

The top of the page features a composite image. On the left, a black silhouette of an industrial refinery with tall distillation columns is set against a red-to-orange gradient background. On the right, a portion of a world map is shown, highlighting the Americas and Africa in yellow and green, with blue oceans. A black banner with white text is overlaid on the left side of the image.

## Fully Automated Analyzers

- Fully conforming to the manual test methods
  - Pour Point by **ASTM D97**
  - Cloud Point by **ASTM D2500**
  - Freezing Point by **ASTM D2386**
  - CFPP by **IP-309**
- Directly refrigerated
  - No cryostat required**
  - No hazardous alcohol needed**
  - Compact
  - Quick start up
- Fully automated
- Self contained
- PC computer controlled
- A wide range of analyzer combinations available

**LAWLER**  
MANUFACTURING CORPORATION

# Directly Refrigerated Automated Analyzers



**DR-34L**  
One Combination Cloud  
and Pour Analyzer and  
One CFPP Analyzer in the  
Refrigeration Cabinet

Lawler has produced a unique set of automated analyzers for the fuels and lubricants industry for the measurement of cold properties such as cloud, pour, freeze and CFPP.

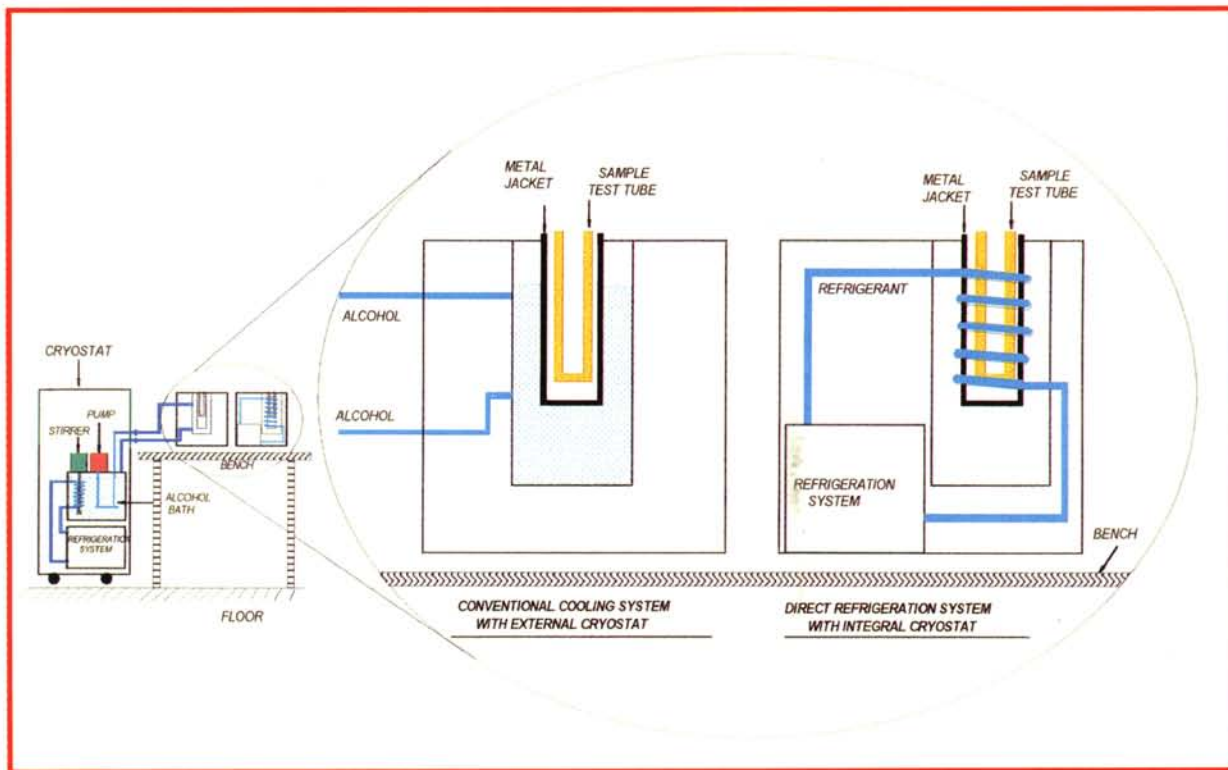
Using these analyzers is simplicity itself: Fill the test jar with test sample, install the test jar on the analyzer, press the start button, and walk away.

Any of the 4 available automated analyzers (cloud, pour, freeze, and CFPP) can be combined in a mix or match combination in a single cabinet installation.

The metal jacket of the automated analyzers is directly cooled by the refrigerant. **NO CRYOSTAT IS REQUIRED.** This innovation replaces the middle step of first cooling the hazardous alcohol and then pumping the cold alcohol to the metal test jacket.

The use of the direct refrigeration technique offers many advantages over the use of the cryostats: no alcohol fire hazard, no alcohol toxicity hazard, no alcohol waste disposal, space saving, energy use reduction, quick start up, to name a few.

Direct refrigeration offers rapid cool down to test temperature (in a matter of minutes) thus saving energy. The bulky floor model cryostats requires hours to cool to operating temperature, or must operate around the clock.



\*Specifications subject to change without notice.



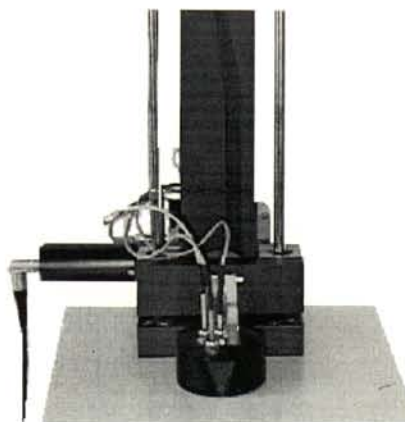
# The Automated Pour Point Analyzer

ASTM D97

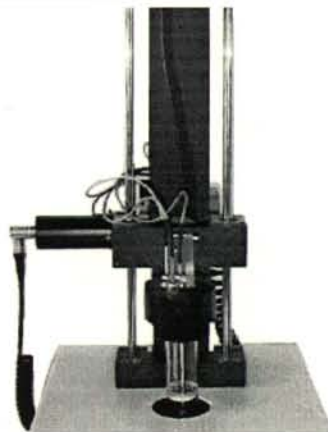
The Automated Pour Point Analyzer fully conforms to method **ASTM D97** even to the extent of **lifting** the test sample from the cold jacket and **tilting** the sample to test for its flow. Flow is detected by two thermal probes above the sample surface that are cooled if touched by the cooler sample. If flow is detected, the test tube is automatically returned to the cold bath.

Since some samples flow near the side of the jar and others near the center, two detection probes are used: one near the center and the other near the side.

Shown on the right is the sequence of the robotics as the sample test jar is lifted, tilted, and eventually held horizontally when no pour is detected.



Test jar in cooling jacket



Lifting test jar from cooling jacket

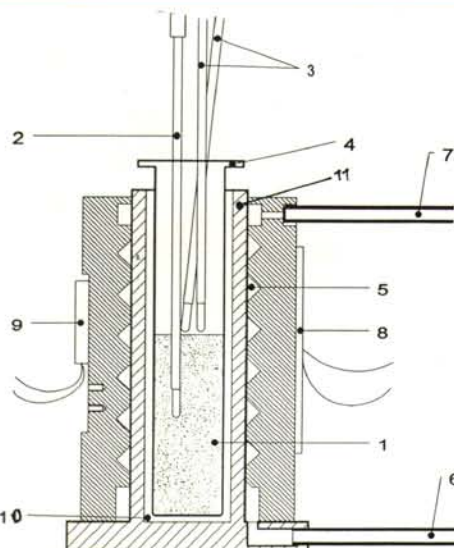


Detection of sample movement



No pour detected, end of test

Robotics of the Pour Point Analyzer



1. Test Sample
2. Sample Temp. Probe
3. Pour Detection Probes
4. Test Jar
5. Refrigerant
6. Refrigerant Inlet
7. Refrigerant Outlet
8. Heater
9. Bath Temp. Probe
10. Air Space
11. Cooling Jacket

Product development focused on exactly duplicating the manual procedure. As an example, 45 experienced operators were observed while conducting pour point measurements for the speed of lifting and tilting the test jar. The pour point robotics lift and tilt the test jar at the average speed used by these 45 operators.

The schematic on the left details the internal configuration of the cooling jacket, probes, etc.

# The Automated Cloud Point Analyzer

ASTM D2500

The Automated Cloud Point Analyzer fully meets the requirements of **ASTM D2500**. The dimensions of the glassware, the metal test jacket, position of probes, cooling profile, and other parameters are identical as specified by the manual method.

The analyzer software confirms cloud point when the fiber optics detects reduction of the pulsing green light reflected from the bottom of the silvered test tube. Green light of a specific wave length has been found to most accurately simulate the human eye sensitivity for the cloud point.

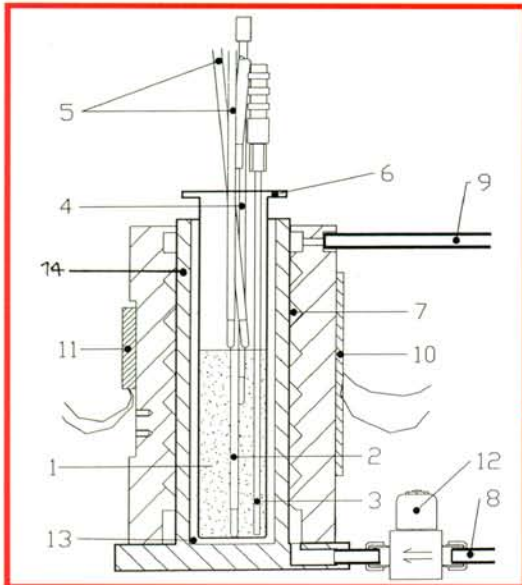


Close-up of Cloud Point Analyzer

## The Automated Cloud and Pour Point Analyzer

ASTM D97

ASTM D2500



1. Test Sample
2. Sample Temp. Probe for Cloud Point
3. Light Optical Fiber
4. Sample Temp. Probe for Pour Point
5. Pour Detection Probes
6. Silver Bottomed Test Jar
7. Refrigerant
8. Refrigerant Inlet
9. Refrigerant Outlet
10. Heater
11. Bath Temp. Probe
12. Control Solenoid Valve
13. Air Space
14. Cooling Jacket



Close-up of Cloud and Pour Point Analyzer Completing a Determination

The Automated Combination Cloud and Pour Point Analyzer fully conforms to **ASTM D97** and **ASTM D2500** in the same unit. The analyzer is the same as the automated pour point unit with the addition of cloud point detection capabilities.

For the cloud point test, the robotics **lifts** the test jar from the cold bath. This jar is held vertically to measure the cloud point. The jar is automatically returned to the cold bath if the cloud point is not detected. This is repeated until the cloud point is determined.

Following the cloud point measurement, testing may be continued (at the operator's discretion) for the pour point determination.



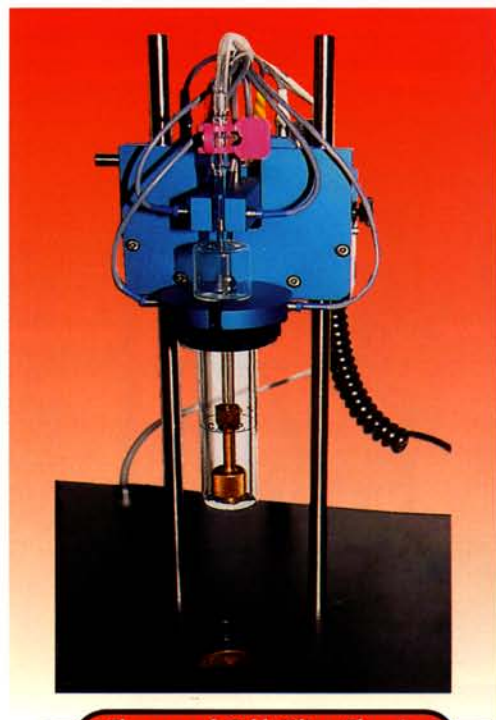
# The Automated Cold Filter Plugging Point (CFPP) Analyzer

IP-309

The Automated Cold Filter Plugging Point Analyzer fully conforms to method **IP-309**. The vacuum is controlled by a dip tube immersed in a water filled jar just as specified by the method. Electronic vacuum control is **not** used since it does not have the same response as the method specified glass jar. Vacuum response is critical to reproducing the manual test results.

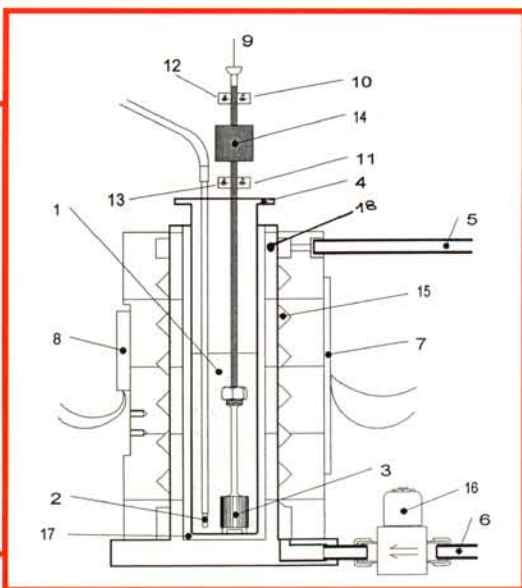
The vacuum is automatically applied every degree as the sample cools and its aspiration and release time recorded and plotted. Fiber optic light guides are used at the bottom and top of the pipette that detect the start of aspiration and its completion. The result is reported when the aspiration or release times exceed 60 seconds.

The software, in addition to plotting sample, bath temperatures and vacuum level, also plots the successive aspiration times, release time, and other parameters of the CFPP test.



Close-up of Cold Filter Plugging Point Analyzer

1. Test Sample
2. Sample Temp. Probe
3. Filter Assembly
4. Test Jar
5. Refrigerant Outlet
6. Refrigerant Inlet
7. Heater
8. Bath Temp. Probe
9. Vacuum Inlet
10. & 12. Pipette's Upper Level Sensor
11. & 13. Pipette's Lower Level Sensor
14. Pipette
15. Refrigerant
16. Solenoid Valve
17. Air Space
18. Cooling Jacket



The schematic on the left details the internal configuration of the cooling jacket, probes, filter assembly, etc. All dimensions are as specified in **IP-309**.

# The Automated Freezing Point Analyzer

ASTM D2386



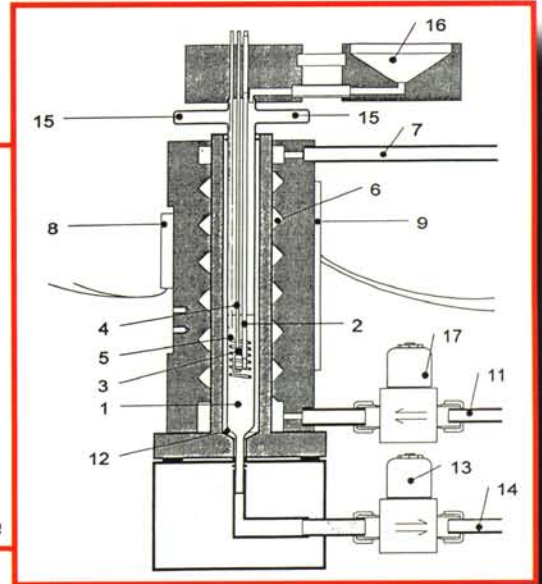
Close-up of Freezing Point Analyzer

The Automated Freezing Point Analyzer fully conforms to method **ASTM D2386**. All dimensions are as specified by D2386. The sample is agitated by a wound wire which is driven by a magnetically operated motor. The sample is poured into the receiver. The sample is automatically fed into the test tube, the start button is pressed, and the test begins. The bath is then cooled at a rate such that the sample cooling rate equals the cooling rate of the manual method.

When the test is completed, the apparatus is automatically warmed, the old sample is gravity drained from the test tube (by actuation of a solenoid valve), the fresh sample flushes the test tube and a new test is started.

Fiber optics reflect light from a C shaped mirror immersed in the test sample. When reduced light is detected the first freezing point is determined. The sample is warmed and the fiber optics detect the melting point.

1. Test Sample
2. Sample Temp. Probe
3. Mirror
4. Light Optical Fiber
5. Stirrer
6. Refrigerant
7. Refrigerant Outlet
8. Bath Temp. Probe
9. Heater
11. Refrigerant Inlet
12. Air Space
13. Drain Solenoid Valve
14. To Waste
15. Overflow To Waste
16. Sample Inlet
17. Control Solenoid Valve



## Automated Sample Feeder for the Freezing Point Analyzer

Automated Sample Feeder for the automated freezing point analyzer is capable of unattended loading of 10 freezing point samples to the freezing point analyzer (above).

The freezing point analyzer is automatically flushed with the new sample and the new sample is automatically loaded into the analyzer to prevent any contamination from the previous sample.

The only operator involvement is placing 10 test samples into the auto-feeder receptacles and pressing the start button.



Auto-Sampler for Freezing Point Analyzer



# The Controlling Software for Automated Analyzers

The full operation of these analyzers (cloud, pour, freeze points, CFPP), including the auto sample feeder is controlled by a computer with a data capture interface. The proprietary MS-DOS based software plots a real time graph of critical parameters as the test sample are cooled. An alarm sounds when the test is complete and the result is displayed. A full year of data is stored and can be retrieved for further spread sheet analysis.



Test in Progress

When multiple samples are being run, the software can display the graph and all critical parameters on a single screen, allowing the operator a quick view summary of progress of the individual tests. When the sample is running, the bar under the graph (also showing critical numbers) is displayed black. When the test results are complete, the bar under the graph is displayed green. The results are also displayed in the green bar. If there is an alarm and the bar under the graph is shown in red.



Display of Test Screens for 6 Tests.

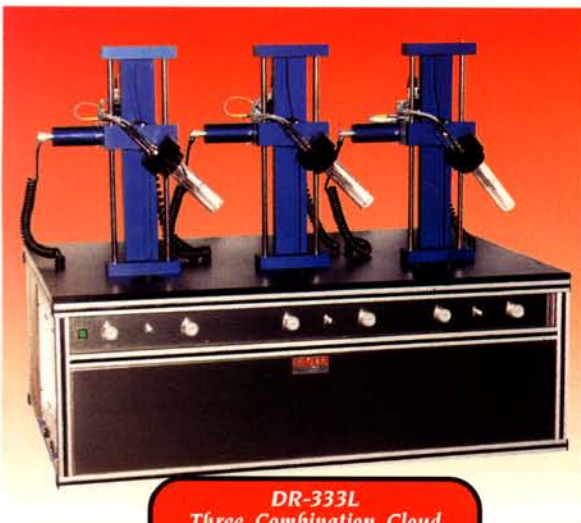
A multitude of screens is available for a wide variety of functions.

The software allows many options in terms of the test procedure. For example, pour point method may be selected that is exactly as per ASTM D97. Other procedures may also be used such as testing for pour every 1°C instead of the standard 3°C.

Of particularly utility is a fast method where the bath is set to the lowest possible bath temperature and the normal test performed. This "plunge" method dramatically speeds up the results. The lower the pour point, the greater the time gain. For example, a -24°C pour point measured by the standard ASTM D97 procedure may take as long as 2.5 hours to complete. With the plunge method, the pour point results are posted in about 40 minutes. In most cases (depending on the sample formulation) the results are equal to the standard procedure.



DR-20H  
One Pour Point Analyzer in  
the Refrigeration Cabinet



DR-333L  
Three Combination Cloud  
and Pour Analyzers in the  
Refrigeration Cabinet

## Available Directly Refrigerated Automated Analyzers

<b>Model No.</b>	<b>Type and Number of Automated Analyzers</b>
<b>DR-10</b>	<b>1 Cloud Point</b>
<b>DR-11</b>	<b>2 Cloud Points</b>
<b>DR-12</b>	<b>1 Cloud Point + 1 Pour Point</b>
<b>DR-13</b>	<b>1 Cloud Point + 1 Combination Cloud/Pour Point</b>
<b>DR-14</b>	<b>1 Cloud Point + 1 CFPP</b>
<b>DR-15</b>	<b>1 Cloud Point + 1 Freeze Point</b>
<b>DR-20</b>	<b>1 Pour Point</b>
<b>DR-22</b>	<b>2 Pour Points</b>
<b>DR-23</b>	<b>1 Pour Point + 1 Combination Cloud/Pour Point</b>
<b>DR-24</b>	<b>1 Pour Point + 1 CFPP</b>
<b>DR-25</b>	<b>1 Pour Point + 1 Freeze Point</b>
<b>DR-30</b>	<b>1 Combination Cloud/Pour Point</b>
<b>DR-33</b>	<b>2 Combination Cloud/Pour Points</b>
<b>DR-34</b>	<b>1 Combination Cloud/Pour Point + 1 CFPP</b>
<b>DR-35</b>	<b>1 Combination Cloud/Pour Point + 1 Freeze Point</b>
<b>DR-40</b>	<b>1 CFPP</b>
<b>DR-44</b>	<b>2 CFPP</b>
<b>DR-45</b>	<b>1 CFPP + 1 Freeze Point</b>
<b>DR-50</b>	<b>1 Freeze Point</b>
<b>DR-55</b>	<b>2 Freeze Points</b>
<b>DR-56</b>	<b>1 Freeze Point + 1 Auto Sample Feeder</b>
<b>DR-333</b>	<b>3 Combination Cloud/Pour Points</b>
<b>DR-343</b>	<b>2 Combination Cloud/Pour Points + 1 CFPP</b>
<b>DR-424*</b>	<b>2 Cloud Points + 2 CFPP</b>
<b>DR-430*</b>	<b>4 Combination Cloud/Pour Points</b>
<b>DR-443*</b>	<b>2 Combination Cloud/Pour Points + 2 CFPP</b>
<b>DR-610*</b>	<b>6 Cloud Points</b>
<b>DR-612*</b>	<b>3 Cloud Points + 3 Pour Points</b>
<b>DR-620*</b>	<b>6 Pour Points</b>
<b>DR-630*</b>	<b>6 Combination Cloud/Pour Points</b>
<b>DR-640*</b>	<b>6 CFPP</b>

*Other analyzer combinations available upon request*

*\*Available as floor models only*

Two low bath temperature options are available:

For -35°C lowest bath temperature use designation -H

For -75°C lowest bath temperature use designation -L.

Approximate overall dimension for Models DR-10H, DR-20H, DR-30H, and DR-40H is 55 x 45 x 83 cm high (22 x 18 x 33 inches high). Approximate overall dimension for all other 1 and 2 position models is 70 x 60 x 83 cm high (27 x 24 x 33 inches high) plus a PC computer. Approximate overall dimension of the 3 position model is 70 x 105 x 83 cm high (27 x 41 x 33 inches high).

All models are available in 115, 208, or 220V for 50 or 60Hz. *Please specify requirements.*

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