

# Thermo-Anemometer Model 9850

## Owner's Manual



UL LISTED  
INTRINSICALLY  
SAFE FOR USE IN  
HAZARDOUS  
LOCATIONS FOR  
CLASS I GROUPS C AND D, CLASS II  
GROUPS E, F, AND G, AND CLASS III, ONLY  
WHEN USED WITH THE FOLLOWING  
BATTERY TYPES: EVEREADY 522;  
DURACELL MN1604; RADIO SHACK 23-553.

**ALNOR**<sup>®</sup>  
TSI Incorporated

## **SAFETY NOTICE**

All normal precautions must be observed when operating the Model 9850 Thermo-Anemometer near moving equipment such as motors and blowers. Exercise care to ensure that the probe or instrument does not interfere with any moving equipment.

## **WARNING**

The operational temperature range of the probe must not be exceeded. See Specifications on page 10 for limits. Calibration inaccuracies and damage to the sensing elements may result if the temperature range is exceeded.

## **BATTERY CAUTION**

If instrument is not to be used for more than two months, remove battery and store in separate plastic container to avoid possible damage from leakage.

## **WARRANTY**

Your warranty information and reply card are enclosed elsewhere in this package. After locating this material, please return the reply card and retain remaining information.

## **LIMITATION OF WARRANTY AND LIABILITY**

Seller warrants that this product, under normal use and service as described in the operator's manual, shall be free from defects in workmanship and material for a period of twenty-four (24) months, or the length of time specified in operator's manual, from the date of shipment to the customer. This limited warranty is subject to the following exclusions:

- a. Batteries and certain other components when indicated in specifications are warranted for a period of 90 days from the date of shipment to the customer.
- b. With respect to any repair services rendered, Seller warrants that the parts repaired or replaced will be free from defects in workmanship and material, under normal use, for a period of 90 days from the date of shipment to the customer.
- c. Seller does not provide any warranty on finished goods manufactured by others. Only the original manufacturer's warranty applies.
- d. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, any goods which are incorporated into other products or equipment by the Buyer. All goods returned under warranty shall be at the Buyer's risk of loss, Seller's factory prepaid, and will be returned at Seller's risk of loss, Buyer's factory prepaid.

The foregoing is IN LIEU OF all other warranties and is subject to the conditions and LIMITATIONS stated herein. NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE.

THE EXCLUSIVE REMEDY OF THE USER OR PURCHASER, AND THE LIMIT OF THE LIABILITY OF SELLER FOR ANY AND ALL LOSSES, INJURIES, OR DAMAGES IN CONNECTION WITH THIS PRODUCT (INCLUDING CLAIMS BASED ON CONTRACT, NEGLIGENCE, STRICT LIABILITY, OTHER TORT, OR OTHERWISE) SHALL BE THE RETURN OF THE PRODUCT TO THE FACTORY OR DESIGNATED LOCATION AND THE REFUND OF THE PURCHASE PRICE, OR, AT THE OPTION OF SELLER, THE REPAIR OR REPLACEMENT OF THE PRODUCT. IN NO EVENT SHALL SELLER BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES. SELLER SHALL NOT BE RESPONSIBLE FOR INSTALLATION, DISMANTLING, REASSEMBLY OR REINSTALLATION COSTS OR CHARGES. NO ACTION, REGARDLESS OF FORM, MAY BE BROUGHT AGAINST THE SELLER MORE THAN ONE YEAR AFTER THE CAUSE OF ACTION HAS ACCRUED.

The purchaser and all users are deemed to have accepted the terms of this LIMITATION OF WARRANTY AND LIABILITY, which contains the complete and exclusive limited warranty of Seller. This LIMITATION OF WARRANTY AND LIABILITY may not be amended or modified nor may any of its terms be waived except by a writing signed by an authorized representative of Seller.

### **Service Policy**

Knowing that inoperative or defective instruments are as detrimental to TSI as they are to our customers, our service policy is designed to give prompt attention to any problems. If any malfunction is discovered, please contact your nearest sales office or representative, or call Customer Service department at (800) 424-7427 (USA) and (1) 651-490-2811 (International).

## **TABLE OF CONTENTS**

General Description.....	1
Operation.....	2
Calibration .....	4
Maintenance.....	7
List of Models/Parts.....	9
Specifications .....	10
Theory of Operation .....	12
Performance Check.....	13
Service and Repair.....	14
Service Information .....	15

## GENERAL DESCRIPTION

The Model 9850 Thermo-Anemometer is a pocket-sized, battery operated, analog readout, portable instrument capable of measuring air velocities from 20 to 2000 FPM (0.1 to 10 m/s) in two ranges. The instrument is designed with a 3-inch retractable probe such that the instrument fits conveniently in its soft carrying pouch or can be carried in a "shirt" pocket.

The instrument is powered up to fifteen hours by a standard 9-volt battery which is easily replaceable by snapping off the removable battery cover from the case.

Applications include air velocity measurements near grills and diffusers, in fume hoods, in clean benches, and in all applications where air movement is critical to human safety or comfort.

## OPERATION

1. Before using instrument, the battery must be installed. This is accomplished by sliding the battery cover on the back of the instrument (near the bottom) away from the case. Once battery compartment is opened, a 9-volt battery can be clipped to the battery strap. (**WARNING:** Use one of the types listed on page 11 to maintain intrinsic safety.) Once properly seated, the battery cover is replaced using the opposite sliding motion used to remove it.
2. Slide probe from inside case by grasping the finger grips on the top of the probe. Once fully extended, the probe can be rotated 180 degrees to allow the meter to be easily read in air flows coming from various directions. When in use, the probe must be turned so that the air flow is in the same direction as the arrow on the top of the probe.
3. Slide switch on the top of the instrument to the battery position. Note the position of the needle on the instrument face. It should be in the dark battery zone on the right hand side of the meter. The further to the right the needle moves, the longer the

remaining battery life. If the needle rests in the narrow portion of the battery line, plans for battery replacement should be made in the near future.

4. Place anemometer in the air flow to be measured, and slide switch on top of instrument to the HIGH position. Read velocity on meter. If velocity is below 250 FPM (1.2 m/s), move switch on top of instrument to LOW position for better resolution.
5. Take and record air flow readings as required.
6. After measurements have been completed, slide switch to OFF position. Next, while holding instrument so that meter is toward user, align arrow on top of the probe to point toward the user. Now press probe back into case for storage.

## CALIBRATION

The 9850 T/A is calibrated by first setting the zero reading mechanically and electrically, and then setting the low range span and high range span.

This procedure should only be attempted by persons who have the proper equipment. Any attempt at recalibrating voids all calibration certification provided with the instrument. To assure best calibration results this procedure should be performed in standard room conditions, that is, 25 degrees Celsius and 760 mm Hg barometric pressure.

***Note:** A change in any one adjustment requires calibration of the zero adjustment, high range span adjustment, and low range span adjustment.*



## **Zero Adjustment**

### **1. Mechanically**

Turn instrument to OFF position and using a screw driver turn screw in front of instrument so the meter needle is lined up with the zero picket.

### **2. Electrically**

Turn instrument to the LO position. Cover probe sensor window to prevent any air flow and turn the ZERO adjustment screw on the left hand side of the instrument until meter needle lines up with the zero picket.

## **Low Span Adjustment**

Set instrument in the wind tunnel with the probe positioned so that the air flow is in the direction of the arrow on the probe. Set instrument to the LO position. Set the wind tunnel to 300 FPM (1.5 m/s) and turn the LSPAN adjustment screw on the left hand side of the instrument until the meter needle lines up with the full-scale mark.

## **High Span Adjustment**

Set instrument in the wind tunnel with the probe positioned so that the air flow is in the direction of the arrow on the probe. Set instrument to the HI position. Set the wind tunnel to 2000 FPM (10 m/s) and turn the HSPAN adjustment screw on the left hand side of the instrument until the meter needle lines up with the full-scale mark.

## **Final Check and Adjustment**

Again cover the probe window to prevent any air flow past the sensors, and check that the meter reads zero when the switch is set to either the LO or HI position. If it does not, repeat the zero and span adjustments as required, until all three meter readings are correct without additional movement of the screws.

## MAINTENANCE

The Model 9850 Thermo-Anemometer is manufactured with solid state components. Thus no maintenance is required, other than periodic checking that the instrument and probe are clean and not damaged.

### Cleaning

Meter Window: Clean with liquid eyeglass cleaner. Do not use abrasives or solvents.

Case: Use mild soap (dishwashing detergent) and water solution on a damp cloth to remove finger marks, oils, or fats. Do not use abrasives or solvents. Do **not** immerse instrument or allow liquids to enter case. Dry instrument thoroughly after cleaning.

Probe: Periodically check to be sure that the sensing area of the probe is clean, and the sensors are free of foreign particles. If cleaning is required use denatured or isopropyl alcohol; extreme care must be used to avoid damaging the sensors. Allow the probe to dry completely before using. Always keep the probe in its retracted position between uses.

## **Battery**

Corrosion: Examine battery at least every two months for signs of corrosion. To access battery, follow instructions in OPERATION section. Remove battery if there are any signs of corrosion or moisture. Clean the battery connectors and any other affected parts with a clean cloth moistened with water only. Allow parts to dry thoroughly, and install fresh battery. If instrument is not to be used for more than two months, remove battery and store in separate container.

Replacement: Refer to Paragraph 3 of the OPERATION section to determine whether battery replacement is needed.

**WARNING:** To maintain the instrument as intrinsically safe for use in hazardous locations, use **ONLY** the following battery types: Eveready 522; Duracell MN1604; Radio Shack 23-553.

## **LIST OF MODELS AND PARTS**

<b>Part No.</b>	<b>Description</b>
634-210-100	9850 Analog Thermo-Anemometer (marked in FPM)
634-210-115	9850 Analog Thermo-Anemometer (marked in meters/sec)
346-028-003	Soft Carry Pouch
459-010-011	Battery, 9V Alkaline
116-210-001	Owner's Manual

## SPECIFICATIONS

### Velocity Ranges

#### *English Units*

Low Range 0 - 300 FPM

High Range 0 - 2000 FPM

#### *Metric Units*

Low Range 0 - 1.5 meters/sec.

High Range 0 - 10.0 meters/sec.

Accuracy  $\pm 3\%$  of reading,

$\pm 1\%$  of full scale

Accuracy is specified within an

ambient temperature range of

68-86 F (20-30 C)

### Scale Divisions

Low Range 10 FPM (0.1 m/s)

High Range 100 FPM (0.5 m/s)

### Temperature Range

Operational 32 to 122 F

(0 to 40 C)

Storage -40 to +150 F

(-40 to +65 C)

### Relative

Humidity 5% to 95% at 40 C

(Non-condensing)

## Dimensions

Instrument Case	4.75x2.75x1.125 in. (120x70x28 mm)
Probe Length	3 in, extended (76mm)
Diameter	312 in. (8 mm)
Weight	8 ounces (225 grams)
Battery	9V Alkaline Eveready 522 Duracell MN1604 Radio Shack 23-533
Battery	15 hours minimum

# THEORY OF OPERATION

## Sensors

Two thermistors are used, positioned at the end of the probe and exposed to the air stream to be measured. One senses the ambient temperature of the air stream. The other is then heated by the circuit above ambient. As air passes over this heated thermistor it produces a cooling effect proportional to the air flow (velocity) and a change in voltage across the thermistor is created.

## Control Circuit

The thermistors form part of a bridge circuit which is used in conjunction with an operational amplifier to create a current proportional to the voltage change. This current drives the meter.

The range switch changes the amplification factor, allowing air velocity to be displayed on either a low or high reading scale.

The switch also has a "BATT" position, where a portion of the battery voltage is substituted for the bridge output, giving an indication of the voltage being provided by the battery.



## PERFORMANCE CHECK

When checking performance, always start by verifying that the meter reads zero with the probe retracted into the case. Also check the battery voltage by reading the meter when the instrument is switched to the BATT position.

Do **not** attempt to adjust any of the calibration potentiometers unless access to a properly calibrated wind tunnel test facility is available.

Environmental conditions (temperature, pressure, humidity, air turbulence) can produce different effects on the measured results for different instrument types. These differences must be considered when comparisons are made.

Shape and size of the duct will tend to produce different measurement results in different instruments. Insertion of a probe in a relatively small channel may change the air velocity as well.

# SERVICE AND REPAIR

## Service and Repair

Please return your Product Registration Card immediately. This allows us send you service reminders, special offers, and important information about your product.

Before sending your instrument for calibration or repair, you should call Customer Service. The Service Department will provide you with the cost of service or calibration, Return Material Authorization (RMA) number, and shipping instructions.

Please have the following information available when you call:

- Owner's name, address, and phone number,  Billing address, if different and applicable,  Instrument name or model,  Serial number,  Date of purchase,  Where purchased

TSI recommends that you keep a "calibration log" and keep all records of service on your instrument.

## Instructions for Return

Send the instrument prepaid. Securely package your instrument in a strong container surrounded by at least two inches (5 cm) of suitable shock-absorbing material. Include the Purchase Order showing instrument model number, cost of service and/or calibration, and the RMA number. Mark the outside of the shipping container with the RMA number. This will expedite processing of your instrument when we receive it.

## Damaged in Transit

All orders are carefully packed for shipment. On receipt, if the shipping container appears to have been damaged during shipment, the instrument should be thoroughly inspected. The delivering carrier's papers should be signed noting the apparent damage. **DO NOT DISCARD THE BOX.**

If the instrument itself has been damaged, a claim should be promptly filed against the carrier by the customer. The selling agent will assist the customer by supplying all pertinent shipping information; however, the claim must be filed by the insured. If the instrument is damaged beyond use, a new order should be placed with TSI while awaiting reimbursement from the carrier for the damaged instrument.

Call TSI directly for assistance if necessary.

## SERVICE INFORMATION

Contact TSI Incorporated directly, before returning your instrument. See INSTRUCTIONS FOR RETURN. Follow the procedure carefully as it will expedite processing. Failure to follow the procedure may cause return of the unit unrepaired. Send your instrument to the factory transportation prepaid. To assure fast turn-around time, photocopy and fill out this form with as much detail as possible and attach it to the instrument.

RMA No. \_\_\_\_\_

Instrument Model \_\_\_\_\_

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

Date of Purchase \_\_\_\_\_

Where Purchased \_\_\_\_\_

Describe Malfunction \_\_\_\_\_

Describe Environment \_\_\_\_\_

Return Instrument to:

Name \_\_\_\_\_

(Your name or company)

Address \_\_\_\_\_

Telephone \_\_\_\_\_

Address Correspondence to:

Name \_\_\_\_\_

Address \_\_\_\_\_

Telephone \_\_\_\_\_

# OWNERSHIP/CALIBRATION LOG

## Equipment Log

Model \_\_\_\_\_

Date of Purchase \_\_\_\_\_

### Calibration Record

1. \_\_\_\_\_ 2. \_\_\_\_\_ 3. \_\_\_\_\_

4. \_\_\_\_\_ 5. \_\_\_\_\_ 6. \_\_\_\_\_

7. \_\_\_\_\_ 8. \_\_\_\_\_ 9. \_\_\_\_\_

10. \_\_\_\_\_ 11. \_\_\_\_\_ 12. \_\_\_\_\_

Notes: \_\_\_\_\_

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