TSI® FMS 5 SOFTWARE HOW TO CONFIGURE AEROTRAK®+ REMOTE PARTICLE COUNTERS

TECHNICAL BULLETIN-TCC-165 (US)
(9/6/2019) Rev B

Contents

Description

This procedure explains, with different scenarios, how to configure the AeroTrak®+ Remote Particle Counters [both with pump (6000 Series) and without pump (7000 Series)] in FMS 5.

Different scenarios include:

- Domain corporate or dedicated network allowing the use of multicast addressing.
- Domain corporate or dedicated network which do not allow multicast addressing.
- Configuring particle counter with pre-saved FMS templates, with or without multicast addressing.
- Configuring particle counter with pre-saved TSI Remote APP templates without multicast addressing.

The fast alarming feature (Instant Alarm or 1 second data) of all AeroTrak+ Remote Particle Counters are covered in Technical Bulletin TCC-174.

The instructions and examples explained herein are using the FMS pharmaceutical screen layout.

Prerequisites

- This procedure is only valid for FMS 5.5 or above with use of all AeroTrak+ Remote Particle Counters.
- Prior to configuring FMS for use with all AeroTrak+ Remote Particle Counters, instruments must be configured with the TSI Remote APP Software. The following technical bulletins are available for your reference.
  - TCC-167—How to Setup AeroTrak+ Remote Particle Counter (7000 Series).
  - TCC-166—How to Setup AeroTrak+ Remote Particle Counter with Pump (6000 Series).
- Windows® Firewall Inbound Rule is set to allow multicast on UDP port 5000 or any other port that has been assigned by network administrator.

Assumptions

- All AeroTrak+ Remote Particle Counters that will be configured in FMS have the following network setup when delivered.
  - ✓ **TCP/IP Address**..... 192.168.200.90
  - ✓ **Gateway Address**..... 192.168.200.1
  - ✓ **Subnet Mask**..... 255.255.255.0
  - ✓ **Multicast Address** 239.100.100.1
  - ✓ **Multicast Port**..... 5000
- Prior to configuring instruments in FMS, the instrument must first be setup with the following network settings with application software (see table below).

	Example 1	Example 3	Example 3	Example 4
TCP/IP Address	192.168.1.61	192.168.1.62	192.168.1.63	192.168.1.64
Gateway Address	192.168.1.1	192.168.1.1	192.168.1.1	192.168.1.1
Subnet Mask	255.255.255.0	255.255.255.0	255.255.255.0	255.255.255.0
Location	ROOM_100	ROOM_200	ROOM_300	ROOM_400
FMS Unit Name	U_A_PLUS_RWP_6301	U_A_PLUS_RWP_6301_2	U_A_PLUS_RWP_6301_3	U_A_PLUS_RWP_6301_4
FMS Sample Point Name	A_PLUS_RWP_6301	A_PLUS_RWP_6301_2	A_PLUS_RWP_6301_3	A_PLUS_RWP_6301_4

- Instruments will be configured as follows in FMS.
  - ✓ **Start Delay Time** ..... 0 sec
  - ✓ **Sample Time** ..... 60 sec
  - ✓ **Hold Time** ..... 0 sec

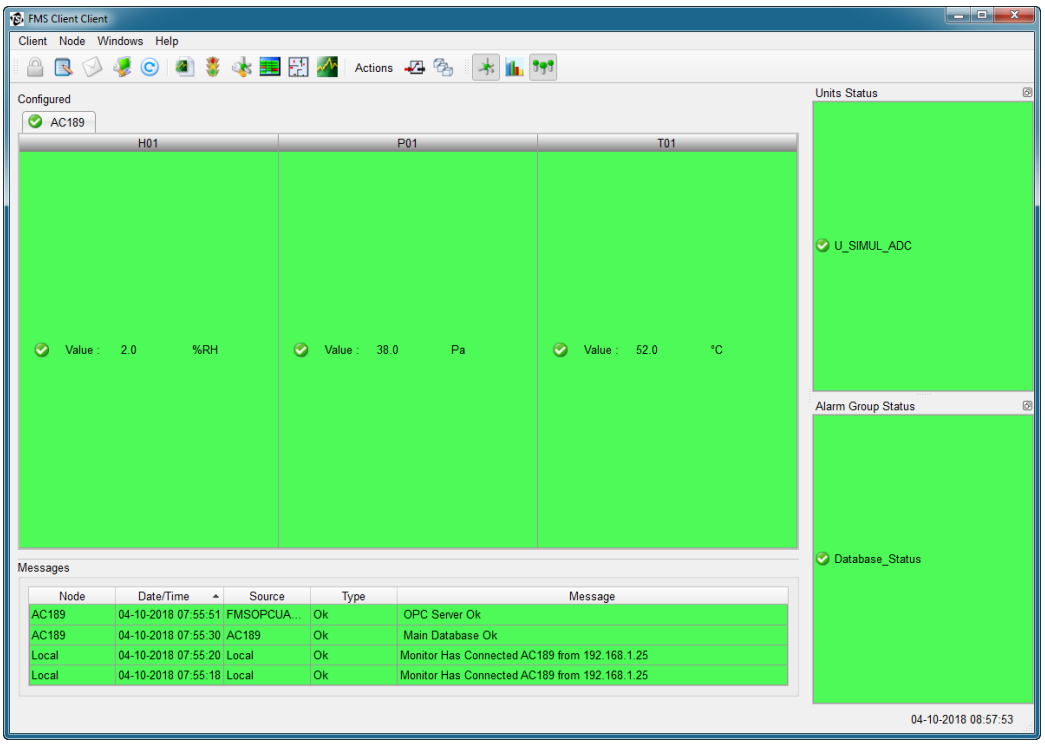
Configuration of All AeroTrak+ Remote Particle Counters in FMS

Adding Instrument with Multicast

For this example, the following settings are assumed for all instruments.

	Example 1
TCP/IP Address	192.168.1.61
Gateway Address	192.168.1.1
Subnet Mask	255.255.255.0
Location	ROOM_100
FMS Unit Name	U_A_PLUS_RWP_6301
FMS Sample Point Name	A_PLUS_RWP_6301

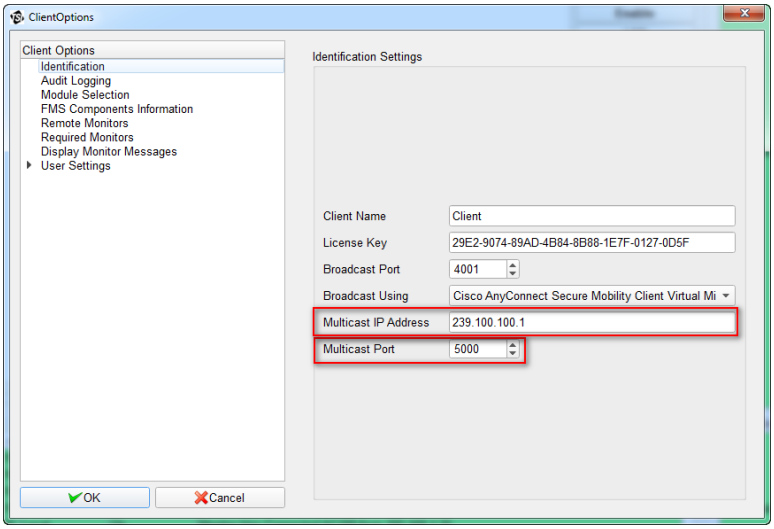
1. Start **Guard Service**.
2. Start FMS Client.

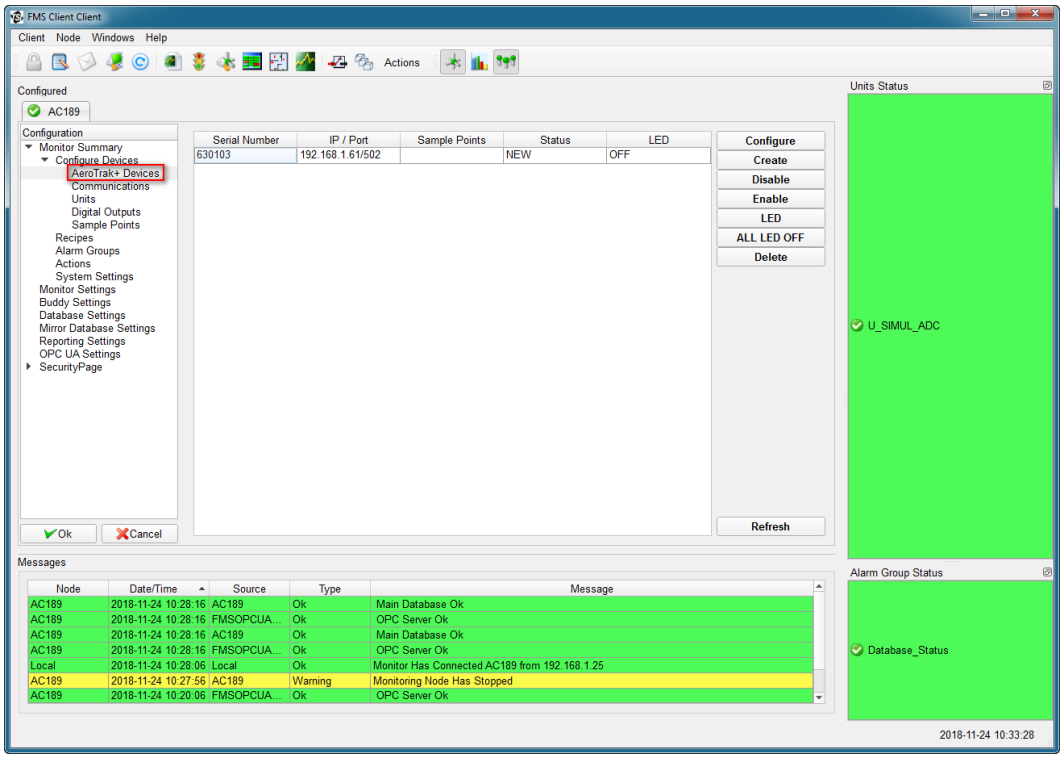


3. Go to **Client** menu and select **Client Options.**
4. Verify that the following settings are set according to the instrument setup.

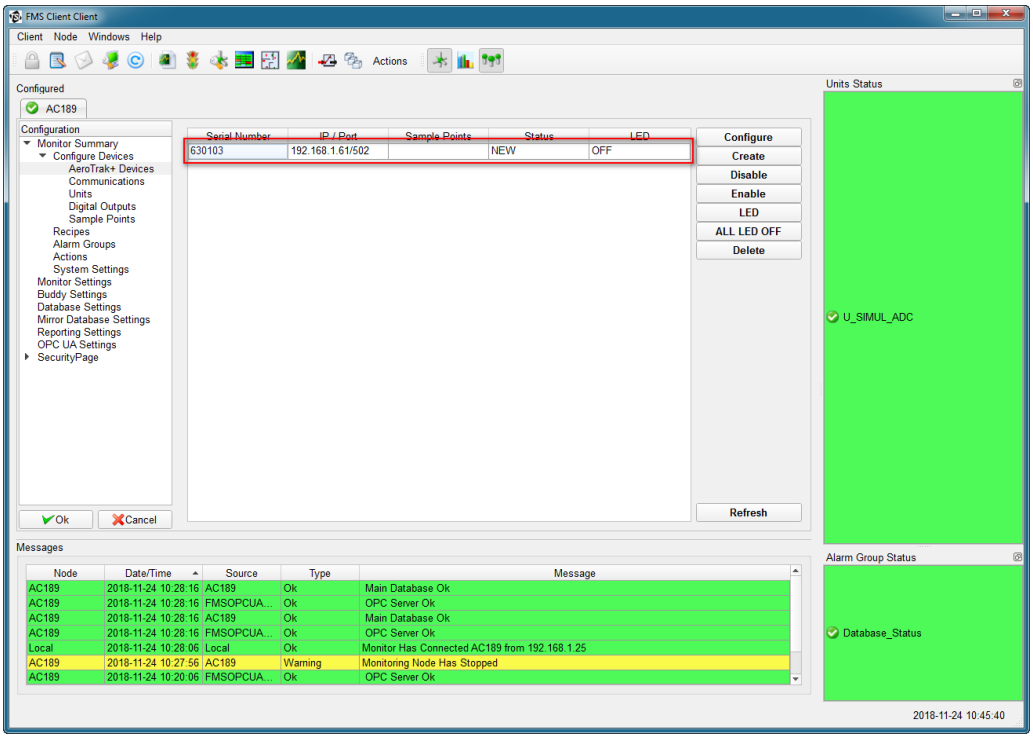
Multicast IP Address.....	Default Address is 239.100.100.1
Multicast Port.....	Default Value is 5000

5. If one of the above settings is changed, click **OK** and restart **FMS Client**.
6. If one of the multicast settings is changed, the corresponding settings will need to be changed on the instrument.
7. Go to **Configure Node**.
8. Expand **Monitor Summary**.
9. Expand **Configure Devices**.
10. Click **AeroTrak+ Devices**.





11. When **Multicast Address** is enabled on the instrument, the instrument will automatically be listed in FMS to configure and **NEW** will display in the **Status** column.



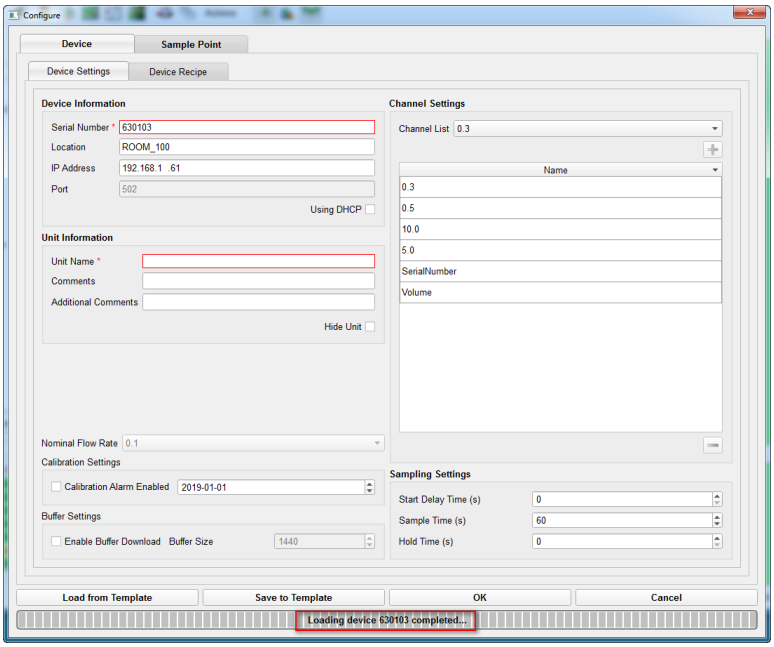
12. The different **Status** levels of the instrument include:

NEW	New instrument needs to be configured.
PENDING	Instrument configured but waiting for FMS configuration to be saved. *or* Instrument modified but waiting for FMS configuration to be saved.
CONNECTED	Instrument and FMS have established a connection.
DISCONNECTED	Instrument is disconnected from the network.
SAMPLING	Instrument is configured, enabled, and sampling.
DISABLED	Instrument is set to disabled.

13. Select the instrument by clicking on the **Serial Number**.
14. Click **Configure**.

15. **Device Settings** tab will display.

    At this time, FMS is loading the settings already set in the instrument during setup.



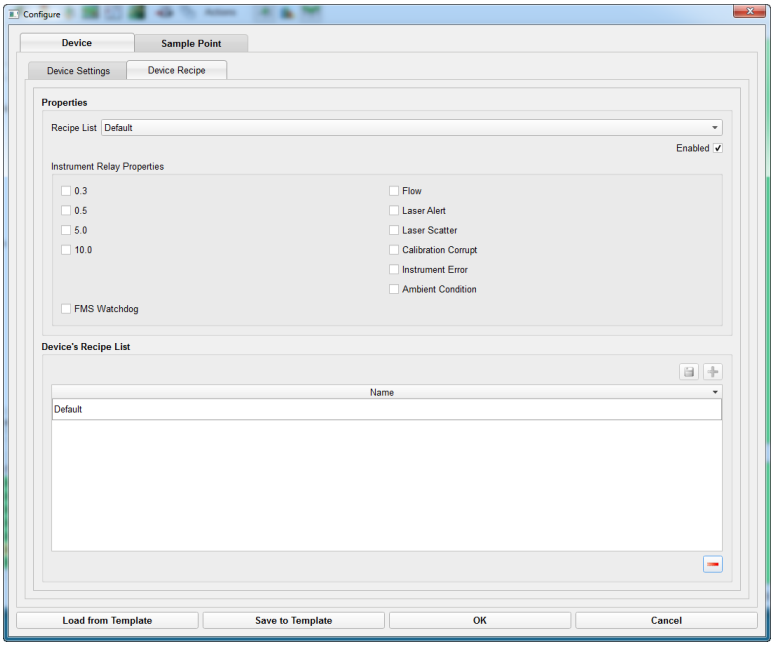
DEVICE INFORMATION	
Serial Number	When instrument is listed from the multicast network, the serial number is automatically read from the instrument.
Location	Location name can be changed and will be retained in instrument after saving the configuration.
IP Address	The IP address of the instrument. This is used by FMS to configure the instrument and collect data from it.
Port	Modbus port number to communicate with instrument. Default value is 502.
Using DHCP	Enabling DHCP mode will automatically disable **IP address** selection. **NOTE:** When using DHCP mode, be sure the DHCP server will always assign the same IP address when lease time expires.
UNIT INFORMATION	
Unit Name	Enter the name for the instrument.
Comments	Enter comments about the instrument.
Additional Comments	Enter additional comments about the instrument.
Hide Unit	Enabling Hide Unit will hide the instrument from the unit status window on the main screen.
Nominal Flow Rate	Nominal flow rate of the instrument.
CALIBRATION SETTINGS	
Calibration Alarm Enabled	According to the date entered, FMS 5 will start generating warnings that the calibration date for the instrument is approaching.

BUFFER SETTINGS	
Enable Buffer Download	If checked, FMS will download, from the device buffer, the number of samples entered in **Buffer Size** after recovering from a communication issue. Default selection is disabled.
Buffer Size	Number of samples to be downloaded when **Enable Buffer Download** is enabled. **Default Value** 1440 **Max Value** 256000
CHANNEL SETTINGS	
Channel List	List of all possible channels. This is only used when **Create** is selected.
	By default, both icons are grayed out when the channel name list is automatically populated when **multicast address** is used.
Name	List of channels that are available on instrument. This list will be populated when multicast address is used. This is only editable when **Create** is selected. This list **MUST** contain all instrument channels as it is used to build the database sample point table.
SAMPLING SETTINGS	
Start Delay Time	Delay before instrument starts to sample.
Sample Time	Sampling time.
Hold Time	Time between each sample.

16. Enter the following settings to configure the instrument.

Serial Number	**DO NOT** change as it is read direct from the instrument.
Location	Enter the location where instrument is installed. **ROOM_100**
IP Address	**DO NOT** change as it is read direct from the instrument.
Using DHCP	Ensure **Using DHCP** is unchecked.
Unit Name	**U_A_PLUS_RWP_6301**
Comments	Enter comments about the instrument.
Additional Comments	Enter additional comments about the instrument.
Hide Unit	Unchecked.
Enable Buffer Download	Checked.
Buffer Size	For purposes of this document, either disable buffer download or select a buffer size >1.
Channel Settings	Verify that all instrument channels are listed.
Start Delay Time	0
Sample Time	60
Hold Time	0

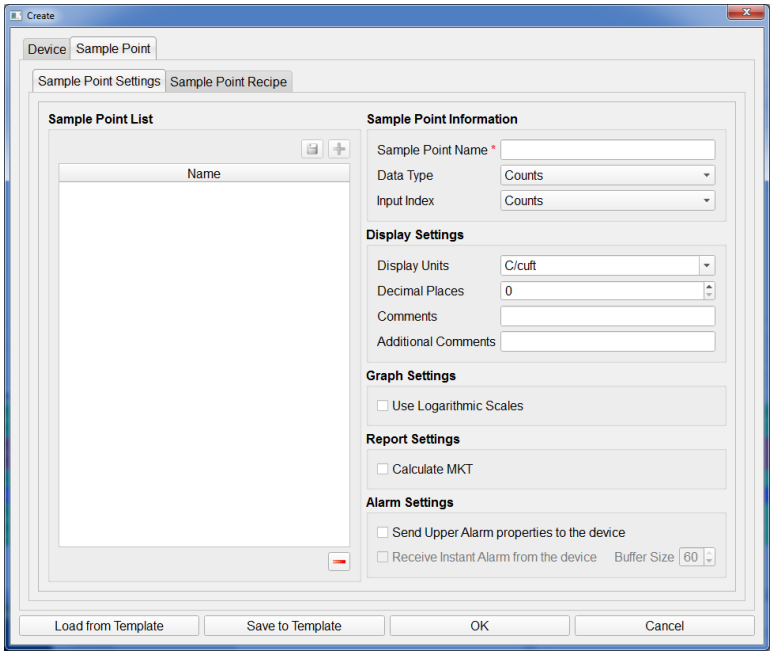
17. Click **Device Recipe** tab.



Recipe List	List of recipes created in the recipe configuration. To setup recipes, refer to section How To Use Recipes included later in this document.
Enable	When checked, the instrument is enabled for the recipe selected in the **recipe list**.
Instrument Relay Properties	List of triggers used by the instrument to trigger internal relay. **NOTE:** If the FMS watchdog is checked, all other alarm selections will be grayed out.
Device Recipe List	List of recipes created for this instrument.
	Click to add a new recipe.
	Click to save recipe settings.
	Click to delete a selected recipe.

18. After changes are made, click **Save**.

19. Click **Sample Point** tab.



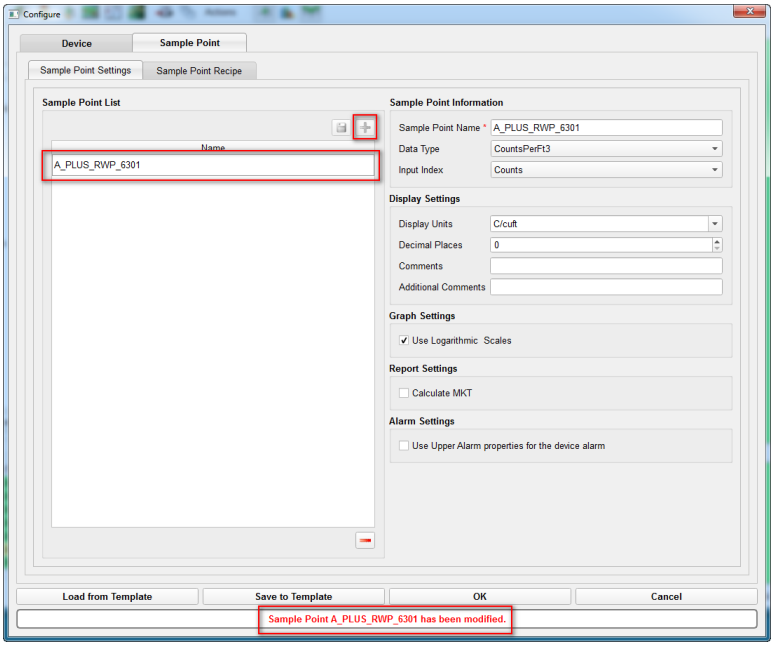
SAMPLE POINT INFORMATION	
Sample Point Name	Name must start with letter A to Z and may not contain spaces. Underline character is allowed. **NOTE:** Maximum of 32 characters allowed.
Data Type	Selections include: • Counts • CountsPerFt3 • CountsPerM3 • ScaledCountsPerM3 • InstantAlarm(Counts)
Input Index	Select: • Counts
DISPLAY SETTINGS	
Display Units	Select the display unit to be associated with this sample point.
Decimal Places	Select the desired number of decimal places.
Comments	Enter comments to describe this sample point.
Additional Comments	Enter any additional comments to describe this sample point.
GRAPH SETTINGS	
Use Logarithmic Scale	Enable/disable **Logarithmic Scale** for use on the inspect windows graph tab.
REPORT SETTINGS	
Calculate MKT	Enable/disable **Mean Kinetic Temperature** (MKT) calculation. Calculating MKT is a way of expressing the overall effect of temperature fluctuations during storage or transit of perishable goods.

ALARM SETTINGS	
Send Upper Alarm	When checked, the value of the upper alarm level set on the **Sample Point Recipe** tab will be stored in the instrument. When used in conjunction with channels that are enabled in the **Instrument Relay Properties** on the **Device Recipe** tab, you can setup the instrument to enter its own alarm mode and trigger its relay.
Receive Instant Alarm	When used in conjunction with **Upper Alarm** settings on the **Sample Point Recipe** tab, you can setup the instrument to generate Instant Alarm data and send it to FMS.
Buffer Size	This is the size of the Rolling Buffer used by the instrument to generate an Instant Alarm.
Sample Point List	List of sample points created for the instrument.
	Click to add a new sample point.
	Click to save the sample point modifications.
	Click to delete a sample point associated to the instrument.

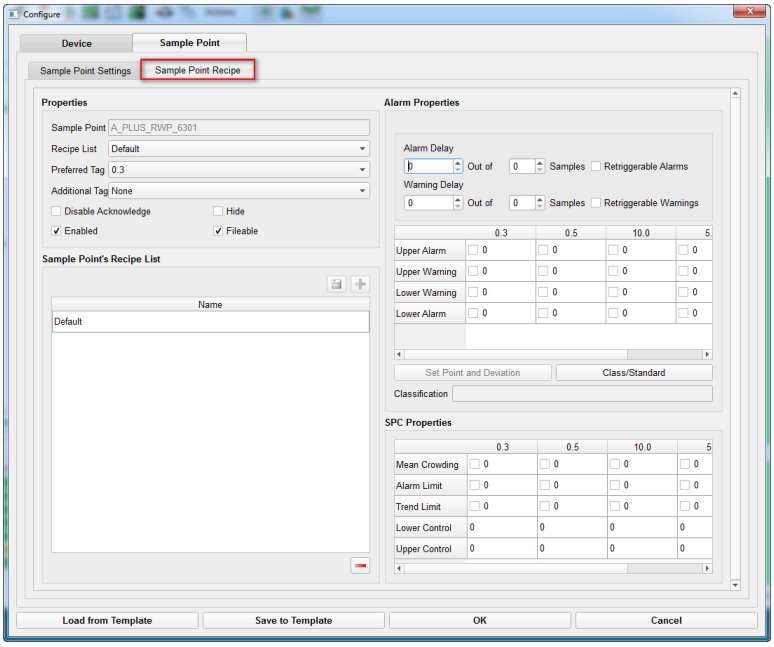
20. Enter the following information to configure the instrument.

Sample Point Name	A_PLUS_RWP_6301
Data Type	CountsPerFt3
Input Index	Counts
Display Units	C/cuft
Decimal Places	0
Use Logarithmic Scale	Enabled
Calculate MKT	Disabled

21. Click + icon to add sample point.



22. Click **Sample Point Recipe** tab.

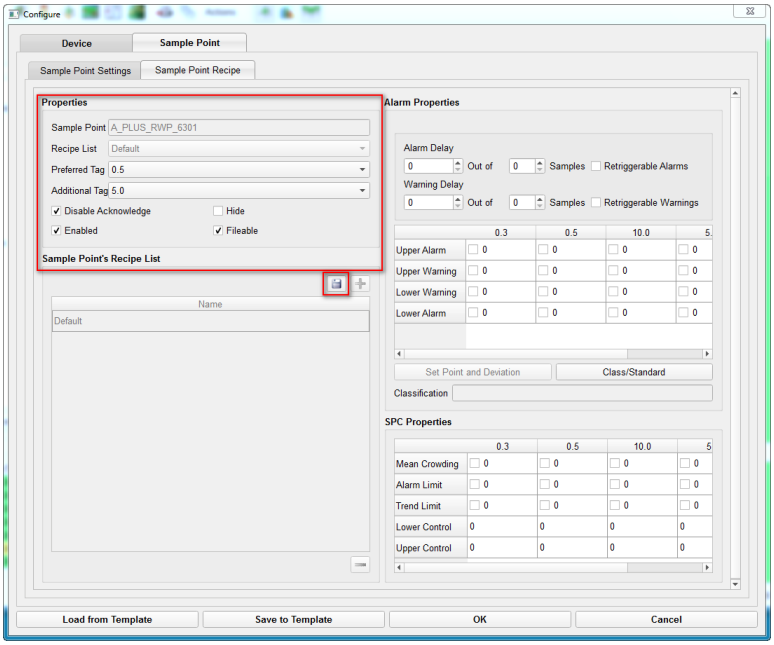


PROPERTIES	
Sample Point	Name created on the **Sample Point** tab.
Recipe List	List of recipes created in the recipe configuration. To setup recipes, refer to section How to Use Recipes included later in this document.
Preferred Tag	Preferred tag to show values on the main screen.
Additional tag	A second tag can be shown simultaneously with the preferred tag on the main screen.
Disable Acknowledge	Enable/disable alarm acknowledgement.
Enabled	Enable/disable **sample point**.
Hide	Hide/unhide the **sample point** from the main screen.
Fileable	Enable/disable data storage for the **sample point.**
ALARM PROPERTIES	
Refer to section How to Setup Alarms included later in this document for a detailed description on how to setup alarms.	
SPC PROPERTIES	
Statistical Process Control (SPC) is used for environmental sensors. Limits can be configured to provide more sophisticated warning and control strategies. Refer to section SPC Properties included later in this document for a detailed description on how to setup SPC.	

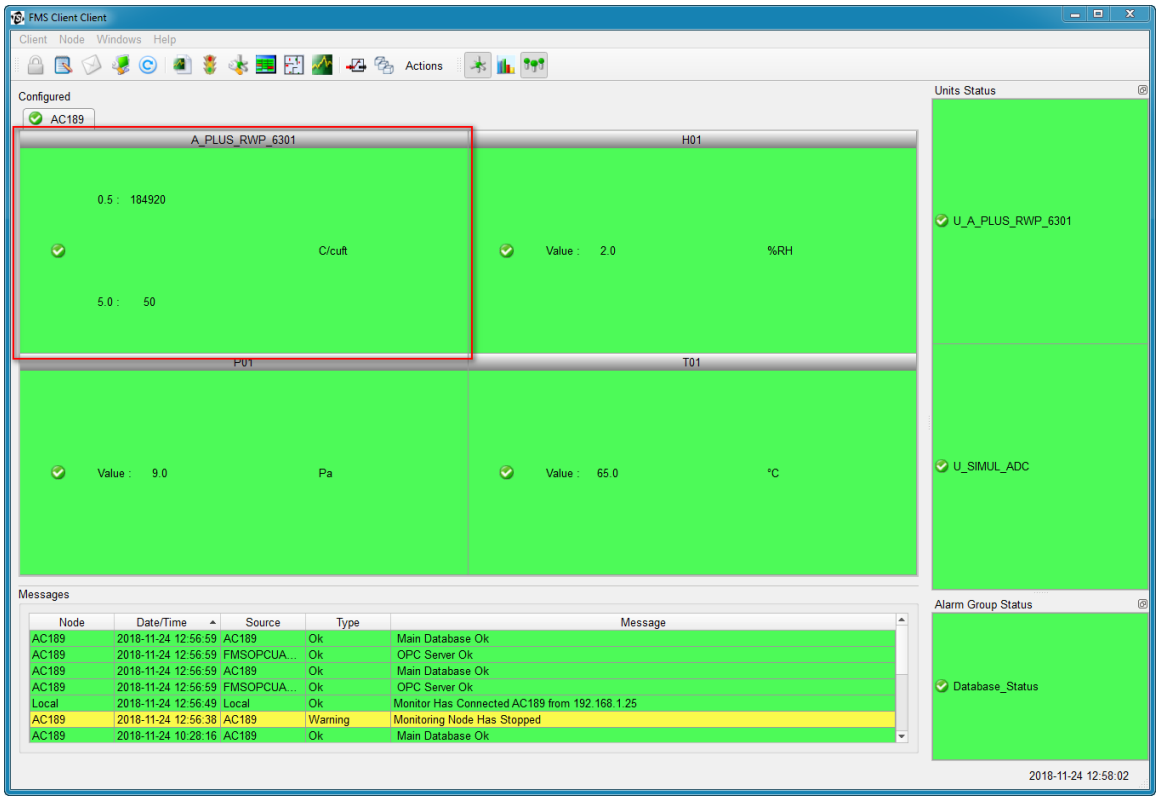
23. Enter the following information to configure the instrument.

Recipe List.....	A_PLUS_RWP_6301
Prefer Tag.....	0.5
Additional Tag.....	5.0
Disable Acknowledge.....	Checked
Enabled.....	Checked
Hide.....	Unchecked
Fileable.....	Checked

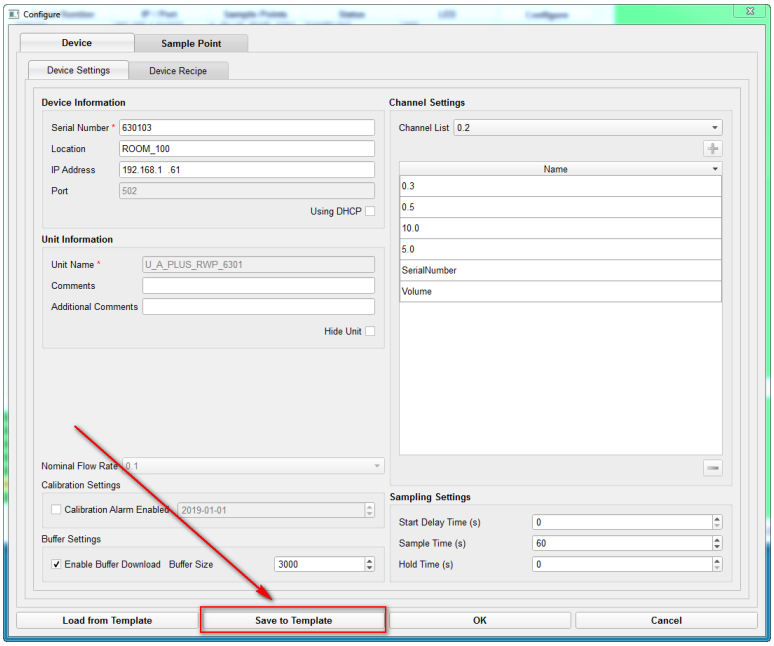
24. Click  icon to save.
25. Click **OK** to exit **AeroTrak+ Devices** configuration screen.
26. Newly configured instrument is now listed in **PENDING**, waiting for settings to be applied to the instrument.
27. Click **OK**.
28. Click **Save** to save FMS configuration.
29. Click **Yes** to reboot the monitor.



30. After monitoring node is restarted, the sample point displays on the screen and the instrument will start sampling.



31. When finished creating the new instrument and sample point, it is possible to save the different settings used and create a template for future use when adding new instruments and sample points.
32. To do this, go to **Configure Node**.
33. Expand **Monitor Summary**.
34. Expand **Configure Devices**.
35. Click **AeroTrak+ Devices**.
36. Select the instrument from which to save the settings as a template.
37. Click **Configure.**
38. Click **Save to Template**.
39. When the **Save File** dialog screen opens, enter a valid name to reference this template (i.e., **RWP_6301).**
40. Click **Save**.
41. When template is saved, click **Cancel** to exit configuration screen.



Adding Instrument without Multicast

A company IT Administrator may communicate that multicasting is not allowed on their network. If this should happen during instrument setup, the multicast capability will need to be set to disabled.

In this instance, the following settings are assumed for the instrument.

	Example 2
Instrument Serial Number	123456
TCP/IP Address	192.168.1.62
Gateway Address	192.168.1.1
Subnet Mask	255.255.255.0
Multicast	Disabled
Location	ROOM_200
FMS Unit Name	U_A_PLUS_RWP_6301_2
FMS Sample Point Name	A_PLUS_RWP_6301_2

The following steps describe how to add a new instrument when broadcasting multicast address is denied or UDP port has been blocked by IT Department.

1. Go to **Configure Node**.
2. Expand **Monitor Summary**.
3. Expand **Configure Devices**.
4. Click **AeroTrak+ Devices**.
5. Click **Create**.

6. Enter the following settings.

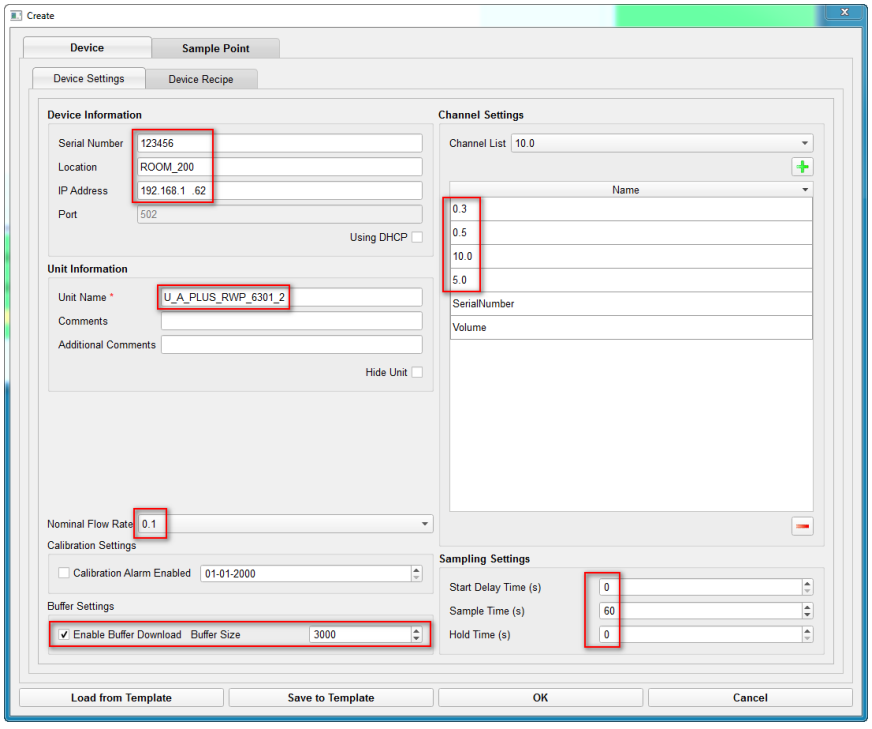
Serial Number.....	123456
Location.....	ROOM_200
IP Address.....	192.168.1.62
Unit Name	U_A_PLUS_RWP_6301_2
Nominal Flow Rate.....	Select Device Flow Rate
Enable Buffer Download.....	Checked
Buffer Size.....	3000
Start delay Time	0
Sample Time.....	60
Hold Time.....	0

7. From the drop-down **channel list,** select the size for the first channel corresponding to the instrument you want to add (i.e., **0.3**) and click  icon.

8. Repeat previous step for all the other sizes (i.e., **0.5, 5.0, 10.0**).

IMPORTANT NOTE

Ensure all the channels available on the instrument are correctly added during this step as they will not be changeable after saving the device configuration.



9. Click **Device Recipe** tab.

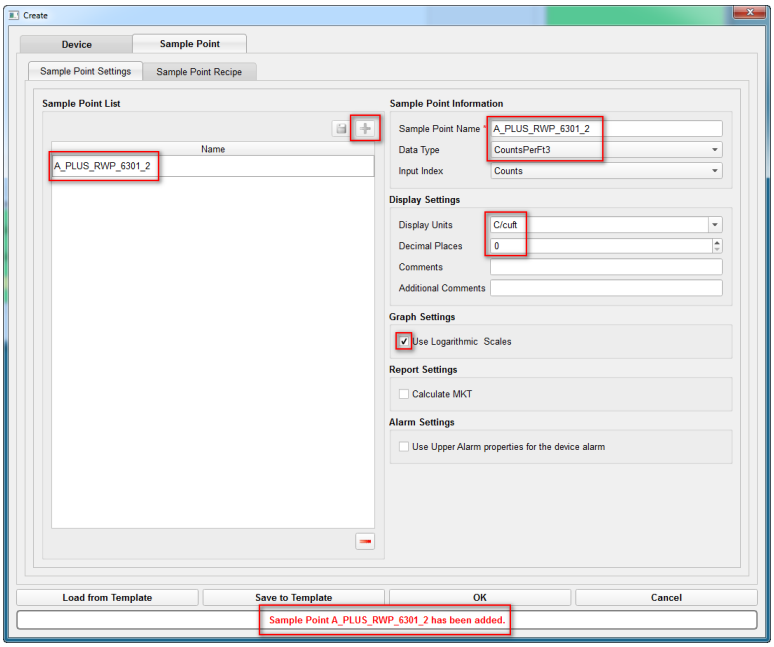
10. Verify **Enabled** is checked.

11. Click **Sample Point** tab and then **Sample Point Settings**.

12. Enter the following settings.

Sample Point Name	A_PLUS_RWP_6301_2
Data Type.....	CountsPerFt3
Display Units.....	C/cuft
Decimal Places.....	0
Use Logarithmic Scale.....	Enabled

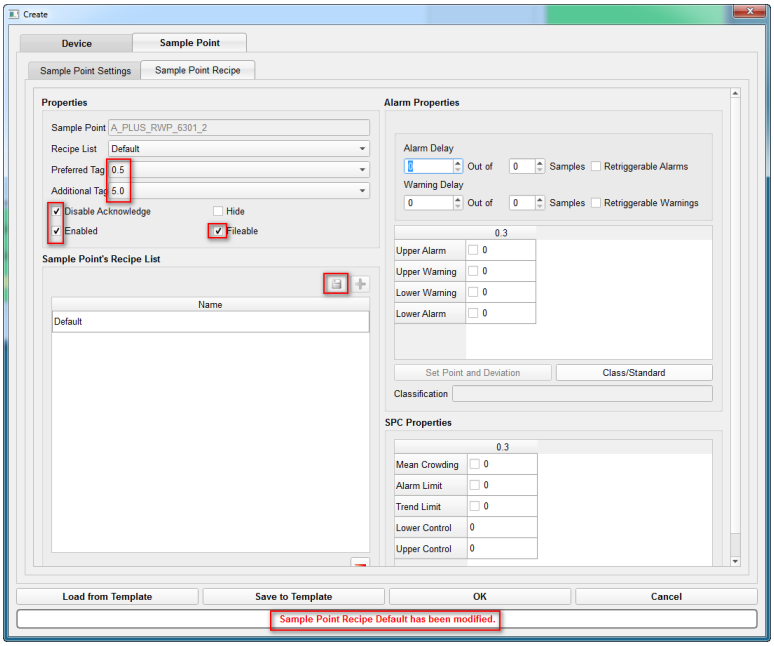
13. Click  icon to add this sample point name to the **sample point list**.
14. Click  icon to save if any changes are made in **sample point settings** after adding it.
15. Click **Sample Point Recipe**.



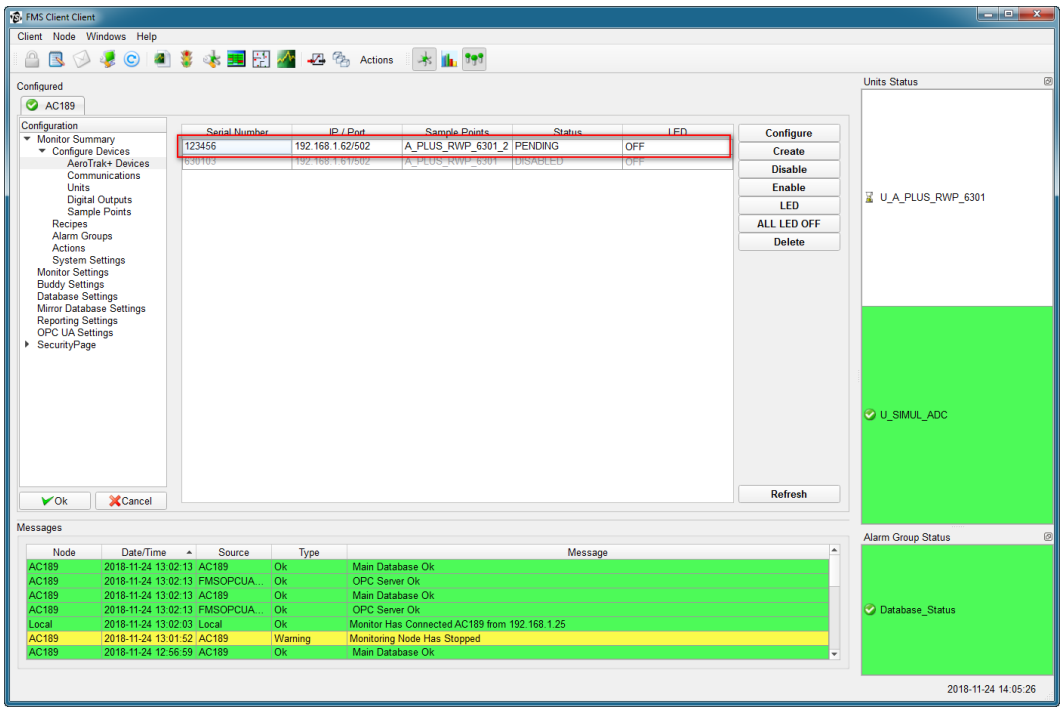
16. Enter the following information.

Prefer Tag.....	0.5
Additional Tag.....	5.0
Disable Acknowledge.....	Checked
Enabled	Checked
Fileable.....	Checked

17. Click  icon to save.
18. To setup alarms properties and SPC properties, refer to How to Setup Alarms included later in this document.
19. Click **OK**.

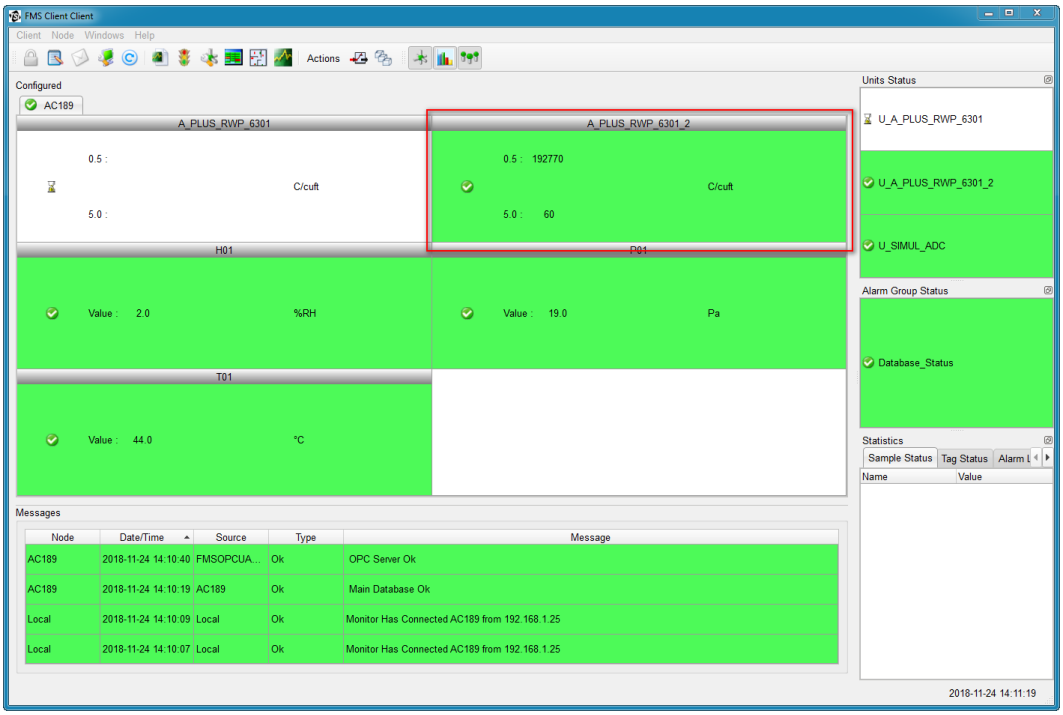


20. New instrument is now appended to the **AeroTrak+ Devices** list.



21. Click **OK** to save your configuration and to send the configuration to the instrument.

22. After monitoring node restarts, the sample point will display on the screen and the instrument will start sampling.



Creating a New Instrument with Templates and Multicast Disabled

When broadcasting multicast address is not allowed, the following steps outline how to add a new instrument in FMS using a prefilled **template**. The **template** used is the one created in section Configuration of New AeroTrak+ Remote Particle Counter in FMS.

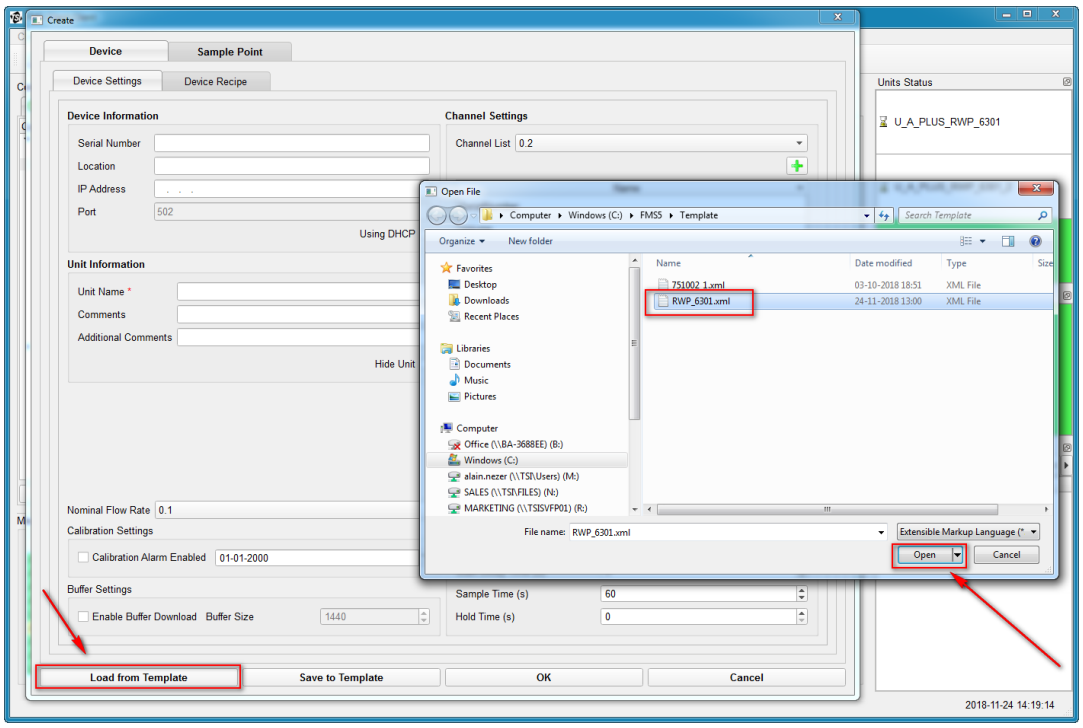
For this example, the following settings are assumed for the instrument.

	Example 3
Instrument Serial Number.....	654321
TCP/IP Address.....	192.168.1.63
Gateway Address.....	192.168.1.1
Subnet Mask.....	255.255.255.0
Location.....	ROOM_300
FMS Unit Name.....	U_A_PLUS_RWP_6301_3
FMS Sample Point Name.....	A_PLUS_RWP_6301_3

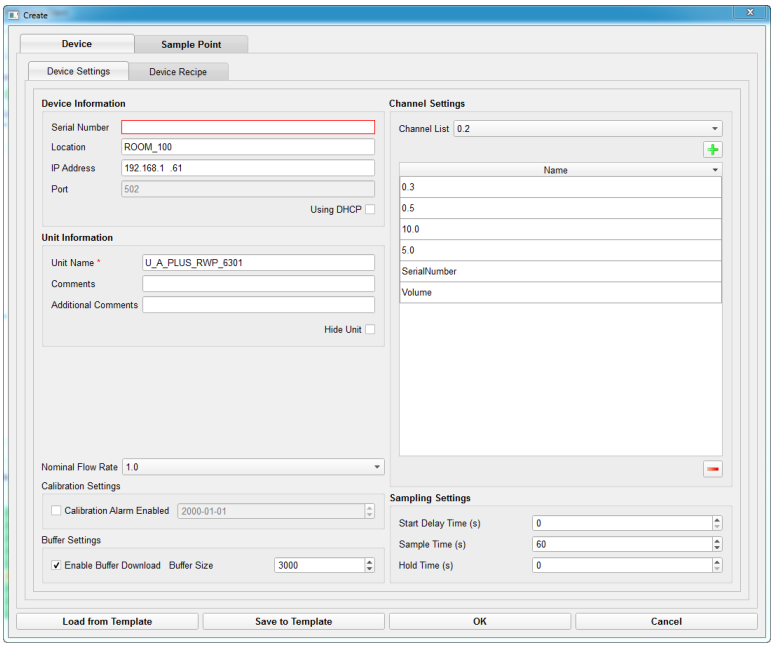
1. Go to **Configure Node**.
2. Expand **Monitor Summary**.
3. Expand **Configure Devices**.
4. Click **AeroTrak+ Devices**.
5. Click **Create**.
6. Click **Load from Template**.

7. Select **Template file** created in step [Configuration of All AeroTrak+ Remote Particle Counters in FMS.]

8. Click **Open**.



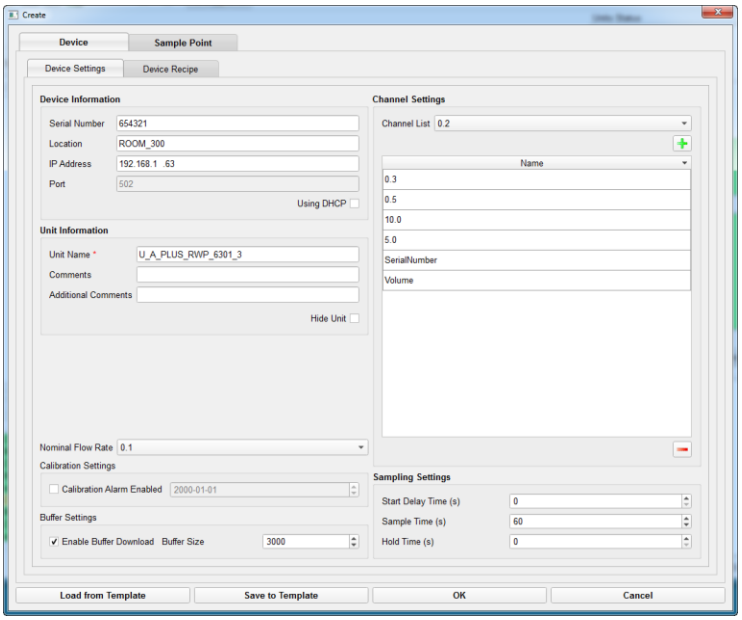
9. The Device Settings tab is now prefilled with settings that were saved in the **template**.



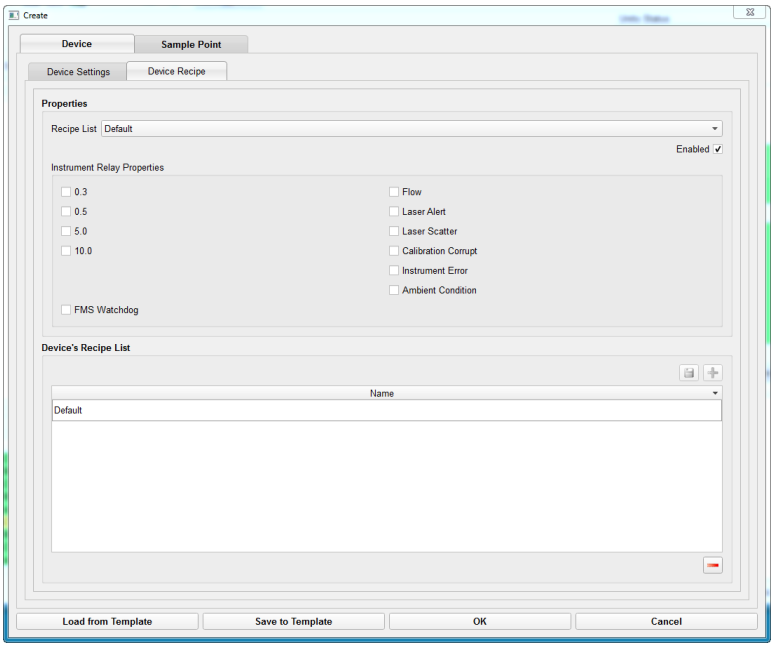
10. It is very important to enter the correct values for the following fields as FMS **DOES NOT** change these settings in the instrument except for **Location.**

Instrument Serial Number.....	654321
TCP/IP Address.....	192.168.1.63
Location.....	ROOM_300
FMS Unit Name.....	U_A_PLUS_RWP_6301_3
FMS Sample Point Name.....	A_PLUS_RWP_6301_3
Nominal Flow Rate.....	Select Device Flow Rate
Enable Buffer Download.....	Checked
Buffer Size.....	3000

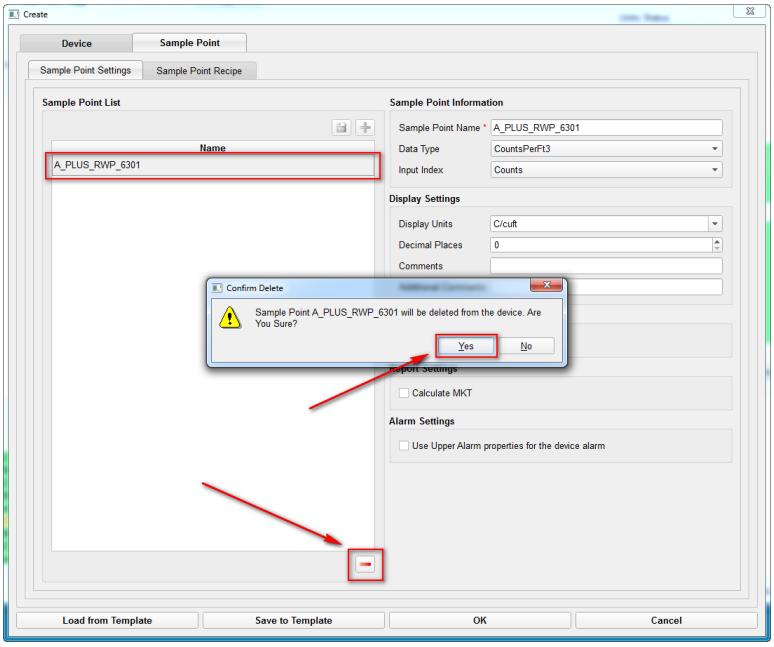
11. The **Unit Name** must be changed and be unique in FMS to avoid any conflict.
12. Change all other settings as needed like **Location**, **Comments**, etc.
13. Verify the correct list of **Channel Settings**. If needed, sizes can be removed from the **name** list and new sizes can be added to reflect the correct sizes of the instrument you want to add.
14. Click **Device Recipe** tab.



15. Set all the **properties** for the **device recipe** based on the **recipe** selected from **recipe list**. **REMEMBER** to click the icon to save any changes.
16. For information on instrument relay properties, refer to How to Setup Alarms.

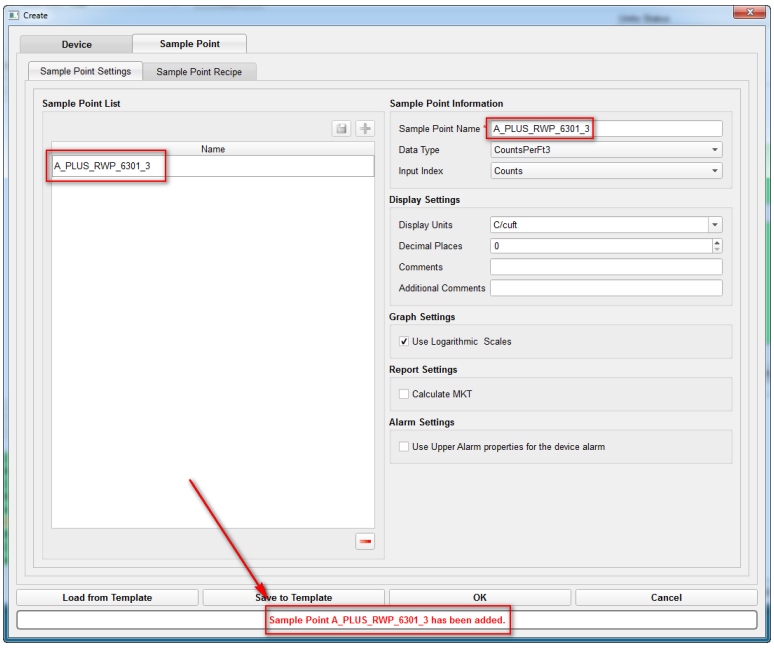


17. Click **Sample Point** tab.
18. Select the **sample point name** that was saved in the **template** and click  icon to remove it from the **sample point list** associated with the instrument being created.
19. A confirmation popup to delete the selected **Sample Point Name** will display. To confirm deletion, click **Yes**.
20. Change the **sample point name** to be unique in FMS, and change any other settings for this sample point.

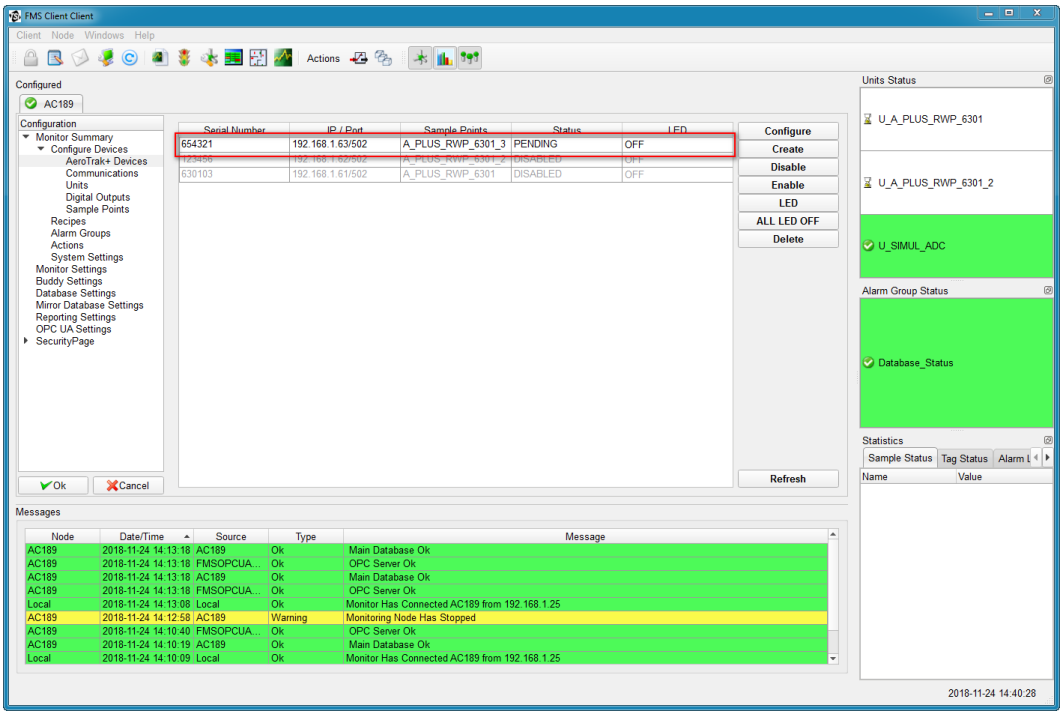


21. When changes are complete, click  icon to add the new **sample point name**. The new **sample point** is now added.
22. Click **Sample Point Recipe** tab.
23. Set all the **properties** for the **sample point recipe** based on the **recipe** selected from **Recipe List**.

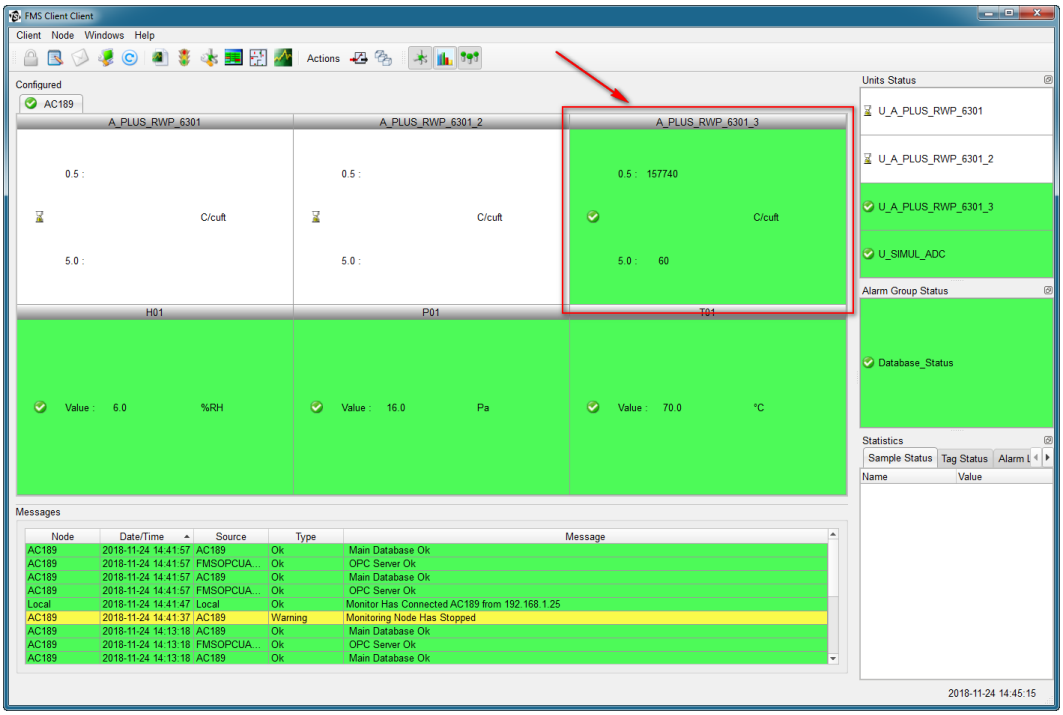
    Refer to section How to Setup Alarms included in this document for information regarding **Alarm and SPC Properties**.
24. When finished setting up the new instrument and **sample point name,** click **OK**.



25. The new instrument is now listed in the instrument window as **PENDING**.



26. Click **OK** to **save** and **exit** your configuration.
27. Click **Yes** to reboot monitor.
28. Refresh the main FMS Screen to show new **sample point.**



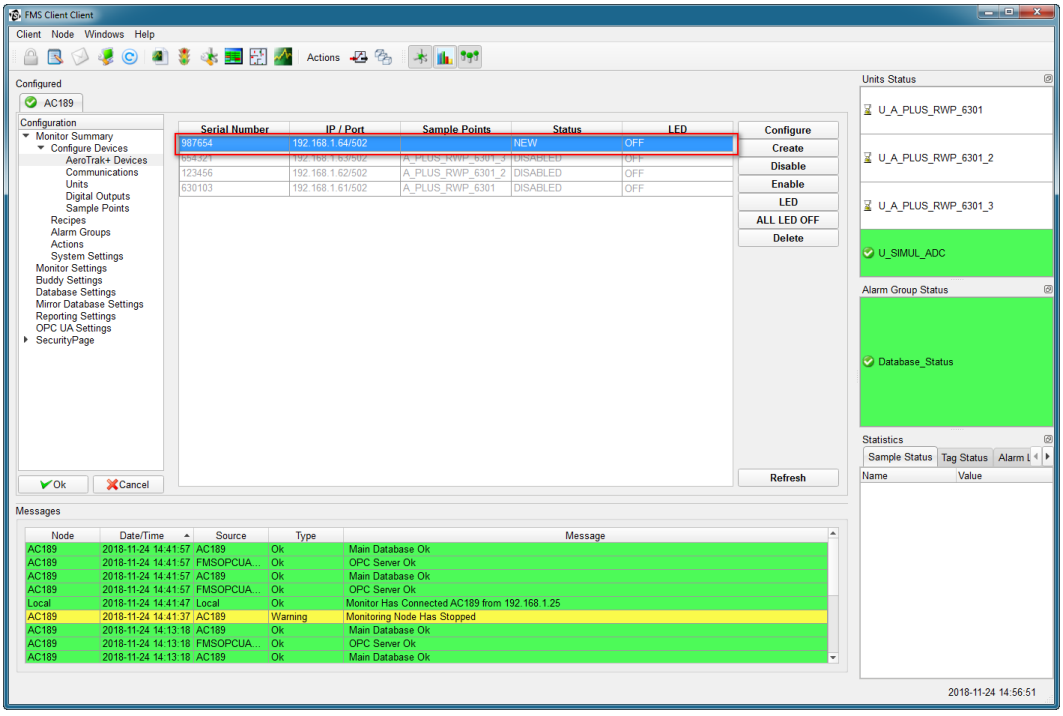
Creating a New Instrument with Templates with Multicast Enabled

When broadcasting multicast address is allowed, the following steps outline how to add a new instrument in FMS with a prefilled template. The **template** used is the one created in step Configuration of All AeroTrak+ Remote Particle Counters in FMS.

For this example, the following settings are assumed for the instrument.

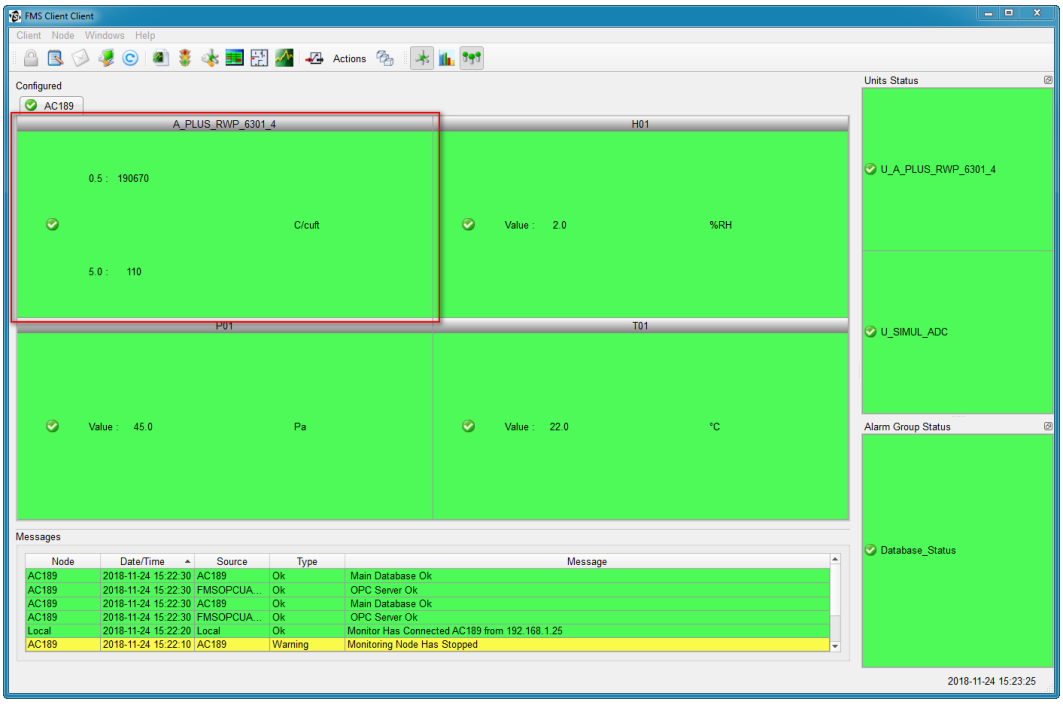
	Example 4
Instrument Serial Number.....	6301033
TCP/IP Address.....	192.168.1.64
Gateway Address.....	192.168.1.1
Subnet Mask.....	255.255.255.0
Location.....	ROOM_400
FMS Unit Name.....	U_A_PLUS_RWP_6301_4
FMS Sample Point Name.....	A_PLUS_RWP_6301_4

1. Go to **Configure Node**.
2. Expand **Monitor Summary**.
3. Expand **Configure Devices**.
4. Click **AeroTrak+ Devices**.
5. The new instrument will automatically populate the list as shown below. If not, click **Refresh** and select the new instrument.



6. Click **Configure**.
7. Click **Load from Template**.
8. From this point forward, **ALL** the configuration steps are the same as explained in Creating a New Device with Templates and Multicast Disabled.

9. After exiting and saving configuration, the new instrument **sample point name** will be shown on the FMS main screen.



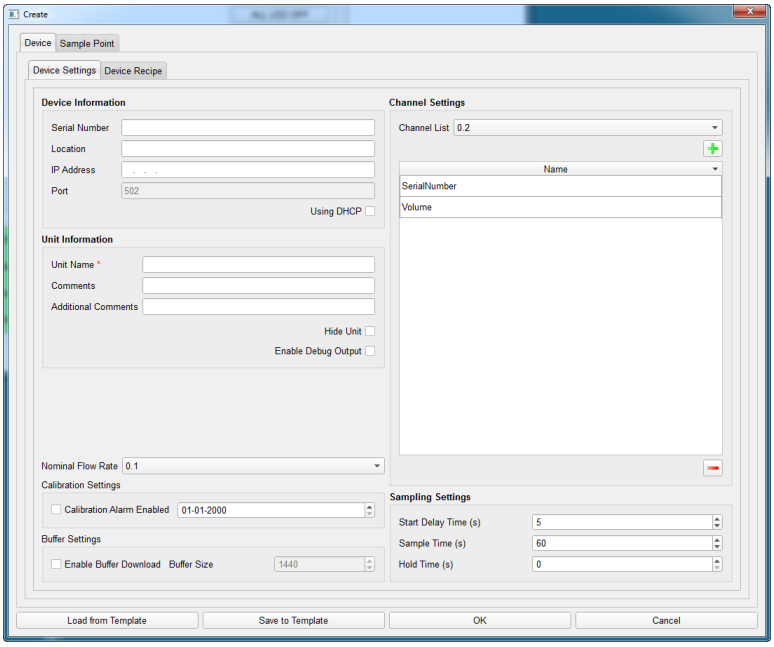
Creating a New FMS Device with a Template Exported from TSI Remote APP

To configure FMS faster, it is possible to import settings saved in an XML configuration file, which is exported with the TSI remote APP, in order to create a new FMS AeroTrak+ Remote Particle Counter.

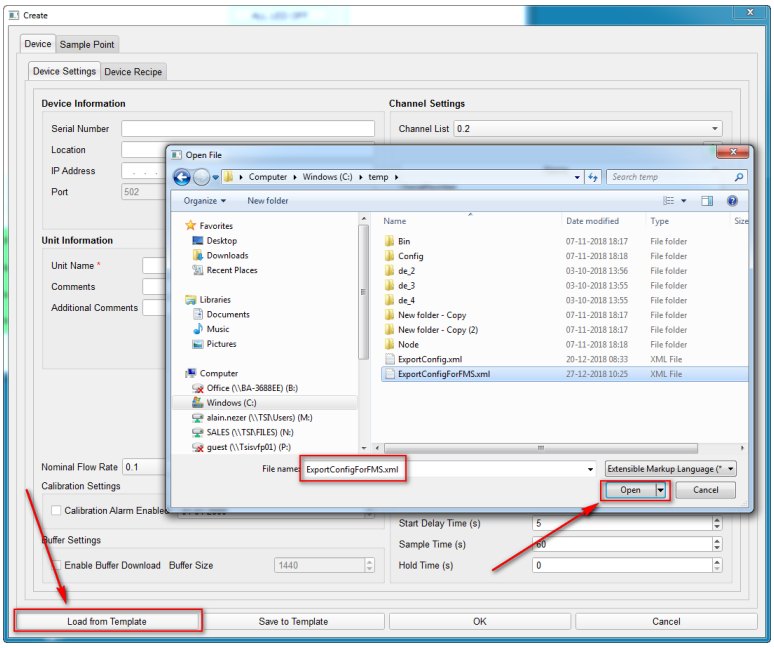
For this example, the following settings are assumed for the instrument.

	Example 5
Instrument Serial Number.....	11223377
TCP/IP Address.....	192.168.1.93
Gateway Address.....	192.168.1.1
Subnet Mask.....	255.255.255.0
Location.....	IMPORTINGINFMS
FMS Unit Name.....	APP_Imported_6301
FMS Sample Point Name.....	APP_6301

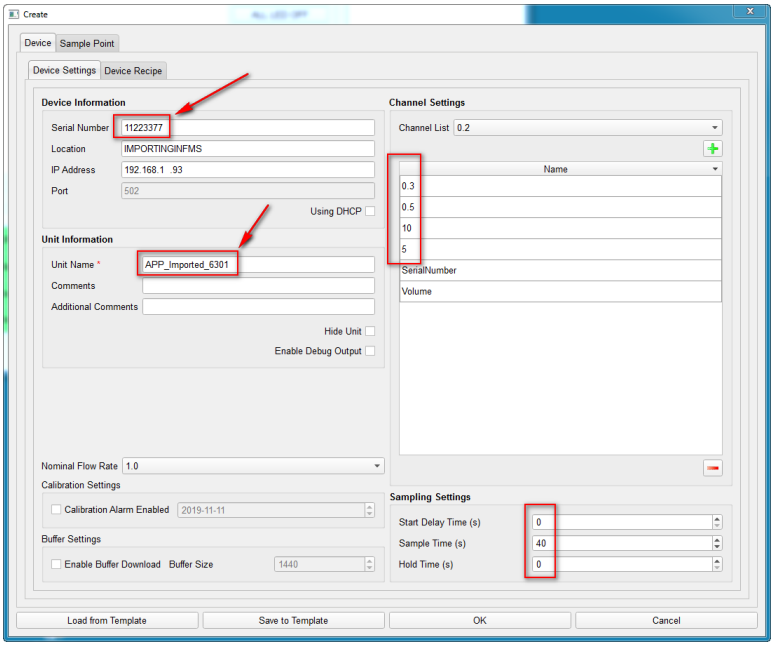
1. Go to **Configure Node**.
2. Expand **Monitor Summary**.
3. Expand **Configure Devices**.
4. Click **AeroTrak+ Devices**.
5. Click **Create**.
6. Click **Load from Template.**



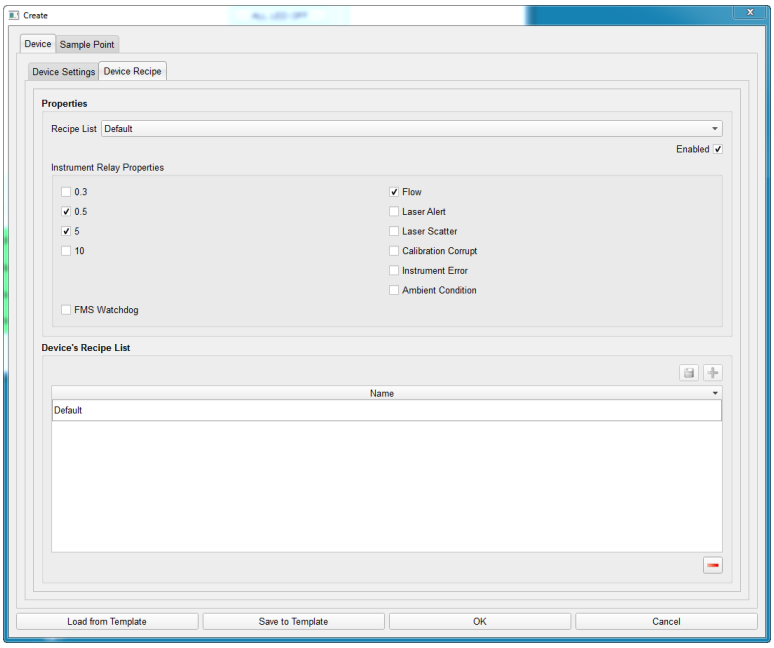
7. Locate the file that has been exported with the TSI Remote APP. Click **Open.**



8. New instrument screen will be filled with settings from the imported XML file.
9. Click **Device Settings** tab, enter the **serial number** of the instrument you are adding to FMS.
10. Enter **Unit Name**.
11. Verify all other settings**.**

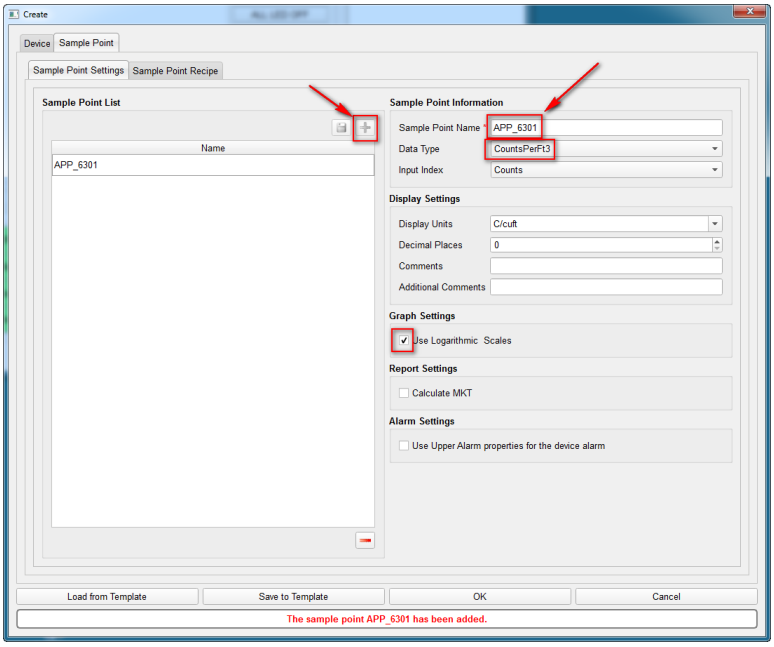


12. Click **Device Recipe** tab and verify imported settings are correct.

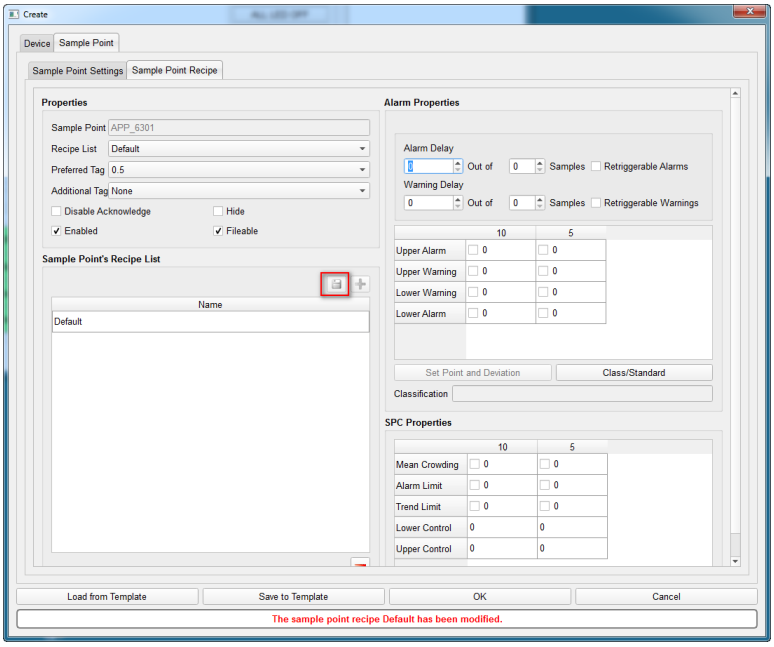


13. Click **Sample Point Settings** tab and enter the **sample point name.**
14. Verify all other settings and make changes if needed.
15. Click **+** icon to save your changes.
16. Click **Sample Point Recipe** tab and make any changes if required.

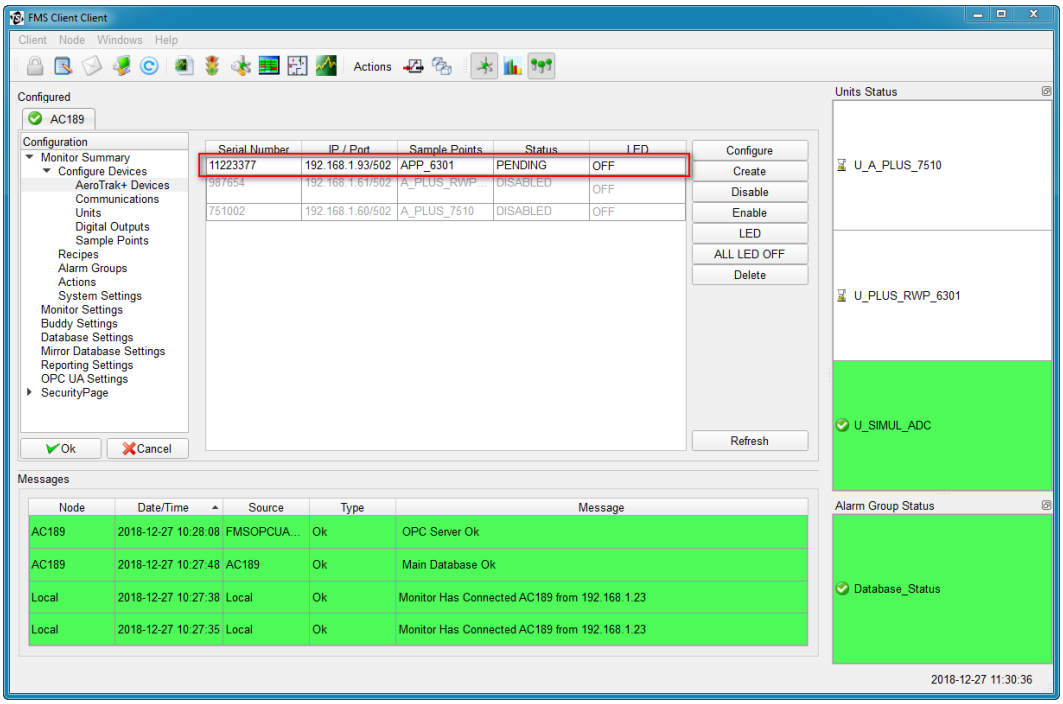
    NOTE: Any alarm values saved in the instrument with the TSI Remote APP are not imported and FMS can override those settings.



17. After changes are made, click **Save**.
18. Click **OK**.

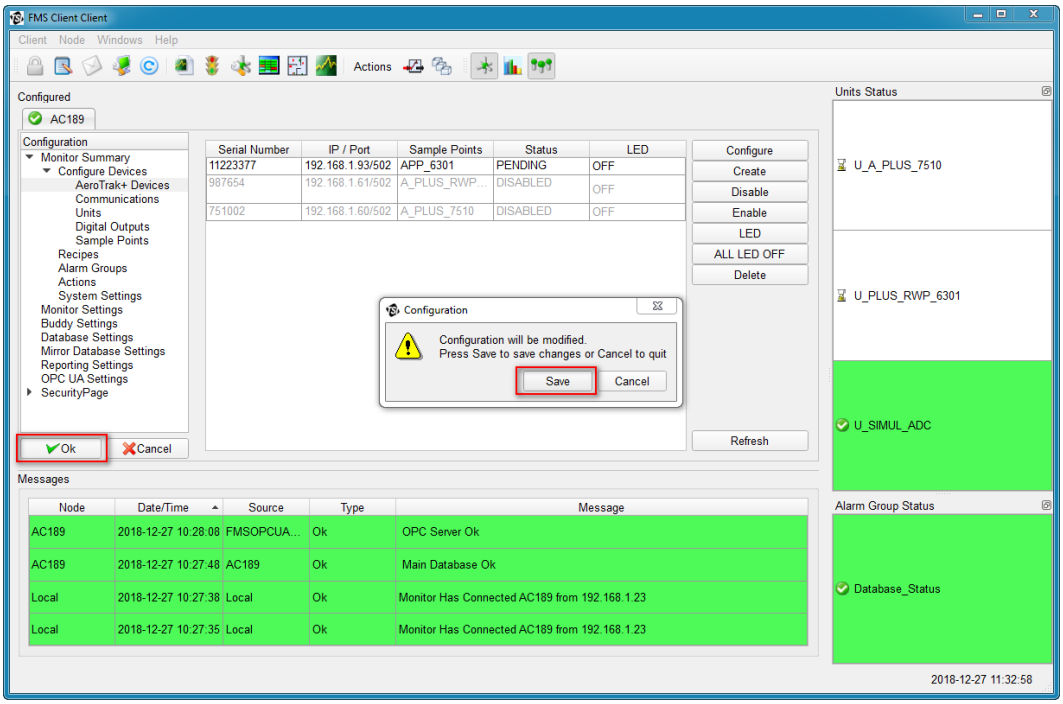


19. The new instrument is now listed as **PENDING** mode.

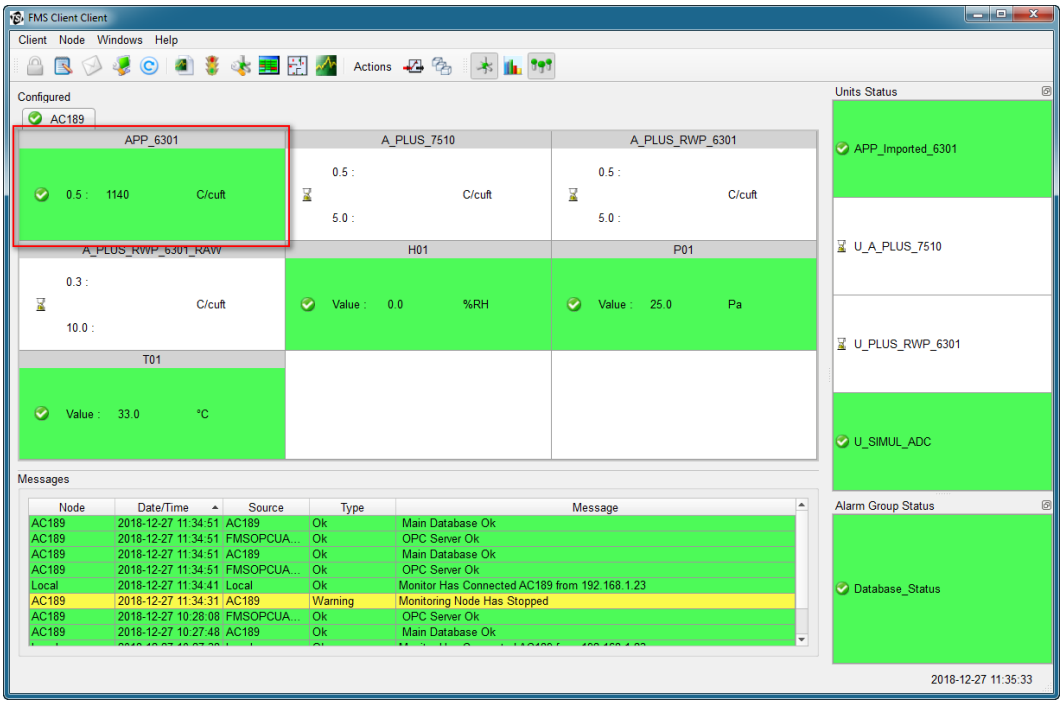


20. Click **OK.**

21. Click **Save** to save configuration changes.



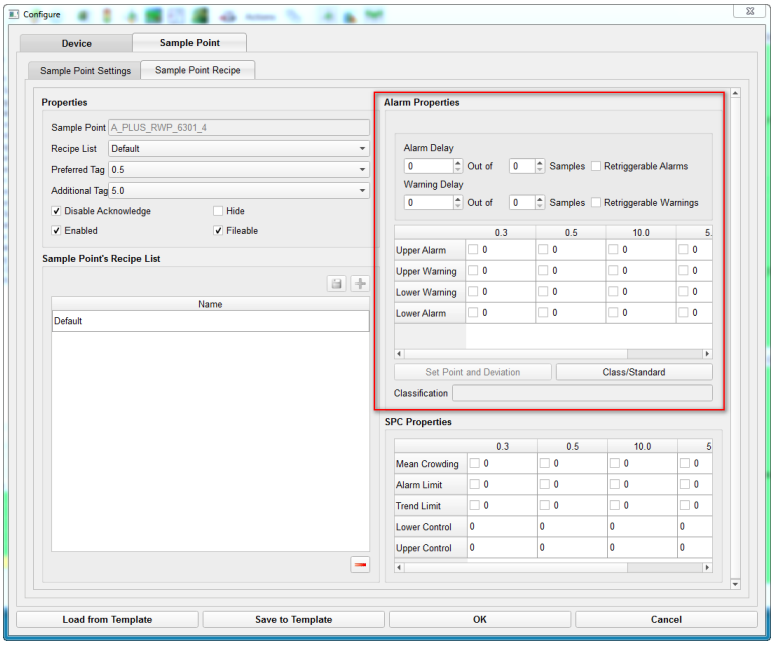
22. When prompted, click **Yes** to immediately apply changes.



How to Setup Alarms

Alarm Properties

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.

- **Warning Delay X of Y Samples**

  The number of consecutive values that are outside the warning limits that must be measured before the sample point goes into warning (yellow). Until the warning threshold is exceeded, the sample point remains in ok state (green).

- **Retriggerable Warnings**

  A warning event is generated for each measurement that is in warning state. When retriggerable warnings is 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.

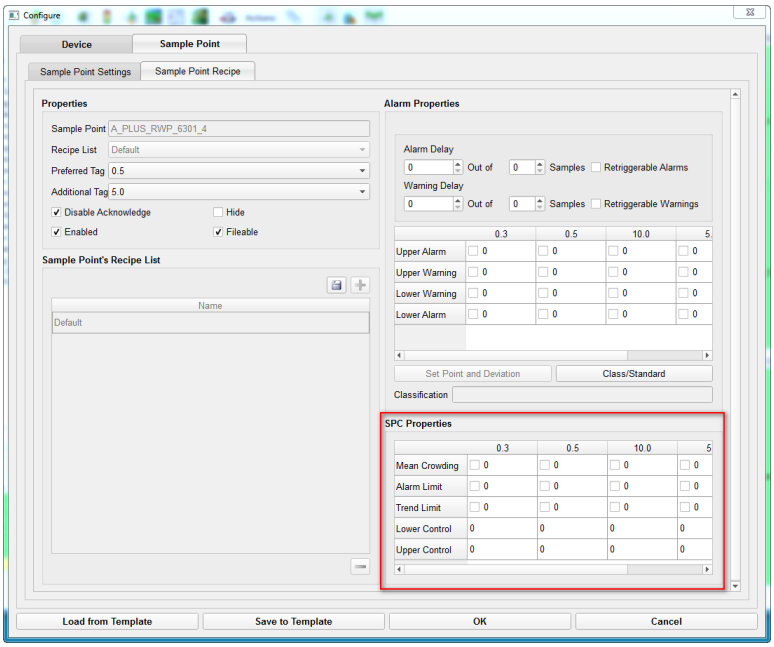
NOTE
Sample points such as an environmental sample point will not have additional columns for size channel.

- **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's 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.

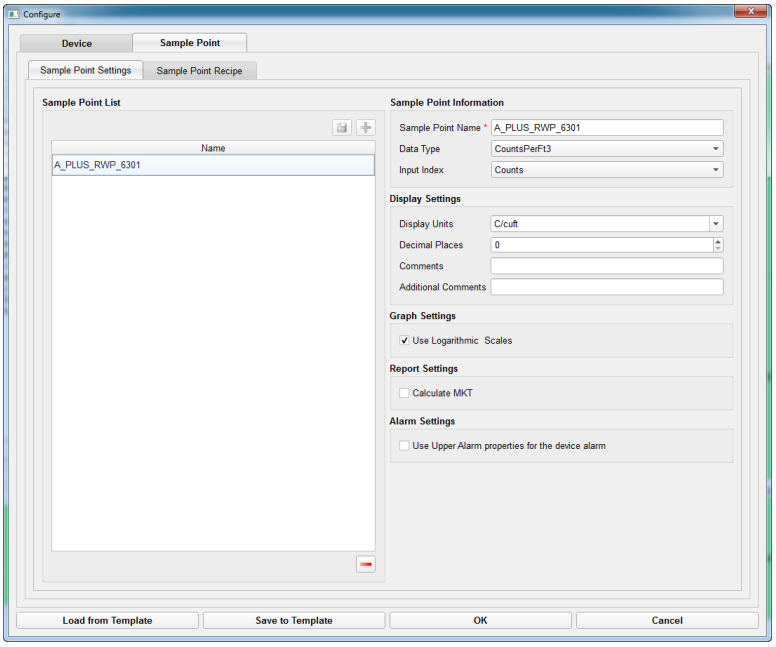
International regulations for the life science industry ***requires*** that the counts per cubic meter be monitored.

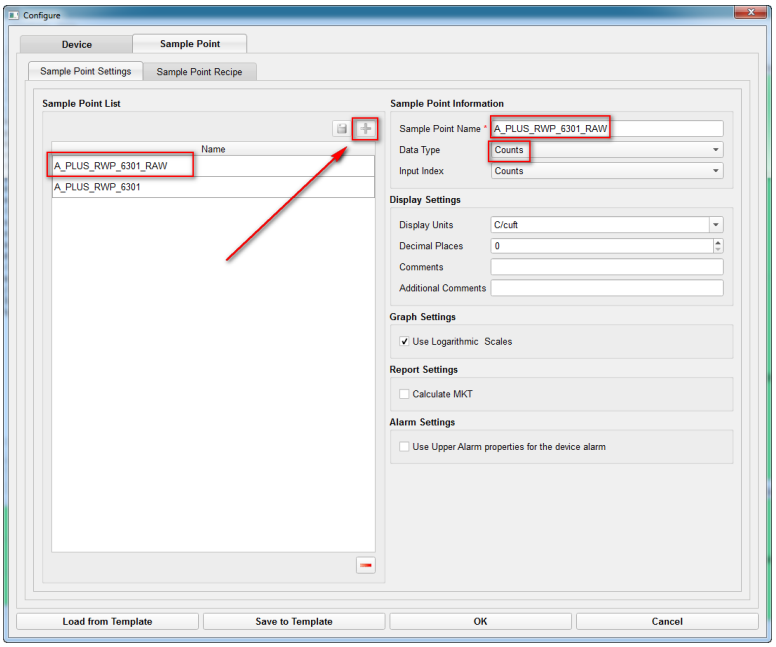
Creating M^3 sample point for all AeroTrak+ Remote Particle Counters is the same as explained in technical bulletin TCC-121: FMS 520 Historic Driver Setup Configuration.

Adding a Second Sample Point

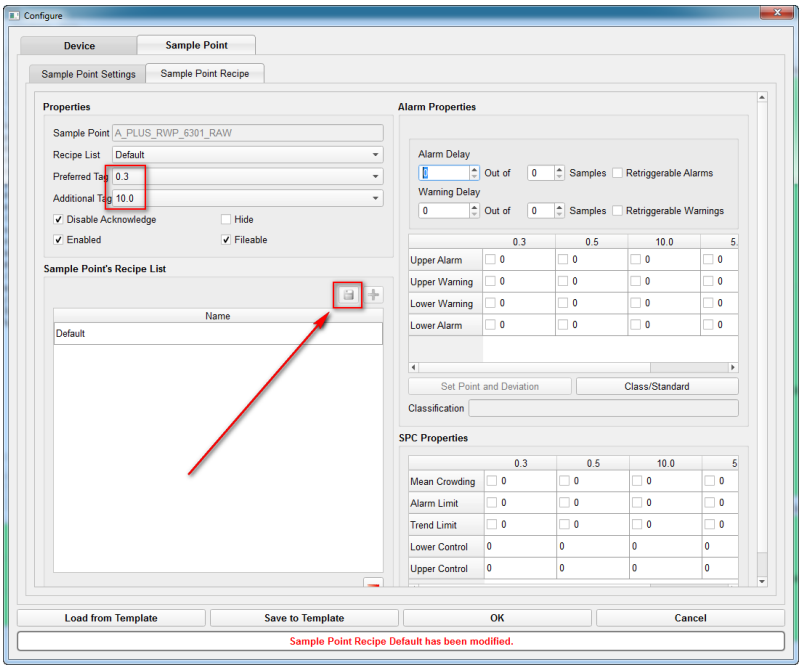
The AeroTrak+ Remote Particle Counter driver allows creation of an additional **sample point(s)** associated to the same instrument. For example, a second **sample point name** needs to show the 0.5 and 5.0 µm channels in RAW counts for the **sample point** name **A_PLUS_RWP_6301**.

1. Go to **Configure Node.**
2. Expand **Monitor Summary.**
3. Expand **Configure Devices.**
4. Click **AeroTrak+ Devices.**
5. Select the instrument to create an additional **Sample Point.**
6. Click **Configure.**
7. Click **Sample Point** tab.
8. Modify the **sample point name** accordingly (i.e., **A_PLUS_RWP_6301_3_RAW.**
9. Modify the other settings for the **sample point information**.
10. Click + icon to add new **sample point name**.



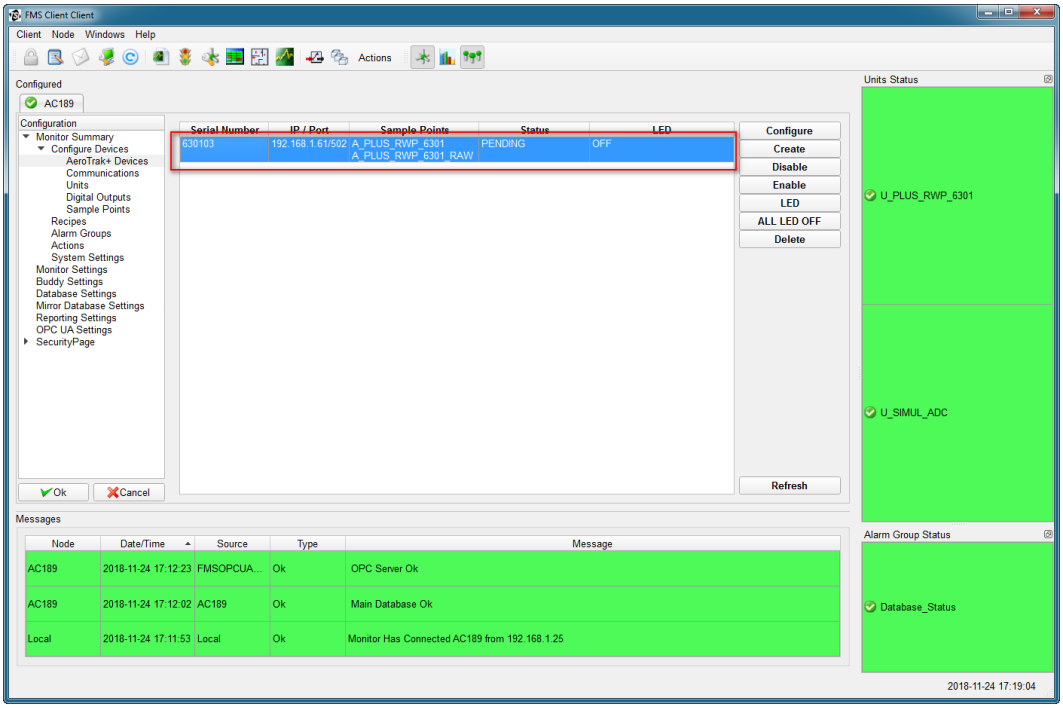


11. Click **Sample Point Recipe**. Modify the properties of the sample point recipe such as below:
    - Prefer Tag **0.3**
    - Additional Tag **10.0**
    - Change any properties wanted.
12. Click **Save**.
13. Click **OK**.



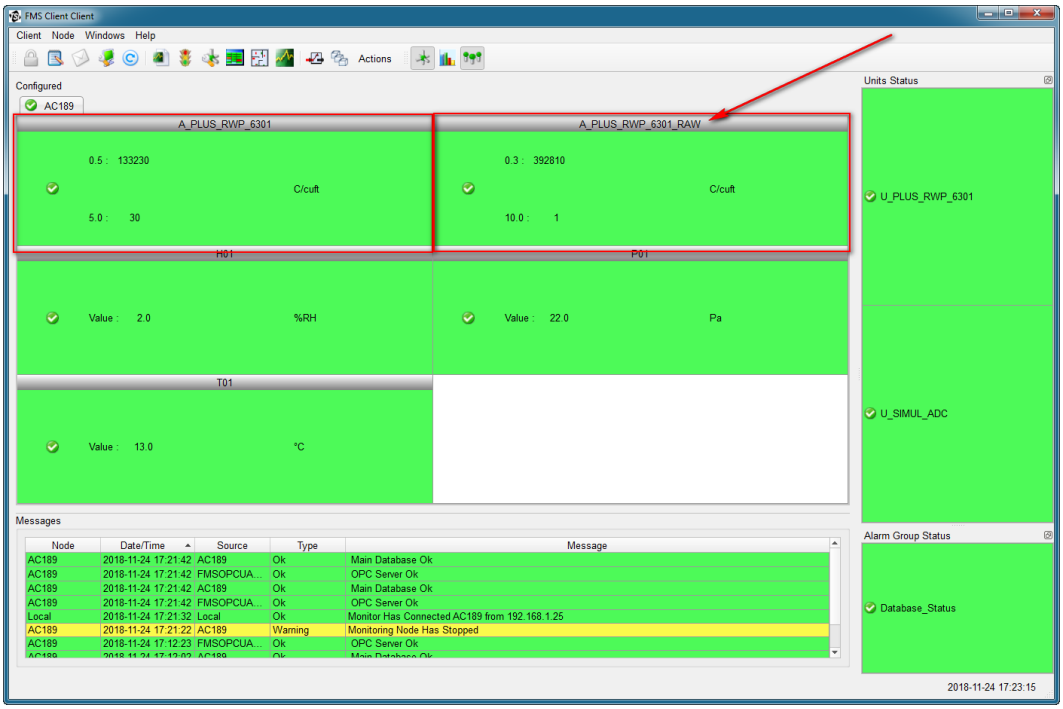
14. The instrument associated with the new sample point name displays as **PENDING**, waiting for the configuration to be saved.

    Both sample point names associated with the instrument listed for the associated serial number.



15. Click **OK**.
16. Click **Save**.
17. Click **Yes** to reboot the monitor.

18. Refresh FMS main screen to see **sample point name**.



How to Use Recipe

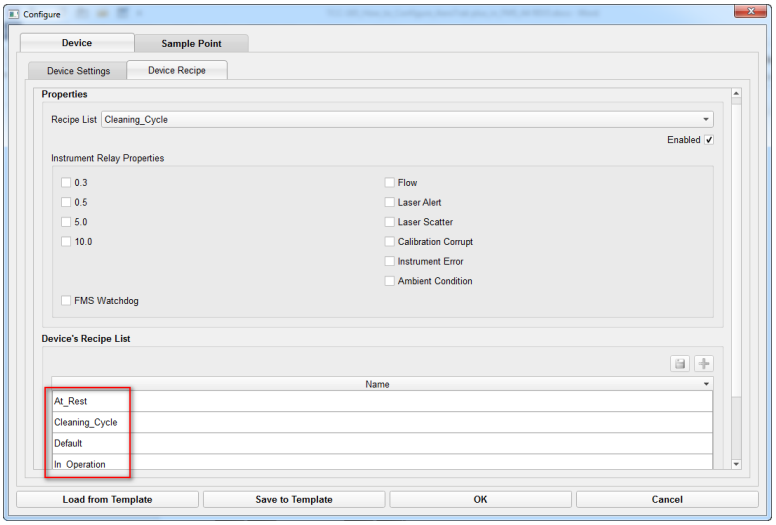
From control windows, four standard recipes are available by default.

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+ Remote 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  icon to add.

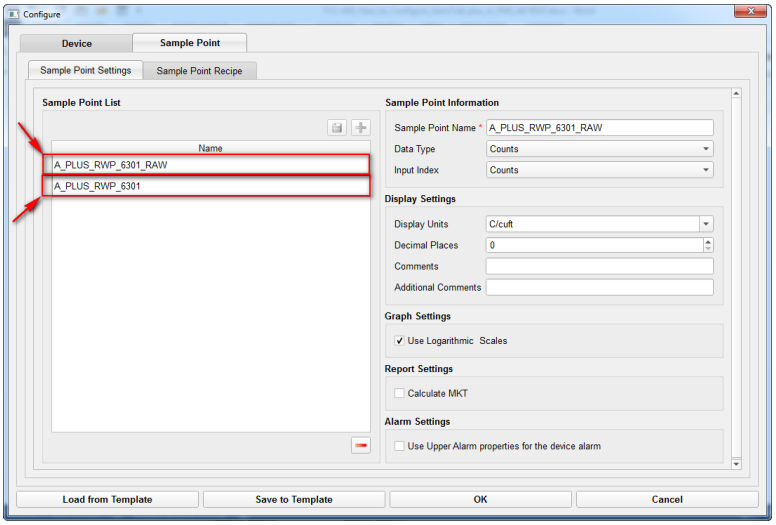
5. Select each recipe one by one and change the different associated settings.

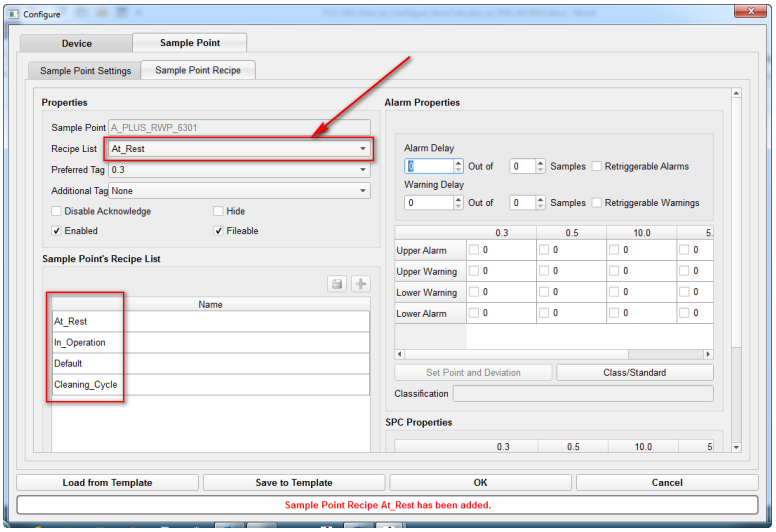
6. Click  icon to save.

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.





Alarm Group Messages

Technical bulletin **TCC-137: FMS 530 Alarm Group with Messages Setup Configuration** explains how to setup alarm group messaging to be able to alarm on specific messages generated by FMS.

By introducing AeroTrak+ Remote Particle Counter driver **TSINextGenerationModbus2X**, the following messages can be selected in alarm group.

- Communication problem: timeout getting sample record
- Instrument alert was triggered externally
- Communication problem: invalid sample record data from buffer
- Ambient condition alert
- Cal. corrupt alert
- Communication problem: timeout during initializing
- Communication problem: timeout getting sample index
- Flow alert
- Index sequence error: record(s) possibility lost
- Instrument error
- Instrument not ready alert
- Laser error
- Laser scatter alert
- Optics dirty alert
- Resetting com channel
- Service alert
- Stale data: reinitializing counter
- Unit working
- Wrong driver selected for this device. This driver for TSI map revision 2.xx only

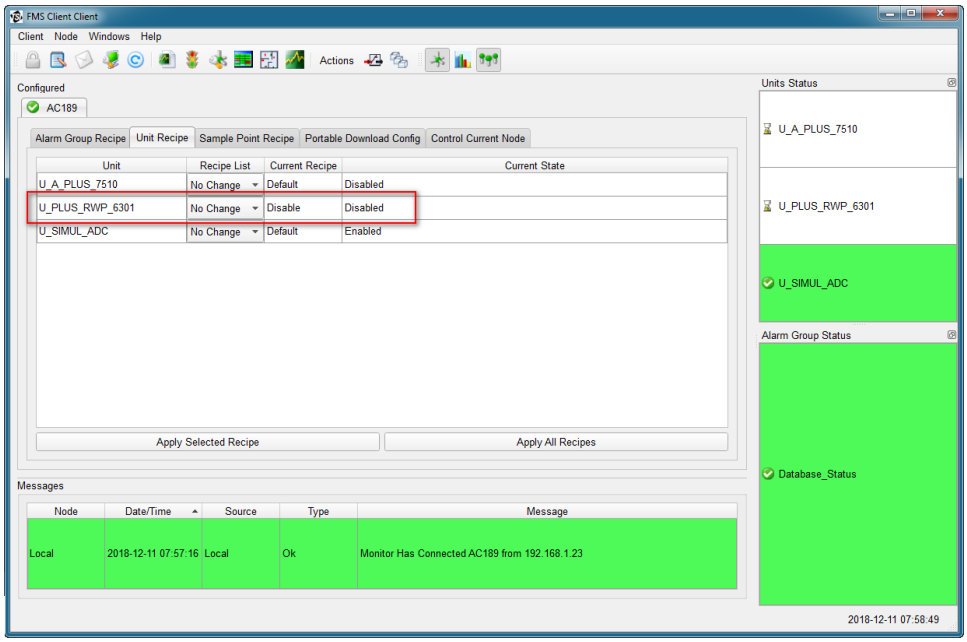
How to Replace Instrument in FMS

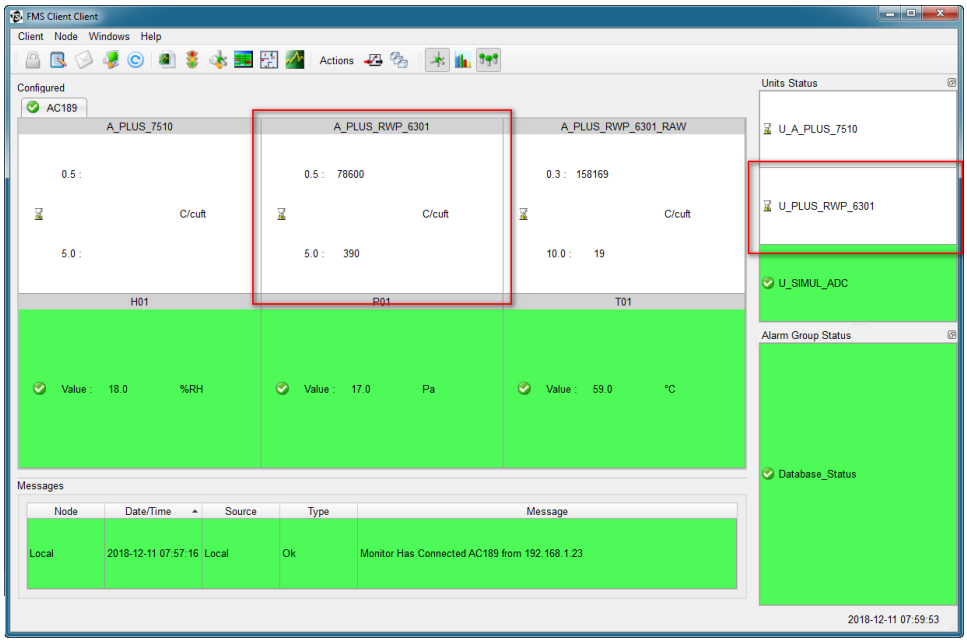
When an instrument needs to be returned for calibration or service, it is necessary that it needs to be replaced by another instrument to keep production ongoing. In this event, all AeroTrak+ Remote Particle Counters, no matter what model, need to be replaced by another model of the same type. It must be programmed with the same IP address as the one being replaced but will have a different **serial number** and **location name**.

Replacing Instrument with Multicast Disabled

The following steps outline how to replace an instrument with IP address 192.168.1.61 and serial number 987654 by serial number 123456 when instrument multicast is **disabled**.

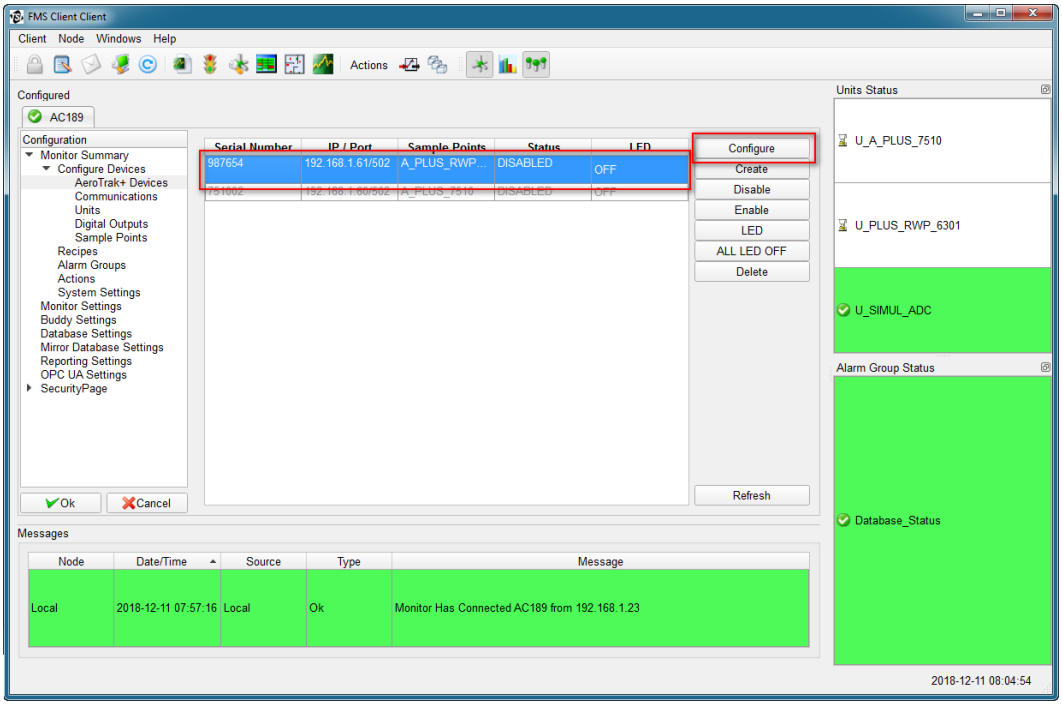
1. Disable instrument from the **control** screen.



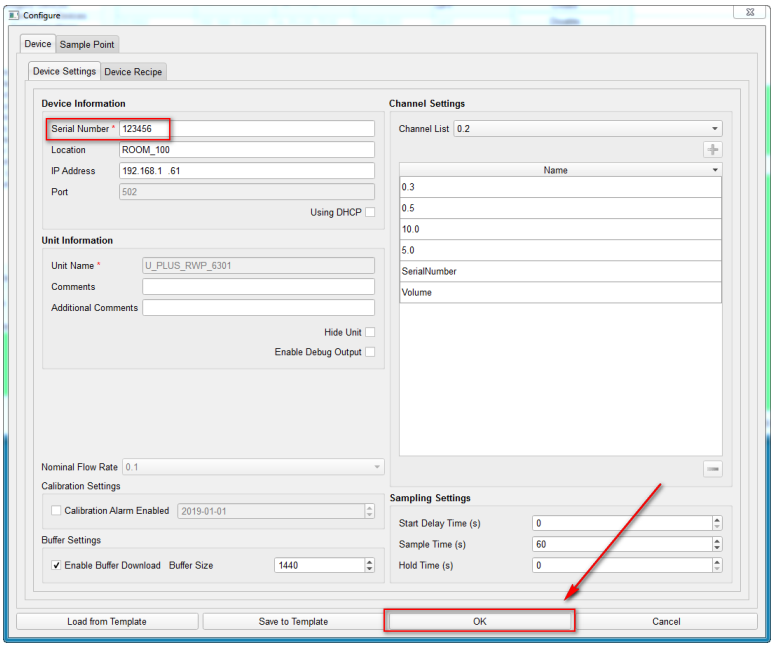


2. Connect instrument serial number 123456 on the network.
3. Go to FMS configuration screen.

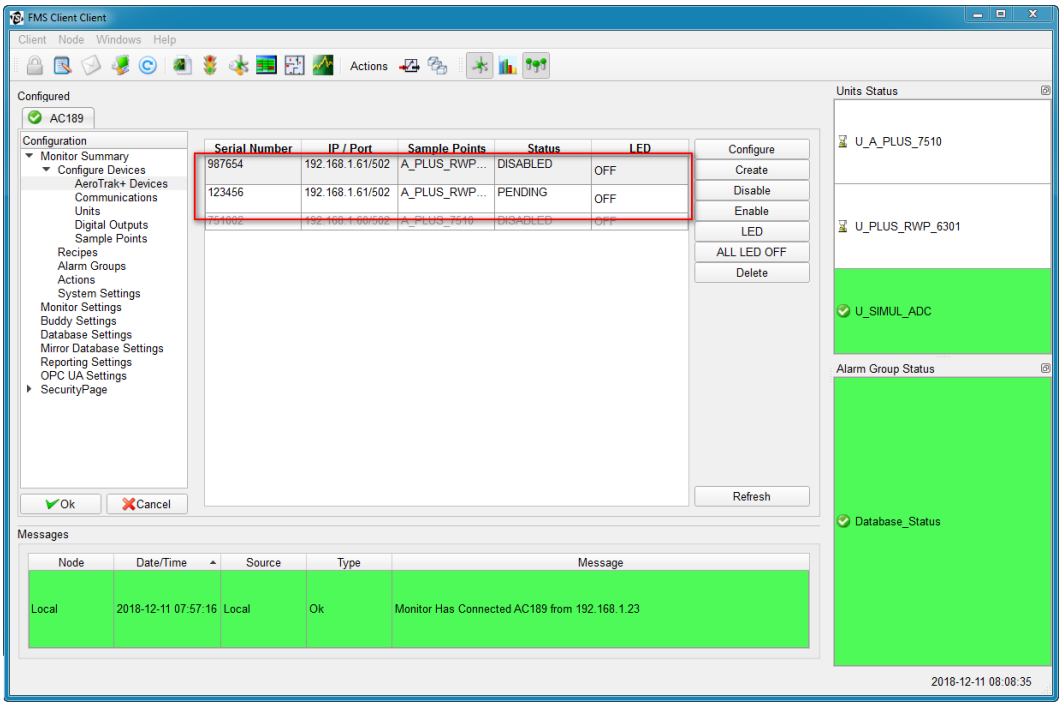
4. Expand **Monitor Summary**.
5. Expand **Configure Devices**.
6. Click **AeroTrak+ Devices**.
7. Select **Serial Number** 987654.



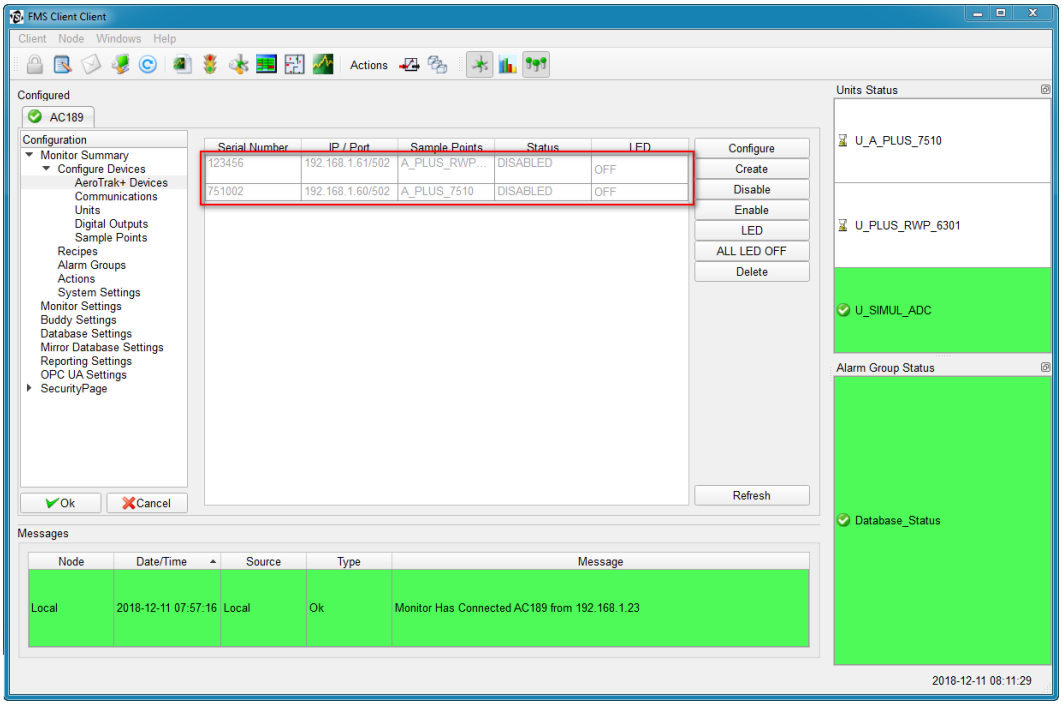
8. Click **Configure**.
9. Replace serial number **987654** by **123456**.
10. Modify **location** if required.
11. Click **OK**.



12. The replacement instrument displays in **PENDING** mode.

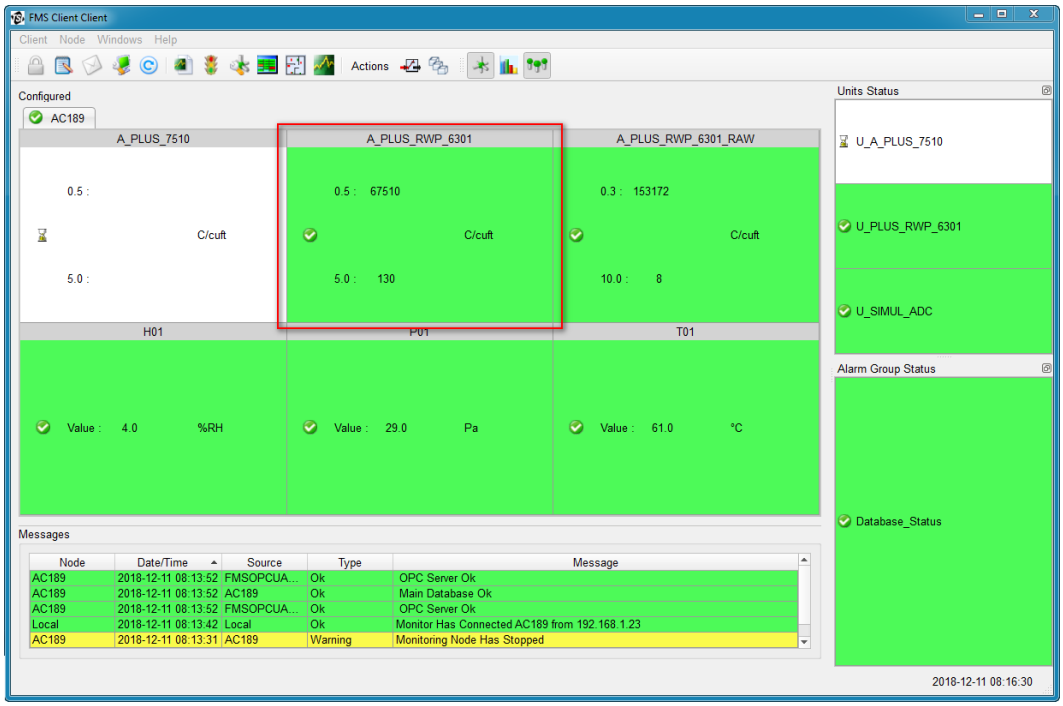


13. Click **Refresh.** The old serial number instrument is now removed from the FMS configuration.



14. Click **OK**.
15. Click **Save** to save your configuration.
16. Click **Yes** to apply changes.

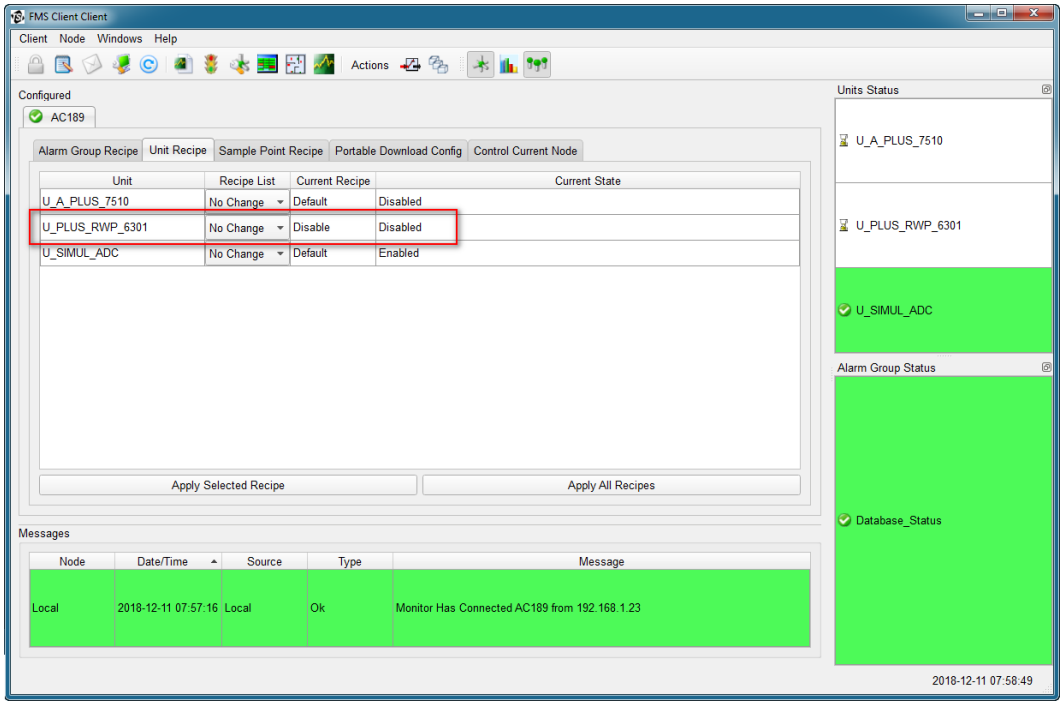
17. After monitor restart, wait approximately one minute to get first sample in.

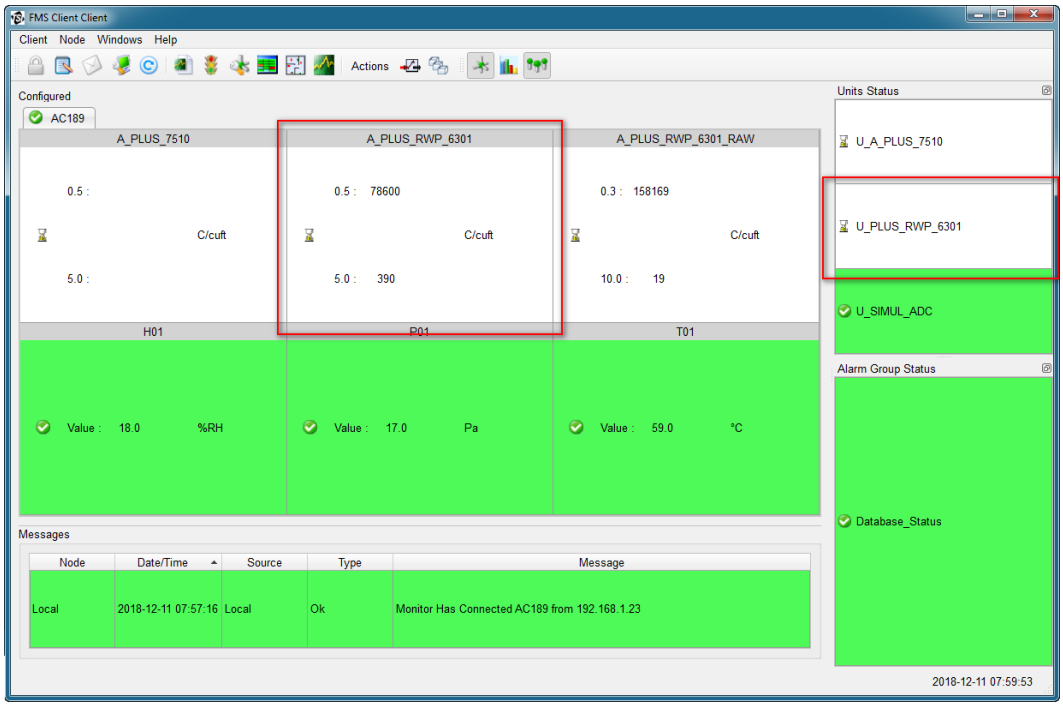


Replacing Instrument with Multicast Enabled

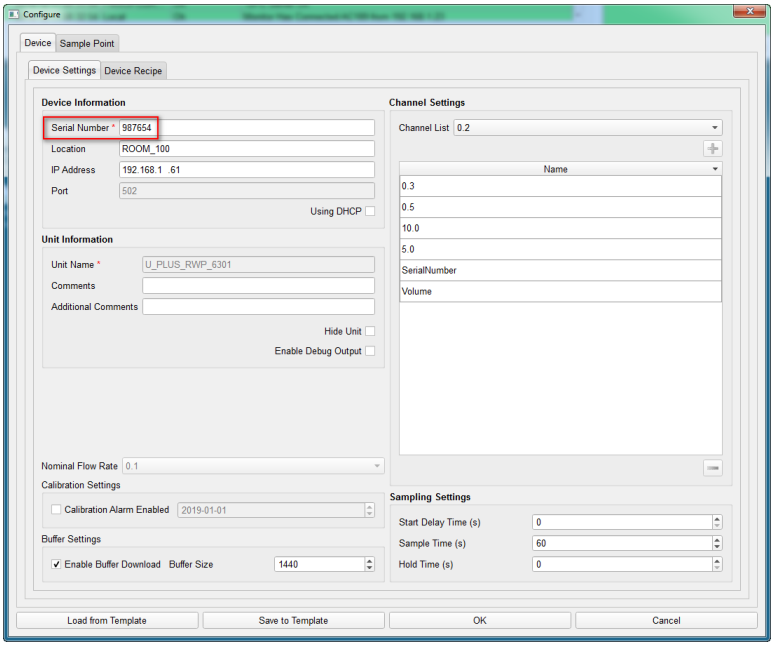
The following steps outline how to replace instrument with IP address 192.168.1.61 and serial number 123456 by serial number 987654 when instrument multicast is **enabled**.

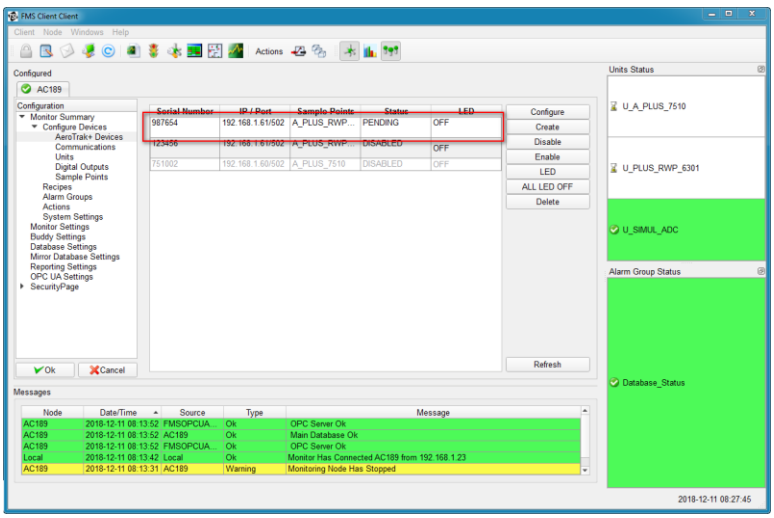
1. Disable instrument from the **control** screen X.



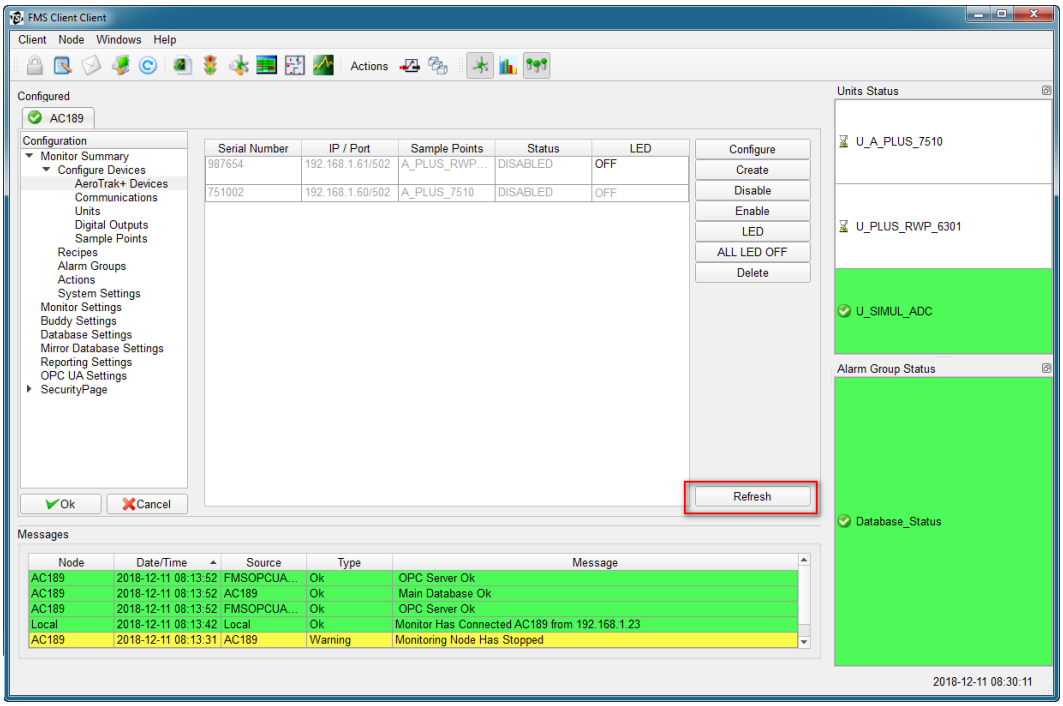


2. Connect instrument serial number 987654 on the network.
3. Go to FMS configuration screen.
4. Expand **Monitor Summary**.
5. Expand **Configure Devices**.
6. Click **AeroTrak+ Devices**.
7. The replacement instrument with serial number 987654 displays **NEW** mode.
8. Select **serial number** 123456 and click **Configure**.
9. Replace serial number 123456 with 987654.
10. Click **OK.** Replacement instrument displays in **PENDING** mode.
11. Modify **location** if required.

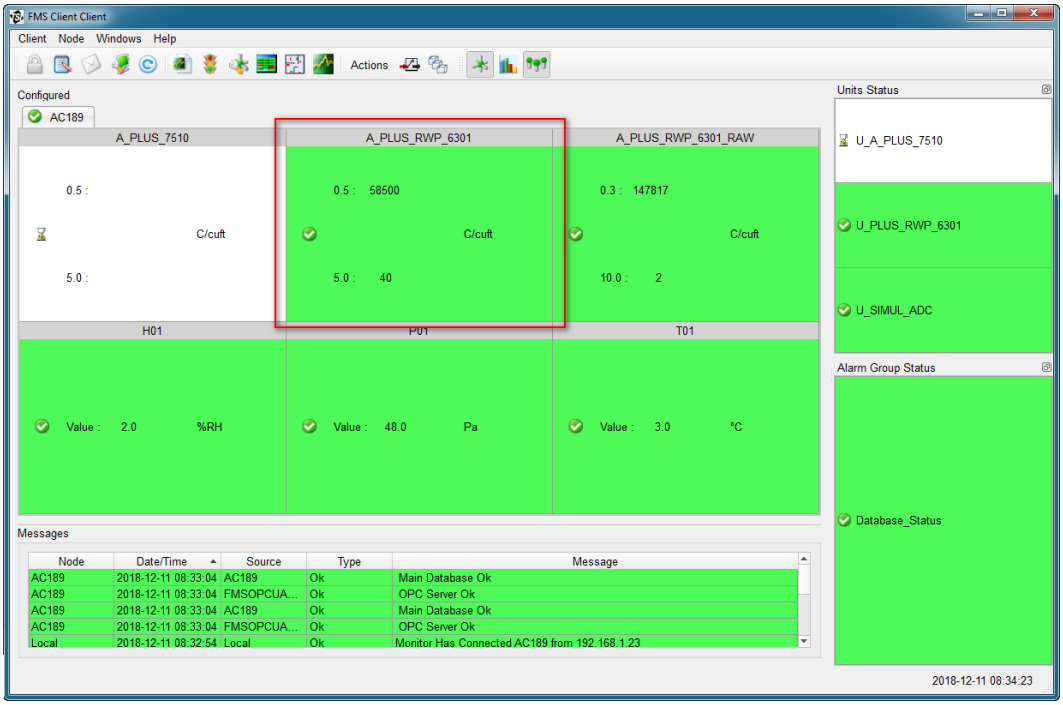




12. Click **Refresh** and then **OK**.



13. Instrument to be replaced with serial number is now removed from the list of instruments.
14. Click **OK**.
15. Click **Save** to save configuration.
16. Click **Yes** to apply changes.
17. After monitor restart, wait about one minute to get first sample in.



Replacing Instrument with FMS Template

1. Prior to beginning this process, the instrument is required to be setup with the same IP address as the one that needs replacement. To do this, use the TSI Remote APP to setup instrument.
2. From the **AeroTrak+ Devices** screen, select the instrument to be replaced.
   - Click **Configure**.
   - Save settings as a template.
   - Close **Configure** window.
   - Select instrument to be replaced and delete it.
   - Connect new instrument to the network.
   - When it appears in the list, it will display in **NEW** mode.
   - Select new instrument and click **Configure**.
   - Load settings from template.
   - Confirm settings are correct and click **OK**.
   - Click **Save**.
   - Click **Yes** to reboot.
3. FMS will automatically reprogram the instrument with all settings (device unit) associated with the instrument IP address.

Security

With introduction of the AeroTrak+ Remote Particle Counter driver, the following security rights can be assigned.

User Groups Level

Configure Node:

- TSI Next Gen

Files to Backup

With the introduction of the AeroTrak+ Remote Particle Counters, new 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:\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)

Troubleshooting

1. Some Windows® 7 Operating Systems will mysteriously refuse sending multicast messages. You may have to add the **Reliable Multicast Protocol** in the protocol list used by the network card.

2. Multicasting **DOES NOT** work on an Ethernet network where multicast addresses are blocked.

   You may have to edit the Windows registry to add the IGMP protocol values as outlined below.

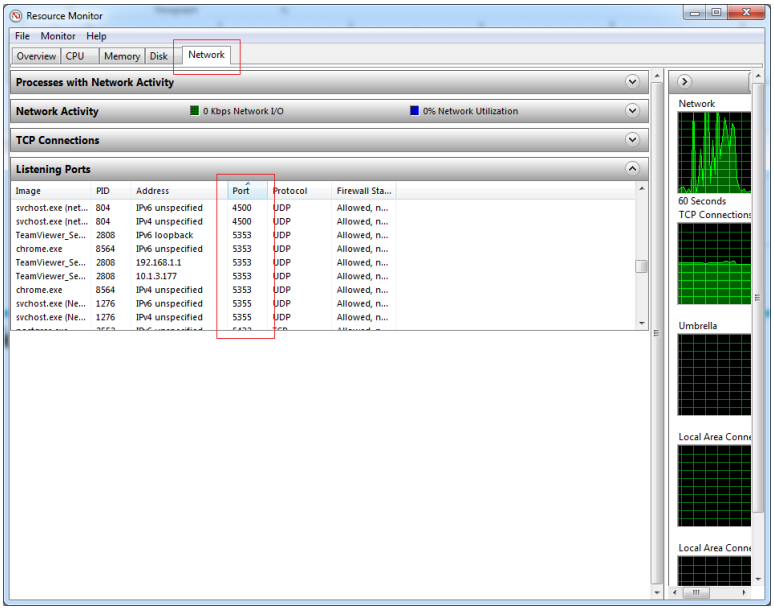
   - Open the Registry Editor , then navigate to HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters\
   - In the right pane, right-click and select New – DWORD (32-bit value) and set name as **IGMPVersion**, set it with the value to 4.

     A value of 4 means support IGMP version 3.
   - In the right pane, right-click and select New – DWORD (32-bit value) and set name as **IGMPLevel** and set it with the value to 2.

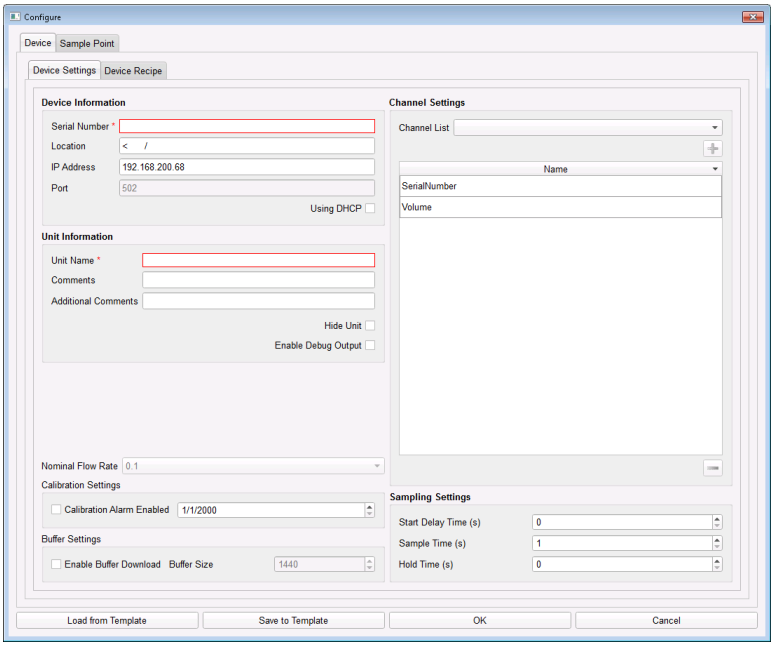
     IGMP level 2 means it supports sending and receiving multicast packets.
   - Restart computer to take the new settings into account.

IMPORTANT NOTE
To edit the Windows registry, you must be logged in with an account having local administrative rights.

3. You may also need to verify the availability of the default port 5000. Follow the process below to do so.
   - ➢ Open **Resource Monitor.**
   - ➢ Select **Network** tab.



4. If the port 5000 is used by other programs, re-assign a new multicast port for both instrument and FMS.
5. Verify instrument is set to use TSI Modbus map version 2.x by following the process outlined below.
   - ➢ If the configuration of multicasting instrument serial number or location fields does not match the expected values, fields will be blank or contain garbage.
   - ➢ Use the TSI Remote APP to verify the use of the correct Modbus Map Version 2.x.



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
- TCC-166—How to Setup AeroTrak+ Remote Particle Counter with Pump (6000 Series)
- TCC-167—How to Setup AeroTrak+ Remote Particle Counter (7000 Series)
- TCC-174 – How to Configure AeroTrak+ Remote Particle Counter Instant Alarm

UNDERSTANDING, ACCELERATED

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