DAVCO Fuel Processor Maintenance And Diagnostic Training
TRAINING SUMMARY

• This training program covers the operation, maintenance and diagnostic procedures for the DAVCO family of Fuel Processors.

• All forms can be downloaded from the DAVCO Web Site www.davco.com. Click the Search tab and enter the Form Number.

• There is a quiz at the end of the program to reinforce important information. Hint: Look for underlined words and descriptions throughout the presentation.

• Please don’t hesitate to contact DAVCO Customer Support or your DAVCO Regional Sales & Service Manager with any questions, suggestions or comments.
ON HIGHWAY PRODUCTS
CONSTRUCTION / INDUSTRIAL PRODUCTS
FUEL PROCESSOR CONCEPT

“ALL-IN-ONE SYSTEM”

Fuel Filter
Fuel rises up to the filter. The patented EleMax® design allows only a portion of the filter media to be used maximizing filter life.

Water Separator
Water and large contaminants fall to the bottom of the body and can be drained away.

Fuel Heater (Optional)
Fuel flows through the heated chamber and up into the "SEEING IS BELIEVING"® clear cover filter area.

SEEING IS BELIEVING®
The patented clear cover allows the user to know when not to change the filter.
USER FRIENDLY WEBSITE

- Easy Navigation and Search
- Product Information
- Parts Information
- Diagnostic Procedures
- Contacts by Region
- OEM Sales Codes
- Fuel Filter Information
DESIGNED FOR THE SUCTION (VACCCUM) SIDE OF THE FUEL SYSTEM
WHEN A DAVCO FUEL PRO 482 IS INSTALLED ON THE DETROIT DIESEL DD15 FAMILY OF ENGINES, THE ENGINE FUEL MODULE FILTERS ONLY NEED TO BE REPLACED AT 150K MILE INTERVALS.
Fuel level rises as the filter media becomes contaminated, the fuel filter doesn’t need replaced until fuel level is at the Top Of The Filter.

The Elemax filter can be identified by the half wrap and a Vapor Pressure Relief Valve on top of the filter element. The combination of Elemax filter design and StrataPore™ media extend filter change intervals.

View Animation of “SEEING IS BELIEVING”® at www.davco.com
FILTER MEDIA

Laminated Melt Blown Filter Media

STRATAPORE™ does not require chemical treatment for water separation.

Cellulose requires chemical treatment to separate water.

Microglass generally is not acceptable with current high pressure common rail injection systems.
Larger debris is captured by the coarse layer.

Smaller debris is captured by the middle layer.

Fine particles are captured by the fine layer.

**Stratapore™ Advantages**
- High Efficiency
- High Capacity (Three Layers)
- Best Fuel Water Separation Efficiency (Media Doesn’t Have to Be Treated)
- Stronger than Cellulose and Glass Media
- Longer Life
STRATAPORE™ VS CELLULOSE

Filter Hours

FWS efficiency, %

Free water, StrataPore
Emulsified water, StrataPore
Emulsified water, Cellulose
FUEL PRO®

For Engine Flow Rates up to 180 GPH
FUEL HEATER OPTIONS

PREHEATERS
12vdc Preheater
120vac Preheater

FLUID HEAT
Fuel Flows Through the Heated Chamber and Up Into the “SEEING IS BELIEVING”® Clear Cover.

Common Rail Return Fuel Flow Rates and Temperatures Are Much Lower Than Pre-2010 Emission Engines. Engine Coolant Must Be Used as Fluid Heat Source to the Fuel Pro.

As with all things there are exceptions, the DD 13, 15 & 16 Engine does not require any fluid heat option due to higher Return Fuel Flow Rates and Temperatures.
Fuel Pro® 382 Fuel Flow with Coolant Heat

- Unfiltered, unheated fuel in
- Warmed fuel passing through filter
- Filtered, warmed fuel out
- Water in fuel
- Coolant through radiator
- Coolant in
- Coolant out
Converting Fuel Pro 382 From Return Fuel to Coolant Heat

**Figure 1: Return Fuel Heat**

**Figure 2: Coolant Heat**

“Y” or “T” connectors can be used in the cab heater hoses.
Upgrading Fuel Pro 382 to Coolant Heat

Figure 1: Kit Contents

Figure 2: Coolant Heating Routing

“Y” or “T” connectors can be used in the cab heater hoses.

3/8” NPT inlet or outlet ports
FUEL PRO® 382

- All-In-One Unit ➔ Water Separator, Fuel Heater, Fuel Filter
- “Seeing is Believing”® Technology
- B20 Biodiesel Compatible
- EleMax® Filter Technology for Increased Filter Life
- Fluid Heat, 12vdc-250w, and/or 120vac-75w Preheater
- Serviceability ➔ No Spill Filter Changes
- Visual Troubleshooting Capabilities
- Fewer Filters to Stock, Lower Disposal Cost, Less Filters Used
- Financial Benefit
FUEL PRO® 482 FEATURES

- **For Detroit DD13, 15 or 16 Engines**
- 7 Micron Filter
- 2.5 Times More Filter Life than Fuel Pro® 382
- Averaging 100k Miles Intervals
- Extends Maintenance Interval on DD13/DD15/DD16 Fuel Module Filters to 150K Miles
- Cast Aluminum Body
- Isoplast Cover and Collar
- Integrated Mounting Bracket
- Fuel In and Out Left Side
- Low Restriction Check Valve
- 12v – 250w Electric Pre-heater Option
- 120v Combo Overnight Heater Option
- Existing Fuel Pro® Drain
FUEL PRO® 483

- For Engines Other Than DD 13/15/16
- 7 Micron Filter
- 2.5 Times More Filter Life than Fuel Pro® 382
- Significant Filter Life Increase
  - 4 to 5 Times Primary Filter Life
  - Average 100k Miles
- Cast Aluminum body
- Isoplast Cover and Collar
- Optional Fuel IN Port Locations
- Optional Coolant IN/OUT Ports
- Low Restriction Check Valve
- Optional heat:
  - Pre Heater- 12V, 24V
  - Overnight Heater- 120V
  - Coolant Heat
- Water in Fuel Sensor
- ESOC Option
• Removes Contaminated Fuel, Sediment and Water From Diesel Fuel Tanks
• Prime Heavy-Duty Diesel Engine Fuel Systems
• Filter and Transfer Fuel in One Operation
SHOP PRO® FEATURES

• Sweep (Clean) Fuel Tanks of Contamination and Water
• Transfer Fuel
• Prime Diesel Engines
• 120VAC and 12VDC Motor with UL Approved Electrical Receptacle
• Heavy Duty Pump
• Heavy Duty Frame
• Water Proof On/Off Switch
• High Capacity EleMax®/Stratapore™ Filter
• Integrated Drip Reservoirs with Drains
• Sight Tube of Fuel Flowing into the Shop Pro Filter
• Easily Identifiably Shop Pro Suction and Pressure Hoses
• Schematic and Written Operation Instruction Labels on the Shop Pro Frame
• Five Year Warranty on Cart and Filter Assembly
• One Year Warranty on Electrical Motor and Mechanical Pump
SHOP PRO® BENEFITS

- No Additional Fuel Required to Prime Diesel Engines, Uses the Vehicle Fuel
- Quickly/Easily Prime Most Diesel Engine Fuel Systems
- Quick Disconnect Hose Connectors
- Eliminate Need for Hand Priming Pumps or Similar Devices
- Sweep Tanks Clean When Contaminated with Antifreeze or Other Fluids
- Transfer or Drain Fuel from Tanks to Aid in Fuel Tank Repair or When Selling the Vehicle or Equipment
- Fill New Spin-On Filters with Clean Fuel
- 7 micron EleMax® Filter For Full Filter Life Usage
SERVICE AND MAINTENANCE
Use Form 3105 for Filter Application Chart

Ensure the correct fuel filter is being used for the engine and meets your company’s policy.
HAND TIGHTEN THE COLLAR AND VENT CAP.

OVERTIGHTENING CAN CREATE A TWISTED SEAL
RESULTING IN AN AIR LEAK.

1. Remove the vent cap (1) and the open drain valve (5) to drain the fuel below the collar level.
2. Remove the cover (2) and collar (4).
   Note: Use Collar Wrench 380134 (metal) or Collar Wrench 382002 (composite)
3. Remove the filter (3), grommet, cover seal, and vent cap seal. Dispose of these properly.
4. Using a clean shop rag, clean the cover, the collar and threads on the Fuel Processor body.
5. Be sure the grommet is in place on the bottom of the filter element. Install new filter.
6. Install the cover seal. Install cover and collar onto the Fuel Pro body. Hand tighten the collar.
7. Fill the cover with fuel.
8. Place the new vent cap seal on the vent cap. Install Vent Cap onto the cover. Hand tighten the vent cap.
9. Start the engine. When the lubrication system reaches its normal operating pressure, increase the engine RPM for one minute. Slowly open vent cap until the fuel level drops to one inch above the collar. Hand tighten the vent cap.

Use Form 1333 for Service Procedure
FUEL PRO® 382 SERVICE

HAND TIGHTEN THE COLLAR AND VENT CAP.

OVERTIGHTENING CAN CREATE A TWISTED SEAL RESULTING IN AN AIR LEAK

FILTER CHANGE PROCEDURE

1. Remove the vent cap and open the drain valve to drain the fuel below the collar level.
2. Remove the collar (using a DAVCO wrench) then remove the clear cover.
3. Remove the filter, cover and vent cap seals. Dispose of properly.
4. Using a clean shop rag, clean the cover, the collar and threads on the Fuel Pro body.
5. Install a new filter, cover seal and vent cap seal.
6. To tighten the collar with the wrench, simultaneously apply downward pressure to the top of the clear cover until it is seated on the body of the Fuel Pro and hand tighten the collar until it no longer spins freely. Torque the cover assembly by rotating the collar clockwise two additional ribs using the collar wrench (~18 ft-lbs).
7. Prime the unit by filling the clear cover with clean diesel fuel until it reaches the top of the filter.
8. Install the vent cap. Start the engine and run for one minute. Slowly open the vent cap and allow the fuel to drop to about one inch above the collar.
9. Close the vent cap. It is normal for the fuel level to vary after the initial start-up and during engine operation. Filter performance is not affected.

Recommended Filter Guide

<table>
<thead>
<tr>
<th>Brand</th>
<th>Part Number</th>
<th>Micron</th>
</tr>
</thead>
<tbody>
<tr>
<td>DDC</td>
<td>A0000903651</td>
<td>7</td>
</tr>
</tbody>
</table>

Tightening the collar with the wrench:

Simultaneously apply downward pressure to the top of the clear cover until it is seated on the body of the Fuel Pro/Diesel Pro and hand tighten the collar until it no longer spins freely. Torque the cover assembly by rotating the collar clockwise two additional ribs using the collar wrench (~18 ft-lbs).

Note: The DAVCO Fuel Pro collar is designed to be removed with a DAVCO wrench. Collars damaged as a result of not using the DAVCO wrench will not be covered under warranty.
DIAGNOSTICS
FREQUENTLY ASKED QUESTIONS

Q: What causes short filter life?
A: Incorrect or inferior quality fuel filter, contaminated or low quality ULSD (Ultra Low Sulfur Diesel) fuel, algae or microbiological growth or a large amount of water in the fuel.
(See Form F3507 Fuel Filter Performance)

Q: If the fuel filter media is black does the filter need to be replaced?
A: Filter media becoming Black is common with ULSD and biodiesel fuels. The black color is caused by contaminants, asphaltine formation or additives in the fuel and can shorten filter life. The advantage of seeing the fuel height in the clear cover of a DAVCO Fuel Pro eliminates unnecessary filter changes. **Only replace the filter when the fuel level is at the top of the filter regardless of the color of the media.**
Q: Is there air above the fuel level in the clear cover?
A: No. The Fuel Pro is designed for the suction (vacuum) side of the fuel system. After the fuel system has been primed, and the engine run, the area above the fuel level in the clear cover is a vacuum not air.

Q: What causes the fuel system to lose prime over night (fuel level lowers in the Fuel Processor clear cover)?
A: There has to be a small air leak somewhere in the fuel system to lose prime. There is a fuel inlet check valve in the Fuel Processor to prevent losing the prime during filter changes and draining the water. If the fuel system isn't air tight the fuel can slowly drain down when the engine is not running. Ensure the inlet check valve is seated and inspect all fuel hoses and fittings for proper torque.
(See Form F3089 Test Procedures for Fuel Processors and F1318 Distinguishing Air from Vapor Bubbles)
Q: What if air bubbles are visible in the fuel inside the Fuel Processor clear cover?
A: Check all fuel hoses and fittings for proper torque. A simple procedure to determine if the air leak is between the fuel tank and the Fuel Pro is to remove the Fuel Pro inlet hose and route a new hose from the Fuel Pro Inlet into a container of fuel or the fuel tank fill cap opening. Start the engine. If bubbles are still present the air leak is in the Fuel Processor if not the air leak is between the fuel tank and the Fuel Processor inlet. (See form F3089 Test Procedures for Fuel Processors)

Q: What if there are bubbles in a sight gauge at the lift pump inlet?
A: It’s not uncommon to see vacuum bubbles at the lift pump inlet with electronic unit injectors or common rail engines. If there is no engine performance complaint, then it’s most likely vapor bubbles created from the pressure differential in the fuel tank and primary filtration assembly (regardless of the fuel filter manufacturer). (See Form F1318 Distinguishing Air from Vapor Bubbles)
Q: Are DAVCO Fuel Processors compatible with B20 biodiesel?
A: Yes. In 2008 all DAVCO Fuel Processors were upgraded with state of the art seals to ensure compatibility with all B20 applications. In addition the Fuel Pro 384 model is available for biodiesel fuel greater than B20.

Q: When should the Fuel Processor assembly be replaced?
A: The only time a Fuel Processor assembly requires replacement is when the aluminum body is damaged.
# CLEAR COVER DIAGNOSTICS

**Use Form F3097 for Clear Cover Diagnostics**

<table>
<thead>
<tr>
<th>VISUAL INDICATION</th>
<th>POSSIBLE SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel level not to the top of the filter</td>
<td>Normal - Do not change the filter</td>
</tr>
<tr>
<td>Fuel level at the top of the filter. Low power</td>
<td>Change the filter at the first available opportunity</td>
</tr>
<tr>
<td>Fuel level at the top of the filter and looks to be full of wax</td>
<td>Change the filter - Run engine for a minimum of 25 minutes at idle. Do not run at full RPM</td>
</tr>
<tr>
<td>Bubbles are seen forming in the fuel</td>
<td>Check all fittings and lines from the fuel tank to the Fuel Processor. Check lower and upper collar o-rings. All bubbles present, see Form 3089</td>
</tr>
<tr>
<td>There is a power complaint and the fuel level is below the collar</td>
<td>Check for a missing grommet at the lower end of the filter or missing/broken spring at top of filter</td>
</tr>
<tr>
<td>Water is included in the cover</td>
<td>Drain the Fuel Processor. Do not drain with the engine running. Drain a full cup of water at a time. Restart the engine - shut off engine and continue to drain and restart until ALL water is removed. If engine coolant is visible, follow proper engine pressure testing procedure to determine root cause. Replace the check valve assembly. Clean or replace and reseat</td>
</tr>
<tr>
<td>Fuel drains back into fuel tank when changing the fuel filter or draining separator</td>
<td>Replace the check valve assembly. Clean or replace and reseat</td>
</tr>
<tr>
<td>No engine coolant (Fuel Pro only)</td>
<td>Check for closed outlet valves at the coolant lines to the Fuel Processor. Make sure the coolant heater valve is open</td>
</tr>
</tbody>
</table>

- Fuel level not to the top – Normal
- Fuel level at top, low power – Change Filter
- Bubbles – See Form 3089
- Fuel waxed to top of filter – change filter and idle
- Water visible in cover – drain water, if antifreeze pressure test engine
- Fuel drain back when changing filter or draining the water – inspect inlet check valve
- Low power and fuel below Fuel Pro collar – inspect filter grommet and spring
- No engine coolant flow to Fuel Pro fluid heater – open coolant flow valves
To test for proper check valve operation, remove the fuel inlet hose and open the vent cap. Fuel should not flow out of the Fuel Pro, although a slight seepage of fuel is normal. If fuel drains back to the fuel tank, remove the check valve assembly at the fuel inlet fitting.

**Step 1:** Use a back-up wrench to hold the check valve body and remove the fuel hose from the inlet of the Fuel Pro.

**Step 2:** Remove and disassemble the check valve assembly.

**Step 3:** Clean and inspect the check valve body. Replace the check valve body if any cuts, grooves or nicks are evident or if the ball seat is not smooth.

**Step 4:** Inspect the check valve spring and spring retainer. If the spring or spring retainer is broken or if the check ball has groves, nicks or is out of round, replace with a check valve service kit. Otherwise, clean and reassemble the check valve assembly.

**Note:** The spring retainer snaps into a groove in the check-valve body.

**Step 5:** Replace the check valve assembly into the body and torque to 44-60 ft-lb.

**Step 6:** Connect the fuel inlet hose, using liquid or paste type thread sealant.

**Step 7:** Prime the fuel system, start the engine and check for any fuel leaks.

<table>
<thead>
<tr>
<th>Check Valve Service Kits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check valve service kit:</td>
</tr>
<tr>
<td>P/N 101132</td>
</tr>
<tr>
<td>Check valve assembly:</td>
</tr>
<tr>
<td>P/N 103071</td>
</tr>
</tbody>
</table>
Bypass valve assembly

1. Remove the vent cap and open the drain valve, drain the Fuel Pro 482 completely.
2. Remove the collar (using a DAVCO wrench) then remove the clear cover.
3. Remove the filter, cover and vent cap seals. Dispose of properly.
4. Using a clean shop rag, clean the cover, the collar and the threads on the Fuel Pro 482 body.
5. Flush the inside of the Fuel Pro 482 body with clean diesel fuel to clear it of any debris.
6. Remove the bypass valve assembly and discard.
7. Remove the protective cap from the replacement bypass valve assembly.
8. Install the replacement bypass valve assembly into the Fuel Pro 482 body (torque to 20 ft-lbs).
9. Install a new filter, cover seal and vent cap seal.
10. Simultaneously apply downward pressure to the top of the clear cover until it is seated on the body of the Fuel Pro/Diesel Pro and hand tighten the collar until it no longer spins freely. Torque the cover assembly by rotating the collar clockwise two additional ribs using the collar wrench (~18 ft-lbs).
11. Prime the unit by filling the clear cover with clean diesel fuel until it reaches the top of the filter.
12. Install the vent cap.
13. Start the engine and run for one minute. Slowly open the vent cap and allow the fuel level to drop to about one inch above the collar.
12VDC AND 120VAC PREHEATERS

Use Form 3134 Electrical and Fluid Heater Test Procedures

There are various configurations of electric preheaters. The voltage and wattage ratings are stamped either on the sheath or hex head of each preheater for identification.

Use form F3134 for the appropriate test specifications.

<table>
<thead>
<tr>
<th>Electric Pre-heater</th>
<th>Watts</th>
<th>Resistance Range (ohms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12VDC (two pin)</td>
<td>250 W</td>
<td>0.6 to 0.8</td>
</tr>
<tr>
<td>12VDC (single pin)</td>
<td>250 W</td>
<td>0.6 to 0.8</td>
</tr>
<tr>
<td>12VDC (single pin)</td>
<td>150 W</td>
<td>0.6 to 1.1</td>
</tr>
<tr>
<td>12VDC (two pin)</td>
<td>150 W</td>
<td>0.6 to 1.1</td>
</tr>
<tr>
<td>24VDC (two pin)</td>
<td>250 W</td>
<td>1.8 to 2.3</td>
</tr>
<tr>
<td>24VDC (single pin)</td>
<td>150 W</td>
<td>3.6 to 4.1</td>
</tr>
<tr>
<td>24VDC (two pin)</td>
<td>150 W</td>
<td>3.6 to 4.1</td>
</tr>
<tr>
<td>120VAC</td>
<td>75 W</td>
<td>1.73 to 203</td>
</tr>
<tr>
<td>120VAC</td>
<td>37 W</td>
<td>369 to 411</td>
</tr>
</tbody>
</table>

**12VDC Thermoswitch Performance Test**

Step 1: Disconnect the harness from the thermoswitch.
Step 2: Connect the ohm meter leads to the pins of the thermoswitch.

**Combination Pre-heater Thermoswitch Performance Test**

Step 1: Disconnect the harness from the heater/thermoswitch combination unit.
Step 2: Using one of the heating devices listed under "Equipment Needed", reduce the temperature of the thermoswitch to below 40°F.
Step 3: Connect the ohm meter leads to the pre-heater pins. Use Table 1 to determine whether the pre-heater resistance value is in the acceptable range.
Step 4: Using one of the pre-heating devices listed under "Equipment Needed", raise the temperature of the combination pre-heater to 70°F. The ohm meter should read "open circuit" for the combination units.
FUEL PRO 382® FLUID HEAT

Use Form 3134 For Electrical and Fluid Heater Test Procedures

The Fuel Pro bottom plate has to be removed to test the fluid heat thermovalve. The thermovalve is spring loaded in the open position as a failsafe feature.
Air bubbles visible in the clear cover are a result of an air leak in the fuel system and will affect engine performance.

Vapor bubbles are many times misdiagnosed as air in the fuel. Vapor bubbles are a result of the pressure differential in the fuel tank and filtration assembly and will NOT affect engine performance.

**Use Form F1318 Distinguishing Air from Vapor Bubbles**
COLD WEATHER TIPS

Use Form F3506 Tips for Cold Weather Operation

The initial onset of cold ambient conditions always generate calls to the DAVCO Customer Support Group. This document contains tips and reminders relative to cold weather operation. The basics, as you already know, are to keep water drained from the fuel tanks and the Fuel Processor, use the preheaters before starting the engine if the fuel is clouded, and ensure all valves are open for the engine coolant heat to the Fuel Processor.
TEST YOUR KNOWLEDGE

• Are DAVCO products designed to work with all diesel engine applications? Yes or No

• Are Fuel Processors designed for the pressure or vacuum side of the fuel system?

• How do you know when to change the filter element in the DAVCO Fuel Pro®?

• What is “Seeing is Believing”® technology?

• Does “Seeing is Believing” technology allow you to see:
  a. How much clean filter media is available
  b. Air Bubbles
  c. Clouded fuel
  d. All of the above
TEST YOUR KNOWLEDGE

• What is an Elemax® Filter?

• Efficient diagnostics always begin with the easiest item to check. After checking the proper torque of all fittings what would be the next simplest procedure if air bubbles are visible in the DAVCO clear cover?

• If a diesel engine is experiencing low power, how can the technician determine if fuel filter restriction is the root cause?

• Over tightening the clear cover collar can create an air leak? Yes or No

• How tight should the clear cover collar be when tightening it?
TEST YOUR KNOWLEDGE

• Is a damaged aluminum body the only reason to replace the Fuel Processor Assembly?  Yes or No

• Are vapor bubbles at the lift pump inlet common?  Yes or No

• Are DAVCO Fuel Processors B20 compatible?  Yes or No

• How much more filter media does the Fuel Pro 482 and 483 EleMax Filters have than the Fuel Pro 382 EleMax filter?  
  2 - 2.5 - 3 - 3.5 times larger?

• What are the Shop Pro Functions?
  A - Sweep Fuel Tanks  B – Transfer Diesel Fuel
  C - Prime Diesel Engines  D – Filter the Fuel to 7 Microns
THANK YOU!

Please contact DAVCO Customer Support or a Regional Sales and Service Manager with any questions, suggestions, comments or request for assistance.

We appreciate the time you have invested to increase your knowledge of the DAVCO products.

Customer Service: 800-328-2611
Email: customerservice@davco.com