



King's Theatre - Annapolis Royal, NS

2018 Sound System Upgrade Project - Dillon Tonkin (consultant)

KING'S THEATRE

**SOUND SYSTEM UPGRADE
2018**

PROJECT REPORT

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INTRODUCTION

This document records details of the Sound System Upgrade project, which was planned and executed in 2018 by sound engineer and consultant Dillon Tonkin for King's Theatre.

PROJECT GOALS

The Sound System Upgrade (hereafter the upgrade) is primarily intended to address the issue of sound quality for movie and Stage-to-Screen presentations, but is also designed to have an obvious and positive impact on all uses of the theatre which include sound reinforcement, particularly live performances.

PROJECT OVERVIEW

King's Theatre has been showing movies for over one hundred years. Cinema technology remained fairly static for many decades, but has progressed rapidly in recent years with the advent of high-definition images and surround sound playback systems.

Upgrades to the King's Theatre sound system in the late 2000's brought the audio facilities up to date, whilst also improving the sound quality for movies.

When the selection of films available on traditional reels became severely limited, it was obvious that a move to a digital system was essential to ensure the survival of the cinema facility at King's. After a fund-raising campaign, a digital cinema system was purchased in 2012, along with equipment to add the required surround sound capabilities to the house system already in place.



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Over time, it became apparent that one aspect of the sound system was still problematic. Because of both the cost and the difficulty of implementing a specialised centre speaker, reliance was made on utilising parts of the current sound system. This approach showed its shortcomings with a lack of clarity and speech intelligibility.

Modern cinema relies heavily on the centre channel for speech. This is a fairly new situation. Some may not be aware that, unlike the older "stereo" systems, it is mostly the case that no main dialogue whatsoever is produced from the left and right speaker channels. Whilst it may be routed artificially, the result of doing so is problems with the positioning of voices, as they appear to the audience. Having a central source for this audio is the only reliable solution, and the only one that presents audio to the audience as intended.

I believe that the impact of an inadequate centre channel was realised only over time.

The goal of the project then, was clearly that of improving clarity, whilst also taking advantage of any other possible benefits that might be found as part of an upgrade.

The goals may be summarised as follows:

- Improved cinema sound, especially centre-channel clarity
- Increased flexibility and control of sound reinforcement facilities
- Improved ease of use for less technical operators
- Streamlined setup for movie performances
- General improvement in sound quality for all shows using the sound system

PROJECT CONSTRAINTS

I identified various constraints for the project. These can be summarised as follows:

- Limitations in the space available for upgrades.
- Limited budget rules out the purchase of the most expensive (and probably best quality) systems.
- The upgrade has to integrate with and complement the existing sound system.
- Where possible, to avoid changing the look of theatre in any negative way.



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TECHNICAL OVERVIEW

Speaker upgrade

The standard practice of implementing a central speaker system behind the screen was not possible, involving as it would the purchase and installation of a new perforated screen far beyond the available budget. In consulting with the supplier of the original system and others, it was suggested that a split system in front of the screen would suffice. This would leave one or more speaker cabinets on stage - a situation I wished to avoid if possible. The previous arrangement of having two speakers at stage level, although a minor eyesore for some, was not the most aesthetically-pleasing solution.

I was very keen to try to retain the current look of the theatre. This means retaining the full curtains and valance, and making sure the curtain remains unimpeded.

Other advantages are less equipment needing to be put in place for movies, a reduced setup time, and the ability to use the centre speaker whenever required.

After measurements I found that a space (albeit very narrow) was available for a flown speaker system, so that idea was pursued. After some research I was able to locate a suitable and very specialised high-powered speaker to implement this solution. It should also be noted here that the use of a single speaker with a wide dispersion characteristics avoids the phase issues found with multi-speaker arrays.

Mixing desk replacement

Creating a high-quality centre channel would also necessitate the updating of the signal sources and amplification. I saw that there was an opportunity to replace the previous analogue mixing desk and associated outboard equipment with a modern digital solution, now many times more affordable than even a decade ago. The advantages of are many, and include:

- Cleaner signal path for improved sound quality
- All signal processing now in the desk allowing for finer setup and more control
- Various setups can be pre-created, allowing use by less technical staff
- Adjustment of the system is easier and faster
- Overall improvement in facilities, flexibility and control
- Extra options for live sound e.g. recording of shows
- Remote control by tablet computer



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Hearing-impaired system

An important element in the upgrade to improve intelligibility for moviegoers was the possibility of providing a hearing-impaired audio system. It was found that an upgrade to the current cinema system was available that would allow the cinema sound to be sent to special headsets. A system was found that was within budget, upgradeable in number of headsets, and able to reach all seats in the auditorium.

Other requirements

Other requirements identified:

- Mounting assembly for centre speaker
- Pulley system to raise the valance
- Amplifier and wiring for centre speaker
- Upgrade/replace wiring for new mixing desk
- Wireless router for remote control
- Tablet for remote control



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TECHNICAL DETAILS AND IMPLEMENTATION

Pre-installation

Pre-installation planning included:

- Plan location of centre speaker
- Design mounting frame
- Wiring routing
- Pulley system
- Removal of current system
- Location and cabling for new mixing desk
- Location and cabling of centre amplifier
- Installation of wireless router

Installation

The installation process included:

- Building and installing the speaker mounting
- Installing and cabling the speaker
- Installing the pulley mechanism
- Installing and cabling the centre-channel amplifier
- Installing and cabling the mixing desk
- Installing the wireless router
- Remote-control tablet setup
- Basic system checks
- Acoustic calibration of the entire system
- Final setup and testing for both cinema and live sound
- Hearing-impaired system installation and testing

Installation notes

The entire installation went as planned, and no unforeseen problems were encountered.



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List of equipment included in the upgrade

The major components now in place following the upgrade are:

- Allen & Heath Qu-24 digital audio mixing console
- Apple iPad (for remote control of above)
- TP-Link wireless router (for network access to the mixing desk)
- QSC ISA280 amplifier (for centre channel, running in bridged mode)
- QSC AP-5102 speaker and yoke kit
- USL UPC Assistive Listening Emitter Panel
- USL IRH-280 Two channel IR headphones for Hearing Impaired (x3)

Other items include the removal of redundant auxiliary equipment and updated wiring.



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CONCLUSION, OUTCOME AND BENEFITS

This project has been both challenging and interesting. Because of the unique nature of the theatre much of the upgrade is bespoke, and could not be purchased "off the shelf". My intimate knowledge of the theatre (both technically and physically) was invaluable in allowing me to find suitable solutions.

I am very happy with the results, especially given that the budget was a fraction of the cost of a complete system upgrade if contracted to a large commercial company.

The main highlights and improvements are:

- Noticeable improvement in movie vocal clarity (speech intelligibility)
- General improvement in live sound clarity, especially stage monitoring system
- Much better control of all theatre audio
- No sound equipment in front of the screen during films
- Less work and a quicker setup for projectionists
- Less chance for error in sound setup
- Easier control of the system including remote access
- The project allowed the entire system to be optimised
- Hearing Impaired system met with much approval

Feedback from patrons over the last few months has been unanimously positive. I believe that complaints about the cinema sound as reported to staff have been non-existent since it's installation, and there is a regular and very enthusiastic response to the provision of the Hearing Impaired headsets.

I would like to credit Scott Hubley for invaluable help in designing and building the speaker support frame and pulley system.

I would also like to thank the General Manager of King's Theatre, Janet Larkman, for her encouragement and assistance during this project.

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