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2 Overview

2.1 Usage

The SCN-LK can be used as well as Coupler or as Repeater.

2.1.1 Coupler

The basic functionality of SCN-LK is coupling a KNX-TP-mainline with a KNX-TP-sub line. SCN-LK provides galvanic isolation between the two connected lines.

Due to the flexibility of SCN-LK, the coupler can be used as a line coupler to connect a line to a main line or as a backbone coupler to connect a main line to a backbone line.

The main task of SCN-LK is filtering the traffic according the installation place in the hierarchy or according to the built in filter tables for group oriented communication.

The SCN-LK 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. 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.

2.1.2 Repeater

The function SCN-LK of as repeater has the target to link two lines for data transfer.

SCN-LK as repeater still provides galvanic isolation between the connected lines.

Up to three line repeaters can be used behind a line coupler. As a result, up to four lines can form a complete line. Each line must be supplied by a dedicated KNX power supply.

2.2 Exemplary circuit diagram

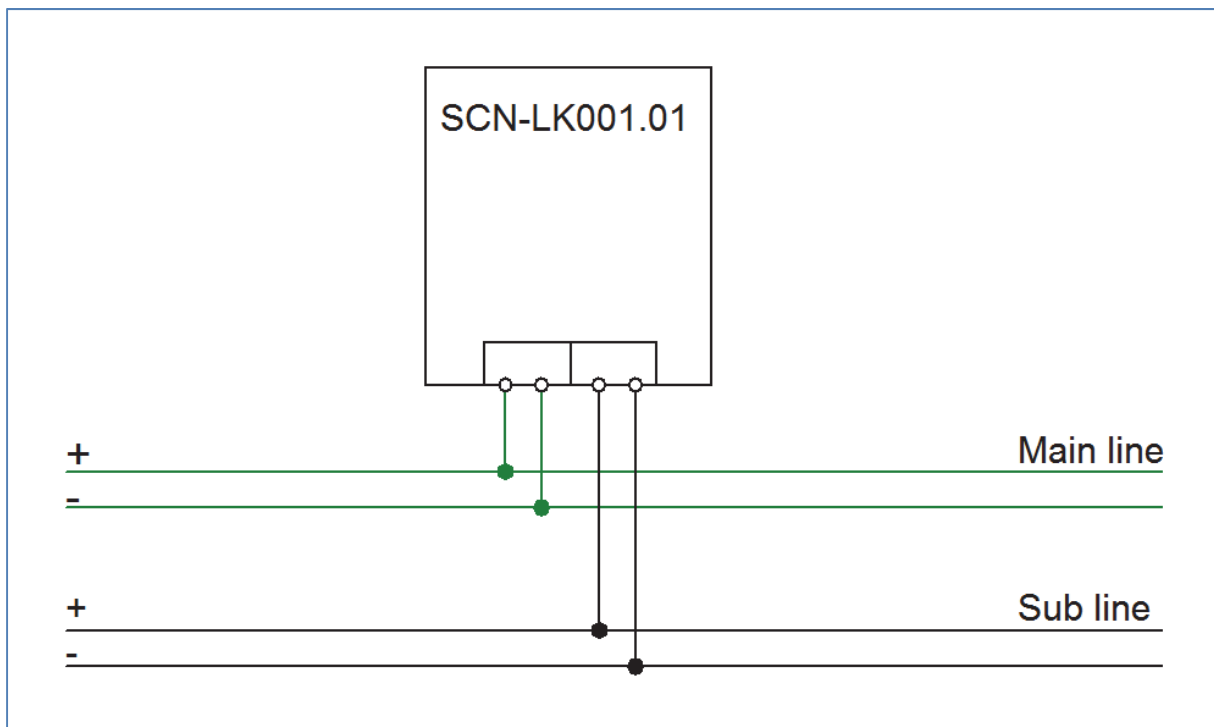
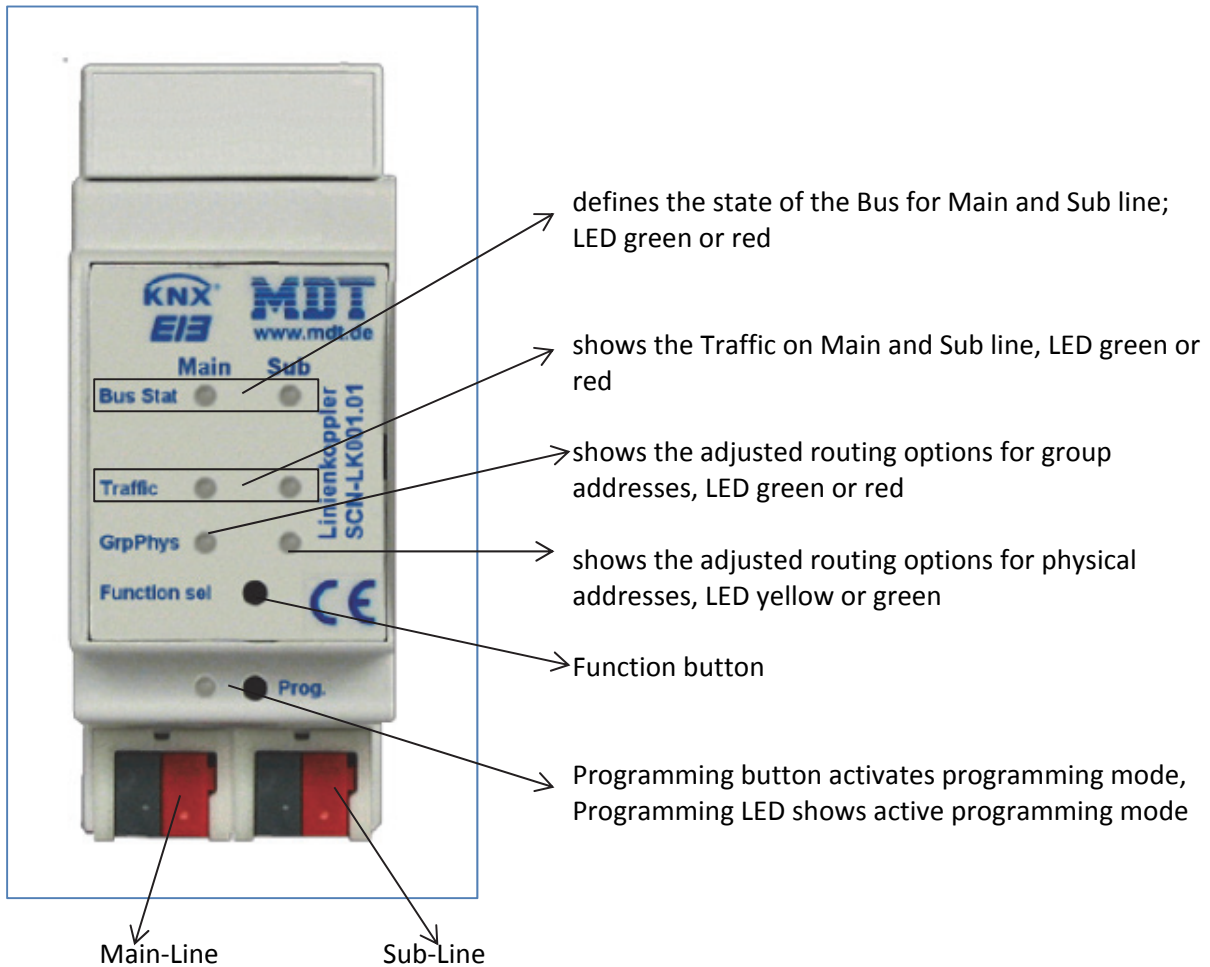


Figure 1: Exemplary circuit diagram

2.3 Structure & Handling



2.3.1 LED-Display

- **LED Bus Stat Main green**
 - Off: main line error
 - On: main line ok
- **LED Bus Stat Main red**
 - On: manual overwrite active
- **LED Bus Stat Sub green**
 - Off: sub line error or not connected
 - On: sub line ok
- **LED Traffic Main green**
 - Blinking: bus traffic on main line
 - Off: no traffic on main line
- **LED Traffic Sub green**
 - Blinking: bus traffic on sub line
 - Off: no traffic on sub line
- **LED Traffic Main red**
 - Blinking: transmission error on main line
- **LED Traffic Sub red**
 - Blinking: transmission error on sub line
- **LED Group Address**

Routing of group telegrams

 - Off: main and sub different
 - Green: filter table active
 - Green + red: route all
 - Red: block
- **LED Physical Address**

Routing of physical addressed telegrams

 - Off: main and sub different
 - Green: filter table active
 - Green + yellow: route all
 - Yellow: block

2.3.2 Function button

Long press (3 sec):

Switch to manual overwrite, configuration is done via ETS.

LED Bus Stat Main red

- On: switch on manual overwrite
- Off: switch to configured routing

Very long press (15s):

LEDs: **Bus Stat Main, Bus Stat Sub, Group Address, Physical Address** are on red

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

3 ETS-Parameters

3.1 Coupler

3.1.1 Functions

If the coupler receives telegrams (for example during commissioning) which use a physical address as destination address, it compares the physical addresses of the receiver with its own physical address and then decides whether it must route the telegrams or not.

The coupler reacts to telegrams with group addresses in accordance with its parameter settings. During normal operation (default setting), the coupler only routes those telegrams whose group addresses have been entered in its filter table.

If the coupler routes a telegram and does not receive an acknowledgement, or if a bus device finds a transmission error, the coupler repeats the telegram three times. With the parameters „Repetitions if errors...“, this behaviour can be set separately for both lines. These parameters should be left in the default setting.

If not already configured as “coupler”, the corresponding application program for “coupler” should be downloaded.

Change can occur under “Change Application Program...” and could be checked under “Properties”:

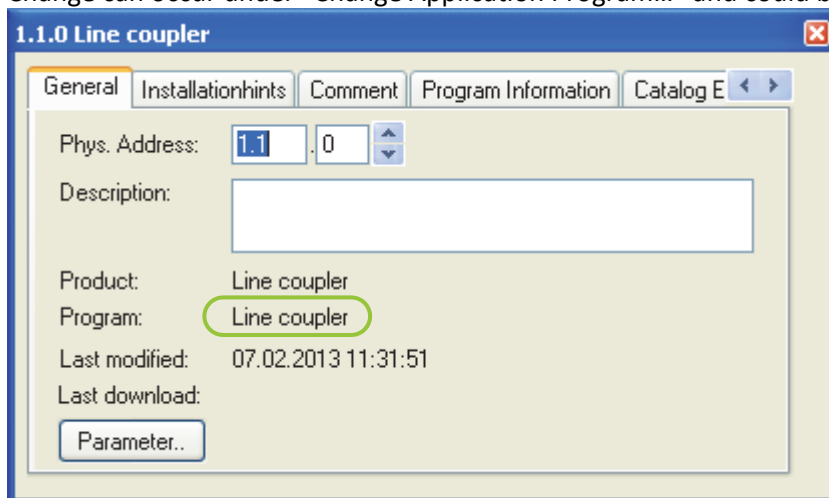


Figure 2: Usage as Line Coupler

3.1.2 General

General	
Fallback time for manual operation	1 hour ▼
Manual function	pass all telegrams ▼

Figure 3: Line Coupler - General settings

The following chart shows the available settings for the submenu “General”:

ETS-text	Dynamic range [default value]	comment
Fallback time for manual operation	<ul style="list-style-type: none"> ▪ 10 min ▪ 1 hour ▪ 4 hours ▪ 8 hours 	Time duration required to exit from “manual operation”
Manual function	<ul style="list-style-type: none"> ▪ Disabled ▪ Pass all telegrams ▪ Pass physical telegrams ▪ Pass group telegrams 	Telegram routing configuration for the manual function.

Table 1: Line Coupler - General settings

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.

3.1.3 Main Line

Main Line	
Configuration	configure
Group telegrams	filter
Main group telegrams 14 / 15	transmit all
Physical telegrams	filter
Physical: Repetition if errors on main line	normal
Group: Repetition if errors on main line	normal
Telegram confirmations on line	if routed
Send confirmation on own telegrams	no

Figure 4: Line Coupler - Main line

The following chart shows the available settings for the submenu “Main Line”:

ETS-text	Dynamic range [default value]	comment
Configuration	<ul style="list-style-type: none"> ▪ groups: filter, physical: block ▪ groups, physical: filter ▪ groups: route, physical: filter ▪ groups, physical: route ▪ configure 	<ul style="list-style-type: none"> - 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 planed configuration.
Group telegrams	<ol style="list-style-type: none"> 1. transmit all 2. block 3. filter 	<ol style="list-style-type: none"> 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. ETS 3/4 produces the filter table automatically.
Main group telegrams 14/15	<ol style="list-style-type: none"> 1. block 2. transmit all 	<ol style="list-style-type: none"> 1. Group telegrams with the main group 14 or 15 (e.g. 14/1) are not routed. 2. Group telegrams with the main group 14 or 15 (e.g. 14/1) are routed.

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

Table 2: Line Coupler – Main line

3.1.4 Sub Line

Line	
Configuration	configure
Group telegrams	filter
Sub group telegrams 14 / 15	transmit all
Physical telegrams	filter
Physical: Repetition if errors on sub line	normal
Group: Repetition if errors on sub line	normal
Telegram confirmations on line	if routed
Send confirmation on own telegrams	no

Figure 5: Line Coupler - Sub line

The following chart shows the available settings for the submenu “Line”:

ETS-text	Dynamic range [default value]	comment
Configuration	<ul style="list-style-type: none"> ▪ groups: filter, physical: block ▪ groups, physical: filter ▪ groups: route, physical: filter ▪ groups, physical: route ▪ configure 	<ul style="list-style-type: none"> - 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	<ol style="list-style-type: none"> 1. transmit all 2. block 3. filter 	<ol style="list-style-type: none"> 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	<ol style="list-style-type: none"> 1. block 2. transmit all 	<ol style="list-style-type: none"> 1. Group telegrams with the sub group 14 or 15 (e.g. 14/1) are not routed. 2. Group telegrams with the sub group 14 or 15 (e.g. 14/1) are routed.
Physical telegrams	<ol style="list-style-type: none"> 1. transmit all 2. block 3. filter 	<ol style="list-style-type: none"> 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 line	<ol style="list-style-type: none"> 1. no 2. reduced 3. normal 	<p>If a transmission error (e.g. due to missing receiver) is found when sending a physical telegram on the sub line:</p> <ol style="list-style-type: none"> 1. The physical telegram is not repeated. 2. The physical telegram will be repeated only one time. 3. The physical telegram is repeated up to 3 times.
Group: Repetition if errors on sub line	<ol style="list-style-type: none"> 1. no 2. reduced 3. 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 will be repeated only one time. 3. The group telegram is repeated up to 3 times.
Telegram confirmations on line	<ol style="list-style-type: none"> 1. always 2. if routed 	<ol style="list-style-type: none"> 1. Each telegram on the sub line is confirmed (ACK). 2. Only telegrams which are to be routed are confirmed on the sub line (ACK).
Send confirmation on own telegrams	<ol style="list-style-type: none"> 1. yes 2. 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 3: Line Coupler - Sub line

3.2 Repeater

3.2.1 Functions

Line repeaters do not have any filter tables. This means that a telegram is sent to all lines irrespective of whether it is processed in the corresponding line. It is therefore not important whether the telegram has been triggered within the lines or whether it has been sent from the main line to the lines via the line coupler.

If an error occurs during the transmission of a telegram with the physical address of a receiver, the line repeater can repeat the telegram. This behaviour can be set separately for both line segments with the parameters „Physical: Repetition if errors on main line/on sub line“.

If the line repeater routes a group telegram and does not receive an acknowledgement, or if a bus device finds a transmission error, the line repeater repeats the telegram three times. With the parameters „Group: Repetition if errors on main line/on sub line“, this behaviour can be set separately for main line and sub line.

If not already configured as “repeater”, the corresponding application program for “repeater” should be downloaded.

Change can occur under “Change Application Program...” and could be checked under “Properties”:

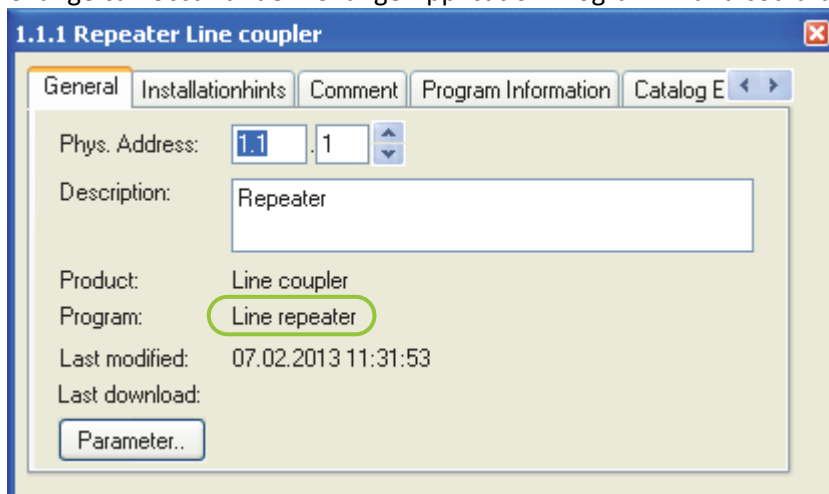


Figure 6: Usage as Repeater

3.2.2 General

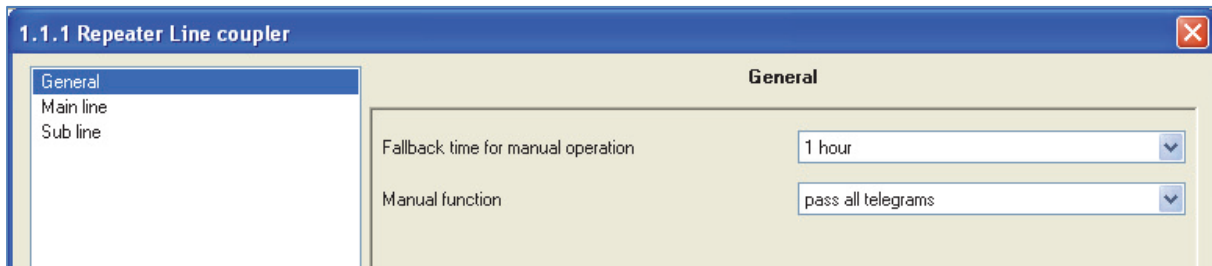


Figure 7: Repeater - General settings

ETS-Text	Dynamic 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 4: Repeater - General settings

3.2.3 Main Line

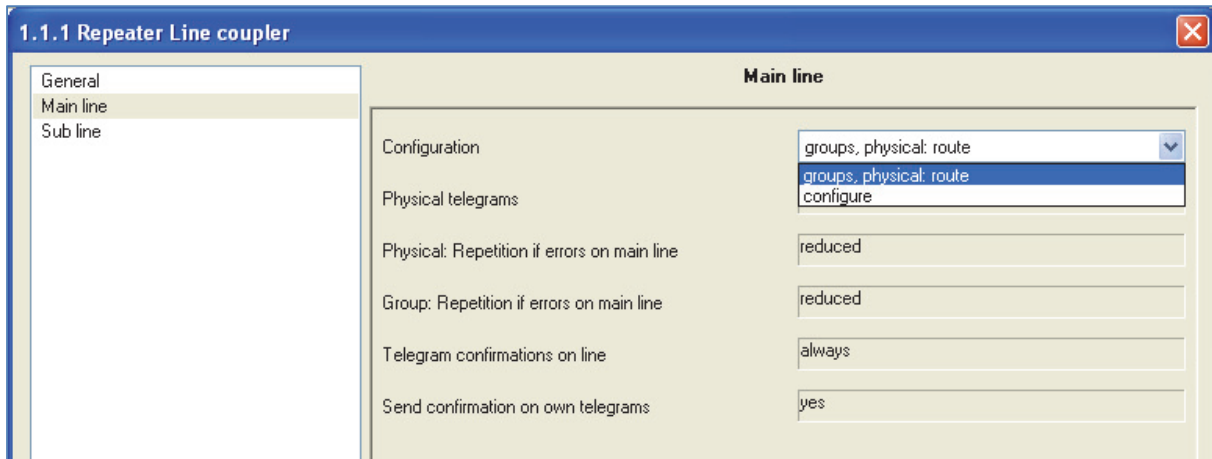


Figure 8: Repeater – Main line

ETS-Text	Dynamic Range [Default value]	Comment
Configuration	groups, physical: route configure [groups, physical: route]	- Route: the telegrams are routed. - Configure: the following parameters can be set individually. This parameter is to be set depending on the planed configuration.
Physical telegrams	1. transmit all 2. block [transmit all]	1. All physical telegrams are transmitted. 2. No physical telegram is transmitted.
Physical: Repetition if errors on main line	1. no 2. normal 3. reduced [reduced]	If a transmission error (e.g. due to missing receiver) is found when sending a physical telegram on the main line: 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 main line	1. no 2. normal 3. reduced [reduced]	If a transmission error (e.g. due to missing receiver) is found when sending a group telegram on the main line: 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	1. if routed 2. always [always]	1. Only telegrams which are to be routed are confirmed on the main line (ACK). 2. Each telegram on the main line is confirmed (ACK).
Send confirmation on own telegrams	1. yes 2. no [yes]	1. Every telegram on the main line is confirmed with its own ACK (from the Line coupler). 2. No confirmation with own ACK

Table 5: Repeater - Main line

3.2.4 Sub line

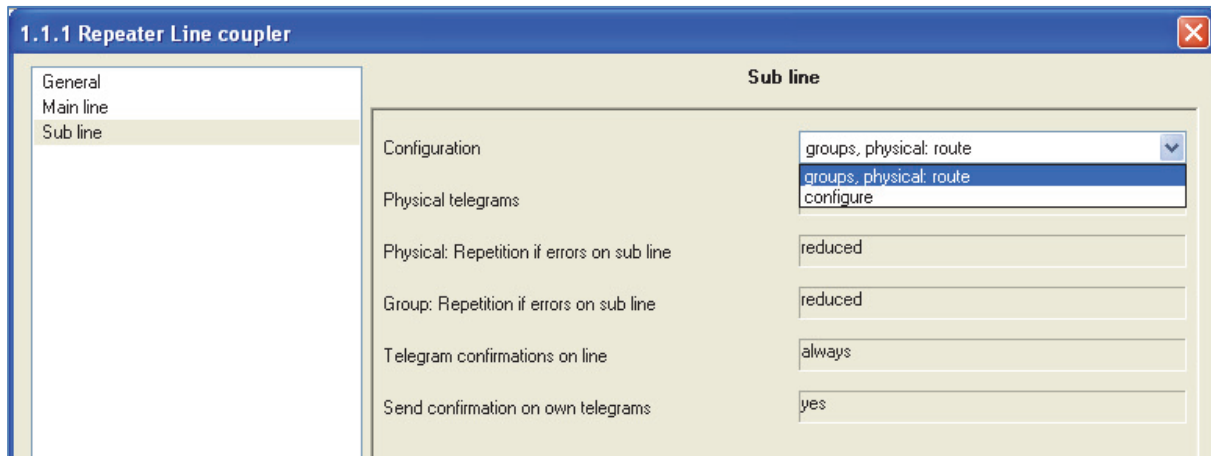


Figure 9: Repeater - Sub line

ETS-Text	Dynamic Range [Default value]	Comment
Configuration	groups, physical: route configure [groups, physical: route]	- Route: the telegrams are routed. - Configure: the following parameters can be set individually. This parameter is to be set depending on the planned configuration.
Physical telegrams	1. transmit all 2. block [transmit all]	1. All physical telegrams are transmitted. 2. No physical telegram is transmitted.
Physical: Repetition if errors on sub line	1. no 2. normal 3. reduced [reduced]	If a transmission error (e.g. due to missing receiver) is found when sending a physical telegram on the sub line: 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	1. no 2. normal 3. reduced [reduced]	If a transmission error (e.g. due to missing receiver) is found when sending a group telegram on the sub line: 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	1. if routed 2. always [always]	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	1. yes 2. no [yes]	1. Every telegram on the sub line is confirmed with its own ACK (from the Line coupler). 2. No confirmation with own ACK

Table 6: Repeater - Sub line

4 Settings at the ETS

4.1 Topology of the project

An exemplary project could look like this:

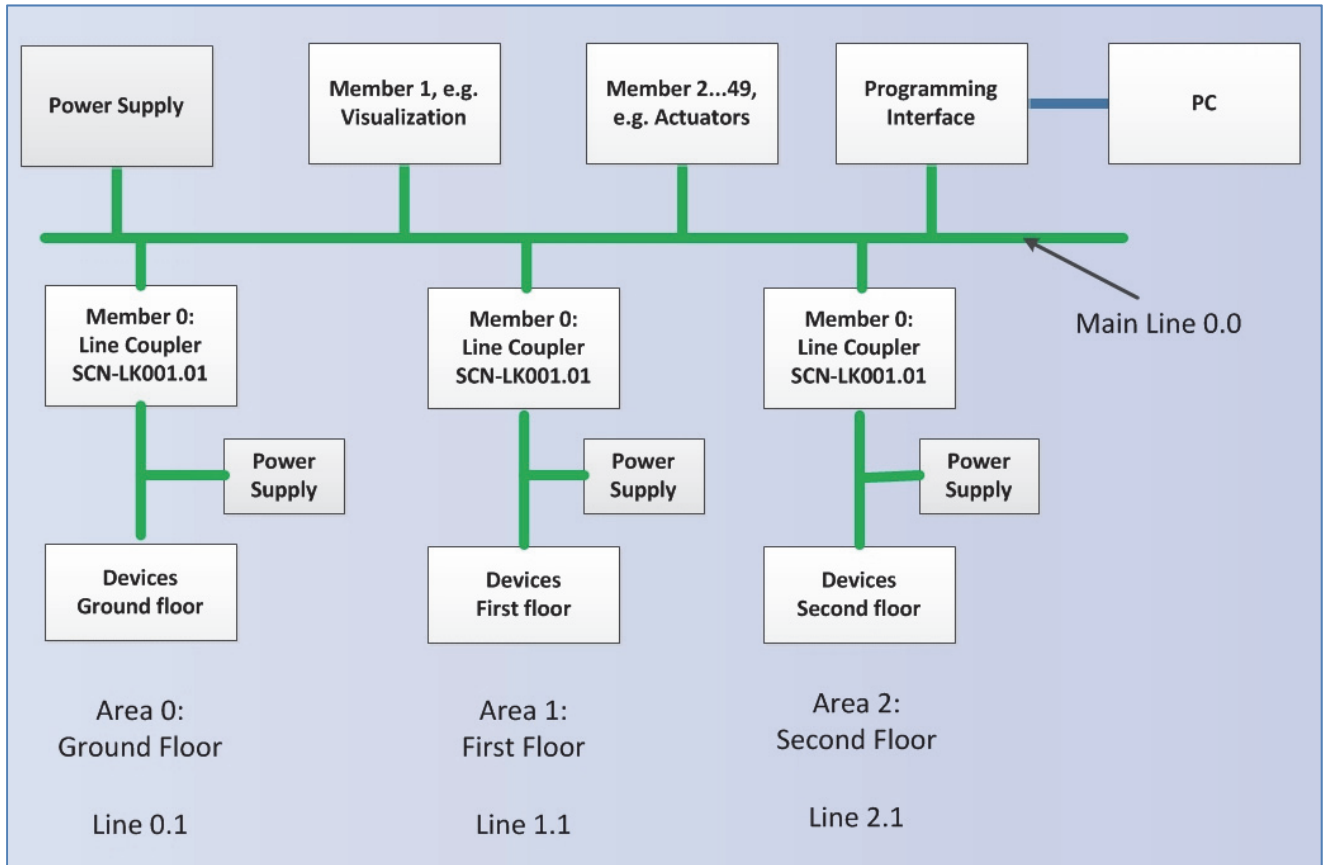


Figure 10: Topology Example

At the ETS, the topology looks like this:

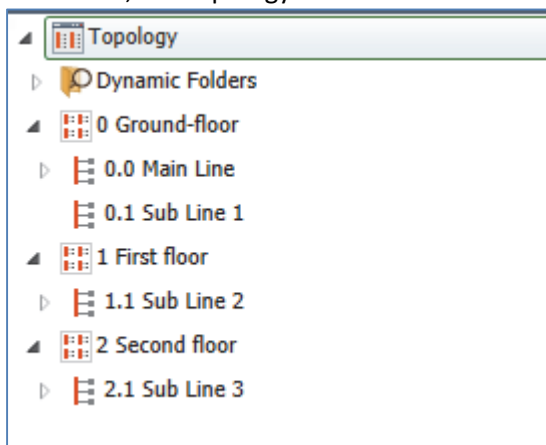


Figure 11: Topology ETS

If the presentation of one Sub line is expanded, it looks like this:

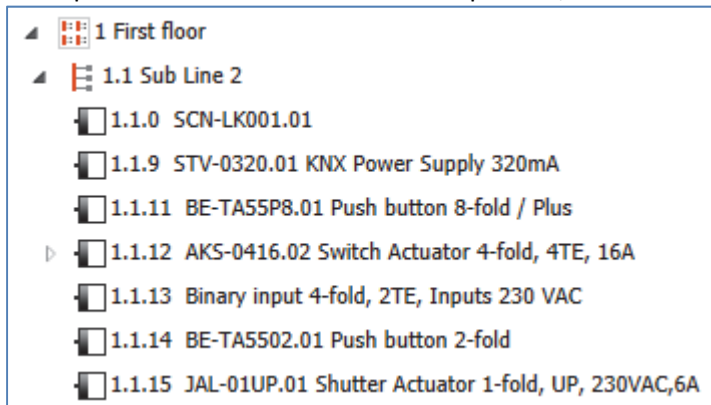


Figure 12: Sub Line ETS

As shown in the upper picture, a sub line in ETS has an easy design and looks like a normal TP-line. The Line Coupler, which must always be member 0, is the “connector” between main and sub line. An additional power supply is necessary for each sub line.

The main looks like this:

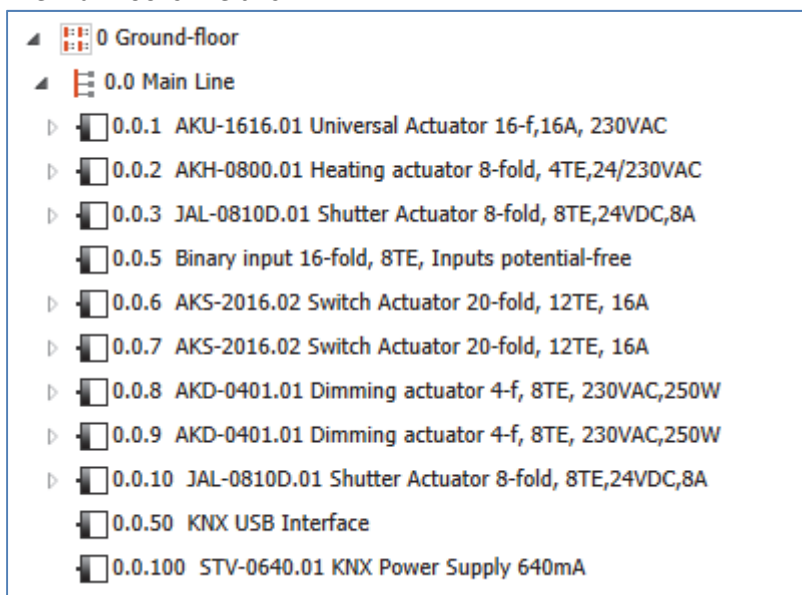


Figure 13: Main Line ETS

4.2 Telegram Forwarding

Two ways of telegram forwarding are differentiated:

1. Telegrams with physical addressing
2. Telegrams with group addressing

The addressing with physical addresses is, for example, used at the programming of the devices, whereas the addressing by group addresses is used at the “normal” bus communication.

The behavior of the Line Coupler at telegrams with physical addressing is easy. If the physical target address is in the line of the Line Coupler, the telegram is forwarded else not.

The behavior of the Line Coupler at group telegrams is defined by filter tables. For that matter, the filter tables indicate the group addresses, which are forwarded from main to sub line and vice versa. For doing this, the Line Coupler listens at the main line and at the sub line to all group telegrams and compares the target address with group addresses in the filter table. If the target address is in the filter table, the telegram will be forwarded to the other line else not.

4.3 Generating Filter Table

The filter table will be generated automatically from the ETS. However there are exceptions in which it can be useful to add group addresses manually to the filter table.

Every group address, which connects communication objects of main lines and sub lines, are automatically added to the filter table. So all group address are in the filter table, which are necessary for the communication between the devices. As mentioned at the beginning of this paragraph, in some cases it can be useful to add addresses manually to the filter table, e.g. for displaying the group addresses in Visualizations or for using the group address at diagnostics at the group/bus monitoring.

For adding the group addresses manually, the group address must be selected in the ETS and the option “Pass through Line Coupler” must be set from No to Yes:

Sub Gro...	Name	Descripti...	Cent...	Pass Through Line Coupler	Last Val...
0	Button 1 - Shutter		No	No	
1	Button 2 -Shutter		No	No	
2	Button 2 - Slats		No	No	
3	Button 3/4 - Switch On/Off		No	No	
4	Day/Night		No	No	
5	Temperature		No	Yes	

Figure 14: Set Filter Table manually

It should be considered, that manual added group addresses can pass all Line Couplers. So the bus load is increased on all lines. So only group addresses should be added, which are really needed.

4.4 Preview Filter Table

A preview of the current Filter table can be seen as follows:

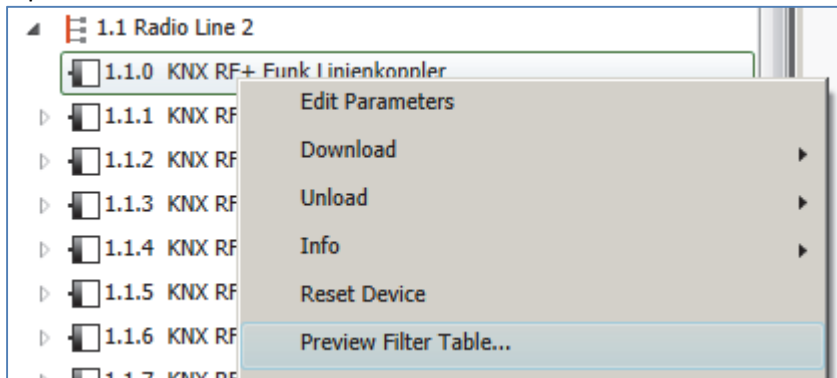


Figure 15: Preview Filter table

For that purpose, you click with the right mouse button at the Line Coupler. Now you can choose the entry “Preview Filter table...” in the context menu. The Filter table shows every group address, which will be transmitted from main line to sub line and vice versa:



Figure 16: Preview Filter table 2

4.5 Approach at startup

After all devices are integrated in the project, appropriate the right topology like described in 4.1 Topology of the project, the devices can be parameterized according to the own wishes. It is recommended to use the SCN-LK001.01 with the default settings. The right course of action at the startup is very important, because otherwise the exchange of data between main line and sub line cannot be guaranteed.

1. Programming the Line Coupler

By programming the Line Coupler, the current settings are load into the Line Coupler. Furthermore the current Filter table is loaded into the Line Coupler.

2. Programming of the devices of the sub line

By programming the devices of the sub line just the parameter settings are load in the memory of the devices.

Important: At every change of the project, the Line Coupler must be load again(Download Application). Afterwards every device, which is changed, must be programmed again.

If Changes at the topology of the project are made, at first the Line Coupler must be downloaded and afterwards every device, which is involved of the change of the topology, must be downloaded again.

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6 Attachment

6.1 Statutory requirements

The above-described devices must not be used with devices, which serve directly or indirectly the purpose of human, health- or lifesaving. Further the devices must not be used if their usage can occur danger for humans, animals or material assets.

Do not let the packaging lying around careless, plastic foil/ -bags etc. can be a dangerous toy for kids.

6.2 Routine disposal

Do not throw the waste equipment in the household rubbish. The device contains electrical devices, which must be disposed as electronic scrap. The casing contains of recyclable synthetic material.

6.3 Assemblage



Risk for life of electrical power!

All activities on the device should only be done by an electrical specialist. The county specific regulations and the applicable EIB-directives have to be observed.

MDT Interface, MDRC

Version		
SCN-USBR.01	USB Interface	2SU MDRC
SCN-IP000.01	IP Interface	2SU MDRC
SCN-IP100.01	IP Interface with Routing	2SU MDRC
SCN-LK001.01	Line Coupler	2SU MDRC

MDT technologies offers four KNX Interfaces to enable communication between PC and the KNX/EIB system.

KNX USB Interface: The USB Interface enables the communication between the PC and the KNX/EIB system. The USB interface is galvanically isolated from the KNX/EIB bus.

KNX IP Interface: The IP Interface enables the communication between the PC and the KNX/EIB system via LAN. 5 simultaneous connections possible. An external power supply (12 to 24VAC/DC) or power over ethernet is required.

KNX IP Interface with routing: This interface offers the same functions as the IP Interface, but the device routes telegrams as a line/area coupler using the the LAN.

KNX IP Line Coupler: The Line Coupler connects two KNX lines to each other. Electrical isolation between the lines and reduction of the busload by using the filter function.

The MDT KNX Interfaces are modular installation devices for fixed installation in dry rooms. They fit on DIN 35mm rails in power distribution boards or closed compact boxes.

For project design and commissioning of the MDT KNX Interfaces it is recommended to use the ETS3f/ETS4 or later. Please download the application software at www.mdt.de/Downloads.html

SCN-USBR.01



SCN-LK001.01



- Production in Germany, certified according to ISO 9001

USB Interface:

- To enable bidirectional communication between PC and the KNX bus via USB
- Fully compatible to ETS3f/4

IP Interface:

- To enable bidirectional communication between PC and the KNX bus TCP/IP
- 5 simultaneous connections possible (SCN-IP000.01 only)
- Programming the KNX bus via TCP/IP
- External power supply or PoE required

- Modular installation device for DIN 35mm rails
- Integrated bus coupling unit
- 3 years warranty

Technical Data	SCN-USBR.01	SCN-IP000.01	SCN-IP100.01	SCN-LK001.01
Interface	USB	Ethernet	Ethernet	KNX
Permitted wire gauge				
Screw terminal	--	0,5 - 4,0mm ² solid core 0,5 - 2,5mm ² finely stranded		--
KNX busconnection terminal	0,8mm Ø, solid core	0,8mm Ø, solid core	0,8mm Ø, solid core	0,8mm Ø, solid core
Power Supply	KNX bus	12 to 24VAC/DC	12 to 24VAC/DC	KNX bus
Power consumption	< 0,3W	< 0,8W	< 0,8W	< 0,3W each line
Operation temperature range	0 to + 45°C	0 to + 45°C	0 to + 45°C	0 to +45°C
Enclosure	IP 20	IP 20	IP 20	IP 20
Dimensions MDRC (Space Units)	2SU	2SU	2SU	2SU