MICROSEP® MARK V DELUXE

MODEL NO. 140-00-0005 WITHOUT BATTERY PACK
MODEL NO. 140-00-0005B WITH BATTERY PACK

OPERATION MANUAL

NOTICE

THIS MODEL INSTRUMENT WILL NOT PERFORM THE ASTM D5000, "STANDARD PRACTICE FOR EVALUATING ACTIVITY OF CLAY ELEMENTS USING A SIDE-STREAM SENSOR" OR THE CLAY MONITOR TEST METHODS. THESE METHODS CAN BE RUN USING MODEL 140-00-0005A WHICH ALLOWS THE 15-SECOND SYRINGE TIME.

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MICROSEP® MARK V DELUXE OPERATION MANUAL

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1.0 SCOPE

1.1 The Microsep® Mark V Deluxe incorporates solid state design and self-contained power source. The instrument provides a quick, portable means for field and laboratory use to rate the ability of aviation turbine fuels to release entrained or emulsified water when passed through fiberglass coalescence material.

2.0 SIGNIFICANCE

2.1 The test provides a measure of surface active materials in aviation turbine fuels. These are known to affect the ability of filter separators to separate free water from fuel.

3.0 DEFINITION

3.1 To distinguish from the standard Water Separometer rating (WSIM) and Minisonic Separometer rating WSIM (MSS), the Microsep® numerical rating should be reported as Microsep® rating (MSEP).

4.0 SUMMARY OF METHOD

4.1 The fuel sample is emulsified with water in a syringe, using the emulsifier which is programmed to operate for a predetermined time period. After emulsification there is a programmed waiting period to allow time to insert the plunger, add the ALUMICEL COALESCER and place the entire assembly on the syringe drive. The sample is expelled from the syringe at a programmed rate by the syringe drive mechanism through a standard ALUMICEL COALESCER. When all of the fuel has been expelled from the syringe, another programmed waiting period is initiated to allow the coalesced water to settle. At the end of the settling time period, an audible signal sounds. Immediately after the audible signal stops, the meter indicates the Microsep® rating which is a measure of the uncoalesced water remaining in the fuel. The results are reported on a 0-100 scale to the nearest whole number. High ratings indicate the water is easily coalesced, and the fuel is relatively free of surfactant materials. A test can be performed in approximately 5 minutes.

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5.0 APPARATUS

5.1 The Microsep® is a completely portable and self-contained unit, operating on an internal rechargeable battery. The unit may be operated at sites where no AC power supply is available. It also may be operated while connected to an AC power line. Detachable power cords are available for various voltages. The AC power source will power the unit and charge the battery. A place has been provided in the cover of the case to store a six-pack of disposable materials for running six tests.

5.2 The main features of the Microsep® are shown in Figure 1 through Figure 3. Figure 1 shows the right hand panel supporting the emulsifier and syringe drive. Figure 2 shows the control panel. Figure 3 shows the instrument ready for test.

5.2.1 The MAIN POWER is controlled by momentarily depressing the "ON" switch. In the battery mode a steady lamp at the ON switch location indicates the battery level is sufficient for testing. If the ON lamp flickers during fuel testing the instrument should be attached to an AC power source for battery charging. In the AC mode the lamp at the ON switch location will flash at a steady rate which indicates the AC source and instrument supply is ready for testing. The power is turned off by momentarily depressing the "OFF" switch. If power is inadvertently left on closing the right hand drive panel will also turn off the instrument. The battery is automatically charged and maintained when the AC power cord is attached to the power line. The AC circuit breaker located on the front panel, offers protection for the AC power circuit. DC power is protected by an internal fuse.

5.2.2 The TEST SELECT section, switches A through G are utilized to select the various test modes available. Individual test parameters are described in sections 9.0 through 15.0.

5.2.3 The "RESET" pushbutton, located on the main control panel, automatically resets the electronic program to test scan and positions the syringe drive into the packing mode.

5.2.4 The SYRINGE DRIVE section is utilized in tests F and G to manually operate the syringe mechanism. "UP" and "DOWN" switches are operational when indicated by the annunciator lamps.

5.2.5 The PROGRAM section consists of the "START" and "READ" switches. During automatic tests A through E the "START" switch is used to initiate all automatic programming. The "READ" switch is used during manual tests F and G to operate the turbidimeter.

5.2.6 The METER adjust section consists of switches labeled with up and down arrows. When the annunciator lamps are on, the switches allow adjustment of the turbidimeter.

5.2.7 The ALERT section is utilized as an annunciator. The "SYR" indicator will light when the syringe drive elapsed time is out of preset limits. The "C/S" indicator will light when 15 ml of fuel sample is left for collection.

5.2.8 The TURBIDIMETER, located under the main control panel, consists of a well for placing the sample vial, a light source and a photocell.

5.3 The small parts and supplies needed to carry out the test are shown in Figure 4 and consist of the following.

5.3.1 PIPETTE - An automatic hand pipette for use with disposable plastic tip. (Supplied with Instrument - Part No. 140-90-5983)

5.3.2 DRIP PAN - A pan used to receive the waste fuel. (Supplied with Instrument - Part No. 140-90-7902)

5.3.3 CONTAINER - A clean container for water. (Not included)

5.3.4 SYRINGE (barrel and plunger) - A disposable 50 ml plastic syringe. (Part of Six-Pack)

5.3.5 SYRINGE PLUG - A plug for the syringe. (Part of Six-Pack)

5.3.6 ALUMICEL COALESCER - A pre-calibrated aluminum, throwaway coalescer cell with a tapered end to fit the syringe. (Part of Six-Pack)

5.3.7 VIALS - A glass vial pre-marked for proper turbidimeter positioning. (Part of Six-Pack)

5.4 SIX-PACK - A new syringe, pipette tip, test sample vial, plug and ALUMICEL COALESCER are used in each test. These disposable parts are available from Emcee in a kit containing all the disposables for 6 tests. (Part No. 840.99-5944)

6.0 REAGENTS

6.1 WATER - Clean, surfactant-free, preferably distilled.

7.0 PREPARATION OF APPARATUS

7.1 If possible, locate the instrument in an area where the temperature is between 65 degrees F. and 85 degrees F. Test performed outside of these temperature limits may not meet ASTM repeatability/reproducibility criteria.

7.2 Remove the instrument from the protective foam case. Open the case and remove the Six-Pack box from the lid. Insert your finger into the hole in the right panel and raise the panel until completely vertical and locked in place. If power is available, check to be certain the source voltage matches the power cord label and connect the power cord.

7.3 Have ready a supply of syringes, ALUMICEL COALESCERS, vials, plugs, pipette tips, drip pan, and a container for clean water. All but the water container are provided with the instrument and Six-Pack.

7.4 The syringe drive speeds are pre-set at the factory and are automatically checked during each test. The syringe drive time is measured and compared to an internal clock. As soon as the syringe reaches the bottom limit the "SYR." alert indicator will illuminate if the syringe speed is out of limits. The syringe alert lamp will remain on until the end of the test to alert the operator the data may be suspect. If the syringe speed is further out of limits the audible alarm will sound 3 times and any test data should be discarded.

7.5 If the instrument is to be operated in a location where an AC outlet is not available, the instrument should be charged for approximately 16 hours before testing. The unit will function properly for approximately 25 tests before battery recharging is necessary.

8.0 PREPARATION OF SAMPLE

8.1 Obtain and handle the samples with the utmost care and cleanliness as required in the ASTM Procedure D-3948. Before pouring the test sample from container, wipe the container outlet thoroughly with a clean, lintless wipe. Then pour the test sample into a clean beaker or directly into the syringe.

8.2 If the sample for test is not within the test temperature limits let the container stand or preferably put sample in a clean beaker and let it come to operating temperature.

9.0 JET A TEST PROCEDURE

9.1 Prepare the DELUXE MICROSEP® as stated in section 7.0.

9.2 Momentarily depress the "ON" switch. The annunciator lamps located on switches A through G in the TEST SELECT section will then be scanning for your selection. Depress switch "A". This will initiate the standard automatic program for Jet A fuel.

9.3 The annunciator lamp on the "START" switch will be illuminated which indicates the program can be started by momentarily depressing this switch.

9.4 At the end of the first clean cycle when the mixer motor stops, press the RESET push-button, remove the syringe barrel from the emulsifier, discard the fuel, and drain the syringe thoroughly. Add 50 ± 1 mL of fresh fuel into the syringe and place the syringe barrel on the emulsifier mount (turn to lock into place). Visually inspect that the syringe barrel is properly aligned concentrically with the mixer and is not touching the propeller. Select Test Mode A by pressing the A push-button.

9.4.1 Initiate the second CLEAN cycle by pressing the START push-button as designated by the annunciator light.

9.5 Add about 15 or 20 ml of the fuel to be tested to a clean vial, wipe with a clean, lintless wipe and insert into the TURBIDIMETER (the hole directly above the PROGRAM and METER sections). Align the black vial mark with the white line on the front panel.

9.6 Remove the syringe from the emulsifier, empty the fuel, draining thoroughly, and add exactly 50 ml of test fuel.

9.7 Using a fresh tip on the hand pipette, add 50 microliters of clean water to fuel sample as follows. Push in plunger, immerse tip just below the water surface, release the plunger and withdraw from the water slowly to avoid water drips adhering to the outside of the tip. Immerse the tip of the pipette just below the fuel surface in the center of the syringe, to ensure the water drops break away cleanly and fall to the bottom; push the plunger, withdraw the pipette, and then release the plunger.

9.8 Place the syringe on the emulsifier turning to lock in place.

9.9 When securely in place depress the "START" pushbutton. This will initiate the automatic program.

AUTOMATIC PROGRAM

Pulsed Tone	4 Seconds
Meter Adjust Period #1	10 Seconds
Emulsification	30 Seconds
Wait	30 Seconds
Pulsed Tone	4 Seconds
Meter Adjust Period #2	10 Seconds
Syringe Drive Down	45 Seconds
Wait	56 Seconds
Steady Tone	4 Seconds
Meter Read	10 Seconds

9.9.1 The automatic program starts with a read meter warning followed by a 10 second full scale adjustment period. During this period adjust the display to 100 using the meter adjust up or down switches.

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9.9.2 After the emulsification period, remove the syringe from the emulsifier and insert the plunger. Remove the plug from the bottom, replace it with an ALUMICEL COALESCER, and place the whole assembly onto the syringe drive mechanism. Attach ground lead between ground jack on side of syringe drive and ALUMICEL COALESCER. Place a waste container beneath the syringe to collect the unwanted fuel.

9.9.3 At the end of the second meter adjust period the syringe will start down. Remove and empty the sample vial and prepare for sample collection. The audio alert and the C/S indicator will indicate the proper time to collect the last 15 milliliters from the syringe.

9.9.4 Place the sample vial in the turbidimeter and rotate to the marked position.

9.9.5 When the steady tone starts the meter will automatically turn on. An additional one second tone during the meter on period will indicate the proper time to read the meter. Record the reading and report as Microsep® rating (MSEP rating).

10.0 JET B TEST PROCEDURE

10.1 Prepare the DELUXE MICROSEP® as stated in section 7.0.

10.2 Momentarily depress the "ON" switch. The annunciator lamps located on switches A through G in the TEST SELECT section will then be scanning for your selection. Depress switch "B". This will initiate the standard automatic program for Jet B fuel.

10.3 The annunciator lamp on the "START" switch will be illuminated which indicates the program can be started by momentarily depressing this switch.

10.4 Remove a plunger from a 50 ml syringe, insert a plug in the bottom, add approximately 50 ml of fuel to be tested, place the syringe on the emulsifier turning to lock in place. Press the "START" pushbutton which will automatically clean the syringe for approximately 30 seconds and also raise the syringe drive to its UP position.

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10.5 Add about 15 or 20 ml of the fuel to be tested to a clean vial and insert into the TURBIDIMETER (the hole directly above the PROGRAM and METER sections). Align the black vial mark with the white line on the front panel.

10.6 Remove the syringe from the emulsifier, empty the fuel, draining thoroughly, and add exactly 50 ml of test fuel.

10.7 Using a fresh tip on the hand pipette, add 50 microliters of clean water to fuel sample as follows. Push in plunger, immerse tip just below the water surface, release the plunger and withdraw from the water slowly to avoid water drips adhering to the outside of the tip. Immerse the tip of the pipette just below the fuel surface in the center of the syringe, to ensure the water drops break away cleanly and fall to the bottom; push the plunger, withdraw the pipette, and then release the plunger.

10.8 Place the syringe on the emulsifier, turning to lock in place.

10.9 When securely in place depress the "START" pushbutton. This will initiate the automatic program.

AUTOMATIC PROGRAM

Pulsed Tone	4 Seconds
Meter Adjust Period #1	10 Seconds
Emulsification	30 Seconds
Wait	30 Seconds
Pulsed Tone	4 Seconds
Meter Adjust Period #2	10 Seconds
Syringe Drive Down	25 Seconds
Wait	56 Seconds
Steady Tone	4 Seconds
Meter Read	10 Seconds

10.9.1 The automatic program starts with a read meter warning followed by a 10 second full scale adjustment period. During this period adjust the display to 100 using the meter adjust up or down switches.

10.9.2 After the emulsification period, remove the syringe from the emulsifier and insert the plunger. Remove the plug from the bottom, replace it with an ALUMICEL COALESCER, and place the whole assembly onto the syringe drive mechanism. Attach ground lead between ground jack on side of syringe drive and ALUMICEL COALESCER. Place a waste container beneath the syringe to collect the unwanted fuel.

10.9.3 At the end of the second meter adjust period the syringe will start down. Remove and empty the sample vial and prepare for sample collection. The audio alert and the C/S indicator will indicate the proper time to collect the last 15 milliliters from the syringe.

10.9.4 Place the sample vial in the turbidimeter and rotate to the marked position.

10.9.5 When the steady tone starts the meter will automatically turn on. An additional one second tone during the meter on period will indicate the proper time to read the meter. Record the reading and report as Microsep® rating (MSEP rating).

11.0 CLEAR AND BRIGHT TEST PROCEDURE

11.1 A numeric value can be determined with the Microsep® relative to sample haze. Using this procedure a fuel sample is passed through a filter to remove water and particulate contamination. This sample provides a clear and bright reference which is compared to the original sample in the turbidimeter.

11.2 Prepare the DELUXE MICROSEP® as stated in section 7.0.

11.3 Momentarily depress the "ON" switch. The annunciator lamps located on switches A through G in the TEST SELECT section will then be scanning for your selection. Depress switch "C". This will initiate the standard automatic program for Clear and Bright Testing. The syringe drive mechanism will automatically move to the up position after depressing switch "C".

11.4 The annunciator lamp on the "START" switch will be illuminated which indicates the program can be started by momentarily depressing this switch.

11.5 Remove a plunger from a 50 ml syringe, insert a plug in the bottom and add approximately 50 ml of fuel to be tested. Insert the plunger. Remove the plug from the bottom, replace it with a special ALUMICEL COALESCER marked CLEAR & BRIGHT. Insert the syringe assembly into the syringe drive mechanism.

11.6 Momentarily depress the "START" pushbutton this will initiate the automatic program.

AUTOMATIC PROGRAM

Syringe Drive Down	45 Seconds
Pulsed Tone	4 Seconds
Meter Adjust Period	10 Seconds
Wait	30 Seconds
Steady Tone	4 Seconds
Meter Read	10 Seconds

11.7 The automatic program starts by passing the test fuel through the ALUMICEL COALESCER marked CLEAR & BRIGHT. Prepare the sample vial for fuel collection. The audio alert and the C/S indicator will indicate the proper time to collect the last 15 ml from the syringe.

11.8 Place the vial of filtered fuel into the turbidimeter and rotate to the marked position.

11.9 When the pulsed tone starts the meter will automatically turn on. During this period adjust the display to 100 using the meter adjust up or down switches.

11.10 Discard the fuel sample and place 15 ml of unfiltered fuel into the sample vial. Insert sample vial into the turbidimeter and rotate to the marked position.

11.11 When the steady tone starts the meter will automatically turn on. During this period record the display as the Clear and Bright rating.

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12.0 DIESEL FUEL TEST PROCEDURE

12.1 Prepare the DELUXE MICROSEP® as stated in section 7.0.

12.2 Momentarily depress the "ON" switch. The annunciator lamps located on switches A through G in the TEST SELECT section will then be scanning for your selection. Depress switch "D". This will initiate the standard automatic program for Diesel fuel.

12.3 The annunciator lamp on the "START" switch will be illuminated which indicates the program can be started by momentarily depressing this switch.

12.4 Remove a plunger from a 50 ml syringe, insert a plug in the bottom, add approximately 50 ml of fuel to be tested, place the syringe on the emulsifier turning to lock in place. Press the "START" pushbutton which will automatically clean the syringe for approximately 30 seconds and also raise the syringe drive to its UP position.

12.5 Add about 15 or 20 ml of the fuel to be tested to a clean vial and insert into the TURBIDIMETER (the hole directly above the PROGRAM and METER sections). Align the black vial mark with the white line on the front panel.

12.6 Remove the syringe from the emulsifier, empty the fuel, draining thoroughly, and add exactly 50 ml of test fuel.

12.7 Using a fresh tip on the hand pipette, add 50 microliters of clean water to fuel sample as follows. Push in plunger, immerse tip just below the water surface, release the plunger and withdraw from the water slowly to avoid water drips adhering to the outside of the tip. Immerse the tip of the pipette just below the fuel surface in the center of the syringe, to ensure the water drops break away cleanly and fall to the bottom; push the plunger, withdraw the pipette, and then release the plunger.

12.8 Place the syringe on the emulsifier, turning to lock in place.

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12.9 When securely in place depress the "START" pushbutton. This will initiate the automatic program.

AUTOMATIC PROGRAM

Pulsed Tone	4 Seconds
Meter Adjust Period #1	10 Seconds
Emulsification	30 Seconds
Wait	30 Seconds
Pulsed Tone	4 Seconds
Meter Adjust Period #2	10 Seconds
Syringe Drive Down	45 Seconds
Wait	56 Seconds
Steady Tone	4 Seconds
Meter Read	10 Seconds

12.9.1 The automatic program starts with a read meter warning followed by a 10 second full scale adjustment period. During this period adjust the display to 100 using the meter adjust up r down switches.

12.9.2 After the emulsification period, remove the syringe from the emulsifier and insert the plunger. Remove the plug from the bottom, replace it with an ALUMICEL COALESCER marked DIESEL, and place the whole assembly onto the syringe drive mechanism. Attach ground lead between ground jack on side of syringe drive and ALUMICEL COALESCER. Place a waste container beneath the syringe to collect the unwanted fuel.

12.9.3 At the end of the second meter adjust period the syringe will start down. Remove and empty the sample vial and prepare for sample collection. The audio alert and the C/S indicator will indicate the proper time to collect the last 15 milliliters from the syringe.

12.9.4 Place the sample vial in the turbidimeter and rotate to the marked position.

12.9.5 When the steady tone starts the meter will automatically turn on. An additional one second tone during the meter on period will indicate the proper time to read the meter. Record the reading and report as Microsep® rating (DMSEP rating).

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13.0 MINISTATIC TEST PROCEDURE

13.1 The Ministatic test utilizes the syringe drive mechanism. For this test it is necessary to move 50 ml of fuel through the syringe in 30 seconds.

13.2 Prepare the DELUXE MICROSEP® as stated in section 7.0.

13.3 Momentarily depress the "ON" switch. The annunciator lamps located on switches A through G in the TEST SELECT section will then be scanning for your selection. Depress switch "G". This will initiate the MINISTATIC TEST program.

13.4 The annunciator lamps in the SYRINGE section will indicate that manual control can be executed on the syringe drive mechanism. Depress the "UP" pushbutton. This will move the syringe mechanism to the upper limit. The annunciator lamp in the PROGRAM section will indicate the turbidimeter can be utilized on demand. Depressing the "READ" switch will turn on the turbidimeter and the adjust capability of the turbidimeter.

13.5 Insert sample into syringe and attach to syringe drive mechanism.

13.6 Momentarily depressing the "DOWN" pushbutton will cause the syringe drive to dispense the fuel sample in approximately 30 seconds.

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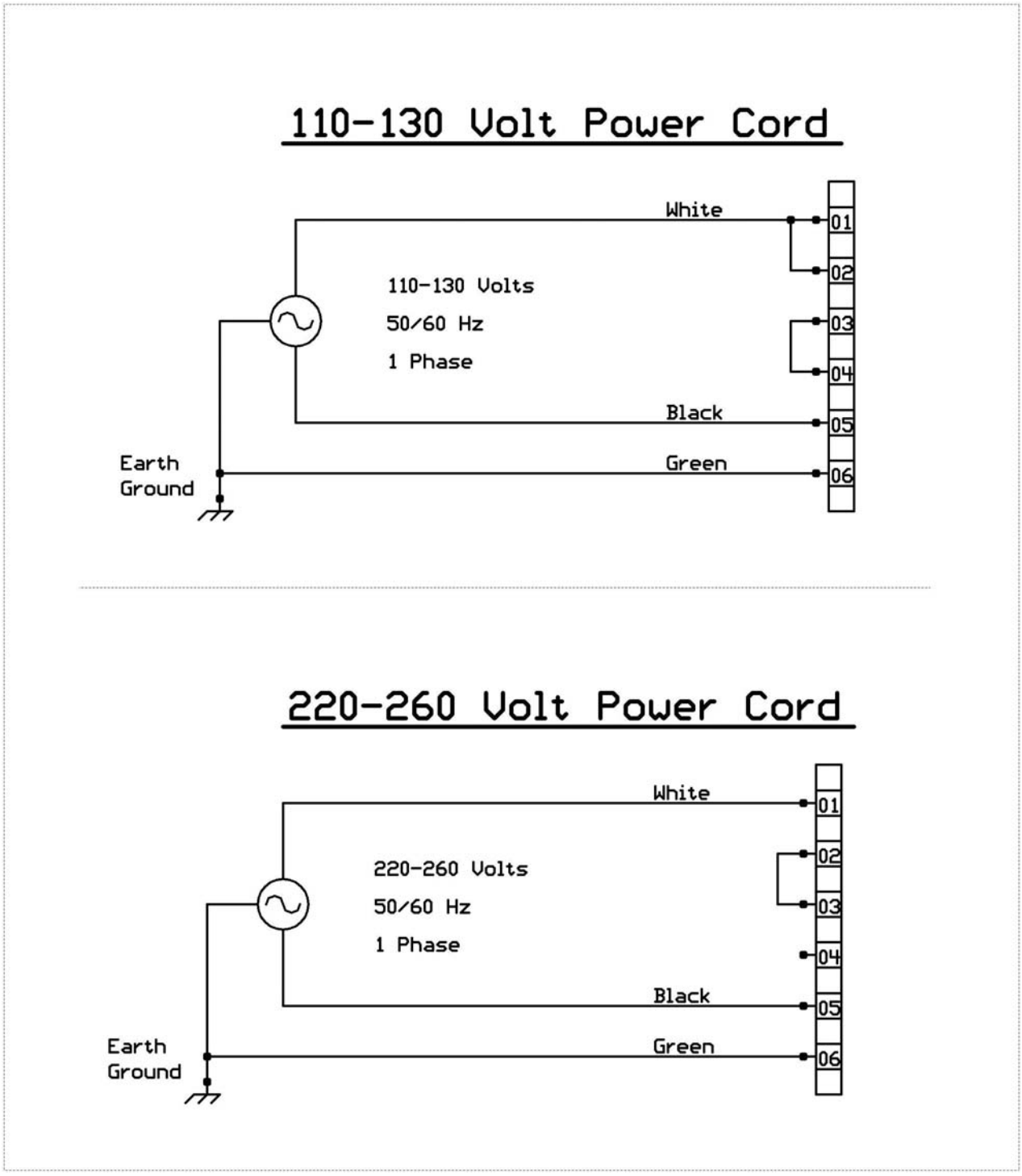
14.0 POWER CORD WIRING



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15.0 FIELD SERVICE

The DELUXE MICROSEP® has been calibrated and adjusted at the factory and should require very little maintenance. This section, however, may assist in cases of minor difficulties that do not require factory service.

15.1 Syringe alert indication - should a syringe alert light or light plus the audible alarm occur during testing, the following steps should be taken: Repeat the test insuring the syringe is centered in the drive mechanism and not binding. Use only a new syringe and plunger since the rubber on the plunger will swell causing increased drag. If possible, time the total syringe down time with a stopwatch. If the time is correct 45 +/- 2 seconds (mode A) or 25 +/- 1 second (mode B) and the alert is not repeated the instrument can be put back into service. If the syringe is within normal limits and the alert system is still triggered the internal clocking system would be at fault and would require factory service. If the syringe drive time is near or above the 47 second time limit it may be due to the syringe gear lubrication. The syringe drive mechanism should be removed from the support panel and cleaned using a suitable solvent (Toluene or Kerosene) and blow dry with an air pressure source. Do not clean the motor. The gears and rack should then be lubricated with Molykote. After remounting the syringe drive on the support panel, cycle the syringe drive several times and repeat the test. Should the drive time still be out of limits factory service will be required.

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16.0 PHOTOGRAPHS

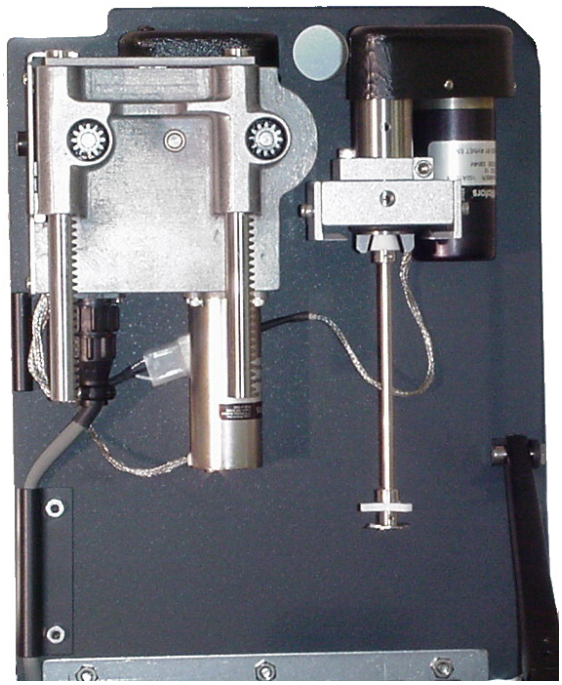

Figure 1

Figure 2

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Figure 3

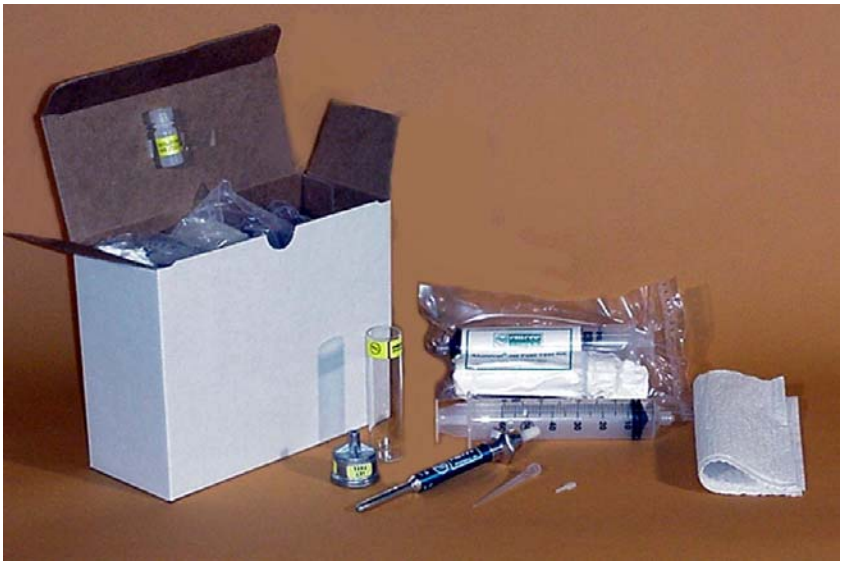

Figure 4