Soil Test Resistance Meter

Model EPT/124F

INSTRUCTION MANUAL

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1) Theory of Operation:

Knowledge of the Procedures for Measuring soil resistively is highly important in the evaluation of soils as to their corrosively. It is equally important for the selection of suitable locations for the cathodic protection installations as well as for the successful design of these installations.

Low soil resistance result in low circuit resistances for galvanic Corrosion cells. This means higher current flow for a given cell potential and the higher current means more corrosion.

Resistance	Corrosively
0-1000 ohm-cm	very corrosive
1000-2000 ohm-cm	Corrosive
2000- 10,000	Mildly Corrosive
10,000 ohm-cm and above	Progressively less Corrosive

Such a rating system is only a general guide. If for example, General soil resistance in an area is well above 10,000 ohm-cm this does not mean that there will be no corrosion- just that the tendency is less. And if there were local low resistance inclusions within the generally high resistance soil, Corrosion could be quite active. To measure soil resistance because of mineral and salt we have to use AC current.

The EPT/124F Soil Test Resistance Meter is a 4 terminal, null balancing Ohmmeter. This model is compatible to use as a 4, 3, or 2 pins device for soil resistance measurement or can be used with a soil box or a single probe.
This equipment provides a low AC voltage 124 HZ square wave current between the C1 and C2 Terminals.

The comparator senses the voltage drop between the P1 and P2 Terminal compares it to internal standard resistors. To find the resistance, we have to use three selectors range (A, B, C, and

one selector multiplier (D) to balance the LCD meter and provide exactly the same drop voltage. When the null meter is balances The position of selectors (A, B, C, D) shows the resistance between P1 and P2

2) Charge the Battery:

The Battery is 7.2 volt/ 3.8 Amp rechargeable Nickel Cadmium. When battery is exhausted a red led will turn on beside a warning massage will be on the LCD Meter. Charge the the battery for 8-10 hours with universal charger.

Technical information:

1- Battery 7.2 V/ 5 Amp
2- Charging Battery Rate 300 Mil amp
3- Output AC square Wave +- 12 volt
4- Frequency 124 HZ
5- Automatic shot down in an hour
6- Push button turn ON and OFF
7- Wight less than 3 1/2 Lb
8- Size pelican case 1200 approximately “20x 28x 15 Cm”
9- Consume rate 50-75 mil Amp per hour

3) How to Start Measuring:

This is the simple and standard way to measure the resistance. Put selector A in position 1 and selectors B and C in position 0 and selector D in position 0.01. If Polarity of LCD Meter is Minus (-) turn the selector D in clock wise direction step by step gently to change the polarity of meter, then come back only one steps.

Turn the selector A in clock wise direction step by step and check the polarity of meter, then come back only one step.

Start with selector B turn clockwise direction to change the polarity of meter then come back only one step.

Finally Start with selector C turn it clock wise step by step very gently to change the polarity and find the smallest number on the LCD null meter. The resistor is ABCX D.
For example if A =1 B =3 C =9 and D position is10, the resistor is 139 x 10 =1390 Ohm.

If you put D= 0. 01, A=1, B=0, and C= 0 and polarity of meter is not negative put A=0 and B=1 and continue the above procedure.

For small resistor when you balance to Zero sometime need to turn selector C to provide Zero with flashing polarity for exact balance.

For big resistance when you balance, may you not able to balance to zero it is not very important only find the smallest number on the LCD by the Selector C regardless the polarity. The Position 10000 for selector D is not applicable for this unit.

4) 4 Pins Method (Wenner):

We have to put 4 pins in to the ground in a straight line at the equal desired spacing. Good connect with the soil is important. The two “C” binding posts are connected to the two end pins and two “P” binding post are connected to the adjacent center pins. Fig. 1

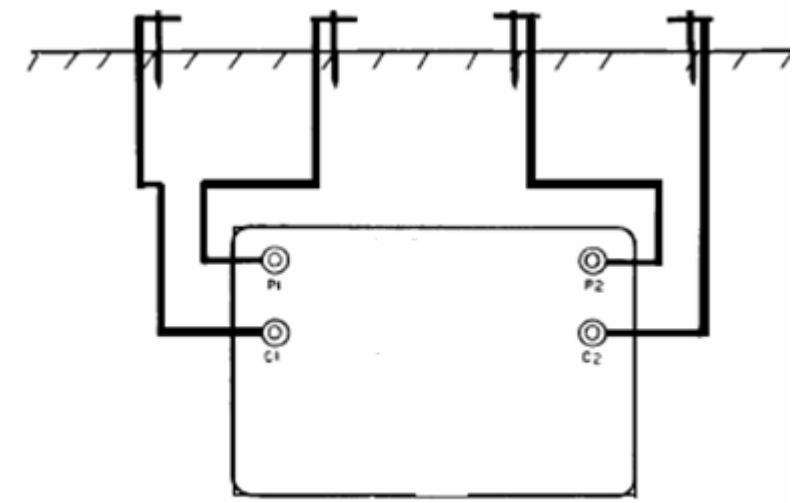

FIG. 1

The measured resistance value is not the soil resistance this is a function of both the measured resistance and pin spacing. For any pin spacing the soil resistance is determined by the following formula:

p = 191.5 X DX R

p= soil resistance in ohm- cm
d= pin spacing in feet
R= measured resistance between p1 and p2 in ohms
For example: assume that a test has been made with pins spaced 4 ft apart and that the resistance between P1 and P2 has been measured and found to be 25 ohms the soil resistance will then be: *P*= 191.5x 4x 25= 19150 Ohm- Cm

5) Soil Box:

This procedure is used for measuring the resistance of soil samples removed from excavations or auger holes. The resistance may be measured on site or samples may be placed in sealed plastic bags.

In use the potential pins are removed and the box filled with the soil sample the soil is compacted to the same degree as it was in the location from which the sample was removed. The potential pins are inserted and soil recompacted to ensure soil in the box is struck off flush with the top of the box. The sample is now ready for the resistance measurement. Fig 2

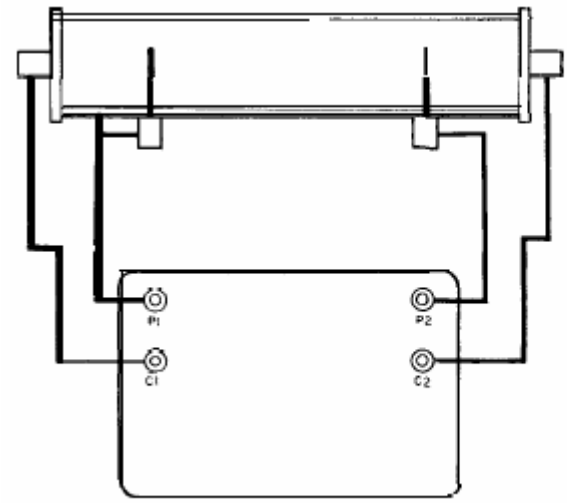

FIG. 2

Balance and read in the usual way. The resistance that shows for this box is exactly soil resistance Ohm-Cm

6) 3 Pins Method:

This method can be used to measure the resistance to earth of a ground rod, ground bed, anode, etc. For this method connect the “C1” and “P1” to the object being measured using separate leads. Connect “C2” to a pin driven in to the soil far enough away from the object under test so that not to interfere the reading.

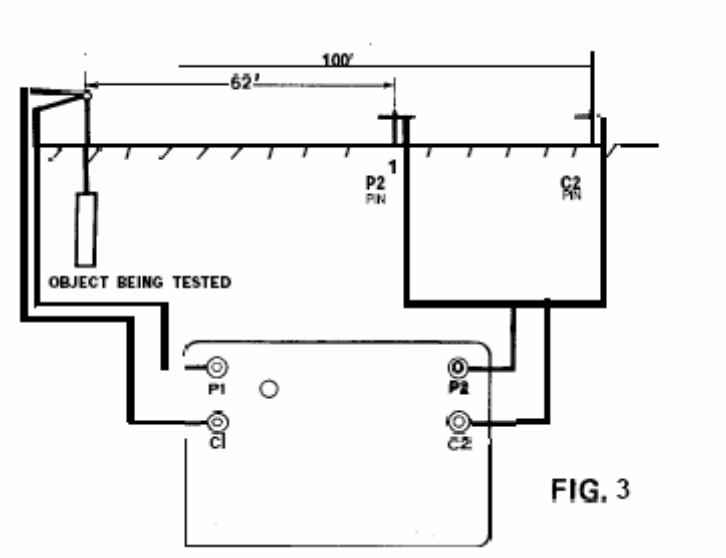

FIG. 3

Normally 100 feet would be typical for a ground rod 15 to 20 feet deep. Connect “P2” to a pin 62% of distance from the object being tested to the “C2” Balance and read in usual way. Fig 3

7) 2 Pins Method:

To measure the resistance between two pins or anodes, connect “C1 “and “p2” to the pins or anodes, using separate leads. Fig 4

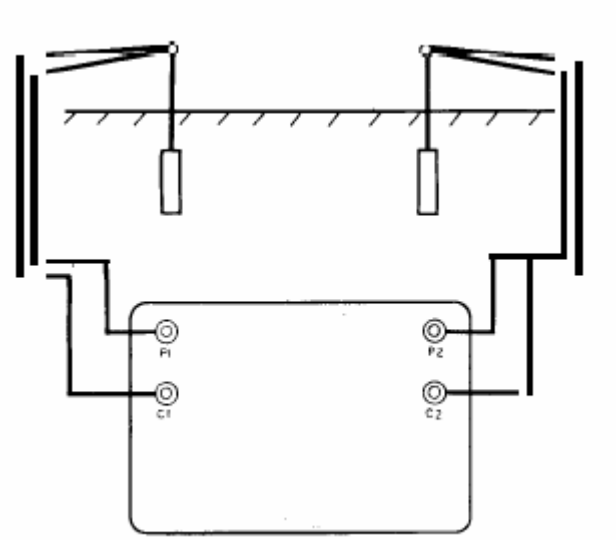

FIG. 4

Balance and read in the usual way. Note that this reading includes the resistance of the two pins or anodes to the soil, the soil resistance between them, and the resistance of any cables from the connections.

8) Single Probe Method:

To use a single probe, connect “C1” to “P1” and “C2” to “P2”. Make the probe connections to “P1” and “p2”. Fig 5

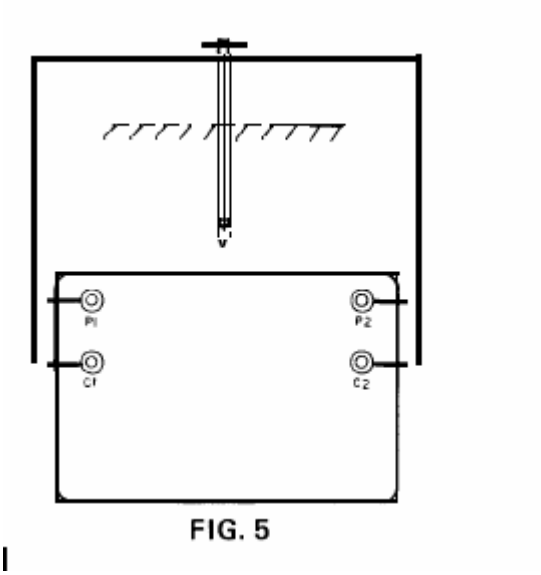

FIG. 5

Drive the probe in to the soil to the desired depth. Balance and read in the usual way. Multiply the reading in ohm s by the correct factor for the probe being used, to obtain resistivity in ohm/cm.

9) Important Operation Notes:

As in any electrical measurement, correct reliable connections are essential for proper results.

The connections to the binding posts, as shown in the diagrams, must be correct or erroneous readings will result.

Pins should be firmly driven in to the soil, not loose in very dry soils it may be desirable to wet the soil around the pins to make reliable contact.

Open or broken lead wires will result in the inability to achieve a balance on any range, or an incorrect balance on a number of ranges. The trouble is revealed by the abnormal action of the null meter. Test of the lead wires, connections and pin setting will reveal the source of the problem.