



# Fuel Testing Procedures

This document specifies the official equipment, procedures and materials for proper testing and verification of fuel in accordance with the requirements of the General Competition Rules. The procedures, equipment, and materials (otherwise referred to as test elements) described herein are the only official methods by which fuel shall be evaluated with regard to compliance. The results obtained by the use of these test elements shall be considered the official fuel test results. If a fuel sample is found non-compliant, a protest or appeal against the test elements shall have no influence in any ruling, provided the elemental verification protocols contained herein are performed as specified. Therefore, protests or appeals shall be focused only on the proper execution of the procedural protocols contained herein.

General considerations (section I), acquisition of a fuel sample for laboratory testing (section II), and testing the Dielectric Constant (DC) value of a fuel sample (section III) are presented in separate sections. DC testing and laboratory testing are independent of one another. DC testing is not a prerequisite for laboratory testing, nor does a DC failure require a laboratory test.

## I. GENERAL CONSIDERATIONS

### A. Test Materials

Precision Fuel Testing Systems G-01 meter, FT-K01 tester, Digatron DT-47FT fuel tester or Digatron FT-64 fuel tester, cyclohexane, reagent or laboratory grade (zeroing standard), collection bottles, cups, pipettes, thermometer, excess material container, funnel and optional cooler. The G-01, FT-K01, DT-47FT and FT-64 will be referred to as the SCCA fuel meter.

### B. Safety and Test Equipment Preparation

The area where fuel testing is performed shall be considered hazardous and all applicable safety protocols herein shall be followed.

#### 1. Dangers (toxic and flammable substances)

- Gasoline, gasoline additives and some testing materials are potentially toxic substances. If you ingest any of these chemicals or get them in your eyes, seek medical attention immediately.

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# Fuel Testing Procedures

- Gasoline may contain tetraethyl lead and other chemicals that can be absorbed through the skin and lungs with considerable cumulative adverse health effects.
- Keep fresh water on hand to flush away chemical spills on you and others.
- Keep all fuel testing components and chemicals away from children.
- Always handle gasoline in a well-ventilated area.
- There shall be no smoking, open flame or running engines within 25 feet of the fuel testing area.

## 2. Environmental concerns

- Collect all waste from fuel testing in a suitable closed container (approved fuel can). Placing fuel sample cups and bottles upside down in a funnel facilitates draining excess fuel or test chemicals into the waste container.
- If possible, excess fuel may be returned to the competitor once processing is complete. Waste fuel and cyclohexane can be decanted and used in any gasoline burning equipment (mowers, generators, pumps, etc) as a means of disposal. If provisions are available for disposal of waste fuel and cyclohexane, please dispose of waste properly.
- Avoid spilling fuel or test chemicals on the ground.

## 3. Cleaning of Equipment

**Be fanatical about cleanliness.** Rinse test equipment after each test with cyclohexane. For collection bottles, empty any fuel not needed for testing, then swirl cyclohexane in the bottle. Drain the cyclohexane, invert the bottle and allow it to dry completely. For sample cups, collect several drained cups, rinse with a small amount of cyclohexane, transferring it from cup to cup. Wipe all equipment dry with a paper towel. Where this is impractical (e.g., pipettes), allow the piece to dry completely. The use of acetone or distilled water as a rinse liquid should be avoided unless absolutely necessary because both affect test results. In any case, allow all test equipment to dry completely before reuse.

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## II. Acquisition of Fuel Samples for Laboratory Testing

Fuel samples may be required as the result of a protest, a Chief Steward's Action or a Request for Action. The fuel sample will be tested against the requirements stated in GCR 9.3.26.A. The procedures are the same in all cases. The fuel samples are to be collected and packaged using the supplied materials in the kit provided by SCCA and the several SCCA forms. Sample forms that can be duplicated as needed are attached to this manual. The forms are also available on the SCCA web site ([scca.com](http://scca.com)).

### A. Laboratory Fuel Testing Kit

The fuel testing kit should contain the following items:

- Rubber gloves (latex-free)
- Plastic disposable pipettes
- Glass vials and caps
- Adhesive labels
- Metal container, filled with vermiculite, and plastic locking ring
- Cushioning material
- Cardboard shipping box (in which kit was delivered)

Required forms:

- Form to record identifying information
- Laboratory Fuel Test Form (to be completed by Chief Steward or Chairman SOM)
- Shipping label

### B. Procedures

- Obtain a fuel sample in a collection bottle used for DC testing (see section III). If DC testing is not going to be performed on the sample, only a small amount of fuel is required.
- Using a supplied plastic disposable pipette, fill three glass vials from the collection bottle. The vial does not need to be filled to the brim. Discard the pipette.  
Note: there are two sizes of vials that may be in the kit. The larger vials hold 3 to 4 ml (about 0.1 to 0.15 ounce) and the smaller vials hold 1.5 to 2 ml (about 0.05 to 0.75 ounce)
- Cap each vial.

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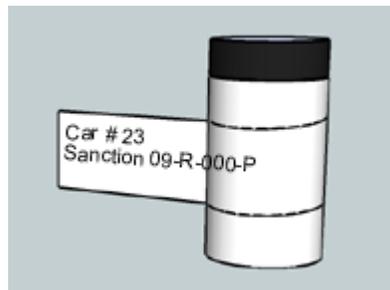
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Note: there are two types of caps. One type is a solid plastic cap. The other type is a plastic cap with a hole and an insert. The insert may be white on both sides or it may have a white side and a colored side. For the inserts that are white on both sides, one side is shiny and slick. The shiny side must face the fuel or the vial will leak. For the inserts that are colored on one side, the colored side must face the fuel or the vial will leak.

- Seal the cap using electrical tape (this is to prevent the cap from loosening during shipment).
- For each vial, on the supplied labels provide the car number and class, the date the sample was obtained, and the event sanction number.
- Wrap the label around the vial and stick it to itself as shown in the figure below.



- Using the Laboratory Fuel Test Sample Identification Form, record the same information as on the label.
- Dispose of any unused fuel in accordance with section I.B.2. Clean and dry the collection bottle before reuse.
- Until the next step, keep the vials in as a cool and dark place if possible (a refrigerator or cooler is preferred, but not required).
- When all samples have been collected for the event, place two (2) of the vials for each test in the metal container (distribute the vials within the vermiculite to protect the vials during shipment). The third vials are to be retained by the Chief Steward or the Chairman SOM (or an official designated by them); these vials should be kept in a cool and dark place until disposal. The contents of the third vials and the vials shall be discarded when the laboratory results are received by the Chief Steward or Chairman SOM. (The third vials will only be used if the original shipment is lost or if the laboratory is unable to process the first vials sent.)

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## Fuel Testing Procedures

- Secure the lid (it is not necessary to pound the lid into place – firmly seated is sufficient)
- Put the plastic safety lock over the top of the metal container.
- Deliver the container, the cushioning material, the cardboard shipping box, the Laboratory Fuel Test Sample Identification Form with identifying information, the shipping label, Laboratory Fuel Test Form and the retained (third) vials to the Chief Steward and/or the Chairman of the SOM, as appropriate.
- Unused vials and pipettes should be retained for future use. Retain the rubber gloves.
- When the Official Observer's Report is filed with the Club Racing Office, a replacement kit will be sent to the designated recipient.

### C. Track Fuel

When a fuel sample is taken from a competitor's vehicle, in accordance with the procedures in section B above, it is required that the competitor state whether or not he claims to be using fuel sold by the track. If so, he must also state which grade of track fuel. If any competitor claims to be using track fuel, a sample of that fuel taken from its track source must be submitted to the laboratory. If a sample of the track fuel was not previously taken for DC testing (see section III), a sample of the claimed fuel must be obtained directly from the track fuel source. This sample shall be prepared for laboratory testing using the procedures in section B above. It shall be labeled as "Control Sample – Track Fuel, Grade X", where X identifies the specific fuel grade of the sample. The control sample will only be processed by the laboratory if a competitor's fuel sample is found non-compliant. The cost of the processing of the control sample will be paid by the Club Racing office.

### D. Shipping

- The Chief Steward or the Chairman SOM must fill in the Laboratory Fuel Test Form. The form is placed in the cardboard shipping box along with the metal container and cushioning material. (A copy should be kept by the Chief Steward or Chairman SOM.)
- The Chief Steward or Chairman SOM must retain the Laboratory Sample Identification Form.
- The cardboard shipping box is to be sealed for shipment.
- The supplied shipping label is to be affixed to the cardboard shipping box.

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- At the earliest opportunity, the box should be sent via UPS or FedEx to the laboratory. Only ground shipping may be used. UPS shipments can be made from any UPS acceptance facility (i.e., UPS Customer Centers, UPS Stores, Office Depot, Staples, or other authorized shippers), but not self-service drop boxes. FedEx will only accept these packages at FedEx staffed locations (not FedEx Stores or drop boxes). (The US Postal Service will not accept these shipments.)
- The laboratory will email results to the Chief Steward or the Chairman SOM within five to seven business days of receipt of the samples.
- The laboratory will receive payment through the Club Racing office from the appropriate bond.
- Upon receipt of the laboratory results, the CSA, RFA or protest can be completed.

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# SCCA LABORATORY FUEL TEST FORM

Fuel samples for laboratory testing must be acquired, packaged and shipped in accordance with the SCCA Official Fuel Testing Procedures. This form must be included in the package sent to the laboratory. The Car Number and Class on the label should be recorded with other required information on the Laboratory Fuel Test Sample Identification Form and on the Protest or CSA/RFA form.

Event \_\_\_\_\_ Date \_\_\_\_\_ Sanction Numbers \_\_\_\_\_

Results will be emailed to the Chief Steward or Chairman SOM (provide email addresses below)

Car Number/Class \_\_\_\_\_ CS/CSOM Name \_\_\_\_\_ CS/CSOM Email \_\_\_\_\_

Car Number/Class \_\_\_\_\_ CS/CSOM Name \_\_\_\_\_ CS/CSOM Email \_\_\_\_\_

Car Number/Class \_\_\_\_\_ CS/CSOM Name \_\_\_\_\_ CS/CSOM Email \_\_\_\_\_

Car Number/Class \_\_\_\_\_ CS/CSOM Name \_\_\_\_\_ CS/CSOM Email \_\_\_\_\_

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Car Number/Class \_\_\_\_\_ CS/CSOM Name \_\_\_\_\_ CS/CSOM Email \_\_\_\_\_

Car Number/Class \_\_\_\_\_ CS/CSOM Name \_\_\_\_\_ CS/CSOM Email \_\_\_\_\_

Car Number/Class \_\_\_\_\_ CS/CSOM Name \_\_\_\_\_ CS/CSOM Email \_\_\_\_\_



# OFFICIAL OBSERVER'S LABORATORY FUEL TESTING REPORT

This form is to be filed with the Official Observer's Report if laboratory fuel tests were submitted from the event in accordance with GCR 9.3.26.A.

Event \_\_\_\_\_ Date \_\_\_\_\_ Sanction Numbers \_\_\_\_\_

Attach a copy of the Laboratory Fuel Test Sample Identification Form.

Replacement fuel test kit will be sent to:

Name \_\_\_\_\_ Title \_\_\_\_\_ Phone \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_



## Fuel Testing Procedures

The fuel testing kit contains a shipping label to be affixed to the shipping carton. The label is printed on a "neon" colored stock. If it is lost, the label below must be used instead.

**CHEMPRO, INC.  
8902 FM 1450 Rd  
Baymont, TX 77520**

**ATTN: SCCA TESTING**

**This package conforms to 49 CFR 173.4 for  
domestic highway or rail transport only**

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# Fuel Testing Procedures

## III. At-track Dielectric Constant (DC) Testing

### A. Testing Considerations

There are several considerations the user of the SCCA fuel meter needs to be aware of to ensure accurate and reliable readings.

#### 1. SCCA Fuel Meter Annual Certification

In order to maintain the highest level of accuracy and reliability in DC testing, each G-01 fuel testing meter or Kavlico FT-K01 Fuel Tester shall be returned to Precision Fuel Testing Systems for an annual service and certification. This service will ensure peak performance, reliability, and repeatability in the field.

To arrange for service on your G-01 meter or Kavlico FT-K01 tester, please contact Charlie Anderson at the following address:

Precision Fuel Testing Systems  
515 W. Wasp Ave.  
Ridgecrest, CA 93555  
760-375-2398 Phone/FAX

Please note that this service is not free, and payment arrangements will need to be made with Precision Fuel Testing Systems directly. In addition, remember to allow plenty of time to have your meters serviced before your season begins.

Digatron DT-47FT and FT-64 meters do not require annual calibration.

#### 2. Use of DC Test Equipment

- **G-01 and FTK-01:** The metal portion of the meter probe is designed to be completely immersed in the sample. If the metal portion of the probe is not entirely submerged or air is trapped inside the probe, the accuracy of the reading will be affected. To eliminate any trapped air inside the probe, gently rock the SCCA fuel meter forward and backward a few times while the probe is immersed in the liquid. This will help any trapped air escape through the probe vent holes.

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- **DT-47FT:** The metal wafers of the probe must be completely immersed in the sample.
- **FT-64:** The probe must be immersed to a depth between the scribe marks. If available, narrow sample containers will reduce the amount of fluid needed for testing.
- Use of a metal or glass container for the sample being measured will adversely affect the accuracy of the reading. The container should be plastic (polypropylene) or other non-conducting material. In addition, the plastic cup shall not be resting on or near a metal surface. It is recommended that there be a minimum of ten (10) inches between the fuel sample container and any metal surface.
- Validity of meter readings is degraded when temperature of the sample being tested is more than five degrees (Fahrenheit) different from the temperature of the meter and the zeroing fluid (cyclohexane). If the meter reading develops a continuous positive or negative drift, measure the temperature of the sample to determine if this is the problem. Allowing the temperature of the sample to normalize with the ambient temperature will usually solve the problem and allow a stable and accurate reading.
- If any service or adjustment of the G-01 or FTK-01 fuel meters is required, the work shall be performed by Precision Fuel Testing Systems to ensure accuracy and reliability of the meter. Digatron DT-47FT or FT-64 meters should be returned to the manufacturer.
- Careful consideration shall be given to the exposure of fuel to ultraviolet light (UV). Many of the chemicals used in the formulation of gasoline are sensitive to UV exposure. Set up the fuel-check area such that the SCCA fuel meter, cyclohexane, and fuel samples are not in direct sunlight and are in an as environmentally stable an area as practical. It is not necessary to be inside; however the more stable the environment the less reinitializing (re-zeroing) of the meter will be required and fewer false positives will be encountered.
- Do not use cyclohexane below 50° F, it freezes at about 42° F and becomes unstable slightly above that. Do not check fuel samples below 50° F; some fuels exhibit unstable DC characteristics at these low temperatures, because some of the fuel components may be freezing.

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## 3. Track Fuel

While not available at every racing facility, fuel is often made available to competitors onsite. If track fuel is available, every effort should be made to test each fuel at the beginning of each day of the event. These tests should be made as early in the day as possible. If performed, the results of each test should be conspicuously posted (on or near the source) for the edification of any interested parties. It is advisable to post specific results for each test so each competitor can use their best judgment in selecting an acceptable fuel.

***NOTE:** If samples of track fuel are taken for DC testing, samples for each track fuel should be retained until the end of the weekend for possible laboratory testing. (See Section II.C above.)*

***NOTE:** The DC of a fuel does not determine how "good" a particular sample is, nor is there any relationship between the meter reading and the octane rating, power characteristics, volatility, freshness, etc. of the fuel sample.*

## B. General DC Testing Procedures

### 1. Responsibilities

- Competitors are responsible for providing a fuel sample and identifying fuel brand and type (if known). Siphoning fuel to obtain a fuel sample is **not** an acceptable means of sample acquisition. (See GCR for requirements for fuel sample acquisition from vehicles.)
- The fuel analyst is responsible for testing fuel samples in accordance with these procedures and recording the results in the fuel test log.
- A dry chemical type fire extinguisher shall be positioned at the sampling point as well as at the testing station.

### 2. Zeroing (Initializing) the SCCA Fuel Meter

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Prior to using the SCCA fuel meter for DC testing, it is important that the instrument be zeroed to the reference hydrocarbon. Cyclohexane is the only reference hydrocarbon to be used with the SCCA fuel meter. For all meter types, fill a plastic sample cup with cyclohexane and label it "S". The amount of cyclohexane is dependent on the meter type. See III.A.2 above.

## G-01 or FTK-01

- For the G-01 or FTK-01, immerse the SCCA fuel meter in the cyclohexane to about one-quarter inch above the exposed metal part of the probe. Make certain the cyclohexane does not rise to the aluminum control box. To ensure trapped air is released from the probe, rock the analyzer and sample cup back and forth.
- With the G-01 or FTK-01 probe immersed in the cyclohexane as specified above, push the power switch to "on". (Note: holding the power switch on for more than 5 seconds will not result in more accurate readings, it just reduces battery life.) Rotate the "zero adjust" knob until the meter reads -0.1, then rotate the "zero adjust" knob back to a reading of 0.0. Withdraw the probe from the cup. Immerse the SCCA fuel meter probe in the cyclohexane again, with the air bubbles removed, and depress the power switch. If the meter reads 0.0, it is properly initialized. If not, repeat the procedure until a consistent 0.0 reading is obtained. Release the power switch and remove the probe from the cyclohexane. Shake any excess liquid from the probe and blot with clean paper towel. Be careful to not disturb the zero adjust knob or re-zeroing will be required. The meter is ready for use

## DT-47FT

- The DT-47FT meter must be set to the proper range the first time it is used; subsequently the range adjustment will not be required. The manufacturer expects that the meter will be set to -75 in cyclohexane. For SCCA use, the meter will be set to 0 (zero) in cyclohexane. With the end of the DT-47FT probe immersed in cyclohexane, press the POWER button to turn on the meter and wait until the initialization process ends. The meter will read somewhere near -75. Simultaneously press the TEMP and POWER buttons to enter the calibration mode. The display will flash. Press the NEXT button twice; then use the → button (under TEMP) to change the value displayed to 0 (zero). (Use the ← button to lower the value if you overshoot.) Press the EXIT button (under POWER) to return to normal operation

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mode. With the end of the DT-47FT probe still immersed in the cyclohexane, press the AUTO CAL button (under STORE). This will adjust the meter to 0 (zero) in cyclohexane. From now on, the meter will read approximately 0 (zero) in cyclohexane when it is turned on.

- For all future use of the DT-47FT, immerse the end of the probe in the cyclohexane, press the AUTO CAL button and wait for the initialization to end; the display will read 0 (zero). Press the EXIT button to return to normal operation mode. The meter is ready for use

***NOTE:** Although the DT-47FT has other functions available, none of these are needed for SCCA DC testing. Specifically, the button labeled "D C" does not initiate the SCCA DC test. The normal operation mode of the DT-47FT (the default when the meter is turned on) is the only test of interest.*

## FT-64

- The FT-64 meter must be set to the proper range the first time it is used; subsequently the range adjustment will not be required. The manufacturer expects that the meter will be set to -75 in cyclohexane. For SCCA use, the meter will be set to 0 (zero) in cyclohexane. Press the POWER button to turn on the meter. (Consult the instruction manual, if necessary.) Press and hold the SET button until the display flashes "SEL". Then press and hold both the LIGHT and SET buttons at the same time to enter the calibration mode. Immerse the FT-64 sensor in cyclohexane and wait a few seconds. (The level of cyclohexane should fall between the scribed lines on the sensor. See the instruction manual for a diagram.) Adjust the value displayed using the up and down arrow buttons so that the value is 0 (zero). The calibration is complete. Press the EXIT button to return to standard testing mode.

***NOTE:** Although the FT-64 has other functions available, none of these are needed for SCCA DC testing. The normal operation mode of the DT-47FT (the default when the meter is turned on) is the only test of interest.*

## 3. Testing the DC of a Sample

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It should be noted that the DC of hydrocarbon liquids decreases with a decrease in temperature, therefore it is important to let the SCCA fuel meter, the cyclohexane, and the fuel test sample stabilize at ambient temperature before testing begins.

- Collect a fuel sample of about in a clean, dry collection bottle Collect enough fuel to perform the test twice. (The amount to be collected depends on the meter being used. See section III.A.2 above.) Once the sample has been drawn, immediately cap and label the sample bottle with the appropriate car number, class, fuel brand and type.
- Make sure the SCCA fuel meter probe is clean and properly zeroed before testing begins (see section 2 above). If the ambient temperature of the area in which the testing is being carried out changes more than a few degrees, the meter will need to be zeroed more often than in a stable temperature environment.
- Fill a clean plastic sample cup with fuel from the collection bottle (enough for the specific SCCA fuel meter being used). Re-cap the collection bottle to preserve its contents and reduce fumes.
- As soon as the meter probe is immersed in the fuel sample take and record the DC from the meter reading.
- Remove the probe from the sample cup and dip the probe in a second cup of cyclohexane. This "rinse" step will prevent contaminating the cyclohexane in the standardizing cup. The cup containing the cyclohexane for standardizing meter should be labeled "S" and the cup containing the cyclohexane for rinsing the meter probe should be labeled "R". Whenever the cyclohexane in the "R" cup does not give a 0.0 or 0 (zero) reading or it shows significant color, it should be used to rinse used collection bottles and cups. The cyclohexane in the "S" cup should then be transferred to the "R" cup, and the "S" cup filled with clean cyclohexane. These cups may be covered with inverted beakers to retard evaporation.
- Determine if the sample is within the specification required in the GCR and record the findings as "P" for PASS or an "F" for FAIL on the fuel test log, and record the actual meter reading.

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**IMPORTANT NOTE:** Do **not** give competitors specific SCCA fuel meter readings. You don't want to aid the amateur chemists in the paddock. Don't allow competitors, entrants or crewmembers in or around the fuel testing area when testing fuel samples. If the sample is marginally compliant or reads above the maximum limit established in the rules, first recalibrate the meter, equalize the temperatures of the sample and calibration cyclohexane, and recheck the sample. If the sample passes the re-test, either the meter was out of calibration, or the fuel sample was contaminated. If the verified reading is correct but is close to the limit, warn the competitor and make an appropriate notation in the test log.

## 4. Dealing with Fuel Sample Dielectric Test Failures (Non-compliant Fuel)

- If the DC of a fuel sample is determined to be non-compliant, a second test series shall be performed using the remainder of the original sample collected. If the re-test also fails, then, with the permission of the Tech Steward, draw a second sample and test this second sample. If the fuel continues to be non-compliant the person performing the test and a Tech Steward should inform the competitor. If the competitor desires to observe a re-test, each step in the process should be witnessed by the competitor and the Tech Steward.
- Upon completion of each test the competitor **and Steward** shall confirm the proper execution of each test procedure, and the log entry of the result description, by initialing beside each test description on the Procedural Acknowledgement form.
- When the test series is complete and the test results are recorded, the Procedural Acknowledgement form shall be signed by both the competitor and the Steward witness. This signed form shows that the competitor agrees that all procedures were executed properly and results recorded accurately.
- Attach all test results pertaining to the failed test and the signed Procedural Acknowledgement (if used), to the Official Report and submit to the Chief Steward for action.

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# Fuel Testing Procedures

## Procedural Acknowledgement

(For SCCA Official Dielectric Testing Procedures)

### Competitor and Steward initial each item upon completion

1. The SCCA fuel meter was calibrated to read zero (0.0) prior to testing in accordance with fuel testing procedure.
2. The Dielectric Constant test was performed using clean labware.
3. The procedures for establishing the Dielectric Constant using SCCA fuel meter were performed in accordance with the SCCA Official Fuel Testing Procedures.
4. The results of the Dielectric Constant test using SCCA fuel meter are recorded correctly.

*I acknowledge that the above procedures were performed in accordance with the SCCA Official Fuel Testing Procedures and that the results of these tests were recorded accurately.*

Competitor Signature:

Date:

Steward Witness Signature:

Date:

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(800) 770-2055 Fax (785) 232-7214 [www.scca.com](http://www.scca.com)



# Fuel Testing Procedures

## Suggested Contact & Supplier List

### Precision Fuel Testing Systems

515 W. Wasp Ave.  
Ridgecrest, CA 93555  
760-375-2398 Phone

**Supplier for:** SCCA DC meters, system components, labware, and service on system components

### Digatron LLC

120 N. Wall St. Suite 300  
Spokane, WA 99201  
www.DigatronUSA.com  
(509) 467-3128

**Supplier for:** SCCA DC meters

### Amico Scientific

7231-A Garden Grove Blvd.  
Garden Grove, CA 92841  
714-894-6633 Phone  
714-898-8694 FAX

**Supplier for:** Cyclohexane, Reagent or Laboratory Grade (zeroing standard)

### Fisher Scientific

800-766-7000

**Supplier for:** labware

- 150mL cup (polypropylene)                      Catalog #01-291-11
- 500mL sample bottle                                Catalog #02-895-1C
- Standard bulb pipette                              Catalog #13-711-7

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