BlueSky™ Air Quality Monitor

Model 8143

Operation and Maintenance Manual

P/N 6013929 Rev. J
January 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.

Part Number

6013929 / Revision J / January 2023

Address

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

Fax No.

(651) 490-3824

LIMITATION OF WARRANTY AND LIABILITY (effective February 2020)
(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 12 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-INFRINGING 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.

Buyer further agrees that purchase of TSI's BlueSky™ Monitors Buyer agrees to the Terms and Conditions of Use and the Privacy Policy located at https://tsi.com/terms/.

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) 680-1220 (USA) or (001 651) 490-2860 (International) or visit www.tsi.com.

Trademarks

TSI and TSI logo are registered trademarks of TSI Incorporated in the United States and may be protected under other country's trademark registrations. BlueSky and DustTrak are trademarks of TSI Incorporated. Wi-Fi is a registered trademark of the Wi-Fi Alliance.

Cloud Software End User Licensing Agreement and Privacy Policy

Go to https://tsi.com/terms/ and click on **TERMS OF USE & PRIVACY POLICY** link.

Contents

Figures

Safety Information

Description of Caution/Warning Symbols

Appropriate caution/warning statements are used throughout the manual and on the instrument that require you to take cautionary measures when working with the instrument.

Caution

CAUTION
Failure to follow the procedures prescribed in this manual might result in irreparable equipment damage. Important information about the operation and maintenance of this instrument is included in this manual.

Warning

WARNING
Warning means that unsafe use of the instrument could result in serious injury to you or cause damage to the instrument. Follow the procedures prescribed.

Caution and Warning Symbols

The following symbols may accompany cautions and warnings to indicate the nature and consequences of hazards:

	Warns that the instrument contains a laser and that important information about its safe operation and maintenance is included in the manual.
	Warns that the instrument is susceptible to electro-static discharge (ESD) and ESD protection should be followed to avoid damage.
	Indicates the connector is connected to earth ground and cabinet ground.

WARNINGS

- Use of components other than those specified by TSI® Incorporated (TSI®) may impair the safety features provided by the equipment.
- When mains power adapters are used, the equipment should be positioned so the mains plug will remain accessible for emergency disconnect.
- When using outdoors, the BlueSky™ monitors power adapter should be connected to a weatherproof “in use” resistant/IP 68 rated outdoor receptacle enclosure.

CAUTIONS

- The BlueSky™ monitors enclosure is designed to be water resistant to rain or spray. It is not designed to be waterproof when immersed. Setting it in a pool of water will result in flooding the inner compartment with water. This will severely damage your BlueSky™ monitor. **DO NOT** install the BlueSky™ monitor less than 1.2 meters or 4 feet from the ground (TSI® recommends 3 meters or 10 feet)! Setting the bottom of BlueSky™ monitor too close to a surface will result is water splashing back in to the inlet and may result in damage to the PM sensor.
- **DO NOT** mount the BlueSky™ Monitor upside down. To increase sampling efficiency, the PM sensor is covered by a porous screen but is not splash proof or water proof. The BlueSky™ monitor has an ingress protection rating of IP 44. Direct injection of water in to the BlueSky™ is likely to damage it.
- Power adapter provided with the BlueSky™ monitor is rated for outdoor use (IP 68). **DO NOT** use any other power supply with the BlueSky™ monitor.

1. The input A/C voltage to the power supply should be between 100 to 240 V with a frequency between 50 to 60 Hz.
2. The power required to run the BlueSky™ monitor is 5W (5.0 VDC and 1 Amp). The BlueSky™ monitor is powered

through the mini-USB connector and there are no outputs available from the BlueSky™ monitor.

3. The power supply adapter provided is rated for outdoor use with an ingress protection rating of IP 68. It can be used outdoors or indoors under wet conditions in rain or snow.
4. The power supply is rated to operate between – 30°C to 80°C (–22°F to 176°F) with humidity ranging from 0% to 95% non-condensing but the BlueSky™ monitor is rated to operate between –10°C to 60°C (14°F to 140°F). TSI® recommends running the BlueSky™ monitor within these temperature limits.
5. The BlueSky™ monitor can be used at altitudes up to 3000 meters (10,000 feet).
6. The BlueSky™ monitor is designed to be used outdoors in highly polluted areas where particulate concentrations can be as high 1000 µg/m^3.

NOTICE

Installation videos can be found on our website tsi.com. Using the search function on the main page, type the model number 8143 into the search field and navigate to the product page.

NOTICE

The safety of any system incorporating the BlueSky™ monitor is the responsibility of the assembler of the system.

LASER SAFETY

- Model 8143 BlueSky™ monitors are Class 1 laser-based instruments.
- During normal operation, you will not be exposed to laser radiation.
- **DO NOT** open the BlueSky™ monitor when it is powered **ON**.
- You will not be exposed to the laser radiation when the BlueSky™ monitor is disassembled.
- The PM sensor has a laser inside it. **DO NOT** open the PM sensor inside BlueSky™ monitor when the BlueSky™ monitor is powered.

Take these precautions:

- **DO NOT** remove any parts from the BlueSky™ monitor unless you are specifically told to do so in this manual.

WARNING

The use of controls, adjustments, or procedures other than those specified in this manual may result in exposure to hazardous optical radiation.

WARNING

If the BlueSky™ monitor is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

When operated according to the manufacturer's instruction, this device is a Class 1 laser product as defined by U.S. Department of Health and Human Services standards under the Radiation Control for Health and Safety Act of 1968. A certification and identification label like the one shown below is affixed to each instrument.

Labels

Advisory labels and identification labels are attached to the instrument.

1. Serial Number Label (Bottom)	
2. Laser Radiation Label (internal, on the PM sensor)	
3. Safety Details	
4. European symbol for non-disposable item. Item must be recycled.	

Reusing and Recycling

As part of TSI® Incorporated's effort to have a minimal negative impact on the communities in which its products are manufactured and used:

- If instrument becomes obsolete, return to TSI® for disassembly and recycling.

(This page intentionally left blank)

Chapter 1

Product Overview

TSI® Incorporated's BlueSky™ Air Quality Monitor is a real-time Particulate Matter (PM) sensor that is designed to provide accurate mass concentration measurements of PM1, PM2.5, PM4, PM10 as well as temperature and humidity. The monitor is designed to be deployed in less than ten minutes and can be used in both indoor and outdoor applications.

Data from the sensor is available at www.tsilink.com. All you need is an internet connection and web browser. The BlueSky™ monitor connects to the internet using wireless technology (Wi-Fi®). There is no need to install an app on your smartphone. Logged data is also stored on the internal mircoSD card.

The BlueSky™ monitor also comes with factory calibration, whose standards adhere to the same standards that are applied to other high-quality monitors like the DustTrak™ and AM520 models. The BlueSky™ monitors also come with self-diagnostics to enable you to run the monitor with greater than 95% up-time and empowers you to be proactive so that the data obtained is very high quality.

Figure 1: Front View of BlueSky™ Air Quality Monitor

® Wi-Fi is a registered trademark of Wi-Fi Alliance.

Figure 2: Bottom view of BlueSky™ monitor

Unpacking

Compare all the components you received with those listed in the table below.

NOTICE
If any parts are missing, contact TSI® Incorporated.

Item	Part Number	Qty	Description
	8143	1	BlueSky™ Air Quality Monitor
	N/A	1	Mounting Bracket
	N/A	1	Screw

Item	Part Number	Qty	Description
	N/A	1	IP68 Rated 5V Power Supply
	N/A	2	Zip Tie

BlueSky™ Monitor Replacement Parts

Listed below are replacement items for the BlueSky™ Air Quality Monitor. Contact TSI® for purchase information.

Item	Part Number	Description
	814304*	Single PM sensor* replacement
	814305	5 pack PM sensors
	814306*	Replacement Mounting Bracket*
	814307	Maintenance kit—Screws, Screw Driver and PM Sensor screens

Item	Part Number	Description
	814301*	Replacement Power Supply— NA Plug Type A (NEMA 1-15)
	814302*	Replacement Power Supply—EU Plug Type C (CEE 7/16)
	814303*	Replacement Power Supply—UK Plug Type G (BS 1363)
	814309*	Replacement Power Supply – India Plug Type D (IS 1293:2005)
	814310*	Replacement Power Supply – AUS/China Plug Type I (2 prong AS 3112)
	814311*	Replacement Power Supply – South Korea Plug Type C (KS C 8305)
	814308*	Replacement microSD card*

*Indicates pre-installed factory item or ships with initial purchase, but is also available as a spare or if replacement is needed.

Accessories

Item	Part Number	Description
	8145-CE	Cellular modem – NA version, FCC certified modem, w/indoor rated power supply
	8145-CEEU	Cellular modem – EU version, CE certified modem, w/indoor rated power supply

Item	Part Number	Description
	8145-SO	Solar system, includes 1 12VDC (8) A-Hr battery, 1 charge controller, 1 panel, 1 outdoor enclosure and mounting hardware
	8145-CS	Solar system + Cellular modem – NA version, includes solar system plus FCC certified cellular modem
	8145-CSEU	Solar system + Cellular modem – EU version, includes solar system plus CE certified cellular modem
	8145-CEOD	Cellular modem + Outdoor enclosure – NA version, FCC certified modem
	8145-CEODEU	Cellular modem + Outdoor enclosure – EU version, CE certified modem

(This page intentionally left blank)

Chapter 2

Setting Up

The BlueSky™ Air Quality Monitor is very easy to set up. The monitor comes fully assembled except for the mounting bracket. Start by unpacking the device and its contents from the shipping package. The monitor is intended to be connected to local 2.4 GHz Wi-Fi® to access all cloud features, but it can be used without Wi-Fi® if needed as all data is recorded to a pre-installed microSD memory card.

A quick start guide is shipped with each instrument. It provides the necessary steps to configure the Wi-Fi® settings for connecting the device to a local Wi-Fi® network and will also guide you through installation. A digital copy of the Quick Start Guide can also be found at https://tsi.com/products/environmental-air-monitors/bluesky-air-quality-monitor-8143/.

Figure 3: Front view of BlueSky™ monitor in package

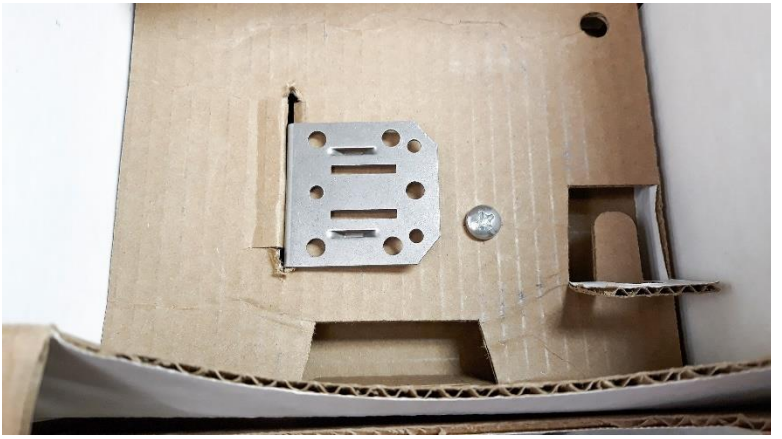


Figure 4: Bottom view of BlueSky™ monitor in package

There are only two reasons why a BlueSky™ monitor would need to be dismantled:

1. To remove the SD card to download data.
2. To replace the PM sensor. The sensor comes pre-installed, in addition to the microSD card.

NOTICE
The BlueSky™ monitor will store data on the SD card under all conditions whether or not the unit is connected to Wi-Fi®. The BlueSky™ monitor does not need Wi-Fi® to function normally. When Wi-Fi® is not available, data can always be found on the SD card.

NOTICE
The BlueSky™ monitor cannot read data from the SD card and upload the data to the cloud when Wi-Fi® is available. However, an internal data buffer will store about a week's worth of data (logged at 15 min. intervals), which will then be uploaded to the cloud. Data older than a week will be available only on the SD card. Currently, customers cannot read the SD card data and upload it to the cloud.

NOTICE

The SD card is user-accessible by removing the two screws that hold the top and bottom halves of the monitor. Data is always logged to the SD card, regardless of whether or not the device is connected to the Wi-Fi®. TSI® is not liable for corrupt data on the SD card. There will be a warning on the cloud data if the BlueSky™ monitor has trouble writing to the SD card.

Connecting the BlueSky™ Monitor to a Wi-Fi® Network

NOTICE

It is recommended that the process of configuring the wireless network settings and connecting the instrument to the internet be performed in an office or a lab environment before setting up in the final location.

1. Remove the power supply from its packaging and connect it to a nearby power outlet. Connect the other end of the power supply to USB port on the bottom of the monitor.
2. After the monitor has powered on, slide the switch on the bottom of the monitor, toward the settings gear. The green LED should blink once per second. The monitor is now like a Hotspot to which a Wi-Fi® device, such as your laptop or mobile device, can connect to. This will allow you to configure the devices Wi-Fi® settings.

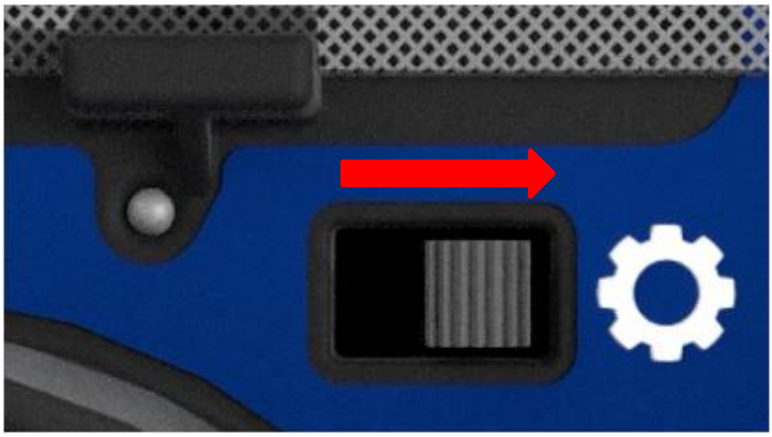


Figure 5: Slide switch toward settings gear

3. Using a laptop, tablet or a smartphone, look for the BlueSky™ Wi-Fi® SSID (Service Set Identifier). The SSID is indicated as **TSI BlueSky 8143YYWWXXX Setup**, which includes the monitor's serial number.

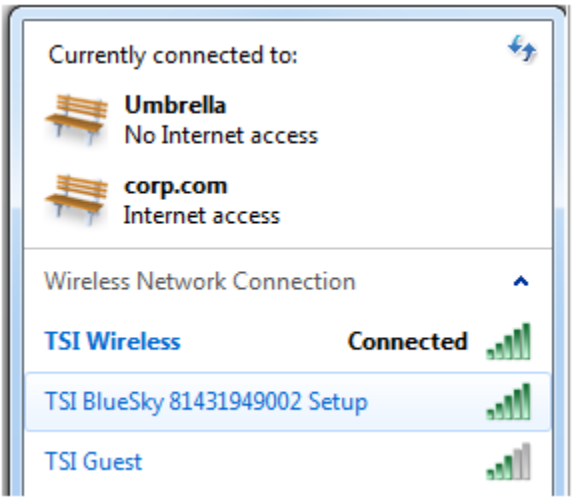


Figure 6: PC wireless configuration

4. Click on the monitor's network and click **Connect**. You will be prompted to enter a password/network security key.

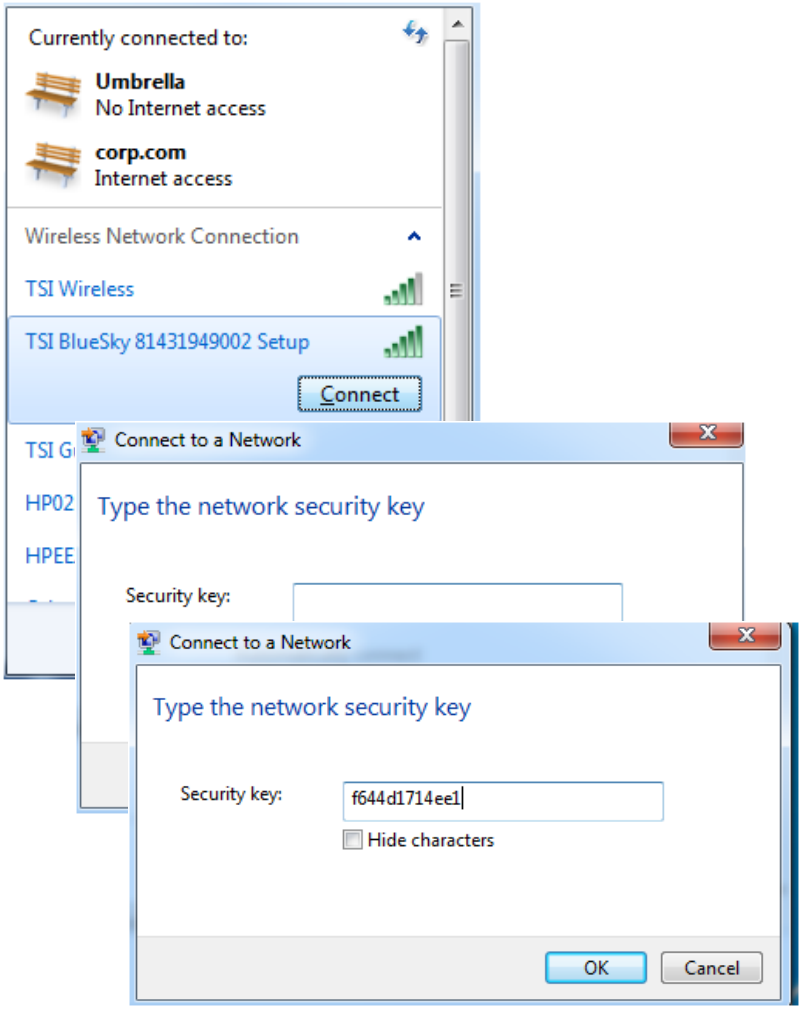


Figure 7: Enter the PWD found on the device label

NOTICE
Your computer or phone may indicate that there is no internet connection present. This is common, because the BlueSky™ monitor is not connected to the internet.

5. The security key (PWD) can be found on the serial number label on the bottom of the monitor or on the label that was placed on the quick start guide.

Figure 8: Security Key (PWD) location

6. Enter the password and click **OK**.
7. After you are connected to the monitor's network, open a web browser on your laptop, tablet or a smartphone and enter the following IP address **192.168.4.1** as shown. Click **Enter** on the keyboard.

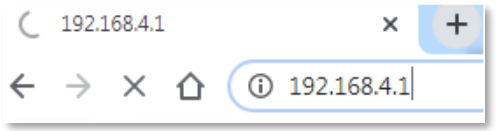


Figure 9: Entering IP address

8. The browser will prompt you to enter the SSID (network name) and password of the network you want the BlueSky™ monitor to connect to. This network should be connected to the internet, which will be used by the BlueSky™ monitor to connect to the cloud.

NOTICE
The BlueSky™ monitor can only connect to 2.4 GHz Wi-Fi® signals. Most Wi-Fi® routers provide several frequency channels. Make sure you are connecting to the 2.4 GHz channel.

9. Click **SAVE** after entering the information.

Figure 10: Entering Wi-Fi network SSID and password

10. The browser should let you know that the Wi-Fi® SSID (network name) and password were saved successfully onto the monitors shown below.

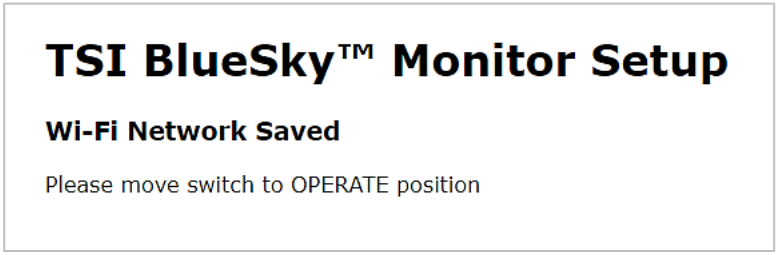


Figure 11: BlueSky™ Monitor Setup Wi-Fi® network saved

The device is now ready to communicate to the Wi-Fi® network. It is recommended that you configure the monitor with the network credentials, which will be present at the final installation location. Then when you plug the monitor in after installation, it will connect to that network and start transmitting data to the cloud.

11. Finally, move the Wi-Fi® switch back into the operate position so it can connect to the local Wi-Fi® network.

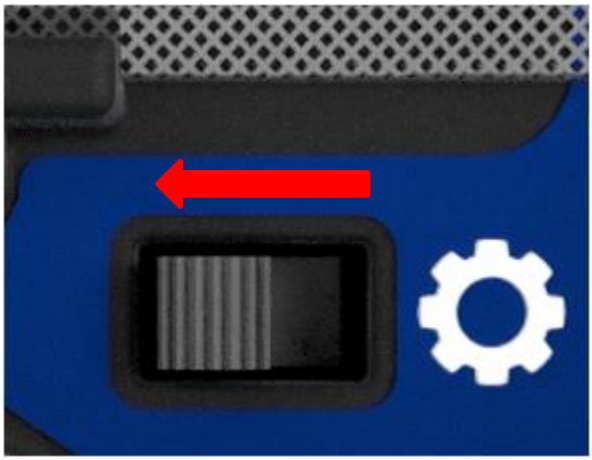


Figure 12: Move Wi-Fi ® switch back into operate position

The BlueSky™ monitor will start uploading data to the cloud once it connects to the Wi-Fi® network. After successful communication with the local Wi-Fi® network and the cloud has been established, the green LED should flash once every two seconds.

If the LED is flashing twice every second, with a 1 second pause in-between, the monitor is trying to connect to the Wi-Fi® network, but cannot. Try repeating the process for entering the Wi-Fi® network information to fix the problem.

If the LED is blinking three times every second, with a 1 second pause in-between, it has established connection to the Wi-Fi® network successfully, but it cannot connect the cloud. This is most likely due to no internet being present on the Wi-Fi® network. Try connecting to a separate Wi-Fi® network, with a known working internet connection.

NOTICE
The monitor does not have the capability to connect to public Wi-Fi® networks that requires a second step of browser authentication, such as a free public hotel or airport network. A different network will need to be chosen.

Refer to the troubleshooting section to debug any problems.

Installing the BlueSky™ Air Quality Monitor

1. The BlueSky® monitor comes with the mounting bracket and zip ties to secure the instrument to a pole or a wall.
2. Start by attaching the mounting bracket to the bottom of the monitor.

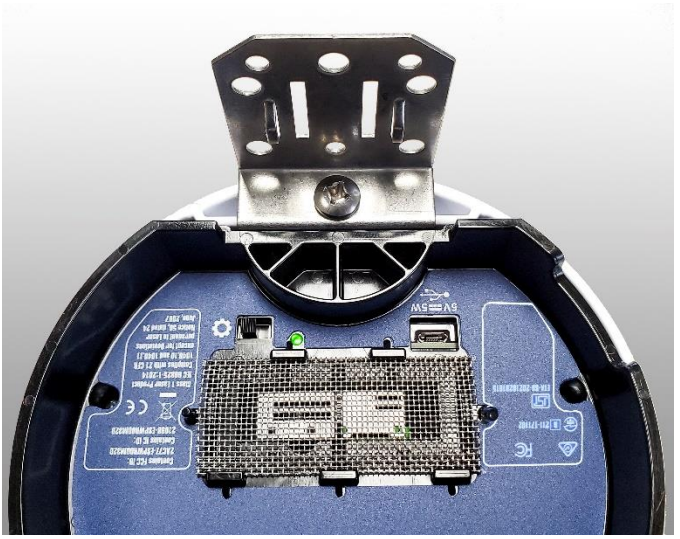


Figure 13: Mounting bracket

3. Next, mount the instrument to a pole or wall using the mounting bracket for stability. Additionally, connect the power cable to the USB port on the bottom of the monitor. Make sure the power cable has some strain relief as shown below in the pole mount example. This prevents the power cable from becoming disconnected during operation.

   Mounting options are shown below.

   a. Pole mount.

Figure 14: Pole mount

WARNING

DO NOT install the BlueSky™ monitor too close to the ground! Minimum distance from ground should be 1.2 meters or 4 feet to prevent water from splashing from the ground to the bottom of the BlueSky™ monitor. TSI® recommends 3 meters or 10 feet.

NOTICE
Use 1/4” screws or #10 screws to mount the bracket to a surface like a wall. The type of screw used depends on the type of the material the surface is made up of.

b. Wall mount.

Figure 15: Wall mount

c. Tripod mount (The bracket needs to be removed to use the Tripod). The thread on the bottom of the device should fit most camera tripods.

4. Plug the other end of the power supply into a weatherproof “in use” resistant/IP 68 rated outdoor receptacle enclosure, an example is shown below.

Figure 16: Water resistant / waterproof outdoor receptacle enclosure

WARNING

Improper outdoor installation could result in equipment damage and/or electrical shock. Installation must follow local electrical codes.

WARNING

DO NOT install the BlueSky™ monitor upside down. The bottom of the device is designed to allow for aerosol to enter the PM sensor. The bottom of the instrument is not water proof. However, if installed upright, it can withstand rain and snow due to the protection from the drip edge.

(This page intentionally left blank)

Chapter 3

Operation

Overview

The BlueSky™ Air Quality Monitor's primary use is in outdoor applications. It is designed to operate 24/7 when powered off a standard outdoor power outlet. Once you have setup your monitor(s) and connected them to a local wireless (Wi-Fi®) network, you can log into the new TSI® platform, www.tsilink.com, and see the air quality around your monitors in real time. It will give you insights into how the air quality varies over time and from monitor to monitor. It allows you to start seeing trends, which can lead to making more informed decisions, benefiting the entire project/community and share more air quality information with your community.

Registering your BlueSky™ Monitor(s) and Account Onboarding

1. After the unit is powered on, check to make sure the green LED at the bottom is flashing once every 2 seconds. If not, go to the troubleshooting section to fix connectivity issues.
2. From any location, open your web browser and enter the BlueSky™ Outdoor Air Quality monitor landing page (www.tsilink.com). If you have an existing tsi.com account, skip to step 5. If not, go to the next step.
3. If you do not have a tsilink.com account, click on the **CREATE ACCOUNT** button. You will be redirected to https://tsi.com/register.

NOTICE
If you already have a TSI.com account, the same credentials can be used to log into tsilink.com.

4. Select type of account that you want to create (business/personal) and follow the instructions.
5. You will receive an email from TSI® to verify your email address. Once you receive this email click on the **Verify Link**. An additional e-mail will be sent letting you know the account has been verified.

NOTICE
Verification for business accounts may take up to 24 hours. You will not be able to login, until the process is complete.

6. Once your account is successfully created go to tsilink.com and login.
7. Now you can register your device(s). Register your device by entering in the required information and click **DONE**. If you do not see the Device Registration screen, click the "**Activate New Device**" icon on bottom right corner of the map.
    - Click on Use Browser Location, to auto generate Latitude and Longitude coordinates or click on the https://www.latlong.net/ link and then manually entering the coordinates.

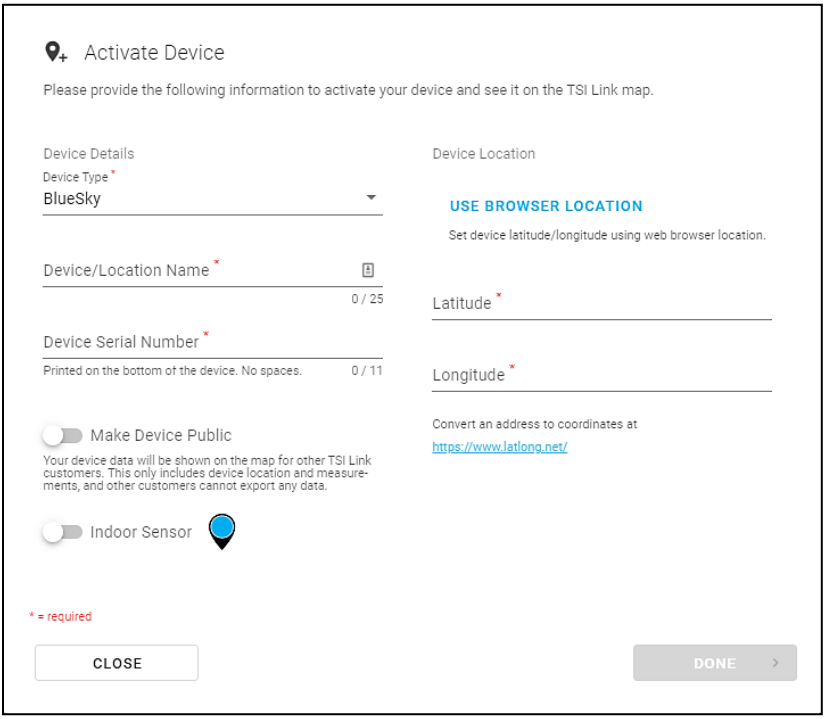


Figure 17: Device registration screen

8. Adjust the device pin location if needed and/or click **Done**.

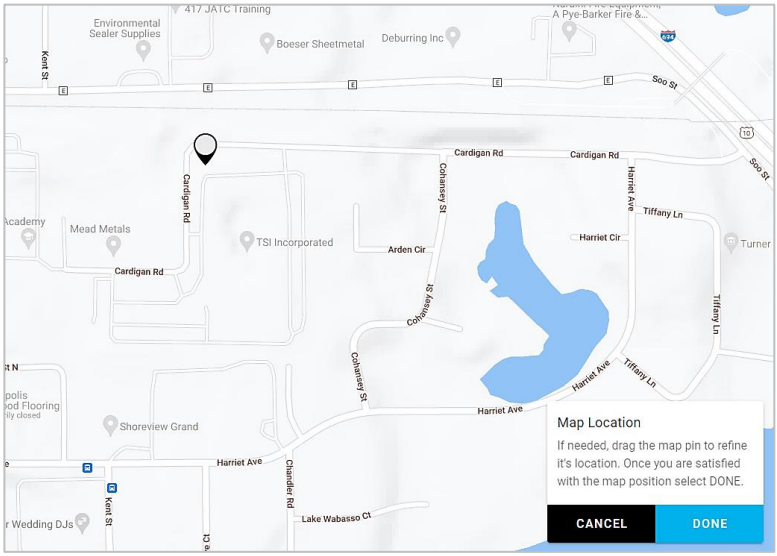


Figure 18: Adjust device pin location

9. Verify your device pin is displaying PM2.5 and other measurements to confirm you successfully signed up for an online account and registered your device.

Figure 19: Map view

10. If you would like to use the Data Services and API functionality of tsilink.com, click on **API**. Enter the device(s) that you want to register to this TSI Link™ Account. Click **SUBMIT**.

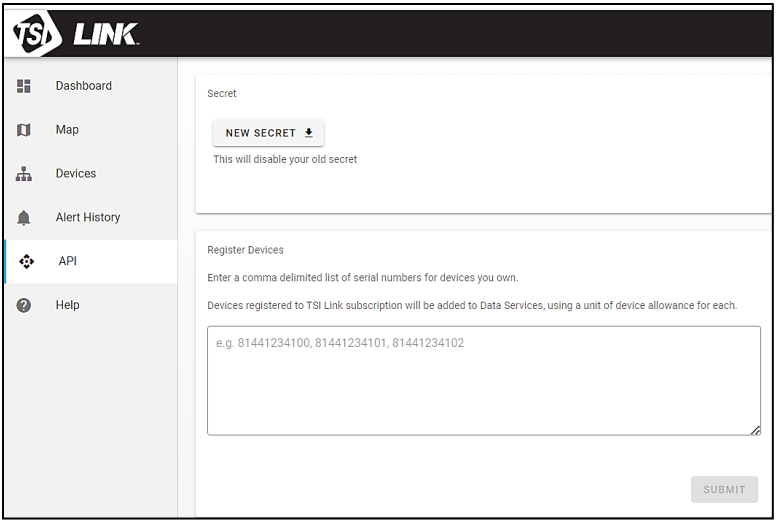


Figure 20: API menu

11. Check box if you are registering device for both TSI Link Software and TSI Link Data Service subscriptions. If you are only registering the device for TSI Link Data Service subscription keep the box uncheck. Click **DONE** when completed.

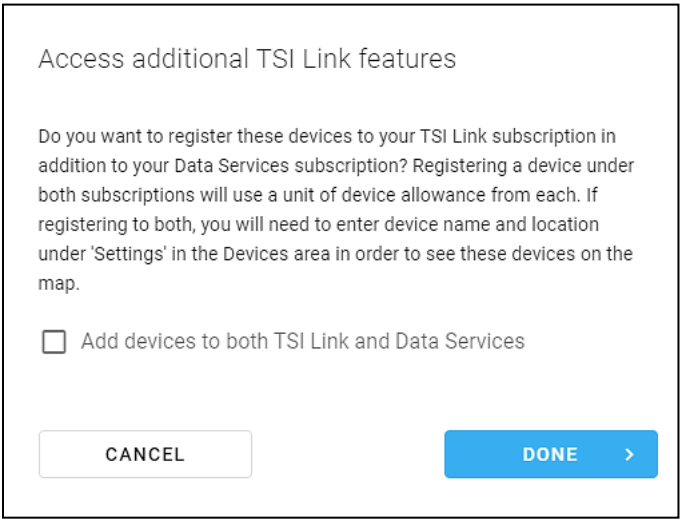


Figure 21: Access additional TSI Link™ features

12. If you have trouble creating an account or need additional information please go to https://tsi.com/resources/tsi-link-monitoring-and-research-faqs/tsi-link-solutions-faqs-installation-and-setup/.

13. Verify your device pin is displaying PM2.5 and other measurements to confirm you successfully signed up for an online account and registered your device.

Figure 22: Verify device pin is displaying PM2.5

Viewing Data from one or more BlueSky™ Monitors

1. Go to http:///www.tsi.com/tsilink and log In.
2. Click on the map and zoom in to the area where your BlueSky™ Outdoor Air Quality device pin is located.
3. Click on the device pin to view the current values. It may take roughly 15 minutes before any data can be seen, after the device has been initially powered on and connected to the cloud.

Downloading Data from one or more BlueSky™ Monitors

1. Go to www.tsilink.com and log in.
2. Click on the map and zoom in to the area where your BlueSky™ device pin is located.
3. Click on the device pin.
4. Click on the history button.
5. Click on the three dots in the top left corner and select **Export CSV**.

Downloading Data from the microSD Card in the BlueSky™ Monitor

1. Disconnect the power to the unit by disconnecting the USB cable from the power adapter.
2. The microSD card is located inside the monitor, which for security reasons, needs to be opened to access the SD card. To do this, separate the white top from the black bottom.

C A U T I O N

NEVER open the unit when the unit is powered on or connected to the power adapter!

The instrument is susceptible to electro-static discharge (ESD) and ESD protection should be followed to avoid damage.

3. Remove the two screws that attach the top and bottom halves of the BlueSky™ monitor together.

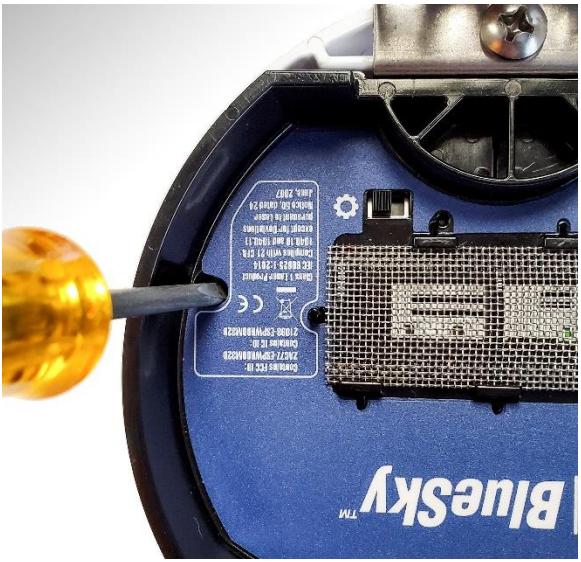


Figure 23: Access microSD card

4. The microSD card holder is located on the top left corner as shown below.

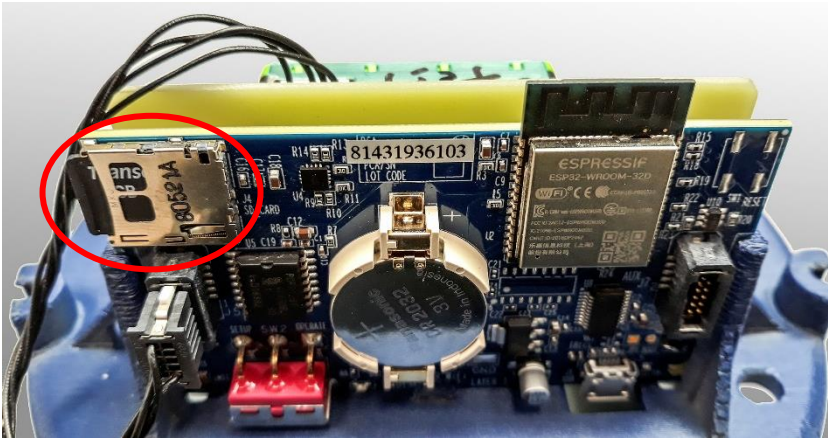


Figure 24: Location of microSD card holder

5. Remove the card and insert the card into a PC to download the data.

6. Once you have downloaded the data, reinsert the card into the BlueSky™ monitor. If the BlueSky™ monitor has any issues writing to the card, an error flag will be activated on the cloud, notifying you that action needs to be taken.

Interpreting the Data Downloaded from the SD Card

Data downloaded from the BlueSky™ Air Quality Monitor will be in the following format:

See Appendix B: for PM Sensor and Device Status definitions.

	A	B	C	D	E	F	G	H	I
	# TSI BlueSky								
	# Model: 8143 Serial: 81432008061								
	# FW: v1.1.0								
	# PM sensor								
	# Model: SPS30 Serial: D8524B470814A84C								
	Timestamp	PM1	PM2.5	PM4	PM10	PM Senso	Temperat	Relative H	Device Statu
	UTC	µg/m³	µg/m³	µg/m³	µg/m³		° Celsius	%	
	11/29/2021 0:00	1	1	1	1	0	25	12	0
	11/29/2021 0:01	1	1	1	1	0	25	12	0
0	11/29/2021 0:02	1	1	1	1	0	25	12	0
1	11/29/2021 0:03	1	1	1	1	0	25	12	0
2	11/29/2021 0:04	1	1	1	1	0	25	12	0
3	11/29/2021 0:05	1	1	1	1	0	25	12	0
4	11/29/2021 0:06	1	1	1	1	0	25	12	0
5	11/29/2021 0:07	1	1	1	1	0	25	12	0
6	11/29/2021 0:08	1	1	1	1	0	25	12	0
7	11/29/2021 0:09	1	1	1	1	0	25	12	0

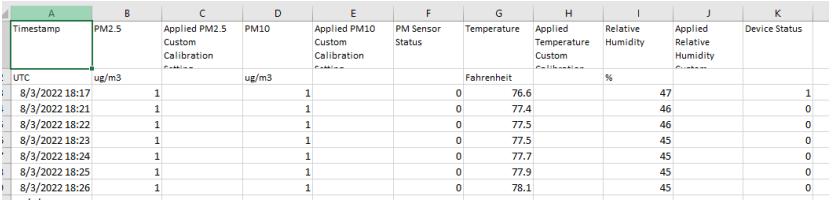
Figure 25: SD card data

Column A	Date in Universal Time Coordinated (GMT)
Column B	PM1.0 Mass concentration data in µg/m³
Column C	PM2.5 Mass concentration data in µg/m³
Column D	PM4 Mass concentration data in µg/m³
Column E	PM10 Mass concentration data in µg/m³
Column F	PM Sensor Status
Column G	Temperature data in °C or °F
Column H	Relative Humidity data in %
Column I	Device Status

Interpreting the Data Downloaded from the Cloud

Data downloaded from the BlueSky™ Cloud will include the following:

See Appendix B: for PM Sensor and Device Status definitions.



	A	B	C	D	E	F	G	H	I	J	K
1	Timestamp	PM2.5	Applied PM2.5 Custom Calibration Setting	PM10	Applied PM10 Custom Calibration Setting	PM Sensor Status	Temperature	Applied Temperature Custom Calibration	Relative Humidity	Applied Relative Humidity Custom	Device Status
2	UTC	ug/m3		ug/m3			Fahrenheit		%		
3	8/3/2022 18:17	1		1		0	76.6		47		1
4	8/3/2022 18:21	1		1		0	77.4		46		0
5	8/3/2022 18:22	1		1		0	77.5		46		0
6	8/3/2022 18:23	1		1		0	77.5		45		0
7	8/3/2022 18:24	1		1		0	77.7		45		0
8	8/3/2022 18:25	1		1		0	77.9		45		0
9	8/3/2022 18:26	1		1		0	78.1		45		0

Figure 26: Downloaded CSV file from Cloud

Column A	Timestamp in Coordinated Universal Time (UTC)
Column B	PM2.5 Mass concentration data in µg/m^3
Column C	Applied PM2.5 Custom Calibration Setting - Multiplication Factor
Column D	PM10 Mass concentration data in µg/m^3
Column E	Applied PM10 Custom Calibration Setting - Multiplication Factor
Column F	PM Sensor Status
Column G	Temperature data in °C or °F
Column H	Applied Temperature Custom Calibration Setting - Offset
Column I	Relative Humidity data in %
Column J	Applied Relative Humidity Custom Calibration Setting - Offset
Column K	Device Status

(This page intentionally left blank)

Chapter 4

Maintenance

Bi-Annual Maintenance Checks

NOTICE
For extreme conditions it is recommended that more frequent maintenance be performed every month.

1. Check the metal screen at the bottom of the BlueSky™ monitor. If it is dirty, remove the screen and clean it with compressed air, soap and water.
2. Make sure there are no cracks on the top cover. Cracks can cause water to leak into the device, which may damage the electronics inside.
3. Make sure the mounting bracket is rigidly mounted to the mounting pole, wall or tripod. Tighten screws if necessary.
4. Check to make sure zip ties are tight and replace them, if necessary, as they can degrade when exposed to direct sunlight or exposed to the elements over a prolonged period of time.
5. Inspect the power supply and the cable to make sure they have not degraded due to exposure to the elements. Replace if you find any cracks in the power supply or the cable as it might cause shorting.

Annual Maintenance Checks

NOTICE
For extreme conditions it is recommended that more frequent maintenance be performed every month.

1. Any maintenance should be performed only after powering the unit down by disconnecting the USB cable from the power adapter.
2. TSI® recommends replacing the PM sensor once a year.
3. To replace the PM sensor, disconnect the cable between the sensor and the PC board, from the PC board.

Figure 27: Replacing PM sensor

4. To remove the sensor from the base, push on the black plastic release to the right of the carrier board and pull up on one side of the carrier board until it is free from the base.
5. The replacement sensor will come with a new cable assembly. Insert the new sensor by aligning the sides of the carrier board and pushing down evenly on both sides until the board bottoms out and snaps in place. Connect the new cable to the main board.
6. Replacement sensor kit can be purchased from TSI®. See the replacement parts section at the beginning of the manual.

Chapter 5

Troubleshooting the BlueSky™ Monitor

The table below lists the symptoms, possible causes and recommended solutions for common problems encountered with the BlueSky™ Air Quality Monitor.

The LED on the bottom can be used to help troubleshoot device issues. Use the blink pattern to identify the error and possible cause.

The LED blinks in the following manner over a 2 second period.

```
* = LED On
_ = LED Off

All LED blink patterns are over a 2 second interval (depicted below):

0       1       2 sec
|       |       |
*__*____________   WIFI connection in progress
*__*__*_________   TSI Link (Cloud) connection in progress, Wifi connected
*_______________   TSI Link (Cloud) connected, Normal operation
*_***___________   Error detected in PM and/or Temp/Humidity Sensor
*******_*******_   WIFI Setup Mode active
```

Possible Cause	Corrective Action
Monitor does not turn on	
Bad Power Connection or Failed Power Supply	Check all power connections, including the power port on the bottom of the device and where the power supply is plugged into an outlet to confirm proper connections have been made. If the power connections have been confirmed and the device still will not power on, try confirming the power supply is working by plugging it into a different monitor. If found that the power supply is defective, a replacement can be purchased. If power supply seems to be working the main board may have failed and the entire device will need to be replaced.

Possible Cause	Corrective Action
Monitor is not reporting data to tsilink.com cloud	
2 blinks every second, followed by a 1 second pause – Not able to connect to network	Initially indicates the device is attempting to connect to Wi-Fi® network. If this status continues, the device is unable to connect to the network. To resolve, repeat the setup process and re-enter the SSID and password. If the problem persists, check the following: • The monitor **CAN ONLY CONNECT TO 2.4 GHZ** Wi-Fi® signals. Most Wi-Fi® routers provide several frequency channels. Make sure you are connecting to the 2.4 GHz channel. • The monitor does not have the capability to connect to public networks that require a second step of browser authentication, such as a free public hotel or airport network. A different network will need to be chosen. • Some corporate networks require the device MAC address for security. This can be found on the serial number label of each monitor. • Additionally, the following firewall ports need to be available: a. DNS: 53 (UDP) b. SNTP: 123 (UDP) c. HTTPS: 443 (TCP) d. MQTT: 8883 (TCP)
3 blinks every second, followed by a 1 second pause – No internet available, cannot connect to cloud	Device is connected to the Wi-Fi® network but it is unable to establish connection with tsilink.com cloud. This can happen if the configured network does not have an internet connection. Check to make sure the Wi-Fi® network actually has an internet connection. Confirm by connecting to the same network with your phone or PC and make sure you can browse the internet.
1 short blink, followed by 3 rapid blinks every second, followed by a 1 second pause – PM Sensor error	An error has occurred in the PM sensor or the Temp/RH sensor. Only the PM sensor can be serviced. Disconnect power and remove the white cover. Check the PM sensor connection and inspect the cable. Disconnect the cable from the PM sensor and the main board. Reconnect the cable, install the cover and power the device on. If the problem persists, replace the PM sensor.

Possible Cause	Corrective Action
PM Readings seem too low	
Plugged screen.	Remove the mesh screen on the bottom of the monitor and blow out any debris with compressed air. Wash with soap and water, dry with compressed and reinstall the screen.
PM sensor has failed and needs to be replaced.	PM sensor may have failed and needs to be replaced. Purchase a replacement sensor from TSI® and install the new into the monitor.
The monitor is located near an object that obstructs the flow.	Move the BlueSky™ monitor into a more open area and ensure the bottom of the device is open to free air.
Readings are not correct	
Custom calibration factor is incorrect	Check the custom calibration factor. Is the value correct? Was it changed by mistake?
No custom calibration factor	Values can be corrected by using a custom calibration factor. The custom calibration factor can be changed in the cloud.

Additional detailed troubleshooting and frequently asked questions can be found on TSI® website by visiting:

https://tsi.com/resources/bluesky-faqs/.

(This page intentionally left blank)

Appendix A

Specifications*

PM Sensor	
Sensor Type	Light scattering single particle counting
Aerosol Concentration Range	0 to 1000 µg/m^3
Measurements	PM1.0, PM2.5 PM4.0, and PM10 on SD Card and PM2.5, PM10 on Cloud
Measurement Resolution	1 µg/m^3
Counting Efficiency	50% at 0.3 µm and 98% at 0.5 µm
Accuracy	±10 % @ 100 – 1000 µg/m^3 when compared to a DustTrak™ DRX monitor
Zero Stability	±1 µg/m^3
Sample Flow Rate	~ 0.3 L/min
Response Time	1 second
Start-up Time	< 8 seconds
Operating Temperature Range ...	-10 to 60ºC
Operating Humidity Range	0 to 95% non-condensing
Storage Temperature .	-40 to 70ºC
Acoustic Emissions Level	25 dBA @ 0.2 m
Temperature Sensor	
Range	-40 to 125°C
Accuracy	±1°C
Response Time	5 to 30 seconds
Humidity Sensor	
Range	0 to 100% RH
Accuracy	±2 % RH
Response Time	8 seconds

Maintenance Requirements	
PM Sensor	Replace PM sensor every year (recommended)
AC and DC Power Requirements	
AC/DC Power Supply .	100 to 240 VAC, 50/60 Hz – INPUT 5 VDC - OUTPUT
Device Input Power	5 VDC
Power Consumption ...	< 5 W
Environmental/Installation Requirements	
Maximum Altitude	3000 meters (10,000 feet)
Pollution Degree	3
Installation Category	III

**Specifications are subject to change without notice.*

Appendix B

Status Flags and Error Codes

Below is a table of error codes that may be listed in the sensor status columns of the downloaded CSV file from the cloud and/or SD card. Any error codes, other than zero, indicate one of the below errors occurred during that logging interval.

The BlueSky™ firmware is taking readings from the sensors usually at a frequency greater than one time per second. What that means is that if an error code is reported, it may have only occurred once during logging interval. For example, a PM sensor error of 16, during a 5 min logging interval, may have only occurred 1 time during the 300 times the firmware was attempting to take a reading from the sensor. Therefore, use best judgement to determine if there is an actual sensor failure. If the device seems to be reporting data accurately, when compared to other BlueSky™ devices and/or a reference device, you may not have to take any action. If needed call TSI® Technical Support and they can help provide direction.

Type	Value	Definition	Actions/Resolutions
Device Status	0	No Errors	N/A
	1	Device was rebooted	No action required
	2	Data was not written to the SD card (SD card not present or write failed)	Confirm SD present and installed properly
	4	Cloud communication error	No action required
	8	Temperature / Relative Humidity sensor error	If error persists may have to replace entire BlueSky™ monitor, it is not possible to replace Temp/RH sensor as it is on the main board
	16	PM Sensor error. See specific sensor status for more details	See PM sensor statuses

Type	Value	Definition	Actions/Resolutions
Device Status *(cont.)*	32	Device Real-Time Clock Battery is low	Replace small coin cell battery on main board. Ensure to use the correct battery part number.
	64	Device internal time has not been synced to the cloud in the last 24 hours	May need to replace coin battery. See 32.
	128	Device internal time value is invalid due to low battery, unpowered device and lack of cloud connection	No action required.
PM Sensor Status	0	No Errors	N/A
	1	Sensor not factory calibrated	Replace PM sensor. All PM sensors from TSI® should be factory calibrated.
	2	Sensor cleaning occurred during interval	No action required
	4	Sensor could not be initialized	No action required
	8	Sensor internal error	Replace PM sensor if problem persists and data does not seem accurate.
	16	Sensor communication timeout	Check sensor cable and ensure the PM sensor is properly connected to main board. Check both ends of the cable. If problem persists after visual inspection of hardware, consider replacing the PM sensor.

Type	Value	Definition	Actions/Resolutions
PM Sensor Status *(cont.)*	32	Sensor communication error	See 16 actions/resolutions
	64	Sensor check sum error	No action required
	128	Sensor limit exceeded	No action required, max concentration exceeded sensor limit.
	256	Sensor fan error	No action required. If problem persists consider replacing PM sensor.

NOTICE

It is also possible that more than one error may occur during the logging interval. If this occurs, the codes are added together to produce the final code. Use math to determine what the individual codes are.

Examples:

Device status =	Reported Code = 3 3 = 1 + 2 = “Device was rebooted” + “Data not written to SD card” Reported Code = 17 17 = 1 + 16 = “Device was rebooted” + “PM sensor error”

Distributed by:

Kenelec Scientific Pty Ltd
1300 73 22 33
sales@kenelec.com.au
www.kenelec.com.au

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

USA	**Tel:** +1 800 680 1220	**India**	**Tel:** +91 80 67877200
UK	**Tel:** +44 149 4 459200	**China**	**Tel:** +86 10 8219 7688
France	**Tel:** +33 1 41 19 21 99	**Singapore**	**Tel:** +65 6595 6388
Germany	**Tel:** +49 241 523030		

P/N 6013929 Rev. J

Printed in U.S.A.