# Aspira Monitoring

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# Aspira System Administrator’s Guide

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# Quick Start

Your Samsung ATIV 500T Smart PC comes pre-configured with the Aspira system. To start using the system immediately, take the following steps:

1. Login to the tablet
2. Plug in and turn on the Dylos Air Quality Monitoring Unit. Connect the unit with the tablet through the full USB port located at the top of the device.
3. On the Desktop is a shortcut icon *Configure Aspira*, double-click on it. This opens the Aspira configuration program. Take a moment to ensure the settings on the *App Config* and *Medication* tabs are correct. Be sure to click on the Save button if you change any settings. Close the program window and the underlying DOS command window when finished.
4. Also on the Desktop is a shortcut *Air Quality Monitoring*, double-click on it to start the Aspira monitoring service. This will popup a DOS (black background) command window with some initial information. You may minimize this window but do not close it. This program must always be running so information regarding air quality and subject readings are properly collected.
5. Return to the Metro Start screen and tap on the fish icon to start the tablet application. This application will notify the user when it is time to take a reading.

# Technical Overview

This section provides an overview of the various programs comprising the Aspira system. It is meant for expert users or technical support personnel.

The Aspira system consists of 4 distinct applications:

1. The Asthma Analyzer application from Microlife
2. The Metro tablet application
3. The MonitoringService (Java)
4. A Configuration Application (Java)

The Asthma Analyzer application is provided by Microlife (make of the spirometer), and is used for exporting spirometer readings off the PF100 device. This only needs to be run by the clinician during a home visit. The Configuration Application is used to configure important settings for the system, and to export collected data into an Excel file. The clinician will typically run it during a home visit.

The Metro tablet application should also always be running. Run the program by tapping on the fish in the Metro interface. Even when the application is not in focus it is still executing. However, the tablet application should always be in focus to ensure the end user properly receives reading notifications.

The MonitoringService is a java console program that reads in values output by the Dylos Air Quality Monitor, so it also should always be running. The console window may be minimized and the end user should not have to do anything with this program.

The Configuration Application should be run by the Clinician each site visit. On the first visit it will help with setup. On subsequent visits it can assist with tuning parameters, extracting logs, and updating medication reminders. If the clinician runs this application and changes any settings, the tablet application and the MonitoringService should be restarted.

# Installation

## System Requirements

The Aspira system requires

* a Windows8 tablet (Pro or regular Windows8, but not WindowsRT)
* It has only been tested on the Samsung 500T tablet, though we have run the system on a Microsoft Surface tablet.
* 64GB disk is recommended, though 32GB should be operational
* The user account should have administrator access for the time being
* Java version 6 (not 7)

## Windows 8 Settings

**NOTE:** The tablet should always be plugged in! The tablet has been configured to not sleep when the AC power is connected. This is necessary to avoid losing readings from the air quality monitor device!

To minimize interruptions and confusion to the end user, the tablets have been pre-configured in the following way:

1. Windows updates have been turned off
2. Windows security settings have been turned down
3. Extra pre-installed applications from Samsung have been removed

The end user should not see constant warnings from Windows and should not update itself periodically. If this happens please inform ASU and we will remotely turn these distractions off.

## Software Installation

The tablet should come with all its required software pre-installed, however instructions on installing dependencies are given below.

### Installing Software Dependencies

The software installation packages have been left on the tablets in the Downloads folder of the main user account.

* Install Java JDK version 1.6, from Oracle’s website java.oracle. com.
* Install the Dylos Log software ver 1.6
* Install the Asthma Analyzer application from MicroLife.
* Install git bash shell (for future patches and remote administration)
* Install Notepad++
* Create desktop shortcuts for the Dylos Logger program, the Asthma Analyzer, the Configuration Application, the Monitoring Service, and Notepad++

### Configuring the Aspira applications

The following configuration files need to be present in the Documents folder of the user.

* SpirometerReadingLog.txt
* airQualityStatus.json
* asthmaMonitoringLog.json
* medicationRemainders.txt
* config.json

Some of these files are empty by default, but they do need to exist before the system is started. Several of the files are maintained through the Configuration Application desktop application described below.

Additionally, the Aspira Monitoring Service uses configuration files in c:\usr\aspira\properties named aspira.properties, dao.properties, and monitoringservice.properties. If any of these files are missing or corrupted, the Monitoring Service will not function correctly.

### Install the Aspira Applications

#### Environment Variables and Settings

The Aspira Monitoring Service and the Configuration Application will both see if you have an environment variable ASPIRA\_HOME set in your environment. This variable should be set to the user’s Documents folder. In DOS:

C:> set ASPIRA\_HOME=\Users\aspiraX\Documents

Where “X” is the number of the aspira user. You may also set this using the Environment Variables tab in the Windows Device Manager. If this environment variable is not set, then the applications will look for the property aspira.home in the file c:\usr\aspira\properties\aspira.properties and use this value. If this is also not available the system will try to make its best guess, but may be inoperable if incorrect.

#### Installing the embedded database and Java applications

In the Downloads folder is a file named aspira.<datetime>.zip where <datetime> is a date and time abbreviation. Using Windows explorer, extract the contents of this zip file to the directory c:\usr\aspira. You may need to create this folder before extracting. When you are done, you should see 4 folders under c:\usr\aspira:

* classes
* lib
* properties
* sql

To run the Java-based applications, you must perform the following configuration steps in a DOS command shell window:

1. cd \usr\aspira
2. Edit the following files in Notepad++: sql/creatdb.sql, sql/initialdata.sql, sql/echodata.sql
   1. Replace $$USER$$ with the username of the main user of the tablet app
   2. Replace all strings ‘jdbc:derby/Users/kevinagary…’ with ‘jdbc:derby:/Users/<user>/Documents/derby\_home/aspiradb’
3. Initialize the embedded database:
   1. java –cp –lib/derby.jar;lib/derbytools.jar org.apache.derby.tools.ij
   2. at the ij prompt:
      1. connect ‘jdbc:/derby:/users/<user>/Documents/derby\_home/aspiradb;create=true’;
      2. run ‘sql/aspiraddl.sql’;
      3. quit;
4. Seed the database: java –cp –lib/derby.jar;lib/derbytools.jar org.apache.derby.tools.ij sql/createdb.sql
5. Edit all files named \*prod.properties
   1. Replace all occurrences of $$USER$$ with the main username
   2. Look for places where $$VALUE$$ is specified and replace with the appropriate value. Typically this will be the air quality monitor id, the spirometer id, or the sex of the user
   3. Replace all strings ‘jdbc:derby/Users/kevinagary…’ with ‘jdbc:derby:/Users/<user>/Documents/derby\_home/aspiradb’
6. Copy the \*prod.properties file to \*.properties. i.e. configpropd.properties to config.properties, aspiraprod.properties to aspira.properties, daoprod.properties to dao.properties, and monitoringserviceprod.properties to monitorservice.properties
7. Edit /Users/<user>Documents/config.json
   1. Ensure the patientid field matches the username of the system
   2. Ensure the deviceid field is the same as the spirometer ID field you entered in step #5

If you have connected the Dylos Air Quality monitor, you can run the Java MonitoringService application from the DOS command-line c:\usr\aspira dir:

java –cp classes;lib/derby.jar;lib/json-simple-1.1.1.jar;lib/jssc25.jar edu.asupoly.aspira.Aspira

There is a desktop shortcut named *Air Quality Monitor* that sets the environment variable ASPIRA\_HOME and runs this java program for you.

You can run the configuration application as well:

java –cp classes;lib/json-simple-1.1.1.jar;lib/derby.jar;lib/poi-3.9-20121203.jar;lib/poi-ooxml-3.9-20121203.jar edu.asupoly.aspira.gui.AdminConfigWindow

There is a desktop shortcut named *Config App* that sets the environment variable ASPIRA\_HOME and runs this java program for you

#### Installing the tablet application

*NOTE: The tablet application is pre-installed on the tablets, there should not be a need to re-install. If there is a need, it is preferred that ASU install it remotely on the tablet.*

The tablet application relies on the 5 files listed above under Configuring the Aspira Applications to be present in the user’s Documents folders with the proper values set in them (in particular, the patient id, device id, and yellow/red threshold values in config.json).

The tablet application is available as a zip distribution in the Downloads folder of the user. Extract this folder to a folder named “Aspira-tablet”.

1. In Windows explorer, go to Aspira-tablet -> Aspira-tablet -> AsthmaMonitoring -> AppPackages -> AsthmaMonitoring\_<version>\_AnyCPU\_Test.
2. Right click on Add-AppDevPackage, then select Run with Powershell.
   1. (If you do not have Powershell installed on your machine, download it here:http://technet.microsoft.com/en-us/library/hh847837.aspx)
3. Follow the steps in the Powershell Window, accepting the defaults

#### Directory structures

The installation process will result in two directories having new folders and files in them. First, environment variable ASPIRA\_HOME should be set to c:\Users\aspiraX\Documents (“X” is your user number), and should have the 5 files listed above, plus 3 file ending in .bat, a folder named derby\_home, and a folder named logs. Directory \usr\aspira should have 3 folders: classes, lib, and sql (it may optionally have a 4th folder named properties). You should not have to touch anything in this folder.

If at any time you need to confirm the monitoring service is running and collecting needed data, you can open the file in the c:\Users\aspiraX\Documents\logs folder named *aspira.WWW\_MMDDYY\_HHmmSS.log*, where WWW is a 3-letter day of week abbreviation, MM is the month (1-12), DD is the day of month (1-31), YY is the year (e.g. 13 = 2013), HH is the hour of day (0-23), mm is the minutes of the hour (00-59), and SS is the seconds (00-59). For example “aspira.Tue\_050713\_081204.log” is the logfile created when the Aspira Monitoring Service application started on Tuesday, May 7, 2013, at 8:12:04AM.

Open the logfile with the latest timestamp (in Windows Explorer you can sort by Last Modified date). Scroll to the bottom to see the most recent entries and fine the information you are looking for. The technical team can help interpret these logs.

# Operating the Spirometer

## Configuring the Spirometer

To understand how to provision a user (patient) id and export data from the spirometer, please see the Microlife PF100 User’s Guide. For the purposes of the Aspira system, one patient needs to be provisioned into the spirometer memory with the same ID as the patient identifier used in the Aspira applications in the config,json and aspira.properties files. For simplicity, the naming convention aspiraX is used both for tablet username and for patient identifier, where X is a number 0-9.

The other important function is to export data from the spirometer. Again the User’s Guide has information on how to transfer data off the device. 240 readings are stored in the flash memory of the device at a time, and can be exported when the USB cable is connected. Using the Asthma Analyzer software, export the stored readings in the XML format, as this is the format the Aspira system understands. However you may also choose to export the stored readings in Comma-Separated Value (CSV) format for direct import into a tool like Excel, though the Aspira system will not consume this format.

## End user operation

### How to Blow Into the Spirometer

**Video Help**

The video in the tablet app demonstrates how to blow into the device. To watch the video, run the app and click on the box that has an image of a little girl blowing into the device.

**Important Guidelines Regarding the Device**

**DO:**

Make sure to do three measurements per day to ensure that there is enough data for analysis.

Make sure the monitor is plugged in to prevent crashes!

Keep the device and apps at a reasonable volume for reminders.

For best results, perform the measurements in a similar position each time.

Please repeat the measurements until you feel you have obtained the best possible result for each measurement. Otherwise, they may reflect instability in your asthma condition.

It is best to perform the three measurements sequentially, as indicated by the next reading time.

After making changes to the config file through the config app, you should close the UI app using (ALT F4) when you are inside the app to make sure that the app updates the next reading time.

Ensure that the device is stored in a safe area at room temperature. Storing the device in extreme conditions (such as humidity, dust, or direct sunlight) can greatly affect its performance.

The device can store up to 240 measured values. When the memory is full, the oldest values are automatically erased! Make sure you visit your clinician in time to analyze your data, or your analysis may be delayed or inaccurate.

Please note that after changing batteries, any old values from the device will be erased!

Clean the device with a soft, dry cloth.

If the device received any knocks (dropping), you will recognize any malfunction or damages or you receive surprising results, it should be checked by the Microlife service representative in your country.

**DON'T:**

Do not let the child use the device unattended (without adult supervision).

Do not drop the instrument or treat it roughly in any way.

Do not use tapwater to clean the measuring tube.

Never put the measuring tube into boiling water.

Never attempt to repair the instrument yourself. Any unauthorized opening of the instrument invalidates all guarantee claims (see manual for information on guarantee claims and repair).

## Clinician’s Guide to the Spirometer

### File Specifications and Examples

The Aspira system uses a variety of files for data, logging, and configuration. These files come in different formats and are used for different purposes; this page is a catalog of each file type with specifications. Examples are in the master branch.

* Spirometer Readings file from device (XML) - This file is produced by the device via export from the asthma application file
* User Interaction logs (Text) - This file is written by the tablet and read by the Monitoring Service. It records all user events. FORMAT: Patient ID, Device ID, Build Version, event type, target, time stamp, value
* Spirometer Manual entry (Text) - records the manual entry of spirometer readings. Written by tablet, read by Monitoring Service.
* Config.json (json) - entire configuration info for app. The Config app writes it and reads it, the tablet app reads it
* Air Quality Status (json) - written by MonitorService, read by tablet. Indicates status of connectivity with AQM and the AQ "zone" reading
* Medication Reminder (txt) - It is written by the config app and tablet app reads this file to determine when to alert user to take a medication.
* Dylos Logs/DylosLog.txt (text) – written by the Dylos Logger program and read by the MonitoringService.
* <munged named>.xml (XML) – written by the Asthma Analyzer program and read in by the Aspira spirometer log import capability. This should be created by the clinician when s/he visits the home.

*It is recommended on each clinician visit to copy all of the files under the end user’s Documents folder to a USB drive for upload at the hospital and safe backup.*

#### Medication Reminder File

Here are some guidelines for medicationReminder.txt:

The format below is ideal, when there has to be a medication reminder in morning, evening and if user has symptoms

Morning – 0800##

Evening – 1500##

Morning##

Medicine 1 > Desc 1##

Evening##

Medicine 1 > Desc 1

Medicine 2 > Desc 2##

Symptoms##

Medicine 1 > Desc 1

Medicine 2 > Desc 2

Medicine 3 > Desc 3##

In the example above, Medicine 1 is taken in the morning, in the evening, and whenever the patient is experiencing symptoms, Medicine 2 is taken in the evening and when the patient experiences symptoms, and Medicine 3 is only taken with symptoms. Morning reminders alarm at 8AM and evening reminders alarm at 3PM (alarms are notifications in the tablet application).

This file may be edited in a text editor like Notepad, however the location of characters *>* and *##* as well as line breaks do have an impact on the program!

If there are no medications for a particular time then the extra delimiters "##" should be present but should be without any spacing or new line. For example if there is no morning medication time then the file should look like this

Morning - 0800;

Evening - 1500;

Morning#### // there are no medicine or description for morning.

Evening##

Medicine 1 > Desc 1##

Symptoms##

Medicine 1 > Desc 1

Medicine 2 > Desc 2##

#### Log Spirometer reading from user

The tablet app writes the values entered by the user into a text file (SpirometerReadingLog.txt) in documents folder in the following format :

Sun Mar 24 16:16:49 MST 2013

PEF Value : 555.5

FEV Value : 111.1

Sun Mar 24 16:17:15 MST 2013

PEF Value : 444.4

FEV Value : 141.2

IMPORTANT: This txt file must exist (even if empty) before the tablet application runs.

#### Puffer Fish moods and next reading alert behavior

There can be three states/moods of the fish:

1. happy

2. normal

3. sad

*Scenario 1: The application is Idle*.

The image of the fish would be "normal" and the next reading card shows time for next reading.

*Scenario 2: It is time to take a reading*.

* The image of the fish would remain normal, an alarm goes off (currently the next reading card blinks) indicating its time to take a reading.
* When the user returns to the home page after taking a reading, the mood of the fish is happy for some time (currently one minute) and then switches back to normal. The next reading card shows time for next reading.

*Scenario 3: User misses a reading*.

When a user doesn’t take a reading (currently 1 minute after the alert for next reading started) then

1. The image of the fish is changed to sad.
2. The next reading card stops blinking.
3. It shows time for next reading.

#### Application Alerts

The application is designed with the expectation that it is active and in focus on the tablet. However, after periods of inactivity, Windows 8 may automatically suspend the application, which may give the appearance of a “crash.” In fact this is as-designed behavior, which tablet operating systems do to conserve system resources. Therefore, the Aspira tablet application has been programmed to use scheduled notifications, which will appear in the upper right corner of any screen, when a reading is upcoming. The end user should tap on the notification to launch the application.

#### Spirometer Validation Rules

The upper and the lower range of the PEF and FEV value can be configured in config.json

The PEF value should be entered as an integer

The FEV value should be entered as a floating point value

The confirm button shows up when the pattern is matched and the entered values fall in the range indicated.