GOSSEN METRAWATT

PerfectLum 3.5

Software

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QUBYX PERFECTLUM USER GUIDE

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INTRODUCTION

When it comes to medical imaging, the ability to see the whole image is important. With a standard workstation configuration using an uncalibrated display, the user runs the risk of missing fine details. Missing fine details can represent a health risk to the patient, which may lead to a misdiagnosis or an expensive lawsuit. The problem is not the image or the practitioner's eye; it is the ability of the display to present all information.

PerfectLum 3.x and PerfectLum 3.x Suite are software solutions, which enable the user to modify display output to meet DICOM part 14 GSDF and other key industry standards. After calibration your workstation will allow you to see the finest details of every image displayed. With PerfectLum medical display calibration software installed on all of your computers, you are ensured that an image will be the same on every display.
PerfectLum Suite is not only a DICOM calibration tool, but also a medical monitor QA application, that verifies the display's conformance to medical standards AAPM TG18, DIN 6868-57, DIN 6868-157, JESRA X-0093, IEC 62563-1 and performs acceptance and conformance tests for those standards.

This document provides details on installation and use of the PerfectLum application.

About PerfectLum 3.x

PerfectLum 3.x is medical display calibration software based on the medical standards NEMA DICOM part 14 GSDF, AAPM TG18, DIN 6868-57, DIN 6868-157, JESRA X-0093 and IEC 62563-1. The software performs calibration to these standards and maintains consistency to all medical workstations. Use of this medical display calibration software enables healthcare professionals to maintain their monitors to international standards of quality.

About PerfectLum 3.x Suite

PerfectLum 3.x Suite is a medical monitor quality assurance suite based on the medical standards NEMA DICOM part 14 GSDF, AAPM TG18, DIN 6868-57, DIN 6868-157, JESRA X-0093 and IEC 62563-1. The medical monitor QA tool performs calibration, acceptance test, conformance test and maintains consistency to all medical workstations. Use of this software enables healthcare professionals to maintain their displays within international standards of quality.

PerfectLum features:

- calibration of all displays to DICOM part 14 GSDF and CIE L* standard
- update of video card LUT or display LUT for displays that comply with the DDC/CI standard
- calibration of multi-head display systems
- history log for comparing and checking results of calibrations
- test patterns to visually check calibration results
- DICOM conformance
- color measurement capability

- many brands of photometer support
- license supports all users on the installed workstation
- Remote control

PerfectLum Suite additional features:

- performing acceptance and conformance tests
- scheduling conformance test automatically and reminding to perform tests
- automated QA

MINIMUM SYSTEM REQUIREMENTS

PERFECTLUM CLIENT OS COMPATIBILITY

- Windows:
  - XP (32-bit and 64-bit)
  - Vista (32-bit and 64-bit)
  - Win 7 (32-bit and 64-bit)
  - Win 8

Processor: Pentium or AMD K7
Minimum RAM: 512MB.
Minimum free space on hard disk: 150MB.

- Mac OS X
  - 10.5 (Leopard, 32-bit)
  - 10.6 (Snow Leopard, 32-bit and 64-bit)
  - 10.7 (Lion)
  - 10.8 (Mountain Lion)
  - Intel hardware is required

Processor: Intel only. No PowerPC support.
Minimum RAM: 512MB.
Minimum free space on hard disk: 150MB.

PERFECTLUM REMOTE SERVER OS COMPATIBILITY

- Windows hosts:
  - Windows XP, all service packs (32-bit)
  - Windows Server 2003 (32-bit)
  - Windows Vista (32-bit and 64-bit).
  - Windows Server 2008 (32-bit and 64-bit)
  - Windows 7 (32-bit and 64-bit)
  - Windows 8
- Mac OS X hosts:
  - 10.5 (Leopard, 32-bit)
  - 10.6 (Snow Leopard, 32-bit and 64-bit)
  - 10.7 (Lion)
  - 10.8 (Mountain Lion)
  - Intel hardware is required
- Linux hosts (32-bit and 64-bit). Among others, this includes:
  - Ubuntu 6.06 ("Dapper Drake"), 6.10 ("Edgy Eft"), 7.04 ("Feisty Fawn"), 7.10 ("Gutsy Gibbon"), 8.04 ("Hardy Heron"), 8.10 ("Intrepid Ibex"), 9.04 ("Jaunty Jackalope"), 9.10 ("Karmic Koala"), 10.04 ("Lucid Lynx"), 10.10 ("Maverick Meerkat), 11.10 (Oneiric Ocelot), 12.04 (Precise Pangolin), 12.10 (Quantal Quetzal)
  - Debian GNU/Linux 3.1 ("sarge"), 4.0 ("etch"), 5.0 ("lenny") and 6.0 ("squeeze")
  - Oracle Enterprise Linux 4 and 5, Oracle Linux 6
  - Redhat Enterprise Linux 4, 5, 6, 7, 8, 9
  - Fedora Core 4 to 17
  - Gentoo Linux
  - SUSE Linux 9, 10 and 11, openSUSE 10.3, 11.0, 11.1, 11.2, 11.3, 11.4, 12.1, 12.2
  - Mandriva 2007.1, 2008.0, 2009.1, 2010.0, 2010.1, 2010.2, 2011

WEB BROWSER COMPATIBILITY

- Mozilla Firefox, version 3.5 or higher
- Safari, version 4 or higher
- Google Chrome, version 3 or higher
- Internet Explorer 8 or higher

HARDWARE REQUIREMENTS

DISPLAYS AND GRAPHIC BOARDS

- all LCD, CRT displays and projectors
- all currently commercially available graphic boards

MEASUREMENT DEVICE

- Display front sensor
- Colorimeter
    - X-Rite Eye-One display
    - X-Rite Eye-One display 2
    - X-Rite Eye-One display Pro
    - X-Rite Monaco OPTIX XR
    - X-Rite DTP 94
    - X-Rite Sequel Gamma 3
    - X-Rite Sequel Chroma 4
    - X-Rite Sequel Chroma 5
    - Datacolor Spyder3
    - Datacolor Spyder4
    - Konica Minolta CA210
    - Konica Minolta CS200
- Spectral photometer
    - X-Rite Eye-One Pro
    - X-Rite Eye-One Monitor
    - PhotoResearch PR 670
    - IBA dositometry / Wellhoefer LX Chroma
- Spot luminance meter
    - IBA dosimetry / Wellhoefer LX Plus
    - IBA dosimetry / Wellhoefer LX Can
    - Pehamed CD mon
    - Pehamed CD LUX
    - Pehamed CD Lux plus
    - Gossen MavoSpot

INSTALLATION

PRE-INSTALLATION CONDITIONS

In order to install PerfectLum Client you must have Administrator privileges or Adminisitrator's password, if required when installing on user profile

Before installing PerfectLum software on your system:

1. Power on the workstation with all display(s) attached that you intend to use.
2. Check if the screen settings are correctly configured:

    - XP - Go to Settings -> Control panel, and double click the display icon. Select the 'Settings' tab to view screen resolution and color settings.
    - Vista - Go to Settings -> Control panel and click on „Adjust screen resolution" under the Appearance and Personalization icon.
    - Windows 7 – Go to Control panel -> Display -> Adjust resolution.
3. Ensure that the screen resolution is set to the native resolution of the display with color quality of 32 bit "true color" or higher.
4. Ensure that the correct graphics card display driver is installed.

5. Repeat these checks for each display attached to your system.
Your system is now ready to start the installation process.

IMPORTANT: Before commencing the installation process, please make sure that the USB photometer is NOT connected. The photometer will be added later, after PerfectLum is successfully installed.

PerfectLum can be operated as a client only or as a client-server combination.
Complete installation consists of several components.

PerfectLum Client

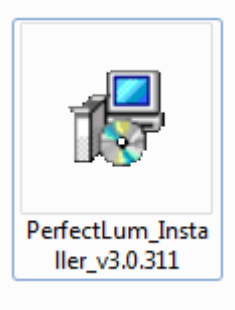
PerfectLum Client is the client application that runs on each of the workstations. It provides a number of actions that can be performed locally on the workstations, including calibrating the displays, viewing test patterns or performing full QA (Quality Assurance) and acceptance tests (QA tests available only in PerfectLum Suite).
Even when PerfectLum Client is not connected to PerfectLum Remote Server it can still run all QA tasks on the workstation.

PerfectLum Remote Server

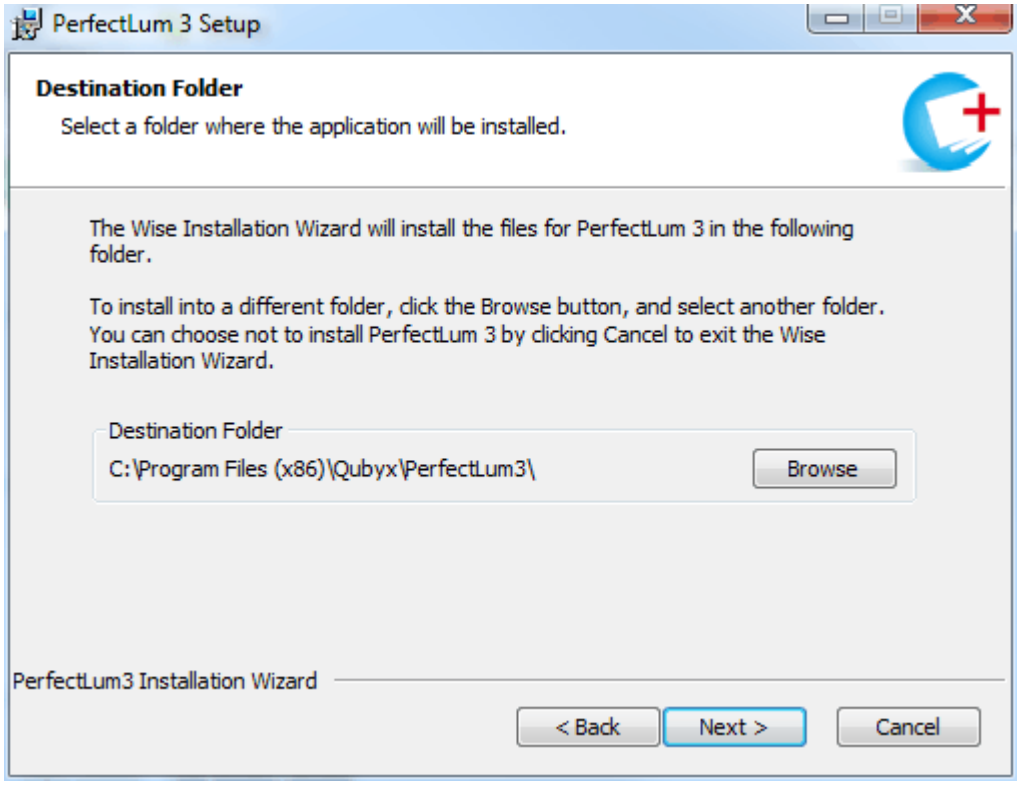
All PerfectLum clients can be connected to PerfectLum Remote Server. No special license is required. QA managers can connect to PerfectLum Remote Server via internet/intranet connection and take full control over the performance of connected workstations from any location at any given time.

SOFTWARE INSTALLATION

Double click the installer



Follow the instructions presented in the installer and click on the QUBYX software license agreement after reading it carefully.



If you don't want to install PerfectLum into the default directory, browse your computer and choose another one.

Windows will present a driver message a few times during PerfectLum installation. This is normal behavior as drivers to support photometers are loaded. Please click the “Install this driver software anyway“ button when prompted.

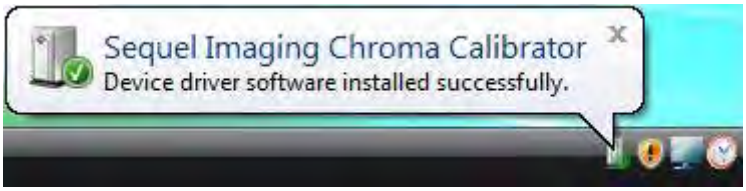
Once the installation is finished reboot your workstation.

PHOTOMETER INSTALLATION

Now that you have installed the software, it is time to install the photometer. Plug the photometer into an unused USB port and refer to the following depending on which OS you are using:

Vista and Windows 7

Vista and Windows 7 will automatically install your device driver. Wait until you receive the “Device driver software installed successfully“ message, and jump ahead to the end of this section.

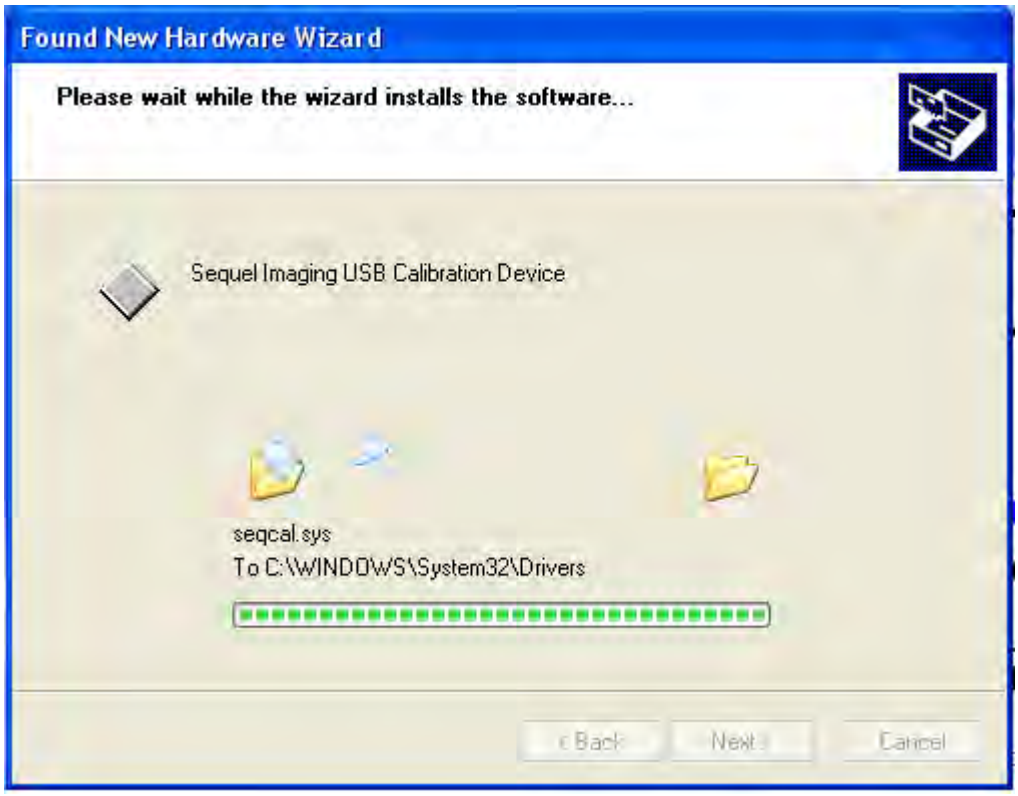


XP

The “Found new Hardware Wizard“ will start. Click the “Yes, this time only“ radio button followed by “Next“

Check the "Install the Software Automatically (Recommended)" radio button and click "Next".

And the software installs automatically while you are waiting.



When all drivers have been loaded and configured, the wizard will prompt you to click the “Finish“ button.

Windows will notify you when the photometer is ready to use, by momentarily displaying the “Found New Hardware“ message balloon in the lower right corner of the screen.

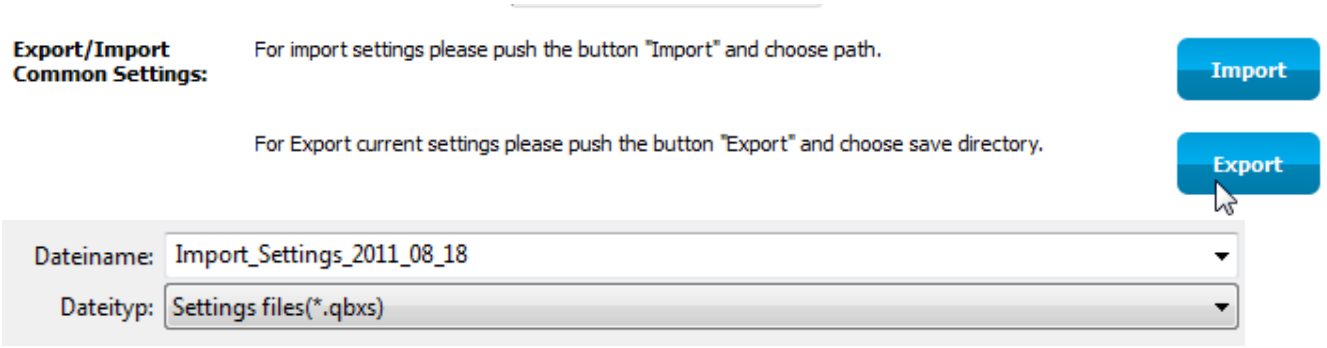
MASS INSTALLATION OF PERFECTLUM

Create your "master" settings file

Before doing a mass auto-installation you need to prepare your "master" settings file.

To do this just make ONE usual installation and make all needed configurations in preferences. (IMPORTANT: Do not forget eventual proxy settings if used in your network).

Then go again to Preferences > Application and click "Export". The software will create the needed file for auto-configuration. The file extension is .qbxs - save the file in your preferred location.



Installation

On every workstation you will need to:

1. copy the PerfectLum Installer msi file and the “master” settings file (.qbxs file)

2. in console run installation in silent mode (you MUST have administrative rights):

msiexec /i [PATH to installer]PerfectLum_Installer.msi /quiet

or if you need specific installation path:

msiexec /i PerfectLum_Installer_v3.0.436.msi /qn INSTALLDIR=D:\Apps\Qubyx\PerfectLum3

WARNING: the installation will not be completely silent - import of PerfectLum2 database will appear for a few seconds. Also the user might be asked to apply drivers’ installation.

Run auto configuration:

[PATH]perfectlum.exe configure <PATH-to-Settings> [<PATH-to-Log>]

Examples:

“C:\Program Files\Qubyx\PerfectLum3\perfectlum.exe” configure default.qbxs

“C:\Program Files(x86)\Qubyx\PerfectLum3\perfectlum.exe” configure default.qbxs d:\logs\p3log.log

“D:\Apps\Qubyx\PerfectLum3\perfectlum.exe” configure d:\tmp\default.qbxs d:\logs\p3log.log

Run auto registration:

[PATH]perfectlum.exe registration <SERIAL> <MAIL> [<PATH-to-Log>]

Example:

“C:\Program Files\Qubyx\PerfectLum3\perfectlum.exe” registration 012XERT2ASDF admin@hospital.co.uk d:\logs\p3log.log

Run auto Remote enabling:

[PATH]perfectlum.exe remote <SERVER> <LOGIN> <PASSWORD> <GROUP_NAME> [<PATH-to-Log>]

Example:

“C:\Program Files\Qubyx\PerfectLum3\perfectlum.exe” remote “http://remote.perfectlum.com” testuser testpassword “our group” d:\logs\p3log.log

NOTES: *<PATH-to-Log> - is optional parameter in all commands*

<GROUP_NAME> - is the name of workgroup you want to connect the machine to. Case insensitive, but sensitive to white spaces

REGISTRATION

There are two possibilities to access the licensing part: over Preferences or License section from the main window.
There are 2 license types available in PerfectLum 3

PerfectLum 3.x license	Unlocks features to calibrate connected displays
PerfectLum 3.x Suite License	Unlocks features to calibrate and to perform Quality Assurance tests on connected displays

LICENSES FUNCTIONALITY

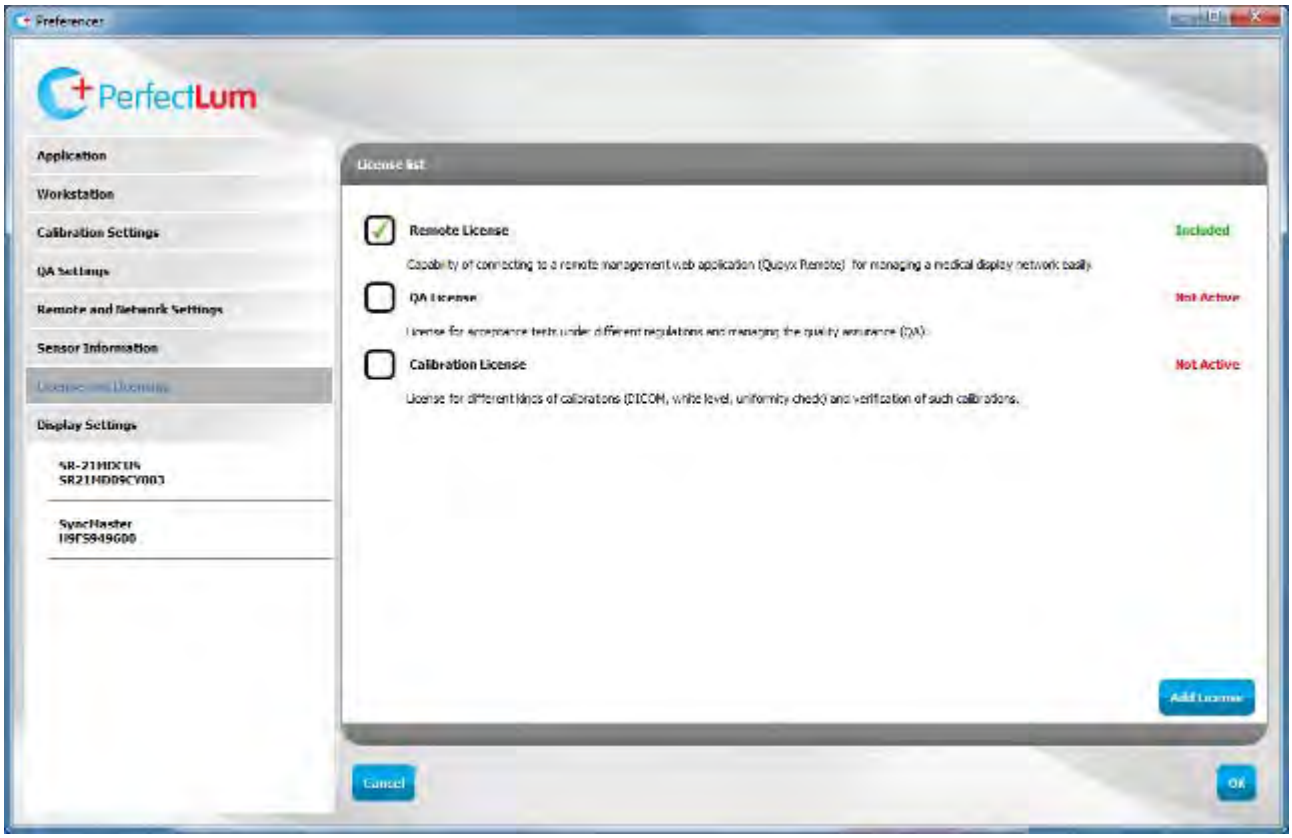
Function	PerfectLum 3.x	PerfectLum 3.x Suite	PerfectLum 3.x Trial Period	PerfectLum 3.x Suite Trial Period	Expired Trial period
Calibrate Display	+	+	+	+	-
Hardware calibration and DDC/CI / USB / Serial usage	+	+	-	-	-
Adjust White Level	+	+	+	+	-
Verify calibration	+	+	+	+	-
Verify White Level	+	+	+	+	-
Verify Uniformity	+	+	+	+	-
Perform Acceptance Test	-	+	-	+	-
Perform Constancy Tests	-	+	-	+	-
Schedule QA Tasks	-	+	-	+	-
Edit Settings	+	+	+	+	+
Edit Calibration Settings	+	+	+	+	-
Edit QA Settings	-	+	-	+	-
Measure Color	+	+	+	+	+
Display Test	+	+	+	+	+

Pattern					
Remote Control	+	+	+	+	-

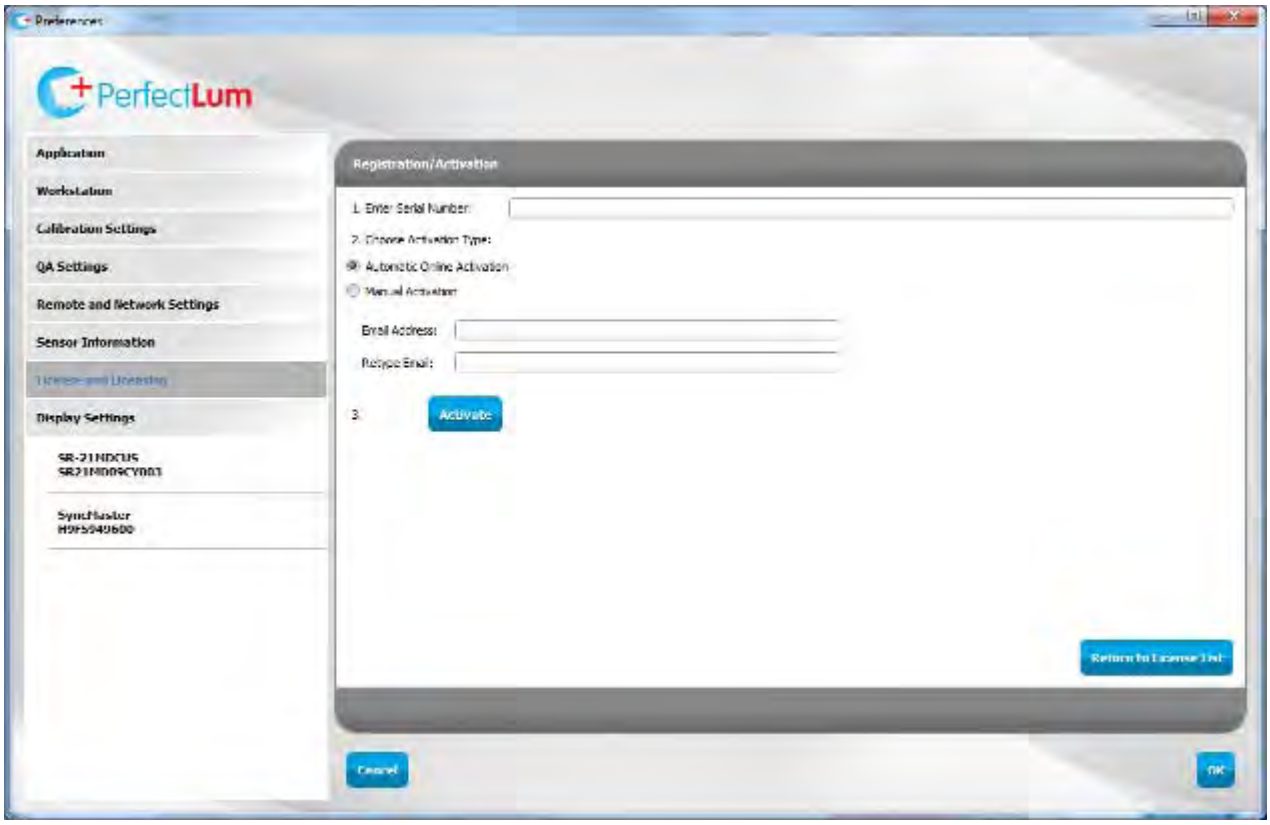
NOTE: Quick access to preferences is Ctrl+P for Windows or Command +, (Command and the comma key) for Mac OS X.

LICENSE ACTIVATION

Until you register your copy of PerfectLum, only Remote license will be activated.



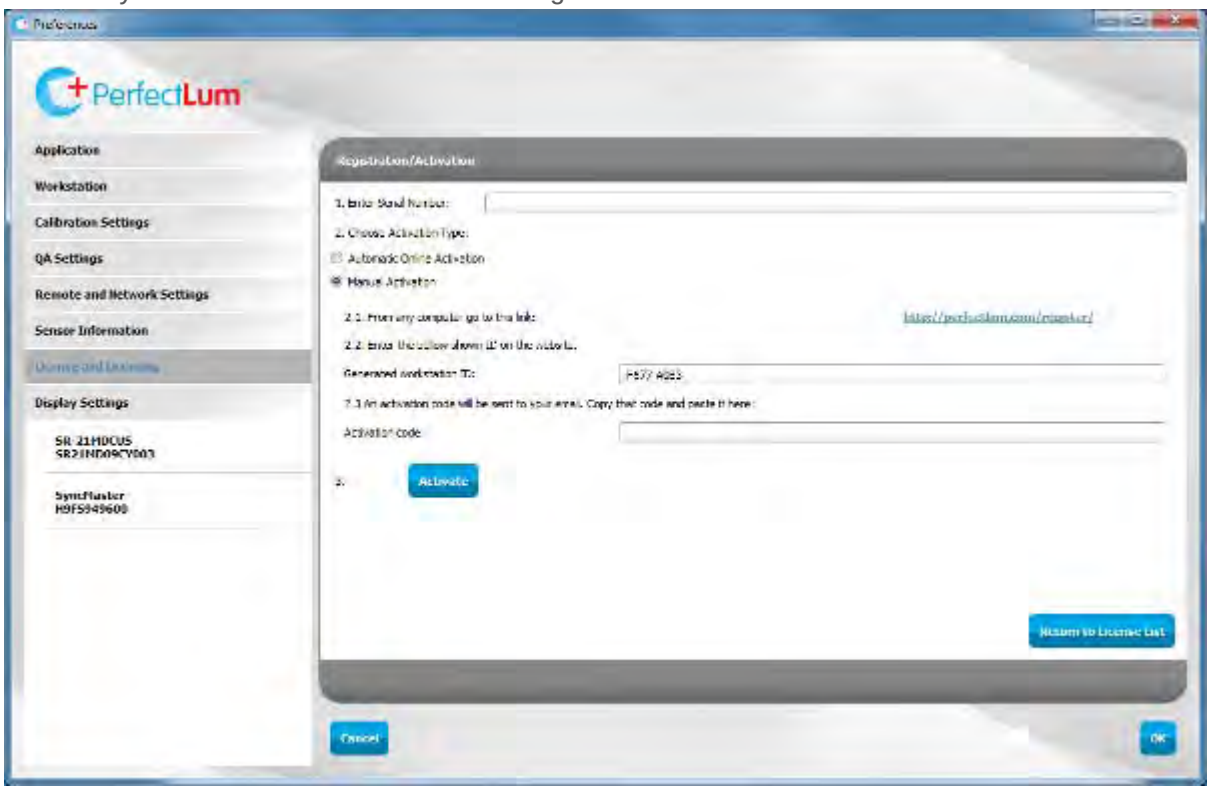
To activate the Calibration and/or QA license, press “License” in the main window, and select “Registration/Activation”. When the Registration/Activation window opens, enter the serial number you obtained when you purchased a license, and choose activation type.



For automatic online activation, just enter and retype your e-mail address, and press the “Activate” button. Automatic activation is possible only when your machine is connected to the Internet.

If your machine is not connected to the Internet, you should select the manual activation option. For manual activation, follow the link http://www.perfectlum.com/register/ from any other machine and fill out the form that you find on the website.

The autogenerated ID that is required by the online form is the generated workstation ID that you see in the registration window of the software.



When you complete and submit the online form, an activation code will be sent to your e-mail.

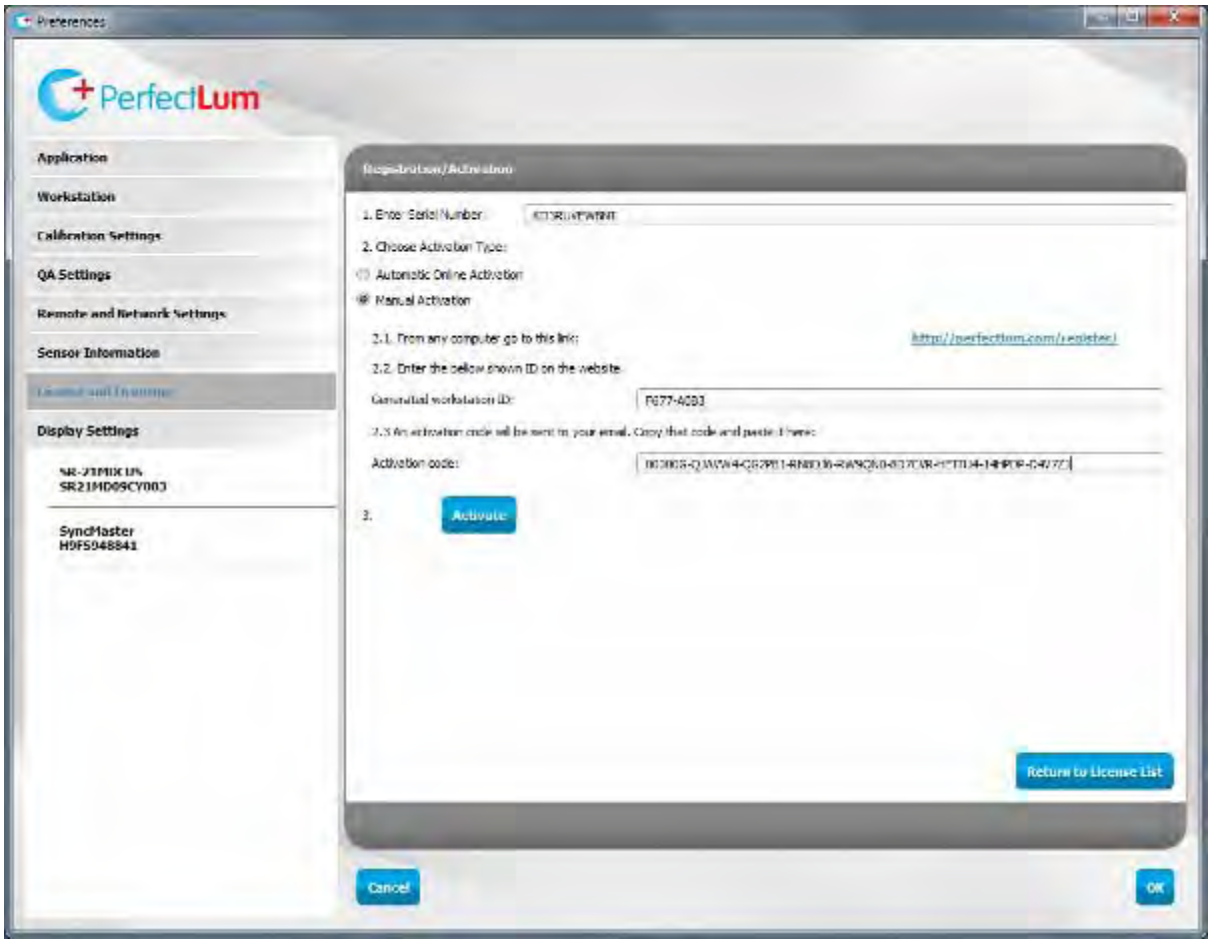
Dear example example,

Thank you for purchasing QUBYX Product. The following email is a response to your online product registration.

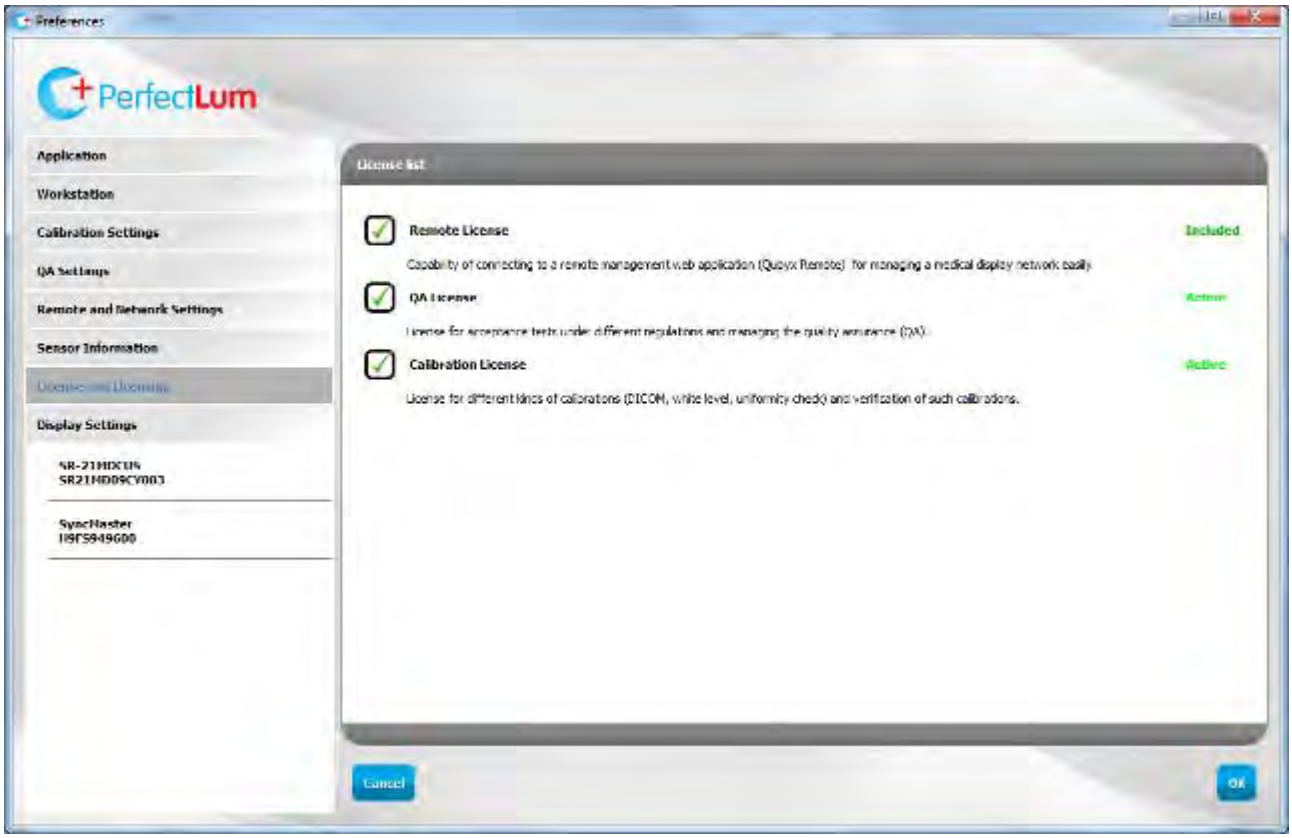
Registration details
Product name : PerfectLum3 Full
CD Serial Number : KII3RUVEWBNT
Auto Generated Number : F677-A0B3
Name : example example
Company : example
Email : email@example.com
Activation Code
00000G-QJAVW4-QG2PB1-RN8DJ6-RW9QN0-8D7CVR-HETTU4-14HPDP-D4V7ZJ

Thank you,
Qubyx Product support team
PerfectLUM Website
PerfectLUM Product Support
Qubyx Website

Enter this code into the “Activation code” field below and press “Activate”.



When you finish the registration, all licenses in the Preferences > License and Licensing section will be marked as active.



PRELIMINARY CONDITIONS:
Before using the software, make sure the following conditions are observed:
- ambient light should be constant;
- ambient light should be as low as possible;
- no direct light should reach the display.

On the left you can notice a list of displays linked to the PC. PerfectLum is able to give you visual feedback to help identify your display in a multiple head situation. Double clicking the selected display icon will identify the selected screen.

PerfectLum's main window is divided into 3 Tabs:

- Calibration and QA Tab (where you can initiate calibrations and QA tasks; QA available in PerfectLum Suite only)
- Scheduler Tab (where you can manage schedules for tasks)
- History Tab (where you can view history data)

In each tab there are buttons or lists of tasks to access all functionalities of the software.

CALIBRATION AND QA TAB

Calibration: this function allows you to calibrate your display. The software will adjust your monitor based on your set preferences. First select the display you want to calibrate from the menu on the left, and then press the “Calibration” button (PerfectLum or PerfectLum Suite license required).

IMPORTANT: Calibration should always be started on a warmed-up display. Warm-up time is specified by the display manufacturer (minimum 30 minutes).

White Level Calibration: adjusts the white level of your display to the target luminance in candelas (PerfectLum or PerfectLum Suite license required).

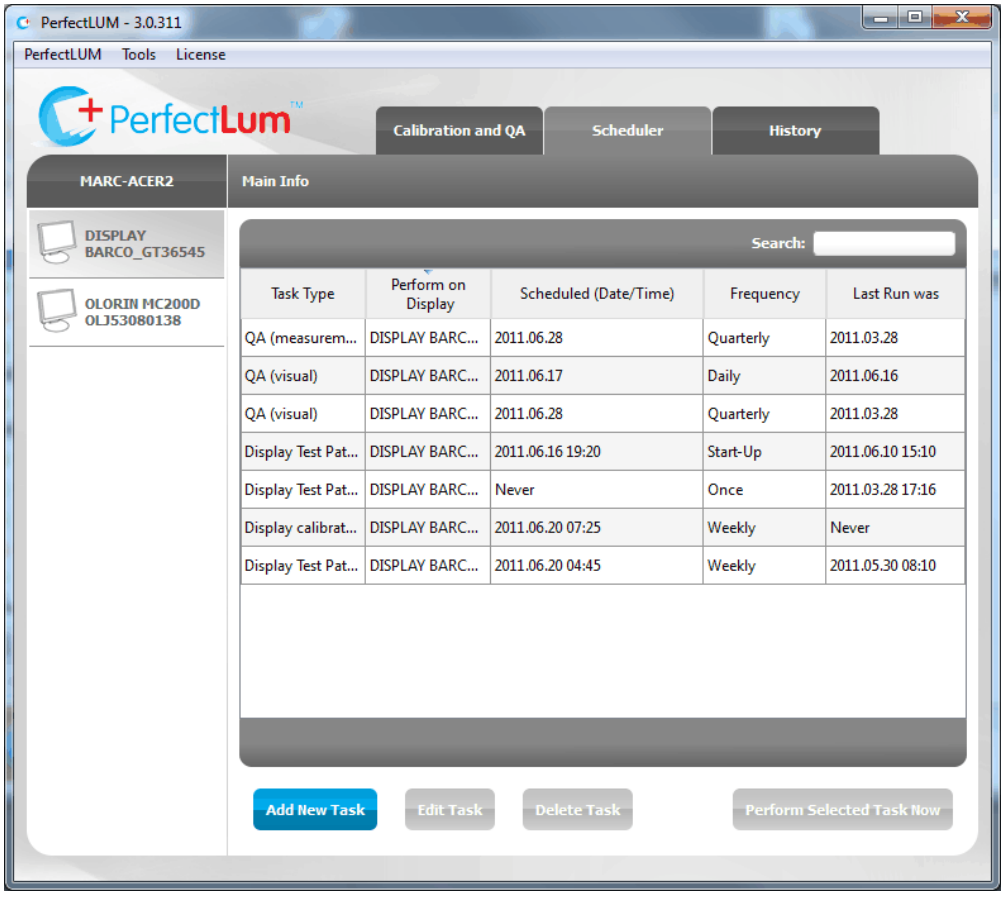
Acceptance Test: this task allows you to perform an acceptance test according to one of the following regulations: AAPM TG18, JESRA X, DIN 6868-57, DIN 6868-157, IEC 62563-1. The function automatically generates schedules for further constancy tests (PerfectLum Suite license required).

Calibration Conformance: The function verifies conformance of the display according to the preferences you have selected as calibration targets.

White Level Check: Verifies the display’s luminance level.

Uniformity Check: This verifies the display’s luminance and color uniformity.
All listed above functions are also available in 15-day trial mode.

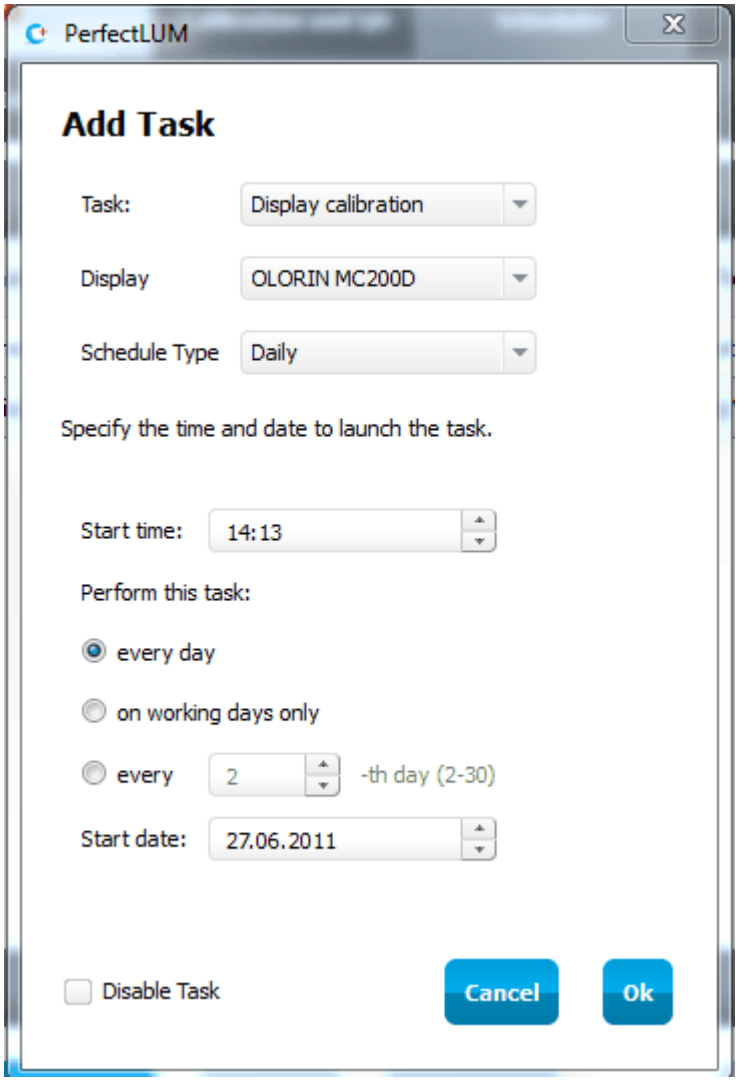
SCHEDULER TAB



In Scheduler Tab you can manage schedules for tasks to be performed on certain displays, dates and times. You can only edit and delete schedules that were created locally. Schedules that were created from the system admin panel on the remote server can be edited and deleted only by the system admin.

In order to create a new task, click the button “Add New Task” and select the following options: type of task (Display calibration, Display conformance, White Level calibration, White Level conformance, Display Test pattern and Display Verify Uniformity), the display you want to perform the task on, schedule type (Start-up, Once, Daily, Weekly, Monthly, Quarterly, Semiannually, Annually) and the scheduled date and time.

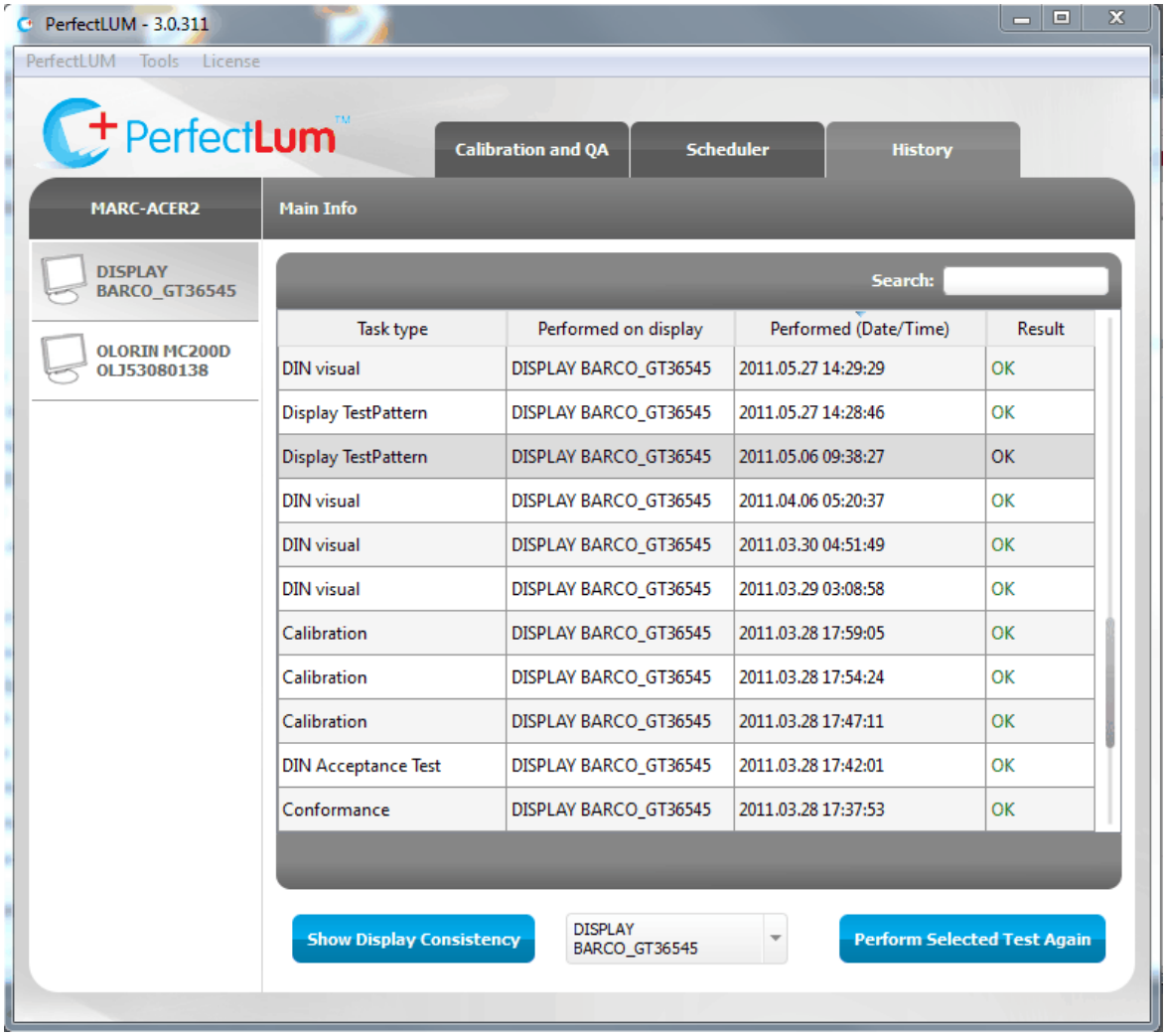
You can also create disabled tasks, which you will not be notified about by task notifier. Just tick the ‘Disable task’ box.



To edit a task, select the task and click on “Edit Task”.
To delete a task, select the task and then click on “Delete Task”
To launch a new task instantly, select the task and click on “Perform scheduled Task now”

In the search field you can filter task types, displays, dates and frequencies.

HISTORY TAB



In History Tab you can view tasks that were performed in the past. Simply double-click on a task to see the detailed report.

Select a task from the list and click “Perform Selected Test Again” to restart the task.

The search field enables you to filter task types, displays, dates and results.
The ‘Show Display Consistency’ function indicates white and black level of selected display over time in a graph.
You can also choose a display by a combo box placed near the ‘Show Display Consistency’ button to see the white and black level of the selected display.

DO MY FIRST CALIBRATION

First select the display you want to calibrate from the menu on the left. After that, press the “Calibration” button. A wizard will pop up and will guide you in order to customize the calibration process.
NOTE: The wizard will not pop up if you had opened the preferences before. You need to check your display and calibration preferences again before calibration.

IMPORTANT: Calibration should always be started on a warmed-up display. Warm-up time is specified by the display manufacturer (minimum 30 minutes).

Select the calibration type by choosing between DICOM, CIE L* and Gamma.

If you want to calibrate the color of the display, select the target value.

If you want to adjust the white level, enter the target white level in candelas.

After you enter the values, place the sensor on the display and start the calibration process. Make sure no ambient light reaches the sensor.

After calibration is finished you will get a report pop up on the screen, where you can see the results of the calibration.

DO MY FIRST ACCEPTANCE TEST (IN PERFECTLUM SUITE ONLY):

When you perform the first acceptance test, a wizard will pop up. The wizard will guide you to select the regulation and the display category. In addition, you have to fill in some information about the location of your workstation and the responsible person.
NOTE: The wizard will not pop up if you had opened the preferences before. You need to check your display and QA preferences again before the test.

Acceptance test consists of two parts: measurement part and a set of visual tests. The exact tests are determined by the used regulation. For measurement tests an on-screen or a handheld measurement device can be used. Please refer to the list of supported measurement devices for detailed information.

After acceptance test was performed, associated constancy tests are automatically scheduled.

PREFERENCES

APPLICATION

LANGUAGE:

Set the language of the application.

SOFTWARE UPDATE:

When you check the check box “Update Software Automatically”, the software will automatically search the server for software updates.

PASSWORD PROTECTION:

When you check the check box “Protect Settings by Password”, two fields will appear on the screen. Enter a password in the first field and repeat it in the second field. Make sure you note down the password in a secured location for future use, since you cannot recover it from the system. Once the preferences are protected by a password, they can be altered only when the correct password is entered in order to unlock them. If you don’t enter the password, settings are visible, but can not be altered.

EXPORT / IMPORT COMMON SETTINGS:

Settings of the application can be exported into one file as backup or as “golden” settings. The same settings can be imported into the application from other machines to work with the same settings and to save time during installations.

- Press Export for exporting the settings, and browse the directory to select the folder where you want to save them.
- Press Import for importing the settings, and browse the directory to select a location to upload the settings file from. The location can also be on a server.

BACKUP / RECOVER:

This function will back up the entire database with all history data, settings and schedules. Press Backup and browse the directory where you want to save the database. Press Recover and browse the database backup to recover the database.

NOTE: Display settings will not be recovered, as display settings and serial numbers can differ.

Check the check box “Activate auto backup” to have the software run an automatic backup every day, week or every month. Select the directory where you want the database to be saved.

NOTE: If the path you’ve chosen for auto backup is changed (renamed or deleted folder) the path line will become selected with a red frame - choose correct path for auto backup and save the preferences.

WORKSTATION

AMBIENT LIGHT:

Ambient Light is the reflection of ambient light on the switched off display panel. Enter a value for ambient light in candelas if you know it, or press “Measure Ambient Light” to measure the reflection. During this process the software will switch off the backlight of the panel. You are to place the sensor 15 cm away from the display facing the switched off panel. The software will measure the reflection of ambient light on the display panel.

During the measurement process don’t move the mouse and don’t hit any keys, as this will switch the display back on. Once the measurement is finished, the display will be automatically switched back on.

TASK DELAY:

Check the check box “Use Scheduler as Task Reminder” to program the application to remind you automatically when a task is due. This function can also schedule start tasks automatically. Set the time between 5 and 60 minutes for the display to warm up after the system boot before starting any scheduled tasks.

SLEEP MODE:

Check the check box “Put display to Energy Saving Mode” to put the display into energy save mode for a set period. In energy save mode the backlight of the display is switched off to save energy and backlight life time.

CALIBRATION SETTINGS

CALIBRATION TYPE:

DICOM	Calibrates to NEMA DICOM Part 14 GSDF (Grayscale Display Function)
Gamma	Calibrates towards the gamma function. Enter a value for gamma. Typically Gamma 1.8 on Macintosh and Gamma 2.2 on Windows machines.
CIE L*	Calibrates to the Color Space Lab of the CIE (Commission International d’Eclarage)

COLOR TEMPERATURE:

Check the check box “Adjust Color Temperature” to calibrate the color of the display and to adjust the display to reach target color temperature. You can enter the target color temperature in 3 different ways:

CIE standard light source color presets	Standard lights between D50 and P93. D65 is the most often used value and represents daylight.
Color temperature	Enter a value for color temperature. Color temperature is less precise and doesn't represent a standard like CIE standards.
Advanced settings x and y value	Enter the x and y coordinates of the CIE xyY color space. The values are generally used to match any other device or film.

WHITE LEVEL:

Check the check box "Set White Level" to adjust the white level of the display to a certain value. Enter the target value in candelas into the field.

UNIFORMITY:

Check the check box "Adjust Uniformity" to correct uniformity of the display. Also set the target luminance homogeneity deviation in areas from 5% to 30%.

QA SETTINGS (IN PERFECTLUM SUITE ONLY)

All information related to Quality Assurance Regulations is entered in this section.

REGULATION:

Select the Regulation you want to use and the Application Category.

Regulation	Category	Application
DIN 6868-57	Mammography	Mammography
	A	Diagnostic
	B	Reviewing
	Dental	Dental
DIN 6868-157	Projection Radiology	Projection Radiology
	Fluoroscopy	Fluoroscopy
	Computer Tomography	Computer Tomography
	Dental	Dental
	Mammography	Mammography
	Operation Room	Operation Room
AAPM TG18	Primary	Diagnostic

	Secondary	Reviewing
JESRA X-0093	Category 1	Diagnostic
	Category 2	Reviewing
IEC 62563-1	Diagnostic	
	Reviewing Monochrome	
	Reviewing Color	

Click on “Show Tests” to see QA tests that are part of this regulation.
Click on “Show Thresholds” to see the thresholds that will be applied during QA tests for this regulation and category.

WORKSTATION LOCATION:

The workstation name is read automatically from the system. It can be overwritten to be personalized. Enter information regarding your facility.

PERSON RESPONSIBLE:

The person responsible is the person who should be notified if something is wrong with the workstation. Please enter the information in associated fields.

REMOTE AND NETWORK SETTINGS

Activate Remote Control for the workstation and connect it to the PerfectLum Remote Control server.

ENABLE REMOTE:

Enter IP number or server address like http://www.remote.qubyx.com into the field “Server Address”. Enter user name and password of the PerfectLum Remote Admin user account and press “Enable Remote Management”. When connection is established, a message will pop up, asking you to select the workgroup for this workstation. Select the workgroup and click ‘Save’. After that all data (schedules, history and preferences) will be immediately synchronized with the remote server.
NOTE: Remote Admin account needs to be created first on PerfectLum Remote. In addition to this, you need to create a workgroup on Remote Server in advance.

REMOTE DATABASE SYNCHRONIZATION:

Select how often you want to synchronize databases between the client and the server.

PROXY SERVER:

Check the check box “Use Proxy” if you use a proxy server to access the internet. This action is required in order to access PerfectLum Remote Management server if you do not use it on the intranet and for activating software license automatically via internet.

LICENSE AND LICENSING

REMOTE LICENSE:

Remote license is included for FREE. You can connect and manage your displays with QUBYX PerfectLum Remote server.

PERFECTLUM 3.X LICENSE:

PerfectLum 3.x License is required to perform calibration and white level calibration, calibration conformance, white level check and uniformity check. It also gives you a full control over the Scheduler Tab where you can make schedules.

PERFECTLUM 3.X SUITE LICENSE:

PerfectLum 3.x Suite license is required to perform calibration and white level calibration, calibration conformance, white level check and uniformity check, QA acceptance and constancy tests for AAPM TG18, JESRA X, DIN 6868-57, DIN 6868-157, and IEC 62563-1 regulations.

DISPLAY SETTINGS

The displays connected to the workstation are visible in separate tabs. Select a display to adjust the settings for that specific display.

IGNORE DISPLAY:

Check the check box “Exclude Display from Testing/Calibration” if you do not want to perform any Quality Assurance tests or calibrations on a specified display.

CALIBRATION UPLOAD:

LUT upload will select the location where LUT (Look Up Table) will be saved and the exact communication channel used to perform the action.

LUT Upload	Look Up Table is saved in	Communication channel used
Graphics card	Graphics card	Graphics card
DDC/CI	Display	DDC/CI i2c channel
Serial	Display	Serial RS232
USB	Display	USB

DISPLAY MODEL:

The software will read the model name of the display from its EDID. You can change the model name. The model name will be visible during calibration and QA reports.

DISPLAY SERIAL NUMBER:

The software will read the serial number of the display from its EDID. You can change the serial number. The serial number will be visible during calibration and QA reports.

DISPLAY MANUFACTURER:

The software will read the name of the display manufacturer from its EDID. You can change the name. The manufacturer name will be visible during calibration and QA reports.

TYPE OF DISPLAY:

Select the type of the display (color/grayscale display or a projector). Depending on your selection, a different calibration algorithm will be used.

DISPLAY TECHNOLOGY:

Select if the display is a Flat screen, LCD or a CRT screen. Depending on your selection different thresholds in QA regulations will be applied.

SCREEN SIZE:

Enter the diagonal size of the display.

RESOLUTION (H/V):

The software will read the display's horizontal and vertical resolution. The resolution will be documented in the QA reports.

BACKLIGHT STABILIZATION:

Select if the display has integrated backlight stabilization that maintains the white level of the display constant over time. If the display has backlight stabilization the intervals for QA test will be larger.

INSTALLATION DATE:

Enter the date when the display was installed.

PERFECTLUM MENU ITEM

SOFTWARE UPDATE

This function checks the server for a new PerfectLum version. You will get a link to download a new version if there exists one.

ABOUT US

The window where you can see our contact information, license agreement, license information and version installed.

TOOLS

Tools are accessible in PerfectLum from the Main Window > Tools

NOTE: Tools are included for free use.

MEASURE COLOR:

This function will open two windows. In the first window you can start measurement. Mix color and gray levels will be displayed in the second window where measurements are actually performed. First select the RGB color patch with sliders or by entering a number for RGB values. Then place the measurement device on the patch and start measuring. You can perform two measurements, the software will compare them and will display color difference in Delta E with or without L (Luminance)

NOTE: Quick access to this tool is Ctrl+M (Mac: Cmd+M)

DISPLAY TEST PATTERN:

Select the display where you want the test-pattern to be displayed and select the Test Pattern you want to display. Click View and Check. For displaying a test image that is not in the list, but is available on the system, select “User Image” click View and Check, navigate to your image file and open it. Click on the test-pattern to close it.

NOTE: Quick access to this tool is Ctrl+T (Mac: Cmd+T)

NOTIFICATION

After a task is created, PerfectLum Task Notification will pop up when scheduled time comes and warm up time has expired (see ‘Use Scheduler as a Task Reminder option of Workstation tab of preferences’). Click ‘Perform Scheduled Tasks’ button to perform scheduled task or ‘Remind Me In’ button to remind about the task later. You can also choose the time of reminding in the combo box placed near. Closing this window means ‘Remind Me In’ + value that is set in the combo box. Measurement tasks that require no manual interruption (Display Calibration, Display Conformance, White Level Calibration,

White Level Check) will be started automatically after 5 minutes and report will be not shown.

REPORT

After each measurement task (except those ones that were started automatically) you will get a report where you can check your result with more details and graphs, and a summary result (OK or Failed). Reports can also be exported as a .PDF file or printed. Use these two icons:

DISPLAY MATCHING

To achieve identical image reproduction on two or more displays connected to one workstation side by side, or several displays connected to different workstations, you will need to adjust such characteristics of the displays as color temperature, white level, and luminance response to the same level.

To match image reproduction on two or more displays, follow this **procedure**:

1. Make sure all displays are set to the same values over the display OSD. Especially important are the color pre-settings, the brightness, and the contrast settings. Doing a factory reset on all displays can be helpful to make sure all of them start from a similar level.
2. Use only one measurement device. Measurement devices, unfortunately, still have considerable deviations when measuring color. So it is recommended to use the same device on all displays.
3. Identify the weakest display. If you want all displays to have the same white level, you need to know which of them has the lowest one and measure it. This white level will become the target value for all displays. It is important to have the same white level on displays that are connected to one workstation and installed side by side.
4. Set your target values for white level, color temperature and luminance response in PerfectLum Preferences.
5. Perform a display calibration with those same settings on each of your displays.

REMOTE MANAGEMENT SETUP ON QUBYX SERVER

If you prefer using QUBYX server for Remote Management instead of setting up your own one, you will be using www.remote.qubyx.com for this purpose.

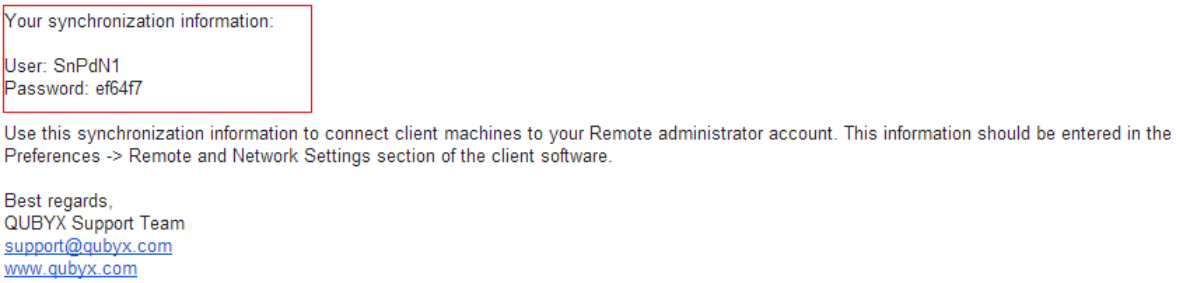
CREATING ADMINISTRATOR ACCOUNT

Go to www.remote.qubyx.com and click the “Get Started” button to create your account. Fill out the form you find on the website.
NOTE: The email you fill in is the email Remote Management will send email alerts to in case a calibration or a QA test is failed.
In this form you also enter the name of organization you will manage and create the first workgroup. When registration is over, you will be able to add more workgroups and edit them.

After you submit the form, the system will send you an email with a confirmation link and login information. The email also contains synchronization information, which you will need to connect a workstation to this Remote management account.

CONNECTING A WORKSTATION TO REMOTE MANAGEMENT

In your client software, go to Preferences > Remote and Network settings. In the server address field the default address https://remote.qubyx.com will already be entered. Enter synchronization username and password, delivered to you in the email, into corresponding fields.


Your synchronization information:

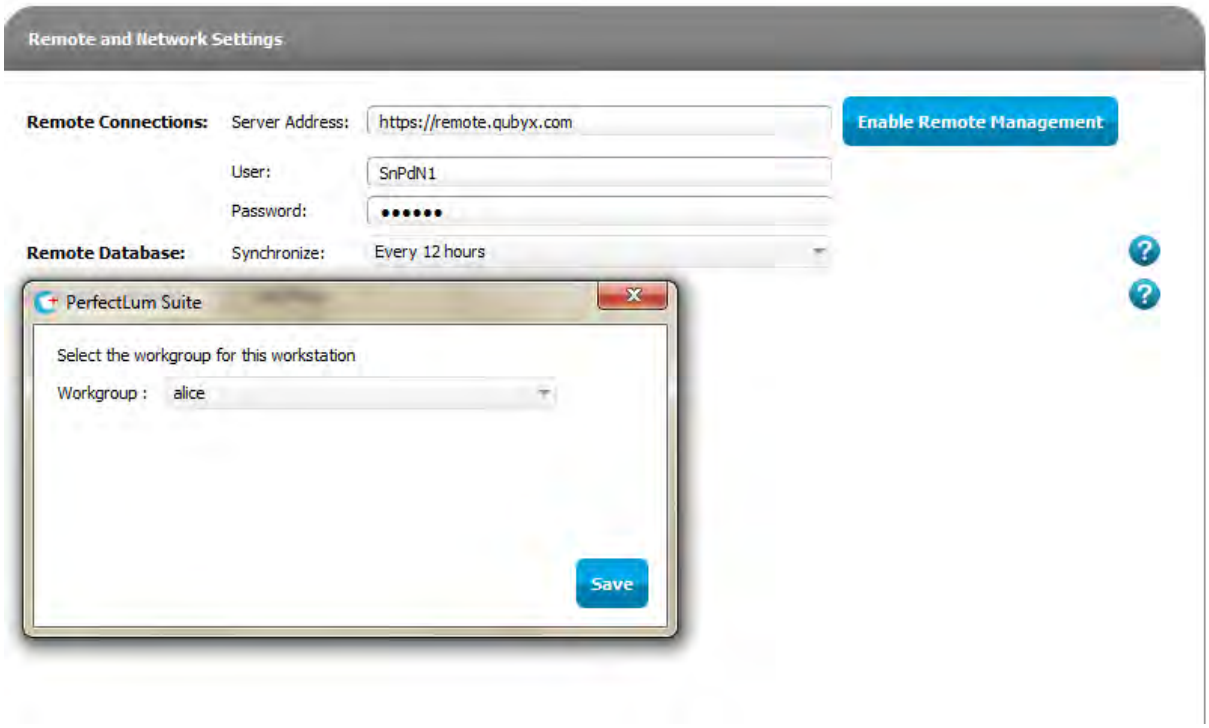
User: SnPdN1
Password: ef64f7

Use this synchronization information to connect client machines to your Remote administrator account. This information should be entered in the Preferences -> Remote and Network Settings section of the client software.

Best regards,
QUBYX Support Team
support@qubyx.com
www.qubyx.com

When this data is entered, select how often you want your software to synchronize with the server and press “Enable Remote Management” button.

In the pop up window, select which workgroup you want to connect this machine to, and press “Save”.



SYSTEM ADMINISTRATOR GUIDE

SYSTEM REQUIREMENTS

Virtual Machine (VM) is provided as OVA package. So, you need virtualization software, which supports OVF (Open Virtualization Format) and .vmdk disk images. Oracle VirtualBox is the preferred choice for running this VM. However, you can use VMware products.

About 550 Mb of free space needed for OVA package and minimum 2 GB needed for VM production use (1.5 GB base system and 500 Mb for database and backups). Note that database and backup images are constantly growing, so you may consider having more free space in advance.

INSTALLING AND CONFIGURING VM

You should use “Import Appliance” option from “File” menu of Oracle VirtualBox Manager in order to install VM. All required settings are predefined. However, you may tune some settings, such as amount of memory, to better fit your requirements. We recommend to select the correct network card in virtual machine settings (network tab) before the first start.

After successful installation you may safely start VM. You may log into console when the login prompt appears. You need to do this in order to check or set up an IP address for VM.

It takes IP address via DHCP by default, but you may want to set a static one.

TCP/IP SETTINGS

In order to find VMs current IP address you need to complete following steps:

1. Log in as root (find passwords in “Default Settings” document).
2. Run “ifconfig” command and find “inet addr” for eth0 interface in its output.

Now, when you know the IP address of VM, you may use it to log in via SSH or Webmin. Note, that “root” user is not allowed to log in via SSH, so you should log in as “perfectlum” and then use “su” command with root password.

In order to set a static IP address or change other network configuration settings you should modify “/etc/network/interfaces” file. Full description of “interfaces” file you may find in “Network Configuration” article from Debian (http://wiki.debian.org/NetworkConfiguration#Setting_up_an_Ethernet_Interface).

The alternative and friendlier way to change system and network settings is Webmin (check Default Settings document f
or Webmin URL). You may change boot-time network settings by selecting “eth0” interface at “Network Interfaces’”section of “Networking -> Network Configuration” menu.

Both “console way” and “Webmin way” are described for next tasks.

CONFIGURING FIREWALL

VM comes up with small set of predefined rules, which are stored at “/etc/iptables/rules” file and executed at boot-time. In order to modify these rules you should edit firewall initialization script “/home/perfectlum/bin/perfectlum-firewall” and then execute it. However, you may edit “/etc/iptables/rules” directly or via Webmin, but “perfectlum-firewall” script is the recommended way to update firewall rules.

Console

```
# nano /home/perfectlum/bin/perfectlum-firewall
```

Modify firewall rules and save changes

```
# /home/perfectlum/bin/perfectlum-firewall
```

Webmin

Use “Linux Firewall” option of “Networking” menu.

MAIL DELIVERY SETTINGS

You may want to provide SMTP server address if you want to receive e-mail notifications from PerfectLum Remote Management. The only way to do this is updating Exim configuration. Exim is the MTA (Mail Transport Agent) software, which is responsible for mail delivery.
Open “/etc/exim4/update-exim4.conf.conf” file in text editor and set “dc_smarthost” directive value to your SMTP server IP-address or hostname. If your SMTP server uses non-default port you may define it using “::” (two colons). Example:

dc_smarthost=’smtp.googlemail.com::587’

If your SMTP server requires authentication, you should define credentials in “/etc/exim4/passwd.client” file. To do this just open “/etc/exim4/passwd.client” in text editor and add a new line with your credentials using following format: smtp_server:login:password. Example:

smtp.googlemail.com:perfectlum@example.com:examplepassword

When all changes are done you should run “update-exim4.conf” script to generate new configuration files and then restart Exim.

Console

```
# nano /etc/exim4/update-exim4.conf.conf

 Modify configuration files according to your needs

# nano /etc/exim4/passwd.client

 Write credentials here if your SMTP server requires authentication

# update-exim4.conf
# /etc/init.d/exim4 restart
```

Webmin

There is no possibility to do this in Webmin

MANAGING BACKUPS

VM is doing automatic database backups every night. Backup starts right after the midnight. Backups older than 7 days from the current date are removed automatically.
Backups are stored at “/home/perfectlum/backups” in a separate disk image. So, you can even attach a physical partition or hard drive, if you need more space for backups.
You may use “perfectlum-restore” script to restore database backup for particular date. Be careful, because “perfectlum-restore” overwrites your current database.
To restore database backup just run “perfectlum-restore” with full path to backup file you want to restore. Example:

/home/perfectlum/bin/perfectlum-restore /home/perfectlum/backups/2011-01-01-perfectlum-mysql-backup

Don't forget to restart MySQL when restore is finished. Simply run following command:

/etc/init.d/mysql restart

DEFAULT SETTINGS

Default System Accounts

System Administrator account

Login: root
Password: vb903lejfMPk1

Default unprivileged account

Login: perfectlum
Password: plumadmin2912

MySQL Accounts

MySQL Administrator account

Login: root
Password: bemy349R00t

PerfectLum Database account

Login: perfectlum
Password: elj390g#$J@ld0289

Use "perfectlum" MySQL database while installing Remote Management.

Firewall Settings

New incoming connections are accepted for the following TCP ports:

20, 21, 22, 80, 443, 11001

New incoming connections are accepted for the following UDP ports:

68

All other new incoming connections which do not satisfy the rules stated are rejected.
All new incoming connections from localhost are accepted.
All outgoing connections are accepted.

Webmin

Webmin is a web-based interface for system administration for Unix. Using any modern web browser, you can setup user accounts, Apache, DNS, file sharing and much more.

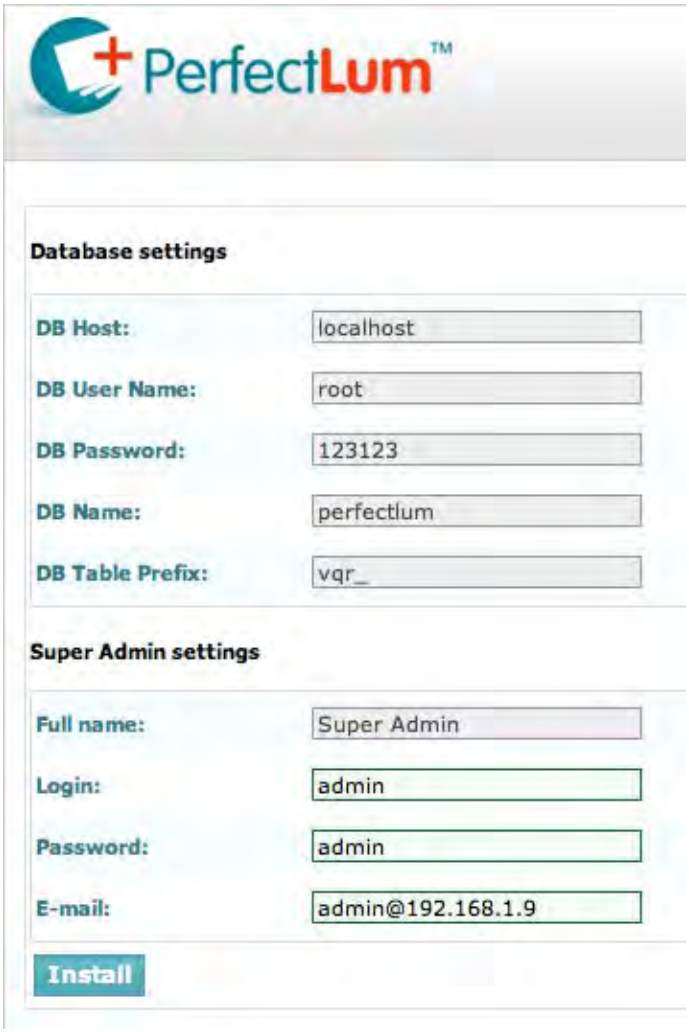
Webmin is listening 11001 TCP port. Point your browser to “http://VM_IP_ADDRESS:11001” and log in using one of default accounts to use it.

PerfectLum Remote site configuration

Enter IP address (static IP or DHCP) in your browser.

A setup screen, where you can set the name, password and email of "Super Admin", will appear.

Then press "Install". If the installation was successful, a congratulation screen will show up.



Before you can connect workstations to Qubyx Remote, some preparations are necessary:

1. In Qubyx Remote, go to "Setup" tab and there to:
Facilities - create a new facility (e.g. NYU Medical Center)
Workgroups - create at least one workgroup (e.g. CT, Radiology, etc.)
Users - create an admin user

2. Now you can connect from client application Perfectlum to Qubyx Remote:
- open preferences and go to "Remote and Network Settings"
- enter Qubyx Remote IP as "Server Address"
- enter the admin user you have created and the password for this admin user
- click "Enable Remote Management" button.

That's it. Now your workstation is connected to Qubyx Remote and will synchronize its data at certain intervals, which are set in the same dialog.

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GSDF Gray Scale Display Function
CIE Commission International d'Eclarage
NEMA National Electrical Manufacturers Association
AAPM American Association of Physicists in Medicine
DIN Deutsches Institut für Normung
IEC International Electrotechnical Commission
LUT Look Up Table
DDL Digital Driving Levels
JND Just-Noticeable Difference
OSD On Screen Display

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