Model 8330
VELOCICHECK®
Air Velocity Meter

Operation and Service Manual

August 2000
P/N 1980066 Rev. D

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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 TSI's Customer Service department at (800) 777-8356 (USA) and (1) 651-490-2711 (International).

CONTENTS

Chapters

Appendices

Available Application Notes

- Constant temperature Thermal Anemometry Theory TI-105
- Traversing a Duct to Determine Average Air Velocity or Volume TI-106

To obtain any of the listed Application Notes contact TSI at the following:

U.S. (800)777-8356/(651)490-2711
Fax: (651)490-2874

International: (1) 651-490-2711
Fax: (1) 651-490-2874

Chapter 1

Setup

This chapter guides you through unpacking and installing batteries into your VELOCICHECK. See chapter 2 for a detailed description of the digital VELOCICHECK's operating functions.

Unpacking

Carefully unpack the instrument and accessories from the shipping container. Check the individual parts against the list of components in Table 1; if any are missing or damages, notify TSI immediately.

Table 1: List of components

Qty	Item	Part #
1	VELOCICHECK Model 8330	8330
1	Carrying case	1319042
4	AA alkaline batteries	1208013
1	Operation and service manual	1980066

Installing the batteries

Install batteries by loosening the screw in the battery access cover located on the back of the instrument. Insert four size AA batteries in the battery tube according to the polarity indicated on the instrument case under the battery access cover. Replace the battery access cover and tighten the screw.

If the batteries are installed incorrectly, no damage to the VELOCICHECK will occur, but the instrument will not function.

Chapter 2

VELOCICHECK Operation

This chapter thoroughly explains how to operate the VELOCICHECK.

Extending the probe

The Model 8330 VELOCICHECK contains a telescoping velocity and temperature measuring probe which is shipped in its collapsed position. To expose the probe to the flow for air velocity or temperature measurements, grasp the tip of the probe and pull firmly.

To retract or collapse the probe, simply push the tip of the probe straight toward the handle. When you collapse the probe, be sure to allow room for the cable to move freely out of the base of the probe. Hindering the movement of the cable at the base of the probe will make it difficult to collapse the probe.

Always store the probe retracted when not in use in order to protect the sensor.

NOTE: As you handle the probe, take care not to bump it against duct walls or other objects. The probe has been made as rugged as possible, but it can be damaged by careless handling.

Measuring temperature

Whenever you plan to measure both temperature and velocity, it is best to measure temperature first.

HINT for measuring temperature: Switch the VELOCICHECK to the temperature mode before turning the instrument on. This will minimize the time required for the temperature sensor to stabilize.

The temperature measuring sensor is in the window near the end of the probe. Extend the probe and expose the sensor in the window to the air where you want to measure temperature.

When you measure temperature in moving air, orient the window of the probe so that the air flows through the window. This will minimize the time required for the temperature readings to stabilize.

Measuring velocity

For highest accuracy, it is important with all VELOCICHECKs to properly align the probe to the flow. For accurate results, the measured air must flow through the sensor window at the end of the probe.

HINT for measuring velocity: If the probe is left to warm up for more than a few seconds at velocities below 50 feet/minute (0.25 meters/sec) it will require more time to stabilize when it is inserted into a higher flow. This is because the probe assembly self heats at such low flows, and must then re-stabilize when placed into higher flow. Fro best response time at velocities of 100-200 feet/minute (0.5-1 meters/sec) it is recommended to first place the probe into the flow, and then turn the meter on.

When the Model 8330 VELOCICHECK is in the velocity mode the temperature sensor will be warmed by heat from the velocity sensor. If the VELOCICHECK is then switched to temperature mode, it will read several degrees high until the temperature sensor can cool. Therefore, when you plan to measure both temperature and velocity, it is best to measure temperature first.

Switching on the power

Turn on the VELOCICHECK using the ON/OFF switch. The VELOCICHECK will display battery life for the first 5 seconds. This number represents the approximate percentage of battery life remaining, and will range from less than zero% for a low battery to something over 100% for a short time while the "surface charge" of the new batteries burns off.

After 5 seconds the VELOCICHECK will begin to display velocity or temperature in the selected units. Units available for display are standard feet per minute (S ft/min) and degrees Fahrenheit (°F), and standard meters per second (S m/s) and degrees Celsius (°C), depending on which instrument you purchased. The units of measure cannot be changed in the field.

Selecting temperature/velocity display

The TEMP/VEL switch on the instrument allows you to switch between the instrument's two measuring modes. Slide the switch to the TEMP position to read the current temperature, or to the VEL position to read the current velocity.

Selecting the sensor response

The Model 8330 VELOCICHECK has a FAST/SLOW response switch for setting the sensor response speed. In the slow response mode, the VELOCICHECK displays the average velocity measured during the past 12 seconds. This is a running average, so the display is updated once a second. In the fast response mode, the meter displays the average velocity measured during the past 3 seconds. The way the VELOCICHECK does velocity averaging is by saving the velocity measured each of the past 12 seconds into 12 separate locations in memory. Every second, a new reading is taken and the oldest reading is thrown out. Depending on the position of the sensor response switch, either the last 3 readings or all 12 readings will be averaged for display.

Batteries

The VELOCICHECK is powered by four AA-size batteries. TSI ships the instrument with alkaline batteries, but nickel-cadmium rechargeable batteries may be used. Keep in mind that battery life is a function of the velocity being measured: the higher the velocity, the shorter the life. Table 2 shows typical battery life for both alkaline and nickel-cadmium batteries at three velocities.

Table 2: Typical battery life* at three velocities

Air Velocity		alkaline life	nickel-cadmium life
(ft/min)	(m/s)	(hrs)	(hrs)
100	0.5	10	2-1/2
1000	5.0	6	1-3/4
2000	10.0	5	1-1/2

* At 20°C

The VELOCICHECK continually monitors its battery supply voltage. Then the battery life falls below 15%, the battery indicator (BAT) in the upper left corner of the display will blink on and off. This indicates a low battery condition and means that the batteries will soon need to be replaced.

- Once the BAT indicator begins to blink, you still have a few minutes to complete the measurements you are making. While the indicator is blinking, the VELOCICHECK continues to measure accurately.

If the battery voltage falls below 3.5 VDC, the display will read "LO" and the BAT indicator will be on continuously. Batteries must then be replaced before velocity readings can be taken.

If you do not install fresh batteries and the voltage falls below 2 volts, the display will go blank.

- Alkaline batteries are recommended for longest life, and the VELOCICHECK battery life indicator will be most accurate with alkaline batteries.

Chapter 3

Maintenance

The VELOCICHECK requires very little maintenance to keep it performing well.

Probe tip

Periodically inspect the probe tip to ensure that it is clean. Dust and oil deposits on the tip and sensor decrease the accuracy of the VELOCICHECK.

CAUTION: The VELOCICHECK must be switched off for cleaning. Do not use high-pressure air, strong solvents, or brushes to clean the sensor tip; damage to the sensors could result.

To remove dust, blow it off with a gentle stream of air or rinse it off with a gentle stream of water. To remove a combination of dust and oil, rinse the probe tip in isopropyl alcohol and then blow it off with a gentle stream of air. Never use heat to dry the probe.

Allow the sensor to dry thoroughly before use.

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 submerge the VELOCICHECK.

Storage

When storing the VELOCICHECK for more than a month, it is recommended that you remove the batteries to prevent damage due to batteries leaking.

Service

To maintain a high degree of accuracy in your velocity measurements, TSI recommends that you return your instrument to the factory for annual calibration. For a nominal fee, we will recalibrate the unit and return it to you with a certificate of calibration and NIST traceability. This 'annual checkup' assures you of consistently accurate readings; it is especially important in applications where strict calibration records must be maintained.

Chapter 4

Troubleshooting

Table 3 lists the symptoms, possible causes, and recommended solutions for common problems encountered with the VELOCICHECK. If your symptom is not listed, or none of the solutions solves your problem, please contact TSI.

Table 3: Troubleshooting the VELOCICHECK

Symptom	**Possible Causes**	**Corrective Actions**
No display	Unit not switched on	Switch on the unit
	Low or dead batteries	Replace the batteries
	Dirty battery contacts	Clean the battery contacts
	Batteries installed incorrectly	Check the battery alignment against illustration inside battery cover
BAT is blinking	Batteries are getting low	Replace the batteries

Symptom	Possible Causes	Corrective Actions
Display reads "LO" and the BAT indicator is on	Batteries are low	Replace the batteries
	Dirty battery contacts	Clean the battery contacts
Velocity reading fluctuates badly	The flow is fluctuating	Reposition the probe in a less turbulent section of the flow or set the RESPONSE switch to SLOW
Velocity reading blinks 4000 ft/min or 20.32 m/s	The velocity exceeds 4000 ft/min or 20.32 m/s	Use an alternate method to measure the velocity
	Sensor may be damaged	Contact TSI
Display indicates over 10 ft/min (0.05 m/s) with probe retracted	Sensor may be damaged	Contact TSI

Appendix A

Standard Velocity vs. Actual Velocity

Since thermal sensors are sensitive to changes in air density and air velocity, all thermal anemometers indicate velocities with reference to a set of standard conditions. For TSI instruments, standard conditions are defined as 70°F (21.1°C) and 14.7 psia (101.4 kPa). Other manufacturers may use different values.

Standard velocity is the velocity the air would be moving if the temperature and pressure were at standard conditions. It is usually the most useful measure of airflow because it defines the heat-carrying capacity of the air.

Actual velocity is the velocity at which a microscopic particle of dust would be traveling if it were in the airstream.

Because actual air density is rarely equal to air density at standard conditions, actual velocity usually differs from standard velocity.

In some instances, actual air velocity rather than standard velocity may be of interest. To obtain the value for actual velocity, multiply your standard velocity readings (as indicated by the VELOCICHECK) by the following density correction factor:

$$Act.Vel. = Std.Vel.\left[\frac{460+T}{460+70}\right]\frac{14.7}{P}$$

Where

T = Ambient temperature in °F
P = Ambient pressure in psia

If you use metric units, the equation becomes:

$$Act.Vel. = Std.Vel.\left[\frac{273+T_m}{273+21.1}\right]\frac{101.4}{P_m}$$

Where

T_m = Ambient temperature in °C
P_m = Ambient pressure in kPa

Example No. 1

You want to measure the actual velocity in a duct. The air temperature in the duct is 55°F and the

pressure is 14.24 psia. You take a measurement and the display reads 1200 ft/min.

$$Act.Vel. = 1200\left[\frac{460 + 55}{460 + 70}\right]\frac{14.7}{14.24} = 1203.7\, ft / \min$$

Example No. 2

You need to measure the actual velocity in a plenum. The air pressure is 99.4 kPa and the temperature is 27°C. The display reading on the VELOCICHECK is 2.30 m/s.

$$Act.Vel. = 2.30\left[\frac{273 + 27}{273 + 21.1}\right]\frac{101.4}{99.4} = 2.39 m / s$$

Appendix B

Specifications

Specifications are subject to change without notice.
Specifications in parentheses () indicate metric equivalents.

VELOCITY:

Range:	0 to 4,000 ft/min (0 to 20.00 m/s)
Accuracy[1]:	±5.0% of reading or ±5 ft/min (±0.025 m/s) whichever is greater

TEMPERATURE:

Range:	0 to 200°F (-18 to 93°C)
Resolution:	1°F (1°C)
Accuracy:	±1°F (±1°C)

OPERATING TEMPERATURE RANGE:

Instrument:	32 to 149°F (0 to 60°C)
Probe:	0 to 200°F (-18 to 93°C)

EXTERNAL METER DIMENSIONS:

Size Measurements:	2.75 in. x 1.3 in. x 5.2 in. (70 mm x 33 mm x 132 mm)

METER PROBE TYPE:

Description:	Detached telescoping
Material:	Nickel-plated brass and stainless steel

METER PROBE DIMENSIONS:

Probe length:	37 in. (94.0 cm) telescopic
Probe tip diameter:	0.236 in. (6.0 mm)
Probe base diameter:	0.395 in. (10.03 mm)

DISPLAY:

Type:	Digital
Description:	41/2 digits, 0.4 in. (10 mm) high

TIME CONSTANT:

Fast mode:	3-second averaging
Slow mode:	12-second averaging

POWER REQUIREMENTS:

four (4) AA-size batteries, nickel cadmium or alkaline (provided)

BATTERY LIFE:

Minimum 10 hours at 100 ft/min (0.5 m/s) using alkaline batteries

STANDARD EQUIPMENT:

Free certificate of NIST* traceability, operation and service manual, four AA-size alkaline batteries and hard-shell carrying case.

1 The accuracy statement of ±5.0% of reading or ±5 ft/min (±0.025 m/s) begins at 25 ft/min through 4000 ft/min (0.13 through 20.00 m/s)

* U.S. National Institute of Standards and Technology