

VelociCalc™ Air Velocity Meter



Model 9535/9535-A

Operation and Service Manual

P/N 1980563, Revision L
August 2023



Start Seeing the Benefits of Registering Today!

Thank you for your TSI® instrument purchase. Occasionally, TSI® releases information on software updates, product enhancements and new products. By registering your instrument, TSI® will be able to send this important information to you.

<http://register.tsi.com>

As part of the registration process, you will be asked for your comments on TSI products and services. TSI's customer feedback program gives customers like you a way to tell us how we are doing.

Copyright©

TSI Incorporated / 2007-2023 / All rights reserved.

Address

TSI Incorporated / 500 Cardigan Road / Shoreview, MN 55126 / USA

Fax No.

(651) 490-3824

LIMITATION OF WARRANTY AND LIABILITY (effective February 2015)

(For country-specific terms and conditions outside of the USA, please visit www.tsi.com.)

Seller warrants the goods, excluding software, sold hereunder, under normal use and service as described in the operator's manual, to be free from defects in workmanship and material for **24 months**, or if less, the length of time specified in the operator's manual, from the date of shipment to the customer. This warranty period is inclusive of any statutory warranty. **This limited warranty is subject to the following exclusions and exceptions:**

- a. Hot-wire or hot-film sensors used with research anemometers, and certain other components when indicated in specifications, are warranted for 90 days from the date of shipment;
- b. Pumps are warranted for hours of operation as set forth in product or operator's manuals;
- c. Parts repaired or replaced as a result of repair services are warranted to be free from defects in workmanship and material, under normal use, for 90 days from the date of shipment;
- d. Seller does not provide any warranty on finished goods manufactured by others or on any fuses, batteries or other consumable materials. Only the original manufacturer's warranty applies;
- e. This warranty does not cover calibration requirements, and seller warrants only that the instrument or product is properly calibrated at the time of its manufacture. Instruments returned for calibration are not covered by this warranty;
- f. This warranty is **VOID** if the instrument is opened by anyone other than a factory authorized service center with the one exception where requirements set forth in the manual allow an operator to replace consumables or perform recommended cleaning;
- g. This warranty is **VOID** if the product has been misused, neglected, subjected to accidental or intentional damage, or is not properly installed, maintained, or cleaned according to the requirements of the manual. Unless specifically authorized in a separate writing by Seller, Seller makes no warranty with respect to, and shall have no liability in connection with, goods which are incorporated into other products or equipment, or which are modified by any person other than Seller.

The foregoing is **IN LIEU OF** all other warranties and is subject to the **LIMITATIONS** stated herein. **NO OTHER EXPRESS OR IMPLIED WARRANTY OF FITNESS FOR PARTICULAR PURPOSE OR MERCHANTABILITY IS MADE. WITH RESPECT TO SELLER'S BREACH OF THE IMPLIED WARRANTY AGAINST INFRINGEMENT, SAID WARRANTY IS LIMITED TO CLAIMS OF DIRECT INFRINGEMENT AND EXCLUDES CLAIMS OF CONTRIBUTORY OR INDUCED INFRINGEMENTS. BUYER'S EXCLUSIVE REMEDY SHALL BE THE RETURN OF THE PURCHASE PRICE DISCOUNTED FOR REASONABLE WEAR AND TEAR OR AT SELLER'S OPTION REPLACEMENT OF THE GOODS WITH NON-INFRINGEMENTS GOODS.**

TO THE EXTENT PERMITTED BY LAW, THE EXCLUSIVE REMEDY OF THE USER OR BUYER, AND THE LIMIT OF SELLER'S LIABILITY FOR ANY AND ALL LOSSES, INJURIES, OR DAMAGES CONCERNING THE GOODS (INCLUDING CLAIMS BASED ON CONTRACT, NEGLIGENCE, TORT, STRICT LIABILITY OR OTHERWISE) SHALL BE THE RETURN OF GOODS TO SELLER AND THE REFUND OF THE PURCHASE PRICE, OR, AT THE OPTION OF SELLER, THE REPAIR OR REPLACEMENT OF THE GOODS. IN THE CASE OF SOFTWARE, SELLER WILL REPAIR OR REPLACE DEFECTIVE SOFTWARE OR IF UNABLE TO DO SO, WILL REFUND THE PURCHASE PRICE OF THE SOFTWARE. **IN NO EVENT SHALL SELLER BE LIABLE FOR LOST PROFITS,**

BUSINESS INTERRUPTION, OR ANY SPECIAL, INDIRECT, CONSEQUENTIAL OR INCIDENTAL DAMAGES. SELLER SHALL NOT BE RESPONSIBLE FOR INSTALLATION, DISMANTLING OR REINSTALLATION COSTS OR CHARGES. No Action, regardless of form, may be brought against Seller more than 12 months after a cause of action has accrued. The goods returned under warranty to Seller's factory shall be at Buyer's risk of loss, and will be returned, if at all, at Seller's risk of loss.

Buyer and all users are deemed to have accepted 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, modified or its terms waived, except by writing signed by an Officer 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) 680-1220 (USA) or (1) 651-490-2860 (International).

Trademarks

TSI and the TSI logo are registered trademarks of TSI Incorporated in the United States and may be protected under other country's trademark registrations.

CONTENTS

CHAPTER 1 UNPACKING AND PARTS IDENTIFICATION	1
CHAPTER 2 SETTING-UP	3
Supplying Power to the Model 9535/9535-A	3
Installing the Batteries	3
Using the Optional AC Adapter	3
Using the Telescoping Probe	3
Extending the Probe	3
Retracting the Probe.....	4
Connecting to a Computer.....	4
CHAPTER 3 OPERATION	5
Keypad Functions	5
Common Terms	5
Menus	6
DISPLAY SETUP	6
SETTINGS	6
FLOW SET UP	6
ACTUAL/STANDARD SETUP	6
DATA LOGGING	7
Measurements.....	7
Delete Data.....	7
% Memory	7
LogDat2™ Downloading Software	7
CHAPTER 4 MAINTENANCE.....	9
Recalibration.....	9
Cases.....	9
Storage	9
CHAPTER 5 TROUBLESHOOTING.....	11
APPENDIX A SPECIFICATIONS.....	13

(This page intentionally left blank)

Chapter 1

Unpacking and Parts Identification

Carefully unpack the instrument and accessories from the shipping container. Check the individual parts against the list of components. If anything is missing or damaged, notify TSI® Incorporated immediately.

1. Carrying case
2. Instrument
3. USB cable
4. CD-ROM with downloading software

(This page intentionally left blank)

Chapter 2

Setting-up

Supplying Power to the Model 9535/9535-A

The TSI® Model 9535/9535-A VelociCalc™ Air Velocity Meter is powered with four size AA batteries.

Installing the Batteries

Insert four AA batteries as indicated by the diagram located on the inside of the battery compartment. The Model 9535/9535-A is designed to operate with either alkaline or NiMH rechargeable batteries, although it will not recharge NiMH batteries. Battery life will be shorter if NiMH batteries are used. Carbon-zinc batteries are not recommended because of the danger of battery acid leakage.

Using the Optional AC Adapter

When using the AC adapter, the batteries (if installed) will be bypassed. Be sure to provide the correct voltage and frequency, which is marked on the back of the AC adapter. The AC adapter will not recharge the batteries.

Using the Telescoping Probe

The telescoping probe contains the velocity and temperature sensors. When using the probe, make sure the sensor window is fully exposed and the orientation dimple is facing upstream.

NOTICE

For temperature measurements, make sure that at least 3 inches (7.5 cm) of the probe is in the flow to allow the temperature sensor to be in the air stream.

Extending the Probe

To extend the probe, hold the handle in one hand while pulling on the probe tip with the other hand. **DO NOT** hold the cable while extending the probe as this prevents the probe from extending.

Retracting the Probe

To retract the probe, hold the handle in one hand while pulling gently on the probe cable with the other hand.

Connecting to a Computer

Use the Computer Interface USB Cable provided with the Model 9535/9535-A to connect the instrument to a computer for downloading stored data.

For more information on how to download stored data see Chapter 3 section titled [LogDat2™ Downloading Software](#).



CAUTION

This symbol is used to indicate that the data port of the Model 9535/9535-A is **NOT** intended for connection to a public telecommunications network. Connect the USB data port only to another USB port.

Chapter 3

Operation

Keypad Functions

ON/OFF Key	Press to turn the Model 9535/9535-A on and off. During the power up sequence the display will show the following: Model Number, Serial Number, Software Revision and Last Date Calibrated.
Arrow (▲▼) Keys	Press to scroll through choices while setting a parameter.
↵ (Enter) Key	Press to accept a value or condition.
Arrow (◀or ▶) and Menu Soft Keys	Press arrow keys to change choices while setting a parameter. Press the Menu soft key to select the Menu selections, which are Display Setup, Settings, Flow Setup, Actual/Std Set up, Data Logging, and Calibration.

Common Terms

In this manual there are several terms that are used in different places. The following is a brief explanation of the meanings of those terms.

Sample	Consists of all of the measurement parameters stored at the same time.
Test ID	A group of samples. The statistics (average, minimum, maximum, and count) are calculated for each test ID. The maximum number of test IDs is 100.
Time Constant	The time constant is an averaging period. It is used to dampen the display. If you are experiencing fluctuating flows, a longer time constant will slow down those fluctuations. The display will update every second, but the displayed reading will be the average over the last time constant period. For example, if the time constant is 10 seconds, the display will update every second, but the displayed reading will be the average from the last 10 seconds. This is also referred to as a “moving average”.

Menus

DISPLAY SETUP

Display setup menu is where you will setup the desired parameters to be displayed on the running screen. With a parameter highlighted you can then use the ON soft key to have it show up on the running screen or select the OFF soft key to turn off the parameter. Use PRIMARY soft key to have a parameter show up on the running screen in a larger display. Only one parameter can be selected as a primary, and up to two secondary parameters can be selected at one time.

SETTINGS

Settings menu is where you can set the general settings. These include Language, Beeper, Select Units, Time Constant, Contrast, Set Time, Set Date, Time Format, Date Format, Number Format, Backlight and Auto Off. Use the ◀ or ▶ soft keys to adjust the settings for each option and use the ↵ key to accept settings.

FLOW SET UP

In Flow Setup mode, there are four types: Round Duct, Rectangle Duct, Duct Area and Horn. Use the ◀ or ▶ soft keys to scroll through the types and then press the ↵ key to accept the desired type. To change the value, highlight the Enter Settings option and press the ↵ key. Use the instructions below to change the value of the type that you selected.

NOTICE

The horn numbers are the models of the horns. For example, 100 refers to a horn model number AM 100. Only horns with Model numbers as follows can be used with this function: AM 100, AM 300, AM 600, and AM 1200. If a horn model number is chosen, the instrument will return to measuring mode and use a preprogrammed curve to calculate flow rate from velocity.

ACTUAL/STANDARD SETUP

Choose Actual/Standard measurements and parameters in the Act/Std Setup menu. Within this menu, the user can also select Standard Temperature, Standard Pressure and a source for the actual temperature. The actual barometric pressure must be entered to convert air velocity and volume measurements to actual conditions.

DATA LOGGING

Measurements

Measurements to be logged are independent of measurements on the display, and must therefore be selected under **DATA LOGGING → Measurements**.

Delete Data

Use this to delete all data, delete test or delete sample.

% Memory

This option displays the memory available. Delete All, under Delete Data, will clear memory and reset the memory available.

LogDat2™ Downloading Software

The TSI® Model 9535/9535-A comes with special software called LogDat2™ Downloading Software, which is designed to provide you with maximum flexibility and power. To install this software on your computer, follow the instructions on the label of the LogDat2™ CD-ROM.

To download data from the Model 9535/9535-A, connect the supplied computer interface USB cable to the Model 9535/9535-A and to a computer USB port. Then run the LogDat2™ software. Within the LogDat2™ software, either select the tests to be downloaded or double-click on a test to open it.

(This page intentionally left blank)

Chapter 4

Maintenance

The Model 9535/9535-A requires very little maintenance to keep it performing well.

Recalibration

To maintain a high degree of accuracy in your measurements, we recommend that you return your Model 9535/9535-A to TSI® Incorporated for annual recalibration. Please contact one of TSI's offices or your local distributor to make service arrangements and to receive a "Service Request" number. To fill out an online "Service Request" form, visit TSI's website at tsi.com/service.

U.S. & International

TSI Incorporated
500 Cardigan Road
Shoreview MN 55126-3996
Tel: (800) 874-1220
(651) 490-2860
Fax: (651) 490-3824

The Model 9535/9535-A can also be recalibrated in the field using the **CALIBRATION** menu. These field adjustments are intended to make minor changes in calibration to match a user's calibration standards. The field adjustment **IS NOT** intended as a complete calibration capability. For complete, multiple-point calibration and certification, the instrument must be returned to the factory.

Cases

If the instrument case or storage case needs cleaning, wipe it off with a soft cloth and isopropyl alcohol or a mild detergent. Never immerse the Model 9535/9535-A. If the enclosure of the Model 9535/9535-A or the AC adapter becomes broken, it must be replaced immediately to prevent access to hazardous voltage.

Storage

Remove the batteries when storing the unit for more than one month to prevent damage due to battery leakage.

(This page intentionally left blank)


Chapter 5

Troubleshooting

Table 5-1 lists the symptoms, possible causes, and recommended solutions for common problems encountered with the Model 9535/9535-A. If your symptom is not listed, or if none of the solutions solves your problem, please contact TSI® Incorporated.

Table 5-1: Troubleshooting the Model 9535/9535-A

Symptom	Possible Causes	Corrective Action
No Display	Unit not turned on	Switch unit on.
	Low or dead batteries	Replace batteries or plug in AC adapter.
	Dirty battery contacts	Clean the battery contacts.
Velocity reading fluctuates unstable	Fluctuating flow	Reposition probe in less-turbulent flow or use longer time constant.
No response to keypad	Keypad locked out	Unlock keypad by pressing ▲▼ keys simultaneously.
Instrument Error message appears	Memory is full	Download data if desired, then DELETE ALL memory.
	Fault in instrument	Factory service required on instrument.

	WARNING
	Remove the probe from excessive temperature immediately: excessive heat can damage the sensor. Operating temperature limits can be found in Appendix A, Specifications .

(This page intentionally left blank)

Appendix A

Specifications

Specifications are subject to change without notice.

Velocity:

Range: 0 to 6000 ft/min (0 to 30 m/s)

Accuracy^{1&2}: $\pm 3\%$ of reading or ± 3 ft/min (± 0.015 m/s), whichever is greater

Resolution: 1 ft/min (0.01 m/s)

Duct Size:

Range: 1 to 250 inches in increments of 0.1 in. (1 to 635 cm in increments of 0.1 cm)

Volumetric Flowrate:

Range: Actual range is a function of actual velocity, pressure, duct size, and K factor

Temperature:

Range: 0 to 200°F (-18 to 93°C)

Accuracy³: $\pm 0.5^\circ\text{F}$ ($\pm 0.3^\circ\text{C}$)

Resolution: 0.1°F (0.1°C)

Instrument Temperature Range:

Operating (Electronics): 40 to 113°F (5 to 45°C)

Operating (Probe): 0 to 200°F (-18 to 93°C)

Storage: -4 to 140°F (-20 to 60°C)

Instrument Operating Conditions When Using the Optional AC Adapter:

Altitude up to 4000 meters

Relative humidity up to 80% RH, non-condensing

Pollution degree 1 in accordance with IEC 664

Transient over voltage category II

Data Storage Capabilities:

Range: 12,700+ samples and 100 test IDs (one sample can contain fourteen measurement types)

Time Constant:

User-selectable

Response Time:

Velocity: 200 msec

Temperature: 2 minutes (to 66% of final value)

External Meter Dimensions:

3.3 in. × 7.0 in. × 1.8 in. (8.4 cm × 17.8 cm × 4.4 cm)

Meter Probe Dimensions:

Probe length: 40 in. (101.6 cm)

Probe diameter of tip: 0.28 in. (7.0 mm)

Probe diameter of base: 0.51 in. (13.0 mm)

Articulating Probe Dimensions:

Articulating section length: 6.0 in. (15.24 cm)

Diameter of articulating knuckle: 0.38 in. (9.5 mm)

Meter Weight:

Weight with batteries: 0.6 lbs (0.27 kg)

Power Requirements:

Four AA-size batteries (included) or AC adapter 9 VDC, 300 mA min.

- ¹ Temperature compensated over an air temperature range of 40 to 150°F (5 to 65°C).
- ² The accuracy statement of ±3.0% of reading or ±3 ft/min (±0.015 m/s), whichever is greater, begins at 30 ft/min through 6000 ft/min (0.15 m/s through 30 m/s).
- ³ Accuracy with instrument case at 77°F (25°C), add uncertainty of 0.05°F/°F (0.03°C/°C) for change in instrument temperature.



Knowledge Beyond Measure.

TSI Incorporated – Visit our website www.tsi.com for more information.

USA **Tel:** +1 800 680 1220

UK **Tel:** +44 149 4 459200

France **Tel:** +33 1 41 19 21 99

Germany **Tel:** +49 241 523030

India **Tel:** +91 80 67877200

China **Tel:** +86 10 8219 7688

Singapore **Tel:** +65 6595 6388

P/N 1980563 Rev L

©2023 TSI Incorporated

Printed in U.S.A.

