Multiplexer A8

Accessory for the KLIPPEL ANALYZER SYSTEM (Document Revision 1.8)

FEATURES

- 8 channels <> 2 busses
- BNC version for microphones
- XLR version for line level signals
- SPEAKON version for high power
- 15 A max. switch current
- IEPE microphone supply
- Multiple routing options
- Control by USB & Parallel Port
- Klippel-GPIO for Production Analyzer and KA3
- dB-Lab templates available

BENEFITS

- Applicable in R&D and end-of-line testing (QC)
- Required for testing of multi-channel systems
- Simplifies cabling and routing
- Intuitive manual control
- Easy integration in automatic tests

The KLIPPEL Multiplexer is a very flexible signal switching hardware with up to 8 channels. Different routing modes are available to use the Multiplexer for selecting one or more input channels from 8 resources or distribute one or two sources to up to 8 receivers. Different hardware versions with different connectors and electrical parameters are available. Different control ports offer the flexible usage in a lot of applications. The Multiplexer can be controlled manually and by software. The Multiplexer can directly be controlled by Klippel hard / software in the QC framework. For R&D and all other applications the routing can be controlled with a Klippel provided USB or parallel port interface software. This software can also be controlled from the command line for automated applications.

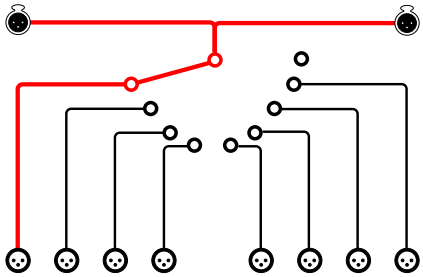
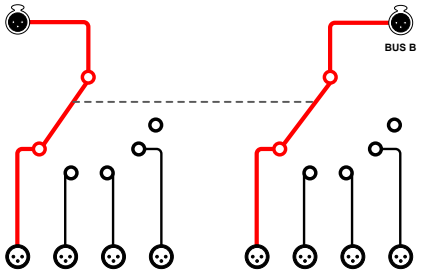
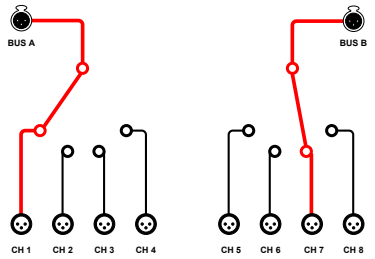
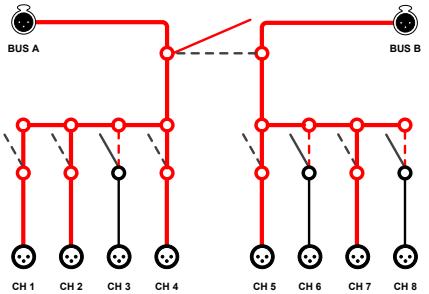
Article Numbers:	2800-101	MUX81-42-BNC (MIC version)
	2800-102	MUX81-42-XLR-IN (LINE-IN version)
	2800-103	MUX81-42-XLR-OUT (LINE-OUT version)
	2800-104	MUX81-42-SPEAKON (SPEAKER version)

CONTENT:

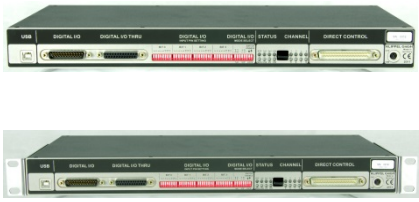
1 Multiplexer Hardware Versions

MUX81-42-BNC **MIC VERSION**	 • Asymmetrical BNC input and output connectors • IEPE supply separately switchable for input 1-4 and input 5-8 • All BNC GNDs are common if IEPE is selected • BNC GNDs can be separated by internal jumpers for multiplexing signals with DC offset • Can be used bi-directional: Select 1 or 2 out of 8 inputs or distribute 1 or 2 signals to up to 8 receivers
MUX81-42-XLR-IN LINE-IN version	 • 8 balanced female XLR input connectors • 2 balanced male XLR output connectors • All pins are switched (permanent GND connection available as option)
MUX81-42-XLR-OUT LINE-OUT version	 • 2 balanced female XLR input connectors • 8 balanced male XLR output connectors • All pins are switched (permanent GND connection available as option)
MUX81-42-SPEAKON **SPEAKER VERSION**	 • 4-pole SPEAKON input and output connectors • All 4 poles (1+, 1-, 2+, 2-) are switched

2 Multiplexer Routing Modes

SINGLE 1 OUT OF 8 **LABELED "1 X 8"**		• Select one of 8 inputs that is routed to the output. • (both output connectors are in parallel) • Or give the input to one of the 8 outputs. • Can be controlled in Manual mode and from Digital I/O, • USB, Direct Control.
DUAL PARALLEL 1 OUT OF 4 **LABELED "2 X 4"**		• Select one of input channel 1 to 4 that is given to output A. • Equivalent input channel 5 to 8 is given to output B • (1+ 5, 2 + 6, 3 + 7, 4 + 8). • Can be controlled in Manual mode and from Digital I/O, • USB, Direct Control.
DUAL SEPARATE 1 OUT OF 4 **LABELED "4 + 4"**		• Select one of input channel 1 to 4 that is routed to output A • Select one of input channel 5 to 8 that is routed to output B • Can be controlled in Manual mode and from Digital I/O, • USB, Direct Control
CUSTOM		• Any combination of input and output channels is possible, e.g. • Parallel input A and B to output channel 0, 1, 2, …8 or • Input A to 0 – 4 output channels • from channel 1, 2, 3, 4 and • Input B to 0 – 4 output channels • from channel 5, 6, 7, 8. • Can only be controlled from USB or Direct Control interface.

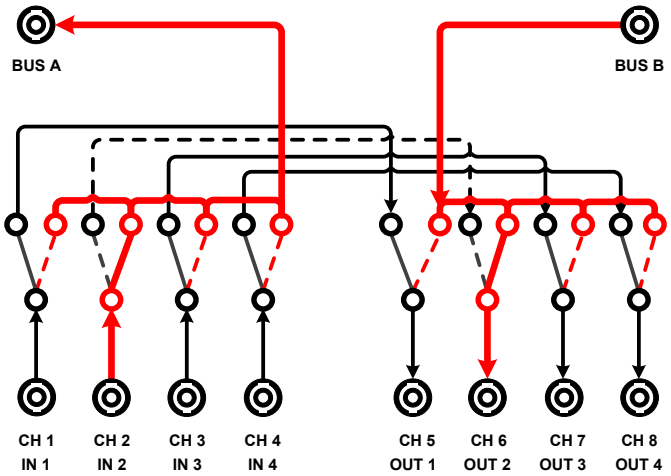
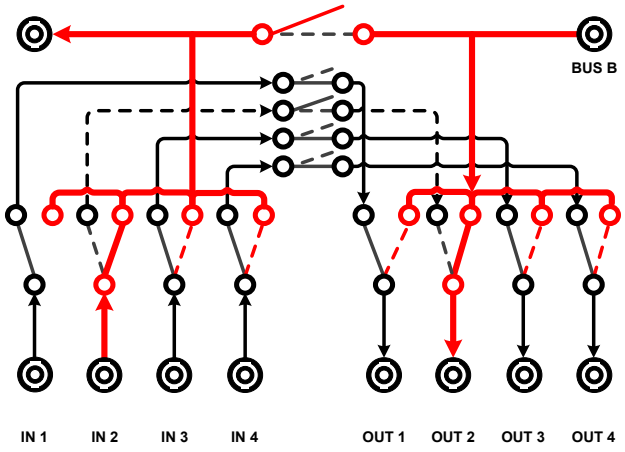
3 Multiplexer Hardware

IN / OUTPUT CONNECTORS		All signal connectors are at the front of the device. There are no active components in the signal path. LINE version provides full symmetrical signal paths. SPEAKER version provides four wire connections for each speaker channel.
RACK MOUNTING		The Multiplexer can be used as desktop device or rack mounted. 19" Rack Mounts can be installed at the front or backside. Status LEDs and Manual mode switch are on both sides of the device.
MANUAL CONTROL		An Up / Down Switch at the front and backside allows to control the Multiplexer manually. An external manual switch can be connected optionally.
IEPE POWER		IEPE microphone supply is available at the BNC multiplexer only. It can be switched for bank 1 (channel 1 – 4) and bank 2 (channel 5 – 8) separately.

3.1 Control Interfaces

DIGITAL I/O	The Digital I/O interface can be connected to the Klippel Production Analyzer or Klippel Analyzer 3 hardware or any parallel PC port. The Digital I/O Thru connectors allows to daisy chain multiple devices. The connection is made by standardized 25 pin D-Sub connectors. The interface is optically decoupled for a stabile operation in rough environments. The Routing Modes have to be selected at DIP switches at the backside of the device.
USB	The USB interface is decoupled for a stabile operation in rough environments.
DIRECT CONTROL	The Direct Control interface offers the possibility to control each relay directly. The wide control voltage range allows the connection from a wide range of devices. The Direct Control interface is optically decoupled for a stabile operation in rough environments.

4 Multiplexer Hardware Options (available on request)

BYPASS	 • Signal from channel 1 is bypassed to channel 5 if channel 1 is not selected (channel 2 to channel 6, 3 to 7, 4 to 8) • Allows to switch one measurement device into the signal path of up to 4 channels while the other channels are still connected • Must only be used in *Dual Parallel 1 out of 4* routing mode
BYPASS SWITCHABLE	 • Same functionality as option “Bypass” • Each of the 4 signals can be controlled in the following modes: • Signal switched of • Signal bypassed (direct connection from input to output) • Signal is routed thru the measurement device • (BUS A = Send to meas. device, BUS B = Return from m. d.) • Multiplexer can be used in all routing modes. (Bypass switched off)
SHORTCUT	• Deselected channel is shorted permanently.
SHORTCUT SWITCHABLE	• Deselected channel 1 to 4 can be shorted. The shortcut is controlled in the same way as the Bypass Switchable relays. • Deselected channel 5 to 8 can be permanently shorted or permanently open.
PERMANENT GND	• Permanent connected GND from all channels is available as option for the Line versions

EXTERNAL MANUAL SWITCH	• An external manual switch can be used to control the Multiplexer routing via the DIGITAL I/O interface • The switch must be active, a high signal (3 – 30 $V_{DC)}$ will cause the Multiplexer to change the routing • A toggle switch for count up/count down or two switches for the mentioned directions are placed at the device

5 Components of Multiplexer Package

The Multiplexer Package (Article Number 2800-10x) includes:

- 1 Multiplexer
- 19” Rack Mount Brackets
- 1 D-Sub 25 Cable 1.8 m
- 1 USB Cable 2 m
- 1 Power Supply with Country specific Power Cable
- 1 User Manual
- 1 Specification
- 2 Signal Cables 1 m: BNC + BNC-XLR-adapter or XLR or SPEAKON according MUX version

6 Safety Requirements

SIGNAL CABLE	All In / Output connections can be made with standardized cable. SPEAKON cable must be four wire connected, if used with Klippel Distortion Analyzer, Klippel Production Analyzer or Klippel Analyzer 3. 2 signal cables for the BUS connectors are included. Cables for the inputs are included for example in Klippel Mic Sets. BNC, XLR, SPEAKON cable are available from Klippel.
CONTROL CABLE	USB cable and D-Sub 25 cable are included. D-Sub 37 cable is not included.

7 Safety Requirements

USE MULTIPLEXER ONLY IN THE SPECIFIED WAY	KLIPPEL GmbH takes no responsibility for any kind of damage caused by the Multiplexer and improper use.

8 Specifications

Parameter	Symbol	Min	Typ.	Max	Unit
Mechanical					
Height	h		44		mm
Width of front blade with rack mount	w_{front}		483		mm
Width of enclosure	w_{case}		436		mm
Depth of enclosure	d_{case}		205		mm
Depth total (with connectors + switch)	d_{total}		225		mm
Electrical - supply					
Supply voltage	V_{DC}	10	24	28	V_{DC}
Electrical – control interface					
Control input voltage (LOW level)	V_{IL}	-0.3	0	0.8	V_{DC}
Control input voltage (HIGH level)	V_{IH}	3	3.3	30	V_{DC}
Control input current capability (HIGH level)	I_{IH}	1			mA
Control input current (HIGH l.) @ 3.3V	$I_{IH\ 3.3V}$		1		mA
Control input current (HIGH l.) @ 24V	$I_{IH\ 24V}$		10		mA
Electrical – signal channels					
MIC & LINE VERSION WITH BNC & XLR CONNECTORS					
Switch & permanent load current	I_{sw}		1 AC & DC	2 DC	A peak
Switch & permanent load voltage	V_{sw}			30 AC & DC	V peak
Switch power	P_{sw}		30 AC & DC	60 DC	W peak
Crosstalk (50 Ohm load) at 1kHz	XT_{1kHz}		-115		dB
Crosstalk (50 Ohm load) at 10kHz	XT_{10kHz}		-95		dB
Switch cycles (switched without load)	$C_{mechanical}$		10^8		cycle
Switch cycles (switched at max. load)	$C_{max.\ load}$		10^5		cycle
Switching time[2]	t_{sw}		5	8	ms
SPEAKER VERSION WITH SPEAKON CONNECTORS					
Switch current (AC & DC)	I_{sw}			15	A RMS
Load current (AC & DC)	I_{load}		8	15 10s	A RMS
Switch voltage (AC & DC) [1]	V_{sw}		100	160	V RMS
Load voltage (AC & DC)[1]	V_{Load}			240	V peak
Switch & load power (AC & DC)	P_{sw}		400	2000 10s	W RMS
Switch cycles typical load	$C_{typ.\ load}$		$10*10^6$		cycle
Switch cycles max. load	$C_{max.\ load}$		$15*10^4$		cycle
Electrical – MIC current supply					
IEPE supply voltage (MIC version)	U_{IEPE}	28.5	30	31.5	V_{DC}
IEPE supply current per channel (MIC v.)	I_{IEPE}	3	3.55	4.1	mA
Switching time[2]	t_{sw}		8	10	ms

(1) Voltages apply for a maximum altitude of 2000m over sea level. At higher altitudes lower voltages will apply

(2) Time from input edge at Digital I/O or Direct Control input to output switched including bouncing.

9 Recommended Operating Conditions

Parameter	Symbol	Min	Typ.	Max	Unit
Power supply voltage	V_{AC}	100		240	V
Power AC-frequency	f_{AC}	47		63	Hz
Operating ambient temperature	T_A	0	25	50	°C
Input power	P		5	15	W
Primary power supply connection with protective earth conductor is required! It must be rated to handle the current stated on the power supply and met the local regulations for power supply connections.					

Power supply connection with removed earth contact could cause high voltages at the enclosure of the device. Never operate the device under condensing conditions!

Control Settings for the DIGITAL I/O interface

The mapping of the hardware control input pins to the internal 4 bit control register can be selected by the customer. There is a dip switch for each control bit on the backside of the device.

VARIABLE DIGITAL I/O PIN – CONTROL BIT MAPPING

Used Input Channel at		**Input Bit Switch**																													
		DIP Switch for Bit 3								**DIP Switch for Bit 2**								**DIP Switch for Bit 1**								**DIP Switch for Bit 0**							
Digital I/O Interface	**Klippel QC Software**	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
D-Sub Pin 2	User Out 9	ON								ON								ON								ON							
D-Sub Pin 3	User Out 7		ON								ON								ON								ON						
D-Sub Pin 4	User Out 5			ON								ON								ON								ON					
D-Sub Pin 5	User Out 3				ON								ON								ON								ON				
D-Sub Pin 6						ON								ON								ON								ON			
D-Sub Pin 15	User Out 8						ON								ON								ON								ON		
D-Sub Pin 16	User Out 6							ON								ON								ON								ON	
D-Sub Pin 17	User Out 4								ON								ON								ON								ON

D-Sub Pin 6 cannot be used for controlling from *Klippel Production Analyzer*, D-Sub Pin 1 is the related GND Pin.

D-Sub Pin 15, 16, 17 cannot be used with *PC Parallel Port*, D-Sub Pin 18 is the related GND Pin

GND Pin for connection to *Klippel Production Analyzer* or *PC Parallel Port* can be selected inside the device via jumper.

ROUTING MODE: SINGLE 1 OUT OF 8 (1X8)

Control Bits				**Functions**
Bit 3	**Bit 2**	**Bit 1**	**Bit 0**	**Selected Routing**
0	**0**	**0**	**0**	**CH 1** to BUS A & BUS B
0	**0**	**0**	**1**	**CH 2** to BUS A & BUS B
0	**0**	**1**	**0**	**CH 3** to BUS A & BUS B
0	**0**	**1**	**1**	**CH 4** to BUS A & BUS B
0	**1**	**0**	**0**	**CH 5** to BUS A & BUS B
0	**1**	**0**	**1**	**CH 6** to BUS A & BUS B
0	**1**	**1**	**0**	**CH 7** to BUS A & BUS B
0	**1**	**1**	**1**	**CH 8** to BUS A & BUS B
1	x	x	x	**All channels off**

ROUTING MODE: DUAL PARALLEL 1 OUT OF 4 (2X4)					
Control Bits				Functions	
Bit 3	Bit 2	Bit 1	Bit 0	Selected Routing	
0	x	**0**	**0**	**CH 1** to BUS A	**CH 5** to BUS B
0	x	**0**	**1**	**CH 2** to BUS A	**CH 6** to BUS B
0	x	**1**	**0**	**CH 3** to BUS A	**CH 7** to BUS B
0	x	**1**	**1**	**CH 4** to BUS A	**CH 8** to BUS B
1	x	x	x	**All channels off**	

ROUTING MODE: DUAL SEPARATE 1 OUT OF 4 (4+4)					
Control Bits				Functions	
Bit 3	Bit 2	Bit 1	Bit 0	Selected Routing	
x	x	**0**	**0**	**CH 1** to BUS A	x
x	x	**0**	**1**	**CH 2** to BUS A	x
x	x	**1**	**0**	**CH 3** to BUS A	x
x	x	**1**	**1**	**CH 4** to BUS A	x
0	**0**	x	x	x	**CH 5** to BUS B
0	**1**	x	x	x	**CH 6** to BUS B
1	**0**	x	x	x	**CH 7** to BUS B
1	**1**	x	x	x	**CH 8** to BUS B

11 Control Settings for the USB Interface

Allows all routings from the routing modes:

- Single 1 out of 8
- Dual Parallel 1 out of 4
- Dual Separate 1 out of 4

As described above for the Digital I/O interface

Allows all routings from the Custom routing mode as described below for the Direct Control interface.

12 Control Settings for the Direct Control Interface

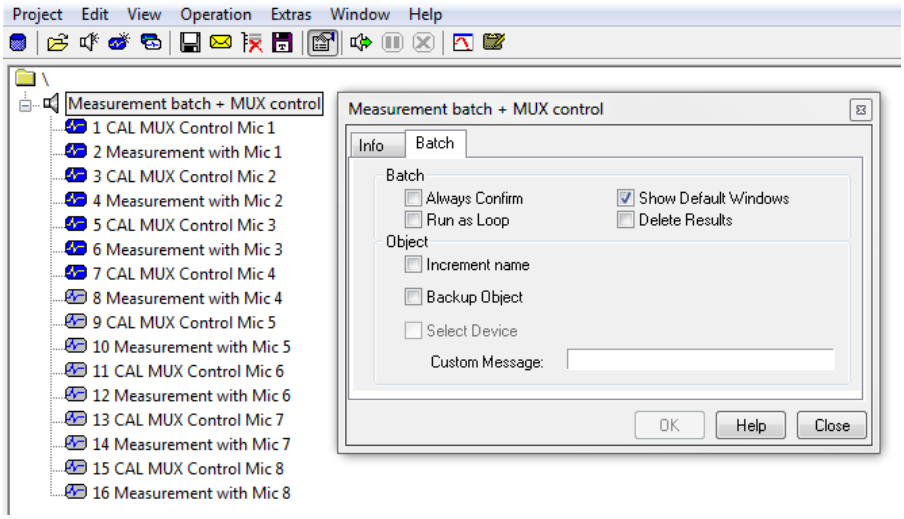
Control Settings for DIRECT CONTROL interface (high active)		
MUX Control Input	**Function (Selected Routing)**	
D-Sub Pin 1	**CH 1** to BUS A	**& CH 1** to BUS B - if Pin 9 is at high level
D-Sub Pin 2	**CH 2** to BUS A	**& CH 2** to BUS B - if Pin 9 is at high level
D-Sub Pin 3	**CH 3** to BUS A	**& CH 3** to BUS B - if Pin 9 is at high level
D-Sub Pin 4	**CH 4** to BUS A	**& CH 4** to BUS B - if Pin 9 is at high level
D-Sub Pin 5	**CH 5** to BUS B	**& CH 5** to BUS A - if Pin 9 is at high level
D-Sub Pin 6	**CH 6** to BUS B	**& CH 6** to BUS A - if Pin 9 is at high level
D-Sub Pin 7	**CH 7** to BUS B	**& CH 7** to BUS A - if Pin 9 is at high level
D-Sub Pin 8	**CH 8** to BUS B	**& CH 8** to BUS A - if Pin 9 is at high level
D-Sub Pin 9	**1 out of 8 mode** (connects BUS A and BUS B)	
D-Sub Pin 10	**Bypass** from Channel **1** to **5** (only used if Option Bypass Switchable is installed additional)	
D-Sub Pin 11	**Bypass** from Channel **2** to **6** (only used if Option Bypass Switchable is installed additional)	
D-Sub Pin 12	**Bypass** from Channel **3** to **7** (only used if Option Bypass Switchable is installed additional)	
D-Sub Pin 13	**Bypass** from Channel **4** to **8** (only used if Option Bypass Switchable is installed additional)	
D-Sub Pin 14	**IEPE** Mic Supply for Channel **1** to **4** (only for the BNC multiplexer)	
D-Sub Pin 15	**IEPE** Mic Supply for Channel **5** to **8** (only for the BNC multiplexer)	
D-Sub Pin 16	Direct Control ON (must be high for Direct Control interface operation)	
D-Sub Pin 17 and 35	alternative supply voltage input 12 to 24 V_{DC} (only if external power supply is not used)	
D-Sub Pin 18 and 36	supply GND (if external power supply is not used, could be connected to D-Sub Pin 19 & 37)	
D-Sub Pin 19 and 37	related GND for D-Sub Pins 1 to16 (must be connected for correct operation)	

13 Control Settings for Option Bypass or Bypass Switchable

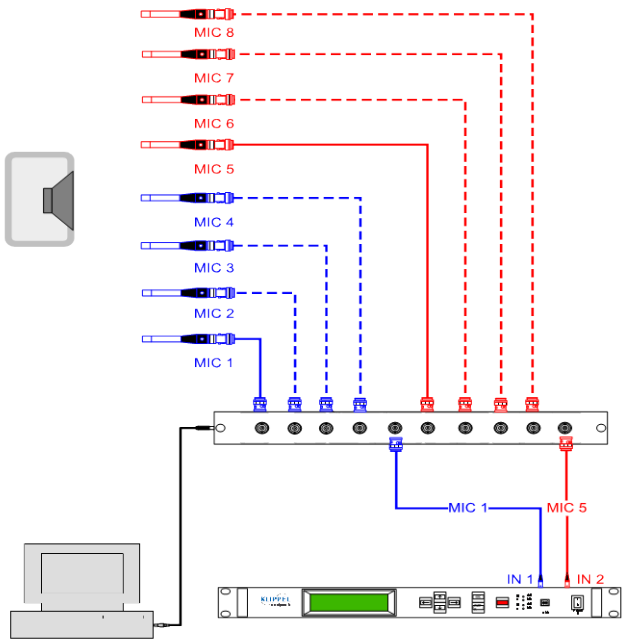
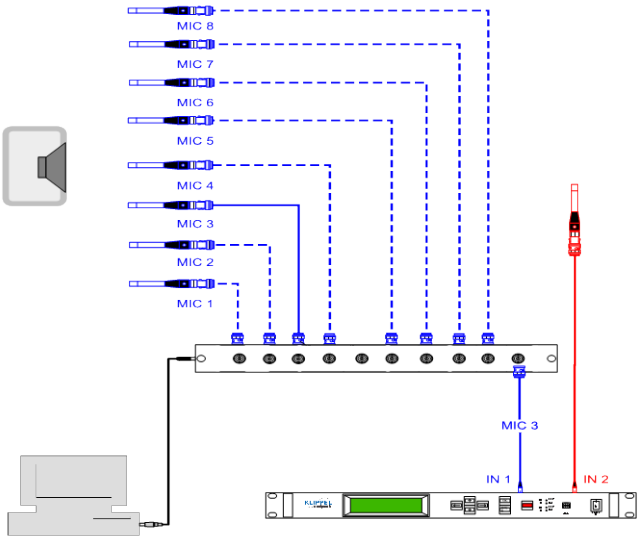
CONTROL SETTINGS FOR DIGITAL I/O AND USB INTERFACE						
Routing mode: Dual Parallel 1 out of 4 (2 x 4)						
Control Bits				**Functions**		
Bit 3	**Bit 2**	**Bit 1**	**Bit 0**	**Selected Routing**		**Bypass switchable**
0	0	**0**	**0**	**1** to BUS A	**5** to BUS B	**open**
0	0	**0**	**1**	**2** to BUS A	**6** to BUS B	**open**
0	0	**1**	**0**	**3** to BUS A	**7** to BUS B	**open**
0	0	**1**	**1**	**4** to BUS A	**8** to BUS B	**open**
1	0	x	x	**All channels off**		**open**
0	**1**	**0**	**0**	**1** to BUS A	**5** to BUS B	**closed: 2** to **6, 3** to **7, 4** to **8**
0	**1**	**0**	**1**	**2** to BUS A	**6** to BUS B	**closed: 1** to **5, 3** to **7, 4** to **8**
0	**1**	**1**	**0**	**3** to BUS A	**7** to BUS B	**closed: 1** to **5, 2** to **6, 4** to **8**
0	**1**	**1**	**1**	**4** to BUS A	**8** to BUS B	**closed: 1** to **5, 2** to **6, 3** to **7**
1	**1**	x	x	**All channels off**		**closed: 1 - 5, 2 - 6, 3 - 7, 4 - 8**
option Bypass (if installed) behaves as Bit 2 is permanently set						

Routing mode: 1 out of 8 (1 x 8)	Option Bypass Switchable cannot be used in this routing mode
Routing mode: Dual Separate 1 out of 4 (1 x 4 + 1 x 4)	Option Bypass Switchable cannot be used in this routing mode
Control Settings for DIRECT CONTROL Interface	see Control Settings for Option Custom Routing

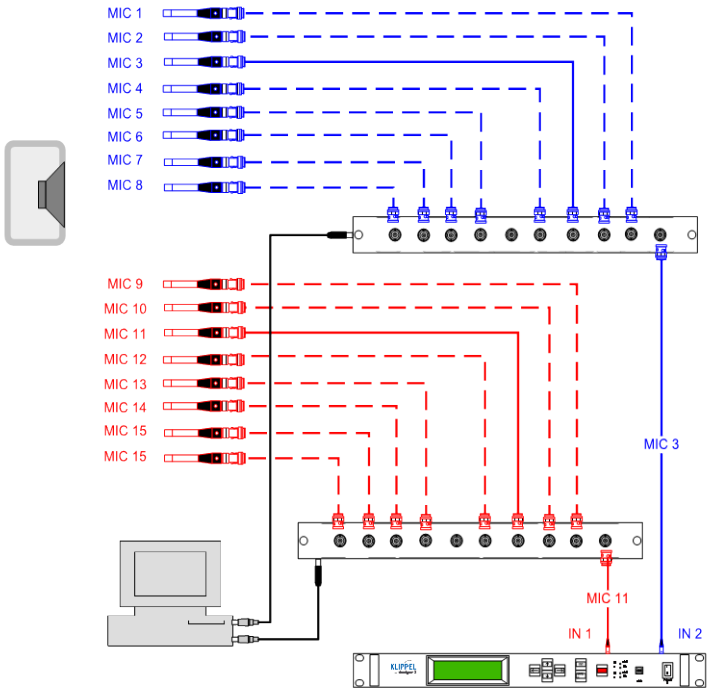
14 Software Control

QC SOFTWARE CONTROL	In QC Standard version the multiplexer routing can be controlled with the additional I/O-Task. See "Spec – QC IO Prompt.pdf"
GENERAL SOFTWARE CONTROL	The Klippel Multiplexer can be controlled in general application context using the USB interface and the Multiplexer control operation. The Multiplexer Control operation needs no license. It can be placed before or after any measurement operation into any measurement object to run automated measurement sequences with the batch processing. 
COMMAND LINE CONTROL	The Multiplexer can be controlled via the USB interface with a command line interface. It is documented separately in its library installation package.
INTEGRATION IN CUSTOMIZED APPLICATIONS	The Multiplexer can be controlled over the USB interface with a Scilab interface. It is documented separately in its library installation package.

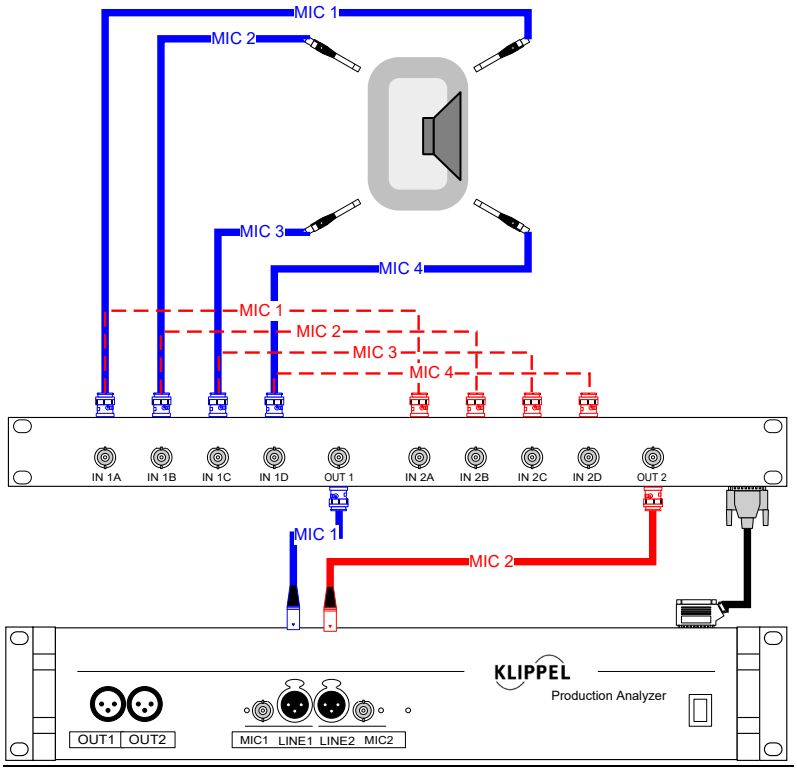
15 Applications

MICROPHONE MULTIPLEXING in *Dual Parallel 1 out of 4* or *Dual Separate 1 out of 4* mode	
MICROPHONE MULTIPLEXING *1 x 8* Configuration	 Typical application: 8 measurement microphones at different positions, one microphone for ambient noise at a fixed position.

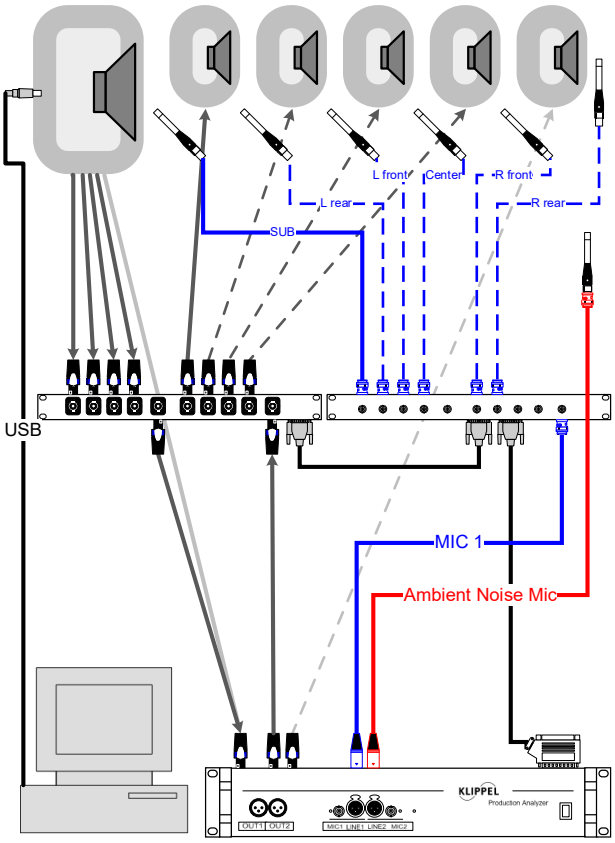
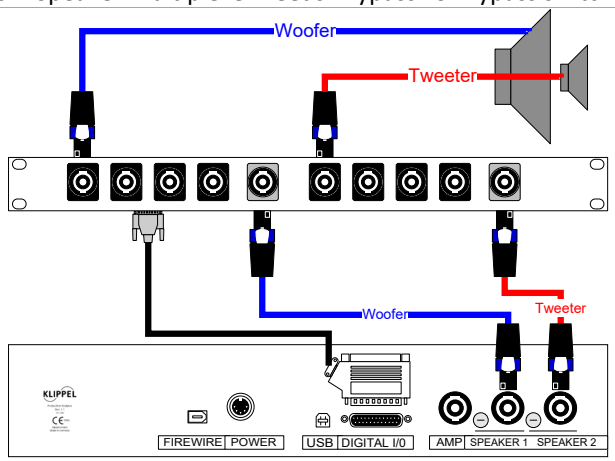
MICROPHONE MULTIPLEXING
***2 x 8* Configuration**



VARIOUS MICROPHONE PAIRS



Typical application: leak detection at loudspeaker cabinets
Measure with any combination of 2 out of 4 microphones.
Signals can be bypassed internally (“Bypass” or “Bypass switchable” option needed) or by external Y-cables.
Multiplexer must be controlled in “Separate 2 out of 4” mode.

SELECTED SPEAKER EXCITATION (Dual Parallel 1 out of 4) + Microphone Multiplexing (1x8)	 Typical application: Final QC-Test of active 5.1 Systems
	Test signal is given via USB to the active subwoofer, all passive satellites are driven by the amplifier inside the Subwoofer. The speaker multiplexer allows to select if: • One of the satellite channels is fed via the voltage and current sensors in the analyzer • The satellite channels which are not tested are bypassed for an overall SPL measurement • Or the not measured satellite channels are switched off for an individual SPL measurement at each channel The 5th speaker cannel is routed directly through the 2nd speaker channel of the Production Analyzer. If more channels have to be measured (e.g. 8.1 systems), a 2nd speaker multiplexer is needed. The ambient noise microphone always monitors the far field sound pressure. Needed option: Speaker Multiplexer needs “Bypass” or Bypass switchable” option.
SHORTING PASSIVE CHANNELS	 Typical application: QC testing of coaxial drivers. • Tweeter channel can be shorted while woofer channel will be tested.

	• Woofer channel can be shorted while tweeter channel will be measured. • Up to 4 coaxial drivers can be measured and shorted with one Multiplexer. • Needed option: “Shortcut” or “Shortcut switchable”

Find explanations for symbols at:
http://www.klippel.de/know-how/literature.html
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