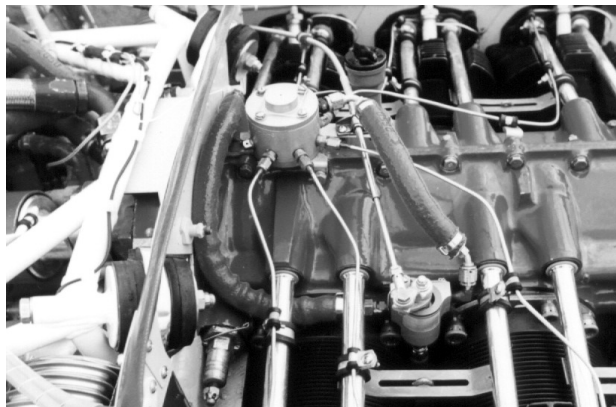
Installation of the purge valve mounted to a distribution block. This is a typical installation for a Long Ez or Cozy, or where the engine is up draft cooled.



For installations where a pressure cowl is used or the cowling is tight to the engine, a horizontal mount purge valve can be used. The actuating lever is mounted down. The metered fuel hose is routed around the front of cylinder #1 on this four cylinder Lycoming. This is a typical installation on RV-4's and Lancair's.

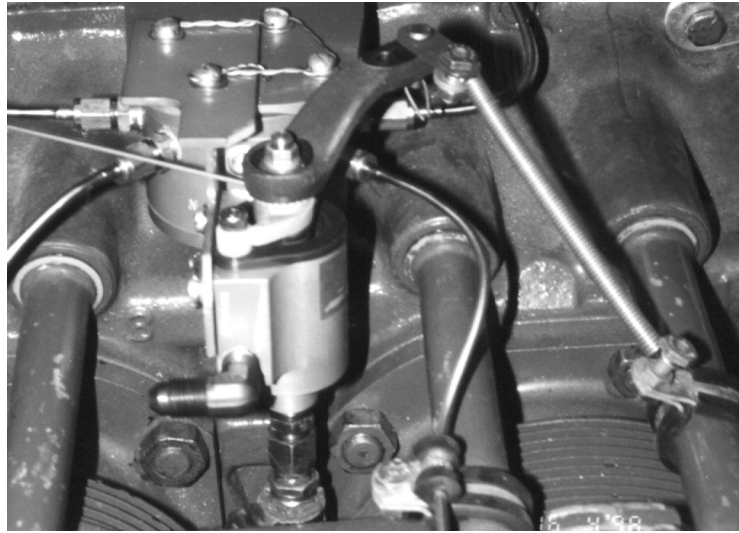


A remote purge valve installation on this Lycoming 540. A short fire sleeved metered fuel hose connects the purge valve outlet to the flow divider inlet.

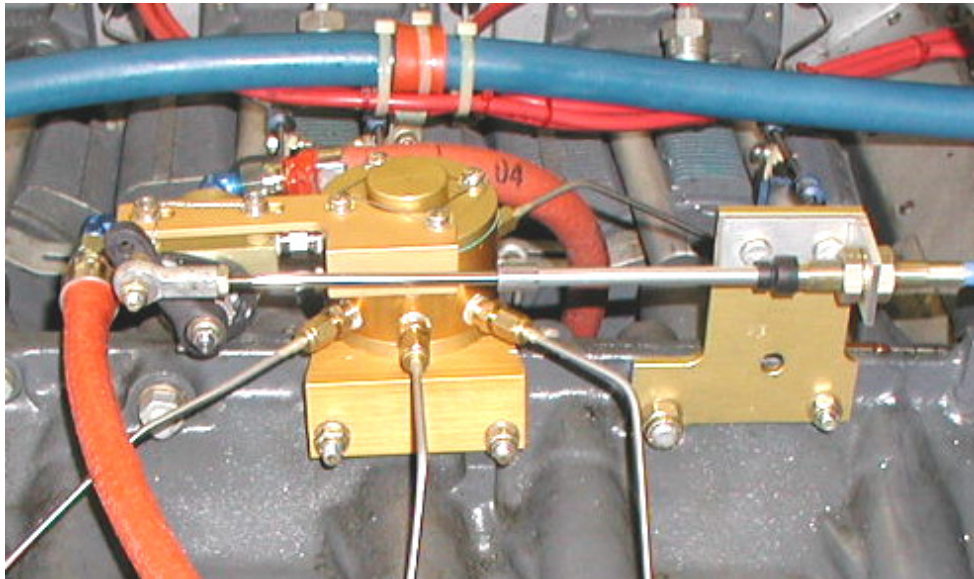


## APPENDIX I (Continued)

A number of different levers are available to fit different clearance requirements. Shown here is a standard throttle lever (P/N 2090118) installed. An offset lever with 1 1/2" offset (P/N 2090156) and a reverse offset lever with 1/2" reverse offset (P/N 2090155) are available from Airflow Performance. The purge valve comes standard with a straight (P/N 2090083) lever.

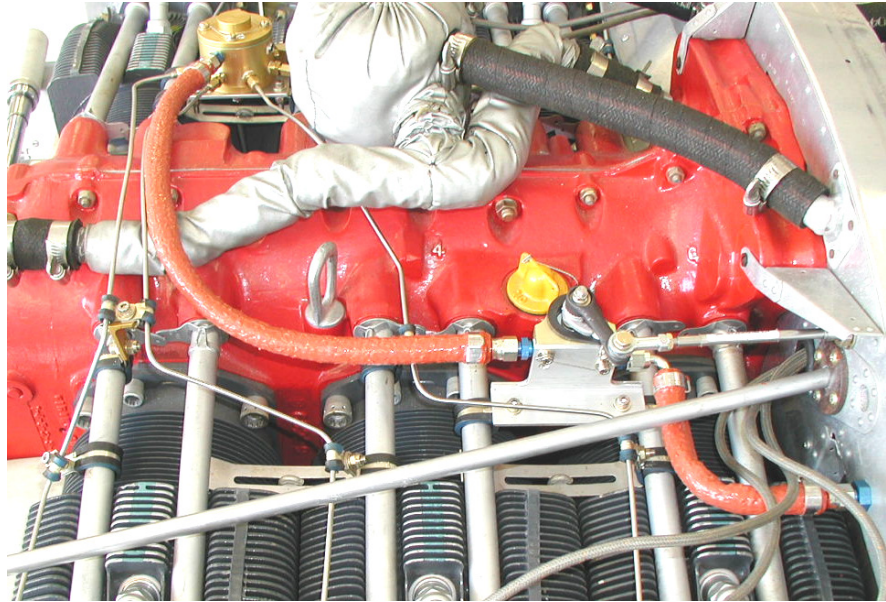


There are many installation possibilities for the purge valve /flow divider assembly. Depending on the application, purge valve rotation can be CW or CCW to run the position.



## APPENDIX I (Continued)

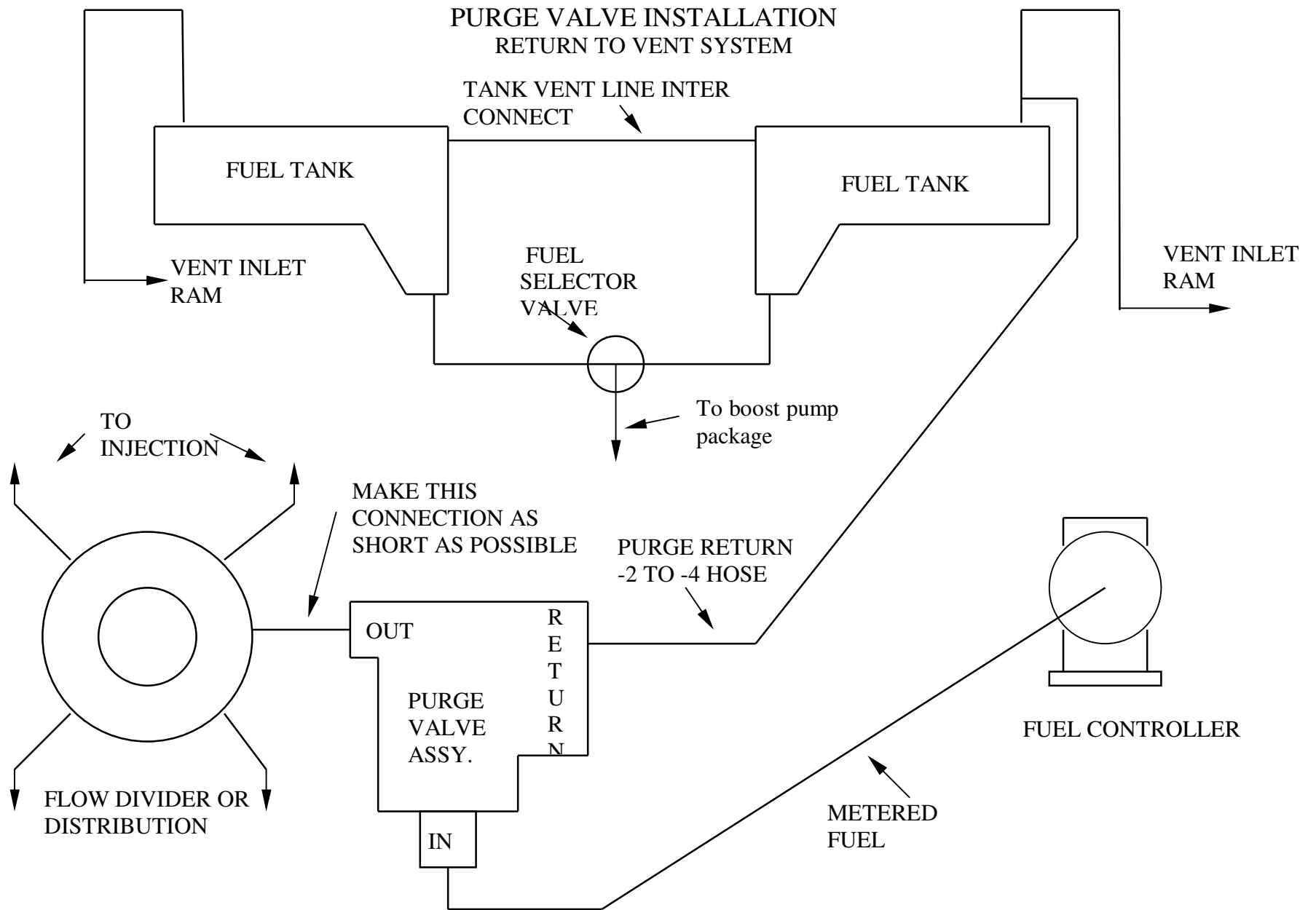
This installation has the flow divider and purge valve mounted to brackets that are supported by the push rod tubes with Adel clamps.



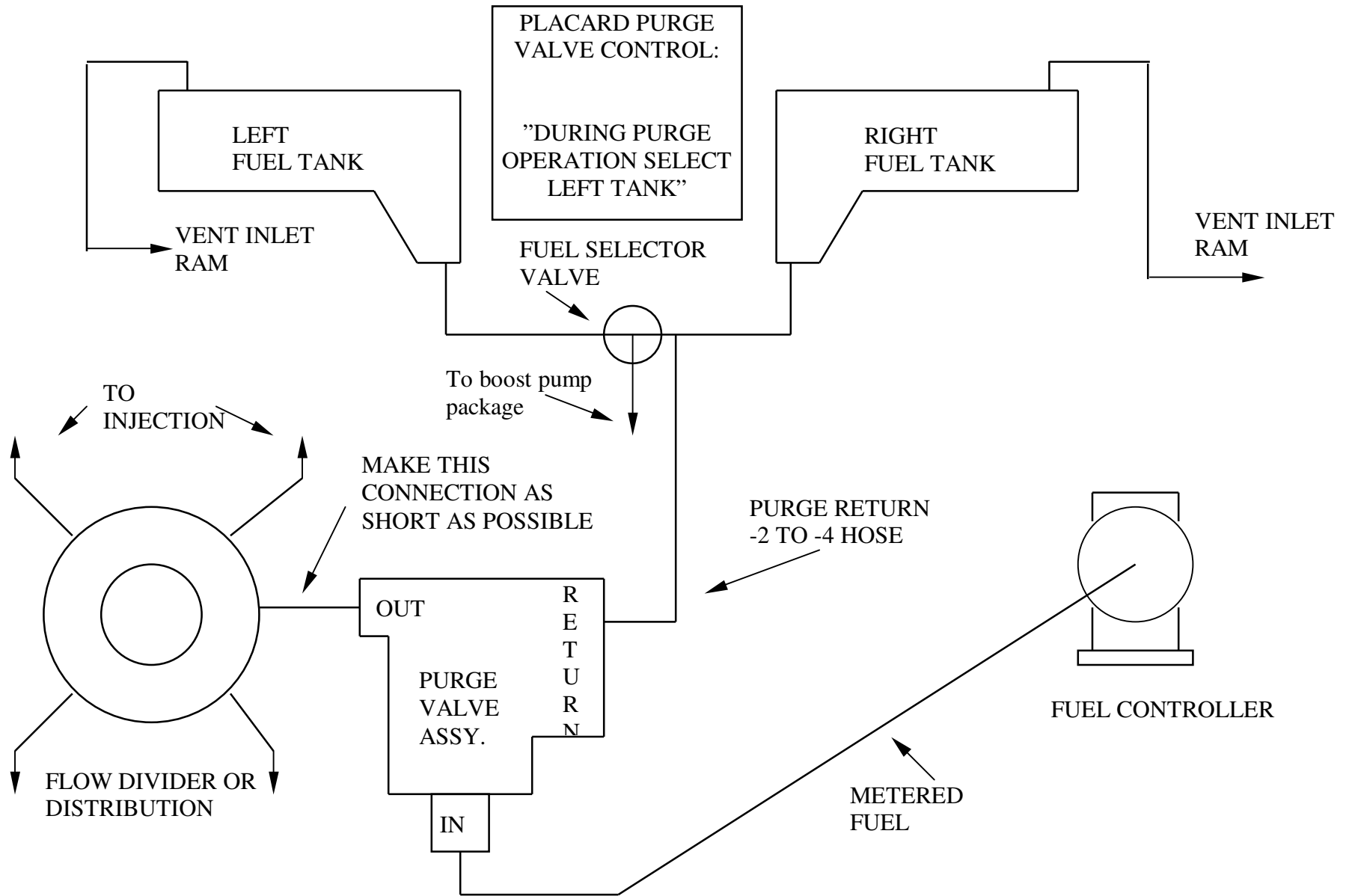
Installation in a Lancair 320. The horizontal mount CCW purge valve is used in this installation



APPENDIX I (Continued)



APPENDIX I (Continued)  
RETURN TO FUEL TANK



# **BULLETIN**



## **ATTENTION**

REFERENCE: PURGE VALVE INSTALLATION

COMPLIANCE: BEFORE NEXT FLIGHT

It has come to our attention after a recent reported incident, that good aircraft installation practices are not followed or over looked. The purge valve stop screw has a drilled head implying that the screw is to be lock wired. This screw is to be lock wired to the purge valve mounting screws.

Failure to over look this detail may allow the stop screw to back out due to engine vibration. This will allow the purge valve assy. to be pushed out of the body by fuel pressure, disrupting the flow of fuel to the engine. Engine stoppage is immediate.

Make sure the purge valve stop screw is lock wired on your installation.



# BULLETIN



## INSTALLATION OF PIPE THREAD AND O-RING FITTINGS

### PIPE THREAD FITTINGS

- DO NOT under any circumstance use Teflon tape.
- Approved sealants are Permatex Thread Sealant #14 or Loctite 565 PST.
- Torque 1/8" NPT fittings to 45 – 65 inch pounds.

### O-RING FITTINGS

- DO NOT under any circumstance use pipe thread sealant or Teflon tape on O-ring fittings.
- Apply a film of motor oil to the O-ring before installing the fitting.
- Torque Inlet Filter Fitting (Blue) between 45 – 50 inch pounds.
- If the fitting leaks around the O-ring seat, replace the O-ring, inspect the O-ring port for scratches or nicks.