How to Configure AeroTrak™+ A100 Portable Particle Counter in FMS

Technical Bulletin TCC-204
Rev. C

Contents

Intent

The purpose of this document is to detail the setup and use of the new TSI AeroTrak™+ A100 Portable Airborne Particle Counter (APC) with FMS 5.7.0 as a Remote Counter or for Portable Buffer Download.

Overview

This procedure explains two different scenarios to use the AeroTrak+ A100 Portable APC:

1. How to configure the AeroTrak+ A100 Portable APC in FMS 5 as an Online Counter.

2. How to configure the AeroTrak+ A100 Portable APC in FMS 5 to be used with Portable Buffer Download.

When AeroTrak+ A100 Portable APC is used as an Online Counter then **TSINextGenerationModbus2X** driver is used to configure the instrument in FMS.

When AeroTrak+ A100 Portable APC is used to download data from a sampling campaign, then **TSIModbus2BufferDownload** driver is used to configure and download this data from the AeroTrak+ A100 Portable APC.

The AeroTrak+ A100 Portable APCs are connected to FMS to have their data downloaded. They are disconnected from FMS during the collection of data called sampling campaign.

Configuration consists of setting many instrument parameters (i.e., Recipes, Zones and Locations).

Downloaded data is stored in FMS Sample Points created for these Units, and specifically named based upon the Zone and Location names.

A buffer download can be initiated from the FMS Client PC or from a designated download location using a switch connected to an FMS analog or digital input.

Prerequisites

This procedure is only valid for FMS 5.7 or above to use all AeroTrak+ A100 Portable APCs.
Windows Firewalls rules are configured including TCP Port 3602 for Portable Buffer Download.

Assumptions

- Windows® firewall ports required for FMS and OPC UA Server are open as described in the FMS Installation Guide.

- FMS 5.7 must be installed and configured prior to starting this procedure.

- For the purpose of this technical bulletin, an AeroTrak+ Portable APC Model A100-35 will be used with the following characteristics:

Flow Rate:	50
Size Channels:	0.3, 0.5, 1, 3, 5 & 10 µm

- AeroTrak+ A100 Portable APC and FMS are installed on an Ethernet network within the following range: 192.168.1.0.

- FMS monitor is setup with the following network settings:

TCP/IP Address:	192.168.1.36
Gateway:	192.168.1.1
Subnet Mask:	255.255.255.0

AeroTrak+ A100 Portable APC used as a Remote Instrument

- AeroTrak+ A100 Portable APC used as a remote instrument will be setup in FMS with the following settings:

A100 Serial Number:	A100352144001
TCP/IP Address:	192.168.1.90
Gateway:	192.168.1.1
Subnet Mask:	255.255.255.0
Start Delay Time:	10 sec
Sample Time:	60 sec
Hold Time:	0 sec
Unit Name:	U_PORTABLE_REMOTE
Historical Unit:	H_ PORTABLE_REMOTE
Buffer Download:	Enabled
Buffer Size:	3000

- AeroTrak+ A100 Portable APC used as a remote instrument sample point name:

C/CF:	PORTABLE_REMOTE_CF
C/M³:	PORTABLE_REMOTE_M3

AeroTrak+ A100 Portable APC used for Portable Buffer Download

- AeroTrak+ A100 Portable APC use for Portable Buffer Download will be setup in FMS with the following settings:

A100 Serial Number:	A100352144001
TCP/IP Address:	192.168.1.90
Gateway:	192.168.1.1
Subnet Mask:	255.255.255.0
Start Delay Time:	10 sec
Sample Time:	60 sec
Hold Time:	0 sec
Communication Channel:	C_A100_PBD
Unit Name:	U_A100_PBD
Port Number:	3602

- AeroTrak+ A100 Portable APC Buffer Download Zone Name:

Zone Name:	Room100

- AeroTrak+ A100 Portable APC Buffer Download Zone Sampling Parameters:

Sample Time:	00:01:00
Volume Unit:	ft³
Start Delay:	00:00:10
Cycles:	15
Continuous	Off
Hold Time:	00:00:00
Sample Gas:	Air

- AeroTrak+ A100 Portable APC Buffer Download Location Name:

Location Name:	LOC1
	LOC2
	LOC3

- AeroTrak+ A100 Portable APC Buffer Download FMS Sample Point Name:

Sample Point Name:	Room100_LOC1
	Room100_LOC2
	Room100_LOC3

- OPC UA Server Settings:

Name:	FMSOPCUASERVER
Address:	192.168.1.36
Port:	4010

AeroTrak+ A100 Portable APC Used as a Remote Counter

AeroTrak+ A100 Portable APC Configuration

IMPORTANT NOTICE
Prior to setting up the AeroTrak+ A100 Portable APC, it is required to delete **ALL** zones, recipes and their associated data.

1. From the Main Screen, press the hamburger Menu and select **Settings**. 2. On the **Settings** screen, press **Data Integrity** button.	
3. On the **Data Integrity** screen, press **Manage Data**. 4. Press **Delete All Records** button.	

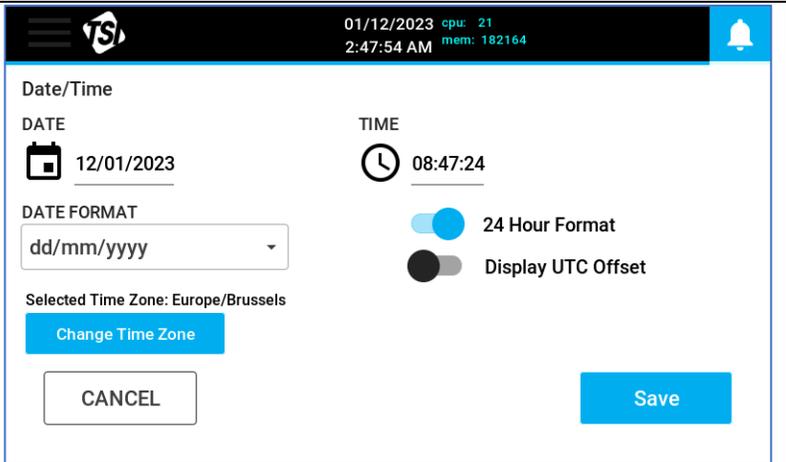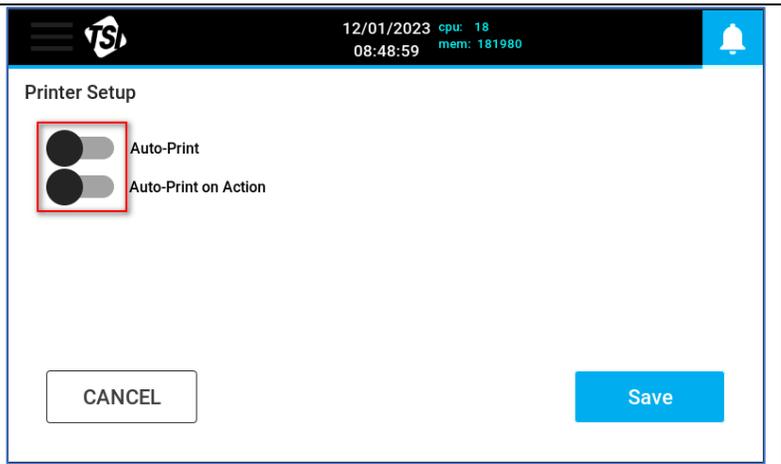|	
5. Confirm Deletion of all records by pressing **OK**.	
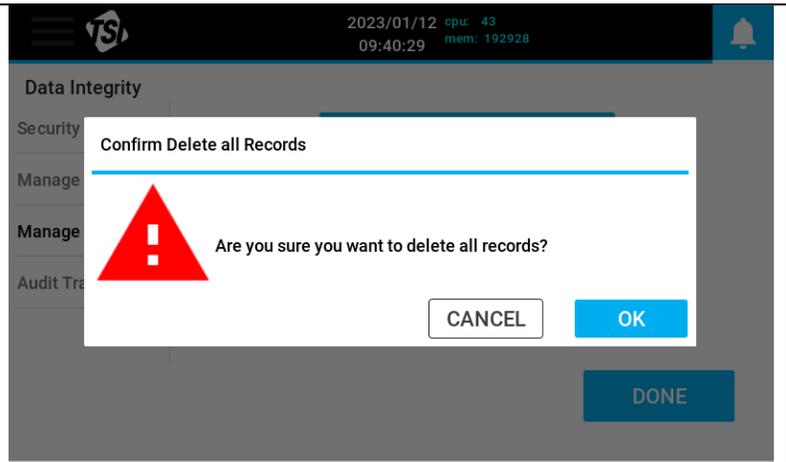
6. On the **Settings** screen, press **Date & Time** button.
 	
7. Verify the following settings and make changes accordingly:
  • **Date**
  • **Date Format**
  • **Selected Time Zone**
  • **Time**
  • **24 Hour Format**
 	
8. Press **Save** button.	

9. On the **Settings** screen, press **Network** button.
 	
10. Enter the following settings:
  • **IP Address**:   192.168.1.90
  • **Subnet Mask**:   255.255.255.0
  • **Default Gateway**:   192.168.1.1
 	
11. Press **APPLY** button.
 	
12. Finished by pressing **DONE** button.	
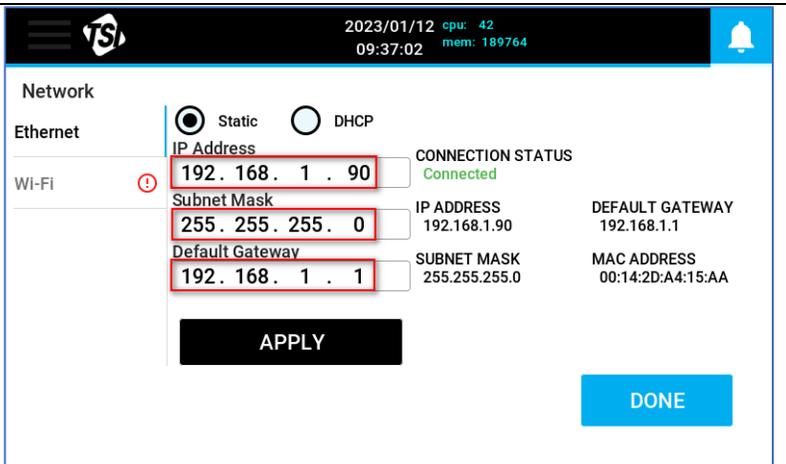
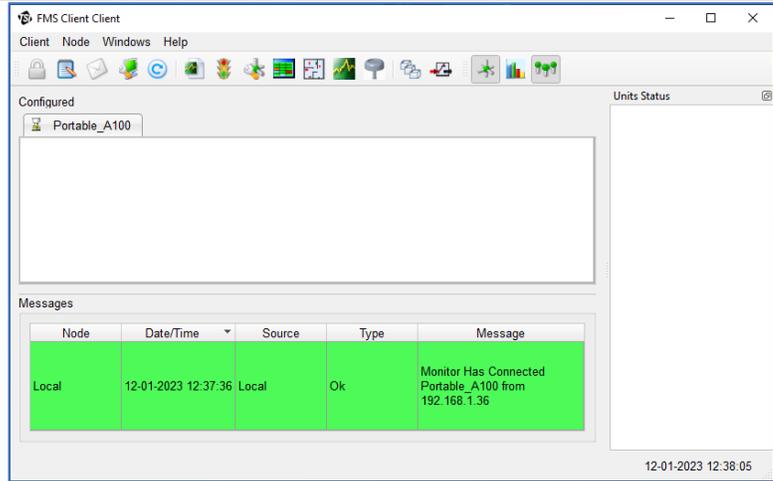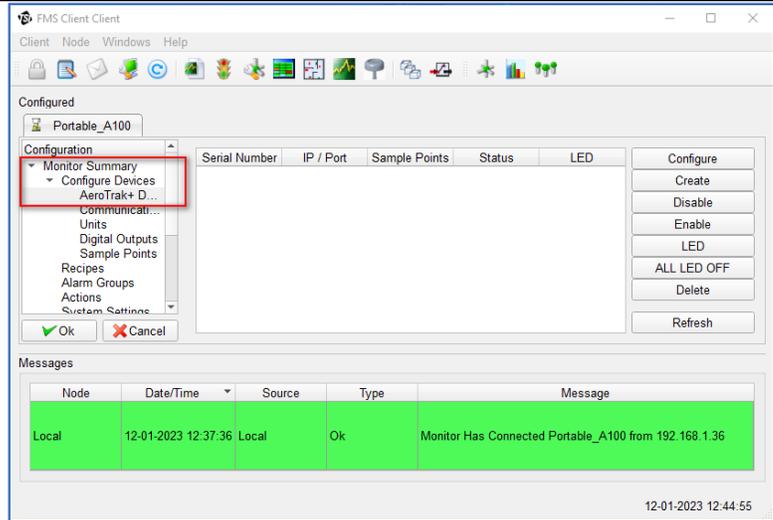|	
13. On the **Settings** screen, press **Printer Setup** button and verify the following options are Disabled: • **Auto-Print**: Off • **Auto-Print on Action**: Off 14. Press **Save** button if any changes were made; otherwise, press **CANCEL** button.	
15. On the **Settings** screen, press **Device Name/Language** button. 16. Enter a Name to be used as the **Device Name,** i.e., **Portable_A100** 17. Select the **Language** to be used on the portable. **NOTICE** The language you select will only apply to the instrument GUI and not FMS Interface.	
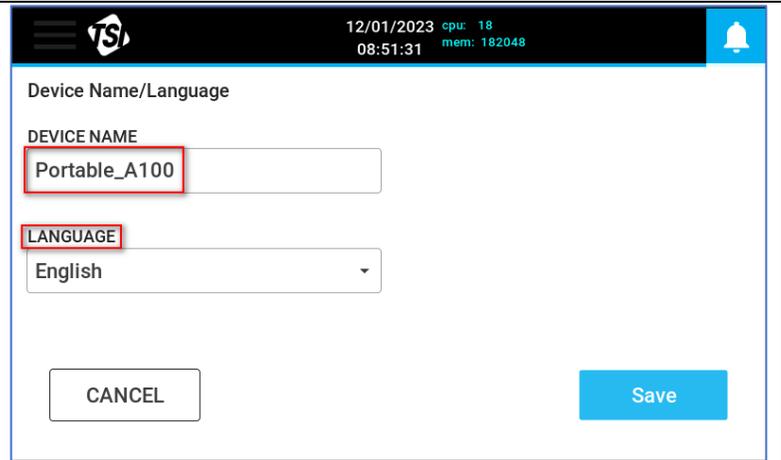
AeroTrak+ A100 Portable APC FMS Configuration

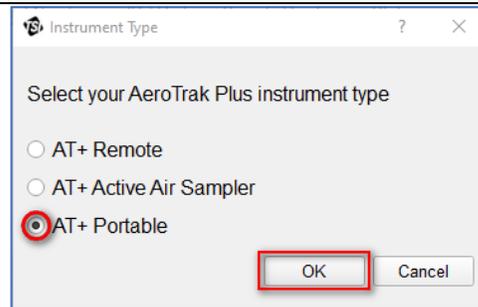|	
1. Start the following Services: 　• GuardService 　• PostgreSQL-x64-10, 14 or 15 depending on the PostgreSQL® version installed. 2. Start FMS Client.	
3. Go to **Configure Node** and expand **Monitor Summary**. 4. Expand **Configure Devices**. 5. Click on **AeroTrak+ Devices**.	
6. Click on **Create** button and select **AT+ Portable**. 7. Click **OK**.	

8. Following the assumptions, enter **ALL** the relevant Instrument information, such as:
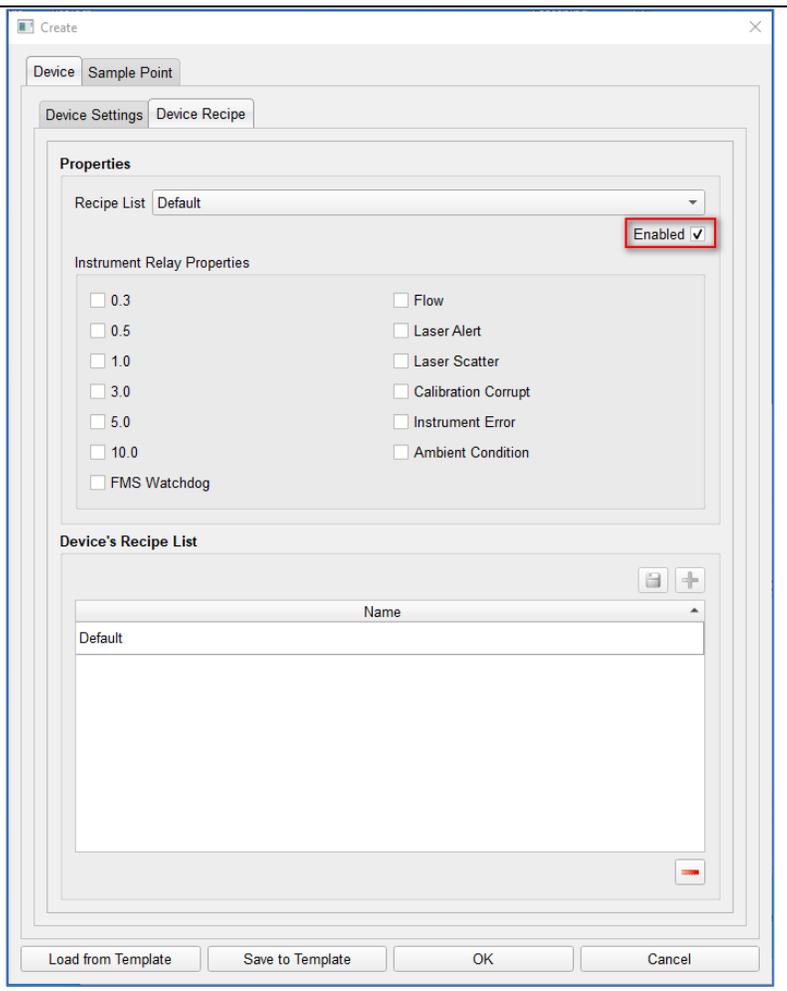
- **Serial Number**
- **IP Address**
- **Unit Name**
- **Nominal Flow**
  1 Cfm Instrument= 1.0
  50 Lpm Instrument= 1.77
  100 Lpm Instrument= 3.53
- **Enable Buffer Download**
- **Buffer Size**
- **Start Delay**
  Minimum Value is 10 sec
- **Sampling Time**
- **Channel List**

|	
9. Click on **Device Recipe** tab. 10. Verify that **Enabled** is checked.	

11. Click on the **Sample Point** tab.

12. Following the assumptions, enter **ALL** the relevant Instrument information's like:

   - **Sample Point Name**

   - Select **CountsPerFt3** from the Data Type drop-down list

   - Check **Use Logarithmic Scales**.

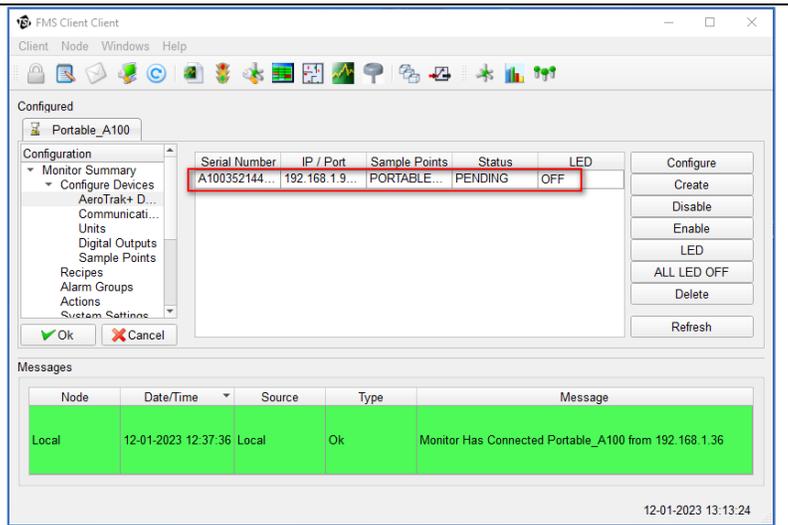13. Click the **+** sign to add the Sample Point Name to the **Sample Point List**.
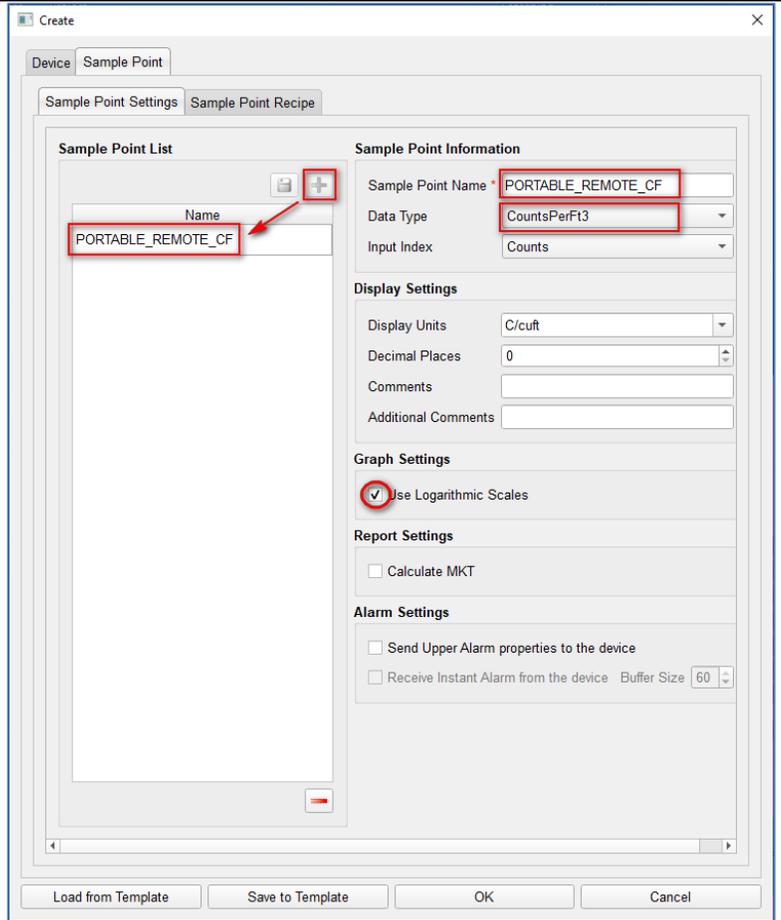
14. Click on the **Sample Point Recipe**.

15. Select the **Preferred Tag**.

16. Select an **Additional Tag**.

17. Make sure **Enabled** is checked.

18. Click **OK**.

NOTICE
The different Size Channel will be populated after clicking **OK**.
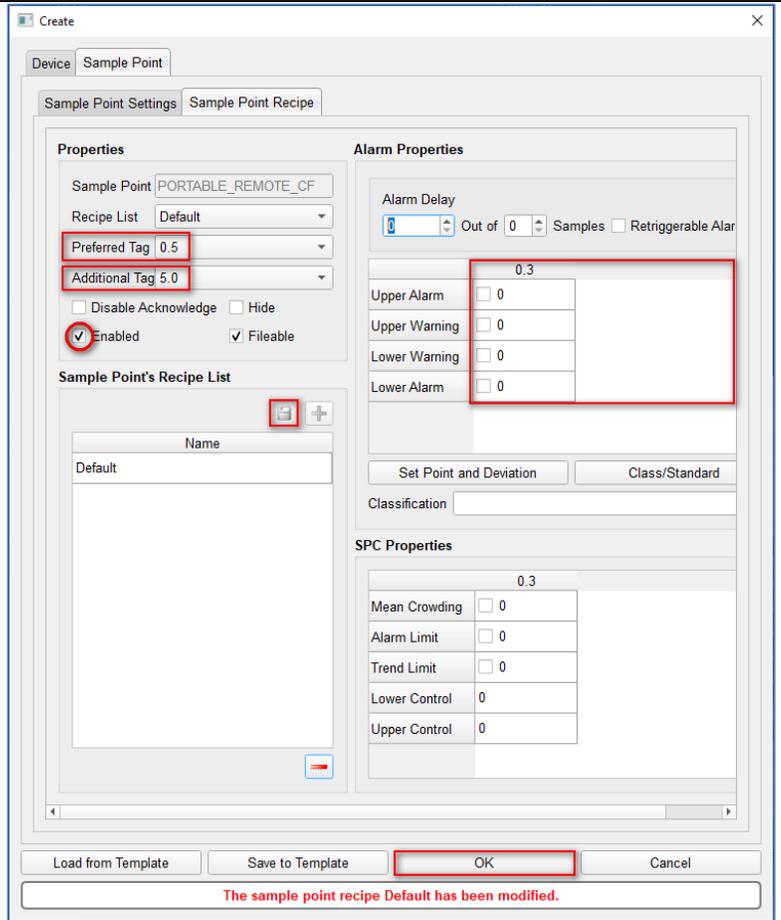
19. You now see the Model A100 listed in the **AeroTrak+ Devices** List as a remote counter.	
20. To setup Alarm Limits, you can now select the Device you want to setup and then click **Configure** button.	
21. You now see the complete list of Size Channels for which you can set Upper Alarm or Upper Warning. 22. When finished, click **OK**.	
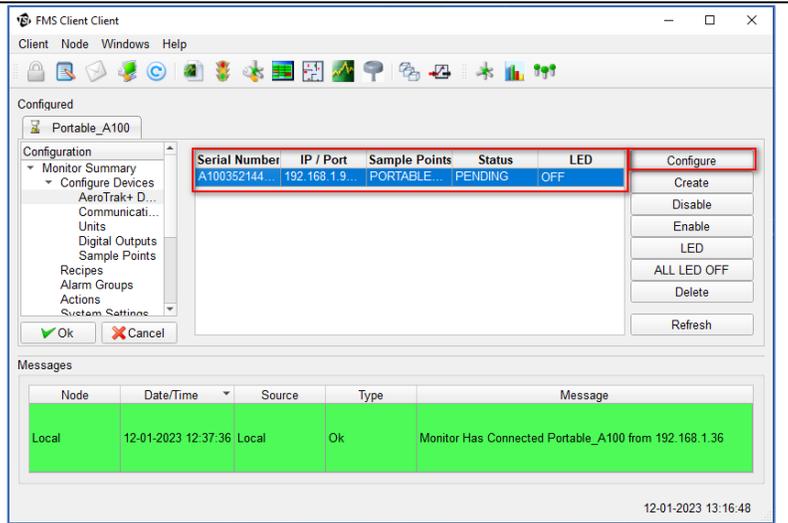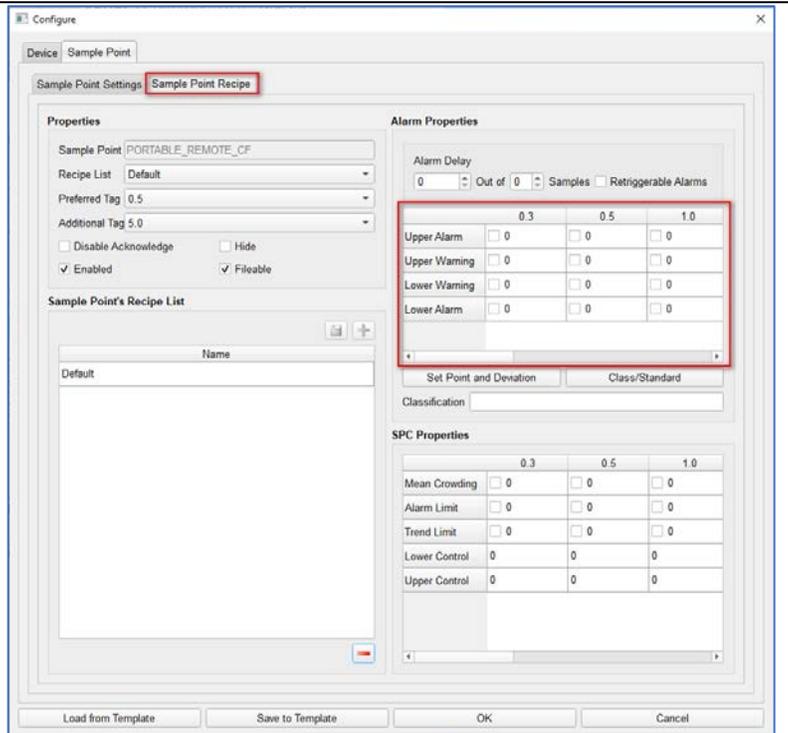
23. To save the configuration, click **Ok**. 24. Confirm saving by clicking **Save** button.	
25. To apply changes immediately, click **Yes** button.	
26. When the Monitor is restarted, the Instrument will start sampling; and after 60 sec, the first sample will be shown on the main screen.	
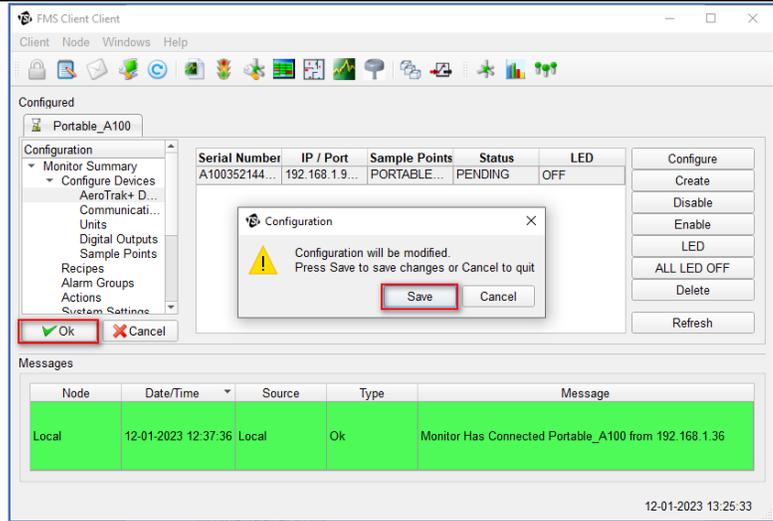
How to Setup Alarms

A sample point can have alarm limits configured to enable alarms to be activated whenever its value falls outside configured values.

Lower and upper alarm limits are critical parameters and often used via alarm groups to trigger alarm beacons, sounders, SMS, and email. They will also trigger a visual change of state on the FMS 5 client to indicate a value trending out of specification.

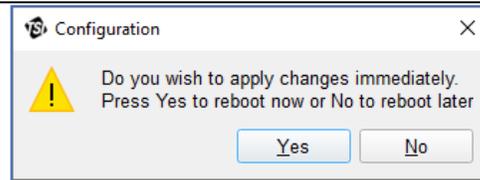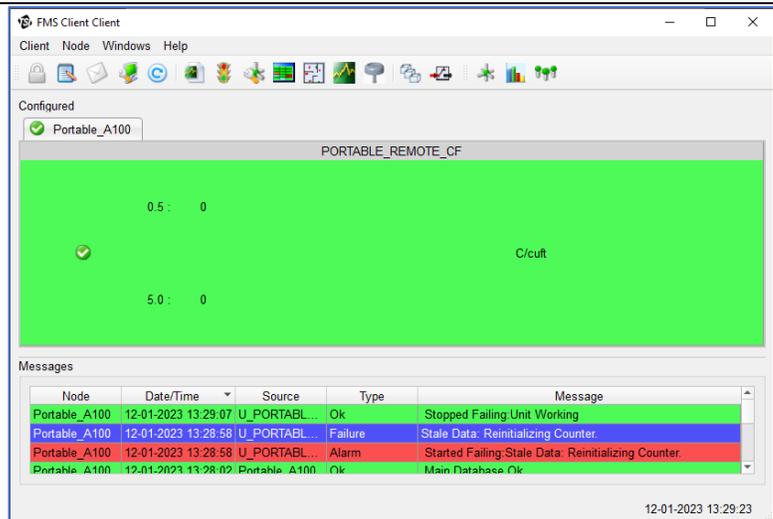## Alarm Delay X of Y Samples

The number of consecutive values that are outside the alarm limits that must be measured before the sample point goes into alarm (red). Until the alarm threshold is exceeded, the sample point is put into a warning state (yellow). This feature is useful for measurements which can have brief periods of alarm state during normal use (such as differential pressure sensors), allowing nuisance alarms to be suppressed. The consecutive values are measured using the current sample time.

Retriggerable Alarms

An alarm event is generated for each measurement that is in an alarm state. When retriggerable alarms is not set, an alarm event is generated only when a sample point enters an alarm state. If the alarm is acknowledged but the sample point remains in the alarm state, no further acknowledgements will be required for this alarm occurrence.

At the same time, FMS will trigger an output if configured the same way as for the acknowledgement.

Retriggerable Warnings

A warning event is generated for each measurement that is in warning state. When retriggerable warnings are not set, a warning event is generated only when a sample point enters the warning state. If the warning is acknowledged but the sample point remains in a warning state, no further acknowledgements will be required for this warning occurrence.

At the same time, FMS will trigger an output if configured. The same way as for the acknowledgements.

Upper Alarm

Required alarm value to trigger alarm. Select the check box to enable the limit.

Upper Warning

Required warning value to trigger warning. Select the check box to enable the limit.

Lower Warning

Required warning value to trigger warning. Select the check box to enable the limit.

Lower Alarm

Required alarm value to trigger alarm. Select the check box to enable the limit.

NOTICE
Sample points such as an environmental sample point will not have additional columns for size channel.

Class/Standard

The Class/Standard button enables single click selection for alarm/warning limits required by a number of common regulatory standards. This function only supports two channel sizes (0.5 and 5.0 μm). To use this function, select the required standard from the drop-down list.

SPC Properties

SPC (Statistical Process Control) is used for environmental sensors. Limits can be configured to provide more sophisticated warning and control strategies.

Whenever the sample point has reached the user defined mean crowding, alarm limit, or trend limit values, the sample point will go into failure.

➢ **Lower Control**
  The lower bound used for SPC.

➢ **Upper Control**
  The upper bound used for SPC.

➢ **Mean Crowding**
  Only has effect if valid control limits are defined. Mean crowding is the number of consecutive readings that are between the lower and upper control limits, exclusive, i.e., lower control < x < upper control.

  Example:

  • **Lower control** 2

  • **Upper control** 8

  • **Mean crowding** 3

Time	8:00	8:01	8:02	8:03	8:04	8:05	8:06	8:07	8:08	8:09
Value	1	2	3	4	10	3	3	6	5	8
State	Ok, mean crowding number is 0	Ok, mean crowding number is 0	Ok, mean crowding number is 1	Ok, mean crowding number is 2	Ok, mean crowding number is 0	Ok, mean crowding number is 1	Ok, mean crowding number is 2	Alarm, mean crowding number is 3	Alarm, mean crowding number is 4	Ok, mean crowding number is 0

➢ **Alarm Limit**
Only has effect if valid control limits are defined. Alarm limit is the number of consecutive readings that lie outside the control limits, inclusive i.e. x <= lower control or x >= upper control.

Example:

- **Lower control** 2

- **Upper control** 8

- **Alarm Limit**   2

Time	8:00	8:01	8:02	8:03	8:04	8:05	8:06	8:07	8:08	8:09
Value	1	2	3	4	10	8	8	15	5	2
State	Ok, alarm limit nbr is 1	Ok, alarm limit nbr is 2	Ok, alarm limit nbr is 0	Ok, alarm limit nbr is 0	Ok, alarm limit nbr is 1	Ok, alarm limit nbr is 2	Alarm, alarm limit nbr is 3	Alarm, alarm limit nbr is 4	Ok, alarm limit nbr is 0	Ok, alarm limit nbr is 1

➢ **Trend Limit**
Trend Limit is the number of consecutive readings that are increasing or decreasing. This is independent of the lower or upper control limits.

Example:

- **Trend Limit**   3

Time	8:00	8:01	8:02	8:03	8:04	8:05	8:06	8:07	8:08	8:09
Value	1	2	3	4	10	3	3	20	19	18
State	Ok, trend nbr is 0	Ok, trend nbr is 1	Ok, trend nbr is 2	Alarm, trend nbr is 3	Alarm, trend nbr is 4	Alarm, trend nbr is 3	Alarm, trend nbr is 3	Alarm, trend nbr is 4	Alarm, trend nbr is 3	Ok, trend nbr is 2

Time	8:10	8:11	8:12	8:13	8:14	8:15	8:16	8:17	8:18	8:19
Value	17	16	15	14	13	12	16	20	21	25
State	Ok, trend nbr is 1	Ok, trend nbr is 0	Ok, trend nbr is -1	Ok, trend nbr is -2	Alarm, trend nbr is -3	Alarm, trend nbr is -4	Alarm, trend nbr is -3	Ok, trend nbr is -2	Ok, trend nbr is 1	Ok, trend nbr is 0

Cubic Meter Sample Point

The counts per cubic meter data type on a TSI particle counter driver in FMS is a real-time rolling counts per cubic meter calculation (c/m^3). This means the driver is only capable of calculating c/m^3 in real-time—any non-real-time data will not be calculated. Prior to FMS 5.2.0 this is fine. However, with the introduction of buffer download, FMS 5.2.0 and newer, any buffered data that is downloaded from the instrument will not have c/m^3 calculated. Historic driver will enable buffered data to be presented as c/m^3.

The historic driver calculates the c/m^3 of air based off of another (associated) sample point's database table. This new driver will be able to calculate c/m^3 of air in real-time as well as non-real-time information. Because the historic driver does the calculations based on the associated sample point's database table, the historic driver will not be able to perform calculations if there is not a valid main database connection. If there is a main database connection error, once FMS re-establishes connection to the main database and the spooled information is inserted into the database, the historic driver will check and attempt to make calculations based on the information that was back-inserted into the database.

International regulations for the life science industry requires that the counts per cubic meter be monitored.

Creating M³ sample point for all AeroTrak+ Portable Particle Counters is the same as explained in technical bulletin TCC 121: FMS 520 Historic Driver Setup Configuration.

How to Use Recipe

From control windows, four standard recipes are available by default.

Default	Applies configuration parameters from the base configuration settings.
Disable	Stops a unit or sample point from gathering data.
Enable	Starts a unit or sample point from gathering data.
No Change	Retains the selected recipe for an item.

Custom recipes can be created to enable closer control of sampling parameters, for example alarm limits.
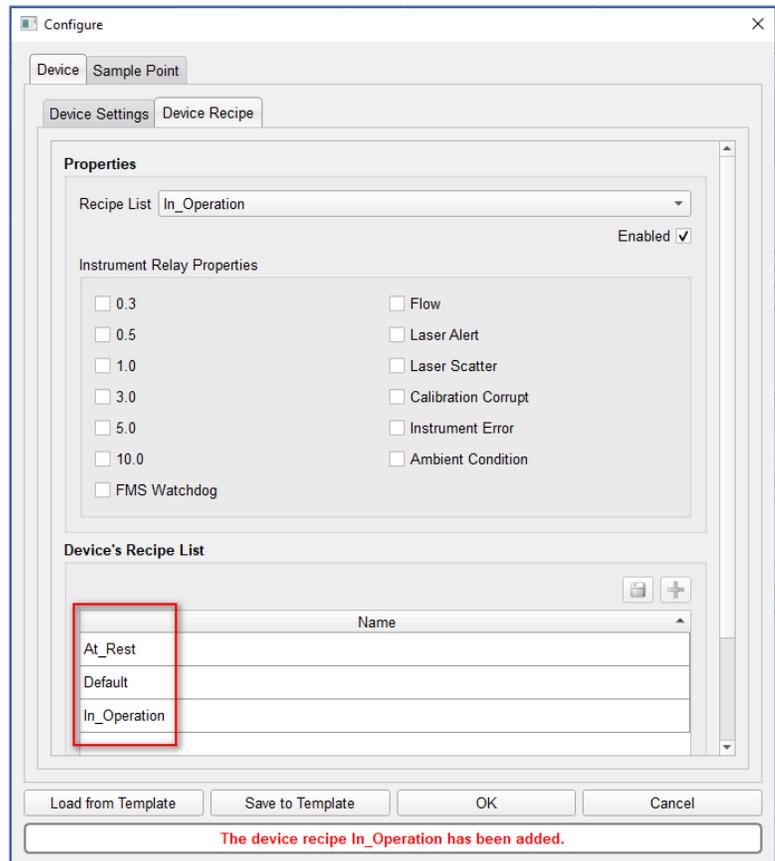
Creating and using **recipes** with all AeroTrak+ Portable Particle Counters is nearly the same as outlined in technical bulletin TCC-123: How to Configure Cleaning in Operation Recipe.

Following TCC-123, there are three additional recipes listed in the **recipe list** drop-down for which different **Sample Point Parameters** and **Device Properties** based on the **Recipe** selected can be applied.

1. **Device Recipe** Properties:

   Select from the recipe drop-down list a **recipe** that the instrument is be configured for. Click ➕ icon.

   When settings for a **recipe** are changed, click 💾 icon to save.

Enabled	Enable/disable device unit.
Channel 1 to 6	Size channel 1 to 6.
Flow	Isokinetic probe may be capped or blower is unable to deliver the required flow (0.1 cfm).
Laser Alert	Laser diode defect (i.e., laser current drastically increased).
Laser Scatter	Too much light scatter in the chamber caused by contamination in the optics chamber or excessive exposure to cleaning fluids or vaporized hydrogen peroxide.
Ambient Condition	Device temperature is exceeded.
Calibration Corrupt	Calibration data corrupted.
Instrument Error	If one of the above alarms occurs, an **instrument error** will be triggered.
FMS Watchdog	When **enabled,** FMS will close the relay for 1 second every 60 seconds. If **enabled** all other **instrument relay properties** will be grayed out and only **FMS watchdog** will be in control of the relay.

2. **Sample Point Recipe** Properties:

   Click **Sample Point Settings** tab, select sample point wanting to configure a recipe for.

3. Click **Sample Point Recipe** tab, select recipe wanting the sample point configured for.

4. Click ![plus] icon to add.

5. Select each recipe one by one and change the different associated settings.

6. Click ![save] icon to save.

7. Proceed with all other recipes.

8. If other **sample points** are associated with this instrument, continue by selecting another **sample point** name from step 2 above.

9. Click **OK** and **Save** configuration.
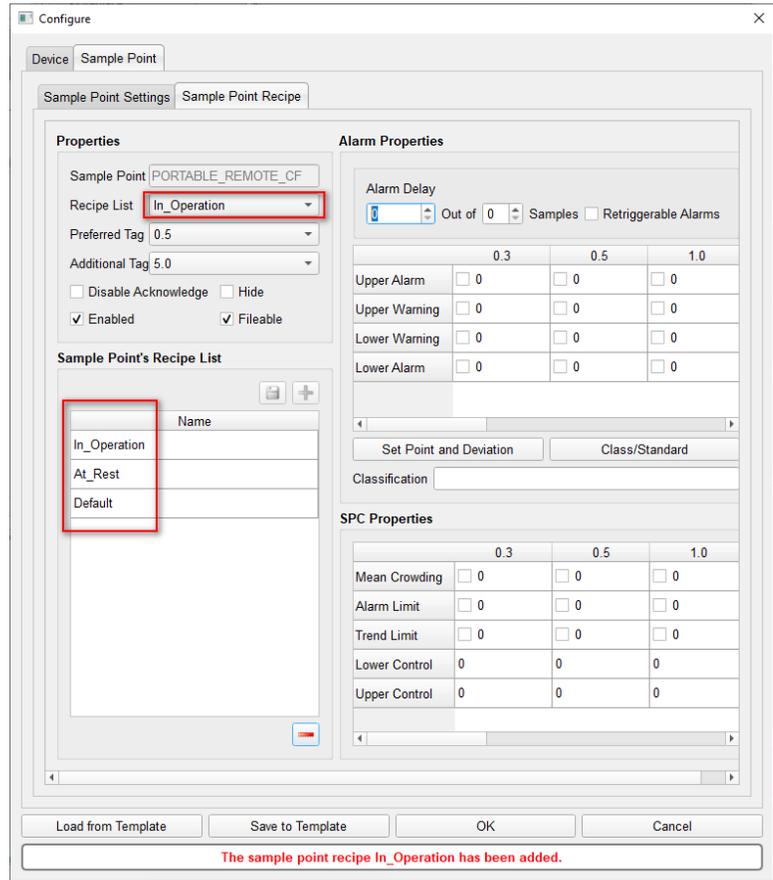
AeroTrak+ A100 Portable APC Used with Portable Buffer Download

FMS Configuration

Setup and configuration is the same for both Pharmaceutical and Semiconductor (Standard) mode.

By default, the **TSIModbus2BufferDownload** driver module is disabled. If the **TSIModbus2BufferDownload** driver is not selectable in the driver drop-down menu of a Unit configuration, make sure the **TSIModbus2BufferDownload** module is checked under **Client Options → Module Selection**.
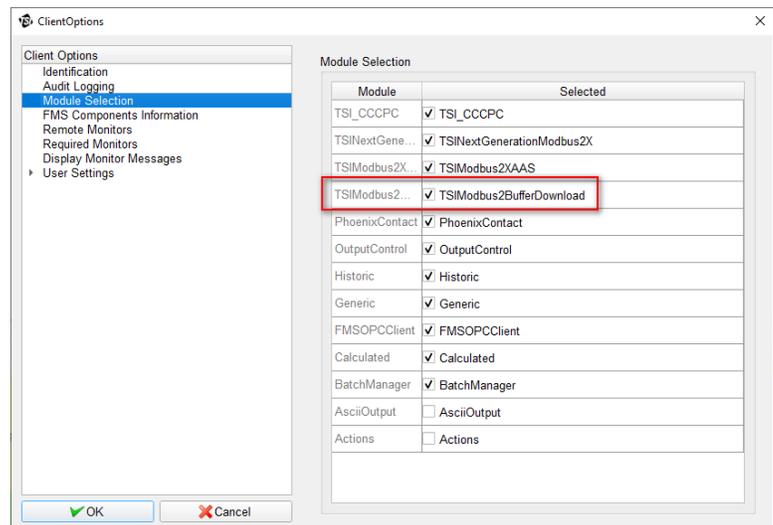
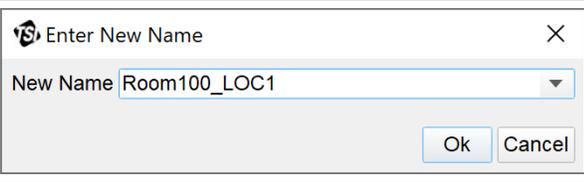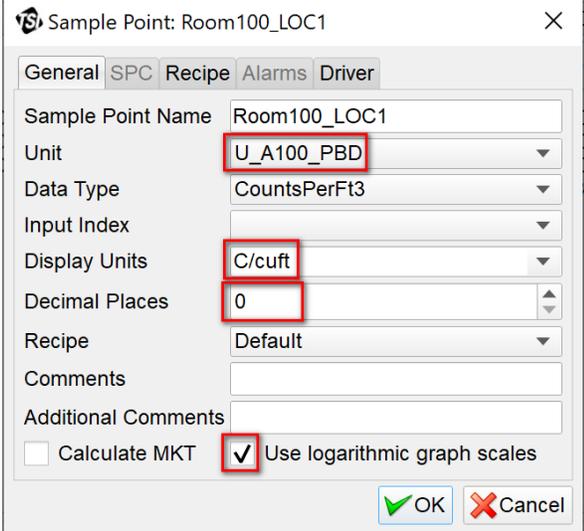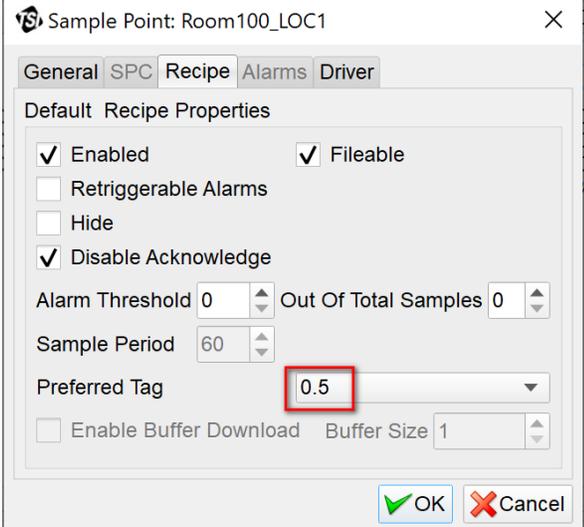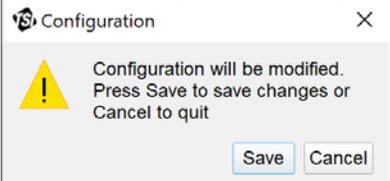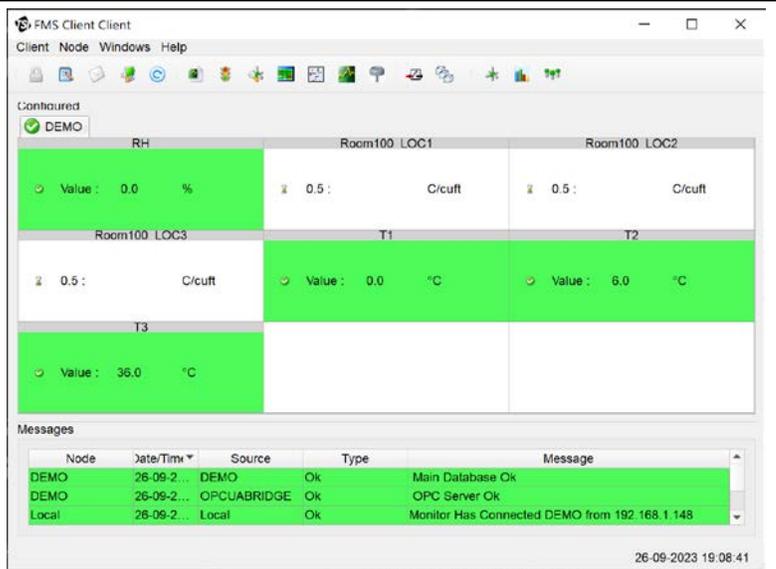|	
1. Start by creating a Communication Unit for the instrument as with any other Portable instrument. Use the following settings : • Packet Driver: **Line Mode** • IP Address: **192.168.1.90** • Port Number: **3602** 2. Make sure **Enable** is checked 3. Click **OK**	
4. Next create a new **TSIModbus2BufferDownload** Unit. 5. Select **TSIModbus2BufferDownload** from the Driver drop-down list on the General tab. 6. Make sure **Enabled** is checked 7. Select the **OK** button to close the dialog.	
8. Re-open the Unit properties window and navigate to the Driver tab. 9. Select the Communications Channel previously created. 10. Select the correct information of the instrument from the **Instrument Type** drop-down list. 11. Click **OK** **NOTICE** TSI recommends you also select the Suppress Connection Failure Messages at this time. Left unchecked, TCP Communication Errors are regularly generated for this Unit when not connected to FMS.	
12. Clicking on the **Instrument Setup** button has currently no effect for further Sample Point Creation.	

Sample Point Creation

1. From FMS Configuration, create a new Sample Point Name called **Room100_LOC1** 2. Click **OK**	**Enter New Name** ✕ New Name: Room100_LOC1 ▾ Ok Cancel
3. On the **General** Tab, select from the **Unit** drop down list the Unit previously created. 4. Select the correct **Display Units** 5. Enter **0** for the number of **Decimal Places** 6. Verify **Use Logarithmic graph scale** is checked.	**Sample Point: Room100_LOC1** ✕ General | SPC | Recipe | Alarms | Driver Sample Point Name: Room100_LOC1 Unit: U_A100_PBD ▾ Data Type: CountsPerFt3 ▾ Input Index: ▾ Display Units: C/cuft ▾ Decimal Places: 0 Recipe: Default ▾ Comments: Additional Comments: ☐ Calculate MKT ☑ Use logarithmic graph scales ✔ OK ✗ Cancel

7. Go to **Recipe** Tab
8. From the **Preferred Tag** drop down, select the Tag you want to see on the Main screen.
9. Click **OK**
10. Repeat from Step 1 to 9 above to create the following Sample Point Name:
  • **Room100_LOC2**
  • **Room100_LOC3**
	Sample Point: Room100_LOC1 ✕
	General | SPC | Recipe | Alarms | Driver
	Default Recipe Properties
	☑ Enabled ☑ Fileable
	☐ Retriggerable Alarms
	☐ Hide
	☑ Disable Acknowledge
	Alarm Threshold: 0 Out Of Total Samples: 0
	Sample Period: 60
	Preferred Tag: 0.5 ▾
	☐ Enable Buffer Download Buffer Size: 1
	✔ OK ✗ Cancel

11. When all Sample Point Name are configured, **Save** your FMS Configuration.	**Configuration** ✕ ⚠ Configuration will be modified. Press Save to save changes or Cancel to quit Save Cancel

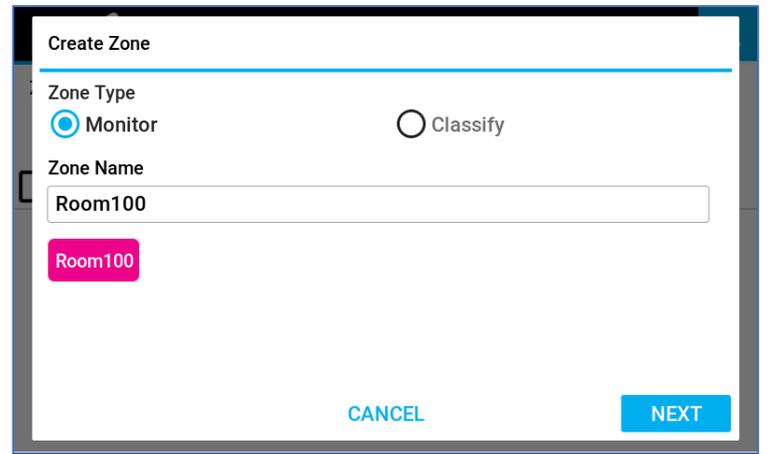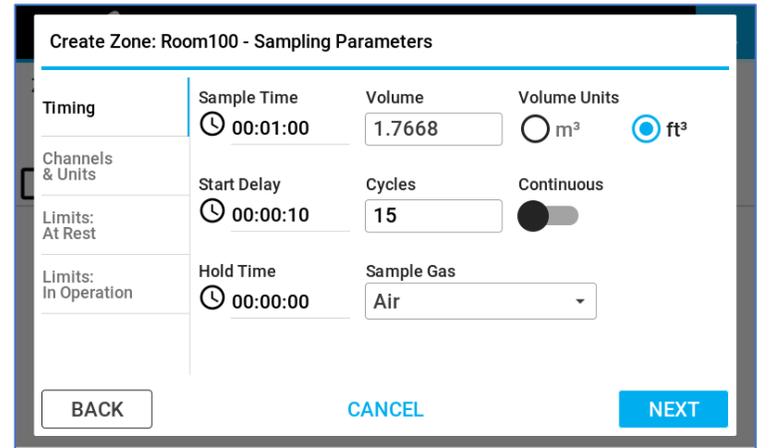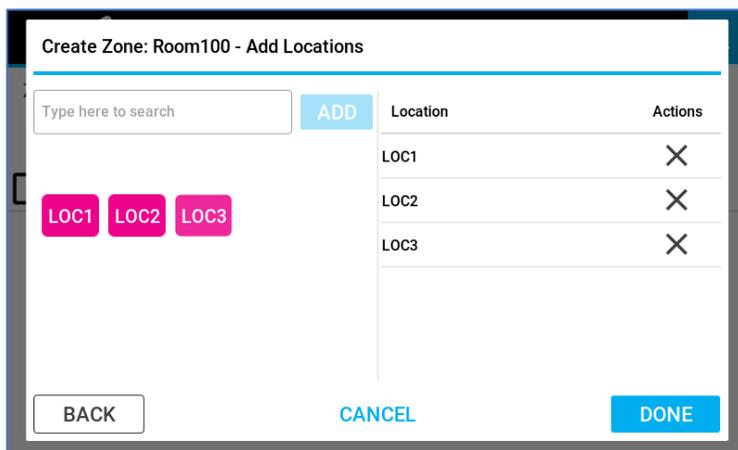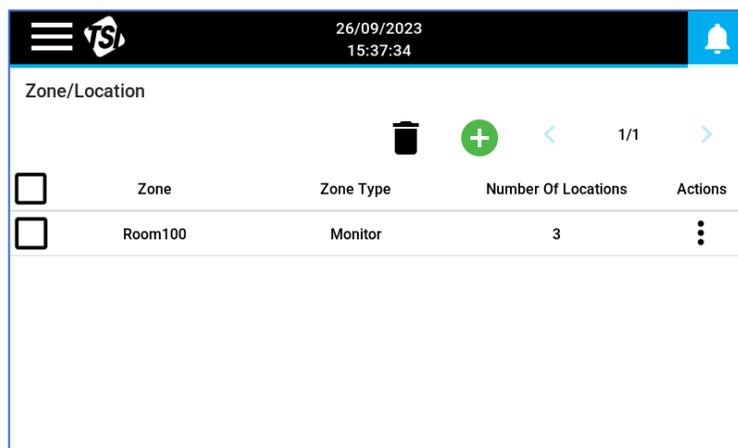|	
12. When Monitor has finished rebooting, refresh the FMS Main Screen allowing to see the newly created Sample Point.	
13. On the AeroTrak+ A100 Portable APC, create the following Zone **Room100.** 14. Click **NEXT** **NOTICE** Spaces are allowed on the AeroTrak+ A100 Portable APC when creating Zones but FMS DOES NOT allow spaces in Sample Point Names.	
15. Set the sampling parameters for the Zone: • Sample Time: **00:01:00** • Start Delay: **00:00:10** • Volume Units: **ft³** • Cycles: **15** 16. Click **NEXT**	

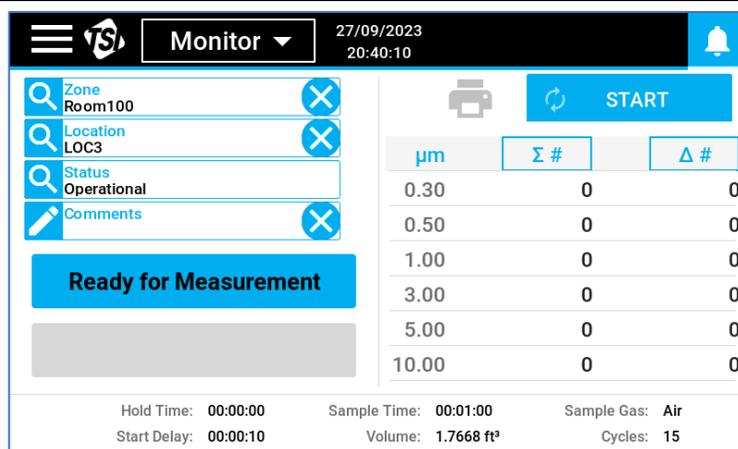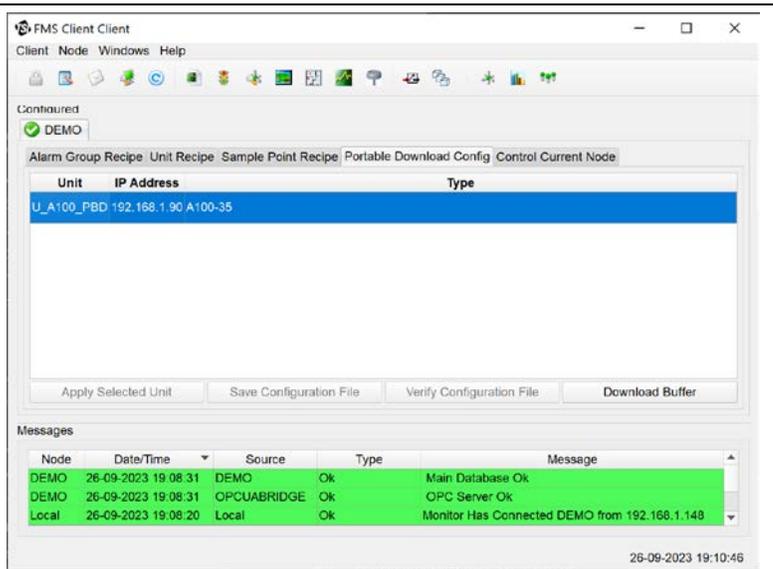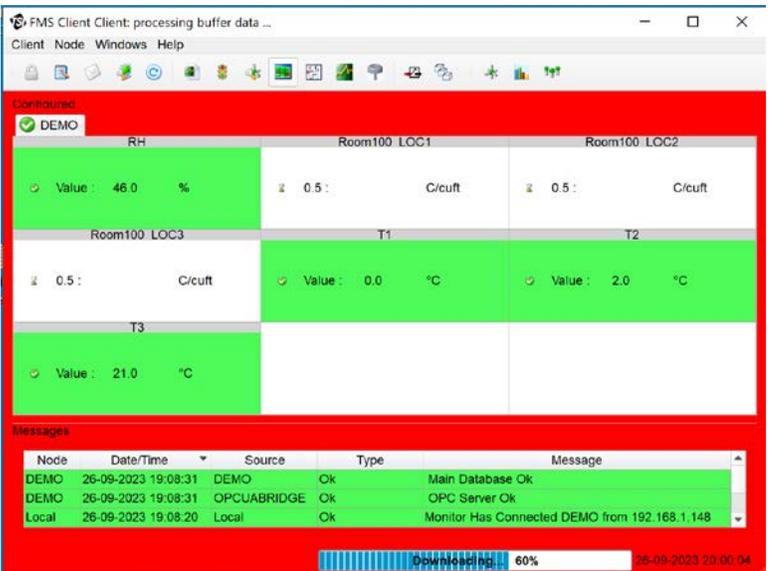|	

17. Create the following Location:
   • **Loc1**
   • **Loc2**
   • **Loc3**
18. Click **DONE.**
	Create Zone: Room100 - Add Locations
	
	Type here to search ADD Location Actions
	LOC1 LOC2 LOC3
	LOC1 ✕
	LOC2 ✕
	LOC3 ✕
	
	BACK CANCEL DONE

19. Your newly created Zone **Room100** is now listed.	26/09/2023 15:37:34 Zone/Location 🗑 ➕ ‹ 1/1 › ☐ Zone Zone Type Number Of Locations Actions ☐ Room100 Monitor 3 ⋮

20. On the hamburger menu, go to the **Sample** screen.
21. Select **Monitor** from the drop down list.
22. Select Zone Name i.e. **Zone100.**
23. Select a Location Name i.e. **Loc3.**
24. Press button **START.**
25. Wait for samples to be finished.
	Monitor ▼ 27/09/2023 20:40:10
	
	🔍 Zone Room100 ✕ 🖨 ↻ START
	🔍 Location LOC3 ✕
	🔍 Status Operational µm Σ # Δ #
	✏ Comments ✕ 0.30 0 0
	   0.50 0 0
	Ready for Measurement 1.00 0 0
	   3.00 0 0
	   5.00 0 0
	   10.00 0 0
	
	Hold Time: 00:00:00 Sample Time: 00:01:00 Sample Gas: Air
	Start Delay: 00:00:10 Volume: 1.7668 ft³ Cycles: 15

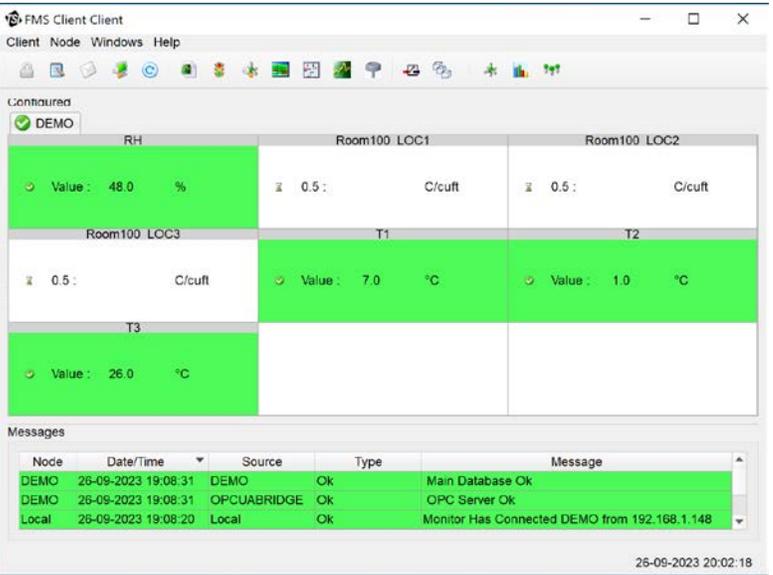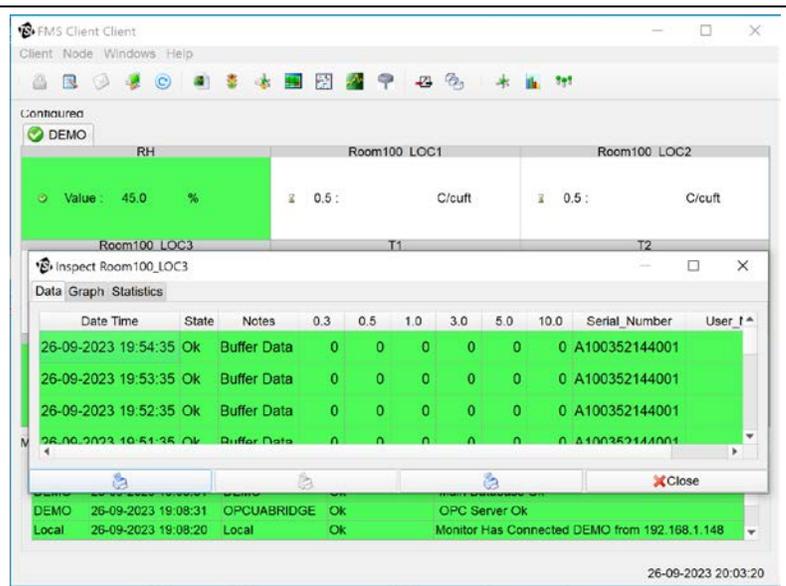|	
26. In FMS go to the **Control Page, Portable Download Config tab.**	
27. Select the Portable Unit you want to download the data from. 28. Click button **Download Buffer.** 29. Confirm Download by clicking **Yes.**	
30. Wait for the download to be finished.	

31. You can now verify that download succeed by looking at the historical data.	

Security

With introduction of the AeroTrak+ A100 Portable APC driver, the following security rights can be assigned.

User Groups Level

Category **Configure Node**:

- TSI Next Gen: enable the ability to view and configure the next generation settings.

Files to Backup

With the introduction of the AeroTrak+ A100 Portable APCs, files are required to be added to the configuration backup. Listed below are **ALL** the folders and files required to be included in the FMS 5 configuration backup.

➢ C:\FMS5\Config\Actions*.*
➢ C:\FMS5\Bin\Guard.ini
➢ C:\FMS5\Config\NodeLocal.xml
➢ C:\FMS5\Config\NodePassword.xml
➢ C:\FMS5\Config\ServerOptions.xml (Only if FMS OPC UA SVR option is installed)
➢ C:\FMS5\Config\OPCUAClientOptions.xml
➢ C:\FMS\Maps*NodeName*.jpg
➢ C:\FMS\Maps*NodeName*.xml
➢ C:\FMS5\Node*NodeName*.xml
➢ C:\FMS5\Node\AlarmGroups*.* (And Sub folders)
➢ C:\FMS5\Template*.* (AeroTrak+ instrument Template files)
➢ C:\FMS5\PKI*.* (And Sub folders, only if FMS OPC UA SVR option is installed)
➢ C:\FMS5\Translations*.* (And Sub folders, only for Non-English FMS5 Interface)

References-Technical Bulletins

- TCC-121—FMS 520 Historic Driver Setup Configuration
- TCC-123—Configure Operation Cleaning Cycle Recipe
- TCC-137—FMS 530 FMS Alarm Group with Messages Setup Configuration

Revision History

Revision	Released	Description
A	1 February 2023	Initial Release
B	27 March 2023	Updated formatting
C	15 October 2023	Updating A+100 PBD

Knowledge Beyond Measure.