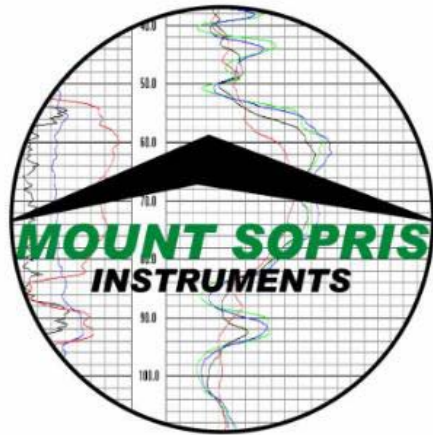


# Fluid Resistivity/ Temperature Probe

Models: 2PFA-1000,  
2SFA-1000, 2SFB-1000, 2WQA-  
1000, 2WQB-1000, 2WQC-1000



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July 9, 2009

# Table of Contents

General Information .....	3
Overview .....	3
Theory of Operation .....	3
Specifications .....	3
Installation .....	4
Operating Procedure .....	5
Operation .....	5
Logging Instructions for Matrix .....	5
Logging Instructions for MSLog with the MGX II .....	6
Performance Checks and Calibrations .....	7
Calibration Instructions for Matrix .....	7
Calibration Instructions for MSLog .....	8
Preventive Maintenance .....	9
Schematics .....	10

2PFA-1000 Fluid Resistivity/ Temperature Probe  
(2SFA,B-1000, 2WQA,B,C-1000)

**General Information**

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**Overview**

The 2PFA-1000, combination temperature/fluid resistivity probe, provides valuable information for the hydrologist and groundwater scientist concerning borehole fluid character and flow. The 2PFA-1000 is configured as a “Poly” probe, with a quick-connect probe top that allows it to be easily attached to either a Poly gamma probe or fitted with a probe top adapter to run in stand alone mode. Other versions of this probe, designated 2WQA-1000, 2WQB-1000, or 2WQC-1000 are stand-alone probes with respectively, a Mount Sopris single conductor, four-conductor, or GO/I four-conductor top. Finally, the measurements are also available as a factory-mounted sub that is mounted permanently to the bottom of the 2PEA-1000, Poly Electric (2SFA-1000) or 2PCA-1000, Poly Caliper (2SFB-1000) or 2CAA-1000 Caliper (2SFB-1000) probes.

**Theory of Operation**

The 2PFA-1000 and its various configurations include a seven electrode mirrored Wenner array for measuring borehole fluid resistivity and a temperature sensor based on a fast response semiconductor device whose output voltage changes linearly with temperature. The resistivity array is an internal cylindrical array open at the bottom of the probe. Borehole fluid passes by the array as the probe is lowered in the hole. The array is completely shielded from the outside borehole, so that only fluid resistivity is measured. The temperature sensor is located at the top of the sensor body, in the center of the three exit ports where the borehole fluid returns to the well bore. The “K” factor for the Wenner array is empirically derived, and is approximately 12, when checked for fluid resistivity ranging from 3 to 78 ohmmeters.

**Specifications**

Diameter	1.5 inches	38 mm
Length	depends on configuration (2WQA-1000 is 22inch, or 56cm)	
Weight	depends on configuration (2WQA-1000 is 5 lbs or 2.3 kg)	
Range	Fluid Resistivity	0-100 Ohm-meters
	Temperature	-20 to +80 degrees Celsius
Resolution	Fluid Resistivity	0.05%
	Temperature	0.1 degrees Celsius
Accuracy	Better than 1% (both sensors)	
Maximum Pressure	2000 psi (13.8 Pa)	
Maximum Temperature	70 deg. C	

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### **Installation**

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The 2PFA-1000 uses the tapered lead 6-ring connector common to the Poly family of probes. It is connected to the Poly Gamma or the optional single conductor adapter by simply unscrewing the bull plug (CCW) and screwing the 2PFA-1000 CW onto the mating connector. A firm hand tight connection is all that is required. A layer of electrical tape can be applied if desired.

The 2SFA-1000, 2SFB-1000 subs are installed at the factory, and should not be removed in the field unless proper procedures are available and performed by a qualified electronics technician.

The 2WQA-1000, 2WQB-1000, 2WQC-1000 versions use MSI single conductor, MSI 4 conductor, or Gearhart 4 conductor tops, ready to connect to their respective mating cable heads.

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## Operating Procedure

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### Operation

Operation of the 2PFA and its siblings requires that the probe be connected to the cable head. *Make sure that probe power is off before connecting or disconnecting the probe to avoid the chance of electrocution or damage to the equipment.* Normally, **no calibrations are necessary, as the probes are calibrated at the factory.** If re-calibration is desired, see below. Instructions for logging vary depending on your equipment. Follow the appropriate instructions below.

### Logging Instructions for Matrix

1. Select the correct tool driver from the Tool panel selection box.
  - a. If the correct Tol file is not available, run MTXFileConfig to install it or manually copy the file from Matrix\Tol to Matrix\Tol\Current.
  - b. Note: With Matrix Version 10 and later copy the file to Matrix\Tools\Standalone
  - c. If you have not calibrated the tol file, right click on the top pane of MCHNum (or click the green ball in the upper left corner of the top pane) and click **Calibration Settings**. Using their respective tabs enter calibration values for each measurement, when done with each tab, click **Calculate** then click **Store** and move to the next tab.
    - i. After calibrating the first time exit Calibration Settings; in the Browsers & Processors Panel click **Close All**, click **Start All** this applies the new calibration settings to all the browsers.
2. Place the tool in the borehole and position the top of the tool at the zero depth point.
  - a. Click the **Depth panel** upper right corner icon. Click **Zero Tool**. If you cannot place the tool top at depth reference (perhaps the bridle will not go through a sheave), press the **Change Depth** button and enter the depth of the bottom of the tool.
3. In the Tool panel, click the Power On button. **It is advisable to power the probe while it is in the hole for a few minutes to warm up the electronics before logging for optimum accuracy.**
4. If you wish to fill out the header, in the Acquisition panel click Header  icon.
5. In the Acquisition panel, click Record  icon and enter a file name.
6. Place the probe at the beginning of the interval to be logged. Usually, temperature – fluid resistivity logs are run from the top to the bottom to avoid disturbing the water column before measurement.
7. Turn on the desired, Depth Sampling mode.
8. If you are printing, turn on the printer in MchCurve.
9. Log to the desired interval as normal. Refer to the MSLog manual for additional information on logging.
10. When done, in the Acquisition panel, click Stop  icon.
11. In the Tool panel, click the Power Off button before removing the probe.

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**Logging Instructions for MSLog with the MGX II**

1. Select the correct tool driver from the Tool panel selection box.
  - a. If the correct one is not available, run MSLConfig to install it or manually copy the file from Mslog\Tol to Mslog\Tol\Current.
  - b. If you have not calibrated the tol file, right click on the top pane of MCHNum (or click the green ball in the upper left corner of the top pane) and click **Calibration Settings**. Using their respective tabs enter calibration values for each measurement, when done with each tab, click **Calculate** then click **Store** and move to the next tab.
  - c. After calibrating the first time exit Calibration Settings; in the Browsers & Processors Panel click **Close All**, click **Start All** this applies the new calibration settings to all the browsers.
2. Place the tool in the borehole and position the top of the tool at the zero depth point.
  - a. Click the **Depth panel** upper right corner **icon**. Click **Zero Tool**. If you cannot place the tool top at depth reference, press the **Change Depth** button and enter the depth of the bottom of the tool.
3. In the Tool panel, click the Power On button. **It is advisable to power the probe while it is in the hole for a few minutes to warm up the electronics before logging for optimum accuracy.**
4. If you wish to fill out the header, in the Acquisition panel click Header button.
5. In the Acquisition panel, click Record and select a file name.
6. Place the probe at the beginning of the interval to be logged. Usually, temperature – fluid resistivity logs are run from the top to the bottom to avoid disturbing the water column before measurement.
7. Turn on the desired Depth Sampling mode.
8. If you are printing turn on the printer in MCHCurve.
9. Log to the desired interval as normal. Refer to the MSLog manual for additional information on logging.
10. When done, in the Acquisition panel, click **Stop**.
11. In the Tool panel, click the Power Off button before removing the probe.

## 2PFA-1000 Fluid Resistivity/ Temperature Probe (2SFA,B-1000, 2WQA,B,C-1000)

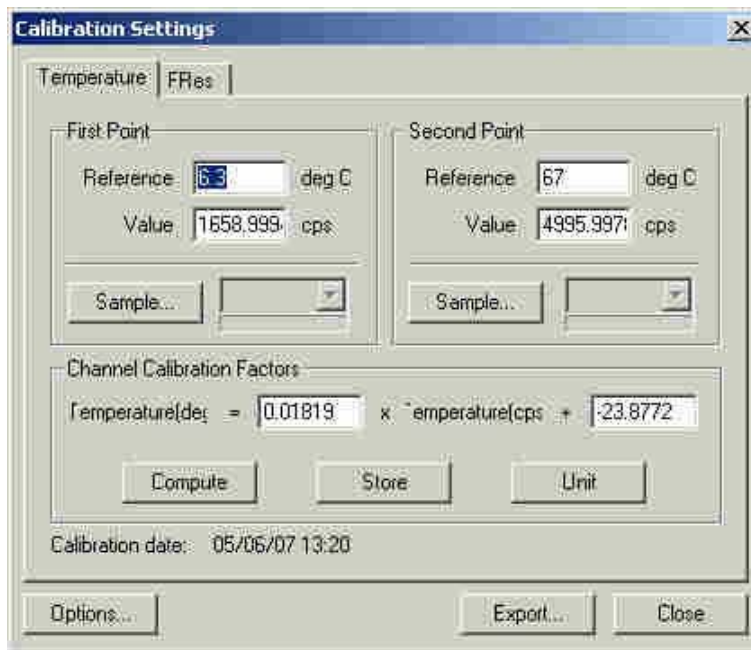
### Performance Checks and Calibrations

The 2PFA series of probes and subs may be re-calibrated in the field, if desired. An accurate thermometer and fluid conductivity/resistivity cell is needed. A good temperature bath is also required, to allow a large mass of water to stabilize at a known temperature. Be sure that the thermometer is placed very close to the sensor to minimize errors. Standard chemical solutions can be purchased from lab supply vendors to calibrate the resistivity array. Contact Mount Sopris for details. Salt-water solutions can be mixed for this procedure, but changes in temperature during mixing can make true resistivity of such solutions difficult to measure.

To enter pre-determined calibrations see step 1 in the previous operating instructions.

### Calibration Instructions for Matrix

- 1) Turn Probe power On.
- 2) Turn Sampling mode to Time and On.
- 3) Connect a calibration standard as described above.
- 4) Allow tool to warm up for 10-15 minutes.
- 5) Right click on MCHNum.
- 6) Click Calibration Settings.
  - a. If you want to view raw numbers in MCHNum uncheck **Use calibrations** first
- 7) Enter the value of the calibration standard (i.e. 6.3 deg C) in the Reference edit box for the First Point.
- 8) Click Sample and wait for the progress bar to finish

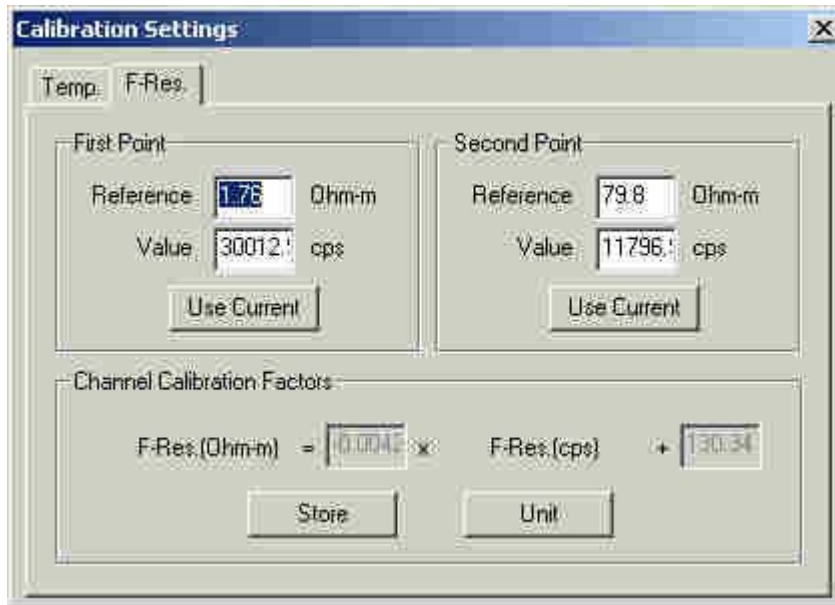


- 9) Connect a different calibration standard as described above.
- 10) Enter the value of the second calibration standard (i.e. 67 deg C) in the Reference edit box for the Second point.
- 11) Press the Second Point **Sample** button to capture the raw tool values.
- 12) Press **Compute** then **Store** to save the values to the tool driver, tol, file.
- 13) Press the **X** in the upper right corner of the browser to close the dialog.
- 14) On the Browsers & processors menu press **Close All**.
- 15) On the Browsers & processors menu press **Start All**. This is necessary so that the browsers and processors can read the new calibration information stored in the tool driver file in step 12 above.

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**Calibration Instructions for MSLog**

- 1) Turn Probe power On.
- 2) Turn Sampling to Time and On.
- 3) Connect a calibration standard as described above.
- 4) Allow tool to warm up for 10-15 minutes.
- 5) Right click on MCHNum.
- 6) Uncheck Use calibration
- 7) Right click on the MCHNum title bar.
- 8) Click Calibration Settings.
- 9) Enter the value of the calibration standard (i.e.1.76 ohm-m) in the Reference edit box for the first point.



- 10) Press the First Point **Use Current** button to capture the raw tool output for the first calibration point.
- 11) Connect a different calibration standard as described above.
- 12) Enter the value of the second calibration standard (i.e. 79.8 Ohm-m) in the Reference edit box for the Second Point.
- 13) Press the Second Point **Use Current** button to capture the raw tool output for the second calibration point.
- 14) Press **Store** to save the values to the tool driver, tol, file.
- 15) Press the **X** in the upper right corner of the browser to close the dialog.
- 16) On the MSLog Browsers & processors menu press **Close All**.
  - a. Select *each Browser or Processor from the menu individually* and press the **Start** button. Wait until the browser or processor Connects then select the next one in the list, press **Start** and so on until all the processors and browsers are running. This is necessary so that the browsers and processors can read the new calibration information stored in the tool driver file in step 14 above.



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**Preventive Maintenance**

The only maintenance required for the 2PFA probe series is to be sure to thoroughly clean the interior of the sensor array (electrodes and temperature sensor) with soft brush and clean fresh water and allow the probe to dry before storing. All threads should be cleaned and greased, and all o-ring surfaces and O-rings should be cleaned and coated with silicone grease. Clean logging equipment provides trouble-free logging.

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**Schematics**

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Drawing Number	500S-2100.S01	Title	Pwr. Sup. and Temp. Cir.
Drawing Number	500S-2100.S02	Title	Current Generator Circuit
Drawing Number	500S-2100.S03	Title	Voltage Measuring Circuit
Drawing Number	500S-2100.S04	Title	Anti-Co and Pulse Driver Cir.
Drawing Number	Wiring Diagram	Title	2PFA-1000 Wiring Diagram
Drawing Number	Wiring Diagram	Title	2WQA-1000 Wiring Diagram
Drawing Number	Wiring Diagram	Title	2SFA-1000 Wiring Diagram
Drawing Number	Wiring Diagram	Title	2SFB-1000 Wiring Diagram

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