Schober Organ Notes No. 77

OVERTURE

Disclaimer: We accept no responsibility for any unfavorable consequences resulting from following our advice

OVERTURE

This issue is a big, and good one! First, the letter from Robert Elliston. I forgot about it for a while. That's what happens when you have your materials in two far apart places. Luckily Robert's son alerted me to the situation and we have the interesting letter in this issue. So, again, if I fail to answer your communication or send you something, etc., please let me know. Secondly, Richard Peterson's "Restoration of a Theatre Organ" is so chock full of great information it could be enough for several issues. The other letters are also very informative.

Letter from Robert Elliston

(Robert Elliston, C201 Post Office Road, Ross Creek, Vic, Aus. 3352, 21st April 2001)

Dear Alex,
My son, Peter, contacted Fred Henn via MSN Hotmail 18 12 2000 as a result of me being presented with the wreck of a Schober Recital organ. The history and story is too long to relate here. But today in my lounge room is a 30 yr old instrument which like Phoenix has been raised from the ashes and which in this computer age, is, and always will be, a lovely musical instrument.

The process of resurrection was not an easy one. The instrument had been constructed with Baroque voicing, which like all things had good and bad points, which only added another dimension to the process. As the emails described, the organ, when it came to me, was as dead as Julius Caesar. Switch on - nothing. Not that there would have been any sound anyway. There was no amplifier.

First port of call was the Power Supply. The main output transistor was as electrically useful as a nut and bolt and in studying the circuit diagram it became apparent that it was, as a 21st century power supply, obsolete. It was gutted from the front. The power transformer and diodes for the receiver remain but all the rest is gone, replaced with a three terminal voltage regulator (adj.). On reading a lot of your problem tech notes and other literature (Organ Notes #53 (???) When were these written?)*, I believe that most of the hum, background noise and poor performance originated right here.

Of course, the old germanium transistors are the weak link but in this organ they are still there and background noise is virtually nil. I can only conclude that if there is no hash to amplify then you won't hear it. Voltage in this organ is 18½ V.D.C. negative. And the new power supply holds it constantly.

Other problems were the usual dead transistors, 046200 in this organ, with Fairchild AY1115 238 direct replacements (whatever they are) and now the silicon 2N4403 which work in most places and which I swap with a living 046200 elsewhere in the organ (if I need to). This is a serious Church musician's organ, and like all good musical instruments has its intrinsic character. It is very much a concept instrument, and that it will forever carry. Not all pianos have to be Steinways. The others have their own worth and qualities too, and so it is with Schober. Beauty is beauty, and what is a daffodil today will be a daffodil tomorrow. It will not

change into a thistle overnight.

So here in Australia there is a Richard Dorf Recital Organ, freshly revarnished to make it look like a million dollars, and which transcribes black and white notation into the most highly creditable works of Karg-Elert, César Franck, Bach, and Rheinberger into that lovely audio we call music.

A few stops have been revoiced. Pedal Bombarde trebled in power. Pedal Diapason doubled. Swell String Diapason also and the Concert Flute. Trumpet reverted to original; also Clarinet; also, Great Chimney Flute 4' and the Tromba, a big Tuba sound. Far more useful.

Other than that the organ is as it was built in 1971. Its voice mightily fills my music room through two even older, genuine, big, Wharfedale Goodman 12" dual cones at one end, matched at the other by another two Wharfedales. The quadraphonic sound through the not so old Marantz amp. is prodigious or whisper-like, according to requirements.

So there we have it. With the aid of your Tech. Notes, all the original construction literature, Sales Brochure, and The Schober demonstration disk on the enclosed Eva Tone sound sheet, and the Sounds of Schober 12" disc which I already had, Richard Dorf's concept is well and truly alive. Only one other thing. The pedal board on my organ had no side cheeks. The pedals were totally exposed and looked awful. I had some original walnut ply in my workshop (from another project) so some new ends were shellac varnished and that ugly problem was solved. If it is of assistance I shall enclose a circuit of the revised power supply.

Sincerely, Robert W. Elliston

P.S. Broken stop tab pivots raised in Tech-notes. Mine solved by Mr. Heath Robinson. 1/8" app. 3/8" Wire diam. app. 1/32" Clip made of phosper bronze, brass, or steel wire (app. .031").

> [NOTE to e-mail subscribers, the above contained a drawing with measurements. The graphics etc. will not reproduce as intended via e-mail, neither will photos, etc. If you want the graphics of any issue, send me a SASE and an extra 1st class stamp. (AK, address at end of this issue).]

Remove next adjacent R.H. nylon button & felt cushion with long nose pliers insert wire clip horizontally to hold broken plastic parts together. A drop of contact glue on the clip will stop it falling out again. And yes it's a pain to insert the clip.

Restoration of a Theatre Schober

by Richard Peterson

In the late 1960's I was looking for an interesting electronics building project and happened to find the Schober Organ Company offices while on a business trip to New York City. I had always loved organ music and the thought of building one from the bottom up sounded great so I took on the task, purchasing kits for my new Theater organ as the home budget permitted. The completed organ sounded great but did exhibit some problems such as noise that neither Schober nor I ever solved to my satisfaction. I learned to play well enough to keep the dog from howling and my mate from leaving me so the project served me well.

The organ gradually degraded over the next 25 years or so and my playing became more infrequent. After retiring and moving into our retirement home I decided that the old organ was still a neat piece of furniture and needed to be restored. Although I found out that the Schober

company was no longer in business I was fortunate enough to find Alexander Kruedener on the internet and that was the catalyst I needed to proceed. Thanks to Alex's vast knowledge of the history of Schober organs and having some parts I needed along the way I was able to initiate my restoration project. I decided that I would maintain the original Schober concepts such as tone generation, etc., wherever possible rather than introduce more modern methods now available to designers. I wanted the final version to be as much like my original organ as possible and the restoration to be relatively low cost.

My major objectives were:

1. Reduce the background noise from the organ.
2. Improve the pedal switch design.
3. Improve the sound system performance.
4. Improve noisy manual key switches.

Along the way, other objectives popped up and these were either achieved or are still in progress.Following is a summary of the results of the restoration project to date.

Noise reduction

The original Theater Organ design used PNP germanium instead of silicon transistors. Several authors of articles concerning Schober Organs have noted that was a major source of the noise I was trying to eliminate. These same authors searched the vast array of modern low-noise silicon transistors and found the 2N4403 a good economical substitute.

Unfortunately, you can not always just substitute the 2N4403 for Schober's 0146127 so some circuit changes were necessary. Most of these changes involved simple transistor circuit biasing modifications. Also, I replaced all electrolytic capacitors throughout the organ with fresh new components. Most of the components I used (capacitors, resistors, and transistors) were purchased from RadioShack.com or Mouser.com. My efforts to reduce output noise involved the following circuit boards and units.

Tone Generators (TTG-4)

It didn't take long for me to find out how much time this project was going to take. The 2N4403 transistor worked fine on the tone generator boards with no circuit modifications. However, I found a new problem. Many of the resistors on the board had increased in value over the 30+ years to as much as twice their original value. So, I had to replace many resistors on each board. I did not find this problem to be as pervasive on the other organ boards but I continued to check. After refurbishing all the tone boards the oscilloscope verified that the new output waveforms from each tone board matched Schober's original waveforms very well.

Per Schober's suggestion, I added a 1000 MFD/30V electrolytic capacitor across the power supply bus to the tone generators to reduce leakage of tones through the power leads.

One board's oscillator was intermittent due to a bad oscillator coil which, thanks to Alex, I replaced and it worked fine. That completed the Tone Generator boards which, so far, are functioning very well.

Pedal Generator (PTG-3)

The Pedal Generator board required some modifications before the 2N4403 could be substituted for the existing 046127 transistors. Resistors 23 and 24 were changed from 27K to 15 K to maintain similar circuit performance. However, I noted a high frequency oscillation at the pedal output terminal PO which often occurs when you switch from germanium to silicon transistors.

This problem was eliminated by soldering a 120 pico-farad capacitor from terminal PS to common.

Coupler Switchers (CTS-1)

The Coupler Switchers required no circuit changes to substitute the 2N4403 transistors for the Schober 046127 transistors.

Bus Amplifiers (BTA-3)

The Bus Amplifiers presented a new problem. I had hoped to make all modifications with changes in circuit component values only but that was not possible with the Bus Amplifiers. The unique method of deriving the woodwind tones set constraints that I could not meet with the existing circuit board layout. For example, the signal at the base of transistor 2 consists of two inputs, an 8' tone and a 16' tone. The amplitude of the 8' tone must be ½ of the amplitude of the 16' tone to produce a square wave at this point. However re-biasing the circuits to accept the new 2N4403 transistor upset this balance and no individual resistor value changes would correct the problem. So some basic circuit changes were necessary. Fortunately, I didn't have do the actual redesign since the Percussion Board (PTN-4) in my organ was a later design and used 045000 silicon PNP transistors in its bus amplifier circuits. I simply duplicated those circuits.

Circuit component value changes were necessary in several places. Resistors 14 through 21 were changed from 150K to 180K. Resistors 40 through 47 were changed from 1.8K to 27K.

The next change involved adding components to the circuit board. The emitters of transistors 1 through 13 required additional components in series with the existing 470 ohm resistors. The additional components were a 6.8 K resistor in parallel with a 25 Mfd/10volt electrolytic capacitor. I took the easy way out with this one and simply lifted the common end of each of the existing 470 ohm emitter resistors from the board. Then I soldered one end of the new parallel combination in that circuit board hole. Then I soldered the free end of the 470 ohm resistor to the free end of the parallel resistor/capacitor combination, arranging them in a sort of teepee configuration.

Unfortunately, all these modifications had changed the input impedances of the various input circuits. This required recalculation of the attenuator resistors 92 through 99 to produce the same signal level at the bases of the input transistors with the new circuit configuration. The new values used were:

BA16 input 33K
BA8 input 33K
BA4 input 33K
BS16 input 2.2K
BS8 input 47 (no change)
BS4 input 1.0K (no change)
BS2 input 3.3K
BS1 input 6.8K

These changes resulted in 2N4403 transistors working well in all of the circuits and nice square waves appearing at the bases of the summing transistors.

Manual Stop Filters

Only two of the transistor circuits on the Manual Stop Filter board required modification to adapt to the 2N4403 transistors. Transistors 53 and 24 required re-biasing while transistors 47 and 19 did not due to the lower values of collector load resistance. Transistors 57 and 30 have

no collector load resistance so no change was necessary there either. For transistor 53, resistor 50 was changed from 180K to 150K and resistor 51 was changed from 3.9K to 6.2K.

For transistor 24, resistor 23 was changed from 150K to 120K and resistor 25 was changed from 3.3K to 5.6K.

Preamplifier-Vibrato Unit (PTR-4)

My ultimate goal for the Preamplifier-Vibrato Unit is to upgrade from the PTR-4 board to the PTR-5A board. However, I haven't yet located a surplus PTR-5A board. The swell shoe circuit associated with the PTR-4 board is noisy and erratic while the circuit on the PTR-5A significantly reduces this problem. (It would not be very difficult to make a new board and this may be my best solution.) Meanwhile, I modified the existing PTR-4 board to accept the 2N4403 transistors.

Since all of the circuits on the board had relatively low collector load resistors I initially changed all of the Schober 046127 transistors to 2N4403 transistors with no circuit modifications. The change was fairly successful but I did notice that some flat topping and distortion occurred with high level signals. Changing resistor 65 from 10K to 6.8K, resistor 19 from 15K to 12K, and resistor 37 from 15K to 12K solved the problems.

I also tweaked a few other values to make the modified board operation more like the original. Resistor 1 was changed from 820 ohms to 1.5K, resistor 61 was changed from 1K to 1.5K, and resistor 80 was changed from 820 ohms to 1.5K.

Fortunately, all the LDR units on the PTR-4 card were ok so I didn't have to fabricate new ones. (Alex has plenty of info on how to accomplish this).

Mixer Compressor (MTC-1)

Transistor circuit 55 required re-biasing to accept the 2N4403 transistor. The other transistor circuits were acceptable in their current configurations but I slightly modified transistor circuits 112 and 18 to improve linearity and prevent flat topping.

For transistor 55, resistor 52 was changed from 120K to 100K and resistor 53 was changed from 3.3K to 3.9K.

For transistor 12, resistor 10 was changed from 33K to 39K and resistor 11 was changed from 3.9K to 4.7K. For transistor 18, resistor 17 was changed from 100K to 68K to duplicate Schober's value of Ve for the LDL.

Percussion Unit (PTN-4)

I have not completely eliminated the Schober transistors in the Percussion Unit. Transistors 225, 233, and 240 in the reiteration circuits are still 046127's. Some redesign will be necessary to substitute 2N4403 silicon units. However, this is a control circuit so the 046127 noise is not a significant problem.

The only other circuits requiring modification for the 2N4403 transistor were transistors 211, 264, 269, 274, 279, and 241.

For transistor 211, resistor 208 was changed from 5.6K to 8.2K. For transistor 264, resistor 265 was changed from 1.0K to 2.2K. For transistor 269, resistor 268 was changed from 1.0K to 2.2K. For transistor 274, resistor 273 was changed from 1.0K to 2.2K. For transistor 279, resistor 278 was changed from 1.0K to 2.2K. For transistor 241, resistor 242 was changed from

1.0K to 2.0K. No changes were necessary in the gate or bus amplifier circuits.

Since Schober had designed the Percussion Unit for their 045000 silicon transistor no changes were necessary to substitute the 2N4403 in the 96 keyer-board sockets.

I have never been pleased with the output level of the Percussion Unit so I added an amplifier to the output terminal (Po) on a separate small circuit board. It is a very simple one stage common emitter amplifier followed by an emitter follower using 2N4403 transistors. Now I don't have to have the Percussion gain control at maximum.

Reverbatape

Just a few comments on the Reverbatape unit. It was a great idea in its day but the mechanical noise was too annoying. So, I removed the Reverbatape from the organ and am going to install a more modern solid state unit when I find one I like. This was the one area where I decided to join the 21st century with the organ restoration.

Pedal switch modification:

Pedal Clavier (PTC-4)

The pedal switches in the original Theater Organ were not very reliable. It seemed like I was forever pulling out the clavier and bending the metal arms, etc. So I decided to do something about it. I had seen several articles in old Organ Notes ("ON's") about different ways owners had changed this switching arrangement but none appealed to me. Again, Alex came to my rescue with some fresh ideas and after studying them I decided to use a method that involved the following procedure:

1. Remove all the old switches from the organ
2. Attach a 1" diameter wooden disc with a 3/8" hole through the center to the end of each pedal (like a doughnut). Use a wood screw and large washer to mount the disc so its position can be adjusted.
3. Mount snap-switches with long actuator arms in the organ in the general area where the original switches were attached.
4. Wire the snap-switches in the same sequence as the original switches.
5. Replace the clavier unit in the organ and adjust the wooden discs until the micro-switches activate properly when the pedal is depressed. The process was fairly easy to accomplish but I had to substitute for some of the suggested materials. I couldn't find the wooden discs at any of our local craft shops so I used 1" diameter spherical wooden ones (doll heads) with 3/8" holes through the center. Also, this modification was devised many years ago when sophisticated gold contact Oak snap-switches were reasonably priced. Those same snap-switches cost 5 to 10 dollars each now which far exceeded my budget. So I substituted some more economical switches from Mouser Electronics. (Mountain Switch stk.# 101-1206, $1.04 each)

The retrofit seems to work fine. I haven't had to readjust any of the switches to date. I don't know how reliable my economy switches are but time will tell. I did note that the metal arm of the snap-switch rubbing on the wooden doll head does produce a little noise but it is not objectionable. I am sure it can be dampened.

Sound system

I didn't purchase any of the Schober speakers for the organ but just used off the shelf ones from Radio Shack. When I finished this retrofit I noticed that the speaker system sounded pretty bad when playing lower keyboard and pedal notes. I suspected that the resonance of the woofer speaker was probably around 50 Hz so I purchased one with a resonance below 33 Hz from

RadioShack.com and it solved that problem. I am still using the old Schober amplifier and it works fine except the cooling fan is somewhat noisy.

Manual Key Switches

I think just about every Schober Organ owner has had problems with scratchy manual keys and there are many suggestions out there on how to solve the problem. So far, I have taken the path of least resistance and purchased spray cans of Deoxit D5 and ProGold G5 to attack the problem. These sprays have work fairly well but still leave room for improvement. This is an area I must investigate more in the future but in the mean time I find that playing the organ a lot also helps reduce the scratchy noise.

Summary

Well, that is my story. I am sure others can and would do it differently and my 'fly by the seat of your pants' engineering was probably suspect at times but the final result has been very satisfying for me. The noise output has been significantly reduced. In fact, I have to depress the swell shoe all the way down to hear any noise. This is a very noticeable improvement.

The pedal switches are working fine but the reliability of the economy switches remains a question.

The sound system is working ok. I know I can improve it more by replacing the old Schober amplifier or at least purchasing a quieter fan. A better speaker system would also provide some improvement. But, overall, the sound is pretty good as it is.

The manual keys are not nearly as scratchy as before. There are many ideas out there to improve the performance of the manuals but so far I am satisfied with what I have done.

I appreciate all the suggestions from other Schober owners along the way and especially Alex's assistance. There is a wealth of knowledge in the old copies of Organ Notes too.

Meanwhile, I am trying to learn to play the organ again after a long dry spell. I still continue to think of ways to improve the organ while keeping it as original as I can. Maybe I'll get around to them soon.

How to Build a Devtronix Type Switching System and Avoid Keying Problems

A letter from Tony Simulinas

Hello!! I've been a member of the Orphan's group now for some time, and wanted to convey my wishes to you and yours for a very safe and Happy Holiday Season!!!

I've got a Theatre model which has been under constant construction and revision for almost six years now. I've one more upgrade to complete, which if it works, and my prototype says it will, will finally eliminate the "spring/buss bar" problem in the keyboards for me once and for all. I've taken an IC chip, a quad analog switch, and wired it into the keyboard assembly as a separate sub-assembly. The purpose is to have the IC do the audio switching instead of the springs and buss bars. So far, everything looks good, an amazing amount of manual labor to bread board together, but, Now, similar to the "Devtronix" system, the springs will actually key the voltage that turns on the IC. The IC does the rest, and the assembly fits nicely in the console, wiring from the tone generators follows pretty much the same format as the book.

I have to build two assemblies, one three bus the other five, but, the added advantage is that on each board, I have spare "dry" contacts which I can use to trigger my percussion section or any

other device or module from. No more mechanical switches!!

Time and effort are the key factors here, the materials needed amount to under $300.00 for mostly the IC's, sockets, and power supply. If all goes well, and if anyone would be interested, I'd gladly supply the schematic and parts list. As I've said, it's VERY time-consuming, but, I'll finally be free of the problems that the original keyboard design had!!

Thanks again for all your efforts in supporting the group, and HAPPY HOLIDAYS!!

Tony Simulinas

Tube Organ Problem

Capacitive Feedback

Our member Anthony Carriero is restoring a Schober Concert (tube organ). A unique problem came up, and that was a distinct yet low coupling to 16' when playing 8' stops. This organ had the newer Pratt Reed 5 bus keyboards which were designed for the solid state Schobers installed. Only 3 of the busses are used for each manual. The Swell does not use the 16' bus, yet the problem occurred only on the Swell. After a lot of testing Anthony found that there is capacitive coupling between the 8' bus and the 16' bus, (which does carry unused 16 foot signal when a key is depressed). Grounding this bus solved the problem. From our organ expert friend Charles Wood, I found out that this sort of reaction can be expected in tube circuits.

It might be a good idea to ground all unused busses so that there is no capacitive interaction from them.

Making Your Own Air Bags for the old Theatre Presets

A letter from Warren Jones

Hi Alex

Thought I would tell you where things have progressed before we head south the end of the month for some warmer weather.

The attachment lists the materials and results tried to date as related to thermally bonding into an airbag. My idea of making circular airbags had problems in quality and time. They worked same as square bags but couldn't control repeatability, and making one at a time was no fun. I like the Polylon and the nylon/rubber material from Player Piano but they will require some agent such as "heat bonding film" to make an airbag. Have some leads on such materials from 3M but will defer that until later. I don't believe anyone would want to glue together 100 small airbags by hand. Therefore, I have defined a process that produces 36 square .004 thick vinyl airbags in less than an hour, then spend another 30 minutes checking them with a probe individually to ensure good bonding. I will make two or three lots before we leave and send them to you. Or if you know of someone that wants to try gluing them to tablets and check function/durability, I can send them direct. To tell the truth, I haven't had much success using the PVC-E glue. Too much glue and it migrates inside the airbag or not enough glue and the joint leaks. Sure would like to know how Kahn did the originals since that was one area that was still intact. Let me know;

Warren

ADS

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

WANTED

Tape Heads: Where Can They be Obtained

Jim Sands writes: "Alex , My name is Jim Sands and I live south of Ottawa between Smiths Falls and Perth. I have built a number of organs over the years. I have enclosed a picture of my last effort. It contains some Schober, Devtronics, and my own designs. I stopped building organs after I retired in 1983. After 43 yrs in electronics I started building live steam locomotives. I have been overhauling the organ and I would like to replace the pickup heads. Do you have any idea where I can get them. Thank you for any help. Regards, Jim." Contact: Email: jim.sands@sympatico.ca [and me (A.K.) as I am also interested].

Recital

I Have Recital organ available for anyone who wants it. Needs some work but should be generally sound. Has most all accessories including extra keyboard. Need the room but put too much effort in it just to set out for junk. Live in Michigan near Ann Arbor Thank you for your efforts.

Contact: Dallas Baker. Phone: 734 482 3854, Email: dbaker304316MI@comcast.net.

Theatre (free in Columbus, Ohio)

Frank Tate Writes: Dear Alex: With a lump in my throat, I have decided to buy a new keyboard and give up the Schober Theatre Organ that has been a part of the living room for nearly 30 years. It needs some work now. The last time I cleaned the key contacts, there was a short and the accompanying keyboard lost volume. Now that I'm about to mark my 85th birthday I find my enthusiasm for tracing voltages has, like my get up and go, got up and went. I offer it free to anyone who would like it; along with all the instruction pages, a second set of pedal switches, an autotuner, the case and bench I built of 3/4 inch birch plywood. It will be up to the recipient to move it out of the front door and into the transport to the new home site. Any help you can give in finding a new home for it will be greatly appreciated,

The Beautiful Wife joins me in wishing you a glorious and healthy 2003! Regards, Frank Tate

Contact Frank: Tel: 614-888-3003, Email: fjt8@columbus.rr.com

Recital (free)

Paul Hamilton writes: Hello Mr. Kruedener: I found the orphan web site via the Google search engine. I thought I would try contacting you in that you may have ideas as to helping me with finding a new home for my 1978 Recital, or perhaps you know someone interested in the organ. I have already posted on Nov. 24/02 a descriptive message on the Yahoo Schober group. A brief description of the organ's features are: The organ is completed throughout to Schober specs using their materials, looks great and everything works and with only with minor problems. It was subsequently modified by adding 2 Devtronix tone generator boards for each of the swell/great. These are 15 volt DC, thus eliminating the keyboard interference. The original Schober single Tone Gen. board was retained for the pedals/mutation stops. I replaced the reverbatape with a Devtronix model. It has the Schober Library of Stops kit. There is no speaker system (the LSS12 speakers were sold previously), nor power amplifier, thus presently the organ headphone amp is used. Hoping to hear from you in due course.

Yours sincerely, Robert Paul Hamilton, Ontario; ro.pa@mail.com

WANTED

PTR 5A Board (Preamp-Vibrato 11819A) for his Schober Theatre Organ. Contact: Richard Peterson, 50 Spring Meadows Drive, Ormond Beach, Fl 32174. Tel.: 386-673-6981; Email: ndgators@bellsouth.net

Recital

A Recital is available for the best offer, in Harwinton, CT 06791. Contact: Mrs. Lillian Mele Tel.: 860-485-1105

Theatre

A Schober Theatre Organ with Combination Action, 2-track Reverbatape, 2 LSS 10 speakers with HF-1 high frequency extension kit and Schulmerich Carillon is available for the BEST OFFER based on the value of the Schulmerich only. In Norristown, PA, Contact: Vladimir R. Weiss TEL.: 610-665-5618 Email: vweiss123@Juno.com

Needed: Organ Repair Person

Does anyone know of an Organ Service Man in the Coeur d Alene Idaho area? Or, can anyone help Kathy Nowlin with problems she has with her (I believe Theatre Schober, possibly a Recital) Contact her at: orvillekathy@mybluelight.com. If you don't have e-mail, please contact me (Alexander Kruedener) and I will send her a message.

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ORGAN NOTES FOR SCHOBER ORPHANS AND FRIENDS Issue #77
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February 2003
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