



Quantum Blue® Connect Software User Manual



Installation and operation instruction for network administrators and users of
Quantum Blue® Connect Software.

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1. INTRODUCTION

This user manual is for the operation of the Quantum Blue® Connect Software (hereinafter referred to as Connect Software) in combination with the Quantum Blue® Reader 3rd Generation (hereinafter referred to as QB3G). Before using Connect Software, it is essential that you read this user manual carefully.

2. GENERAL INFORMATION

2.1 Scope of delivery

The Connect Software is provided as a complete installation package including the required runtime libraries:

- SetupAll.bat: Batch file for a complete installation of Connect Client and Connect Server on the same PC including the required runtime libraries.*

NOTE

All setup files require a 64 bit Windows operating system.

NOTE

Please note that the software does not run on macOS operating systems.

2.2 Version management

This document is the Quantum Blue® Connect Software User Manual VA2_EN.

* The setup package includes the following components which can be also found as separate files in the scope of delivery:

- SetupLr4ConnectServer.exe: Setup file for the Connect Server
- SetupLr4ConnectClient.exe: Setup file for the Connect Client
- .NET Core Windows Desktop runtime library, required for both Connect Client and Server
- ASP.NET Core runtime library, required only for the Connect Server

2.3 Intended use of the Quantum Blue® Connect Software

The Quantum Blue® Connect Software is a Windows desktop application which enables convenient display, review and printing of QB3G results from a laboratory computer or notebook for authorized users. The software can also transfer QB3G results uni-directionally to a LIS (Laboratory Information System) or similar information systems.

2.4 Training for Connect Software Users

The Connect Software should be installed by the institution's network administrator or laboratory IT-specialist. BÜHLMANN Laboratories AG Technical Support / Your local BÜHLMANN Laboratories AG distributor will assist in case of any questions upon installation of the Connect Software.

The Connect Client application does not require dedicated training. All necessary steps to operate the Connect Client application are described in this user manual.

3. GENERAL DESCRIPTION AND MAIN FUNCTIONS OF CONNECT SOFTWARE

The Connect Software is based on a client-server architecture and can be divided into two parts: the Connect Server application, representing the core application, and the Connect Client application. The core application commonly runs on a server, and can therefore be installed in common Microsoft Windows server environments within a local network of a hospital or a physician office. The software is accessed and used with the Client application installed on a personal computer (PC) or notebook. It is also possible to install both the Connect Server and Client application on the same PC or notebook. A schematic overview of the Connect Software installation options are given in Figure 1, page 5.

The installation on a local network and connectivity to LIS has to be done by an IT-specialist.

Data transfer between connected Quantum Blue® Reader instruments and the Connect Software is 2048 Bit SSL encrypted.

Main functions of the Connect Software are:

- convenient sorting, reviewing and printing of test results in PDF format from any office workstation
- result review within a local network for all connected Quantum Blue® Reader instruments - results are received and stored in a database (only applicable for software installed on a local network)
- bridging function between server and connected Laboratory Information System (LIS), Hospital Information System (HIS), middleware or physician office management software (only applicable for software installed on a local network)

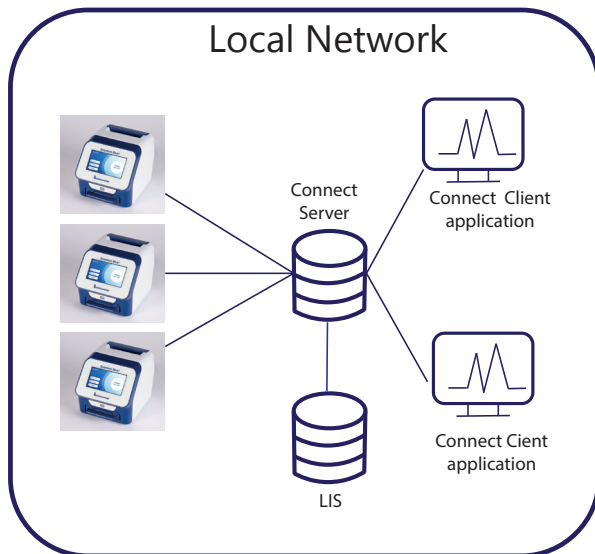


Figure 1a: Local network installation

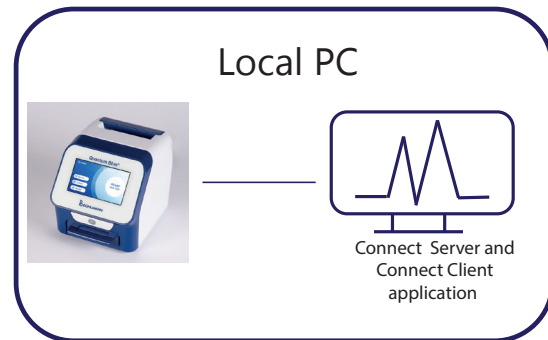


Figure 1b: Local PC installation

Figure 1: Schematic overview of Connect Software installation options

4. SYSTEM REQUIREMENTS

- Requirements for Connect **Server and Client** installation:

Windows 10 or Windows 11 / 64 bit incl.

→ ASP.NET Core runtime library

→ .NET Core Windows Desktop runtime library

- The recommended minimum screen resolution is at least 1280*720 Pixel.

5. INSTALLATION OF CONNECT SOFTWARE

The standard installation procedure is stratified into 4 main steps:

1. Installation of Connect Server and Client application - Local PC installation
2. Restart of computer and login to the Connect Client application
3. Adjustment of firewall settings
4. Setup of Quantum Blue® Reader to connect with the Connect Software- Local PC connection

NOTE

Please note **that administrator rights** are required on Server, Client and Quantum Blue® Reader instruments to do the installation and configuration.

5.1 Installation of Connect Server and Client application - local PC installation

The installation package (Figure 2) can be downloaded from a website. The website address and download information is provided on the download instructions included in each QB3G Reader package. In order to install the Connect Server and Client application both on a local PC, please copy the installation package folder on your PC or Notebook. Double click on the file "SetupAll" and follow the guided installation procedure (refer to Figure 3a-3c).

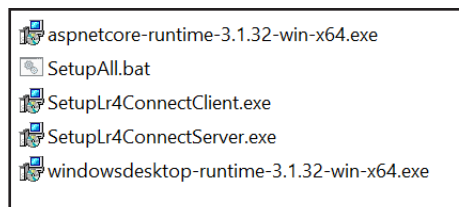


Figure 2: Installation package

NOTE

Please note that the Connect Server and Client application require a Windows Operating System (Windows 10 or Windows 11).

INSTALLATION

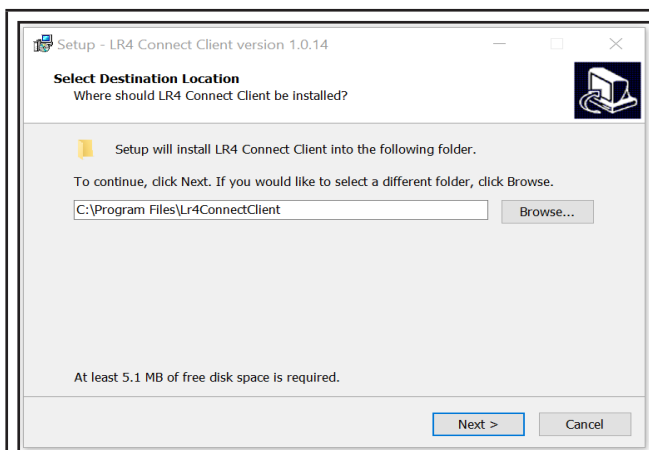


Figure 3a: Choose your installation folder for the «Lr4ConnectClient» by clicking on «Browse» or click «Next» to install in the default folder.

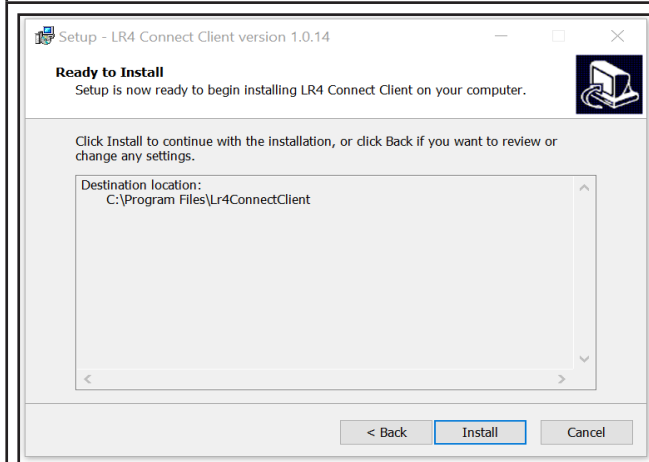


Figure 3b: Click on «Install».

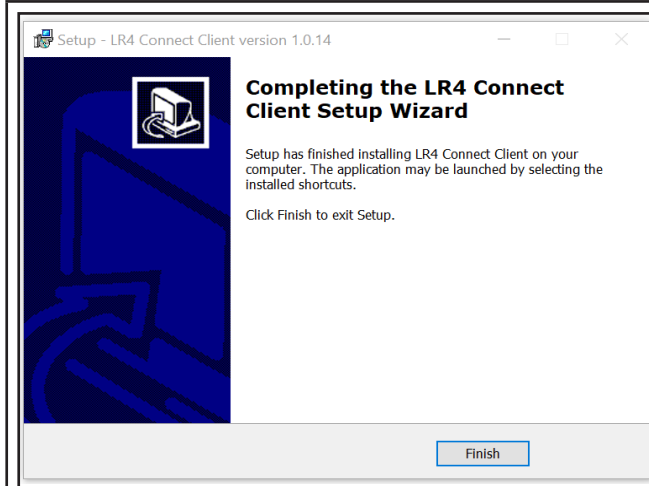


Figure 3c: Click «Finish» to complete the installation process for the «SetupLr4ConnectClient».

Repeat the steps described above for installation of the «SetupLr4ConnectServer».

IMPORTANT

If the Windows firewall asks which permissions should be assigned to the Connect Software, please select all (domain, private and public).

Figure 3: Local PC installation procedure of Connect Server and Client application

5.2 Restart of computer and login to the Connect Client application

Step 1:

Restart your PC or notebook after completion of Connect Server and Client application installation.

Start the Connect Server application by navigating to C:\Program Files\Lr4ConnectServer and clicking on the Lr4ConnectServer.exe file. The Connect Client application has to be started by clicking on the desktop icon or by selecting it from the Windows start menu.

Step 2:

Log in to the Connect Client application by using your Windows password (Figure 4a). In case your local PC or notebook does not require password entry to log in, leave the password entry empty when starting Connect Client application and press "OK" (Figure 4b).

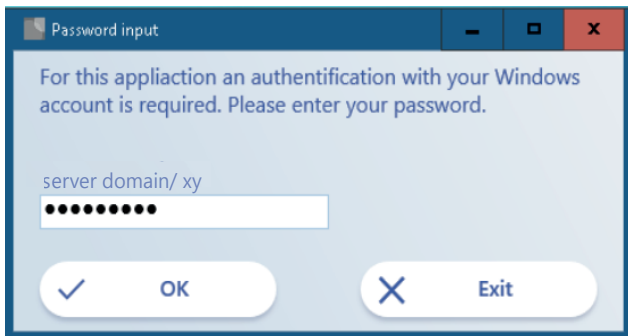


Figure 4a: Log in with Windows password

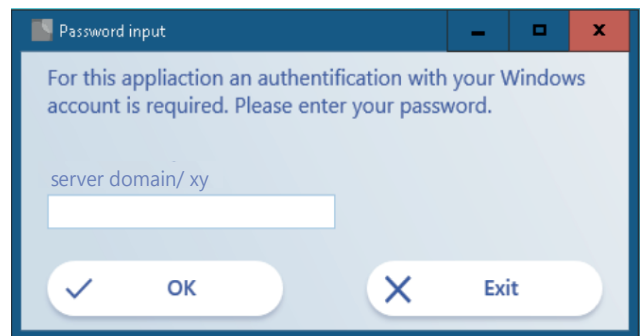


Figure 4b: Log in without Windows password

5.3 Adjustment of firewall settings

To prevent that the connection with the Quantum Blue® Reader from being disrupted by a firewall, you need to ensure that Connect Server application and Client application are listed in the list of programs, which are allowed to communicate with external systems.

Navigate to Settings/Network and Internet/Windows Firewall/Allow an app through the firewall (firewall settings might vary depending on your operating system).

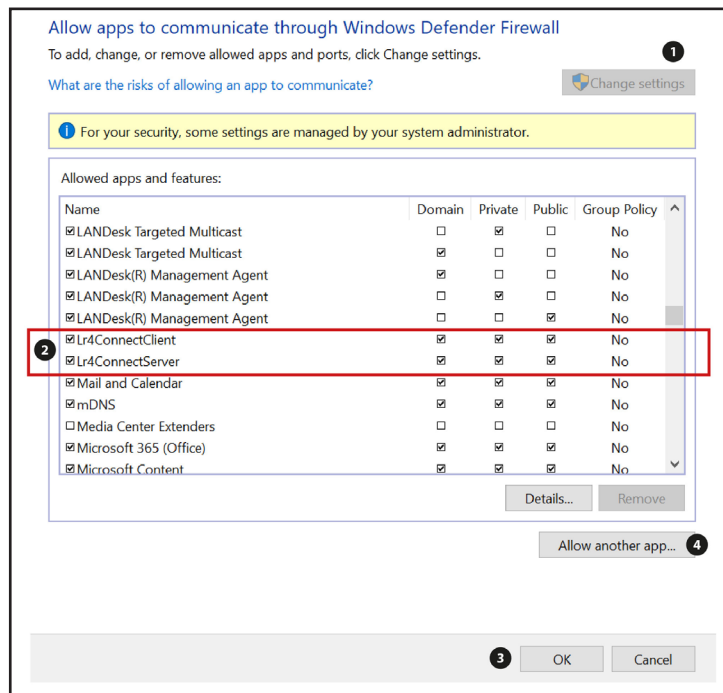


Figure 5: Firewall settings

Click on “Change settings” (position 1, Figure 5). Go through the list of apps and features and check the checkboxes (2) for the app named “Lr4ConnectServer” and “Lr4ConnectClient”. Confirm your selection with “OK” (3).

If the applications are missing in the list, add them by clicking on the menu “allow another app” (4) and search for the respective executable (.exe) file for the Connect Server and Client application. The Connect Server executable file is usually located under “C:\Program Files\Lr4ConnectServer.exe”, the Connect Client executable file usually under “C:\Program Files\Lr4ConnectClient\Lr4ConnectClient.exe”.

5.4 Setup of Quantum Blue® Reader to connect with the Connect Software - Local PC connection

Step 1:

Start your Quantum Blue® Reader and go to System/Settings/Admin Area/Communication Settings (Figure 6). For more information on operating the instrument, please refer to the Quantum Blue® Reader Manual.

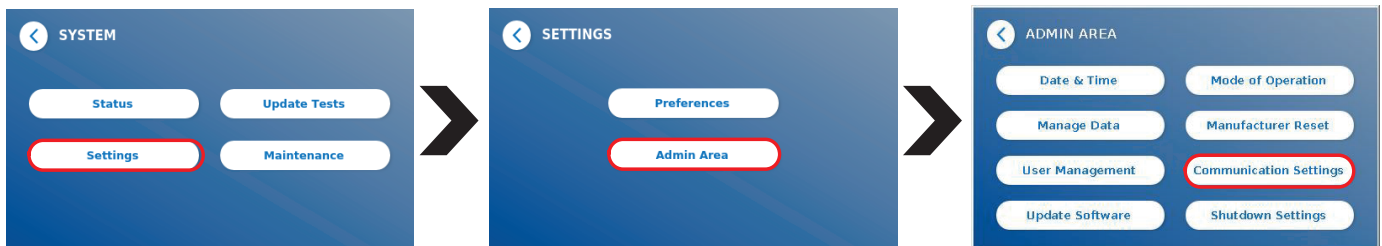


Figure 6: Menu System

Step 2:

Connect the Quantum Blue® Reader via its ethernet port at the rear of the instrument with the USB port of a local PC via a suitable ethernet to USB adapter.

NOTE

Please note that you need a **network cable** and **USB adapter for the network cable** (not provided with the Quantum Blue® Reader) to connect the Quantum Blue® Reader to the USB port of the local PC.

Step 3:

Go to the submenu **Network** of the menu **Communication Settings** of your Quantum Blue® Reader (Figure 7). Ensure to have the DHCP turned **ON** (1) and press **Save** (2) .

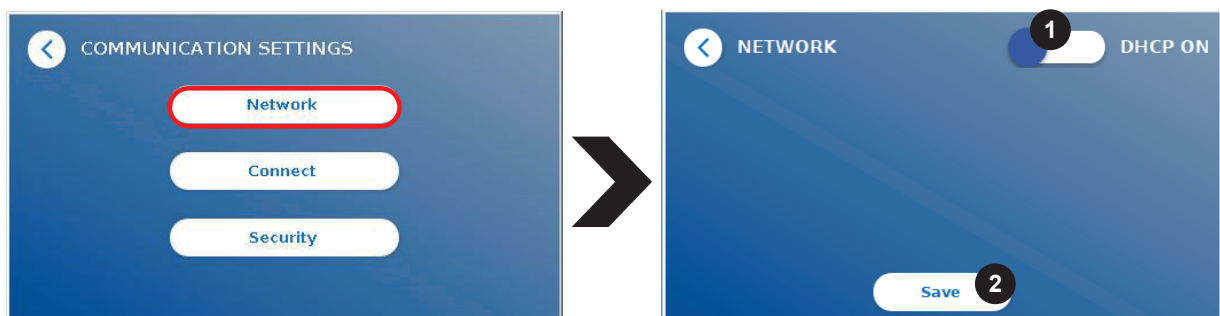


Figure 7: Menu Communication Settings

Step 4:

For establishing a successful connection between a local PC and the Quantum Blue® Reader, you need to set up the ethernet interface.

Navigate to Setting/Network & Internet/Change Adapter Options (Figure 8).

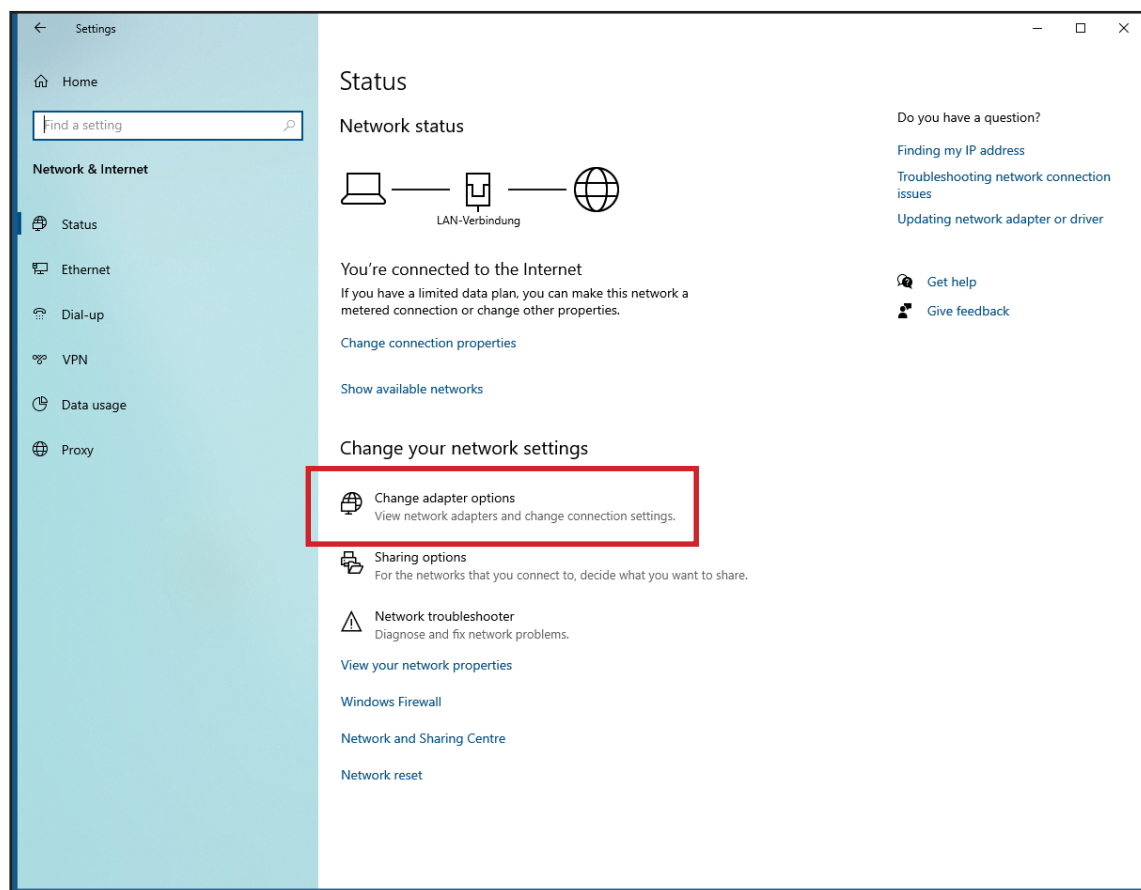


Figure 8: Network status

The network connections page, listing each of your network adapters, will appear (Figure 9). Right click on the connection that you want to configure and select «Properties».

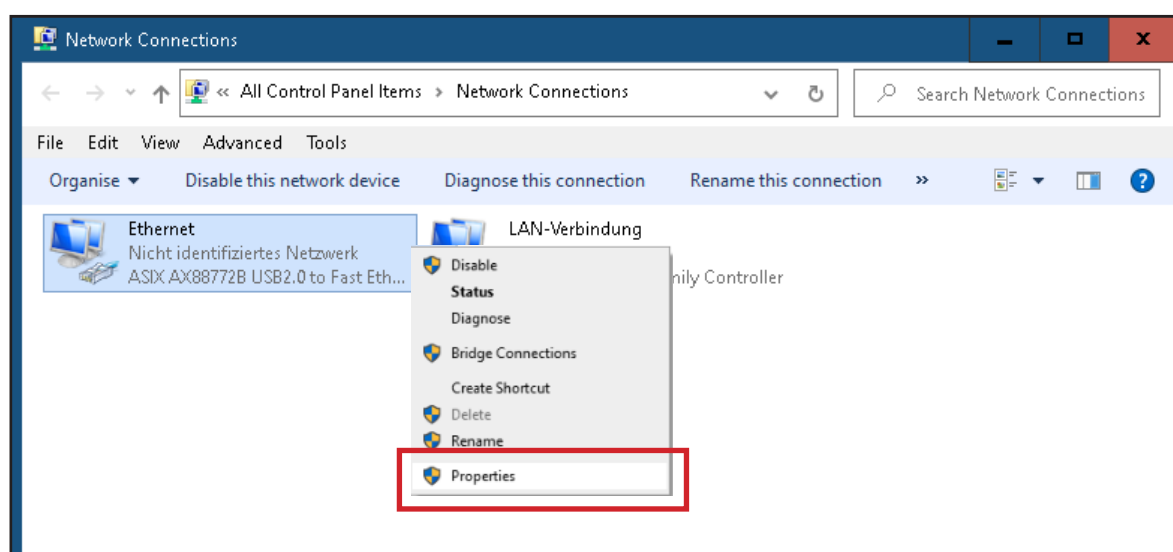


Figure 9: Network connection

INSTALLATION

The ethernet properties dialog box will open (Figure 10). Review the list of connection items listed in the properties dialog box. Search for the Internet Protocol Version 4 (TCP/IPv4).

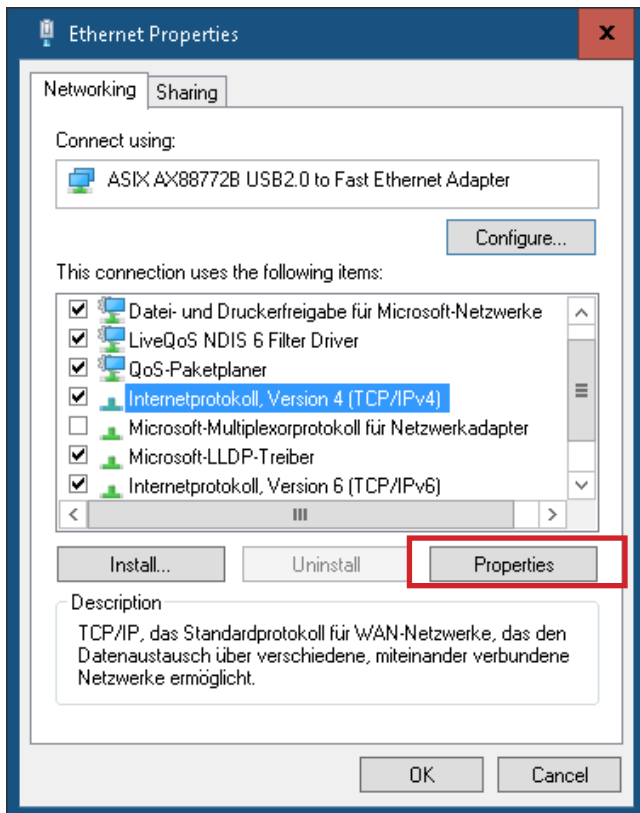


Figure 10: Search for Internet Protocol Version 4

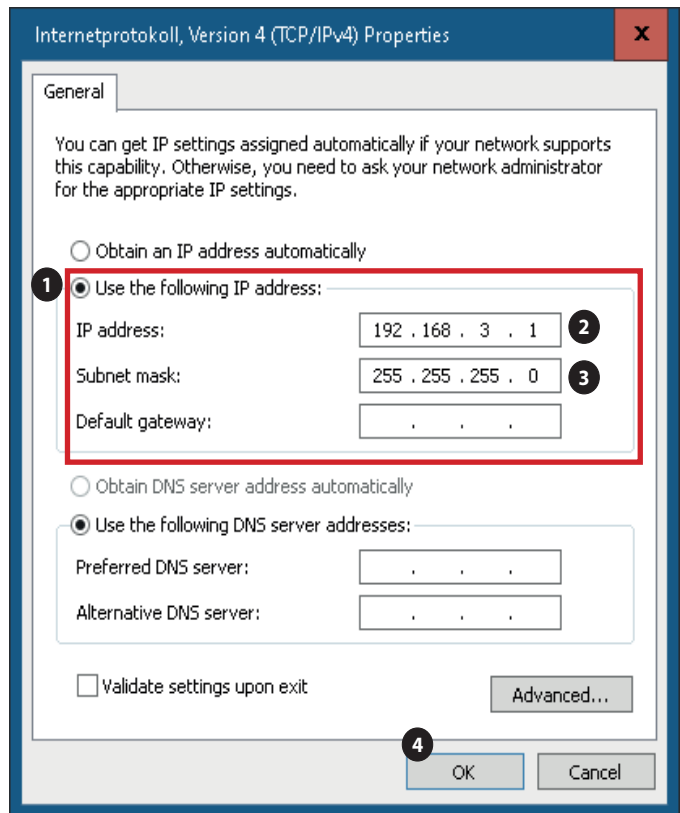


Figure 11: Add IP address and subnet mask

For configuration, click on the Internet Protocol Version 4 (TCP/IPv4) and then select «Properties» (Figure 10) to display the TCP/IP properties dialog box (Figure 11). Choose option «Use the Following IP Address»(1): Type in the IP address 192.168.3.1 (2), the subnet mask 255.255.255.0 (3) and leave the default gateway address empty. Confirm by clicking «OK» (4).

Go to the Connect Server application window of your PC. The previously defined IP address should be indicated (Figure 12).

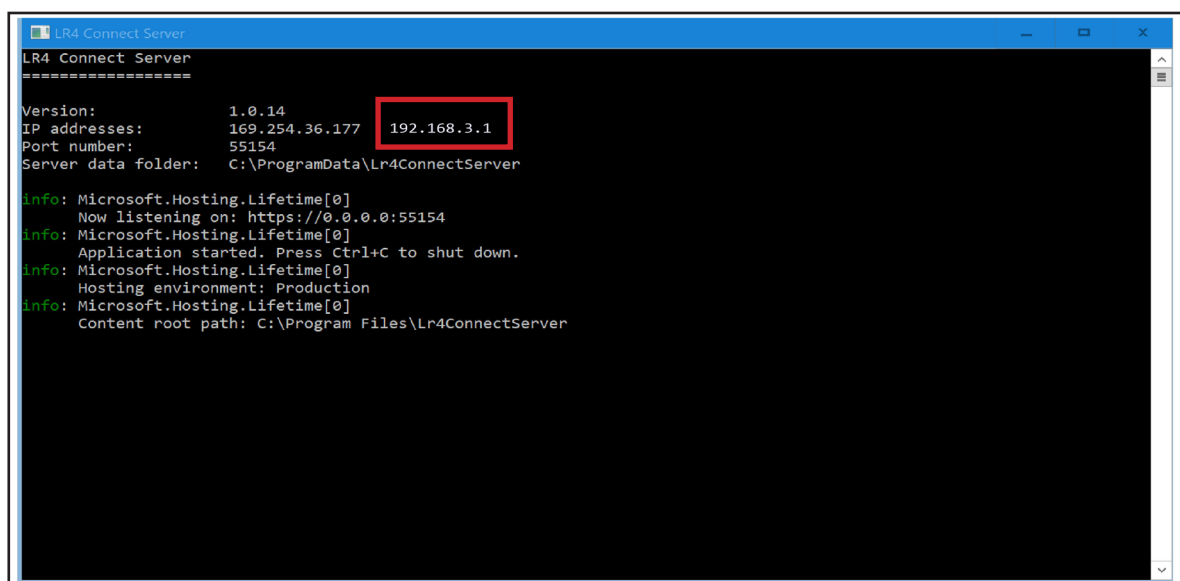


Figure 12: Check the IP address

Step 5:

Go to the submenu **Connect** of the menu **Communication Settings** (Figure 13). Turn the Connect function ON (1).

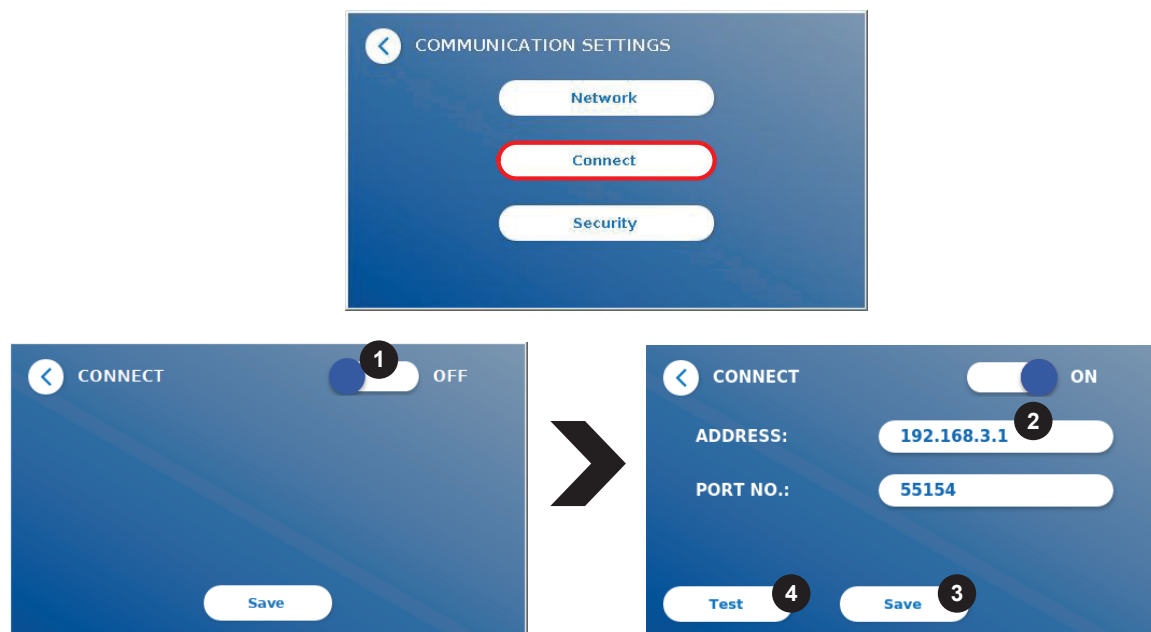


Figure 13: Connection establishment

Enter now the IP address 192.168.3.1 (2) which you previously entered in the TCP/IP Properties box of your computer (Figure 11) and use the port number written in the Connect Server application window (Figure 12). **Save** (3) the entered data. Reopen the submenu **Connect** and press **Test** (4).

After pressing **Test**, the Quantum Blue® Reader display will show a Connect Server availability message (Figure 14) in case the connection was successfully established. On the Home Screen of the instrument an additional icon (人) is shown (Figure 15). The icon remains white as long as the connection is active. It will turn red, when the connection is inactive.

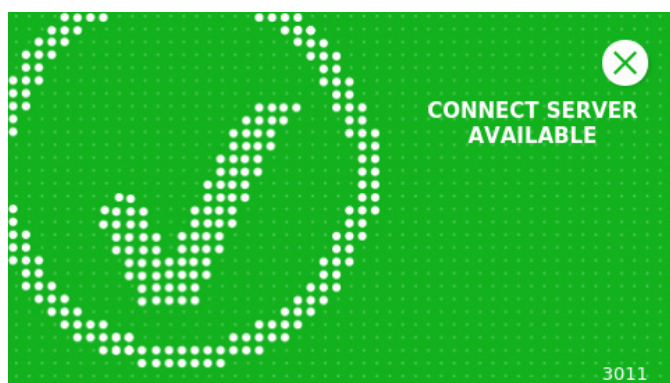


Figure 14: Connection successfully established

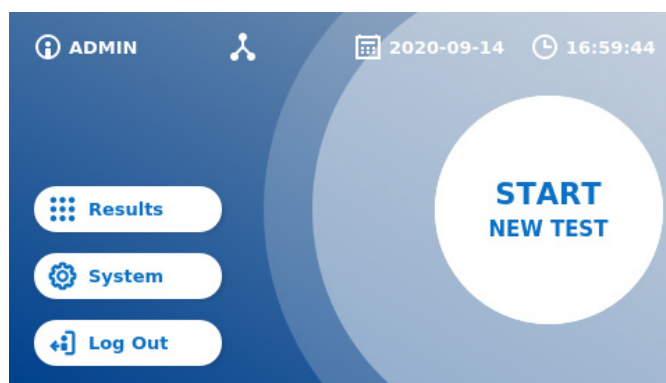


Figure 15: Connection active

In case the Quantum Blue® Reader cannot be connected to the Connect Software please check all the communication settings and/or your Windows firewall settings once again.

6. CONFIGURATION OF THE CONNECT SERVER

Once the connection has been successfully established, you can configure the Connect Server in two ways:

- as an application via the Start menu. The user must start and end the server manually or set to auto start
- as a Windows service. The server starts and ends automatically (in the background) when the computer is booted and runs independently.

6.1 Starting the Connect Server as an application

Go to start and open LR4 Connect Server:

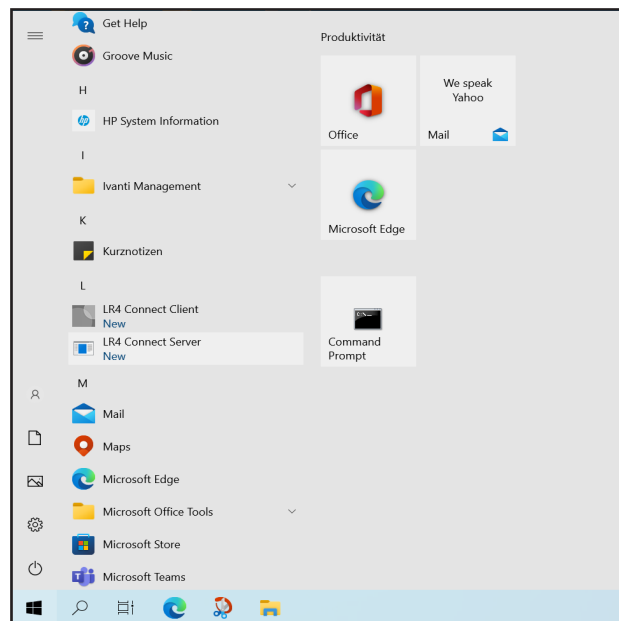


Figure 16: Open LR4 Connect Server

6.2 Starting the Connect Server as a Windows service

Stop the Connect Server by opening the Connect Server window and pressing Ctrl + C. In order to start the Connect Server as a Windows service, it must be installed as a Windows service first. For this, search for "Command Prompt" and run it with administration rights.

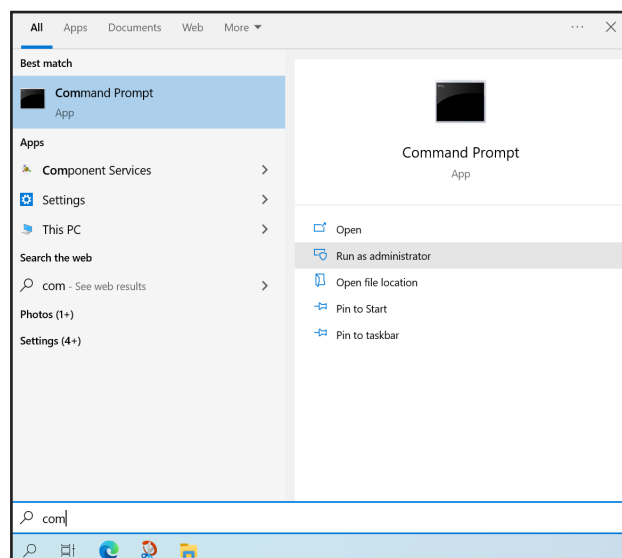


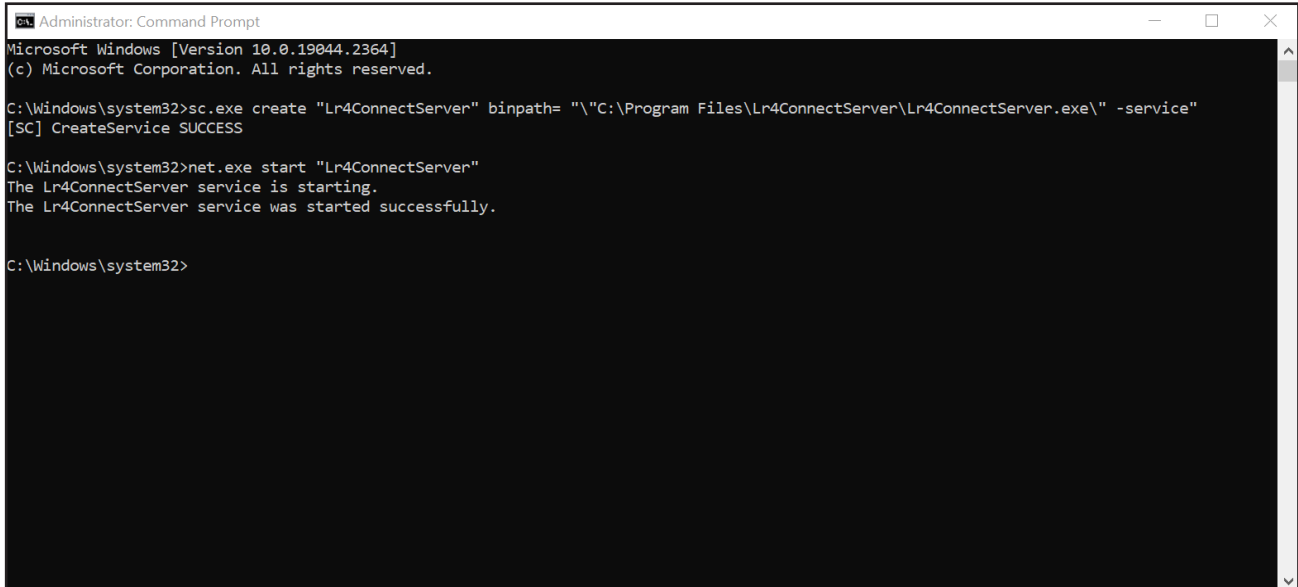
Figure 17: Start Command Prompt app

CONFIGURATION OF CONNECT SOFTWARE

Enter in the Command Window following code:

`sc.exe create "Lr4ConnectServer" binpath= "\"C:\Program Files\Lr4ConnectServer\Lr4ConnectServer.exe\" -service"` and then click "enter". You should get the following message: "CreateService SUCCESS".

Then write `net.exe start "Lr4ConnectServer"` and click "enter". You should get the following message: "The Lr4ConnectServer service was started successfully."



```
Administrator: Command Prompt
Microsoft Windows [Version 10.0.19044.2364]
(c) Microsoft Corporation. All rights reserved.

C:\Windows\system32>sc.exe create "Lr4ConnectServer" binpath= "\"C:\Program Files\Lr4ConnectServer\Lr4ConnectServer.exe\" -service"
[SC] CreateService SUCCESS

C:\Windows\system32>net.exe start "Lr4ConnectServer"
The Lr4ConnectServer service is starting.
The Lr4ConnectServer service was started successfully.

C:\Windows\system32>
```

Figure 18: Enter the code

NOTE

If you use your own customized Connect Server make sure to add the correct name.

To check this setting, you can open the Task Manager, the service must now be entered and the Status must show "Running" (Figure 19):

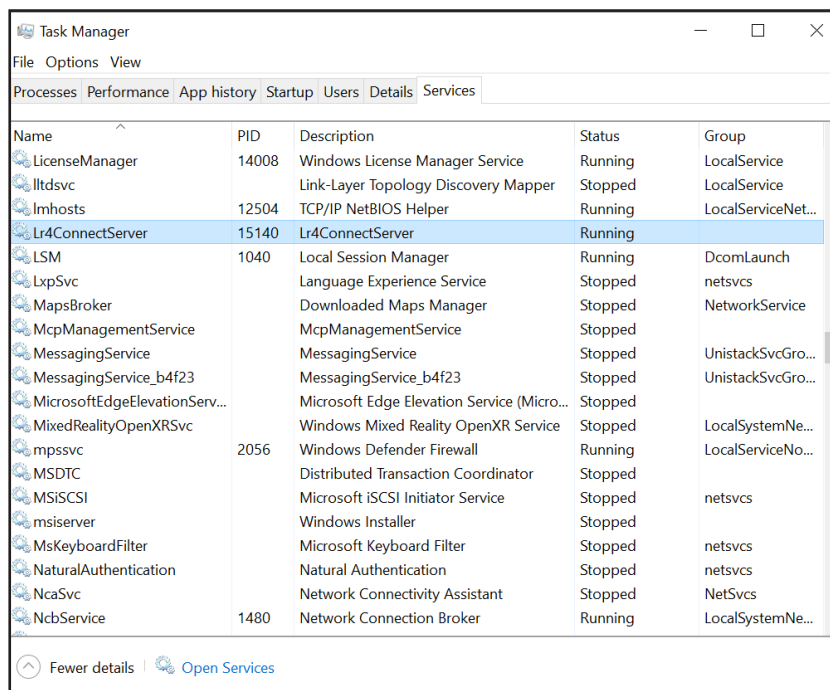


Figure 19: Add the correct name to own Connect Server

Now the Connect Server can be used. It starts/end automatically in the background.

If you want to delete Connect Server as a window service you must enter the following code into the Command Prompt window: `sc.exe delete "Lr4ConnectServer"`

You should get the following message: "DeleteService SUCCESS".

7. CONFIGURATION OF CONNECT CLIENT APPLICATION

Double click on the «LR4 Connect Client» icon on your desktop to start the application. Log in with your Windows password (refer to Step 2 of chapter 5.2 Restart of computer and login to Connect Client application).

All settings can be accessed by clicking on Settings → «Options» on the menu bar.

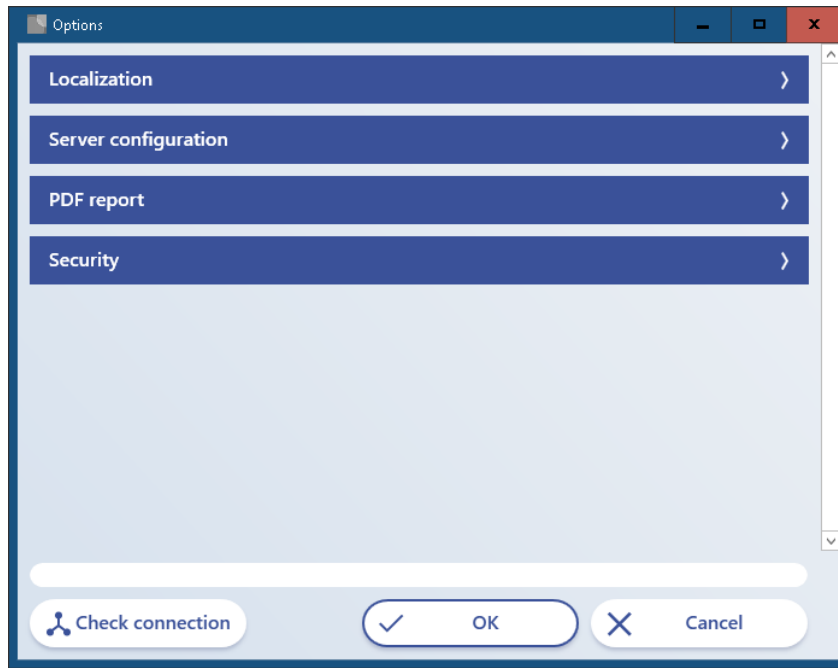


Figure 20: Menu Options

7.1 Localization

In order to apply the desired language of the Connect Client, go to «Localization» and choose the appropriate language from the drop down menu. Click «OK» and restart the Connect Client application.

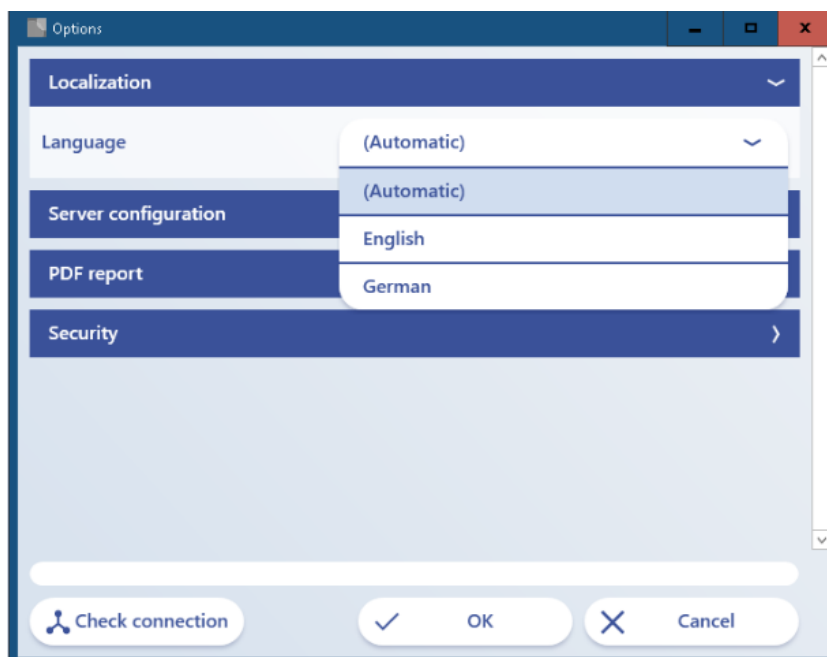


Figure 21: Language selection

7.2 Server configuration

In order to connect to the Connect Server application, specify server and port number in the drop down menu «Server configuration» (Figure 20). As the Connect Server application is running on the same computer as the Connect Client application, the server address «localhost» can be entered. The server port number is indicated in the Connect Server application window (refer to Figure 12).

Click on «Check connection» to verify the connection.

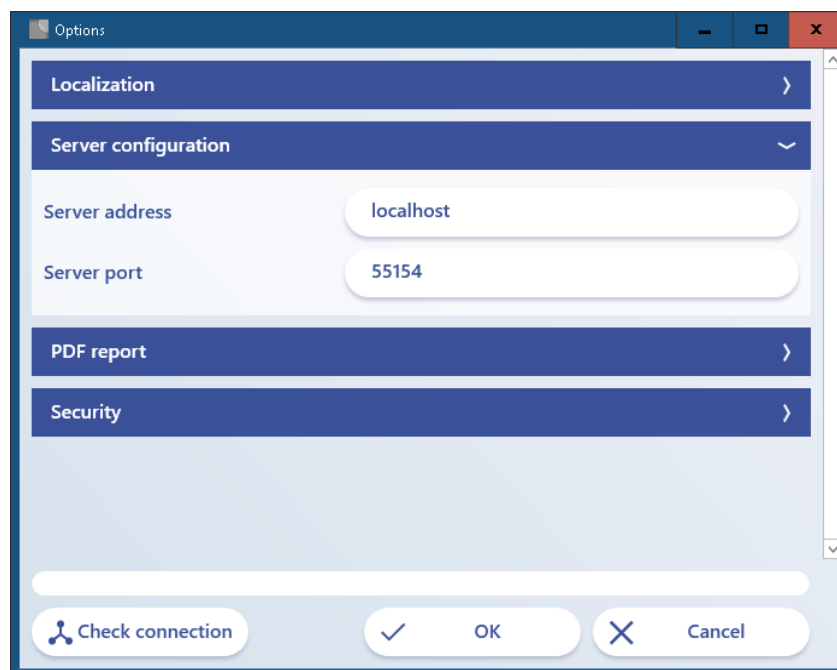


Figure 22: Server configuration

7.3 PDF report

PDF reports for single test results or batches of test results can be created. Reports can be customized by adding a graphic (png, jpg, gif format) in the left and right corner of the header (position 1, Figure 23).

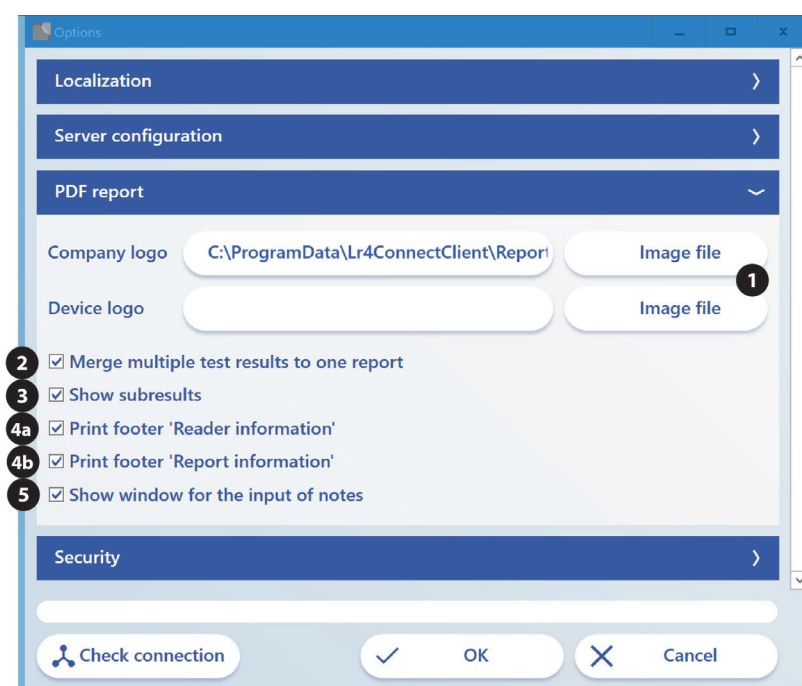


Figure 23: Create a PDF report

CONFIGURATION OF CONNECT SOFTWARE

The following options can be applied by activating the corresponding checkbox:

2	Merge multiple test results to one report	If activated, selected results will be compiled to one PDF report. Otherwise, selected results will be opened individually as single report
3	Show subresults	If deactivated, the subresult section will not appear on the report.
4a	Print footer "Reader Information"	Information about the used Quantum Blue® Reader for the individual result will be printed in the footer of the report
4b	Print footer "Report Information"	Information about the user and the Connect Software version will be printed in the footer of the report
5	Show window for the input of notes	Pop up window to enter notes to the individual result report will open.

An example of a PDF report is shown in Figure 24, for which all checkboxes (2-4, Figure 23) have been activated and a device logo is displayed (picture of Quantum Blue® Reader on the right side of the report).



Result Report

Patient ID: Test

Test name: LF-TLIF

Product ID: TLIF

Test result: <0.4 µg/mL

Subresults:

Control Line	VALID
Infliximab	<0.4 µg/mL
Test Line	VALID

Specimen: Serum

Dilution: 1:20

Measuring range: 0.4-20 µg/mL

Test performed: 10.02.2023 09:30:27

Lot ID: 2218N

Expiry date: 31.05.2023

User ID: ADMIN

Notes:
Additional notes

Reader information:
Run number: 41 Device ID: BI-POCTR-ABS Device serial number: 03108 ISW version: 1.5.0.16897

Report information:
Creation date: 10.02.2023 09:31:59 PC user: gmadmin Connect SW version: 1.0.14

Figure 24: Example of a PDF report

7.4 Security

The security menu allows the customization of an automatic logout. The automatic logout time, after a certain period of user inactivity, can be defined by the user and set in minutes (e.g. 10, 20, 30 etc).

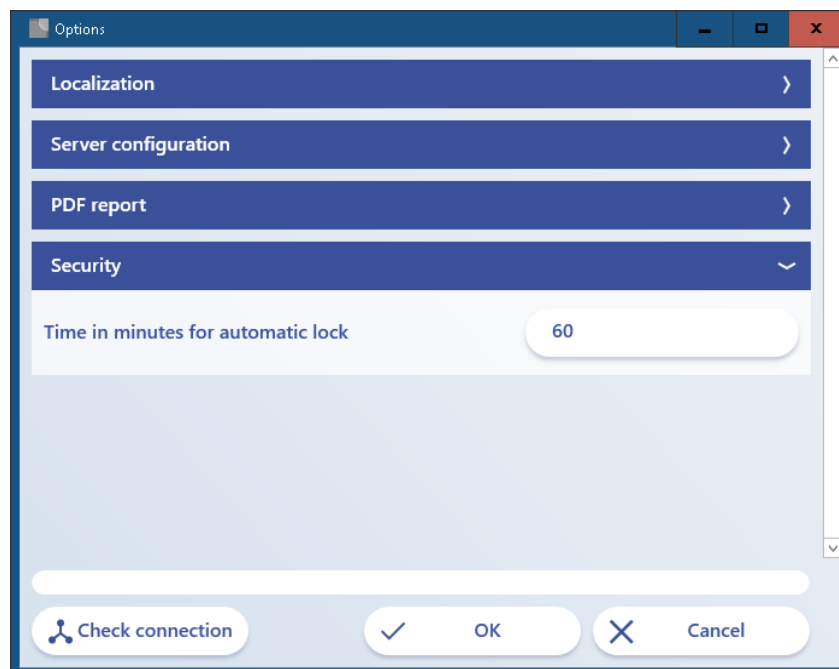


Figure 25: Add the automatic logout time

8. WORKING WITH THE CONNECT CLIENT APPLICATION

8.1 Main view of the Connect Client application

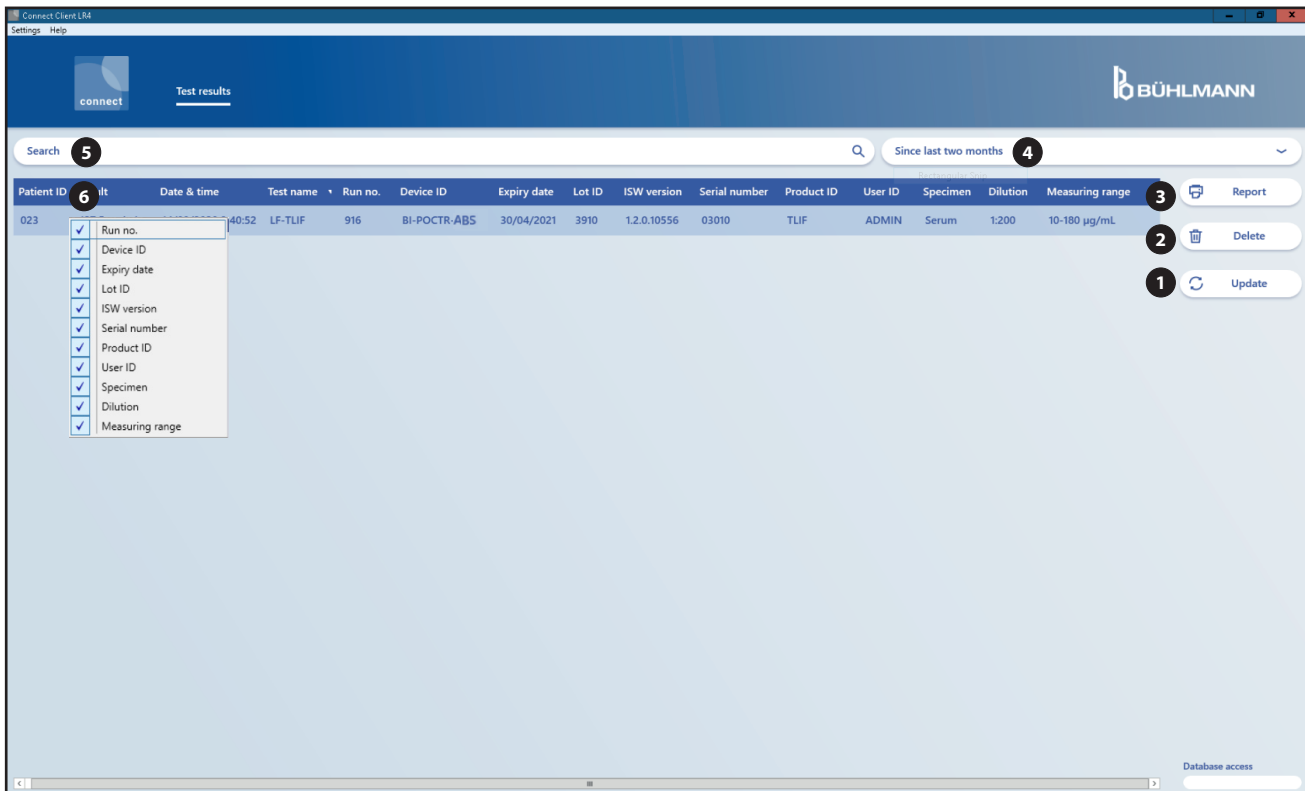


Figure 26: Options for the Connect Client application

- 1** Update button: To send a new request for updated results to the Connect Server.

Note: Press this button once, when you have started the software.
- 2** Delete button: To delete test results of selected rows.
- 3** Report button: To create reports for selected results.

Note: Press and hold the CTRL key to select test results of several individual rows. Press and hold the SHIFT key to select test results of several consecutive rows.
- 4** Time filter: To select the time frame for result displaying

Note: Choose the time frame from the drop down list.
- 5** Search field: To search for results generated with a specific test method, on a specific date, for a specific sample/user ID etc.
- 6** Column header: To customize the order of columns containing result information (e.g. date & time, test method etc)

Note: Results are sorted in an ascending or descending manner. The column order can be changed by shifting columns from right to left or vice versa. A right-click on a column header opens a menu, in which all parameters for results are listed. Select which parameters you want to display by checking or unchecking the corresponding checkbox.

8.2 Report configuration

A note can be added to a test result report if the checkbox “show window for the input of notes” was activated in the PDF report drop down menu (refer to position 5 in Figure 23). When clicking on the report button, a notes field will pop up and comments/notes can be entered (Figure 27). By clicking on “View” the report will be finalized. If the note is left empty, the note section will not be displayed in the PDF report.

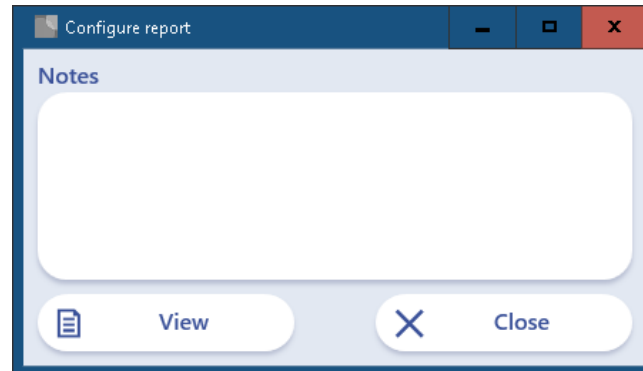


Figure 27: Add a comment/ note

NOTE

The software will use the default program to open and view PDFs.

9. DEINSTALLATION OF CONNECT SERVER AND CLIENT

Use the Windows tools to uninstall the Connect-Client and Server applications (Settings/Apps Features).

10. ERROR HANDLING

Error behavior	Measure
Error message "Timeout of database server!"	<p>A connectivity error occurred. Possible reasons:</p> <ul style="list-style-type: none"> •Connect Server application was not started. •The Windows firewall is blocking the Connect Server application. •Server address or port number are incorrectly configured.
Error message "The server address is invalid!"	The server address must consist of four numbers separated by a point, e. g. "172.31.90.16". Each number must be in the range from 0 to 255. Alternatively the text "localhost" is allowed.
Error message "The port number is invalid!"	The port address must be a number from 0 to 65535.
The PDF report cannot be shown.	There is no PDF viewer installed. Install Adobe Acrobat Reader or a similar PDF viewer.

11. FILE EXPORT

The Connect Server can export result files from the Connect Server application to a specified file server in the JSON and/or HL7 format which is a commonly used text file format. Third party programs like middleware, LIS etc. can import these files into their database.

11.1 Configuration of the Connect Server for the export of result files

The Connect Server settings are stored in the text file (Figure 28) in the JSON file format:

C:\ProgramData\Lr4ConnectServer\ServerSettings.json

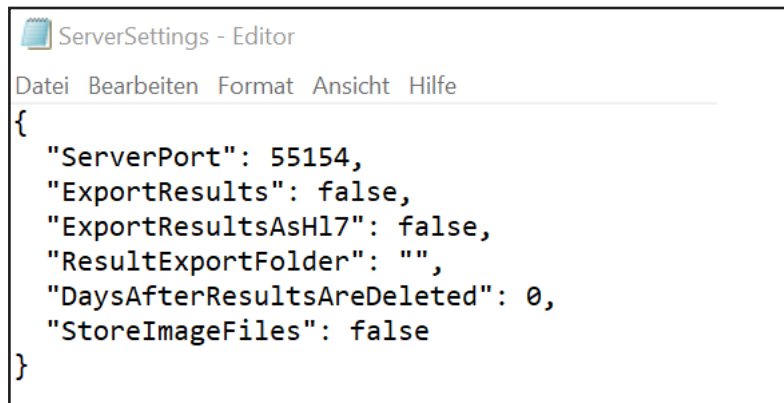


Figure 28: Connect Server settings

NOTE

The C:\ProgramData folder is invisible by default in Windows File Explorer. To navigate to this folder open Windows File Explorer, type the folder path directly into the address bar of the Windows File Explorer and press "Enter".

The default content of the file "ServerSettings.json" is as follows:

```
{
...
"ExportResults": false,
"ResultExportFolder": ""
}
```

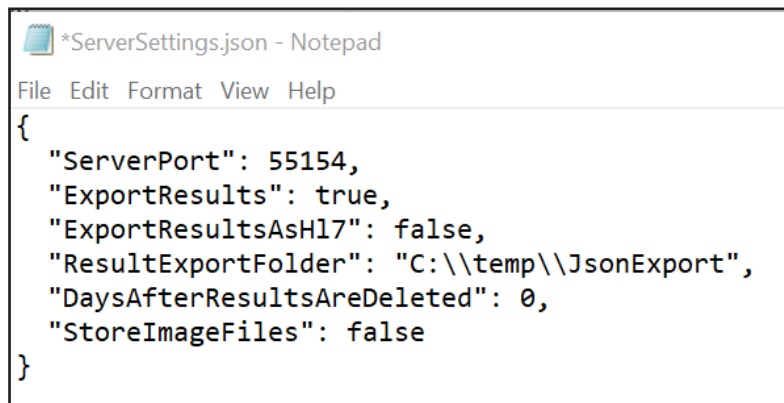
NOTE

Results can be exported as either JSON file or HL7 file or both at the same time, depending on the settings.

11.1.1 JSON file format export

To activate the result export, the following steps are necessary:

- Stop the Connect Server by opening the Connect Server window and pressing Ctrl + C.
- Open the JSON file "ServerSettings.json" in a text editor.
- In the line "ExportResults" change the value from "false" to "true", note: **do not** remove the comma at the end of the line.
- In the line "ResultExportFolder" enter the folder at which the result data should be stored. The folder must contain a full path and has to be quoted. For each backslash character "\" two backslash characters "\\" have to be written. For example, in order to set the folder "C:\\temp\\JsonExport" the text: **"ResultExportFolder": "C:\\temp\\JsonExport"** has to be entered.



```
*ServerSettings.json - Notepad
File Edit Format View Help
{
  "ServerPort": 55154,
  "ExportResults": true,
  "ExportResultsAsH17": false,
  "ResultExportFolder": "C:\\temp\\JsonExport",
  "DaysAfterResultsAreDeleted": 0,
  "StoreImageFiles": false
}
```

Figure 29: Connect Server settings

- Save the JSON file.
- Restart the Connect Server application using the start menu

A new JSON file is written for each test result. The file name contains the time stamp of the file creation. Normally a data entry consists of: name enclosed in quotes, a colon and a value. Further descriptions about the JSON format can be found at <https://docs.fileformat.com/web/json/>.

An example of the file content:

```
{
  "SampleId": "S378463",
  "FinalResult": "<0.4 µg/mL",
  "DateTime": "2023-01-06T08:11:17",
  "LotId": "0216",
  "ExpiryDate": "2023-07-31T00:00:00",
  "RunNo": 2674,
  "MethodName": "LF-TLIF",
  "DeviceId": "BI-POCTR-ABS",
  "IsVersion": "1.4.1.12975",
  "SerialNo": "03079",
  "ProductId": "TLIF",
  "UserId": "ADMIN",
  "DilutionRatio": "Serum",
  "DilutionRange": "1:20",
  "SubresultItems": [
    {
      "ParamName": "Infliximab",
      "BinResult": "<0.4 µg/mL"
    },
    {
      "ParamName": "Control Line",
      "BinResult": "VALID"
    },
    {
      "ParamName": "Test Line",
      "BinResult": "VALID"
    }
  ]
}
```

11.1.2 HL7 file format export

To activate the result export, the following steps are necessary:

- Stop the Connect Server by opening the Connect Server window and pressing Ctrl + C.
- Open the JSON file "ServerSettings.json" in a text editor.
- In the line "ExportResultsAsHL7" change the value from "false" to "true", note: **do not** remove the comma at the end of the line.
- In the line "ResultExportFolder" enter the folder at which the result data should be stored. The folder must contain a full path and has to be quoted. For each backslash character "\" two backslash characters "\\" have to be written. For example, in order to set the folder "C:\temp\HL7Export" the text: **"ResultExportFolder": "C:\\temp\\HL7Export"** has to be entered.

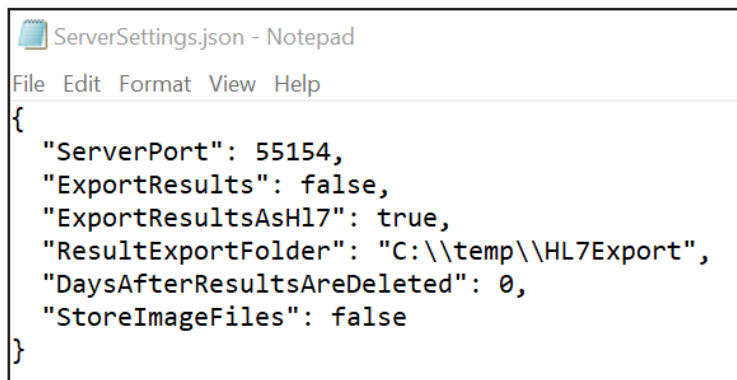


Figure 30: Connect Server settings

- Save the JSON file.
- Restart the Connect Server application using the start menu

A new HL7 file is written for each new test result. Old test result will not generate HL7 files. The file name contains the time stamp of the file creation. Normally a data entry consists of: name enclosed in quotes, a colon and a value.

An example of the file content:

MSH|^~\&|||||20230116174804||ORU^R01|20230116174804104100|P|2.5

PID|1||Z999||Z999

PV1||U

OBR|1||2681|^LF-TLIF

OBX|1|ST|LF-TLIF||<0.4 µg/mL||||F||20230116174600

OBX|2|ST|Infliximab||<0.4 µg/mL||||F||20230116174600

OBX|3|ST|Control Line||VALID||||F||20230116174600

OBX|4|Test Line||VALID||||F||20230116174600

Each line in the HL7 text is called a segment and a segment starts with a command (e. g. MSH). A segment consists of several fields and these fields are separated by a pipe symbol '|'. Each field has an index number, and the index numbering starts with 0. The short form for a field is "segment_name field_index", e. g. "OBR 3" means field index 3 in the segment "OBR". The relevant fields which are filled by the Connect Server are described in the following table.

Field	Value
MSH 6	Date and time when the HL7 record was created. Format «yyyyMMddHHmmss»
MSH 9	Message Control ID
MSH 11	HL7 version number
PID 3	Patient ID or Sample ID
PID 5	Patient ID or Sample ID
OBR 3	Run number
OBR 4	Circumflex accent (^) followed by the method name
OBX 1	Consecutive result number: 1 = Main result, 2 = First subresult, 3 = Second subresult etc.

Field	Value
OBX 3	Main result: Method name, Subresult: Parameter name
OBX 5	Main result: Final result, Subresult: Result value
OBX 14	Date and time of the result in the format «yyyyMMddHHmmss»

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Quantum Blue® Connect Software User Manual

Document Version: VA2

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Printed in Switzerland