Live Recording Prep

Some tips on things that may make things go easier

https://www.freqsound.com/recording.html
First mobile system 2003

Recording Drives

- Hard drives - internal, external, mechanical, or SSD. They have varying speeds that they can read/write data. The more tracks you will be recording simultaneously, as well as the ***Sample Rate*** and ***Bit Depth***, can greatly affect your needs.
- Blackmagic Disk Speed Test - this is a free Mac program that can help with a comparison for drives you might have to work with.

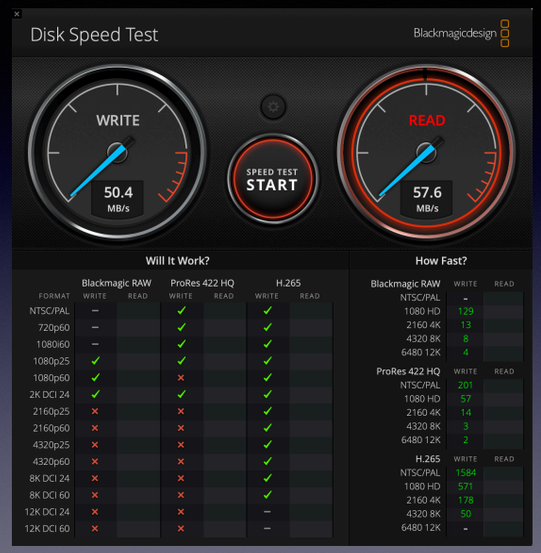
Logo has link: https://apps.apple.com/us/app/blackmagic-disk-speed-test/id425264550?mt=12

https://www.easeus.com/partition-manager-software/test-hard-drive-speed.html
Some free PC software

There are several examples of different drives, both internal and external, on the next few slides to give an idea of relative speeds.

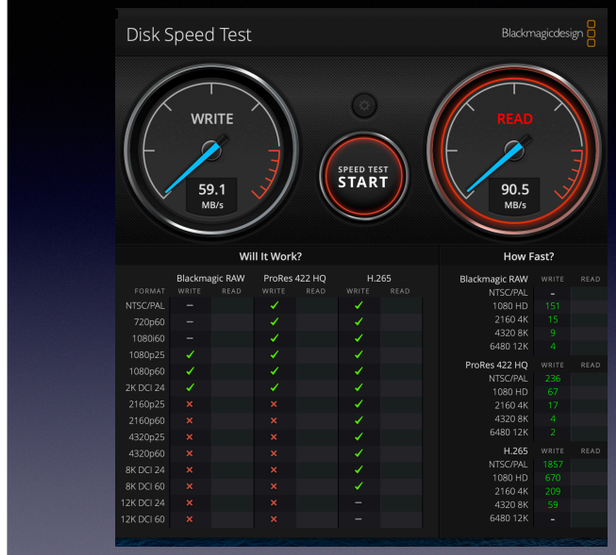
I used several computers as well since the factory installed Apple SSDs vary greatly with year and model

The large meters at the top are the numbers we're interested in. The bigger the numbers the faster the drive can read and write data.

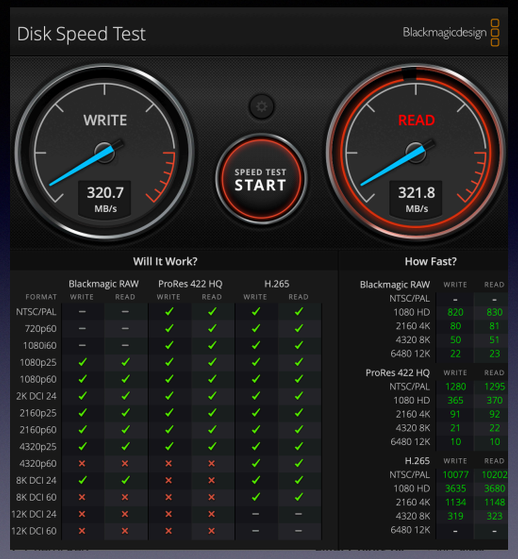


Seagate External USB HDD drive

HDD mechanical/spinning hard disk drive

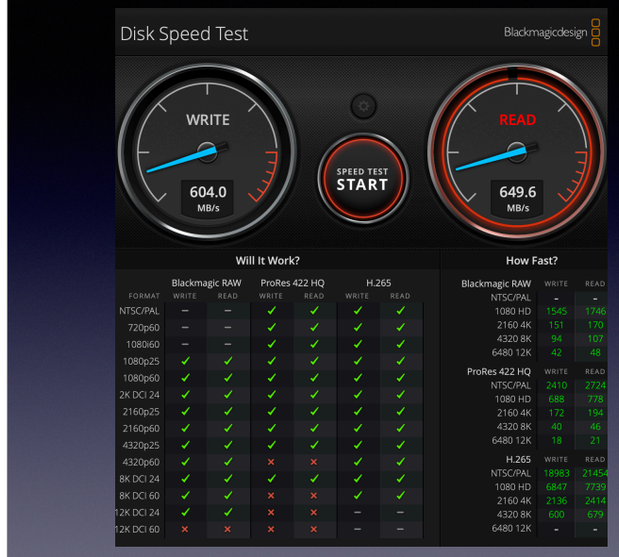


Western Digital External USB HDD drive

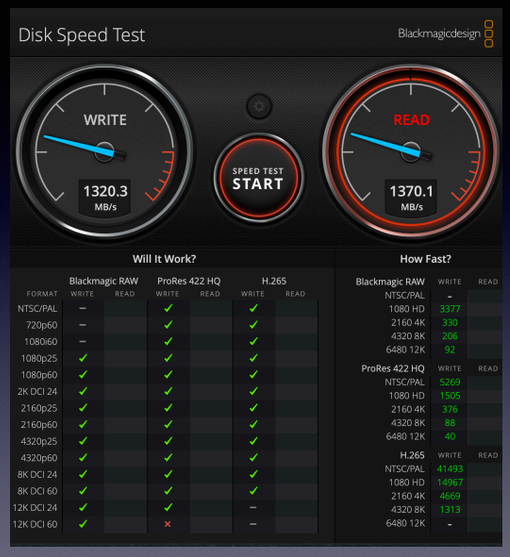


OWC External USB SSD

Comparing these two drives - the SSD is about 5x faster writing and 3.5x faster reading.



2013 MacBook Pro internal SSD



2015 MacBook Pro internal SSD

The 2013 is about 2x faster than the external SSD on the previous slide
The 2015 is just over 2x faster both reading and writing than the 2013

2019 Mac Pro internal SSD

2020 M1 Mac mini internal SSD

The 2019 is about the same as the 2015 for writing, but 2x faster reading.
The 2020 doubles the writing speed of the 2019.

Recording Space Available

- You'll need to know several things to make sure you have the minimum space required to record a live show or studio session
  - Bit Depth- 16 bit is 2 bytes per sample, 24 is 3, and 32 is 4
  - Sample Rate - 44.1k, 48k, 88.2k, 96k,192k samples per second
  - Number of tracks being recording - up to 128 at once over AVB
  - Length of performance in minutes (and better to plan for more)

Hard drives - so much cheaper than 2" tape - in the 80s about $250 for 15 minutes of 24 track recording time.
SSDs are more expensive than HDD drives, but that gap has been steadily closing.
You can buy 4-6 terabytes of HDD storage for as low as $100. SSDs can be closer to 1TB for the same money.

Calculate for 1 minute on 1 track

- **bytes per sample * sample rate per second * 60 (for one minute)**
- 16 bit/44.1khz requires 5,292,000 bytes per minute - about 5.3 MB
- 24 bit/48k requires 8,640,000 bytes per minute - about 8.6 MB
- 24 bit/96khz requires 17,280,000 bytes per minute - about 17.3 MB
- 32 bit/96khz requires 23,040,000 bytes per minute - about 23 MB
- 32 bit/192khz requires 46,080,000 bytes per minute - about 46 MB

Don’t worry about the math here. A later slide shows that DP can do this for you with any project.

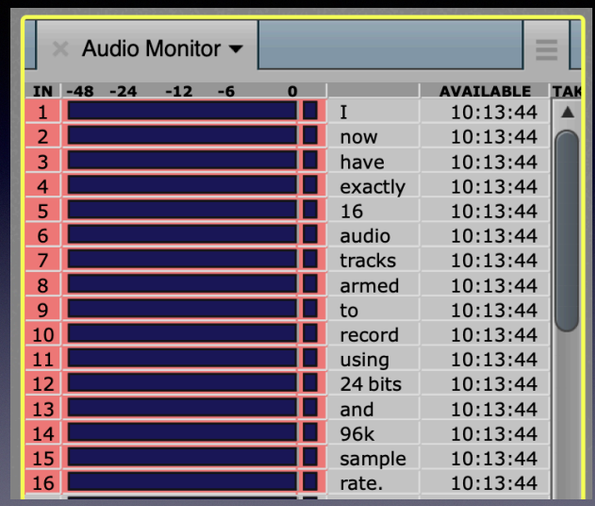
Total space needed for Performance

- **number of tracks * number of minutes * MB per minute**
- 24 tracks * 60 minutes * (16/44.1k) 5.3MB = 7,632 MB or 7.6 GB
- 32 tracks * 90 minutes * (24/48k) 8.6 MB = 24,768 MB or 24.8 GB
- 32 tracks * 120 minutes * (24/96k) 17.3 MB = 66,432 MB or 66.5 GB
- 96 tracks * 150 minutes * (24/96k) 17.3 MB = 249,120 MB or 250 GB
- 96 tracks * 150 minutes * (32/192k) 23 MB = 331,200 MB or 331 GB

You could record about 130 hours of 24 track audio 16/44.1 on a 1 terabyte drive - like the top example.
You could record 30 hours of 24 track audio at 32/192 on the same drive.

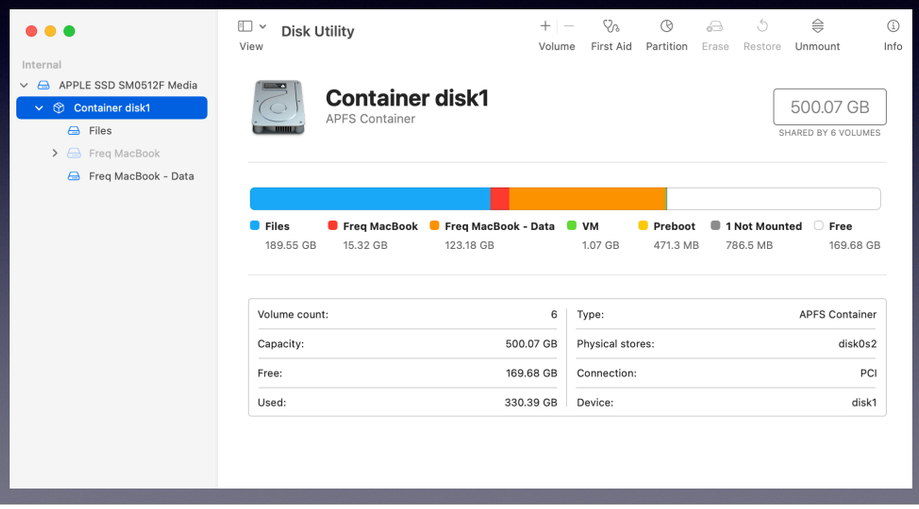
Digital Performer's Audio Monitor will do these calculations for you. If you arm the tracks you're going to be recording onto, it will tell you the total time available on the current project drive.

In the example on the right the record format is set to 24 bit/96k. 16 tracks are armed. The column on the right says there are just over 10 hours of record time available before the drive is full.



Streamline the computer for recording

Making sure unneeded things are off and drives are healthy

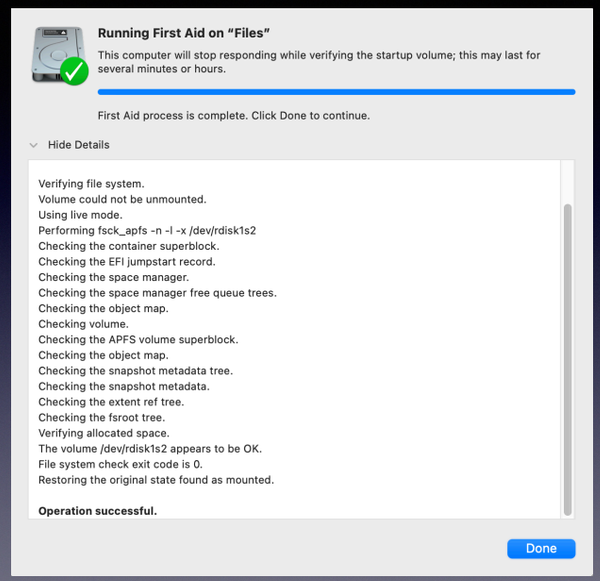


Apple’s Disk Utility in the Applications/Utilities folder - I don’t know what the PC equivalent is.

Inside Disk Utility

It's a good idea to run First Aid on all the drives that will be connected when recording. This helps make sure there are no known drive problems.

Completely remove unneeded files (making a backup of any data) or erase your record drive if possible. It is great to have a clean empty space to record to.



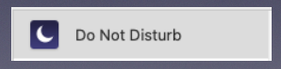
Disk Utility can repair some drive problems, but also erase and format drives. Always backup files before erasing or formatting. I prefer to have at the very least 3x the space needed to record a show - and to have an extra drive for backup as soon as the show is over. The Meyerhoff show had an intermission - during which I was able to copy the first half to 2 additional drives, then erase the original to have extra space on the recording drive (one SSD, one HDD). 100GB took about 4 minutes to the SSD, 17 minutes to the HDD.

System Preferences

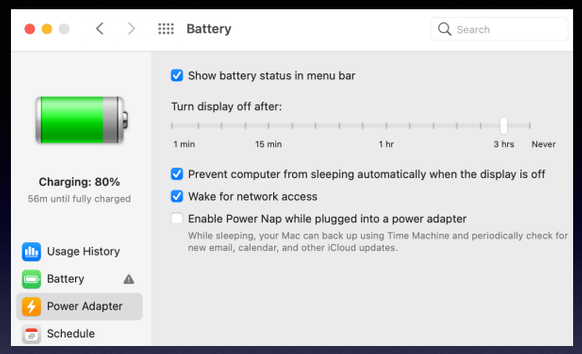
There are options for computer Sleep in the Battery or Energy Saver panel. Set “Turn display off after” to 3 hours or Never to prevent the display going dark during the recording.

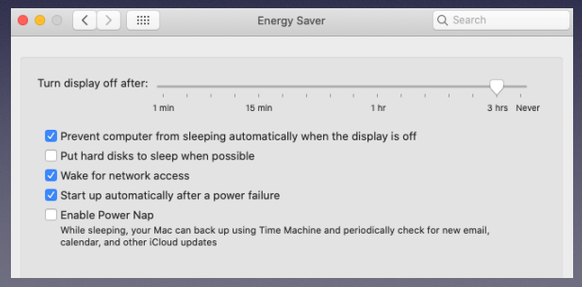
Turn off “Put hard disks to sleep when possible” and turn off “Enable Power Nap” if those options are available.

Turn on Do Not Disturb in the Notifications panel.



In the Desktop & Screen Saver panel disable the Screen Saver.





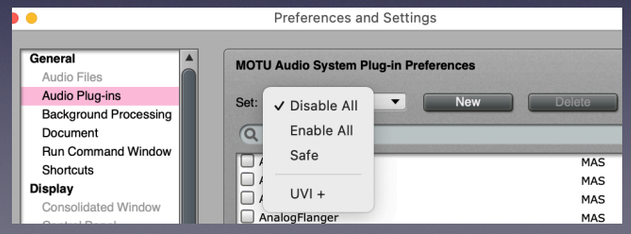
Some LaunchAgent items and other automatic things should be disabled if possible. Avid Link for example, or StreamDeck, Camera apps etc. if not being used during the show.

Streamline DP for recording

Quit all open applications. If you don't need them during the show, turn off WiFi, Bluetooth, and any menubar utilities.

If you launch DP with the option-key down, you can select a Plug-in Set. You can choose Disable All to help optimize performance.

You can also access this menu from Preferences/General/Plug-ins. If you do need some plug-ins during recording, you can create your own custom set here with just the ones you need.



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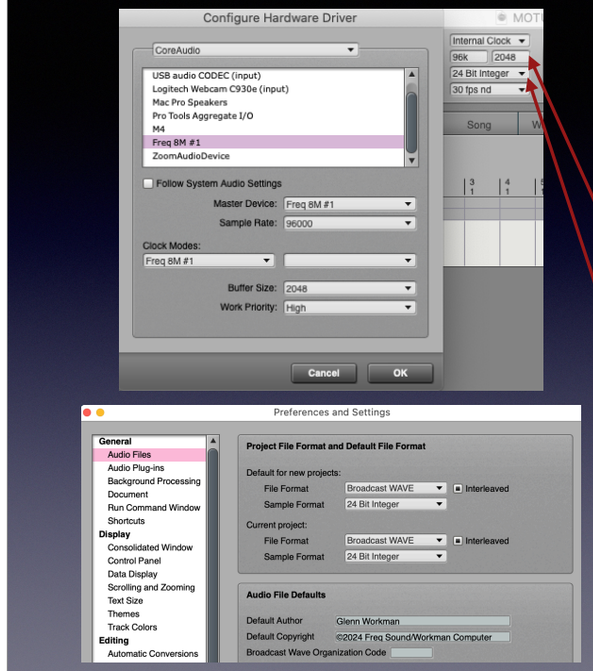


Streamline DP for recording

In the Configure Hardware Driver window make sure the correct interface is selected. Set the Buffer Size as high as your interface allows. You can also set the Buffer Size in the Control Panel window.

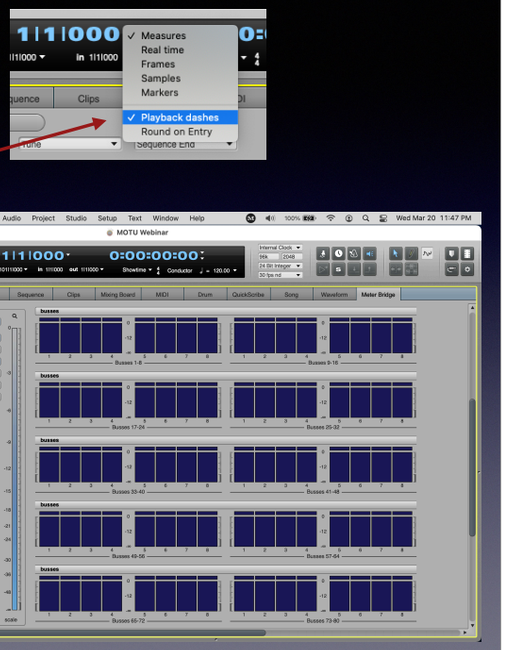
Bit Depth can be set for projects in Preferences/General/Audio Files. It too can be set in the Control Panel window.

If working with others, like a video crew, try to make sure everyone is using the same Sample Rate and Bit Depth settings. This prevents the need to convert files to some other format after a show. This should be known BEFORE show day so you can prep your template file and confirm system capability in advance.

Streamline DP for recording

Rapidly changing numbers like ticks, hundredths of seconds, frames, and samples, can be turned into dashes during playback and recording for both of the Control Panel counters. This can help with a jerky or sluggish counter display.

Close all un-needed panels and windows. I prefer to see the Audio Monitor on one side and the Meter Bridge or Mixing Board in the body.



You can also hide the Auxiliary Counter in Preferences/Display/Control Panel.

AVB Setup & Suggestions

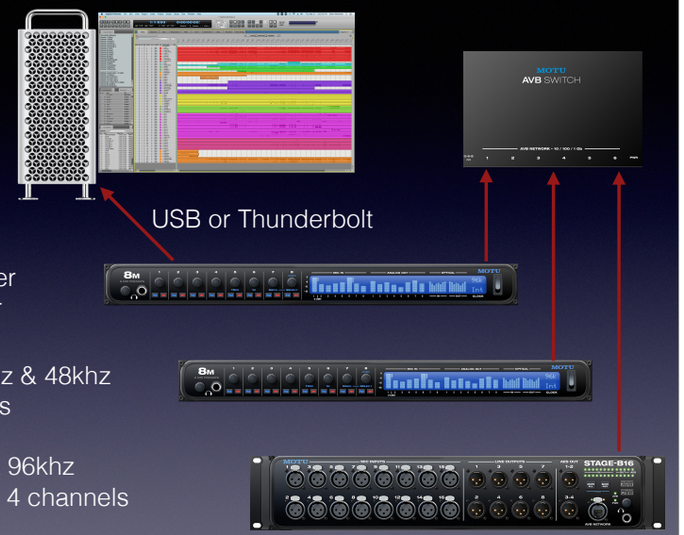
Using more than 2 AVB capable interfaces with an AVB switch

A MOTU AVB stream is a connection for up to 8 channels of audio per stream

The examples will be using two MOTU 8M interfaces and one Stage B-16 interface

Connected by USB
- 16 AVB Streams in and out except above 96k
- 44.1khz/48khz - 64 channels to/from computer
- 88.2khz/96khz - 32 channels to/from computer
- 176.4khz/192khz - 24 channels to/from computer
  but does reduce the AVB out streams to 8

Connected by Thunderbolt
- 16 AVB Streams in and out available all the time
- 44.1khz to 96khz - 128 channels to/from computer
- 176.4khz/192khz - 64 channels to/from computer

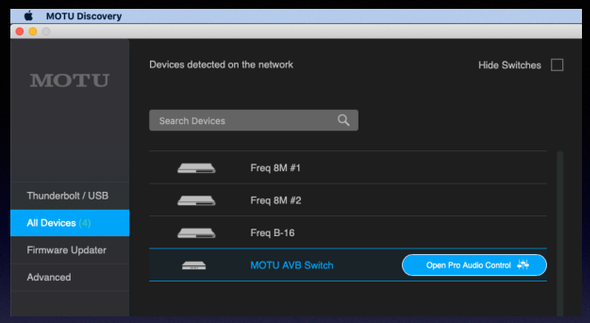


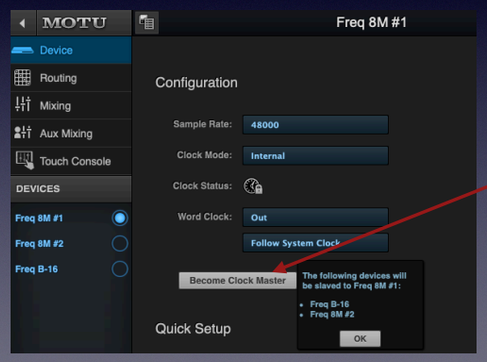
8M Lightpipe inputs are 8 channels each at 44.1khz & 48khz
Each 8M can produce 3 AVB streams at those rates

8M SMUX inputs are 4 channels each at 88.2khz & 96khz
At those rates 2 of the AVB streams are reduced to 4 channels

Stage B-16 has a maximum sample rate of 96kz
It has 2 AVB in & out streams at any rate from 44.1khz to 96khz

The MOTU Discovery app will show you all the devices connected to your computer. Hovering your mouse over any device gives you the option to open Pro Audio Control.

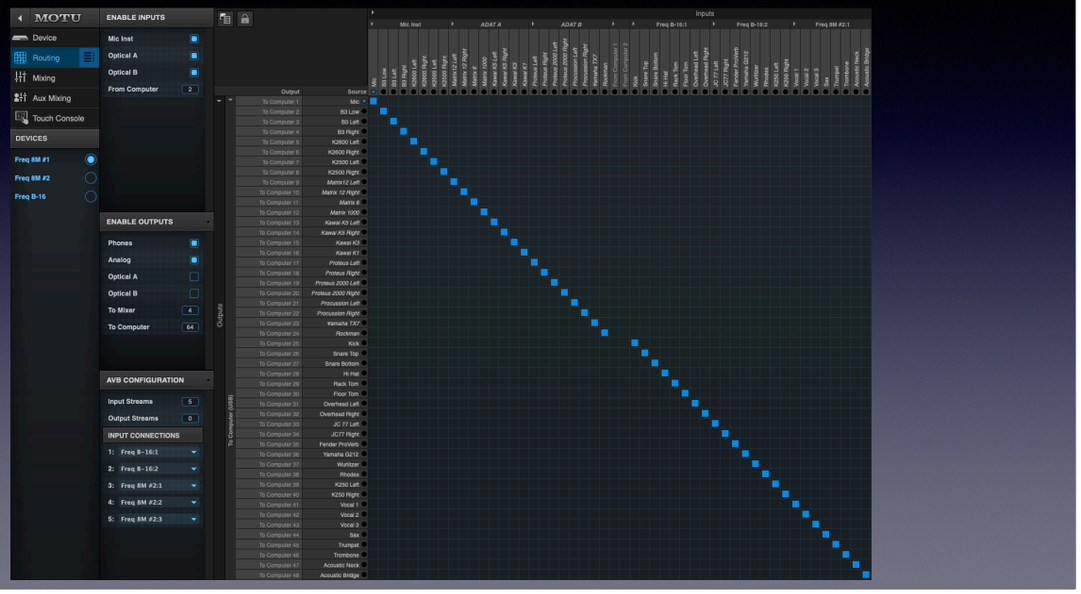




In this configuration the Freq 8M #1 is set to Become Master Clock. The other AVB devices sync to that as shown below.

It’s best to make sure interfaces have the most current versions available, as well as the MOTU Audio drivers that match your operating system. This info can be found in the Firmware Updater sidebar of MOTU Discovery.

Enable only the number of streams you'll need during the recording. Disable any Inputs and Outputs you don't need during recording. This routing screen shows 2 input streams from the B-16 and 3 from 8M #2. There are a total of 64 inputs available from the 3 interfaces, so set the To Computer number to match.



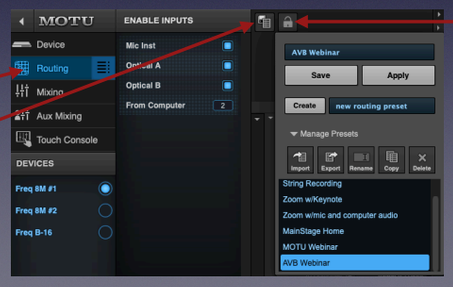
5 input streams (2 from the B-16 and 3 from the 8M #2) with 8 channels each is 40 inputs. The 8M #1 also provides 24 inputs for a total of 64 available in this setup.

The Devices page of the Clock Master in this configuration puts all the analog input controls on one page. Here you can adjust input trim, add phantom power, insert a pad, and reverse phase on any channel. The 8M mic channels also have V-Limit™ - a hardware limiter that adds +9dB of protection to help prevent clipping, and SoftClip™ which engages just before clipping to reduce perceptible distortion.

Once everything is configured for your session you can follow the steps below so you can recall them for future recordings.

1) Click Device then select the interface by clicking the name

2) Click the file icon and Save the Device preset



3) Click Routing then click the file icon and Save the Routing preset

4) You can click the padlock icon to prevent accidental routing changes

5) Repeat steps 1-4 for each interface in your system

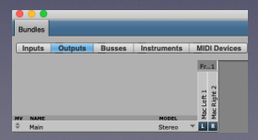
You can also Export these files to use in other systems or as a backup.

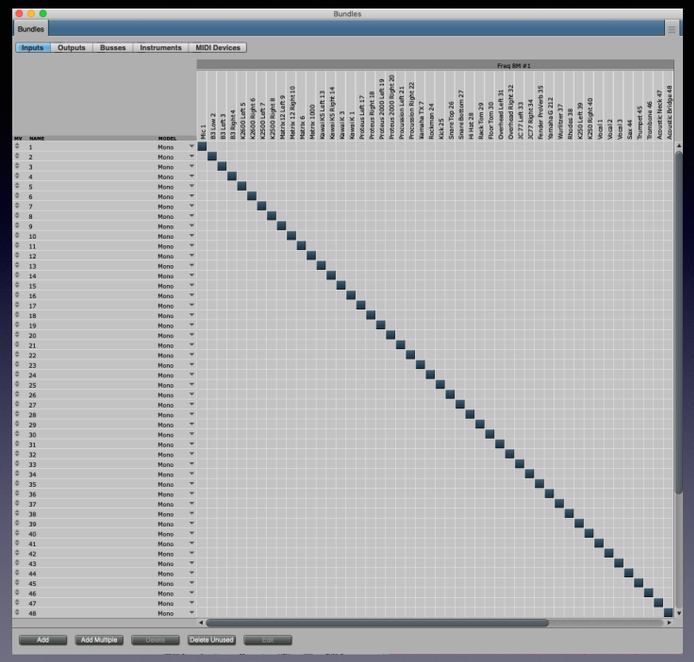
In the DP Bundles window create the number and type of input connections from your AVB network

If you created names for the channels in Pro Audio Control, they will appear across the top of the window

You can double click items in the Name column to give them more descriptive names in DP

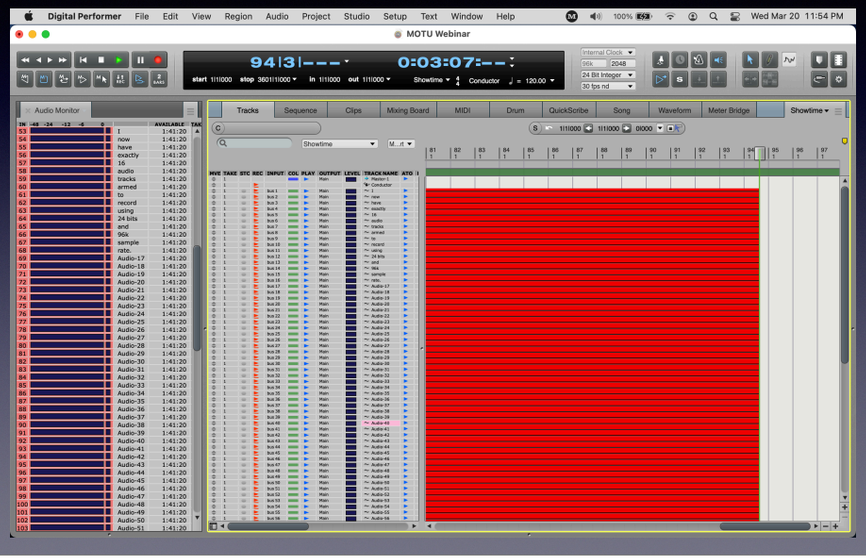
Outputs can be kept to a minimum for monitoring during the recording





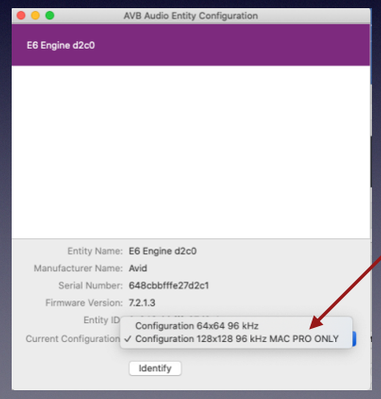
Bundles can be saved from the corner menu in this window.

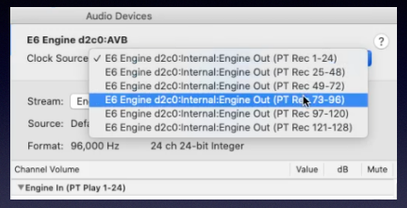
On a day before the show do a stress test recording with the maximum number of tracks you're expecting to need for as long as the show might be, and add an extra half hour for good measure. You can set a stop time when running this test so you can leave it unattended.



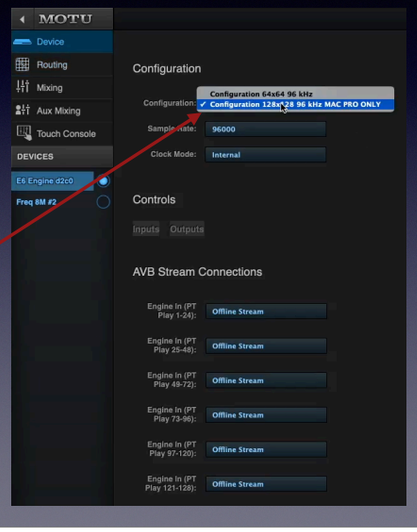
If you come back after that time and there is no error message, no crash, no lockup, then you're good to go.

An Avid S6L console was being used for the show that prompted this visit to AVB World. It does have 128 AVB channel output, but it is configured in five 24 channel streams and one 8 channel stream. It is currently not able to be reconfigured to all 8 channel streams, so would not connect directly to a MOTU system without skipping groups of channels.





The only way to record directly into DP was with a Mac Pro over Ethernet.

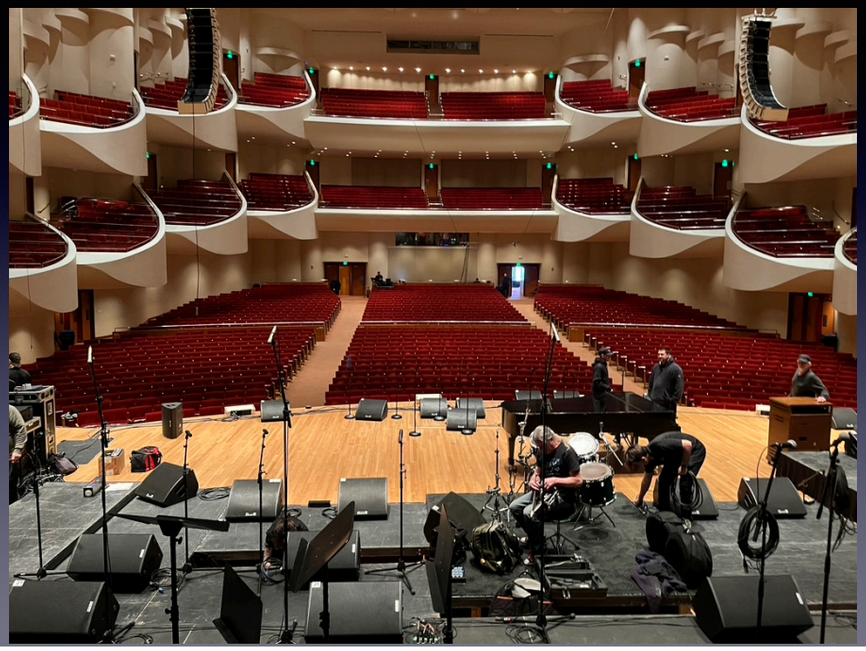


The Avid console shown below courtesy of Evan Kirkendall & Harford Sound

Now on with the show

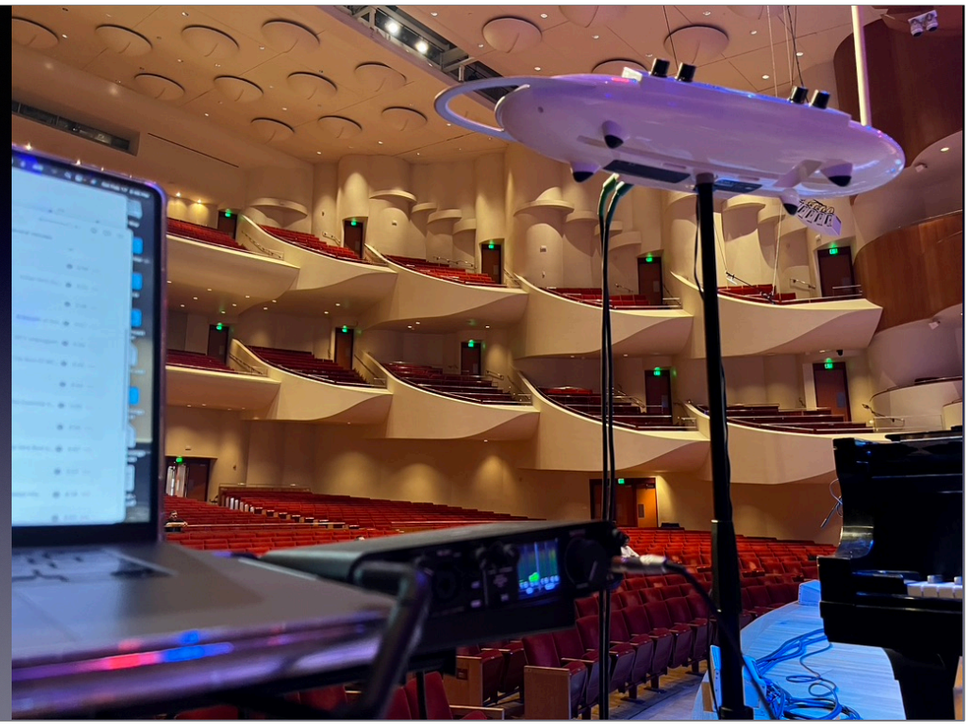
There are two different Avid consoles Harford Sound used.

Set up the day of the show at the Meyerhoff Symphony Hall in Baltimore MD



Soundcheck that afternoon

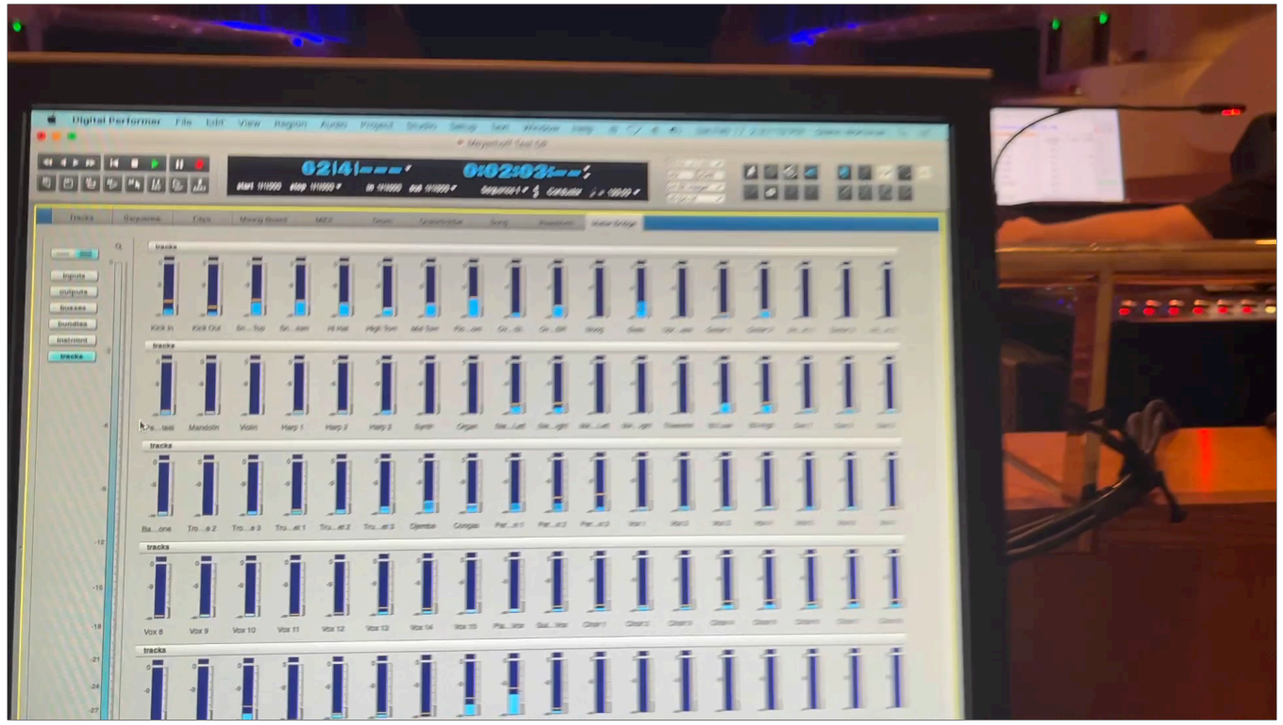
A MOTU M4 handling audio chores for the mighty Theremini



Early part of the show

MOTUnity's™ own Jim Jones at the piano - Jim was the musical director for the concert

Wow, look, not everyone is holding up a cellphone trying to record the show. How refreshing.



DP running during the show.

The better your prep work, the easier the gig will be. Try to get an input list so you can name all the tracks before recording starts. Audio files use the track names, so this prevents having files called Audio1, Audio2, etc.

Any comments, suggestions, or improvements to this are welcome - Glenn Workman