## I.  Content

| **Revision: 1** | **Released** |
|---|---|
| date: October 15$^{th}$, 2015 | date: |
| by: | by: |

## II. Sybox 2 - the Articulograph AG501 synchronization platform

### A. Sybox Function

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

With the Sybox 2 there are status-, trigger- and pretrigger signals available to be used by other systems. It is possible to synchronize two computers or systems with the speech movement recording.



Fig. 1: Sybox 2

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

### 3. Signal functions

Status signals "PSR_dn" and "T_active"

These signals are for future use.

Trigger signal "Sweep"

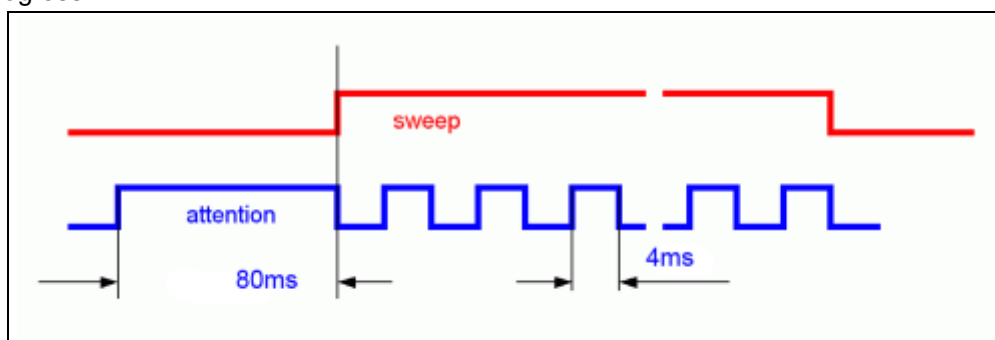The sweep signal is in active (LOW) condition as long as the speech movement recording is in progress.



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

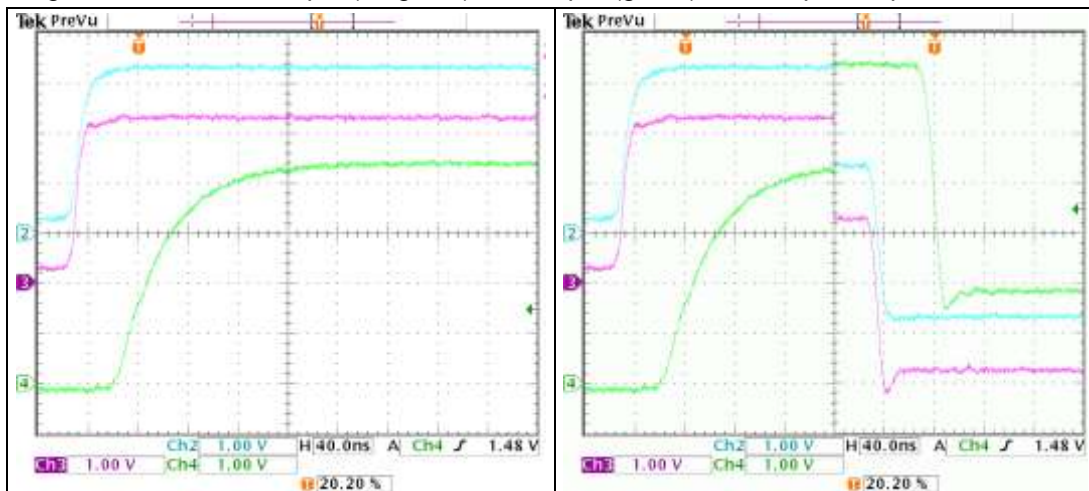Fig. 4 and 5 show the input (magenta) and output (green) of one opto coupler.



| 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 2 is connected to the Articulograph AG501 with a 3m cable.

## 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 Iso1 .. Iso2. 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 or two connectors from your electronic interfaces to the Iso1 .. Iso2 connectors

### Details for connecting your computer or your system

The length of Iso connector cables should not exceed 25 cm.

The HDMI connectors are used for synchronizing two AG501 systems .

Please ask bahne@articulograph.de if you have any problems.

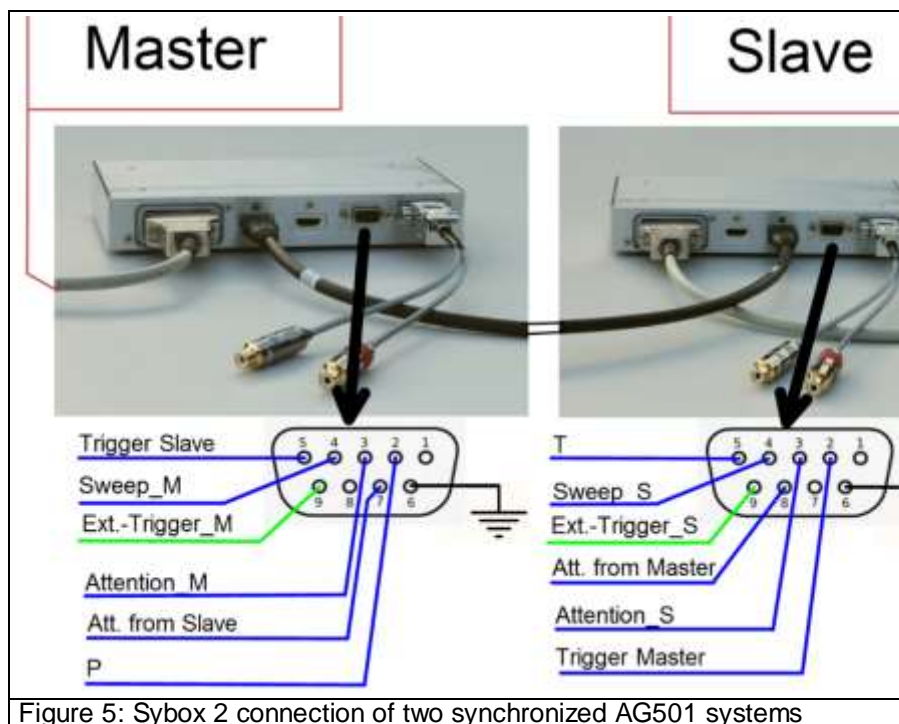| Pin | Signal |
|-----|--------|
| 1 | not connected |
| 2 | PSR_dn |
| 3 | Attention |
| 4 | Sweep |
| 5 | T_active |
| 6 | ground |
| 7 | internal* |
| 8 | internal* |
| 9 | internal* |
| Table 1: Iso# connections | |



Figure 5: Sybox 2 connection of two synchronized AG501 systems
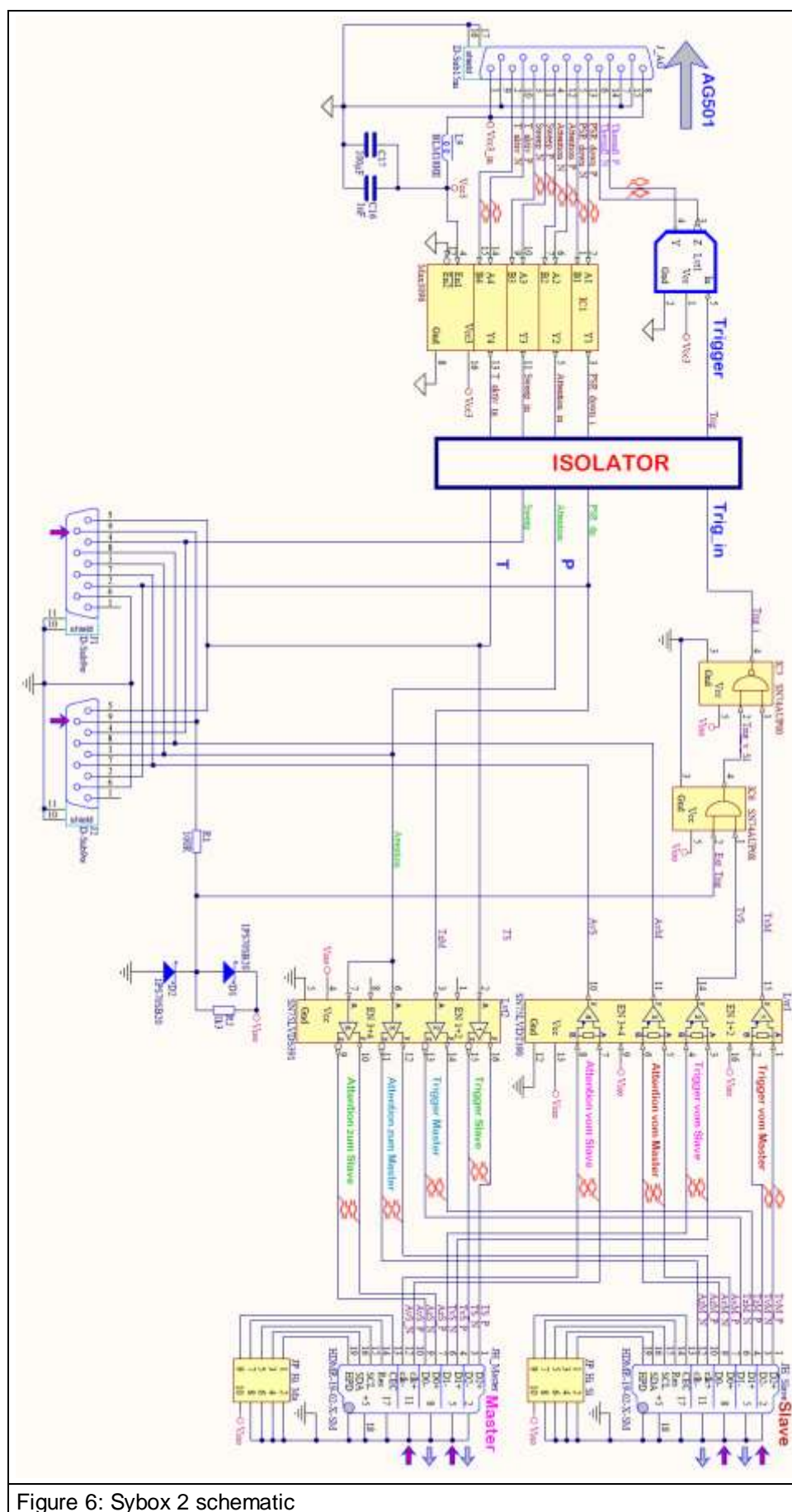
Figure 6: Sybox 2 schematic

## III. Revision history - Sybox 2 Manual

| Date | Revision | Annotation |
|---|---|---|
| October 15th, 2015 | 1 | Initial documentation |