

SMART Trac II



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SMART Turbo™ is a trademark of CEM Corporation
SMART Trac II™ is a trademark of CEM Corporation
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Patents: 6.548.303 6,548.304 7,125,721 7,220,591

MANUFACTURED IN THE
UNITED STATES OF AMERICA

This instrument complies with United States Code of Federal Regulations (CFR) Title 21, Part 1030 for microwave leakage. A verification report is on file.
This instrument complies with United States Code of Federal Regulations (CFR) Title 47, Federal Communications Commission (FCC) Part 18 – Industrial, Scientific and Medical (ISM) Equipment – emissions requirements. A verification report is on file.

NOTICE

The following precautions should be observed to avoid possible exposure to excessive microwave energy:

- Do not tamper with the safety interlocks. The SMART Turbo is equipped with two safety interlocks which prevent the instrument from producing microwave power if the cover is open.
- Do not place any object between the microwave cavity and the cover or allow soil or cleaner residue to accumulate on sealing surfaces.
- Do not operate the instrument if it is damaged. It is particularly important that the SMART Turbo cover close properly and that there is no damage to the cover (bent), hinges and latch (broken or loosened), or sealing surfaces.
- The instrument should be adjusted or repaired only by qualified service personnel.

The following precautions should be observed to avoid instrument-induced electromagnetic interference:

- Certain heart pacemakers or other magnetically sensitive prosthetic devices may be affected by magnetic fields as low as 0.5 mT. It is recommended that persons with heart pacemakers or other magnetically sensitive devices do not approach within 11 in. (0.3 m) of the SMART Trac II magnet component.
- The possibility of instrument-induced electromagnetic interference is minimal from the SMART Turbo if precautions outlined above are followed.
- The instrument should not be placed close to any electrical device susceptible to EMI. It is suggested that the user post a sign warning pacemaker wearers that both a microwave and magnetic device are in operation.
- If the SMART Turbo is suspected of inducing EMI, the cover should be carefully inspected. A microwave leakage measurement should be performed as outlined in the Troubleshooting, Maintenance and Service section of the SMART Turbo operation manual. Leakage measured above the legal limit of 5 mW/cm² should be reported to the CEM Service Department.

Operating Safety Precautions

To avoid degradation of the SMART Trac II magnet performance or operator injury, do not place ferromagnetic items (e.g. mechanical tools) near the magnet. Magnets can attract ferrous objects, turning them into projectiles and causing injury.

To prevent injury from high voltages, do not remove instrument covers or components unless you are trained in the repair of high voltage instruments. **All components of this instrument utilize high voltages.** Instrument service and repair should be performed only by those highly trained in repair and maintenance of high voltage and microwave power systems.

To the best of our knowledge, the information contained herein is accurate. However, CEM cannot accept liability of any kind for the accuracy or completeness of the information contained in this manual. The final determination of the suitability and proper use of the instrument described herein, the accuracy of the information and data obtained from such use, and whether such use infringes any patents or the legal safeguards of others are the sole responsibility of the user.

Warnings, Cautions and Notes

Warnings, cautions and notes are included throughout this manual and should be read thoroughly and strictly followed.

WARNING: A warning is inserted for essential information used to emphasize dangerous or hazardous conditions to the operation, cleaning and maintenance of the instrument which may result in personal injury.

CAUTION: A caution is inserted for essential information used to emphasize procedures which, if not strictly followed, may result in damage or destruction to the instrument or improper instrument operation.

NOTE: A note is inserted for emphasis of procedures or conditions which may otherwise be misinterpreted or overlooked and to clarify possible confusing situations.

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Introduction

The CEM SMART Trac II™ Rapid Fat and Moisture/Solids Analyzer combines microwave drying with nuclear magnetic resonance (NMR) to accurately measure the fat content of virtually any type of food product. A sample is dried to remove the hydrogen protons present due to moisture. The NMR then sends a pulse of radio-frequency energy through the sample, causing the remaining hydrogen protons to generate a signal known as spin echo. The intensity of the FID is analyzed by the system software to determine the amount of fat protons in the sample. Fat protons have a slower decay rate than other food components such as protein or carbohydrates; therefore, they can be accurately measured.

The SMART Trac II System consists of a SMART Turbo™ Moisture/Solids Analyzer, a SMART Trac II™ processor module and a SMART Trac II™ NMR. The sample is dried in the SMART Turbo, rolled in CEM Trac Film™ and placed in the NMR. While within the static magnetic field of the NMR, the sample is pulsed with radio frequency (RF) energy. The resulting signal is recorded and analyzed for the total proton activity of fat present in the sample. The SMART Turbo then analyzes the NMR data and calculates the moisture and fat results.

The SMART Trac II™ Rapid Fat and Moisture/Solids Analyzer is a fast, non-destructive method of fat measurement which does not require solvents or calibration by the user. It directly measures fat content using a signal-to-mass ratio. It measures fat throughout the sample, providing an accurate analysis that is independent of sample uniformity is not affected by changes in color or texture. Indirect methods measure the fat on the surface of the sample only.

NMR has three major advantages over traditional methods of fat analysis. It is faster, cleaner (no solvents) and non-destructive. Despite the word “nuclear” in the name, NMR does not use or generate radiation. The word “nuclear” in NMR refers to the instrument’s ability to analyze the nuclei of the sample.

System Installation

Note: Retain all packing materials.

1. Following the instructions provided in the packing carton, carefully remove the SMART Turbo from its shipping carton and place it on a vibration-free workbench or laboratory table in a location that:
 - provides a draft free, dust free, dry environment. The temperature of the room must be between 50°F and 85°F (10°C - 30°C). Temperature should not vary more than 10°F (5°C) per day. Relative humidity range should be 0-85%.
 - is free from vibration of large equipment and/or excessive walk-through traffic.
 - does not have a steel (iron) top. Materials such as wood, plastic, aluminum, or non-magnetic stainless steel are suitable surfaces. Ensure that no steel bar, supporting the work surface, runs directly beneath the magnet.
 - allows the instrument to be connected to a dedicated, grounded outlet as specified in the instrument specifications and capable of accepting the plug of the power conditioner.
2. Carefully remove the SMART Trac II processor module from its shipping carton and place it on the workbench or table, on a shelf above the workbench, or on the floor underneath the workbench.
3. Cut the retaining straps and carefully lift the shipping carton from the magnet pallet. Remove the foam from the top of the magnet.
4. Using two (2) people, one positioned on each side of the magnet, and the lifting straps, lift the magnet from the container and position it on the work surface beside the SMART Turbo.
5. Inspect each component of the system for visual damage.

WARNING

If damage is noted, do not attempt instrument operation.

AVERTISSEMENT

Ne pas mettre en marche si l'instrument est endommagé.

6. If any instrument component has been damaged in shipping, contact the freight carrier to report the damage and to file a damage report. Contact the CEM Service Department or the nearest subsidiary or distributor (page 5) to request service information.
7. Verify that all accessories illustrated and listed in figure 1 are included.
8. Refer to the instructions provided in the packing carton and/or figure 4 of this manual and carefully connect each cable provided in the SMART Trac accessory kit and cable kit. Ensure that each cable is connected properly. Use caution to prevent bending or damaging the pins of the connectors.
9. Unpack the heater and heater block. Place the heater block inside the heater. Follow the manufacturer's instructions included with the heater block to set the temperature of the heater on 40°C. Place the oil standards in the heater block and permit the standards to heat for 3-4 hours.
10. Refer to the SMART Turbo operation manual and prepare the instrument for operation, ensuring that the dual voltage supply and fuses are properly selected and installed.
11. If using external components such as a printer, computer or balance, install these components as outlined in this manual.
12. Unpack the power conditioner and place it on the work bench or the floor as far away from the SMART Trac II magnet as possible.
13. Plug the power cords from the SMART Turbo and the processor module into the power conditioner (figure 2).
14. Plug the power cord of the power conditioner into the appropriate electrical outlet. Turn the power conditioner on.
15. Position the power switch of the SMART Turbo and the SMART Trac II processor module in the "on" position.

Note: The illustrated power cord is applicable to the U.S. only. Power cords for instruments installed in other countries will be supplied based on electrical specifications for the applicable country.

16. Permit the system to warm up.

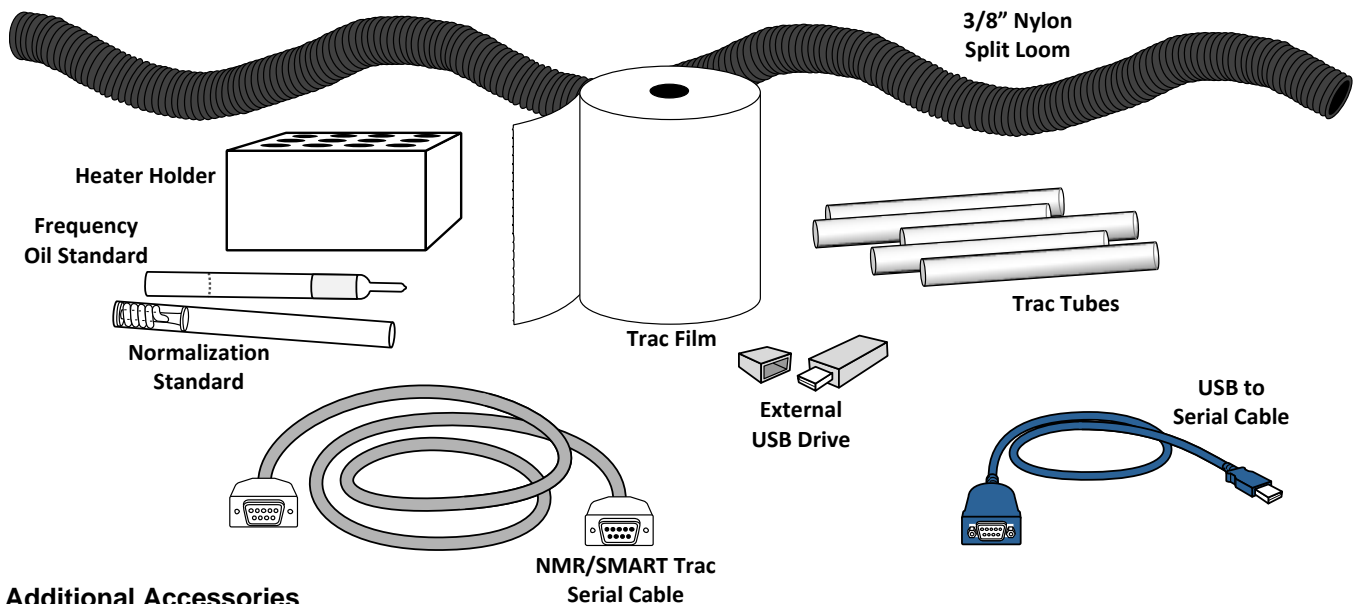
CAUTION

The SMART Trac System requires a warm up period of at least 4 - 8 hours prior to operation. If the instrument is switched off for an extended period of time (weekend, holidays, etc.), ensure that warm-up time is permitted prior to use.

Note: CEM Corporation recommends that the SMART Trac II System power cords be connected to electrical outlets and the power switches remain in the "on" position at all times. After 15 minutes of idle time, the SMART Turbo assumes a "sleep" mode.

Accessory Kit

- Trac Tube (160505) 5 tubes
- Trac Film (159875)
- Heater Holder
- Maintenance Guide (SM0044)
- NMR/SMART Trac Serial Cable (160270)
- USB to Serial Cable (160335)
- External USB Drive
- SMART Trac Operation Manual (600153)
- 3/8" Nylon Split Loom
- Frequency Oil Standard (160065)
- Normalization Standard (160570)

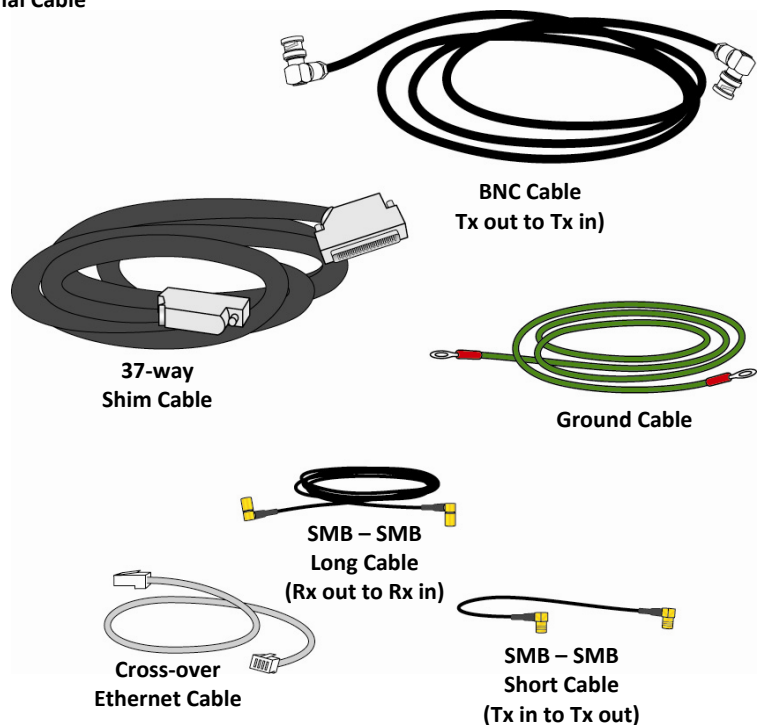


Additional Accessories

- Trac Station (159870)
- Heater (159885 - 120V) (159891 - 220/240V)
- Fuse, 5AMP, 250V Type T (BR188275)
- Fuse, 3.15AMP, 250V Type T (BR198879)

Cable Kit (160660)

- BNC Cable
- Ground Cable
- Shim Cable
- Short SMB – SMB Cable
- Long SMB – SMB Cable
- Cross-over Ethernet Cable



Monitor (Optional)

- Monitor Cable (VGA)
- Monitor Power Cord

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External Balance

1. Press the power switch of the SMART Turbo to the “off” position.
2. Place the external balance on a vibration-free sturdy laboratory workbench or table.
3. Plug one connector of the cord shipped with the external balance into the socket on the balance and the other connector into the external balance port of the SMART Turbo. Plug the balance power cord into a grounded AC electrical outlet.
4. Based on the type of external balance used, refer to the manufacturer’s manual and/or CEM Corporation instructions for specific procedures for setup and configuration of the balance and instrument.

Outlined below are default values for compatible external balances.

Denver Instrument: 300 Baud

No Parity
8 Data Bits
2 Stop Bits

Mettler: 2400 Baud

Even Parity
7 Data Bits
1 Stop Bit

Sartorius: 1200 Baud

Odd Parity
7 Data Bits
1 Stop Bit

Scientech: 2400 Baud

Even Parity
7 Data Bits
1 Stop Bit

External Printers

Instrument Description

Display — displays menu choices, instructional messages and analysis results on a 1/4 VGA black and white screen

Keyboard — controls operation of the SMART Turbo. Temperature, time, or other numeric data may be entered with the numeric keys as requested on the display.

Internal Printer — provides printout of methods, data and results.

Cavity — decreases test times due to its patented compact Octawave™ design.

Air Shield — prevents air flow within the microwave cavity from affecting weight measurements.

Balance Pan — holds sample and sample pads during analysis.

Interlock Assembly — monitors mating of cavity cover and instrument skirt.



Fuses — prevent electrical power overload.

Power Cord Receptacle — receives the female end of the power cord.

Power Switch — turns electrical power to the instrument on and off.

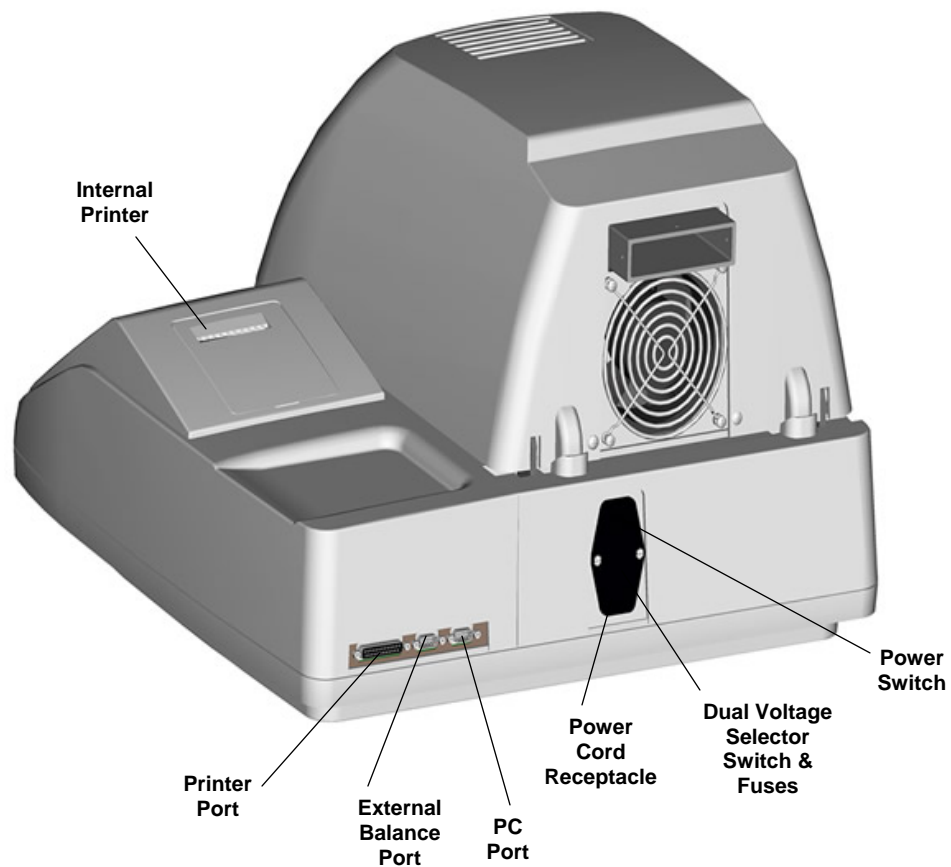
Nameplate — lists model and serial number (not shown).

Dual Voltage Selector Switch - permits electrical voltage for the instrument to be switched from 110 VAC to 220 VAC.

PC Port — permits connection and communication with processor module

Printer Port — permits connection and communication with an external printer.

External Balance Port — permits connection and communication with an external balance for specific applications.



Keyboard

Enter — Press to store entered parameters and data in the computer memory.

Exit — Press to exit screen.

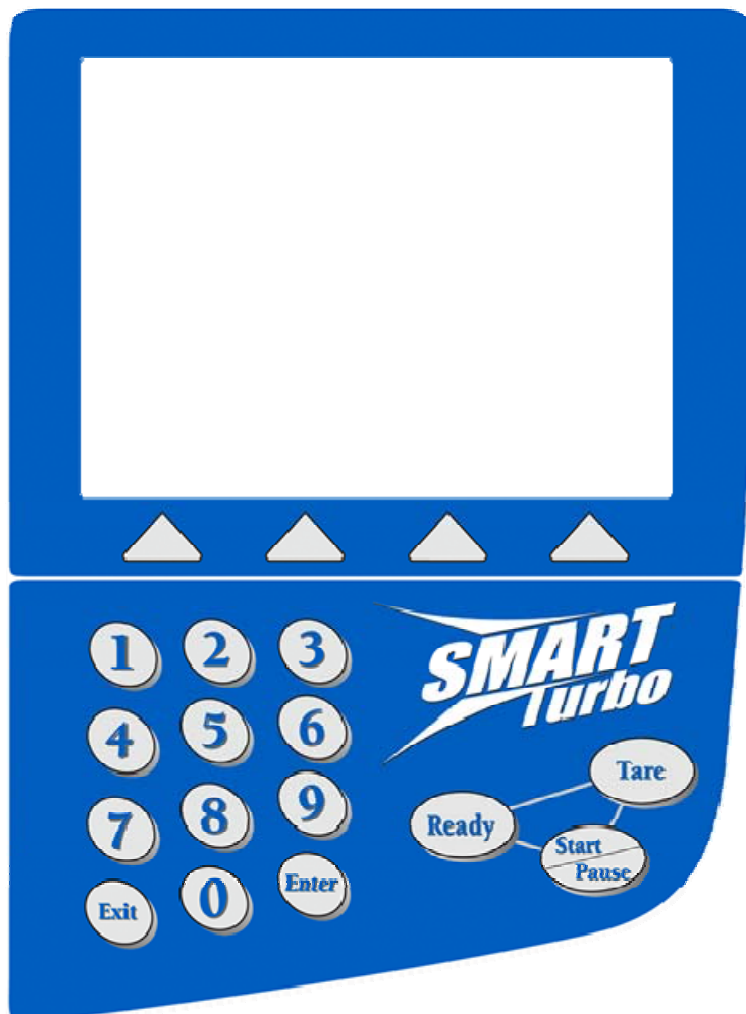
Ready — Press to initiate current method for a test or to reset method for next test.

Start/Pause — Press to begin or pause sample analysis. Microwave heating begins when the Start/Pause button is pressed unless the cavity cover is open. Operation will continue through the analysis unless the Start/Pause button is pressed to interrupt the analysis or the operation key indicating “Stop Test” is pressed.

Tare — Press to tare or zero the weight of the sample pads prior to sample analysis.

0 - 9 — Press to select items from menus such as the Main Menu, setup screens, etc. and to select values for parameters such as time and power.

▲ Operation Keys — Press to select specific operation options such as “Stop Test,” “Print,” “Main Menu,” Prev. Page,” etc.



Sample Analysis

Proper sample preparation and testing are critical to obtaining accuracy and precision. Each sample has a specific characteristic composition; therefore, each sample may require an individual method of analysis. However, guidelines can be established for analysis of general sample types.

- **Sampling** — A representative sample is critical to obtain proper analysis.
- **Preparation** — As with any chemical analysis, a homogeneous sample is critical to obtaining precision and accuracy.
- **Weight** — A consistent sample size helps ensure precision and accuracy. Most CEM applications specify a sample size of 2-5 grams, emphasizing the importance of a homogeneous sample.
- **HOLDERS** — Absorbent pads to which a sample can be applied are used for most analyses. Glass fiber pads are recommended because glass fibers do not absorb microwaves. A drying basket is also available.
- **Application** — Most samples should be spread smoothly, avoiding lumps, peaks or any uneven areas. Sample spread must be consistent.
- **Drying Time** — The drying time is determined by the type of sample and its microwave absorbency. Constant weight drying permits drying of a sample until a constant weight is achieved. Set time drying permits the control of the sample analysis by entering a specified time and power level.
- **Infrared Temperature** — The infrared temperature measurement may be used to operate at temperatures used in standard or vacuum oven procedures.
- **Microwave Power** — The power necessary to dry a sample is determined by sample composition. A sample should be tested at the highest possible power without burning or degradation of the sample.

Sampling

Proper sampling of a product or process is critical in achieving proper moisture/solids analysis. A representative sample is required to ensure that the test results are representative of the entire batch or lot of material.

Many standard procedures such as AOAC, USDA and ASTM methods reference sampling techniques. It is extremely important to follow techniques outlined in these procedures for a particular sample type.

Proper handling and storage of the sample prior to analysis is also critical in achieving accurate and representative results. Samples should not be exposed to the air for long intervals prior to analysis. Proper storage also ensures that no moisture is lost.

Preparation

Sample preparation is critical to achieving precise and accurate test results. The sample should be properly prepared to achieve repeatable moisture results between duplicate analyses of the same sample. Sample preparation is a physical modification of the sample. Physical modification may be as simple as stirring or shaking the sample to ensure homogeneity or more complex such as particle size reduction, dilution or deaeration.

The objective is to create a homogeneous sample and to improve the correlation of the test method to standard methods. Some products, such as a beef emulsion or comminuted poultry, may require no additional preparation. Other materials will require particle size reduction, dilution or deaeration prior to testing. Samples should be kept cool and in sealed containers to prevent loss of moisture. If repeatable results cannot be obtained on the same sample, re-blend the sample to improve the homogeneity and repeat tests. Sample preparation methods include:

- **Mixing of Sample** — Thoroughly stir or shake sample to ensure homogeneity.
- **Particle Size Reduction** — Many products require particle size reduction prior to being applied to the glass fiber pad. Reduction, based on product sample, can be accomplished with a meat grinder, either an industrial or consumer grade food processor, a coffee mill or a cheese grater. The meat grinder is the best choice for all meat products. USDA procedure specifies three to four passes through a 1/8" or 5/64" blade with mixing between grinds. A USDA inspector or outside laboratory can make recommendations. An industrial grade food processor is a good alternative for grinding meat products. A consumer grade food processor is ideal for grinding frozen potatoes, breaded products, or "dry" snack foods such as cookies, crackers, and chips. A coffee mill can be used to grind or mix "dry" snack foods. A cheese grater can be used to grate small quantities of hard cheese samples or soap.
- **Dilution** — Products with a high carbohydrate content are strong microwave absorbers and have a tendency to burn. These samples may require either a water or salt dilution.
 - **Water Dilution** — A specified amount of sample is diluted with a specified amount of water and mixed in a blender. Typical samples include doughs, cheese powders, corn syrups, dried meat bases and sauces. An external balance and a blender are required for this procedure.
 - (1) Interface an external balance with the SMART Turbo.
 - (2) Tare the blender cup on the external balance.
 - (3) Add product sample to the blender cup.
 - (4) Add water to the product sample in the blender cup.
 - (5) Blend until a homogeneous mixture is obtained.
 - (6) Use the diluted sample to perform analysis.
 - **Salt Dilution** — A specified amount of salt is added to the product sample prior to analysis. Typical samples include frozen potatoes and frozen breaded products. This procedure requires a teflon basket and dry table salt (sodium chloride).
 - (1) Line a Teflon® basket (CEM p.n. 200090) with two square glass fiber pads.
 - (2) Place the lined basket on the balance of the Moisture/Solids Analyzer. Press "Tare."
 - (3) Place approximately 8g of salt in the lined basket. Press "Tare."
 - (4) Place the product sample on top of the salt. Press "Start" to record the initial weight.
 - (5) Press "Stop."
 - (6) Thoroughly mix the salt and sample in the basket.
 - (7) Return the basket to the balance of the Moisture/Solids Analyzer. Press "Start" to continue the sample analysis.

- **Deaeration** — Frozen dairy and imitation dairy products must be deaerated to remove the excess air in order to provide reproducible test results. This procedure requires a 125 mL Erlenmeyer flask, a 1 liter beaker, a magnetic stirrer, a 1 1/2" x 3/8" magnetic stirring bar, and a #5 rubber stopper.
 - (1) Place 100 mL of sample in a 125 mL Erlenmeyer flask.
 - (2) Place a 1 1/2" x 3/8" magnetic stirring bar in the flask. Using a #5 rubber stopper, loosely cap the flask.
 - (3) Place flask in a 1 liter beaker containing 250 mL of water which has been heated to 70°C.
 - (4) Place beaker with flask on a magnetic stirrer. Mix for 5 - 7 minutes.
 - (5) Cool sample to ambient temperature and thoroughly mix sample prior to testing.

Weight

Sample weight can be very critical to the final test result. As with most analytical procedures, a consistent sample size helps ensure precision and accuracy. Sample sizes can vary, based on type of sample, from 1 gram on the low end (high percent solids level) to 10 grams on the high end (very low percent solids level). Test procedures documented by CEM and included in this manual, are for specific sample types and suggested sample size. Sample size should remain within the weight guidelines. CEM has determined that the suggested sample size results in the most consistent drying and test results. Heavier sample weights may cause sample degradation or burning, resulting in high moisture results. Lower sample weights may result in under-drying of the sample.

HOLDERS

Sample holders should be transparent to microwave energy.

CEM Square Sample Pad — The square pad is the most commonly used sample holder. Typically, two (2) pads are used with the sample "sandwiched" between the pads. For heat sensitive samples, only one pad is recommended to minimize heat buildup. For low solids samples, three or four pads are used for absorption.

CEM glass fiber pads are designed to provide optimum conditions for rapid, thorough and repeatable drying. CEM Corporation follows strict specifications in the manufacture of sample pads. Specifications include low moisture content and optimum absorbency, density, porosity, and strength for microwave drying.

- **Moisture Content** — Excessive moisture in sample pads will cause moisture or solids values to be incorrect. Controlling the moisture ensures that residual moisture is maintained to very close tolerances.
- **Absorbency** — The pad material must be absorbent enough to form a wick for a liquid sample and to be a sample holder for more viscous type samples.
- **Density** — The sample medium must have uniform density to guarantee that the moisture will volatilize rapidly and evenly, without causing residual heating.
- **Porosity** — Correct porosity of the pad material ensures maximum surface area for liquid samples in order to increase volatilization of moisture. Correct porosity helps prevent sample degradation or burning.
- **Strength** — The tensile strength of the medium has a direct effect on the ability of the sample pad to withstand the stress imposed during sample application.

Application

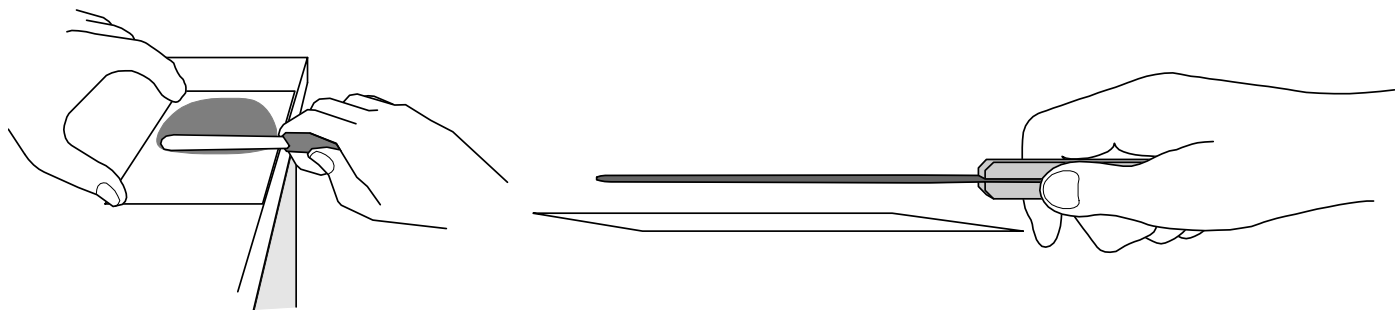
The viscosity of the sample plays an important role in determining how the sample is spread onto the pad for analysis. If a sample is thin, it can be placed onto the pad with a pipette and can be tested at high power levels. A thin sample spread over a large area permits moisture to evaporate rapidly with little residual heat buildup. Glass fiber pads may be stacked for increased absorbcency.

High viscosity samples (samples that do not flow well) require a different technique. If the sample can be easily spread across the glass fiber pad, no dilution is required. A thick sample will tend to puddle and form a crust, sometimes trapping volatiles within the bubble. Overheating or burning can also occur on thick samples. If repeatable results cannot be obtained by spreading the sample, a dilution may be necessary. The sample must be soluble in the diluting agent, and the diluting agent must be a microwave absorber.

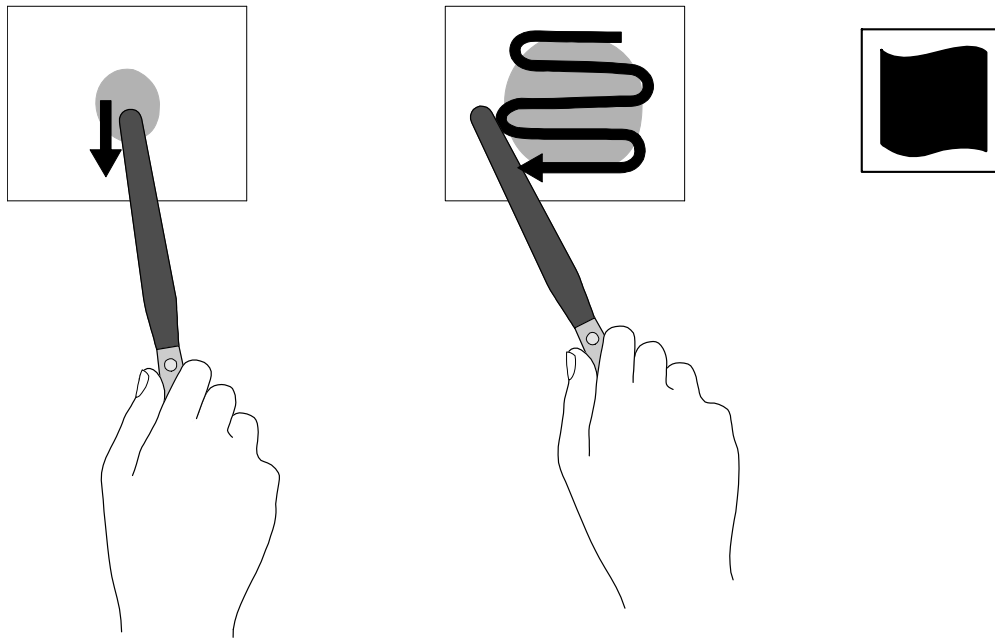
To generate the appropriate amount of heat and achieve optimum moisture results, different types of samples must be spread to different thicknesses over different areas of the glass fiber sample pad. As a general guideline, the sample will generate heat in direct proportion to the thickness of the sample layer on the pad. A sample spread too thickly can cause sample burning; a sample spread too thinly can cause insufficient drying. The prepared sample should be applied to a glass fiber sample pad. Once the sample is properly applied to the sample pad, it should be covered with a second glass fiber pad to ensure heat retention and to eliminate splattering.

Liquid samples should be placed onto the pad with a pipette. Solids samples should be spread onto a pad placed on the edge of a clean, flat surface, such as a countertop. The spatula should be held level with the pad when spreading the sample to ensure a smooth, uniform application of sample to the pad surface.

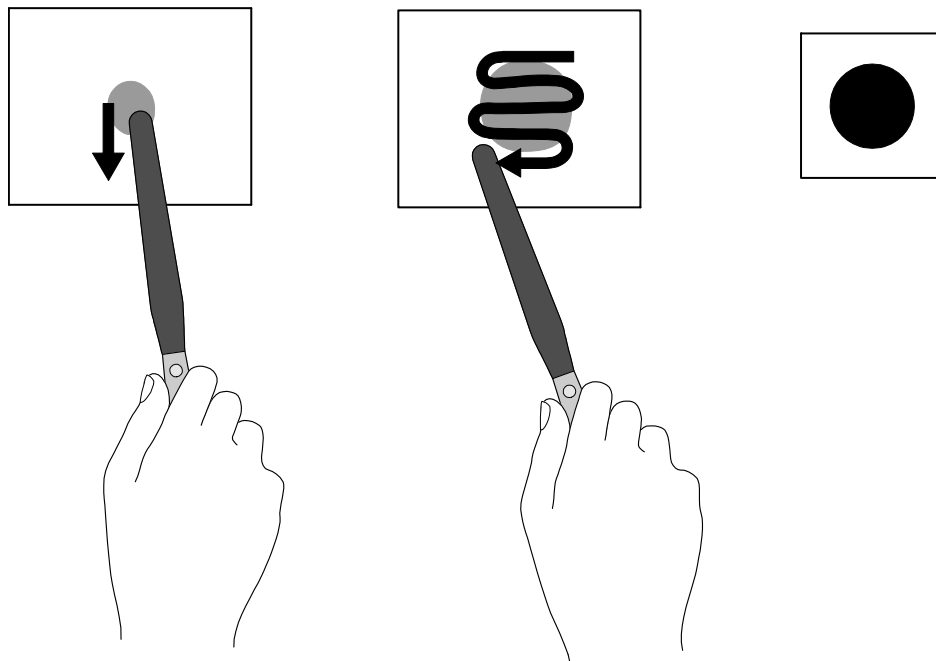
It is recommended that CEM Corporation or a local distributor be consulted prior to testing any solvent based sample.



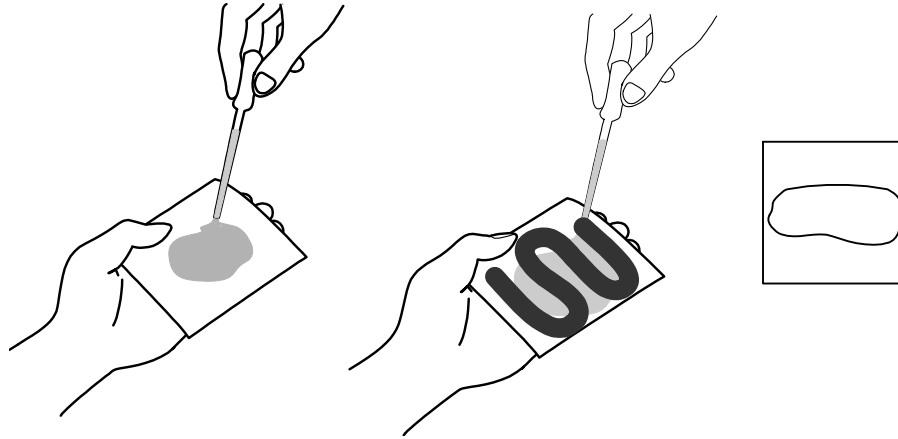
If the sample is in a paste, semi-solid, or crumb form or a raw or skeletal meat product such as fresh pork, ground beef, or chicken, place the sample on the end of a spatula and spread it across one end of the pad. Then spread the sample to a uniform thickness covering approximately 90% of the pad surface area.



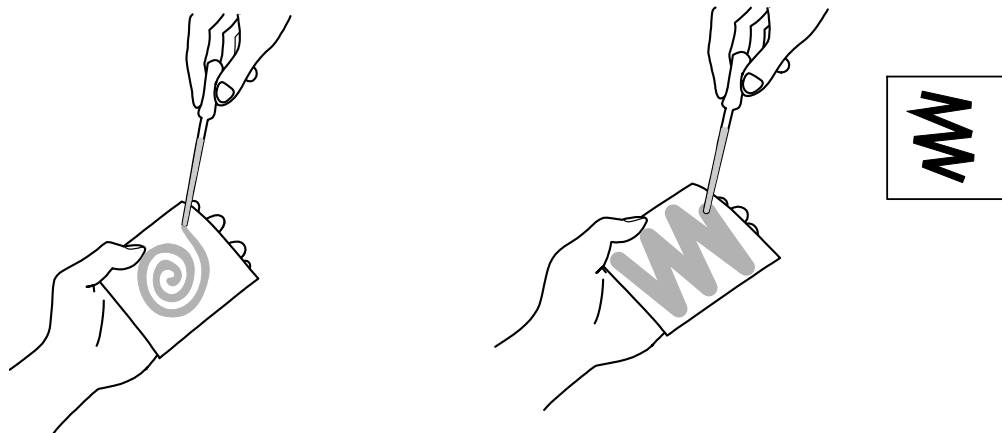
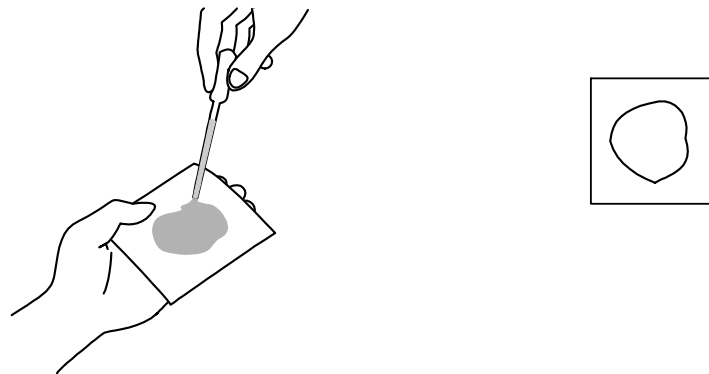
If the sample contains bound water such as an all-meat emulsion, cooked all-meat sausage, sausage with extenders, semi-dry sausage, or ham, place the sample on the end of the spatula and apply the sample to the middle of the pad. Then spread the sample around the pad in a circle to generate thermal heat.



If the sample is a heat sensitive sample such as a water-based or solvent-based liquid, use a pipette to dispense the sample onto the pad(s). Sample size should be 2-5 grams, based on solid content of the sample — 2-3 grams for high solids samples, 4-5 grams for samples containing less than 15 percent solids. Samples containing less than two percent solids may require as much as 10 grams for analysis. Large quantity samples should be pipetted onto the pads in a thin even layer. Additional glass fiber pads may be used for increased absorbency. A sufficient number of pads should be used to ensure that liquid samples do not drip onto the floor of the instrument cavity.



If the sample is a water-based liquid or solvent-based chemical, use a pipette to puddle the sample onto the pad(s). Cover the sample with an additional pad. A sufficient number of pads should be used to ensure that liquid samples do not drip onto the floor of the instrument cavity.



Standard application used for heat sensitive samples if sample burns when using the puddle and spread technique.

Method Information

Most water based samples should achieve constant weight settings in 1 - 3 minutes.

The microwave power and temperature settings should be appropriate to the sample. The standard oven or vacuum oven temperature recommended in a reference method for the sample should be followed. If no reference method is available, a starting temperature of 100 °C should be programmed. Because the power level in the instrument is adjusted based on temperature feedback, most samples can be dried using a 100% power level setting. If a sample contains a strong microwave absorber such as carbohydrates, the power level will likely need to be adjusted. In most instances, a 10% power change will be sufficient to prevent overheating.

During the initial testing of a new sample, the weight display should be monitored to ensure that the sample does not ignite and that a stable weight reading is displayed. Sharp declines in weight indicate excessive sample heating. If ignition occurs, the flame detection sensor will abort the analysis.

Samples that are strong absorbers of microwave energy should be diluted or tested at reduced power levels. These products usually contain simple carbohydrates or tightly held moisture that will not readily escape, causing overheating and/or burning and non-reproducible results. These samples should be tested at a low power. Examples of heat sensitive samples include powders, paper fibers, candy and black liquor.

Method Development

The CEM Applications Laboratory has developed procedures for various types of samples. These procedures include parameters (program, power, time, sample preparation, etc.) needed to program the SMART Turbo and analyze samples in the SMART Trac System. CEM sample analysis procedures can be requested from the CEM Applications Laboratory.

If a procedure for a particular sample is not included in the applications list, review all information in this chapter relating to sample preparation, sample spread technique, time and power parameters, redry time, and bias identification to develop an application method. If necessary, call the CEM Applications Laboratory for additional information and assistance (800) 726-3331.

1. Begin testing at 100% power and 100°C.
2. If the sample has high solids content (approximately 75% solids), begin testing with a low sample weight (1 - 2 grams).
3. Use Quick Test, Constant Weight for testing.
4. Observe weight change closely. The weight should steadily decline. If weight is erratic (± 1 mg), the test should be stopped because the sample is probably burning. Reduce the power to 50% and perform the test again. If the sample continues to burn, adjust the power in 5 degree increments.
5. Record final weight result and time.
6. Perform multiple sample tests with determined power and time. Results should be within $\pm 0.2\%$.

SMART Trac Method Setup and Determination

For the SMART Trac II system, it is necessary to obtain a high and low fat reference sample to create a method. The reference values for these samples should be accurately measured by an AOAC approved reference technique. If inaccurate reference values are used in the SMART Trac II setup, the method will not produce accurate results. It is necessary to develop a method only once for the SMART Trac II system since the method creates a linear model that never changes.

To determine the number of methods needed for the SMART Trac II system, consider the following:

1. How many different types of fats and fat products will be tested? Different types of fats include butterfat, meat fat, and vegetable oils. Each of these types of fats have different proton counts and will need to be separated into different methods.
2. What is the expected or necessary precision range required for the product?
For sample results with less than $\pm 0.1\%$ range, it may be necessary to set up several methods for a specific product type. For example, ice cream mixes typically require methods of 0 - 4%, 4 - 10% or 10 - 18%. This division of methods permits the operator to achieve results of less than $\pm 0.1\%$ range over ten samples.

When analyzing meat samples, each type of meat (i.e. beef, pork, poultry) requires a different method. Since meat samples typically require a $\pm 0.25\%$ range or greater, only one method is necessary per product type.

3. What is the product fat range for the same type of fat and sample? If the product fat ranges are greater than 40 - 50% (i.e. difference between low and high fat products), it is recommended to develop two different methods. These methods would include one method for the highest and middle fat range products one method for the middle and low fat products. For example, mayonnaise is 85%, 33% and 1% fat for Regular, Light and No Fat respectively. Two methods are used for mayonnaise - one for 85 to 33% and one method for 33 to 1% fat.

Determining Ash/COH for Processed Meats

For samples that contain salt, sugar, spice, cure or other added components, ash/carbohydrate (COH) values must be determined by analysis. For purposes of calculating the protein by difference, the specific amount of each component (salt, spice, bone, etc.) is not important, only the total amount.

To determine ash/COH values for finished products or blends with sugar, salt, spice, etc., use the following procedure:

1. Collect and prepare three (3) samples from different lots of the same product. Store the samples in airtight containers until tested.
2. Analyze the 3 samples in duplicate for fat and moisture in the SMART Trac System using "long" methods (Kjeldahl). If necessary, an independent laboratory can provide this analysis.
3. Average the results of the duplicate analyses for each sample, then total the % Protein + % Fat + % Moisture for each sample.
4. Subtract the sum from 100% to get an Ash/Carbohydrate factor. For example, if the composition of a sample is:

Moisture	52.54%
Fat	28.36%
Protein	11.25%
Total	92.15%

Ash/COH = 100% - 92.15%
Ash/COH = 7.85%

5. Calculate an average of the the ash/COH values for each of the 3 samples and program that factor into the SMART Turbo.

Check samples periodically to verify the ash/COH values. Variations in the amount of added constituents (salt, sugar, spice, extenders, etc.) can cause the ash/COH factor to vary.

Ash Content Of Meats

The following values should be helpful in establishing ash/carbohydrate factors for raw meats. Since the carbohydrate values for these meats are so low, the ash alone is usually adequate. Obviously, for meats with added salt, spice, cure, sugars, soy, etc., the ash/COH values will vary.

The following values are estimates since composition may vary due to individual differences in the the meat sources, seasonal variations, processing, etc.

	Moisture	Protein	Fat	Ash
Green Beef Material				
Bull Meat	67.90	19.40	11.70	1.00
Ship Boneless Beef	64.00	16.20	19.00	.80
Regular Boneless Beef	70.00	20.00	9.00	1.00
Boneless Beef Pad for Ck.	65.70	18.30	15.00	1.00
Boneless Bull Chux	72.50	19.80	7.20	.50
Boneless Chux C & C	70.00	19.30	9.70	1.00
Boneless Ship Chux	62.10	17.55	19.35	1.00
Shank Meat	72.60	19.80	6.60	1.00
Clods	72.30	20.18	6.90	.62
Sirloin Butts	66.60	19.40	13.00	1.00
Star Beef (Dry Sausage)	70.00	20.00	9.00	1.00
Spcl. Beef	69.00	19.00	11.00	1.00
Spcl. Bf. Trmgs.	52.50	14.60	31.90	1.00
Reg. Bf. Trmgs.	64.60	19.40	15.00	1.00
Bnls. Plates	43.60	13.40	42.00	1.00
Bnls. Flanks	41.90	13.10	44.00	1.00
Bnls. Plate Trmgs.	40.30	12.70	46.00	1.00
Beef Fat	11.80	5.10	82.90	.20
Beef Fat from Old Cow	22.20	5.60	71.80	.40
Brains	77.40	11.40	9.80	1.40
Cheeks	70.00	19.30	9.70	1.00
Diaphragm Meat	65.79	18.21	15.60	.50
Gullet Meat	73.20	16.80	9.00	1.00
Head Meat	68.45	18.96	11.59	1.00
Hearts	72.40	16.55	9.80	1.25
Lips	59.40	17.07	22.53	1.00
Lungs	78.00	18.80	2.20	1.00
Tongues	64.25	17.75	17.00	1.00
Tongue Trimmings	69.40	19.17	10.43	1.00
Tripe, Cooked	81.90	15.50	2.10	.50

Ash Content Of Meats (Continued)

	Moisture	Protein	Fat	Ash
Green Pork Material				
Spiced Ham Trimmings	61.10	16.90	21.00	1.00
Lean Ham Trimmings	63.80	17.70	17.50	1.00
Hamette	66.40	18.40	14.20	1.00
Corned Pk. Shldr. Mt.	61.80	15.00	20.00	3.20
A Shoulder Trimmings	61.80	17.10	20.10	1.00
B Shoulder Trimmings	45.40	12.70	40.90	1.00
B & F Shldrs. 1/2" Fat	49.20	13.80	36.00	1.00
B & F Shldrs. 1" Fat	45.30	12.70	41.00	1.00
Lean Picnic Trimmings	59.90	16.60	22.50	1.00
C.T. Butts	57.90	16.10	25.00	1.00
Boneless Boston Butts	47.30	13.20	38.50	1.00
Boneless Packer Side Mt. 124-55	41.10	11.30	46.60	1.00
Skd. Belly Mt.	24.80	7.00	67.50	.70
Reg. Pk. Trimmings	34.30	9.70	55.00	1.00
Neck Bone Trimmings	51.50	14.40	33.10	1.00
Spec. Lean Trim.	58.10	15.90	25.00	1.00
A Pk Trimmings	68.80	22.50	8.00	.60
Blade Meat	73.10	18.00	7.80	1.10
Picnic Shank Meat	65.30	18.90	15.00	.80
Ham Shank Meat	62.60	17.60	19.00	.80
Pk. Trimmings Pad for Ck.	64.00	15.00	20.00	1.00
Neck Fat Skin Off	13.00	2.60	84.00	.40
Skd. Jowls	22.10	5.70	71.70	.50
Belly Fat Skin Off	6.40	1.30	92.20	.10
Ham Fat Skin Off	11.80	3.10	84.90	.20
Back Fat Skin Off	5.70	1.30	92.90	.10
Gelatin Skins 10% Fat	47.50	22.80	28.50	1.20
Brains	77.40	11.80	9.80	1.00
Cheeks	67.25	15.75	16.00	1.00
Cheeks Pad. for Ck.	67.25	15.75	16.00	1.00
Diaphragm Meat	68.20	17.00	13.65	1.15
Gullet Mt.	74.60	16.20	8.00	1.20
Head Mt.	58.00	15.25	25.00	1.75
Head Skins	32.40	9.25	57.37	.98
Hearts	74.40	17.50	7.00	1.10
Jaw Mt	69.00	18.73	11.27	1.00
Livers	69.80	23.50	3.85	2.85
Melts	79.30	17.70	1.80	1.20
Snouts	52.25	14.61	32.14	1.00
Snout Mt.	59.00	16.43	23.57	1.00
Stomachs	70.25	13.85	13.50	1.90
Tongues	58.35	16.25	24.50	1.00
Tongue Trimmings	26.50	8.65	64.85	.10

Ash Content Of Meats (Continued)

	Moisture	Protein	Fat	Ash
Cured Pork Material				
Clear Fat	18.10	2.30	78.10	1.50
DS Fat Backs	9.20	1.80	85.00	4.00
Smoked Pk. Skins	12.80	38.00	46.50	2.70
Bacon Ends and Pieces	14.50	7.70	76.00	2.50
High Fat Cracklings	6.00	19.00	74.00	0.00
Med. Fat Cracklings	5.00	43.00	51.00	0.00
Low Fat Cracklings	8.00	84.50	6.50	0.00
Green Calf Material				
Reg. Boneless Veal	72.25	19.80	6.95	1.00
Cheeks	74.50	17.21	7.21	1.00
Gullet Meat	76.50	15.20	7.30	1.25
Hearts	71.70	19.67	7.63	1.00
Tripe	87.30	9.00	3.20	.50
Green Sheep Material				
Reg. Boneless Mutton	69.40	19.17	10.43	1.00
Cheeks	67.90	18.84	12.26	1.00
Gullett Meat	75.00	15.40	9.10	.50
Hearts	67.20	14.90	14.40	3.50
Tripe	90.05	8.07	1.40	.48

Edit/Create Method

Methods can be created in the following modes in either constant weight or set time:

- **Moisture/Fat NMR**
 - Standard — System performs a moisture/solids determination.
 - Dilution — Sample is diluted, and a dilution factor is used for the diluted sample result; therefore, an accurate moisture/solids value for the undiluted sample is obtained. An interfaced external balance is required. The dilution program should be used with samples that burn easily, viscous samples or samples which dry unevenly.
 - Syringe Weigh – This procedure is used for samples that, due to rapid evaporation, cannot achieve a stable initial weight with the standard moisture/solids application. The instrument internal balance or an external balance can be used for calculating the weight of the syringes.
- **Moisture/Fat/Protein NMR**
 - Standard
 - Dilution
 - Syringe Weigh
- **Moisture/Fat Dry NMR**
 - Standard
 - Dilution
 - Syringe Weigh
- **Fat NMR**

Edit Method

1. With the CEM Main Menu displayed, press “2” to activate the Edit/Create Method screen.

CEM Main Menu			
1. QUICK TEST 2. EDIT/CREATE METHOD 3. LOAD METHOD 4. SETUP 5. PRINT 6. STATISTICS 7. SMART Trac II			
Press item number to select or READY to run test.			
METHOD - XXXXXXXX			

2. Press the item number of the method to be edited.

Note: If the method to be edited is not displayed on the screen, press the operation key below NEXT PAGE to access additional methods. Continue to press the operation key below NEXT PAGE until the desired method is displayed.

Edit/Create Method			
1. NEW METHOD 2. MILK MT 3. TEMP VERIFY 4. POWER TEST 5. STD SOLUTION 6. BUTTER 7. CHEESE 8. EGGS			
Press item number to select or READY to run test.			
			NEXT PAGE

3. Refer to the CREATE METHOD section of this manual for specific instructions for entering method information to edit desired modes and/or parameters.

CAUTION

If a CEM preprogrammed method is edited, new parameters will be saved. To prevent elimination of the preprogrammed method, refer to the preprogrammed method and create a new method with the desired parameters.

Edit/Create Method			
1. MAYONNAISE 2. MEAT (PROCESSED) 3. MEAT (RAW) 4. MILK 5. PET FOOD 6. SALAD DRESSING 7. TOMATO PASTE 8. WATER BASED CHEMICAL			
Press item number to select or READY to run test.			
			NEXT PAGE

Create Method

Moisture/Fat NMR – Standard

NOTE

To create a new Moisture/Fat/NMR method, it is necessary to have at least two samples — one reference sample at the high end of the fat range and one reference sample at the low end of the fat range with reference extraction values. These values are necessary to ensure valid data points in the method.

1. With the CEM Main Menu displayed, press “2” to activate the Edit/Create Method screen.

CEM Main Menu			
1. QUICK TEST 2. EDIT/CREATE METHOD 3. LOAD METHOD 4. SETUP 5. PRINT 6. STATISTICS 7. SMART Trac II Press item number to select. METHOD - XXXXXXXX			

2. Press “1” to create a new method.

Edit/Create Method			
1. NEW METHOD 2. MILK MT 3. TEMP VERIFY 4. POWER TEST 6. STD SOLUTION 6. BUTTER 7. CHEESE 8. EGGS Press item number to select.			
			NEXT PAGE

3. Using the operation keys below the arrows select the first letter or number of the method name.
4. Press ENTER.
5. Continue using the operation keys to select each letter or number of the method name. Press ENTER after each selection until the entire method name is selected (16 characters maximum).

Note: If the method name utilizes numbers only, use the numeric keypad to enter the numbers for the name.

6. Press READY.

METHOD NAME:			
0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Space Delete			
Highlight choice, press ENTER.			
Press READY to continue.			
←	→	↑	↓

7. Press "1" to toggle and select "Moisture/Fat/NMR."
8. Press "2" to toggle and select "Constant Weight" or "Set Time."
9. Press "3" to toggle the turbo mode "On" or "Off."

Note: The instrument default for "Turbo" is "On."

10. Press READY.

Edit Method			
1. CALCULATION MODE: MOISTURE/FAT NMR 2. TIME PARAMETER: CONSTANT WEIGHT 3. "TURBO": ON Press item number to select. Press READY to continue.			
MAIN MENU		PREV PAGE	

1. Press "1" to select "Standard."
2. Based on the selection made in step 8 (Constant Weight or Set Time), enter method parameters as follows:

Moisture/Fat NMR			
1. STANDARD 2. DILUTIONS 3. SYRINGE WEIGH Press item number to select.			
MAIN MENU		PREV PAGE	

Constant Weight

Constant weight permits the operator to dry a sample until a constant weight is achieved. Dryness is specified by defining a maximum acceptable weight loss over a specified time interval. During the specified time, when the weight loss is equal to or less than that which was specified, the analysis stops and results are calculated.

- a. Press "1" to select and enter power.
- b. Using the numeric keys, enter the power level (1 - 100%).
- c. Press ENTER.
- d. Press "2" to select and enter delta weight.

Note: To edit any of the parameters, press the numeric key of the parameter to be edited and use the numeric keys to enter the new parameter. Then, press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DELTA WEIGHT: 0.0 mg 3. DELTA TIME: 0 secs 4. MAX TIME: 10 mins 5. BIAS: ±0.00% 6. MIN RESULT: 0.00% 7. MAX RESULT: 100.00% Press item number to select or NEXT PAGE for more menu items			
MAIN MENU		PREV PAGE	NEXT PAGE

Standard Moisture/Fat NMR			
Moisture Parameters → 1. POWER: 0% 2. DELTA WEIGHT: 0.0 mg 3. DELTA TIME: 0 secs 4. MAX TIME: 10 mins 5. BIAS: ±0.00% 6. MIN RESULT: 0.00% 7. MAX RESULT: 100.00% Input power, press ENTER. Entry: 000			
MAIN MENU		PREV PAGE	NEXT PAGE

- e. Using the numeric keys, enter the delta weight (.1 - .9). Normally, a weight loss differential of 0.2 - 0.5 mg is used.
- f. Press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% → 2. DELTA WEIGHT: 0.0 mg 3. DELTA TIME: 0 secs 4. MAX TIME: 10 mins 5. BIAS: ±0.00% 6. MIN RESULT: 0.00% 7. MAX RESULT: 100.00% Input delta weight, press ENTER. Entry: 0.0			
MAIN MENU		PREV PAGE	NEXT PAGE

- g. Press “3” to select and enter delta time.
- h. Using the numeric keys, enter the delta time (1 - 60 seconds). Normally a differential time interval of 10 – 15 seconds is used.
- i. Press ENTER.

Note: Maximum run time is the amount of time the instrument will operate prior to shutdown if a constant weight has not been reached. A maximum run time must be entered or the program will be invalid. If the instrument shuts down due to maximum run time, parameters should be adjusted prior to repeating the analysis.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DELTA WEIGHT: 0.0 mg → 3. DELTA TIME: 0 secs 4. MAX TIME: 10 mins 5. BIAS: ±0.00% 6. MIN RESULT: 0.00% 7. MAX RESULT: 100.00% Input delta time, press ENTER. Entry: 00			
MAIN MENU		PREV PAGE	NEXT PAGE

- j. Press “4” to select and enter maximum run time. If using the default value of 10 minutes, omit step k.
- k. Using the numeric keys, enter the maximum run time (1 - 60 minutes).
- l. Press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DELTA WEIGHT: 0.0 mg 3. DELTA TIME: 0 secs → 4. MAX TIME: 10 mins 5. BIAS: ±0.00% 6. MIN RESULT: 0.00% 7. MAX RESULT: 100.00% Input max time, press ENTER. Entry: 10			
MAIN MENU		PREV PAGE	NEXT PAGE

- m. If applicable, press “5” to select and enter a moisture bias.
- n. Using the numeric keys, enter the + or – moisture bias.
- o. Press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DELTA WEIGHT: 0.0 mg 3. DELTA TIME: 0 secs 4. MAX TIME: 10 mins → 5. BIAS: ±0.00% 6. MIN RESULT: 0.00% 7. MAX RESULT: 100.00% Input bias, press ENTER. Entry: 0.00			
MAIN MENU	+/-	PREV PAGE	NEXT PAGE

- p. Press “6” to select and enter a minimum result.
- q. Using the numeric keys, enter the minimum result.
- r. Press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DELTA WEIGHT: 0.0 mg 3. DELTA TIME: 0 secs 4. MAX TIME: 10 mins 5. BIAS: ±0.00% → 6. MIN RESULT: 0.00% 7. MAX RESULT: 100.00% Input min result, press ENTER. Entry: 0.00			
MAIN MENU		PREV PAGE	NEXT PAGE

- s. Press “7” to select and enter a maximum result.
- t. Using the numeric keys, enter the maximum result.
- u. Press ENTER.

Note: Proceed to step 12.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DELTA WEIGHT: 0.0 mg 3. DELTA TIME: 0 secs 4. MAX TIME: 10 mins 5. BIAS: ±0.00% 6. MIN RESULT: 0.00% → 7. MAX RESULT: 100.00% Input max result, press ENTER. Entry: 0.00			
MAIN MENU		PREV PAGE	NEXT PAGE

Set Time

Set time permits the operator to control the sample analysis by entering a specified analysis time and power level. At the end of the specified time, the percent solids and/or moisture of the sample is calculated and displayed.

- a. Press “1” to select and enter power.
- b. Using the numeric keys, enter the power level (1 - 100%).
- c. Press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DRY TIME: 00:00 min:sec 3. BIAS: ±0.00% 4. MIN RESULT: 0.00% 5. MAX RESULT: 100.0% Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

Standard Moisture/Fat NMR			
Moisture Parameters → 1. POWER: 0% 2. DRY TIME: 00:00 min:sec 3. BIAS: ±0.00% 4. MIN RESULT: 0.00% 5. MAX RESULT: 100.0% Input power, press ENTER. Entry: 000			
MAIN MENU		PREV PAGE	NEXT PAGE

- d. Press “2” to select and enter dry time.
- e. Using the numeric keys, enter the dry time (1 sec. - 99 min. 59 sec.).
- f. Press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% → 2. DRY TIME: 00:00 min:sec 3. BIAS: ±0.00% 4. MIN RESULT: 0.00% 5. MAX RESULT: 100.0% Input dry time, press ENTER. Entry: 00:00			
MAIN MENU		PREV PAGE	NEXT PAGE

- g. If applicable, press “3” to select and enter a moisture bias.
- h. Using the numeric keys, enter the +or – moisture bias.
- i. Press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DRY TIME: 00:00 min:sec → 3. BIAS: ±0.00% 4. MIN RESULT: 0.00% 5. MAX RESULT: 100.0% Input bias, press ENTER. Entry: 00.00			
MAIN MENU	+/-	PREV PAGE	NEXT PAGE

- j. Press “4” to select and enter a minimum result.
- k. Using the numeric keys, enter the minimum result.
- l. Press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DRY TIME: 00:00 min:sec 3. BIAS: ±0.00% → 4. MIN RESULT: 0.00% 5. MAX RESULT: 100.0% Input min. result, press ENTER. Entry: 0.00			
MAIN MENU		PREV PAGE	NEXT PAGE

- m. Press “5” to select and enter maximum result.
- n. Using the numeric keys, enter the maximum result.
- o. Press ENTER.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DRY TIME: 00:00 min:sec 3. BIAS: ±0.00% → 5. MAX RESULT: 100.0% Input max. result, press ENTER. Entry: 100.00			
MAIN MENU		PREV PAGE	NEXT PAGE

Note: Proceed to step 12.

12. Press the operation key below “Next Page” to access additional parameters.

Standard Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DRY TIME: 00:00 min:sec 3. BIAS: ±0.00% 4. MIN RESULT: 0.00% 5. MAX RESULT: 100.0% Press READY to run test			
MAIN MENU		PREV PAGE	NEXT PAGE

13. Press “1” to select and enter a maximum temperature. If using the default value of 110°C, omit step 14.
14. Using the numeric keys, enter the maximum temperature (0 - 300°C) of the instrument during the analysis.
15. Press ENTER.

Standard Moisture/Fat NMR			
→ 1. MAX TEMP: 110 C 2. MIN WT RANGE: 2.00g 3. MAX WT RANGE: 4.00g 4. WT COMPENSATION: ON Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

16. Press “2” to select and enter a minimum weight range. If using the default minimum weight range of 2.00g, omit step 17.
17. Using the numeric keys, enter a minimum weight range of the sample (0 - 50g).
18. Press ENTER.

Standard Moisture/Fat NMR			
1. MAX TEMP: 110 C → 2. MIN WT RANGE: 2.00g 3. MAX WT RANGE: 4.00g 4. WT COMPENSATION: ON Input min. wt. range, press ENTER. Entry: 2.00			
MAIN MENU		PREV PAGE	NEXT PAGE

19. Press “3” to select and enter a maximum weight range. If using the default maximum weight range of 4.00g, omit step 20.
20. Using the numeric keys, enter the maximum weight range.
21. Press ENTER.

Standard Moisture/Fat NMR			
1. MAX TEMP: 110 C 2. MIN WT RANGE: 2.00g → 3. MAX WT RANGE: 4.00g 4. WT COMPENSATION: ON Input max. wt. range, press ENTER. Entry: 4.00			
MAIN MENU		PREV PAGE	NEXT PAGE

Note: Weight compensation is designed for use with samples having a buoyancy effect created by heat. It should be used (turned on) for samples such as milk, margarine, condiments, etc. which have a higher temperature when the final weight is calculated than at the beginning of the test.

- 22. Based on sample type, press “4” to toggle and turn weight compensation “on” or “off.”

Note: Press the operation key below PREVPAGE to return to the moisture parameters screen.

- 23. Press the operation key below NEXT PAGE.
- 24. Press “1” to toggle from “<80.0%” to “>80.0%” to “<1.0%.”
- 25. Press “2” to enter a fat bias.

Note: A fat bias may be required on a method that has been copied from a method for a similar product. The bias is defined as the difference between the reference method results and the SMART Trac II results obtained on the copied method.

- 26. Using the numeric keys, enter the desired fat bias.

- 27. Press “3” to enter a warm-up delay time.

Note: A warm-up delay is used to permit temperature stabilization for heat sensitive samples.

- 28. Using the numeric keys, enter the desired warm-up delay time (1 - 60 minutes).

Standard Moisture/Fat NMR			
1. MAX TEMP: 110 C 2. MIN WT RANGE: 2.00g 3. MAX WT RANGE: 4.00g → 4. WT COMPENSATION: ON			
Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

Standard Moisture/Fat NMR			
→ 1. FAT RANGE: <80% 2. FAT BIAS: +X.XX 3. WARMUP DELAY: XX 4. RUN TIME: XX			
Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

Standard Moisture/Fat NMR			
1. FAT RANGE: >1.0% → 2. FAT BIAS: +X.XX 3. WARMUP DELAY: XX 4. RUN TIME: XX			
Input bias, press ENTER. Entry: +00			
MAIN MENU	+/-	PREV PAGE	NEXT PAGE

Standard Moisture/Fat NMR			
1. FAT RANGE: >1.0% 2. FAT BIAS: +X.XX → 3. WARMUP DELAY: XX 4. RUN TIME: XX			
Input warmup delay, press ENTER. Entry: 00			
MAIN MENU		PREV PAGE	NEXT PAGE

29. Press “4” to toggle and select a run time of “8” or “64.”

30. Press the operation key below “Next Page.”

Standard Moisture/Fat NMR			
1. FAT RANGE: >1.0% 2. FAT BIAS: +X.XX 3. WARMUP DELAY: XX → 4. RUN TIME: XX Input warmup delay, press ENTER. Entry: 00			
MAIN MENU		PREV PAGE	NEXT PAGE

31. Press the operation key below ADD to enter a reference for the sample.

Edit References			
Press ADD to enter a new Reference.			
ADD	DELETE	PREV PAGE	EDIT

34. Using the numeric keys, enter a reference value determined by the AOAC or reference extraction method.

Note: At least two AOAC or reference extraction methods must be performed using a high and low fat content sample to establish high and low reference values.

Edit References			
Input reference, press ENTER. Entry: xxx.xx			
ADD	DELETE	PREV PAGE	EDIT

35. Press "1."


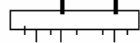
Edit References			
1. XX X.XX			
Press item number to collect Standards data.			
ADD	DELETE	PREV PAGE	EDIT

36. Press the operation key below ADD STANDARD.

Edit Standard – X.XX%			
<u>% Fat</u>	<u>S/M</u>	<u>Mass</u>	
Press ADD STANDARD to collect standard data.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

37. Lift the cover of the SMART Turbo. Place two square glass fiber sample pads on the balance pan. Close the instrument cover.

38. Press TARE.

XXXXXX			
Power:	xxx %		
Temp (xxx):	xx.x		
Time:	xx:xx		
			
Wt: x.xxxxg			
Place pads on balance and press TARE.			
ID			

39. Wait for the instrument to tare the weight of the sample pads. The method test screen will reappear when the tare function is complete.

TARING BALANCE . . .

Note: The “T” in the lower left corner of the balance icon indicates that the weight of the sample pads has been tared.

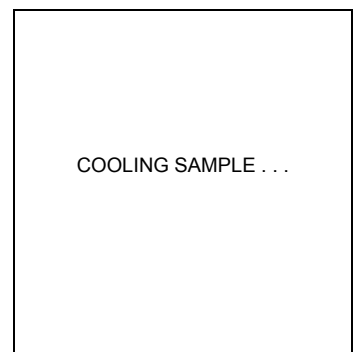
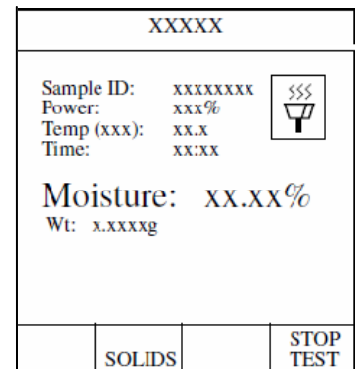
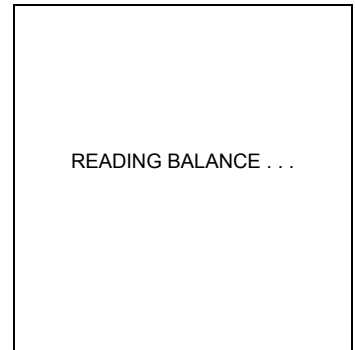
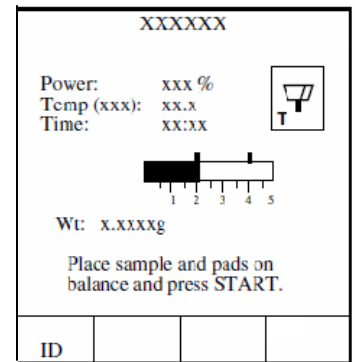
40. Lift the instrument cover. Remove the square pads from the sample pan.
41. Apply sample in a thin, even layer to one of the square sample pads and cover the sample with the second pad.
42. Quickly place the square sample pads back on the balance pan. Close the instrument cover.
43. Press START.

The instrument reads and records the initial weight of the sample prior to beginning the analysis.

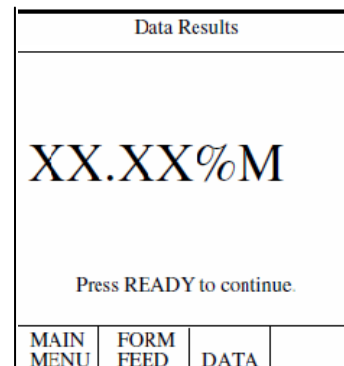
As the analysis begins, the flashing microwave indicators in the balance icon appear and the time begins counting (up for Constant Weight or down for Set Time). The sample weight decreases as the moisture is removed.

Note: Press the operation key below STOPTEST to end the analysis.

During the drying time, the operation key below SOLIDS may be pressed to display % solids or % moisture.

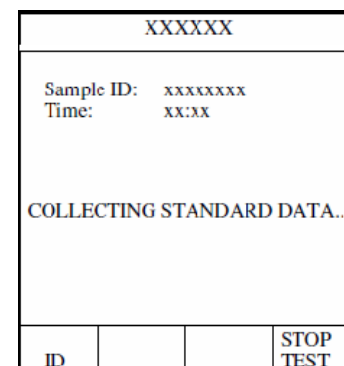
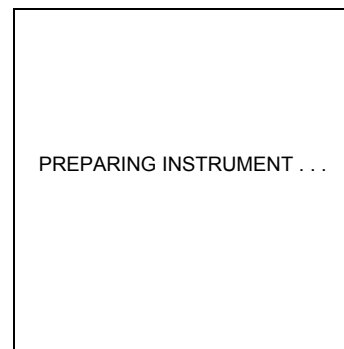
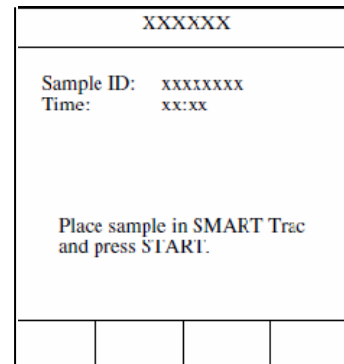


When the drying time is complete, five short beeps will be heard. If the cooling sample option is turned on, the Cooling Sample screen will be displayed until the sample is cooled to 45 °C. The Data Results screen will appear, displaying either the % moisture or % solids as selected.



44. Press READY.
45. Prepare (wrap) the sample in accordance with the instructions in the "Trac Station Sample Preparation" section of this manual.
46. Place the Trac tube with the pressed sample pads into the sample area of the SMART Trac II magnet.
47. Press START.
48. While the SMART II Trac is analyzing the second sample, press the first sample pads out of the Trac tube as illustrated in "Trac Station Sample Preparation."

The SMART Trac II analyzes and records the total proton activity of fat present in the sample. The SMART Turbo then analyzes the data and calculates and displays the fat results.



49. Press ADD STANDARD.

50. Repeat steps 32 through 48.

Note: CEM Corporation recommends performing and entering at least three (3) standards. A maximum of eight (8) standards can be entered.

51. Press “Exit.” Repeat steps 38 through 51 to create a second reference value. Continue this process until required samples have been tested.

Note: At least two (2) reference standards (high and low) are required to complete a method. At least three (3) replicates of each standard must be performed. The SMART Trac II system cannot complete the fat analysis without the required data.

As the replicates of the standards are collected, screens similar to the ones on the right are displayed. Percent fat, number of proton counts (signal/mass) and unit sample weight (mass) are determined and recorded for each sample. As the result of each replicate is recorded, it is “tagged” with an asterisk.

52. Compare the calculated references for each replicate to the appropriate standard (high or low). “Untag” any reference that deviates from the acceptable range for the sample by pressing the number of the reference. The asterisk disappears. For example, if the standard for the sample is 33.00% and the acceptable range is 32.85% to 33.15%, untag any reference outside this range. “Untagging” a reference prevents the software from using that value for final sample calculations.

53. To complete the method, press “Exit” two times. The “Writing Standards Data” screen will appear, followed by the Main Menu.

Edit Standard – XX.XX%			
% Fat	S/M	Mass	
*1. ----	XXXX.XXXX	X.XXXX	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

Edit Standard – 50.00%			
% Fat	S/M	Mass	
*1. 50.00	3064.5804	2.1710	
2. 49.76	3020.2666	3.9581	
*3. 50.00	3064.5987	3.7406	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

Edit Standard – 33.00%			
% Fat	S/M	Mass	
*1. 33.06	2023.0021	2.7868	
*2. 32.94	2015.4405	2.5401	
3. 32.49	1907.6087	3.3361	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

Moisture/Fat NMR - Dilutions

Note: Refer to the “Instrument Setup” section of the operation manual for the SMART Turbo to ensure that the applicable external balance is selected.

NOTE

To create a new Moisture/Fat NMR method, it is necessary to have at least two samples –one reference sample at the high end of the fat range and one reference sample at the low end of the fat range with reference extraction values. These values are necessary to ensure valid data points in the method.

1. With the CEM Main Menu displayed, press “2” to activate the Edit/Create Method screen.

CEM Main Menu			
1. QUICK TEST 2. EDIT/CREATE METHOD 3. LOAD METHOD 4. SETUP 5. PRINT 6. STATISTICS 7. SMART Trac II			
Press item number to select. METHOD - XXXXXXXX			

2. Press “1” to create a new method.

Edit/Create Method			
1. NEW METHOD 2. MILK MT 3. TEMP VERIFY 4. POWER TEST 5. STD SOLUTION 6. BUTTER 7. CHEESE 8. EGGS			
Press item number to select.			
			NEXT PAGE

3. Using the operation keys below the arrows, select the first letter or number of the method name.
4. Press ENTER.
5. Continue using the operation keys to select each letter or number of the method name. Press ENTER after each selection until the entire method name is selected (16 characters maximum).

Note: If the method name utilizes numbers only, use the numeric keypad to enter the numbers for the name.

6. Press READY

METHOD NAME:			
0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Space Delete			
Highlight choice, press ENTER.			
Press READY to continue.			
←	→	↑	↓

7. Press "1" to toggle and select "Moisture/Fat NMR."
8. Press "2" to toggle and select "Constant Weight" or "Set Time."
9. Press "3" to toggle the turbo mode "On" or "Off."

Note: The instrument default for "Turbo" is "On."

10. Press READY.

11. Press "2" to select "Dilutions."

12. Press the numbers (1 - 7 Constant Weight or 1 - 5 Set Time) and enter the appropriate method parameters.

Note: Refer to the "Quick Test" section of the SMART Turbo operation manual for instructions for entering method parameters for Constant Weight and Set Time.

13. Press the operation key below NEXT PAGE to access additional method parameters.

Edit Method			
1. CALCULATION MODE: MOISTURE/FAT NMR 2. TIME PARAMETER: CONSTANT WEIGHT 3. "TURBO": ON Press item number to select. Press READY to continue.			
MAIN MENU		PREV PAGE	

Moisture/Fat NMR			
1. STANDARD 2. DILUTIONS 3. SYRINGE WEIGH Press item number to select.			
MAIN MENU		PREV PAGE	

Dilution Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DELTA WEIGHT: 0.0 mg 3. DELTA TIME: 0 secs 4. MAX TIME: 10 mins 5. BIAS: ±0.00% 6. MIN RESULT: 0.00% 7. MAX RESULT: 100.00% Press item number to select or NEXT PAGE for more menu items			
MAIN MENU		PREV PAGE	NEXT PAGE

C
O
N
S
T
A
N
T

W
E
I
G
H
T

Dilution Moisture/Fat NMR			
Moisture Parameters 1. POWER: 0% 2. DRY TIME: 00:00 min:sec 3. BIAS: ±0.00% 4. MIN RESULT: 0.00% 5. MAX RESULT: 100.0% Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

S
E
T

T
I
M
E

14. Press the numbers (1 - 4) and enter the appropriate method parameters.

Note: Press the operation key below PREV PAGE to return to the moisture parameters screen.

15. Press the operation key below NEXT PAGE to access additional selections.

16. Press "1" to toggle from "<80.0% to >80.0%" to "<1.0%."

17. Press "2" to enter a fat bias.

Note: A fat bias may be required on a method that has been copied from a method for a similar product. The bias is defined as the difference between the reference method results and the SMART Trac II results obtained on the copied method.

18. Using the numeric keys, enter the desired fat bias.

19. Press "3" to enter a warm-up delay time.

Note: A warm-up delay is used to permit temperature stabilization for heat sensitive samples.

20. Using the numeric keys, enter the desired warm-up delay time (1 – 60 minutes).

21. Press "4" to toggle and select a run time of "8" or "64."

22. Press the operation key below "Next Page."

Dilution Moisture/Fat NMR			
→ 1. FAT RANGE: >1.0% 2. FAT BIAS: +X.XX 3. WARMUP DELAY: XX 4. RUN TIME: XX Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

Dilution Moisture/Fat NMR			
1. FAT RANGE: >1.0% →2. FAT BIAS: +X.XX 3. WARMUP DELAY: XX 4. RUN TIME: XX Input bias, press ENTER. Entry: +00			
MAIN MENU	+/-	PREV PAGE	NEXT PAGE

Dilution Moisture/Fat NMR			
1. FAT RANGE: >1.0% 2. FAT BIAS: +X.XX → 3. WARMUP DELAY: XX 4. RUN TIME: XX Input bias, press ENTER. Entry: +00			
MAIN MENU	+/-	PREV PAGE	NEXT PAGE

Dilution Moisture/Fat NMR			
1. FAT RANGE: >1.0% 2. FAT BIAS: +X.XX 3. WARMUP DELAY: XX → 4. RUN TIME: XX Input warm-up delay, press ENTER. Entry: 00			
MAIN MENU		PREV PAGE	NEXT PAGE

23. Press the operation key below “Add” to enter a reference for the sample.

Edit References			
Press ADD to enter a new Reference.			
ADD	DELETE	PREV PAGE	EDIT

24. Using the numeric keys, enter a reference value determined by the AOAC or reference extraction method.

Note: At least two AOAC or reference extraction methods must be performed using a high and low fat content sample to establish high and low reference values.

Edit References			
Input references, press ENTER. Entry: xxx.xx			
ADD	DELETE	PREV PAGE	EDIT

25. Press the item number of the standard to collect.

Edit References			
1. xxx.xx			
Press item number to collect Standards data.			
ADD	DELETE	PREV PAGE	EDIT

26. Press the operation key below “Add Standard.”

Edit Standard – X.XX%			
<u>% Fat</u> <u>S/M</u> <u>Mass</u>			
Press ADD STANDARD to collect standard data.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	EDIT PRINT

Note: To perform a moisture/fat NMR or moisture/fat/protein NMR dilution analysis, the applicable external balance must be selected in Setup procedures outlined in the SMART Turbo operation manual.

Note: If the sample and diluents are to be weighed on an external balance not connected to the SMART Turbo System, press the operation key below "Ratio" to enter the dilution ratio.

External Balance Not Connected to SMART Trac II Instrument

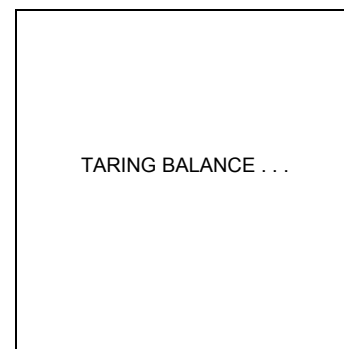
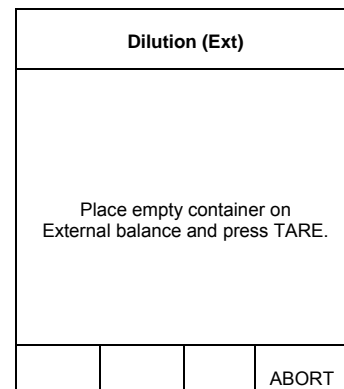
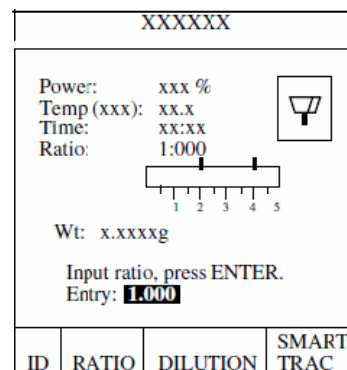
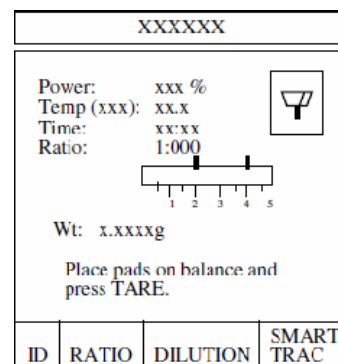
27. Lift the cover of the SMART Turbo System. Place two square glass fiber sample pads on the balance pan. Close the instrument cover.
28. Press TARE.
29. Using the numeric keys, enter the dilution ratio.
30. Press ENTER.

External Balance Connected to SMART Trac II Instrument

31. Press the operation key below "Dilution" to engage the external balance and activate the dilution menu.

32. Place an empty container suitable for the sample and diluents on the external balance. Wait for the weight to stabilize.
33. Press TARE.

34. Wait for the instrument to tare the weight of the container.



35. Place the sample in the container on the external balance pan.

36. Press READY.

Dilution (Ext)			
Add sample to container and press READY.			
			ABORT

The instrument reads and records the weight of the sample.

READING BALANCE . . .			
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37. Add the diluent to the sample in the container on the external balance pan.

38. Wait for the weight to stabilize.

39. Press READY.

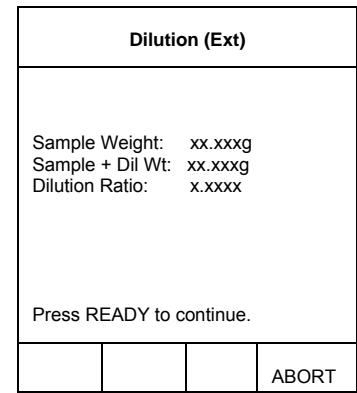
Dilution (Ext)			
Sample Wt: xx.xxxg			
Add diluent to container and press READY.			
			ABORT

40. The instrument reads and records the weight of the sample and diluents.

READING BALANCE . . .			
-----------------------	--	--	--

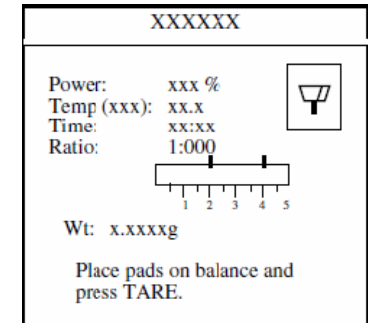
The instrument displays the weight of the sample, the weight of the sample and diluent, and the dilution ratio.

41. Press READY to continue the analysis.

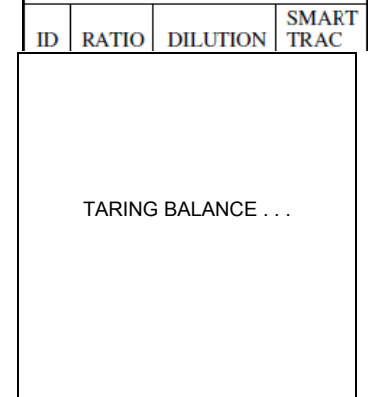


42. Lift the cover the SMART Turbo. Place two square glass fiber sample pads on the balance pan. Close the instrument cover.

43. Press TARE.



44. Wait for the instrument to tare the weight of the sample pads. The method test screen will reappear when the tare function is complete.



Note: The “T” in the lower left corner of the balance icon indicates that the weight of the sample pads has been tared.

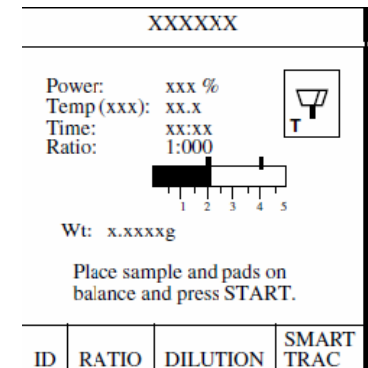
45. Lift the instrument cover. Remove the square pads from the sample pan.

46. Apply sample in a thin, even layer to one of the square sample pads and cover the sample with the second pad.

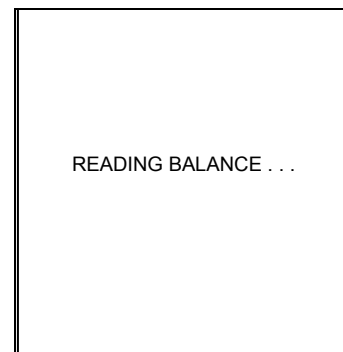
47. Quickly place the square sample pads back on the balance pan. Close the instrument cover.

48. Press START.

49.



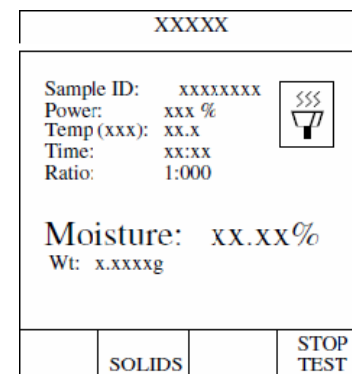
The instrument reads and records the initial weight of the sample prior to beginning the analysis.



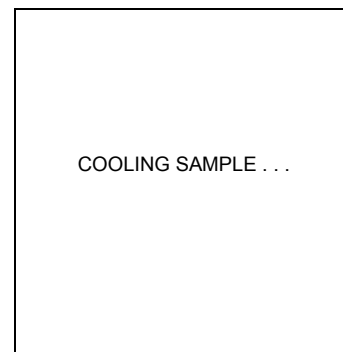
As the analysis begins, the flashing microwave indicators in the balance icon appear and the time begins counting (up for Constant Weight or down for Set Time). The sample weight decreases as the moisture is removed.

Note: Press the operation key below STOPTEST to end the analysis.

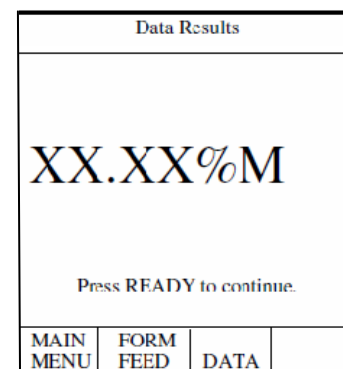
50. During the drying time, the operation key below SOLIDS may be pressed to display % solids or % moisture.



51. When the drying time is complete, five short beeps will be heard. The Cooling Sample screen will be displayed until the sample is cooled to 45 °C. The sample is cooled to allow optimal fat analysis. The Data Results screen will appear, displaying either the % moisture or % solids as selected.



52. Press READY to continue with the fat analysis.



53. Prepare (wrap) the sample in accordance with the instructions in the “Trac Station Sample Preparation” in this manual.

54. Press START.

The SMART Trac analyzes and records the total proton activity of fat present in the sample. The SMART Turbo then analyzes the data and calculates and displays the fat results.

XXXXXX			
Sample ID: xxxxxxxx Time: xx:xx			
Place sample in SMART Trac and press START or place pads on balance and press TARE.			
ID			SMART TRAC

PREPARING INSTRUMENT . . .

XXXXXX			
Sample ID: xxxxxxxx Time: xx:xx			
COLLECTING STANDARD DATA...			
ID			STOP TEST

55. Press ADD STANDARD.

56. Repeat steps xx through xx.

Note: CEM Corporation recommends performing and entering at least three (3) standards. A maximum of eight (8) standards can be entered.

57. Repeat steps xx through xx to create a second reference value.

Edit Standard – XX.XX%			
% Fat	S/M	Mass	
•1. ----	xxxx.xxxx	x.xxxx	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

Note: At least two (2) reference standards (high and low) are required to complete a method. Three (3) replicates of each standard must be performed. The SMART Trac system cannot complete the fat analysis without the required data.

As the replicates of the high and low standards are performed, screens similar to the ones on the right are displayed. Percent fat, number of proton counts (signal/mass) and unit sample weight (mass) are determined and recorded for each sample. As the result of each replicate is recorded, it is “tagged” with an asterisk.

Edit Standard – 50.00%			
% Fat	S/M	Mass	
*1. 50.00	3064.5804	2.1710	
2. 49.76	3020.2666	3.9581	
*3. 50.00	3064.5987	3.7406	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

58. Compare the calculated references for each replicate to the appropriate standard (high or low). “Untag” any reference that deviates from the acceptable range for the sample by pressing the number of the reference. The asterisk disappears. For example, if the standard for the sample is 33.00% and the acceptable range is 32.85% to 33.15%, untag any reference outside this range. “Untagging” a reference prevents the software from using that value for final sample calculations.

59. To end the method, press “Exit” two times. The “Writing Standards Data” screen will appear, followed by the Main Menu

Edit Standard – 33.00%			
% Fat	S/M	Mass	
*1. 33.06	2023.0021	2.7868	
*2. 32.94	2015.4405	2.6401	
3. 32.49	1907.6087	3.3361	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

Moisture/Fat/Protein NMR

Note: Refer to the Setup section of the operation manual for the SMART Turbo to ensure that the applicable external balance is selected.

NOTE

To create a new Moisture/Fat/NMR method, it is necessary to have at least two samples –one at the high end of the fat range and one at the low end of the fat range with reference extraction values. These values are necessary to ensure valid data points in the method.

1. With the CEM Main Menu displayed, press “2” to activate the Edit/Create Method screen.

CEM Main Menu			
1. QUICK TEST 2. EDIT/CREATE METHOD 3. LOAD METHOD 4. SETUP 5. PRINT 6. STATISTICS 7. SMART Trac II Press item number to select. METHOD - XXXXXXXX			

2. Press “1” to create a new method.

Edit/Create Method			
1. NEW METHOD 2. TEMP VERIFY 2. POWER TEST 3. STD SOLUTION 4. BUTTER 5. CHEESE 6. EGGS 7. ICE CREAM Press item number to select.			
			NEXT PAGE

3. Using the operation keys below the arrows, select the first letter or number of the method name.
4. Press ENTER.
5. Continue using the operation keys to select each letter or number of the method name. Press ENTER after each selection until the entire method name is selected (16characters maximum).

Note: If the method name utilizes numbers only, use the numeric keypad to enter the numbers for the name.

6. Press READY.

METHOD NAME:			
0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Space Delete			
Highlight choice, press ENTER.			
Press READY to continue.			
←	→	↑	↓

7. Press "1" to toggle and select "Moisture/Fat/Protein NMR."
8. Press "2" to toggle and select "Constant Weight" or "Set Time."
9. Press "3" to toggle the turbo mode "On" or "Off."

Note: The instrument default for "Turbo" is "On."

10. Press READY.

11. Press "1" to select "Standard."

12. Press the numbers (1 - 7 Constant Weight or 1 - 5 Set Time) and enter the appropriate method parameters.

Note: Refer to the QUICK TEST section of the SMART Turbo operation manual for instructions for entering method parameters for Constant Weight and Set Time.

13. Press the operation key below NEXT PAGE to access additional method parameters.

Edit Method			
1. CALCULATION MODE: MOISTURE/FAT PROTEIN NMR 2. TIME PARAMETER: CONSTANT WEIGHT 3. "TURBO": ON Press item number to select. Press READY to continue.			
MAIN MENU		PREV PAGE	

Moisture/Fat/Protein NMR			
1. STANDARD 2. DILUTIONS 3. SYRINGE WEIGH Press item number to select.			
MAIN MENU		PREV PAGE	

Std M/F/P NMR			
Moisture Parameters 1. POWER: 0% 2. DELTA WEIGHT: 0.0 mg 3. DELTA TIME: 0 secs 4. MAX TIME: 10 mins 5. BIAS: ±0.00% 6. MIN RESULT: 0.00% 7. MAX RESULT: 100.00% Press item number to select or NEXT PAGE for more menu items			
MAIN MENU		PREV PAGE	NEXT PAGE

Std M/F/P NMR			
Moisture Parameters 1. POWER: 0% 2. DRY TIME: 00:00 min:sec 3. BIAS: ±0.00% 4. MIN RESULT: 0.00% 5. MAX RESULT: 100.0% Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

C
O
N
S
T
A
N
T

W
E
I
G
H
T

S
E
T

T
I
M
E

14. Press the numbers (1 – 5) and enter the appropriate method parameters.

Note: Press the operation key below PREV PAGE to return to the moisture parameters screen.

15. Press the operation key below NEXT PAGE.

16. Press "1" to toggle from "<1.0%" to "<80%" to ">80%."

Note: A fat bias may be required on a method that has been copied from a method for a similar product. The bias is defined as the difference between the reference method results and the SMART Trac results obtained on the copied method.

17. Press "2" to enter a fat bias.

18. Using the numeric keys, enter the desired fat bias.

19. Press "3" to enter a warm-up delay time.

Note: A warm-up delay is used to permit temperature stabilization for heat sensitive samples.

20. Using the numeric keys, enter the desired warm-up delay time (1 - 60 minutes).

Std M/F/P NMR			
1. ASH + CARB: +0.00% 2. MAX TEMP: XXX C 3. MIN WT RANGE: X.XXg 4. MAX WT RANGE: X.XXg 5. WT COMPENSATION: OFF			
Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

Std M/F/P NMR			
→1. FAT RANGE: >8.0% 2. FAT BIAS: +X.XX 3. WARMUP DELAY: XX 4. RUN TIME: XX			
Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

Std M/F/P NMR			
1. FAT RANGE: >1.0% → 2. FAT BIAS: +X.XX 3. WARMUP DELAY: XX 4. RUN TIME: XX			
Input bias, press ENTER. Entry: +00			
MAIN MENU	+/-	PREV PAGE	NEXT PAGE

Std M/F/P NMR			
1. FAT RANGE: >1.0% 2. FAT BIAS: +X.XX → 3. WARMUP DELAY: XX 4. RUN TIME: XX			
Input warm-up delay, press ENTER. Entry: 00			
MAIN MENU		PREV PAGE	NEXT PAGE

21. Press “4” to toggle and select a run time of “8” or “64.”

22. Press the operation key below “Next Page.”

Std M/F/P NMR			
1. FAT RANGE: >1.0% 2. FAT BIAS: +X.XX 3. WARMUP DELAY: XX → 4. RUN TIME: XX			
Input warm-up delay, press ENTER. Entry: 00			
MAIN MENU		PREV PAGE	NEXT PAGE

WRITING STANDARDS DATA . . .

23. Press the operation key below “Add” to enter a reference for the sample.

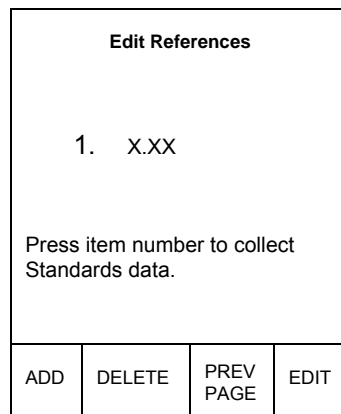
Edit References			
Press ADD to enter a new Reference.			
ADD	DELETE	PREV PAGE	EDIT

24. Using the numeric keys, enter a reference value determined by the AOAC or reference extraction method.

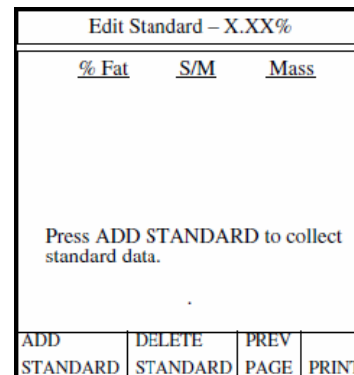
Note: At least two AOAC or reference extraction methods must be performed using a high and low fat content sample to establish high and low reference values.

Edit References			
Press ADD to enter a new reference. Entry: xxx.xx			
ADD	DELETE	PREV PAGE	EDIT

25. Press the item number of the standard to collect.

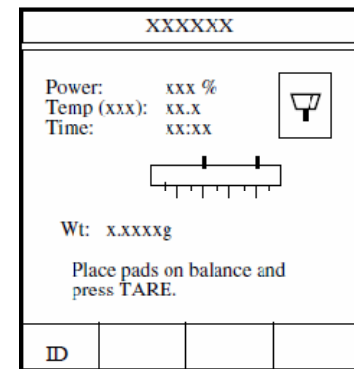


26. Press the operation key below “Add Standard.”

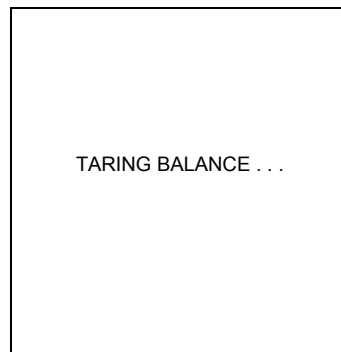


27. Lift the cover of the SMART Turbo System. Place two square glass fiber sample pads on the balance pan. Close the instrument cover.

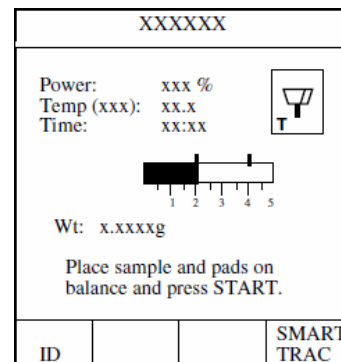
28. Press TARE.



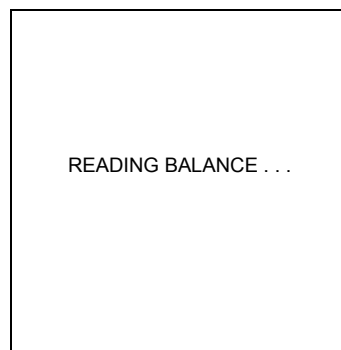
29. Wait for the instrument to tare the weight of the sample pads. The method test screen will reappear when the tare function is complete.



30. Lift the instrument cover. Remove the square pads from the sample pan.
31. Apply sample in a thin, even layer to one of the square sample pads and cover the sample with the second pad.
32. Quickly place the square sample pads back on the balance pan. Close the instrument cover.
33. Press START.



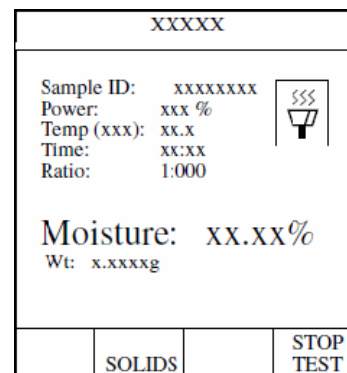
The instrument reads and records the initial weight of the sample prior to beginning the analysis.



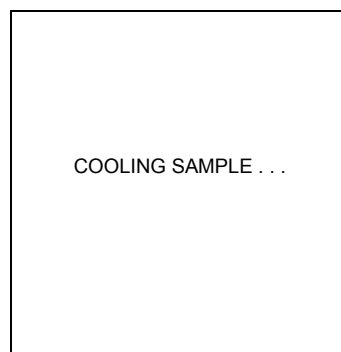
As the analysis begins, the flashing microwave indicators in the balance icon appear and the time begins counting (up for Constant Weight or down for Set Time). The sample weight decreases as the moisture is removed.

Note: Press the operation key below STOP TEST to end the analysis.

34. During the drying time, the operation key below SOLIDS may be pressed to display % solids or % moisture.



35. When the drying time is complete, five short beeps will be heard. The Cooling Sample screen will be displayed until the sample is cooled to 45 C. The sample is cooled to allow optimal fat analysis. The Data Results screen will appear, displaying either the % moisture or % solids as selected.



36. Press READY to continue with the fat analysis.

Data Results			
XX.XX%M			
Press READY to continue.			
MAIN MENU	FORM FEED	DATA	

37. Prepare (wrap) the sample in accordance with the instructions in the “Trac Station Sample Preparation” in this manual.

38. Press START.

The SMART Trac analyzes and records the total proton activity of fat present in the sample. The SMAR Turbo then analyzes the data and calculates and displays the fat results.

XXXXXX			
Sample ID:	xxxxxxx		
Time:	xx:xx		
Place sample in SMART Trac and press START or place pads on balance and press TARE.			
ID			SMART TRAC

39. Press the operation key below “Add Standard.”

40. Repeat steps xx through xx.

Note: CEM Corporation recommends performing and entering at least three (3) standards. A maximum of eight (8) standards can be entered.

41. Repeat steps xx through xx to create a second reference value.

Edit Standard – XX.XX%			
% Fat	S/M	Mass	
*1. ----	xxxx.xxxx	x.xxxx	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

Note: At least two (2) reference standards (high and low) are required to complete a method. Three (3) replicates of each standard must be performed. The SMART Trac cannot complete the fat analysis without the required data.

As the replicates of the high and low standards are performed, screens similar to the ones on the right are displayed. Percent fat, number of proton counts (signal/mass) and unit sample weight (mass) are determined and recorded for each sample. As the result of each replicate is recorded, it is “tagged” with an asterisk.

Edit Standard – 50.00%			
% Fat	S/M	Mass	
*1. 50.00	3064.5804	2.1710	
2. 49.76	3020.2666	3.9581	
*3. 50.00	3064.5987	3.7406	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

42. Compare the calculated references for each replicate to the appropriate standard (high or low). “Untag” any reference that deviates from the acceptable range for the sample by pressing the number of the reference. The asterisk disappears. For example, if the standard for the sample is 33.00% and the acceptable range is 32.85% to 33.15%, untag any reference outside this range. “Untagging” a reference prevents the software from using that value for final sample calculations.
43. To end the method, press “Exit” two times. The “Writing Standards Data” screen will appear, followed by the Main Menu.

Edit Standard – 33.00%			
	% Fat	S/M	Mass
*1.	33.06	2023.0021	2.7868
*2.	32.94	2015.4405	2.6401
3.	32.49	1907.6087	3.3361
Press item number to select or READY to display graph.			
ADD	DELETE	PREV	
STANDARD	STANDARD	PAGE	PRINT

Fat NMR - Standard

Note: When testing for fat results only, the sample weight can be recorded using the internal balance, an external balance, or can be entered manually. If using an external balance, ensure that the appropriate external balance is selected in System Options (Setup).

1. With the CEM Main Menu displayed, press "2" to activate the Edit/Create Method screen.

CEM Main Menu			
1. QUICK TEST 2. EDIT/CREATE METHOD 3. LOAD METHOD 4. SETUP 5. PRINT 6. STATISTICS 7. SMART Trac II Press item number to select. METHOD - XXXXXXXX			

2. Press "1" to create a new method.

Edit/Create Method			
1. NEW METHOD 2. TEMP VERIFY 2. POWER TEST 3. STD SOLUTION 4. BUTTER 5. CHEESE 6. EGGS 7. ICE CREAM Press item number to select.			
			NEXT PAGE

3. Using the operation keys below the arrows, select the first letter or number of the method name.
4. Press ENTER.
5. Continue using the operation keys to select each letter or number of the method name. Press ENTER after each selection until the entire method name is selected (16 characters maximum).

Note: If the method name utilizes numbers only, use the numeric keypad to enter the numbers for the name.

6. Press READY

METHOD NAME:			
0 1 2 3 4 5 6 7 8 9 A B C D E F G H I J K L M N O P Q R S T U V W X Y Z Space Delete			
Highlight choice, press ENTER.			
Press READY to continue.			
←	→	↑	↓

7. Press "1" to select "Fat/NMR."

8. Press READY.

Edit Method			
1. CALCULATION MODE: FAT/NMR			
Press item number to select. Press READY to continue.			
MAIN MENU		PREV PAGE	

9. Press "1" to select and enter a fat bias.

Note: A fat bias may be required on a method that has been copied from a method for a similar product. The bias is defined as the difference between the reference method results and the SMART Trac results obtained on the copied method.

Fat NMR			
→ 1. FAT BIAS: +X.XX 2. WARMUP DELAY: XX 3. RUN TIME: XX			
Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU		PREV PAGE	NEXT PAGE

10. Using the numeric keys, enter the required fat bias.

11. Press ENTER.

Fat NMR			
→ 1. FAT BIAS: +X.XX 2. WARMUP DELAY: XX 3. RUN TIME: XX			
Input fat bias, press ENTER. Entry: +0.0			
MAIN MENU	+/-	PREV PAGE	NEXT PAGE

12. Press "2" to select and enter a warm-up delay time.

13. Using the numeric keys, enter the desired warm-up delay time (1 – 60 minutes).

14. Press ENTER.

Fat NMR			
1. FAT BIAS: +X.XX → 2. WARMUP DELAY: XX 3. RUN TIME: XX			
Input warm-up delay, press ENTER. Entry: 00			
MAIN MENU		PREV PAGE	NEXT PAGE

15. Press "3" to toggle and select a run time of "8" or "64."

16. Press the operation key below "Next Page."

Fat NMR			
1. FAT BIAS: +X.XX 2. WARMUP DELAY: XX → 3. RUN TIME: XX			
Input warm-up delay, press ENTER. Entry: 00			
MAIN MENU		PREV PAGE	NEXT PAGE

Reference Value Setup

The Reference Values - one high and one low value - established by the long extraction methods should be entered. Once the high and low values are entered, at least 3 - 8 readings for each of the reference values should be entered. This setup establishes the accuracy of the method; therefore, all information should be as accurate as possible.

WRITING STANDARDS DATA. . .

READING STANDARDS DATA. . .

17. Press the operation key below ADD to enter a reference for the sample.

Edit References			
Press ADD to enter a new Reference.			
ADD	DELETE	PREV PAGE	EDIT

18. Using the numeric keys, enter a reference value determined by the AOAC or reference extraction method.

Note: At least two AOAC or reference extraction methods must be performed using a high and low fat content sample to establish high and low reference values.

Edit References			
Input reference, press ENTER. Entry: xxx.xx			
ADD	DELETE	PREV PAGE	EDIT

19. Press "1."



Edit References			
1. XXX.XX			
Press item number to collect Standards data.			
ADD	DELETE	PREV PAGE	EDIT

20. Press the operation key below "Add Standard."

Note: To continue to determine standards data, proceed with step 22 below.

Edit Standard – X.XX%			
<u>% Fat</u> <u>S/M</u> <u>Mass</u>			
Press ADD STANDARD to collect standard data.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

21. If Autotrack is turned off and a sample identification name or number is required, press the operation key below ID.

XXXXXX			
Power:	xxx %		
Temp (xxx):	xx.x		
Time:	xx:xx		
			
Wt: xxxxxg			
Place pads on balance and press TARE.			
ID			

- Using the operation keys below the arrows, position the cursor on (select) the first number or letter of the sample identification. Press ENTER. Continue to position the cursor on each letter or number and press ENTER until the identification is complete.

- Press READY.

Note: If using an identification number only, use the numeric keys to enter the number and press ENTER.

Note: The sample weight can be recorded using the internal balance of the instrument, an external balance, or it can be recorded manually. To use the internal balance, continue with step 24. To use an external balance, proceed to step 34. To enter the sample weight manually, proceed to step 45.


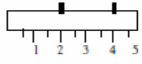
Internal Balance

- Lift the cover of the SMART Turbo. Place two square glass fiber sample pads on the balance pan. Close the instrument cover.

- Press TARE.

- Wait for the instrument to tare the weight of the sample pads. The method test screen will reappear when the tare function is complete.

SAMPLE ID			
0	1	2	3
4	5	6	7
8	9	A	B
C	D	E	F
G	H	I	J
K	L	M	N
O	P	Q	R
S	T	U	V
W	X	Y	Z
Space		Delete	
Highlight choice, press ENTER.			
Press READY to continue.			
←	→	↑	↓

XXXXXX			
Time:	xx:xx		
			
Wt:	x.xxxxg		
Place pads on balance and press TARE.			
ID		INITIAL WEIGHT	SMART

Trac			
TARING BALANCE . . .			

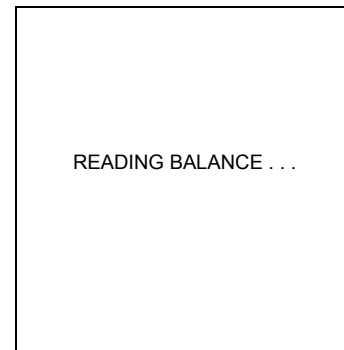
- Lift the instrument cover. Remove the square pads from the sample pan.

- Apply sample in a thin, even layer to one of the square sample pads and cover the sample with the second pad.

- Quickly place the square sample pads back on the balance pan. Close the instrument cover.

- Press READY.

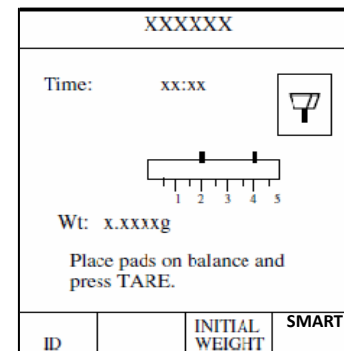
- 31. The instrument reads and records the initial weight of the sample prior to beginning the analysis.
- 32. Lift the instrument cover. Remove the pads from the sample pan.
- 33. Proceed to step 50.



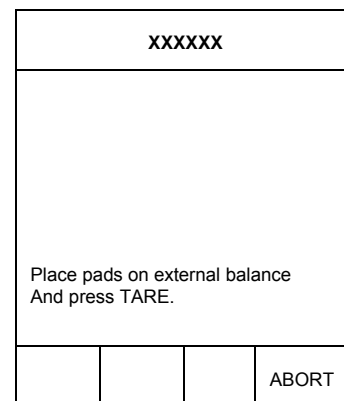
External Balance

Note: If using an external balance, ensure that the appropriate external balance is selected in System Options (Setup).

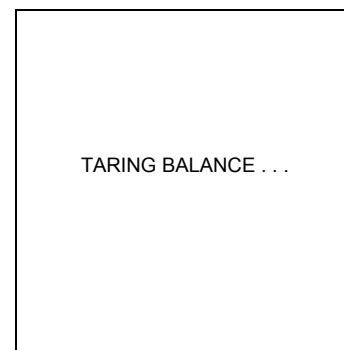
- 34. Press the operation key below “Initial Weight.”
- 35. Place two square glass fiber sample pads on the external balance pan.
- 36. Press TARE.



Note: Press “Abort” to end the weighing on the external balance.



- 37. Wait for the instrument to tare the weight of the sample pads.



38. Remove the square pads from the external balance.
39. Apply sample in a thin, even layer to one of the square sample pads and cover the sample with the second pad.
40. Quickly place the square sample pads back on the external balance.
41. Press READY.

XXXXXX			
Place sample on external balance And press READY.			
			ABORT

42. The instrument reads and records the initial weight of the sample prior to beginning the analysis.
43. Remove the pads and sample from the external balance.
44. Proceed to step 50.

READING BALANCE . . .

Manual Entry of Sample Weight

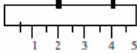
Note: If using manual entry, ensure that the external balance setting is selected as "None" in System Options (Setup).

45. Press the operation key below "Initial Weight."
46. Using the numeric keys, enter the weight of the sample.
47. Verify that the proper weight has been entered.
48. Press ENTER.
49. Proceed to step 50.

XXXXXX			
Time: xx:xx			
Wt: x.xxxxg			
Place pads on balance and press TARE.			
ID		INITIAL WEIGHT	SMART

XXXXXX			
Time: xx:xx			
Wt: x.xxxxg			
Input weight, press ENTER. Entry: 00.0000			
ID		INITIAL WEIGHT	SMART

50. Prepare (wrap) the sample in accordance with the instructions in the "Trac Station Sample Preparation" in this manual.
51. Place the Trac tube with the pressed sample pads into the sample area of the SMART Trac II magnet
52. Press START.

XXXXXX			
Time: xx:xx			
			
Place sample in SMART Trac and press START.			
		INITIAL WEIGHT	SMART TRAC

PREPARING INSTRUMENT . . .

The SMART Trac II analyzes and records the total proton activity of fat present in the sample. The SMART Turbo then analyzes the data and calculates and displays the fat results.

53. Press EXIT.

XXXXXX			
Sample ID: xxxxxxxx			
Time: xx:xx			
COLLECTING STANDARD DATA...			
ID			STOP TEST

54. Press the operation key below "Add Standard" and repeat the procedures above.

Note: CEM Corporation recommends performing and entering at least three (3) standards. A maximum of eight (8) standards can be entered.

Edit Standard – XX XX%			
	% Fat	S/M	Mass
•1.	-----	xxxx.xxxx	x.xxxx
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

Note: At least two (2) reference standards (high and low) are required to complete a method. At least three (3) replicates of each standard must be performed. The SMART Trac II cannot complete the fat analysis without the required data.

As the replicates of the standards are collected, screens similar to the ones on the right are displayed. Percent fat, number of proton counts (signal/mass) and unit sample weight (mass) are determined and recorded for each sample. As the result of each replicate is recorded, it is “tagged” with an asterisk.

55. Compare the calculated references for each replicate to the appropriate standard (high or low). “Untag” any reference that deviates from the acceptable range for the sample by pressing the number of the reference. The asterisk disappears. For example, if the standard for the sample is 33.00% and the acceptable range is 32.85% to 33.15%, untag any reference outside this range. “Untagging” a reference prevents the software from using that value for final sample calculations.

56. To complete the method, press EXIT two times. The “Writing Standards Data” screen appears, followed by the Main Menu.

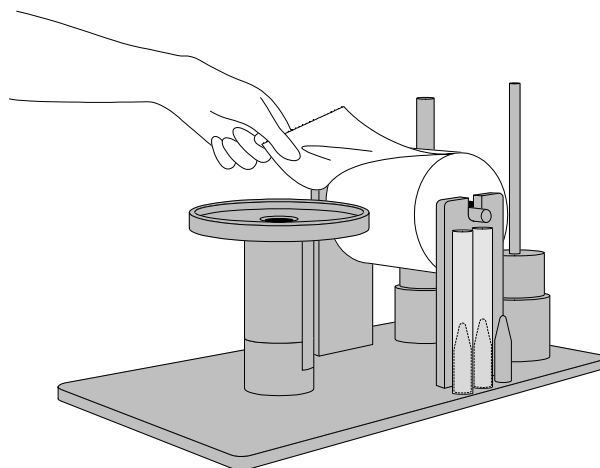
Edit Standard – 50.00%			
% Fat	S/M	Mass	
*1. 50.00	3064.5804	2.1710	
2. 49.76	3020.2666	3.9581	
*3. 50.00	3064.5987	3.7406	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT
Edit Standard – 33.00%			

% Fat	S/M	Mass	
*1. 33.06	2023.0021	2.7868	
*2. 32.94	2015.4405	2.6401	
3. 32.49	1907.6087	3.3361	
Press item number to select or READY to display graph.			
ADD STANDARD	DELETE STANDARD	PREV PAGE	PRINT

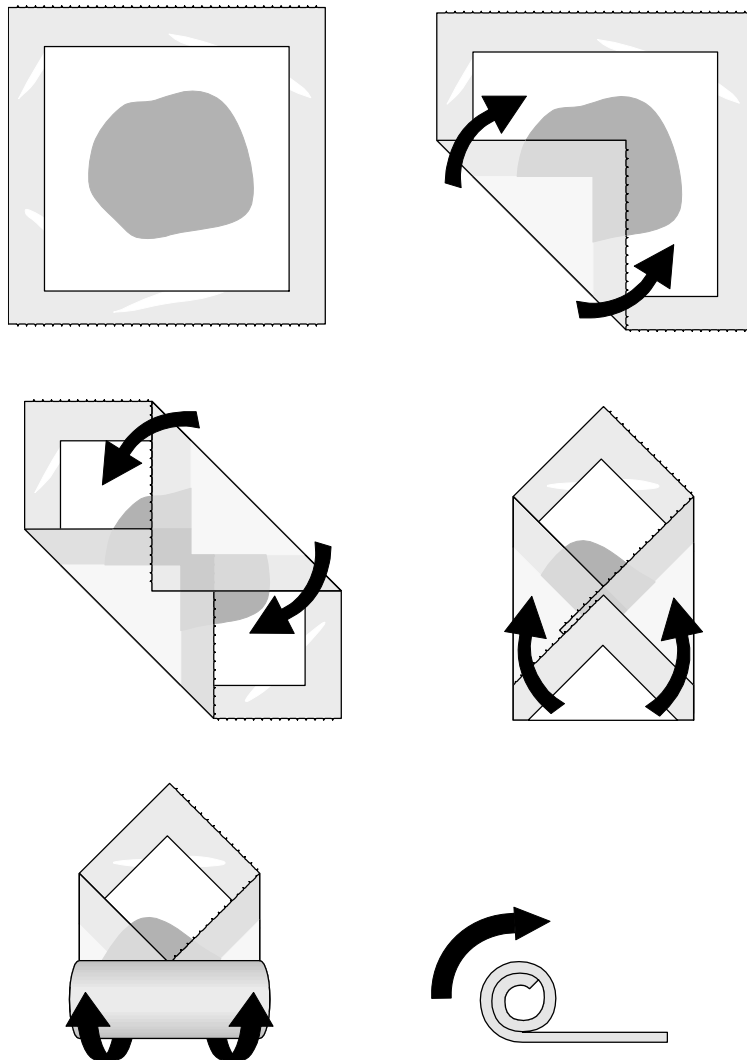
WRITING STANDARDS DATA . . .

Trac Station Sample Preparation

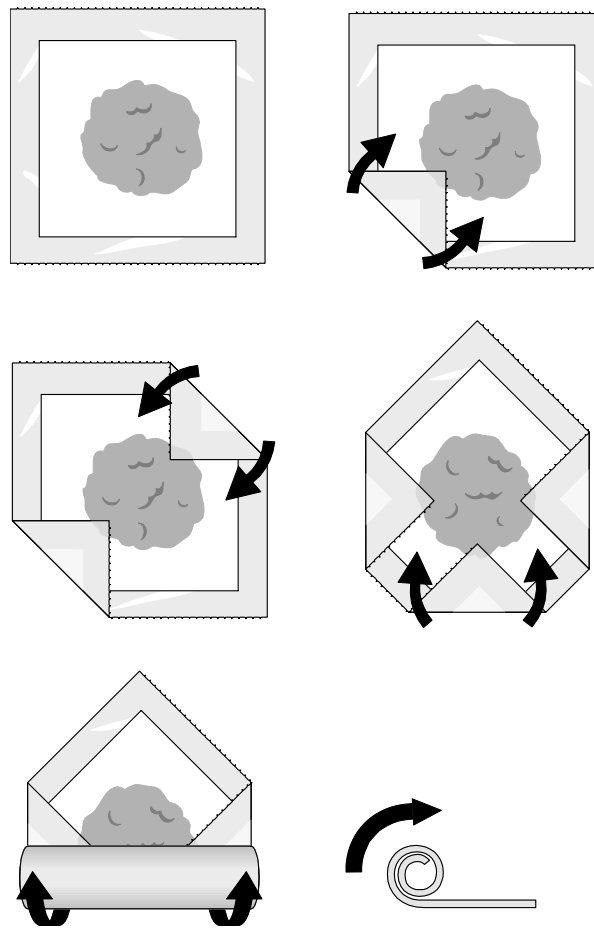
1. Remove and place one sheet of Trac Film on the platform of the Trac Station.
2. Lift the cover of the SMART Turbo and remove the pads from the balance pan.



3. Place the two square pads and dried sample in the center of the Trac Film.
4. Prepare the sample pads. Fold the left corner of the film and pads as illustrated. Fold the right corner. Pull the lower edge of the film and sample pads toward the top and begin to roll them into a tube.

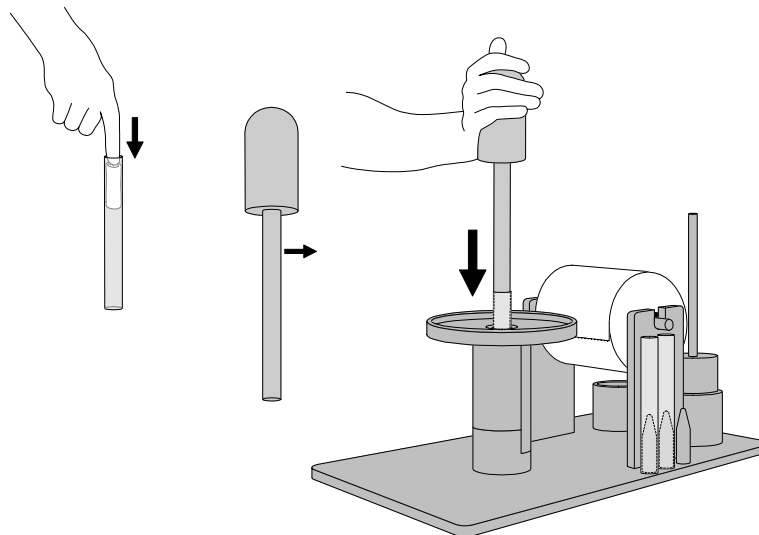


Note: For samples that are rigid after drying and more difficult to roll into a cylinder, prepare the pads as illustrated.

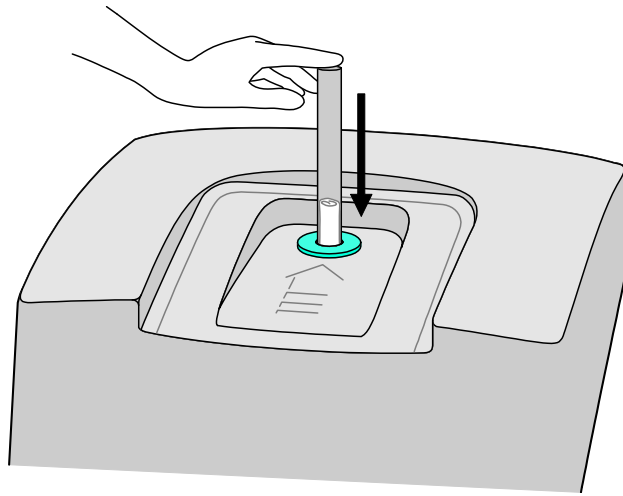


5. Position the wrapped tube sample into the Trac tube. Carefully press the sample into the bottom of the tube with the Trac Station press. The sample should be pressed firmly to ensure that the sample is positioned in the appropriate analysis area.

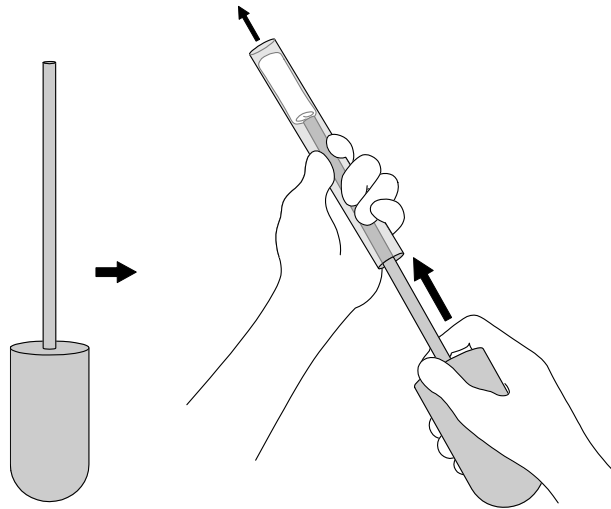
Note: The Trac Station has a mark to verify the height of the sample in the tube.



6. Place the Trac tube with the pressed sample pads into the sample area of the SMART Trac magnet.



7. Press the sample pads out of the Trac Tube.



Load/Run Method

1. Press "3" to select and load a method for use in an analysis.

CEM Main Menu			
1. QUICK TEST 2. EDIT/CREATE METHOD 3. LOAD METHOD 4. SETUP 5. PRINT 6. STATISTICS 7. SMART Trac II Press item number to select or READY to run test.			

2. Press the item number of the method to be loaded.


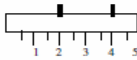
Load Method			
1. NEW METHOD 2. TEMP VERIFY 2. POWER TEST 3. STD SOLUTION 4. BUTTER 5. CHEESE 6. EGGS 7. ICE CREAM Press item number to select or READY to run test.			
			NEXT PAGE

When the CEM Main Menu returns to the screen, the selected method will be displayed.

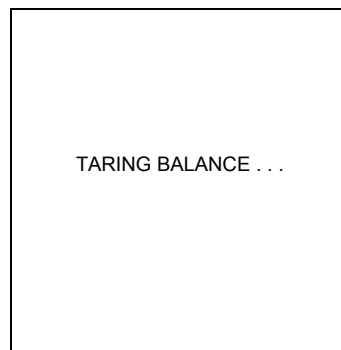
3. Press READY to display the initial screen of the selected method.

CEM Main Menu			
1. QUICK TEST 2. EDIT/CREATE METHOD 3. LOAD METHOD 4. SETUP 5. PRINT 6. STATISTICS 7. SMART Trac II Press item number to select. METHOD - XXXXXXXX			

4. Lift the cover of the SMART Turbo. Place two square glass fiber sample pads on the balance pan. Close the instrument cover.
5. Press TARE.

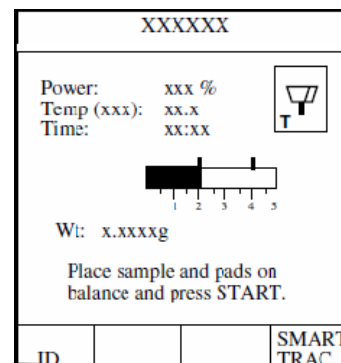
XXXXXX			
Time: xx:xx			
			
Wt: x.xxxxg			
Place pads on balance and press TARE.			
ID		INITIAL WEIGHT	

- Wait for the instrument to tare the weight of the sample pads. The method test screen will reappear when the tare function is complete.

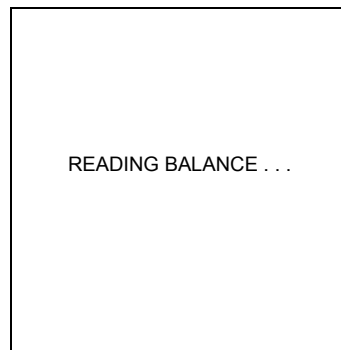


Note: The “T” in the lower left corner of the balance icon indicates that the weight of the sample pads has been tared.

- Lift the instrument cover. Remove the square pads from the sample pan.
- Apply sample in a thin, even layer to one of the square sample pads and cover the sample with the second pad.
- Quickly place the square sample pads back on the balance pan. Close the instrument cover.
- Press START.



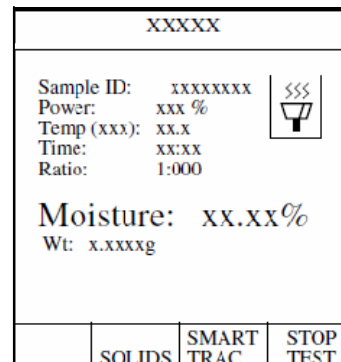
The instrument reads and records the initial weight of the sample prior to beginning the analysis.



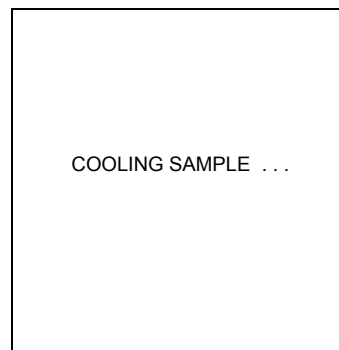
As the analysis begins, the flashing microwave indicators in the balance icon appear and the time begins counting (up for Constant Weight or down for Set Time). The sample weight decreases as the moisture is removed.

Note: If necessary, press the operation key below STOP TEST to end the analysis.

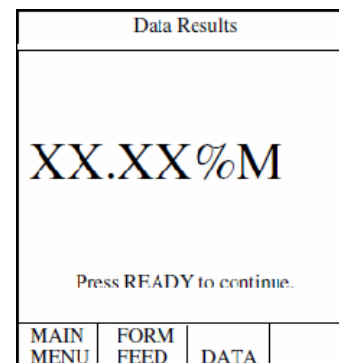
During the drying time, the operation key below SOLIDS may be pressed to display % solids or% moisture.



When the drying time is complete, five short beeps will be heard. The Cooling Sample screen will be displayed until the sample is cooled to 45°C. The Data Results screen will appear, displaying either the % moisture or % solids as selected.



11. Press READY to continue with the fat analysis.
12. Prepare (wrap) the sample in accordance with the instructions in the "Trac Station Sample Preparation" in this manual.
13. Place the Trac tube with the pressed sample pads into the sample area of the magnet.



14. Press START.

The SMART Trac analyzes and records the total proton activity of fat present in the sample. The SMART Turbo then analyzes the data and calculates and displays the fat results.

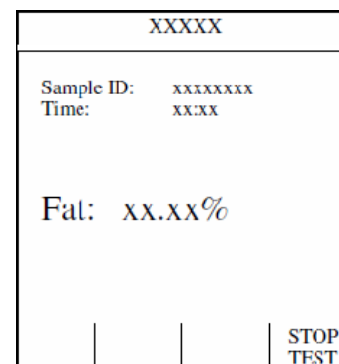
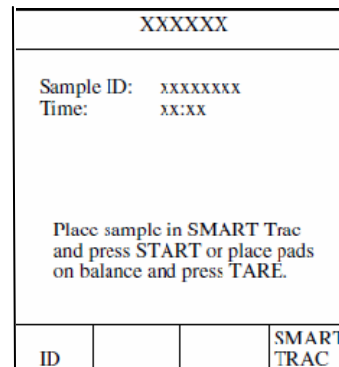
Alternate Mode

Same Method: Press TARE to dry additional samples using the same method. Place the pads and sample on the balance and press START. Once the moisture analysis begins, press SMART TRAC and recall the previous sample ID. Place that sample in the SMART Trac and press READY. The fat results will be displayed at the top of the SMART Turbo screen.

Different Method: To access a different method when using the alternate mode, press "Exit." Press "Load Method" and select the appropriate method. Then begin the drying process. Once the moisture analysis begins, press SMART TRAC and recall the previous sample ID. Place that sample in the SMART Trac and press READY. The fat results will be displayed at the top of the SMART Turbo screen.

Note: If necessary, press the operation key below STOP TEST to end the analysis.

Note: Press READY to analyze additional samples using the same method.



Note: Press the operation below “Form Feed” to advance paper from the internal printer.

15. Press the operation key below “Data” to display the analysis data.

Data Results			
<p>XX.XX%F</p> <p>Press READY to continue.</p>			
MAIN MENU	FORM FEED	DATA	PRINT

16. Press the operation key below “Sample Weights” to display the weight data.

Data Results			
<p>Sample ID: XXXXXXXX</p> <p>Dry Time: XX:XX</p> <p>Moisture: XX.XX%</p> <p>Redry Time: XX:XX</p> <p>Fat: XX.XX%</p> <p>Press READY to continue.</p>			
MAIN MENU	FORM FEED	SAMPLE WEIGHTS	PRINT

Note: If performing a moisture/fat/protein analysis, the data results screen will also provide the % protein of the sample.

Data Results			
<p>Sample ID: XXXXXXXX</p> <p>Dry Time: XX:XX</p> <p>Moisture: XX.XX%</p> <p>Redry Time: XX:XX</p> <p>Fat: XX.XX%</p> <p>Protein: x.xx%</p> <p>Press READY to continue.</p>			
MAIN MENU	FORM FEED	SAMPLE WEIGHTS	PRINT

The Sample Weight Data screen displays the initial weight, the final weight and the differential weight.

Sample Weight Data			
<p>Initial Wt: x.xxxxg</p> <p>Final Wt: x.xxxxg</p> <p>Diff Wt: x.xxxxg</p> <p>End Wt: x.xxxxg</p> <p>M Bias: ±x.xx%</p> <p>F Bias: ±x.xx%</p> <p>Press READY to continue.</p>			
MAIN MENU		PREV PAGE	

Note: If performing a moisture/fat/protein analysis, the sample weight data screen will also display an ash and carbohydrate percentage.

17. Press the operation key below “Prev Page” to return to the Data Results screen.

Sample Weight Data			
Initial Wt:	x.xxxxg		
Final Wt:	x.xxxxg		
Diff Wt:	x.xxxxg		
End Wt:	x.xxxxg		
M Bias:	±x.xx%		
F Bias:	±x.xx%		
Ash + Carb:	±x.xx%		
Press READY to continue.			
MAIN MENU		PREV PAGE	

18. Press the operation key below PRINT to print the analysis results either on the internal printer or an external printer, if installed.

Note: Press READY to analyze additional samples using the same method

19. Press the operation key below “Main Menu” to end the analysis and return to the CEM Main Menu screen.

Data Results			
Sample ID:	XXXXXXXXXX		
Dry Time:	XX:XX		
Moisture:	XX.XX%		
Redry Time:	XX:XX		
Fat:	XX.XX%		
Press READY to continue.			
MAIN MENU	FORM FEED	SAMPLE WEIGHTS	PRINT

SMART Trac

1. From the Main Menu, press “7” to activate SMART Trac.

CEM Main Menu			
1. QUICK TEST 2. EDIT/CREATE METHOD 3. LOAD METHOD 4. SETUP 5. PRINT 6. STATISTICS 7. SMART Trac II			
Press item number to select or READY to run test.			

Frequency Optimization

2. Press “1” to access the “Frequency Optimization” screen.

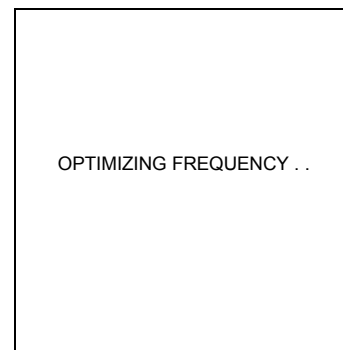
SMART Trac II			
1. FREQUENCY OPTIMIZATION 2. PULSE WIDTH OPTIMIZATION 3. EDIT METHOD STANDARDS 4. IMPORT METHOD 5. EXPORT METHOD 6. TYPE STANDARDIZATION 7. UNIT NORMALIZATION			
Press item number to select or NEXT PAGE for more items.			
			NEXT PAGE

3. Insert the oil test standard in the SMART Trac II magnet.
4. Press READY.

Frequency Optimization			
Insert the Oil Test Standard In magnet.			
Press READY to continue.			
MAIN MENU			

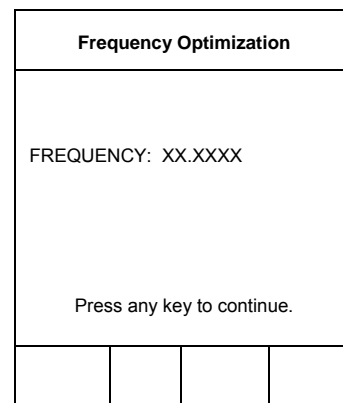
5. Wait for the instrument to optimize the frequency of the oil test standard.

Note: The optimization requires less than 1 minute.



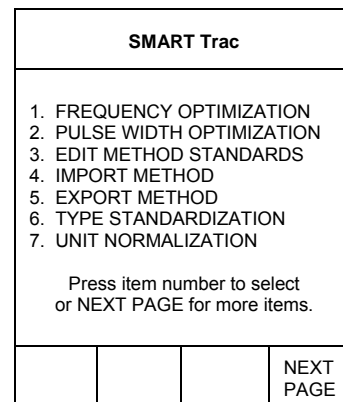
Note: If a reading is displayed, the system is ready for operation. If a reading is not displayed, an "optimize error" is reported. Contact CEM Service.

6. Press any key to return to the SMART Trac II screen.

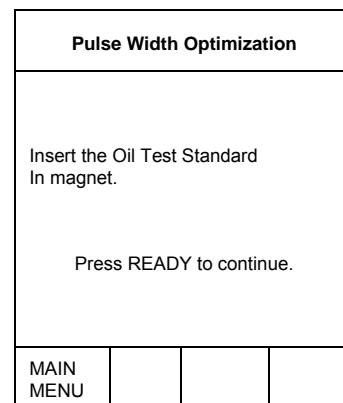


Pulse Width Optimization

7. Press "2" to perform a pulse width optimization.

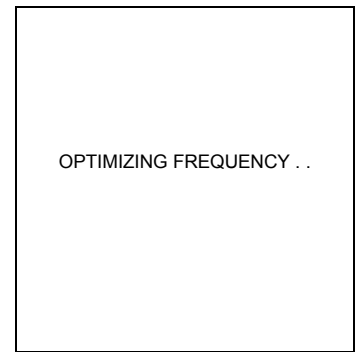


8. Insert the oil test standard in the SMART Trac II magnet.



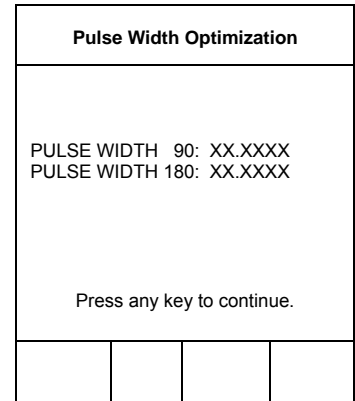
9. Wait for the instrument to optimize the frequency of the oil test standard.

Note: The optimization requires at least 10 minutes.



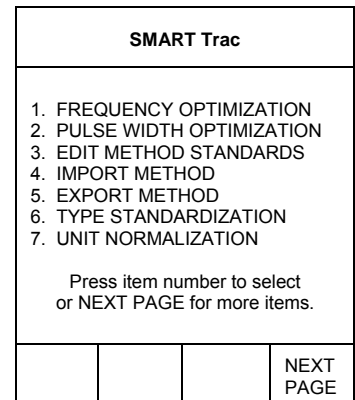
Note: If a reading is displayed, the system is ready for operation. If a reading is not displayed, an "optimize error" is reported. Contact CEM Service.

10. Press any key to return to the SMART Trac II screen.

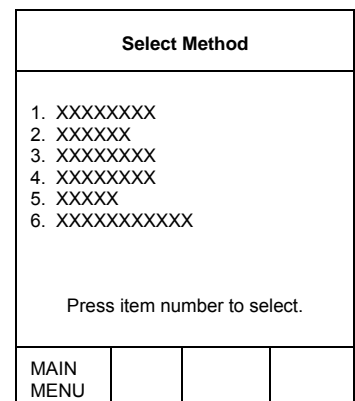


Edit Method Standards

11. Press "3" to access the "Edit Method Standards" screen.



12. Press the appropriate item number of the method for which setup standard(s) is to be added.



Import Method

13. Press "4" to access the "Import Method" screen.

SMART Trac II			
1. FREQUENCY OPTIMIZATION 2. PULSE WIDTH OPTIMIZATION 3. EDIT METHOD STANDARDS 4. IMPORT METHOD 5. EXPORT METHOD 6. TYPE STANDARDIZATION 7. UNIT NORMALIZATION			
Press item number to select or NEXT PAGE for more items.			
			NEXT PAGE

14. Insert the memory stick containing the method to import to the system software into the USB port of the processor module.

15. Press READY.

Import Method			
Insert memory stick in USB.			
Press READY to continue.			

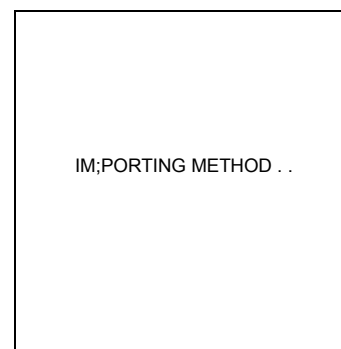
16. Wait while the system reads the information from the memory stick.

READING METHOD NAMES . .			
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17. Press the item number of the method to be imported from the memory stick.

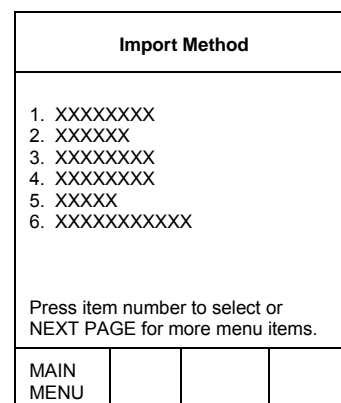
Import Method			
1. XXXXXXXX 2. XXXXXX 3. XXXXXXXX 4. XXXXXXXX 5. XXXXX 6. XXXXXXXXXXXX			
Press item number to select.			
MAIN MENU			

18. Wait for the SMART Trac II system to import the method information from the memory stick to the system software.



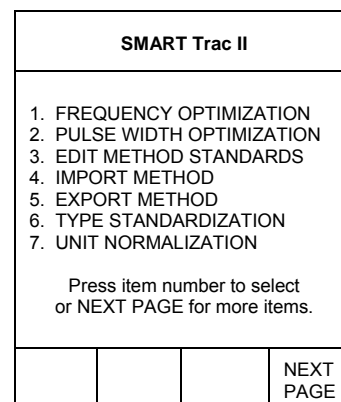
19. The software returns to the screen listing the items contained on the memory stick for additional importing, if desired.

20. Once the desired method(s) is imported from the memory stick, press EXIT to return the SMART Trac II screen.



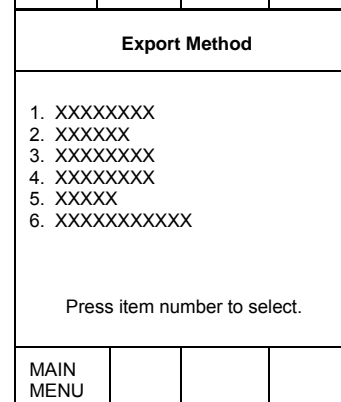
Export Method

21. Press "5" to access the "Export Method" screen.



22. Press the item number of the method to be exported to the memory stick.

Note: CEM Corporation recommends use of a new memory stick for any method backup.



23. Insert a memory stick on which to export the method information into the disk drive on the SMART Trac processor.

24. Press READY.

Export Method			
Insert memory stick in USB.			
Press READY to continue.			

25. Wait while the system exports the information to the memory stick.

EXPORTING METHOD . .			
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26. The software returns to the screen listing the items contained on the memory stick for additional importing, if desired.

27. Once the desired method(s) is exported from the system software to the memory stick, press EXIT to return the SMART Trac II screen.

Export Method			
1. XXXXXXXX			
2. XXXXXX			
3. XXXXXXXX			
4. XXXXXXXX			
5. XXXXX			
6. XXXXXXXXXXXX			
Press item number to select.			
MAIN MENU			

Type Standardization

28. Press "6" to access the "Type Standardization" screen.

Note: Type Standardization is a process of transferring an existing method from one unit to another. The accuracy of the transferred method is dependent on:

- collecting low and high reference samples with accurate results.
- Running replicates (at least 3) on the low and high reference samples on the SMART Trac.

29. Import and load the desired method as outlined in this manual.

30. Run replicates (at least 3) on the low and high reference sample as outlined in this manual.

31. Calculate mean for the low and high reference.

SMART Trac II			
1. FREQUENCY OPTIMIZATION			
2. PULSE WIDTH OPTIMIZATION			
3. EDIT METHOD STANDARDS			
4. IMPORT METHOD			
5. EXPORT METHOD			
6. TYPE STANDARDIZATION			
7. UNIT NORMALIZATION			
Press item number to select or NEXT PAGE for more items.			
MAIN MENU			NEXT PAGE

32. Press the item number of the method to be type standardized.

Select Method			
1. XXXXXXXX 2. XXXXXX 3. XXXXXXXX 4. XXXXXXXX 5. XXXXX 6. XXXXXXXXXXXX			
Press item number to select or NEXT PAGE for more menu items.			
MAIN MENU			

33. Enter the actual mean (SMART Trac results) and the expected mean (reference method) for both the low and high reference.

34. Press the function key below "Accept" to accept the values and perform a linear regression.

Note: Pressing "Clear" will cancel and erase the Type Standardization.

Type Standardization			
1. ACTUAL LOW: X.XX 2. EXPECTED LOW: X.XX 3. ACTUAL HIGH: X.XX 4. EXPECTED HIGH: X.XX			
Press item number to select.			
MAIN MENU		ACCEPT	CLEAR

35. Press EXIT to return to the SMART Trac II screen.

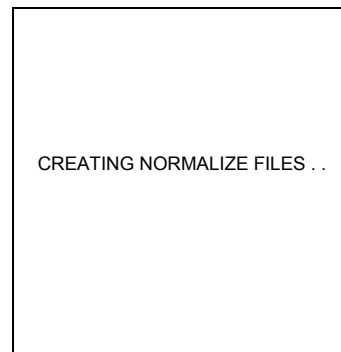
Type Standardization			
$Y = X.XXXX + X.XXXX$			
1. ACTUAL LOW: X.XX 2. EXPECTED LOW: X.XX 3. ACTUAL HIGH: X.XX 4. EXPECTED HIGH: X.XX			
Press item number to select.			
MAIN MENU		ACCEPT	CLEAR

Unit Normalization

36. Press "7" to access the "Unit Normalization" screen.

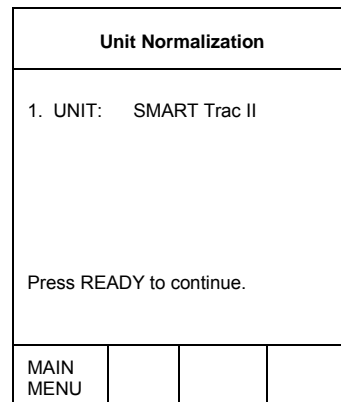
SMART Trac II			
1. FREQUENCY OPTIMIZATION 2. PULSE WIDTH OPTIMIZATION 3. EDIT METHOD STANDARDS 4. IMPORT METHOD 5. EXPORT METHOD 6. TYPE STANDARDIZATION 7. UNIT NORMALIZATION			
Press item number to select or NEXT PAGE for more items.			
			NEXT PAGE

37. Press READY.

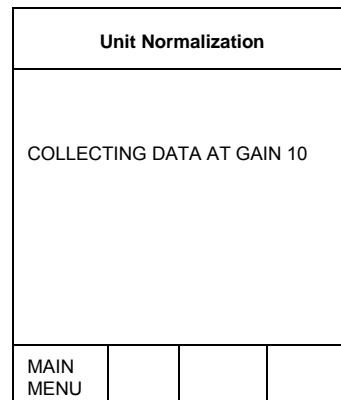
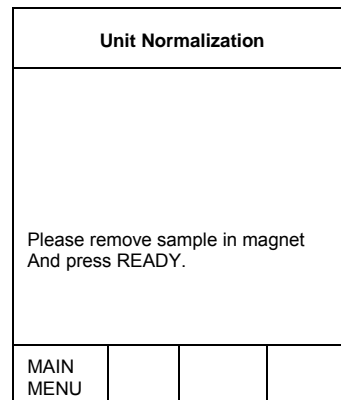


38. Remove the sample from the SMART Trac II magnet.

39. Press READY.



40. Wait approximately 1-1/2 – 2 minutes.



41. Wait approximately 1-1/2 – 2 minutes.

Unit Normalization			
COLLECTING DATA AT GAIN 25			
MAIN MENU			

42. Wait approximately 1-1/2 – 2 minutes.

Unit Normalization			
COLLECTING DATA AT GAIN 50			
MAIN MENU			

43. Wait for the standard to be temperature conditioned.

44. Insert the Normalization Standard into the SMART Trac II magnet.

45. Press READY.

Unit Normalization			
<p>The standard will be temperature Conditioned for 45 minutes Prior to data collection.</p> <p>Please insert Method Transfer Standard and press READY.</p>			
MAIN MENU			

Diagnostics

46. Press “1” to select “Diagnostics.”

SMART Trac II			
<ol style="list-style-type: none"> 1. DIAGNOSTICS 2. BACKUP 3. RESTORE 4. SOFTWARE UPDATE <p>Press item number to select.</p>			
		PREV PAGE	

47. Press "1" to select "System Check."

SMART Trac II Diagnostics			
1. SYSTEM CHECK 2. MAGNET HOMOGENEITY 3. MAGNET STABILITY 4. EXPORT LOG FILE 5. EXPORT DATA FILE Press item number to select.			
MAIN MENU			

The instrument software performs a system check and displays the results.

PERFORMING SYSTEM CHECK . .

48. Information displayed on the System Check screen can be printed or exported by pressing the operation keys below "Print" or "Export." Press the operation key below "Refresh" to update the results.

49. Press EXIT to returns to the "Diagnostics" screen.

SMART Trac II Diagnostics			
1. xx.x	2. xx.x	3. xx.x	4. xx.x
5. xx.x	6. x.x	7. x.x	8. xx.x
9. xx.x	10. xx.x	11. -x.x	12. -xx.x
13. x.x	14. xx.x	15. x.x	16. x.x
17. xx.x	18. xx.x	19. xxxx.x	20. xxxx.x
21. xxxx.x	22. xxx.x		
MAIN MENU	REFRESH	EXPORT	PRINT

50. Press "2" to select "Magnet Homogeneity."

SMART Trac II Diagnostics			
1. SYSTEM CHECK 2. MAGNET HOMOGENEITY 3. MAGNET STABILITY 4. EXPORT LOG FILE 5. EXPORT DATA FILE Press item number to select.			
MAIN MENU			

51. Insert the Trac tube containing the proper oil test standard into the SMART Trac II.

52. Press READY.

SMART Trac II Diagnostics			
Insert the oil test standard In SMART Trac			
Press READY to continue.			
MAIN MENU			

The instrument reads and records the homogeneity of the oil test standard.

READING HOMOGENEITY . . .			
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The instrument displays the magnet homogeneity result. The homogeneity result should be between 0 – 20 ppm. If the homogeneity is not within the proper range, contact the CEM Service Department.

53. Press any key to return to the “Diagnostics” screen.

SMART Trac II Diagnostics			
Magnet Homogeneity 0.52			
Press any key to continue.			
MAIN MENU			

Contact CEM Corporation for additional diagnostic information.

Maintenance and Service

The following information covers routine maintenance and basic troubleshooting. For detailed instructions concerning service and repair, contact the CEM Service Department or the nearest subsidiary or distributor.

Routine Maintenance

A routine preventive maintenance program is recommended to ensure optimum performance of the SMART Trac instrument.

Refer to the SMART Turbo Operation Manual for routine maintenance procedures for the SMART Turbo.

Daily

Perform a Frequency Optimization.

Weekly

Clean the interior of the SMART Turbo™.

Inspect the SMART Turbo™ air shield and clean or replace as required.

Verify the proper operation of the energy distributor blade.

Perform a Pulse Width Optimization.

Monthly

Perform a SMART Turbo balance calibration.

Perform a MONITOR sample test.

Clean SMART Turbo air intake vents.

Perform a Check Standard.

Service and Repair

WARNING

The SMART Turbo utilizes high voltage and microwave radiation. Instrument service and repair must be undertaken only by technicians trained in the repair and maintenance of high voltage and microwave power systems.

Mise en garde

Le SMART Turbo requiert une haute tension et produit une radiation de micro-ondes. L'entretien et les réparations doivent être seulement fait par un personnel formé en réparation et entretien de systèmes opérant avec de haute tension et produisant de micro-ondes.

If damage to the SMART Turbo is detected, do not attempt further instrument operation. Contact the CEM Service Department or the nearest subsidiary or distributor.

CEM Corporation
Service Department
P.O. Box 200
3100 Smith Farm Road
Matthews, NC 28106-0200 USA
email: service@cem.com
Website: www.cem.com/support

Within the continental United States

Telephone: (800) 726-5551
Fax: (704) 821-4368

Outside the United States

Telephone: (704) 821-7015
Fax: (704) 821-4368

Subsidiary Offices

CEM Microwave Technology Ltd.
2 Middle Slade
Buckingham Industrial Park
Buckingham MK18 1WA
United Kingdom
Tel: 44.1.280.822873
Fax: 44.1.280.822342

CEM GmbH
Carl-Friedrich-Gauss-Strasse 9
47454 Kamp-Lintfort
Germany
Tel: 49.2842.96440
Fax: 49.2842.964411

CEM S.r.l.5.
Via Dell'Artigianato, 6/8
24055 Cologno al Serio
Italy
Tel: 39.35.896224
Fax: 39.35.891661

CEM μ Wave S.A.S.
Immeuble Ariane
Domaine Technologique de Saclay
4, Rue René Razel
91892 Arsay France
Tel: 33.1693.55780
Fax: 33.1601.96491

WARNING

To avoid possible electrical shock or exposure to microwave energy, disconnect the instrument from the electrical outlet prior to any disassembly procedures.

Mise en garde

Pour éviter toute possibilité d'une décharge électrique ou une exposition aux micro-ondes, débrancher l'instrument de la prise de courant avant toutes procédures de désassemblage.

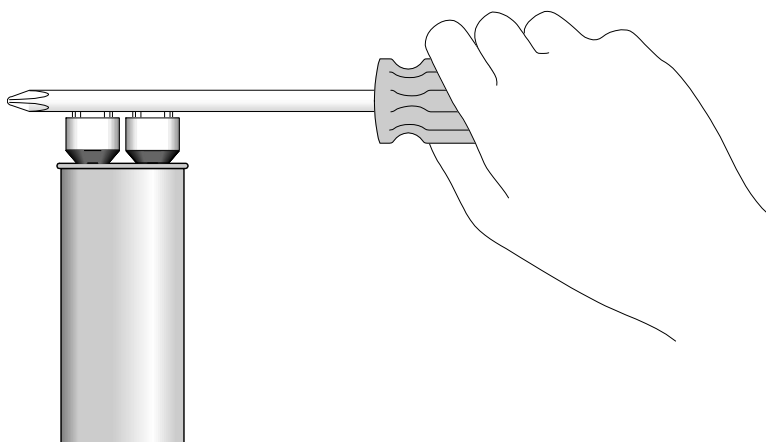
It is recommended that service and repair by the user be limited to replacing components such as fuses, printed circuit boards, interlocks, etc. The user may find it convenient to stock an assortment of replacement parts to facilitate service procedures.

WARNING

Prior to troubleshooting or replacement of any component in the high voltage section of the SMART Turbo, the instrument must be switched off and unplugged from the electrical outlet. Permit the instrument to sit idle for at least two (2) minutes. Using a well insulated screwdriver, touch the end of the screwdriver between the terminals of the high voltage capacitor (illustrated below) to discharge all residual voltage from the instrument.

Mise en garde

Avant de réparer ou remplacer une pièce dans la section de haute tension, l'instrument doit être débranché de la prise de courant. L'instrument doit être laissé au repos pour un minimum de deux (2) minutes. En utilisant un tourne-vis bien isolé, placer l'extrémité du tourne-vis entre les terminaux de l'accumulateur de haute tension afin de décharger l'instrument de tout courant résiduel.



Specifications

Moisture/Solids Range:	0.01% to 99.99% in liquids, solids and slurries, 0.01 resolution
Balance Capacity:	50 grams, 0.1 mg readability
Program/Data Storage:	100 methods, 300 results
Standard Software:	Constant weight and time, fat and moisture
Data Entry:	Keypad with menu-driven software
Display:	Black & white VGA (320 x 240) Optional flat panel LCD display
Interfaces:	RS232, USB, Ethernet
Standard Printer:	Internal impact printer
Accessory Ports:	2 serial, RS 232, 9 pin ports for network connection, external balance or bar code reader. Parallel port for external printer, 6 USB ports, 1 ethernet CAT 5 port
Instrument Dimensions:	
SMART Turbo:	22.0 in. (W) x 23.3 in. (D) x 14.5 in. (H) 55.9 cm (W) x 59.1 cm (D) x 36.8 cm (H)
Processor:	14.2 in (W) x 14.2 in (D) x 13 in (H) 36 cm (W) x 36 cm (D) x 33 cm (H)
Magnet:	11.8 in (W) x 12.6 in (D) x 16.1 in (H) 30 cm (W) x 32 cm (D) x 41 cm (H)
Instrument Weight:	
SMART Turbo	55 lbs., 25 kg
Processor	37 lbs., 17 kg
Magnet	110 lbs., 50 kg
Voltage:	100-240 V (50-60 Hz)
Ambient Air Temperature:	Temperature must be between 15 °C (59 °F) and 30 °C (86 °F). For optimum stability and performance, the ambient temperature should not vary more than 5 °C/day.
RF Pulse Generator:	Pulse power 300 W nominal. Pulse times variable in 100 ns increments Transmit and receive phases selectable 0, 90, 180 and 270°. Nominal 90° pulse times 3 µs (10 mm probe) and 4.5 µs (18 mm probe)
Magnet:	Permanent, thermally stabilized, 0.55 T (23.4 MHz proton)
Signal Detection:	Dual channel (quadrature) detection with programmable low-pass filtering. Programmable data acquisition rate up to 10 mHz per pair of points.
Power Conditioner Requirements:	120V 60Hz Instrument (2.1 kVA, 120V/60 Hz) 240V 50 Hz Instrument (1.8 kVA, 240/50 Hz)
SMART Turbo™:	10 Amps (110 – 127 V, 60 Hz); 5 Amps (220 – 240V, 50/60 Hz) 10 Amps (100V, 50/60 Hz); 5 Amps (200 – 208 V, 50/60 Yz)
SMART Trac II Magnet & Processor:	6.4 Amps

Warranty

What Is Covered:

CEM Corporation warrants that the instrument will be free of any defect in parts or workmanship and will, at its option, replace or repair any defective part (excluding consumables) or instrument.

For How Long:

This warranty remains in effect for 365 days from date of delivery to the original purchaser.

What Is Not Covered:

This warranty does not cover parts or workmanship damaged due to:

- Neglect, abuse or misuse,
- Damage caused by or to test samples,
- Damage incurred during instrument relocation,
- Damage caused by or to any attached equipment,
- Use of incorrect line voltages or fuses,
- Fire, flood, "acts of God" or other contingencies beyond the control of CEM Corporation,
- Improper or unauthorized repair, or
- Any other damage caused by purchaser or its agents.

Responsibilities of Purchaser:

To ensure warranty coverage, the purchaser must:

- Use the instrument according to directions,
- Connect the instrument properly to a power supply of proper voltage,
- Replace blown fuses,
- Replace consumables and
- Clean the instrument as required.

How to Get Service:

Purchaser should contact the Service Department of CEM Corporation or the nearest CEM subsidiary or distributor for return authorization and for proper crating and shipping instructions to return instrument, freight prepaid, for service. On-site repairs by an authorized service technician are available through the CEM Service Department. Travel costs will be charged to the purchaser for on-site repairs.

Within the U.S.

CEM Corporation
3100 Smith Farm Rd.
Matthews, NC 28105-5044
(800) 726-5551
Fax: (704) 821-4368

Outside the U.S.

CEM Corporation
3100 Smith Farm Rd.
Matthews, NC 28105-5044
(704) 821-7015
Fax: (704) 821-4368

Warranty Disclaimer:

CEM Corporation hereby excludes and disclaims any warranty of merchantability or fitness for any particular purpose. No warranty, express or implied, extends beyond the face hereof. CEM Corporation shall not be liable for loss of use of instrument or other incidental or consequential costs, expenses or damages incurred by the purchaser or any other user. This warranty is not transferable.

Purchaser's Rights under State Law:

This warranty gives the purchaser specific legal rights, and the purchaser may also have other rights which vary from state to state.



Corporate Headquarters

CEM Corporation
Service Department
PO Box 200
3100 Smith Farm Road
Matthews, NC 28106-0200 USA

800.726.5551 (phone within USA)
01.704.821.7015 (phone outside of US)
01.704.821.4369 (fax)
service@cem.com (email)
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United Kingdom Subsidiary

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Carl-Friedrich-Gauss Strasse 9
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49.2842.964411 (fax)
info@cem.de (email)
www.cem.de (web site)

French Subsidiary

CEM μ Wave S.A.S.
Immeuble Ariane
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info.fr@cem.com (email)

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Italy
390.35.896224 (phone)
390.35.891661 (fax)
info.srl@cem.com (email)