Anti-Icing Additive

INJECTOR GUIDANCE FROM THE MANUFACTURERS

Hammonds and Gammon Technical Products developed specific injector and maintenance guidance for your use. Additionally, Air BP Aviation and ChevronTexaco recommend that you refer to the MSDS and wear appropriate PPE.

PREVENTATIVE MAINTENANCE CHECKLIST

HAMMONDS MANUAL AND “SMART” MODEL 600 PRIST® INJECTORS

1. Check additive supply daily and inspect desiccant dryer. If dryer is more than three quarters pink, replace the element.

2. Always wear gloves and goggles when handling additive or servicing your additive system.

3. Inspect entire system monthly for leaks including all fittings on additive tank, delivery and injection lines, calibration gauges and additive pump.

4. Inspect and clean screens in Sight Flow Indicators and filters in additive lines in “Smart” systems monthly.

5. Check pump stroke adjustment setting monthly, should be about 60% and knob should be tight. Knob should not move when operating.

6. Change diaphragm annually. Follow factory recommendations for procedures.

7. Be certain system has 25 PSI check valve on calibration output port before calibrating to atmosphere in an open container.

8. If additive supply is incorrectly installed below injector, consult Hammonds for special instructions.

9. Visually check for additive flow through Sight Flow indicator, Suction Calibration gauge or digital additive meter during each use.

10. Check calibration of any additive system every 90 days.

11. Consult Hammonds for free assistance in operating and maintaining your Hammonds additive system. 800-582-4334 – website hammondscos.com

   Do not guess, call the factory.

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GAMMON TECHNICAL PRODUCTS – OFFERS GUIDANCE ON INJECTOR USAGE

Gammon Technical Products makes three additive injectors, the Digital Viper, Viper Eclipse and Viper Stealth. Gammon Technical also has made an older design. This injector has an air-operated valve, connected by tubing, on the side of the meter register.

If you have this unit, the GTP-2276, contact Gammon Technical directly at gammontech@gammontech.com.

The following manuals are simple operating manuals. Installation manuals are also available by going to: http://www.gammontech.com/mainframe/Pmanuals.htm

What Viper do you have?

Digital Viper - No display, has a simple control box with no lights or switches.

Viper Eclipse - Rectangular shaped digital display, 4-1/4” x 2-3/8”, mounted in aS/S control box with two red lights, one green light, one selector switch and one push button switch.

Viper Stealth - Square shaped display, 3-3/4” x 3-3/4”, mounted in a fiberglass control box with one red indicator light and no switches.

Viper Operation Manual

Operation:

1. Verify whether or not the aircraft to be refueled needs additive injected into the fuel.

2. Verify that there is a sufficient amount additive in the reservoir to complete the refueling operation.

3. Turn the air supply valve to the on position.

4. Turn the Inject/Test valve to INJECT.

5. The aircraft can now be refueled.

6. Watch the sight flow indicator to verify that additive is flowing.

7. When the refueling operation is complete, turn the air supply valve and the Inject/test valve each to the off position.
**Viper Calibration:**

1. Set the truck up to re-circulate fuel.
2. Turn the air supply valve to the on position.
3. Turn the Three-way TEST/INJECT valve to TEST.
4. Place a graduated cylinder under the test port tubing.
5. Flow fuel thru the truck until there is no air coming out of the test port.
6. Empty the graduated cylinder. Place it under the test port.
7. Flow 100 gallons of fuel thru the truck.
8. Verify that 380 ML of additive has flowed into the graduated cylinder.
9. This should be done several times to verify the amount.

**Viper Eclipse Operation Manual**

**Description:** The Viper Eclipse additive injection system is a self-monitoring and self-adjusting additive injection system. The system was designed so the operator has to make a decision to inject additive or not to inject additive each time an aircraft is refueled. Each time the vehicle is moved, the additive injection system is reset. The vehicle now cannot pump fuel until the operator selects either additive or no additive. A display is provided to show the actual injection rate in parts per million and percent of additive. A second screen on the display will show gallons or Liters of fuel pumped and gallons or Liters of additive injected.

**Operation:**

1. Verify whether or not the aircraft to be refueled needs additive injected into the fuel.
2. Verify that there is a sufficient amount of additive in the reservoir to complete the refueling operation.
3. Use the selector switch on the control box to either select additive or no additive. This will enable the vehicle to pump fuel. The selector switch is not an OFF/ON switch for the injection system. If the wrong selection is made, the vehicle must be turned off and restarted. The only way the system can be manually turned off is to turn off the ignition switch of the vehicle. The system will automatically turn off when the vehicle is moved.
4. The aircraft can now be refueled.
5. If the system shuts down the vehicle, look at the warning lights on the control box to determine whether too much or too little additive was injected. Make a note of the parts per million of additive injected and the number of gallons/Liters of fuel pumped. If no additive was injected, verify that all of the valves installed in the additive lines and air lines are turned on, and that there is additive in the reservoir. Press the reset button to restart the system.

**Calibration:** If there is a problem with the calibration contact Gammon Technical.

1. Set the truck up to re-circulate fuel.
2. Select additive on the control box.
3. Turn the Three-way TEST/INJECT valve to TEST.
4. Place a graduated cylinder under the test port tubing.
5. Flow fuel thru the truck until there is no air coming out of the test port.
6. Press the reset button on the control box. This will reset the display to 0.
7. Empty the graduated cylinder. Place it under the test port.
8. Flow 350 to 450 Liters of fuel thru the truck.
9. Compare the amount of additive in the graduated cylinder, to the amount that is shown on the GALLONS of ADDITIVE display.
10. This should be done several times to verify the amount.
11. Turn the TEST/INJECT valve to INJECT.

**Operation of the display unit:** The display unit is set up so that only two screens are accessible to the operators. All of the settings in the PLC are protected by a password. This password is needed to make any changes to the program.

1. Use the selector switch on the control box to select additive.
2. The display will turn on.
3. When ready, the display will show the percent and parts per million of additive.
4. Press the NEXT button on the display to go to the next screen. This will show Liters of fuel and liters of additive. Press the PREV button to return to the first display.

Viper Stealth Additive Injection

Operation:

1. Turn on the power. The display on the control panel should turn on.

2. Verify that the three-way inject/test valve is in the inject position.

3. Verify that the additive reservoir has sufficient additive. The minimum amount of additive to be injected is 1 gallon for every 1000 gallons of fuel.

4. Press the #2 button on the control panel key pad. This will activate the additive pumps and prepare the system to start injecting additive.

5. Verify that the additive pumps are running and the display shows fuel and additive information.

6. Start the flow of fuel.

7. When finished, turn off the power to the additive system.

If the system is not injecting the correct amount of additive, a red indicator light will be activated.

The control panel display will show the total number of gallons of additive injected, the total number of gallons of fuel loaded, the parts per million of additive injected and the percent of additive injected. This information will be stored in the memory of the display with a time and date stamp.

Calibration:

1. Turn on the power.

2. Press the right arrow button until you get to the password screen.

3. Press the enter button. Enter the password and press enter.

4. Press the right arrow button until you see the calibration screen.

5. Turn the three-way test valve to test.

6. Press enter.

7. Place a graduated cylinder under the test port.

8. Press and hold the 0 button. Flow at least 600 ml into the container. Release the 0 button.

9. Compare the ml of additive in the container to the amount shown on the display.

10. If the amounts are not the same, call Gammon Technical for instructions.

11. Press the enter button to turn off the additive pumps.

12. Press the right arrow button to go to the select additive screen.

To view previous fueling information:

1. Turn on the power.

2. Press the right arrow button until you get to the password screen.

3. Press the Enter button. Enter the password, press the Enter button.

4. Press the Up or Down button until you see the time and date of the previous fueling.
Please note there are containers that are in service on dispensing equipment, specifically stainless steel containers, that do not fall into the following listed categories. When handling additive, be sure to read the manufacturer’s MSDS and wear appropriate personal protective equipment (PPE).

Quick Guide to Additive Dispensed

<table>
<thead>
<tr>
<th>55 Gallon Vertical Drum</th>
<th>5 Gallon Plastic Jug</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record level in height of liquid from bottom of drum in inches with fractions in decimal form</td>
<td>Record level in height of liquid from bottom of jug in inches with fractions in decimal form</td>
</tr>
<tr>
<td>A) Starting level __________”</td>
<td>A) Starting level __________”</td>
</tr>
<tr>
<td>B) Ending Level __________”</td>
<td>B) Ending Level __________”</td>
</tr>
<tr>
<td>C) Subtract B from A = __________”</td>
<td>C) Subtract B from A = __________”</td>
</tr>
<tr>
<td>D) C x 1.75 = ___________ gallons dispensed</td>
<td>D) C x .43 = ___________ gallons dispensed</td>
</tr>
</tbody>
</table>

(A 55-gallon drum (22.5” ID) holds about 1.75 gallons per inch of height.)

(A 5-gallon jug (11.25” ID) holds about .43 gallons per inch of height.

Conversion chart: Fractions to Decimal

<table>
<thead>
<tr>
<th>Fraction</th>
<th>Decimal</th>
</tr>
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<tbody>
<tr>
<td>1/8”</td>
<td>.125”</td>
</tr>
<tr>
<td>1/4”</td>
<td>.25”</td>
</tr>
<tr>
<td>3/8”</td>
<td>.375”</td>
</tr>
<tr>
<td>1/2”</td>
<td>.5”</td>
</tr>
<tr>
<td>5/8”</td>
<td>.625”</td>
</tr>
<tr>
<td>3/4”</td>
<td>.75”</td>
</tr>
<tr>
<td>7/8”</td>
<td>.875”</td>
</tr>
</tbody>
</table>

For example:

#1. Record starting levels in all tanks and drums. Subtract the amount remaining.

#2. Record number of 5-gallon jugs used or reused. Add this to line #1 to calculate the total gallons of additive dispensed.

#3. Compare this to the amount of additive treated fuel dispensed. The ration should be 1/1000, or .1%.

Example with Numbers:

A. Total amount of treated fuel sold = 23,500 gallons.
B. Total amount of additive gone from inventory = 21.5 gallons.
C. 21.5 /23500 x 1000 = 0.915 % volume of additive to fuel. This is too low. It should be 0.1.

What could be wrong? The fueler forgot to turn on the injector, the reservoir went dry or the additive injector(s) is out of adjustment.

Remember: Additive = 1 gallon per thousand gallons
Continued Quick Guide to Additive Dispensed

<table>
<thead>
<tr>
<th>Rectangular metal tank:</th>
<th>Horizontal Cylindrical tanks:</th>
</tr>
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<tbody>
<tr>
<td>Record level in height of liquid from bottom of tank in inches with fractions in decimal form. Also record tank width and length (not height).</td>
<td>Fill reservoir half way or specific gallons required.</td>
</tr>
<tr>
<td><strong>A)</strong> Starting level _______”</td>
<td># of 5 gallon drums used</td>
</tr>
<tr>
<td><strong>B)</strong> Ending Level _______”</td>
<td>______ x 5 = ______ gallons additive</td>
</tr>
<tr>
<td><strong>C)</strong> Subtract B from A = _______”</td>
<td>B) Amount of additive removed from number of gallons of treated fuel sold _______ gallons.</td>
</tr>
<tr>
<td><strong>D)</strong> Tank inside width (subtract a little for wall thickness) D _______”</td>
<td></td>
</tr>
<tr>
<td><strong>E)</strong> Tank inside length (subtract a little for wall thickness) E _______”</td>
<td></td>
</tr>
<tr>
<td><strong>F)</strong> Multiply D _______” x E _______” = F _______”</td>
<td></td>
</tr>
<tr>
<td><strong>G)</strong> Divide F _______” / 231 = G _______” gallons per inch</td>
<td></td>
</tr>
<tr>
<td><strong>H)</strong> C x G = Gallons dispensed</td>
<td></td>
</tr>
</tbody>
</table>

(A tank 12” x 16” is 192 cubic inches per inch of height. A gallon is 231 cubic inches. Such a tank is 192/231 = .83 gallons per inch. A change of 1.5 inches = 1-1/4 gallons.)

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Remember: Additive = 1 gallon per thousand gallons
Recommended PPE for Dispensing Anti-Icing Additive Via an Aerosol Can

- Neoprene or Rubber Gloves
- Face Shield

Recommended PPE for Transferring Anti-Icing Additive From Bulb Storage Into a Dispenser

- Goggles
- Neoprene or Rubber Gloves
- Splash Resistant

- Half Mask Respirator with Organic Vapor Chemical Filters