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Advanced Emulsion Stability Meter

Part No. 131-56

Instruction Manual

Updated 10/26/2026
Ver. 4

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Intro

The Advanced Emulsion Stability (AES) Meter is a sine wave instrument. It is manufactured in accordance with the American Petroleum Institute (API) “Recommended Practice Standard Procedure for Field Testing Oil-Based Drilling Fluids”, 13B-2. It is accurate, compact, and portable and is intended for routine field and laboratory use to measure the relative electrical strength of drilling fluids having a continuous oil phase.

The ES Meter is self contained and consists of a meter and probe. It operates on either AC power adapter, DC power adapter (cigarette lighter, etc.), USB power, or four 9 volt alkaline batteries. Two calibration verification plugs are included to ensure accuracy.

The data collected from the AES Meter can also be recorded via software. A USB Cable can be connected directly from the AES Meter to any computer running windows.

Description

The dielectric breakdown voltage is the point at which the drilling fluid becomes electrically conductive. The unit provides a constant rate of voltage increase until the emulsion becomes electrically conductive. A current flow of 61 micro amps (61 µA) across the electrodes will cause the display to stop, allowing time to take the reading. The reading is called the electrical stability, emulsion stability, or ES value of the fluid.

The electrical stability value will decrease with increasing testing temperature. The recommended API test temperature is either 120° ± 5°F (50° ± 2°C) or 150° ± 5°F (65° ± 2°C), depending on the temperature of the well.

The chemical composition and shear history of a drilling fluid control the absolute magnitude of the AES in a complex fashion. Therefore, interpreting the oil-wet state of a mud from a single ES measurement is not appropriate. Only trends in AES should be used in making treatment decisions.

Components

#130-76-03	Thermocouple
#131-01	Probe
#131-51	Calibration Standard, High and Low
#147-02	9-Volt Alkaline Battery: Qty: 4

Optional:

#110-10	Marsh Funnel Viscometer
#110-20	Measuring Cup, 1000 mL, Plastic
#120-59-520	USB Cable
#130-10-30-4	Power Supply, 15 Volt
#130-38	Thermocup, 115 Volt
#130-38-1	Thermocup, 230 Volt
#152-37	AC Power, 115 Volt
#152-38	AC Power, 230 Volt
#154-01	Dual-Scale Thermometer with Metal Dial, 5" Stem: 0° - 220°F (-10° - 100°C)
#154-22	Pocket Thermometer, 1", 0° - 220°F

Specifications

Meter:

Wave form:	Sine, < 5% total harmonic distortion
AC Frequency:	340 ± 10 Hz
Output Units:	Peak Volts
Ramp Rate:	150 ± 10 Volts per second, automatic operation
Minimum Output Range:	3 - 2,000 Volts (Peak)
Trip Current:	61 ± 5 uA
Size:	10.67" × 9.75" × 4.86" (27 × 25 × 12 cm)
Weight:	6 lb (2.72 kg)
Shipping Size:	11" × 11" × 7" (28 × 28 × 18 cm)
Shipping Weight:	10 lb (4.54 kg)

Electrode:

Housing:	Material resistant to oil mud components up to 220°F (105°C)
Material:	Corrosion-resistant metal
Diameter:	0.125" ± 0.001" (3.18 ± 0.03 mm)
Spacing (gap):	0.061" ± 0.001" (1.55 ± 0.03 mm) at 72°F (22°C)

The calibration verification probes are mounted on the lid inside the case. The probe is secured on the lid inside the case with the calibration verification plugs. The batteries are installed underneath the digital display inside the AES Meter case. Unscrew the four thumb screws on the display panel to access the battery receptacles.

Procedure

1. Prepare the probe.

   a. Inspect the electrode probe and cable for any evidence of damage.

   b. Ensure that the entire electrode gap is free of deposits.

   c. Clean the electrode body thoroughly by wiping with a clean paper towel. Be sure to clean the electrode gap.

   d. Swirl the electrode probe in the base oil used to formulate the mud. If the base oil is not available, another oil or mild solvent like Isopropanol is acceptable.



   Do not use a detergent solution or aromatic solvents such as xylene to clean the electrode.

   e. Clean and dry the electrode probe.

2. Pre-heat the oil mud sample to 120° ± 5°F (50° ± 2°C) or 150° ± 5°F (65° ± 2°C), depending on the temperature of the well.

3. Pour the sample through a 12-mesh screen or Marsh Funnel screen into a glass or plastic container. **Do not use a metal container**.

4. Press the POWER button. Use the thermocouple to record the mud temperature.



   Find temperature readings in the LOGGED DATA tab in the software.

5. Hand stir the sample with the electrode probe for approximately 10 seconds. This will help create a uniform composition and temperature. Position the electrode probe so that it does not touch the bottom or sides of the container. Be sure the electrode surfaces are completely covered by the sample.

6. Push the test button to begin the voltage ramp. Do not move the electrode during the voltage ramp.

7. At the conclusion of the ramp test, note the ES value displayed on the readout.

8. Repeat the above procedure with the same mud sample. The two ES values should not differ by more than 5%. If they differ by more than 5%, the meter or electrode should be checked.

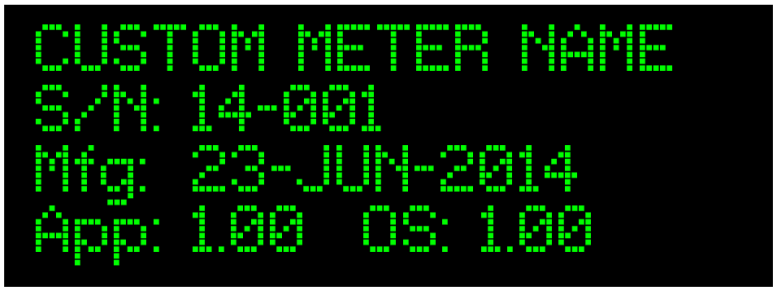
9. Record the average of the two ES measurements.

Onboard Control

Power the unit via 9V Batteries, AC, DC, and/or USB and press the power button to turn on the meter. You will see this screen.



After a short delay, display will show information specific to the meter.



LINE 1: The user-programmed custom name or ID for the meter. To program a name, see page 10. This line will be blank if nothing is programmed.

LINE 2: The serial number of the ES Meter.

L**INE 3:** The manufacture date of the ES Meter.

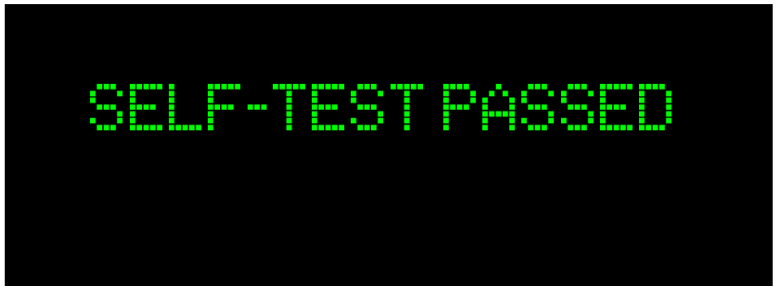
LINE 4: The Application and OS firmware versions.



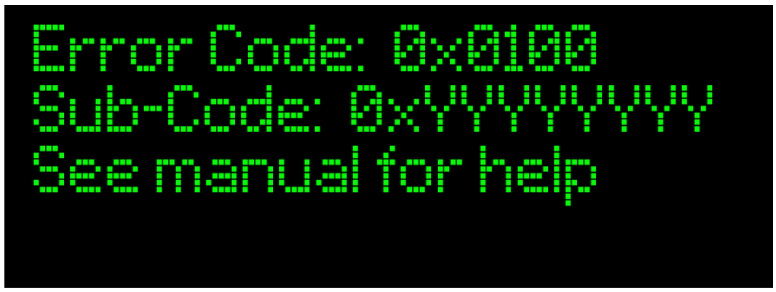
Note

If the meter is turned ON without any external power source, the meter will use its batteries. To conserve battery power, the meter will disable the USB port. In order for the USB port to function, the USB cable must be plugged in while the meter is OFF.

The meter will automatically perform a self test every time it is turned on. If the self test passes, it will briefly show this screen before continuing to the home screen.



A self test failure will display this screen:



Error 0x0100 indicates a self-test failure and 0xYYYYYYYY is a code specific to the type of error detected. If the self test fails, first cycle the power. If the error remains, change the batteries and/or switch to an alternate power source. If the error still remains, the meter will need to be repaired by a qualified technician.

Onboard Control

Home Screen

After a successful self test, the meter will display the home screen:



LINE 1: Displays the meter's status.

LINE 2: The description saved with the test (See page 11 for instructions on setting group names).

LINE 3: Current time and date.

LINE 4: Last test peak volts and current temperature reading. If the probe reads 500 C or 932 F, the thermocouple is not connected.

From the Home Screen, press the **TEST** button to start an ES test or press the **UP/DOWN** buttons to access the system menus (See page 11).

The first line of the Home Screen shows the meter's status. If multiple status indicators are active, each will be displayed for 1 second in an endless cycle. Here are all of the possible status line messages:

"READY TO TEST" – The meter is ready to test. Press the **TEST** button to start a test.

"RUNNING TEST" – The meter is currently running an ES test. The voltage displayed is the current peak voltage applied to the probe. The voltage is ramped automatically. Press **STOP** to abort the current test.

"TEST FINISHED" – The test has finished and the result is displayed on the Home Screen. The peak voltage will display on the bottom line. If the voltage is blank, the meter reached its maximum voltage without reaching the current trip threshold.

"TEST ABORTED BY USER" – The test in progress was aborted when the user pressed the **STOP** button. The peak voltage indicated will be blank since the test was not completed.

"OVERCURRENT SHUTDOWN" – This indicates the test was stopped due to an unexpectedly high power condition in the electronics. Clean the probe and retry the test. If this error persists then replace the batteries or change to an alternate power source. If the error still persists, return the meter for service. Pressing **TEST** to start a new test clears this message.

“OVERTEMP SHUTDOWN” – The test was aborted due to an unexpectedly high temperature in the electronics. Clean the probe and retry the test. If the error still persists, return the meter for service. Pressing **TEST** to start a new test clears this message.

“UNDERVOLTAGE ERROR” – The last test did not have the required power to properly perform the test or a short was detected on the ES probe. First clean the probe and repeat the test. If the error persists replace the batteries or change the power source. If the error still persists, return the meter for service. Pressing **TEST** to start a new test clears this message.

“BATTERY LOW” – The voltage on the internal battery pack is low. Replace the batteries soon to avoid test failure. Note that low battery power can cause self test failures and undervoltage errors. This message will only be displayed when operating from the battery pack.

“TEST NOT API RP 13B-2” – The testing parameters (frequency, ramp rate, max voltage, max current) are not compliant with the API RP 13B-2 requirements. This indicates the user has specified custom testing parameters. See page 14 for instructions on setting custom test parameters.

“TIME/DATE NOT SET” – The internal clock is not set. Set the clock before testing or calibrating.



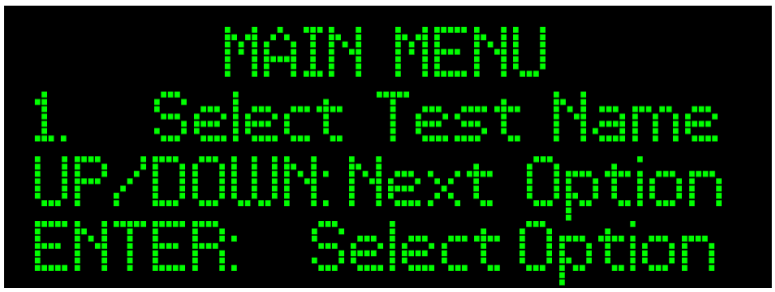
Note

The clock requires constant power. Changing the batteries or unplugging the meter when batteries are not installed will reset the timer.

Onboard Control

Main Menu

The Main Menu is accessible from the Home Screen by using the **UP/DOWN** arrow buttons when the meter is idle. It is not available when the meter is testing. The meter will return to the Home Screen after 10 seconds of inactivity or if the **EXIT** button is pressed.



LINE 1: Name of the current screen.

LINE 2: The current menu option.

LINE 3: Menu usage instructions. Use the **UP/DOWN** buttons to scroll through menu options.

LINE 4: Menu instructions. Press the **ENTER** button to select the menu option.

Menu Options:

1. Select Test Name
2. Run Probe Check
3. Toggle Temp Units
4. Set Time and Date
5. Meter Usage Data

Select Test Name:

The advanced ES Meter organizes tests into Test Groups. This feature enables the user to differentiate between samples or test locations. There are 50 groups. A custom description can be programed for each Test Group through the software. (See page 15).

1. Press the **UP/DOWN** button repeatedly until the display shows “1. Select Test Name”.
2. Press **ENTER**.
3. Press the **UP/DOWN** button repeatedly to scroll through test names.
4. Press **ENTER** to select a name.

Toggle Temp Units:

This option toggles the temperature units displayed on the Home Screen between Fahrenheit and Celsius.

1. Press the **UP/DOWN** button repeatedly until the display shows “3. Toggle Temp Unit”.
2. Press **ENTER**.
3. Press the **UP/DOWN** button to choose Fahrenheit or Celsius.
4. Press **ENTER** to select the desired unit.

Set Time and Date:

This menu option allows you to set the time and date in the meter’s clock.

Note

The clock requires constant power. Changing the batteries or unplugging the meter when batteries are not installed will reset the timer.



1. Press the **UP/DOWN** button repeatedly until the display shows “Set Time/ Date”.
2. Press **ENTER**.
3. Use the **UP/DOWN** buttons to edit the year.
4. Press the **ENTER** button to save the year and move to the month.
5. Use the **UP/DOWN** buttons to edit the month.
6. Press the **ENTER** button to save the month and move to the day.
7. Use the **UP/DOWN** buttons to edit the day.
8. Press the **ENTER** button to save the day and move to the current time.
9. Use the **UP/DOWN** buttons to edit the hour.


Note

Note that AM/PM is set along with the hour.

10. Press the **ENTER** button to save the hour and move to the first digit of the minutes.
11. Use the **UP/DOWN** buttons to edit the first digit of the minutes.
12. Press the **ENTER** button to save the first digit of the minutes and move to the second digit of the minutes.
13. Use the **UP/DOWN** buttons to edit the minutes.
14. Press the **ENTER** button to save the minutes.
15. The seconds will be automatically cleared to 0.

Meter Usage Data:

This menu option displays the usage statistics for the meter.



LINE 1: This lists the number of power cycles the meter has logged since manufacture.

LINE 2: This lists the total number of ES tests performed since manufacture.

LINE 3: This lists the date of the last ES probe calibration.
A date of 01-JAN-2000 indicates no calibration has been performed or the calibration data has been cleared.

LINE 4: This lists the date of the last thermocouple probe calibration.
A date of 01-JAN-2000 indicates no calibration has been performed or the calibration data has been cleared.

Software

Setup

The software for the Advances ES Meter is embedded in the meter itself. All that is required is a USB cable and a PC. The software includes advanced testing parameters, test history, and remote operation.

When the ES Meter is connected to a computer, the software should open automatically. However, certain anti-virus software will block the auto run feature.

If the software does not open automatically when connected:

1. Got to “My Computer” and open the meter’s drive.
2. Double click on the PC software “ES-Test.exe” to start the program.

Tip

In some cases, a pop up box may appear asking if this program is a trusted program and does it want to be ran.

In other cases, the software can be accessed in “My Computer” and double clicking on the meter’s drive. At that point it should start.

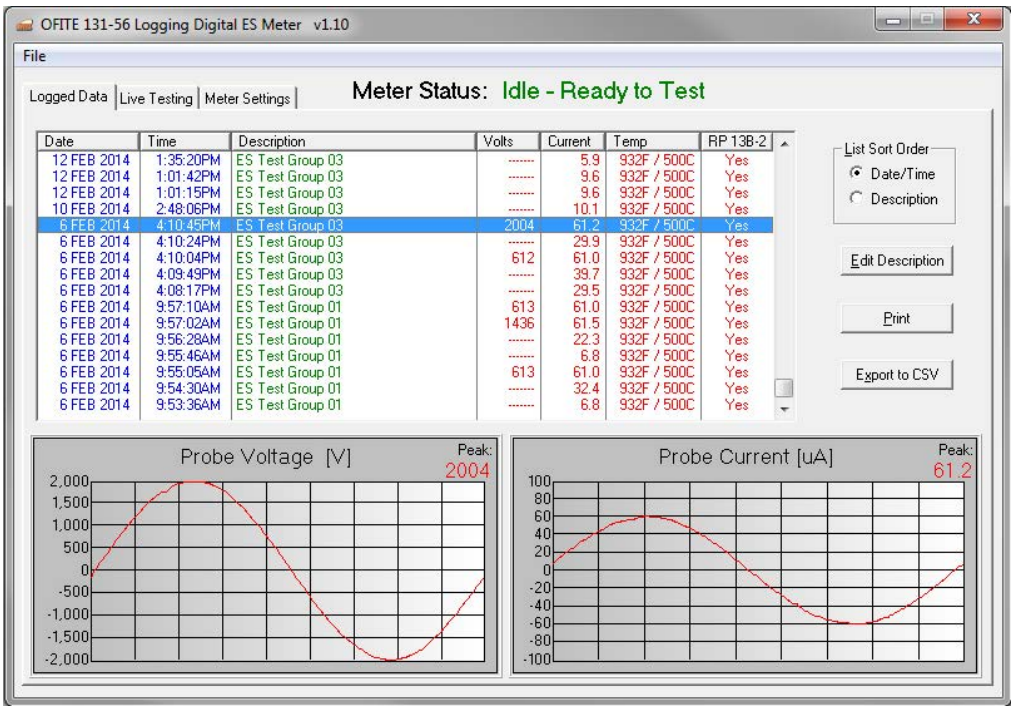
The software can also be installed directly onto a computer. This will allow the user to view and print tests without connecting the meter to the computer.

To install the software:

1. Got to “My Computer”, right-click the meter’s drive and select “Open”. A list of files should appear.
2. Right-click on the files “ES-Test.exe” and choose “Copy”.
3. Click on a clear spot on the desktop (or the desired location of the software) and then right-click and select “Paste”.

Software

Procedure



Connecting to the PC:

1. Power the unit via 9V Batteries and USB cable.

   The clock requires constant power. Changing the batteries or unplugging the meter when batteries are not installed will reset the timer.

Note

2. Turn on both the PC and the meter.

3. Click the software icon on the desktop named ES-Test.exe. The window shown above will open.

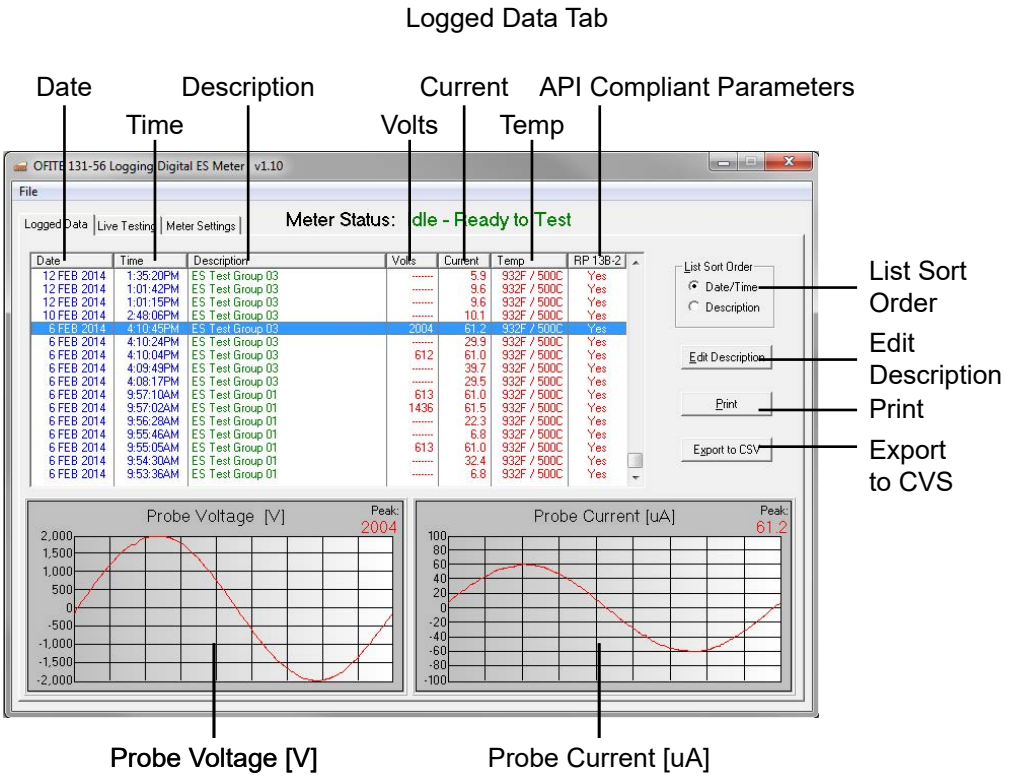




Note

The data is recorded and controlled in three tabs:

- Logged Data
- Live Testing
- Meter Setting



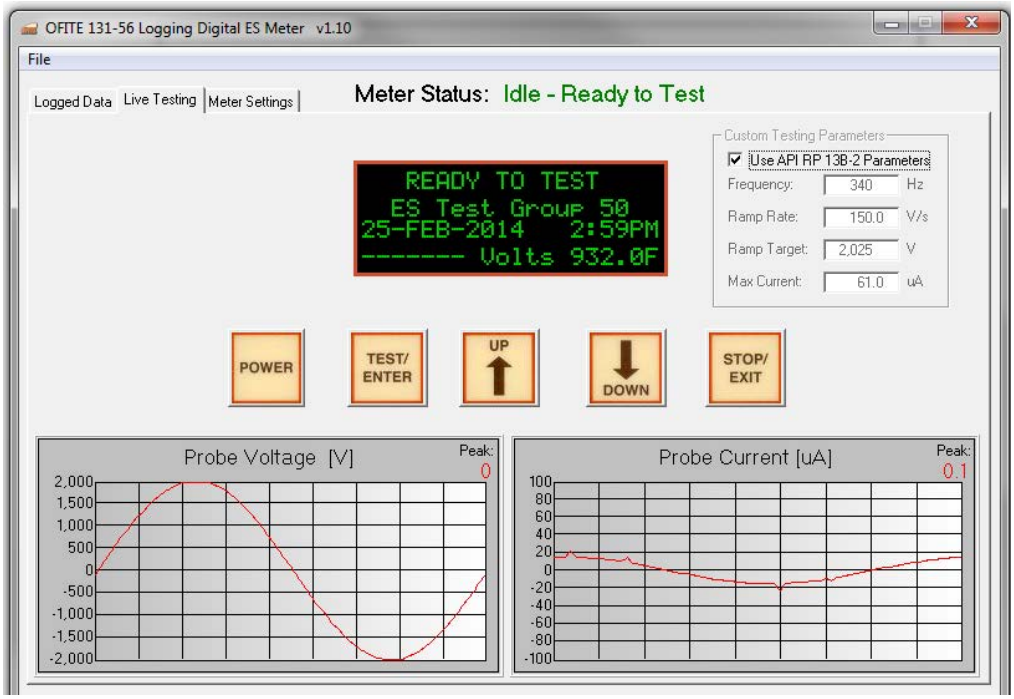
Logged Data

List Sort Order - The data can be displayed either by Date/Time or by the test description.

Edit Description - Any test description can be changed by clicking the EDIT DESCRIPTION button. Highlight the line that requires a description change and press the EDIT DESCRIPTION button. The curser will begin to blink in the description column allowing it to be changed as needed.

Print - Allows the user to print the read out on display.

Export to CVS - Press EXPORT TO CVS button to save data to the hard drive.



Live Testing

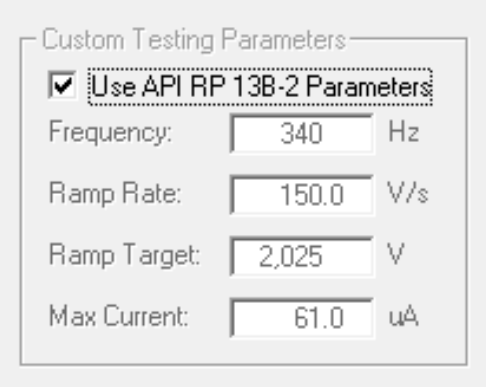
Click on the Live Testing tab to bring up the window shown above. All of the functions that can be operated using the onboard controls can be operated through the software as well.

POWER: On/Off

TEST/ENTER: Begin voltage ramp / Select a desired value or menu option

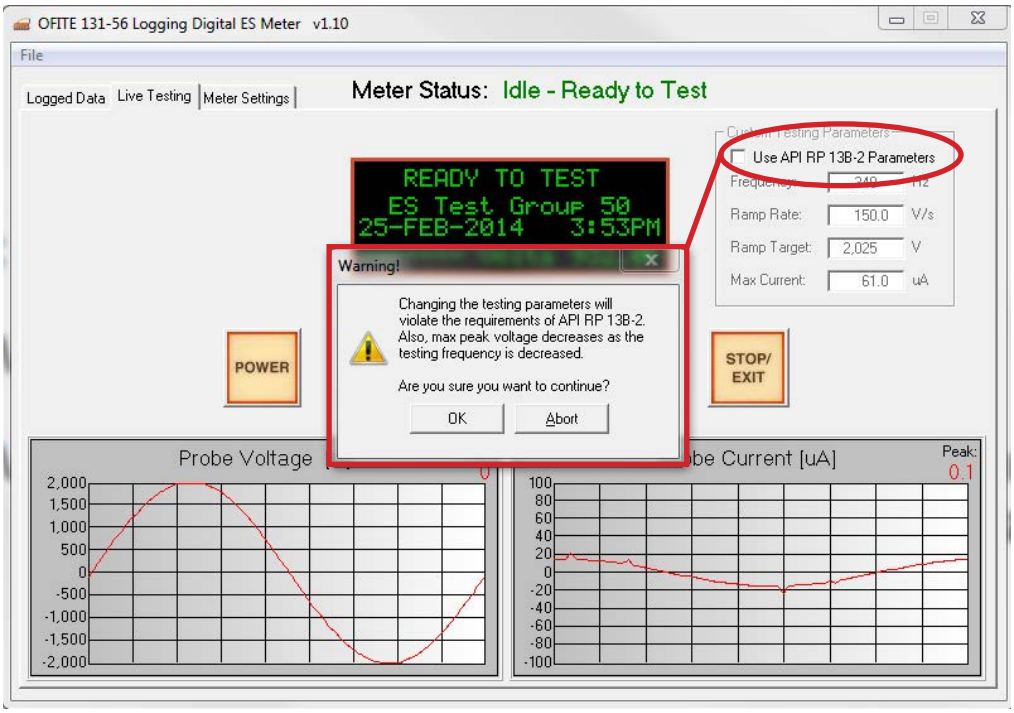
UP/DOWN: Scroll through the menu options

STOP/EXIT: Stop the test or exit a certain menu option

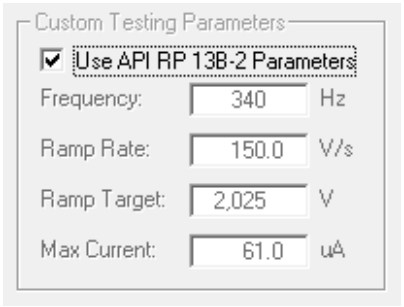


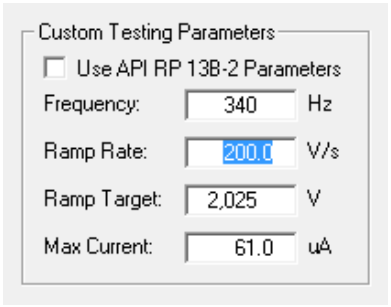
Custom Testing Parameters

The values provided in this section are standard API 13B-D compliant parameters which are set by default.



If a test must be taken outside of API parameters, uncheck the box next to "Use API RP 13B-2 Parameters". A warning will appear to inform the user that any test taken after this point will violate the requirements of API RP 13B-2.

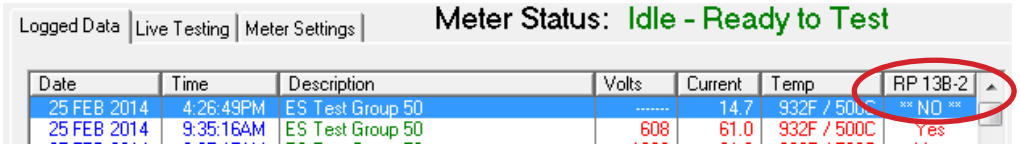


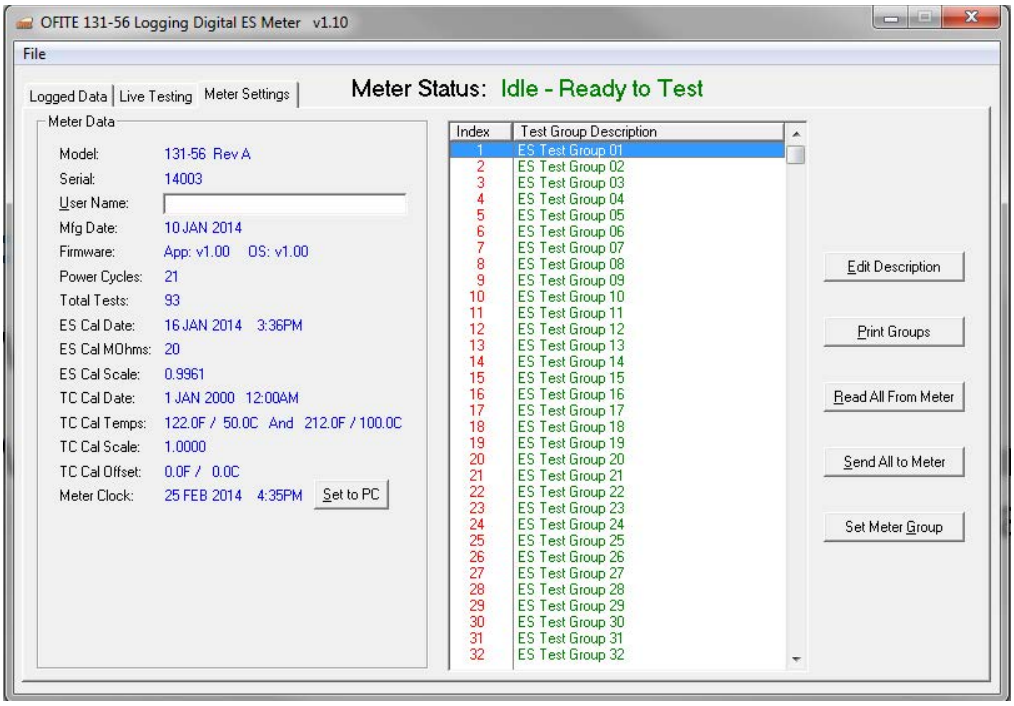


Change any parameter to the desired value and run another test.

Go back to the Logged Data tab to evaluate the data outside of the API standards.

The "RP 13B-2" column will indicate that the previous test taken was not a standard API compliant test.



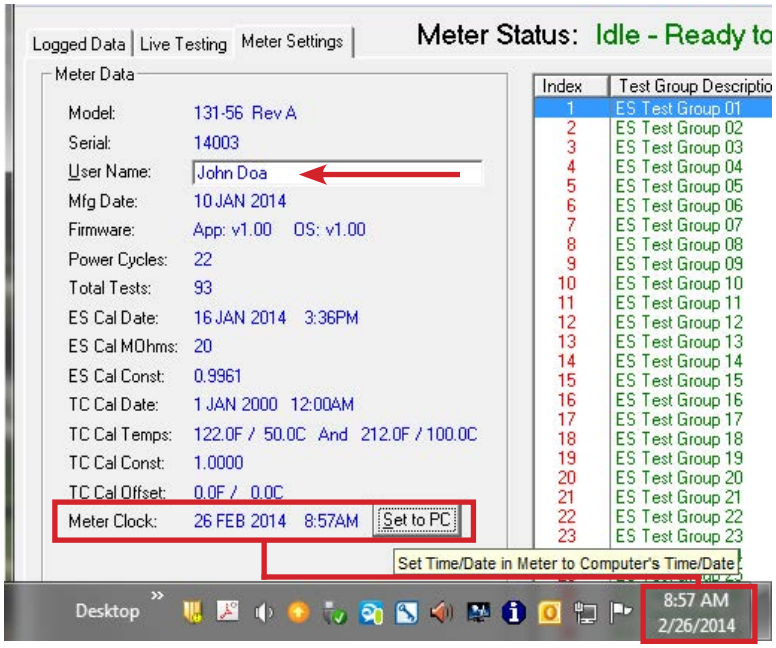


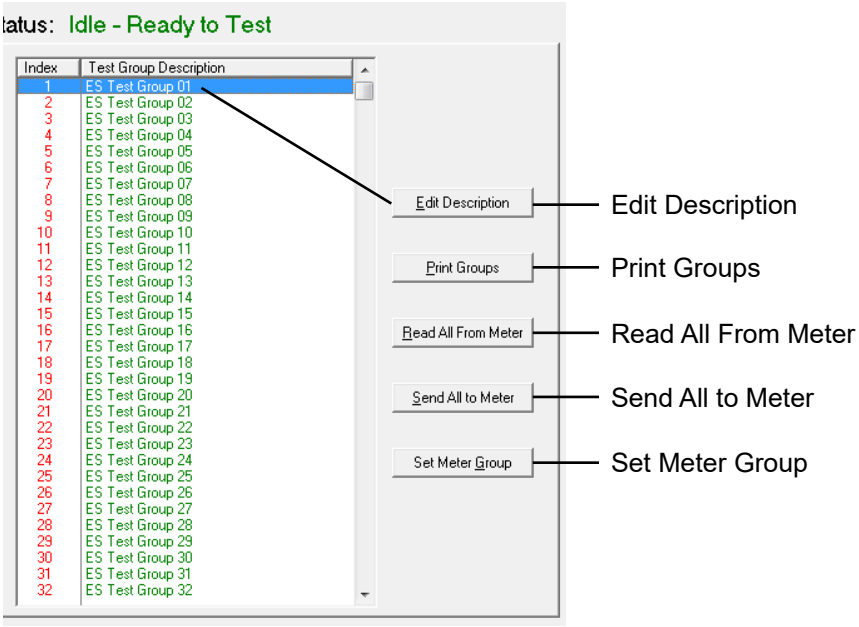
Meter Settings

Meter Data - The left side of this window contains manufacturing information about the meter.

User Name - This section can be edited to identify the user.

Meter Clock - The Meter clock can be synchronized with the PC.





Edit Description - Edit the Test Group Description.

Print Groups - Print test group descriptions list.

Read All From Meter - Read all test group descriptions from the connected meter into this list.

Send All to Meter - Send all test group descriptions in this list to the connected meter.

Set Meter Group - Set the meter to selected test group.

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.