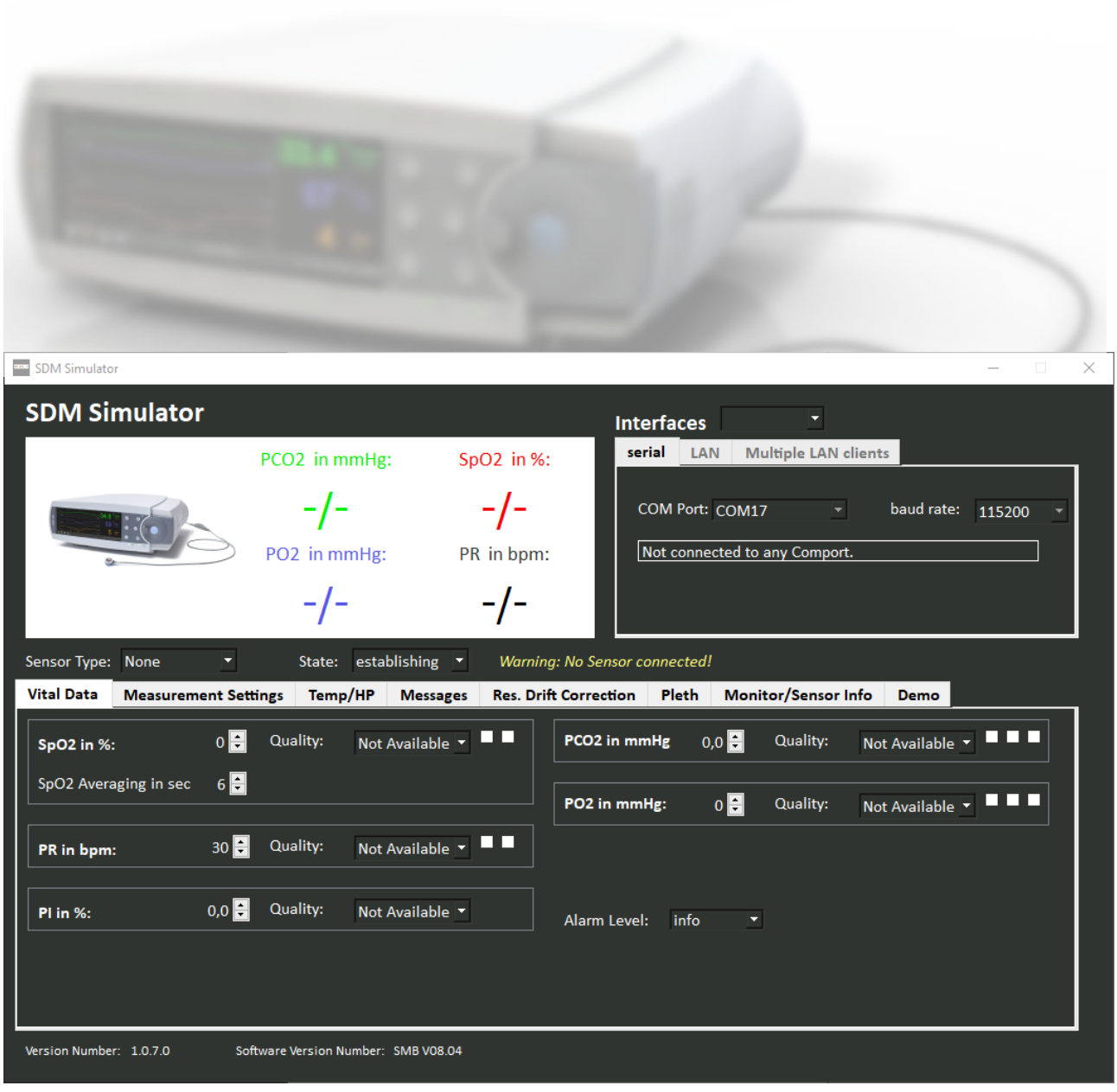
Sentec Digital Monitor (SDM) Simulator

Instruction Manual

HB-008401-c



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1. PURPOSE OF THIS DOCUMENT

This document summarizes the functionalities and features of the Sentec Digital Monitor (SDM) Simulator. It shall support software developers with implementing a Sentec interface driver for third party devices based on SDM interface protocol 'SentecLink' with 'SMI Mode'. The SMI Mode is designed for communication between the Sentec Digital Monitor (SDM) and the manufacturer's third party device in order to duplicate and display data on manufacturer's device.

2. REFERENCES

[1] SDM Technical Manual HB-005752
[2] SRS SDM-Simulator RF-008130
[3] SentecLinkProtocol SMI Mode HB-008001

This document is based on software version SMB V08.04.xx as well as the listed documents above.

3. INTRODUCTION

The SDM Simulator simulates the most important data objects of the SDM software that are provided and described in detail in the interface protocol description (see [2]). With the simulator, it is possible to imitate several sensor and monitor states to generate complex scenarios being relevant to develop and test the interface driver. Next to selected settings (concerning vital data, measurement, temperature, etc.) general and special bits of single data objects can be set via mouse click. For every parameter, a tooltip with further information such as the object name (SMI command to request the parameter values via interface) is provided. Communication to the simulator can be established via serial or LAN interface.

***Note**: The simulator does not provide the same dependencies between the different settings as the monitor software, e.g. when changing the patient type on the monitor, the sensor temperature changes automatically. On the simulator, nearly all settings are independent. Therefore, it is possible to simulate cases that would not happen in real situations.*

***Note**: This document does not explain / describe the function of the data objects or the general / special quality bits. For further information concerning content of data objects and their qualities, refer to the interface protocol description (see [2]).*

4. REQUIREMENTS AND FIRST STEPS

SYSTEM REQUIREMENTS

	SDM Simulator
CPU	2 GHz and higher
Operating System	Microsoft Windows 7 (64 bits), 8 (64 bits), 8.1 (64 bits), 10 (64 bits)
Communication Port (serial or serial via USB2Serial Converter)	YES
Network connection	Recommended
Screen	XGA (1024 x 768) The Sentec Digital Monitor (SDM) Simulator software is not optimized for high resolution displays.

STARTING SDM SIMULATOR

To run the application on a computer, proceed as follows:

1. Switch on your PC and start Windows
2. Download latest SDM Simulator version via download link:
   http://registration.Sentec.ch/Connectivity&OEM/Tools.html
3. Extract data from zip.-file
4. Double-click on **SDM_Simulator.exe** to start the application

LICENSE INDICATION

The SDM Simulator is based on Qt (https://www.qt.io/developers/) which is provided under the GNU Lesser General Public License v. 3 (“LGPL”) and in part on the work of the Qwt project (http://qwt.sf.net). All used software library sources are unmodified. If the library sources are required, contact: gpl@Sentec.com.

5. LABELING OF GUI ELEMENTS

In the following screenshot, the different widgets of the graphical user interface (GUI) after start-up of application are explained.

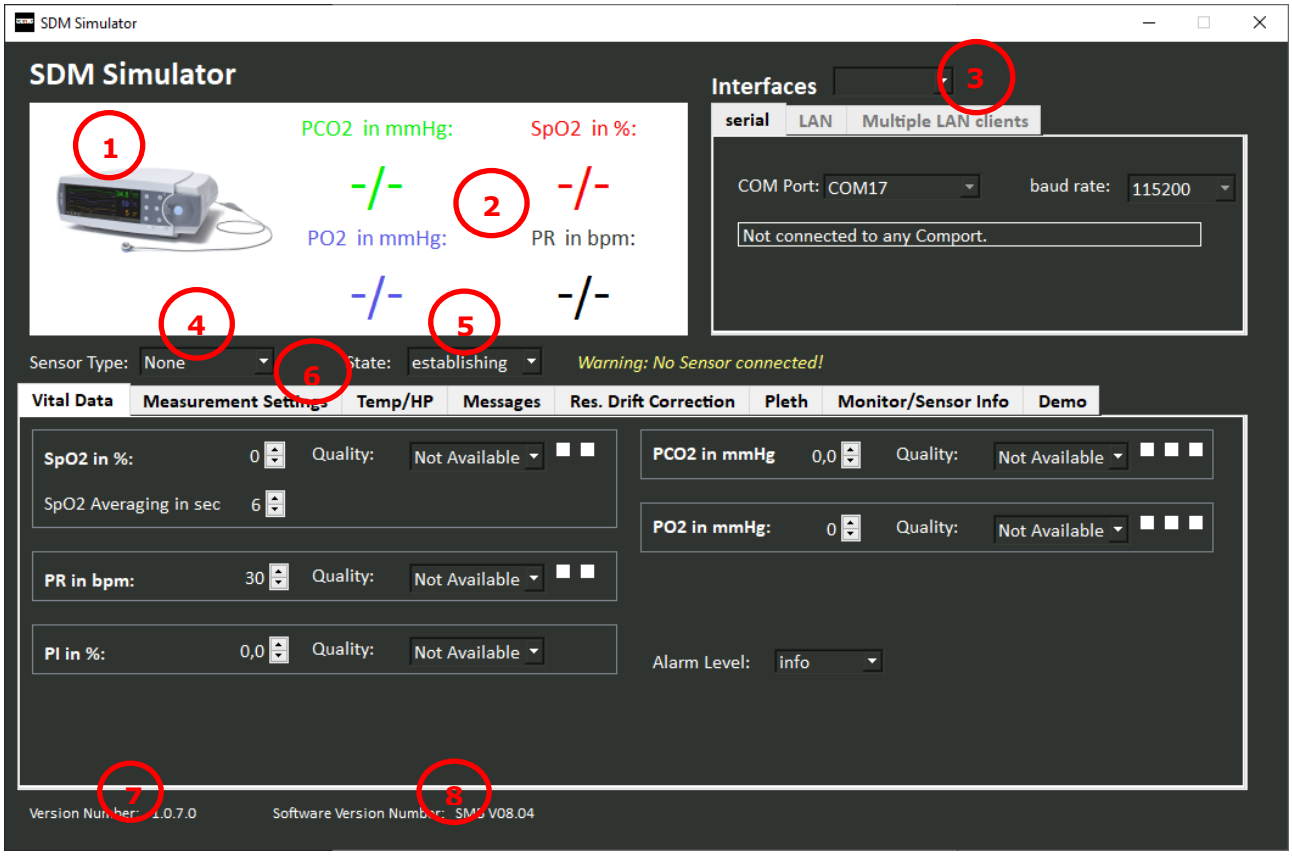

Figure 1: GUI elements after application start-up

① Main image
② Display of vital data and their general quality indicator
③ Combo box for selecting communication interface for interface tab underneath
④ Combo box for selecting sensor type (*OxiVenT™, V-Sign™* or "*None*")
⑤ Combo box for selecting sensor state (*establishing, floating, docking, measuring*)
⑥ Main tabs arranged in different tabs to separate various settings
⑦ Simulator version number
⑧ SDM software version that the simulator is based on

6. MAIN TABS

6.1. VITAL DATA

The primary parameters (PCO2, PO2, SpO2, PR) as well as the secondary parameter PI (Pulsation Index) are structured as followed on GUI:

Figure 2: Structure of primary parameters on GUI

For the parameters as well as every individual checkbox without label, a tooltip with Information indicating its meaning is provided. A tooltip of a parameter provides the SMI command to request the parameter via interface and it appears when moving the mouse over the parameter name label.

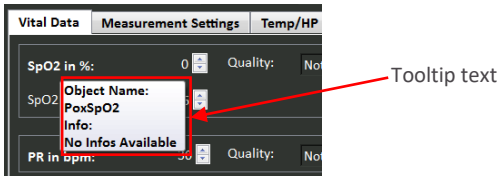

Figure 3: Tooltip

The value imaged in the *main image* depends on the vital data setting. If a parameter is flagged with general quality '*valid*' or '*questionable*', the parameter value is displayed in the corresponding color. The values are

- greyed out if the general quality is flagged as '*unstable*'
- replaced by "---" if the general quality is flagged as '*invalid*'
- replaced by "-/-" if the general quality is flagged as '*not available*'

6.2. MEASUREMENT SETTINGS

In tab '*Measurement Settings*' basic settings can be set before starting a measurement. Selectable is

- the patient type ('*neonate*' for neonatal patients and '*adult*' for pediatric and adult patients) via combo box
- enabled parameters (primary parameters in various combinations) via combo box
- monitoring time (remaining site time) via spin box
- alarm limits (high and low) for the primary parameters via spin boxes

6.3. TEMP/HP

TEMPERATURE SETTINGS

The '*Sensor Temperature*' with corresponding general and special quality bits as well as '*Sensor Set Temperature*' can be changed in tab '*Temp/HP*'. With '*Sensor Temperature*', the current measured temperature of the connected sensor is displayed. On the GUI, this parameter is structured equivalent to the primary data in tab '*vital data*' (see section 6.1). The '*Sensor Set Temperature*' is modifiable via spin box.

HEATING POWER SETTINGS

The Heating Power (HP) displays the power that is needed to heat up the sensor and keep the sensor temperature at a constant level. HP is structured the same way as the primary parameters on the GUI. Additionally, the heating power mode ('*relative*' – RHP, '*absolute*' – AHP and '*off*') is selectable via combo box. For RHP mode, a reference is set to calculate the relative HP value. This reference can be modified on the GUI via spin box.

6.4. MESSAGES

The application provides status messages for technical and physiological information/alarms dependent on the sensor state. According to sensor state, the different messages are sorted in sub tabs. The messages in the current activated sub tab can be (re)set via checkboxes. Checked messages are also displayed as status code in the frame on the right side of the main tab in prioritized sequence.

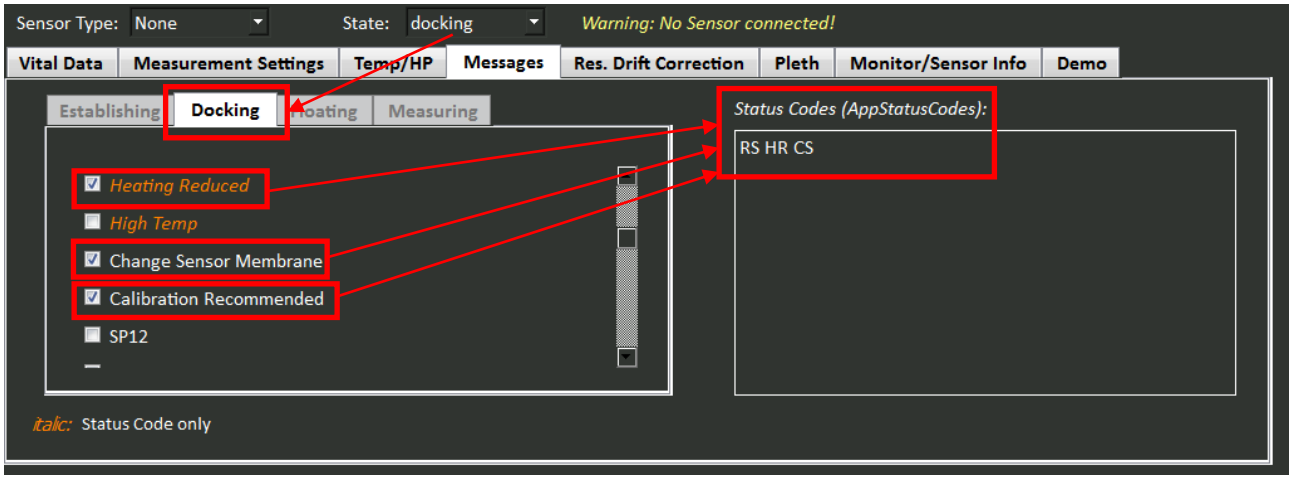

Figure 4: Messages tab

Note: Messages that are written in 'Italic' are only status codes in the SDM software or replaced by icons on SDM display, which means that the SDM does not put out a message if these cases occur.

6.5. RES. DRIFT CORRECTION

The 'Retrospective Correction of Residual drift' of PCO2 values can be managed via requesting '*Pco2CalibrationLine*', '*MpbRtc*' and '*Pco2Progress*'. '*Pco2CalibrationLine*' provides 12 fields with Information where the first field contains the MPB time, exemplary fixed values for the following ten fields and a variable validity field. While the '*Validity*' is selectable via combo box, all other fields can be notified via button, which is displayed in a label.

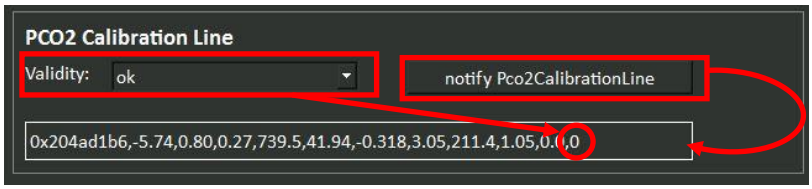

Figure 5: 'Pco2CalibrationLine'

Next to '*Pco2CalibrationLine*', a frame with the MPB time is displayed. It is possible to adjust the time (that counts in seconds) with an offset (negative and positive) via spin box in a range of ± 3600 sec.

'Pco2Progress' consist of an '*estimated duration time*' and a '*counted-up time since start*', which are merged to one value. Each time is configurable via spin box. Additionally, 8 attribute bits can be (re)set and are displayed equivalent to the special and general quality bits for the primary / secondary parameters on the GUI.

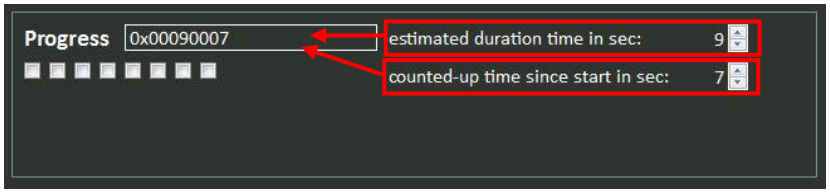

Figure 6: 'Pco2Progress'

6.6. PLETH

In tab '*Pleth*', the plethysmographic waveform is updated while the sensor state is '*measuring*'. The values of the wave are based on real physiological example values.

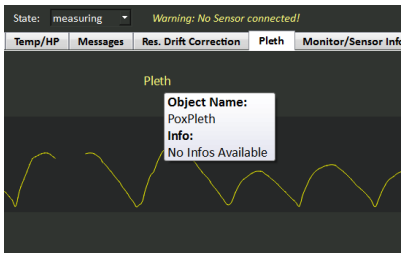

Figure 7: Plethysmographic waveform

6.7. MONITOR/SENSOR INFO

In tab '*Monitor/Sensor Info*', the software versions and serial numbers of the monitor and the sensor are displayed. While

- *'SMB Serial Number'*,
- *'Sensor Serial Number'* and
- *'Sensor Software Version'*

are exemplary fixed numbers,

- *'SMB Software Version'*,
- *'MPB Software Version'* and
- *'Sensor Name'*

are editable via combo box.

Note: *In order to ensure traceability and compatibility, we recommend that the software developer, implements the afore-mentioned data objects. Implementation of the SMB software version is mandatory. The editable data objects can be used to test compatibility also. It should be ensured not to support older software versions than SMB V08.00.x. Ensure to support all software versions that are lower than SMB V09.xx. as well..*

6.8. DEMO

In tab '*demo*' it is possible to play two demonstrations which displays different scenarios for the primary parameters and also to script a customized demo version. For playing a customized demo, a text file (.txt) can be created under following rules:

- Choose a name for the file (e.g. 'CustomizedDEMO:')
- Set value and quality bit like: <object name=value|bits> (e.g. <PoxSpo2=95|00>)

It is possible to integrate a delay in seconds with

- 'wait X' (X being *number of seconds*)

or to implement loops with

- 'loop Y' (Y being *number of Iterations*)
- 'end' indication of loop

Each statement has to start on a new line as the commands are read line per line. The application ignores statements that are not stated as described above. This can be used to comment the script.
The file shall be stored in SDM Simulator folder. The customized demo starts after clicking the 'open' button and selection of the corresponding file in the dialog.
While a demo is playing (regardless of whether a provided one or a customized demo) a 'cancel' button appears that can be used to quit the running demo.

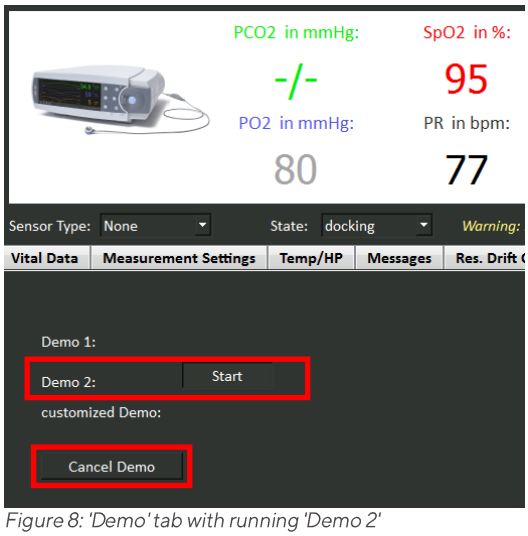

Figure 8: 'Demo' tab with running 'Demo 2'

7. SETUP COMMUNICATION

Setting up a communication works via serial or LAN interface. It is common to use only one interface at a time. Therefore, the application provides the possibility to activate the preferred interface via combo box that is placed above the interface tab.

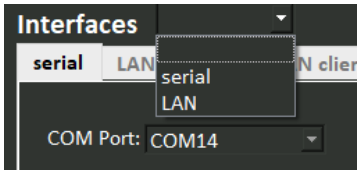

Figure 9: Interface tab

COMMUNICATION VIA SERIAL INTERFACE

To setup a serial connection to the simulator, a RS232 cable should be connected to the PC where the simulator is running.

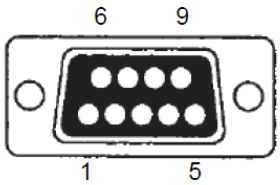

Figure 10: Serial port

Pin	Description
1	Reserved
2	Transmitted data (Tx)
3	Received data (Rx)
4	Reserved
5	Signal ground
6-9	Reserved

Figure 11: Pin assignment of serial port

Parameter	Setting
Bits per second	User-selectable: 115'200, 57'600, 38'400, 19'200 (SDM's menu parameter 'Interfaces/Serial Interface/Baud Rate (SenTecLink)'
Data bits	8
Parity	None
Stop bits	1
Flow control	None

Figure 12: Serial port settings

After starting up the application and activating the serial interface by selecting '*serial*' in the corresponding combo box (described above), all available COM ports are appended on COM port combo box.

The communication can be established with the assistance of a terminal program (e.g. HTerm 0.8.1beta, freeware) and the selection of the corresponding COM ports in the terminal program and the simulator. Before starting the communication, a baud rate has to be selected. Provided baud rates are 115'200, 57'600, 38'400 and 19'200. When the connection is established the simulator starts with an online output immediately. The simulator supports switching off the online output by sending "/online=off". All data objects are accessible via the SMI commands that are described in the interface protocol (see [2]).

Note: The strings of Online Output Mode are fixed strings that are not updated to remind the user to switch this mode off. The SDM Simulator only supports switching the Online Output Mode on and off.

COMMUNICATION VIA LAN INTERFACE

To setup a LAN connection to the simulator, a local network has to be preconfigured on the PC where the simulator is running. After starting up the application and activating the LAN Interface by selecting '*LAN*' in the corresponding combo box, following settings are selectable:

- '*IP Port*' number (0 - 65535)
- '*IP Address*' (only Ipv4 addresses; indirectly selectable via Ethernet adapter)
- '*Interfaces*' (to select the correct Ethernet adapter)

The simulator sets a default port and the client's local IP address automatically. By changing the Ethernet adapter, the IP address changes automatically. Furthermore, a *Device Name* is displayed. The simulator only provides an exemplary fixed name.

The Communication can be established with the assistance of a terminal program (e.g. Docklight Scripting version 2.2.4, freeware). Before starting the communication, the Ethernet adapter and the IP port number has to be selected. When the connection is established all data objects are accessible via the SMI commands that are described in the interface protocol (see [2]).

MULTIPLE LAN CLIENTS

By selecting '*LAN*' on the interface combo box, the sub tab '*Multiple LAN clients*' is also activated to manage multiple clients accessing data from one SDM via LAN interface. On the GUI, the settings for:

- '*LAN Rejection Rate*'
- '*LAN Processing Rate*'
- '*Remote Timeout*'
- '*Remote Ref*' and
- '*Remote Lock*

are not modifiable. Access is only possible via remote application or with the assistance of a terminal program. While '*LAN Rejection Rate*' and '*LAN Processing Rate*' are only writable with expert level on SDM software, the SMI Simulator permits writing to these data objects in user level.

'*Remote Ref*', '*Remote Lock*' and '*Remote Timeout' depend* on each other.
'*Remote Timeout*' determines when a lock has to be refreshed. If an SDM is locked by a client and '*Remote Timeout*' resets the lock, a *'refresh lock'* button appears adjacent to the remote lock label.

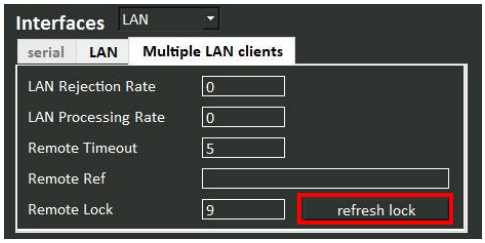

Figure 13 'refresh lock' button

The 'refresh lock' button can be clicked to refresh the lock. It is also possible to refresh the lock or set a new lock via remote application (or terminal program). Setting a new lock or refreshing the lock hides the button. The button is a feature that is only provided in the SMI Simulator and is not part of the SDM software or SDM user menu.

In the simulator, an individual string can be set as '*Remote Ref*'. A string is cleared automatically if an SDM is unlocked by the remote application.

Note: *Contrary to the simulator, a remote application can only set any string if the device is locked successfully in the SDM software.*

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9. ABBREVIATIONS

AHP	Absolute Heating Power
GUI	Graphical User Interface
HP	Heating Power
LAN	Local Area Network
MPB	Multi Parameter Board
PCO2	partial pressure of carbon dioxide
PI	Pulsation Index
PO2	partial pressure of oxygen
PR	Pulse Rate
RHP	Relative Heating Power
SDM	Sentec Digital Monitor
SMB	Sentec Monitor Board
SMI	Sentec Monitor Interface
SpO2	oxygen saturation

Care with Confidence

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