2014 Repair of Schantz Organ

Trinity Episcopal Church
708 South Bethlehem Pike
Ambler PA, 19002

Problem Overview: Although there had been descending performance of the 32 foot Soubasse (speaker) stop for some times, a significant decline occurred in March of 2014. This prompted investigation.

Original Equipment: The speaker portion of the 32 foot Soubasse stop consisted of a custom driver board from Peterson, which produced tone. This signal is then fed into a Crown Microtech 600 power amplifier. This drove two Intersonics ServoDrive Contrabass cabinets. These cabinets were located in the rear of the chest at about a 12 foot elevation. The Contrabass design was the brainchild of Tom Danley, who founded Intersonics. Unlike conventional speakers, this design uses a DC motor to drive the cones via a belt and leaver system.

Investigation: The first, and most obvious factor of failure was a complete loss the foam type of cone suspension. *(Figure A below)* This in itself could have been repaired but the cabinets (240 pounds) would have to be extracted from the chest. Further investigation revealed that the loss of suspension had caused the belt assembly to walk down the motor shaft and tear up the belts. *(Figure B)* Contact was made with Peterson, as well as several vendors, and finally to Danley Sound, the current incarnation of Tom Danley's company.

Figure A

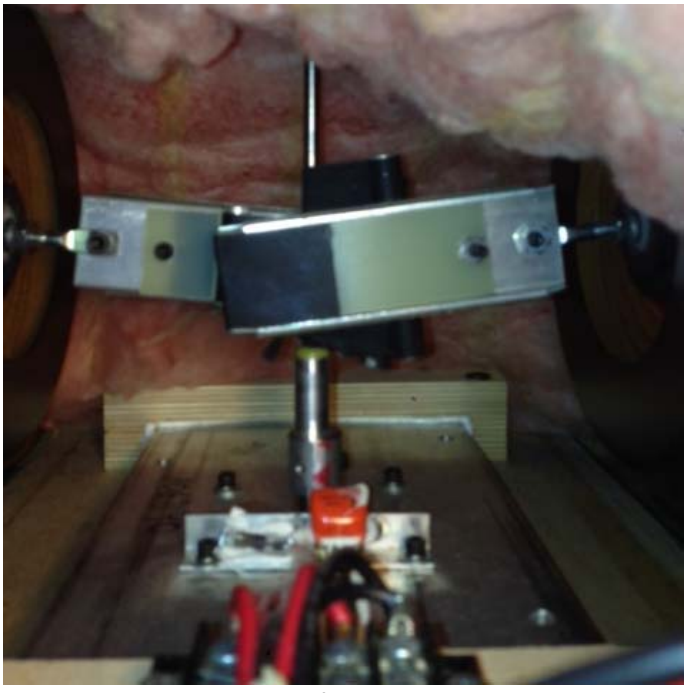

Figure B

Apparently, Danley had sold off Intersonics (later, renamed "ServoDrive") and this company had folded. No parts were available to repair the belt assembly. In addition, it was learned that the motors were brush type DC motors, and were long overdue for replacement brushes. Facing these factors, the decision was made not to pursue repair of the old cabinets.

Picking a replacement: Filling the hole left by the Contrabass would not be an easy task. As I have 30 years background in commercial sound, I remember what an impact the "ServoDrive" products had on the commercial sound market back in the 1980s. By eliminating the problems associated with front pole piece gaps and coil efficiency problems of conventional speakers, ServoDrive was able to produce a product that remained flat to below 20 Hz.

As no company markets this technology, a conventional subwoofer would have to be used. Several requirements stood out. These were as follows:

- The subwoofer would have to have good response in the 30 to 120 Hz range.
- It would have to be capable of handling enough energy to produce a seamless transition from pipe to speaker with enough overhead to handle multi-note sub harmonics.
- The build of the cabinet would have to be sufficient as to have a 40+ year life.
- The drivers would have to utilize a cloth (as compared to foam) suspension to ensure a long life.
- Voice coil structure and power handling would need to exceed what could be produced by the Crown amp.
- Units should have a reasonable efficiency, something often lacking in subwoofers.
- Size and weight would have to be compatible with the organ chest.

Despite the long list of manufacturers available, almost all were quickly eliminated. The product that was the best fit was produced by the commercial sound division of Klipsch. The model chosen was the KI-115 which is a single 15 inch driver in a tuned port enclosure. For needed displacement, four of these units would be used. Each had an 8 ohm impedance, which allowed the Crown Microtech to be loaded at 4 ohms per channel, which was the same load presented by the Contrabass cabinets. In addition, the total weight and size were compatible with the location of the current cabinets.

Timeline: The Klipsch KI-115 cabinets are not mass marketed or a common stock item. Still, once a distributor was located they were able to promise delivery for approximately one week before the critical Holy Week services. It was obvious that due to this time table that we would not be able to install these inside the chest before Easter. A plan was adopted to position them outside the chest and then work on the mechanics of moving them inside at a later date.

Figure C

A partially hidden location was chosen in a small hallway next to the chest. *(Figure C)* I knew the location, especially the fact they were on the floor, would color the sound. As it turned out, the effect of the hall and the resonance of the chapel were not too detrimental. We reduce the gain on the Microtech power amp by about 6db to achieve a basic match.

Final installation: This took place in July 2014. By that time I had been able to study the structure of the chest to design a plan for extraction of the old cabinets in installation of the new. There were two routes available. One involved removing pipes at the front of the chest. The other involved removing a panel at the rear of the chest. The second route would allow us to effect the repair with the least amount of visual disturbance. The chapel behind the chest was closed and we erected four frames of scaffold. This would allow us to extract the cabinets by lifting the upward which would reduce the risk of any collateral damage. The upper right rear panel was removed and the cabinets were replaced. *(see figure D)*

Another key factor in choosing the Klipsch was that these cabinets could be stacked in such a way as to avoid interference with current internal structures. *(See figure E)* The cabinets came with parallel NL4 connectors. 14 gauge cables were made up to connect them to the Crown amp. In addition, layers of rubberized cloth were placed between each cabinet to insure they would not relocate themselves due to vibration.

Figure D

Figure E

Voicing alignment: The Peterson driver board is equipped with individual level controls for each of the twelve notes it produces. To achieve balance, we worked in a crew of three; myself in the chest, our organist (Steve Schreiber) at the organ console, and our original Schantz representative (Bob Betty) in the Nave of the church. Working downward on the petal from the last pipe to the first electronic, we sampled the sound from various locations to assure a smooth transition. Once found, we progressed downward through the bottom octave to achieve balance, compensate for standing wave issues, and insure the instrument was rattle free. Overall gain ended up 3db lower that the original Contrabass cabinets. In fact, there was a good deal of headroom available.

John Dziel
Financial and technical administrator
Trinity Church
215-646-0416
accounting@trinityambler.com

Technical Footnote: In researching the Contrabass we learned why the technology was discontinued. It was not due to their sound. The design was based on a low inertia servo motor used in large computer tape drive systems. With the demise of the old tape technology, the cost of these motors went up threefold, and then tenfold after that. Obtaining the motors finally became impossible.

Link for data on the Klipsch KI-115 http://www.klipsch.com/ki-115