

Room combining systems can become difficult and expensive to accomplish, especially when providing both video and audio. The number of rooms to combine can also add to the complexity of the system. When video is added to a room combining system, it is necessary to add a control system with a fairly sophisticated program. How well the system works and how easy it is to use depends on the designer and experience of the programmer.

The typical room combining system consists of a control system, digital signal processor (DSP), and HDMI matrix. When there are only two rooms to combine, the designer may want to just make a Master / Slave room where the presenter's room (Master) feeds the Slave room. This was acceptable with old analog rooms, but with HDMI there are delays which may cause the audio in the slave room to be delayed by as much as 70 milliseconds. The best method is to connect all rooms to an HDMI matrix and then switch the video and audio to the desired rooms. One of the most difficult issues when combining is the volume control. When combined, volumes need to be grouped, and this requires volume level feedback at the touch panels to follow the new grouping.

When designing a room combining system, the following questions need to be asked:

- How many rooms?
- Are there video displays?
  - What are the displays?
  - Are both HDMI and VGA video needed?
  - Are there any shared video sources such as a Blu-ray or CD?
  - Is there any need to be in combined mode and have different video at the displays?
  - Are there podiums or just wall plates, and how many per room?
    - If Podium, is there a Blu-ray in the podium?
- Are microphones required and do they need to be assigned to rooms?

The answers to these questions will determine the complexity of the room, and if it requires custom software, or can a TEKVOX Room Combining Drop-In be used. If the room requires shared video sources, different video at the displays, multiple wall plates or podiums in a room, or microphones are assigned, then this system requires custom design and software. Otherwise, it is possible to use a TEKVOX Room Combining Drop-In saving thousands of dollars.

For rooms requiring specialized products and soft software, TEKVOX can help with design, supply products, and software services.

## Room Combining Drop-In

The standard TEKVOX Drop-In systems for Room Combining are designed to provide solutions for up to four rooms. These systems use the TEK 1201-HD-N seamless presentation switcher to provide the room's video and audio sources, including program and microphone level control. Unlike other room combining systems requiring a DSP to provide all of the audio control at the matrix, the TEKVOX Drop-In system does all of the audio control before the matrix. This means raising and lowering the volume at the podium will also raise and lower the levels in all combined rooms.

When ordering a TEKVOX Drop-In system, you specify how you want it to operate by using a TEKVOX Drop-In Worksheet. From this information TEKVOX preconfigures the system before shipping. You will receive everything you need to drop-In a preconfigured room combining system.

Included with all TEKVOX control products you get full remote system management and control over the campus network using TEKVOX's TekManager. To provide cloud based management, TEKVOX offers TekManager Enterprise. One of the great features of a TEKVOX Drop-In is the ability to swap out displays without having to rewrite control software. This feature can save thousands of dollars in the future when video projectors are changed.

## Operation

At each podium there is a TEKVOX TCX9 touchscreen controller and a 1201 presentation switcher. If a wall plate is desired instead of a podium, it is possible to mount the 1201 into a wall box such as the Chief PAC525FW, and mount the TCX9 on the wall. The reason 1201 is required instead of just a wall plate is to provide volume control of both the program and microphone sources. One feature the TCX9 offers is a wedge design and can be mounted upside down on a wall. This improves the viewing angle and makes it easier to read, especially if you have to meet the requirements of the Americans with Disabilities Act (ADA).



The TEKVOX TEK-MHD44TP HDBaseT matrix can be mounted in a 2x2 ceiling box, like the FSR CB-224S, or in an equipment rack or the first room's podium. The Main operation of the system is provided by the TCX9s which function as both the touchscreen and control system. Up to four TCX9s can connect to a TEK 3 and they will synchronize their operation with each other via the TEK 3s. This is made possible by a unique TCP/IP protocol of the TEK 3s called TekEzLink. Any changes in a TEK 3 made by one of the TCX9s, is relayed to all of the other connected TCX9s.

At each display there is a CB1-A ceiling box housing the TEK 3, HDBaseT receiver with audio extraction and a speaker amplifier. Each room can be purchased with 4 ceiling tile replacement speakers. The CB1-A is shipped fully wired and configured by TEKVOX. A unique feature of the CB1-A is the connections below the ceiling. The CB1-A provides power for the projector, control and an HDMI connection below the ceiling to make for easy connections to the projector without having to use plenum cables. The electrician only needs to connect power to a side mounted junction box.



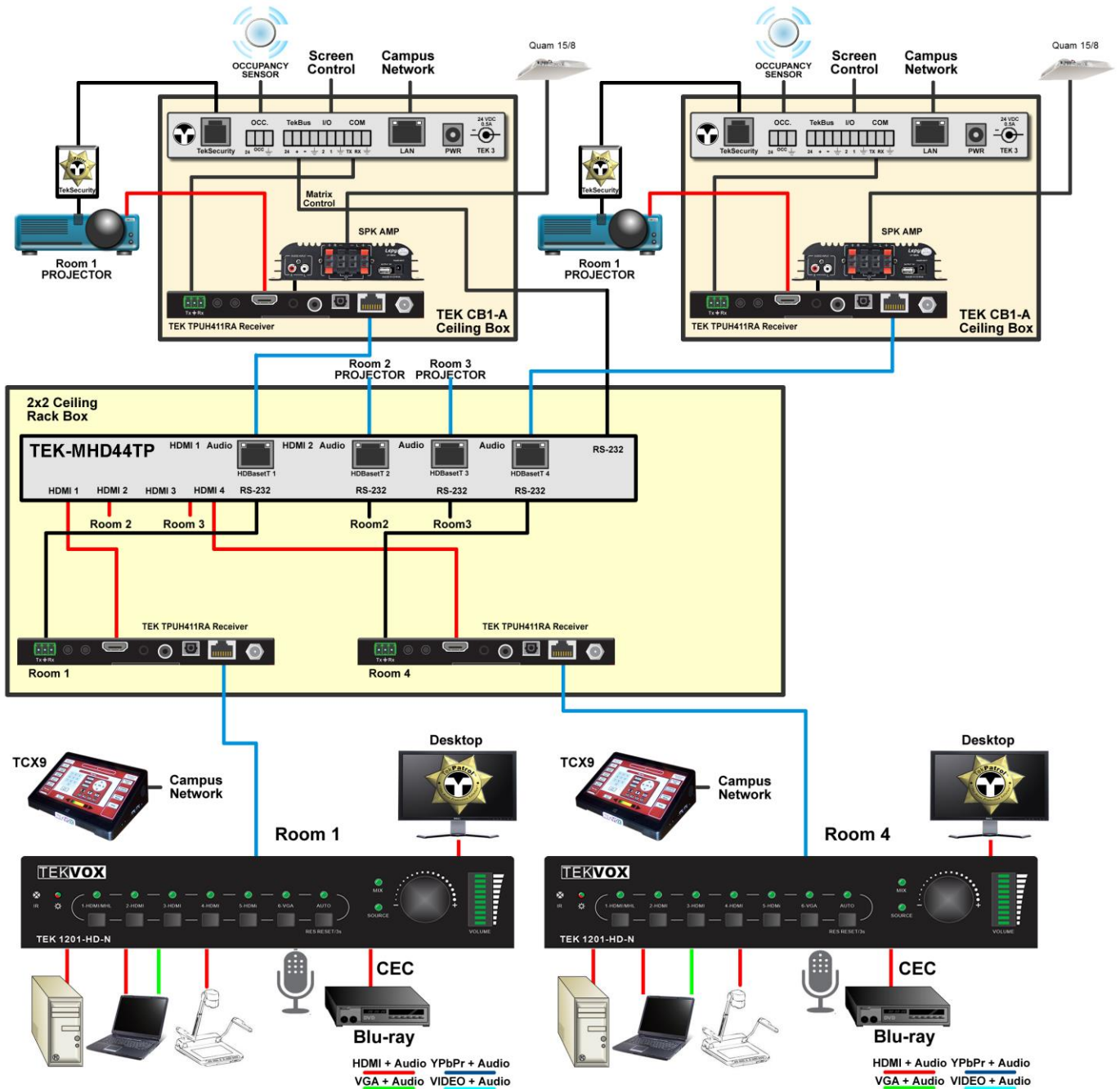
The TCX9s and the TEK 3s communicate with each other using the TekEzLink protocol over the campus network. The TEK 3s and the TCX9s can be powered using POE. This is the preferred method. The 1201 presentation switcher has 5 HDMI inputs and 1 VGA input with a line level Mix input for a microphone mixer. To improve audio performance there are separate volume controls for input source and Mic inputs. A nice feature of the 1201 is it has CEC control of the HDMI sources allowing for control of a Blu-ray player with CEC. There are two mirrored outputs on the 1201 with both HDMI and HDBaseT connections. The HDMI connection can be used as a confidence monitor. The HDBaseT output can power its receiver at the TEK-MHD44TP matrix. Control for the 1201 is provided using far-end HDBaseT RS232 control at its receiver. This allows for the room's TEK 3 to control the 1201 by using RS232 over the HDBaseT connection, thereby eliminating a lot of extra control cabling.

The TEK 3 is basically a mini network controller with the three driver based serial ports and logic outputs for control of a projection screen. When TEK 3s are used with the TCX9, a distribute control system is created offloading control software from the TCX9 to the TEK 3s. This reduces the complexity of the software in the TCX9. Since the TEK 3s provide the drivers for the equipment, replacing projectors and other equipment can be done without having to change any software in the TCX9s.

In separate mode the TEK-MHD44TP matrix is routed with inputs connected to their respected outputs (1>1, 2>2, 3>3, 4>4). This basically creates a TEKVOX standard Drop-In classroom where the 1201 is directly connected with its ceiling box. If there are more than two rooms, then a combining configuration page on the TCX9 is used to setup the room configuration. This page can be password protected, if required. With only a two room system, the combining operation is made when powering the system on.

When rooms are combined, the room starting the operation is the main room and all other rooms combined with this room are locked out. This is used to keep someone from taking over the meeting by accident. The main room including audio is routed to all rooms it is combined with.

Below is an illustration of a four room combining system using the TEKVOX Room Combining Drop-In. This system can be configured from two to up to four rooms by just adding TEKVOX Standard Classroom Drop-ins.



## Installation

The TEKVOX Drop-In Room Combining system requires only one Cat 6A cable from the Podium to the equipment rack for the matrix switcher. If there is a storage room nearby, then the MHD44TP 4x4 matrix switcher can be installed in a wall rack. Another solution is to use a ceiling rack such as the FSR CB-224S 4-RU to mount the equipment in. For a two room combining system the MHD44TP can be placed in the room 1's podium. This requires extra Cat 6A cable at room 1's podium.

Since all HDBaseT outputs on the TEKVOX products used in the Drop-In have Power over Cable (PoC), there is no need for power supplies at the receivers. The 1201 has an HDBaseT output with PoC to power its receiver. Furthermore, the TEK MHD44TP HDBaseT output has PoC to power its receivers. The 1201 has 5 HDMI inputs and 1 VGA input. For control of the Blu-ray the 1201 also includes CEC control for its HDMI sources. No need for IR cables that typically fall off.

At the projector, the TEK CB1-A ceiling box is used to provide easy installation for the equipment and power if needed. A great feature of the ceiling box is it provides power, HDMI, and control below the ceiling for the projector, eliminating the need for expensive plenum cables.

TEKVOX	Room Combining Drop-In Systems using the TCX9 or owner furnished iPad	
71023-DI-2	Two Room Combining System	MSRP \$16,475
71023-DI-3	Three Room Combining System	MSRP \$21,625
71023-DI-4	Four Room Combining System	MSRP \$26,775

## Conclusion

When designing room combining systems, it is important to know what is required. Does the system only require basic room combining, or whether it will require extensive programming? For most system, the end user only need the basics and wants the system to be easy to operate and functional. With the TEKVOX Drop-In Room Combining system, you get an easy to install system that won't take out your budget. If you require more complexity in the system, TEKVOX can support you with the expertise in design support and programming.