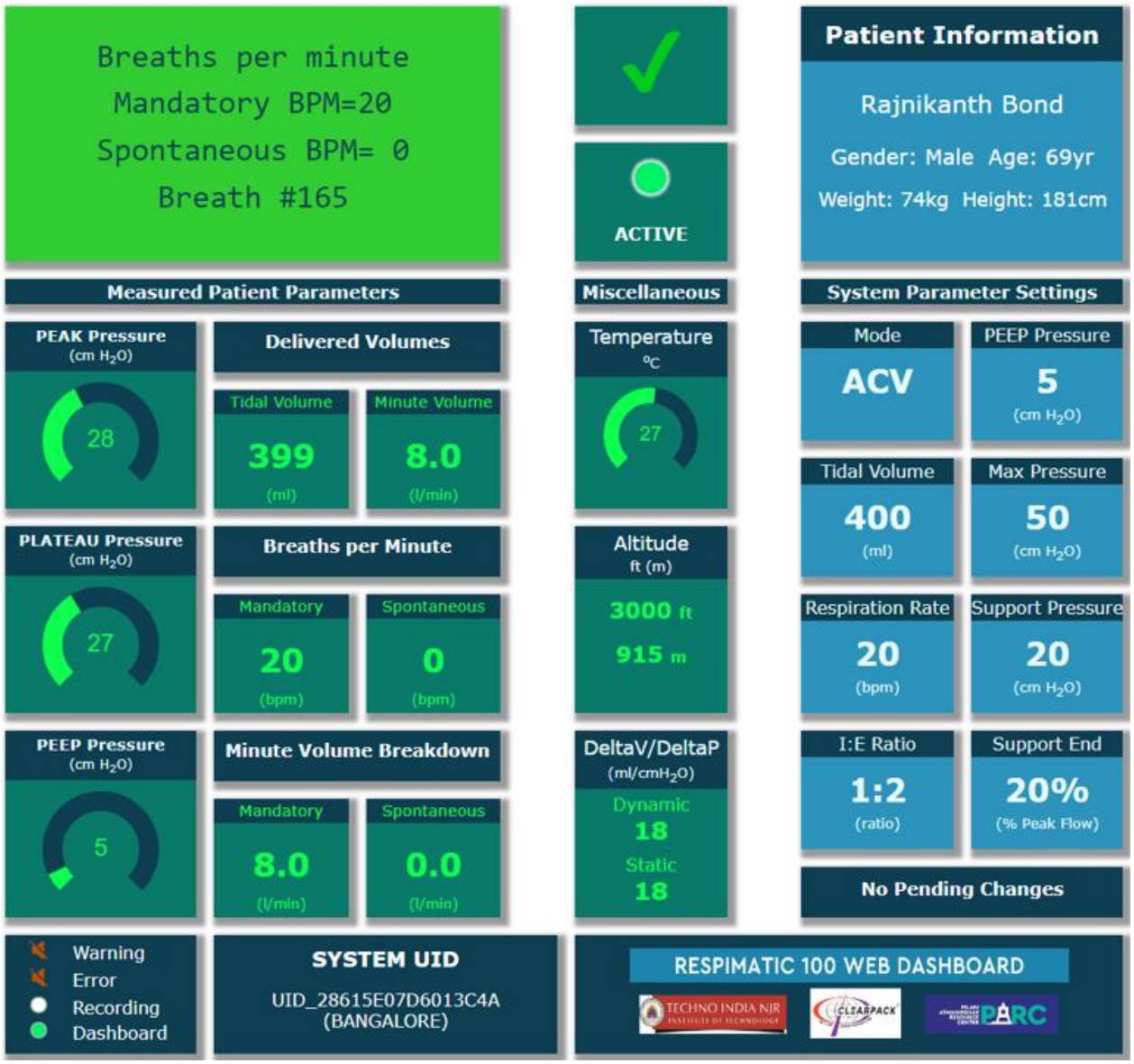
Respimatic 100



An Affordable, Robust Emergency Respiration Assist Device

Web Applications Operating Manual

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Introduction

In addition to the front panel, Respimatic 100 provides the ability to remotely monitor all respiration sessions via a WEB dashboard. Doctors and technicians can use the dashboard to connect to any Respimatic system using a unique system ID embedded in each system. This feature is useful to enable a remote specialist to observe the key system and patient parameters during a session and suggest a course of action for the local practitioners.

A brief overview of the process is as follows.

1. There must be a Wi-Fi network at the site where the Respimatic system is deployed. If required, use a 4G/5G dongle to establish a Wi-Fi network. One dongle can serve multiple systems at the same site at the same time.
2. There must be Wi-Fi or wired internet at the monitoring site.
3. Enable WEB dashboard monitoring on the Respimatic system.
4. Allow the Respimatic system to log on to the Wi-Fi network.
5. Visit the provided URL at the monitoring site.
6. Pair the WEB dashboard at the monitoring site with the Respimatic at the deployment site using the Respimatic System Unique ID.
7. WEB Dashboard allows monitoring only. It does not permit remote control of the system.

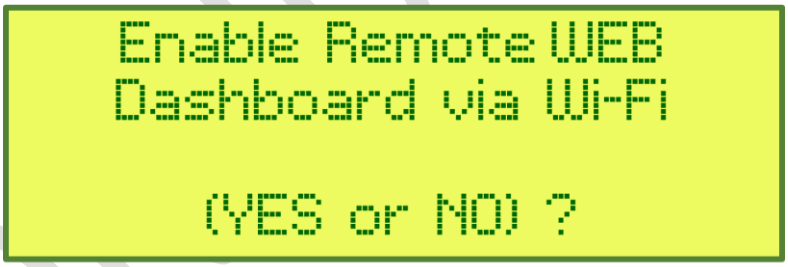


Figure 1: Enable/Disable Wi-Fi login

During the start-up sequence, the system gives an option to enable or disable remote monitoring for the system. Once enabled, the system guides the user to set up the remote WEB Apps.

Setting up Wi-Fi credentials

Respimatic system remembers the history of prior Wi-Fi networks that have been used by the system. The user is provided with an option to either auto-connect to a previously known Wi-Fi network or to configure a new one or to use an OTP. If desired, the recorded Wi-Fi history can be erased at this time.

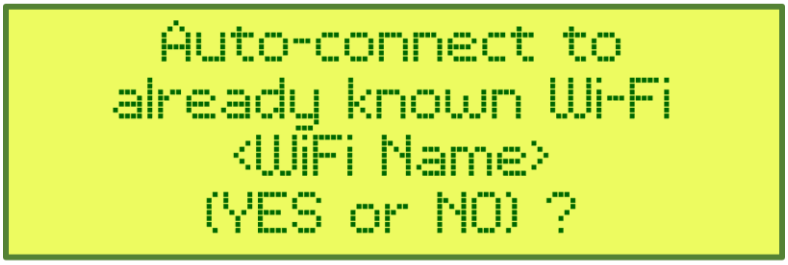


Figure 2: Wi-Fi Autoconnect

If Auto-connect is not enabled or if Auto-connect fails, the next option is to use a configuration portal to setup a new Wi-Fi network for the system to log in to. To enable login through a configuration portal, the system sets up a local, temporary Wi-Fi network named "Respimatic Wi-Fi". The user can use either a wifi-enabled laptop of smartphone to log on to this network.

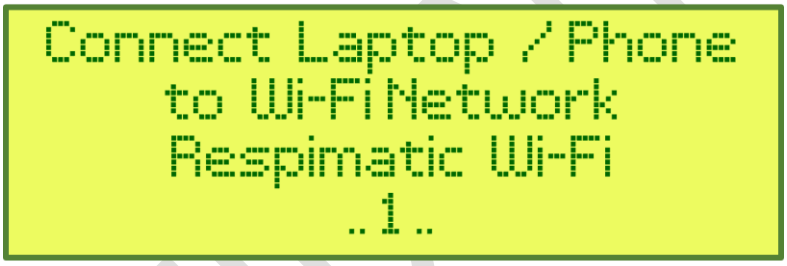


Figure 3: Connect to Respimatic W-Fi network

Upon login to this "Respimatic Wi-Fi" network, a portal screen is automatically presented on the laptop or the smartphone which guides the user step-by-step to enabling system to login to a desired Wi-Fi network. The portal time out in 2 minutes if unable to log on for whatever reason. If the system times out, the user can retry as many times as desired.

In case the portal does not automatically open, open a browser and navigate to 192.168.1.4 (URL) after connecting to the "Respimatic Wi-Fi" network.

WiFi login has two options as below.

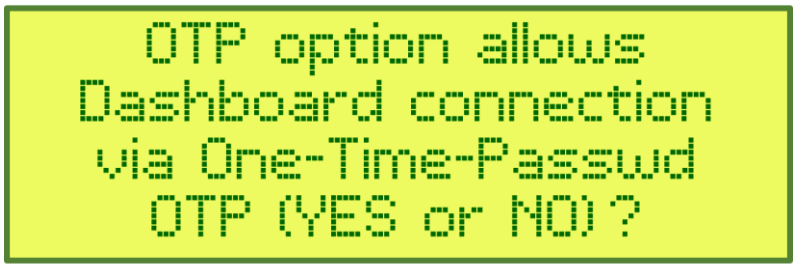


Figure 4: Login OTP Selection

1. Anonymous

   No message is sent to the Web Apps portals to announce the login. Only those browsers with prior knowledge of the particular system can connect to it.

   (See section on Systems Table)

2. Broadcast

   A message is sent to all Web Apps portals to announce the login. An OTP will be generated and displayed on the system's Front-panel. Only those browsers with knowledge of the OTP (One Time Password) system can connect to it.

   (See section on Systems Table)

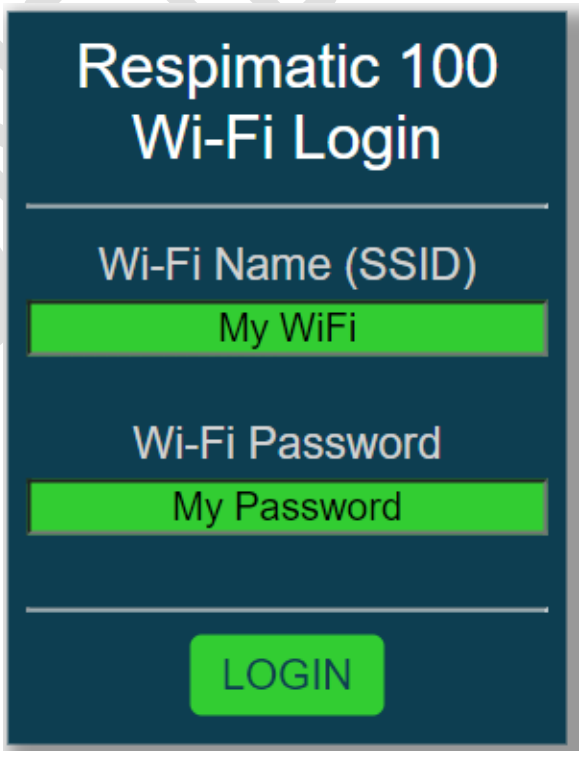


Figure 5: Wi-Fi Configuration Portal

If the Wi-Fi login was unsuccessful, the user can still continue without enabling a WEB dashboard.

Upon a successful Wi-Fi login, the system is now ready to be connected to the WEB Apps using the unique system id (SYSUID). The SYSUID is a 20 character string starting with the prefix "UID_" followed by 16 hexadecimal digits. Another option is to connect using the OTP displayed as below. Further details can be found in the next section.

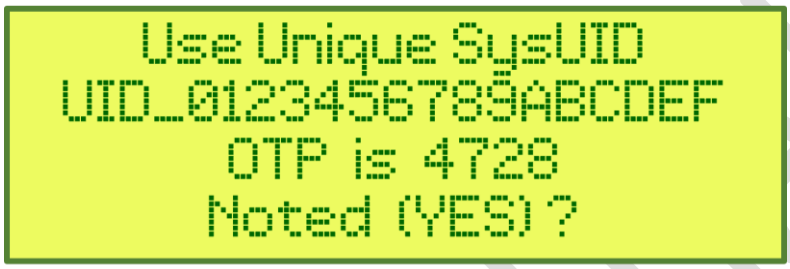


Figure 6: Wi-Fi Login Successful

Launching the WEB Apps

https://www.respimatic.com

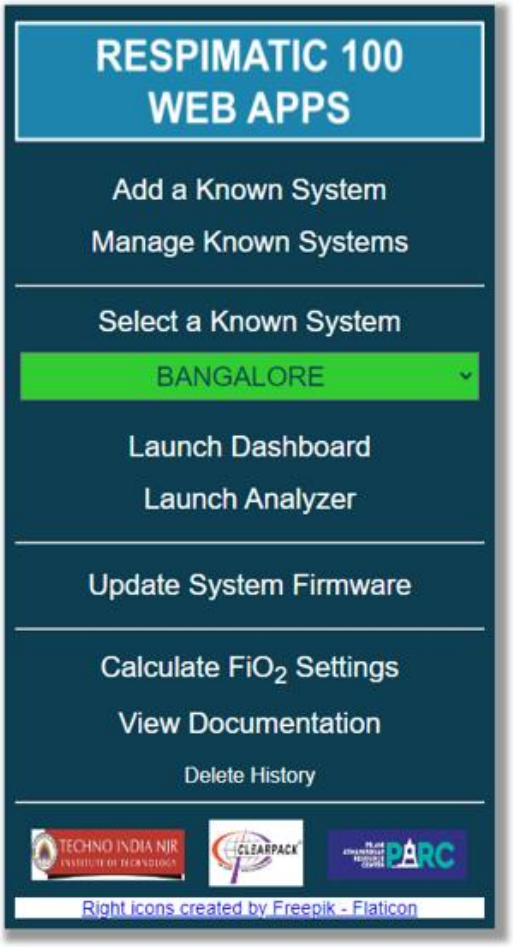


Figure 7: Web Apps Main Menu

Figure 8: Respimatic Systems Table

IMPORTANT

Use CTRL key and +/- keys to zoom in/out

or hold down the CTRL key and use the mouse wheel to zoom in/out

till the content fits well in the browser screen.

The screenshot above on the left is the main portal menu while the screenshot on the right above is the Systems Table.

All the Web Apps communicate with a particular Respimatic 100 system via a Unique System ID (UID). Each Respimatic 100 system has a built-in UID which is 20 characters long (e.g. UID_AAAABBBBCCCCDDDD). This UID is displayed on the system's front panel upon a WiFi login. It can also be accessed via the STANDBY menu on the system.

Each time a system logs in, the main portal page displays a popup message as below.

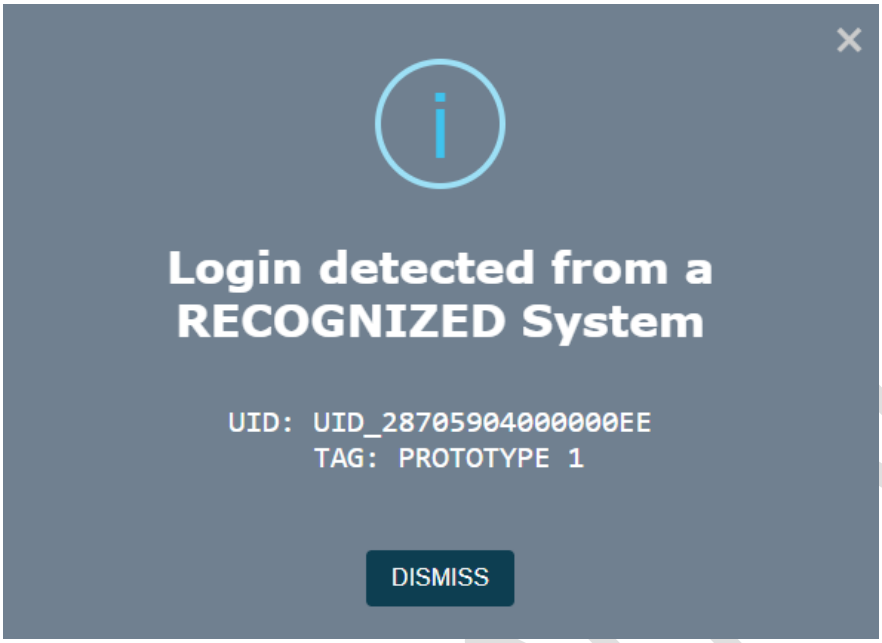


Figure 9: Login Message Popup

The main Respimatic.com portal holds a table of the Respimatic 100 systems it recognizes. Initially this table is empty. Once populated, it is accessible for all times after that. The table is accessed via the "Manage Known Systems" button.

Each unique system id (SYSUID) of the Respimatic 100 systems can be associated with an easy to remember name tag. The browser remembers the history of all the SYSUIDs that have been used and presents them in the dropdown list in the main menu box above.

The table of name tags and associated SYSUID (Systems Table) is accessed through the "Manage Known Systems" button. The + menu button on the Systems Table adds a system. To select a system to communicate with either double click on the appropriate row or use the checkmark button against the row. A system can be removed from the table using the trash menu button in the appropriate row. The trash button on the top right removes all system information. The systems table can also be exported as a JSON xml file and can be imported from a JSON xml file by clicking the appropriate icons on the table banner. Finally, the back arrow menu button on the top left can be used to navigate back to the main menu.

There are two ways to populate the systems table.

1. If you know the UID of your system(s), simply add the information using the "Add New System" button. Each system can be assigned a tag name so that it is easy to remember and access. The popup for "Add New System" is shown below.

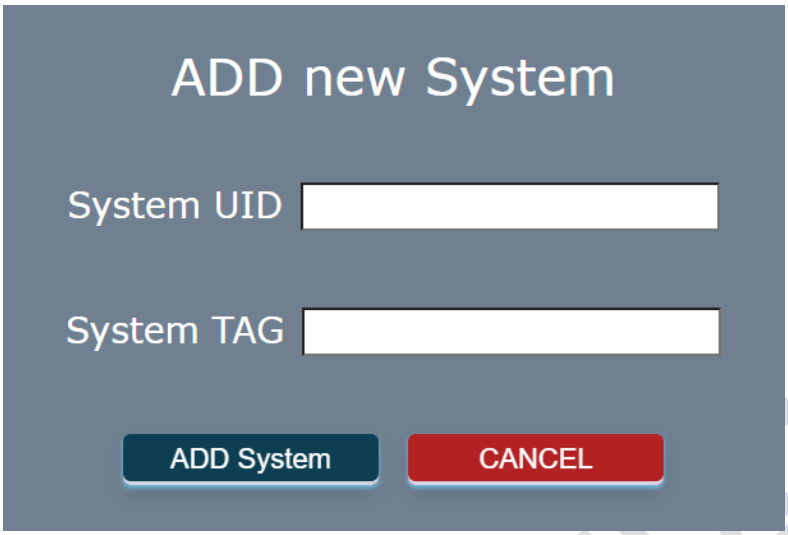


Figure 10: Add a new system to Systems Table

2. Every time a recognized or unrecognized system logs in, there is a message displayed on the portal web page. In case of an unrecognized system, the portal popup message provides an option to add the unrecognized system to the systems table using an OTP displayed on the system's front panel.

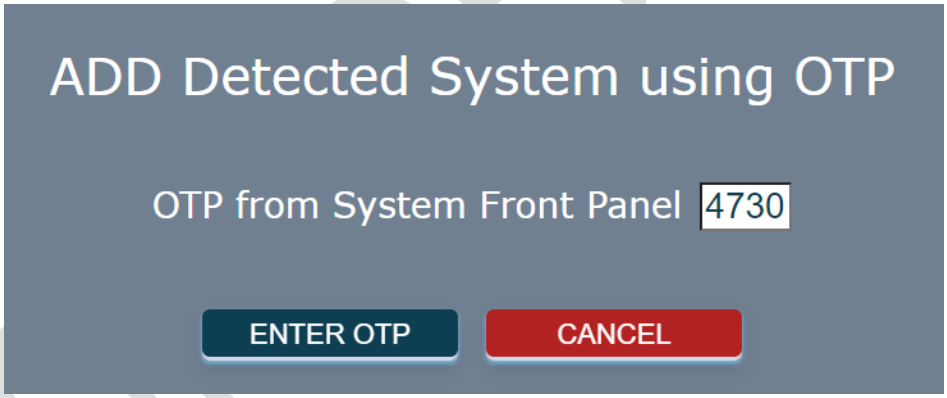


Figure 11: Add a new System using OTP

The following WebApps are available via the links on the main menu.

- *Launch Dashboard* - Monitor a session remotely. It requires a SysUID to be selected to determine the Respimatic system to connect to.

- *Launch Analyzer* - Analyse a previously recorded session. It requires a SysUID to be selected to determine the Respimatic system to connect to.

- *Update System Firmware* – Download and install a new release of firmware for the Respimatic system.

- *Calculate FiO2 Settings* – Calculate required Oxygen inflow rate. It does not require a SysUID.

- *View Documentation* – All the pdf documents are accessible through this link. It does not require a SysUID. If a "PDF Viewer" extension is loaded in your browser the documents can be read online or else, they can be downloaded. Figure below is a screenshot of the document's web page.

Figure 12: Respimatic Documentation

WEB Dashboard

The live WEB dashboard, when connected, offers a choice of six different views. The user can switch between these views at any time. Figure below shows the sidebar for the dashboard.

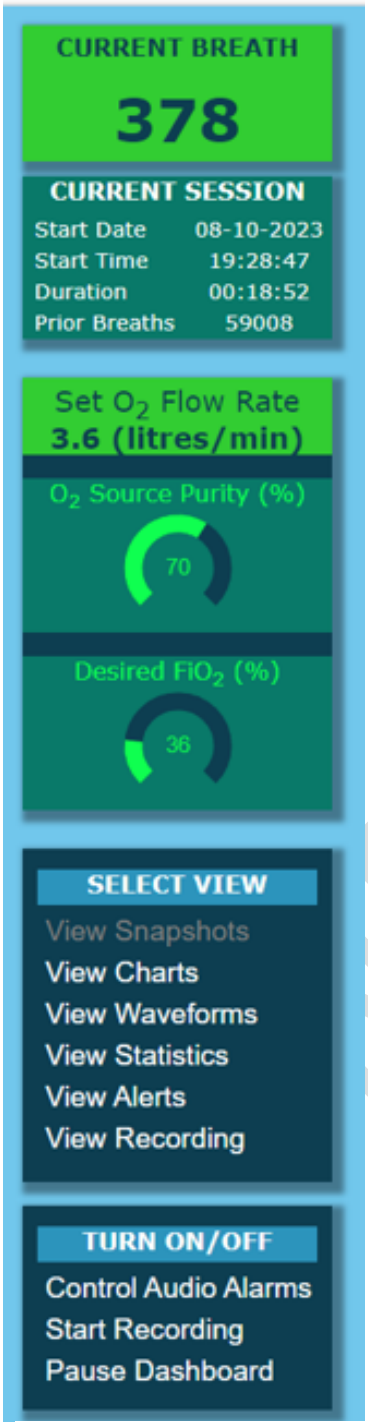


Figure 14: Dashboard Menu

The box on the top shows some relevant summary data for the current session.

The next box allows for selecting the type of view to display. Available views are as below.

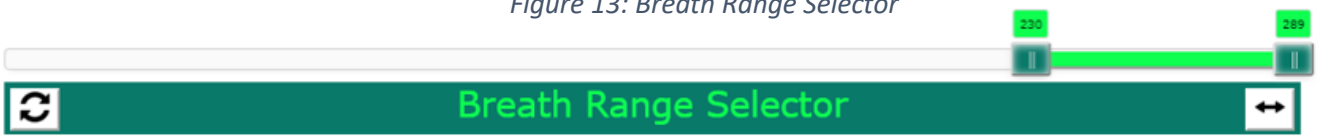
1. Snapshots view
2. Charts view
3. Statistics view
4. Alerts view
5. Breath Shapes View
6. Recording View

The next box allows for turning on/off session recording and dashboard updates. Pausing dashboard updates only stops the display from updating, fresh data continues to get collected and will get displayed once the 'Pause Dashboard' is turned OFF.

The box at the bottom displays all FiO2 related settings. These settings are only for monitoring, the user must use the physical system's control panel to change these settings like all other settings.

The Figure below shows a Slider that can be used to select the range of breath numbers to display the required data for. The breath number range can be selected by grabbing the slider handles and sliding then to the required breath numbers. The range can then be committed using the checkmark button. Once committed the display is frozen to the selected range. The rolling button on the extreme left discards the selected range and enables a fresh display update on each new breath. The double arrow button selects the entire range and freezes the display to that.

Figure 13: Breath Range Selector



Dashboard Audible Alarms

By default, all audible alarms are turned OFF. The audio alarms can be selectively turned ON/OFF using the "Control Audio Alarms" button.

Below is a screenshot of the Audio alarm settings.

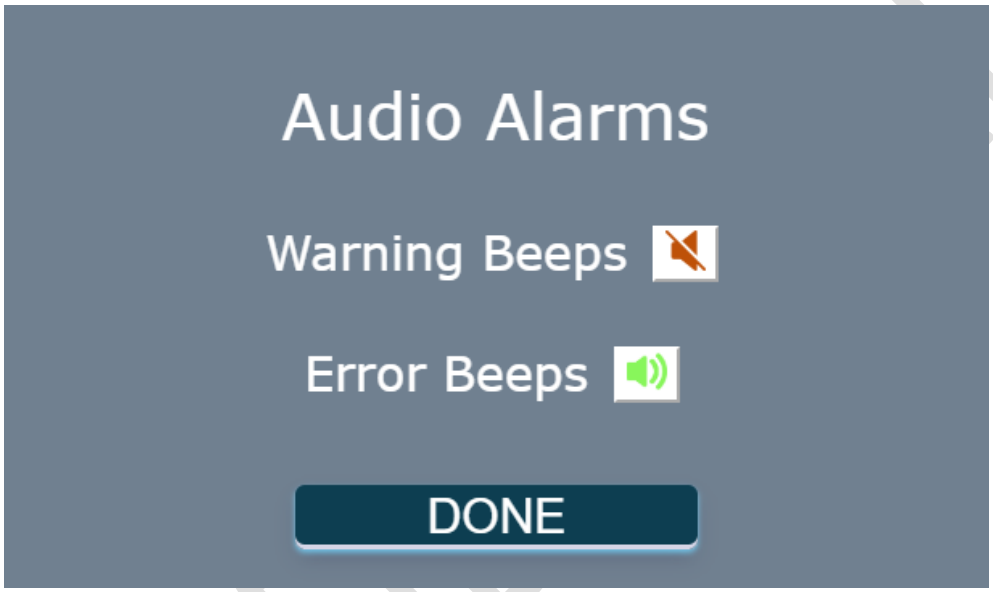


Figure 15: Setting Audio Alarms

Dashboard Snapshots View

Below is a screenshot of the WEB Dashboard "Snapshots View". All the Respimatic parameters, both input and output, are presented on the dashboard for easy viewing as a cohesive whole.

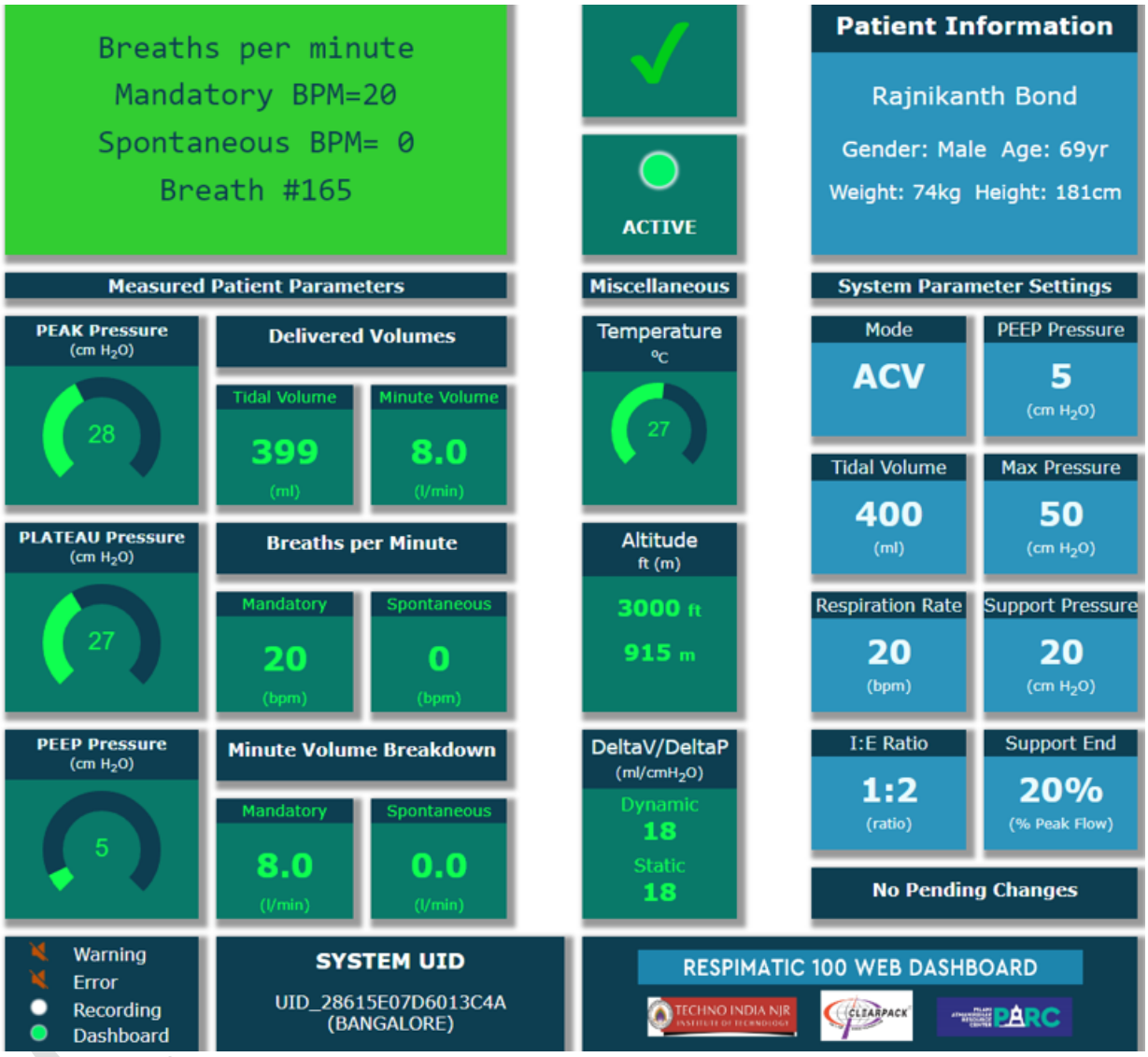


Figure 16: Dashboard Snapshots View

Note that for safety reasons, the Dashboard only allows monitoring of a remote system. The dashboard cannot be used to control the remote system. That must be done using the front panel of the physical Respimatic system.

Dashboard Charts View

The Dashboard also provides an option for a "Charts View". A screenshot of the charts view is shown below. This screenshot shows three chart boxes. A chart box can be added at any time using the + menu button on the top left of the chart box. Use the trash menu button on the top right to delete a chart box.

The parameters to chart can be selected using the checkboxes on the edit menu. The edit menu button is also on the top right of each chart box. The charts are updated after every breath. The X-axis can be selected as breath number or as elapsed time between breaths.

By default, the system charts the selected parameters for the past 60 breaths on a rolling basis, the charts are updated after each breath.

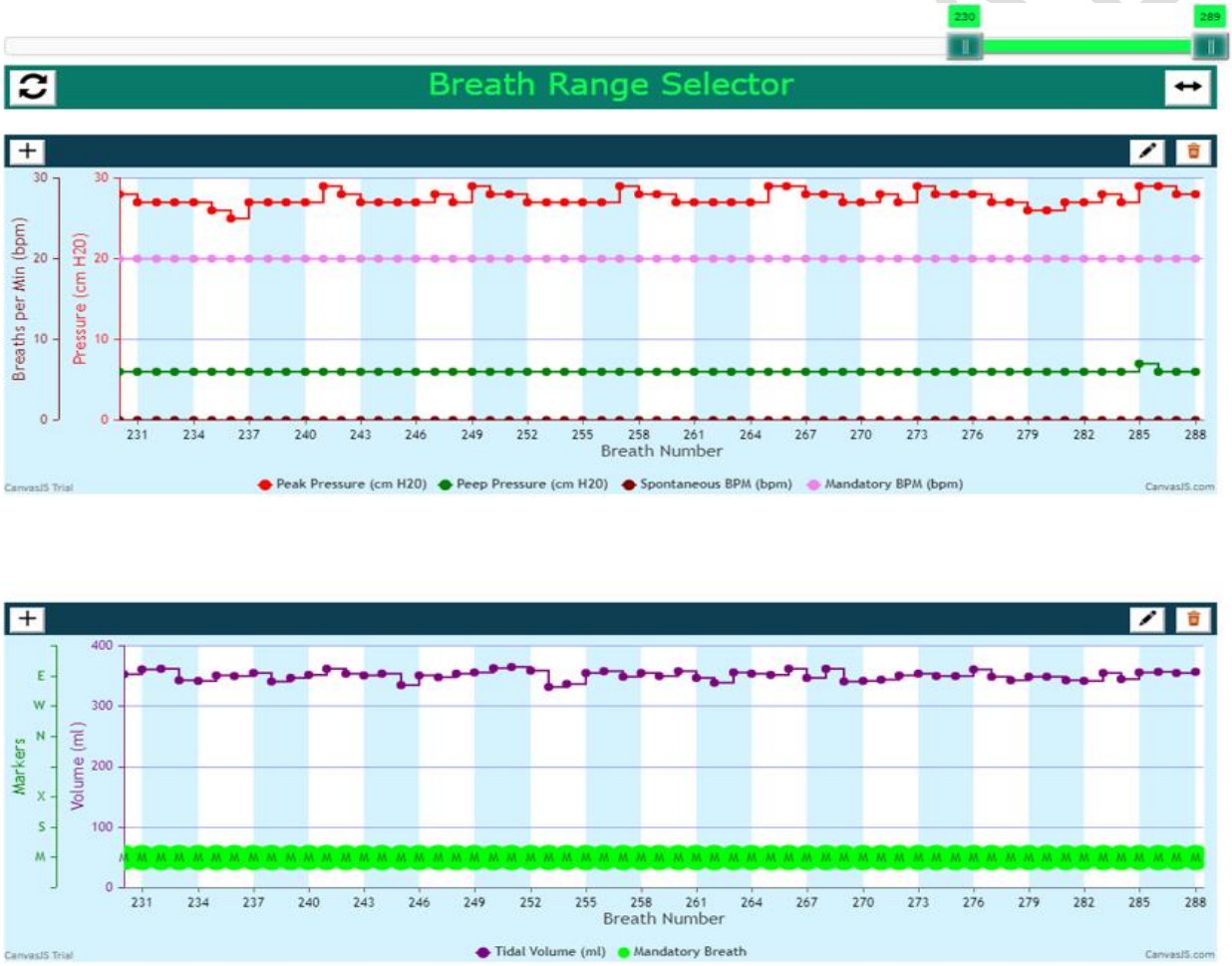


Figure 17: Dashboard Charts View

There is a Range Slider above the chart boxes to pan or zoom to any desired range of breath numbers. Use the handles on the Slider to select a particular range. If a particular range is selected, further chart updates are disabled till the range is reset using the RESET button on the range slider, the new parameter values are still stored for later display. Upon RESET, the chart boxes return to their default display mode.

The chart box edit menu is shown below. Any collection of the shown parameters can be displayed in any chart box or in multiple chart boxes.

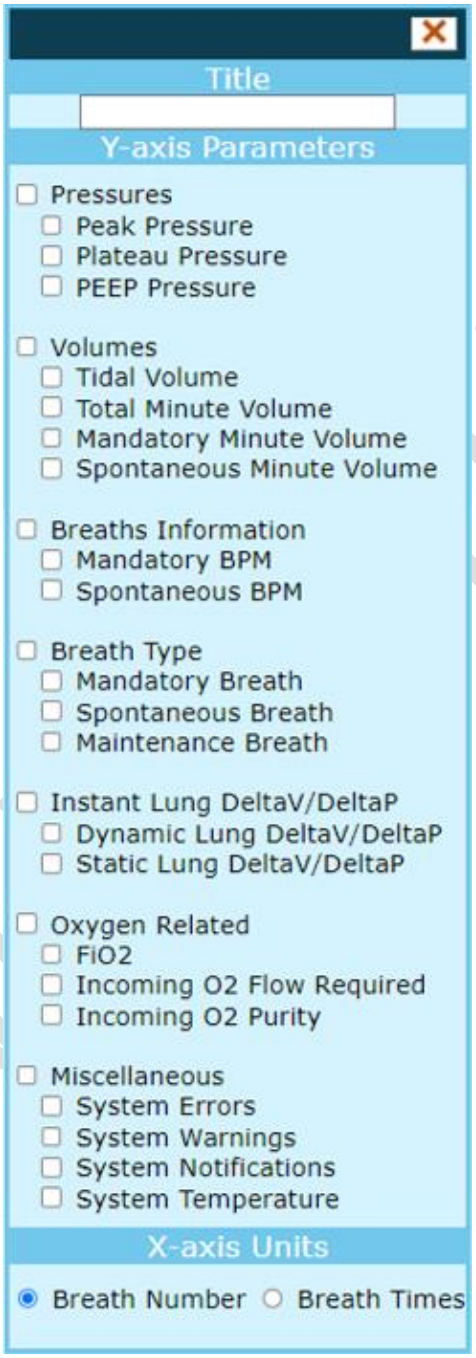
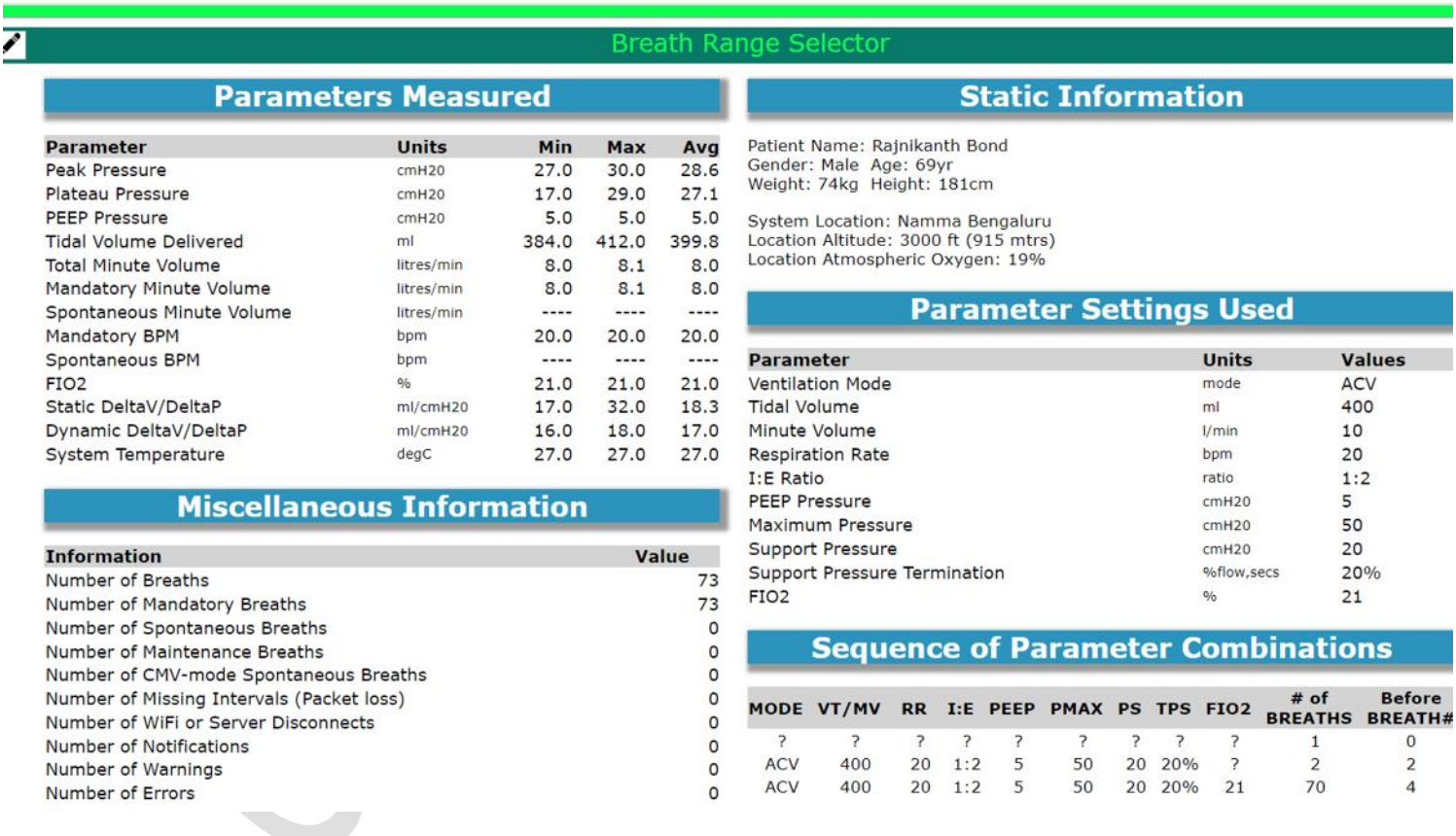


Figure 18: Charts Edit Menu

Dashboard Statistics View

The Dashboard also provides an option for a "Statistics View". A screenshot of the statistics view is shown below.

The statistics are collected for the entire range updated after every breath by default. The range slider can be used to gather statistics for any range of breath numbers. The RESET menu button on the range slider causes the updates and display to go back to their default mode.



Breath Range Selector

Parameters Measured

Parameter	Units	Min	Max	Avg
Peak Pressure	cmH20	27.0	30.0	28.6
Plateau Pressure	cmH20	17.0	29.0	27.1
PEEP Pressure	cmH20	5.0	5.0	5.0
Tidal Volume Delivered	ml	384.0	412.0	399.8
Total Minute Volume	litres/min	8.0	8.1	8.0
Mandatory Minute Volume	litres/min	8.0	8.1	8.0
Spontaneous Minute Volume	litres/min	----	----	----
Mandatory BPM	bpm	20.0	20.0	20.0
Spontaneous BPM	bpm	----	----	----
FIO2	%	21.0	21.0	21.0
Static DeltaV/DeltaP	ml/cmH20	17.0	32.0	18.3
Dynamic DeltaV/DeltaP	ml/cmH20	16.0	18.0	17.0
System Temperature	degC	27.0	27.0	27.0

Miscellaneous Information

Information	Value
Number of Breaths	73
Number of Mandatory Breaths	73
Number of Spontaneous Breaths	0
Number of Maintenance Breaths	0
Number of CMV-mode Spontaneous Breaths	0
Number of Missing Intervals (Packet loss)	0
Number of WiFi or Server Disconnects	0
Number of Notifications	0
Number of Warnings	0
Number of Errors	0

Static Information

Patient Name: Rajnikanth Bond
Gender: Male Age: 69yr
Weight: 74kg Height: 181cm

System Location: Namma Bengaluru
Location Altitude: 3000 ft (915 mtrs)
Location Atmospheric Oxygen: 19%

Parameter Settings Used

Parameter	Units	Values
Ventilation Mode	mode	ACV
Tidal Volume	ml	400
Minute Volume	l/min	10
Respiration Rate	bpm	20
I:E Ratio	ratio	1:2
PEEP Pressure	cmH20	5
Maximum Pressure	cmH20	50
Support Pressure	cmH20	20
Support Pressure Termination	%flow,secs	20%
FIO2	%	21

Sequence of Parameter Combinations

MODE	VT/MV	RR	I:E	PEEP	PMAX	PS	TPS	FIO2	# of BREATHS	Before BREATH#
?	?	?	?	?	?	?	?	?	1	0
ACV	400	20	1:2	5	50	20	20%	?	2	2
ACV	400	20	1:2	5	50	20	20%	21	70	4

Figure 19: Dashboard Statistics View

Dashboard Alerts View

The Dashboard also provides an option for a "Alerts View". A screenshot of the alerts view is shown below.

By default, it displays the complete history of errors and warnings encountered in the current session. The range slider on top can be used to see the alerts for any range of breath numbers. The RESET menu button causes the updates to go back to their default mode.

Figure 20: Dashboard Alerts View

Dashboard Waveforms View

The Dashboard also provides an option to view the detailed pressure and flow waveforms for selected breaths. Figure below shows a sample of such a view.

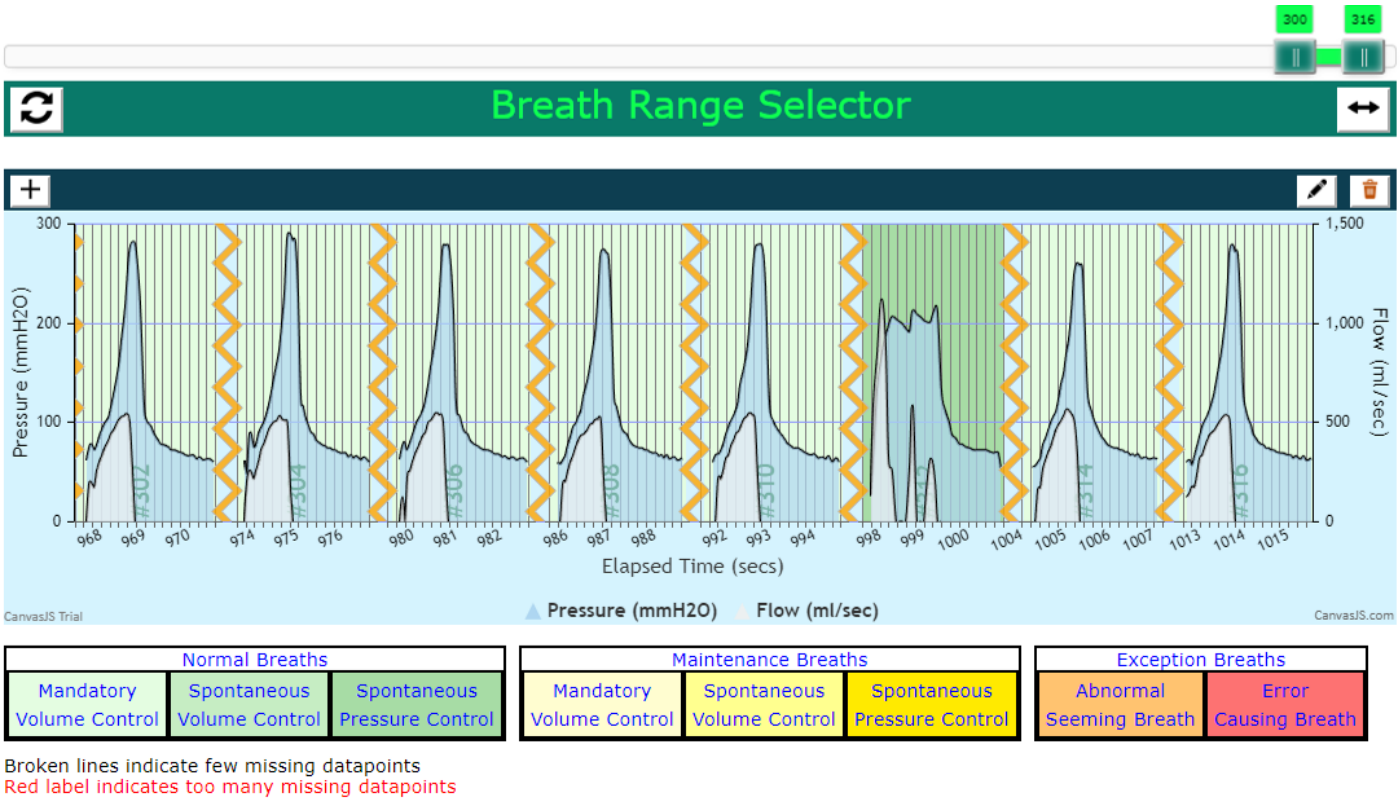


Figure 21: Breath Detailed Pressure and Flow Graphs

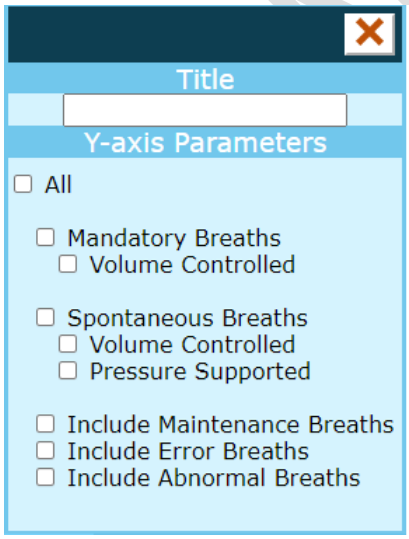


Figure 22: Breath Type Menu

The EDIT icon on each box allows the selection of the kinds of breaths to display. The graphs are color coded as per the legend at the bottom of the page. The breath selection menu is shown in the Figure on the left.

Dashboard Recording

The Dashboard also provides an option to record any part of the current session using the "Start Recording" menu button on the sidebar menu. The recoding can be paused at any time causing that paused window to not be recorded. The Recording at the bottom left of the Snapshots view indicates whether the recording is currently active.

The recording is stored in a JSON database on the disk of the laptop or the desktop that the browser is running on. This recording can be analysed at any future time using the Analyzer WebApp. A screenshot of the recording view is shown below.

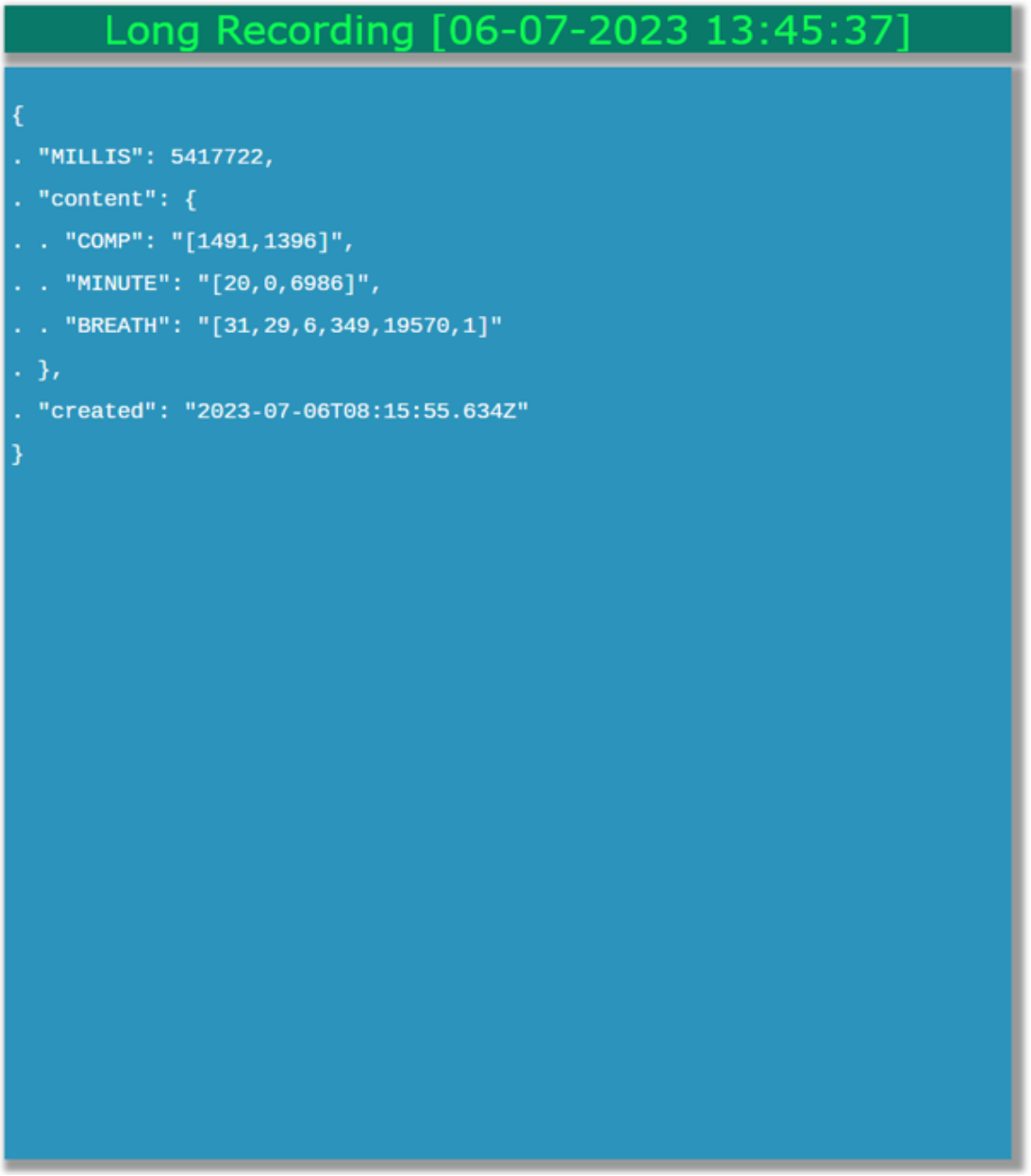


Figure 23: Dashboard Recording View

WEB Analyzer

The Analyzer enables the analysis of a previously recorded session with a patient. The process starts with selecting a session recording to analyse.

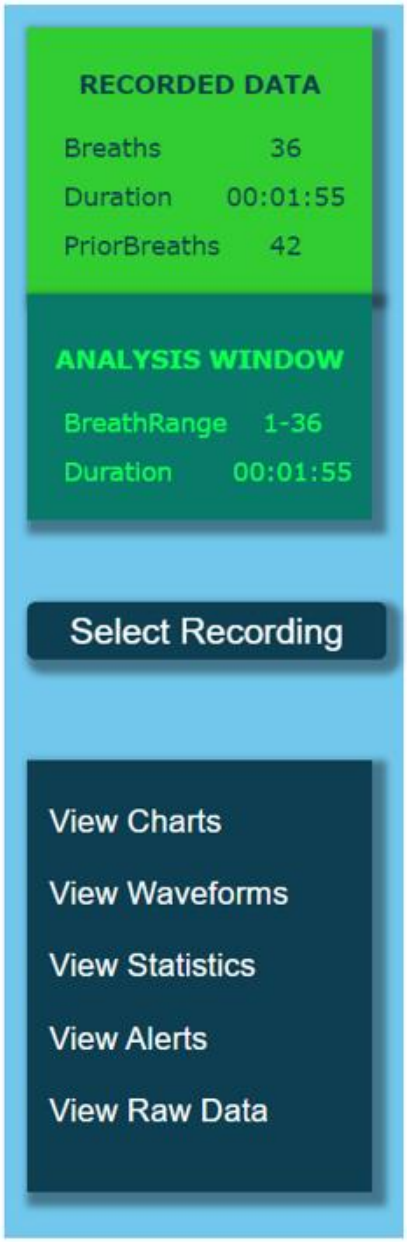


Figure 24: Analyzer Sidebar Menu

Analyzer Sidebar Menu

The main menu for the Analyzer is presented as a sidebar menu as shown in the Figure on the left.

The box on the top provides a summary of the currently selected recording for analysis.

Analyzer Recording Selector

Each previously recorded session is presented in a Selector table. Select a recording for analysis either by double-clicking on a row or using the appropriate checkmark menu button.

Figure 25: Analyzer Selector Table

After a database is selected, a summary of the recording data is displayed in the top box of the sidebar and the selected table row is highlighted.

Analyzer Range Slider

By default, the analysis window is the entire recording. To select a particular breath number range to analyse, use the handles of the Range Slider shown below to zero in on

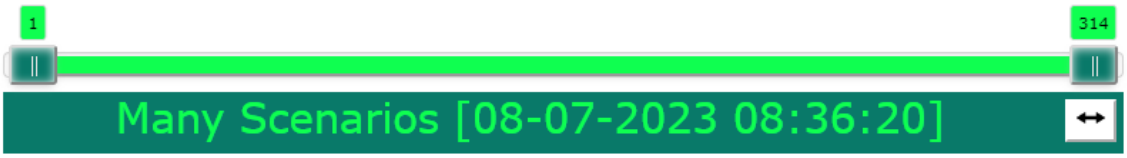


Figure 26: Analyzer Breath Range Selector

the interval of interest. All Analysis actions use the currently selected analysis range. The range selector works in the same fashion as described earlier in the Dashboard section.

Analyzer Recording Import Export

The EXPORT menu button on each row enables the user to export the database to a text file that can be sent to others for analysis. The IMPORT button on the top left allows the user to import a previously exported text file as a new session available for analysis. Below is a screenshot of the Import screen.

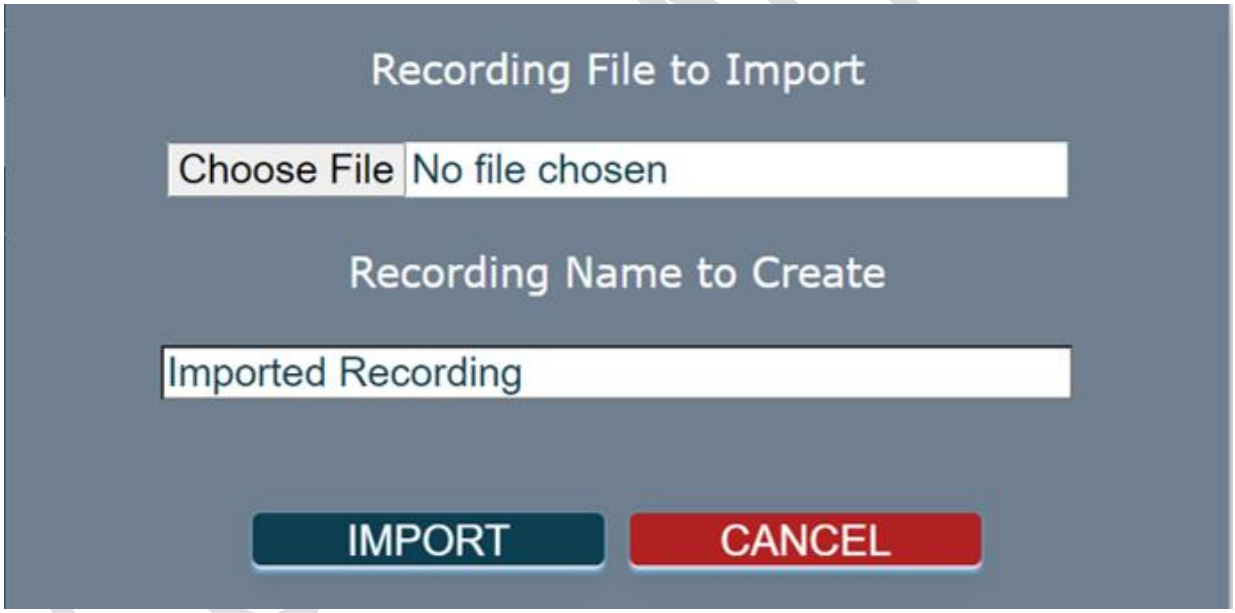


Figure 27: Analyzer Import View

Analyzer Charts, Statistics, Breath Waveforms and Alerts Views

Finally, the Charts, Statistics, Breath Shapes and Alerts views work in the same fashion as described in the Dashboard section above.

Updating System Firmware

Occasionally the system may need to be upgraded in the field for new features or bugs. The new firmware releases are made available on the web for downloading and installing. The following menu interface is a part of the Web Applications to enable the end user to accomplish these upgrades.

For further details click on the Step-by-step Instructions on this application.

Figure 28: Firmware Update Web Application

Below is a screenshot of step-by-step instructions.

Figure 29: Step-by-step instructions on Updating Firmware

FiO_2 Calculator

FiO2 is controlled externally by setting an appropriate Oxygen input flow rate from the external Oxygen source.

This stand-alone calculator enables calculating the required Oxygen flow rate given the following parameters.

- Deployment Altitude
- Desired FiO2
- Purity of the Oxygen Source
- Tidal Volume
- Respiration Rate

Simply position the mouse over any gauge and turn the scroll wheel to change its value. Else, the required value can be typed in the center of each gauge.

Figure 25: FiO2 Calculator

Index Table