

# Logos Foundation

electronics laboratory

Kongostraat 35

9000 GENT

## Guitar-Organ repair report:

Original circuitry: 1966-1967

client complaint: percussion circuit not functioning.

Printed Circuit board marked OS/063 -JMI49

- Power supply measured o.k. Just rectified 12V ac. Regulator circuit on the PC board has clearly been modified. However, the regulated output voltage measured -8.462V, which is within specifications, the service manual specifying -8.4V.
- On a first measurement, transistor TR1 appeared to have a CE short. We at first replaced it with a BCZ11, as we found specified in the replacement parts list. Later on, we found that there are actually two TR1's in the circuits and for the percussion board it had to be a UI5703 type. We replaced it again with a AC128. The cause of this failure might very well be a user that attempted to use external voltage control on the plectrum connector, not realizing he had to do with a circuit with a positive ground! Antique circuitry indeed.
- TR4/TR5 originally were a matched pair of U15703 germanium PNP transistors, after the circuit drawing and the repair manual. We found them on the instrument replaced with two BC559 silicon transistors. It is unlikely that the circuit has ever worked after this 'repair'. The base voltage for silicium transistors ought to be about three times the voltage required for germanium types (600mV versus 200mV). Consulting very similar circuits from the same period, indicate transistor types such as OC72 or OC74.(Jansen, p.116) Later replacement candidates could be AC128. We have to check for a good match in Hfe parameters. As we found a new matched pair of AC128's in our old stock, we replaced both transistors with this type.
- We replaced following electrolytic capacitors, as we found them to be too leaky for reliable operation:
  - C1 – 400uF with 470uF/25V (radial type)
  - C13 – 125uF/16V with 150uF/25V
  - C11 and C12 – 100uF/6.4V with 100uF tantalum 20V, 10% (high quality axial type)
  - C8 - 50uF with 47uF/ 16V tantalum (radial, drip)
- We found the 2k potmeter for the repeat rate to be broken. Measurement revealed an unstable resistance value of 6k4 to somewhere in the megaohm range... The carbon layer under the wiper clearly got worn out. We replaced the pot with a new 2k2 lin type.
- After replacing TR2 (originally specified as UI5703 again, but the component we found at that place was a silicon transistor (if not even a FET..., as it looks pretty much like a p-Channel E300 or E310) of a much later date and type -undeterminable, as no type numbers could be read from the body-) with yet another new AC128, we finally got the repeat circuit to work again.
- There are still problems with the reliability of the percussion ON/OFF switch, despite the treatment with contact cleaner. It should be replaced with a two-deck rotary switch.
- R9, the 1k series resistor (carbon, 10%) replaced with 100 Ohms to increase the range of the repeat frequency, on request of Luk Vaes. [done 22.02.2013]

### Hypothesis:

examination of the instrument shows many signs of modification attempts by the previous owner, including the drilling of extra holes through the side of the instrument as well as through the face side. We assume that after an unsuccessful attempt to repair the percussion circuit, the user might have tried to use external circuitry to the same or a similar purpose. Hence the two extra holes in the side. We attribute the failure of the percussion circuitry to a user trying out some kind of external voltage control (using a positive voltage with respect to ground) on the plectrum connector. Under no circumstances the plectrum should make contact with any piece of equipment outside the guitar itself. The plectrum input is unprotected by design.

After our repair session, the instrument is back to its original functional condition.

dr. Godfried-Willem Raes  
februari 2013

### Bibliographical references/sources:

- Fisher, Michael "TVT Transistoren A..Z, Vergleichstabelle", ed. EVT, Gerhard Ruder, Muenchen, 1982
- Jansen, J.H. 'Transistoren, theorie en praktijk', Zoetermeer 1964. Balanced modulator circuit documented p. 116-117.
- Julander E., "Guide to Radio Technique", Philips Technical Library, 1965.
- Service Manual for the Guitar-Organ.

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### Maintenance and repair 05.03.2013-06.03.2013:

- The 5 conductor cable between power supply and instrument must have been placed under stretch conditions during the rehearsal sessions. This broke the conductors carrying the guitar signal and caused a short on the power supply. As a result, the power transformer burned out. We replaced the 12V transformer, the bridge rectifier and exchanged the very old 5000uF/15V capacitor with a new 10000uF/25V one.