Designation: D 7261 – 07

An American National Standard

Standard Test Method for Determining Water Separation Characteristics of Diesel Fuels by Portable Separometer[1]

This standard is issued under the fixed designation D 7261; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope*

1.1 This test method covers a rapid portable means for field and laboratory use to rate the ability of diesel fuels (both neat and those containing additives) to release entrained or emulsified water when passed through fiberglass coalescing material.

1.2 This test method is applicable to diesel fuels such as D 975 Grade No. 1 and Grade No. 2 of all sulfur levels, and MIL-F-16884, naval distillate fuel (NATO F-76).

NOTE 1—This test method is similar to Test Method D 3948 which is applicable to aviation turbine fuels.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [2]

D 975 Specification for Diesel Fuel Oils

D 1193 Specification for Reagent Water

D 3948 Test Method for Determining Water Separation Characteristics of Aviation Turbine Fuels by Portable Separometer

D 4057 Practice for Manual Sampling of Petroleum and Petroleum Products

D 4176 Test Method for Free Water and Particulate Contamination in Distillate Fuels (Visual Inspection Procedures)

D 4177 Practice for Automatic Sampling of Petroleum and Petroleum Products

D 4306 Practice for Aviation Fuel Sample Containers for Tests Affected by Trace Contamination

D 4860 Test Method for Free Water and Particulate Contamination in Mid-Distillate Fuels (Clear and Bright Numerical Rating)

D 6426 Test Method for Determining Filterability of Middle Distillate Fuel Oils

2.2 *Military Standard:*

MIL-F-16884 Fuel, Naval Distillate (NATO F-76)[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *Micro-Separometer rating (DSEP rating), n*—a numerical value indicating the ease of separating emulsified water from fuel by coalescence as affected by the presence of surface active materials (surfactants) in the fuel.

3.1.2 *reference fluid, n*—a reference fluid base to which prescribed quantities of a known surface active agent have been added.

3.1.2.1 *Discussion*—The known surface active agent is typically bis-2-ethylhexyl sodium sulfosuccinate, commonly referred to as AOT, dissolved in toluene.

3.1.3 *surfactants, n—in petroleum fuels*, surface active materials that could disarm (de-activate) filter separator (coalescing) elements so that free water is not removed from the fuel in actual service.

3.1.3.1 *Discussion*—Technically, surfactants affect the interfacial tension between water and fuel which affects the tendency of water to coalesce into droplets or not.

[1] This test method is under the jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.14 on Stability and Cleanliness of Liquid Fuels.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

***A Summary of Changes section appears at the end of this standard.**

3.1.4 *strong surfactants*, *n—in petroleum fuels*, surface active materials that disarm filter separator elements.

3.1.4.1 *Discussion*—Strong surfactants can be refinery process chemicals left in the fuel or contaminants introduced during transportation of the fuel.

3.1.5 *weak surfactants*, *n—in petroleum fuels*, surface active materials that do not adversely affect the performance of filter separator elements in actual service.

3.1.5.1 *Discussion*—Weak surfactants are typically certain types of additives used in fuels.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *DSEP rating*, *n*—the Micro-Separometer rating of diesel fuels as measured by this test method.

3.2.1.1 *Discussion*—The "D" in DSEP stands for diesel fuel. (See 14.1 for more information.)

3.2.2 *reference fluid base*, *n*—a distillate diesel fuel that has been carefully cleaned in a prescribed manner to remove all surface-active contaminants, and having a minimum DSEP rating of 97.

3.2.2.1 *Discussion*—The reference fluid base should be a diesel fuel typical of fuels to be tested.

3.3 *Abbreviations:*

3.3.1 *ac*—alternating current

3.3.2 *AOT*—Aerosol OT (see 8.1)

3.3.3 *C/S*—collect sample

3.3.4 *dc*—direct current

3.3.5 *MSEP*—Micro-Separometer

3.3.6 *DSEP*—Micro-Separometer–Diesel

4. Summary of Test Method

4.1 A 50 mL water/fuel sample emulsion is created in a syringe using a high-speed mixer. The emulsion is then expelled from the syringe at a programmed rate through a standard fiber-glass coalescer and the effluent is analyzed for uncoalesced water by a light transmission measurement.

4.2 The results are reported on a 0-to-100 scale to the nearest whole number, however the effective range of the test equipment is from 50 to 100. High ratings indicate that water is easily coalesced, implying that the fuel is relatively free of surfactants.

4.3 A test can be performed in 5 to 10 min.

5. Significance and Use

5.1 This test method provides a measure of the presence of surfactants in diesel fuels, and can be performed in the field or in a laboratory. Like Test Method D 3948 used for jet fuel, this test method can detect traces of some refinery treating chemicals left in fuel. It can also detect surface active substances added to or picked up by the fuel during handling from point of production to point of use.

5.2 Certain additives, which can act as weak surfactants, give a slightly reduced DSEP rating. Other substances which are strong surfactants give much lower DSEP ratings.

5.3 While filter separators have not been common in diesel fuel systems, they could become more prevalent with ULSD containing increased additive content to ensure clean, dry fuels in new engine designs. Weak surfactants, with slightly reduced DSEP ratings, do not affect the ability of filter separators to separate free water from the fuel. Strong surfactants give a much lower DSEP rating and adversely affect the ability of filter separators to separate free water from the fuel.

5.4 Results from this test method do not have a known relationship to the rate of water settling in tanks.

5.5 The Micro-Separometer has a measurement range from 50 to 100. Values obtained outside of those limits are undefined and invalid.

NOTE 2—In the event a value greater than 100 is obtained, there is a good probability that light transmittance was reduced by material contained in the fuel used to set the 100 reference level. The material was subsequently removed during the coalescing portion of the test, thus, the processed fuel had a higher light transmittance than the fuel sample used to obtain the 100 reference level resulting in the final rating measuring in excess of 100.

6. Interferences

6.1 Any suspended particles, whether solids or water droplets or haze, in a fuel sample will interfere with this test method, which utilizes light transmission of a fuel sample after emulsification with water and subsequent coalescence.

6.2 Non-hydrocarbon components such as oxygenates, especially alcohols, or emulsified water have not been verified for this test method and will likely interfere.

7. Apparatus

7.1 A *Micro-Separometer*[4,5] *instrument* is used to perform the test. The unit is portable and self-contained, capable of operating on an internal rechargeable battery pack or being connected to an ac power source using power cords which are available for various voltages. Connection to an ac power source will provide power to the unit and affect battery recharge. The accessories can be packed in the cover of the lockable case.

7.1.1 The Emcee Model 1140 Micro-Separometer Mark V Deluxe and associated control panel is shown in Fig. 1. The emulsifier is on the right side of the raised panel and the *syringe drive mechanism* is on the left side. The control panel containing the operating controls (pushbuttons) is mounted on the fixed panel in the left side of the case. Table 1 lists the manual and audio operating characteristics of the instrument. A circuit breaker located on the control panel provides protection for the ac power circuit. The turbidimeter is located under the main control panel and consists of a well in which the sample vial is placed, a light source, and a photocell.

NOTE 3—Of the lettered (A-G) pushbuttons, only the D pushbutton is applicable to this test method.

[4] The sole source of supply of the apparatus known to the committee at this time is the Model 1140 Micro-Separometer Mark V Deluxe, available from EMCEE Electronics, Inc., 520 Cypress Ave., Venice, FL 34285, U.S.A. www.emcee-electronics.com. If you are aware of alternative suppliers, please provide this information to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee,[1] which you may attend.

[5] The Model 1140 Micro-Separometers Mark III and Mark V Standard versions may also be used, but they are no longer supported by the manufacturer. For operating procedures using these instruments, the user is referred to Test Method D 3948–87.

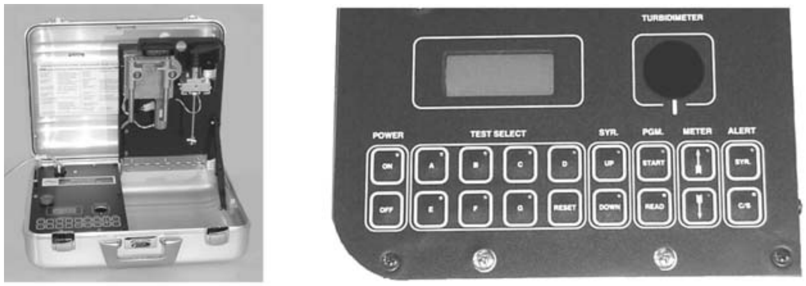

FIG. 1 Micro-Separometer Mark V Deluxe and Associated Control Panel

TABLE 1 Manual and Audio Operating Characteristics of the Emcee Model 1140 Micro-Separometer Instrument for Mode D Operation

Available Test Mode(s) Function	Mark V Deluxe
Test Mode - Select Mode D	
Depress	D Pushbutton
Syringe Drive	Not required
Speed Selection	Not required
Clean Cycle	
Depress	START Pushbutton
Initiate Automatic Test Sequence	
Depress	START Pushbutton
Cancel Automatic Sequence	
Depress	RESET Pushbutton
1st Meter Read	
1st Meter Adjust	Depress ARROWED Pushbuttons
2nd Meter Read	
2nd Meter Adjust	Depress ARROWED Pushbuttons
Collect Sample	Short Tone and C/S Annunciator Lamp Illuminates
3rd Meter Read	
Record Measurement	Pulsed Tone Sounds 5 s into 3rd Meter Read

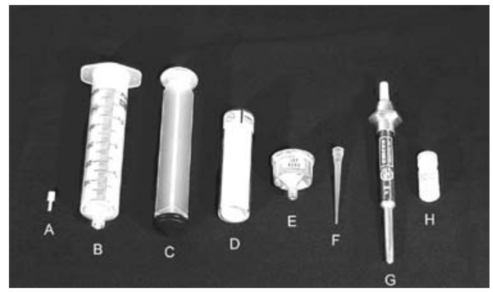

FIG. 2 Test Supplies and Small Parts

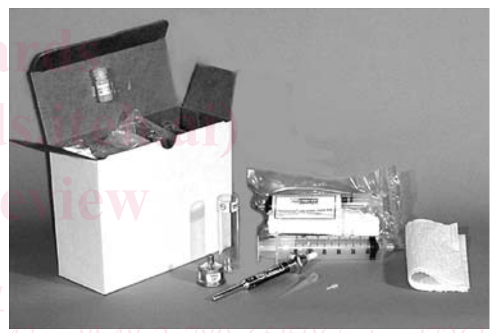

FIG. 3 Six Pack and Test Accessories

7.2 *Beaker, Catch Pan, or Plastic Container*—(Supplied with each Micro-Separometer) used to receive the waste fuel during the coalescence period of the test.

7.3 *Pipet*—An automatic 50-µL hand pipet (supplied with each Micro-Separometer) designed to accept a disposable plastic tip.

8. Reagents and Materials

8.1 *Aerosol OT*, (AOT), solid (100 % dry) bis-2-ethylhexyl sodium sulfosuccinate.

8.2 *Dispersing Agent*—Toluene solution (**Warning**—Flammable. Vapor harmful.) containing 1 mg of Aerosol OT per milliliter of toluene.

8.3 *Expendable Materials* needed to perform the test are shown in Fig. 2 and consist of the following:[6]

8.3.1 *Syringe Plug, (A)*—A plastic plug used to stopper the syringe during the clean and emulsion cycles.

8.3.2 *Syringe, (Barrel (B) and Plunger (C))*—A disposable 50 mL plastic syringe.

8.3.3 *Vials, (D)*, 25-mm outside diameter vial premarked for proper alignment in the turbidimeter well.

8.3.4 *DCell[7] Coalescer, (E)* an expendable, pre-calibrated aluminum coalescer cell with a tapered end to fit the syringe. It is labeled in a white background with black lettering:

DCELL®, DIESEL FUEL, D 7261

8.3.4.1 In order for a coalescer to be acceptable for this test method, it shall have been manufactured using 2-grades of fiberglass and have passed factory calibration tests for air flow and leakage.

8.3.5 *Disposable Plastic Pipet Tip (F)*—Used with an automatic 50-µL hand pipet (Fig. 2, G).

8.3.6 *Container (H)*—A clean container of double-distilled water (8.7).

8.4 *Reference Fluid Base*—A surfactant-free, clean, distillate diesel fuel which is used to verify proper operation and is prepared in the manner described in Annex A1 (see 3.2.2). (**Warning**—Flammable. Vapor harmful.)

8.5 *Reference Fluid*—(**Warning**—Flammable. Vapor harmful.) A fluid used for checking the operational performance of

[6] A new syringe, pipet tip, test sample vial, syringe plug, DCell coalescer (trademarked) and double distilled water are used in each test. These expendable materials are available from Emcee Electronics, Inc. in a kit, termed the DCell Micro-Separometer Six Pack (trademarked), containing supplies for six tests (Fig. 3).

[7] The term “DCell” and logo are registered trademarks of EMCEE Electronics, Inc, 520 Cypress Ave., Venice, FL 34285.

TABLE 2 Expected Performance for Reference Fluids[A]

AOT mL/L	DSEP Rating	Std Dev
0.0	97	0.89
0.2	90	2.88
0.4	85	2.58
0.8	77	1.55
1.6	65	1.75

[A] Expected range of values obtained by using increasing amounts of dispersing agent AOT used to verify instrument calibration. The values shown in Table 2 are the averages that were derived from an in-house test study conducted in September 2005, by Emcee Electronics, Inc. One operator using one Micro-Separometer performed 6 successive tests on each reference fuel. The values in Table 2 are graphically shown in Fig. 9.

the Micro-Separometer instrument), consisting of increasing concentrations (0 to 1.6 mL/L) of dispersing agent added to the reference fluid base. The DSEP ratings for this range of concentrations appear in Table 2. The reference fluids are prepared and tested as described in Sections 12 and 13.

8.6 *Toluene*, ACS reagent grade. (**Warning**—Flammable. Vapor harmful.)

8.7 *Water*, clean, double-distilled and surfactant-free: D 1193 Type IV reagent water, re-distilled. In practice, re-distillation of commercial distilled water has proven to be satisfactory.

8.7.1 Use of water other than double-distilled water (such as tap water) will render test results invalid.

9. Hazards

9.1 The primary hazard in this test method is the flammability of the fuels that are tested. Take suitable precautions to avoid sparks, flames or sources of ignition.

9.2 Minimize worker exposure to breathing fuel vapors.

10. Preparation of Apparatus

10.1 Locate the instrument on a clean workbench in an area where the temperature is between 18 and 29°C (65 and 85°F) and does not vary more than ±3°C (5°F).

10.2 Open the case, and raise the right panel until completely vertical and locked in place.

10.2.1 If ac power is available, connect the power cord.

10.2.2 If the internal battery power is used, ensure that the batteries are charged sufficiently to perform the desired number of tests.

NOTE 4—Low battery power is indicated when the power lamp does not illuminate. To recharge the battery, connect the instrument to an ac power source for at least 16 h (full charge) prior to use. Approximately 25 tests can then be performed.

10.2.3 Turn the Mark V Deluxe instrument on by depressing the switch (pushbutton) marked ON.

NOTE 5—The on-power indicator light will alternately pulse on and off when the instrument is connected to an ac power source and will stay on continuously when operated by the battery pack. Flickering of the power indicator light, during any portion of a test sequence being performed using battery power, indicates that recharging is necessary.

10.3 Have ready a supply of syringes, syringe plugs, vials, DCell coalescers, the pipet and pipet tips, and a clean container of double-distilled water.

NOTE 6—Syringe drive travel times during the coalescing test period were initially calibrated at the factory for each mode of operation and have a significant bearing on the final test results. Syringe drive travel times exceeding the upper limit will cause the final results to measure high; conversely, travel times below the lower limit will cause the final results to measure low. Mark V Deluxe instruments have self-check circuitry to detect out-of-tolerance syringe drive travel times. The alert indicator lamp (marked SYR) illuminates and depending on the degree (more than 3 s) of the out-of-tolerance condition, three short (1-s) tones will also sound. An occasional out-of-tolerance alert may be experienced due to some intermittent condition, which probably will not be indicative of instrument failure. However, repeated alerts are cause for returning the instrument to the factory for adjustment.

11. Sampling and Sample Preparation

11.1 Rinse the sample container three times with the product to be sampled before collecting the sample. Collect a sample of at least 1-L, and preferably about 3-L, in a clean container in accordance with Practice D 4057 or D 4177.

NOTE 7—Test method results are known to be sensitive to trace contamination from sampling containers. For recommended sampling containers, refer to Practice D 4306. Special precautions concerning sample containers and sampling technique are discussed in Appendix X1. Extreme care and cleanliness are required in taking samples either directly into the test syringe or into a sample container.

11.1.1 Before pouring the test sample from the container, wipe the container outlet thoroughly with a clean, lintless wiper; pour the test sample into a clean beaker or directly into the barrel of the test syringe.

11.2 (**Warning**—Do not, under any circumstances, prefilter the test fuel. The filter media can remove the very materials, surfactants, that the test method is designed to detect. If the test fuel is contaminated with particulate matter, allow such materials to settle out of the fuel before testing. Test methods such as D 4176, D 4860, and D 6426 may be used to determine the quality and cleanliness of the sample.)

NOTE 8—If a sample does not clear up after being allowed to stand for a period of time, the sample cannot be tested by this test method (6.1).

11.3 If the sample is not within the test temperature limits of 18 to 29°C (65 to 85°F), allow the sample to stand or place the sample container in a water bath until the temperature is within the prescribed limits. The preferred temperature for testing is approximately 27°C (80°F).

12. Calibration and Verification

12.1 The instrument is calibrated at the factory by using in-house test equipment.

12.2 Instrument performance, especially for field use, may be verified by performing DSEP tests using a dilution of the dispersing agent (as prepared in 8.3), a reference fluid base (as prepared in Annex A1), and double-distilled water.

12.2.1 Prepare a 10:1 dilution by diluting 10 mL of dispersing agent (8.2) with 90 mL of toluene.

NOTE 9—Since 1 mL of dilution is equal to 0.1 mL of dispersing agent, 50 µL of dilution is equal to 0.1 mL/L when added to 50 mL of reference fluid base. The 0.1 mL/L of dispersing agent corresponds to even multiples of the concentration levels listed in Table 2.

12.2.2 Use the 50 µL pipet (8.3.5) to add increments of 0.1 mL/L of dispersing agent to reference fluid base.

TABLE 3 Test Sequence (Mode D Operation)

Micro-Separometer Action	Operator Activity	Time minutes & seconds	
		Test Sequence (Time)	Elapsed Time
Start sequence	Depress start switch	0	0
Pulsed tone	Prepare for meter read	0:04	0:04
Meter on	Full-scale adjustment 1	0:10	0:14
Emulsifier on	Observe emulsification	0:30	0:44
No activity	Place emulsified sample into syringe drive	0:30	1:14
Pulsed tone	Prepare for meter reading	0:04	1:18
Meter on	Full-scale adjustment 2	0:10	1:28
Syringe drive	Coalescence period	0:45	2:13
Starts down	Collect sample		
No activity	Place sample into turbidimeter well	0:56	3:09
Steady tone	Prepare for meter reading	0:04	3:13
Meter on	Read results	0:05	3:18
One second tone	Record results	0:05	3:23

12.2.3 Perform DSEP tests with several reference fluids and double-distilled water (8.7) according to Section 13.

12.2.4 Compare the DSEP ratings to the values listed in Table 2 for the particular concentration of dispersing agent used.

12.3 If the results do not fall within the range of limits shown in Table 2, the reference fluid shall be discarded and a fresh quantity of reference fluid prepared and the verification repeated.

12.4 If repeated verification tests give out–of-tolerance test results, return the instrument to the factory for adjustment and re-calibration.

13. Procedure

13.1 Select Mode D operation.

13.1.1 Depress pushbutton D for Mode D operation.

NOTE 10—Sequential illumination of the pushbuttons will cease and the depressed pushbutton will stay lit. The correct syringe drive speed is set automatically.

13.2 To remove any contaminants from the syringe barrel and stirrer, run two 50-mL portions of the fuel to be tested through the mixing system in clean cycles, as follows.

13.2.1 Remove a plunger from a new 50-mL syringe and wipe the tip using a clean, lintless wipe to remove any sheen caused by excess lubricant. Insert a plug into the exit hole of the syringe barrel, add 50 ± 1 mL of fuel, and place the syringe barrel on the emulsifier mount, turning to lock in place.

13.2.2 Ensure that the syringe barrel is properly aligned concentrically with the mixer shaft and is not touching the propeller. Proper alignment can be verified by grasping the syringe barrel and moving the same until the propeller on the end of the mixer shaft is free and not touching.

NOTE 11—Misalignment can cause plastic shavings to form and collect on the coalescer filter material resulting in erroneous test results. This applies to all instruments manufactured prior to July, 1988 which have not been serviced by EMCEE Electronics, Inc. since that date. Since July, 1988, with ASTM approval, all new instruments and those returned for service have had a standoff installed on the mixer shaft to prevent the syringe barrel from coming into contact with the mixer blades.

13.2.3 Initiate the clean cycle by depressing the start push-button as designated by the annunciator light. (**Warning**—Do not operate the mixer without having a syringe with fuel in place. The mixer bearings depend on the fuel for lubrication.)

13.2.4 At the end of the first clean cycle, when the mixer motor stops, press the reset pushbutton, remove the syringe barrel from the emulsifier, discard the fuel, and drain the syringe thoroughly.

13.2.5 Add 50 ± 1 mL of fresh fuel into the syringe and place the syringe barrel on the emulsifier mount (turn to lock in place). Visually inspect that the syringe barrel is properly aligned concentrically with the mixer shaft and is not touching the propeller. Select Test Mode D by pressing D pushbutton.

13.2.6 Initiate the second clean cycle by pressing the start pushbutton, as designated by the annunciator light.

13.3 Add about 15 to 20 mL of the fuel to be tested into a new vial. Wipe the outside of the vial with a clean, lintless wiper and insert the vial into the turbidimeter well aligning the black mark on the vial with the line on the front panel. (This vial of clean fuel is required for setting the meter reading to 100 in 13.9.)

13.4 At the end of the second clean cycle, when the mixer motor stops, remove the syringe barrel from the emulsifier, discard the fuel, and drain the syringe thoroughly.

13.5 Add 50 ± 1 mL of fresh fuel sample into the syringe.

13.5.1 Handle the syringe in such a manner as to minimize warming of the fuel sample by body heat.

13.6 Using a fresh plastic tip on the hand pipet, add 50 µL of double-distilled water (8.7) to the fuel sample as follows: Holding the pipet in hand, give a slight twist to the plastic tip to ensure a tight seal, push in the plunger, immerse the tip just below the water surface, release the plunger, and withdraw from the water slowly to avoid water drops adhering to the outside of the tip. Immerse the tip of the pipet just below the fuel surface in the center of the syringe (Fig. 4) to ensure the water drops break away cleanly and fall to the bottom, push and hold in the plunger, withdraw the pipet, and release the plunger.

13.7 Place the syringe barrel on the emulsifier mount, turning to lock in place.

13.8 With the syringe in place, depress the start pushbutton (Fig. 5) to initiate the automatic portion of Test Mode D.

NOTE 12—If for any reason it is desired to interrupt the sequence and start over, the reset pushbutton will cancel the test in progress and reset the program to the beginning of the clean segment of the test cycle.

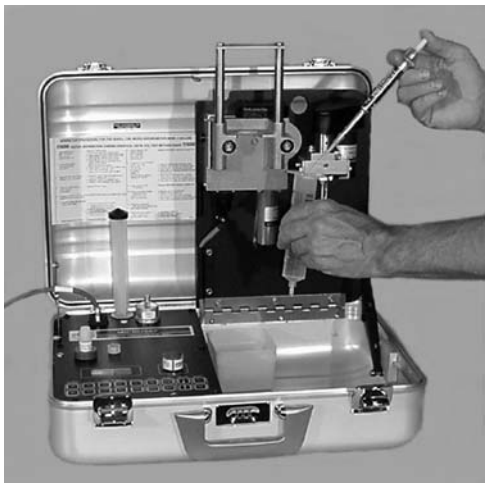

FIG. 4 Water Addition

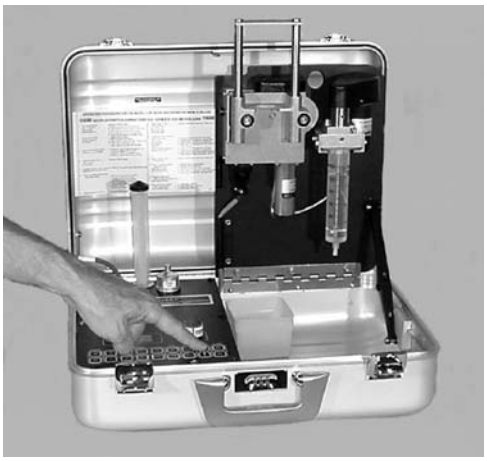

FIG. 6 Meter Adjustment

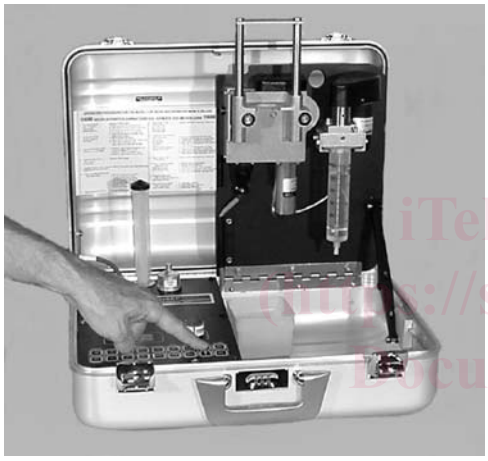

FIG. 5 Emulsification

FIG. 7 Coalescence

13.9 The automatic program starts with a read meter indication (four short tones) followed by a 10-s full-scale adjustment period. During this period, depress the illuminated arrowed pushbuttons to adjust the meter to read 100 (Fig. 6). After the full-scale adjustment period, the mixer motor activates and the emulsion process is initiated.

NOTE 13—If the adjustment cannot be completed at this time, final adjustment can be accomplished during the second meter adjust period occurring later in the test sequence.

NOTE 14—A few drops of fuel can seep from the hole in the emulsifier head during the high-speed mixing operation. This should not affect the test results.

13.10 When the mixer stops (after emulsification), remove the syringe barrel from the emulsifier and partially insert the plunger to seal the open end of the syringe. Invert the syringe (exit hole up), remove the plug, and exhaust the entrapped air in the syringe barrel without significant fuel loss by carefully inserting plunger to the 50-mL mark. (Use a clean wipe over the exit hole to capture the small amounts of fuel which may be extruded as foam.) Affix a new coalescer (8.3.4) to the end of the syringe barrel. **Warning**—Use of an incorrect coalescer, such as a jet fuel coalescer, will give erroneous results.

13.10.1 Place the entire syringe assembly into the syringe drive mechanism (Fig. 7). To minimize the effect of plunger resistance (drag) in the syringe barrel, align the syringe assembly vertically in the syringe drive mechanism with the end of the syringe plunger parallel with pushbar of the syringe drive mechanism. Position a waste container beneath the coalescer to collect the unwanted portion of the processed fuel sample during the coalescing period.

13.10.2 Electrically bond the coalescer to the Micro-Separometer to prevent buildup of an electrostatic charge that could result in ignition of flammable test fluids.

13.10.2.1 Fasten the alligator clip to the coalescer and insert the plug in the chassis ground jack (Fig. 7). Other suitable grounding methods may be used for previous models.

NOTE 15—Each Mark V instrument is furnished with a ground lead that has an alligator clip on one end and a banana plug on the other.

13.11 After four short tones, which indicate the second meter adjust period, adjust the meter reading to 100, if necessary. The syringe drive mechanism will start down at the end of the meter-adjust period forcing the water/fuel emulsion through the coalescer (Fig. 7). During this operation, remove the vial from the turbidimeter well and discard the fuel.