Preface

Best viewed in **Landscape** orientation.

This is an Interactive iBook, **Touch** the images.

Some images are fully **Interactive**.

Use the standard iOS two finger pinch to Zoom In and Out (Gesture C) on the image below.

Next, touch a Text Box.

**Interactive Preface.1** An example of an Interactive image.

When you are ready, touch on the right hand edge of this page to read the Application Guide.
In this Application Guide we will explore how Q-Sys can be used as the audio processing system in a typical Sports Bar.

Key points will be multiple source to multiple zone routing, Q-Sys TSC-3 touchscreen controllers, basic All-Call paging, and 3rd party control of a video switcher.
This project represents a typical Sports Bar where the primary focus is to provide a high quality audio and video experience in a relaxed atmosphere for the patrons. Often different sports events will be routed to different parts of the venue, as such the project is divided into multiple output zones. Each of those zones has independent source and volume controls made available on QSC’s TSC-3 installed touch screen controllers.

In addition to multiple Satellite TV decoders, there is also a wall mounted Jukebox which is intended to keep the patrons entertained when there are no sports events being broadcast. For situations where the Jukebox is not being fully utilized there is a generic BGM player so that there is always some audio content available in order to maintain an appropriate atmosphere. In this example the BGM player will be active permanently but will be ducked by the Jukebox, therefore the BGM player will automatically become active whenever the Jukebox playlist is empty. We will explain how to achieve this function later in the Application Guide.

To aid with special events (Birthdays, Party’s, general announcements etc) there is the ability to make basic ‘All-Call’ paging announcements from
either the Reception or from a wireless microphone kept behind the Bar.

It is important that the audio broadcast in each zone matches the video feed to the screens in those zones. Ordinarily this would require the use of an expensive control system but with Q-Sys we can remotely control the Video Switcher. This is accomplished using the built-in LUA Scripting engine and again, we will explain that in detail a little later in the Guide. Lip Sync between the audio and video sources can be assured by inserting a suitable fixed delay on the zone outputs.
Here is a system diagram (Interactive 1.2) showing the devices being used in this project and how they are connected.

Notice the various zones on the right hand side, this will allow us to have complete control over what is seen and heard in each of those locations.

You can also see an RS-232 connection from the Q-Sys Core Processor to the video switcher, this allows us to remotely control the video routing in the venue.

As described in the Preface, navigate around this image to see how the system looks.
Here you will see all of the QSC hardware being used in this project.

You’ll notice that QSC is able to provide Signal Processing, Amplifier and Loudspeaker products to fulfill the customers requirements thereby offering a complete end-to-end solution for the audio elements of this system.

Click on each of the products to see a short summary.
This Application Guide provides access to a pre-built Sports Bar design file for you to use with the latest version of Q-Sys Designer.

You can download a copy of the Design file and all supporting material using the "Download Design File" button on this page, simply click the button and fill in your email address, a copy of the content will be sent directly to that email address.

**Image 1** shows a screen capture from the Q-Sys Designer file. The block in the centre is a Container which houses all of the signal processing required in this Application Guide. The text labels clearly show the I/O designations for each wire node. By copying this Container into your design you can allocate the channels to the physical I/O cards present in your system.

Double clicking on the Container inside Q-Sys Designer will show all of the audio processing elements present in the system (**Image 2**).

You can see that each zone has its own separate section (indicated with a colored box) making it very simple understand how the system is divided up.
First you will notice that each zone has a Router, these are configured as Stereo objects and are sized based on the number and type of inputs required at each zone. In the case of Zones 1, 2 and 3 we want all Sports and Music content available, for the Ancillary areas we are only concerned with the Music sources, hence the smaller Router.

After the Router you will see some Gain Objects and Mono Sum objects. These are the Gain stages which will be made available to the end user as Volume controls for the various zones.
After the Gain stages you will see Priority Duckers which are used by the Paging system. In this particular example we are implementing very basic “All-Call” paging so the Priority Ducker is an effective and simple way to achieve that. Under normal conditions the audio present on Input 1 of the Priority Ducker is passed directly to the Output. However, if the audio present at the Priority Input exceeds the detection threshold (configured on the Control Panel) then the level of Program audio is reduced (ducked) and the audio present at the Priority input is fed to the Output. This signal flow is described in Interactive 1.11.

The Paging Priority Duckers are placed after the zone Gain Stages so that the individual zone volume controls do not interfere with the predetermined system wide Paging volume (Page Level control pins).

After the Priority Duckers you will see a Processing container. Inside these you will find Parametric Equalizers for room tuning plus Delay objects to allow for any Audio / Video lip sync compensation that may be required. Since the signal paths are fixed, irrespective of which video source is being viewed, this delay time can be set once during system commissioning and then will not need to be adjusted again.

After Processing is an additional Gain stage which would be used to trim the relative zone volumes to achieve a suitable maximum.
level setting throughout the venue. These would be configured during the system commissioning process and would typically not be altered afterwards.

All audio input and output channels from this DSP section are transported through Q-Sys Designer Snakes which provide a convenient way to route multiple channels to various locations. **Image 3** shows how we have grouped the various input and output types together.

**Image 3** Q-Sys Designer Snakes
The TSC-3 controller provides a very simple and cost effective way to distribute zone controls around your venue. There are a number of factors all contributing to its versatility:

1. TSC-3 is a network controller so it can be deployed using industry standard CAT5 cable, it can therefore integrate with your standard network infrastructure if available. Cabling and connectors are inexpensive and simple to use.

2. TSC-3 is a PoE compliant device so it takes its power over the same Ethernet cable as the Control data. You simply need to ensure that you are using a Qualified network switch that is PoE capable or using one of the many PoE Injectors available on the market.

3. The controls displayed on the screen are completely customizable. As such the system programmer can liaise with the end user to ensure that the TSC-3 provides all of the controls required and displays them in a user friendly way for the client.

In this application, we have programmed three TSC-3 UCI’s, one for each zone. The Dining area UCI has two sub-pages, tabs displayed at the bottom of the screen allow for simple navigation between them. Scroll left or right through Gallery 1.1 to see all of the UCI displays (tap to go full-screen).
On each of the zone pages we have exposed the appropriate Source Select controls as well as a simple Up / Down Volume control. The orange bar graph gives simple visual feedback of the current volume setting.

The Manager has access to a system wide overview of the whole venue. This UCI is designed to display on an Apple iPad™ but could also be displayed on a QSC TSC-8 installed touch screen controller or on any standard Windows™ PC using the Q-Sys UCI Viewer application.

In this case the manager has access to all zones with the addition of bar graph meters showing the audio present at the outputs. This is useful for situations where the manager is not near a zone to hear it, using these controls the Manager can at least see that there is audio present.

There is a section showing the audio input level for all sources, again this can be useful to help identify problems such as a satellite TV decoder having been switched off.

There are simple independent controls for the Merchandise Store and Restroom areas. Both share the same source but have separate volume controls.

And finally there is a section showing the Paging Status, again useful to provide instant visibility to what is happening in the venue.
A key part of this system design is the requirement for the video channel selection to synchronize with the audio channel selection. We can achieve this with Q-Sys by connecting the RS-232 port on the Core to the Video Switcher. Once the physical connections are set up we need to start the Control programming.

The first step is to expose the controls pins we want to use as Control Inputs in the Q-Sys design file. We can expose the Output Select control pin on the zone Routers (Image 5). These will provide a numerical value which represents the channel currently selected on the Router.

Next we wire those Output Channel Selects (one for each zone) to a LUA Control Script object called Number to Trigger Converter (see Image 6 - tap for full screen).
This object is very simple and allows us to convert the numerical value provided by the Router Channel Select control pins to an independent Trigger control. An example of this script is shown in **Image 7**. You can see that when Router Value 1 is active, Output 1 is Triggered. When Router Value 2 is active, Output 2 is Triggered and so on. What you'll also notice is that when the Router value is 5 or higher then Output 5 is Triggered. This allows us to view the JukeBox video channel whenever any of the Music sources are selected.

**Image 7 Example Number to Trigger Converter**

```text
-- Inputs
number = Controls.Inputs[1]

-- Outputs
t1 = Controls.Outputs[1]
t2 = Controls.Outputs[2]
t3 = Controls.Outputs[3]
t4 = Controls.Outputs[4]
t5 = Controls.Outputs[5]

-- Code
function convert ()
    if number.Value == 1 then t1:Trigger()
    elseif number.Value == 2 then t2:Trigger()
    elseif number.Value == 3 then t3:Trigger()
    elseif number.Value == 4 then t4:Trigger()
    elseif number.Value >= 5 then t5:Trigger()
end

Controls.Inputs[1].EventHandler = convert
convert()
```

The output of the Number to Trigger Converters are wired to the Trigger 2 script which handles all of the communications with the Video Switcher (see again **Image 6**). It is useful to separate these different tasks in to different scripting blocks, particularly when starting to learn code programming as it helps with troubleshooting. This script block should also be wired to the Core Serial Port which is a Component of the Core when viewed in the Q-Sys Designer Inventory pane.

At this stage we need to build a LUA Script to handle the control communications with the Video Switcher. This task is best assigned to a qualified code programmer who will find it very simple to use the LUA programming language to develop the necessary code. By way of an example of how this might look, please take a look at **Image 8** although please note that the example script provided with this Application Guide actually uses TCP/IP to communicate with a Kramer Video Switch, not RS-232.

This kind of programming requires a reasonable amount of prior experience with writing code and we do not expect that all DSP programmers will be able to do it. QSC will be happy to provide the contact details of 3rd party programmers in your area who could assist you on your projects.

Additionally, the LUA programming language has a lot of similarities with the AMX language so if you have a friendly AMX
programmer on your team (or in your contacts list) then they should be able to help.

Additional training resources for those interested in learning LUA can be found at:

http://lua-users.org/wiki/LearningLua
You may have noticed on the zone source selects that there are two options for BGM (see Image 9). One that is BGM only and another that is BGM + Jukebox.

The BGM Only selection is straightforward as it simply passes the BGM Player audio directly to the zone.

BGM + Jukebox is useful for situations where the Jukebox playlist is not being fully utilized and therefore is sometimes not playing any audio. In order to avoid any gaps in the audio we can use the BGM as a constant audio source which will only be interrupted if the Jukebox playlist is active.
We achieve this by using the simple circuit shown in Image 10. The BGM Input is split (using Signal Names), one pair are sent directly to the output (Snake channels 3 and 4), the other pair are fed in to a Stereo Gain Ramp object. The Ramp object allows you to configure a start and end volume setting (States A and B) as well as a time constant to fade between those states.

Under normal conditions (no Jukebox audio) the Gain Ramp is in position A which is 0db (or unity gain). However, if the Jukebox Player starts then that audio input triggers a Signal Presence Detector. The output of this is used to switch the Gain Ramp to State B (-100db, effectively off). The Jukebox audio passes through the 2x1 Stereo mixer to the BGM + Jukebox output.

When the Jukebox playlist is empty and the audio stops then the Signal Presence Detector switches it’s output off, this in turn is sent through a Logic NOT gate to invert it and therefore set the Gain Ramp back to State A (unity gain).

This is a very simple but effective way to guarantee that there are no gaps in the audio when the Jukebox is selected.

Image 10 Ducking the BGM with the Jukebox
Q-Sys allows the system designer to build customized User Interfaces and display them on any of the following:

- QSC TSC-3 or TSC-8 Controllers,
- Apple iPad, iPhone or iPod Touch
- any Windows™ Computer

Not only can the programmer choose to display system controls such as source selectors and volume controls, as would normally be the case, the programmer can also display images. Using this feature it is possible to leverage the power and customizable nature of the TSC devices to supplement other parts of your business.

For example, imagine that the main bar area of the venue has many booths, each booth has its own loudspeaker (i.e. a dedicated zone) as well as a dedicated TSC-3 on the wall. This now gives the patrons complete control over what they listen to, perhaps they could choose from a collection of different playlists or sources.

Additionally you could use TSC devices to display advertising messages such as the example shown in Image 11. There could be as many different images as the customer wants, these could be scheduled to appear at different times of the day or could be triggered manually by the Manager, whichever is most appropriate.

To do this we need to add a new page for every image that we want to display on the TSC-3 UCI. Once complete we need to add the TSC-3 Status/Control

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**TIPS AND TRICKS**

- Ducking the BGM with the Jukebox
- UCI’s as Advertising boards
Components to our workspace, these can be found in the Inventory pane of Q-Sys Designer.

Using some Custom Momentary Controls and a very simple script we can provide the ability to remotely control what is being displayed on the TSC devices (see Image 12).

The LUA Script might look something like this (Image 13).

Image 13 Remote UCI Page Changer

```
11 -- Inputs
12 normal = Controls.Inputs[1]
13 ad1 = Controls.Inputs[2]
14 -- Output
15 page = Controls.Outputs[1]
16 -- Code
17 function change()
18 if normal.Value == 1 then page.String = "Zone Levels"
19 elseif ad1.Value == 1 then page.String = "Happy Hour"
20 end
21 end
```

Scheduling this is simply a case of building Control Change Commands and adding them to the Calendar all in the Q-Sys Administrator.
Section 8

Additional Resources

RESOURCES AVAILABLE

✔ Q-Sys Training Online

QSC hosts a huge collection of online video tutorials and training content which is all free to use without registration.

The two videos below are highlighted to focus on the UCI Creation process used to build the control panels being displayed on the TSC-3’s. They represent just a small part of the Q-Sys Online Training experience so please visit www.qsctraining.com to become a fully Certified Q-Sys Programmer.

Movie 1.1 Q-Sys UCI Tutorial 1

Movie 1.2 Q-Sys UCI Tutorial 2
End