

Audio-Adapter410 for DSP-Board CENS402

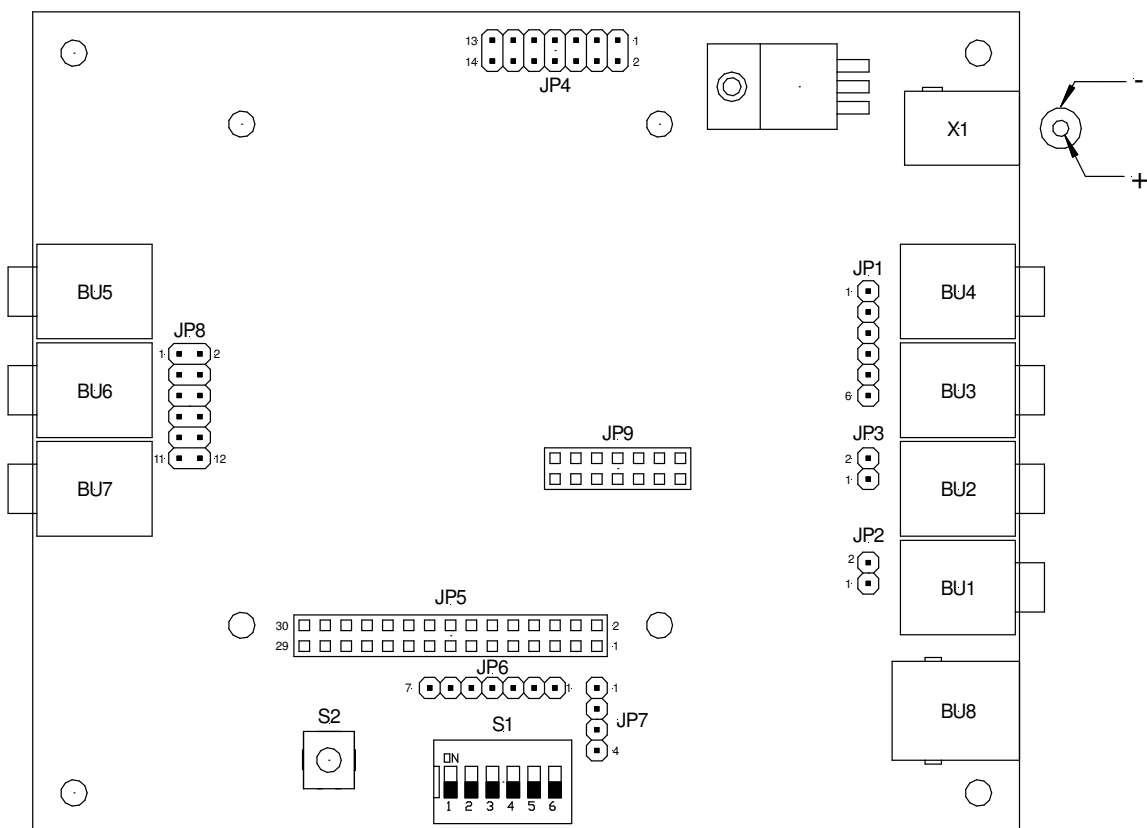
Technical Data Sheet

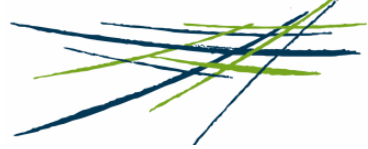
Ruwisch & Kollegen GmbH
Ostendstr. 25 12459 Berlin
Tel. +49 30 5321 0376
Fax +49 30 5321 0458
E-Mail: info@r-u-k.de
<http://www.r-u-k.de>

Version 1.0 Date: 17.09.2005 Author: Ralph Böttcher

Introduction

Audio-Adapter410 is an interface board making evaluation of the DSP-board CENS402 and its functionalities most convenient. Being inserted "piggyback", CENS402 can be supplied with a standard power supply (9-12 V, 100 mA; connector **X1**); and audio signals are put in and out by means of 3.5 mm stereo jacks (connectors **BU3** – **BU7**). Furthermore, **Audio-Adapter410** provides two microphone amplifiers for immediate connection of electret microphones (**BU1**, **BU2**). (Symbols in **bold** refer to the below diagram.)





Getting Started

Six DIP switches (**S1**) are connected to GPIO-pins of the DSP and thus their functionality relates to DSP-software, for details please see the below description of **JP6** and refer to applicable software datasheets. Push-button **S2** evokes a reset of the DSP. As an example it is now described how **AudioAdapter410** shall be connected for evaluation of noise- and echo cancelling software package **CNS200CES201-TI54** Version 2.0.5.1:

Plug in the 3.5 mm jack of an electret microphone to input **BU2** and connect headphones to output **BU5** (for your convenience, **BU5** provides a stereo signal, so both ears receive the microphone signal. After connecting 12V DC 200mA (positive center connector) to **X1** you hear the microphone signal in the headphones.

Noise cancelling

Provide some slowly changing noise (e.g. by playing back a suitable wave file, or just place the microphone near a PC and utilize its ventilation as mild noise source). After enabling Noise Cancelling by setting DIP switch 1 to “on”, the noise will be reduced. Setting DIP switches 3 – 5 to “on” will increase the noise cancelling level, whereas DIP switch 3 is the most significant bit and DIP switch 5 is the least significant bit (i.e. there are seven levels of Noise Cancelling as soon as it is switched on with DIP switch 1).

Echo cancelling

For the evaluation of full-duplex echo-cancelling connect a standard PC loudspeaker box to “line-out” of a PC and play back an arbitrary signal that simulates a receive-signal of a telephone conversation. Connect this same signal also to input **BU3** of **AudioAdapter410** (use a T-plug for dividing the signal). This signal serves as reference signal of the echo canceller; it is required for the calculation of the transfer function between loudspeaker and microphone and removal of the “echo” of the loudspeaker signal in the microphone recording.

After connecting all signals and fixing loudspeaker and microphone press “reset” (**S2**); this invokes fast adaptation of the echo canceller to the acoustic characteristics. In case the positions of microphone or loudspeaker or the volume setting of the latter has been changed it is suggested to press “reset” again, because adaptation of the echo canceller during normal operation (i.e. not after a reset) is much slower than after reset.

DIP switch 2 switches Echo Cancelling on and off: While the loudspeaker is playing back the “receive signal” from the PC you hear this signal in the headphones when DIP switch 2 is “off”. After changing this DIP switch to its “on”-position, the loudspeaker echo is removed from the headphones, while all other signals (noise and “near-end” speech can still be heard unaltered.

During far-end single talk the echo is reduced by 45 dB, and comfort noise is filled in for the convenience of far-end hearing. During double-talk (i.e. near-end and far-end speak simultaneously) the echo is reduced by 25 dB. This fulfils the ITU-T G.165 recommendation for Acoustic Echo Cancellers.



Description of the input / output connectors of AudioAdapter410

X1	Power supply	9 – 12 V DC, 100 mA	Positive Center Connector
----	--------------	---------------------	---------------------------

Function of the 3.5mm stereo jacks BU1 – B7

BU:	Function:	Specification:	Remarks:
1	Microphone Input 2 Microphone Hot = Tip Microphone GND = Body	Max. input: $V_{\text{eff}}=20$ mV Bias voltage: 6 V Input resistor: 680 Ohm	Mount R21 for this function.
2	Microphone Input 1 Microphone Hot = Tip Microphone GND = Body	Max. input: $V_{\text{eff}}=20$ mV Bias voltage: 6 V Input resistor: 680 Ohm	For connection of microphone 1 to ring of this jack, mount R22 and remove R21
3	Line Input 2	Max. input: $V_{\text{eff}}=700$ mV Input resistor: 47 kOhm	
4	Line Input 1	Max. input: $V_{\text{eff}}=700$ mV Input resistor: 47 kOhm	For connection of line input 1 to ring, mount R34 and remove R33
5	Output 2	Output resistor: 150 Ohm	Mount R29 to connect Output 3 to ring of jack
6	Output 1	Output resistor: 600 Ohm	
7	Output 3	Output resistor: 150 Ohm	
8	USB-Connector		PC communication

All audio signals and several internal signals are available at nine rows of pinheads, **JP1 – JP9**:

Pin assignment of JP1:

JP 1 parallels the 3.5 mm jacks BU1 – BU4. This is useful as alternative to BU1 – BU4 as well as for measurement purposes.

Pin	Function:	Specification:	Remarks:
1	+8 V		
2	Microphone BU1	Max. input: $V_{\text{eff}}=20$ mV Bias voltage: 6 V Input resistor: 680 Ohm	Tip of BU1
3	Microphone BU2	Input sensitivity: 20 mV Bias voltage: 6 V Input resistor: 680 Ohm	Tip of BU2
4	Line Input BU3	Max. input: $V_{\text{eff}}=700$ mV Input resistor: 47 kOhm	Tip of BU3



5	Line Input BU4	Max. input: $V_{\text{eff}}=700 \text{ mV}$ Input resistor: 47 kOhm	Tip of BU4
6	GND		

Pin assignment of **JP2**:

JP2 serves as connector for a PCB-mounted electret microphone. Please note that **JP2** is disabled if an external microphone is plugged in to **BU1**.

Pin	Function:	Specification:	Remarks:
1	Microphone Input 1	Input sensitivity: 20 mV Bias voltage: 6 V Input resistor: 680 Ohm	
2	GND		

Pin assignment of **JP3**:

JP3 serves as connector for a PCB-mounted electret microphone. Please note that **JP3** is disabled if an external microphone is plugged in to **BU2**.

Pin	Function:	Specification:	Remarks:
1	Microphone Input 1	Input sensitivity: 20 mV Bias voltage: 6 V Input resistor: 680 Ohm	
2	GND		

JP4 is for internal use, only. DO NOT CONNECT.

Pin assignment of **JP5**:

JP5 is connected to the DSP-board CENS402:

Pin	Function	Connector	Description	Remarks
1	Serial in	SER_IN	Serial input for PC communication	3.3 V
2	Input 4 minus		Symmetric codec input, minus.	
3	Serial out	SER_OUT	Serial output for programming with PC. Use level converter for connection to PC.	3.3 V
4	Input 4 plus	Tip of BU4	Symmetric codec input, plus.	
5	Programming	PROG	Internal use only.	DO NOT CONNECT
6	Microphone Input minus		Symmetric codec input, minus.	



7	HD2 of DSP	CONF1 of CENS402	GPIO of DSP for software use.	3.3 V
8	Microphone Input plus		Symmetric codec input, plus.	
9	HD3 of DSP	CONF2 of CENS402	GPIO of DSP for software use.	3.3 V
10	Input 2 minus		Symmetric codec input, minus.	
11	HD4 of DSP	CONF3 of CENS402	GPIO of DSP for software use.	3.3 V
12	Input 2 plus	Tip of BU2	Symmetric codec input, plus.	
13	HD5 of DSP	CONF4 of CENS402	GPIO of DSP for software use.	3.3 V
14	Input 1 plus	Tip of BU1	Symmetric codec input, plus.	
15	HD6 of DSP	CONF5 of CENS402	GPIO of DSP for software use.	3.3 V
16	Input 1 minus		Symmetric codec input, minus.	
17	Ground	GND		
18	Input 3 minus		Symmetric codec input, minus.	
19	Output 2 minus		Symmetric codec Output, minus.	
20	Input 3 plus	Tip of BU3	Symmetric codec input, plus.	
21	Output 2 plus	Tip of BU5	Symmetric codex Output, puls	
22	Ground	GND		
23	Output 1 minus		Symmetric codec Output, minus.	
24	Ground	GND		
25	Output 1 plus	Tip of BU6	Symmetric codec input, plus.	
26	Reset			
27	Output 3 minus		Symmetric codec Output, minus.	
28	Power Supply			5 ... 8 V
29	Output 3 plus	Tip of BU7	Symmetric codec input, plus.	
30	Ground	GND		



Pin assignment of **JP6**:

JP6 parallels **S1** and thus enables connection of external components (e.g. switches). According to DSP software, pins of **JP6** can be used as input or output. Make sure that all DIP switches of **S1** are “off” when connecting signals to **JP6**!

Pin	Relation to DIP switches S1	Function of CENS402	DSP-I/O	Specification:
1	n/a		+8 V	
2	DIP switch 1	CONF1	HD2	3.3 V Logic In/Output
3	DIP switch 2	CONF2	HD3	3.3 V Logic In/Output
4	DIP switch 3	CONF3	HD4	3.3 V Logic In/Output
5	DIP switch 4	CONF4	HD5	3.3 V Logic In/Output
6	DIP switch 5	CONF5	HD6	3.3 V Logic In/Output
7	n/a		Ground	

Pin assignment of **JP7**:

JP7 is connected to symmetric microphone input of the Codecs of the DSP-board. (Requires special DSP-software.)

Pin	Function:	Specification:	Remarks:
1	Regulated Voltage	+8 V	20 mA max.
2	Microphone Input minus		
3	Microphone Input plus		
4	Ground	GND	

Pin assignment of **JP8**:

JP8 connects to *all* D/A outputs of the codecs of the DSP-board. The *positive* outputs of the (symmetric) codecs are additionally connected to **BU5** – **BU7**.

Pin	Function:	Specification:	Remarks:
1	Codec Output 2 minus	Ri = 150 R	Symmetric output
2	Regulated Voltage	+8 V	20 mA max.
3	Codec Output 2 plus	Ri = 150 R	Symmetric output
4	Ground	GND	
5	Codec Output 1 minus	Ri = 600 R	Symmetric output
6	Regulated Voltage	+8 V	20 mA max.
7	Codec Output 1 plus	Ri = 600 R	Symmetric output
8	Ground	GND	
9	Codec Output 3 minus	Ri = 150 R	Symmetric output
10	Regulated Voltage	+8 V	20 mA max.
11	Codec Output 3 plus	Ri = 150 R	Symmetric output
12	Ground	GND	

JP9 is for internal use, only.