PROCESS AUTOMATION

Freelance 2019
Introduction
Getting Started

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About this book

Use of warning, caution, information, and tip icons

This publication includes **Warning**, **Caution**, and **Information** where appropriate to point out safety related or other important information. It also includes **Tip** to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

Electrical warning icon indicates the presence of a hazard which could result in *electrical shock.*

Warning icon indicates the presence of a hazard which could result in *personal injury.*

Caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in *corruption of software or damage to equipment/property.*

Information icon alerts the reader to pertinent facts and conditions.

Tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although **Warning** hazards are related to personal injury, and **Caution** hazards are associated with equipment or property damage, it should be understood that operation of damaged equipment could, under certain operational conditions, result

in degraded process performance leading to personal injury or death. Therefore, comply fully with all **Warning** and **Caution** notices.

Terminology

The Glossary contains terms and abbreviations that are unique to ABB or have a usage or definition that is different from standard industry usage. Please make yourself familiar to that.

You will find the glossary at the end of the ***Engineering Manual System Configuration.***

Document conventions

The following conventions are used for the presentation of material:

- The words in names of screen elements (for example, the title in the title bar of a window, the label for a field of a dialog box) are initially capitalized.
- Capital letters are used for the name of a keyboard key if it is labeled on the keyboard. For example, press the ENTER key.
- Lowercase letters are used for the name of a keyboard key that is not labeled on the keyboard. For example, the **space bar, comma key**, and so on.
- Press CTRL+C indicates that you must hold down the CTRL key while pressing the C key (to copy a selected object in this case).
- Press **ESC, E, C** indicates that you press and release each key in sequence (to copy a selected object in this case).
- The names of push and toggle buttons are boldfaced. For example, click **OK**.
- The names of menus and menu items are boldfaced. For example, the **File** menu.
  - The following convention is used for menu operations: MenuName > MenuItem > CascadedMenuItem. For example: select **File > New > Type**.
  - The **Start** menu name always refers to the **Start** menu on the Windows Task Bar.

- System prompts/messages are shown in the Courier font, and user responses/input are in the boldfaced Courier font. For example, if you enter a value out of range, the following message is displayed:

  ```
  Entered value is not valid.The value must be 0to30.
  ```

  You may be told to enter the string TIC132 in a field. The string is shown as follows in the procedure:

  TIC132

  Variables are shown using lowercase letters.

  sequence name

Related documentation

The following list gives an overview of the documentation relating to the Freelance system.

Title	Number
Introduction – Getting Started	3BDD012560
Introduction – New Features History	3BDD011933
Mounting and Installation Instructions, Safety Instructions	2PAA109317
Mounting and Installation Instructions, AC 900F Controller	2PAA109295
Mounting and Installation Instructions, AC 800F Controller	3BDD012501
Mounting and Installation Instructions, AC 700F Controller	2PAA103858
Mounting and Installation Instructions, Rack System	3BDD012603
Mounting and Installation Instructions, I/O Modules for AC 700F/900F	2PAA109294
Engineering Manual, Process Stations	2PAA114393
Engineering Manual, S700 I/O Modules	2PAA105800
Engineering Manual, System Configuration	3BDD012503
Engineering Manual, IEC 61131-3 Programming	3BDD012504

Title	Number
Engineering Manual, Functions and Function Blocks	3BDD012514
Engineering Manual, Operator Station Configuration	3BDD012518
Engineering Manual, Communication and Fieldbusses	3BDD012515
Engineering Manual, IEC 60870-5 Telecontrol Library	3BDD012509
Engineering Manual, User Management	3BDD012513
Engineering Manual, Trend Server	3BDD012527
Engineering Manual, OPC Server F	3BDD012511
Reference Manual, DMS / API	3BDD012508
Engineering Manual, Bulk Data Manager	2PAA105801
Operators Manual, Freelance Operations	3BDD011932
Operators Manual, Archive Browser	3BDD012601
Engineering Manual, Process Station - Rack System	3BDD012520
Engineering Manual, I/O Modules for AC 700F / AC 900F	2PAA109292
Engineering Manual, Formulation	2PAA110024
Engineering Manual, OPC Tunnel	2PAA106899

1 General notes

1.1 Freelance support

For technical assistance, please contact your local service organization.

http://www.abb.com/contacts/

or

https://new.abb.com/control-systems

1.2 System requirements

It is strongly recommended to install the Freelance software on your PC and additionally only the third party software mentioned here. Freelance is not tested and released together with any other applications.

If you are using other software packages together with the Freelance software and should encounter any problems, we request you to uninstall these other software packages first.

1.2.1 Operating system

All components of Freelance 2019 can be used with the following versions of the Microsoft Windows operating system:

- Windows 7 Professional SP1 32 bit
- Windows 7 Professional SP1 64 bit
- Windows 7 Enterprise SP1 32 bit
- Windows 7 Enterprise SP1 64 bit
- Windows 10 Pro 32 bit

- Windows 10 Pro 64 bit
- Windows 10 Enterprise 32 bit
- Windows 10 Enterprise 64 bit

The Freelance OPC Server and Trend Server can also be used with the following versions of the Windows operating system:

- Windows Server 2016
- Windows Server 2019

This feature is intended for integration with 800xA Operations.

Security updates

It is strongly recommended to install all Microsoft custom suggested security updates.

The current results for Microsoft Security update tests for the active Freelance versions can be found in ABB Library or in myABB/MyControlSystem in the document **"Freelance: Microsoft Security Updates Validation Status"** (2PAA107593).

Service packs and security updates are available free of charge from Microsoft Corporation (also on the Internet at http://www.microsoft.com).

System Hardening

The System Hardening function is intended to increase the Freelance system security. See the "Freelance Hardening Manual" (2PAA112641) for details about the required settings. Essentially, system hardening is achieved by removing unnecessary Windows components, deactivating unused Windows services and configuring the firewall accordingly.

You can find the Freelance Hardening Manual in the ABB Library and in myABB/MyControlSystem

1.2.2 Web browsers

Usage of the web display in a Freelance Operations station requires that the Microsoft Internet Explorer or Microsoft Edge is installed on the respective Freelance Operations PC. Usage of the diagnosis web pages of the Freelance

process stations requires that the Microsoft Internet Explorer or the web browser Microsoft Edge (Windows 10) is installed on the PC used for commissioning. For Freelance 2019 this feature is tested and released for version 11 of Microsoft Internet Explorer.

1.2.3 Microsoft Office

Usage of the Bulk Data Manager and Excel Reports functionality requires that Microsoft Office, especially Microsoft Excel, is installed on the PC. The following Microsoft Office/Excel versions can be used with Freelance 2019:

- Office 2016 32 bit
- Office 2019 32 bit

1.2.4 Windows user access rights

Installing the Freelance software requires administrator privilege.

Users working with Freelance applications do **not** need administrator privileges. They should be members of the Windows user group "ABB Freelance Basic Access".

The creation of Freelance Operations users is supported through the **Freelance Settings** tool (see Modify installation settings on page 68).

1.2.5 Recommended PC equipment

The below-mentioned specifications for PC equipment are recommendations, only. They were selected to ensure a fluent workflow and to have good response times. Depending on the size of your project you might experience a fluent behavior with a less powerful PC as well.

It is recommended to always install and run the OPC Server and Trend Server on separate PCs.

Freelance Engineering

Hard disk for installation	1 GB free disk space
Hard disk for operation	10 GB free disk space
Operating system	Microsoft Windows 7 (32/64 bit) Microsoft Windows 10 (32/64 bit)
CPU speed	≥ 2 GHz
RAM	≥ 4 GB
Ethernet card with supported Interface	10/100 MBit

Freelance Operations

Hard disk for installation	500 MB free disk space
Hard disk for operation	≥ 2 GB free disk space
Recommended for archiving	≥ 80 GB (depending on configuration)
Operating system	Microsoft Windows 7 (32/64 bit) Microsoft Windows 10 (32/64 bit)
Speed	≥ 3 GHz
RAM	4 GB
Ethernet card with supported Interface	10/100 MBit

OPC Server

Hard disk for installation	500 MB free disk space
Hard disk for operation	≥ 2 GB free disk space
Operating system	Microsoft Windows 7 and Windows 10 Microsoft Windows 2016 Server Microsoft Windows 2019 Server
Speed	≥ 2 GHz
RAM	≥ 4 GB
Ethernet card with supported interface	10/100 MBit

1.2.6 Freelance network / Control Net

The security of industrial automation and control systems becomes increasingly critical as different networks are connected and systems are integrated in a collaborative manufacturing environment. For industrial automation and control systems the potential impact of an attack may be more serious than for computer systems in general. Users of industrial automation and control systems need to pay correspondingly increased attention to these issues.

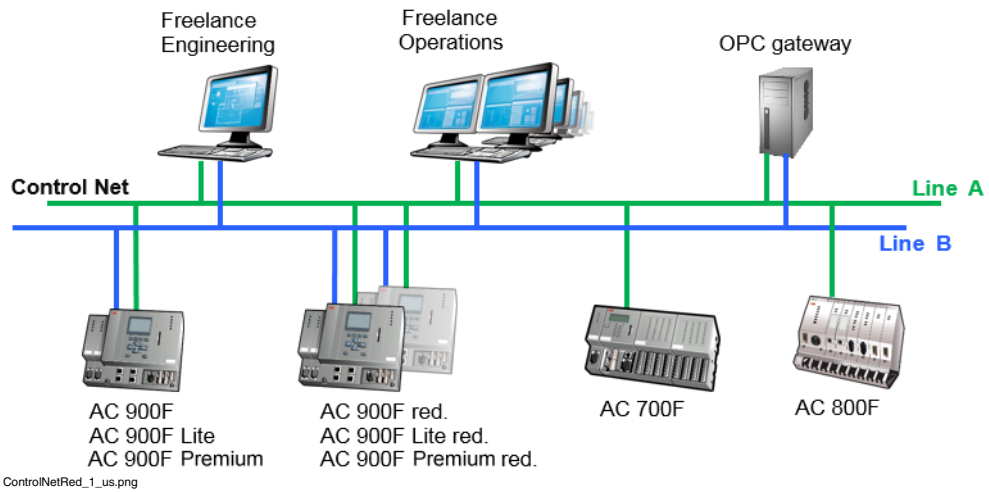
It is recommended to separate the Freelance network and the global company network.

For more details and background information, please refer to the document **"Security for Industrial Automation and Control Systems"** (3BSE032547) in the ABB Library and in myABB/MyControlSystem.

1.2.7 Control Net redundancy

Optionally, communication between AC 900F controllers and operator or gateway stations and lateral communication between AC 900F controllers is possible using a Control Net in a redundant configuration. The following Freelance stations support Control Net redundancy:

- AC 900F
- AC 900F redundant
- AC 900F Lite
- AC 900F Lite redundant
- AC 900F Premium
- AC 900F Premium redundant
- Freelance Engineering
- Freelance Operations (operator station)
- OPC Gateway
- OPC Gateway redundant.



ControlNetRed_1_us.png

Communication between the operator stations and gateway stations (horizontal communication) is only possible via the configured Ethernet line. Redundancy is not supported in this case. Communication between AC 900F controllers (lateral communication) and with operator or gateway stations (vertical communication) is done via the active Control Net line. In the event of a failure of the active line, a

redundancy toggle to the redundant line occurs within a configurable changeover time.

All Freelance stations which no Control Net redundancy support (eg.: AC 800F) should only be connected to the Control Net Line A.

1.2.8 Network protocol

The **network protocol** used by Freelance is **TCP/IP**. No other protocol is required. With other network protocols, correct network operation cannot be ensured.

If Freelance is installed in a virtualized system, the configuration "Bridged" must be selected for the network adapter on the virtualized system.

IP addresses of the address block 172.16.0.0/20 are recommended for addressing the stations and resources in a project. The subnet mask 255.255.240.0 is the default setting for Freelance.

IP address settings

Windows 7
Start > **Control Panel** > **Network and Internet**
> **Network and Sharing Center** > **Change adapter settings**
> Right-click a network adapter > **Properties**
> Select **Internet Protocol Version 4 (TCP/IPv4)** > **Properties**

Windows 10
Windows button > **Settings** > **Network & Internet** > **Change Adapter Options**
> Right-click the appropriate network adapter > **Properties**
> Select **Internet Protocol Version 4 (TCP/IPv4)** > **Properties**

Enter an IP address and subnet mask for the network adapter:

IP address: 172.16.x.x for example, 172.16.1.20

Subnet mask: 255.255.240.0

An address in the same subnet must be assigned to all Freelance stations on the same Control Net, e.g. 172.16.0.1 to 172.16.15.254. The first and last addresses of the subnet are reserved (broadcast addresses) and must not be used.

For a Control Net in a redundant configuration addresses of a separate subnet must be assigned to the network adapters of Line A and Line B, e.g.:

Line A: 172.16.0.1 to 172.16.15.254

Line B: 172.16.16.1 to 172.16.31.254.

Subnet mask for time synchronization

Besides the Windows PCs the process stations need a valid network configuration.

To permit time synchronization, all stations must be located in the same subnet.

If other subnet masks than 255.255.240.0 are used, make sure that they are contiguous. The equivalent bit pattern must start and then continue with 1 values. It may change to zeros once and must then end with zeros.

Valid example:

11111111 11111111 11110000 00000000 = 255.255.240.0

Invalid example:

11111111 11111111 11111001 00000000 = 255.255.249.0

When using redundant AC 800F process stations, the subnet mask 255.255.240.0 must be used.

The IP address of the redundancy link of a redundant controller is automatically assigned by the controller itself and cannot be modified. Make sure that redundant operation is enabled in the controller.

For setting the IP addresses, resource IDs and subnet masks of your controllers, refer to the respective ***Mounting and Installation*** manuals and in the ***Engineering Manual System Configuration***.

Stations connected via a router participate neither in the normal time synchronization nor in lateral communication. The function “External time server” (see ***Engineering Manual System Configuration, Project*** **tree**) can be used to implement time synchronization for external process stations.

Parameters for DNS server and WINS

No parameters must be set for DNS or WINS, if the software is run on a standalone system. The default network settings of the Windows installation can be used unchanged to operate a Freelance system. The TCP/IP protocol must be used on all PCs.

Usage of host names

Up to Freelance 2013 is was possible to use symbolic names for the computers and process stations instead of IP addresses when configuring a project. Freelance 2016 does no longer support this feature.

When a project is imported from a previous Freelance version, the host names are replaced with the IP addresses specified in the host file. The host file does not require any further maintenance activities.

Network configuration check

To check the network configuration between a Windows PC and a controller station or between two Windows PCs, use the **ping** command.

Windows 7:
Start > Enter **cmd** > Press [Enter]

Windows 10:
Windows button > **Windows System** > **Command prompt**

A windows console window opens (prompt).

Enter the **ping** command to check if a connection to the address can be established.

For example, enter `ping 172.16.1.20` to check the connection to the station with the IP address 172.16.1.20.

If the connection is OK, the pinged station or computer will reply and a time value how long the sent package took to return is printed out. If the connection is not OK, a **request timed out** message is displayed.

If the DNS name resolution is used, this can also be tested with the ping command. For example, enter **ping opc_gwy**.

Windows firewall settings to use the ping command

To check the connection to a Windows computer, the firewall rules on the Windows target machine must be adjusted. By default, the Windows firewall blocks incoming ping requests.

Open the configuration of the advanced Windows firewall on the target machine (not the machine where the ping is entered):

Windows 7:
Start > Control Panel > System and Security > Administrative Tools > Windows Firewall with Advanced Security.

Windows 10:
Windows button **> Settings > Update & security > Windows Security > Firewall & Network Protection > Advanced Settings > Inbound Rules**

Enable the inbound firewall rules named **File and Printer Sharing (Echo Request - ICMPv4-In)** to allow ping requests to this computer.

1.3 Freelance add-on software packages

With the Freelance 2019 setup CD, compatible software packages such as Freelance Formulation, DTMs, Control Aspect (CBF Viewer) and ABB OPC Tunnel are provided. Depending on the functionality selected during the setup, these components will be installed together with the Freelance software.

When the Freelance software is installed in the Engineering Station or a Combined Engineering & Operating Station version, some macros and templates with a description file are also installed on the PC in the Freelance installation directory <FreelanceData >\.

1.3.1 S700 templates

GSD based templates for easy integration of S700 modules in the Freelance hardware configuration.

export**S700_CI741_Template_US.hwm**
export**S700_CI741_Template_DE.hwm**
export**S700_DC705F_Template_US.hwm**

1.3.2 User defined function blocks for field devices

User defined function blocks for easy integration of S700 modules in Freelance programs:

export**S700_UFBsUS**

User defined function blocks for easy integration of S800 modules in Freelance programs:

export**S800_UFBsGR**
export**S800_UFBsUS**

User defined function blocks for easy integration of S900 modules in Freelance programs.

export**S900_UFBsUS**

User defined function blocks for easy integration of ACS800 drives through Modbus RTU in Freelance programs.

export**ACS800_Drives_UFBsUS**

1.3.3 Tag type libraries

Example of OPC function block classes for Freelance function blocks for connecting a Freelance project through PLC integration functionality:

export**FreelanceSampleTagTypeLib_V1.1.prt**

Example of OPC function block classes for AC500 function blocks for connecting an AC500 project into a Freelance system through PLC integration functionality:

export**AC500 StandardTagTypeLibrary V1.0.prt**

1.3.4 Graphic macros

To support the user in creating complex process displays, several graphic macros are prepared and provided during the installation of Freelance Engineering. These macro libraries are copied into the directory <FreelanceData>\macros.

- **3D_Macros.bol**
  The description of this library can be found in the file ***3D_Macros Library.pdf*** in the folder “macros”.

- **hb_sym01.bol**
  For more information on these macros, refer to ***Engineering Manual Operator Station Configuration, Graphic Display***.
- **Macros.bol:**
  This library contains graphic macros that simplify the creation of user defined faceplates in the new design of Freelance Operations.
- **S900_UFB_macro_library.bol**
  This library contains graphic macros to be used with S900 device.
- **ufp_sym1.bol**
  This library contains graphic macros that simplify the creation of user defined faceplates in the conventional design of Freelance Operations. For more information, refer to ***Engineering Manual IEC 61131-3 Programming, User-defined Function Blocks***.

1.3.5 Terminal emulation

For diagnosis purposes a debug terminal can be connected to a Freelance controller. When installing Freelance Engineering, a terminal emulation program is installed in the following folder: <Freelance_installation_folder>\exe**Terminal.exe.**

1.4 Compatible fieldbus software

1.4.1 PROFIBUS DTMs

The Freelance 2016 software is compatible with the following DTMs for PROFIBUS Remote I/Os::

ABB PROFIBUS Hart Library DTM400	2.00.36
ABB S800 I/O DTM	Version 6.0.00300.5
ABB S800 I/O Firmware	CI801: 1.5/1; 1.6/1 CI840: 4.2/2, 4.3/2
ABB S900 DTM	Version 6.0.00300.8
ABB S900 I/O Firmware	CI920: 1.5.9; CI92AS: 2.1.0
ABB Basic HART DTM /HART DTM Builder	Version 6.0.00300.1
- FDT Base Container	Version 14.0.00300.1
- FDT Shared Components	Version 14.0.00300.3

Freelance 2019 is also compatible with the DTMs for HART and Profibus PA devices which are listed as interoperable in the data sheets "Freelance Integrated HART Devices" 3BDD011926 Rev January 2019 or higher and "Freelance Integrated PROFIBUS Devices" 3BDD011925 Rev January2019 or higher.

Updates of these data sheets will also contain compatibility statements for Freelance 2019. The data sheets can be found in the ABB Library http://inside.abb.com/abblibrary/downloadcenter under:
Control Systems / Freelance / Device Management HART / HART DTM
and
Control Systems / Freelance / Device Management PROFIBUS / PROFIBUS DTM.

1.4.2 FOUNDATION Fieldbus Linking Device

Freelance 2019 is also compatible with the LD 800HSE Firmware Version 1.60.0.00, 1.60.1.00 and LD 810HS Version 1.20.01.4403. Further details can be found in the ABB Library under:
Control Systems / Freelance / Device Management FOUNDATION Fieldbus

1.5 Third party software

1.5.1 Adobe Acrobat

The current Release Notes and newest information about the software can be accessed directly in Freelance Engineering. For this purpose, a PDF reader software such as Adobe Reader must be available on your configuration PC.

1.5.2 Antivirus program

The Freelance software has been tested under Windows 7 and Windows 10 with the antivirus program McAfee, VirusScan Enterprise® (Version 8.8 Patch 12). For the up-to-date tested DAT files and Virus Definition Files refer to the document 2PAA118238 “Freelance System Daily verification of McAfee & Symantec updates” available in the ABB Library under:

Control Systems / Freelance / System / Freelance System Versions / Freelance 2019

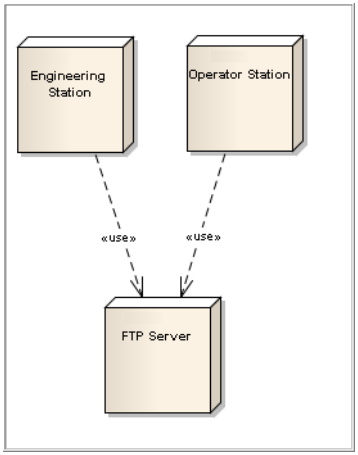
Antivirus programs and background tools can affect the installation procedure of the Freelance software. We therefore recommend to disable programs of this kind before executing the Freelance setup program and re-enable them after the setup has finished.

1.5.3 FTP server

Freelance Operations and Freelance Engineering have built-in FTP clients. For some features like automatic archiving an FTP server can be used.

We recommend to use the Microsoft FTP Server together with the Freelance software. It is delivered with certain versions of Windows and can be installed through the Windows Control panel. It runs as a service process and uses the maintenance infrastructure of the internet information server.

For data security reasons, it is recommended to run the FTP server on a separate machine within the controller network. A typical network setup could look like this:



FTP Scenario us.bmp

For security reasons use a specific FTP login user with limited rights for FTP server login. For example, create a Windows user called “FreelancerFTP” for that purpose on the machine that hosts the FTP server.

Use a unique password for FTP operations.

It is not required to create this Windows user on the FTP client machines.

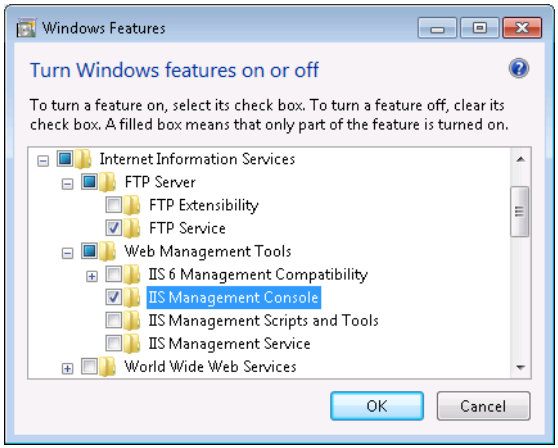
The FTP user must have all access rights to the FTP server root directory and all subdirectories on file system level. Otherwise, it may not be possible to read or write files.

In the described basic configuration FTP passwords are transmitted as clear text over the network.

Clarify a secure FTP setup with the network and system administrators.

The following chapters about FTP server installation and configuration are kept as simple as possible. The intention is to give a working starting point that can be customized as required.

FTP server installation



FTP Server Win7 Windows Features us.bmp

Windows 7:
Start > Control Panel > Programs > Programs and Features
> click **Turn Windows features on or off** in the left navigation bar.

Windows 10:
Windows button > **Settings > Apps & Features > Programs and Features**
> click **Turn Windows features on and off** in the left navigation bar

The **Windows Features** are displayed > Expand **Internet Information Services**

> expand **FTP Server >** select **FTP Service**
> expand **Web Management Tools** > select **IIS Management Console > OK**

The FTP server is installed.

FTP server configuration

Windows 7:
Start > Control Panel > System and Security > Administrative Tools > double-click **Computer Management**

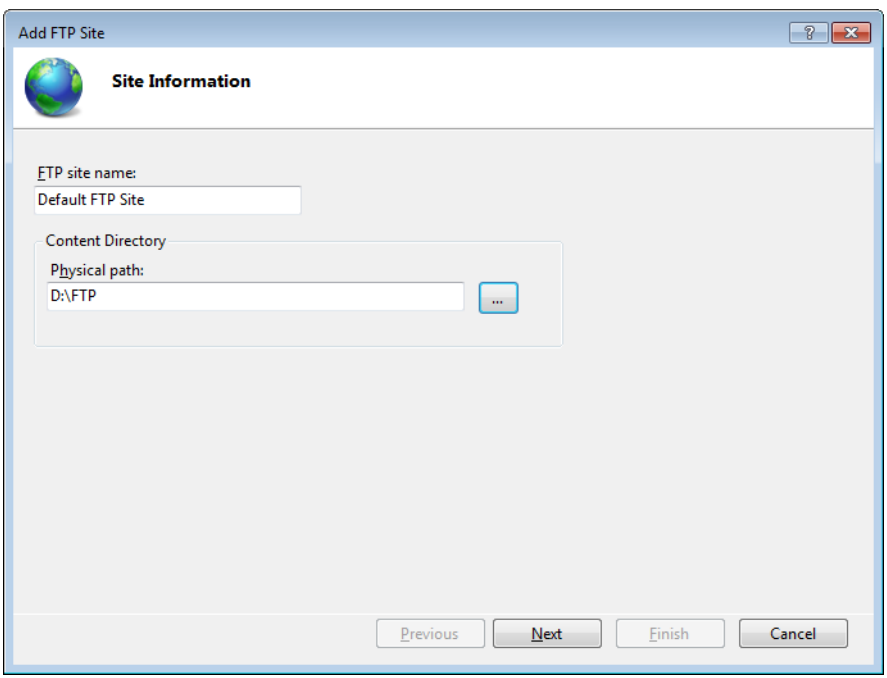
Windows 10:
right-click the Windows button and start **Computer Management**

> expand **Services and Applications > Internet Information Services**

The IIS management console is displayed. It has a left tree area named “Connections”, a right area called “Actions” and context dependent area in the middle.

In the **Connections** tree, expand the root node **>** right-click **Sites >** select **Add FTP Site**

A wizard to configure an FTP site opens.



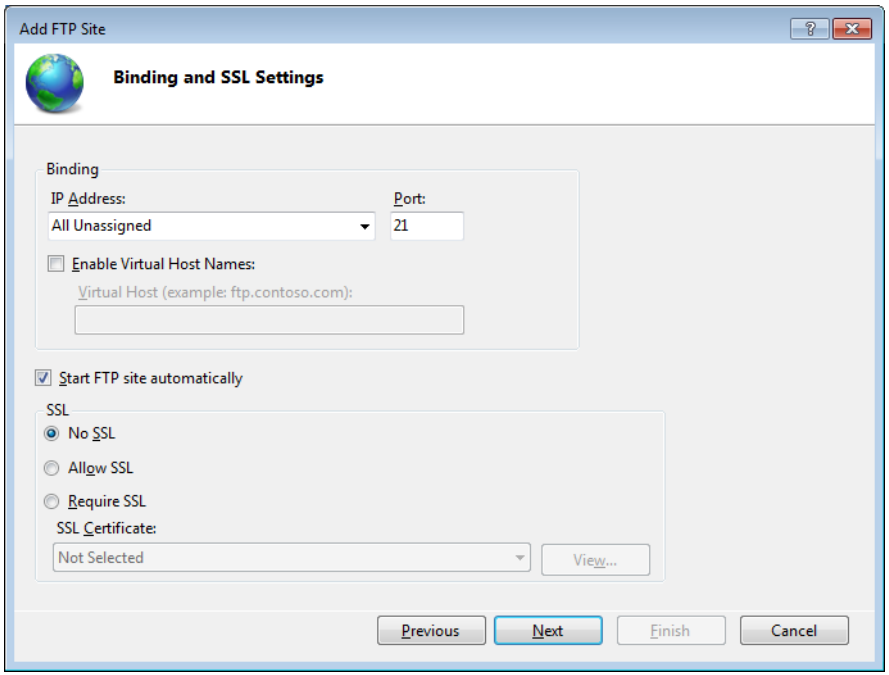
FTP Add FTP Site us.bmp

Enter the FTP site properties:

FTP site name Enter a free name for your site, for example, “Default FTP Site”.

Content directory
Select a root directory path for the FTP site. In this directory all content of the FTP site will be stored.

After pressing **Next** the **Bindings and SSL Settings** can be configured.

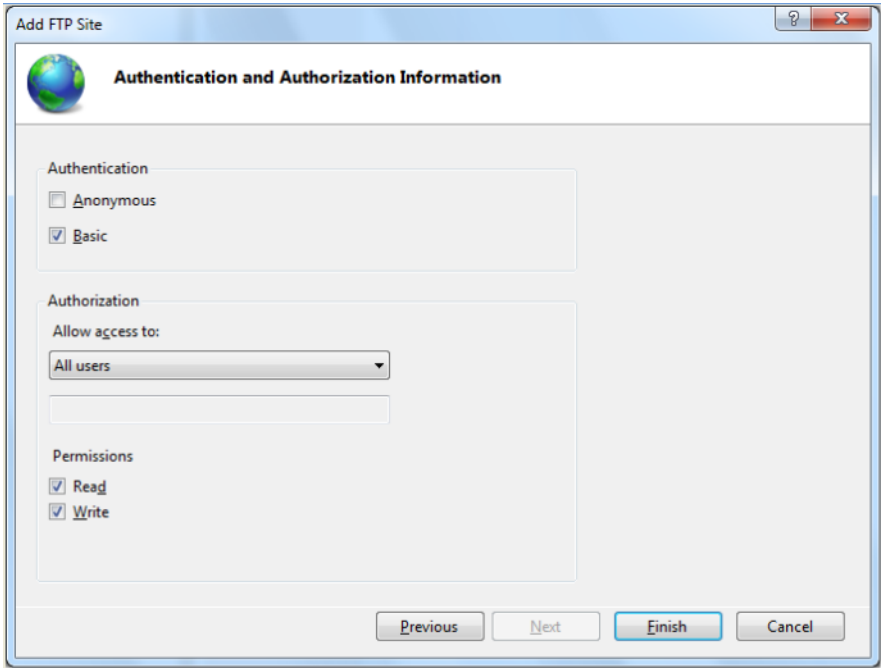


FTP Binding and SSL figure us.bmp

Select **No SSL**, all other entries can be accepted.

Click **Next** to continue.

The **Authentication and Authorization Information** page is shown.



FTP Basic Authentication us.bmp

Enable **Basic** Authentication.

Under **Authorization,** select **All users** from the Allow access list.

Under **Permissions,** select both **Read** and **Write**.

Click **Finish** to complete the basic FTP server configuration..

The FTP login user - for example, “FreelancerFTP” - must have the necessary access rights to the FTP site directory - here “D:\FTP” - and subdirectories on file system level. Otherwise you cannot be able to read or write files, even if the server allows it.

Enable FTP firewall rules

When the FTP server is installed, the Windows firewall with advanced security will still block all external FTP traffic. To prepare external access, the FTP server installer has added 5 preconfigured firewall rules, 3 inbound and 2 outbound, which must be enabled.

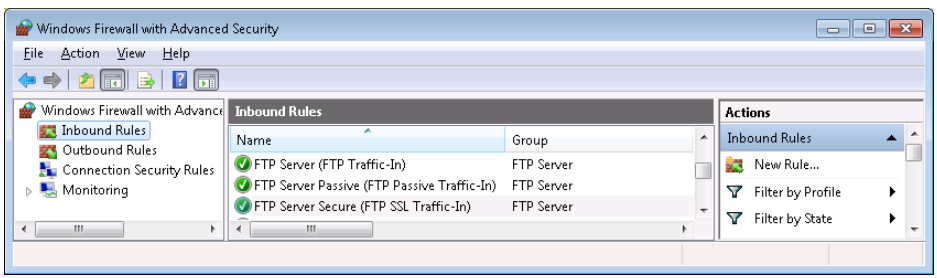
Open the configuration dialog of the Windows firewall with advanced security.

Windows 7:
Start > Control Panel > System and Security > Administrative Tools > Windows Firewall with Advanced Security
> select **Inbound Rules**

Windows 10:
Windows button > **Settings > Update & Security > Windows Security > Firewall & network protection > Advanced Settings > Inbound Rules**

Enable the following inbound rules:

- FTP Server (FTP Traffic-In)
- FTP Server Passive(FTP Passive Traffic-In)
- FTP ServerSecure(FTP SSL Traffic-In)

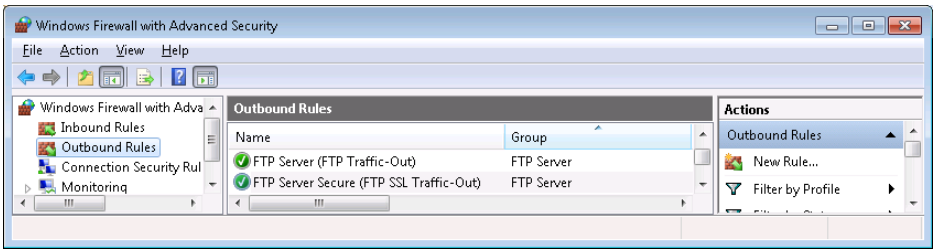


FTP Inbound FTP Rules Windows 7 us.bmp

> select **Outbound Rules**

Enable the following outbound rules:

- FTP server (FTP Traffic-Out)
- FTP Server Secure (FTP SSL Traffic-Out)



FTP Outbound FTP Rules Windows 7 us.bmp

If the FTP server is initially installed, the firewall still blocks the traffic until the service of the FTP server is restarted.

Restart the Windows service **Microsoft FTP Service**:

Windows 7:
Start > Control Panel > System and Security > Administrative Tools > double-click **Services**

Windows 10
right-click the Windows button and start **Computer Management** > expand **Services and Applications** > select **Services**

select **Microsoft FTP Service** > Restart the service

The FTP server is restarted and the firewall will use the exception rules now.

Testing the FTP server

Perform the following steps to test the FTP server functionality:

- Logon with an FTP client (for example, the Windows FTP command line client or FileZilla), from another Windows PC using the created limited user (for example, “FreelancerFTP”) for login.
- Upload a file.
- Download a file.

Now the FTP based functionality in Freelance Engineering and Freelance Operations can be configured and used.

1.5.4 Java installation

Java is used to display applets in a Web browser. It is necessary, if the Emulator View of the Controller Emulator will be used.

On a 64-bit PC, the 64-bit version of the Microsoft Edge web browser or the Microsoft Internet Explorer 11 must be used to run the applet.

Installation

Java 8 Update 171 or higher is recommended.

Download the Java Runtime Environment (JRE) from the website, www.java.com and install it.

Depending on the Java security settings, the emulator website may need to be added to the exception list (http://<IP-Adr>:8888/SCGui.html).

Testing Java

After installation of the Freelance Controller Emulator, this software can be used to test the Java installation. Start the Internet Explorer and open the Controller emulator manager by entering the address http://<IP addr.>:8888.

Start a Controller emulator station and click the **Emulator View** of the station to view the information.

Accessing the Controller emulator manager or the web interface of a process station may fail if an internet proxy is configured.

To exclude specific IP addresses from being accessed through the proxy:

Internet Explorer:
Start the Internet Explorer > **Tools** > **Internet Options** > **Connections** > **LAN settings** > press the **Advanced** button > Enter the IP addresses or IP address patterns that shall not be accessed through an Internet proxy.

Edge:
start Edge > **Settings and more** (···) > **Settings** > **View advanced settings** > **Open proxy settings** > Enter the IP addresses or IP address patterns that shall not be accessed through an Internet proxy.

1.6 PC settings

1.6.1 Disable automatic Windows updates

The automatic update of the Windows operating system should be disabled.

Automatic updates may reboot the PC automatically. It is highly recommended to disable them.

Windows 7:
Start > Control Panel > System and Security > Windows Update > select **Change settings** > select **Never check for updates** from the list > **OK**

Windows 10:
Windows button > **Settings > Update & Security > Advanced options**
Option 1: Pause updates > **On**
Option 2: Defer installation of feature updates (up to 365 days) and / or security updates (up to 30 days)
Option 3: Set "Semi-Annual Channel", this delays updates until Microsoft considers an update as "business-suited", usually four months after publication.

For Windows 10 Pro and Enterprise, an automatic update can only be deferred, but not disabled. Therefore, it is recommended to use the Windows 10 Long Term Servicing Channel (LTSC).

During the mainstream support phase (5 years), the Windows Long Time Service Channel allows only security updates and critical bug fixes to be downloaded without any new features. This will allow you to postpone updates and only download security updates and critical bug fixes.

For security reasons, Windows updates, especially security updates, should be performed on a regular basis. This must be done in consultation with the system administrator and according to company-specific security policies.

1.6.2 User Account Control

Freelance 2019 supports Windows User Account Control (UAC). User Account Control can prevent malicious software from damaging a computer. If User Account

Control is enabled, to improve IT security, a program will only be run with administrator privileges if this has been explicitly authorized. User Account Control suppresses the automatic installation of unauthorized software and prevents unwanted changes to the system settings. The following setting should be selected for User Account Control:

- Standard - notify me only when apps try to make changes to my computer

1.6.3 Windows firewall

The Windows operating system comes with an integrated firewall. A firewall can block the communication between applications.

The firewall configuration is handled by the Freelance setup. The firewall is configured to allow the Freelance applications to communicate properly. There is no specific configuration required by the user. See also Windows firewall on page 85.

1.6.4 Configure power options

The Windows power management may shut down the PC to save energy or put it to sleep mode. This must be avoided. It must be ensured that the energy saving mechanisms are configured in a way that the computer is always on.

Windows 7:
Start > Control Panel > System and Security > Power Options
If not expanded, expand **Show additional plans**
> Select the **High Performance** power plan.

Windows 10:
Windows button > **Settings > System > Power & sleep**
> Screen - turn off after **Never**
> Sleep - PC goes to sleep after **Never**

1.6.5 Disable screen saver

It is strongly recommended to disable the Windows screen saver, especially for a Freelance Operations PC. Perform the following steps on all Freelance PCs:

Windows 7:
Start > Control Panel > Appearance and Personalization > Personalization > click **Screen Saver** in the lower right corner > in the **Screen Saver list**, select **(None)** > **OK**

Windows 10:
Windows button > **Settings** > **Personalization** > **Lock screen** > **Screen saver settings** > select Screen saver **None** > **OK**

1.6.6 Windows text size

Freelance supports the default text size which should not be modified.

1.6.7 For Freelance Operations: Set screen resolution

The Freelance Operations software supports both the conventional screen formats 4:3 / 5:4 and the widescreen formats 16:9 / 16:10. For the 5:4 screen format a monitor screen resolution of 1280 * 1024 pixels is recommended, for the 16:9 widescreen format a resolution of 1920 * 1080 pixels should be used.

On screens with a low resolution, scroll bars may be displayed if required.

Freelance Operations supports up to four monitors, even with different screen resolutions.

1.6.8 For Freelance Operations: Set Windows theme

The Freelance Operations software is not released for any Windows theme; **Windows 7 Basic** theme or **Windows 10 - Background - Solid color** must be used

for Freelance Operations. Using other Windows themes may lead to unhandsome effects in the Freelance Operations software

Windows 7:
Start > Control Panel > Appearance and Personalization > Personalization > select **Windows 7 Basic** as theme

Windows 10:
Windows button > **Settings > Personalization > Background > Solid color**

1.6.9 For Freelance Operations: Disallow operating system access

Operator stations shall be configured to disallow operating system access. Freelance Operations is designed to support this.

Background information

When you start Freelance Operations in Production mode, the Windows Start button is disabled. There is no minimize button in Freelance Operations. This behavior has been implemented because of security concerns. The Freelance Operations user cannot switch to other applications. Only those applications that have been started before the start of Freelance Operations can be reached by the Freelance Operations user by pressing the ALT+TAB keys.

The Windows operating system can be reached from the Freelance Operations menu (**Tools > System > Operating system**) after entering a password. With this action the Windows Start button is enabled and is displayed with text. This is not a security problem, as long as the task bar is in the background of Freelance Operations.

Configure the Windows task bar

In Freelance Operations, the task bar cannot be suppressed in all cases. If the property “Lock the task bar” has been enabled, the task bar is always shown in front of Freelance Operations. Therefore, the task bar property “Lock the task bar” must be disabled to make sure that the Freelance Operations user has no access to other applications.

Windows key at the keyboard

To suppress access to the Windows operating system, also the Windows key at the keyboard should be disabled. This can be done in the Settings tool. For details refer to General Freelance settings on page 68.

1.7 Licensing

Different licenses are available to configure and operate a Freelance system:

- **Freelance Engineering license** to program and configure your plant with Freelance Engineering
- One **Controller license** for each controller or process station to be used
- **Freelance Operations licenses** for the integrated Human Machine Interface (HMI) for observation and operation with Freelance Operations
- One **Connectivity license** for each OPC server to provide data for another system and the Trend server for data acquisition on Freelance Operations
- **Batch license** for connecting a batch application with the Freelance system

1.7.1 Freelance Engineering

Freelance Engineering is the central Freelance software which is used for programming, configuration and commissioning of the Freelance process stations as well as the Freelance operating stations. Also gateway stations can be configured to provide data of a Freelance project to other control systems.

Two license types are available for Freelance Engineering:

- Freelance Engineering **Standard**
- Freelance Engineering **Professional**

Freelance Engineering Standard

With Freelance Engineering Standard license the following functions are supported:

- Configuration and commissioning of user programs
- IEC 61131-3 programming (FBD, IL, LD, ST, SFC)
- Graphical hardware configuration

- Integral fieldbus configuration for PROFIBUS and FOUNDATION Fieldbus
- IEC 61131-3 data types and user-defined (structured) data types
- Project-wide variables and function block lists
- Online cross-reference
- Efficient plausibility check
- Extensive online help
- 16 character tag names
- Function block TUNE
- Sequence of events
- User-defined function block classes (runtime license)
- OPC function block classes (runtime license)

Runtime license for User-defined and OPC function block classes means that function blocks created in another project can be imported into the own project and used for execution only. It is not possible to zoom in the definition and modify them.

This functionality is possible only for function block classes that are locked in the definition project.

Additionally, online test functions (debugging functions) and graphical documentation of the entire user program are supported.

Besides the programs, all hardware components are displayed in graphical form and are submitted to a plausibility check together with the allocated software.

Freelance Engineering Professional

Freelance Engineering Professional supports all functions of Freelance Engineering Standard and additionally provides the following features:

- Access protection (Security lock)
- Creation of user-defined function blocks (developer license)
- Creation of OPC function block classes (developer license)
- FDT/DTM support

1.7.2 Freelance process stations

One **Controller license** is required for each process station. A controller license includes the usage of 50 I/O signals (inputs/outputs); the number of I/Os can be extended in steps of 50.

A control software license supports:

- IEC 61131-3, digital and analog value processing
- Controller function blocks
- Integration of PROFIBUS
- Integration of FOUNDATION Fieldbus (only supported for AC 800F)
- Communication with Freelance Operations
- 50 I/O signals
- Serial package Modbus Master, Modbus Slave
- Ethernet package Modbus Master, Modbus Slave
- Serial package Sartorius scales interface (only supported for AC 800F)
- Serial package Protronic coupling (only supported for AC 800F)
- 800xA Operation and Process Portal B Support
- Tune (Self tune PID)
- Sequence of events (only supported for Rack I/O)

Options for the control license

The control license can be extended with the following options:

- Set of 50 I/O signals
- Telecontrol library (IEC 60870-5-101 and IEC 60870-5-104)

Licensing used I/Os

The Freelance Engineering software adds up and displays all I/O components used in a project. The used I/Os in an open project are shown with the license bargraphs in the Status bar (see ***Engineering Manual System Configuration, License indicator***) and can also be displayed in the hardware manager.

> **Hardware structure > Show all used I/Os**

As a rule, only a project without any errors in plausibility check indicates the actually required number of I/O licenses. If the number of I/Os used in a project exceeds the number of licensed I/Os, it will not be possible for the project to pass the plausibility check. As a result, you cannot download the software configuration into the process station.

The number of I/Os relevant for licensing is determined by counting only those I/Os that are in use, that is:

- I/O components assigned to a IEC variable, or
- I/O components used in a program, or
- I/O components provided through a gateway (OPC server)

If the same variable is used in multiple ways, only one of them is considered as variable that has to be licensed, that is how often a variable is used is not relevant for determining the number of required I/O licenses.

The input/output variable definition depends on the respective bus/fieldbus.

I/O modules

Every channel assigned to an IEC variable or used in a program or gateway independent from the data type is considered as an I/O.

PROFIBUS

All I/O components agreed on the controller and used in a program or gateway are considered as I/Os.

FOUNDATION Fieldbus

Every I/O component that is transferred between the linking device and the process station and that is used in a program or gateway is considered as an I/O.

Modbus

All Boolean data (coils) or registers used by the transmit and receive function blocks are considered as I/Os.

The following data are not considered as I/Os:

- Send/receive function blocks
- Diagnostic data (DP, PA)
- Alarms (FF)

- Parameters (PA, FF)
- Global variables

1.7.3 Freelance Operations

A **Freelance Operations license** is required for each operator station. A special license **Combined workplace** is necessary to use Freelance Engineering and Freelance Operations (Lite or Standard) at the same PC.

Freelance Operations Standard

A Freelance Operations license supports:

- Observation and operation of all tags through faceplates
- Graphic displays, Trends, Historian, Reports, Operator logs
- SFC displays, Time scheduler, WEB displays
- Extended diagnostic

Freelance Operations Lite

A Freelance Operations Lite license supports all Freelance Operations Standard functions, with the following limitations:

- max. number of user-specific graphic displays (FGR) is limited to 5
- the below-listed options are not available

Options for the Freelance Operations license

The Freelance Operations Standard license can be extended with the following options:

- Multi-monitor support (up to four monitors)
- Control Aspect to display Freelance Engineering function block diagrams in Freelance Operations with online values (read-only mode)

1.7.4 Connectivity server

One **Connectivity license** is required for each gateway station in a Freelance project. A gateway station provides process signals and variables of a Freelance project to other systems or Freelance Operations through a server.

The following connectivity licenses are available for a Freelance system:

- **Generic OPC server** license to support the general OPC interface
- **OPC for Extended Automation** to support connectivity with System 800xA and Process Portal B
- **Trend server** to support data acquisition in Freelance Operations without using trend acquisition function blocks.

1.7.5 Batch

A **Batch license** is required to support batch applications with the Freelance system. The following batch licenses are available:

- **Freelance Formulation** to support an Essential Recipe Manager
- **Freelance Batch** to support the interface to the Workflow Manager
- **Batch for Extended Automation** to support the interface to an 800xA Batch system

1.8 Control system lifecycle management program

Automation Sentinel is the ABB control system lifecycle management program. An introductory trial period to the Automation Sentinel program will be included, at no additional cost, with each new ABB control system software delivery. Please contact your designated Automation Sentinel responsible for any questions or please refer to the Automation Sentinel product guide for detailed information on the program and on how to calculate and order Automation Sentinel subscriptions.

1.9 Hardkey

Freelance products are protected by means of USB hardkey and an associated authorization code, which activates those products for which official orders have been processed. For details, refer to Licensing on page 39.

The following types of the hardkey are available:

- Freelance Engineering
- Freelance Operations

- Combination (Freelance Engineering and Freelance Operations)

1.9.1 Hardkey during installation

If no hardkey is installed on the PC during installation, the Freelance system will launch in demo mode. The software will be available for 100 days and will expire after this time.

For usage of the software for production the hardkey is necessary during installation.

In case of a hardkey failure, the software will enter an emergency mode, which – just like the demo mode – expires after 100 days. As long as the hardkey is replaced within these 100 days, the rights conferred by the license will remain in effect.

Similarly, if the hardkey is unplugged after startup, the software will go into emergency mode.

Changing from production mode back to demo mode is not possible.

1.9.2 License extension

In case of license extension, you will receive a new authorization code that you should enter as follows:

Windows 7:
Start > All Programs > ABB > Freelance 2019 > Settings

Windows 10:
Windows button > **ABB > Settings**

Select the tree item:
> General settings > Authorization key installation

1.10 Compatible hardware versions

For all details for the released controllers and I/O components refer to the corresponding ***Release Notes, Appendix A, Compatible Hardware Versions***.

2 Freelance installation

2.1 Preparation to install the Freelance software

Make sure that the preparations on your PC have been executed accordingly; refer to Section 1, General notes.

2.1.1 Checklist for PC preparation

- ☐ Has the Windows operating system been fully installed, including the current updates?
  See Operating system on page 13.
- ☐ Is the automatic update of the Windows operating system disabled or delayed?
  See Disable automatic Windows updates on page 35.
- ☐ Is the User account control enabled?
  See User Account Control on page 35.
- ☐ Have the Power options been checked?
  See Configure power options on page 36.
- ☐ Is the Screen saver deactivated?
  See Disable screen saver on page 37.
- ☐ Freelance Operations only: Is the screen resolution set?
  See For Freelance Operations: Set screen resolution on page 37.
- ☐ Freelance Operations only: Is the Windows theme set?
  See For Freelance Operations: Set Windows theme on page 37.
- ☐ Freelance Operations only:
  Is the Windows task bar configuration appropriate?
  See For Freelance Operations: Disallow operating system access on page 38.

☐ Is TCP/IP protocol installed as network protocol?
Have the IP addresses been entered?
See Freelance network / Control Net on page 17.

2.1.2 Checklist for before starting the setup

☐ Do you have a current authorization key file available?
If not please contact your local ABB sales office.
See Authorization key installation on page 70.

☐ Is the **USB hardkey** installed at the USB port?

☐ Is an administrative user with password ready to be used as operator?
See Windows user access rights on page 15.

☐ In case you are a user of an earlier Freelance version:
Have you backed up your existing projects?
Refer to Upgrade an existing version to the new version on page 48.

2.1.3 Checklist for after installation of Freelance

☐ Check the Freelance installation.
See Freelance Check tool on page 83

☐ Check Windows firewall rules.
Windows firewall on page 85.

2.2 Upgrade an existing version to the new version

Upgrade means the change from an existing Freelance version to a newer version. This process includes the software as well as the configured data and archives. The following steps should be performed to upgrade all data to the new version.

- Save the project configurations
- Upgrade the Freelance software
- Upgrade the project data for the new version

2.2.1 Save the project configurations

Existing project configurations can be saved without any problem, if the upgrade is to the next higher revision level (e.g. from Freelance 2016 to Freelance 2019). To perform a project upgrade, you must export the project with the old version of Freelance Engineering to a CSV file and then import that CSV file into the new version of Freelance Engineering. When changing over several versions (for example, from Freelance V9.2 to Freelance 2019), it may be necessary to upgrade each intermediate version (e.g.: 9.2 -> 2013 -> 2016 -> 2019).
For more information and assistance contact your local ABB service organization.

Before installing the new software version, it is strongly recommended to save all your configuration data.

Checklist

- ☐ Are all changed or modified parameters stored in the project files?
- ☐ Are all function block parameters in the project files documented?
- ☐ Have all project files been exported from the existing version of Freelance Engineering version.

Save all parameters in the project files

In the first step you must ensure that all parameters, which have been changed either from the operator station or during commissioning mode, are stored in the project file using the CORRECT option. Each parameter modified with a WRITE command is set to its original value while the process station is being loaded. With the function **Load/Parameters** you can save all modified parameters:

Start **Freelance Engineering >** Open project > Switch to **Commissioning** mode **> Load > Parameters > Only different > Correct parameters**

Document function block parameters

It is recommended that you document the parameters of the function blocks in the projects. In case of incompatible changes to the function block library which cannot be handled automatically by the system, it may be necessary to re-enter parameters.

Export the project files from older versions

Existing projects from an older version must be exported (create *.CSV file) using your existing Freelance Engineering version, before starting the setup of the new software version.

Save all configured projects in a *.CSV file. See also ***Engineering Manual System Configuration, Project manager, Exporting a project***.

Start **Freelance Engineering >** Open project **> Project > Project manager > Export >** Save the data in *.CSV format

Repeat these steps for all your projects.

2.2.2 Upgrade of the Freelance software

If a **Freelance version** is already installed on the system, this version must be uninstalled before the new version can be installed. If the new setup is started without uninstalling the old version, the setup displays a warning and will abort. Freelance versions can be removed through the Windows Control Panel:

Windows 7:
Start > Control Panel > Programs and Features

Windows 10:
Windows button > Settings > Apps & Features

> Select the program to uninstall, for example **ABB Freelance 2016**
> Select **Uninstall**

The additional packages such as the OPC tunnel, S800 DTM, S900 DTM, FDT shared components, FDT Base container, Control Aspect (CBF Viewer), etc. are also uninstalled if they have been installed using the Freelance setup function. If necessary, the additional packages must be manually uninstalled.

The Freelance setup also includes a **Remove** option to uninstall the Freelance software and any additional packages. See also Remove option on page 67.

> Start **Autoplay.exe** from the **SetupCD** of the existing Freelance version
> Select the language > **Freelance software**
> Select **Remove** in the maintenance dialog and proceed until the software is uninstalled

After uninstalling the old software components, the new software can be installed as described below; see Install Freelance software on page 51.

2.2.3 Upgrade of the project data for the new version

After the new setup is completed, the project configurations are upgraded by importing the *.CSV files in the new Freelance Engineering version. In general, necessary updates are performed automatically during the import and no special customer actions are required.

If a Freelance project was created in Windows XP and is now opened in Windows 7 or Windows 10, the time zone setting will be lost.

To set time zone, open the project with Freelance Engineering, right-click the CONF node in the Project tree > **Header** > **Timezone**.

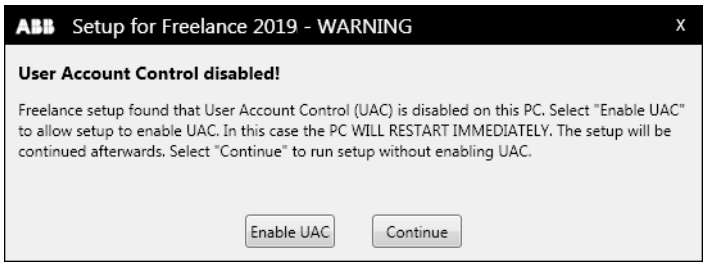
2.3 Install Freelance software

2.3.1 Start setup

To install the Freelance software, insert the Freelance software USB flash drive. The autoplay dialog starts automatically, if the Autoplay function is enabled in Windows. If this function is disabled, you can start the dialog manually.

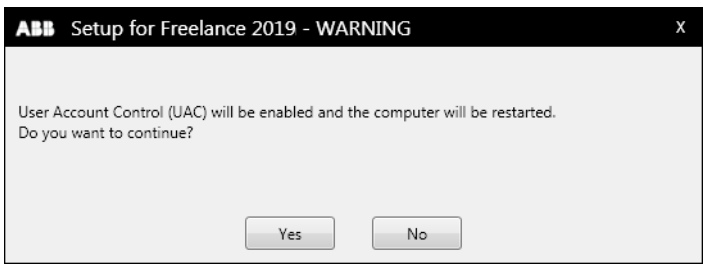
Start the Windows Explorer
> Select USB drive > run **Installer.exe**.

When installing under Windows 7, the Freelance Setup program recognizes whether User Account Control (UAC) is disabled and displays the following warning:



EnableUAC.png

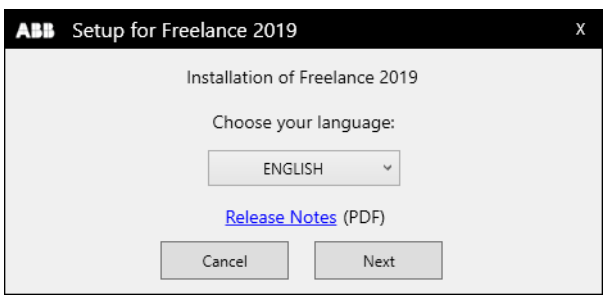
Click Enable UAC to enable the UAC feature.



EnableUAC2.png

Make sure that you have no unsaved work and click **Yes** to restart the computer. After the reboot, the Freelance Setup program must be restarted.

First select the language for the software.



tb499_us.png

Release Notes This option opens the **Release Notes** document for reading, which lists the new features of this version.

A PDF reader software like Adobe Acrobat Reader is required to open the document.

Next	This option starts the Freelance software installation.
Cancel	Cancellation of the freelance installation.

Read first the **Release Notes** and then start the Freelance software installation.

2.3.2 General operation in the setup procedure

These buttons are available in the dialog boxes:

Next	Continue the installation with the next dialog box.
Back	Returns to previous window.
Cancel	Aborts the installation; can be done at any time.

In some dialogs a description to the dialog content can be obtained by clicking on the **Help** icon provided on the top right side of the screen.

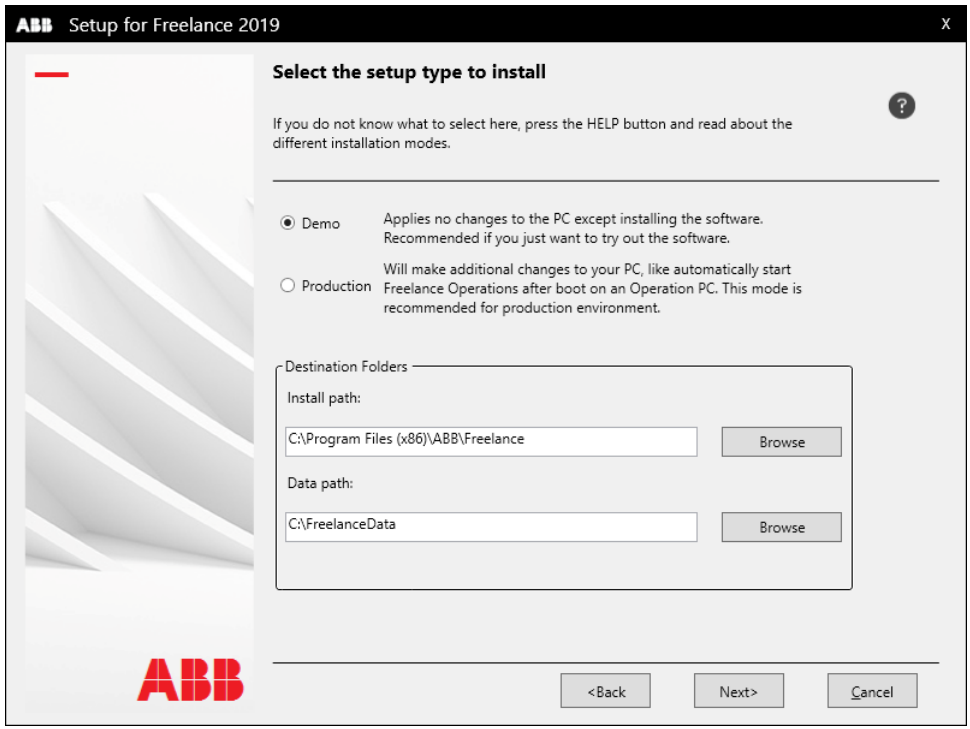
2.3.3 Welcome screen

The Welcome screen reminds the user of important steps to do before the software is installed. See also Upgrade an existing version to the new version on page 48.

Ensure that the preconditions are fulfilled and continue with **Next**. The License agreement will open. To accept, select the appropriate check box and continue.

2.3.4 Selecting a setup type

In the next dialog you have to choose the required setup type.



tb500_1_us.png

Demo Select Demo mode to install the software on the system for a trial. No license is required and all functionalities of the software are available to the user.
The validity of this mode is limited to 100 days.

Production Select Production mode to install the software in the production environment. The Production mode will modify the setting on the PC besides installing the software. License keys must be provided for installing the selected components.

Destination folders
Changes the default path for installing the software and storing the data.

2.3.5 Installation directories

The default destination directory for the installation depends on the used Windows operating system:

Windows 32 bit: C:\Program Files\ABB\Freelance

Windows 64 bit: C:\Program Files(x86)\ABB\Freelance

The following subdirectories are created below the installation directory:

Control Aspect	Files for software packet Control Aspect (CBF Viewer)
dmsapi	Application interface
exe	dll and exe files for Freelance Engineering
FDT Base Container	Files for FDT Base Container
FDT Shared	Files for FDT Shared Components
OPCTunnel	Installation folder for OPC Tunnel Server
S800 IO DTM	Installation folder for S800 DTM
S900 IO DTM	Installation folder for S900 DTM
setctrl	Setup control
VisHelp	Online help for Freelance Operations

The default destination directory for Freelance project data is

C:\FreelanceData

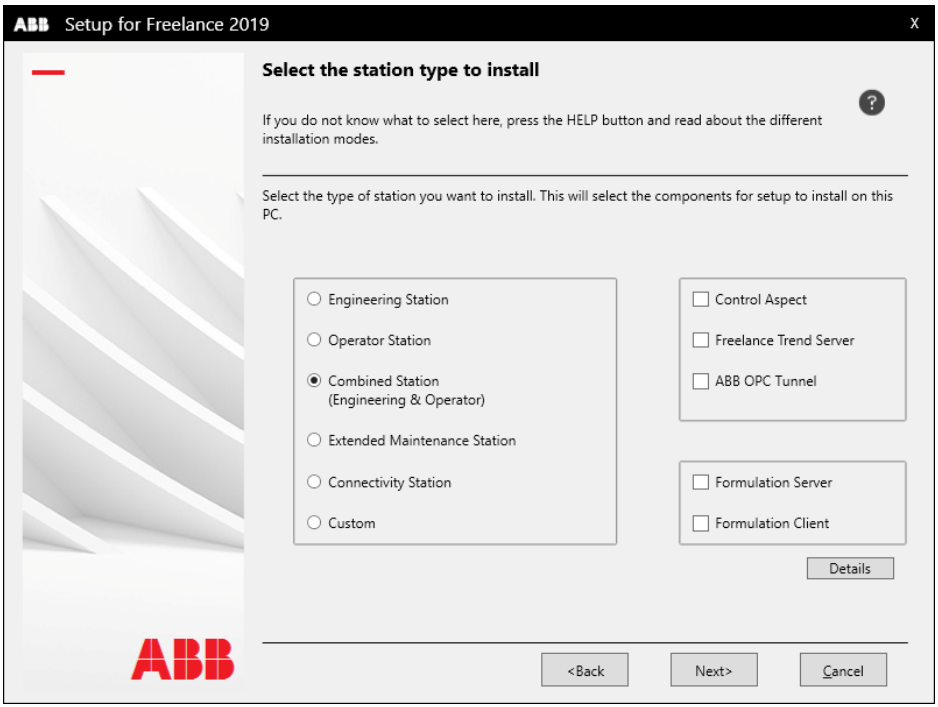
The following subdirectories are created below the data directory:

bitmaps	Bitmap files for the project documentation in Freelance Engineering and bitmap files for PROFIBUS devices in Freelance Engineering and Freelance Operations
bpr	Operation logs
curv	Trend archives
doc	Project documentation
export	Exported project files or program sections
ff	Files from FOUNDATION Fieldbus Standard
gsd	PROFIBUS device master data files

License	License files
Logs	Log files
macros	Macros for the graphic editor
NameSrv	Network information
OPC Server	OPC server information
opcsrv	OPC server (Trace files)
OPCTunnel	Installation folder for OPC tunnel
proj	Default folder for project files
proj\BDM	Default folder for Bulk Data Manager templates and files
reports	Default folder for Excel reports
sap	Disturbance course logs
sfp	Signal sequence logs
ucurv	User-defined trend archives
wave	Wave files for alarm messages in Freelance Operations

2.3.6 Workplace type

A workplace type is used to install a typical set of the Freelance software components on your PC.



tb500_8_us.png

Depending on the selection in this dialog, a typical set of Freelance software components will be installed on your PC:

Engineering Station
: Freelance engineering software with all subcomponents for field bus configuration

Operator Station
: Freelance Operations software for visualization

Combined Eng. & Oper. Station
: Combination of all components for configuration and visualization

Extended Maintenance Station
: Freelance software for visualization and PROFIBUS FDT and FOUNDATION fieldbus configuration software to operate field bus devices on an operator station.

Connectivity Station
Freelance OPC Server software

Custom This option is recommended for advanced users of the Freelance software. All software components can be selected or deselected individually.

Depending on the selected workplace type, these additional components can be selected or deselected for installation:

Control Aspect
View real-time data in Freelance Operations for the application programs from Freelance Engineering.

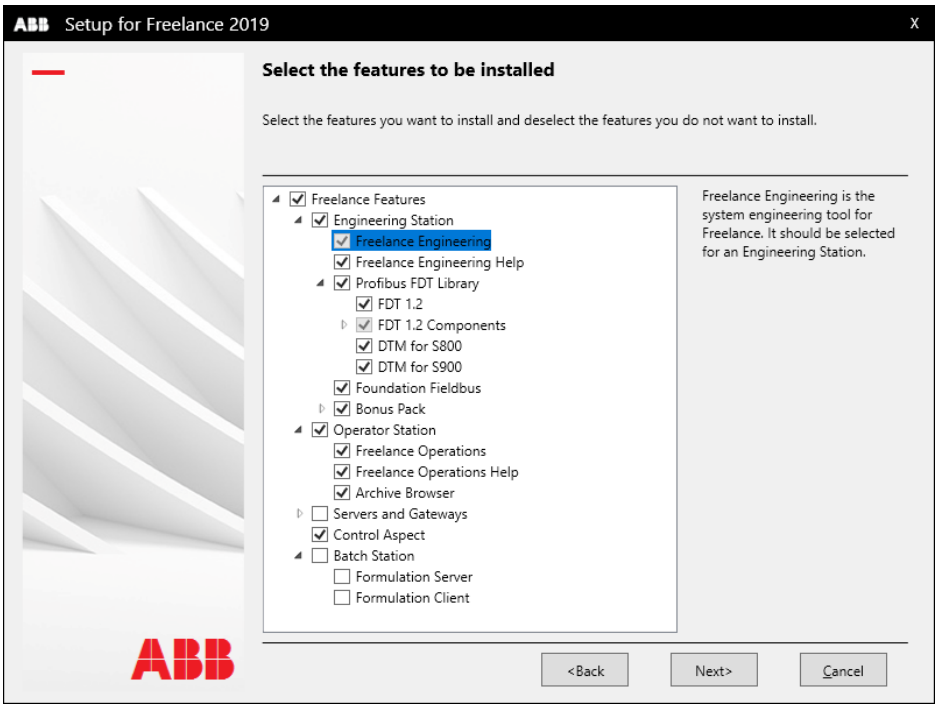
Freelance Trend Server
Special OPC server that supports user defined trend displays in Freelance Operations.

ABB OPC Tunnel
Link Trend and OPC servers with the Freelance system.

Details The selected software components are shown in a tree structure. Click on a component name in the feature tree to display a brief description of that component and information about the required space on the PC

A similar feature tree is shown after selecting *Custom* and button **Next**. In the custom mode all software components can be selected or deselected individually for installation.

2.3.7 Freelance software packages



tb500_9_us.png

The following software packages can be installed with this setup:

Engineering Station

- **Freelance Engineering**
  Software package for configuring and commissioning process, gateway and operator stations for Freelance projects.
- **Freelance Engineering Help**
  Online help for Freelance Engineering.
- **PROFIBUS FDT Library**
  Software for configuring PROFIBUS installations using FDT/DTM interfaces, version FDT 1.2 in Freelance Engineering projects
  - **FDT1.2**

  - **FDT1.2 Components**
    To configure the field devices in Freelance Engineering using DTMs, you have to install these software components in addition to the PROFIBUS FDT libraries.
    - **FDT Shared Components**
    - **FDT Base Container**
  - **DTM for S800**
  - **DTM for S900**

- **Foundation Fieldbus**
  Software for configuring FOUNDATION Fieldbus devices
- **Bonus Pack**
  - **Controller Emulator**
    This software package can be used to emulate process stations. A project configuration can be tested in the absence of any existing hardware.
  - **Bulk Data Manager**
    Freelance Bulk Data Manager is a tool that allows manipulation of large data sets during engineering with Freelance Engineering with the help of Microsoft Excel. The functionality provided comprises the import/export of tag and variable lists, multiplying of typical application solutions and parameter changes for complete sets of function blocks.

Operator Station

- **Freelance Operations**
  Software for an operator station for operating and observing the processes configured using Freelance Engineering.
- **Freelance Operations Help**
  Online help for the Freelance Operations operator station.
- **Archive Browser**
  Software package for viewing archived trends and logs.

Servers and Gateways

- **Freelance OPC Server**
  Gateway for interfacing Freelance projects with other application programs, should be installed on a Connectivity station only.
- **Freelance Trend Server**
  The Trend Server is a special OPC server that supports user defined trend displays. Only one Trend server is allowed in a Freelance system and should be installed on an operator station or a dedicated Connectivity station.
- **Application Programming Interface (API)**
  Programming interface for direct communication with a process station.
- **OPC Tunnel**
  Used to link Trend and OPC servers with the Freelance system (Freelance Engineering and Freelance Operations). Install this on all machines running Freelance OPC servers, Freelance Trend server and any OPC server from other vendors which should be connected to the Freelance project.

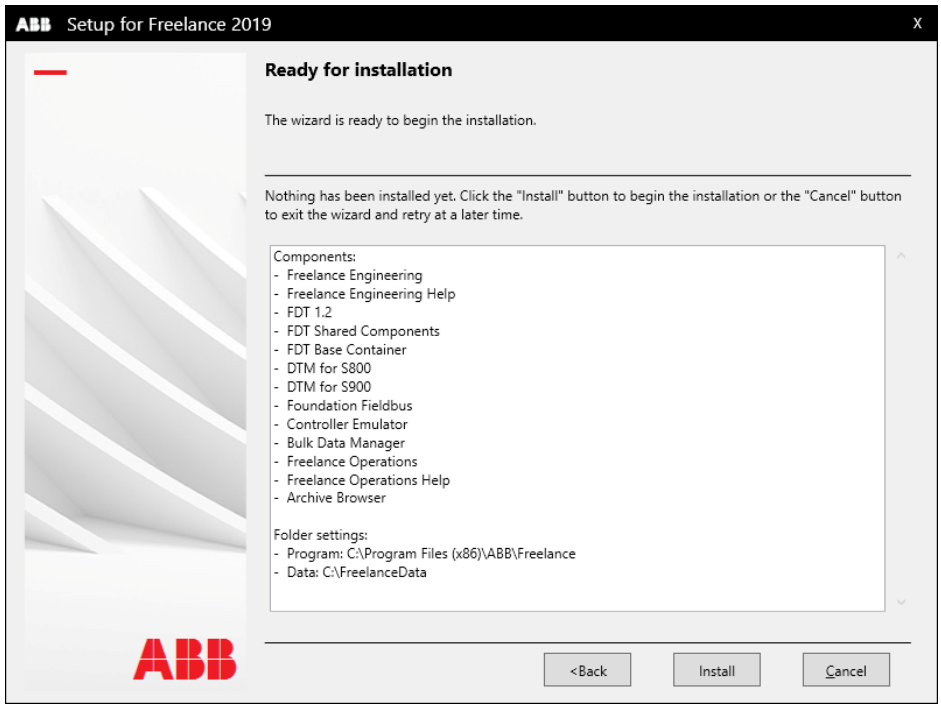
Control Aspect
Used to view real-time data in Freelance Operations for the application programs (FBD, SFC and so on) from Freelance Engineering.

Batch Station

- **Formulation Client**
  This option installs the complete Formulation functionality without a local database. The client installation uses the shared database from the server.
- **Formulation Server**
  This option installs the complete Formulation functionality including a local database that will be shared with the client installations.

2.3.8 Ready to install dialog

If the feature selection is completed, click **Next** to start the installation.



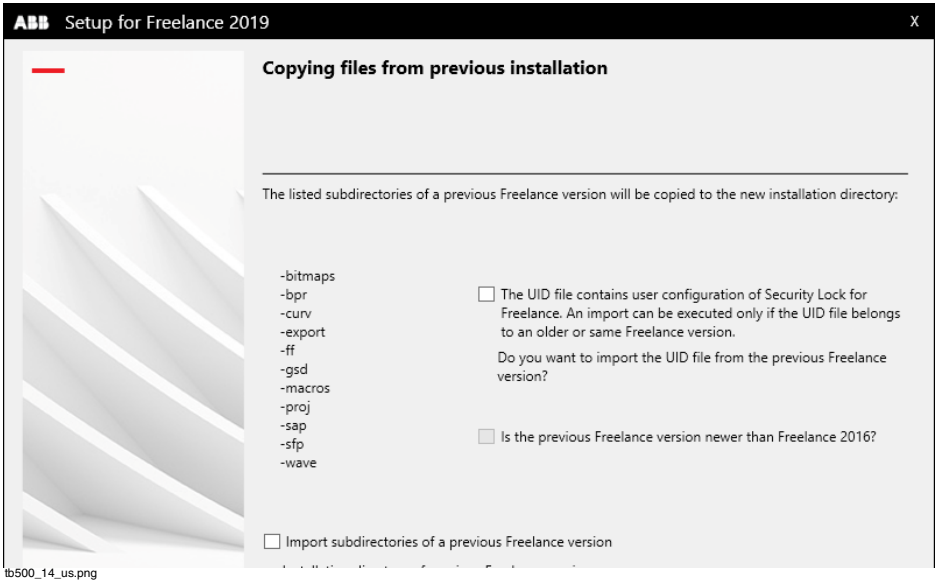
tb500_11_us.png

Clicking on the **Install** button will install the selected components.

2.3.9 Import data from previous versions

After installation of the software packages it is possible to import Freelance data from a previous version. This dialog must be used only if the new Freelance system version has been installed in another directory than the previous version.

Use this dialog to copy all project and archive data into the new Freelance installation directory.



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If the project data are to be copied into the new directory, activate the checkbox **Import subdirectories of a previous Freelance version** and **Browse** to the directory name of the previously used Freelance version.

Clicking the **Next** button copies the data from the previous version.

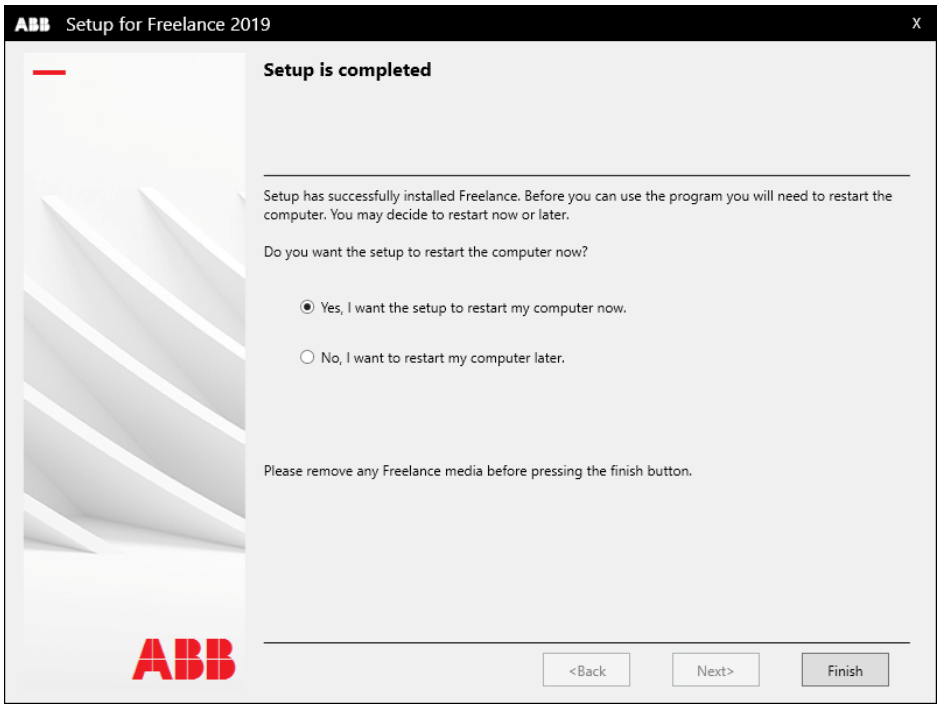
2.3.10 Modify initial installation settings

In the next installation step, the **Settings** dialog can be used to customize the installation to your computer and requirements. The settings can be modified retroactively after the installation has been completed without having to carry out the installation again.

For a detailed description of the configuration dialog, refer to chapter Modify installation settings on page 68.

2.3.11 Finishing the installation

With a click on **OK** in the **Settings** dialog the installation will be finished. A screen indicating the completion of the installation is displayed as follows.



tb500_31_us.png

Choose the required boot action:

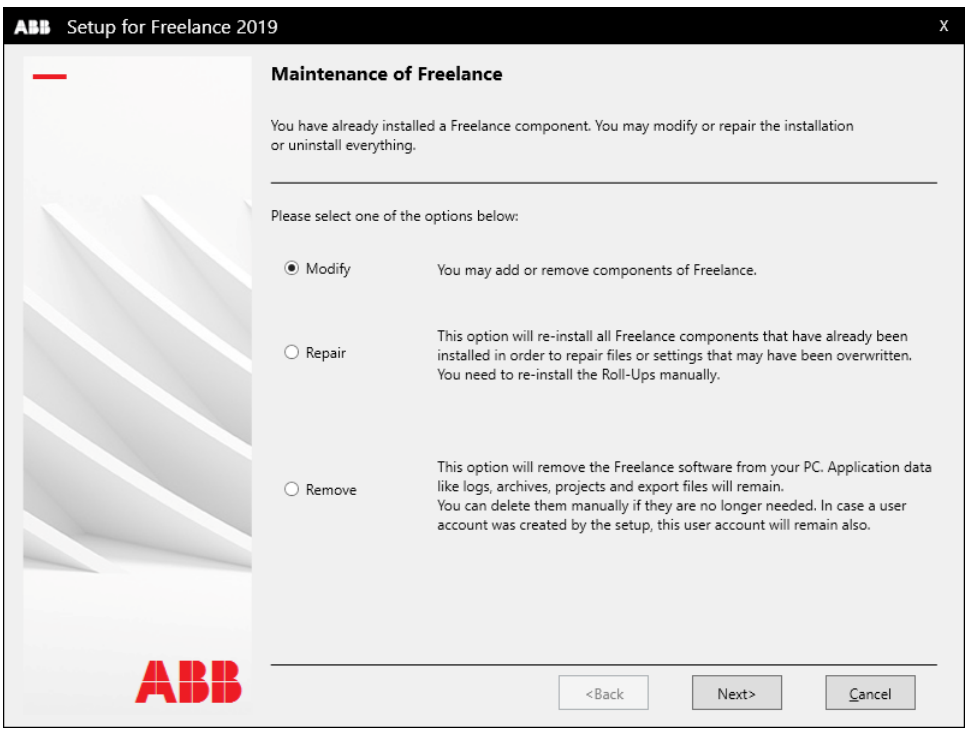
Yes	Restart the computer now.
No	Install the additional Freelance products, then restart the computer once after completing all installation procedures.

The **Finish** button is used to complete the installation.

In case you have installed the Control Aspect (CBF Viewer), you must open it once in order to start the Control Aspect configuration wizard. For details refer to the installation guide of the Control Aspect which has been installed together with the software.

2.4 Installation maintenance mode

If the setup program is started on a PC where one or more Freelance components of the same version have already been installed, the setup program automatically changes over to **Maintenance mode**.



tb500_12_us.png

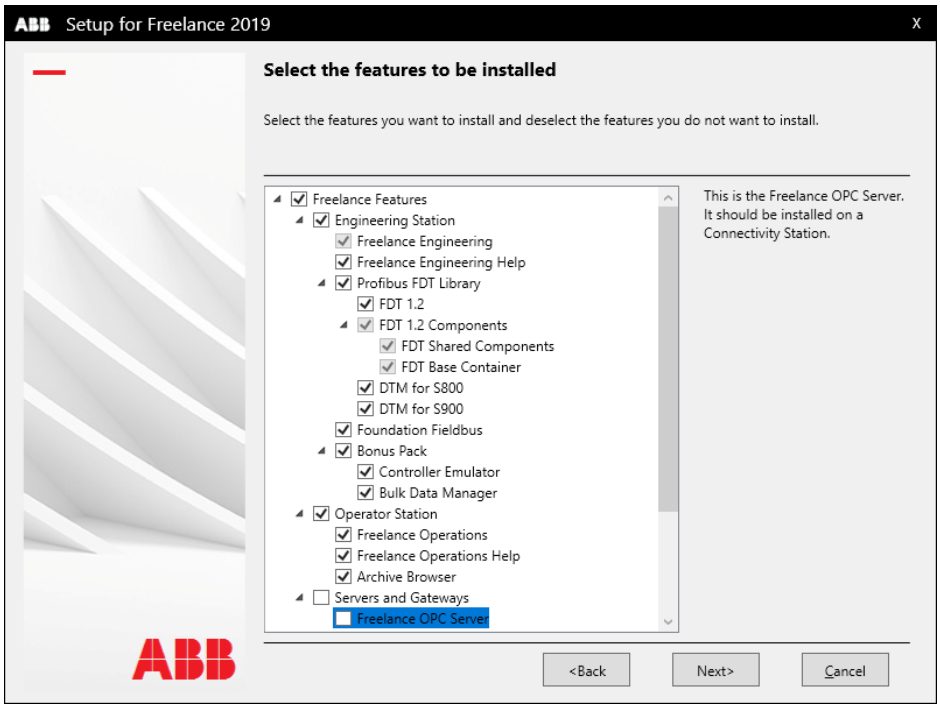
Modify Add or remove components of the Freelance installation.
For details refer to Modify option on page 66.

Repair Reinstall components that have already been installed to repair files or settings that may have been overwritten.
For details refer to Repair option on page 67.

Remove Remove all Freelance components from your system.
For details refer to Remove option on page 67.

2.4.1 Modify option

This option can be used to add or remove components of the Freelance software. Choosing this option and clicking **Next** will open the “feature-tree” dialog.



tb500_16_us.png

The components that are already installed on the system will appear with a check mark, whereas all other components will be unchecked.

If you want to uninstall a component that is already installed on the system, then uncheck that component from the list.

Check the components that are to be installed and click the **Next** button.

The setup program makes the required modifications and displays the “Maintenance complete” screen. Click the **Finish** button to complete the installation.

2.4.2 Repair option

This option is used to reinstall components that have already been installed on the system, in order to repair files or settings that may have been overwritten. In addition, you can use the **Repair** option to install another language selected in the language selection dialog.

The repair option will overwrite the content of temporary corrections, roll-ups and all manual changes to the setup files.
All temporary correction and roll-ups have to be reinstalled manually.

If any file, registry key or content of any installed component is corrupted in the system, choosing this option will repair or put back the contents of the components. Th setup program replaces or repairs and verifies files and registry keys contained in the Freelance software components.

Select the **Repair** option and click - **Next**; the setup program will make the necessary repairs.

The configuration screen is displayed when the repair process is completed. Modify the settings if required. For details refer to Modify installation settings on page 68.

To complete the repair, the system must be restarted. Select whether this should be done now or later and click the **Finish** button to terminate the setup program.

2.4.3 Remove option

This will remove all Freelance components from your system. The setup program asks you to confirm the removal of the components. After accepting this message all installed Freelance components will be removed from the system.

Application data like logs, archives, projects and export files will not be removed. These can be deleted manually if they are no longer required. In case a user account was created by the setup program this user account will also remain.

To complete the uninstall, the system must be restarted. Select whether this should be done now or later and click the **Finish** button to terminate the setup program.

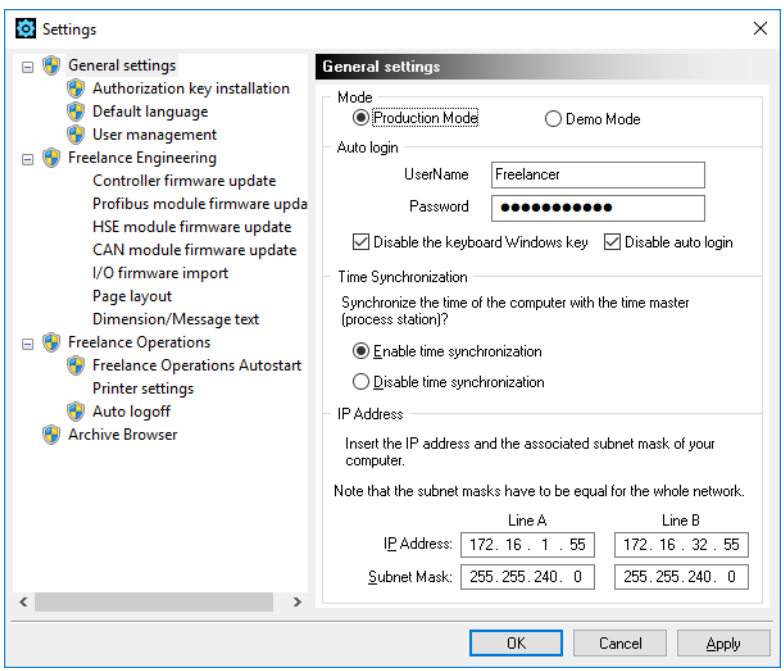
2.5 Modify installation settings

The **Settings** program is provided to accomplish basic configuration and maintenance tasks for the Freelance software. It is automatically started at the end of the software installation, but can also be started manually using the Windows Start menu at any time.

> Start > All Programs > ABB > Freelance 2016 > Settings

If the Settings tool is started after an installation, all entries in the tree structure should be selected one by one to check and configure the settings. After the configuration is completed, press **OK** to apply the changes and close the dialog.

2.5.1 General Freelance settings



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Mode The installation mode can be changed from Demo to Production or vice versa in this dialog without having to reinstall the software.

Demo Mode To install the software for demo-purpose or for a try out.

Production Mode
To install the software in the production environment.

Selecting Production mode will enable the Freelance Operations Autostart function. After a reboot Windows will start Freelance Operations automatically. This will prevent access to the operating system.

Auto login (User account details)
The Freelance Operations user for the Production mode in the Autostart mode is defined in this dialog. The default user is “Freelancer” and the default password is “welcome123#”. This can be changed as required.

If the installation is made using the "Production Mode" option, the user "Freelancer" is created during the installation process and assigned to the "ABB Freelance Basic Access" user group.

If another user is specified, make sure that the user is also a member of the ABB Freelance Basic Access group.

Disable the keyboard Windows key
Select this option and reboot the system to disable the Windows key operation in Production mode.

This parameter is not accessible in Demo mode.

Disable auto login
If this option is selected, the Auto login feature will be disabled after a restart.

Time synchronization

This allows you to synchronize the Windows computer time with the time of the process stations.

This parameter must be set consistently for all computers in a Freelance system. After the Time synchronization settings have been changed, all Freelance applications (Freelance Operations, OPC Server, Trend Server, etc.) must be restarted to ensure that the changes become effective.

Time synchronization must be activated if the Freelance Operations software and trend displays are used in the Freelance system.

IP Address The IP address uniquely identifies devices in the Control Net. Entry of IP address for Line A e.g.: 172.16.1.1. If no Control Net redundancy is needed, the input fields for Line B must be left empty. For a Control Net in a redundant configuration, you have to assign addresses of a separate subnet for Line A and Line B.
For more information, see IP address settings on page 19.

Subnet Mask Defines whether the addressed device is located in the same network or has to be addressed through routers.
Entry: 255.255.240.0

If you operate your Freelance system in a network with other network components, you must contact your network administrator before allocating the IP addresses.

Authorization key installation

You should have received an Authorization key file from ABB. Enter the drive name and/or directory path or select the directory where the Authorization key file is located, using the **Browse** button.

When the **Install** button is clicked, the Authorization code is transferred to the installation directory.

Default language

If you have installed the Freelance software in more than one language, the language for the Freelance user interface can be selected as follows:

Windows 7
Start > Control Panel > Clock, Language and Region > Region and Language > Format > select language, e.g. **English (United States)**

Windows 10
Windows button > **Windows System > Control Panel > Clock and Region > Region > Format** > select language, e.g. **English (United States)**

In case you select a language in Windows, but Freelance software is not installed in this language, you can use the Settings dialog option "Default language" to determine the language to be used for the Freelance user interface.

Example:

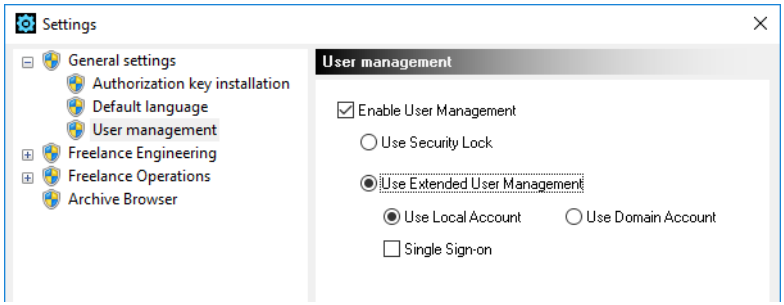
You have installed the Freelance software in English and in German, but have set the Windows format to French. With the Settings dialog option, "Default language" you can specify that the Freelance software must use the English (or French) language for the user interface.

The language setting can be applied to the following packages by selection:

- Freelance Engineering
- Freelance Operations
- Archive Browser
- Security lock
- OPC Server / Freelance Trend Server

A locale can only be applied if the relevant package has been installed on the corresponding computer.

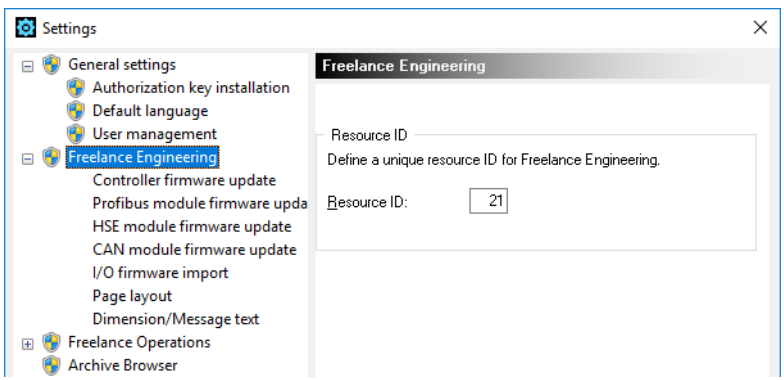
User Management



Usermanagement_en.png

This setting enables the Freelance user management. Details are described in the ***Engineering Manual User Management***.

2.5.2 Settings for Freelance Engineering



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Resource ID Several software packages can be run at the same time on a PC. To enable these software packages to be addressed unambiguously, each one must be assigned a unique number, the resource identification number.
All the resources within a Freelance project must also have a unique resource ID.

Controller firmware update

This dialog is used to update the firmware of the process stations.

The process station cold-starts after loading the firmware update.

This requires that the TCP/IP protocol is loaded and that a connection is established through the system bus to the process and gateway stations.

IP address

Enter the IP address of the station for download.
If you are using a redundant station you must specify both addresses (IP address 1 and IP address 2).

After pressing the **Download** button, the current version of the firmware update is loaded to the addressed CPU module or the controller.

If you have more than one process station and/or gateway station, you must carry out this procedure for each station.

For details refer to the ***Engineering Manual Process Stations***.

PROFIBUS module firmware update

The firmware update in the PROFIBUS modules of the connected controllers can be loaded with the current version.

Once the IP address of a controller has been entered, the current firmware update version is loaded to all the PROFIBUS modules of the controller concerned.

If you are using a redundant station you must specify both addresses (IP address 1 and IP address 2).

HSE module firmware update

The firmware update in the HSE modules of the connected controllers can be loaded with the current version.

Once the IP address of a controller has been entered, the current firmware update version is loaded to all the HSE modules of the controller concerned.

If you are using a redundant station you must specify both addresses (IP address 1 and IP address 2).

I/O firmware import

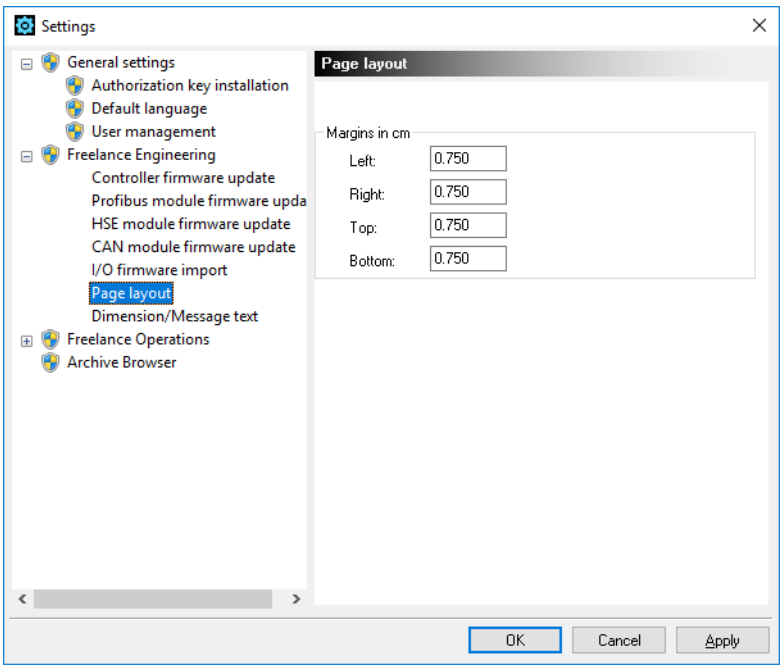
Current versions of the firmware for the I/O modules can be imported into the PC from a file directory.

To load the I/O firmware into the appropriate modules, you must select the I/O modules and start the load instance in the Commissioning mode of Freelance Engineering.

Enter the drive name and/or directory path or select the directory where the I/O firmware files are located using the **Browse** button.

When the **Import** button is clicked, all I/O firmware files are imported from the specified directory into the system.

Page layout



tb500_34_us.png

In this dialog you can specify the page layout for the printable project documentation.

Dimension/Message text

Language

The selection list contains the language abbreviations of the files with the dimensioning and message texts which have already been installed on your PC. During the installation a file “digit<language>.str”, for example, **digitus.str,** is copied into the installation directory. Selecting a language code in this dialog will copy the corresponding file to "digitool.str" in your <Freelance_installation_folder>\exe.
The texts of this file are used when creating the user program in Freelance Engineering and when loading the program to the operator station.

Select the language that will be used in the operator station.

Selection is only possible if more than one language is installed.

Import

The **Load** button loads all files with the name “digit<language>.str” from the specified directory into the installation directory; these files can then be made available to Freelance Engineering through the **Language setting** dialog.

The default files can be modified using a text editor. The file structure cannot be altered.

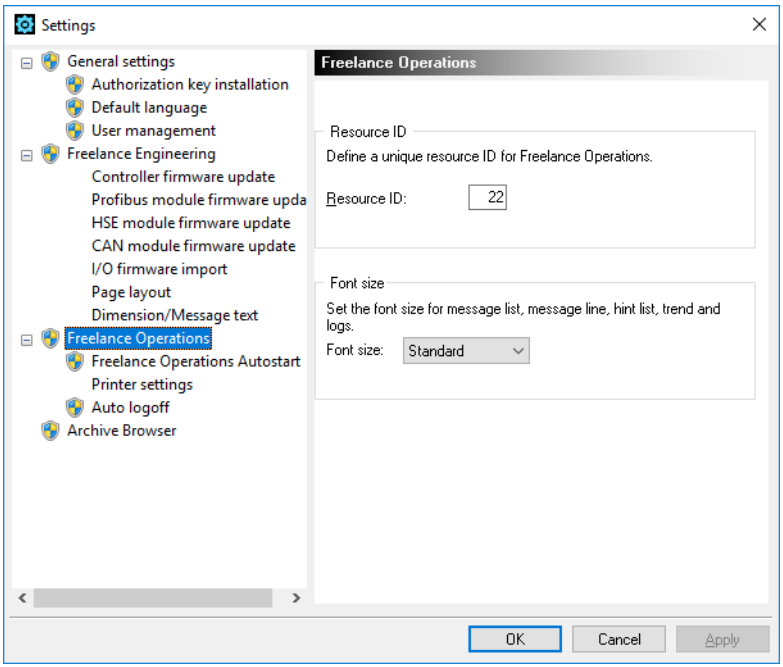
The texts are defined as follows under the section [PARA]:

DIMENSION_0 = dim_text1
DIMENSION_1 = dim_text2
DIMENSION_2 = dim_text3
...

NOTIFICATION_0 = messagetext1
NOTIFICATION_1 = messagetext2
NOTIFICATION_2 = messagetext3
...

Use this dialog if you have adapted the standard file to your project requirements using a text editor.

2.5.3 Settings for Freelance Operations



tb500_23_us.png

Resource ID Several software packages can be run at the same time on a PC. To enable these software packages to be addressed unambiguously, each one must be assigned a unique number, the resource identification number.
All the resources within a Freelance project must also have a unique resource ID.

Font size Setting the font size for the message list, message line, hint list, trend and logs.

Freelance Operations autostart

Freelance Operations can be installed such that it is launched automatically after Windows starts.

Yes, start Freelance Operations automatically (Recommended)
PC is restarted, Windows logs in automatically with Auto Logon

user and Freelance Operations is launched.
Only those applications that have been **started before the start of** Freelance Operations can be reached by the Freelance Operations user by means of ALT+TAB keys.

No, start Freelance Operations manually
Freelance Operations will not be started automatically. Freelance Operations can be started using the Start menu.

Printer settings

Two printers are supported per operator station. One printer must be used for the continuous output of the Signal sequence log. The other printer is then available for printing the Operation logs or Disturbance course logs. One of the two printers is also used for hardcopies.

Printer 1 Choose a printer installed under Windows, for example, for continuous stationary.

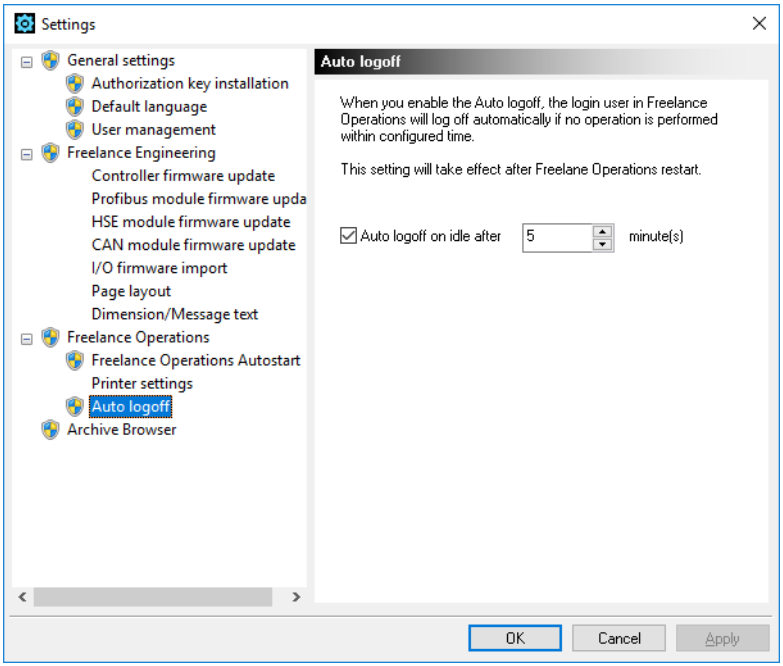
Printer 2 Choose a printer installed under Windows, for example, a color printer.

Hardcopy Printer 1/2
Choose one of the installed printers to print a hardcopy from the operator station.

For hardcopies, do not choose a printer which is used for producing Signal sequence logs.

Margins of Printer 1/2 in cm
The page layout for the two installed printers is defined.

Auto logoff



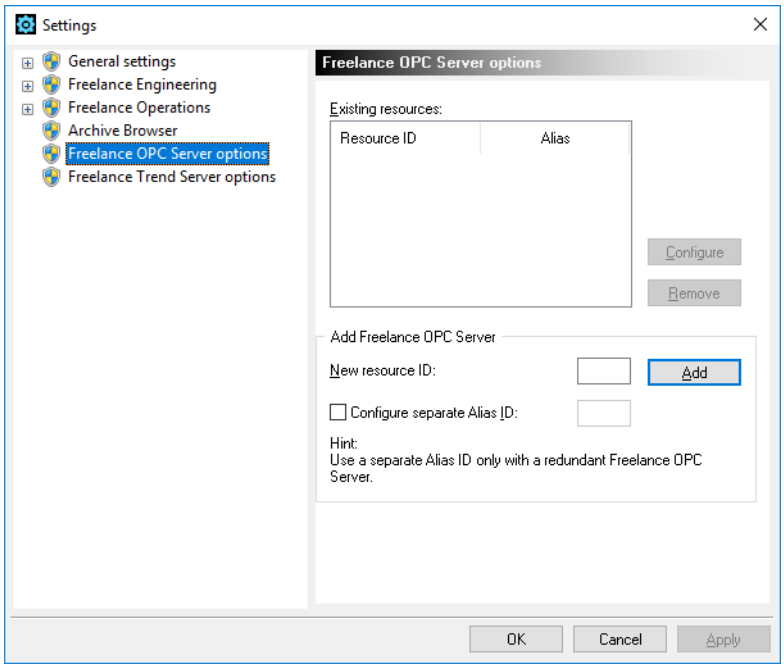
Autologoff_en.png

If Auto logoff is enabled, the Freelance Operations user will be logged off automatically if no operations is performed within a configured time period.

2.5.4 Settings for Archive Browser

The dialog is used to specify whether or not the user can delete archive files within Archive Browser.

2.5.5 Settings for OPC server



tb500_26_us.png

New resource ID

During the installation, the OPC server software is installed on the PC, but no instance is created. Enter the Resource ID under which the OPC server shall be executed.
Several software packages can be run on a PC at the same time. To enable these software packages to be addressed unambiguously, each one must be assigned a unique number, the resource identification number.
All resources within a Freelance project must also have a unique resource ID.

Add After entering a Resource ID, this button is used to create an instance of the OPC server. In this way you can create several OPC server instances on one PC.

Configure separate Alias ID

In addition to the Resource ID which is used for communication within a Freelance projects, a second Resource ID can be configured to establish a redundant OPC connection for an 800xA system. This checkbox must not be selected for standard applications.

Existing resources

The list shows the Resource IDs of the OPC server instances created on this PC.

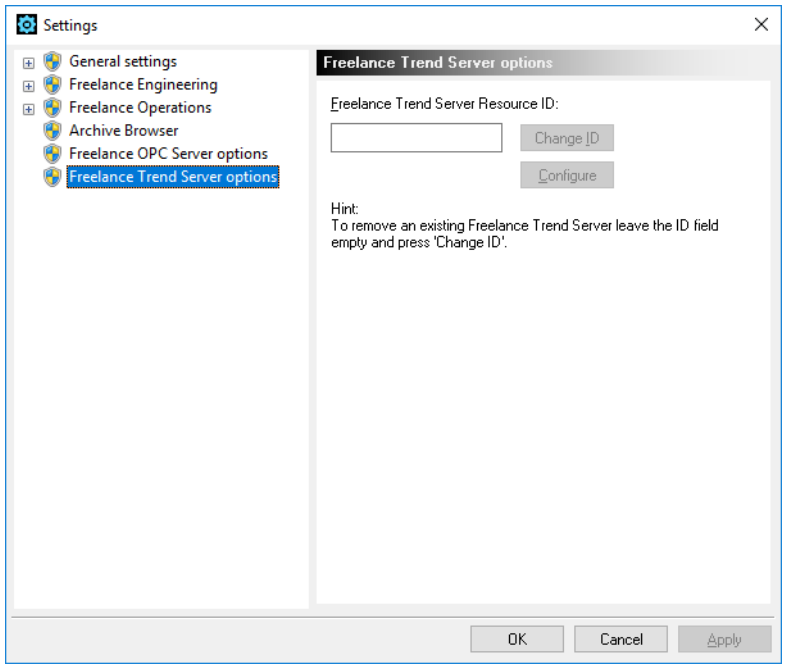
Configure Allows to run the OPC server selected in the list with another user account.

If the OPC server is configured to be connected to System 800xA Version 6.0 (UAC enabled), the user entered here must have the rights to change the system time (SeSystemtimePrivilege).

Remove The instance of the selected OPC server will be deleted.

Deleting all OPC server instances on a computer does not automatically delete the OPC server software.

2.5.6 Settings for Trend server



tb500_28_us.png

Trend-Server Resource ID

During the installation, the Trend server software is installed on the PC, but no instance is created. Enter the Resource ID under which the Trend server shall be executed.
Several software packages can be run at the same time on a PC. To enable these software packages to be addressed unambiguously, each one must be assigned a unique number, the resource identification number.
All resources within a Freelance project must also have a unique resource ID.

Change ID An instance of the Trend server is created after entering a Resource ID. If you want to use the Trend server under a different Resource ID, edit the displayed number before pressing the **Change ID** button.
If you want to delete the Trend server from the local PC, delete the displayed number before pressing **Change ID**.

Configure Allows to run the Trend server with another user account.

If Freelance Operations, OPC Server and Freelance Trend Server are run on the same PC, they must be executed using the same user account.

2.5.7 Confirm changes

Once all the settings have been made, click **OK** to accept all changes and to finish the Settings tool.

2.6 Installation complete

We wish you every success using Freelance to perform your automation tasks. Freelance Engineering will greatly reduce the effort required. Not least because of standards such as Windows and IEC 61131-3, this is an innovative product which is setting standards in this field through its use of a common database for configuring the user programs and for display.

If you have unexpected problems during installation, please contact your local Freelance provider or your local ABB office.

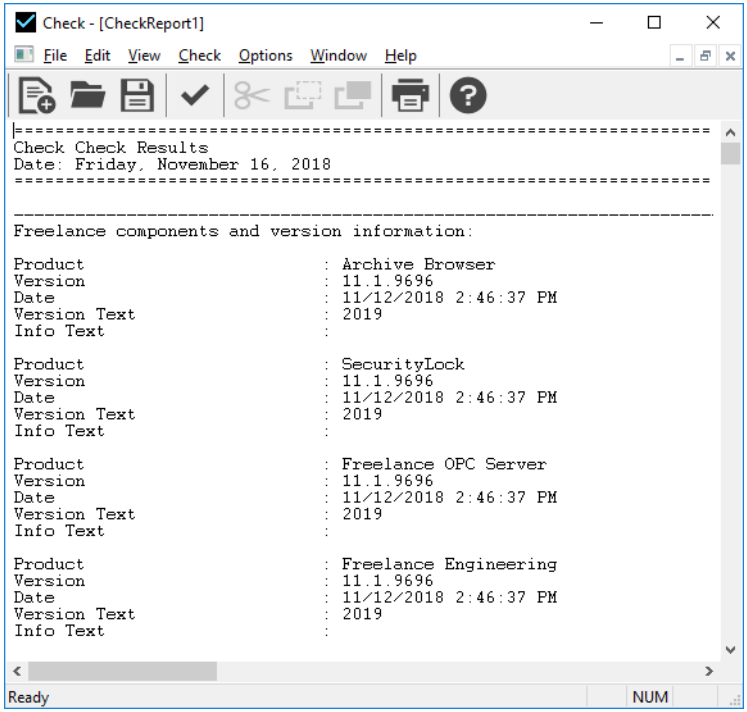
2.7 Check the Freelance installation

2.7.1 Freelance Check tool

The test program **Check** can be used to check the installation.

Windows 7:
Start > All Programs > ABB > Freelance 2019 > Tools > Check

Windows 10:
Windows button > **ABB > Check**



tb005_us.png

Check > All Components initiates a full test of all the installed Freelance components. All the files that have been installed are checked. The test log can be output, allowing you to compare the nominal status and the actual status.

The Check program can also be started from the Freelance Engineering help menu.

Help > About > List all information.

2.7.2 Windows firewall

During the installation process the setup will add several Freelance programs to the firewall exclusion list. To verify the entries made, you can open the Windows advance firewall configuration:

Windows 7:
Start > Control Panel > System and Security > Windows Firewall

Select **Advanced settings.**

Windows 10:
Windows button > **Windows Administrative Tools > Windows Defender Firewall**

The Windows firewall with Advanced security configuration is shown.

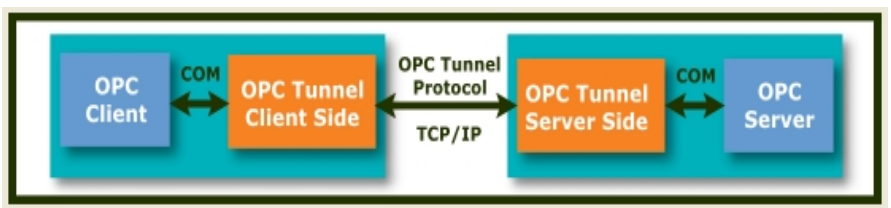
Select **Inbound Rules.**

When the setup has finished there are several entries that start with “Freelance”.

2.8 ABB OPC Tunnel

Depending on the selection during Freelance installation, the software component **ABB OPC Tunnel** will be installed. This component must be installed on **all PCs with an OPC server to be connected to the Freelance system.** The OPC Tunnel replaces the Windows DCOM configuration and makes its complicated settings unnecessary.

The OPC tunnel software has three major components: **OPC tunnel client**, **OPC tunnel server** and **OPC tunnel configurator.**



Tunnel Architecture us.bmp

The **OPC tunnel client** side is integrated into the Freelance Engineering and Freelance Operations and will start automatically.

The **OPC tunnel server** has a separate configuration tool which is not part of Freelance Engineering or Freelance Operations.

The **OPC tunnel configurator** is used to set up the communication parameters of the tunnel.

Configuration of the OPC tunnel is described in the ***Engineering Manual OPC Tunnel Configuration***.

3 First steps

3.1 Introduction

Once you have carried out the installation of Freelance Engineering as described in the preceding section, you can immediately begin to set up a project.

Use the Start menu to launch Freelance Engineering.

If your hardkey is not attached, or if you have not installed a license file, a message will be displayed to that effect. Correct the cause of the problem and relaunch the program.

The version details of the installed software are displayed in the “About Freelance Engineering” window. Confirm this dialog using the **OK** button.

3.2 Creating a project file

Choose **New** from the **Project** menu and specify a file name for saving your project on the hard disk. The default directory used is **<FreelanceData>\proj**,
but you may choose a different directory if you wish.

Once you have specified a unique file name, a further dialog appears, allowing you to enter general project data such as project number, person in charge, customer and so on. This data can also be entered or modified at any time in the future. When this dialog is confirmed with the **OK** button, an empty project file is created.

The first step of the configuration process involves setting up the software view for the project. This means that tags, variables and the functions to be calculated are defined.

In a second step, this configuration is assigned to the existing hardware, that is the process stations and I/O units.

3.3 Step 1: Configuring the software view of the project

Once you have defined the general project data, you will enter the software view of the configuration, the Project tree.

The project tree displays the functions of a project in a clear format. The individual elements or objects, generally known as **project elements**, are structured in accordance with IEC 61131-3. To develop a project tree, select a node in the tree and choose **Insert next level/Insert below** or **Insert above** from the menu, or use the insertion options directly from the context menu. Depending on the node selected in the project tree, a selection list with the objects that can be inserted in that position in the tree opens.

The topmost element in a project is the **Configuration CONF**, which is the sum total of all the project elements in a Freelance system.

The first structural level below the configuration is **Software SW** or **Hardware HW** elements. The Software element is formed by the resources, which represent the various different stations in a project. For the processing of the process itself there are the **D-PS (process station)** resources, for operation and observation of the process there are the **D-OS (operator station)** resources, for interfacing to external systems there are the **D-GS (gateway station)** resources, and for integrating data from external systems there is the **OPC-S (OPC server)** resource.

Insert a process station below the software node.You can add either a redundant (D-PS/RED) or a non-redundant (D-PS) process station. Further specification which type of process station - AC 900F, AC 800F, AC 700F or rack based station - is used, will be performed later in the hardware structure.

Insert a D-PS process station now and name it “PS”.

Once a name has been assigned to the resource, its basic structure is added to the project tree. Below the resource node, system functions and user-defined functions are organized in two task lists **<res_name>.SYSTask** and **<res_name>.USRTask**.

Configuration of the system task provides an opportunity to define the response of the process station to specific situations such as cold start, warm start and redundancy transfer.

Below the node **USRTask** the user-defined functions are specified which are to be executed in the process station. These functions can be executed in different tasks. A task is represented as a separate node in the project tree.

One **Default task** can be set up for each process station. This task is always executed when none of the other tasks is being calculated. Besides the default task other tasks can be created. Typically, each task is processed repeatedly in **Interval mode** with a configured time interval, the task **Cycle time**.

Now create a **Task** below the USRTask node.

PL programs (program lists) and SFC programs (sequential function chart programs) are specified below each task. The actual functions in programs are configured below a program list.

Create a program list PL with an IL (instruction list) program below it. Double-click the IL node to enter the instructions. For example, enter the following program (creation of a saw-tooth curve):

Line	Label	Op.	Operand	()	Comment
0001		LD	Init		already initialized?
0002		EQ	1		
0003		JMPC	L010		
0004		LD	0		
0005		ST	Counter		Init counter
0006		LD	1		Set Init flag
0007		ST	Init		
0008		ST	UP		Flag:count up or down
0009					
0010	L010				
0011		LD	UP		count direction UP or DOWN?
0012		EQ	1		
0013		JMPC	L050		
0014					
0015		LD	Counter		decrement counter
0016		SUB	1		
0017		ST	Counter		
0018		LE	-100		
0019		RETCN			
0020		LD	1		
0021		ST	UP		
0022		RET			
0023					
0024	L050				
0025		LD	Counter		increment counter
0026		ADD	1		
0027		ST	Counter		
0028		GE	100		
0029		RETCN			
0030		LD	0		
0031		ST	UP		
0032		RET			

first01us.bmp

While you are entering data you will prompted to define the variables being used. You should define the variables `Init` and `UP` with data type BOOL, and `Counter` with data type INT.

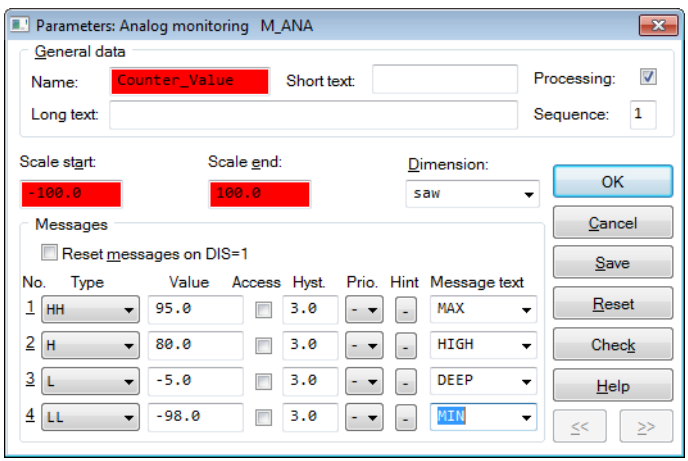
To check the program choose **Editor > Check** from the menu. Any errors that may be detected are shown in a list. Double-clicking on an error message will take you automatically to the place where the error has been detected. Correct the error(s) and run the plausibility check again.

Save the IL program and select again the IL node in the project tree. Another program should now be used to monitor the current count and generate an alarm message if required.

Add an FBD (function block diagram) program beneath the IL program. Double-click on the program or click E**dit > Program** to open the FBD editor.

Select an analog monitoring function block M_ANA from menu **Blocks > Monitoring**. Alternatively you can switch the view in the left window from project tree to libraries explorer and select there the M_ANA function block from the **Monitoring** library**.** Position the block in the editor area and double-click it. Define the **Parameters** by specifying a name, setting the scaling from -100.0 to 100.0 (in accordance with the `Counter` in the IL program), and define up to four limit values.

Example of a completed parameter definition dialog:



ParaM_ANA.png

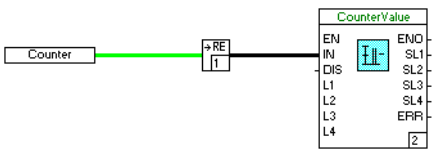
Place a variable in the FBD editor. To do so, choose **Variable read** from the context menu (the variable `Counter` should be read and linked with the input IN of the

monitoring block). You can enter the variable name directly in the parameter dialog, or use the **F2** key to choose it from a list. Before linking the variable `Counter` with the function block's input pin IN, its data type must first be converted from integer to REAL. This is done by choosing the converter block TO_RE (to REAL) from the Libraries explorer or the context menu, **Data type to REAL**.

Draw a line from the variable to the converter's input and from the converter's output to the function block's input IN: click a pin and move the mouse cursor to the pin of the other block.

The processing sequence is shown in the lower right corner of the function blocks. It is not correct and needs to be adjusted. Open the parameter definition dialog for the analog monitoring block (**Right click > Parameters**) and change the sequence from 1 to 2. The processing sequence for the converter block will be automatically adjusted to 1.

Your program could then look similar to this image:



first03us.bmp

Choose the Check tool bar from the editor tool bar line to validate the program.

Now check the plausibility of the project tree. Select the top most node and click **Project > Check all**.

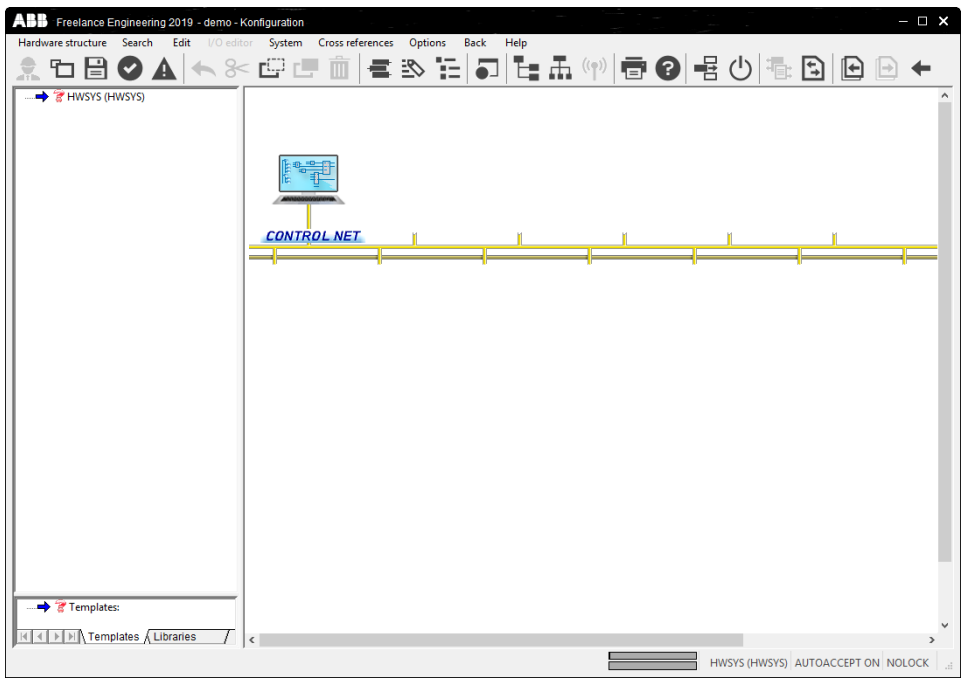
Any errors that may be detected are shown in a list. Double-clicking on an error message will take you automatically to the place where the error has been detected. Correct the errors and check the project for plausibility again.

3.4 Step 2: Configuring the hardware assignment

To configure the hardware in the project, choose **Hardware structure** from the **System** menu or click the relevant button on the tool bar.

The hardware editor shows two representations of the hardware in the project. In the left-hand section of the screen all the hardware is represented in a tree view, while the right-hand section contains a graphical view of the currently-selected object.

A project with no hardware configuration is displayed as follows:



first10_us.png

The computer displayed represents the configuration PC (Freelance Engineering) and cannot be modified. The yellow lines represent the Control Net. Shown below the system bus are the process stations, while above the bus - adjacent to the configuration PC - are the configured operator and gateway stations.

The project hardware will be configured as follows:

- Select the object in the tree structure and choose **Insert** from the **Edit** menu

  or

- Select the object in the tree structure and choose **Insert** from the context menu

  or

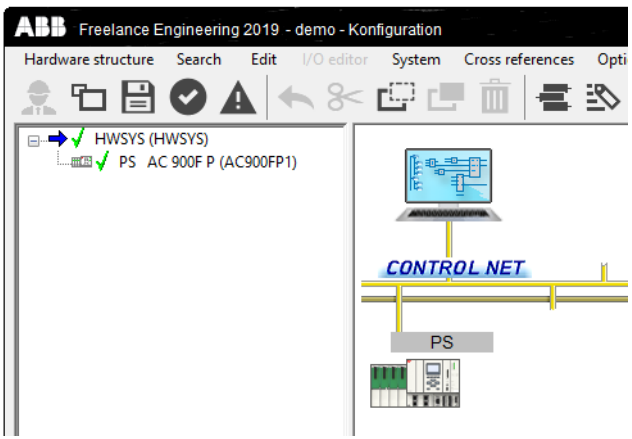
- Click on an unoccupied position in the graphic view (your selection will be indicated by a dashed red border) and double-click.

The following dialog presents a list of objects which can be inserted at the selected position.

Now insert a process station in accordance with the available hardware.

The hardware and software components of the project are integrated by selecting the hardware and then choose **Resource allocation** from the **Edit** menu to assign a resource.

Now select the process station and assign the “PS” resource from the project tree.



First11_en.png

The network configuration dialog (Menu: **Hardware structure > Network**) allows the stations’ resource ID and IP address to be defined. Select the process station and click **Edit**. Enter a unique resource ID for your station and its IP addresses. If no Control Net redundancy is configured or stations are used which do not support Control Net redundancy, you only have to enter an IP address for Line A. Close the network configuration with **OK**.

Usually no changes to the default boot parameters of the process station are necessary. If you need to edit them nevertheless, select the process station in the

hardware manager. Then select **Edit > Parameters**. The **Boot Parameters** of a process station can now be modified. Close the hardware parameters dialog.

To validate the hardware configuration select **Hardware structure > Check all**. No errors should be shown in the **Plausibility check error list**.

Now save the changes with **Hardware structure > Save** and exit the hardware manager with **Hardware structure > Exit**.

Select the uppermost node in the project tree and check the plausibility of all project data. When the **Project > Check all** menu item is chosen, all objects below the selected node are checked. The menu item **Project > Check** leads to only those objects being checked which are displayed with a pink node.

3.5 Step 3: Commissioning

Once any errors that the plausibility check reported have been rectified, the project can be commissioned. Choose **Project > Commissioning** or the appropriate tool bar button to switch from configuration to commissioning mode.

When switching to commissioning mode, Freelance Engineering attempts to establish a communication link with all the configured stations. As well as the resource nodes, the current states of the connections are indicated in the project tree.

In a newly-installed system the firmware update will have been loaded into the process station in the course of the installation process. If the IP addresses and subnet masks have been configured correctly, then the project tree node for the process station will be labeled **“No operating system”**. Other states include:

- **“Running”**: Operating system or configuration has been loaded.
- **“Version error”**: The configuration in the process station belongs to another project or is outdated.
- **“Wrong DMS version”**: The version of communication software in the process station is different from the Freelance Engineering version. With the configuration tool “Settings”, the current firmware must be loaded into the process station first.

An arrow before the node indicates that the data for the node is not yet available on the associated hardware and still needs to be loaded.

Select the resource node of the process station and open the context menu. If commissioning for the first time, choose **Load > Whole station**. Changes and enhancements to the configuration can be loaded into the process station later with **Load > Changed objects**.

If the load operation has been completed successfully, the nodes in the project tree will appear green and the load arrows will be removed.

It may occur very rarely that the status indicated in the project tree or hardware structure is not updated directly after a load operation. For example, the status “stopped” may be indicated for a process station although the load operation has been completed successfully and the resource has assumed the “running” state. To solve this problem, execute in Freelance Engineering any action which will refresh the screen content. For example, you can navigate from the hardware structure to the project tree and back again.

3.6 Step 4: Testing the configuration

In commissioning mode there are various different options in Freelance Engineering for testing and checking the current project configuration. Select an object and double-click to open it. As in the configuration phase, the relevant editor is then opened. It is not possible to modify the configuration here, but the current values can be checked, and influenced to a certain extent.

IL program

If an IL program has been loaded into a process station and executed there, then the IL editor can be opened in Freelance Engineering commissioning mode. For each step in the calculation, the current values for variables are displayed before the comment column. Boolean variables are displayed as F for FALSE and T for TRUE.

FBD program

If an FBD program has been loaded into a process station and executed there, then the FBD editor can be opened in Freelance Engineering commissioning mode. The current value can be read from the connecting lines.

Different colors are used for different data types. Lines for data of type BOOL are solid for the value TRUE and dashed for the value FALSE.

The cursor can be moved to all other lines. The current value is shown in the form of a data tip. The current values for a function block pin are shown when the cursor is moved to it.

Value window

The value window can be used to provide a lasting display of a value. Another window is displayed. Choose **Windows > Show value window** to open the value window.

Once a variable, a data flow line or a function block pin has been selected in an editor or a list, **Enter variable** can be chosen from the context menu or the **Windows** menu. The format for displaying the value is chosen in another dialog. After this dialog has been confirmed, the variable will appear in the value window. The value displayed is updated once per second.

3.7 Step 5: Saving the project data

The Freelance Engineering project data can be saved in binary format (Freelance Engineering project file, PRO) or as a text file (comma separated values, CSV). The standard format is binary. For data exchange purposes projects can be exported as a csv-text file after switching to the **Project manager** (**Project > Project manager**).

To save a project:

- In the project tree: **Project > Save project**
- In the project manager: Select **Save project** in section **Manage project** or from **Project** menu

To export a project:

- In the project manager: **Project > Export...**
  A file name for the csv file must be entered then.

Archived and exported projects provide additional data safety and recovery options. Export files are required for the product upgrade procedure.

3.8 Step 6: Configuring an operator station

The Freelance Operations software must be installed on a computer connected to the Freelance Engineering through a network. The Freelance Operations software can also be installed along with the Freelance Engineering software on the same PC.

To create an operator station in Freelance Engineering, switch back to configuration mode and to the project structure view. Select the process station node. Choose **Edit > Insert below** to display the list of possible resource types. Choose **Operator station D-OS** and specify a name.

Move to the hardware structure and select the uppermost node in the tree. Choose **Edit > Insert** to display the list of possible resource types. Choose **VIS Operator station** and click **OK**. Specify a name and the mounting position for the new hardware. The predefined values can be accepted with the **OK** button.

Select the new resource in the tree or in the graphic view, then choose **Edit > Resource allocation...**. Select the software resource that you defined previously and assign it to the hardware.

As with the process station, the IP address and the resource ID must be configured for the operator station. In the **Hardware structure > Network** dialog enter the IP address or host name and the resource ID you defined when installing the Freelance Operations software. Click **OK** to apply you changes.

Check the hardware by selecting the topmost hardware node and then **Hardware structure > Check**.

Save your changes and exit the hardware manager. Back in the project tree view select the uppermost node in the project tree and validate the project data with **Project > Check**.

3.9 Step 7: Commissioning the operator station

Once any errors that the check reported have been rectified, the project can be commissioned. Choose **Project > Commissioning** to switch from configuration to commissioning mode.

Besides the resource nodes, the current states of the connections are indicated in the project tree. If not already done, start Freelance Operations now on the operator station PC.

The process station should be flagged with the connection status **running**, and the operator station with **Version error**. If the Freelance Operations software is not running or not reachable through the network, then **No connection** will be reported for the operator station.

Select the node for the process station and choose **Load > Changed objects**; then select the node for the operator station and choose **Load > Whole station**.

Change over to the operator station with Freelance Operations running. In the icon bar, click the Tag list icon  .

The tag list is displayed. The name of the M_ANA function block is displayed in this list. Select the name of the function block to display its faceplate.

In the M_ANA faceplate the increasing and decreasing value (saw tooth) is visualized with a green bar. Alarms are listed in the **Message list!** along with their current time stamps, when the value reaches the defined limits.

You have mastered the first steps with Freelance. You have learned how to write a simple program, run it on a process station, visualize its state and display alarms. Congratulations.

3.10 Step 8: Integration of a PLC system

A PLC system can be integrated in a comfortable way into a Freelance system through Freelance Engineering. If a connection is established between Freelance Engineering and the OPC server of another system, the configuration of the OPC server can be read through the browser interface. The read OPC items are displayed in a list view. OPC items can be used to define a new function block type (OPC function block class). A faceplate can be configured for each function block class.

In a second step tag instances based on the classes can be created from the OPC item list. With the defined faceplates a quick and easy visualization on a Freelance Operations station is available.

A single OPC item can be instantiated as a variable in the Freelance project.

Library for OPC function block classes OPC_FB-LIB

Below the project tree Software node any nodes of type OPC_FB-LIB (Library for OPC function block classes) can be configured. The OPC_FB-LIB nodes are used to

structure OPC function block classes in a logical way – for example all classes which are used by an external OPC server.

OPC function block class OPC_FB-CLASS

Each OPC_FB-CLASS is defined by its interface and a faceplate. The OPC FB classes do not have any functional code.

The interface is created through the class definition in the OPC item list. Also, it can be manually defined directly with the editor “OPC_FB class components”. The instances are available only through the OPC server (only the storage types VAR, VAR_VIS and MESSAGE are available).

For the definition of the faceplate for an OPC_FB class the functions of the Graphics editor are available.

OPC server in the project tree

To configure an external OPC server in the project tree, the IP address of the PC and a port number is required.

For easy and comfortable connection of external OPC servers naming conventions and alarm mapping can be defined in the **Configure name pattern dialog**.

The Configure name pattern dialog defines naming conventions for the items found through the browser interface of the OPC server. For connection to another Freelance system or an AC500 OPC server, predefined templates for the naming conventions can be used. For connecting OPC servers from other systems, the naming for DataAccess and Alarms&Events items can be specified by using the “Prefix”, “Tag”, “Selector” and “Postfix” fields in the dialog.

The **Alarm mapping dialog** maps the alarms generated by the OPC server or PLC to corresponding Freelance messages. In the upper part of the dialog the OPC severity is mapped to the message priorities of the Freelance system. In the other part the mapping of the attributes is specified; for example, it is configured whether “Condition” or “Sub-Condition” must be used as message type in Freelance.

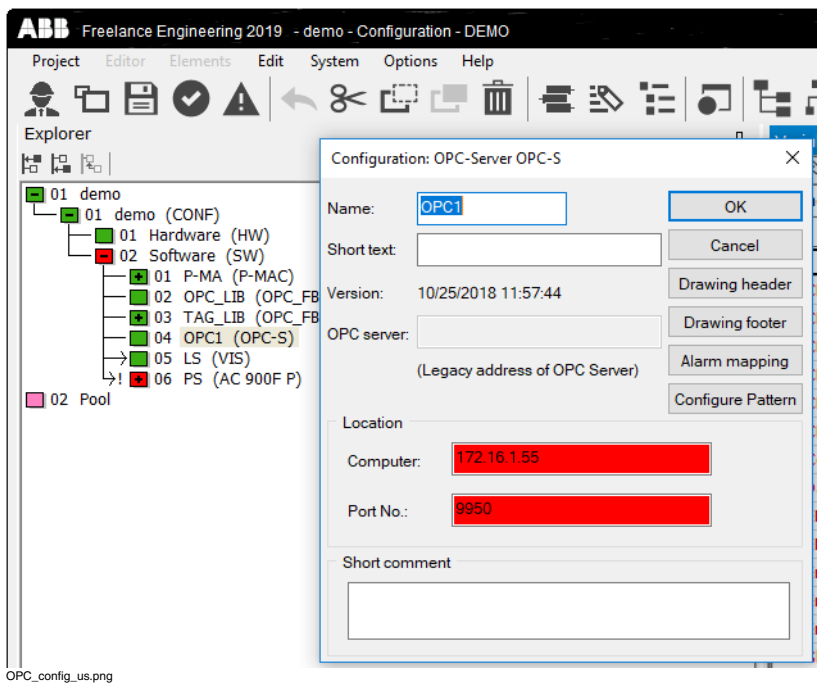
3.10.1 Configuration of an OPC server

> In the project tree, right-click **Software (SW)** > **Insert** > **next level** > select **OPC server OPC-S** > **OK**

Configuration dialog is displayed.

Enter any **Name** (for example, OPC1) and the **Location**, where OPC server is running.

Specify the IP address of the PC on which the **OPC server** and the **OPC tunnel** is installed. The port number is the same as the one used in the OPC tunnel configuration (9950).



OPC_config_us.png

3.10.2 OPC function block library

An OPC function block class library **OPC_FB-LIB** is used to structure OPC function block classes. For each OPC_FB_LIB the assignment to OPC servers in the Freelance project are configured.

> In the project tree, right-click **Software (SW) > Insert > next level > OPC function block library (OPC_FB-LIB)**

Double click an OPC_FB-LIB node to configure the assignment of the OPC libraries to the OPC servers in the project.

For using predefined OPC function block classes, a library provided with the setup can be imported:

> Edit > Import Block

Browse a library file, for example **...\export\FreelanceSampleTagTypeLib.prt**

The import result will the added in the **Pool** node, drag and drop it below the **OPC_FB-LIB** node. The library may now be used in the project.

3.10.3 Browse and add items of an external OPC server

The configuration of an OPC server can be read directly in the project through the browsing interface:

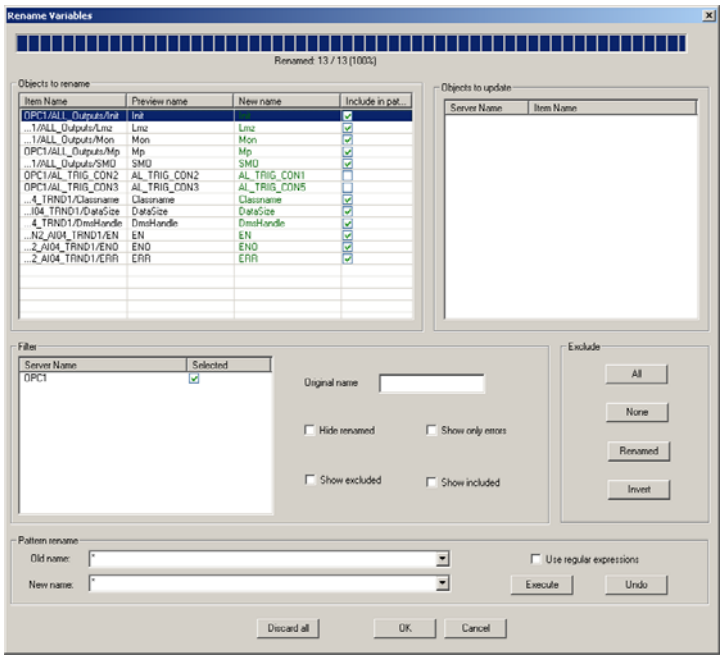
> Project tree **> System > OPC item list**

Click **Synchronize** and select the required OPC server from the list. All items of this OPC server which can be reached through the browser interface are listed in the OPC item list dialog. After selecting one or more of these items from the list, a new function block class OPC_FB-CLASS or a new instance for an already existing OPC_FB-CLASS can be created.

3.10.4 Instantiate tags

Instantiate tags using the **Instantiate all** button in the OPC item list. This will match the OPC items (the “selector” part of the OPC item name after the separator) in the

item list with that in the tag type library and lists the matching tags. The list of tags with proposed tag names are listed in a **Rename** dialog as shown below.



OPC_Server_Rename.bmp

Specify the new names for new tags in the *New name* column and click **OK**. The tags linked to the corresponding OPC items are created in the tag list.

3.10.5 Assign variables

A single item can be instantiated as a variable in the Freelance project. Select the OPC items from the OPC item list that are to be used in free graphics or trend displays and assign them to variables. A new dialog, similar to the tag name dialog, shows the OPC items and suggested new variable names.

Specify the required “variable name” in the *New name* column and click **OK**. All the OPC items with the new names will be assigned as a variable in the **variable list**.

You can configure free graphics and trends from the tags and variables created above. For more information, refer to ***Engineering Manual System Configuration*** and ***Engineering Manual IEC-61131-3 Programming***.

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