AIRPRO®
SOLUTIONS
MODELS AP500/AP800

OPERATION/USER MANUAL

TSI®

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Manual History

The following is a history of the AirPro® Solutions Models AP500/AP800 Operation/User Manual, P/N 6010062.

Revision	Date
A	February 2017

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AirPro® Instrument Models AP500/AP800

Warranty

Copyright©	TSI Incorporated / 2017 / All rights reserved.
Address	TSI Incorporated / 500 Cardigan Road / Shoreview, MN 55126 / USA
E-mail	answers@tsi.com
Fax No.	(651) 490-3824
Patents	Patents pending.
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. Carbon monoxide (CO) Electro-chemical sensors are warranted for 12 months from the date of shipment.

c. Pumps are warranted for hours of operation as set forth in product or operator's manuals;

d. 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;

e. 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;

f. 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;

g. 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;

h. 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.

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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.

Mobile Application End User License Agreement

This Mobile Application End User License Agreement ("**Agreement**") is a binding agreement between you ("**End User**" or "**you**") and TSI Incorporated ("**Company**"). This Agreement governs your use of the AirPro Mobile Software on the MOBILE PLATFORM, (including all related documentation, the "**Application**"). The Application is licensed, not sold, to you. The entire license agreement can be found at https://my.tsi.com/pdfs/TSI%20AirPro%20EULA.pdf

APPENDIX A

Open Source Software Licenses License	Link
Android Open Source License	http://developer.android.com/license.html
Crashlytics Agreement	http://try.crashlytics.com/terms/terms-of-service.pdf
Apache 2.0	http://www.apache.org/licenses/LICENSE-2.0.txt
MIT	http://opensource.org/licenses/MIT
Open source license on github	https://github.com/soffes/SSKeychain

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) 874-2811 (USA) or (1) 651-490-2811 (International).

Trademarks

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Bluetooth is a registered trademark of Bluetooth SIG, Inc., a Delaware corporation ("Bluetooth SIG")

Contents

Safety

This section provides instructions to ensure safe and proper handling of the AirPro® Products.

W A R N I N G
The instrument must be used in the manner described in this manual. Failure to follow all of the procedures described in this manual can result in serious injury to you or can cause irrevocable damage to the instrument. There are no user-serviceable parts inside the instrument. Refer all repairs to a qualified factory-authorized technician.

W A R N I N G
Do not use the instrument or probes near hazardous voltage sources since serious injury could result.

Bluetooth® Safety and Compliance

This product uses Bluetooth® Low Energy v.4.0 to transmit with software applications.

Hereby, TSI Inc. declares that this Bluetooth® Low Energy test and measurement instrument is in compliance with Directive 2014/53/EC.

The full text of the EU declaration of conformity is available at the following internet address: www.tsi.com/AirPro-CE-DOC.

BLE Transmit Power Rating is +3 dBm, MAX @ 2.4 – 2.5 GHz

Note
This device may not cause interference; this device must accept any interference, including interference that may cause undesired operation of the device.
l'appareil ne doit pas produire de brouillage; l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Note

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:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

W A R N I N G

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Battery Safety and Disposal

This instrument uses a rechargeable Lithium ion battery with built-in protection against fire and explosion hazard. **Always dispose of Li-ion batteries and transport Li-ion batteries in compliance with regional regulations.**

W A R N I N G
DO NOT abuse the battery in any way as the battery may rupture or catch fire. • Use only TSI supplied batteries (Part number 800532) in this instrument. • **DO NOT** use a substitute or non-rechargeable battery in this instrument. • **DO NOT** short-circuit, incinerate, dismantle or mutilate Lithium ion batteries. • **DO NOT** expose to water or heat. • **Do** charge the battery in the proper charging conditions • **DO NOT** use equipment if battery becomes hot. **IMMEDIATELY** turn off the equipment if battery becomes hot to the touch. • **DO NOT** use any battery which shows signs of damage, such as bulging, swelling, a swollen plastic wrap, liquid in the plastic wrap, etc.

Description of Labels and Markings

This section acquaints you with the advisory and identification labels on the instrument and used in this manual to reinforce the safety features built into the design of the instrument. It also identifies instrument markings.

Warning

W A R N I N G
Warning means that unsafe use of the instrument could result in serious injury to you or cause irrevocable damage to the instrument. Follow the procedures prescribed in this manual to use the instrument safely.

Caution

C a u t i o n
Caution means *be careful*. It means if you do not follow the procedures prescribed in this manual you may do something that might result in equipment damage, or you might have to take something apart and start over again. It also indicates that important information about the operation and maintenance of this instrument is included.

Serial Number Label	
	AirPro S/N:AP5001616003 Contains: FCC ID: Q0QBLE112, IC6123A−BGTBLE112, MIC ID R 209−J00046, KCC−CRM−BGT−BLE112−A 5V === 5W This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. TSI Incorporated 500 Cardigan Road, Shoreview, MN 55126, USA Made in USA CE
WEEE marking indicates item is non-disposable and must be recycled.	

RoHS

AirPro series instruments are RoHS compliant.

CE

AirPro series instruments are CE compliant.

CHAPTER 1
Parts Identification

The items listed below may be received as part of an individual product package or as a bundled package of several products.

Carefully unpack the instrument(s) and accessories from the/their shipping container(s). Check the individual parts against the list of components below. If anything is missing or damaged, notify TSI immediately.

Description	Part number	Reference picture	For use with
Instrument for measuring differential pressure and barometric pressure.	AP800		AP800
Instrument for use with probes and for measuring barometric pressure.	AP500		VTH-S, VTH-A, VT-S, VT-A, TH-S
Articulated probe for measuring velocity, temperature, and humidity.	VTH-A		AP500
Straight probe for measuring velocity, temperature, and humidity.	VTH-S		AP500
Articulated probe for measuring velocity and temperature.	VT-A		AP500
Straight probe for measuring velocity and temperature.	VT-S		AP500
Straight probe for measuring temperature and humidity.	TH-S		AP500
Probe Extension—12 in. (305 mm); used to extend the reach of the probe. The maximum number of extensions that can be stacked together is three.	800529		AP500 and probe Models VTH-S, VTH-A, VT-S, VT-A, TH-S

Description	Part number	Reference picture	For use with
Carrying case, small; capable of holding 1 instrument, 1 probe and 3 extensions.	800534		AP500 or AP800
Carrying case, large; capable of holding 2 instruments, 2 probes and 3 extensions.	800535		AP500 or AP800
Probe protective case.	800536		VTH-S, VTH-A, VT-S, VT-A, TH-S
Static Pressure Probes and Tubing Kit—contains two static pressure probes and two 4 ft. (1.2 m) lengths of tubing.	800533		AP800
Pitot probe.	634634000 634634001 634634002 634634003 634634005	Pitot probe (5/16" (8 mm) diameter) - 12" (30 cm) Pitot probe (5/16" (8 mm) diameter) - 18" (46 cm) Pitot probe (5/16" (8 mm) diameter) - 24" (61 cm) Pitot probe (5/16" (8 mm) diameter) - 36" (91 cm) Pitot probe (5/16" (8 mm) diameter) - 60" (152 cm)	AP800
	634634004	Telescoping pitot probe - 8" to 38" (20 cm to 96 cm)	
Locator clips provide a visual indicator of how far the probe is inserted into duct. Quantity 20.	800537		VTH-S, VTH-A, VT-S, VT-A, TH-S
Lithium-ion Rechargeable Battery.	800532	3500mAh	AP800, AP500

Description	Part number	Reference picture	For use with
Universal AC/DC adapter for charging the battery while it is in the instrument.	800531		AP800, AP500
External battery charger.	800530		AP500, AP800
Duct plugs, 3/8" (9.5 mm) diameter—1000 pieces.	634650002		AP500, AP800
Duct plugs, 3/8" (9.5 mm) diameter—5000 pieces.	634650003		AP500, AP800

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CHAPTER 2
Set Up

Supplying Power to the Instrument

These instruments can be powered with a battery or with the AC adapter.

Installing the Battery

W A R N I N G
This instrument uses a rechargeable Lithium ion battery with built-in protection against fire and explosion hazard. Use only TSI supplied batteries (TSI part number 800532) in this instrument. **DO NOT** use a substitute or non-rechargeable battery. Always dispose of Li-ion batteries in compliance with regional requirements. **DO NOT** abuse the battery in any way as the battery may rupture or catch fire.

- **DO NOT** short circuit, incinerate, dismantle, or mutilate Lithium ion batteries.
- **DO NOT** expose to water or heat.
- **DO** charge the battery in the proper charging conditions
- **DO NOT** use equipment if battery becomes hot. **IMMEDIATELY** turn off the equipment if battery becomes hot to the touch.
- **DO NOT** use any battery which shows signs of damage, such as bulging, swelling, a swollen plastic wrap, liquid in the plastic wrap, etc.

Insert the battery as indicated by the diagram located on the inside of the battery compartment. The Lithium-ion battery is a rechargeable battery. When a new battery is fully charged and used in the AP500, it will last for more than 8 hours at 100 ft/min (0.5 m/s) and 77°F (25°C). Runtime will be shortened at colder temperatures and higher flows. With Model AP800 new fully charged batteries typically last more than 32 hours.
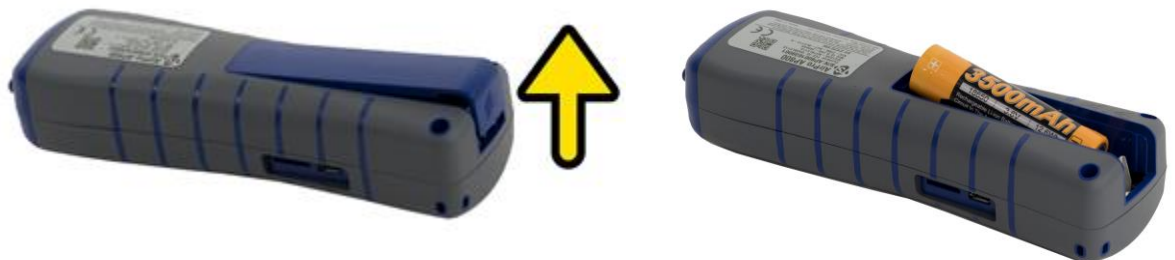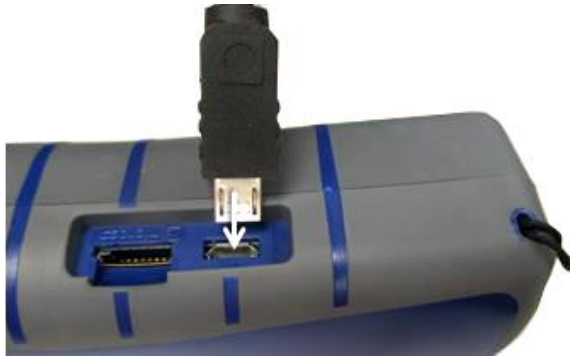
Using the AC Adapter

<table>
<tr><td>C a u t i o n</td></tr>
<tr><td>Use only the AC adapter provided (TSI part number 800531) and **do not** substitute another adapter or use a computer to supply power. Use of an incorrect power supply can cause the measurements to be inaccurate.</td></tr>
</table>

The AC adapter can be used to power the instrument and to charge the battery. Be sure to provide the correct voltage and frequency, which is marked on the back of the AC adapter. When the battery needs to be recharged, plug in the AC/DC adapter. Observe the orange LED which indicates the battery is in the process of charging. The LED will turn off once the battery is completely charged.


<table>
<tr><td>Note</td></tr>
<tr><td>The battery must be installed before the AC/DC adapter is plugged in to initiate recharging. If the AC/DC adapter is plugged in before the battery is installed then the battery will not recharge.</td></tr>
</table>

Using a Memory Card

The instrument allows for the use of a micro SDHC card to provide additional data storage. The memory card must be purchased separately. It must be preformatted with a FAT32 file system with a minimum of 100 MB space free. The memory card plugs into the slot next to the USB port.
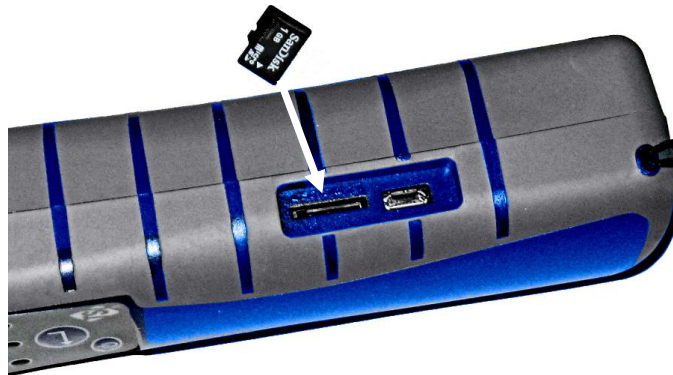
Connecting Probes

The probes for the Model AP500 instrument screw into the top of the handle. Insert the probe into the knurled nut and hold it tight. Then twist the knurled nut until tight. It should take only 5 to 6 turns and a hard stop will indicate when it is tight. You can orient the probe 360 degrees by loosening the nut, twisting the probe and retightening the nut. The probe for Model AP800 is integrated into the instrument and is not removable.

Using Extensions

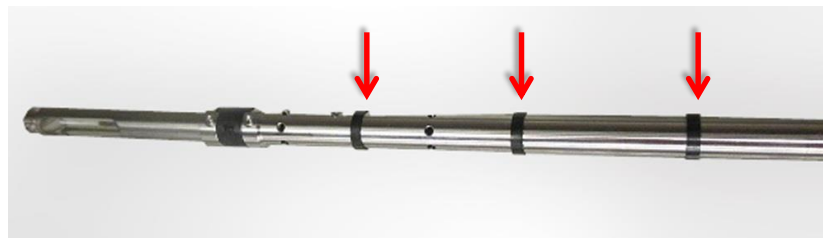Extensions can be used to extend the reach of the probe by up to 3 feet.

W A R N I N G
DO NOT use more than 3 feet of extensions or the measurement will become inaccurate.

Using Locator Clips

Locator clips snap onto the probes and slide easily along the probe body. They are used to set the depth at which the probe is to be inserted into an airstream.
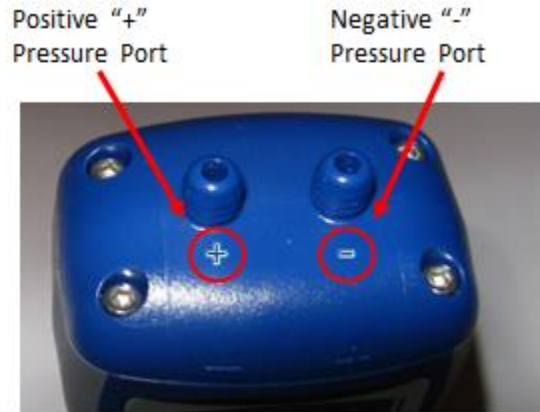

Note
For temperature and humidity measurements, make certain that at least 3 inches (7.5 cm) of the probe is in the flow. This will allow the temperature and humidity sensors to be in the air stream.

Using the Pressure Ports (Model AP800 only)

The Model AP800 has pressure ports that can be used to measure static and differential pressures. The "+" port connects to the higher pressure and the "-" port connects to the lower pressure. When the pressure is connected the same way the tubes are marked, the meter displays a positive number. When the pressure is reversed, the meter displays a negative number.

WARNING
DO NOT expose the pressure ports to more than 190 inH$_2$O (47280 Pa) pressure differential. This will damage the sensor and make the measurement inaccurate.

Connecting the Static Pressure Probe

The Model AP800 can be used with the Static Pressure probe by connecting to the "+" port on the instrument using pressure tubing. The Static Pressure probe is used to measure the duct static pressure and features a magnet which holds the probe to the ductwork.
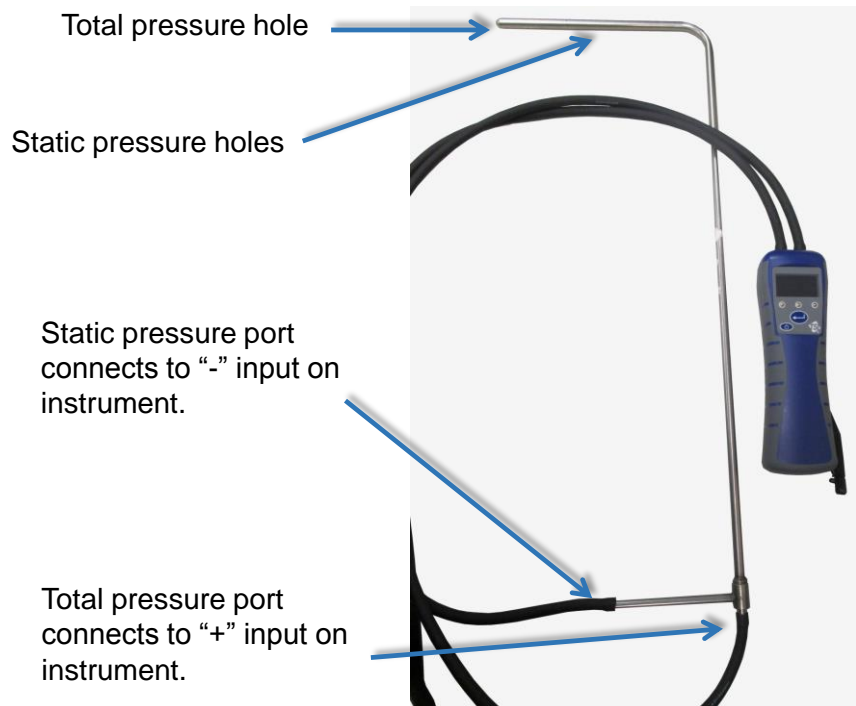
Connecting an Optional Pitot Probe

When connected to a pitot probe, air velocity or air volume can be measured. A pitot probe can be connected to the "+" and "-" pressure ports on the Model AP800 using two pieces of tubing of equal length. The total pressure port of the pitot probe connects to the "+" port on the instrument, and the static pressure port of the pitot probe connects to the "-" port on the instrument.

Note
The pitot velocity needs a valid temperature to perform the standard or actual velocity correction. The temperature setting is controlled in the AirPro Mobile application, see Chapter 4.

Total pressure hole

Static pressure holes

Static pressure port connects to "-" input on instrument.

Total pressure port connects to "+" input on instrument.

Using the Carrying Cases and Protective Probe Case

The carrying cases can be used to store and transport the instruments, probes and accessories. The small case accommodates one instrument and one probe while the larger case accommodates two instruments and two probes. The probe protective case will accommodate any of the probe variants. Use the protective probe case to transport and store the probe when it is not in operation.

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AirPro® Instrument Models AP500/AP800

Operation

Instrument Operation

Keypad Functions

●	●	●
Power Indicator	Bluetooth® connectivity indicator	Charging indicator
Green = battery power is ok. Red = battery power is low.	Flashing = Broadcasting Steady = Connected	On = Battery is charging
		Off = Battery is not charging

Press the **ON/OFF** key to turn the instrument on and off. To turn the instrument off, press and *hold* the **ON/OFF** key for 3 seconds before releasing the **ON/OFF** key. The instrument will count down.

Press ↵ to freeze the display on a current value. The display will indicate the data is frozen ▣. Use ↵ again to unfreeze the display. Also this button can be set up to aid in data logging in the AirPro Mobile application. See Data Logging for further details.

Model AP800 Differential Pressure Auto-Zero

When the Model AP800 is first powered on, the differential pressure sensor will be automatically zeroed. Do not apply a pressure to the ports when powering it on but leave both ports open to atmosphere. The instrument will indicate if the pressure zero was successful.

Common Terms

Within the AirPro Mobile Application Software, there are several terms that are used in different places. The following is a brief explanation of the meanings of those terms and what AirPro Mobile feature set is applicable.

Term	Definition	Feature
Primary Measurement	The Primary Measurement is displayed prominently on AirPro Mobile's Probe Measurement screen. The measurements available depend on your probe and your user license.	Basic, Advanced and Professional
Display and Logging Setup	You can configure which measurements to display and log with AirPro Mobile. The measurements available depend on your probe and your user license. Options include Off, Display and Log, Display, and Off.	Advanced and Professional
Flow Calculations Setup	Flow is calculated based on the probe's velocity measurement and the duct cross sectional area you specify.	Advanced and Professional
Pitot Flow Setup	Pitot flow is calculated based on the probe's differential pressure measurement and the duct cross sectional area you specify.	Advanced and Professional
K-Factor Flow Setup	K-factor flow is calculated based on the probe's differential pressure measurement and the K-Factor you specify. The K-Factors are obtained from the diffuser or flow station manufacturer.	Advanced and Professional
Corrections & Offsets	You can apply correction factors to thermal air flow, pitot flow and pitot velocity. The measurement displayed and logged will be the raw measurement multiplied by the value you specify here. You can apply offsets to temperature, relative humidity, and barometric pressure. The measurement displayed and logged will be the raw measurement added to the value you specify here.	Advanced and Professional
Probe Storage	Probe Storage displays the memory card status. It will indicate if the card has a compatible format and if an existing file is on the card. If there is a log file present on the card, you can download it to AirPro Mobile. Typically a 2 minute log will take 5 minutes to download. You can also extract files from the memory card by using a card reader.	Professional
Probe Name	Probe Name lets you name the instrument in use. You do not have to name the instrument. The default is "Unit Name."	Basic, Advanced and Professional
Battery Level	Battery level indicates the percent of battery power remaining in the instrument. It will also indicate if an AC/DC adapter is connected to the probe. It does not display the battery level remaining of your Smartphone.	Basic, Advanced and Professional
Time Constant	The time constant is an averaging period. It is used to dampen the displayed measurement. 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."	Basic, Advanced and Professional
Display Scrolling	You can configure the measurements shown on the instrument display with this feature. The measurement options available will depend on the type of probe and user license that you have.	Basic, Advanced and Professional

Term	Definition	Feature
Display Sleep Time	Display Sleep can be used to prolong battery life on the instrument. If a period of inactivity is detected from the keypad, the display is turned off. The display can be reactivated by tapping any key on the probe keypad.	Basic, Advanced and Professional
Auto Shut Off Time	Auto Shut off can be used to prolong battery life. If this option is enabled, the instrument will shut off automatically when it has detected a period of inactivity. The handle will not shut off if it is paired with AirPro Mobile or if it is logging or if there is activity on the probe keypad.	Basic, Advanced and Professional
Calibration Certificate	The Calibration Certificate feature allows you to request an electronic copy of the probe's calibration certificate. The most recent certificate will be sent to the email address you set up in your User Profile.	Professional
Sample	Each time you start logging, a sample is taken from all connected probes. A sample consists of measurements stored at the same time. The values stored will be the averages over the sampling interval.	Advanced and Professional
Sampling Interval	Average measurements will be displayed and logged at the end of each Sampling Interval. Set the Sampling Interval to exceed the time constant. For example, if the sampling interval is set to 10 seconds, each sample will be the average over the previous 10 seconds.	Advanced and Professional
Test ID	Each sample is associated with a Test ID. A Test ID may include multiple samples as long as each sample has a similar test configuration including offsets, units of measure, probe hardware, etc. AirPro Mobile creates a table of summary statistics (minimum, maximum, average) for data files saved to the Smartphone.	Advanced and Professional
Manual Save	The Manual Save option lets you set a Sampling Interval. Average measurements will be displayed and logged at the end of each Sampling interval. Set the Sampling interval to exceed the time constant. Data is logged to AirPro Mobile.	Advanced and Professional
View Before Saving	Manual Save allows the option to View Before Saving. By default this feature is disabled so AirPro Mobile automatically saves every sample you initiate. If you enable this feature, AirPro Mobile will display the measurement at the end of the Sampling interval and give you the option to save it or discard it.	Advanced and Professional
Continuous Save	Continuous Save lets you set a Sampling Interval. Average measurements will be logged at the end of each Sampling interval. Set the Sampling interval to exceed the time constant.	Advanced and Professional
Test Length	Continuous Save lets you set the Test Length. Samples will be logged automatically until the Test Length has ended.	Advanced and Professional
Save Data To	By default data is logged to AirPro Mobile (your smartphone). Available with a Professional user license is the option to Save Data to a memory card on your probe. One Test ID at a time can be saved to a memory card. It can be retrieved from the card using a card reader or by using the download feature described in Probe Settings.	Professional

Common Symbols

The following symbols are used in this manual and on the product. The following is a brief explanation of the meanings of these common symbols.

(symbol)	Temperature
(symbol)	Relative Humidity
(symbol)	Barometric Pressure
(symbol)	Dew Point
(symbol)	Wet bulb
(symbol)	Velocity
(symbol)	Flow

AirPro Mobile

The AirPro Mobile application has multiple user levels such as Basic, Advanced, and Professional. The Basic level is available for free. The Advanced and Professionals user levels are license based. You can select the level of features you need for your application according to the functionality matrix shown below.

Function	Basic	Advanced	Professional
Display multiple measurements simultaneously	X	X	X
Configure probes	X	X	X
Calculate pitot probe velocity	X	X	X
Configure units of measurement	X	X	X
Supports multiple languages	X	X	X
Calculate statistics: minimum, maximum, average		X	X
Calculate Dew Point and Wet Bulb temperatures		X	X
Calculate Flow		X	X
Apply correction factors and offsets		X	X
Log data		X	X
Number of instruments connected simultaneously	1	2	6
Share data with email and cloud		X	X
Store data on probe's memory card			X
Graph data			X
Duct Traverse Application			X
Obtain electronic calibration certificate			X

Before you can use AirPro Mobile, you must first create a new account or log into an existing account. Once you have an account, AirPro Mobile enables the features as defined by the account's license level.

AirPro® Instrument Models AP500/AP800

If you select and pay for the non-basic user levels of AirPro Mobile, you can associate that license to two smartphones. Then if you attempt to associate the license to a third smartphone, you will see a notice that the limit of devices has been reached. Go to https://my.tsi.com/ to view a list of the devices that are currently associated with your account. You must remove one of them before associating the license with a new smartphone.

Smartphone Requirements

AirPro Mobile operates with a smartphone running a minimum of Android 4.3 or iOS 9.

Note
AirPro Mobile supports many languages as described in Appendix A. AirPro Mobile will operate in these languages according to your smartphone language selection.

Download AirPro Mobile

AirPro mobile for iOS can be downloaded from: https://itunes.apple.com/us/app/airpro-mobile/id1146476516?mt=8.

AirPro mobile for android can be downloaded from: https://play.google.com/store/apps/details?id=com.tsi.android&hl=enfor.

Create an Account

You must create an account to use AirPro Mobile. Go to https://my.tsi.com/ to create an account, redeem codes, and manage your devices and probes. You may associate your account with up two devices. If you want to associate it with a third device, you can disassociate one of the existing devices by logging into https://my.tsi.com/ and managing your devices. AirPro Mobile will verify your user license every time it opens and connects with a network.

# Log in to AirPro Mobile

To log in:

1. Tap the AirPro Mobile icon on the screen of your smartphone.

2. When the Login screen appears, enter the email address and password that you have registered and select **Login**.

Note: See Create an Account information on registering your email address.
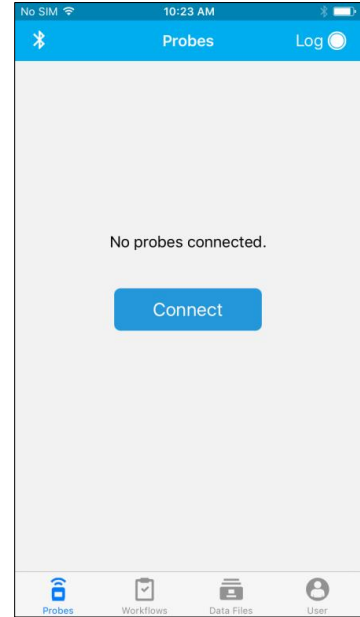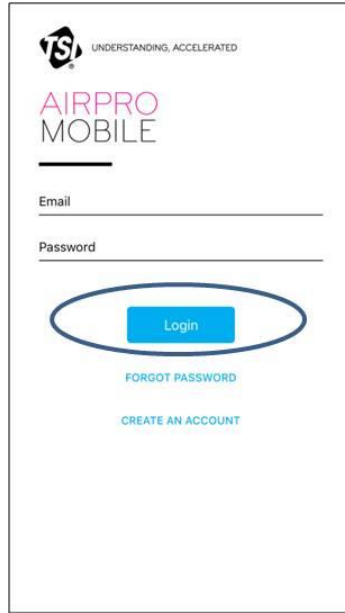
Connect AirPro Mobile with Probe

1. After you log in, AirPro Mobile looks for available probes. If "No probes connected" is displayed, power on an AirPro instrument such as the Model AP800 or Model AP500 with an attached probe.

2. Select **Connect**.
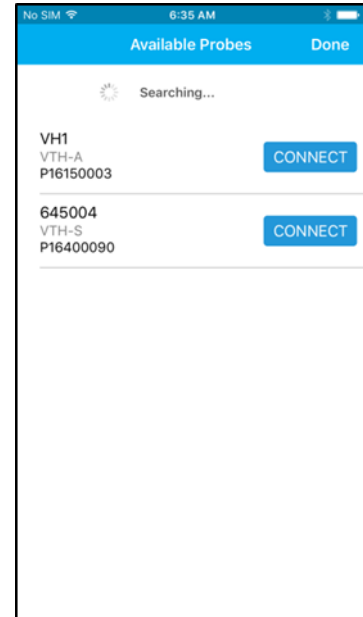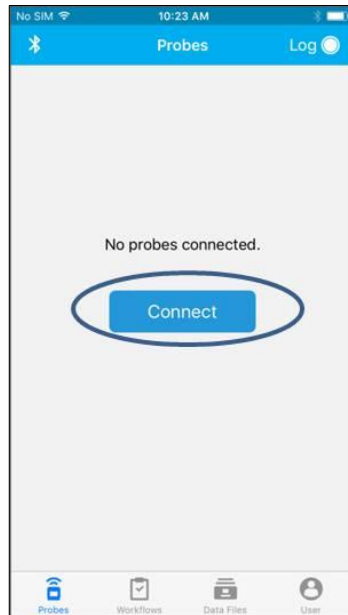
Available Probes

AirPro Mobile lists the probe(s) that have been found. For each probe found, it displays the probe model, the probe serial number, and the programmable *Unit Name*. If you do not see your probe, swipe the Available Probes screen to refresh it.

1. Select **Connect**. When AirPro Mobile connects to the probe, it will show **Disconnect** and the probe will show a solid blue LED.

2. Select **Done** to display the Probe Measurement screen for each connected probe.

With an Advanced license you can connect up to two probes and with Professional licenses you can connect up to six probes.
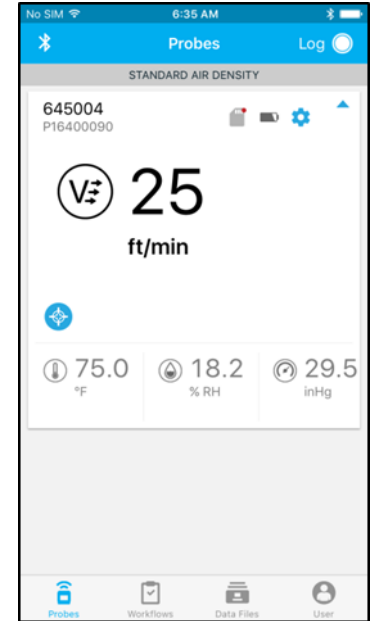
Probe Specific Configurations

Set up the Probe

Many of the settings on the Probe Measurement screen and the instrument interface can be configured from the Probe Settings menu.

To configure these settings tap the ⚙ icon on the Probe Measurement screen.
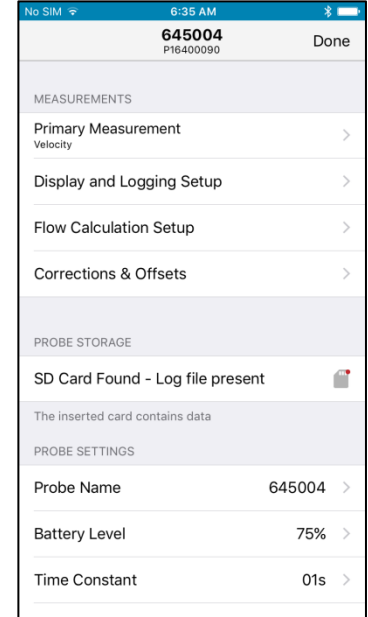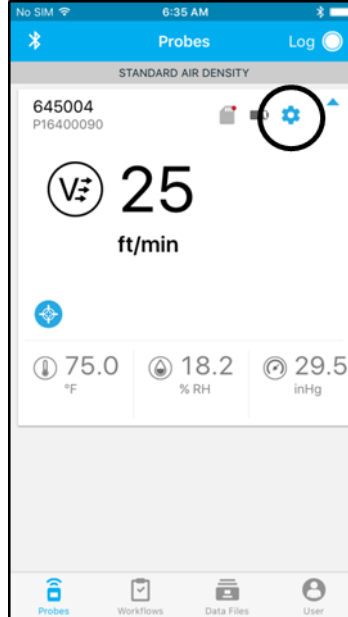
Show a Target Value

A target dial can be configured for the primary measurement. This will show you how far off the current reading is from a desired value.

To set and display a target value from the Probe Measurement display:

1. Tap ⊕.

2. Enable **Show a Target Value**.

3. Enter a Target Value and select **Save**.

4. Enter a Target Range and select **Save**.

Your selection is saved to AirPro Mobile.
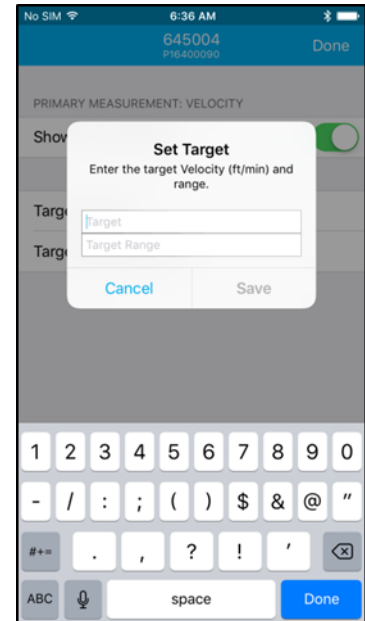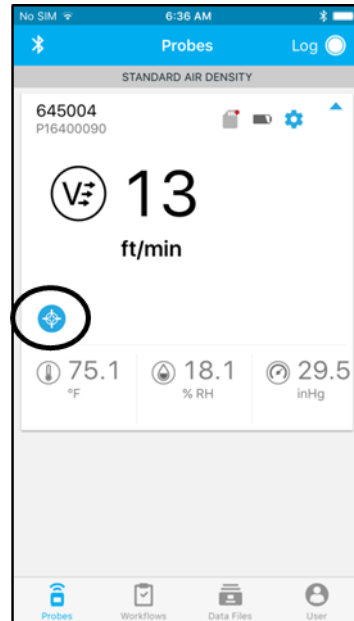
Data Logging

Data Logging is available with Advanced and Professional licenses. You can log data with multiple probes simultaneously to develop an assessment of system-wide performance. You can log in one of two modes, either Manual Save mode or Continuous Save mode. With Manual Save you can decide when you want to collect a sample. Alternatively with Continuous Save you can automate data collection. By default AirPro Mobile saves data to your smartphone. This requires you to keep your smartphone within 80 ft. (25 m) in line of sight of your probe. With the Professional user license you have the additional option of unattended logging. Unattended logging lets you save measurement data to the instruments SD card (not available from TSI) so that you can disconnect your smartphone and take it with you. When logging to the probe's memory card the instrument will automatically disconnect from AirPro Mobile, the display will indicate it is logging data 🔼 and it will not connect to any AirPro Mobile application until the test length completes.

Data can be viewed with AirPro Mobile or the associated file(s) can be moved to your desktop computer and opened with spreadsheet applications such as Microsoft® Excel® spreadsheet program.

◎ Logging

Logging can be managed while you monitor measurements from the Logging screen.

1. Connect at least one probe to AirPro Mobile.

2. Tap the ◯ icon to enter the Logging screen. The Logging screen displays whether you are in Manual Save mode or Continuous Save mode. Data logged will vary depending on the mode.

◎ Start Logging

Every time you initiate a log, data will be collected simultaneously from all connected probes.

1. Prior to starting the log, you can identify the test details by attaching photos and comments 💬 📷 .

2. Tap ◯ to start the data collection. Alternatively you can start it by pressing ⤶ from your probe keypad.

3. AirPro Mobile will indicate when data collection is complete.

4. See Data Files for instructions on viewing and managing the logged data.
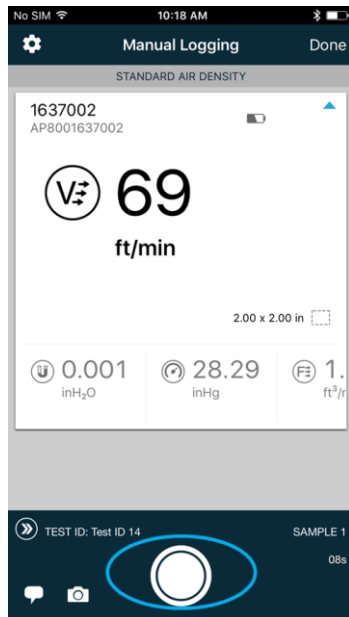
⊚ Data Logging Settings

⬜ Set Up Logging

Parameters for Data Logging can be accessed from the Log Settings menu. These settings are saved to AirPro Mobile.

1. Tap ⚙ to configure or view the logging parameters.

2. Select **Test ID** to change the name of the test file. If you do not enter a Test ID, AirPro Mobile will assign a name.

3. To change the logging mode, Select **Manual Save** or **Continuous Save.**
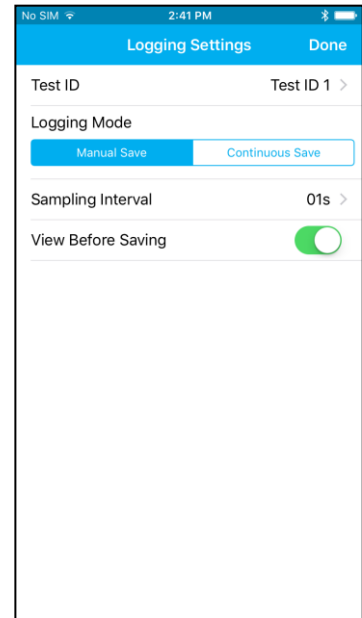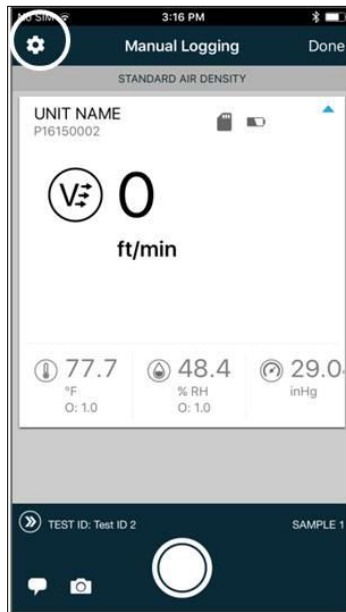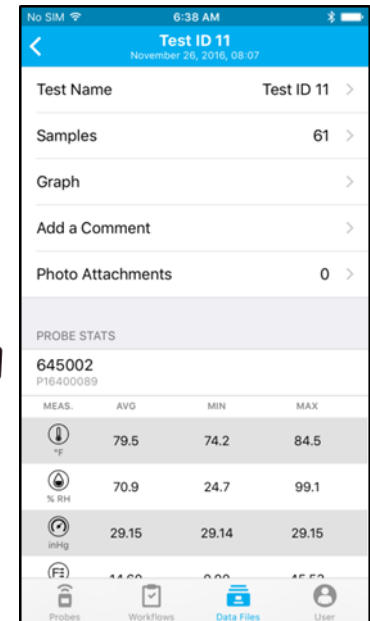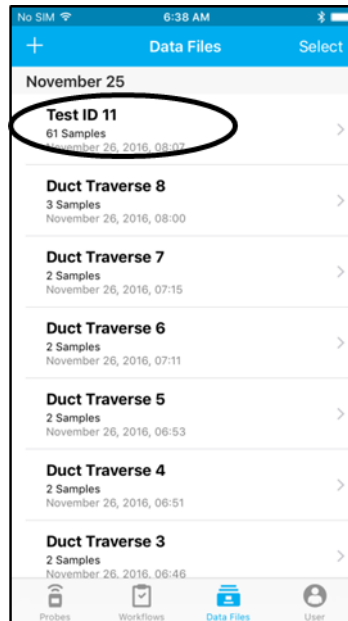
🗄 Data Files

The Data File menu provides a list of the test records that you created from the Data Logging screen. It is available with Advanced and Professional AirPro Mobile user licenses. You can view logged information from AirPro Mobile. You can also manage the data files from this screen. For instance you can delete files, add photos, or distribute files to your desktop system for further reporting.

 Data Files

The Data Files screen lists the files stored with AirPro Mobile.

- Tap to access the data files menu.

- Select any test id to view its details.

 View Data File Information

For each data file, you can view and change information that you previously associated with the test such as the **Test Name**, **Comments** and **Attachments**.

Summary statistics are shown in the **Probe Stats** table.

- Select **Samples** to display the sample records associated with the test.

- Select **Graph** to select the measurements you would like to see graphed. (Available with Professional user license.)

You can clear all the samples from the test. After the data is cleared, the Test ID will become available again for taking new data.
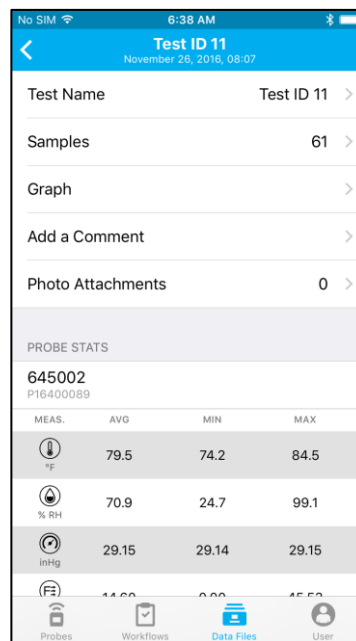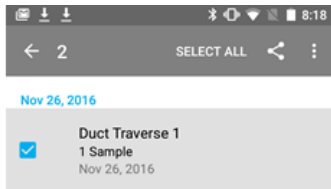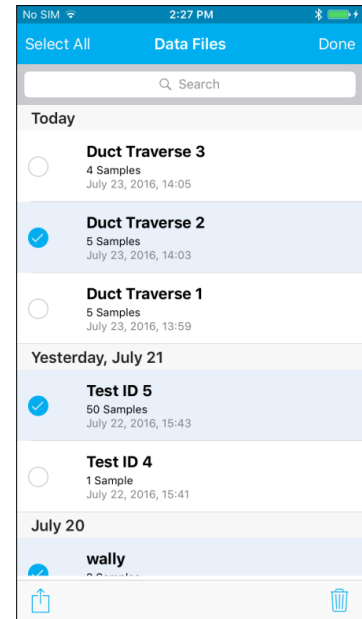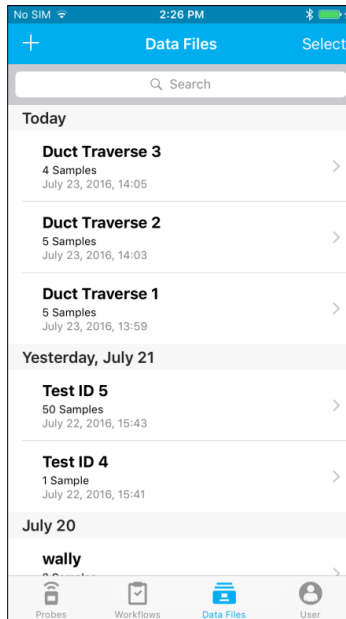
Delete Data Files

To delete test files in AirPro Mobile for iOS, tap **Select**, mark those tests you want to delete and tap 🗑 . Then select **Done**.

With AirPro Mobile for Android, tap and hold any test name in the list. A Select Test menu will appear.

Mark the files you want to delete and then select ⋮ and select **Delete**.

Share Data Files

To share the information of one or more tests with someone, tap **Select** and mark those tests you want to share. Select the 📤 icon and then select the appropriate application to complete the operation.

With AirPro Mobile for Android, tap and hold any test name in the list. A Select Test menu will appear.
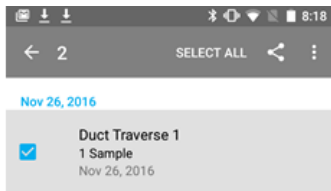
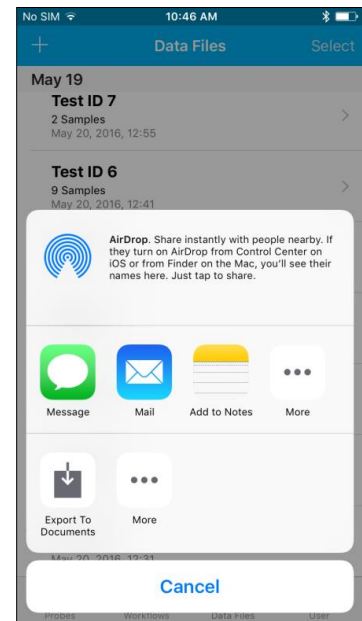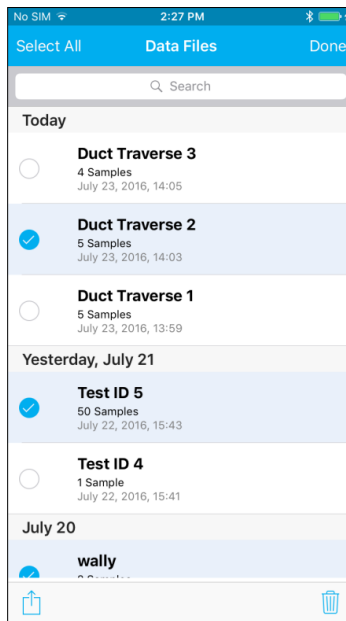Mark the files you want to share. Select the ◁ icon and then select the appropriate application to complete the operation.
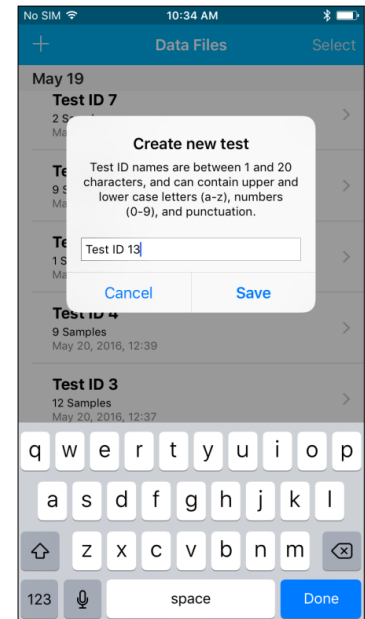
Create a New Test

To manually create a new test record, select [+]. By default, the current data file name (for example Test ID) will be incremented by one. You can also change the name by adding text, numbers, and punctuation for the new test file name.

Select **Save** when done.

This test record is made available for logging samples. See Data Logging for more information.
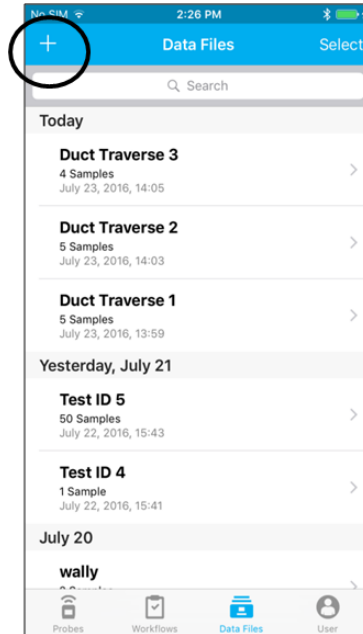
Workflows

The Duct Traverse Workflow is available with the Professional AirPro Mobile user license. There are two Duct Traverse Methods that are available: log-Tchebycheff (or simply log-T) and Equal Area.

The Workflow feature will step you through the measurement. AirPro Mobile assists you in calculating and logging the measurement points.

Conducting Workflow

To begin the Workflow, tap the workflow icon [✓].

![clipboard icon] **Select Duct Type**

Select the type of duct traverse you will be performing with the probe: rectangular or circular.
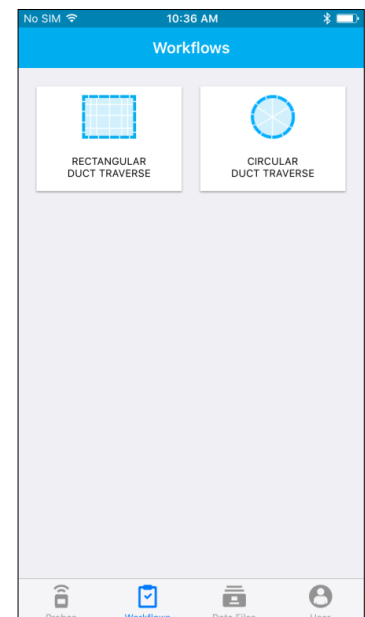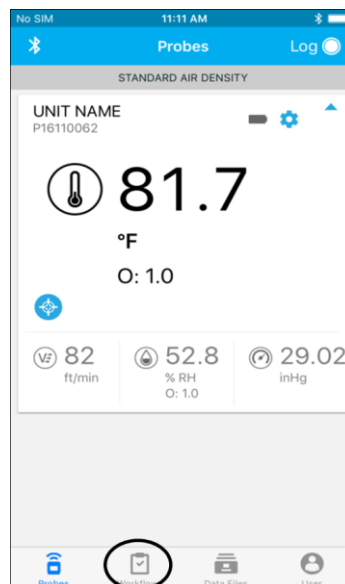
A rectangular duct traverse is selected in this example. The steps of a circular traverse are similar.
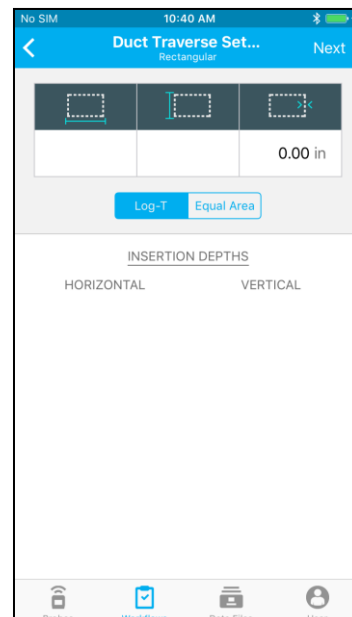
![clipboard icon] **Duct Traverse Setup**

- Enter the duct's outer dimensions and wall thickness. If you know the internal dimensions of the duct, enter those but specify a wall thickness of 0.

Note: The dimensions you specify here will be retained in the probe after you complete the Duct Traverse Workflow. These will become the new dimensions used in flow calculation. For more information see the Flow calculation setup or Pitot Flow Setup in the Probe Settings menu.

- Select the type of traverse that you want to do, Log-T or Equal Area.

AirPro Mobile calculates the insertion depths from the information that you entered.
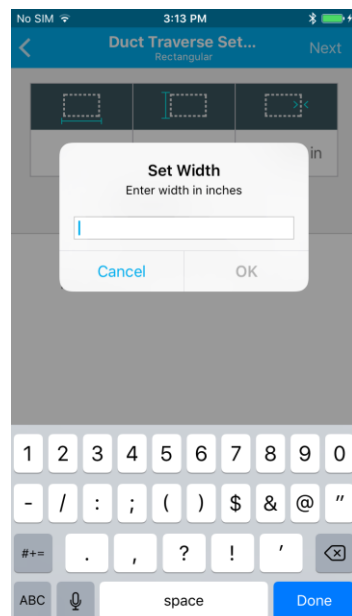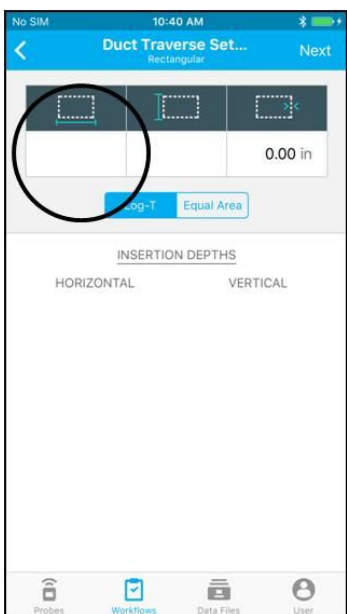
☑ Duct Traverse Setup *(continued)*

Select **Next** to view the settings for the probe and for the data logging.
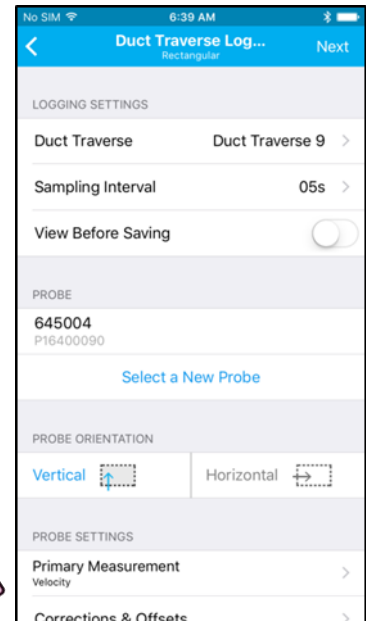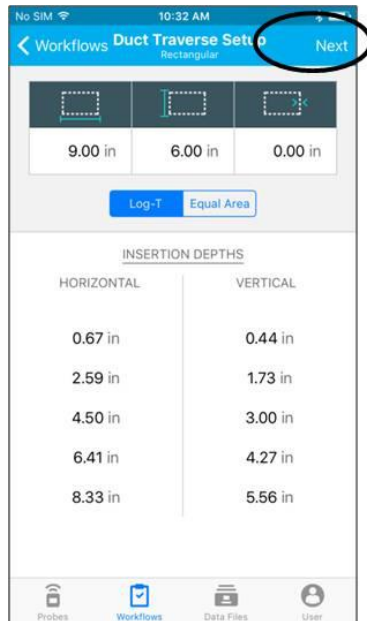
☑ Duct Traverse Setup *(continued)*

Parameters for data logging are shown.

- Specify a **Duct Traverse** name; all data will be logged under this Test ID.

- With the **Sampling Interval** specify how long to capture data at each insertion point.

- Duct traverses must be done in Manual logging mode. Select **View before saving** if you want a choice to discard or save each sample.

Note: The values you specify here are not retained after you have completed the Duct Traverse workflow.
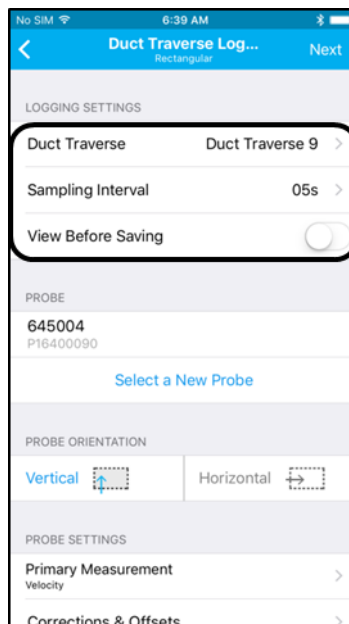
✅ Duct Traverse Setup *(continued)*

You can select any probe connected to AirPro Mobile capable of performing a duct traverse: VTH-S, VTH-A, VT-S, VT-A, AP800.

- Verify the probe corresponds to the one you wish and if it does not, click on **Select a New Probe**.

- Also, select the **Probe orientation** into the duct: Vertical or Horizontal.
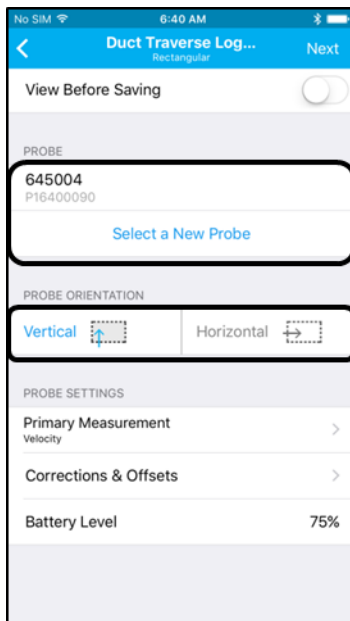
✅ Duct Traverse Setup *(continued)*

Applicable parameters from the Probe Settings menu are shown.

Note: The values you specify here will be retained in the probe after you exit the Duct Traverse Workflow.

- Select the **Primary Measurement** which specifies the measurement you want to monitor during the duct traverse: flow or velocity. This does not affect which measurements are logged.

- Verify the settings are correct for the measurement **corrections and offsets**.

- Verify the probe has a sufficient **Battery level** to complete the workflow.

Select **Next** to view the Traverse Screen.
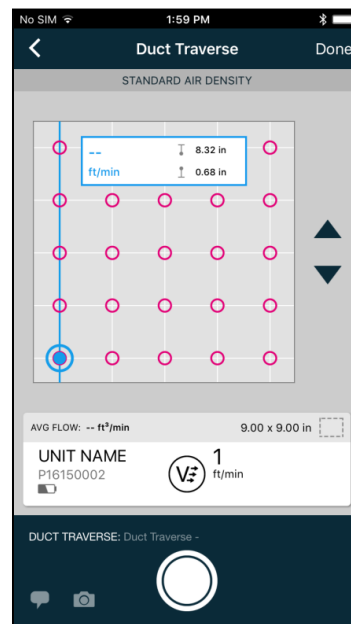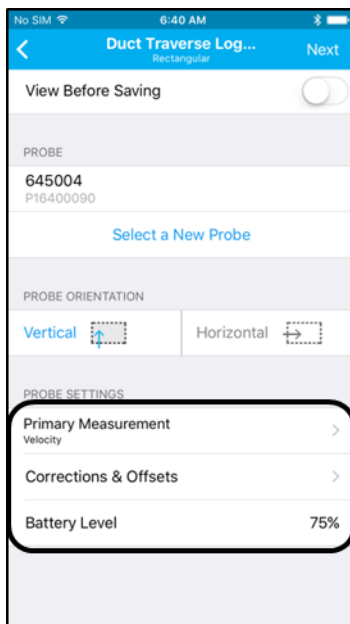
✅ **Duct Traverse Setup** *(continued)*

Insert the probe in the first access port and tap ⬭ to take a data sample. Alternatively you can start sampling by pressing ⬅ from your probe keypad.

After the data sample completes, the location indicator ◉ advances to the next insertion point. You can use the ▲ and ▼ arrows to skip insertion points. You can also tap on any point to take a sample.

All readings are saved in the duct traverse file. The file can be viewed from the Data Files menu.

Select **Done** when the traverse is completed.
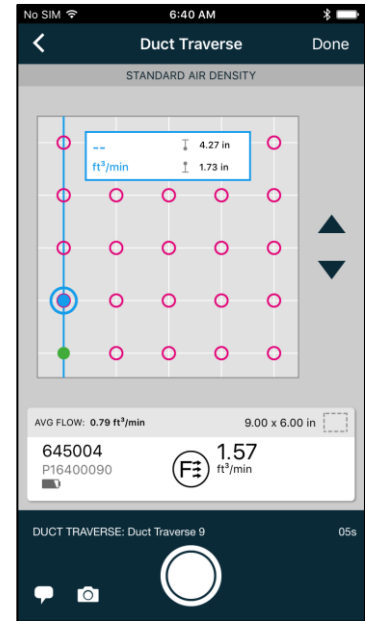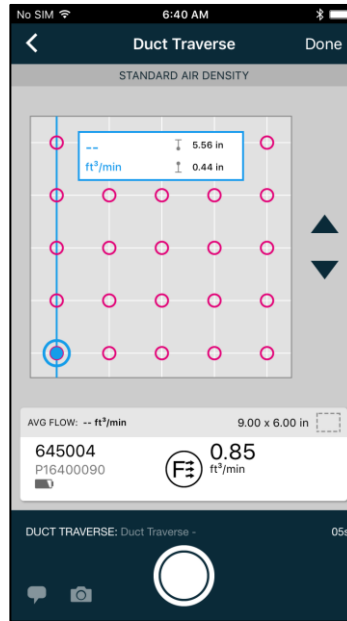
👤 **Global Setup, Units of Measure and Standard/Actual Setup**

The Global setup menus let you configure and view global information for AirPro Mobile and all attached probes. The Global parameters include your user account and profile information and your user preferences such as Units of Measure and Standard/Actual setup.

👤 **Units of Measure**

Multiple units of measure are available from the global setup menu. The settings you apply will be reflected in AirPro Mobile, all data logs and the probe display. They will affect all connected probes.

- With AirPro Mobile for iOS, select 👤 and then select **Units of Measure** from the menu. Alternatively with AirPro Mobile for Android, select ⋮ , and then select **Preferences**, and then **Units of Measure**.

- Select the measurement you want to change.

- Select the new units of measure you want to use and **<**.

The settings are saved to the probe.
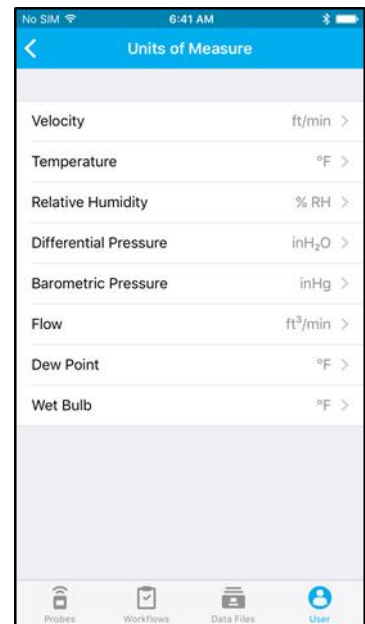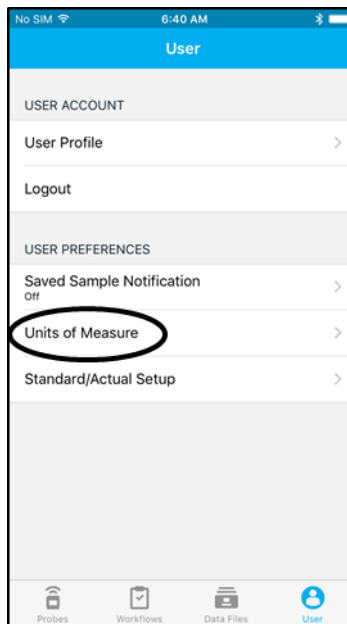
Standard/Actual Setup

Standard or actual corrections can be applied to flows and velocities. The settings you apply will be reflected in AirPro Mobile, the probe display and data logs. They will affect all connected probes.

- With AirPro Mobile for iOS, select ![icon], and then select **Standard/Actual** setup from the menu. Alternatively with AirPro Mobile for Android, select [⋮], and then select **Preferences**, and then **Actual/Standard** setup.

- For the Model AP800, enter the temperature value you want to use for calculations of Standard and Actual pitot velocity and flow.

- The AP500 and AP800 measure the actual barometric pressure using an internal sensor; no user entry is needed.
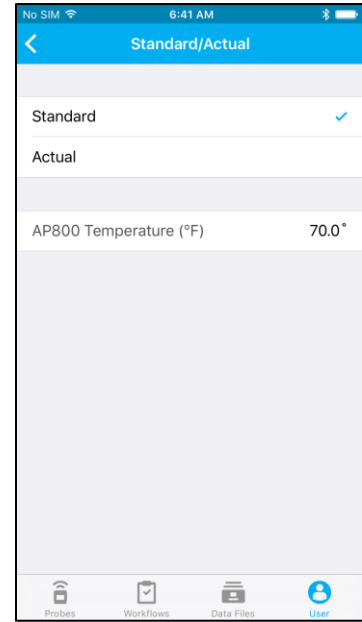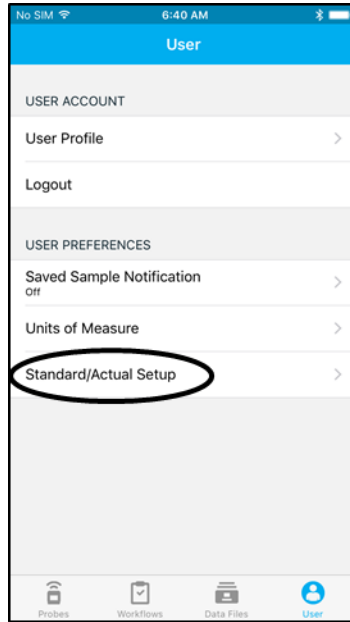
The settings are saved to the probe.

User Profile

From the Global setup menu you can view or change your user profile including, license type, name, email address, role, business name and phone number. You can also change your password.

- With AirPro Mobile for iOS, select ![icon], and then select **User Profile** from the menu. Alternatively with AirPro Mobile for Android, select [⋮], and then select **User Profile**.

- To change any field, select **Edit**.

- Select **Save**.

- Select **<** to return to the previous screen.

Note: With AirPro Mobile for iOS, the option to change password is shown in the scroll list only once you have selected **Edit**.
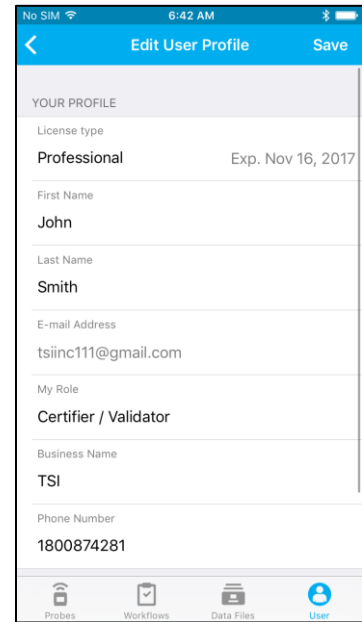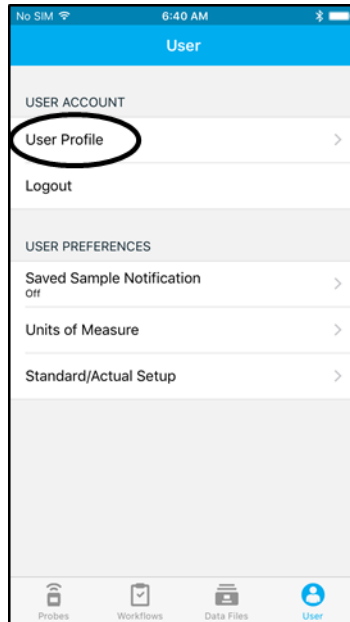
 Saved Sample Notification

Set sound and/or vibration notification when manually saving samples.

- With AirPro Mobile for iOS, select . Alternatively with AirPro Mobile for Android, select and then select **Preferences**.

- Select **Saved Sample Notification** from the menu.

- Select **Sound** or **Vibration** to enable/disable the action for sample notification.

- Select **<** to return to the previous screen.
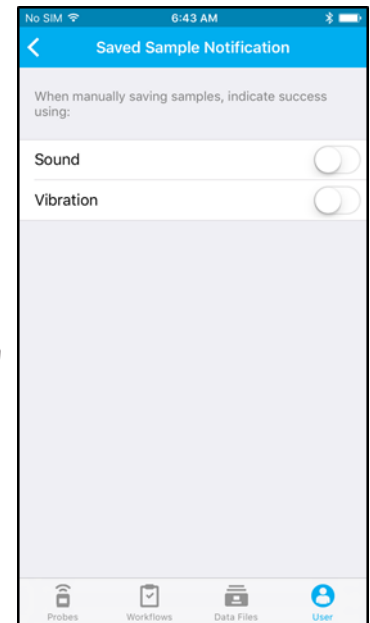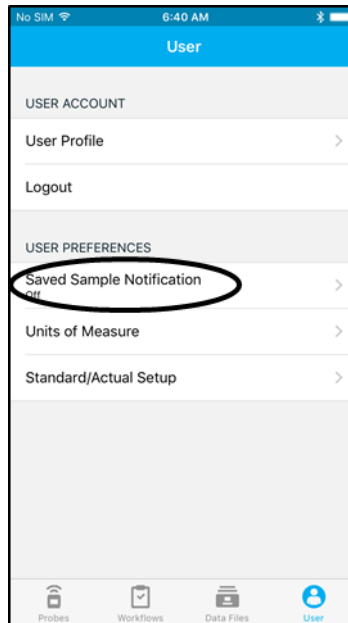
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CHAPTER 4
Maintenance

The Model AP500 and Model AP800 and probe accessories require very little maintenance to keep them performing well.

Recalibration

To maintain a high degree of accuracy in your measurements, TSI recommends that you return your Model AP800, AP500 and probes (VTH-S, VTH-A, VT-S, VT-A, TH-S) to TSI for annual recalibration. Please contact one of TSI's offices or your local distributor to make service arrangements and to receive a Return Material Authorization (RMA) number. To fill out an online RMA form, visit TSI's website at http://service.tsi.com.

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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 instrument. If the enclosure of the instrument or the AC adapter becomes broken, it must be replaced immediately to prevent access to hazardous voltage.

Storage

Remove the batteries when storing the instrument for more than one month.

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CHAPTER 5
Troubleshooting

The table below lists the symptoms, possible causes, and recommended solutions for common problems encountered with the instrument or AirPro Mobile. If your symptom is not listed, or if none of the solutions solves your problem, please contact TSI.

Symptom	Possible Causes	Corrective Action
Unit does not turn 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.
	Improper use of extensions.	Do not connect more than 3 extensions to the probe.
"No probe" displayed on instrument.	Probe is not attached or a sufficient connection is not made.	Securely tighten the probe down. Power cycle.
	Probe or handle is damaged.	Return both to TSI for service.
"Service Handle" displayed on instrument.	Handle is damaged.	Return handle for service.
"Service Probe" displayed on instrument.	Probe is damaged.	Return probe for service.
"Over heat" displayed on instrument.	Battery is damaged. Handle is being used outside of temperature range.	Replace battery. Remove from external heat source.
"Low Battery" displayed on instrument.	Battery power is low.	Charge battery.
Instrument shuts off quickly.	AirPro Mobile Auto shutoff or Auto sleep is turned on.	Configure probe settings from AirPro Mobile.
	Instrument is overheated. See Spec.	Replace battery or remove from external heat source.
	Battery is low.	Charge battery. If battery is charged, then replace it.
	Probe is disconnected.	Reconnect probe.
NOT able to charge battery in Handle. Charging LED will not light.	AC/DC Adapter defective.	Replace AC/DC Adapter with new.
	Incorrect AC/DC Adapter used.	Only use TSI PN 800531.
	USB-micro connector on Handle loose or broken.	Re-insert AC/DC Adapter cable into handle and ensure correct fit. If still NOT working, return Handle for service.
Handle powers down automatically with charged battery installed.	Battery installed with incorrect polarity.	Remove battery and re-install observing correct polarity.

Symptom	Possible Causes	Corrective Action
"---" is displayed on handle.	Invalid measurement has been detected.	If this happens frequently then return probe for service.
9e20 is displayed in the log or in AirPro Mobile.		
AirPro Mobile shows "You have reached your 2 device limit for this account."	Each time you download AirPro Mobile to your Smartphone, it is considered a new association. You are only allowed two association licenses.	Go to https://my.tsi.com and browse to Device Manager. Unregister the devices you are no longer using.
Red Exclamation mark appears on the SD card indicator.	Corrupt data file or card has less than 100 MB free space.	Replace card or delete files on card to free more space.
Charging LED flashes.	Battery has an error condition.	Verify battery is oriented correctly. Replace battery.

W A R N I N G

Remove the probe from excessive temperature immediately: excessive heat can damage the sensor. Operating temperature limits can be found in Appendix A, Specifications. The pressure sensor is protected from damage up to 7 psi (48 kPA or 360 mmHg). At higher pressure it can burst.

APPENDIX A
Specifications

Specifications are subject to change without notice.

Model AP500 AirPro Mobile with Probes

Wireless Connectivity Range (line of sight)
80 ft. (25 m) maximum

Model AP500

Barometric Pressure
Range .... 20.36 to 36.65 in. Hg (517.1 to 930.9 mm Hg)
Accuracy .... ±2% of reading

Instrument Temperature Range
Operating (Electronics) .. 40 to 113°F (5 to 45°C)
Storage .... -4 to 140°F (-20 to 60°C)

Display Interface
Organic light-emitting diode (OLED)
0.4 in. (10 mm) digit height

External Meter Dimensions
2.1 in. x 8.5 in. x 1.6 in. (53 mm x 181 mm x 40 mm)

Meter Weight with Batteries
0.5 lbs. (0.23 kg)

Power Requirements
AirPro Li-ion battery .... 3500 mAh
AC Adapter .... (TSI part number 800531 only)
Input .... 90 to 240 VAC, 50 to 60 Hz
Output .... 5 VDC, 2A

Battery Life
8+ hours at 100 ft/min (0.5 m/s) and 77°F (25°C)

Model AP500 AirPro Measurement Probes

Velocity (VT-S, VT-A, VTH-S, VTH-A)

Range.............................. 0 to 6,000 ft/min (0 to 30 m/s)

Accuracy[1&2] .... ±3% of reading or ±3 ft/min (±0.015 m/s), whichever is greater

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

Temperature (VT-S, VT-A, VTH-S, VTH-A, TH-S)

Range............................. 14 to 150°F (-10 to 65°C)

Accuracy[3] .... ±0.5°F (±0.3°C)

Resolution .... 0.1°F (0.1°C)

Relative Humidity (VTH-S, VTH-A, TH-S)

Range............................. 5 to 95% RH

Accuracy[4] .... ±3% RH

Range............................. 0.1% RH

Straight Probe Dimensions (VT-S, VTH-S, TH-S)

Probe length.................... 12 in. (305 mm)

Probe diameter (largest) . 0.375 in. (9.5 mm)

Articulating Probe Dimensions (VT-A, VTH-A)

Probe length.................... 12 in. (305 mm)

Probe diameter (largest) . 0.375 in. (9.5 mm)

Articulating section length 6.0 in (15.24 cm)

Probe Extension Dimensions (800529)

Probe length.................... 12 in. (305 mm)

Probe diameter (largest) . 0.375 in. (9.5 mm)

[1] Temperature compensated over an air temperature range of 40 to 150°F (5 to 65°C).
[2] The accuracy statement begins at 30 ft/min through 6,000 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.
[4] Accuracy with probe at 77°F (25°C). Add uncertainty of 0.1% RH/°F (0.2% RH/°C) for change in probe temperature. Includes 1% hysteresis.

Model AP800

Wireless Connectivity Range (line of sight)

80 ft. (25 m) maximum

Static / Differential Pressure

Range[1] .... -15 to +15 in. H_2O
(-28.0 to +28.0 mm Hg, -3735 to +3735 Pa)

Accuracy .... ±1% of reading ±0.005 in. H_2O
(±0.01 mm Hg, ±1 Pa)

Resolution .... 0.001 in. H_2O (0.1 Pa, 0.01 mm Hg)

Velocity (Pitot Probe)

Range[2] .... 250 to 15,500 ft/min (1.27 to 78.7 m/s)

Accuracy[3]: .... ±1.5% at 2000 ft/min (10.16 m/s)

Resolution .... 1 ft/min (0.1 m/s)

Barometric Pressure

Range .... 20.36 to 36.65 in. Hg (517.1 to 930.9 mm Hg)

Accuracy .... ±2% of reading

Instrument Temperature Range

Operating .... 40 to 113°F (5 to 45°C)

Storage .... -4 to 140°F (-20 to 60°C)

Display Interface

Organic light-emitting diode (OLED)
0.4 in. (10 mm) digit height

External Meter Dimensions

2.1 in. x 7.1 in. x 1.6 in. (53 mm x 181 mm x 40 mm)

Meter Weight

Weight with batteries: 0.45 lbs (0.20 kg)

Power Requirements

AirPro Li-ion battery .... 3500 mAh

AC Adapter .... (TSI part number 800531 only)

Input .... 90 to 240 VAC, 50 to 60 Hz

Output .... 5 VDC, 2A

Battery Life

32+ hours

[1] Overpressure range = 7 psi (190 in. H2O, 360 mmHg, 48 kPa).
[2] Pressure velocity measurements are not recommended below 1,000 ft/min (5 m/s).
[3] Accuracy is a function of converting pressure to velocity. Conversion accuracy improves when actual pressure values increase.

Supported Units of Measure and Defaults

Pressure........................... inH$_2$O, inHg, Pa, hPa, kPA, mmHg, cmHg, mmH$_2$O, cmH$_2$O

Temperature.................... °F, °C

Velocity* .... ft/min, m/s

Relative Humidity .... %RH

Barometric Pressure .... in.Hg, in.H$_2$O, kPa, hPa, mmHg, cmHg, cmH$_2$O

Flow* .... ft^3/min, m^3/s, m^3/h, l/s

Dew Point........................ °F, °C

Wet Bulb.......................... °F, °C

*User can also select Standard or Actual.

Language Options

- English
- Spanish
- German
- French

- Italian
- Japanese
- Chinese Simplified
- Chinese Traditional

- Swedish
- Finnish
- Dutch
- Korean