CHORUS

GEWISS

KNX/IP Router - from DIN rail

CE

KNX®

GW A9707

Technical Manual

Contents

1 Introduction

This manual explains the functions of the "**KNX/IP Router**" device (GWA9707), and how they are set and configured using the ETS (Engineering Tool Software) configuration software.

2 Application

The KNX/IP Router also makes it possible to forward KNX telegrams between different lines by using the LAN network (IP) as a backbone. The device also makes it possible to connect a PC to the KNX BUS via the IP network (for ETS programming, for example).
The Router is powered by the KNX BUS line.
The IP address can be obtained respectively from a DHCP server or be configured manually (ETS).
It has an 8 kbyte filter table and is able to buffer up to 150 telegrams.

2.1 COUPLER function

The KNX/IP Router acts as a line and/or area coupler; in both cases, the backbone is always formed by the LAN (IP) line.
The physical address assigned to the device determines when the device works as a line coupler and when it works as an area coupler: if the physical address is defined in the form *x.y.0* (where *x* and *y* may assume values between 1 and 15), the router acts as a line coupler; on the other hand, if the physical address is defined in the form *x.0.0* (where *x* may assume values between 1 and 15), the router acts as an area coupler.

If the device is used as a line coupler, there must be no other KNX/IP Router above it in the system type (e.g. figure 2.1). This means that, if the device has the physical address *1.1.0*, there cannot be another router with the address *1.0.0*.
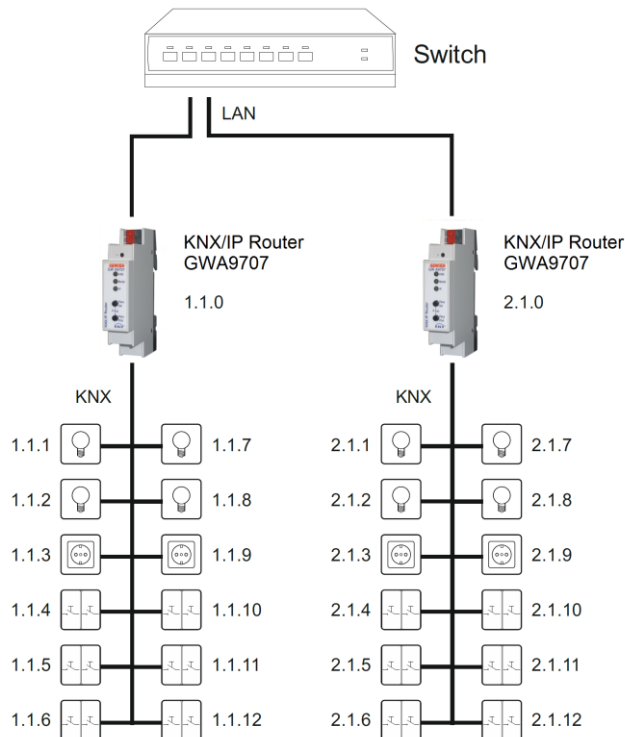
Fig 2.1: KNX/IP Routers as line couplers

If the device is used as an area coupler (**x.0.0**), there must be no other KNX/IP Router below it in the system type (e.g. figure 2.2). This means that, if the device has the physical address **1.0.0**, there cannot be another router with - for example - the address **1.1.0**.
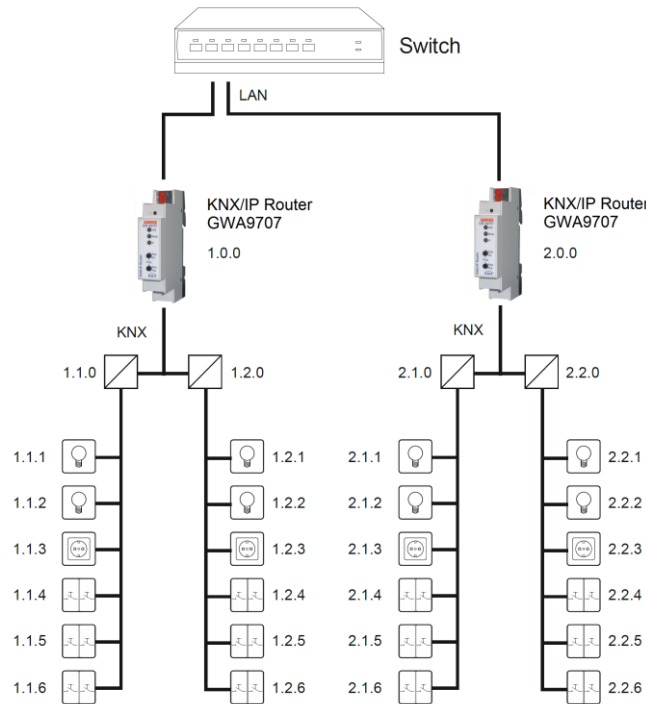
Fig 2.2: KNX/IP Routers as area couplers
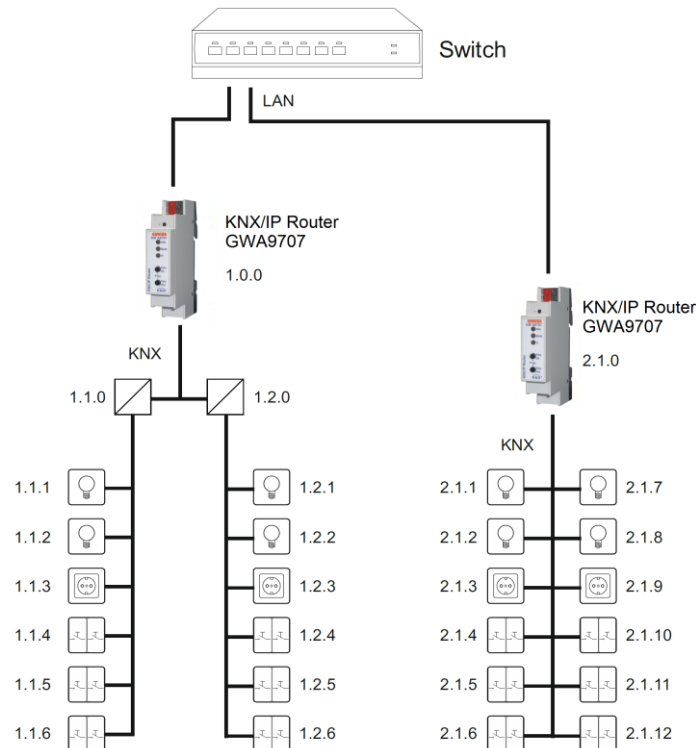
Fig 2.3: KNX/IP Routers as area coupler and line coupler

The KNX/IP Router has a filter table for reducing the traffic on the KNX BUS line; the filter table (8 kB) supports the extended group addresses, and is automatically generated by ETS.
Given the difference in data transmission frequency between Ethernet (10 Mbit/s) and KNX (9.6 kbit/s), more telegrams can be transmitted on IP. If several telegrams are sent on the same BUS line one after the other, they must be stored in the router buffer to make sure none of them is lost. The KNX/IP Router can store up to 150 telegrams (sent from the IP backbone to the KNX BUS line).

2.2 BUS ACCESS INTERFACE function

The KNX/IP Router can be used to access the KNX BUS from any point of the LAN network; for this reason, it requires a second address (network address), as described in the Interface settings with ETS menu.

⚠️ **ATTENTION!** Remote access via NAT, without additional security measures, poses significant dangers. Port forwarding provides universal access to your local IP network and to your KNX system. Any Internet user can discover the open port on your static public IP address and can, for example, access your KNX network via the ETS software.

Use NAT only temporarily for testing or diagnostic purposes. Afterwards, close the port again to avoid cyber attacks.

If remote access is realized through NAT, it is highly recommended that you do not specify the default port 3671 towards the Internet. Port 3671 is the official port for efcp - eFieldControl (EIBnet) registered by KNX Association. This port can easily be easily determined by unauthorized people. Please use a port in the non-reserved range between port 50000 and port 60000.

Permanent remote access should be established only when protected! Remote access via Virtual Private Network (VPN) is recommended. The VPN feature is already integrated into most DSL routers.

Setting a password for the ETS project can also help prevent malicious manipulation of devices.

To always guarantee the correct level of security in KNX installations, consult the KNX-Security-Checklist-en.pdf.

3 Installation and connection

Command and display elements:
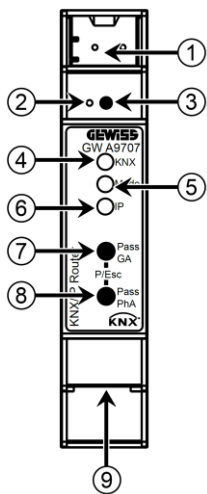
1. KNX BUS terminals
2. LED for programming physical address
3. Button key for programming physical address
4. KNX line status LED
5. Device operating mode status LED (Mode)
6. IP line status LED
7. Push-button for manually activating the forwarding of telegrams with a group address (Pass GA)
8. Push-button for manually activating the forwarding of telegrams with a physical address (Pass PhA)
9. LAN RJ-45 socket-outlet for the Ethernet connection.

The router is powered by the KNX BUS line. No auxiliary power supply is needed.

ATTENTION: the device cannot work in the event of a KNX BUS voltage failure.

3.1 How to programme the KNX physical address

The KNX physical address programming mode can be activated/deactivated by pressing the programming push-button, or by simultaneously pressing the **Pass GA** and **Pass PhA** push-buttons.

3.2 Display elements

The **KNX** LED lights up with a green colour when the device is powered via the KNX BUS line, and flashes green while the KNX telegrams are being transmitted. In the event of a communication error (e.g. repetition of telegrams or collisions), the LED turns red for a short time.

The **IP** LED lights up when there is an active Ethernet connection; it turns green when the device has a correct IP configuration (IP address, Sub net and Gateway) and it turns red if the configuration is invalid or non-existent (e.g. when the device has not received the IP configuration from the DHCP server). The IP LED flashes green when there is data traffic on the IP line.

The test purposes (for example, when starting up the system), the configured forwarding settings (filter or block) can by bypassed by manually activating the forwarding of telegrams.
Pressing the **Pass GA** push-button activates/deactivates the forwarding of telegrams with a group address; pressing the **Pass PhA** push-button activates/deactivates the forwarding of telegrams with a physical address. When one of the two forwarding functions is activated, the **Mode** LED flashes once with an orange colour; if both functions are active, the LED flashes twice.
Pressing the **Pass GA** and **Pass PhA** button keys at the same time deactivates the manual telegram forwarding function (Esc).
The **Mode** LED can signal configuration errors when neither the programming mode nor the manual telegram forwarding function is active.
Summary of the various **Mode** LED indications:

Mode LED	Event
Fixed green	Device in operating mode
Fixed red	Programming mode active
Single orange flash	Programming mode deactivated. Manual telegram forwarding function active. Forwarding of telegrams with a group address or physical address active
Double orange flash	Programming mode deactivated. Manual telegram forwarding function active. Forwarding of all telegrams active
Flashing red	Programming mode deactivated. Manual telegram forwarding function deactivated. KNX/IP Router configuration error (e.g. download of ETS application interrupted).

3.3 Factory settings

The factory settings of the KNX/IP Router are:
Device physical address: **15.15.0**
KNXnet/IP tunnelling connections active: **1**
KNXnet/IP tunnelling physical address connection: **15.15.250**
IP address assignment: **DHCP**

3.3.1 Restoring the factory settings

To restore the factory settings, you must:
1. Remove the KNX terminal from the device
2. Press the KNX physical address programming push-button, and keep it pressed
3. Reconnect the KNX terminal
4. Keep the KNX physical address programming push-button pressed for at least 6 seconds
5. The brief flashing of all the LEDs indicates that the factory parameters have been restored

4 Interface settings with ETS

In ETS, the KNX interfaces can be selected and set directly from the menu
- *Bus → Interfaces* in ETS5
- *Settings → Communication* in ETS4

ETS can communicate with the KNX/IP Routers even if the relative ETS database has not been imported; if the KNX/IP Router settings are not compatible with the configuration of the KNX system, the device must be configured within the KNX project (see ETS Database).
The IP address is automatically assigned via DHCP in the factory, and no further settings are required. In order to work properly, there must be a DHCP server installed on the LAN network (many DSL routers have a built-in DHCP server).
Once the device has been connected to the KNX BUS and the LAN network, it should automatically be visualised in ETS5, in the *Bus → Interfaces* menu (or *Settings → Communication* in ETS4), under the **Discovered Interfaces** item, (or **Discovered connections** in ETS4).
Click on the interface to select it and use it as the current one. The right-hand part of the ETS window shows information about the router and the connection.
The name of the KNX/IP Router and its physical address (**Host Individual Address**) can be modified within the ETS project.
To act as an interface, the device has additional physical addresses that can be set via ETS (version 4.2 or higher). The KNX telegrams that a client (e.g. ETS) sends via the KNX/IP Router use one of the additional router addresses as their sender's address. A connection is associated with each address; in this way, any reply telegrams can be transmitted to the relative clients.
The additional physical addresses must not be already in use by other KNX devices, and they must belong to the same KNX line on which the device is installed.

Example:
Physical address of the device **1.1.10** (address in the ETS project)
Connection 1   **1.1.250** (1st individual address)
Connection 2   **1.1.251** (2nd individual address)
Connection 3   **1.1.252** (3rd individual address)
Connection 4   **1.1.253** (4th individual address)
Connection 5   **1.1.254** (5th individual address)

The Individual Address field of ETS5 is used to modify the KNX physical address of the KNXnet/IP connection currently being used. To check whether the physical address that you want to set is being used by another device in the KNX system, press the **Address free?** push-button.
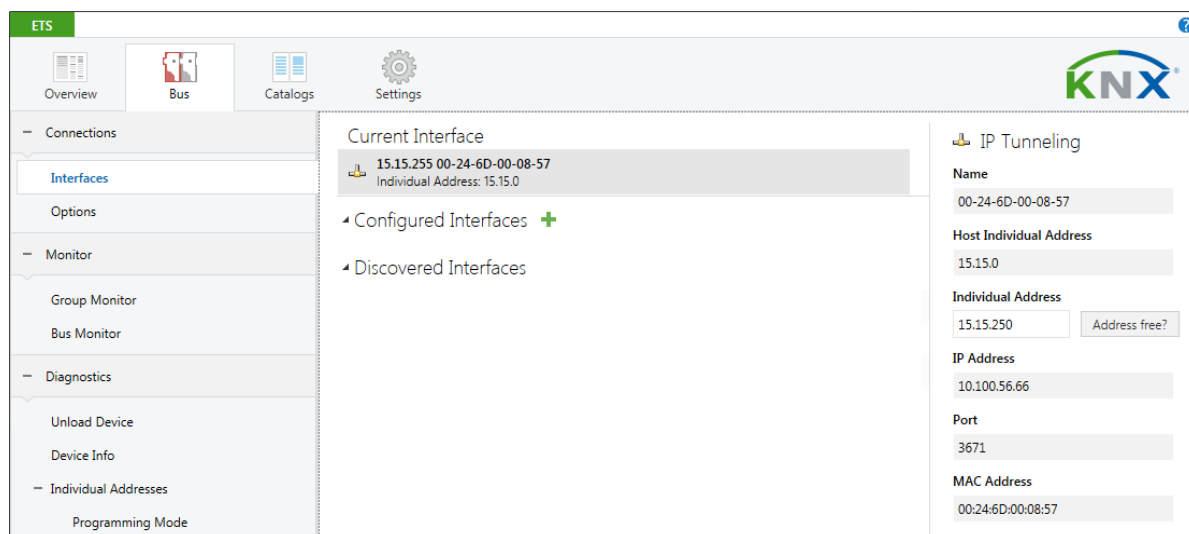

The physical address of the device, and the additional physical addresses, can be modified within the ETS project once the device has been inserted in the project.
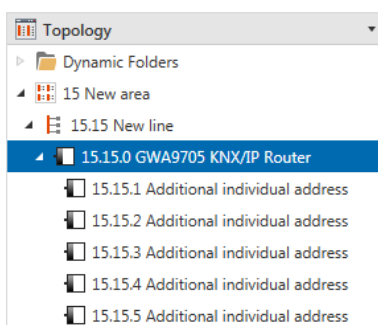
5 ETS Database

In the ETS4/5 database, certain parameters are displayed in the **Properties** window (in the right-hand part of the ETS window); the settings relating to the IP address can be found in this window.
In ETS4, the additional physical addresses are located in the **Properties** window as well.
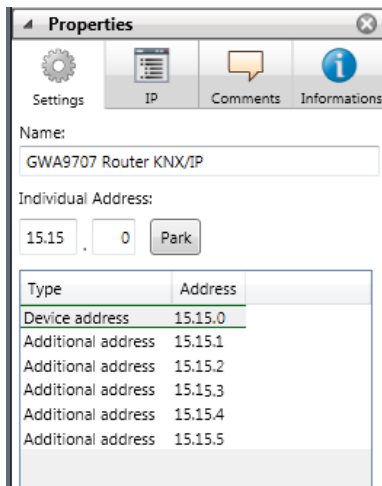
In ETS5, the individual addresses are displayed in the "Topology" view.

Each address can be modified by entering the required value in the **Individual Address** field of the **Properties** window; if the field frame turns red, this means the address is already being used in the ETS project.

ATTENTION: make sure none of the additional addresses are already used in the KNX system.
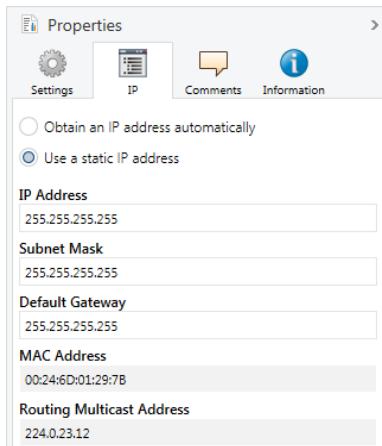
From the topological view of the ETS project, click on the KNX/IP Router - the **Properties** window will appear on the right; you can modify the device name in the **Settings** card.
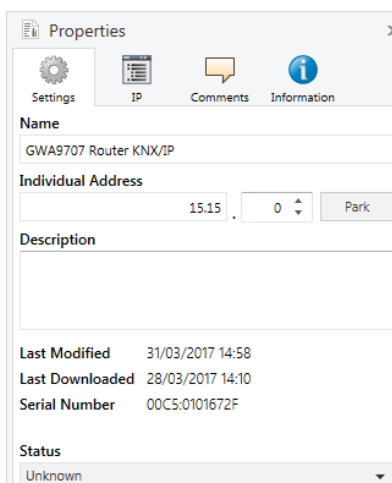
The **IP** card shows the network settings of the device. Changing from "Obtain an IP address automatically" to "Use a static IP address" activates the fields for setting the IP address, the network sub-mask and the predefined gateway.

*ATTENTION: modifications made in the **Properties** window will only become effective after downloading the ETS application of the KNX/IP Router.*

5.1 IP Address

Key in the IP address of the KNX/IP Router. This is used to address the device in the IP (LAN) network. The assignment of the IP address should be managed by the network administrator.

5.2 Subnet Mask

Key in the network sub-mask. The device uses the mask to determine whether there is a communication partner in the local network. If there are no partners in the local network, the device sends the telegrams to the predefined gateway which then re-routes them to the other sub-networks.

5.3 Default Gateway

Key in the predefined gateway address (e.g. the address of the system DSL router).

5.4 Example of IP address assignment

A PC is used to connect to the KNX/IP Router:
IP address of the PC: **192.168.1.30**
Sub-network mask of the PC: **255.255.255.0**
The KNX/IP Router is in the same local LAN network as the PC; this means it has the same sub-network mask. The sub-network binds the IP addresses that can be assigned; in this example, the IP address of the KNX/IP Router must be 192.168.1.xx, where "xx" is a value between 1 and 254 (excluding the value 30, which has already been assigned to the PC). It is important to make sure the same value is not assigned twice.
IP address of the KNX/IP Router: **192.168.1.31**
Sub-network mask of the KNX/IP Router: **255.255.255.0**

6 ETS database parameters

The following parameters can be set in ETS.

6.1 *"General" menu*

6.1.1 Activation/Deactivation of the programming mode with frontal pushbuttons

Used to enable the activation/deactivation of the programming mode by simultaneously pressing the **Pass GA** and **Pass PhA** push-buttons. The programming push-button is always enabled, and is not affected by the configuration of the parameter in question.

6.1.2 Forwarding telegrams manual function

Used to enable and set the duration of the manual telegram forwarding function. When this function is enabled, press the **Pass GA** push-button to activate/deactivate the forwarding of telegrams with a group address, or press the **Pass PhA** push-button to activate/deactivate the forwarding of telegrams with a physical address. In both cases, the forwarding settings that have been configured (filter or block) are bypassed by manually activating the telegram forwarding operation.

6.2 *"Routing (KNX -> IP)" menu*

This menu contains the parameters for configuring the behaviour of the device when the telegrams transit on the KNX BUS line, defining their blockage or forwarding towards the backbone.

6.2.1 Group telegrams (main groups 0 to 13)

Used to set the behaviour of the router during the transit of BUS telegrams sent to a main group address between 0 and 13. The values that can be set are:

- *block*

If this value is set, all the telegrams that transit in the line/area handled by the router, and are being sent to a main group address between 0 and 13, are not forwarded to the backbone (IP).

- *route*

If this value is set, all the telegrams that transit in the line/area handled by the router, and are being sent to a main group address between 0 and 13, are forwarded to the backbone (IP) regardless of the filter table used. This setting is only used for testing purposes.

- *filter*

If this value is set, the filter table generated by ETS is used to distinguish which of the telegrams transiting in the line/area handled by the router, and being sent to a main group address between 0 and 13, should be forwarded to the backbone (IP).

6.2.2 Group telegrams (main groups 14 to 31)

Used to set the behaviour of the router during the transit of BUS telegrams sent to a main group address between 14 and 31. For the values that can be set, refer to Group telegrams (main groups 0 to 13).

6.2.3 Individual addressed telegrams

Used to set the behaviour of the router during the transit of BUS telegrams sent to a physical address. The values that can be set are:

- *block*

If this value is set, all the telegrams that transit in the line/area handled by the router, and are being sent to a physical address, are not forwarded to the backbone (IP).

- *route*

If this value is set, all the telegrams that transit in the line/area handled by the router, and are being sent to a physical address, are forwarded to the backbone (IP) regardless of the filter table used.

- *filter*

If this value is set, the filter table generated by ETS is used to distinguish which of the telegrams transiting in the line/area handled by the router, and being sent to a physical address, should be forwarded to the backbone (IP).

6.2.4 Broadcast telegrams

Used to set the behaviour of the router during the transit of broadcast BUS telegrams. The values that can be set are:

- *block*

If this value is set, all the broadcast telegrams that transit in the line/area handled by the router are not forwarded to the backbone (IP).

- *route*

If this value is set, all the broadcast telegrams that transit in the line/area handled by the router are forwarded to the backbone (IP).

6.2.5 Acknowledge (ACK) of group telegrams

Used to set the condition that generates the acknowledgement (ACK) by the router of telegrams on the KNX line that are being sent to any group address. The values that can be set are:

- *always*

If this value is set, an acknowledgement (ACK) is generated for all the telegrams that transit in the line/area handled by the router, and are being sent to a group address.

- *only if routed*

If this value is set, an acknowledgement (ACK) is only generated for BUS telegrams forwarded to the backbone line (IP) and being sent to a group address.

6.2.6 Acknowledge (ACK) of individual addressed telegrams

Used to set the condition that generates the acknowledgement (ACK) by the router of telegrams on the KNX line that are being sent to any physical address. The values that can be set are:

- *always*

If this value is set, an acknowledgement (ACK) is generated for all the telegrams that transit in the line/area handled by the router, and are being sent to a physical address.

- *only if routed*

If this value is set, an acknowledgement (ACK) is only generated for BUS telegrams forwarded to the backbone line (IP) and being sent to a physical address.

- *answer with NACK*

If this value is set, a negative acknowledgement (NACK) is generated for all the telegrams that transit in the line/area handled by the router, and are being sent to a physical address. This means that communication on the KNX line with telegrams being sent to a physical address is not possible. None of this affects the transit of telegrams being sent to any group address. This setting can be used to impede any attempt to tamper with the KNX devices.

ATTENTION !!!: if this setting is applied, the configuration of the router can no longer be modified except via another KNX/IP Router belonging to a different line (so that the configuration is made via telegrams on the IP backbone and not on the KNX BUS line).

6.3   Routing (IP -> KNX)" menu

This menu contains the parameters for configuring the behaviour of the device when the telegrams transit on the IP backbone line, defining their blockage or forwarding towards the KNX line.

6.3.1 Group telegrams (main groups 0 to 13)

Used to set the behaviour of the router during the transit of telegrams on the IP backbone, being sent to a main group address between 0 and 13. The values that can be set are:

- *block*

If this value is set, the telegrams being sent to a main group address between 0 and 13 are not forwarded in the KNX line/area handled by the router.

- *route*

If this value is set, the telegrams being sent to a main group address between 0 and 13 are forwarded in the KNX line/area handled by the router, regardless of the filter table used. This setting is only used for testing purposes.

- *filter*

If this value is set, the filter table generated by ETS is used to distinguish which of the telegrams transiting in the IP backbone, and being sent to a main group address between 0 and 13, should be forwarded in the KNX line/area handled by the router.

6.3.2 Group telegrams (main groups 14 to 15)

Used to set the behaviour of the router during the transit of telegrams on the IP backbone, being sent to a main group address between 14 and 31. For the values that can be set, refer to Group telegrams (main groups 0 to 13).

6.3.3 Individual addressed telegrams

Used to set the behaviour of the router during the transit of telegrams in the IP backbone, and being sent to a physical address. The values that can be set are:

- *block*

If this value is set, the telegrams being sent to a physical address are not forwarded in the KNX line/area handled by the router.

- *route*

If this value is set, all the telegrams being sent to a physical address are forwarded in the KNX line/area handled by the router, regardless of the filter table used.

- *filter*

If this value is set, the filter table generated by ETS is used to distinguish which of the telegrams transiting in the IP backbone, and being sent to a physical address, should be forwarded in the line/area handled by the router.

6.3.4 Broadcast telegrams

Used to set the behaviour of the router during the transit of broadcast telegrams on the IP backbone line. The values that can be set are:

- *block*

If this value is set, the broadcast telegrams that transit in the IP backbone are not forwarded in the line/area handled by the router.

- *route*

If this value is set, all the broadcast telegrams that transit in the IP backbone are forwarded in the line/area handled by the router.

6.3.5 Repetition of group telegrams

Used to enable the retransmission on the KNX BUS line of telegrams being sent to any group address and which were lost during forwarding from the IP backbone to the KNX BUS line. The values that can be set are:

- *disabled*

If this value is set, telegrams being sent to any group address, and which were lost during forwarding from the IP backbone to the KNX BUS line, are not retransmitted on the BUS.

- *enabled*

If this value is set, telegrams being sent to any group address, and which were lost during forwarding from the IP backbone to the KNX BUS line, are retransmitted on the BUS (max. 3 attempts).

6.3.6 Repetition of individual addressed telegrams

Used to enable the retransmission on the KNX BUS line of telegrams being sent to any physical address and which were lost during forwarding from the IP backbone to the KNX BUS line. The values that can be set are:

- *disabled*

If this value is set, telegrams being sent to any physical address, and which were lost during forwarding from the IP backbone to the KNX BUS line, are not retransmitted on the BUS.

- *enabled*

If this value is set, telegrams being sent to any physical address, and which were lost during forwarding from the IP backbone to the KNX BUS line, are retransmitted on the BUS (max. 3 attempts).

6.3.7 Repetition of broadcast telegrams

Used to enable the retransmission on the KNX BUS line of broadcast telegrams which were lost during forwarding from the IP backbone to the KNX BUS line. The values that can be set are:

- *disabled*

If this value is set, broadcast telegrams which were lost during forwarding from the IP backbone to the KNX BUS line are not retransmitted on the BUS.

- *enabled*

If this value is set, broadcast telegrams which were lost during forwarding from the IP backbone to the KNX BUS line are retransmitted on the BUS (max. 3 attempts).

7 Programming

The KNX/IP Router can be programmed via ETS in various ways:

7.1 Via the KNX BUS

The device must at least be connected to the KNX BUS. ETS requires an additional interface (e.g. USB) in order to access the BUS; in this way, both the physical address and the entire application (including the IP configuration) can be programmed.
This type of programming is recommended if it is not possible to establish an IP connection.
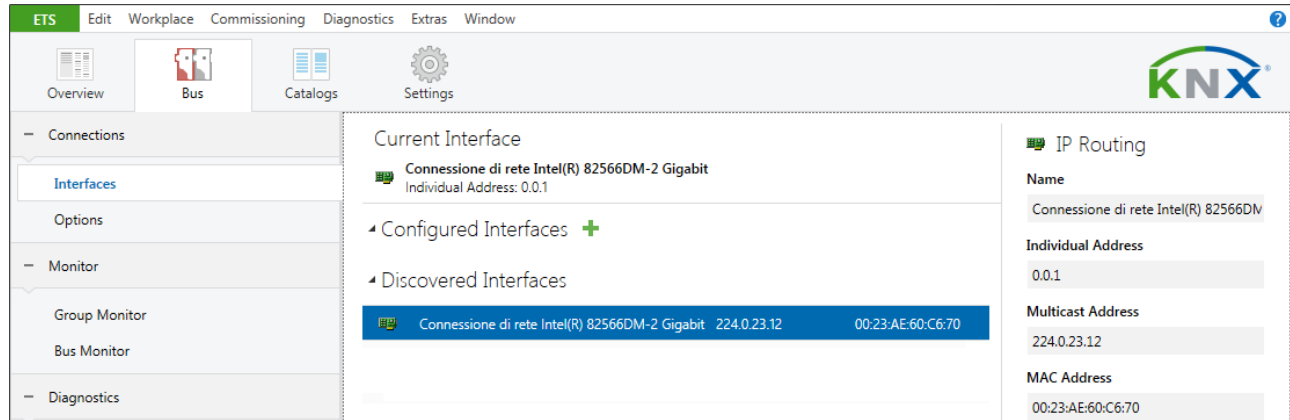
7.2 Via the KNXnet/IP Tunnelling connection

No additional interface required. Programming is only possible if the device has already a valid IP configuration (e.g. obtained from DHCP).
In this case, the router will be displayed in the interface configuration section of ETS and, after selecting it, you can download the configuration from the ETS project as for the other devices.

## 7.3 Via the KNXnet/IP Routing connection

No additional interface required. Programming is only possible if the device has already a valid IP configuration (e.g. obtained from DHCP).
In ETS, the IP routing interface only appears if the LAN network contains at least one device that supports the routing protocol. The IP routing interface is displayed with the name of the PC network card. After selecting the interface, you can download the configuration from the ETS project as for the other devices.

7.4 Via a direct IP connection

Whereas the transmission speed for the KNXnet/IP Tunnelling and KNXnet/IP Routing connections is limited to that of the KNX TP line, with a direct IP connection you can download the router configuration more quickly. A direct IP connection is only possible if the device has already a valid IP configuration and a physical address. To enable this option, go to the *Bus → Connections → Options* window of ETS5 and select the "Use direct IP connection if available" option. The router parameters will be downloaded directly onto the device, and the operation will not be visible in the ETS line control.
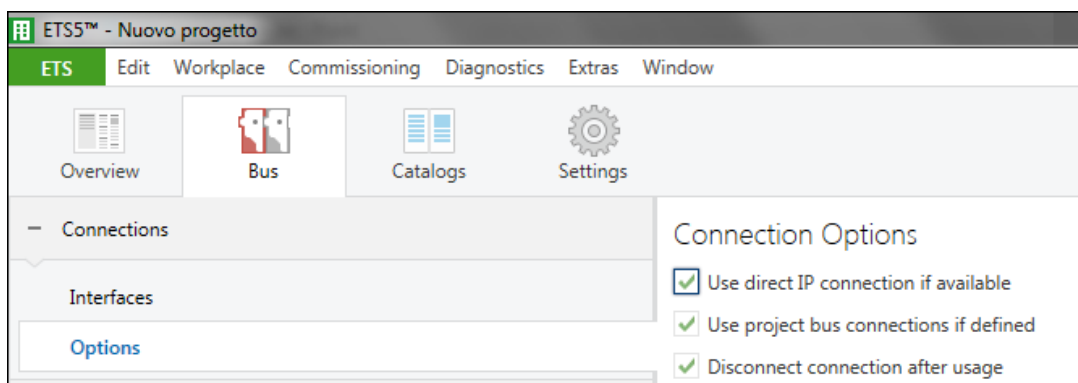
NOTE: During ETS application download, the device operating mode status LED (Mode) blinks green.

8 Multi-connection activation without ETS (for use with the Easy Controller)

In order to use the router without the aid of ETS (e.g. with the Easy Controller), you can activate the multi-connection directly from the device; the additional addresses will be automatically assigned by the device itself.
To activate the multi-connection, press the physical address programming push-button for at least 1 second; the programming LED will light up briefly, and the device will automatically assign the additional addresses.

With the factory configurations, the addresses assigned are:

Physical address	**15.15.0** (default)
Connection 1	**15.15.250** (default)
Connection 2	**15.15.251** (multi-connection assignment)
Connection 3	**15.15.252** (multi-connection assignment)
Connection 4	**15.15.253** (multi-connection assignment)
Connection 5	**15.15.254** (multi-connection assignment)

Remember that, with the factory setting, the IP address is automatically assigned via DHCP; in order to work properly when using Easy Controller, there must be a DHCP server installed on the LAN network (many DSL routers have a built-in DHCP server).

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