Equipment List

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Science On a Sphere® Hardware Specifications

We have tested out a limited set of system components that we know work with Science On a Sphere®. While other components may work, we can only guarantee a fully functional system that is built using these brands and models

Detailed Parts List

- Complete System -- Detailed Parts List (PDF)
- Complete System -- Detailed Parts List (XLS)

PC Specifications

DELL T5820 - Recommended Computer Specification. Two of these units are required, one operational and one for a hot spare. Each machine **requires two** NVIDIA - the Quadro P2000 video cards. They are available as an option from Dell when you customize the computer. See video card specifications for details.

NOTE: The computers should be shipped to the SOS staff for integration prior to the installation at the following address.

Video Projector Specifications

SOS uses video projectors to display images onto a sphere, however not every projector is well suited for SOS. The system needs high quality, bright, long duty cycle projectors for proper system operation. Of extreme importance is the choice of the projector lens.

One of the projector characteristics we look at closely is brightness. While this is somewhat subjective, we have found that projectors need to produce a nominal 3500 ANSI LUMENs. This can vary depending on the ambient light conditions but 3500 LUMENs is the minimum -- many of our sites use 4000 LUMEN projectors.

The duty cycle of the projector is important for reliability. Since the projectors operate for 8 to 10 hours per day, often 7 days a week, the projectors need to be designed to run for that many hours. Generally, "board room" class projectors fit into this category. We find that these board room class projectors have the appropriate number of fans and filters to operate well in a museum environment.

As you might expect, the projector lens choice is critical. In most cases, the standard lens is usually adequate and always gives the best price. However the zoom and throw ranges need to be checked against the specifics of each sphere installation. The general rule of thumb used is that the projected image needs to be 72" in height at the distance given between the projector lens to the center of the sphere. We've used the "lens" calculator found at the web site, http://www.projectorcentral.com to checkout the throw/zoom ranges for a particular projector lens. Because this component is so critical, we request that each site check with NOAA before procuring a projector.

Here are a few projectors that we've used at other SOS installations and we have high confidence that they work properly with SOS within the distances listed below (again, the distance is measured from the projector lens to the center of the sphere). Other projectors will work, but we will only support projectors that have been pre-approved by NOAA.

- DLP with Laser Lamp (1920x1200 resolution, 5400 lumens, 20,000 hour lamp life)
  - Panasonic PT-RZ570u - standard zoom lens (14'0" - 28'2" for a 68" sphere)
- DLP with Laser/LED Hybrid Lamp (1920x1080 resolution, 3500 lumens, 20,000 hour lamp life)
  - Panasonic PT-RZ470u - standard zoom lens (15'7" - 31'4" for a 68" sphere) (*out of production July 2019*)
  - Panasonic PT-RZ370u - standard zoom lens (15'9" - 31'5" for a 68" tall sphere) (*out of production July 2019*)

In order to mount the projector, it is recommended to buy a projector mount that allows for adjusting the pitch, yaw, and height. The RPA series of projector mounts from Chief is customizable for every projector and works well for SOS. Make sure to order the RPA custom projector mount based on your projector selection, and not the universal projector mount. Also, we have found the RPA custom mount is better for our purposes than the RPA Elite custom mount, so don't order any of the Elite versions. For example, for the Panasonic PT-RZ570u, we recommend the RPA324 mount and for the Panasonic PT-RZ370 or 470, we recommend the RPA313 mount. Use the MountFinder to find the custom RPA mount for you.

NOTE: If you want to be able to turn the projectors off from the computer, ethernet cables will need to be run to each projector.

Video Card Specifications

Each SOS computer should be ordered with **two** NVIDIA Quardo P2000 video cards installed by Dell. Please make sure that you order two for each computer. It is listed as "dual" on the computer specs quote with a quantity of 1, but that means two cards!

These cards have four DisplayPort outputs. If you use the recommended DisplayPort extenders below, then you won't need to order any adapters. If you choose to use HDMI or DVI or VGA extenders, **you need to order active adapters**. It is critical that these adapters are specified as active, or they will not work. We recommend ordering the active adapters from startech.com. Please let the SOS Team know if you are not using DisplayPort extenders.

Video Extenders

In order to connect the projectors to the SOS computer, we recommend the use of videos extenders. The extenders you use will vary depending on your projector selection.

If you are using the Panasonic PT-RZ570 projector, then you will need the:

- Extron DTP T DP 4k 230 Transmitter

DisplayPort cables will be run from the graphics card to the transmitters and then a ethernet cable will be run from each transmitter to the projectors, which have a built in reciever.

If you are using the Panasonic PT-RZ470 or Panasonic PT-RZ370, then you will need the:

- Extron DTP T DP 4k 230 Transmitter
- Extron DTP HDMI 4k 230 Rx

DisplayPort cables will be run from the graphics card to each of the transmitters and then a ethernet cable will be run from each transmitter to the receivers. An HDMI cable will be needed to run from the receivers to the projectors.

NOTE: If you have cable runs that are less than 100 feet, then you can use long HDMI cables without the need for extenders, but you will need active adapters.

Audio System (Reference System)

Science On a Sphere requires an audio system, however there are numerous ways to build audio components. Here is one example of how to build an audio system for SOS. It includes a basic, 4 input, mono mixer with four speakers. The speakers are two powered speakers and two un-powered slave speakers. The mixer is used to combine audio that comes from the SOS computer system and a wireless microphone. The shopping list for the reference system can be found here (SOS_Audio_Equipment.pdf). If the reference audio system is used, here is the suggested cabling layout.

For a higher-end audio installation, David Eltzroth has written a white paper discussing a Dolby stereo surround audio system for SOS.

Bluetooth Adapter

The Bluetooth adapter plugs into the main computer via USB and allows for another way to connect the iPad. The following model is regularly used with Science On a Sphere. This is an optional purchase:

- TRENDnet TBW-106UB

Apple iPad Remote Control

As of SOS release 3.4.2, SOS supports the Apple iPad and other iOS devices for sphere operations. For simplicity, we refer to this as the iPad interface, but it can be installed on a recent version of any the following devices:

- iPad
- iPad Mini

The iPad and iPad Mini provide a richer interface with more information available to the user. The free app is named "SOS Remote" and is available in the Apple App Store.

In addition to one of the above devices, the use of this interface requires Wi-Fi access to the SOS computer. There may be an existing Wi-Fi infrastructure at your site that you can use. If not, you will need to purchase an additional Wi-Fi router.

Further information about the iPad app, including Wi-Fi requirements, is available in the SOS Remote App Manual.

Many sites find that having an iPad case with a hand strap that makes it easy to hold during presentations is really nice to have. There are lots of options available online.

Optional Hardware

SOS comes with additional optional software that is available to all SOS sites. This software includes the SOS Public Kiosk software. To utilize this software, additional hardware is needed, as described below.

SOS Public Kiosk Hardware

The Public Kiosk software runs on a PC running Microsoft Windows. It is officially supported on Windows 7, 8, and 10, with Windows 10 being preferred. The User Interface looks best on screens with 16:9 ratios. It requires a touch screen, which can be separate from the computer or in an all-in-one configuration. The touch screen works best when mounted either in a kiosk housing near the sphere or mounted to the railing that surrounds the sphere. The kiosk PC must be on the same network as the SOS machine, either directly connected with Ethernet or by Wi-Fi.

In our experience, basically any Windows PC that works with a touchscreen will work with the SOS Kiosk. One configuration that is well tested is a PC with the following specifications:

- OS: Windows 10
- CPU: Intel core-i5-6500T (Quad Core, 6 MB, 4T, 2.5 GHZ)
- Memory: 8 GB
- Graphics: Intel Integrated
- Storage: 128 GB HDD or SSD

More details about the kiosk can be found in the kiosk manual.