

HDL[®]

User Manual

KNX net/IP Router M/IPRT.1

KNX net/IP Interface M/IPIF.1



buspro KNX[®]

www.hdlautomation.com

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1. Overview

KNX net/IP is a **tunnelling** and **routing** device. It contains KNX net/IP Router (M/IPRT.1) and KNX net/IP Interface (M/IPIF.1).

It can be used as **line- or backbone** coupler and provides a data connection between the upper KNX net/IP line (main line or backbone) and the lower TP KNX bus line (sub line). It also provides with the tunnelling protocol a connection point for ETS to enable commissioning and monitoring.

IP Routers are similar to TP line couplers, except that they use Ethernet for the main line. However, it is also possible to directly integrate KNX end devices via IP, making Ethernet respectively IP (Internet Protocol) a KNX medium in its own right.

KNX net/IP can also connect two separate installations/systems.

2. Main functions

Following highlights are characterizing KNX net/IP Interface:

- Support of long messages up to 250 byte. In combination with line coupler M/LCR01 and USB interface "M/USB01" long messages are made possible (e.g. energy metering applications).
- It provides the tunnelling protocol, a connection point for ETS to enable commissioning and monitoring (4 parallel connections are possible).
- KNX net/IP can be used for replacing a line coupler or an area coupler. The best advantage of this change is using LAN as a fast medium for exchange of telegrams between the lines and/or areas.
- sending IAK on own message: sending of immediate acknowledged (IACK) on a frame that is sent by the KNX device itself.

When the KNX net/IP sends a message and there is nobody to acknowledge this message, the KNX net/IP would repeat the last message up to 3 times. In case there is an IACK, there will be no repetition. The failure mechanism in case of a negative IACK or BUSY is still maintained.

- Routing of all physically addressed messages, no matter of own physical address, on press of a button on the device without reconfiguring the device with ETS.
- High internal amount of communication buffers capable smoothing peaks in communication load.
- Detailed possibility for diagnosis by displaying all operational states with 6 duo LEDs. (Bus OK (each line), traffic (each line), errors/faulty communication NACK, BUSY on the bus (each line))
- UPnP available to discover the device in IP network. The ETS can discover the

- device as communication interface through Eibnet/IP Search Request.
- WEB interface: currently providing device settings and an opportunity to switch on to program mode.
 - The firmware can be updated through the web interface.
 - Wide power supply voltage.
 - Modular installation device for 35mm DIN rails.

NOTE

Please note that commissioning straight at delivery status (default settings) means:

- the fallback time after manual operation is 120 min and***
- the physical address is 15.15.255.***

2.1 Communication objects

KNX net/IP has no KNX communication objects.

2.2 KNX net/IP as programming interface

KNX net/IP 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.

2.3 Tunnelling

The presence of the Internet Protocol (IP) has led to the definition of KNXnet/IP.

KNXnet/IP provides the means for point-to-point connections -KNXnet/IP Tunnelling- for ETS and/or between a supervisory system and a KNX installation.

KNXnet/IP Device Management provides configuration of KNXnet/IP devices through the KNX network effectively reducing the time required for configuration.

2.4 Routing

Routing is how lines or areas may interconnect using IP networks via KNXnet/IP.

KNXnet/IP Routing defines how KNXnet/IP routers communicate with each other using IP networks.

2.5 Coupler

The basic functionality of KNX net/IP is coupling the Ethernet with KNX-TP line(s).

KNX net/IP provides galvanic isolation between the two connected lines.

Due to the flexibility of KNX net/IP, the coupler can be used as a line coupler e.g. to connect through Ethernet several TP lines together, as a backbone coupler to connect through Ethernet several TP areas or to connect different TP installations/systems.

The KNX net/IP provides outstanding features compared to other similar products, for example support for long messages (up to 250 byte length) and a configurable one button activation of special functions (e.g. transmit all group telegrams). These are helpful during installation, during run time and for trouble shooting. The high informative 6 duo LED display shows accurate the bus

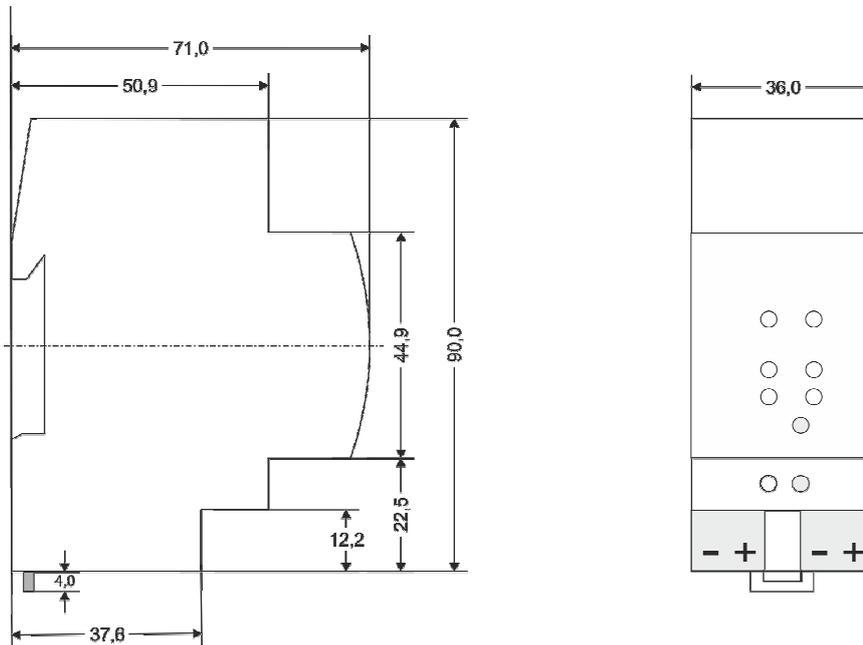
status on each line. This helps identifying common communication problems due to bus load or retransmissions on both lines.

3. Basic parameters

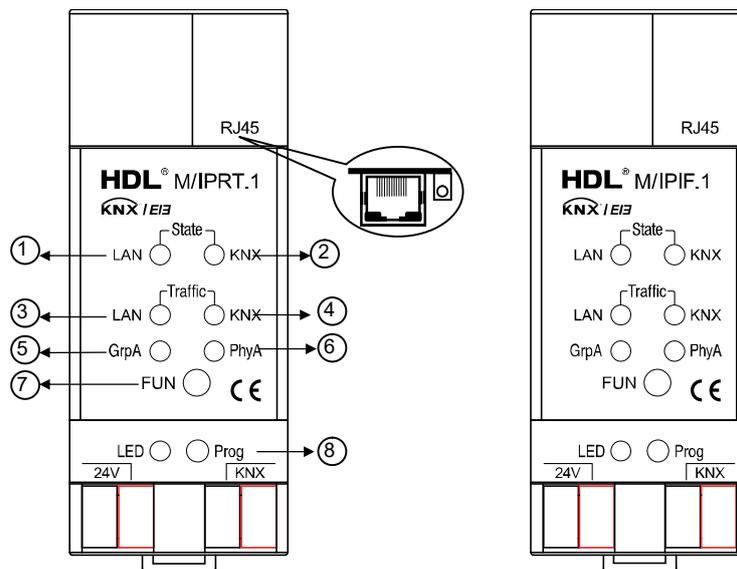
Marking/Design	KNX net/IP		
Supply voltage	DC 24V (DC 12 to 30V)		
Current consumption from KNX	Typ. 5 mA		
Current consumption	Typ. 190 mA		
Power consumption	Typ. 520mW, max 800mW		
Rated voltage / Rated current	Supply (V)	I typ. (mA)	P typ. (W)
	11	45	0,495
	15	33	0,495
	20	25,3	0,506
	24	21,6	0,5184
	31	18	0,558
Connections	IP line: RJ45 socket for 10/100BaseT, IEEE 802.3 networks KNX line: KNX Wago bus connecting terminal (red/black) screw less for single-core cable Ø 0,6 to 0,8 mm		
Display elements	LED Power LED LAN-OK LED LAN-RX/TX LED for programming mode	LED Error LED KNX-OK LED KNX-RX/TX	
Control elements	Function button, Programming button		
Installation	on 35 mm DIN rail mount EN 60715 TH 35-75		
Type of protection	IP 20 according to EN 60529		
Degree of pollution	2 to IEC 60664-1		
Protection class	Class III to IEC 61140		
Overvoltage class	Class III to IEC 60664-1		
CE-indication	in accordance with EMC and low voltage guidelines Device complies with EN 50090-2-2, IEC 60664-1		
Bus	Safety extra low voltage DC 21...30V SELV		
Housing colour	Plastic PA66 housing grey		
Dimensions	DIN-rail mounted device H= 90mm, W= 36mm (2 SU), D= 70mm		

	Mounting depth 64 mm
Weight	66 g
Climatic conditions	EN 50090-2-2
Temperature range	Operation: -5°C... +45°C non-condensing Storage: -20°C... +60°C
Relative humidity	5% to 93% non-condensing

4. Dimension and specifications



Dimensions in mm
Tolerance: -0.5 mm/DIN 16742



4.1 Normal mode

- ① **LED Bus Stat LAN green**
 - Off: LAN line error
 - On: LAN line OK
- LED Bus Stat LAN red**
 - On: manual overwrite active
- ② **LED Bus Stat KNX green**
 - Off: KNX line error or not connected
 - On: KNX line OK
- ③ **LED Traffic LAN green**
 - Blinking: bus traffic on LAN line
 - Off: no traffic on LAN line
 - Speed up to 10 Mbit/s
- LED Traffic LAN red**
 - Blinking: transmission error on LAN line
- ④ **LED Traffic KNX green**
 - Blinking: bus traffic on KNX line
 - Off: no traffic on KNX line
- LED Traffic KNX red**
 - Blinking: transmission error on KNX line
- ⑤ **LED Group Address**
 - For KNX net/IP Interface not in use.
- ⑥ **LED Physical Address**
 - For KNX net/IP Interface not in use.

4.2 Function button

- ⑦ **Function button**
 - Long press (3 sec)**
 - Switch to manual override.
 - Default function is set with LAN line and (KNX) line parameter.
 - Manual override functionality is configured in “General parameters”.

NOTE

The latest downloaded settings (parameters) are still available after switching back from “Manual operation” to “Normal operation”.

Very long press (15s)

LEDs: LEDs are on red

- release button and press again for some sec: resets all the parameter to factory default (incl. physical address).

4.3 Addressing mode

- ⑧ **LED addressing mode**

Off: normal operating mode

On: addressing mode

After receiving the physical address the KNX net/IP automatically returns from addressing mode to the normal operating mode.

Button addressing mode

Button for switching between normal operating mode and addressing mode for assigning the physical address.

4.4 KNX Telegrams in the network

The IP Router sends telegrams from/to the KNX to/from 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 the IANA. This address should stay as defined and only changed if it becomes necessary due to the existing network. By commissioning, it should be regarded that all KNX IP devices which should communicate with one another via IP must use the same IP routing multicast address. Settings are to be changed in the "General Parameters".

NOTE

Multicast IP address 224.0.23.12 may need to be enabled corresponding to the type of network and the setting of the network components.

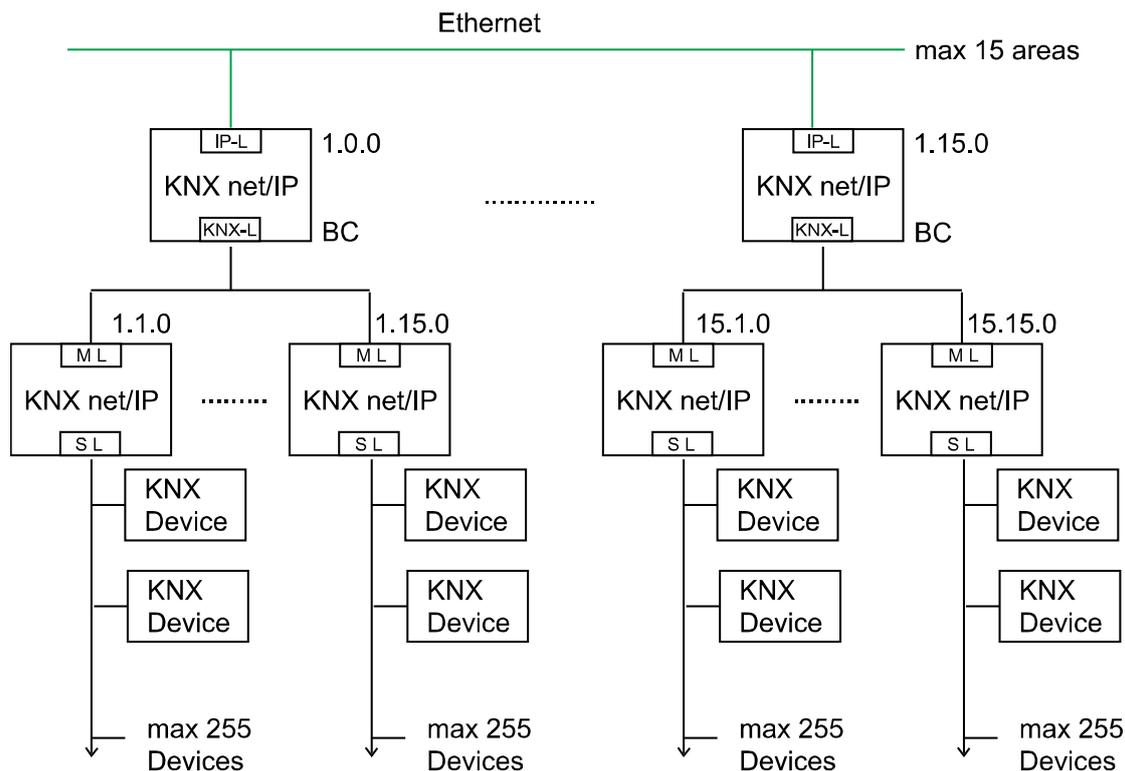
4.5 KNX net/IP as Area coupler

KNX net/IP 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 till 15.0.0).

For now in the actual ETS, up to **15 areas** can be defined with area couplers.

The following illustration shows the topology with KNX net/IP routers as area couplers and KNX net/IP couplers as line couplers.



- IP-L: IP line
- KNX-L: KNX line
- BC: Backbone coupler
- ML: Main line
- SL: Sub line

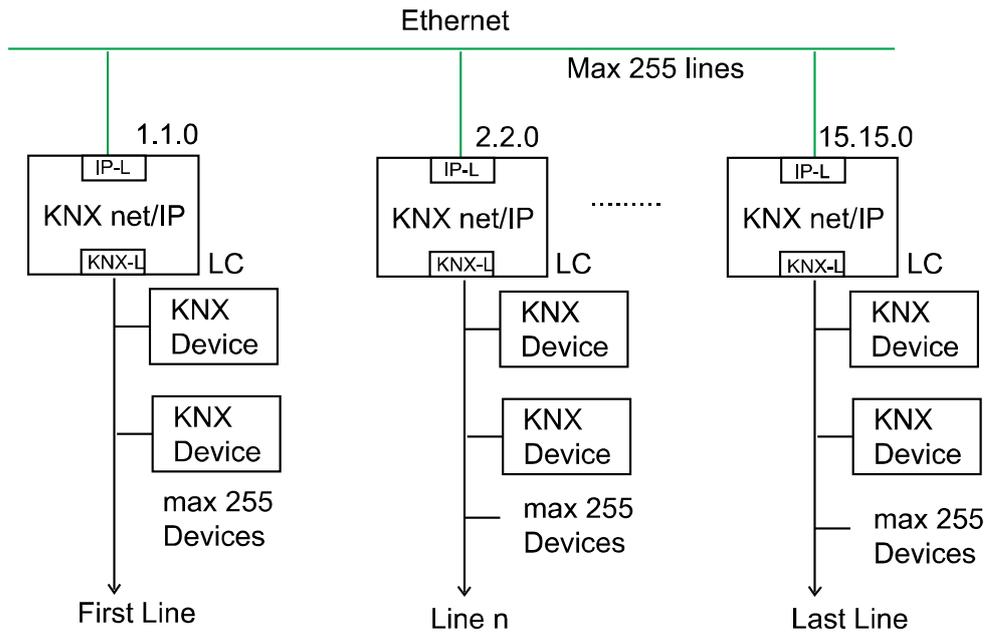
4.6 KNX net/IP as Line coupler

KNX net/IP 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 till 15.15.0).

For now in the actual ETS, up to **225 lines** can be defined (1.1.0 till 15.15.0).

The following illustration shows the topology with KNX net/IP routers as line couplers.

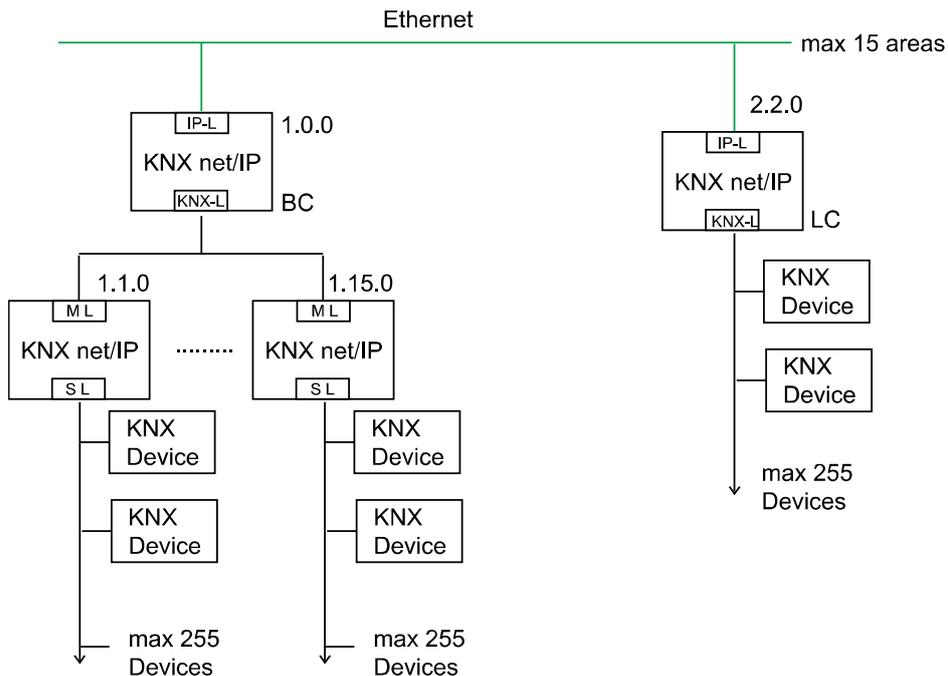


IP-L: IP line
 KNX-L: KNX line
 LC: Line coupler

4.7 KNX net/IP in mixed System

If it is necessary in a KNX system to use the KNX net/IP 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 KNX net/IP used as a line coupler uses a line coupler address from a free area.



5. System connection

5.1 General



Picture 1: General

ETS-Text	Range [Default value]	Comment
Host name	ZYXW [KNX IP Router]	Field to enter the KNX net/IP name (30 signs max.). For an easy search of the device with the ETS or with a KNXnet/IP visualisation system.
Enable slow connections	enable disable [disable]	Enable to support slow tunnelling connections

Table 1: Parameter General

NOTE

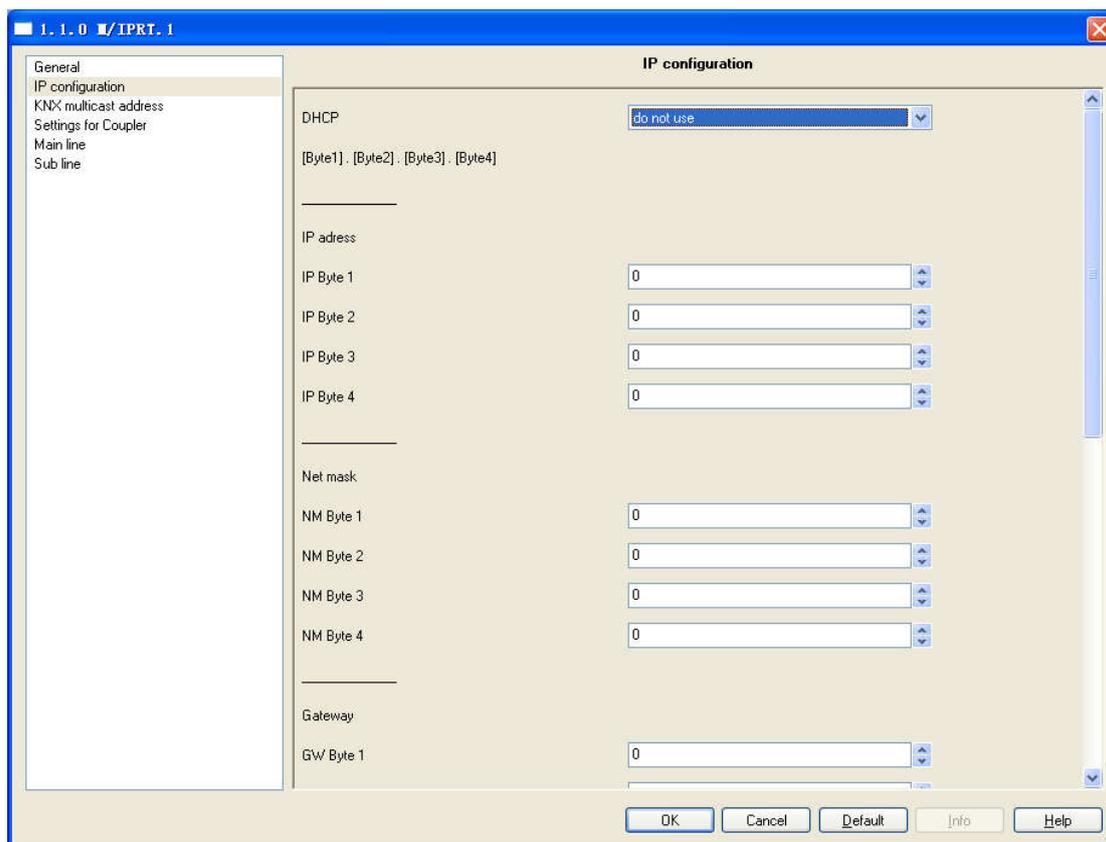
5.2 IP Configuration



Picture 2: DHCP configuration

ETS-Text	Range [Default value]	Comment
DHCP	use do not use [use]	If DHCP is used, no parameterisation needed. If DHCP is not used, following parameters are to be set.

Table 2: DHCP configuration



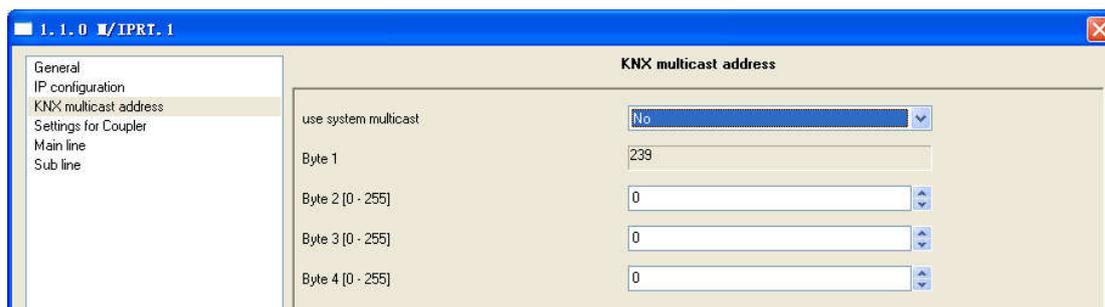
Picture 3: DHCP manual configuration

ETS-Text	Range [Default value]	Comment
DHCP configuration [Byte1]. [Byte2]. [Byte3]. [Byte4]	use do not use [use]	If DHCP is not used, following parameters are to be set.
<u>IP Address</u> IP Byte 1 IP Byte 2 IP Byte 3 IP Byte 4	0...255 0...255 0...255 0...255	IP Byte 1 to 4: manual input.
<u>Net mask</u> NM Byte 1 NM Byte 2 NM Byte 3 NM Byte 4	0...255 0...255 0...255 0...255	Net mask Byte 1 to 4: manual input.

<u>Gateway</u>		Gateway Byte 1 to 4: manual input.
GW Byte 1	0...255	
GW Byte 2	0...255	
GW Byte 3	0...255	
GW Byte 4	0...255	

Table 3: DHCP manual configuration

5.3 KNX multicast address



Picture 4: KNX multicast address

ETS-Text	Range [Default value]	Comment
Byte 1 [224 ... 239]	224...239 System: [224] Individual: [239]	First byte of the IP routing multicast address. If System multicast address used: "224" is permanently set. If Individual multicast address used: "239" is permanently set.
Byte 2 [0 ... 255]	0...255 [0]	Second byte of the IP routing multicast address. Can only be set manually if an individual multicast address is used.
Byte 3 [0 ... 255]	0...255 [23]	Third byte of the IP routing multicast address. Can only be set manually if an individual multicast address is used.
Byte 4 [0 ... 255]	0...255 [12]	Fourth byte of the IP routing multicast address. Can only be set manually if an individual multicast address is used.

Table 4: KNX multicast address

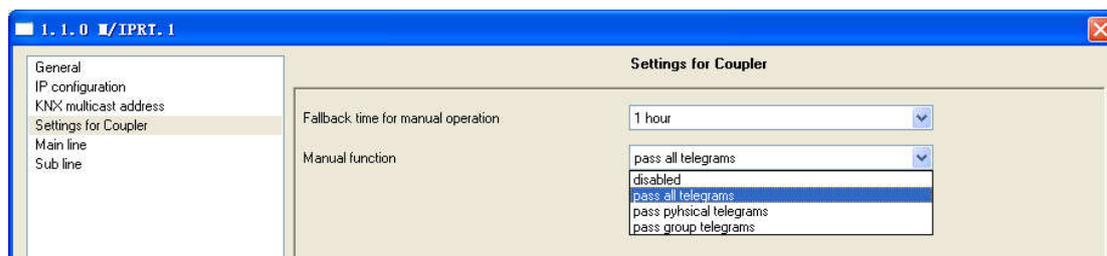
NOTE

The Multicast IP address 224.0.23.12 is the defined address for the KNXnet/IP from the KNX Association in conjunction with the IANA.

This address should stay as defined and only changed if it becomes necessary due to the existing network.

By commissioning, it should be regarded that all KNX IP devices which should communicate with one another via IP must use the same IP routing multicast address.

5.4 Settings for coupler



Picture 5: Settings for coupler

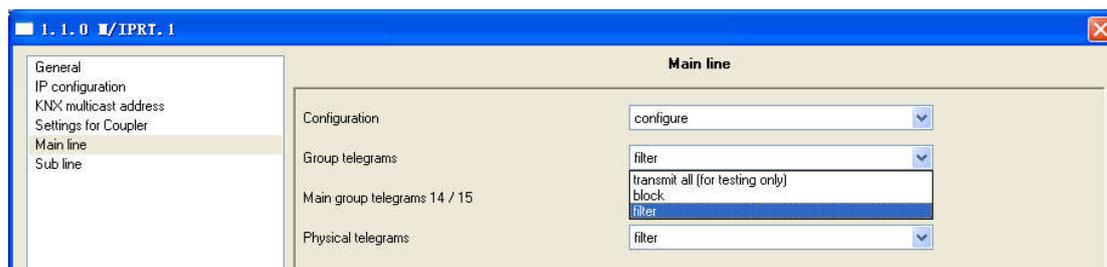
ETS-Text	Range [Default value]	Comment
Fallback time for manual operation	10 min, 1 hour, 4 hours, 8 hours [1 hour]	Time duration required to exit from “manual operation”
Manual function	Disabled Pass all telegrams Pass physical telegrams Pass group telegrams [pass all telegrams]	Telegram routing configuration for the manual function.

Table 5: Parameter General

5.5 Main Line



Picture 6: Main Line/Configuration



Picture 6.1: Main Line/Group or Physical telegrams configured individually

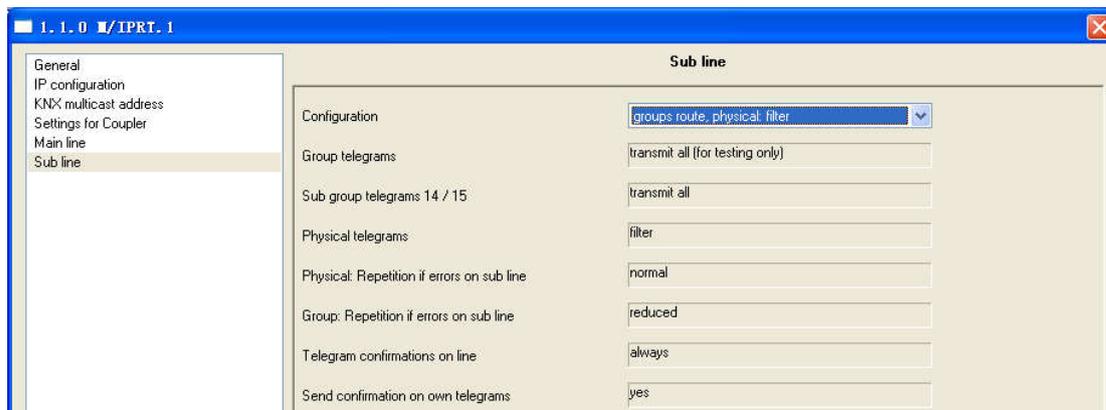
ETS-Text	Range [Default value]	Comment
Configuration	groups: filter, physical: block groups, physical: filter groups: route, physical: filter groups, physical: route configure [groups, physical: filter]	- Block : no telegram is routed. - Filter : Only telegrams are routed which are entered in the filter table. - Route : the telegrams are routed. - Configure : the following parameters can be set individually. This parameter is to be set depending on the planned configuration.
Group telegrams	1. transmit all (for testing only) 2. block 3. filter [filter]	1. All group telegrams are transmitted. 2. No group telegram is transmitted. 3. Only group telegrams are routed which are entered in the filter table. The ETS 3/4 produces the filter table automatically.
Main group telegrams 14/15	1. transmit all 2. block [transmit all]	1. Group telegrams with the main group 14 or 15 (e.g. 14/1) are routed. 2. Group telegrams with the main group 14 or 15 (e.g. 14/1) are not routed.
Physical telegrams	1. transmit all (for testing only) 2. block 3. filter [filter]	1. All physical telegrams are transmitted. 2. No physical telegram is transmitted. 3. Only physical telegrams are routed based on physical address.

Table 6: Main Line

NOTE

Please note that the parameter “transmit all” for Group or Physical telegrams is intended only for testing purposes and it should not be set for normal operation.

5.6 Sub line



Picture 7: Sub line

ETS-Text	Range [Default value]	Comment
Configuration	groups: filter, physical: block groups, physical: filter groups: route, physical: filter groups, physical: route configure [groups, physical: filter]	- Block : no telegram is routed. - Filter : Only telegrams are routed which are entered in the filter table. - Route : the telegrams are routed. - Configure : the following parameters can be set individually. This parameter is to be set depending on the planned configuration.
Group telegrams	1. transmit all (for testing only) 2. block 3. filter [filter]	1. All group telegrams are transmitted. 2. No group telegram is transmitted. 3. Only group telegrams are routed which are entered in the filter table. The ETS 3/4 produces the filter table automatically.
Sub group telegrams 14/15	1. transmit all 2. block [transmit all]	1. Group telegrams with the sub group 14 or 15 (e.g. 14/1) are routed. 2. Group telegrams with the sub group 14 or 15 (e.g. 14/1) are not routed.
Physical telegrams	1. transmit all (for testing only) 2. block 3. filter [filter]	1. All physical telegrams are transmitted. 2. No physical telegram is transmitted. 3. Only physical telegrams are routed based on physical address.
Physical: Repetition if errors on sub	1. no 2. normal 3. reduced	If a transmission error (e.g. due to missing receiver) is found when sending a physical telegram on the sub line:

line	[normal]	<ol style="list-style-type: none"> 1. The physical telegram is not repeated. 2. The physical telegram is repeated up to 3 times. 3. The physical telegram will be repeated only one time.
Group: Repetition if errors on sub line	<ol style="list-style-type: none"> 1. no 2. normal 3. reduced [normal]	<p>If a transmission error (e.g. due to missing receiver) is found when sending a group telegram on the sub line:</p> <ol style="list-style-type: none"> 1. The group telegram is not repeated. 2. The group telegram is repeated up to 3 times. 3. The group telegram will be repeated only one time.
Telegram confirmations on line	<ol style="list-style-type: none"> 1. if routed 2. always [if routed]	<ol style="list-style-type: none"> 1. Only telegrams which are to be routed are confirmed on the sub line (ACK). 2. Each telegram on the sub line is confirmed (ACK).
Send confirmation on own telegrams	<ol style="list-style-type: none"> 1. yes 2. no [no]	<ol style="list-style-type: none"> 1. Every telegram on the sub line is confirmed with its own ACK (from the Line coupler). 2. No confirmation with own ACK

Table 7: Sub Line

NOTE

If the parameter “Send confirmation on own telegrams” is set yes, KNX net/IP will send an ACK systematically when sending any own routed telegram.

