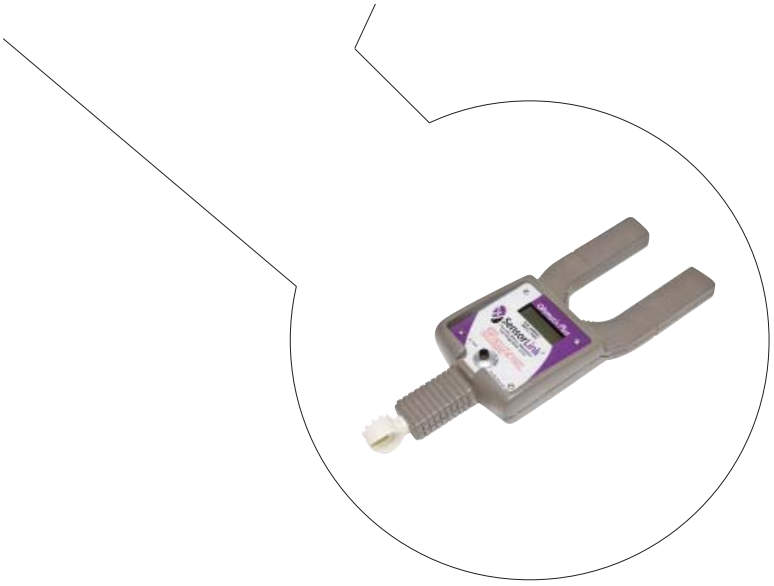

Operators Manual

Ohmstik PLUS

Multiple Reading
Live-Line Micro Ohmmeter

SensorLink®

Model 8-082XT Plus

Model 8-084 Plus

Operators Manual
OhmstikPlus

Multiple Reading Live-Line Micro Ohmmeter

Available Stock Codes:			
8-082 XT PLUS 50HZ	8-082 XT PLUS 60HZ	8-082 XT PLUS EURO	8-082 XT PLUS FRG
8-084 PLUS 50HZ	8-084 PLUS 60HZ	8-084 PLUS EURO	8-084 PLUS FRG

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Figure 1.0

Figure 2.0

Theory of Operation

The Ohmstik Plus Live-Line Micro Ohmmeter is designed to be attached directly to an energized, high voltage line and directly read the resistance in micro-ohms. The Ohmstik Plus can be used on almost any connection in a utility. Line splices can be checked after installation, or after many years of service. Bolted terminals, taps, jumpers and substation bus bars can be evaluated. Switches, fused disconnect and normally open switches that have been open for long periods can be measured just after closing. Each of these connections can be measured quickly after installation, or surveyed after long service, to ensure proper resistance.

It attaches to any hot stick and is pressed against the splice or connector in such a manner that the connection under test is between the two electrodes. In a few seconds the instrument is removed from the line and the line amperage and resistance are displayed on the front panel of the instrument.

The Ohmstik Plus is designed to store up to nine sets of readings.

Safety Information:

⚠ **The probes on the Ohmstik Plus measure voltage drop and are intended to measure the micro voltage drop from the same phase. Connecting the probes in a phase to phase, phase to ground, or any application where the voltage potential between the probes is more than 2.5 volts will cause damage to the instrument and create a fault on the system.**

Great care should be exercised to insure that the probes do not touch or engage the air gap of adjacent phases or ground connections.

Specifications

Model Number	8-082 XT Plus	8-084 Plus	8-090 Plus
Sensor Type	Standard	Wide Jaw	Ultra Wide Jaw
Sensor Opening	2.5 in, 6.35 cm	3.86 in, 9.8 cm	6 in 15.4 cm
Weight	2.4 lbs, 1.10 kg	4.0 lbs, 1.81 kg	5 lbs, 2.3 kg
Frequency	Actual frequency indicated on unit		
50Hz Calibrated	47 to 53Hz		
60Hz Calibrated	57 to 63Hz		
Type of Reading	Nine measurement sets		
Range of Operation			
Voltage phase to phase	500kV		
True RMS Amps	1 - 1400A		
Micro-Ohms	5-2500 μΩ		
Resolution			
Amps 0.9-99.9A	0.1A		
Amps 100-1400A	1A		
Micro-Ohms 1-999	1 μΩ		
Micro-Ohms 1000-2500	1.0 mΩ		
Accuracy			
Current	±1% ±1 A		
Micro-Ohms Absolute	±2% ±2 μΩ		
Micro-Ohms Repeatability	±1% ±2 μΩ		
	Accuracy is diminished if the current is less than 15A on 0-35kV and when current is less than 50A when on 36-500kV		
EEC Standards	Successfully passed test standards indicated by CE		
Mechanical			
Controls	Single button operation		
Operating Temperature	-22° to +140° F (-30° to +60° C)		
	Lithium battery required for temperatures below -4° F (-20° C)		
Display	Graphic Display		
Housing	Shock & Water resistant molded urethane		
Hotstick Mounting	Universal chuck adapter (hotstick not included)		
Battery	9 Volt Alkaline or Lithium		

Operating Instructions

To turn on the Ohmstik Plus:
Press the function button. The following information will appear on the display:

SensorLink Copyright 2004	Then
Ohmstik*Plus*	Followed by
F808-XPO-100 Ver. X.XXX	Followed by
Ready	

The Ohmstik is now ready to measure Amps and Micro-Ohms.

Taking a measuerment:

1 Place the Ohmstik*Plus* on a conductor carrying at least two amps of AC current, as depicted in Figure 3.0. It is essential you make contact between the conductor and the voltage sensor, which is the V-shaped plate between the jaws, as well as the voltage probe. Measurement begins as soon as the Ohmstik*Plus* is in position and is stable.

Figure 3.0

2 Being careful not to allow movement of the instrument during the measurement, leave the Ohmstik*Plus* in position to measure for at least five seconds. While the Ohmstik*Plus* is taking a measurement it will display the word "Sampling".

3 Remove the Ohmstik*Plus* from the conductor. It holds the reading and displays it as follows:

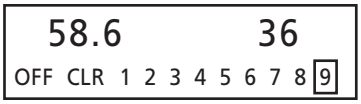
58.9	38
1 AMPS	

Taking multiple measurements:

To take up to eight more readings, simply follow steps one through three over again. The number in the box in the lower left side of the display will indicate which reading you are taking.

Viewing the multiple measurements:

Press and hold the control switch down until you see the following screen:



When the switch is held down, the cursor will continuously scroll through the menu options at the bottom of the screen. To view any of the readings, release the switch when that option is highlighted with the cursor.

Deleting measurements:

Press and hold the control switch down until you see the main screen with the "POWER OFF", "CLEAR DATA" and "1" through "9" menu options. Release the switch when the cursor scrolls over the "CLEAR DATA" option. A confirmation screen will appear:

Press and hold the control switch down until you see the selector box over the desired function. Release the switch when the cursor scrolls over the "YES" option. All data is now deleted.

Power Off the Ohmstik PLUS:

Press and hold the control switch down until you see the main screen with the "POWER OFF", "CLEAR DATA" and "1-9" menu options. Release the switch when the cursor scrolls over the "OFF" option. A confirmation screen will appear:

Hold the control switch down while the cursor cycles through the "NO/YES" menu. Release on "YES". Release the switch when the cursor scrolls over the "YES" option. The Ohmstik*PLUS* is now off.

The Ohmstik*PLUS* will power off by itself if left inactive for 20 minutes.

Troubleshooting an Error Message:

1. FULL

The Ohmstik*Plus* has room to accomodate nine sets of readings in its memory. Attempting to store additional readings results in the following screen:

You must clear the data with the "CLEAR DATA" option before any further readings may be taken.

2. NO CONTACT

The Ohmstik*Plus* reads current but not μΩs:

This indicates that either one of the two voltage sensors is not making contact. Use the rough edges of the probes to clean the corrosion from the conductor and re-take the measurement. Make certain that both voltage sensors are making contact.

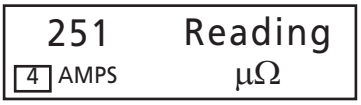
3. POOR CONTACT

This means either there is Poor Contact between the two voltage contacts:

Provide five seconds to measure, while the Ohmstik*Plus* is held stationary with both voltage probes securely on the line.

4. READING

The following message indicates that the current measurement was completed before the resistance measurement could be completed:



Provide five seconds to measure, while the Ohmstik*Plus* is held stationary with both voltage probes securely on the line.

Troubleshooting an Error Message: **(continued)**

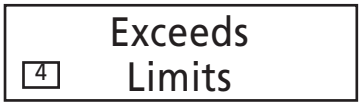
5. UNABLE TO MEASURE

The Ohmstik*Plus* uses logic to know when it is on a conductor by looking for a stable load:

Hold the OhmstikPlus firmly on the line for at least five seconds. The Ohmstik*Plus* samples the line three times every 100 milliseconds. If it can't find three consecutive reads that are similar within five seconds it will display "Unable To Measure".

6. EXCEEDS LIMITS

The Ohmstik*Plus* limits the maximum current to 1400 Amps.



Exceeds Limits indicates that the current limit has exceeded 1400 Amps.

7. LOW BATTERY

The following message will display if the battery voltage is too low and needs to replaced.

8. If the instrument **turns off**, and will not power-on, replace the battery. The Ohmstik*Plus* will power off when the battery voltage drops too low. See the Battery Replacement instructions on page eight.

Application:
Deterioration Influences

Time is not an "aging factor" for fittings. Deterioration is due to increases in resistance of the connection. The increased resistance is produced, in part, by peaks of load and fault current that can heat the interface, even if only temporarily, or for a few cycles (also in part by oxidation of the interfaces during thermal expansion and cooling, and by corrosion accelerated by moisture and chemicals in very small quantities that get in between the strands). Every splice has at least one "uphill" side for water, etc. to run. The reasons we hear that fewer "dead-ends" fail may be that most of them are pointed "downhill".

All of these influences accelerate the deterioration of fittings that are not installed properly. Cleaning and roughening the conductor was always important in making a "good fitting", and with today's shorter, harder alloy tube fittings, we have found it critically important, even with the new conductor. Proper dispersion of an inhibitor will help keep the interfaces from oxidizing. All major manufacturers have frequently found a missing, or inadequately dispersed, inhibitor when examining failed fittings. Proper die closure is very important, especially with the newer (last 20 years or so) alloy tube "single die" type compression fittings. There is generally less conductor inserted in the fitting than in the older "hex die" type of fitting, so it is less forgiving of installation error. These consequences of installation lead to incremental increases in resistance during the service life of the fitting. Resistance measurements of newly made alloy tube fittings indicate they are more likely to start service at the higher end of the normal range than the lower end.

Lately, what has been learned about fitting reliability indicates that there will be more problems with unexpected failures than in the past. This comes at a time when just the opposite is needed. Fittings need to be replaced on a planned basis, before failure occurs.

Ohmstik Evaluation Method

The Ohmstik Evaluation Method provides definitive and actionable early warnings of a deteriorating fitting. This method directly measures the resistance of the connection with an Ohmstik. The resistance is the electrical condition of the splice. If the resistance is outside the normal range, the connection is deteriorating. A connection with resistance above the normal range is in a failure process, where the time to failure depends on how high the resistance is. The appropriate planned actions for ranges of resistance above normal are shown in Table One. The resistance ratio is calculated by comparing the resistance of the fitting over the resistance of the conductor.

All fittings or splices consist of two different connectors. All connectors consist of three resistors in series; the resistance of the conductor, the connector and the interface between the conductor and the connector (See figure 4.0).

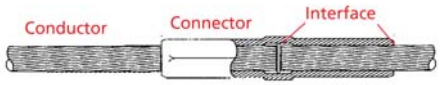


Figure 1.0

The interface is the only resistor of the three that changes over time. The object of the Ohmstik Evaluation Method is to measure as little of the conductor & connector as possible, and all of the section that surrounds the interface.

A good way to make reliability judgments about a connector is to compare the resistance of the connector assembly to the conductor. This ratio allows you to compare measurements on connectors of various sizes.

Continued...
Ohmstik Evaluation Method

1. In order to establish the baseline, or denominator, for the ratio of the subsequent measurements, measure the resistance of a portion of the conductor that is equal in length to the interface portion of the connector.

Figure 5.0

2. Measure the interface of one of the connectors.

Figure 5.1

3. Measure the interface of the second connector.

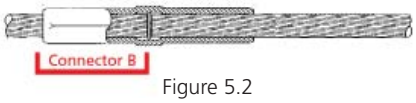


Figure 5.2

The ratio is calculated by making the conductor measurement as the denominator and the Connector measurement as the numerator.

Ratio = Connector / Conductor

The following table shows the suggested action for various ratios based on maintaining the present load rating.

Resistance ratio	Condition of fitting	Action
0.3 to 1.0	Normal Connection Serviceable New connections are expected to be in the 0.3 to 0.8 range	None
1.01 to 1.2	Serviceable; poor Shows deterioration; Overloads & faults may deteriorate the connection	Re-inspect in one year, or after next fault
1.21 to 1.5	Serviceable; poor Serviceable, shows deterioration; Overloads & faults may deteriorate the connection	Fault
1.51 to 2.0	Serviceable; very poor High loads, overloads, or faults may deteriorate the connection	Schedule replacement in less than three months
2.01 to 3.0	Bad; deterioration rate is increasing High loads, overloads, or faults may fail the connection; High tensions from cold weather or wind may initiate failure under normal loading	Schedule replacement very soon
> 3.0	Failing Normal loads, overloads, or faults may fail the connection; High tensions from cold weather or wind are likely to initiate failure under normal loading	Replace as soon as possible

Table 1.0: Actions required based on resistance ratios (^{R}fitting / ^{R}conductor)

Note: This information was developed from field measurements, manufacturer data, lab tests, failure analysis and understanding of deterioration mechanisms. This guideline may be modified as field & test data accumulates.

Standard Probes and Accessories

7-081 XT Standard Fused Probe

The probe is designed for use in close proximity to adjacent phases or ground structures (see Cautions on page one). In the event of making a phase to phase or phase to ground connection, the Fused Probe will break the connection.

Standard Accessories in the 7-081 XT Accessory Kit Include:

(1) Fused Probe
(1) Contactor Attachment
(1) Probe Hook
(1) 4" Rod, Straight
(1) 4" Rod, Bent
(1) Philips Head Screw
(1) Coupling Nut
(4) Lock Washers
(6) Hexnuts

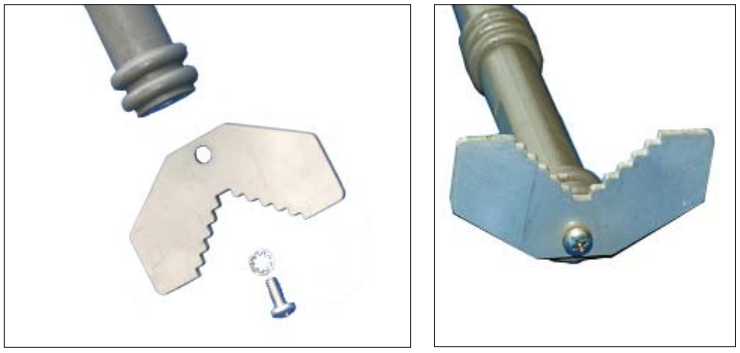


Figure 6.0: Fused Probe Configuration with Contactor Attachment

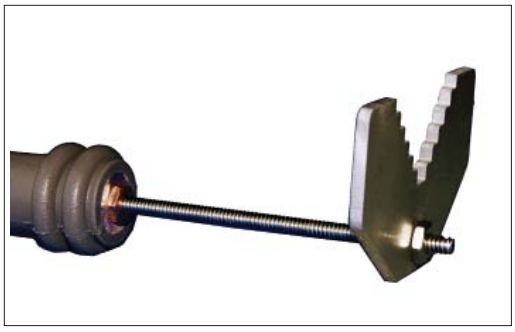


Figure 6.1: Fused Probe Configuration with the Straight Rod and Contactor Attachment

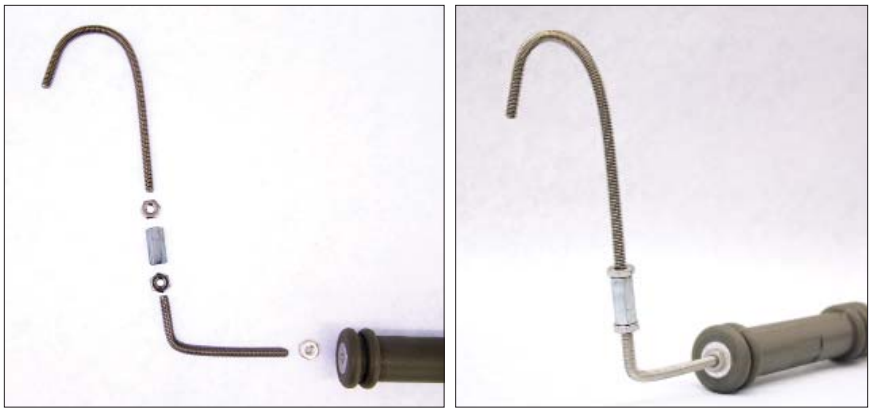
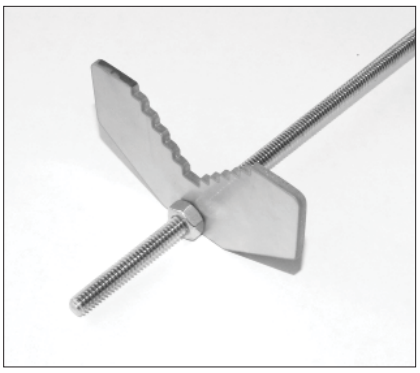


Figure 6.2: Fused Probe Configuration with the Bent Rod and Curved Rod

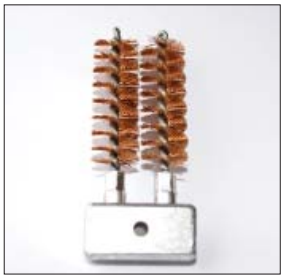
Optional Probes and Accessories

7-0xx XT Adjustable Probe Kit
The Adjustable probe is designed for any measurement where the distance to be measured is less than 12 inches. This probe wil adjust from 4 to 13 inches.

The 7-0xx XT Adjustable Probe Kit includes:
(1) Adjustable Probe
(1) Contactor Attachment
(2) Hex Nuts



7-0xx Wire Brush Contactor



7-050 Universal Adapter
The Universal Adapter allows the user to adjust the Ohmstik*Plus* at compound angles. This is a useful adapter when working from the ground on complex apparatus.

Battery Replacement

When the "LO BAT" indication shows on the display, the battery should be replaced. The unit will continue to operate for a few hours. The Ohmstik Plus is powered by a single 9V battery. To replace the battery, remove the four screws on the battery cover at the rear of the unit. Carefully insert a screwdriver blade in the notch and pry the cover out, being careful not to damage the cover seal. Pull the battery out of the compartment and separate the battery from the battery connector. To avoid breaking the battery leads do not pull on the battery only. Install a fresh battery and reinsert the battery in its compartment. *Do not pinch the wires* between the battery and compartment; put wires in slot above the battery. Reinstall the cover by gently pressing it into place while pulling out on the edges of the compartment, and reinstall the four cover screws. Take care to avoid overtightening the screws. Always reuse the screws provided and do not damage or lose the o-ring seal on each screw.

Cleaning

The Ohmstik Plus can be cleaned by wiping with a small amount of alcohol on a rag.

Sensorlink® Corporation
Warranty

SensorLink warrants each instrument it manufactures to be free from defects in materials and workmanship under normal use and service for the period of one year after date of shipment. Within this period, SensorLink agrees to repair or replace, at SensorLink's option, any instrument that fails to perform as specified. This Warranty shall not apply to any instrument that has been:

1 Repaired, worked on, or altered, including removal of the front panel, by persons unauthorized by SensorLink in such a manner as to injure, in SensorLink's sole judgment, the performance, stability, or reliability of the instrument;

2 Subjected to misuse, negligence, or accident; or

3 Connected, installed, adjusted, or used otherwise than in accordance with the instructions furnished by SensorLink.

This Warranty is in lieu of any other warranty, expressed or implied. SensorLink reserves the right to make any changes in the design or construction of its instruments at any time, without incurring any obligation to make any change whatever in units previously delivered.

If a failure occurs, contact the manufacturer for a Return Authorization and instructions for return shipment. This warranty constitutes the full understanding of the manufacturer and buyer, and no terms, conditions, understanding, or agreement purporting to modify or vary the terms hereof shall be binding unless hereafter made in writing and signed by an authorized official of SensorLink Corporation.

Quality Assurance Certification
OhmstikPlus
Models 8-082 XT Plus, 8-084 Plus, and 8-090 Plus

SensorLink certifies that its calibration measurements are traceable to the National Institute of Standards and Technology (NIST), to the extent allowed by the Institute's calibration facility, and to the calibration facilities of other International Standards Organization members.

This document certifies the following OhmstikPlus was tested at the Sensorlink High Voltage Laboratory, Ferndale, WA, USA to the appropriate standard and comply with the requirements of that standard.

Serial Numbers _____

Model Numbers _____

I hereby certify that the OhmstikPlus listed above has passed all tests defined in the Sensorlink Corporation standard. I also certify that I have reviewed the standard and test procedure and that they are sufficient in determining compliance with the standard.

Signed_____

Date_____

Form No: SALE-Manual Template OHMSTIK-008 REV: V01
Date: 11/19/2013
Manual Stock Code No: DOPM-808-203

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