

## Sybox Opto-4 the Articulograph AG500 synchronisation platform

### Sybox Function

#### Synchronizes other systems with the Articulograph AG500

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

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

The communication between all involved programs inside the Articulograph AG500 system is done over TCP/IP connection (see fig. 2).

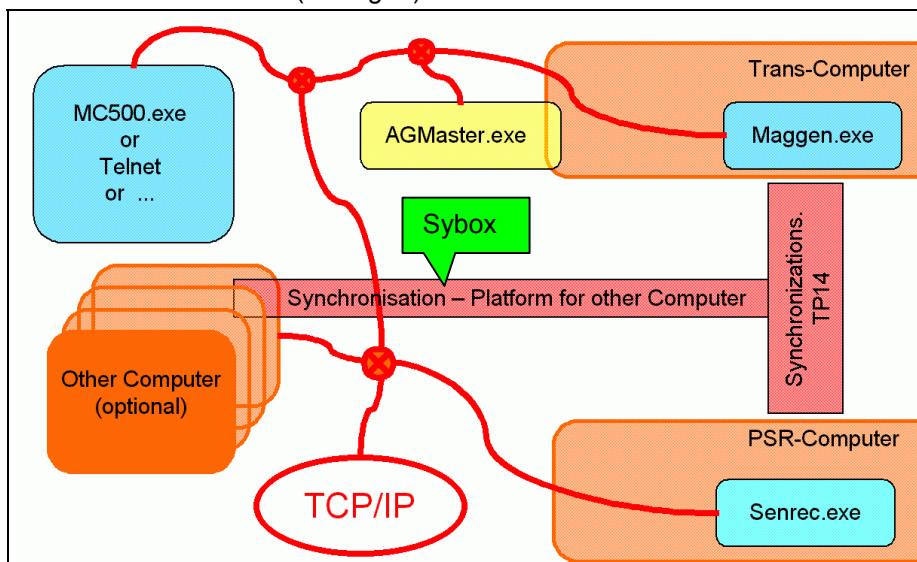


Fig. 2: communication between computer and computer programs

The Trans- and PSR computer have an extra hardware communication by the TP14 cable. The Sybox "copies" this high precision timing signals and makes them available for other systems.

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## 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.

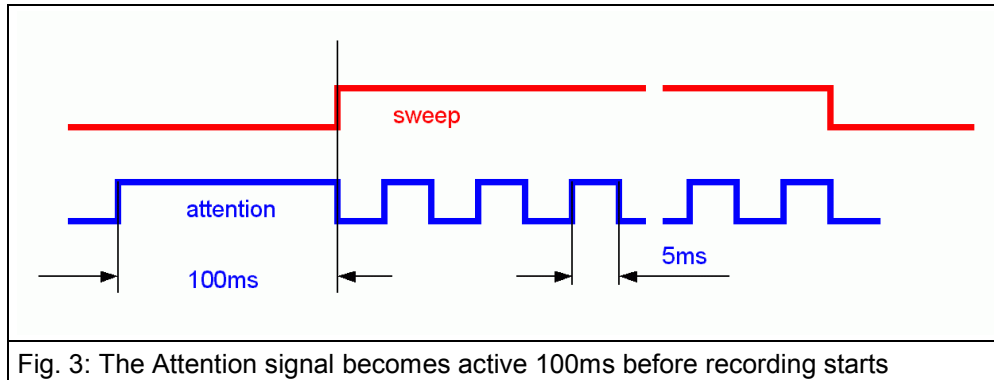


Fig. 3: The Attention signal becomes active 100ms before recording starts

### Pre-Trigger signal "Attention"

This signal has two functions: It goes active (LOW) exact 100ms 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 getting active, the Attention signal starts to change its level every 5ms until Sweep goes inactive.

The 5ms time interval between two consecutive Attention edges describes the exact interval for one movement sample (200Hz).

## 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.

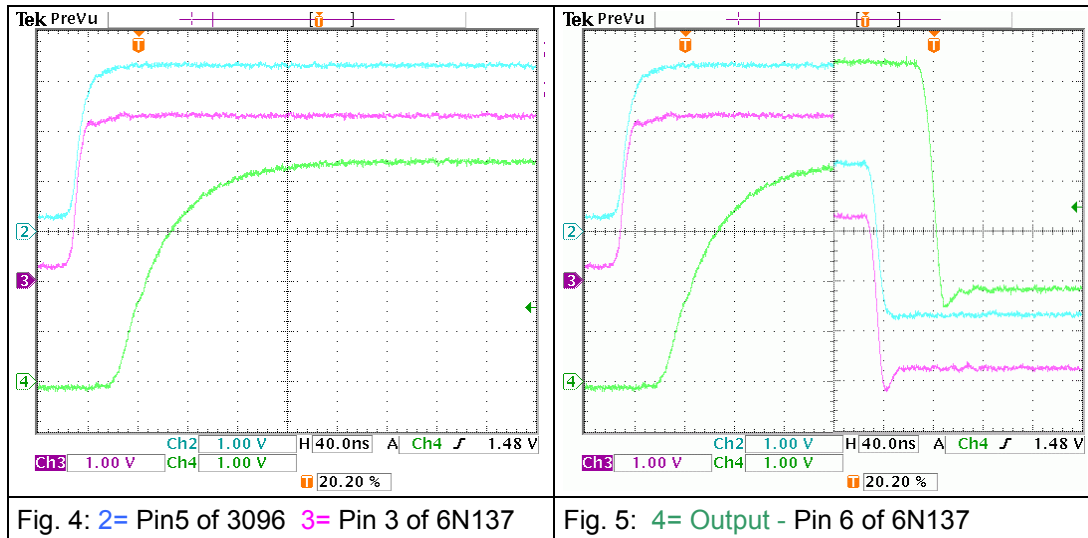
Inside the Sybox there is a Max3096 (Maxim) receiver that converts the signals to TTL level for the opto couplers input.

### galvanic separation

With the opto couplers there is no galvanic connection between the Articulograph AG500 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.



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 AG500 with an 10m cable. So it can be placed far away from the speech recording place.

## 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

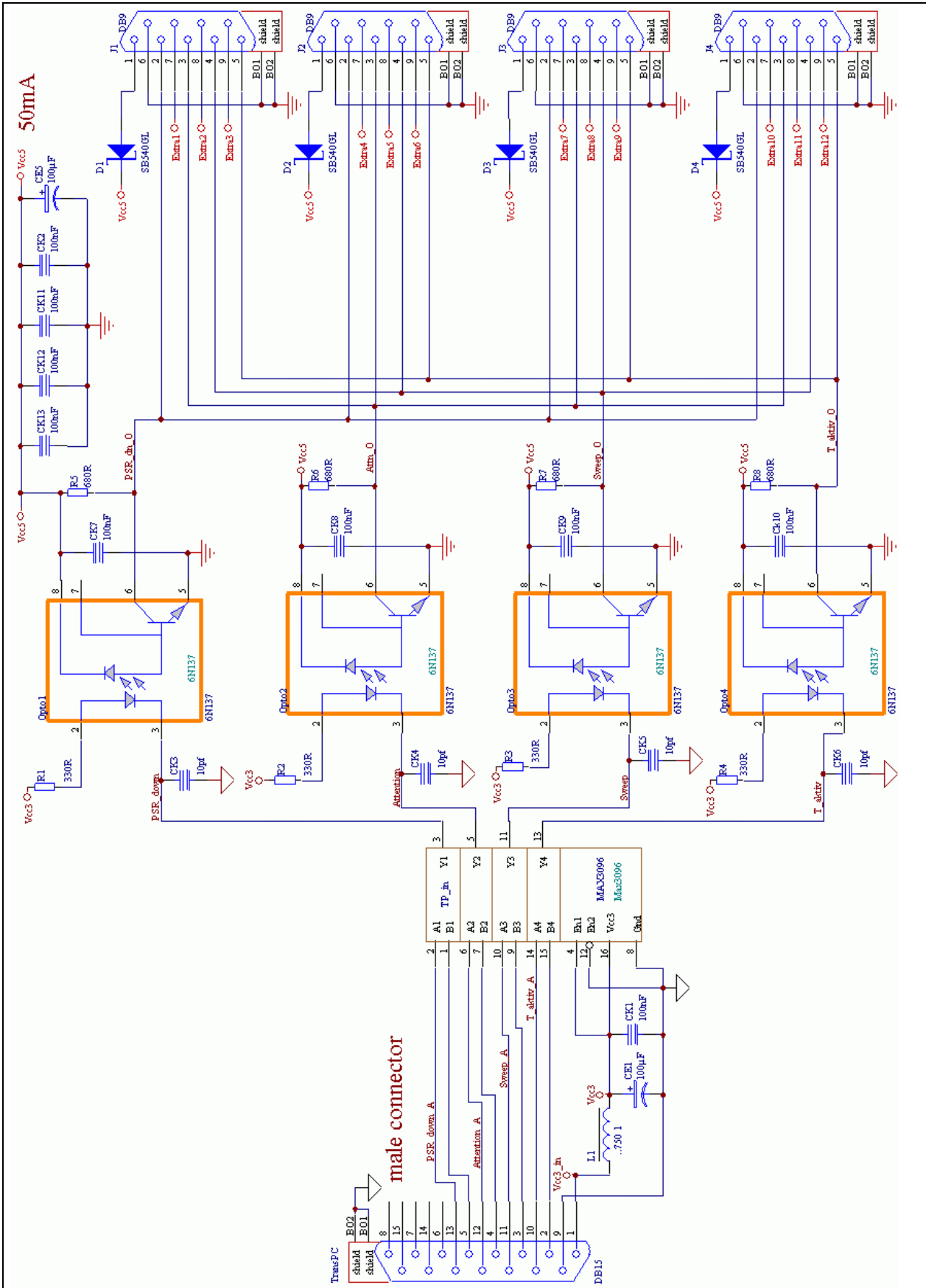


Figure 6: Sybox-Opto4 schematic

## Extensions

There are additional spaces to add electronic to combine with the Articulograph AG500 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.

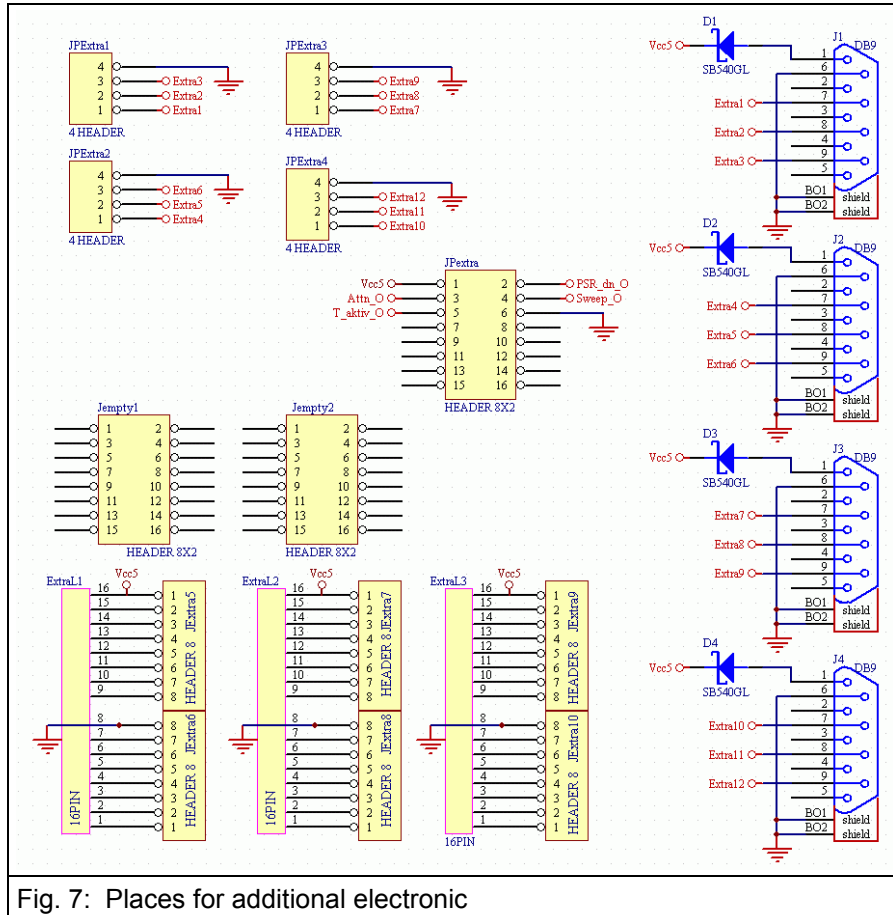


Fig. 7: Places for additional electronic

- 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
- Extra1 .. ExtraL3 are places for devices – they have 5V and ground connection

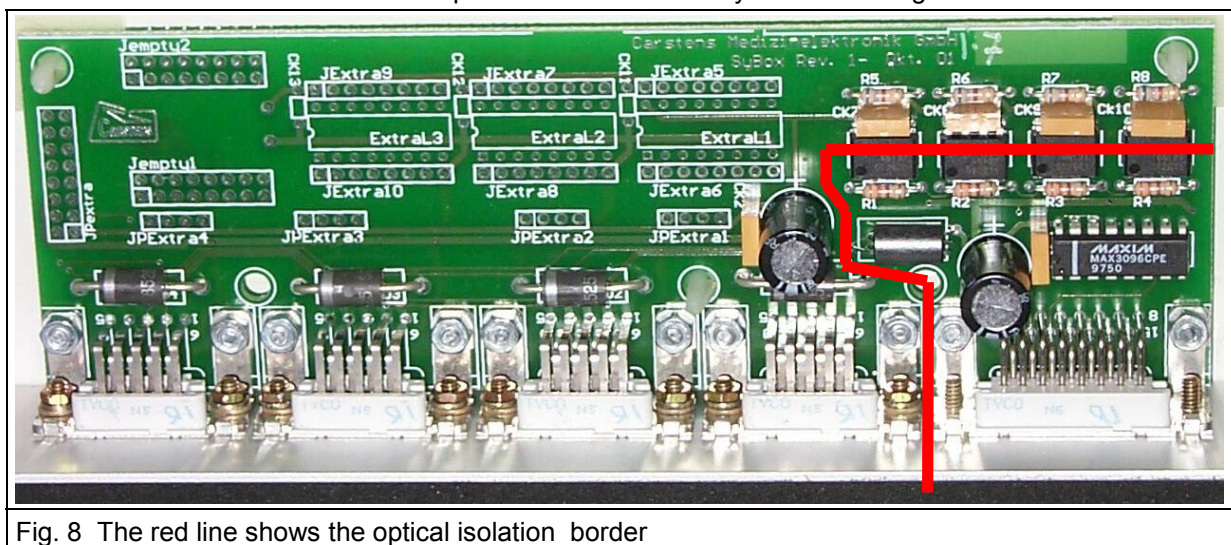


Fig. 8 The red line shows the optical isolation border