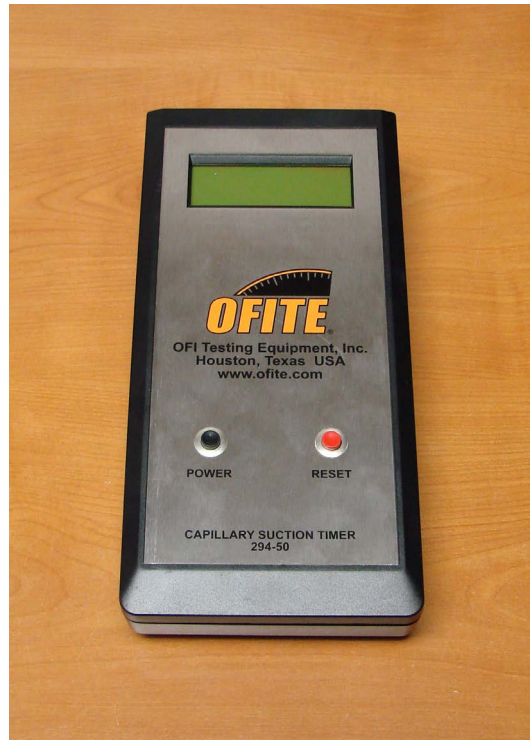




*Dependable Products From People You Trust*



# OFITE Capillary Suction Timer

**Part No. 294-50**

## Instruction Manual

Updated 5/13/2019

Ver. 2

**OFI Testing Equipment, Inc.**

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## ***Intro***

The Capillary Suction Timer (CST) principle was developed at the Water Pollution Research Laboratory in Stevenage, England, for studying the filterability of sewage sludge and for evaluating the effects of pretreatment chemicals and process conditions of sewage treatment. It has been widely used to study the colloidal properties of clay suspensions. The petroleum industry uses the CST to characterize shales and to optimize the electrolyte concentration in drilling fluids for minimizing its effect on shale formations.

CST studies of filtration characteristics of aqueous systems utilize the capillary suction pressure of a porous paper to affect filtration. When a suspension is filtered under the influence of this suction pressure, the rate at which filtrate spreads away from the suspension is controlled predominately by the filterability of the suspension. The CST automatically measures the time for the filtrate to advance between radially separated electrodes when a fixed area of special filter paper is exposed to the suspension.

## ***Description***

The CST consists of two separate components - the acrylic filtration unit with the electrodes and a timer. The method is rapid and easy to use. A sample of the aqueous system to be tested is placed in the sample cylinder and the suction pressure of the filter paper beneath the sample draws out the filtrate. The filtrate progresses radially in an essentially elliptical pattern with the timer starting when the liquid reaches the first pair of electrodes. When the liquid reaches the third electrode, the timing ceases, and an audible signal is sounded. The CST reading is indicated on an LCD counter indicating to tenths of a second.

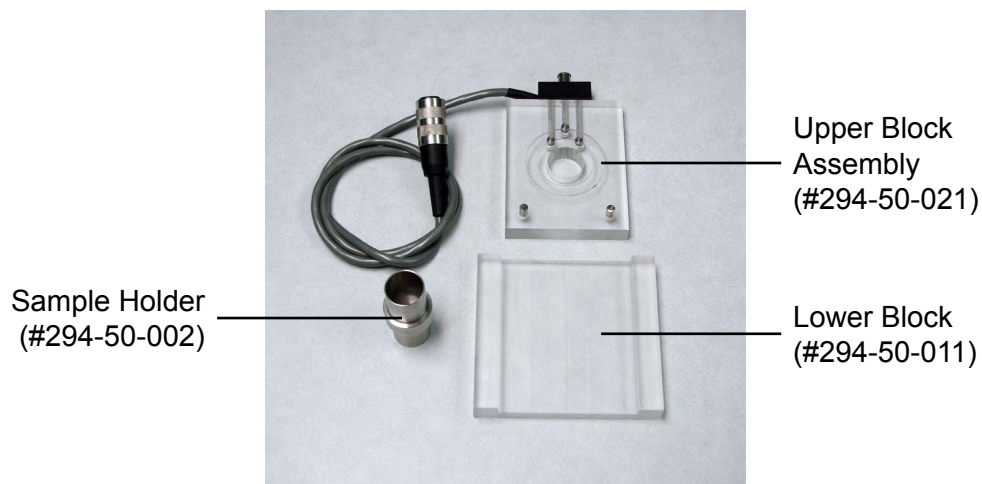
The CST can be powered either by a standard 9 volt battery or with the provided power supply. The power supply can accept 90 to 264 volts AC in and outputs 12 volts DC.

# Components

- #147-02 Battery, 9-Volt, Alkaline
- #294-01 Standard CST Paper; Whatman #17; Chromatography Grade; Package of 100
- #294-50-002 Sample Holder
- #294-50-021 Upper Block Assembly
- #294-50-011 Lower Block
- #294-50-012 Electrode
- #294-50-015 Power Supply, 90 - 264 VAC In, 12 VDC Out
- #294-50-017 Adapter Set for Power Supply, 4-Plug Wall Clip (US, UK, European, and Australian)

## Optional:

- #294-05 Special CST Paper; Recommended for very viscous or slow filtering systems; Package of 300



# Operation

1. Before each test, make sure the upper and lower blocks are clean and dry.
2. Plug the upper block into the socket on the rear panel of the control box.
3. Place a sheet of filter paper on the lower block. Place the upper block onto the lower block on top of the filter paper with the stainless steel probes facing down.
4. The sample holder has two openings. One side has a 1 cm diameter opening for “fast” filtering. The other side has a 1.8 cm diameter opening for “slow” filtering. Insert the holder into the upper block and rotate it slightly while applying light downward pressure. This will ensure an even contact with the filter paper.
5. Turn on the control box. The initial display will read:

OFITE Inc.  
Capillary Suction Timer  
Firmware Ver: 1.xx

When this display times out, it should read “Timer Ready 0.0 s”. If it does not, press the reset button to reset the controls.



The CST will automatically power off after a period of inactivity. If this occurs while test results are displayed on the screen, the next time the unit is powered on, the previous results will be displayed again.



The CST performs a continuity check on initial power-up and when the RESET button is pressed. If there is an electrical connection between the probes (e.g. if used test paper was left on the stand), the screen will display a continuity error. Make sure the upper and lower blocks and the paper are clean and dry, then try again.

6. Using a syringe or pipette, pour 5 mL of sample fluid into the sample holder. Liquids from the sample will be absorbed by the filter paper in a circular pattern of increasing diameter. When the liquid reaches the first pair of contacts, the unit will beep and the timer will start. When the liquid reaches the third contact, the timer will stop and the unit will beep again. Record the timer reading. This is the “capillary suction time” in seconds and tenths of seconds.
7. Carefully remove the upper block from the lower block and remove the sample holder. Remove and discard the filter paper. Thoroughly clean and dry the upper and lower blocks and the sample holder. Any moisture remaining on these components may affect future test results.
8. Repeat this process at least 3 times per sample and average the results.
9. When testing is complete, turn off the control box.

## Notes

Several factors have a significant effect on the CST including the filter paper, temperature and suspended solids concentration.

1. A double thickness of filter paper may be used to slow down the rate of travel of the liquid. This is sometimes useful with a very fast aqueous system.
2. A special filter paper (#294-05) is available for very slow filtering systems.
3. Whatman #17 chromatography grade filter paper is machine made and as a result has a grain in the paper. This grain produces a slightly elliptical wetted area instead of a circular wetted area. To assure that the CST is always measured along the major axis of the ellipse it is important to perform every test with the filter grain running parallel to the longer side of the lower block.
4. Temperature has a significant effect on CST results. The CST decreases as the temperature of the fluid being tested increases. To minimize the effect of temperature on the fluid being tested, the samples should be at ambient temperature prior to performing the tests. The temperature of the fluid should also be recorded so corrections can be made if there are temperature variations among the samples.
5. Suspended solids concentration has a significant effect on the test results. When using the CST procedure to evaluate drilling fluid additives, sludge conditioners, or assist in the operation of a dewatering process, this effect can be avoided by adhering to proper sample preparation procedures, particularly in ensuring homogeneity in each of the samples to be tested. Comparison of CST data between different original samples (especially if taken on different days) cannot be made with confidence unless suspended solids concentrations are comparable. A rough correction for different solids contents can be made by dividing the CST value by the solids concentration.
6. It is recommended to take several readings (4 or 5) for each test. Discard any erroneous readings and then average the ones remaining.
7. It is important to maintain solid contact between the electrodes and the test paper. Weights can be placed on the upper block to hold it down.
8. Always place the device on a level surface and keep it stationary during testing. Avoid twisting the cable.
9. To produce repeatable results, use a consistent delivery device for every test. It is recommended to use a pipette on a stand at a constant height and a pipetter.
10. Make sure the device always has adequate power while testing. If available, AC power is preferable.



**Note**

The Capillary Suction Timer relies on electrical current to start and stop the test. This device may not work properly with fluids that do not conduct electricity (such as oil or deionized water).

11. For more information, refer to the following papers:

“A Rectangular Capillary Suction Apparatus”; D.J. Lee and Y. H. Hsu; Ind. Eng. Chem. Res.; 1994.

“Assessment of Capillary Suction Time (CST) Test Methodologies”; O. Sawalha and M. Scholz; Environmental Technology; Vol. 28; 2007.

“Development of a Revised Capillary Suction Time (CST) Test”; Miklas Scholz and Julian Tapp; Water Conditioning and Purification; 2006.

Polymer Deflocculants: Chemistry and Application; R.D. Wilcox and M.A. Jarrett, NL Baroid; IADC/SPE 17201; 1988.

# Maintenance

1. Always keep the upper and lower blocks clean and dry. Occasionally clean the probes by drawing the block carefully with a slight downward pressure over 400 grit carborundum paper laid on a flat surface.
2. This instrument uses a commonly available 9-volt battery (#142-02), which should provide many hours of operation before replacement is necessary. For maximum operational life, an alkaline type battery is recommended.

A low-battery warning will display when it is time to replace the battery. To replace the battery:

- a. Turn the instrument OFF.
- b. Remove the two screws and lift the battery cover off. Remove the old battery and replace it with a fresh one. Place the battery cover back on the case and tighten the two screws.
- c. Turn the instrument on to verify operation.



# Warranty and Return Policy

## Warranty:

OFI Testing Equipment, Inc. (OFITE) warrants that the products shall be free from liens and defects in title, and shall conform in all respects to the terms of the sales order and the specifications applicable to the products. All products shall be furnished subject to OFITE's standard manufacturing variations and practices. Unless the warranty period is otherwise extended in writing, the following warranty shall apply: if, at any time prior to twelve (12) months from the date of invoice, the products, or any part thereof, do not conform to these warranties or to the specifications applicable thereto, and OFITE is so notified in writing upon discovery, OFITE shall promptly repair or replace the defective products. Notwithstanding the foregoing, OFITE's warranty obligations shall not extend to any use by the buyer of the products in conditions more severe than OFITE's recommendations, nor to any defects which were visually observable by the buyer but which are not promptly brought to OFITE's attention.

In the event that the buyer has purchased installation and commissioning services on applicable products, the above warranty shall extend for an additional period of twelve (12) months from the date of the original warranty expiration for such products.

In the event that OFITE is requested to provide customized research and development for the buyer, OFITE shall use its best efforts but makes no guarantees to the buyer that any products will be provided.

OFITE makes no other warranties or guarantees to the buyer, either express or implied, and the warranties provided in this clause shall be exclusive of any other warranties including ANY IMPLIED OR STATUTORY WARRANTIES OF FITNESS FOR PURPOSE, MERCHANTABILITY, AND OTHER STATUTORY REMEDIES WHICH ARE WAIVED.

This limited warranty does not cover any losses or damages that occur as a result of:

- Improper installation or maintenance of the products
- Misuse
- Neglect
- Adjustment by non-authorized sources
- Improper environment
- Excessive or inadequate heating or air conditioning or electrical power failures, surges, or other irregularities
- Equipment, products, or material not manufactured by OFITE
- Firmware or hardware that have been modified or altered by a third party
- Consumable parts (bearings, accessories, etc.)

## Returns and Repairs:

Items being returned must be carefully packaged to prevent damage in shipment and insured against possible damage or loss. OFITE will not be responsible for equipment damaged due to insufficient packaging.

Any non-defective items returned to OFITE within ninety (90) days of invoice are subject to a 15% restocking fee. Items returned must be received by OFITE in original condition for it to be accepted. Reagents and special order items will not be accepted for return or refund.

OFITE employs experienced personnel to service and repair equipment manufactured by us, as well as other companies. To help expedite the repair process, please include a repair form with all equipment sent to OFITE for repair. Be sure to include your name, company name, phone number, email address, detailed description of work to be done, purchase order number, and a shipping address for returning the equipment. All repairs performed as "repair as needed" are subject to the ninety (90) day limited warranty. All "Certified Repairs" are subject to the twelve (12) month limited warranty.

Returns and potential warranty repairs require a Return Material Authorization (RMA) number. An RMA form is available from your sales or service representative.

Please ship all equipment (with the RMA number for returns or warranty repairs) to the following address:

OFI Testing Equipment, Inc.  
Attn: Repair Department  
11302 Steeplecrest Dr.  
Houston, TX 77065  
USA

OFITE also offers competitive service contracts for repairing and/or maintaining your lab equipment, including equipment from other manufacturers. For more information about our technical support and repair services, please contact [techservice@ofite.com](mailto:techservice@ofite.com).