

WAGO SYSTEM **750**

Modular I/O System

KNX IP StarterKit 2

512 206 18



Installation Guide

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Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

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We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally protected by trademark or patent.

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1 Important Notes

To ensure fast installation and start-up of the units described in this manual, we strongly recommend that the following information and explanations be read carefully and adhered to.

1.1 Legal Principles

1.1.1 Copyright

This Manual, including all figures and illustrations, is copyright-protected. Any further use of this Manual by third parties that violate pertinent copyright provisions is prohibited. Reproduction, translation, electronic and phototechnical filing/archiving (e.g., photocopying) as well as any amendments require the written consent of WAGO Kontakttechnik GmbH & Co. KG, Minden, Germany. Non-observance will involve the right to assert damage claims.

WAGO Kontakttechnik GmbH & Co. KG reserves the right to make any alterations or modifications that serve to increase the efficiency of technical progress. WAGO Kontakttechnik GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

1.1.2 Personnel Qualification

The use of the product described in this Manual is exclusively geared to specialists having qualifications in PLC programming, electrical specialists or persons instructed by electrical specialists who are also familiar with the appropriate applicable standards. WAGO Kontakttechnik GmbH & Co. KG does not assume any liability whatsoever resulting from improper handling and damage incurred to both WAGO's own and third-party products by disregarding detailed information in this Manual.

1.1.3 Intended Use

The components are equipped from the factory with hardware and software configurations that meet the individual application requirements. Changes are permitted exclusively within the framework of the various alternatives that are documented in the specific manuals. WAGO Kontakttechnik GmbH & Co. KG will be exempted from any liability in case of changes in hardware or software as well as to non-compliant usage of components.

Please send your requests for modified and new hardware or software configurations directly to WAGO Kontakttechnik GmbH & Co. KG.

1.2 Symbols


DANGER:

Always observe this information to protect persons from injury.


NOTICE

Always observe this information to prevent damage to the device.


NOTE

Marginal conditions that must always be observed to ensure smooth operation.


ESD (Electrostatic Discharge)

Warning of damage to the components through electrostatic discharge. Observe precautionary measures for handling components at risk of electrostatic discharge.


NOTE

Routines or advice for efficient use of a device and software optimization.


ADDITIONAL INFORMATION

References to additional literature, manuals, data sheets and INTERNET pages.

1.3 Number Notation

Number code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	In quotation marks, nibble separated with dots (.)

1.4 Safety Information



NOTICE:

Switch off the power before replacing any components!

In the event of deformed contacts, the module in question shall be replaced, as its functionality can no longer be ensured on a long-term basis.

The components are not resistant against materials having seeping and insulating properties. Belonging to this group are materials such as aerosols, silicones, triglycerides (found in some hand creams). If it cannot be excluded that such materials will appear in the component environment, then additional measures shall be taken:

- install the components in an appropriate enclosure.
 - handle components only with clean tools and materials.
-



NOTE:

Soiled contacts shall only be cleaned with ethyl alcohol and leather cloths. This helps ensure compliance with ESD information.

Do not use any contact spray. The spray may impair contact area functionality in most extreme situations.

The WAGO-I/O-SYSTEM 750 and its components are an open system. As such, the system and its components have to be installed only in appropriate housings, cabinets or in electrical operation rooms. Access to such equipment and fixtures is granted to authorized, qualified staff only by means of specific keys or tools.

The valid standards and guidelines applicable for the installation of switch cabinets shall be adhered to.

1.5 Scope of Validity

These QuickStart instructions describe the KNX IP StarterKit with the KNX IP Controller 750-849 and several basic components of the WAGO I/O SYSTEM.

You will find detailed information about operation, assembly and start-up in the manuals "KNX IP Controller 750-849" and "WAGO I/O PRO CAA". This documentation is therefore only valid in conjunction with the appropriate manuals.



ADDITIONAL INFORMATION:

The manuals "KNX IP Controller 750-849" and "WAGO I/O PRO CAA" can be found on the "WAGO-I/O-PRO CAA" (759-911) CD or the "ELECTRONICC Tools & Docs" CD (Art. no.: 0888-0412), or on the internet at <http://www.wago.com>.

2 Getting Started

2.1 Hardware Design

The node is to be installed as follows (viewed from left to right):

750-849; 750-402; 750-504; 753-646; 750-600.

The DC 24V unit is connected with the power supply (24V and 0V) for the controller and for the power contact (see Fig. 1).

For an application example, it is sufficient to lay a jumper between "24V" and "+" or between "0V" and "-".



NOTE:

Use a small screwdriver to switch the mode selector to the upper position (see Fig. 1). In this setting, the Firmware and application program are executed (Activate program execution/"RUN").

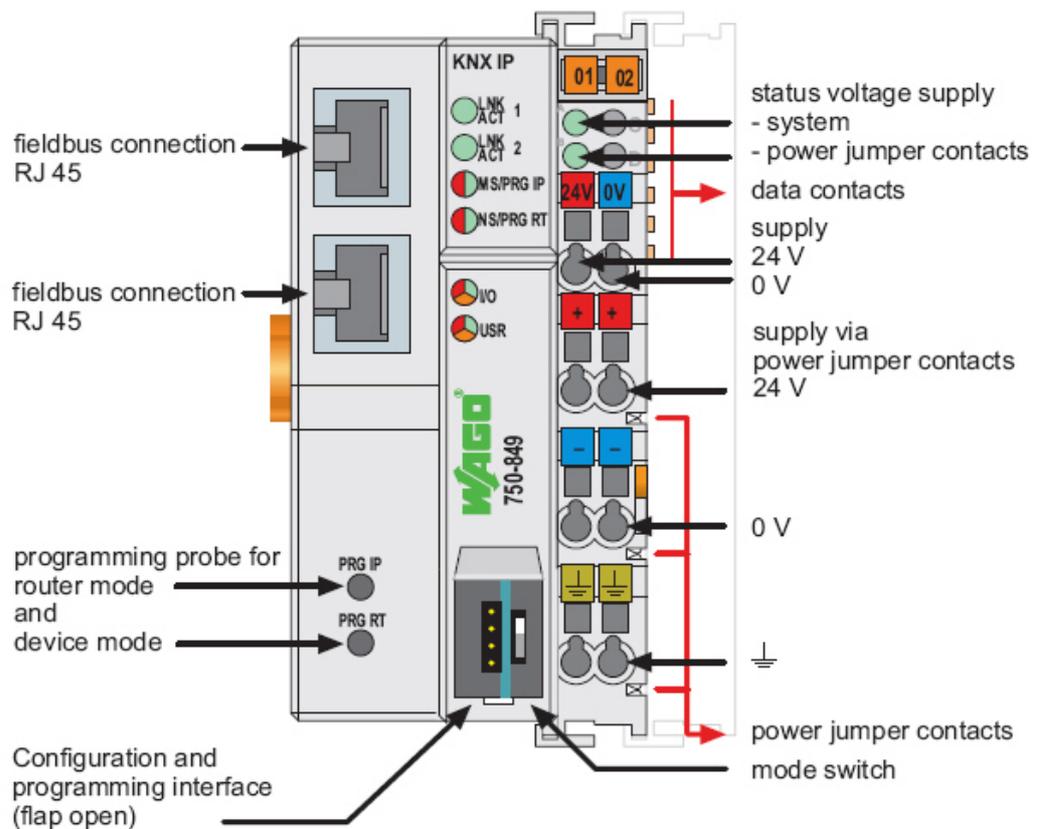


Fig. 1.: KNX IP Feldbus Controller 750-849

2.2 Structure of KNX Topology

The KNX network topology is structured as follows:

The KNX backbone line 1.0.x is declared as a medium "IP". A WAGO KNX IP Controller is inserted on the backbone line as a node with address 1.0.1. From firmware 01.01.26(03), the Web-based controller management is used to set the function of the just inserted KNX/EIB/TP1 module (753-646). Router mode is enabled when delivered.

A total of up to 64 KNX bus nodes can be connected to the line of the router module. The line must be applied through a KNX power supply using a reactor.

An Ethernet connection connects the PC with installed ETS3f software to the RJ45 port of the WAGO KNX IP Controller. The ETS3 then has access to all devices connected in the network. Another KNX interface (USB or RS232) is required for the second application example.

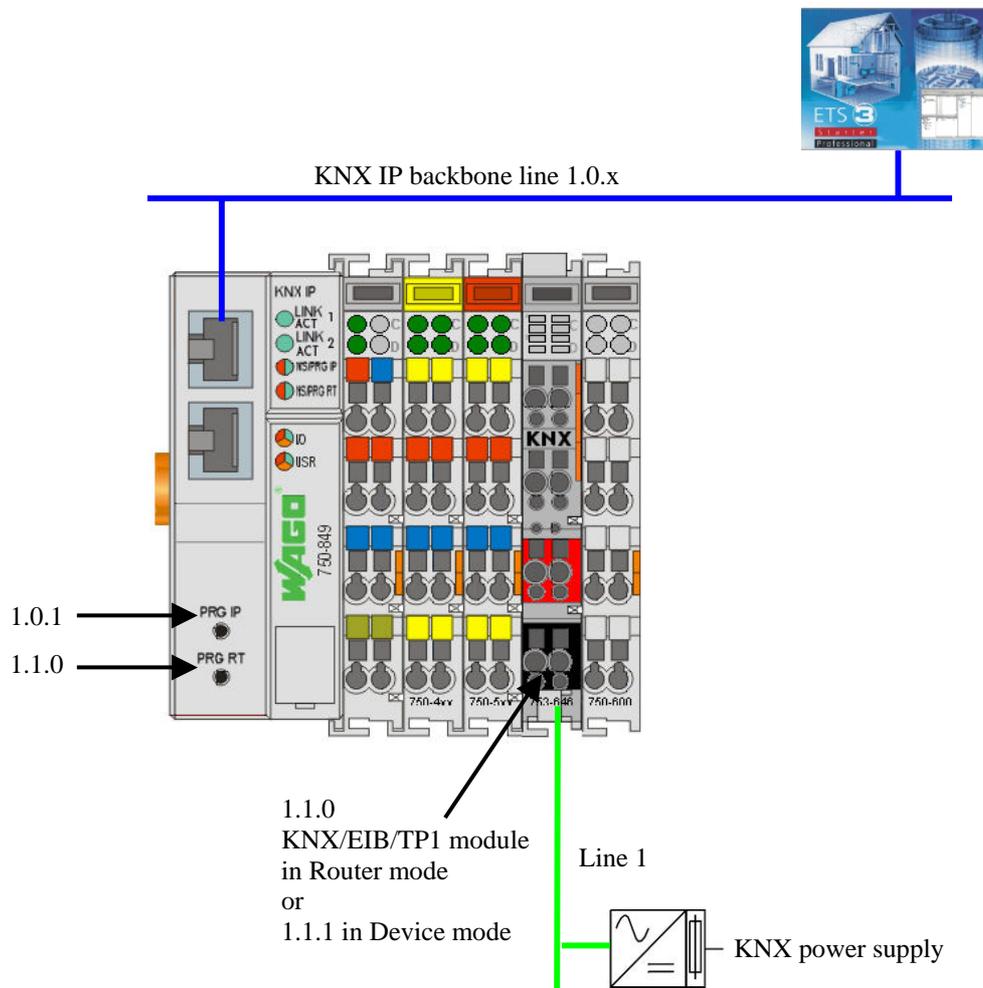


Fig. 2.: Topology in node view (Router mode)

In the structure of the WAGO KNX StarterKit, the topology may contain a KNX IP router and KNX IP controller or a programmable controller with KNX TP1 module as a bus node (see Fig. 3 / 4):

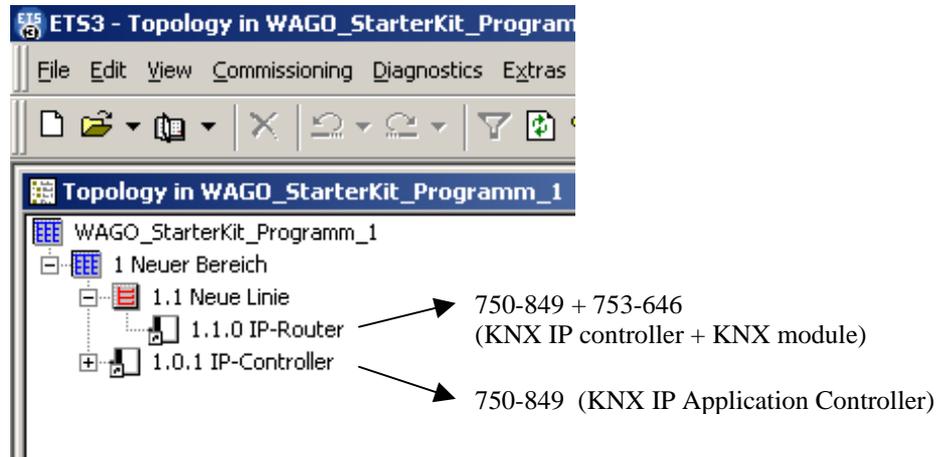


Fig. 3.: Topology in the ETS3 view (Router mode)

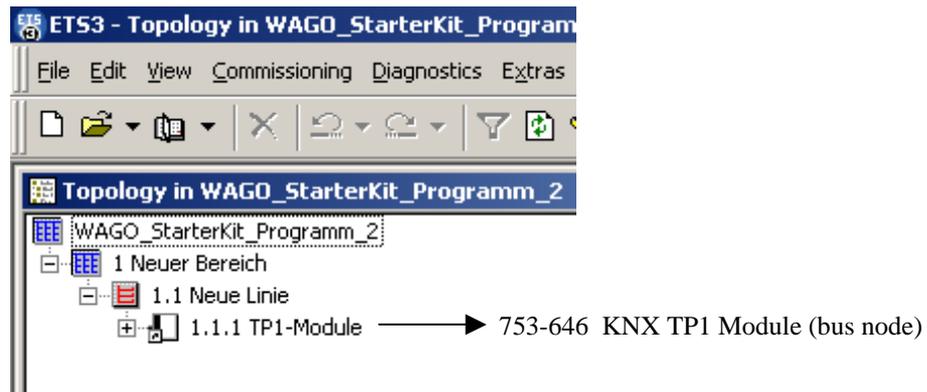


Fig. 4.: Topology in the ETS3 view (Device mode)

2.3 Preparatory Measures

This section describes preparative measures which are necessary for the start-up of the KNX StarterKit. It is assumed in all subsequent sections that the settings and installations described in this section have been carried out.

2.3.1 Installing WAGO I/O PRO CAA (CoDeSys Automation Alliance)

The StarterKit contains a CD (art. no. 759-333) with the programming software WAGO I/O PRO CAA. WAGO I/O PRO CAA is a programming and visualization tool for PLC programs. With this software, the application programs for the programmable Fieldbus Controller (e.g. KNX IP Controller 750-849) are developed. WAGO I/O PRO CAA functions in compliance with the standard of IEC 61131-3. This standard describes the requirements of a programming system. The AWL, KOP, FUP, CFC, ST and AS programming languages are supported. The optimal programming language can be chosen for each application.

Installation:

1. Insert the WAGO I/O PRO CAA CD into your CD-ROM drive.
2. Start the executable installation program "setup.exe".
3. Follow the instructions during installation using the specified settings when possible.
4. After installation is completed, start the programming software from your PC's start menu:
Start \ Programs \ WAGO Software \ CoDeSys for Automation Alliance \ CoDeSys V2.3 \ CoDeSys V2.3
5. You need a driver to use the USB service cable to program the WAGO controller. You can find the driver on the included "Tools and Docs" CD at *Downloads>>Automation>>WAGO-I/O-SYSTEM 750/753>>WAGO USB Service Cable Driver, Series 750+857*.
Follow the installation instructions.



NOTE:

Microsoft .NET Framework 1.1 is required to install the USB cable driver. Open the **CONTROL PANEL** and go to **Software** to check if the program is installed on our PC. It must be installed before installing the USB cable driver.

2.3.2 Copying the Project Data to the PC

To start up the KNX IP StarterKit's example application, data is required which is provided on the Internet. You then receive the link to the StartKit's example application.

http://www.wagocatalog.com/okv3/Download_files/KNX_StarterKit_2_d.zip

Unzip the ZIP data to an empty folder on your PC. The data can then be copied to the target folder (see below).

01. ETS3f project database

Copy the "WAGO_StarterKit2.db" ETS3 database to the following directory:

 C:\Programme\Ets\Database

02. WAGO I/O PRO CAA application program

Copy the WAGO I/O PRO CAA application programs "WAGO_KNX_StarterKit_02_Programm_1.pro" and "WAGO_KNX_StarterKit_02_Programm_2.pro" to the following

 C:\Programme\WAGO Software\CoDeSys V2.3\Projects

03. WAGO I/O PRO CAA libraries

Copy the WAGO I/O PRO CAA libraries "KNX_Standard.lib", "KNX_IP_750_849_01.lib" and "KNX_Applikations_02.lib" to the following directory:

 C:\Programme\WAGO Software\CoDeSys V2.3\Targets\WAGO\Libraries\Building

04. WAGO Ethernet Settings

Install the WAGO Ethernet Settings software (V4.5)

05. Product database

Contains the product databases for the IP controller, KNXTP1 module and IP router for other ETS projects



ADDITIONAL INFORMATION:

You can find other downloads for the KNX/EIB applications on the WAGO website <http://www.wago.com> under Service → Downloads → Building automation → KNX/EIB downloads

2.3.3 Configuration of the ETS3 Database Selection

The installation of the ETS3 Professional software (version 3.0f or higher) is required to start up the WAGO KNX IP StarterKit.



ADDITIONAL INFORMATION:

An update that may be necessary for the ETS 3.0 software can be found on the Konnex website <http://www.konnex.org>.

1. Starting ETS3

Start the ETS3 software via your PC's start menu:

Start \ Programs \ ETS \ ETS3 Professional.

2. Database selection by user

Select the **PROMPT USER** function in the **Tools \ Options \ Database** menu item.

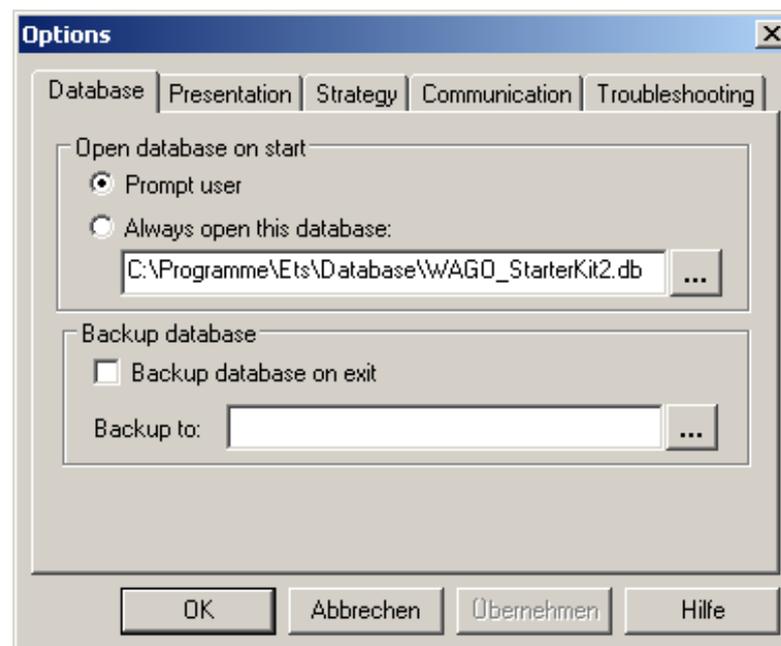


Fig. 5.: Activate database scanning

3. Closing ETS3

Close the ETS3 software via the menu item **File \ Exit**

4. Restarting ETS3

See Point 1

5. Selecting the project database

After restarting the ETS3 software, the "**Open database**" window appears (see Fig. 6). Select the file "WAGO_StarterKit2.db" and exit the window via the **OPEN** button.

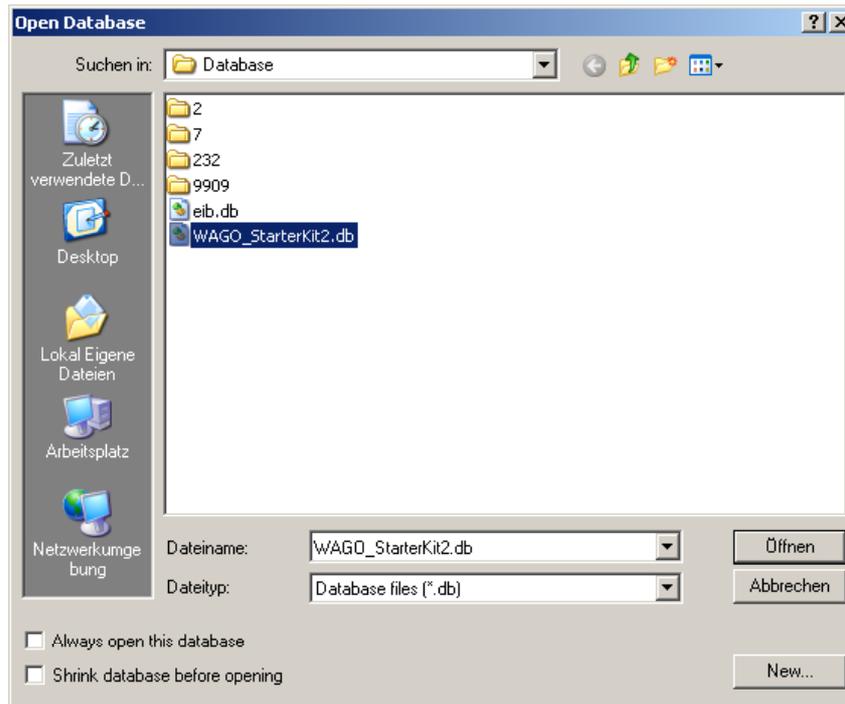
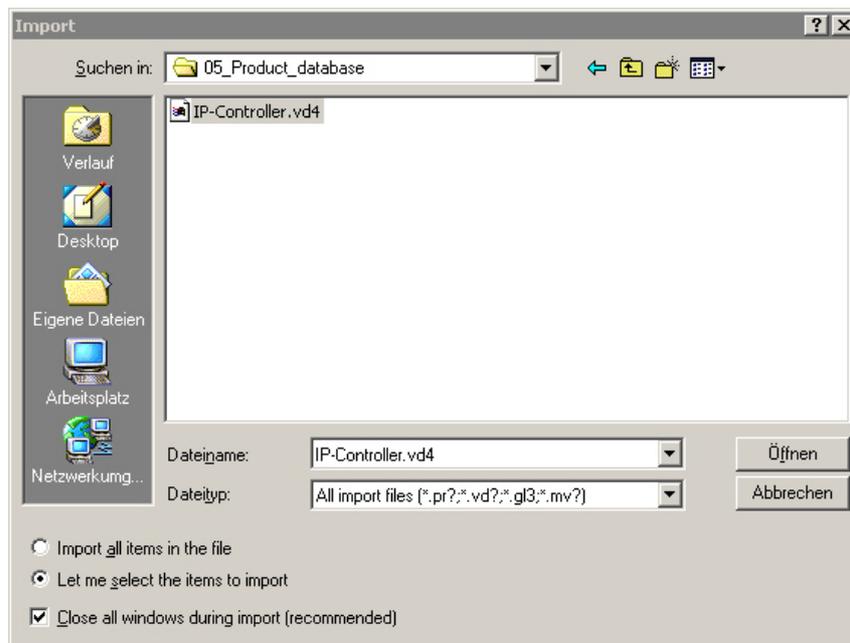


Fig. 6.: Open database

2.3.4 Importing the Product Databases

Import the product database for IP Controller 750-849 in the ETS3 software. Go to the **File \ Import ** menu to open the file "IP-Controller.vd4" from the 05_ProductDatabase folder. The menus and setting screens in the ETS3 are expanded by the "IP" medium.



2.4 Starting Up the Ethernet Network

This section describes how an IP address can be assigned to the KNX IP Controller.

After switching on the controller, an IP address from the address area 169.254.1.0 to 169.254.254.255 is automatically assigned using AutoIP (assuming no DHCP server was found). It is shown below how the IP address can be changed using the ETS3 software.

The following requirements must be met:

1. Creating a network connection

Create a connection between one of the two RJ45 Fieldbus interfaces of the KXN IP Controller and your PC's network card. The cross-over cable contained in the StarterKit can be used for this purpose.

2. Identifying the IP address of the PC

You can identify the network address of your PC under **Start \ Settings \ Network and Dial-up Connections \ LAN Connection x**. Highlight the internet protocol (TCP/IP) in the drop-down list box and press the **PROPERTIES** button.

The KNX IP Controller's IP address, which is to be set up later, must be in the same address area as that of the connected PC.

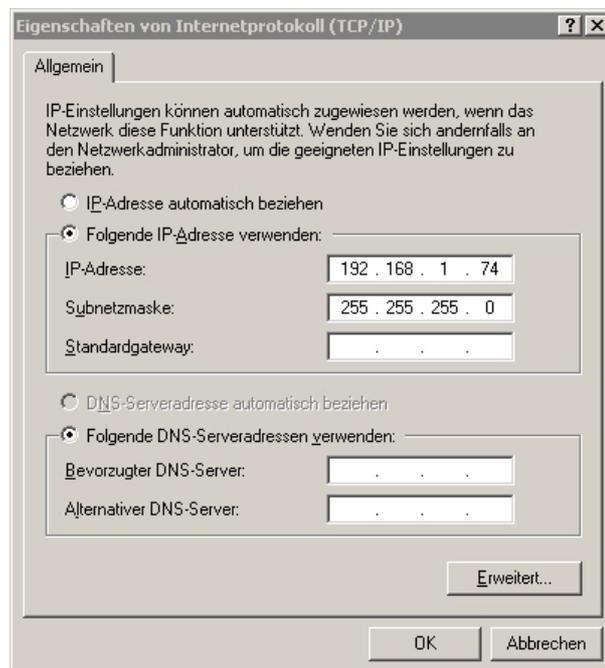


Fig. 7.: Settings of the PC's network card

**ADDITIONAL INFORMATION:**

A detailed description of other possibilities for the assignment of an IP address can be found in the manual for the KNX IP Fieldbus Controller 750-849. You can find this on the website <http://www.wago.com> under Service \ Downloads \ Building automation \ KNX/EIB Downloads

**NOTE:**

The double assignment of IP addresses can lead to serious network errors.

2.4.1 Setting up the ETS3 communication driver

To set up the communication driver, please proceed as follows:

1. Starting ETS3

Start the ETS3 software via your PC's start menu:

“Start \ Programs \ ETS \ ETS3 Professional

2. Selecting the project database

After restarting the ETS3 software, the "**Open database**" window appears (see Fig. 6). Select the file "WAGO_StarterKit2.db" and exit the window via the **OPEN** button.

3. Configuring the interface

You can set up the configuration of the interface under **Tools \ Options \ Communication**. Press the **CONFIGURE INTERFACE** and **NEW** buttons. Configure the interface as shown in Figure 8 and exit the window by clicking the **OK** button.

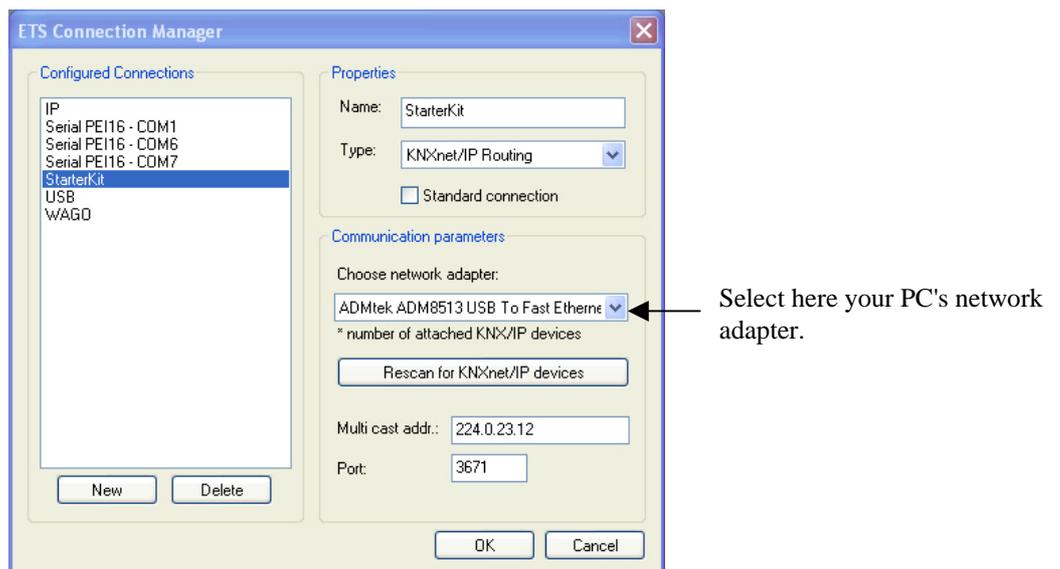


Fig.8.: Configuring the ETS3 communications interface

2.4.2 Assigning the IP Address with the WAGO ETS3 Plug-in

The IP address is created by setting the parameters in the WAGO ETS3 Plug-in.

1. Selecting the device

Highlight the IP router with the physical address 1.1.0 in the Topology window and select the **EDIT PARAMETERS...** menu item via the context menu.

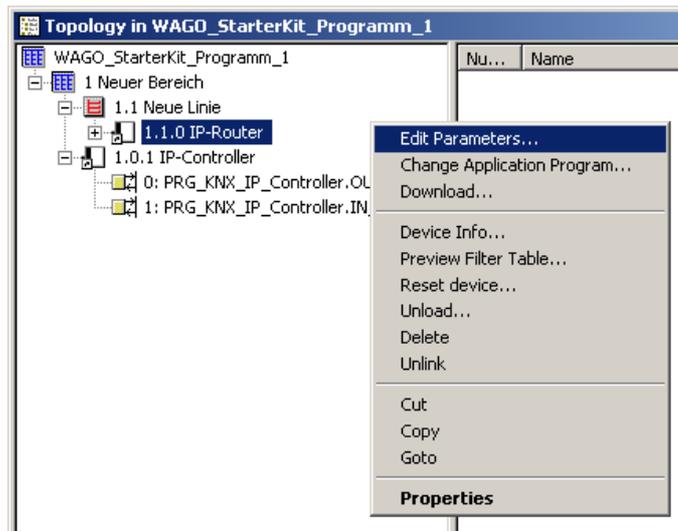


Fig. 9.: Editing the parameters of the IP router

2. Plug-in configuration

After the action under Point 1 has been carried out, the WAGO ETS3 plug-in for the IP router opens. Here you set the desired IP address of the WAGO KNX IP Controller 750-849 as shown in Fig. 10.

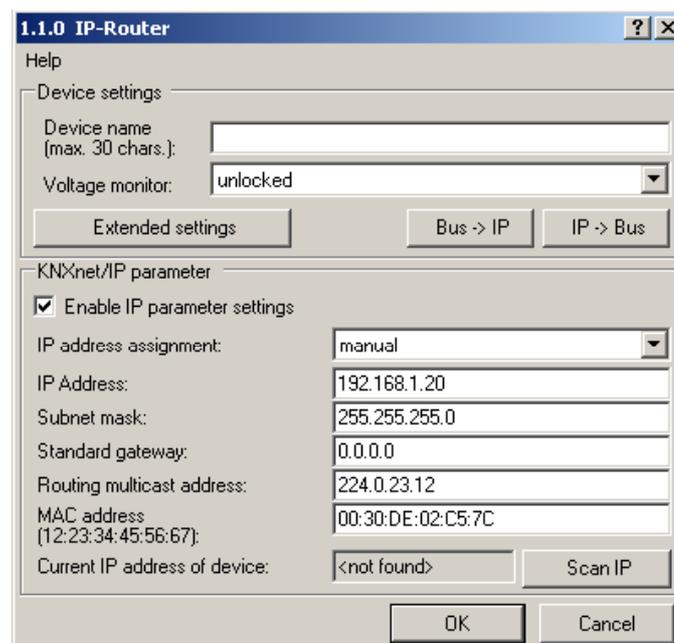


Fig. 10.: Settings of the IP router plug-in



NOTE:

The MAC address of the KNX IP Controller must be given in the "MAC Address" field. This address can be found on the backside of the controller, as well as on a self-adhesive removable label on the side of the controller.

3. Programming the physical address

Load the settings made in Point 2 via ETS3 download to the KNX IP Controller. Highlight the IP router with the physical address 1.1.0 in the Topology window and select the **PROGRAM...** menu item in the context menu (Fig. 11).

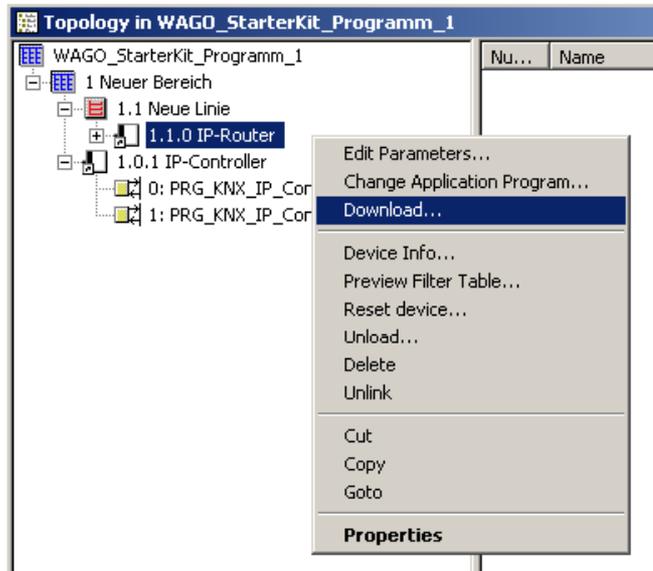


Fig. 11.: Starting the ETS download

Press the **PROG. PHYS. ADDR. & APPL.** in the "Program" window (Fig. 12).

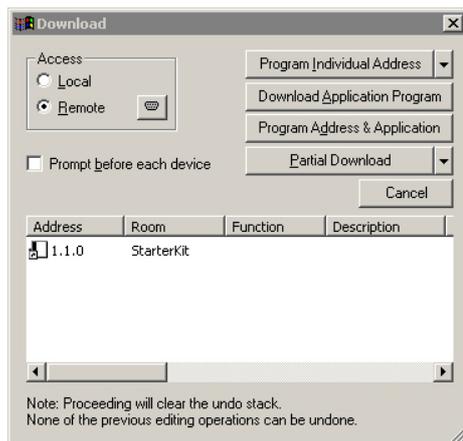


Fig. 12.: Starting the ETS download

4. Pressing the programming button

The ETS software will prompt you to press the programming button of the selected device. On the WAGO KNX IP Controller, press the programming pushbutton with the "PRG RT" label (see Fig. 1).

5. Loading the application program

After the controller has started again (I/O LED on the controller lights up green), press the **APPLICATION PROGRAM** button in the "Program" window (Fig. 12).. The ETS3 then begins loading the application program.

6. Resetting

After the download is completed, reset the controller (e.g. by temporarily disconnecting the 24V power supply).

7. Testing the connection

To test the connection, open the DOS shell by entering "cmd" under **Start \ Run** (Fig. 13).

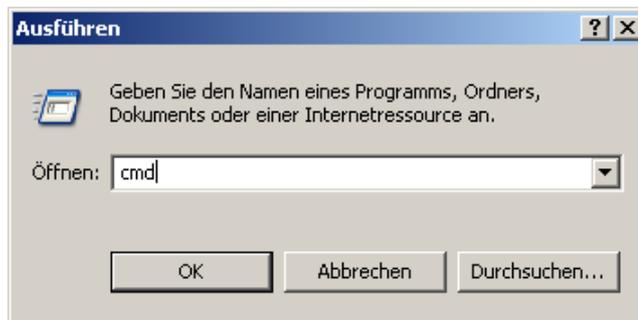


Fig. 13.: Opening the DOS shell

Enter the "ping" command and the IP address of the controller. A proper connection is illustrated in Figure 14.

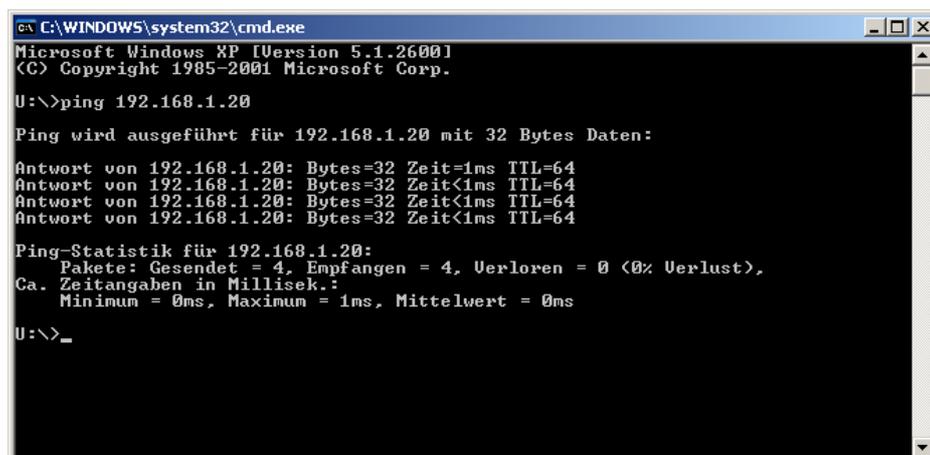


Fig. 14.: Testing the connection to the 750-849 Controller

8. Many settings can be viewed and edited using **WebBasedManagement** (WBM). To do this, launch your web browser and enter <http://> in the address line, followed by the IP address of the node (e.g.: <http://192.168.1.20>).

The integrated web server then returns the following website.

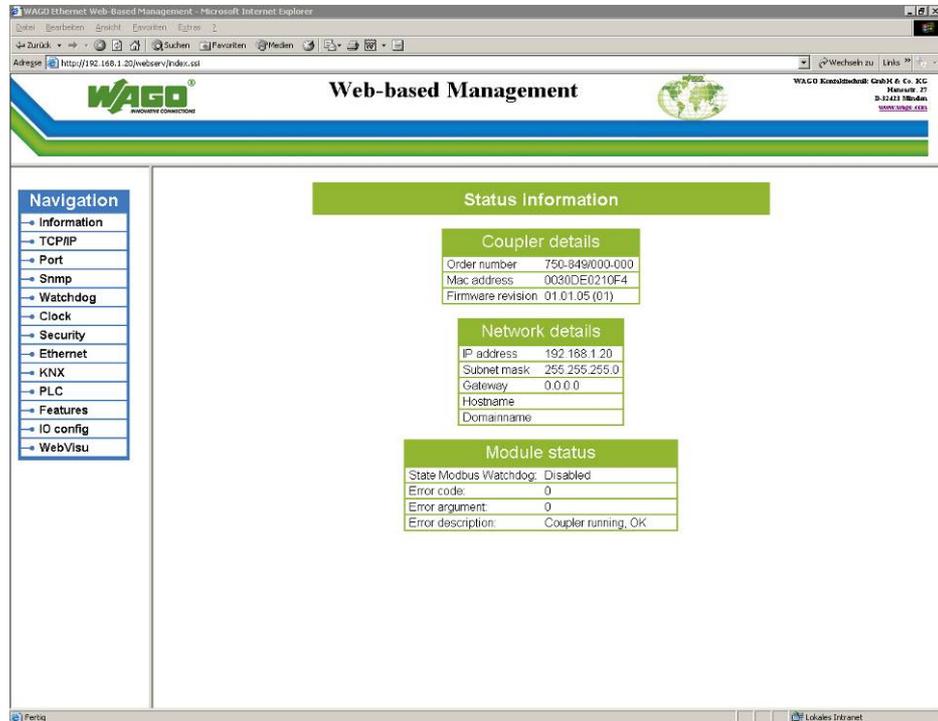


Fig. 15.: Homepage of the web server integrated in the 750-849 Controller

The configuration sites linked via Hyperlinks require a login. In the default state the following users are defined:

User	Password
admin	wago
user	user
guest	guest

Fig. 16.: Users and passwords of the 750-849 Controller's web server



NOTE:

The IP address for the controller can alternatively be assigned with the "WAGO Ethernet Settings" software instead of with the WAGO ETS3 Plug-in.

3 Application Example: KNX IP Router and Controller

Application as KNX IP router and KNX IP controller.

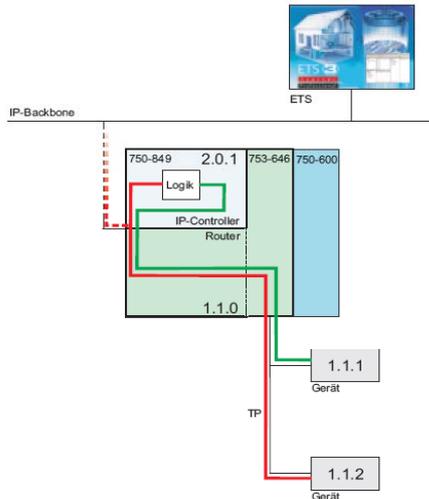


Fig. 17.: Structural concept of the KNX IP router and KNX IP controller

Requirement: The WAGO I/O PRO CAA software (CoDeSys) must be correctly installed and the KNX-specific libraries must be in the library directory of the WAGO I/O PRO CAA software.

Double-click to start the "WAGO_KNX_StarterKit_02_Programm_1.pro" application program from the *C:\Programs\WAGO Software\CoDeSys V2.3\Projects* directory.

3.1 Hardware Configuration

The variables for the digital inputs and outputs are declared in the PLC configuration (Fig. 18).

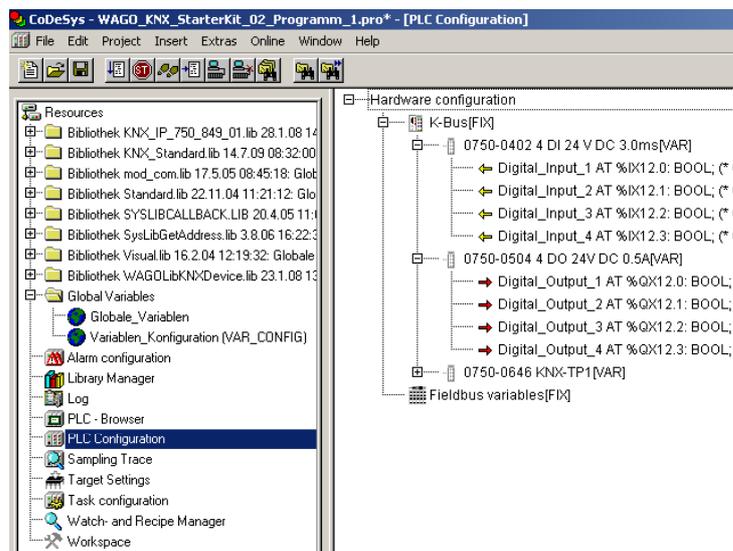


Fig. 18.: Hardware configuration

3.2 Main Program

Figure 19 shows the main program "PLC_PRG". In the main program, the "PRG_KNX_IP_Controller" subprogram is started.

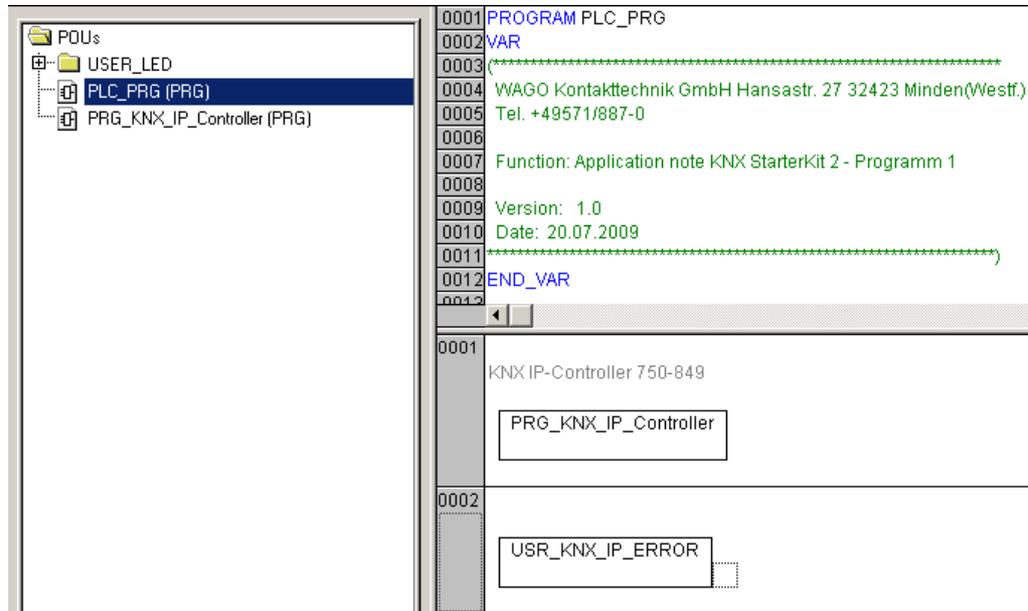


Fig. 19.: View of the main program

3.3 Subprogram "PRG_KNX_IP_Controller"

The "FbKNX_Master_849" module in network 1 (Fig. 20) serves to communicate status information between the IEC application and the KNX IP Fieldbus. The module is absolutely necessary to achieve a data exchange between the IEC application and the KNX IP Fieldbus. This module may only be called up once per KNX IP Controller.

It is critical that the instance of the "FbKNX_Master_849" and all other KNX modules of the IP Controller are combined with the input and output variables "typKNX_IP_Controller".

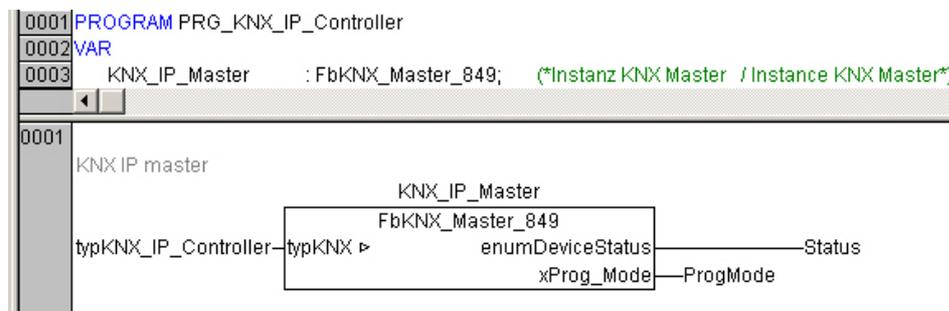


Fig. 20.: KNX IP Master program call

In networks 2 and 3 (Fig. 21), special KNX modules are called up from the linked KNX libraries. These module instances are displayed later in the WAGO ETS3 plug-in as so-called network variables. By combining the network variables with group addresses, KNX communication objects are created for the IP Controller (phys. addr. 1.0.1).

In network 2, the "Digital_Input_1" is connected with a module of the DPT_switch data type. That means that the signal of the first digital input should be sent to the bus as a 1-bit telegram. In network 3, the same module is called up except the bus receives the 1-bit telegram to control the first digital output "Digital_Output_1".

The "typKNX_IP_Controller" variable establishes the connection to the FbKNXMaster_849. The variable with the "typDPT_Dummy" designation has no functional significance in the example application. It gives the user the option of permanently saving the data received by the bus. The values received (e.g., setpoint value specifications) are retained even in the case of a power failure. If the function is not required, all KNX modules can be linked to the same "typDPT_Dummy" variables.

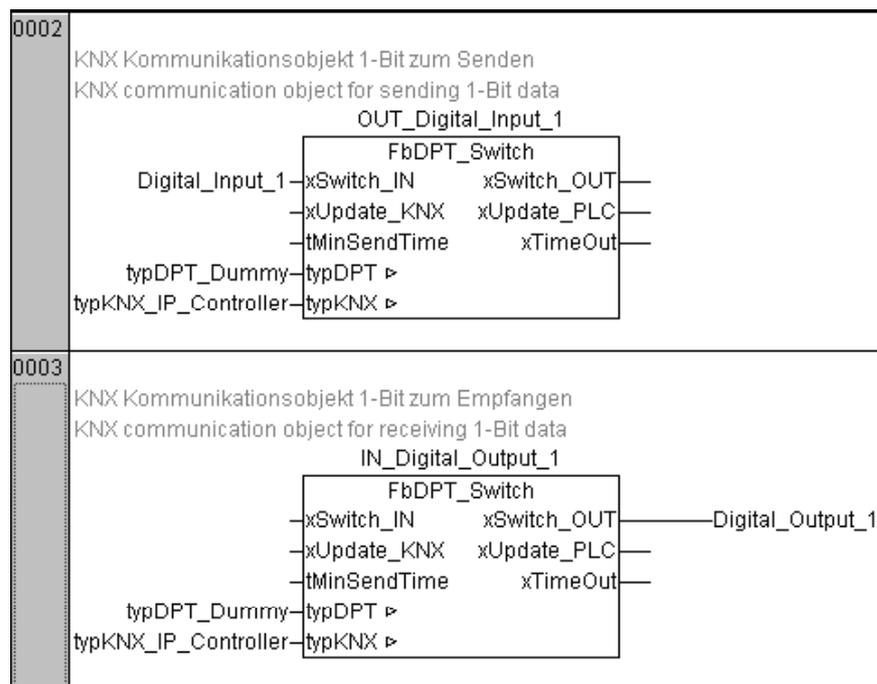


Fig. 21.: Program call of the KNX DPT modules

**NOTE:**

In order to better recognize later the data channel of the communication objects in the WAGO ETS3 Plug-in or in the ETS software, we recommend using the following syntax with regards to the instance names of the DPT modules:

1. Data direction KNX bus ==> IEC application

Input = **IN...**

2. Data direction IEC application ==> KNX bus

Output = **OUT...**

3.4 Configuring the Symbol File

The WAGO ETS3 Plug-in requires the so-called symbol file for importing the KNX DPT variables from the IEC application program. All the necessary information for being able to form an assignment between the names of the PLC variables and the associated memory address is located in this file. An adjustment in the **Project \ Options \ Symbol configuration** menu is necessary for the variables to be written to the symbol file when compiling the PLC program (Fig. 22).

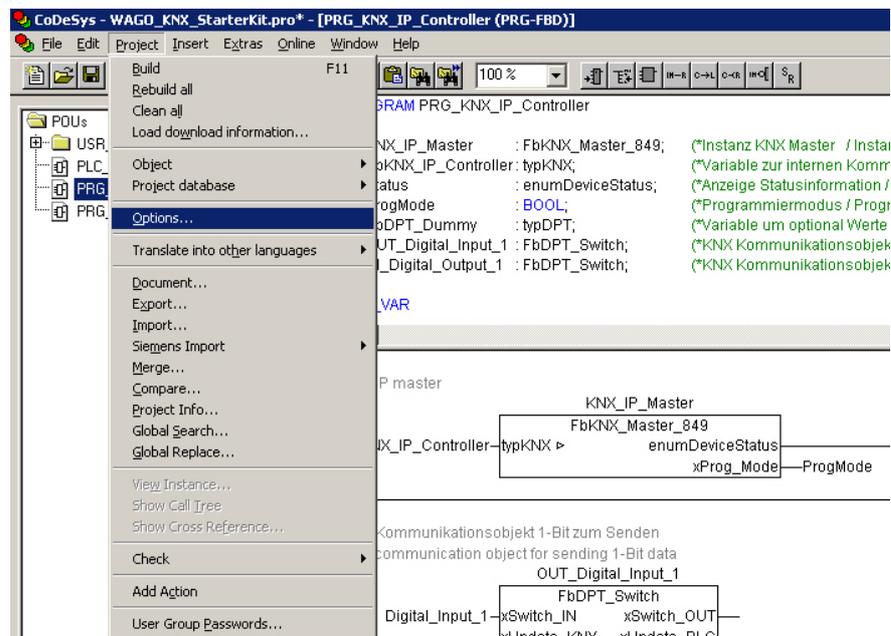


Fig. 22.: Opening the symbol configuration in *Project/Options*

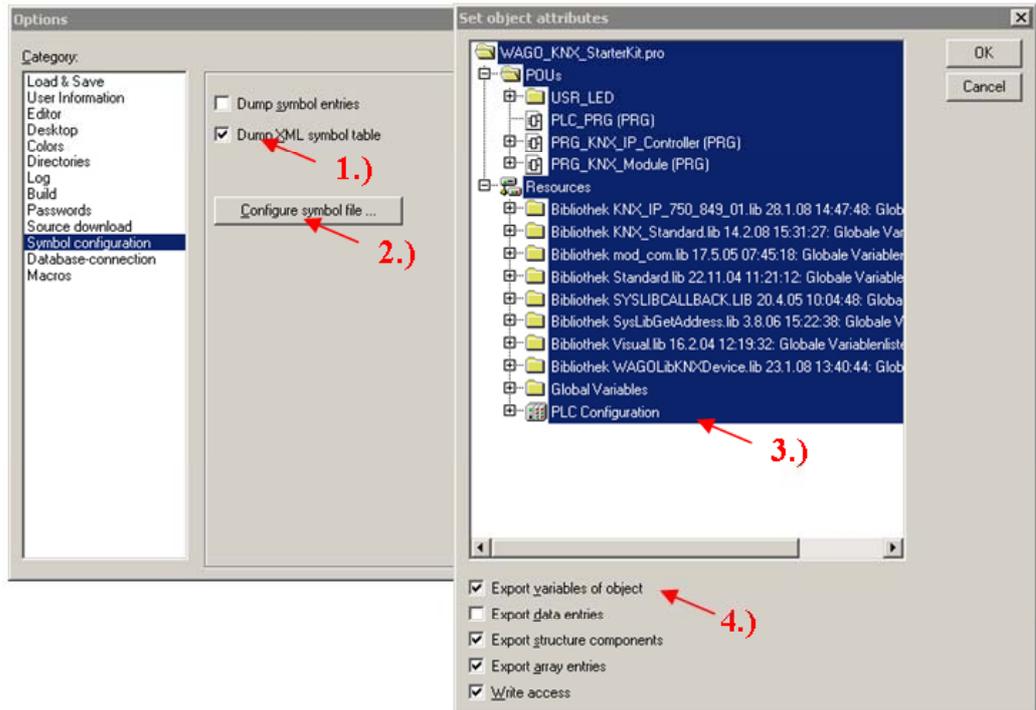


Fig. 23.: Symbol configuration settings

1. The **CREATE XML SYMBOL TABLE** option must be enabled (Fig. 23). After compiling the program, an XML symbol file is then created in the project directory and is given the name <projectname>.SYM_XML.
2. Click on **CONFIGURE SYMBOL FILE** with the left mouse button.
3. If necessary, select the variables depicted in the tree structure for which symbol entries should be generated. To do this, you can either mark project modules, as a result of which the associated variables will be selected, or you can specifically mark individual variables. As a default setting, we recommend that you mark all project building blocks.
4. Select the **OUTPUT VARIABLES OF OBJECT** entry with the left mouse button. The variables of the selected object are output in the symbol file. NOTE: if the checkbox is displayed with a gray background, the check mark should be deactivated and newly activated.
5. Press **OK** to exit the window.

3.5 Activation of the USR LED

The KNX IP Fieldbus Controller 750-849 features an LED with the designation "USR" (see Fig. 1). This LED can be controlled via the user program. For the StarterKit, this LED is used to display the following conditions

RED

The application program is not running because it is in STOP mode.

GREEN

The application program is running because it is in RUN mode.

RED FLASHING

The application program is running, but communication between the IEC application and the KNX network is disrupted. An adjustment of the SYM_XML file in the WAGO ETS3 Plug-in is presumably necessary.



NOTE

The program in the "USR_LED" folder and network 2 in the "PLC_PRG" main program will not be further discussed in this case, since they are not directly associated with KNX functionality.

3.6 Downloading the Program to the 750-849 Controller

1. Setting up the communication driver

Click the **NEW** button in the **Online \ Communication parameters** window to create a new communication channel. In the parameter window, select the device "Tcp/Ip (3S Tcp/Ip driver)" and click **OK** to confirm.

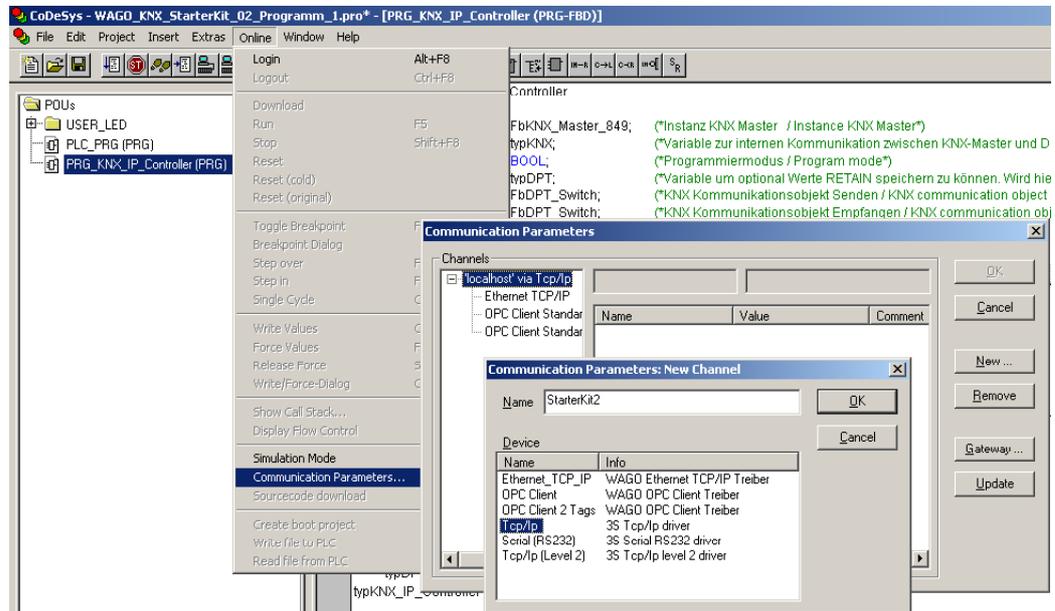


Fig. 24.: Creating a new communication channel

- Under "Address", enter the IP address of your KNX Controller (e.g. 192.168.1.20). As port, enter 2455. When exiting the window, make sure that the entry has been applied.

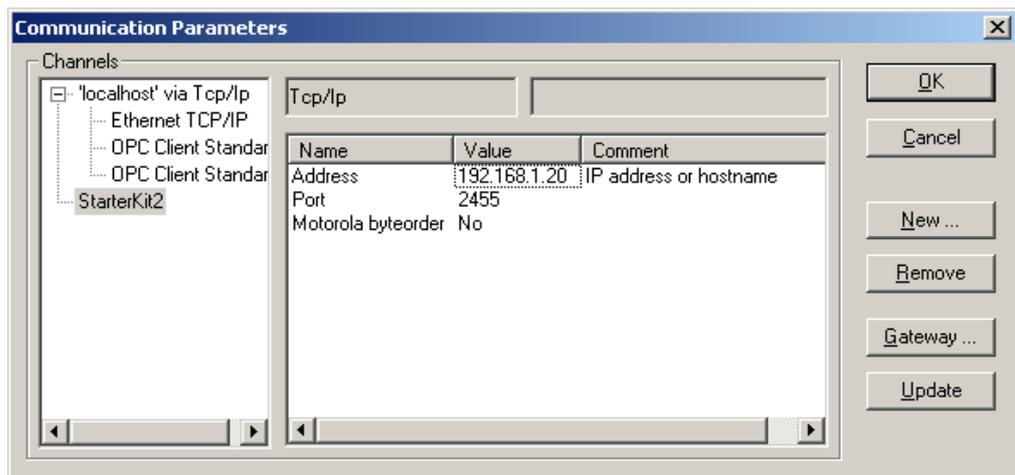


Fig. 25.: Creating a new communication channel

3. Loading the program

Transfer the program via **Online \ Log in**.

4. Starting the program

Start the program via **Online \ Start**.

5. Creating a boot project

A so-called boot project must be created so that the application program starts up automatically after a reset. Load the boot project into the controller via **Online \ Create boot project**.

3.7 ETS3 Configuration

3.7.1 Configuration Router

For the WAGO StarterKit example application, the router should be set to "forward". This means that all message frames will be forwarded, regardless of the entries in the filter table.

NOTE



If the controller is permanently operated in a system, filter tables should be set up and the settings in the router adjusted to reduce the network load due to message traffic in the line segments.

1. Selecting a device

Highlight the IP router with the physical address 1.1.0 in the Topology window and select the **EDIT PARAMETERS...** menu item via the context menu.

2. Setting up the configuration

Click **BUS => IP** or **IP => BUS**, to set up the configuration. Fig. 26 shows the configuration of the router.

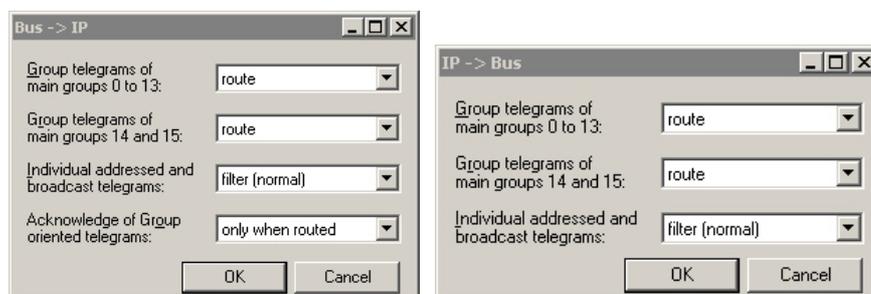


Fig. 26.: Configuration, router setup

3. Programming the application

Load the settings created under Point 2 into the KNX IP Controller via ETS3 Download. Highlight the IP router with the physical address 1.1.0 in the Topology window and select the **PROGRAM...** menu item via the context menu.

In the "Program" window, press the **APPLICATION PROGRAM** button

3.7.2 Configuration of the IP Controller

1. Selecting a device

Highlight the IP Controller with the physical address 1.0.1 in the Topology window and select the **EDIT PARAMETERS...** menu item via the context menu.

2. Adjustment of SYM_XML

Carry out an adjustment of the SYM_XML file. The file selection window opens via the menu **File \ Import SYM_XML file**. In the *C:\Programs\WAGO Software\CoDeSys V2.3\Projects* directory, select the "WAGO_KNX_StarterKit_02_Programm_1.SYM_XML" file.

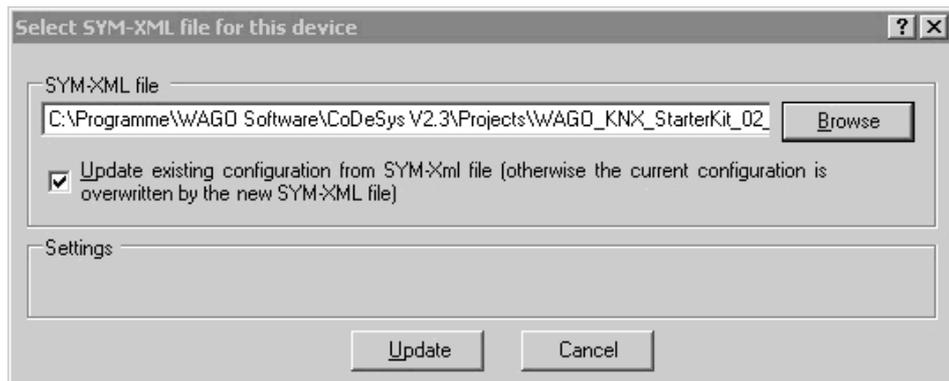


Fig. 27.: Selecting the SXM_XML file



NOTE:

When adjusting the SYM_XML file, the alarm message shown in Fig. 28 appears. The message indicates that binary files could not be found. These files are only needed when the IEC application program download should be carried out via the ETS3 Plug-in. This message is irrelevant for the StarterKit and can therefore be confirmed with **OK**.

If this function is desired, the **Online \ Create boot project** command must be executed in the WAGO I/O PRO CAA software. This command must be executed while offline (**not logged in!**). The binary files <Projectname..prg> and <Projectname..chk> are then created in the project directory.



Fig. 28.: Alarm message when adjusting/importing the symbol file

3. Testing or creating the group address assignments

In the StarterKit's example application, the IP controller exhibits two assignments to group addresses. The following assignment is configured:

Digital input 1 ==> 1/1/1 (send data channel)

Digital output 1 <==1/1/3 (receive data channel)

New assignments can be added at any time. Fig. 29 shows a section of the project documentation (**FILE \ PRINT PREVIEW \ BASED ON GROUP ADDRESSES**) of the WAGO ETS3 Plug-in. Then close the plug-in.

Gruppenadressen:

1. 1/1/1 WAGO_Digital Input 1
 1. PRG_KNX_IP_Controller.OUT_Digital_Input_1
2. 1/1/3 WAGO_Digital Output 1
 1. PRG_KNX_IP_Controller.IN_Digital_Output_1

Fig. 29.: Group address assignment, IP controller

4. Programming the physical address

Load the settings made via ETS3 download to the KNX IP Controller. Highlight the IP controller with the physical address 1.0.1 in the Topology window and selection the **PROGRAM...** menu item in the context menu. Press the **PROGRAM PHYS. ADDR.** button in the "Program" window.

5. Pressing the programming button

The ETS software will prompt you to press the programming button of the selected device. On the WAGO KNX IP Controller, press the programming pushbutton with the "PRG IP" label (see Fig. 1). The ETS3 then begins loading the physical address.

6. Programming the application

Press the **APPLICATION PROGRAM** button in the "Program" window. The ETS3 then begins loading the application program.

3.7.3 Testng with the ETS 3 Group Monitor

The ETS3 group monitor is used to check the configurations or programming in the above mentioned section. To test the application, proceed step by step as follows:

1. Starting the ETS3 group monitor

Start the group monitor via the **Diagnose \ Group message frames** menu

2. Receive value

Connect digital input 1 (yellow terminal, top left) to a +24V DC voltage signal. The telegrams of the group addresses 1/1/1 should appear as a response in the "GroupMonitor" window.

3. Send value

Click the **READ/SEND** button in the "GroupMonitor" window. Enter the group address 1/1/3 in the window (Fig. 30) and write an "On" or "Off" value. The status of the first digital output (red module) should be affected.

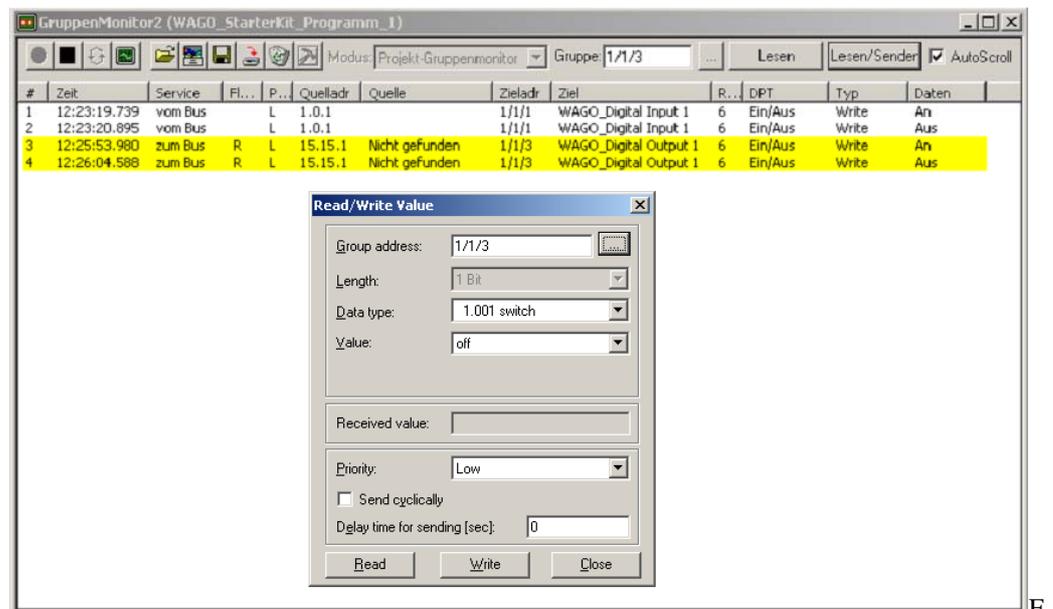


Fig. 30.:ETS3 group monitor

4 Application Example: Application Controller TP1

In the first application example, the first connected KNX/EIB/TP module 753-646 worked on the controller in Router mode. The user can also use the user-programmable KNX IP Controller. However, if there is a line coupling unit in the KNX TP1 network already, the device mode of the KNX/EIB/TP module must be used to prevent conflicts between the physical addresses. The user then has a user-programmable application controller with TP1 bus interface.

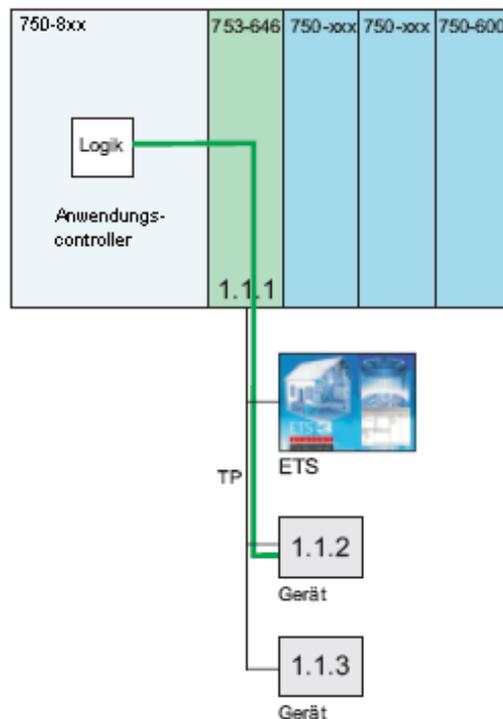


Fig. 31.: Structural concept of the KNX application controller

The Device mode of the KNX/EIB/TP1 module must be enabled in the WebBasedManagement of the controller as described below. However, start-up is only possible from the KNX TP1 network via a standard interface (serial or USB).

4.1 Configuration of the Controller with KNX/EIB/TP1 Module

1. Configuration of the KNX Controller in WebBasedManagement

Launch your web browser and enter <http://> in the address line, followed by the IP address of the node (e.g.: <http://192.168.1.20>).

The integrated web server then returns the following website.

The screenshot shows the WAGO Web-based Management interface. The navigation menu on the left includes: Information, Ethernet, TCP/IP, Port, SNMP, Watchdog, Clock, Security, KNX, PLC, Features, IO config, and WebVisu. The main content area displays the following information:

Status information	
Coupler details	
Order number	750-849/000-000
Mac address	0030DE0272BA
Firmware revision	01.01.26 (03)
Network details	
IP address	192.168.1.20
Subnet mask	255.255.255.0
Gateway	0.0.0.0
Hostname	
Domainname	
Module status	
State Modbus Watchdog:	Disabled
Error code:	0
Error argument:	0
Error description:	Coupler running, OK

Fig. 32.: Web-Based Management

- In the Navigation menu to the left, select "KNX". After logging in (factory settings: user: admin, password: wago), the following menu appears.

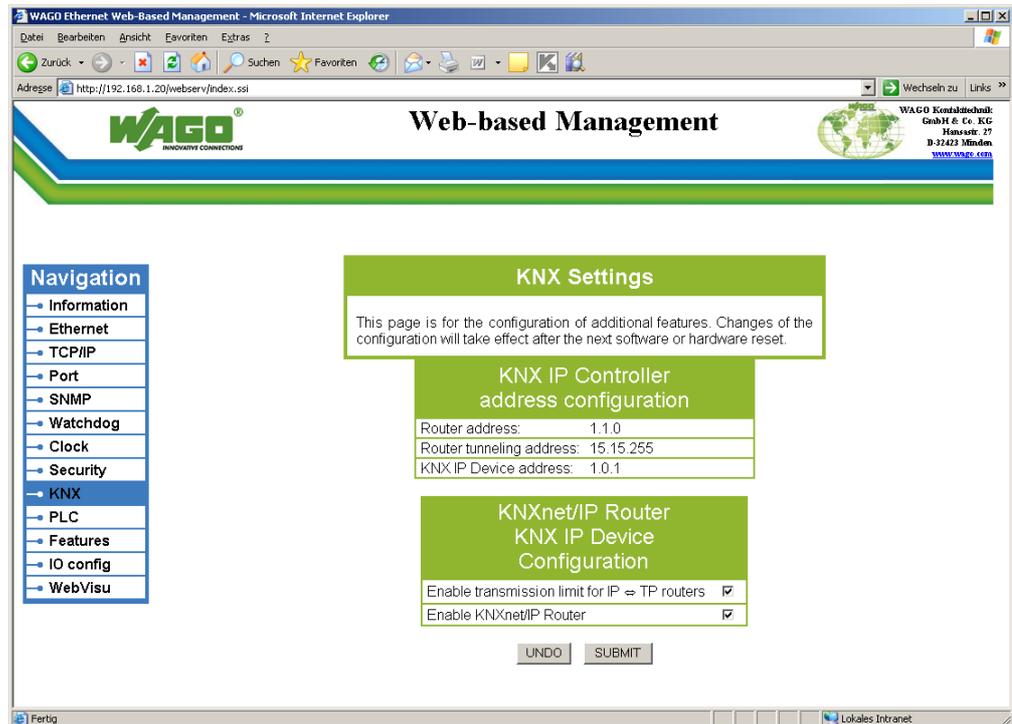


Fig. 33.: Web-Based Management

3. Remove the check mark behind "Enable KNXnet/IP Router" and click **SUBMIT** to confirm the change.
4. Reset the controller by briefly interrupting the power supply. After the controller has rebooted, the connected KNX/EIB/TP1 module can be addressed like a TP1 bus node. The controller can then be put into a new or existing KNX line like a TP1 bus node with a physical address (e.g., 1.1.1).
5. Double-click to start the "WAGO_KNX_StarterKit_2_Programm_2.pro" application program from the *C:\Programs\WAGO Software\CoDeSys V2.3\Projects* directory.

4.2 Main Program

Figure 34 shows the main program "PLC_PRG". In the main program, the "PRG_KNX_Module" subprogram is started.

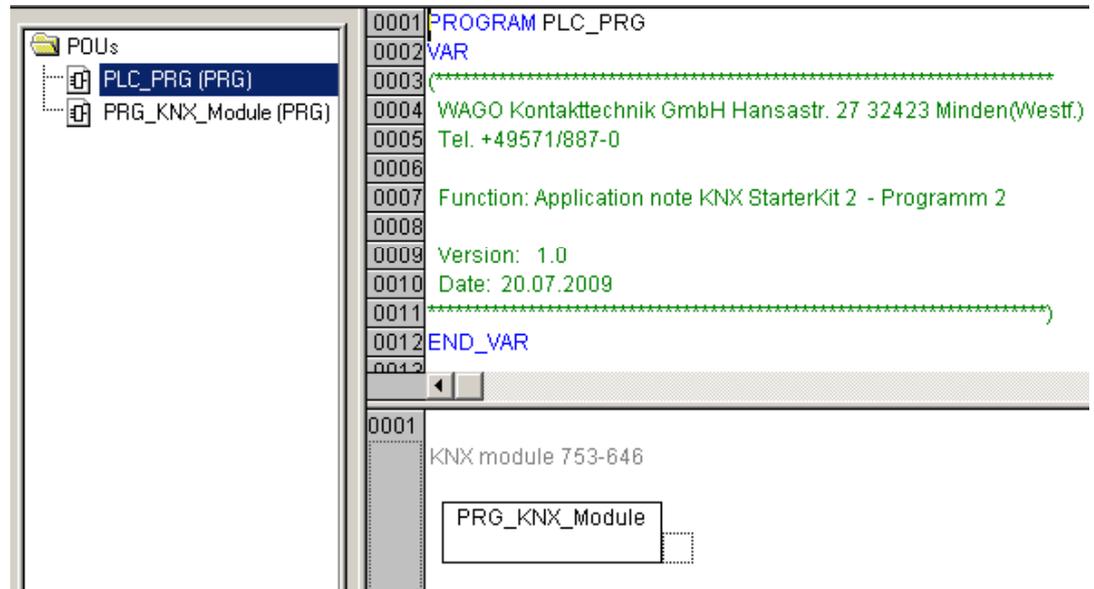


Fig. 34.: View of the main program

4.3 Subprogram "PRG_KNX_Module"

The "FbKNX_Master_646" module in network 1 (Fig. 35) includes all existing commands of the modules that are combined with the "typKNX_Module" variables and provides for their execution. In addition, the master module uses this variable to direct the KNX receive data to the DPT module with the appropriate destination address. This module may only be called up once per installed KNX Module 753-646.

At the "bModule_753_646" input point, the index of the inserted KNX Module 753-646 is entered. Counting is done from left to right.

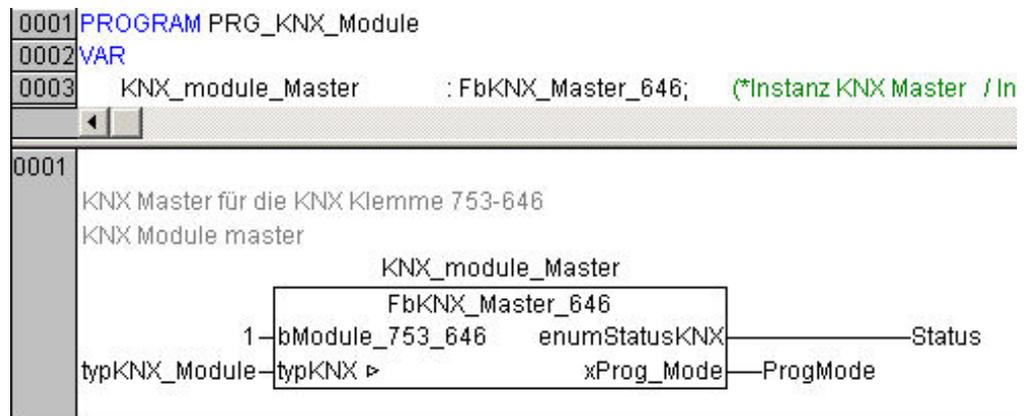


Fig. 35.: KNX Master 646 program call

In this example, the first KNX Module should be used to communicate. It is critical that the instance of the "FbKNX_Master_646" and all other KNX modules of the IP Controller are combined with the input and output variables "typKNX_Module".

In networks 2 and 3 (Fig. 36), special KNX modules are called up from the linked KNX libraries. These module instances are displayed later in the WAGO ETS3 plug-in as so-called network variables. By combining the network variables with group addresses, KNX communication objects are created for the KNX/EIB/TP1 Module 646 in the ETS3.

In network 2, the "Digital_Input_2" is connected with a module of the DPT_switch data type. That means that the signal of the second digital input should be sent to the bus as a 1-bit telegram. In network 3, the same module is called up except the bus receives the 1-bit telegram to control the second digital output "Digital_Output_2". The "typKNX_Module" variable establishes the connection to the FbKNXMaster_646.

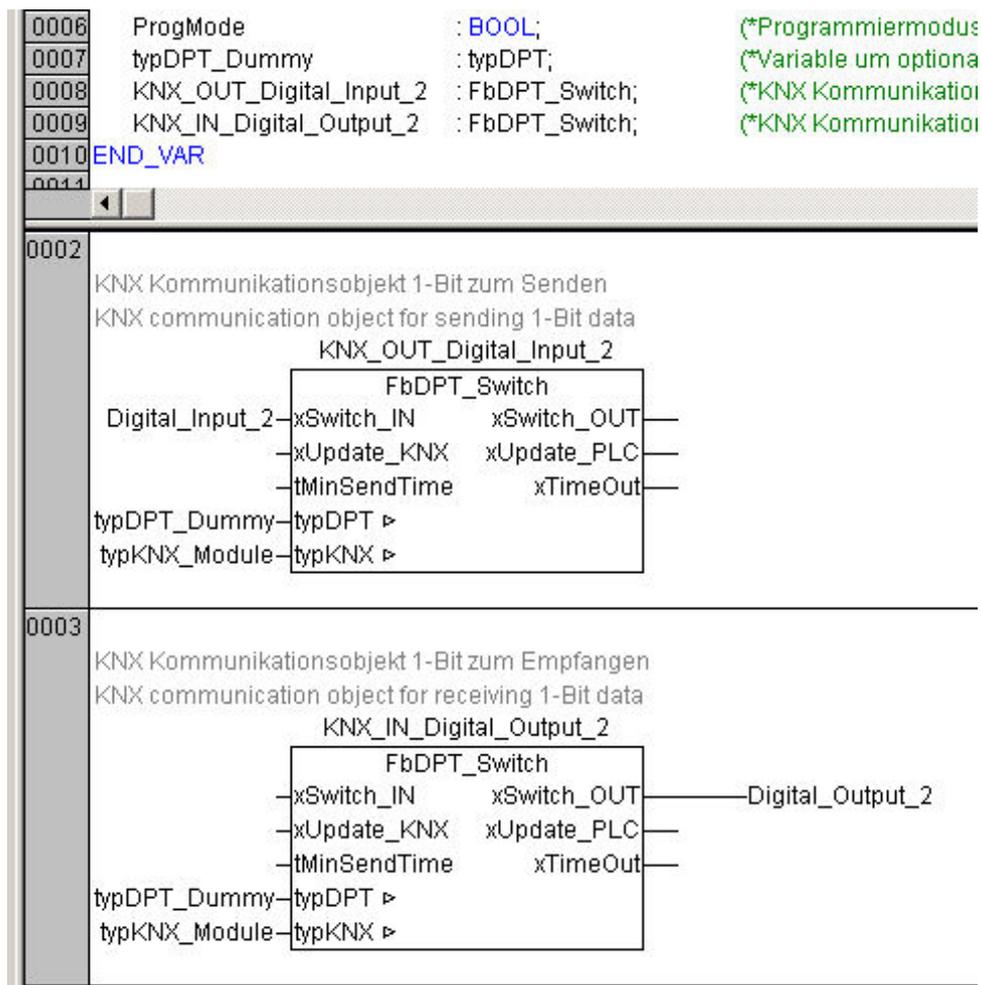


Fig. 36.: Program call of the KNX DPT modules

The variable with the "typDPT_Dummy" designation has no functional significance in the example application. It gives the user the option of permanently saving the data received by the bus. The values received (e.g., setpoint value specifications) are retained even in the case of a power failure. If the function is not required, all KNX modules can be linked to the same "typDPT_Dummy" variables.

4.4 Configuring the Symbol File

The WAGO ETS3 Plug-in requires the so-called symbol file for importing the KNX DPT variables from the IEC application program. All the necessary information for being able to form an assignment between the names of the PLC variables and the associated memory address is located in this file. This is described in detail in Section 2.5.4 (Configuration of the Symbol File).

4.5 Downloading the Program to the 750-849 Controller

- **Setting up communication drivers**
Use the same settings as under Sec. 2.5.6
- **Loading the program**
Transfer the program via **Online \ Log in**.
- **Starting the program**
Start the program via **Online \ Start**.
- **Creating a boot project**
A so-called boot project must be created so that the application program starts up automatically after a reset. Load the boot project into the controller via **Online \ Create boot project**.

4.6 ETS3 Configuration

4.6.1 Configuration of the KNX/EIB/TP1 Module

1. Starting ETS3

Start the ETS3 software via your PC's start menu:
"Start \ Programs \ ETS \ ETS3 Professional

2. Selecting the project database

After restarting the ETS3 software, the "**Open database**" window appears (see Fig. 6). Select the file "WAGO_StarterKit2.db" and exit the window via the **OPEN** button.

3. Opening ETS 3 program 2

If a project is open after starting the ETS3, please close it via **FILE\CLOSE PROJECT**. Then open "WAGO_StarterKit_Programm_2" under **FILE\OPEN PROJECT/MANAGE**.

4. Selecting the device

Highlight the TP1 Module with the physical address 1.1.1 in the Topology window and select the **EDIT PARAMETERS...** menu item via the context menu.

5. Adjustment of SYM_XML

Carry out an adjustment of the SYM_XML file. The file selection window opens via the menu **File \ Import SYM_XML file**. In the *C:\Programs\WAGO Software\CoDeSys V2.3\Projects* directory, select the "WAGO_KNX_StarterKit_02_Programm_2.SYM_XML" file.

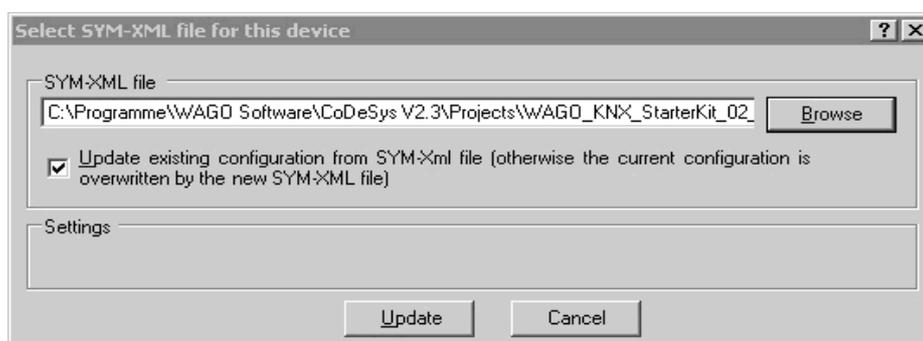


Fig. 37.: Selecting the SXM_XML file

6. Testing or creating the group address assignments

In the StartKit2's example application, the controller exhibits two assignments to group addresses. The following assignment is configured:

Digital input 2 ==> 1/1/2 (send data channel)

Digital output 2 <==1/1/4 (receive data channel)

New assignments can be added at any time. Fig. 38 shows a section of the project documentation (**FILE \ PRINT PREVIEW \ BASED ON GROUP ADDRESSES**) of the WAGO ETS3 Plug-in. Then close the plug-in.

Gruppenadressen:

1. 1/1/2 WAGO_Digital Input 2
 1. PRG_KNX_IP_module.KNX2_OUT_Digital_Input_2
2. 1/1/4 WAGO_Digital Output 2
 1. PRG_KNX_IP_module.KNX2_IN_Digital_Output_2

Fig. 38.: Group address assignment, TP1 Module

7. Adding the interface

To program the KNX/EIB/TP1 Module in this mode, a KNX interface is required (USB or RS232). Please add the interface to the setup available to you and set up the interface in the ETS3 for bus access. A KNX power supply is also required in this structure.

8. Programming the physical address and application

Load the settings made via ETS3 download to the KNX/EIB/TP1 Module. Highlight the TP1 Module with the physical address 1.1.1 in the Topology window and select the **PROGRAM...** menu item in the context menu. In the "Program" window, press the **PROG. PHYS. ADDR. & APPL.** button.

9. Pressing the programming button

The ETS software prompts you to press the programming button of the selected device. Use a jumper to briefly bridge both connecting terminals above the red bus connecting terminal (Fig. 39). The LED B lights up red to display the programming mode. The ETS3 then begins loading the physical address and the application program. LED D blinks yellow to indicate data transfer to the KNX bus.

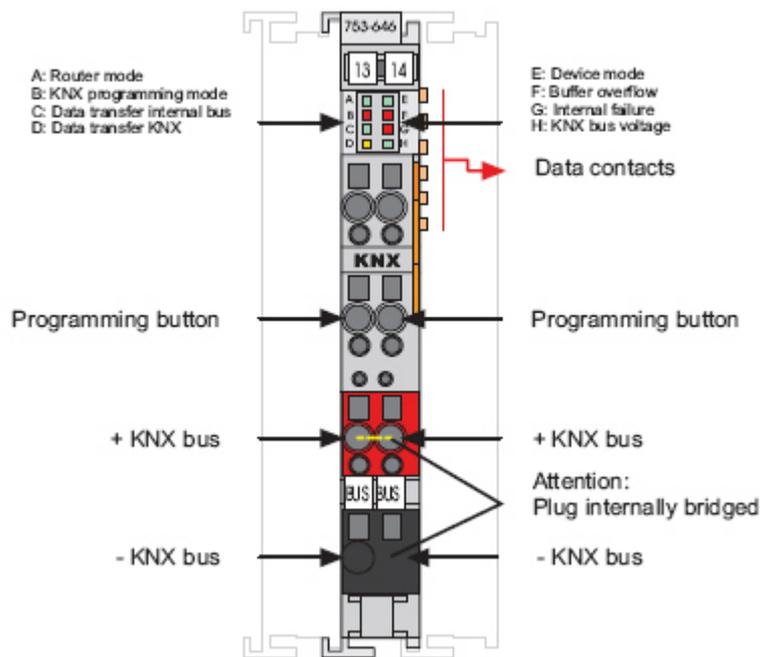


Fig. 39.: Status messages, programming key and TP1 Module connection

10. Testing

After the download is completed, LED E and LED H (Fig. 39) should light up green. This indicates that the module is working in Device mode and the KNX-TP1 bus voltage is on. If not the case, please see refer to the Troubleshooting section.

4.6.2 Testing the Application with the ETS3 Group Monitor

The ETS3 group monitor is used to check the configurations/programming in the above mentioned section. To test the application, proceed step by step as follows:

1. Starting the ETS3 group monitor

Start the group monitor via the **Diagnose \ Group message frames** menu

2. Send value

Click the **READ/SEND** button in the "GroupMonitor" window. Enter the group address 1/1/4 in the window (Fig. 40) and write an "On/Off" value. The status of the second digital output (red module) should be affected.

6. Receive value

Connect digital input 2 (yellow terminal, top right) to a +24V DC voltage signal. The telegrams of the group addresses 1/1/2 should appear as a response in the "GroupMonitor" window.

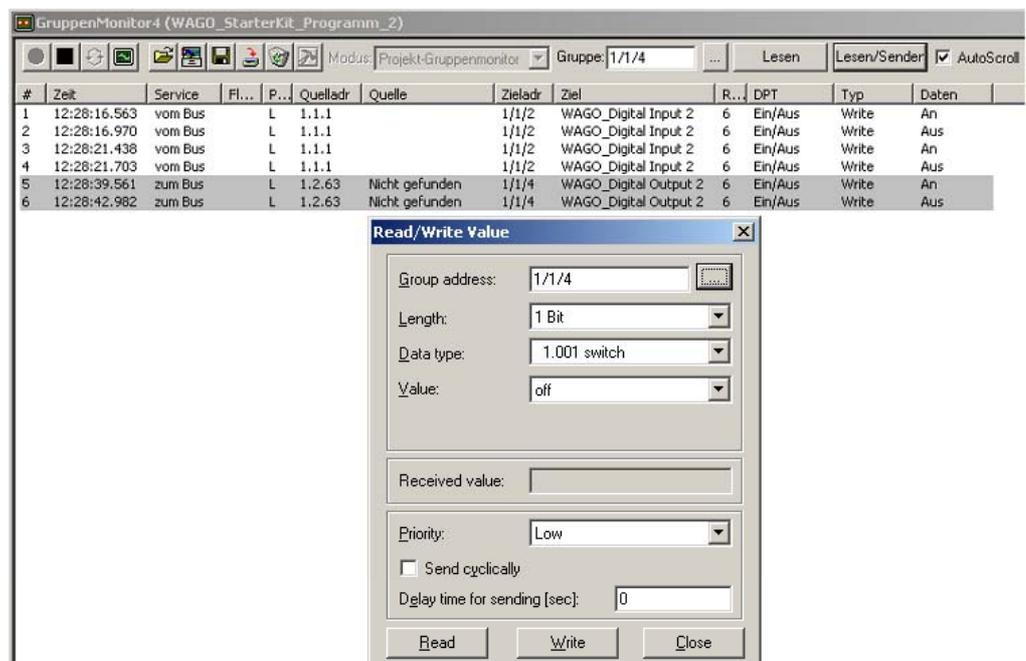
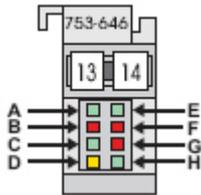


Fig. 40.:ETS3 Group monitor

5 Troubleshooting

5.1 Module 753-646 returns checksum error (LED G is red)

Problem



LED G on Module 753-646 **lights up red** and LED E is flashing. No communication with KNX network possible. The IEC module "FbKNX_Master_646" returns the status `KNX_NO_DEVICE_MODUS`.

Possible causes

1. In the IEC application, KNX modules are declared that are not called up in the program.
2. PLC program has not been started.
3. ETS3 application has not been transferred.
4. The current SYM_XML file was not imported in the WAGO ETS3 Plug-in.
5. The symbol configuration in the CoDeSys project was configured incorrectly.

Solution

1. Check whether all KNX modules are called up cyclically in the IEC application. Select the **UNUSED VARIABLES** function in the **Project / Check CoDeSys** menu. The CoDeSys message window displays all variables not used in the program. Delete any KNX modules from the variable declaration if necessary. The IEC application must be launched again and an adjustment of the SYM_XML file carried out in the ETS3 Plug-in.
2. See Section 4.5
3. Check the programming status of the module in the ETS3 software (see ETS3 Help under Index, Programming status). Launch the application program again if necessary.
4. Carry out an adjustment of the SYM_XML file in the WAGO ETS3 Plug-in and then launch the application program.
5. See Section 3.4

5.2 The status message of the FbKNX_Master_849 Module returns the error "KNX_Appl_CRC_ERR"

Problem

See Section 5.1

Possible causes

See Section 5.1

UUUUUUUUUUUSolution

See Section 5.1

5.3 The status message of the FbKNX_Master_646 Module returns the error "KNX_NO_DEVICE_MODUS"

Problem

See Section 5.1

Possible causes

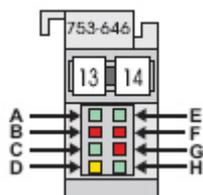
See Section 5.1

Solution

See Section 5.1

5.4 The status message of the FbKNX_Master_646 Module returns the error "KNX_POWER_FAILURE"

Problem



No communication with KNX network possible. The IEC module "FbKNX_Master_646" returns the status KNX_POWER_FAILURE. LED H on Module 753-646 is off.

Possible causes

No power supply for KNX Module 753-646

Solution

Make sure that Module 753-646 is connected to a KNX power supply.

5.5 No matching network variables in the SYM_XML file

Problem



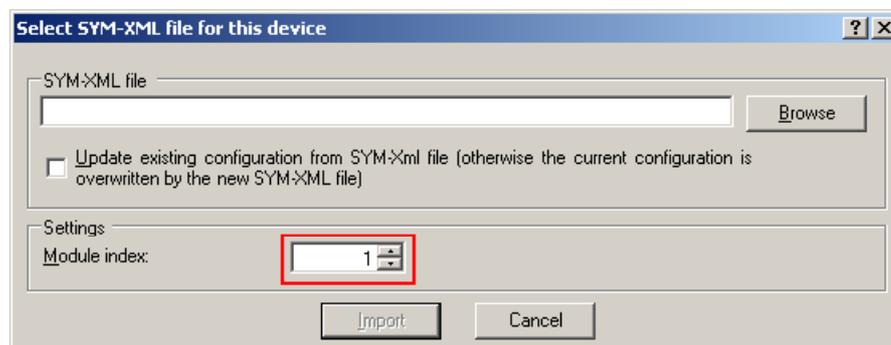
When importing the SYM_XML file in the WAGO ETS3 Plug-in, the error message appears that no matching network variables are available.

Possible causes

1. The symbol configuration is faulty.
2. When importing the SYM_XML file for Module 753-646, the wrong module index was specified or the DTP modules of the IEC application have an incorrect instance name.

Solution

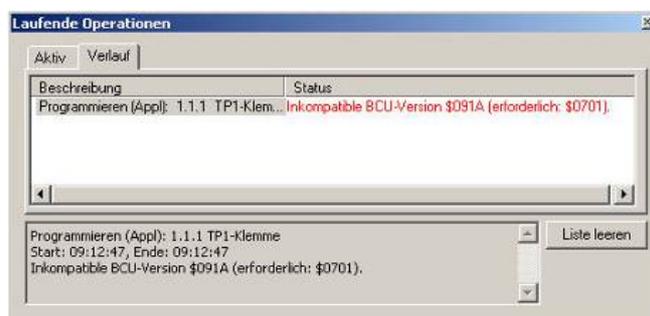
1. See Section 3.4
2. If more than one KNX Module 753-646 is used on a fieldbus controller, the instance names of the DPT modules must contain prefixes. This ensures that the module assignment of the DPT modules is recognizable in the SYM_XML file. The following syntax must be adhered to:
 no prefix ==> first module 753-646
 KNX2_XXX ==> second module 753-646
 KNX3_XXX ==> third module 753-646



5.6 Incompatible BCU Version \$091A

Problem

When attempting to program Module 753-646, the error message "Incompatible BCU Version \$091A (required: \$0701)" appears.



Possible causes

The KNX Module 753-646 is still configured to Router mode.

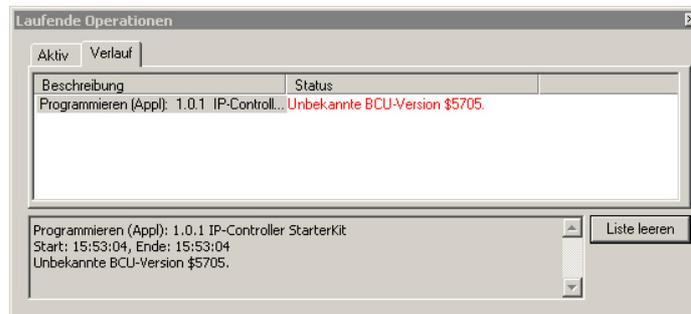
Solution

Check whether LED A is switch on to Module 753-646. If the LED is on, then please configured the module mode. Use Web-based Management of the controller to change the function of the module (see Section 4.1). Disable "KNXnet/IP Router".

5.7 Unknown BCU Version \$5705

Problem

When attempting to program KNX IP Controller 750-849, the error message "Unknown BCU Version \$5705" appears.



Possible causes

The ETS3 software does not recognize the BCU version because it was not previously imported.

Solution

BCU version \$5705 is integrated by importing the product database for the KNX IP Controller (see Section 2.3.4).



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