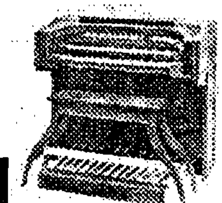
ORGAN NOTES



FOR SCHOBER ORPHANS AND FRIENDS

Issue #72 | Fred Henn Founder & Headmaster Emeritus | April 2002

EDITOR Alex Kruedener
kruedener@juno.com

FORMATTING Bill Kohrumel
bk3@usmo.com

EMAIL Jack D. Gildar
JDgildar@juno.com

Schober Organ Orphans' Page: http://www.users.cloud9.net/~pastark/schober.html

OVERTURE

I hope that this issue finds all of you well and enjoying your Schober organs. Not too many ads this time. As you know our ads are not limited to organ parts etc. If you have anything to sell or give away for the shipping charges, please send in an ad. If you do have anything organ related and you don't need it, please make it available to other members by either giving it away for the shipping charges or by offering it for sale, you will probably be helping a fellow member.
A.K.

CONSOLETTE II PROJECT
by Richard McBeth

PHASE 1

Phase 1 of the Consolette project is to develop the tone generator circuit. The basis of this design was the same as used by Devtronix. The circuit is designed around two integrated circuit chips. Unfortunately both chips are obsolete now but may still be purchased (see Note 1). The first chip is the MO-83 a top octave synthesizer (TOS) signal generator. The second is the TDA1008 a gating/frequency divider for electronic musical instruments. A combination of these chips will generate and switch all the notes in an organ. In essence they replace the Schober tone generators and the keyboard-switching matrix. At the same time they may be designed to generate the same saw-tooth signals that the Schober stop filters require. It should be noted that this approach is technology from the late 70s early 80s. Today's technology would do the complete organ electronics (tone generation, switching, filters, etc.) using a Digital Signal Processor (DSP) and a microprocessor all on a 4" by 6" PCB for the cost of a few hundred dollars.

Figure 1 illustrates the basic block diagram of the complete tone generation system.

The TOS chip is crystal controlled at 4 mega hertz (MHz) for long term stability. It has internal frequency dividers that create the top (highest) frequencies used by an organ. This starts at the high C of the 1-foot pitch and goes down (for all notes) 1 octave. Figure 2 shows the internal block diagram of the TOS chip.

Figure 3 is the block diagram of a TDA1008 chip. One chip is required for each note (C, C#, D...B) and generates the tones for 5 octaves. Each keyboard has its own set of 13 TDA chips. A 13th chip is required to control the low C on the keyboard. Remember there are 6 C notes on the Schober 61 key keyboard. Referring to Figure 3, each key of a 5 octave spread of a given note is connected to input K1 to K5. Outputs are taken from Q1 to Q5.

Q1 = 1 ft, Q2 = 2 ft, Q3 = 4 ft, Q4 = 8 ft, Q5 = 16 ft.

Pin P is connected to the appropriate TOS signal and pin S is connected to a potentiometer and controls the decay (sustain) of the output. (More about this later) The dividers at the left generate the correct frequency for a given note. For instance, middle A key will produce 440 +/- ½ Hz on the 8 ft output (Q4). The matrix switches the correct frequencies to the output as a function of which key is depressed.

Figure 4 shows the input key switch circuit to the TDA1008 chip. One of the advantages of this chip is that it controls attack and decay of the tone when a key is depressed. The key switch S1 switches +6V to the TDA1008 input circuit. Resistor R1 and capacitor C1 control the attack time. I have set this up at about 20 milliseconds. R1 and C1 also provided de-bounce for the key switch. Any contact bounces when it is first made. This creates noise. The action of R1 and C1 will filter out this noise. The maximum decay (sustain) of the tone, when a key is released, is controlled by R2 and C1. I have set this up for about 1 second. Sustain is further controlled at pin S by a potentiometer and may be controlled from maximum (1 sec.) to almost 0 time. The attack, hold and decay of a note are known as its envelope. See Figure 5. (Future plans call for an electronic echo chip. See Note 2.)

All tones generated in the above discussion are square waves because these are easy to generate and divide. The keyed tone needs to be converted into a saw-tooth waveform because that's what is required by the Schober stop filters. This was accomplished the same way Schober did, by using a ladder resistor network. See Figure 6. Finally, the saw-tooth signals from each TDA1008 chip are bussed together and buffered by an operational amplifier (op-amp). The output of the op-amp is sent to the organ bus amplifier and then to the stop filters.

The TDA1008 chip requires three different voltages, +12, +9 and +6 volts. I purchased a +/- 5V and +/- 12V power supply on the WEB for about $20 and use 7806 and 7809 voltage regulator chips to develop +9 and +6 on the PCB. +12 volts is used for the 4 MHz oscillator and the TOS chip. +/- 12 volts will provide the power required to operate operational amplifiers and the +5 volts provides any logic chip power that may be required.

The physical construction of the circuit evolved into a base motherboard that holds the common circuits (+9, +6 regulators, 4 MHz oscillator, TOS chip and the saw-tooth buffers). On this board were sockets to plug in 7 baby boards.

Each baby board has 2) TDA1008 chips and the saw-tooth resistor network. Power and S sustain voltage is bussed to each baby board. The saw-tooth signals were bussed from the baby board to the op-amp on the motherboard. Finally, the key switches were connected to the baby boards as required.

From Figure 4 see that the keyboard switch switches +6 volts to the TDA1008 chip. This required modification of the keyboards and is the subject of the Phase 2 report.

Note 1: MO-83 TOS chip from Organ Supply Corp. TDA1008 chip from Classical Organ Inc.

Note 2: HT8955A and 21256 DRAM from Radio Shack WEB site

Silicon Transistors

Richard Peterson who is revitalizing his Schober Theatre Organ writes: "...My biggest headache in switching to silicon transistors was the Bus Amps. You can't just substitute silicon transistors for the originals and maintain the woodwind concept. Asked for help several times but to no avail. Then I happened to remember that the Percussion unit also used Bus Amps and silicon transistors so I just stole that circuit and modified the boards appropriately. Of course this changed the input impedance of the amps so I had to also change most of the various input resistors. Resulted in the clarinet really sounding like a clarinet..."

ADS

Disclaimer:
Any deals, making of payments, receipt of payments or verifications are strictly your responsibility.

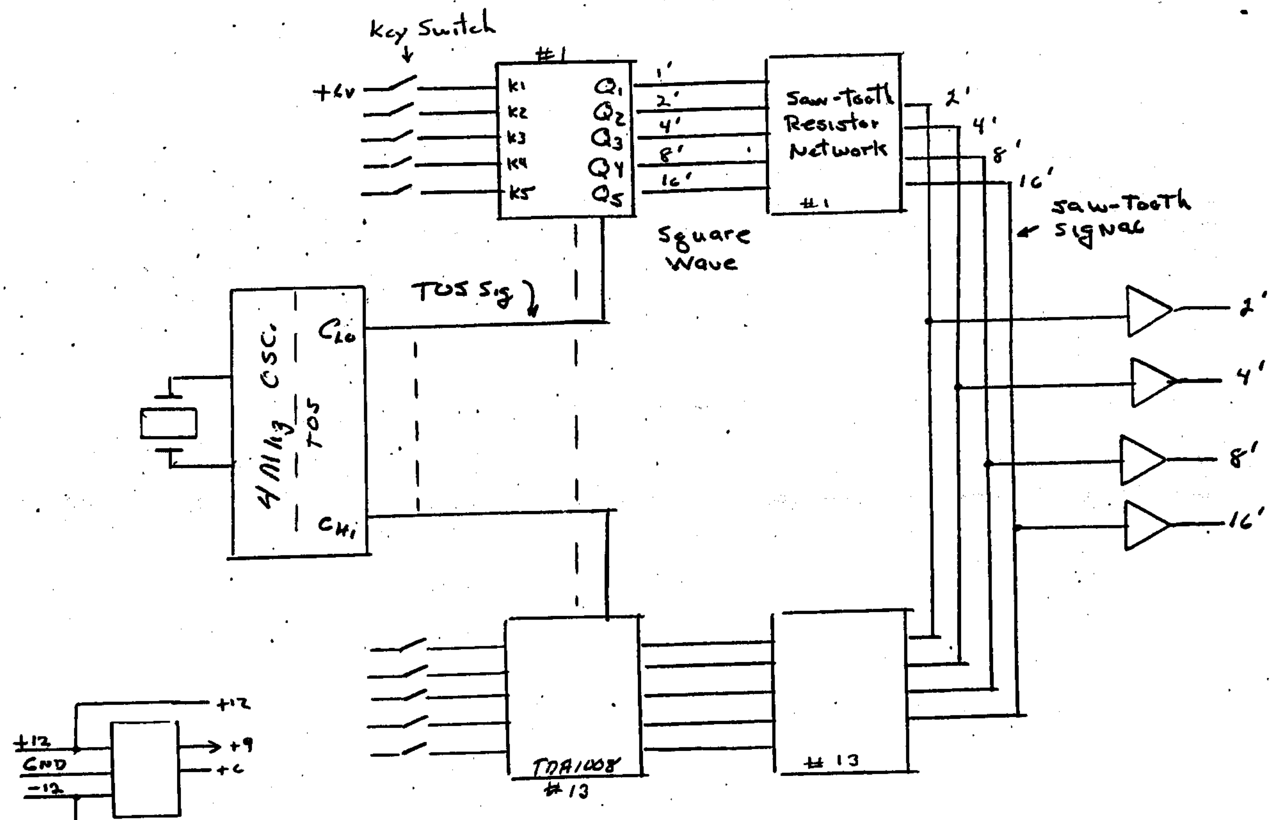
Theatre Schober

Bill Hughes is offering his Theatre Schober complete with percussion and Devtronix tone generators to a good home. It also includes a home built amplifier but no speakers. He is located in Ontario, Canada. Contact him at ontadian@hotmail.com. If you don't have e-mail, write to me (Alexander Kruedener) and I will get in touch with Bill.

Recital Schober

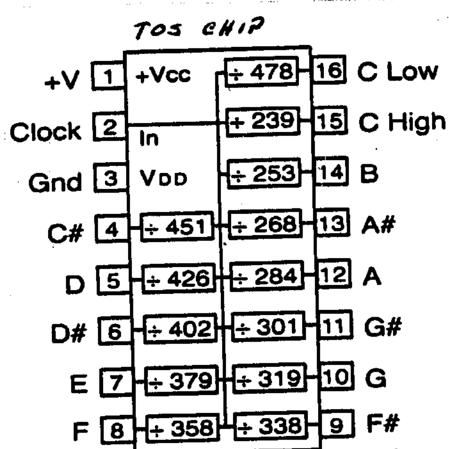
A Recital is for sale in the Chico, California area. Contact: Robert Cavarra. Email: rcavarra@attbi.com

Alexander Kruedener
161 East 89 Street, Apt. 4E
New York, NY 10128
(212) 831-0662
Kruedener@juno.com



Key Switch
+6v
#1
k1
k2
k3
k4
k5
Q1
Q2
Q3
Q4
Q5
1'
2'
4'
8'
16'
Saw-Tooth Resistor Network
#1
Square Wave
Saw-Tooth Signal
TOS Sig.
OSC.
4 MHz
TOS
CLo
CHi
TDA1008
#13
#13
+12
GND
-12
+12
+9
+6
-12

Fig. 1



TOS CHIP
+V 1 +Vcc
Clock 2 In
Gnd 3 VDD
C# 4 ÷ 451
D 5 ÷ 426
D# 6 ÷ 402
E 7 ÷ 379
F 8 ÷ 358
÷ 478 16 C Low
÷ 239 15 C High
÷ 253 14 B
÷ 268 13 A#
÷ 284 12 A
÷ 301 11 G#
÷ 319 10 G
÷ 338 9 F#

Fig. 2

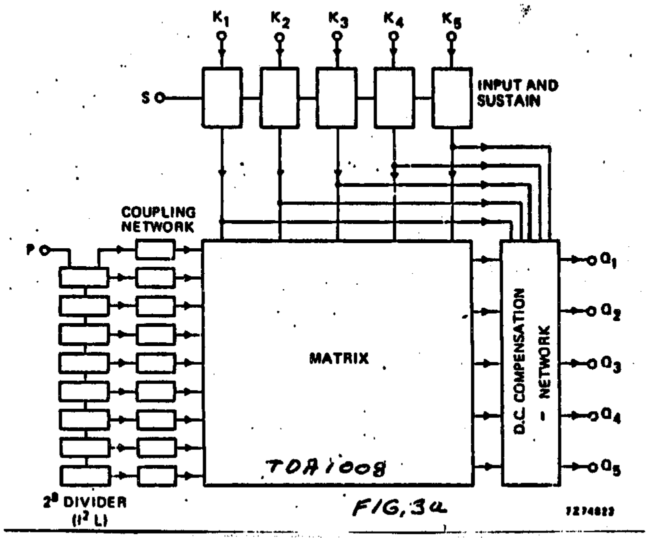


FIG. 3a

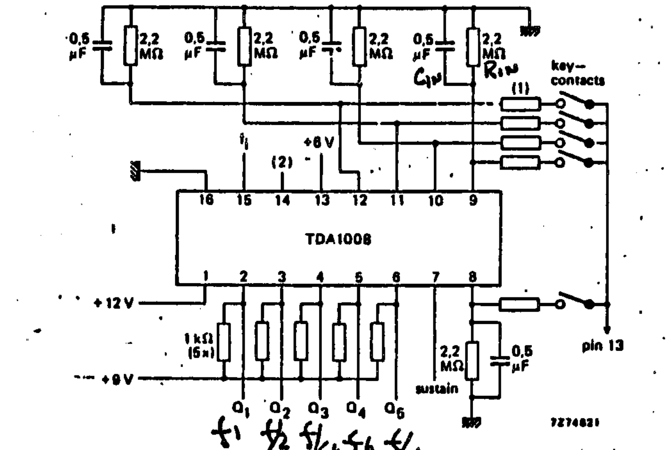


Fig. 3b

(1) If required contact-current limiting resistors.
(2) a. Factory test point; ungated output from the final divider.
b. Can be used for obtaining very low frequencies (pedals). It should be connected to pin 13 (+ 6 V) via a resistor of minimum 300 kΩ to deliver the current I_{14}.

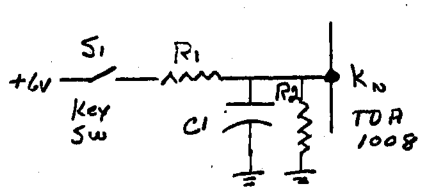
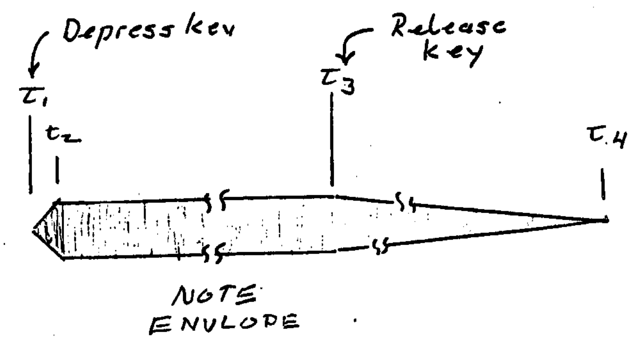
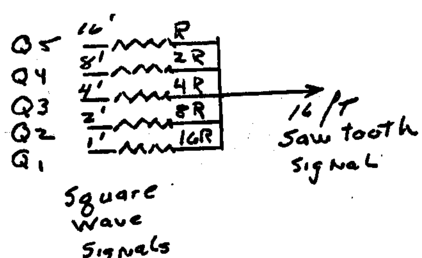


Fig 4



t_1 to t_2 = ATTACK TIME
t_2 to t_3 = Hold TIME
t_3 to t_4 = DECAY TIME

FIG. 5



Resistor Network

Fig 6