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Applicable additional manuals:
None

Aerospace Group
Conveyance Systems Division
Carter® Brand Ground Fueling Equipment

Installation Instructions

Level Sensor

Model 64079

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Installation Instructions for
Model 64079 Level Sensor

1.0 SCOPE

These installation instructions have been developed for use in mounting Model 64079 Level Sensor in a bottom loading system of a refueler. These instructions do not cover all requirements for such an installation, which might be dictated by other authorities, which have jurisdiction over the use of your vehicle. The responsibility for proper final installation configuration is yours. Consult with the local airport authority or corporate authority for further information.

2.0 EQUIPMENT SUPPLIED BY CUSTOMER

The following is a listing of the required equipment supplied by the customer in a bottom loading system on a refueler:

- A Carter brand 3 inch 64129A, 4 inch 64055A or 64143, 64118A or 64128A Bottom Loading Internal Valve.
- A 5¼ inch 64078 or 64159 Vent.
- Precheck valve if desired.
- Plumbing hardware and mounting hardware and gaskets as needed to mount the equipment.

3.0 GENERAL DESCRIPTION

3.1 Operation

Model 64079 Level Sensor is a fluidic type device used to detect a rising fuel level in the tank and relay a signal to the mating internal valve to stop the filling of the tank. The unit has three ports, an inlet, an outlet and a precheck port. The use of the latter is optional and its use will be explained in more detail later. The inlet port accepts relatively high pressure from the inlet of the internal valve plumbing system, forming a stream of fuel that is directed through an orifice to bridge the gap between the inlet and outlet. A nozzle installed within the outlet port senses the impinging stream. The impinging stream imposes a relatively high pressure on the nozzle. The outlet port is plumbed to the pilot port on the internal valve. The sensed pressure in this line will cause the pilot valve to open, venting the main piston chamber of the internal valve. The piston chamber is connected to the inlet of the internal valve through an orifice. Venting the piston chamber through the pilot reduces the piston chamber pressure and the higher inlet pressure can then open the internal valve to allow filling the tank.

When the level in the tank reaches the jet being emitted in the level sensor, the static fuel in the tank interrupts the jet reducing the pressure sensed at the nozzle in the outlet of the level sensor. This reduction in pressure can no longer keep the pilot valve of the internal valve open hence it closes. This stops the venting of the piston chamber and the pressure in the piston chamber becomes equal to the inlet pressure. The piston area on the chamber side is greater than that exposed to the inlet side of the piston. This area difference (with the equalization of the pressure) plus the piston spring, causes the internal valve to close. The rate of closure is controlled by the area of the orifice through the piston into the chamber.

3.2 Prechecking

Most customers require, wisely, that any bottom loading system be capable of being checked to determine that it is functioning properly before the tank is full and it is too late to stop the filling before an overfill might occur. This function is called “Prechecking”. Due to the special nature of the level sensor controlled bottom loading system, there are two methods of accomplishing a precheck. One is more difficult to install but simulates the actual function of the system better. Although it is more closely related to the actual action when using the system, Carter does not

necessarily recommend that it is needed. Both approaches will be discussed in the following paragraphs:

3.2.1 "Real" Precheck Approach

In this installation, the precheck port in the integral "can" of the unit is utilized. Fuel pressure from a location upstream of the internal valve (routed from near the bottom loading adapter) is plumbed through a 3/8" manual on/off valve through the tank wall. (Check regulations to determine if a check valve is needed at the incursion into the tank). The line is connected to the "Precheck" Port. When properly installed and the proper adjustments are made (as explained later), the manual valve can be opened to flood the can faster than it will drain. This will simulate a full tank causing the jet to be interrupted and the internal valve to close. Closing the manual valve will stop the flow into the can and the level therein will drop allowing the jet to re-establish and the internal valve to open again. This action indicates a properly functionally bottom loading system (internal valve and level sensor only - does not assure that the vent is properly open) hence the loading can be continued with assurance that it will shutoff when the tank is full. The main disadvantage in this type of precheck system is the need for the incursion into the tank just for the precheck line (results in two such transgressions through the wall). It also requires a trial and error adjustment of the precheck "gate" located in the bottom of the precheck side of the can. This function will be explained in more detail later. The precheck can and adjustment gate is a standard part of all Carter 64079 Level Sensor unlike the Whittaker unit. In addition, should the "real" precheck method be chosen the adjustment, which is trial and error on both the Carter and Whittaker units, is much simpler than on the Whittaker unit. There are no buttons to use to plug a number of holes in a flimsy plastic can. In addition, the mounting stud hole on the Carter unit is located outside of the drain/precheck can not inside the two cans like on the Whittaker unit. There is no additional leakage path from the can to seal.

3.2.2 "Simulated" Precheck Approach

Since the internal valve will **not** open unless the level sensor is functioning properly and the main failure mode of both the internal valve and the level sensor is to fail close this "simulated" precheck approach is recommended. A 3/8" manual **ball** (can be spring loaded open if desired) is installed in the line from near the bottom loading adapter to the inlet of the level sensor. This line obviously must be routed through the tank wall (a check valve may be necessary). When the bottom loading operation is started, the prechecking is accomplished by closing the ball valve. This simulates the interruption of the jet within the level sensor and the internal valve closes. Opening the ball valve will reestablish the operation. The theory of this type of precheck is that if the internal valve will open, the level sensor is obviously functioning properly. Interrupting the flow through the level sensor (simulating the tank level at full) causes the system to close establishing that the internal valve will close. Hence all functions are really checked. This precheck system requires only one tank wall incursion and no adjustments.

3.3 Draining of Level Sensor

The level sensor is a continuous flow device, flowing upwards of 0.5 gpm even after the internal valve closes. This can cause two problems that must be addressed:

- The continuous flow could possibly result in an overfill of the refueler if left unattended and connected to the bottom loading rack. Under normal operating circumstances, this is not likely to occur; however, it is possible. The volume contained in the fuel tank **above the final shutoff level** will normally be in the order of at least 100 gallons. At a rate of 0.5 gpm, it will take over three hours to cause an overfill and then it will be at the rate of 0.5 gpm.
- During the loading operation, the continuous flow is collected within the can of the level sensor. A drain connection is provided on the unit to which a simple fuel resistant plastic tube can be attached. The drainage can then be directed to the bottom of the fuel tank of the refueler. The Carter

Level Sensor, unlike the Whittaker unit, has an integral can, it is not an option. All fuel flowing within the Carter unit is contained within the unit, there is not auxiliary drainage that will not be directed down the drainage tube.

CAUTION!

Why is the drainage tube important?

The dropping of fuel from the top of the tank to the bottom can generate static electricity. It has been demonstrated many times that this is a fact. Under the right conditions, static electricity thus generated could cause an explosion. The simple action of draining the flow down the plastic tube will prevent such possible action.

Carter **strongly recommends** that all installations of this type of device have the drainage tube included as a standard part of the system.

4.0 INSTALLATION

All tubing utilized within the tank should be coiled to allow for easy removal of the internal valve without removal of the level sensor connections.

CAUTION!

Teflon tape should not be used in installing the fittings in the system. Pipe thread sealant that will not generated loose pieces of sealant that could clog the level sensor should be used.

4.1 System without a Precheck Function - The inlet of the level sensor is connected to a pressure source, normally just downstream of the bottom loading adapter. In fact, if any of the Carter 6958, 61272 or 61528 adapters are utilized a port for this application is provided as standard.

Note that a check valve may be required at the tank entry of this line by the proper authorities. The line must be at least 3/8" tubing and, if used, the check valve must be free flowing with as little restriction as possible. A "swing check" type valve is recommended over a poppet type. The length of line may also result in too much restriction (pressure drop) and result in too little pressure being presented at the outlet of the level sensor to open the internal valve. A minimum of 5 psi is required at the internal valve for proper function. This translates into a minimum of 10 psi at the inlet of the level sensor. If there is too much pressure drop in the inlet tubing to the level sensor, or too low of bottom loading pressure at the loading rack, the system will probably open, cycle close and then reopen and then continuously repeat this cycling action.

The outlet port of the level sensor is connected to the pilot port on the mating internal valve by means of a ¼" tube. Since there is no flow in this leg of the installation, the pressure drop is of little importance.

The Precheck Port should be plugged to prevent drainage from the can. Absolute tight sealing of this port is not necessary. The drainage connection should be attached to a suitable length plastic tube to allow for transmitting the flow from the level sensor to the bottom of the tank.

A convenient mounting stud is provided as option A on the unit. This stud, if mounted in a fixed nut, will allow for final adjustment of the shutoff level in the tank.

4.2 Installation using "Precheck" Port - The installation above should be followed except that a second 3/8" diameter pressure line must be installed from the bottom loading adapter to the precheck port. A manual, normally closed valve, should be included near the entrance to

this line (near the bottom loading adapter) for convenience.

The adjustment of the precheck “gate” has to accomplished by trial and error due to the variance of the available pressure to effect a precheck. A pressure gage should be installed temporarily at the connection of the precheck line for test purposes. The gate is a sheet metal part fastened to the bottom of the can under the “splash shield”. It is necessary to remove the splash shield to get at the gate. Remove the two screws affixing the splash shield and set them aside for later re-attachment. There are two screws through two slots holding the gate in place. Loosen, but do not remove these screws. Position the gate at a mid-way position and fasten the screws. Do not over torque the screws, they are small and the base metal of the can is die cast aluminum. Reassemble the splash shield. Start the bottom loading system with a minimum of 15 psi at the bottom loading adapter gage. If the ultimate customer loading rack will have a minimum pressure greater than 15 psi, then use the know minimum. The lower the difference between the minimum and the maximum pressures will make it easier to make the proper adjustment. Once the system is allowing the tank to be loaded, open the precheck valve and assure that the position of the gate is such that the can fills faster than the drainage. If it will not fill, stop the test and readjust the gate to further close off the drainage and repeat the test.

Once this test has been completed, increase the test rig pressure to 75 psi (or greater if it is known that the ultimate customer will have a greater pressure). Start the bottom loading procedure and observe that the can does not fill on it own while the tank is being filled. The object is to allow the tank to fill while the can is draining sufficiently to not automatically “precheck” the level sensor. If it does then further fine adjustment of the gate may be necessary to arrive at an adjustment that will meet both the low and high-pressure requirements.

4.3 Installation with a Simulated Precheck System - This installation is the same as in paragraph 4.1 except a normally open **3/8” ball valve** is installed directly into the line from the bottom loading adapter to the inlet port on the level sensor. It is important that a ball valve be used to minimize the pressure loss in this line. Prechecking is accomplished by simply closing the ball valve after establishing the flow through the system. After the system has stopped flow, reopen the ball valve and complete the bottom loading operation.

5.0 OPERATION

There are no special needs during normal system operation. The system will operate automatically once properly set up as described under Installation above. The manual operation required of the system is when a precheck function is included. This is described under the appropriate system above. Since there are no non-metallic parts within the unit, once properly installed there is no maintenance for the life of the vehicle.

6.0 TROUBLESHOOTING

6.1 Internal valve will not attempt to open.

6.1.1 Level Sensor installed backwards.

6.1.2 Inlet or outlet orifices plugged. Check for presence of contaminate and clear the orifices.

6.1.3 Diaphragm in pilot on internal valve blown, replace the pilot.

6.2 Internal valve opens then closes and cycles from open to closed.

6.2.1 Pressure at the outlet of the bottom loading adapter too low. It should be at least 15 psi for proper operation.

6.2.2 If a “real” type of precheck system is used, the precheck gate may be adjusted too close to the closed position preventing proper drainage and premature prechecking is occurring. This will be evidenced by a slow cycling of the system from open to closed. It takes time for the can to fill and then drain. It will also probably occur at relatively high adapter pressures. Reduce

the pressure to 15 psi and check to see if the condition goes away.

6.2.3 The pressure loss in the line from the adapter to the inlet of the level sensor is too great. Be sure that 3/8” tubing was used and if a precheck or check valve is used that the pressure loss across such items is a minimum. At least 5 psi must be present at the inlet of the level sensor for proper operation.

6.3 Internal Valve does not shutoff at the proper level.

6.3.1 Main piston is jammed open. With 10 psi or less at the adapter attempt to load the tank. If a significant flow is established, then the piston is probably jammed open for some reason and the valve must to removed for service.

6.3.2 Splash shield on the level sensor may have been left off. The tank will fill properly but the final shutoff level may be considerably higher than normal, well above the level sensor.

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