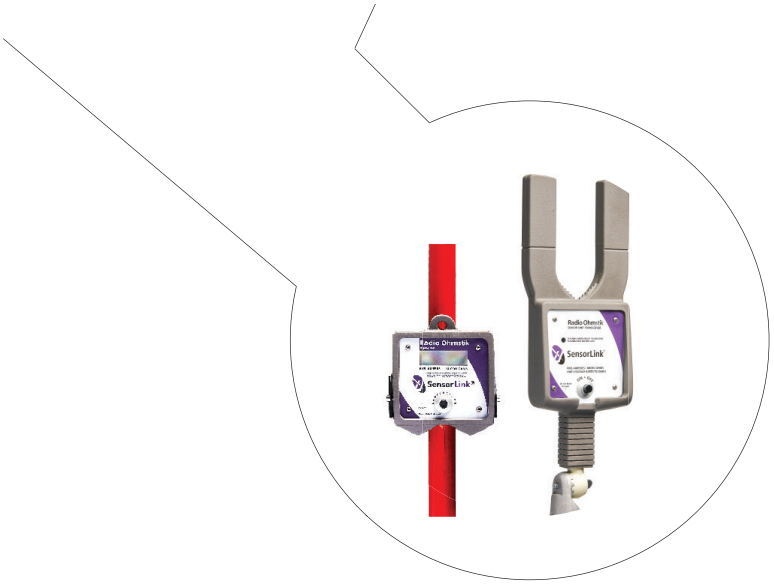

Operators Manual

Radio Ohmstik

Radio Linked
Micro Ohmmeter

SensorLink® Corporation

Model 8-182
Radio Ohmstik Transmitter
Model 8-184 not pictured

Model 8-180
Radio Ohmstik Display Unit

Model 6-182
Radio Ohmstik Kit
and Accessories

OPERATORS MANUAL

Radio Ohmstik

Radio Linked Live-Line Micro Ohmmeter

Available Stock Codes:		
8-182 50HZ	8-182 60HZ	8-182 EURO
8-180	8-180 EURO	8-184 50HZ
8-184 60HZ	8-184 EURO	

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Specifications

Model Number & Type	8-182	8-184
Type	Standard	Wide Jaw
Sensor Opening	2.5 in, 6.35 cm	3.86 in, 9.8 cm
Weight	2.3 lbs, 1.05 kg	4.0 lbs, 1.81 kg
Measurements		
Amps	1-1400 A	
Microohms	5-2500 μΩ	
Accuracy		
Amps	±1% ±1 A	
Microhms Absolute	±2% ±2 μΩ	
Microhms Repeatability	±1% ±2 μΩ	
Accuracy is diminished if the current is less than 15 amps 0-35kV and when current is less than 50 A while on 36-500kV		
Range of Operation		
Voltage	Rated 500kV	
Resolution		
Amps 1.9-99 A	0.1 A	
Amps 100-1400 A	1.0 A	
Microhms 0-999 μΩ	1 μΩ	
Frequency	Actual frequency indicated on the unit	
50Hz Calibrated	47 to 53Hz	
60Hz Calibrated	57 to 63Hz	
Radio		
Frequency	ISM 2.4 GHz	
Power	63 mW, 10 mW in Europe & Japan	
Range	150', (46 meters) Line of Sight, 120' (36.5 meters) in Europe & Japan	
Mechanical		
Battery	9 Volt Alkaline, 1 each per unit	
Battery Life	6-8 Hours at 68°F or 20°C, 3-4 Hours at 32°F or 0°C	
Detachable Probes	Fused Probe or Adjustable Probe	
Ambient Temperature	-4 to +140° F, -20 to +60° C	
Display	Graphics LCD	
Software Requirements	Radio Ohmstik Software	
System Requirements	Windows XP, Vista, WIN 7, WIN 8, WIN 10	
Hardware Requirements	Minimum of two USB ports	
EEC Standards	Successfully passed international test standards indicated by CE	

Safety Information

Read all safety and instruction statements before using the product. Failing to follow the safety guidelines can cause severe injury or death.

Ohmstiks are designed for use on live, overhead lines with 0 to 500KV. All procedures appropriate for the line voltage are to be taken, including proper work techniques, equipment, and Personal Protection Equipment.

The Ohmstik should be used only by certified personnel who have been trained for live-line, high voltage work by their organization.

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 system fault.

The hot stick length must be the correct for line voltage per minimum approach distances stated in published OSHA regulations and/or provided by the utility.

The cover plate, chuck, and entire Ohmstik are to be considered at the same potential. Putting the cover plate, chuck, or other parts of the Ohmstik within the air gap of adjacent phases or ground could cause a phase to phase or phase to ground fault.

Do not alter the product in any manner.

Theory of Operation

The Radio Ohmstik Live-Line Micro Ohmmeter measures micro-ohm resistance on conductors, connectors, splices, and switching devices positioned directly on energized, high voltage lines. Resistance is the electrical condition of the connection and calculating the measurements into condition ratios provides definitive and actionable early warnings of a deteriorating fitting. If the resistance of the fitting 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 Ohmstik is placed on a splice or connector so the connection under test is between the two electrodes. Measurement data is communicated to both the Remote Display and the Radio Ohmstik Software on the user's laptop. At the same time, the GPS device sends location data to the Software. When a valid measurement is received, the software writes the data to a comma separated (CSV) file. This combined data allows the user to map the location of the connector as well as the measurements to analyze its condition.

FCC & Industry Canada Statements

United States of America and Canada
Contains FCC ID: OUR-XBEEPRO
Contains Model XBee-PRO Radio, IC: 4214A-XBEEPRO

The/XBee-PRO® RF Module has been certified by the FCC for use with other products without any further certification (as per FCC section 2.1091). Modifications not expressly approved by Digi could void the user's authority to operate the equipment.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Re-orient or relocate the receiving antenna, Increase the separation between the equipment and receiver, Connect equipment and receiver to outlets on different circuits, or Consult the dealer or an experienced radio/TV technician for help.

Cleaning

The Radio Ohmstik should be cleaned by wiping with a silicone hot stick wipe to remove dirt, sand, and salt that will degrade the urethane housing.

Transporting

There are no special considerations for transporting this device.

Calculating Connector Resistance Ratio:

Resistance ratio is calculated by comparing the resistance of the fitting over the resistance of the conductor. Factors effecting the readings may include line tension and wire condition (heavily birdcaged or other).

Ratio = Connector / Conductor

All fittings or splices consist of two different connectors. All connectors consist of three resistors in series: (1) resistance of the conductor, (2) the connector, and (3) the interface between the conductor and the connector.

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

EXAMPLE: A splice connector has two interfaces.

Step 1: TAKE THE CONDUCTOR MEASUREMENT

Measure a portion of the conductor equal in length to the interface portion of the connector. Various lengths can be configured with the probes sent with the unit.

Step 2: MEASURE THE INTERFACE OF CONNECTOR SIDE A

Measure the interface of the first connector.

One contactor should be placed in just past the compressed section. On an automatic splice, place the contactor in the middle of the connector. The second contactor should be placed on the conductor, as close to the connector as possible without touching the connector.

Step 3: MEASURE THE INTERFACE OF CONNECTOR SIDE B

Measure the interface of the second connector.

One contactor should be placed in just past the compressed section. On an automatic splice, place the contactor in the middle of the connector. The second contactor should be placed on the conductor, as close to the connector as possible without touching the connector.

Ratio Conditions and Actions

Evaluating any necessary actions can be completed once the ratios for the connector are calculated. The following table shows the suggested action based on maintaining the present load rating of the asset.

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 Shows deterioration; Overloads & faults may deteriorate the connection	Re-inspect in six months, or after next fault
1.51 to 2.0	Serviceable; Very poor High loads, overloads, or faults may deteriorate the connection	Schedule asset 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 asset 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

*Actions required based on resistance ratios (^{R}fitting / ^{R}conductor)

*These ratio conditions and actions are developed from field measurements, manufacturer data, lab tests, failure analysis and understanding of deterioration mechanisms. This guideline may be modified as field and test data accumulates.

Calculating the Resistance of Power Tap Connectors:

The Ohmstik will take resistance on other Full and Limited tension connectors. It is always best practice to take all three readings of the series and evaluate the condition with the above table. However, due to the build and size, it may not be possible to take all three readings in series. If evaluating based on a benchmark measurements, or comparison to a known good fitting, a reading across the connector can be made.

Factors effecting the reading may include line tension and wire condition (heavily birdcaged or other).

Radio Ohmstik Communication

The user is able to view the measurement sets on both a Display Unit and on a laptop running Radio Ohmstik software. These communications may be used singly, or at the same time.

With Radio Ohmstik software and GPS, the following data may be written to the data file: Amps, Micro-Ohms, Date, Time, Comments, Latitude, and Longitude (with the GPS USB plugged into the laptop).

Communicating to the Display Unit: The Display Unit is designed to be attached to a hot stick or held by hand. The sensor transmits the live readings to the Display Unit via radio. This functionality allows the user to easily see readings were taken. Readings are not saved on the Display unit.

Communicating to the Laptop: With the Radio Ohmstik software loaded, and the radio adapter plugged in, the Sensor will transmit the data and readings to the laptop. The measurement set will automatically be saved as a .csv file for future review.

Radio Ohmstik System Requirements

OPERATING SYSTEM: Radio Ohmstik Software installs onto computers running Windows XP, VISTA, 7, 8, and 10. USB ports are needed for both GPS and Radio communication.

NETWORK INSTALLATION: This is a single user application and is not supported when installed onto a server.

INSTALLATION AUTHORITY: Installation will require administration rights. Computers managed by electric utility organizations often limit the programs that can be installed. If the user does not have admin rights they will need the assistance of the IT department to download the software.

USB PORT PERMISSIONS: The USB GPS and USB Radio have install programs that run the first time connected. The user may have rights to install programs but may not be aware that the USB ports are locked on the PC. Please contact your network administrator for permission and instructions to complete the install if drivers are not installing automatically and need to be installed manually.

Softlink Installation

Step 1: Softlink Installer is available at www.sensorlink.com/products/ohmstik. Save the file to the desired location. The Radio Ohmstik .exe file will automatically begin the download when clicked.

Step 2: You must agree to the licensing agreement to proceed with the download.

Step 3: A dialog box will appear to let you know when the download is complete. Shortcut paths will automatically load during the install.

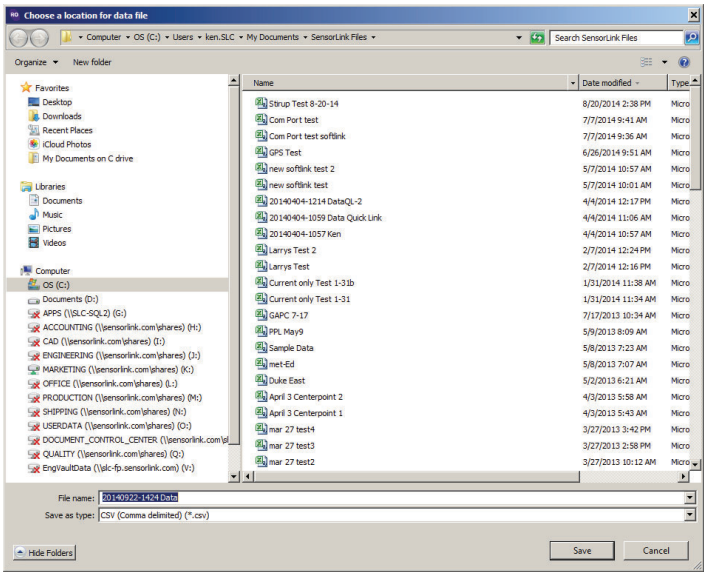
Setup: Communication with Software

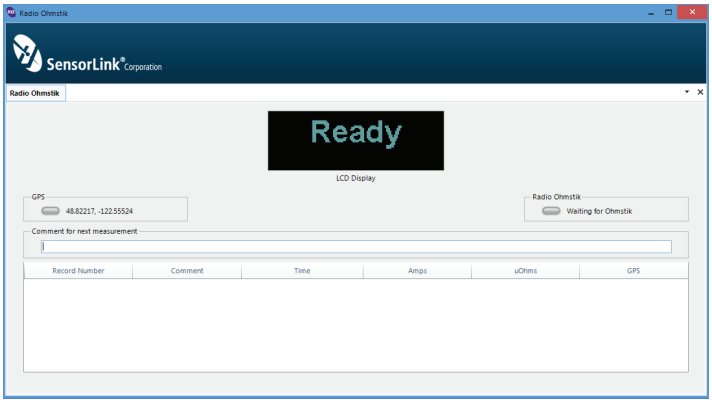
Step 1: Plug the 7-024 USB Radio and the 7-025 USB GPS devices into the laptop's USB ports. It will take several seconds for the computer to discover the devices

Step 2: Open the Radio Ohmstik Software

Step 3: The program starts by asking the user to select a file name and location to write the data. *Note: The default File Name is a date and time code for the date and time the application is opened.*

Step 4: Select Save; the Radio Ohmstik Dashboard will load and is ready for measurments





Setup: Communication with Radio Display

Step 1: If securing to a hot stick, place the Display Unit with the Velcro strap so the LCD display is visible while taking measurements.

Step 2: Press the function button on the Display Unit. The display will run through a startup sequence, ending with No Signal.

SensorLink Copyright 2011	F574 8XP 300 Firmware XXX	No Signal

Setup: Radio Ohmstik Sensor

Step 1: Attach the Probe to the back of the Radio Ohmstik.
7-081 XT Standard Probe, for 8-182 Transmitter
7-081 Standard Probe, for 8-184 Transmitter

The probe is designed for use in close proximity to adjacent phases or ground structures. **See Safety Information on page five.** In the event of making a phase to phase or phase to ground connection, the Probe will break the connection.

Step 2: Press the function button on the Radio Ohmstik sensor. The LED will flash green when powered on.

Step 3: Both the Display and Software will indicate the Radio Ohmstik is ready to take measurements

Display

Software Dashboard

Taking a Measurement:

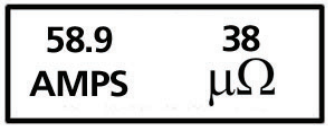
Step 1: Place the Radio Ohmstik on a conductor as depicted below. It is essential to make contact between the conductor and the voltage sensor, which is the V-shaped plate between the jaws, as well as the voltage probe.

Step 2: Measurement begins as soon as the Ohmstik is in position and stable on the conductor.

Step 3: While the Radio Ohmstik is taking the measurement, the screens will display:

Step 4: The display screens will show the current in the conductor as well as the Micro-Ohm resistance of whatever is between the two voltage probe.

Step 5: Remove the Ohmstik from the conductor. It holds the reading and displays it as follows:



Step 6: Remove the Radio Ohmstik from the conductor or splice.

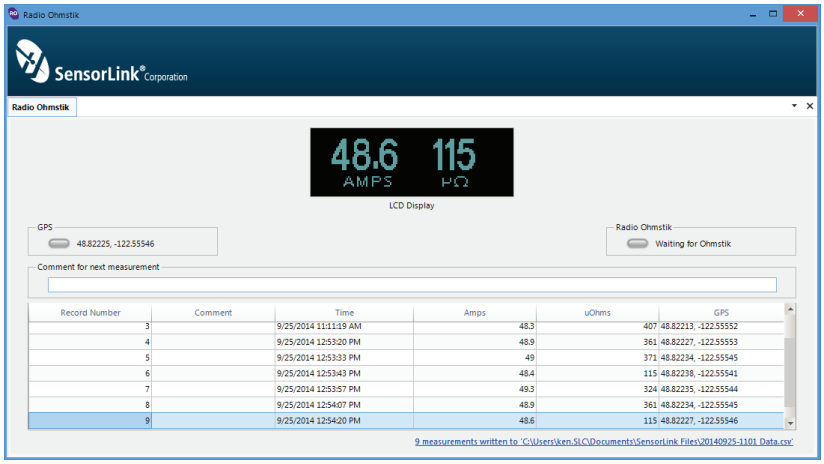
Step 7: The measurements are now written to the Radio Ohmstik software. The displays will continue to show readings until the Radio Ohmstik is placed on a new current carrying conductor, or until the units are powered off.

Step 8: Continue to take measurements for ratio analysis. See pages 8-9 for measurement sequence and resistance ratio calculations.

Collecting Measurements in Software

Step 1: The Radio Ohmstik software will display the completed measurement and GPS location on the Dashboard.

Step 2: The data will automatically be written to a comma-separated values (CSV) file when the Radio Ohmstik is removed from the conductor.



Step 3: A comment may be added before the reading is taken. Any comment written will be a part of the record for the next reading and will save for future lines. If the comment is not needed delete it on the record before taking the next measurement.

Step 4: To review the data, open the saved CSV file in any spreadsheet or word processing application.

Note: Opening the CSV file while the dashboard is open, will stop the recording of readings. The number of readings will be recorded on the dashboard but the readings will not be stored.

Power Off the Radio Ohmstik

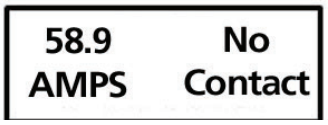
Press and hold the Function Button on the Display Unit until the LCD goes blank

or Press and hold the Function Button on the Radio Ohmstik until the LED goes off. Either of these actions will power off itself and the accompanied device. The Radio Ohmstik will power off by itself if left inactive for 20 minutes.

Troubleshooting and Error Messages:

"No Contact"

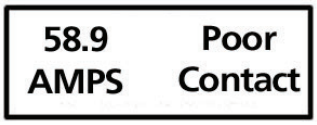
The Radio Ohmstik reads current but not micro-ohms:



This indicates one of the two voltage sensors is not making contact. Use the rough edges of the probe to clean corrosion from the conductor and re-take the measurement. Make certain both voltage sensors are making contact. The fitting cannot be covered. See page 13 for instructions on Taking a Measurement.

"Poor Contact"

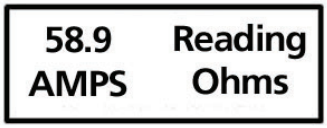
The Radio Ohmstik reads current but not micro-ohms:



There is poor contact on the conductor with one of the voltage contacts. Provide five seconds to measure, while the Radio Ohmstik is held stationary with both voltage probes securely on the line.

"Reading Ohms"

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



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

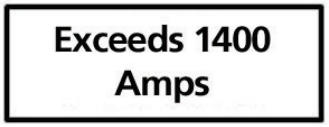
"Unable To Measure"

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

Hold the Radio Ohmstik firmly on the line for at least five seconds. The Ohmstik samples the line three times every 100 milliseconds. If it cannot find three consecutive reads that are within tolerance it will display "Unable To Measure".

"Exceeds 1400 Amps"

The Radio Ohmstik limits the maximum current to 1400 Amps:



The Radio Ohmstik is not specified to measure above 1400A.

Battery Replacement

The Radio Ohmstik system is powered by two 9V batteries, one in the Radio Ohmstik and one in the Display. The expected battery life for both units is 6 to 8 hours at 68° F or 20° C. The expected life declines in colder environments. At 32°F or 0°C it is reduced 3 to 4 hours.

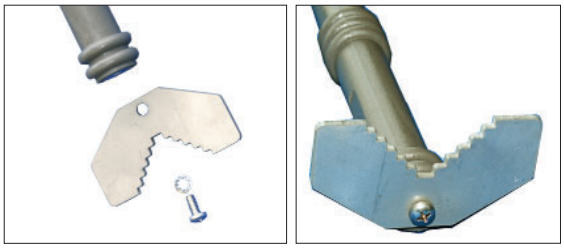
Note: It is recommended fresh batteries be installed prior to operation each day. Always replace both batteries.

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 over tightening the screws. Always reuse the screws provided and do not damage or lose the O-ring seal on each screw.

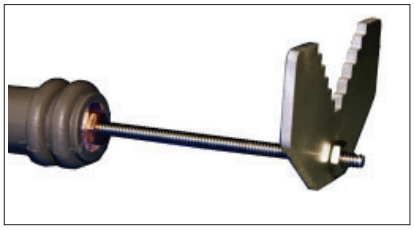
Standard Probes and Accessories

7-081 and 7-081XT Accessory Kits Include:

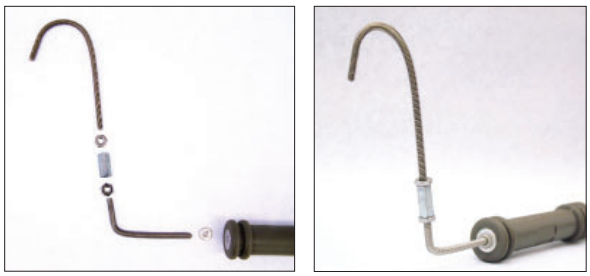
(1) Standard Probe
(1) Wire Brush Contactor
(1) 4" Rod, Straight
(1) Philips Head Screw
(4) Lock Washers
(1) Contactor Attachment
(1) Probe Hook
(1) 4" Rod, Bent
(1) Coupling Nut
(6) Hexnuts



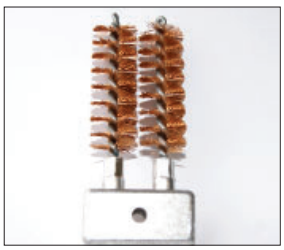
Standard Probe Configuration with Contactor Attachment



Standard Probe Configuration with a Straight Rod and Contactor Attachment



Standard Probe Configuration a Bent Rod and Curved Rod



Wire Brush Contactor

7-081 ADJ Adjustable Probe Accessory Kit Includes:

The Adjustable probe is designed for any measurement where the distance to be measured is less than 12 inches. This probe will adjust from 4 to 13 inches.

Adjustable Probe Kit includes:

(1) Adjustable Probe
(1) Contactor Attachment
(1) Wire Brush Contactor
(2) Hex Nuts

Adjustable Probe with Contactor Attachment

Other Replacement Accessories

7-050 Universal Adapter

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

7-025 USB GPS Adapter

7-051 Carrying Case

7-024 USB Radio Adpater

SensorLink Corporation Warranty

SensorLink Corporation 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 Corporation agrees to repair or replace, at SensorLink Corporation'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 Corporation in such a manner as to injure, in SensorLink Corporation'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 Corporation.

This Warranty is in lieu of any other warranty, expressed or implied. SensorLink Corporation 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
Radio Ohmstik
Transmitter Models 8-182 and 8-184
Display Unit Model 8-180

SensorLink Corporation 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 Radio Ohmstik was tested at the SensorLink Corporation High Voltage Laboratory, Ferndale, WA, USA to the appropriate standard and comply with the requirements of that standard.

Sensor; Model Number: _____

Serial Number: _____

Display Unit; Model Number: _____

Serial Number: _____

I hereby certify that the Radio Ohmstik 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: _____

Made in the USA.

Form No: SALE-Manual Template OHMSTIK-008 REV: V04
Date: 01/2020
Manual Stock Code No: DOPM-818-200

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