

ABB i-bus® KNX IP Router IPR/S 2.1

Intelligent Installation Systems



This manual describes the function of the IP Router IPR/S 2.1 with the application program *IP Routing*.
Subject to changes and errors excepted.

Exclusion of liability:

Despite checking that the contents of this document match the hardware and software, deviations cannot be completely excluded. We therefore cannot accept any liability for this. Any necessary corrections will be inserted in new versions of the manual.

Please inform us of any suggested improvements.

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1 General

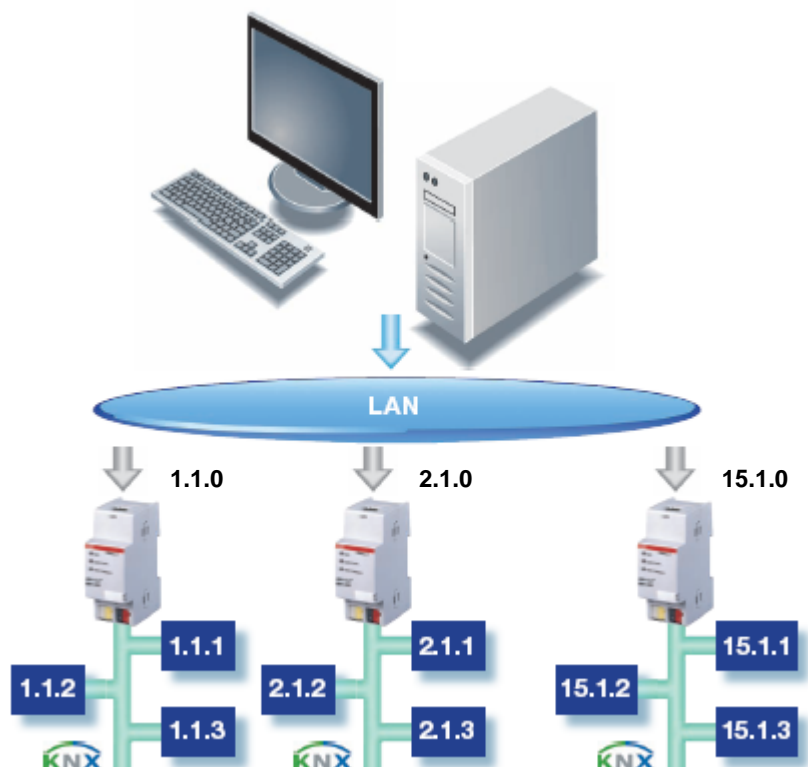
The IP Router IPR/S 2.1 connects the KNX bus with the Ethernet network. KNX telegrams can be sent to or received from other devices via the network. The device uses the KNXnet/IP protocol from the KNX Association for communication. This is not compatible with the EIBlib/IP protocol as used for example, by the IP Gateway IG/S 1.1.

In older documents and in the ETS 3.0e the KNXnet/IP protocol is also referred to as the EIBnet/IP protocol.

Both protocols and specifications are identical.

1.1 Product and functional overview

The IP Router in addition to the tunnelling function for point-to-point communication, also incorporates the functions of a line coupler (routing). The IP Router can thus distribute telegrams in the network to other lines or areas, as well as receive telegrams from there.



2 Device technology



IPR/S 2.1

The IP Router 2.1 is a modular installation device (MDRC) and forms the interface between KNX installations and IP networks. It can be used as a fast line and area coupler and can utilise the local network (LAN) for fast exchange of telegrams between the lines/areas.

KNX devices can be programmed via the LAN using ETS 3.0.

The device uses the KNXnet/IP protocol from the KNX Association (Routing and Tunnelling).

The IP address can be fixed or can be received from a DHCP server.

The power supply range is from 10 to 30 V DC.

2.1 Technical data

Supply	Supply voltage U_s	10...30 V DC via plug-in terminal Ripple: < 5 %
	Power consumption	Maximum 1.9 W at 10 V
	Current consumption	Maximum 190 mA at 10 V
	Leakage loss	Maximum 1.9 W at 10 V
	Rated voltage U_n	12 V DC
	Rated current I_n	145 mA at 12 V
	Current consumption KNX	From KNX < 10 mA
Connections	KNX	Bus connection terminal
	Plug-in terminal for operating voltage	Plug-in terminal
	LAN	RJ45 socket for 10/100BaseT, IEEE 802.3 networks, AutoSensing
Operating and display elements	LED red and button	For assignment of the physical address
	LED green	Operating mode display
	LED yellow	Network connection indicator
		KNX telegram traffic indicator
Enclosure	IP 20	to DIN EN 60529
Safety class	II	to DIN EN 61140
Isolation category	Overvoltage category	III to DIN EN 60664-1
	Pollution degree	2 to DIN EN 60664-1
KNX safety extra low voltage	SELV 24 V DC	
Temperature range	Operation	0 °C...+45 °C
	Storage	-25 °C...+55 °C
	Transport	-25 °C...+70 °C
Ambient conditions	Maximum air humidity	93 %, no condensation allowed

Design	Modular installation device (MDRC)	Modular installation device, ProM
	Dimensions	90 x 36 x 64 mm (H x W x D)
	Mounting width	2 modules at 18 mm
	Mounting depth	68 mm
Installation	On 35 mm mounting rail	to DIN EN 60 715
Mounting position	as required	
Weight	0.100 kg	
Housing, colour	Plastic housing, grey	
Approvals	KNX to EN 50 090-1, -2	
CE mark	in accordance with the EMC guideline and low voltage guideline	

Application program	Maximum number of communication objects	Maximum number of group addresses	Maximum number of associations
Routing	0	0	0

Note

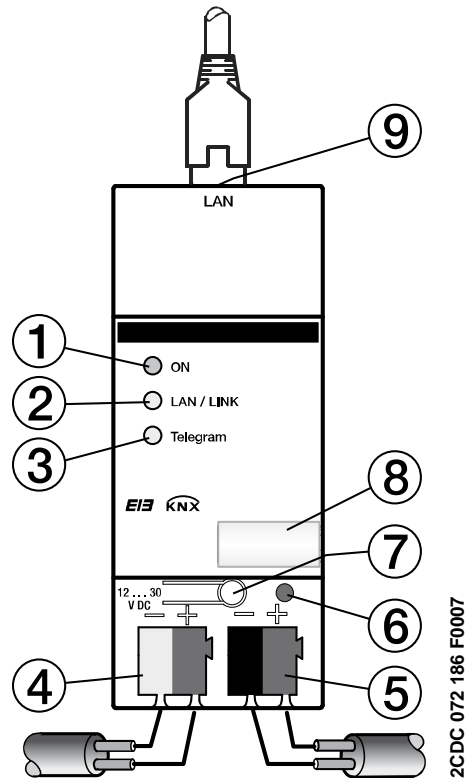
The programming requires EIB Software Tool ETS3 V3.0e or higher.

If ETS3 is used a *.VD3 or higher type file must be imported.

The application program is available in the ETS3 at ABB/System devices/Routing.

The device does not support the closing function of a project or the KNX device in the ETS. If you inhibit access to all devices of the project with a *BCU code* (ETS3), it has no effect on this device. Data can still be read and programmed.

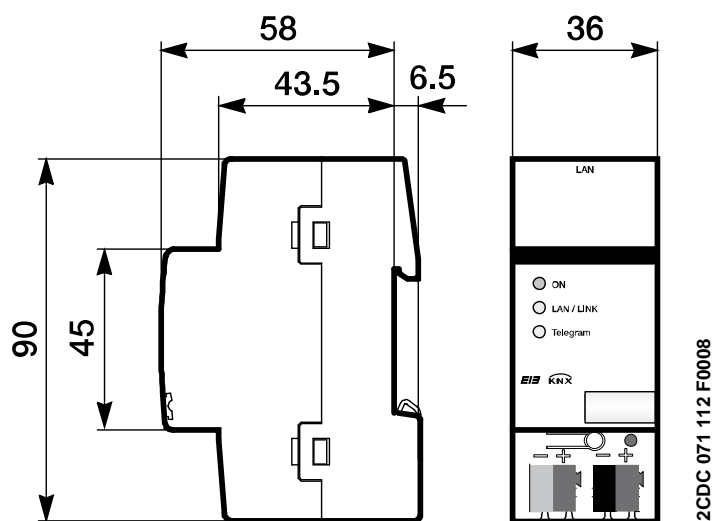
2.2 Circuit diagram



IPR/S 2.1

- | | |
|-----------------------------|----------------------|
| 1 LED ON | 6 Programming LED |
| 2 LED LAN/LINK | 7 Programming button |
| 3 LED telegram | 8 Label carrier |
| 4 Supply voltage connection | 9 LAN connection |
| 5 KNX connection | |

2.3 Dimension drawing



2.4 Assembly and installation

Accessibility to the device for the purpose of operation, testing, visual inspection, maintenance and repair must be provided compliant to DIN VDE 0100-520.

Commissioning requirements

In order to commission the device, a PC with ETS from ETS3 V3.0e or higher as well as an interface to the ABB i-bus®, e.g. via a KNX interface as well as a supply voltage in the range from 10 to 30 V DC is required.

If the IP Router or other KNX devices are to be programmed via a network (LAN), a PC with LAN connection is required.

The installation and commissioning may only be carried out by electrical specialists. The appropriate norms, guidelines, regulations and specifications should be observed when planning and setting up electrical installations.

- Protect the device from damp, dirt and damage during transport, storage and operation.
- Only operate the device within the specified technical data limits!
- The device should only be operated in an enclosed housing (distribution board)!

Supplied state

The device is assigned with the physical address 15.15.0 in the factory and a second physical address 15.15.100 for a tunnelling connection.

The application program is preloaded in the factory. The IP address is set to automatic IP assignment (DHCP/AutoIP).

Assignment of the physical address

The assignment of the address of the ABB i-bus® IP ROUTER is carried out via the ETS and the programming button on the device.

The device features a programming button for assignment of the physical device address. The red programming LED lights up after the button has been pushed. It switches off as soon as the ETS has assigned the physical address or the programming button is pressed again.

Cleaning

If devices become dirty, they can be cleaned using a dry cloth. Should a dry cloth not remove the dirt, the devices can be cleaned using a slightly damp cloth and soap solution. Corrosive agents or solutions should never be used.

Maintenance

The device is maintenance-free. No repairs should be carried out by unauthorised personnel if damage occurs, e.g. during transport and/or storage. The warranty expires if the device is opened.

2.5 Description of the inputs and outputs

Supply voltage input 10 to 30 V DC

Only a DC voltage in a range of 10 to 30 V may be connected to the power supply input. We recommend using an NT/S power supply from our range. Once the supply voltage has been connected to the system, a start routine is executed in the device. As soon as it is ready for operation – a maximum of 40 seconds after connecting the supply voltage – the ON LED on front of the device lights up.

Caution

The supply voltage must be between 10 to 30 V DC.
Otherwise the device may be damaged!

KNX connection

The supplied bus connection terminal is used to connect to the KNX bus.

Note

Programming requires ETS3 from version 3.0e or higher.

LAN connection

The network connection is carried out via an Ethernet RJ 45 interface for LAN networks. The network interface can be operated with a transmission speed of 10/100 Mbit/s. Network activity is indicated by the LAN/LINK LED on the front of the device.

2.6 Operating controls

There are no operating controls located on the IP Router.

2.7 Display elements

Three indicator LEDs are located on the front of the IPR/S:



ON



LAN/LINK



Telegram

ON

- The LED lights up if the power supply is available and the device is ready for operation.
- The LED flashes when the device starts-up, a maximum 40 seconds after the supply voltage is applied.

LAN/LINK

- The LED lights up if the device detects a connection to the network.
- The LED flashes if the device detects activity on the network, e.g. when data is exchanged.

Telegram

- The LED lights up when a connection to the KNX is available.
- The LED flashes if the device detects a telegram on the KNX.

3 Commissioning

3.1 Overview

Parameterisation of the IP Router is implemented using the Engineering Tool Software ETS3 from version 3.0e.

3.2 Parameters

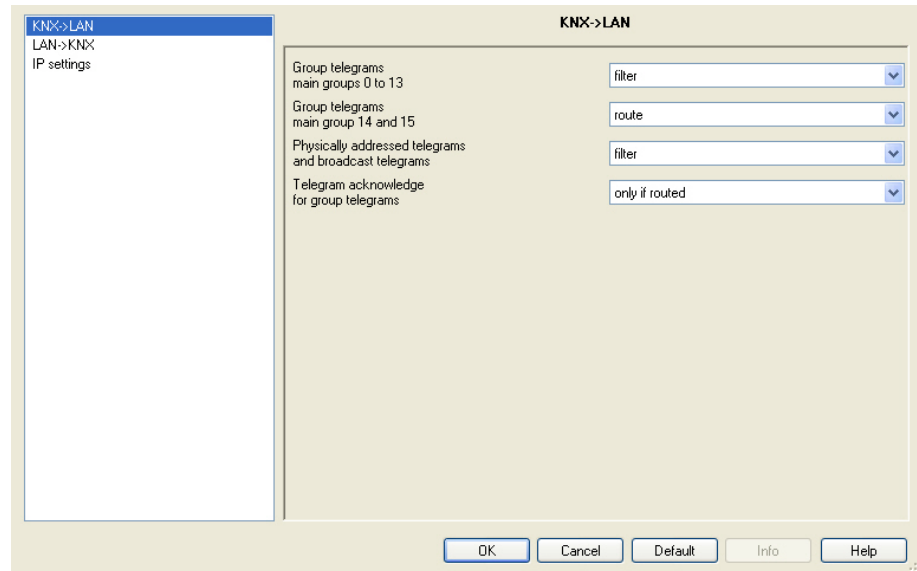
This chapter describes the parameters of the IP Router using the parameter window. The parameter window features a dynamic structure so that further parameters or whole parameter windows may be enabled depending on the parameterisation and the function of the outputs.

The default values of the parameters are underlined, e.g.

Option: yes
 no

3.2.1 Parameter window *KNX -> LAN*

In the parameter window *KNX -> LAN* it is possible to define the processing of telegrams from the KNX system to the LAN network.



Group telegrams main groups 0 to 13

Options: filter
route
block

This parameter defines if the telegrams with group addresses of the main groups 0 to 13 are filtered, routed or blocked.

- *filter*: The telegrams with the group addresses of the main groups 0 to 13 from the KNX to the LAN are filtered in accordance with the filter table, which is automatically calculated by the ETS.
- *route*: All group telegrams of main groups 0 to 13 are routed without considering the filter table settings. This setting is only useful for commissioning and diagnostics. It should not be used during normal operation.
- *block*: All group telegrams from the KNX to the LAN are blocked without considering the filter table settings.

**Group telegrams
main groups 14 and 15**

Options: route
 block

This parameter defines if the telegrams with group addresses of the main groups 14 and 15 are routed or blocked.

As ETS cannot compute filter tables for the main groups 14 and 15, these group addresses can only be routed or blocked.

- *route*: All group telegrams of main groups 14 and 15 are routed.
- *block*: No group telegrams of main groups 14 and 15 are transferred from the KNX to the LAN.

**Physically addressed telegrams
and broadcast telegram**

Options: filter
 block

This parameter defines whether the physically addressed telegrams or broadcast telegrams, e.g. group addresses 0/0/0 are filtered or blocked.

- *filter*: Only the telegrams from the KNX to the LAN which are supposed to exit the line are sent.
- *block*: Physically addressed telegrams and broadcast telegrams are not processed by the IPR/S. With this setting it is not possible to send physically addressed telegrams from a line of a lower level than the IPR/S, to another line, e.g. during programming.

**Telegram acknowledge
for group telegrams**

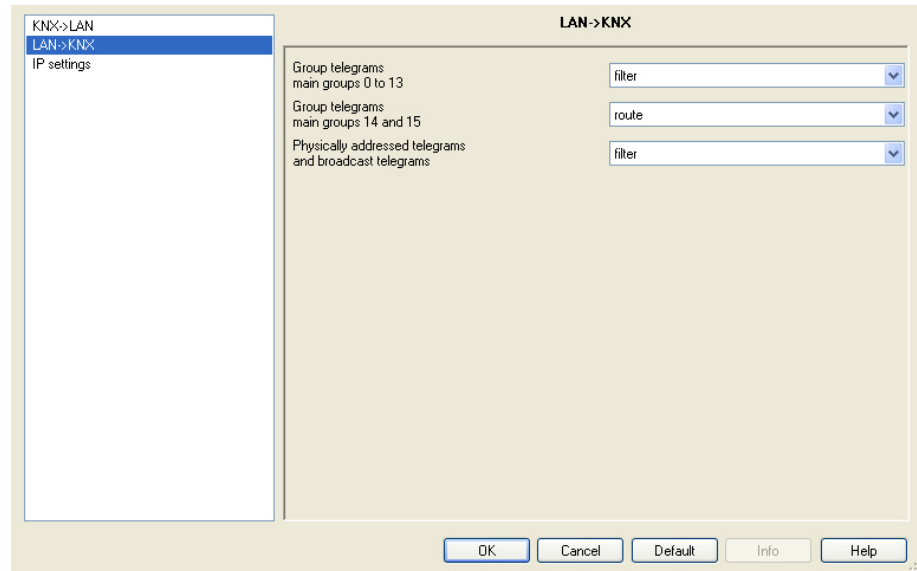
Options: only if routed
 always

This parameter determines if group telegrams are to be acknowledged by a telegram.

- *only if routed*: The group telegrams are only acknowledged (send ACK) if they are also routed by an IP Router to the LAN. Thus, only telegrams which are also entered in the IPR/S filter table are acknowledged.
- *always*: All group telegrams on the KNX are acknowledged by the IPR/S.

3.2.2 Parameter window LAN -> KNX

In the parameter window *LAN -> KNX* it is possible to define the processing of telegrams from the LAN network to the KNX system.



Group telegrams main groups 0 to 13

Options: filter
route
block

This parameter defines if the telegrams with group addresses of the main groups 0 to 13 are filtered, routed or blocked.

- *filter*: The telegrams with the group addresses of the main groups 0 to 13 from the LAN to the KNX are filtered in accordance with the filter table, which is automatically calculated by the ETS.
- *route*: All group telegrams of main groups 0 to 13 are routed without considering the filter table settings. This setting is only useful for commissioning and diagnostics. It should not be used during normal operation.
- *block*: All group telegrams from the LAN to the KNX are blocked without considering the filter table settings.

**Group telegrams
main groups 14 and 15**

Options: route
 block

This parameter defines if the telegrams with group addresses of the main groups 14 and 15 are routed or blocked.

As ETS cannot compute filter tables for the main groups 14 and 15, these group addresses can only be routed or blocked.

- *route*: All group telegrams of main groups 14 and 15 are routed.
- *block*: No group telegrams of main groups 14 and 15 are transferred from the LAN to the KNX.

**Physically addressed telegrams
and broadcast telegram**

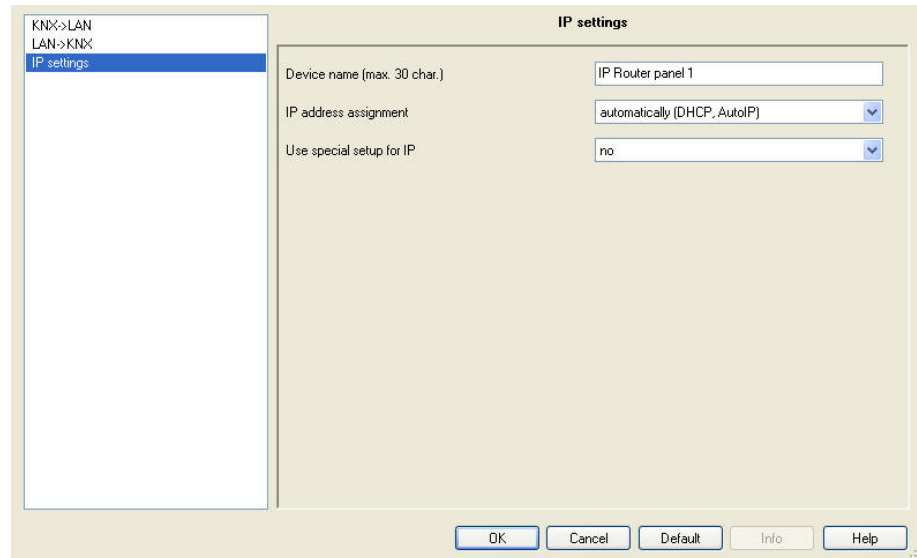
Options: filter
 block

This parameter defines whether the physically addressed telegrams or broadcast telegrams, e.g. group addresses 0/0/0 are filtered or blocked.

- *filter*: Only the telegrams from the LAN to the KNX which are supposed to enter the line are sent.
- *block*: Physically addressed telegrams and broadcast telegrams are not processed by the IPR/S.
With this setting, physically addressed telegrams or broadcast telegrams from the LAN to the KNX are blocked

3.2.3 Parameter window *IP settings*

In the parameter window *IP settings*, settings on the IP side of the IP Router are undertaken.



Device name [max. 30 char.]

Options: ABB IP-Router IPR/S

The device name is used for identification of the device on the LAN. After a search query, e.g. by the ETS, every KNXnet/IP device reports its name and can be allocated accordingly. For example, the installation location can be identified by the names assigned to the devices, e.g. IPR/S, HALL, SUB7, etc.

The text may be a maximum of 30 characters in length. This name is also displayed when this device is determined in the ETS as the communications interface.

For further information see: [IPR/S as a programming interface](#)

IP address assignment

Options: automatically
fixed

- *automatically*: In the standard setting the IP Router expects the assignment of an IP address by a DHCP server (dynamic host configuration protocol). This server responds to a request by assigning a free IP address to the device. If a DHCP server is not available in the network or it does not respond within 30 seconds, the device starts an auto IP procedure. It assigns itself with an address from the reserved range for auto IP addresses (169.254.xxx.yyy).
- *fixed*: If no DHCP server is installed on the network or if the IP address should remain static, it can be assigned as fixed. The parameter window *IP Address* appears.

Use special setup for IP

Options: no
 yes

- *no*: The IPR/S sends the telegrams as multicasts on the IP network with the standard address 224.0.23.12.
- *yes*: The standard setting is not used.
The parameter window *IP communication* appears.

3.2.4 Parameter window *IP address*

The parameter window *IP address* is only visible if on the parameter page [*IP settings*](#) the option *fixed* has been selected for the *IP address assignment* parameter.

IP address	
IP address	
Byte 1	192
Byte 2	168
Byte 3	0
Byte 4	222
Subnet mask	
Byte 1	255
Byte 2	255
Byte 3	255
Byte 4	0
Default gateway	
Byte 1	0
Byte 2	0
Byte 3	0
Byte 4	0

IP address

Options: Byte x 0...255

The IP address is the unique address of the IP Router in the LAN. This address should be entered in a byte-by-byte manner, e.g. as follows for address 192.168.0.10:

Byte 1: 192

Byte 2: 168

Byte 3: 0

Byte 4: 10

Subnet mask

Options: Byte x 0...255

The *Subnet mask* defines the network class. The subnet mask must be set to reflect the number and structure of the subnet. In the simplest case of a small network the subnet mask 255.255.255.0 should be set as follows:

Byte 1: 255

Byte 2: 255

Byte 3: 255

Byte 4: 0

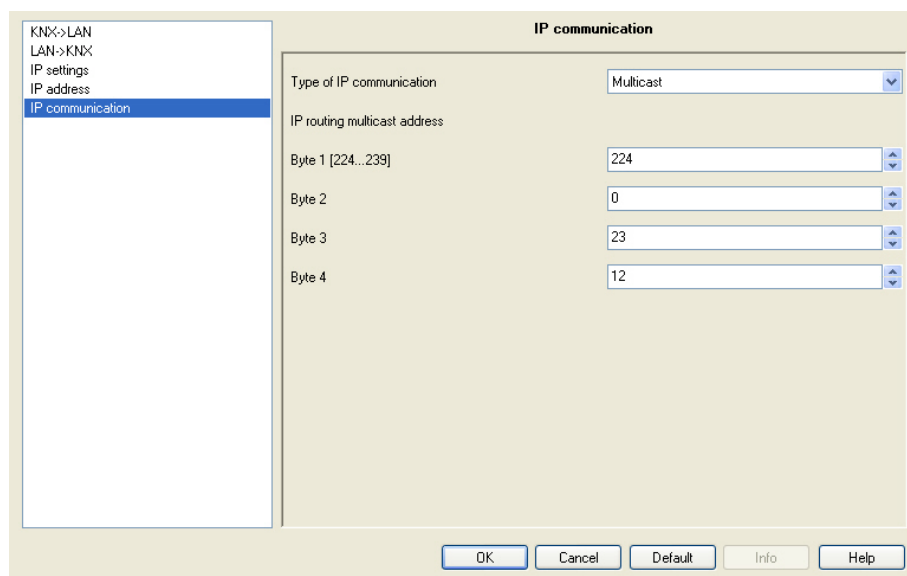
Default gateway

Options: Byte x 0...255

The parameter *Default gateway* defines the connection point, e.g. the IP address of a Router between networks through which IP telegrams are transferred. These gateways are only available in larger networks. For smaller networks the setting 0.0.0.0 can be retained.

3.2.5 Parameter window *IP communication* *Multicast*

The parameter window *IP communication* is only visible if on the parameter page *IP settings* the option yes has been selected for the *Use special setup for IP* parameter.



Type of IP communication

Options: Multicast
Unicast

The type of IP communication defines the type of telegrams that the IP Router sends on the IP network.

- **Multicast:** This is the defined type of communication for KNX-IP devices for KNXnet/IP from the KNX association. This setting should be retained and only changed if the existing network demands that telegrams are sent as Unicast.
- **Unicast:** The routing for the device is switched off. The IP telegram is only sent as a Unicast to the set addresses. This special communication is not compliant to the KNXnet/IP specification and currently only functions (date 08/2008) between ABB-IPR/S devices.

IP routing multicast address

Options: Byte x 0...255

The IP routing multicast address defines the target address of the IP telegrams of the IPR/S. The preset address 224.0.23.12 is the defined address for the KNXnet/IP from the KNX Association in conjunction with IANA for KNX-IP devices. This address should be retained and only changed if the existing network demands that another address be used.

Important

All IP Routers or other KNXnet/IP devices which are required to exchange telegrams on the IP network must use the same routing multicast IP address.

If devices are to be used in the same network but do not need to exchange telegrams, they must use different routing multicast IP addresses.

3.2.6 Parameter window *IP communication Unicast*

The parameter window *IP communication* is only visible if on the parameter page *IP settings* the option yes has been selected for the *Use special setup for IP* parameter.

Type of IP communication

Options: Multicast
Unicast

The type of IP communication defines the type of telegrams that the IPR/S sends on the IP network.

- *Multicast*: This is the defined type of communication for KNX-IP devices for KNXnet/IP from the KNX association. This setting should be retained and only changed if the existing network demands that telegrams are sent as Unicast.
- *Unicast*: The routing for the device is switched off. The IP telegram is only sent as a Unicast to the set addresses. This special communication is not compliant to the KNXnet/IP specification and currently only functions (date 08/2008) between ABB-IPR/S devices.

IP routing unicast address 1/2

Options: Byte x 0...255

The Unicast IP address 1 defines the target address of the IP telegram of the IP Router.

Unicast IP port 1/2

Options: 3671

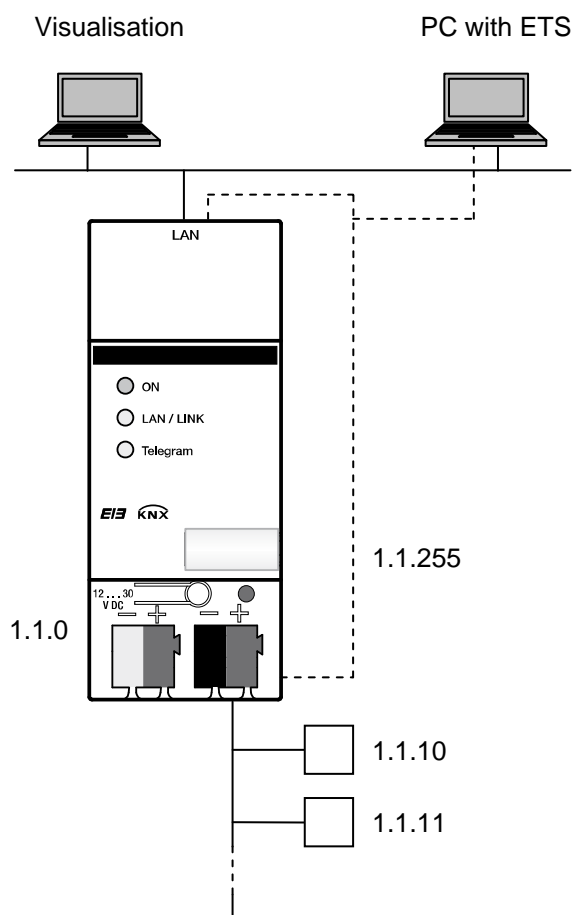
This parameter defines the port for the IP address 1 or 2. No generally reserved ports may be used, e.g. for http, ftp or 0-1024, 1900, 1901, 50000, 50001, 50002, 51000-51255. If one of these ports is entered Unicast transmission is not activated.

3.3 Communication objects

The IP Router IPR/S has no KNX communication objects.

3.4 IPR/S as a programming interface

The IP Router IPR/S can be used together with the ETS as a programming interface. The device provides an additional physical address for this purpose which can be used for a tunnelling connection, e.g. for ETS:

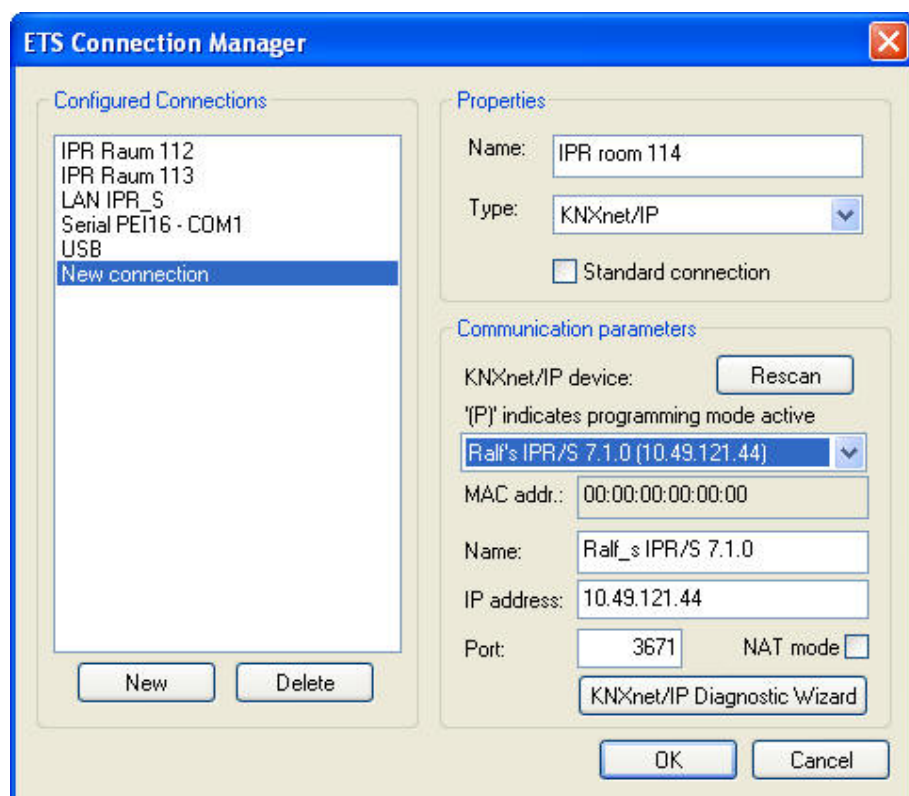
**Note**

The physical address for the tunnelling connection must fit the topology. For this reason 1.1.255 has been used in the above example.

3.4.1 Settings from ETS3.0f

The ETS connects for programming purposes to this second physical address in order to program devices in the line.

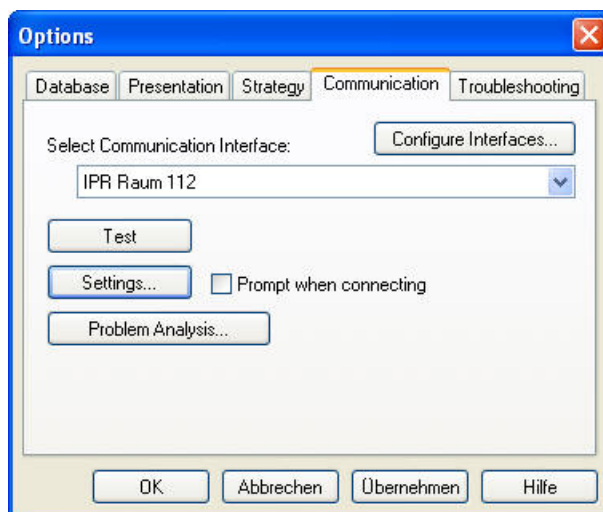
For this purpose the ETS must be set as follows via the window *Extras/Options/Communication*:



- Click *Configure interface*, a new window appears.
- Click on *New*.
- The name should be overwritten with a name which matches the KNX installation, e.g. *IPR Room 112*.
- Select the *KNXnet/IP* type.
- The ETS now searches automatically via the LAN connection for KNXnet/IP devices in the network and indicates them in the combination field under KNXnet/IP device.
- Select the device from the combination field. If it is not shown click on *Rescan*.
- After selection of the device, its data, e.g. MAC or plain text name, are displayed:
- With the acknowledgement OK, the setup of the IPR/S as a programming interface is completed.

If the required device is not connected, the connection can be checked by clicking on the button *KNXnet/IP Diagnostic Assistant*.

After completion of the settings, the connection to the IPR/S can be tested by clicking on *Test* in the new window:



The physical address of the tunnelling connection can be set as a programming interface via the *Settings* button. The following window appears:

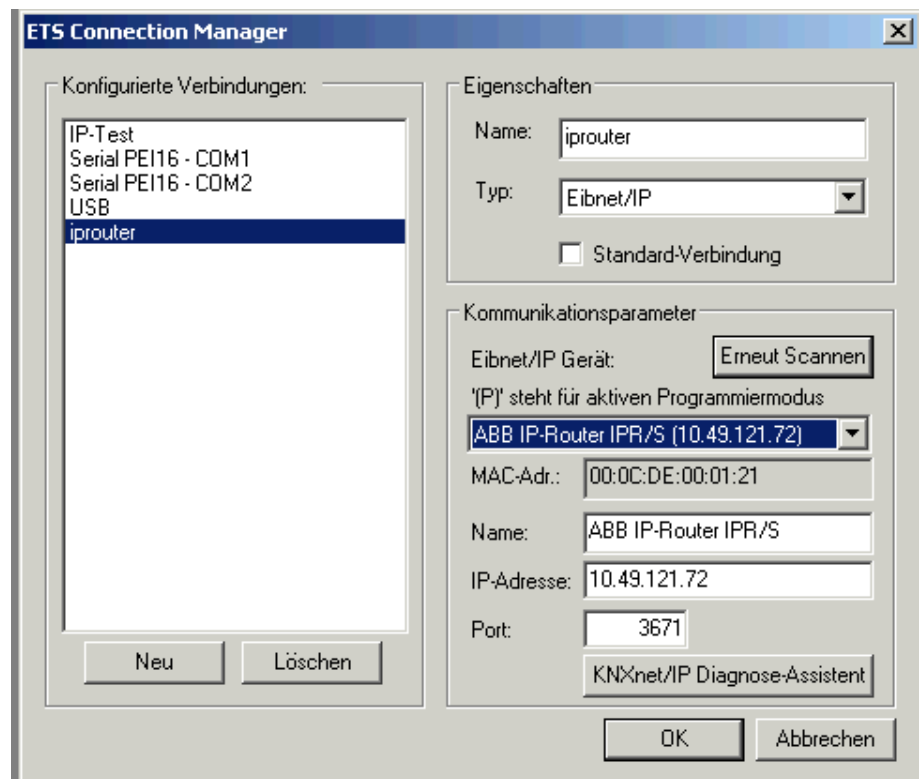


It must be assured that the physical address of the tunnelling connection matches the topology, e.g. 1.1.255.

3.4.2 Settings for ETS3.0e

The settings for the ETS3.0e are mainly identical to those of the [ETS3.0f](#). However with ETS3.0e the designation EIBnet/IP is used instead of KNXnet/IP.

The following illustration shows the settings:



4 Planning and application

4.1 The IP Router in the network

The IP Router is designed for use in 10/100 BaseT networks compliant to IEEE802.3. The device features an AutoSensing function and sets the baud rate (10 or 100 MBit) automatically.

4.1.1 IP Address of the IPR/S

The IP address of the device can be received from a DHCP server. For this purpose the automatic assignment setting of the IP address in the ETS is required, see parameter window [IP settings](#). If no DHCP server is found with this setting, the device starts an AutoIP procedure and autonomously assigns an IP address from the range 169.254.xxx.yyy.

The IP address which the device receives during start-up (via DHCP or AutoIP) is retained until the next restart (switch on/off or reprogramming).

If the IP address of the IPR/S is to have a fixed assignment, in the ETS a fixed IP address (as well as a subnet mask and standard gateway) are set, see parameter window [IP settings](#).

4.1.2 KNX telegrams in the network

The IP Router sends telegrams from the KNX to the IP network in accordance with the KNXnet/IP protocol specification. These telegrams are sent in the default setting as multicast telegrams to the multicast IP address 224.0.23.12 port 3671. The Multicast IP address 224.0.23.12 is the defined address for the KNXnet/IP from the KNX Association in conjunction with IANA for KNX-IP devices. This address should be retained and only changed if the existing network demands that another address be used.

As several IP Routers in a network can communicate with one another, multicast communication must be possible between the devices. Depending on the type of network and the setting of the network components used, e.g. routers, switches or firewalls, the Multicast IP address 224.0.23.12 may need to be enabled explicitly beforehand. Please discuss the topic with your network administrator.

If no multicast communication is possible in a network, the IPR/S can also send Unicast telegrams to an IP address. This can be, e.g., the IP address of a PC on which the visualisation software is running. The communication is not compliant to the KNXnet/IP specification and currently only functions (date 08/2008) between ABB-IPR/S devices.

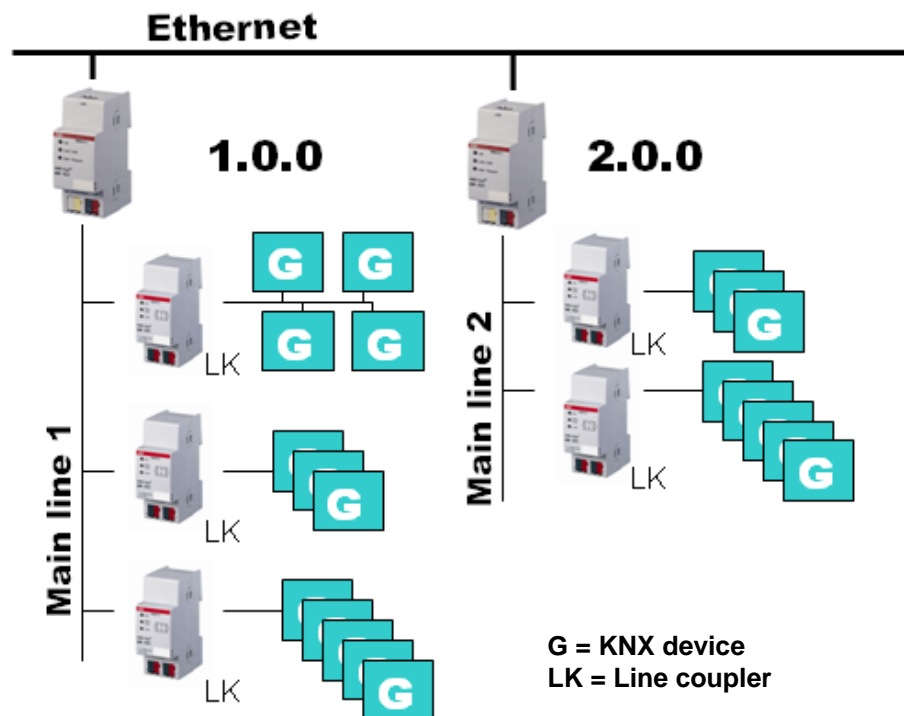
For further information see: Parameter window [IP communication Unicast](#)

Note
With the design of the KNX system it is important to note that the number of transferred telegrams is also limited when IP Routers are used. Due to the high baud rates on the IP side (10/100 Mbit/s), telegrams may be lost with high levels of data exchange for system reasons on the TP1 line (9.6 kbit/s).

4.1.3 IPR/S as an area coupler

The IP Router in a KNX system can assume the function of an area coupler. For this purpose it must receive the physical address of an area coupler (1.0.0...15.0.0). At the present time in an ETS project (ETS3.0f) up to 15 areas can be defined with area couplers.

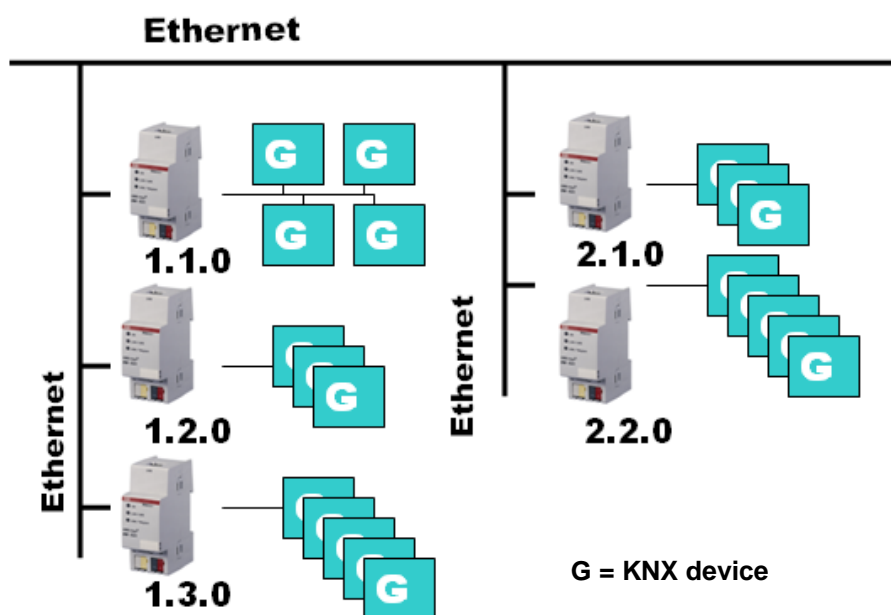
The following illustration shows the topology with IP Routers as area couplers and KNX line couplers (LK/S4.1).



4.1.4 IPR/S as a line coupler

The IP Router in a KNX system can assume the function of a line coupler. For this purpose it must receive the physical address of a line coupler (1.1.0...15.15.0). At the present time in an ETS project (ETS3.0f) up to 225 lines can be defined.

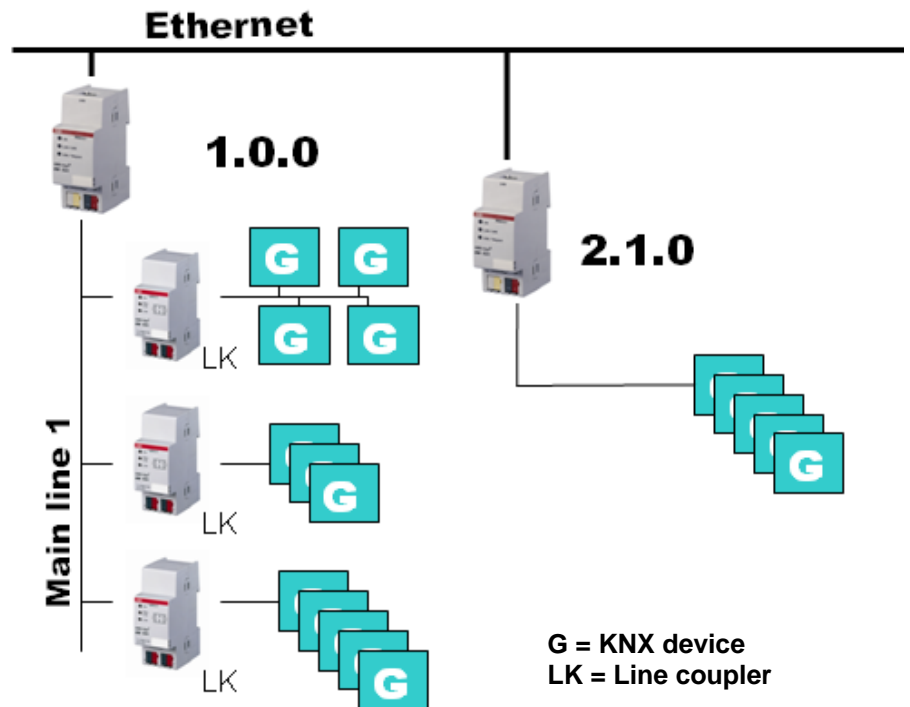
The following illustration shows the topology with IP Routers as line couplers.



This topology can be defined as a flat topology, as there are KNX main or area lines. The telegrams of a KNX line are transferred directly to the Ethernet.

4.1.5 Mixed topology

If it is necessary in a KNX system to use the IP Router at one point as an area coupler, e.g. office complex, and at another point as a line coupler, e.g. a remote underground garage; this is possible. It is only necessary to ensure that the IP Router used as a line coupler uses a line coupler address from a free area, e.g. in the illustration it is 2.1.0.



A Appendix

A.1 Ordering information

Short description	Designation	Order No.	bbn 40 16779 EAN	Price group	Weight 1 pc. [kg]	Packaging [pc.]
IPR/S 2.1	IP Router, MDRC	2CDG 110 061 R0011	652 29 2	26	0.1	1

A.2 Notes

This image shows a full page of blank graph paper. The grid consists of small, equal-sized squares formed by thin black lines. There are no margins, text, or other markings on the page.

This image shows a full page of blank graph paper. The grid consists of small, uniform squares formed by thin black lines. A single vertical line runs down the center of the page, dividing it into two equal halves. The background is white, and the grid covers the entire area except for the central vertical line.

A.4 Notes

This image shows a full page of blank graph paper. The grid consists of small, uniform squares formed by thin black lines. There are no margins, text, or other markings on the page.



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Pub. No. 2CDC 502 046 D0202

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