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by:	by:

## II. Sybox Opto-4 the Articulograph AG501 synchronization platform

### A. Sybox Function

#### 1. Synchronizing other systems with the Articulograph AG501

With the Sybox-Opto4 there are status-, trigger- and pretrigger signals available to be used by other systems. It is possible to synchronize up to four other computer or systems with the speech movement recording.



Fig. 1: Sybox-Opto4 front- and backside view

#### 2. Direct access to the low level system signals

#### 3. Signal functions

Status signals "PSR\_dn" and "T\_active"

This signals in "LOW" condition show that both programs (maggen and senrec) are running normally.

Trigger signal "Sweep"

The sweep signal is in active (LOW) condition as long as the speech movement recording is in progress.

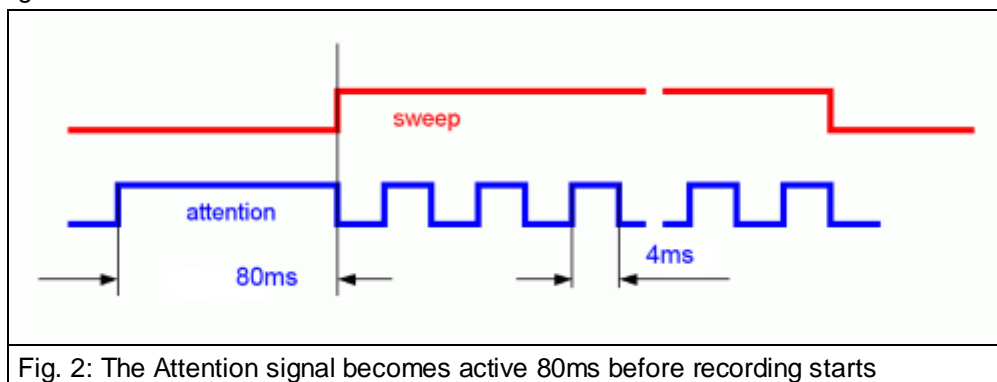


Fig. 2: The Attention signal becomes active 80ms before recording starts

### Pre-Trigger signal "Attention"

This signal has two functions: It goes active (LOW) exact 80ms before the sweep recording will start. This lets programs know in advance at what time the recording will start.

At the same time when the Sweep signal get active, the Attention signal starts to change its level every 4ms until Sweep goes inactive.

The 4ms time interval between two consecutive Attention edges describes the interval for five movement sample (five samples at 1250Hz → 250Hz).

## 4. Signal properties

### Twisted pair lines

The DB15 cable is connected to the Trans-Computer inside the carrier. It is a twisted pair connection for transmitting high frequency signals over long distances.

Inside the Sybox there is a Max3096 (Maxim) receiver that converts the signals to TTL level for the opto couplers input.

### Galvanic separation

With the opto couplers there is no galvanic connection between the Articulograph AG501 and other connected computer or systems. This is for electrical safety and prevents disturbances.

### High timing precision

Fig. 4 and 5 show the input (magenta) and output (green) of one opto coupler.

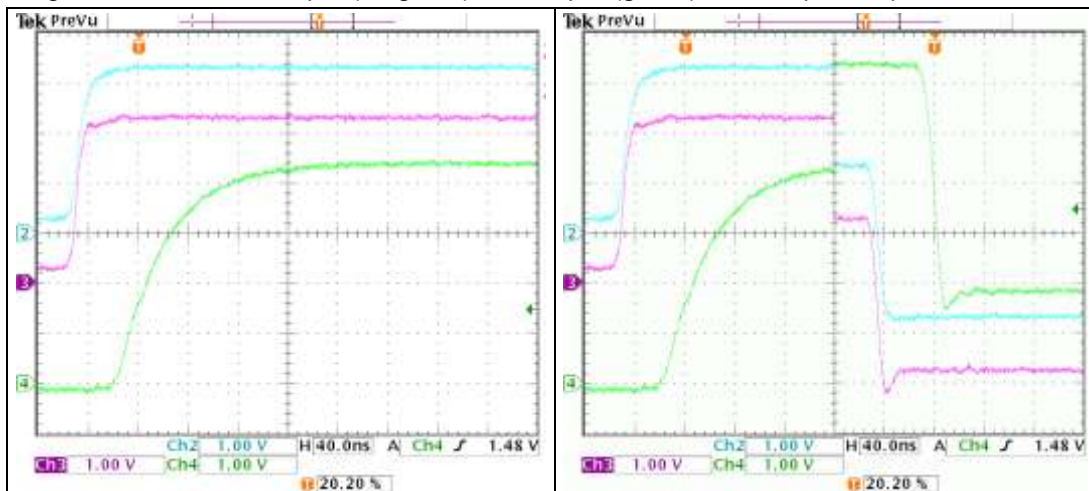


Fig. 3: 2= Pin5 of 3096 3= Pin 3 of 6N137

Fig. 4: 4= Output - Pin 6 of 6N137

The most delay is caused by the opto coupler 6N137. This delay is constant  
All in all the signals timing precision is better than 50ns.

### Connection over a long distance

The Sybox Opto-4 is connected to the Articulograph AG501 with a 10m cable. So it can be placed far away from the speech recording place.

## B. Installation

The twisted pair cable with the male DB15 connector comes out of the carrier.

All signals are available at the four DB9 socket connectors Opto-J1 .. Opto-J4. Each connector offers all four signals. They all have the same pin assignments.

- plug in the DB15 connector into the Sybox connector marked "TransPC"
- connect one to four connectors from your electronic interfaces to the Opto-J1 .. Opto-J4 connectors

### Details for connecting your computer or your system

One of your connectors must have the power supply at pin 1 (5V, 50mA) and at pin 6 (ground).

Please refer to the schematic in fig.6 for more details. The power supply is necessary to provide the opto couplers output stage with the required 5 V.

The pins marked "internal\*" have a connection to a free solder point. This is for bringing signals from your electronic into additional logic inside the Sybox (see Extensions).

Please ask [bahne@articulograph.de](mailto:bahne@articulograph.de) if you have problems to provide the power supply.

Pin	Signal
1	5V Power supply
2	PSR_dn
3	Attention
4	Sweep
5	T_active
6	ground
7	internal*
8	internal*
9	internal*
Table 1: Opto-J# connections	

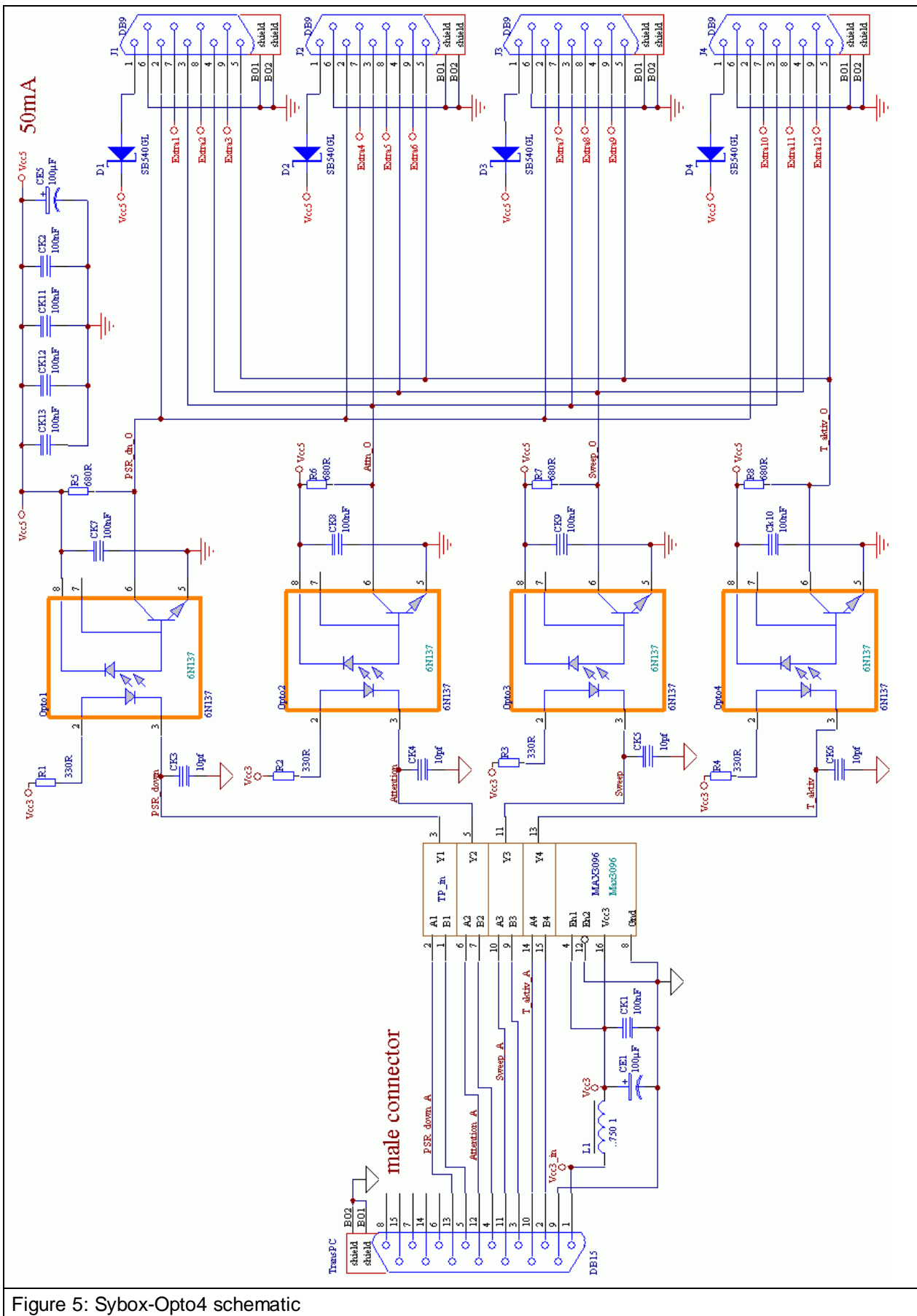


Figure 5: Sybox-Opto4 schematic

## C. Extensions

There are additional spaces to add electronic to combine with the Articulograph AG501 synchronization signals.

This is for your information only. Please make sure that modification are only performed by qualified persons that can guarantee that all modification conform to all regulations.

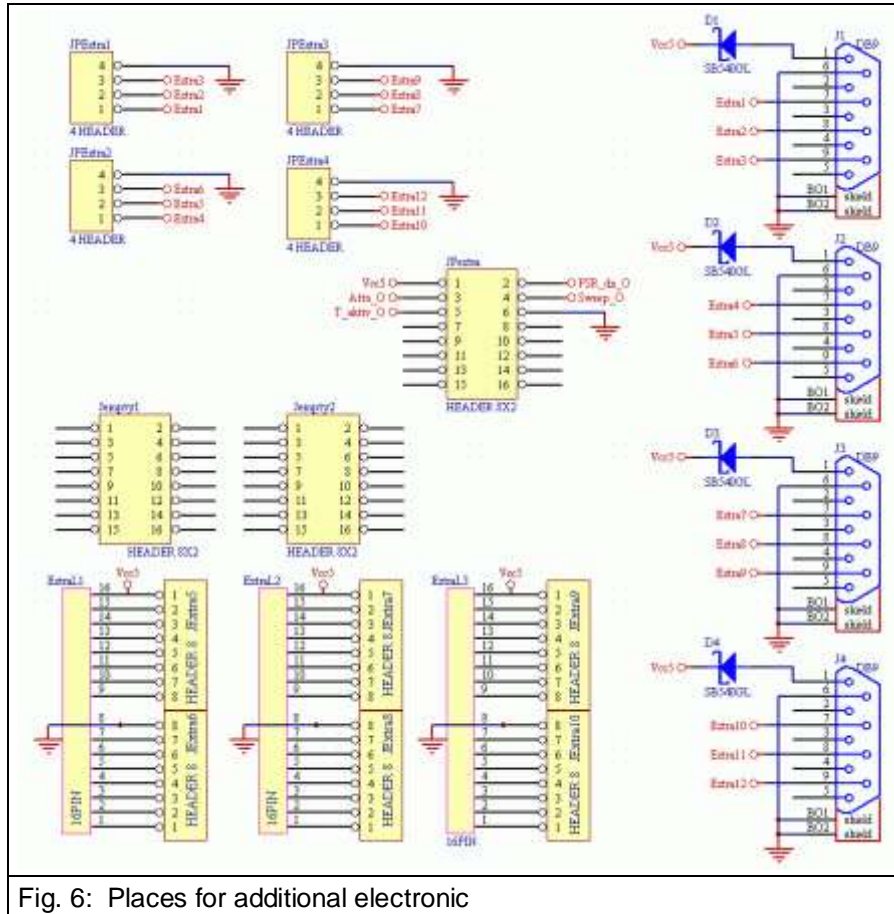


Fig. 6: Places for additional electronic

- JPExtra1 .. JPExtra4 are connected to Extra1 .. Extra12 (see Table 1: internal\*)
- JPextra offers all signals and 5V Power supply
- Jempty1 an Jempty2 have no connections
- ExtraL1 .. ExtraL3 are places for devices – they have 5V and ground connection

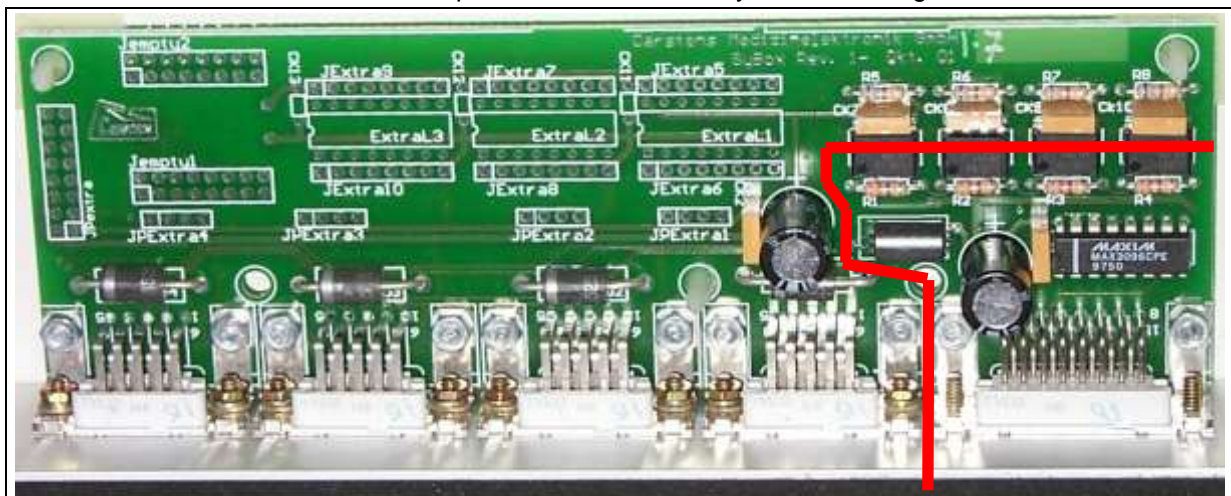


Fig. 7 The red line shows the optical isolation border

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### III. Revision history - Sybox Manual

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Date	Revision	Annotation
April 30 <sup>th</sup> , 2002	1	Initial documentation
February 17 <sup>th</sup> , 2014	2	Frequencies changed