

Title: The User's Connection to ACS Modular Wiring for Power, Voice, and Data -- Modular Furniture and Access Floor Modules

Author: Hal M. Mueller

Introduction

There are two end users in a modular wiring system. One is the occupant of the building. The other end user is the facility engineer charged with maintenance and re-configuration of the system when moves, adds, and changes occur. These two end users have different concerns regarding the modular wiring system and their interaction with it. The wise engineer, specifier, and owner will take more than a few moments to consider these two end users in their decision to use modular furniture or access floor modules to deliver power to the workstation.

To the building occupant, the features of the modular wiring are of no consequence, so long as their computer works properly. Oh, certainly they want something to which it is easy to attach their computers and other appliances. But once they make an easy, reliable connection to the modular wiring system, their interaction will be infrequent. The facility engineer, on the other hand, will be concerned with the hassle of re-configuring the modular wiring system for moves, adds, and changes. This end user will be concerned with the effort and costs associated with those changes.

This application note will outline the basics of interconnection between the ACS modular wiring system for power when placed under an access floor to connect with modular furniture and with access floor modules. We'll consider how the underfloor modular wiring system can be optimized for connection to modular furniture or access floor modules. Finally, we'll lay out some of the issues to consider when making the choice between modular furniture or access floor modules.

The Modular Furniture Connection for Power

The eight-wire system is a nearly universal power connection for modular furniture. It is embraced by all of the large suppliers of modular furniture and consists of a four-circuit scheme with two neutrals and two grounds. The eight-wire system is shown in Figure 1 below.

This shows clearly how the eight-wire system gets its name; the total number of conductors in this scheme is eight. There are four phase conductors or hot conductors. Two conductors are the neutral or grounded conductors and are sometimes supplied as oversized neutrals. Finally, the remaining conductors are the grounding conductors, one of which can be wired as an isolated ground. Figure 1 also shows the variety of connections that can be wired with these eight conductors to create various types of circuits. With the four hot conductors, three can share one neutral conductor to create three general purpose circuits while the fourth uses the second neutral conductor to create a dedicated neutral circuit. This arrangement is sometimes referred to as a "3+D" arrangement.

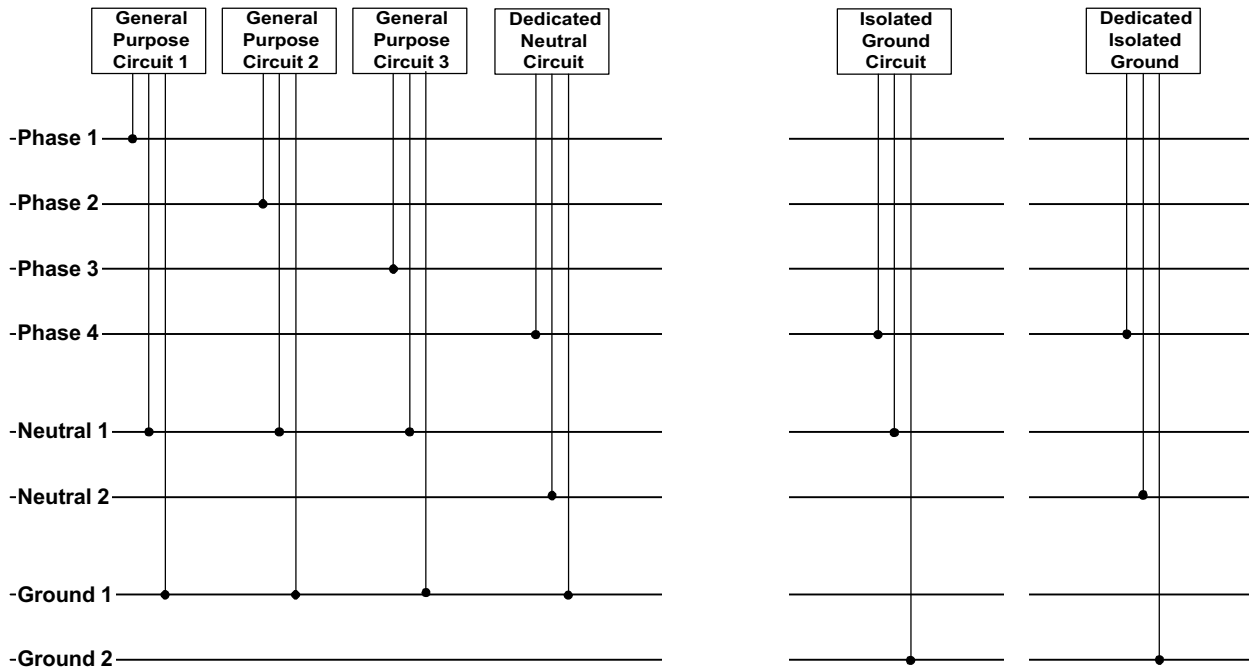


Figure 1. The Eight-Wire Modular Furniture Power System

In addition, using the second ground conductor, one or more isolated ground circuits can be created. Finally, using the second neutral conductor and the second ground conductor, a dedicated, isolated ground circuit is possible. Figure 2 shows two more of the standard combinations of circuits used in modular furniture wiring. Clearly, it is simple to imagine a

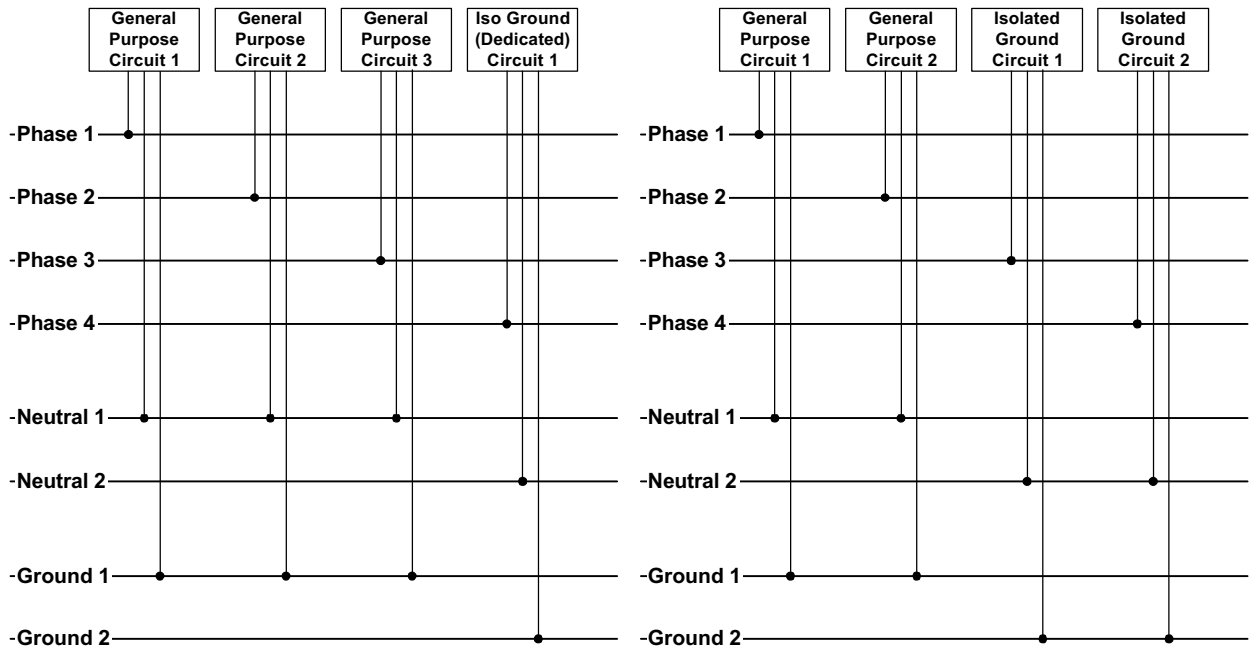


Figure 2. "3+I" Arrangement and "2+2" Arrangement.

“3I+1” arrangement consisting of three isolated ground circuits and one general purpose circuit.

Some manufacturers have changed one of the hot conductors to act as a third neutral or have augmented the eight-wire system to add the third neutral conductor. This allows a “3 with separate neutrals” arrangement. This arrangement is less commonly used than the others outlined.

Obviously, in modular furniture, the expected load at each receptacle governs the number of receptacles to be installed on each circuit. Limiting the number of receptacles that share each circuit provides spare capacity for each user.

The Access Floor Module Connection for Power

An access floor is generally a series of floor tiles suspended above the structural floor of a building using a series of pedestals. The pedestals are mounted to the structural floor, usually concrete, and the tiles are mounted atop the pedestals. The floor tiles vary in size and thickness depending on the manufacturer of the access floor; thus, the pedestals vary in height and spacing depending upon the tile. The floor finish is applied to the floor tiles in a manner that allows later access to the space below the floor tiles.

This construction creates an air space below the access floor through which various services can be delivered throughout the space, including power, voice and data wiring. Interestingly, the National Electric Code (NEC) classifies this space under the floor tiles as an “other space used for environmental air”. Power may be delivered below the access floor using a modular wiring system must meet the NEC requirements for wiring methods to be used in such an environmental air space.

The floor tiles, in most cases, retain sufficient strength to support normal loads even when a mounting hole for an access floor module is cut through the tile. The access floor module, the local connection point for the user, is flush-mounted in the hole cut into the floor tile. The access floor module provides the user with access to power, voice and data interconnections through a hinged or removable lid. When closed, the lid supports loads applied to the box and allows the users' appliance cables to enter the access floor module.

The access floor modules available on the market vary in size from very small and shallow in depth to very large volume custom assemblies. In addition, the access floor module vary in shape; most common are rectangular or square shapes. The size of the access floor module determines the number, rating, and type of power and data receptacles that can be installed for the user. A typical access floor module will supply the user with at least one general purpose duplex receptacle and one isolated ground duplex receptacle as well as one voice and one data connection.

Connecting the ACS Modular Power System

The America Cable Systems Power Connector

The ACS power connector is used in the ACS modular power system as part of the cables and distribution boxes. The connector can be configured in both a five-pole and a ten-pole version. The ten-pole version is usually provided as a combination of general purpose and isolated ground power. The most commonly used connector configurations are described in the figure below.

5-Pole Connector		10-Pole Connector			
Pin	Clear Plastic	Pin	Clear Plastic	Pin	Orange Plastic
1	Phase 2	1	Phase 2	6	N/C
2	Phase 1	2	Phase 1	7	Phase 4
3	Ground	3	Ground	8	Ground
4	Neutral	4	Neutral	9	Neutral 2
5	Phase 3	5	Phase 3	10	Isolated Ground

Figure 3. ACS Five-Pole and Ten-Pole Connectors.

Thus, with the ACS ten-pole power connector we can provide the eight-wire connection for modular furniture. In addition, we can create the equivalent to the modular furniture eight-wire system for use with access floor modules. This is illustrated in the following figure.

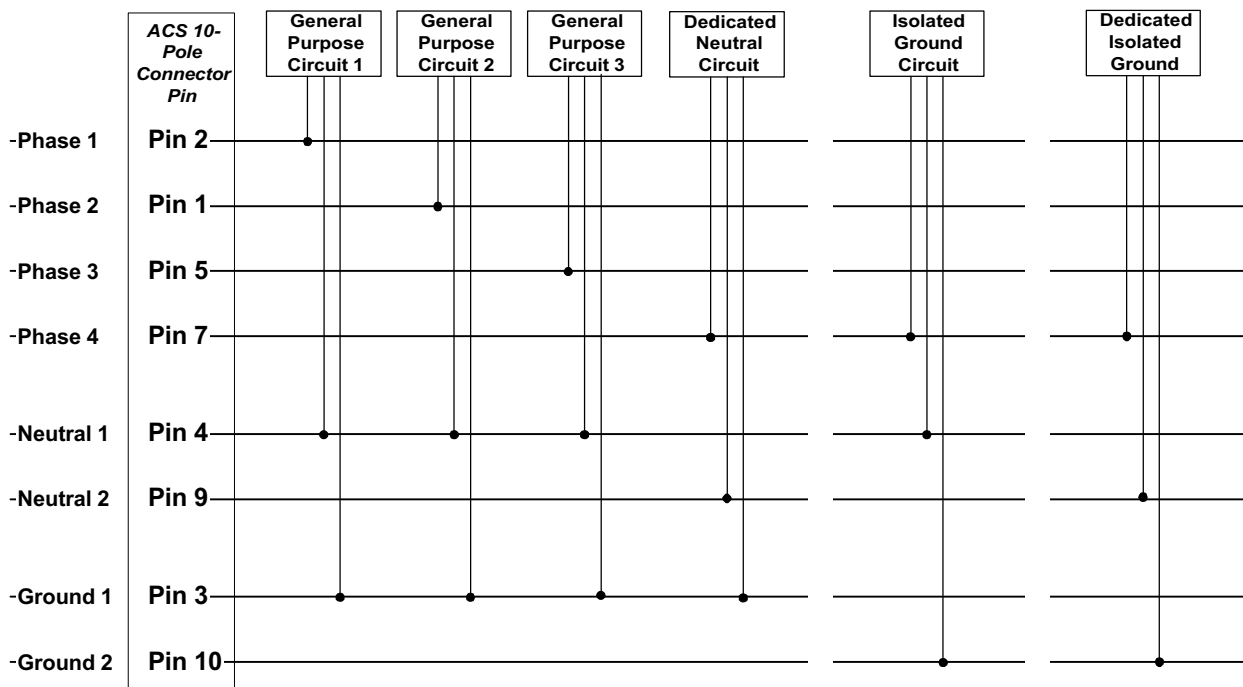


Figure 4. Application of the ACS Ten-Pole Connector to Eight-Wire System.

The result is that by using the ACS ten-pole connector on the distribution boxes and cables that make up the modular power system, we are in the unique position of being able to provide equivalent functionality in the power whether it is routed in modular furniture or to access floor modules. Since the same functionality can be delivered to the end user through either pathway, the modular wiring system specifier's choice boils down to a selection of the best pathway to the point of use—furniture panels or the access floor. The modular wiring system configuration should then be optimized to deliver the power through the selected pathway in the best way.

Connecting To Modular Furniture

The main distribution box provides three complete connections for modular furniture feeds to distribute power within a zone of service. In this application, the power is concentrated at the ports of the modular power system and then further distributed throughout the office space using the pathway within the modular furniture. Connection to the modular furniture is most commonly accomplished as shown in the upper left-hand sketch, through a trade standard junction box mounted beneath the access floor. This is because local electrical inspectors, the folks at the sharp end of the stick, generally prefer not to have these connections made in the furniture pathway.

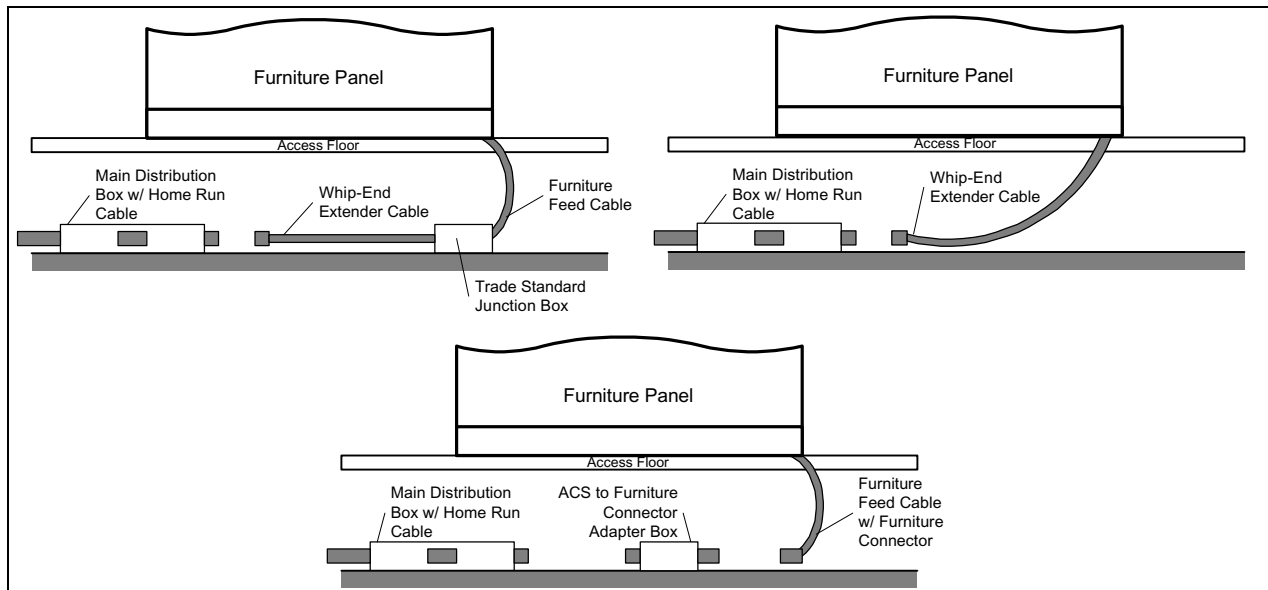


Figure 5. ACS Modular Power System Connection to Modular Furniture.

The ACS modular power system can easily be configured to supply modular furniture with an eight-wire connection. Most commonly, this results in the standard ACS 10-pole connector supplying the conductors needed to create the “3+D”, “2+2”, or “3I+1” arrangements. This is shown schematically in the figure below.

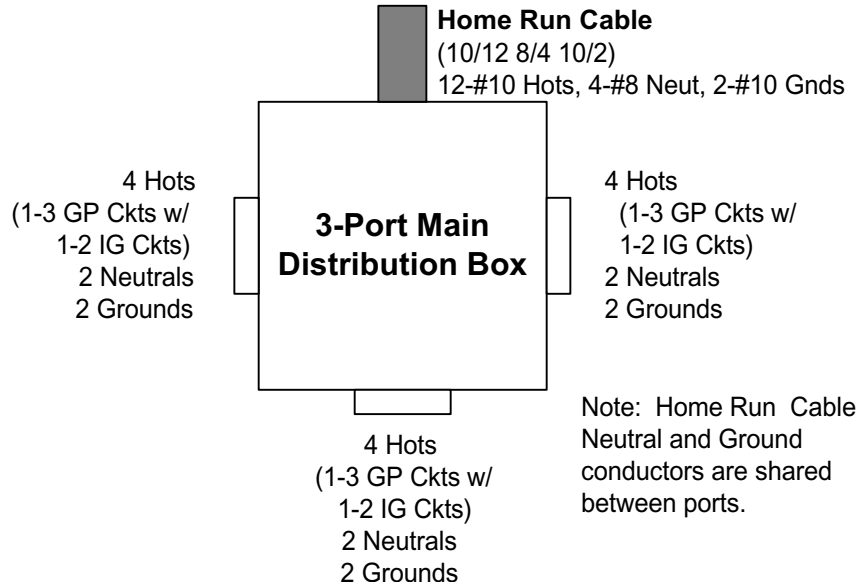


Figure 6. ACS Main Distribution Box for Modular Furniture Connection.

Connecting To Access Floor Modules

The ACS modular power system can also easily be configured to supply modular furniture to access floor modules. In this case, because power distribution within the zone of service is carried out by the modular wiring system, the system looks different from that used for the modular furniture connection. The modular wiring system itself performs the task of splitting circuits, balancing loads, and providing spare capacity for each user and thus the power isn't as concentrated at any one port of the modular power system. In addition to the Main Distribution Boxes, Secondary Distribution Boxes may be used to share circuits between users. This is shown schematically in the figures below.

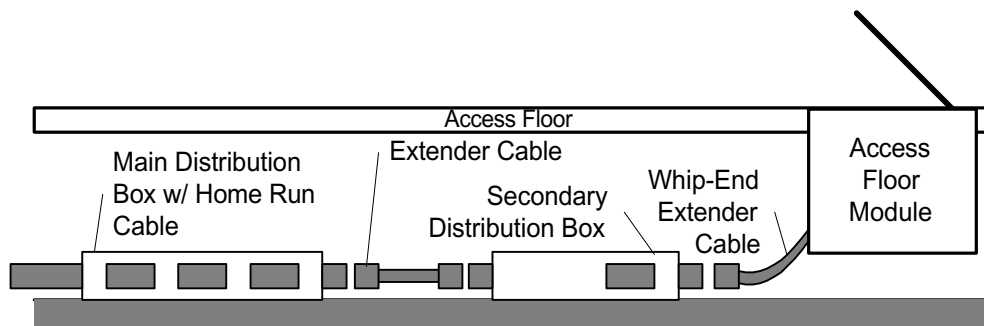


Figure 7. ACS Modular Power System Connection to Access Floor Modules.

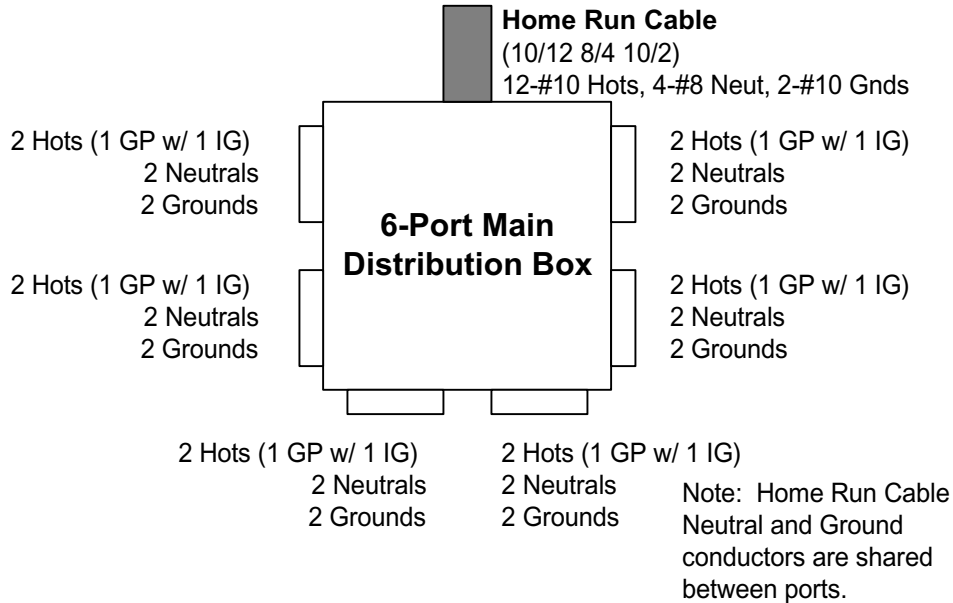


Figure 8. ACS Main Distribution Box for Access Floor Module Connection.

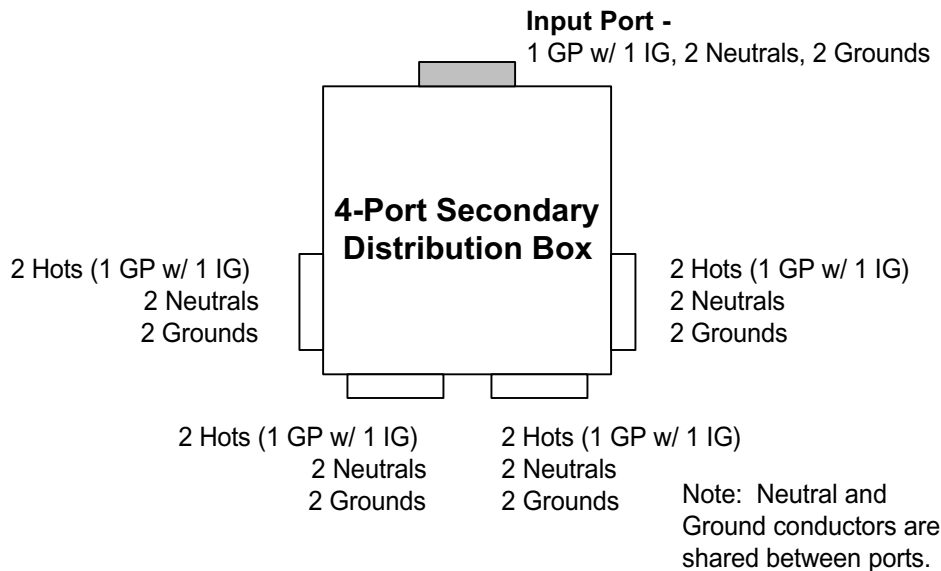


Figure 9. ACS Secondary Distribution Box for Access Floor Module Connection.

Connecting the ACS Modular Voice and Data System

Without getting too far into the requirements set up by the telecommunications industry for reliable high-speed data connections, suffice it to say that data connections are a little more complicated than power connections since the cable cannot be broken in too many places. As a result, a cable must travel from the point of service for the user back to the telecommunications patch panel or to an intermediate “consolidation point” under the access floor. The ACS Zone

Distribution Box serves as this intermediate consolidation point in the ACS voice and data modular wiring system.

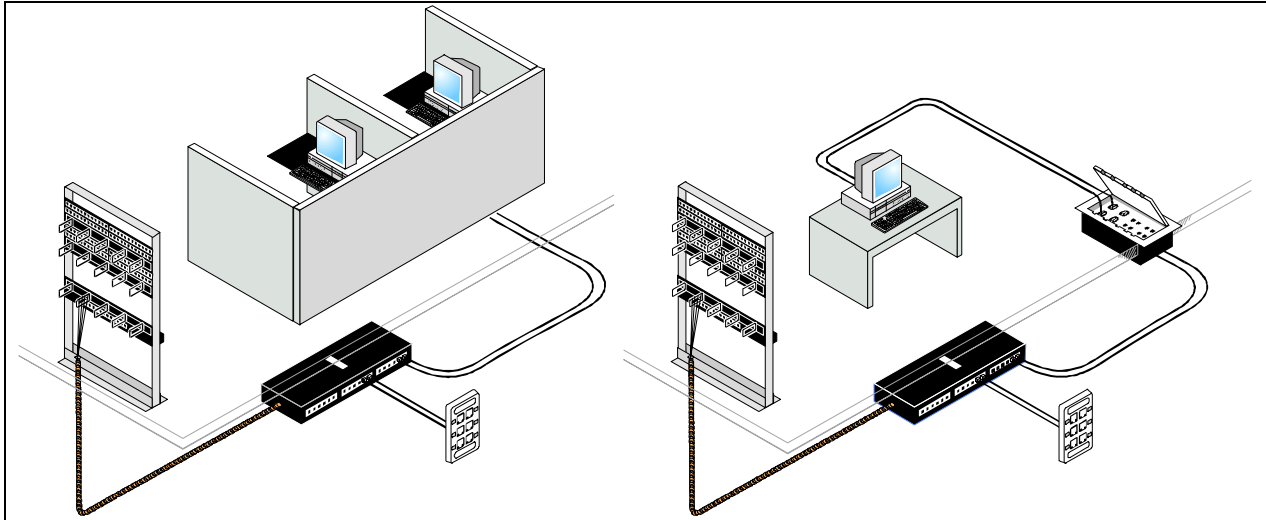


Figure 10. Voice & Data Cabling to Modular Furniture and Access Floor Modules.

As shown in the figure, when routing the voice and data cables to the point of use in modular furniture or access floor modules, there is only one connection allowed between the zone distribution box and the user's appliance. When using modular furniture, this connection is placed in the furniture pathway at a point convenient to the user. This results in a long section of cable passing through the access floor, the interface of the building's pathway, to the modular furniture pathway. With the access floor module, the connection is placed at the floor module itself, making the connection at a convenient interface in the building's pathways. This distinction is important when considering the effort required to relocate the cabling when a move, add, or change occurs.

Decision: Modular Furniture or Access Floor Modules

This decision should put greater weight on the concerns of the nearly forgotten user, the facilities engineer who will have to live with it for the life of the building. We should try to minimize the hassle experienced by the facilities engineer in maintenance and re-configuration of the modular wiring system. The nod should go to that power distribution pathway offering the least effort to reconfigure in the face of moves, adds, and changes, especially in tenant-occupied space that may change tenants frequently. The sophisticated reader will know that the author of this article already has opinions regarding the optimum solution, but please consider the following analysis.

When selecting a user interface for a modular power, voice and data wiring system used with an access floor, both modular furniture and access floor modules have advantages and disadvantages. Listed in the table below is the author's evaluation of the pertinent factors.

	Modular Furniture	Access Floor Modules
Pro	<ul style="list-style-type: none"> • With all parts installed properly, provides appearance favored by interior designers. • Available spare capacity is easily brought online for adds. 	<ul style="list-style-type: none"> • Reconfiguration is completely modular. • Unlicensed personnel can safely implement reconfiguration. • Available spare capacity is easily brought online for adds. • Distribution of power within space created by access floor system allows installation within large pathway. • Distribution of power fully utilizes convenient space created by access floor system. • Cables for voice and data connections do not pass through the access floor, easing moves, adds, and changes.
Con	<ul style="list-style-type: none"> • Reconfiguration is usually hindered by hard-wired trade-standard junction boxes. • Reconfiguration usually requires a licensed electrician to implement. • Distribution of power within modular furniture involves fitting cables into narrow pathways. • Distribution of power within modular furniture fails to use space created by access floor system. • Voice and data connections require long cables hard-wired into furniture panels, inhibiting later changes. • In actual use, rarely retains the neat appearance it had when installed. 	<ul style="list-style-type: none"> • Space must be allowed for access floor module access. • Floor tile placement for rectangular floor modules can be problematic to avoid lid opening in wrong direction.

While the author clearly believes that there are more advantages to using access floor modules over modular furniture when connecting the ACS modular wiring system, the reader should not consider this a rejection of modular furniture in this application. Rather, the savvy reader will use this information as a springboard to investigate these same issues as they apply to their own building.

Questions? Did you find this article useful? For further information or to discuss the author's conclusions, please call Hal M. Mueller at 1-800-426-3170 or send email to hal@acs-mail.com.