

Operators Manual  
**TMS Single Phase**  
Transformer Meter





TMS Sensors  
MODEL: 950



Side "A"



Side "B"

# Operators Manual

## TMS

### Single Phase Transformer Meter

Available Stock Codes:			
950-50HZ	950-60HZ		

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## SPECIFICATIONS

Model Number	950, (1) TMS Unit
Optional Accessories	7-027, (1) USB Radio Adaptor DREP-950-000, (1) Calibration Verification Report S580-001-003 (1) Steelhead Software 7-029, (2) Replacement Bolts, TMS
Range of Operation	
Voltage	100 - 277 VAC
Current	1 - 700 Amps
Resolution	
Voltage	0.1 V
Current	0.1 AMP
Watts	0.1 kW
KWh	0.1 KWH
Accuracy	
Voltage	0.5% ± 1 Digit
Current 1A to 3A	0.5% ± 2 Digits
Current 3A to 700A	0.5% ± 1 Digits
KWH	1% ± 1 Digits
Frequency	
50 Hz or 60 Hz	47 to 53 Hz (50 Hz) or 57 to 63 Hz (60 Hz)
Mechanical	
Weight	1.5 lbs, 0.68 kg
Sensor Opening	1 inch, 25 mm
Conductor Range	#2 to 600 kcmil
Maximum Insulation Thickness	Up to 100 mils, 2.5 mm
Operating Temperature	-22 to +140° F, -30 to +60° C
Radio	
Type & Band	ISM 2.4 GHz
Transmit Distance	300 ft, 100 meters
Transmit Power	63 mW, 18 dBm (EU & Japan 10mW, 10dB)
Power	
System	Line Powered
Clock Battery Backup	14 days, 2 each CR2032 Lithium coin cells
Logging Capacity	330 days @ 5 minute intervals
Software Requirement	SensorLink's Steelhead Software
Software System Requirements	Windows XP (SP3), VISTA, Win 7, Win 8, & Win 10
Meter Standards	Applicable Standards of ANSI C12.1, FCC Part 15, & CISPR 22

## Safety

The TMS Transformer Meter System is designed for use on transformers where the voltage is between 100 to 277 VAC. All precautions appropriate for the line voltage should be taken. For safety purposes, the entire sensor assembly should be considered to be at the same potential as the conductor. The appropriate Personal Protection Equipment must be worn.

## Theory of Operation

The SensorLink TMS unit gives precise information to quickly identify inefficient Transformer loading or power theft without the requirement of Advance Metering Infrastructure.

The drive-by Transformer Meter is designed to capture the following parameters:

- Accumulated kilowatt hours
- Average Volts
- Average Amps
- Interval Kilowatt hours

Using secure radio protocol, the stored data is downloaded while the meters are still deployed on the Transformer.

The radio in the Transformer Meter communicates to a USB radio transceiver that is connected to the user's laptop. This standards based, non-licensed wireless network solution supports low power consumption, security, and reliability.

The TMS unit quickly installs on the energized, secondary of a pole mounted Transformer. The meters employ a low voltage, insulation piercing connector that securely attaches the sensor to the conductor. This voltage connection supplies the voltage measurement and the power to operate the TMS unit.

Steelhead Software is used for the setup, download, and review of the recorded data. Data may also be saved to a .csv file for review in other software programs.

## Radio Information

### FCC and IC Notices

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

Clean the TMS unit by wiping with a small amount of alcohol on a rag.

## Transporting

Package contains Lithium ion 2032 coin cell batteries. Handle with care. When package is damaged it can cause fire. Special procedures should be followed; inspect the package and arrange repack by qualified persons when required. Contact SensorLink at: +360-595-1000.

# Battery

## Changing the Battery

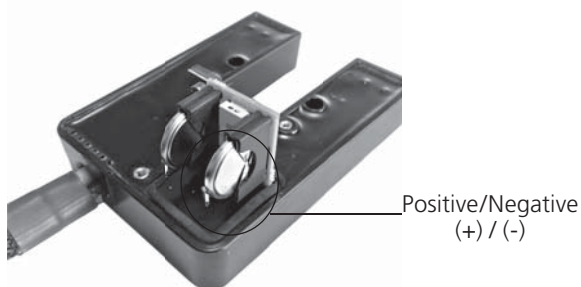
The TMS Transformer Meter is powered by the line. Two coin cell Lithium Ion batteries power the clock during momentary power disruptions and outages. The batteries need to be installed prior to installing a TMS in the field. The batteries will provide clock backup for up to 14 days of outage.

**The battery compartment is under the clamp assembly on the "Line" sensor.**

1. Remove the lid and clamp assembly by removing the three screws



2. Insert the two CR2032 batteries with the positive (+) side facing the clip that holds them in place



3. Attach the lid and clamp assembly back to the sensor.

## Incorrect Battery Installation

Steelhead's Battery Status will display "bad battery" when communicating to a unit with a backward battery. Installing the batteries backwards will result in no battery backup in the instance of an outage and a loss of the clock synchronization. Already logged data will be lost. Any new data logged after power is restored will not have correct time and date stamps.



## Steelhead for TMS

Steelhead software allows the user to communicate, download, view, and graph data from their Installed TMS units. In order for a laptop running Steelhead to communicate, the TMS Unit must be installed on a powered line. The USB Radio must be attached to the PC and within 300 feet, line-of-site, to the TMS Meter.

## License Key

A License Key is required to operate Steelhead Software. A License Key is issued once the user's company email address has been validated by SensorLink.

The standard License Key is valid for 365 days after the installation.

Contact SensorLink to issue any new License Keys.

## Steelhead System Requirements

Steelhead installs on all computers running Windows XP Service Pack 3 and newer. The computer has to be connected online to the internet for installation and activation of the licensing key. Internet access is not necessary for any other use of the Software.

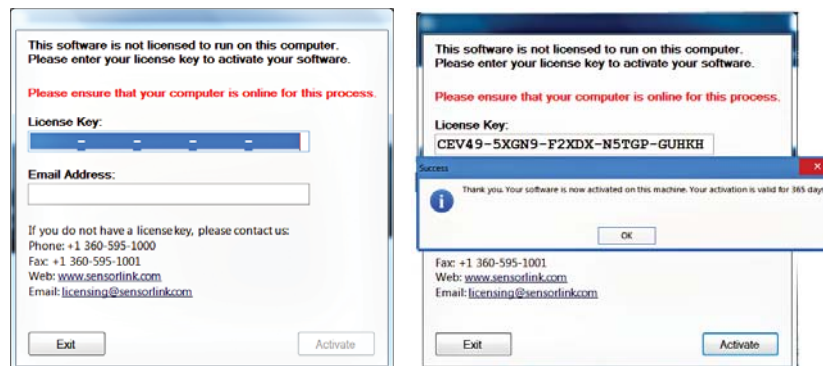
## Steelhead Installation

*Step 1:* Insure the computer is connected to the internet

*Step 2:* Steelhead Installation Wizard will automatically load when the CD is placed in the computer; select "NEXT" to proceed with the installation

*Step 3:* You must select "I Agree" to the licensing agreement to proceed

*Step 4:* To activate Steelhead, enter the License Key you received with the pre-validated email address



*Step 5:* Steelhead can now be opened from the shortcut on your desktop or from the start menu

## Installation: Line to Neutral

Each sensor is individually labeled: 'LINE' and 'LINE/NEUTRAL'. The unit labeled 'LINE' must be installed on the main line, and the unit labeled 'Line/Neutral' must be installed on the Neutral.

The unit labeled 'LINE' is identified as "A" in Steelhead. The unit labeled 'LINE/NEUTRAL' is identified as "B" in Steelhead.

The TMS units may be installed anywhere between the transformer and the customer's meter.

### **Attaching the TMS Line to Neutral:**

Use the following steps to install the TMS Line-to-Neutral on a transformer:

1. Insert fresh batteries before installing the meter onto the line.
2. Place the sensor labelled 'LINE/NEUTRAL' to the neutral.
3. Loosen the clamp bolt so the clamp is open to go on the secondary conductor of the transformer.
4. Place the sensor of the conductor with the clamp facing up.
5. Using a ½ inch socket, ratcheting box wrench, or a power screw gun, tighten the bolt. Tighten the bolt so the sensor remains on the conductor with the clamp facing up.
6. The shear head nut will break away at 38 in-lbs of torque. This insures the insulation is pierced and the clamp assembly is protected from over tightening.
7. Place the 'LINE' sensor on the conductor to be measured and repeat the processes two through six.
8. Three audible beeps should be heard within 15 seconds of the TMS unit being installed. This is confirmation the meter is being powered by the line.
9. The installation is complete. Now, setup needs to be completed in Steelhead Software.



## Installation: Line to Line

Each sensor is individually labeled: 'LINE' and 'LINE/NEUTRAL'. When installing on Line-to-Line applications, either sensor can be put on either line.

The unit labeled 'LINE' is identified as "A" in Steelhead. The unit labeled 'LINE/NEUTRAL' is identified as "B" in Steelhead.

The TMS units may be installed anywhere between the transformer and the customer's meter.

### **Attaching the TMS Line to Line:**

Use the following steps to install the TMS Line-to-Line:

1. Insert fresh batteries before installing the meter.
2. Loosen the bolt until the clamp is open enough to fit onto the secondary conductor of the transformer.
3. Place the sensor of the conductor with the clamp facing up.
4. Using a ½ inch socket, ratcheting box wrench, or a power screw gun, tighten the bolt. Tighten the bolt so the sensor remains on the conductor with the clamp facing up.
5. The shear head nut will break away at 38 in-lbs of torque. This insures the insulation is pierced and the clamp assembly is protected from over tightening.
6. Repeat steps two through six on the second conductor.
7. Three audible beeps should be heard within 15 seconds of the TMS unit being installed. This is confirmation the meter is being powered by the line.
8. The installation is complete. Now, setup needs to be completed in Steelhead Software.

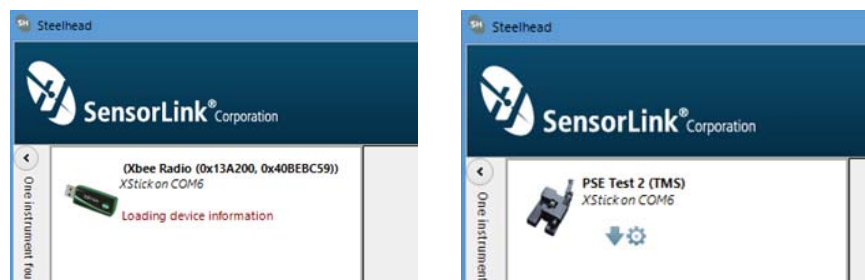


## Connect with USB Radio

The USB Radio will install the driver the first time it is installed. To communicate with the TMS units, insert the USB Radio cable into the Laptop's user port. Open Steelhead from either the Desktop or Start Menu.

Steelhead will show the communication device and TMS unit once both are within radio distance and are communicating.

With Steelhead running, the description and photo displayed will change from the communication device to the unit when the TMS unit has been discovered:



### Note:

If the driver does not install automatically, it could be due to the following:

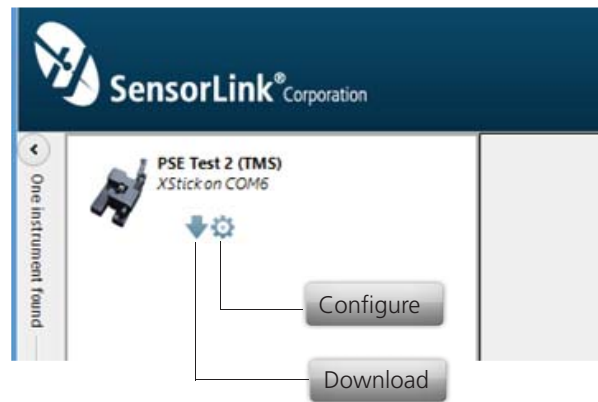
- Laptop docking stations - Causes the program to hang up or have no communication with the USB
- USB Port Authority - Network security/group policy provisions restricting access to USB Ports
- Installation Authority - Network security/group policy provisions restricting access to application installation
- Network Installations - Applications stored on the server are not supported

Please contact your company IT Department if access is denied due to network security policy.

## Configure

The TMS Unit has to be synchronized to the clock through the configure screen each time new batteries are installed.

Select the Configure button to setup preferences.



## Configuration...continued

TMS Configuration

TMS Information

Serial Number: 1505015-02

Name (16 Characters)  
RevPro #5

Description (46 Characters)  
1360 Stonegate Way, June 15-29

TMS Connection Type  
Line to Line

Delete Interval Data, Reset Accumulated KWH, and Synchronize Clock:  
Update and Delete All

Delete Interval Data Cancel

**Serial Number:** The serial number is defined at the time of manufacture and cannot be changed

**Name:** Identify the TMS Unit with up to 16 characters

**Description:** Enter a description of up to 46 characters. For example, you may want to note the TMS Unit's service location and the date range for the recordings

**TMS Connection Type:** Select 'Line to Line' or 'Line to Neutral', per the Transformer style

**Update and Delete All:** This selection does the following:

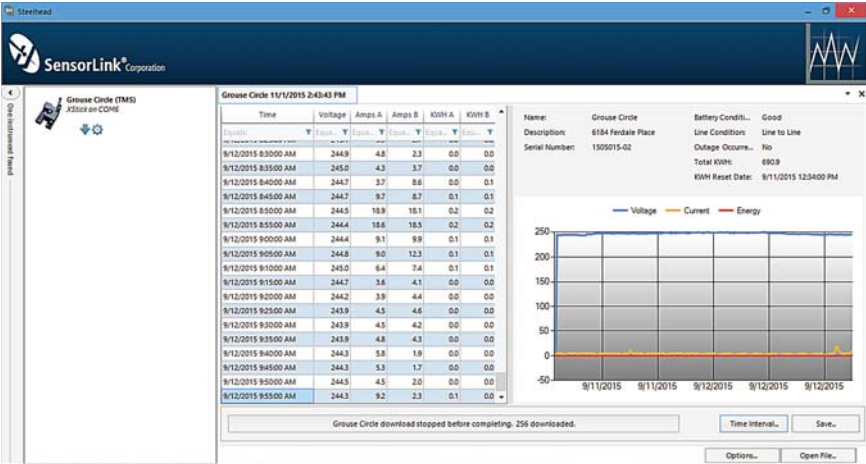
- Deletes all the logged interval data
- Resets the Accumulated KWH readings
- Synchronizes the time clock
- Updates changes made to the name and description of the unit

# Download

Selecting the Download button instructs Steelhead to begin downloading data from the TMS Unit.

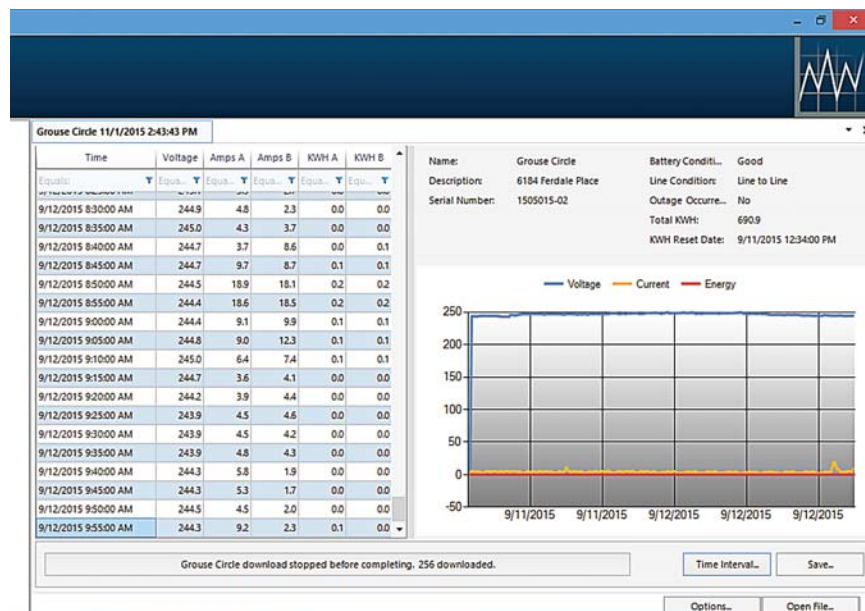


The user is able to view the Recorder's configuration, data, and progress as it is downloading in both a chart view and graph view.



The download can be stopped at any time by clicking the red button.

## Continued...Download



**Name:** This is the 16 Character Name setup in the Configure screen

**Description:** This is the long description setup in the Configure screen

**Serial Number:** This is the unit's serial number, assigned by the factory

**Battery Condition:** The battery can report as GOOD, MARGINAL, or BAD. We recommend replacing the battery as soon as possible when MARGINAL or BAD. A BAD battery will lose all clock synchronization.

**Line Condition:** This indicates how the unit was setup in the Configure screen, it can either report being setup as "Line to Line" or "Line to Neutral"

**Outage Occurrence:** This reports if there was an outage at any time during the Unit's deployment

**Total KWH:** Total KWH since the last Reset

**KWH Reset:** This is the start date of the Accumulated KWH

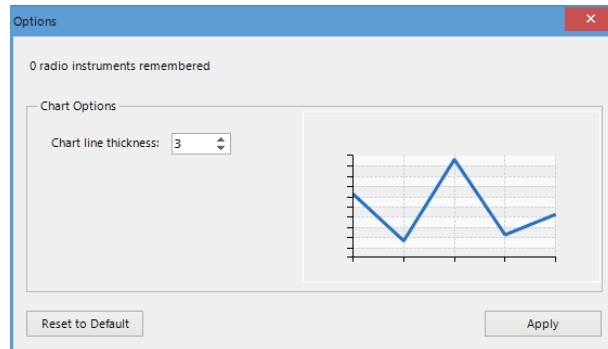
**Options:** Select this to change the user preferences and to synchronize the clock after installing a new battery

**Open File:** Select this option to open previously saved data files



## Options

Select the Options button on the download screen to change user preferences.



### Radio instruments remembered:

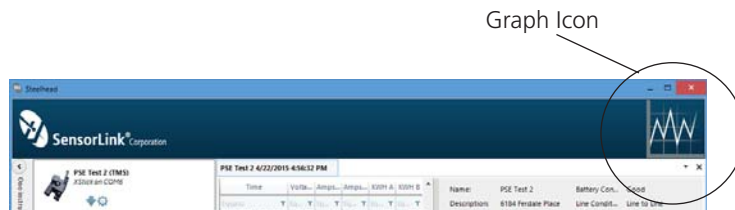
Steelhead Software remembers TMS units in previous download sessions. This memory allows faster recognition in future communications. Select "Reset to Default" for Steelhead to forget the radios.

### Chart line thickness:

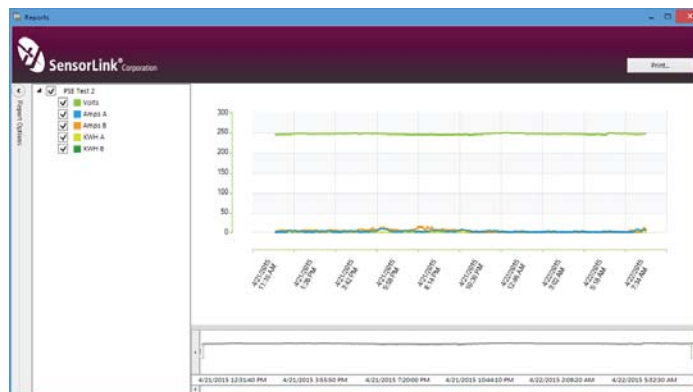
The thickness of the graph lines can be changed by the user. Thickness is numbered 1 - 10, and defaults at three. The software will show a preview to the user as the value is changed. Select "Apply" to update any Chart Line Thickness change.

## Graphing

To graph the downloaded data, click the Graph Icon on the download screen.



A second screen will open and display the data in graphical format.



### Report Options

Select the units and measurement parameters to graph by clicking in the selection boxes. Only selected measurement parameters will display on the graph. Selecting only one parameter at a time will show more resolution on the graph.

### Hide and Show Report Options

Click the left arrow to hide Report Options. Click the right arrow to show the hidden Report options.

### Zoom Window

The bottom graph displays the entire time series. To view a section of time, adjust the left and right sliders. The upper graph will display the values between the slides.

### Cursor Tool

Placing the cursor over the graph will display the date and time values of the measurements.

## 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

## Model 950

### TMS Single Phase

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 Model 950 was/were tested at the SensorLink Corporation High Voltage Laboratory, Ferndale, WA, USA to the appropriate standard and comply with the requirements of that standard.

Serial Number: \_\_\_\_\_

I hereby certify that the Model 950 TMS Unit(s) have/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 TMS SINGLE-016 REV: V01  
Date: 10/0215  
Manual Stock Code No: M050-001-001

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