

Model 653B Resistivity Meter

Instruction Manual



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Instrument No. 101582036

Model 653B Resistivity Meter Instruction Manual

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Houston, Texas, USA

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Table of Contents

1	Introduction.....	4
1.1	Document Conventions	4
2	Safety	6
2.1	Battery Safety	6
3	Features and Specifications.....	7
4	Operation.....	9
4.1	Fluid Samples.....	9
4.2	Semisolid Samples	10
5	Troubleshooting and Maintenance.....	13
5.1	Calibration	13
5.2	Battery Replacement	13
5.3	Cleaning	14
6	Parts List.....	15
7	Warranty and Returns.....	16
7.1	Warranty.....	16
7.2	Returns.....	16

List of Figures

Figure 3-1	Resistivity Meter, Model 653B	8
Figure 4-1	Resistivity Chart for NaCl Solutions.....	12

List of Tables

Table 3-1	Resistivity Meter, Model 653B Specifications	7
Table 3-2	Range of Environmental Conditions	7
Table 6-1	Model 653B Resistivity Meter Included Parts, P/N 101582036	15
Table 6-2	Optional Equipment.....	15

1 Introduction

The Model 653B Resistivity Meter is a portable electronic meter that measures the resistivity of fluids, slurries, and semisolids according to API Recommended Practice 13B-1. The resistivity range for this meter is 0.01 to 10 ohm meters. This ohm-meter reading can be converted to ppm sodium chloride by using the sodium chloride resistivity chart provided in this instruction manual. Field and laboratory personnel rely on this instrument to evaluate formation characteristics from electric logs. Resistivity is the ability of a material to resist conduction; conductivity is the reciprocal of resistivity.

1.1 Document Conventions

The following icons are used as necessary in this instruction manual.



NOTE. Notes emphasize additional information that may be useful to the reader.



CAUTION. Describes a situation or practice that requires operator awareness or action in order to avoid undesirable consequences.



MANDATORY ACTION. Gives directions that, if not observed, could result in loss of data or in damage to equipment.



WARNING! Describes an unsafe condition or practice that if not corrected, could result in personal injury or threat to health.



ELECTRICITY WARNING! Alerts the operator that there is risk of electric shock.



HOT SURFACE! Alerts the operator that there is a hot surface and that there is risk of getting burned if the surface is touched.



EXPLOSION RISK! Alerts the operator that there is risk of explosion.

2 Safety

Safe laboratory practices and procedures should be observed while operating and maintaining the Model 653B.

2.1 Battery Safety



On nine volt batteries, the positive and negative terminals are on the same end, next to each other. If these terminals touch anything metal, such as steel wool, coins, or a paper clip, a short circuit could occur, creating heat, sparks, a fire, or an explosion.



Nine volt batteries can explode if they are stored in a hot location, charged improperly, or if the terminals contact metal, creating a short circuit.



Some batteries contain toxic or corrosive material, which can leak if the battery is damaged.

- Store unused 9-volt batteries in their original packaging, a sealed plastic container, or securely cover both terminals to prevent short circuits.
- Do not charge rechargeable batteries before storing them.
- Store batteries at or below 70°F (21°C).

3 Features and Specifications

The Model 653B can measure resistivity from 0.01 to 10 ohm-meters. The ohm-meter reading can be converted into parts per million sodium chloride (or equivalent calcium chloride, potassium chloride or other carbonate or hydroxyl salts) using the resistivity chart (Figure 4-1). This instrument can be operated by its 9V battery. Refer to Figure 3-1.

The Model 653B has these features:

- Direct reading in ohm-meters
- Built-in temperature probe
- Push Button for calibration (black)

Table 3-1 Resistivity Meter, Model 653B Specifications

Category	Specification
Meter Range	0.01 to 10 ohm-meters
Meter Dimensions (Height x Width x Length)	3.1 x 3.7 x 6.2 inches 8.0 x 9.5 x 15.8 centimeters
Carrying Case Dimensions (Height x Width x Length)	9 x 3.5 x 7.9 inches 22.9 x 8.9 x 20.1 centimeters
Weight	3.25 lb (1.5 kg)
Power Supply	9V alkaline battery

Table 3-2 Range of Environmental Conditions

Maximum Altitude	6562 ft (2000 m)
Temperature Range	41°F to 104°F (5°C to 40°C)
Maximum Relative Humidity (RH)	80% RH at 87.8°F (31°C) or less 50% RH at 104°F (40°C)



Figure 3-1 Resistivity Meter, Model 653B

4 Operation

This resistivity meter can measure resistivity of fluid samples and semisolid samples (e.g., filter cakes or mud solids). Procedures for both types of samples are listed here.

The resistivity chart (Figure 4-1) is used to determine the quantity of sodium chloride (in combination with distilled water or other salt-free aqueous medium) that is required to produce a solution with the same resistivity as the sample. The concentration for carbonate salts, calcium salts, and hydroxyl salts can be found in conductance tables for aqueous solutions.

4.1 Fluid Samples

This procedure explains how to measure resistivity of liquids, filtrates, and drilling fluids. Refer to Figure 3-1.

1. Remove the sample cell and fill it with the sample. Fill and discharge the sample cell several times before the final fill. To fill use the suction ball to pull sample into the Lucite cell.



Make sure there are no bubbles in the sample.

2. Reattach the sample cell onto the pins on the meter.



Be sure the sample fills the area between the two metal posts in the cell. If the sample is not at room temperature, wait for the temperatures of the sample and the cell to reach equilibrium.

3. Press black switch to calibrate the meter. Use the **ADJ** control to set the meter to the **ADJ** position.
4. Press both the black and red switches at the same time. Then read the resistivity directly from the meter in ohm-meters.

5. Read the temperature of the sample as shown on the thermometer in the cell wall.
6. Remove the sample cell and clean it with distilled water. If necessary, use a pipe cleaner and mild soap to clean the cell bore.



Do not use solvents to clean the cell.

7. Using the resistivity chart (Figure 4-1), convert the resistivity in ohm-meters to concentration of chlorides.

4.2 Semisolid Samples

This procedure explains how to measure resistivity of semisolid samples, such as filter cakes and mud solids. Refer to Figure 3-1.

1. Prepare samples of uniform moisture content.
2. Remove the sample cell from the resistivity meter.
3. Completely fill the slot on the outer surface of the cell with semisolid sample.
4. Reattach the sample cell onto the pins on the meter.



Be sure the sample fills the area between the two metal posts in the cell. If the sample is not at room temperature, wait for the temperatures of the sample and the cell to reach equilibrium.

5. Press black switch to calibrate the meter. Use the ADJ control to set the meter to the ADJ position.
6. Press both the black and red switches at the same time. Then read the resistivity directly from the meter in ohm-meters.
7. Read the temperature of the sample as shown on the thermometer in the cell wall.
8. Remove the sample cell and clean it with distilled water. If necessary, use a pipe cleaner and mild soap to clean the slot.



Do not use solvents to clean the cell.

9. Using the resistivity chart (Figure 4-1), convert the resistivity in ohm-meters to concentration of chlorides.

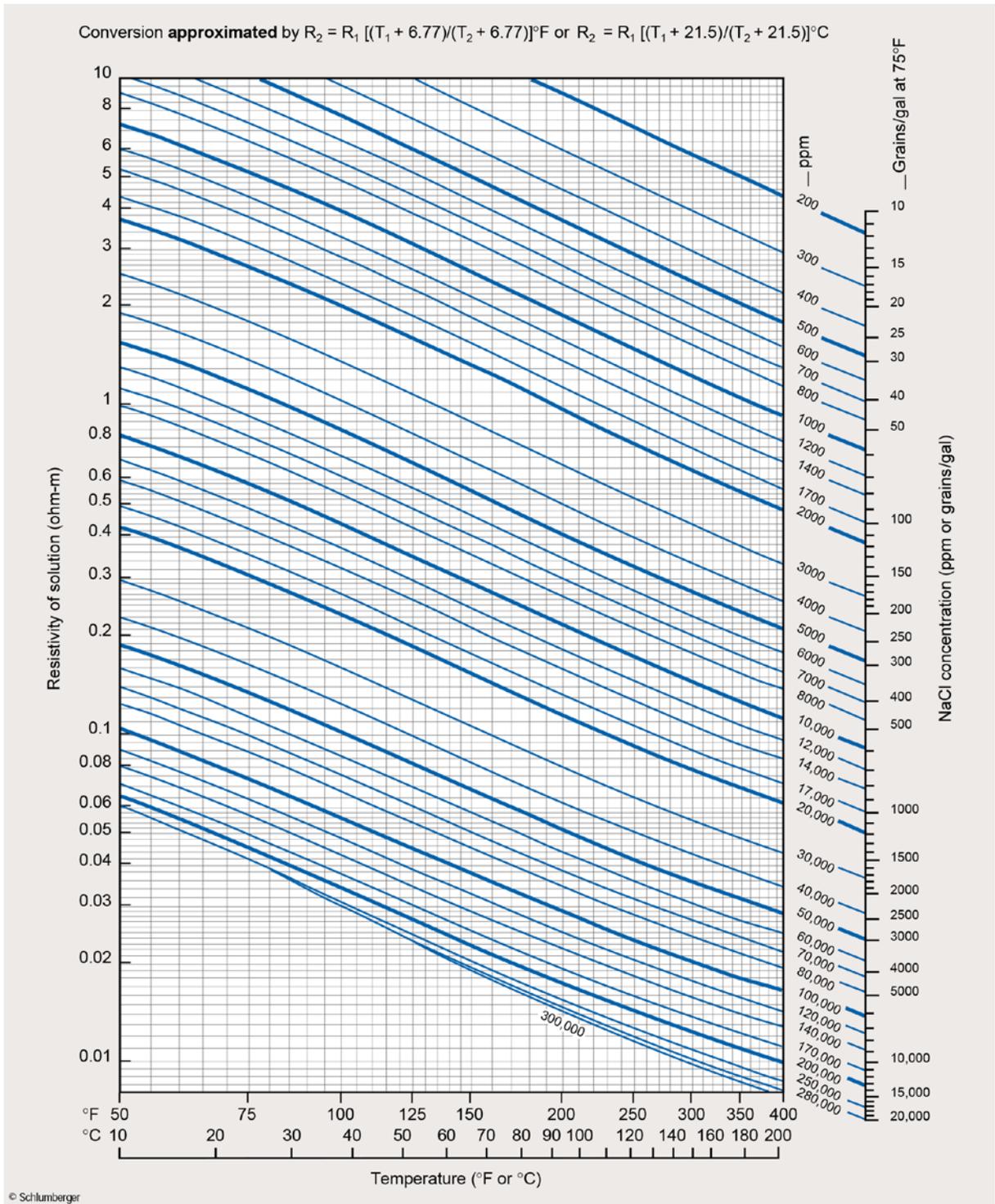


Figure 4-1 Resistivity Chart for NaCl Solutions

5 Troubleshooting and Maintenance

Calibration and regular maintenance procedures are described in this section. If more extensive maintenance or service of the instrument is required, please contact Fann Instrument Company.

5.1 Calibration

Press black switch to calibrate the meter. Use the **ADJ** control to set the meter to the **ADJ** position.

A thorough calibration requires a calibration kit.



A calibration kit (P/N 210179) is available as a separate purchase. See the parts list for details.

5.2 Battery Replacement

When the meter cannot be calibrated with the zero control, replace the 9 Volt battery (P/N 205643).



Observe the polarity marking on the printed circuit board.



If the battery is inserted incorrectly, it will become damaged.

5.3 Cleaning



Always clean the cell immediately after making a measurement.



Do not use solvents to clean the cell.



Avoid scratching the surface of the cell.

1. Purge the cell with distilled water until it is clean.
2. If additional cleaning is necessary, use a pipe cleaner and mild soap.
3. After extensive use, follow these steps to thoroughly clean the cell.
 - a. Soak the cell bore in cleaning solution (P/N 210181) for 2 to 3 hours.
 - b. Scrub it with a pipe cleaner.
 - c. Rinse with distilled water.
 - d. Dry the cell with a clean pipe cleaner.

6 Parts List

Table 6-1 Model 653B Resistivity Meter Included Parts, P/N 101582036

Part No.	Description
205643	BATTERY, 9 VOLT
208758	CARRYING CASE
210174	CELL (COMPLETE)
210170	CIRCUIT BOARD ASSEMBLY
210168	ELECTRODE CONTACT (2 REQUIRED)
204330	KNOB
101418648	INSTRUCTION MANUAL
205764	METER, 0 TO 50 MICRO AMPS
210441	PIPE CLEANERS, 20/PKG
205119	BLACK PUSHBUTTON SWITCH
205120	RED PUSHBUTTON SWITCH
210071	RUBBER BULB
206043	THERMOMETER

Table 6-2 Optional Equipment

Part No.	Description
210179	RESISTIVITY CALIBRATION KIT*
210181	CLEANING SOLUTION, 4 OZ.
210182	STANDARD RESISTIVITY SOLUTION, 4 OZ.

*Calibration Kit includes pipe cleaners, cleaning solution, and standard resistance solution.

7 Warranty and Returns

7.1 Warranty

Fann Instrument Company warrants only title to the equipment, products and materials supplied and that the same are free from defects in workmanship and materials for one year from date of delivery. **THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED OF MERCHANTABILITY, FITNESS OR OTHERWISE BEYOND THOSE STATED IN THE IMMEDIATELY PRECEDING SENTENCE.** Fann's sole liability and Customer's exclusive remedy in any cause of action (whether in contract, tort, breach of warranty or otherwise) arising out of the sale, lease or use of any equipment, products or materials is expressly limited to the replacement of such on their return to Fann, or at Fann's option, to the allowance to Customer of credit for the cost of such items. In no event shall Fann be liable for special, incidental, indirect, consequential or punitive damages. Notwithstanding any specification or description in its catalogs, literature or brochures of materials used in the manufacture of its products, Fann reserves the right to substitute other materials without notice. Fann does not warrant in any way equipment, products, and material not manufactured by Fann, and such will be sold only with the warranties, if any, that are given by the manufacturer thereof. Fann will only pass through to Customer the warranty granted to it by the manufacturer of such items.

7.2 Returns

For your protection, items being returned must be carefully packed to prevent damage in shipment and insured against possible damage or loss. Fann will not be responsible for damage resulting from careless or insufficient packing.

Before returning items for any reason, authorization must be obtained from Fann Instrument Company. When applying for authorization, please include information regarding the reason the items are to be returned.

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