ASCO Power Technologies™

Benefits of Custom-Engineered Transfer Switches

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Life Is On Schneider Electric

Benefits of Custom-Engineered Transfer Switches

Custom Features Extend Transfer Switch Value

The following narrative identifies benefits that custom engineering services can bring to power transfer switches. It also provides examples of custom-engineered features commonly added to power transfer equipment.

INTRODUCTION

Across the critical power equipment industry, manufacturers offer automatic transfer switches in a wide-range of designs and ampacities. Nevertheless, facilities can require functions and features exceeding those offered by standard transfer switch models. In addition, many facilities can benefit by combining features, accessories, and even systems in ways that are unavailable through standard transfer switch offerings. In these instances, custom transfer switch engineering and manufacturing can integrate additional equipment to optimize functionality and deliver power systems at lower overall installed cost.

PRIMARY BENEFITS

Custom-engineered transfer switches fall chiefly into two categories. The first category adds functions, features, and components that may not be available on standard transfer switches. The second adds value by integrating other source and distribution equipment into a transfer switch enclosure or equipment lineup. The benefits of each category are explained as follows.

Added Features

In normal applications, features, components, and accessories are added to standard transfer switches to meet specific needs. However, when customers require capabilities and features beyond those on a manufacturer's option list, custom engineering services can produce solutions that meet project specifications. For instance, a customer may request a specific manufacturer's power meter to match meters used elsewhere in its existing facilities. Likewise, transfer switch lineups can be engineered to provide functions and capabilities beyond those found in standard offerings, such as integrated distribution breakers.

Consolidated Equipment

Transfer switches and lineups can be engineered to consolidate equipment that would otherwise be separately installed. For instance, a standard, full-functioning, Automatic Transfer Switch (ATS) can be provisioned with a separate, breaker-equipped, service entrance compartment and additional equipment sections for distribution circuit breakers. When compared to separately engineered and installed equipment, integrated solutions typically reduce the space, time, and overall cost of critical power systems, as follows:

> Space: Integrated equipment can be set in adjoining equipment sections or even integrated into different compartments within the same section. Doing so can minimize floor area, wall space, and total volume of the equipment to reduce real estate requirements or facilitate the location of other equipment and systems.

Time: By integrating equipment into a single deliverable product, the design, procurement, manufacture, and shipment of normally separate devices becomes more efficient.

Labor: With separate equipment, devices are installed in different locations and require custom wiring and conduit to be furnished and installed. With an integrated solution, the equipment is deployed with factory-designed and furnished bus, cable, and control wiring to reduce both procurement errors and installation time. Installation and commissioning is streamlined because the integrated product is assembled and tested before it leaves the factory.

Cost: In ASCO's experience, the cost of equipment on smaller projects can be variable, with some custom-engineered equipment exceeding the cost of stand-alone equipment, and some projects realizing savings via integration. On larger projects, there is almost always a savings in direct capital equipment costs. In either instance, the overall cost of specifying, designing, manufacturing, shipping, installing, commissioning, and housing integrated power equipment is typically lower for custom-engineered equipment than for solutions that utilize stand-alone devices.

EXAMPLES OF VALUE-ADDED FEATURES

A variety of features can be incorporated into transfer switches and equipment lineups through custom engineering. Some of the most common are described as follows.

Source Fusing

Transfer switch withstand and close-on ratings are a function of both current and time. If overcurrent protection devices can clear faults more quickly, transfer switches can withstand higher amounts of power before the fault is cleared. Because fuses typically open more quickly than circuit breakers, fuse-equipped transfer switches can provide the highest withstand ratings. The table below compares ratings for representative ASCO transfer switches and shows higher ratings for fused models. (Always refer to directly to the manufacturers most recent transfer switch ratings. Ratings for ASCO Transfer switches can be found in ***ASCO Publication 1128 - Withstand and Closing Ratings For Transfer Switch Equipment.***)

UL 1008 Withstand and Closing Ratings for Select ASCO Transfer Switches

		300, 4000 & 7000 SERIES							4000 & 7000 SERIES			
Frame	Switch Rating (Amps)	Current Limiting				Specific Brea			Time Based			
		480V Max.	600V Max.	Max. Size, A	Class	240V Max.	480V Max.	600V Max.	Time (sec)	240V Max.	480V Max.	600V Max.
G	1000-1200	200kA	200kA	2000	L	85kA	85kA	85kA	0.05	85kA	85kA	85kA
G	1600-2000	200kA	200kA	3000	L	125kA	125kA	125kA	0.05	100kA	100kA	100kA
G	2600-3000	200kA	200kA	4000	L	100kA	100kA	100kA	0.05	100kA	100kA	100kA
G	4000	200kA	200kA	5000	L	100kA	100kA	100kA	0.05	100kA	100kA	100kA

Bus Riser

Conductors between transfer switches and their power sources and load circuits typically use cable terminated by lugged or crimped connections. Alternatively, transfer switches can be engineered to connect to power source and load circuits via copper busway systems (Figure 1). Four common reasons to do so include:

Compact Installation: Conducting high-amperage currents via cable can require both greater space and greater labor than copper bus of similar ampacity.

Secure Connection: While cables routinely utilize lugged or crimped connections, bus uses bolted connections, and thus more secure.

Efficient Installation: Because it is bolted in place, bus can be quicker to install.

System Compatibility: Where bus is already present in a facility, bus riser-equipped transfer switches can be easily connected to expand the system.

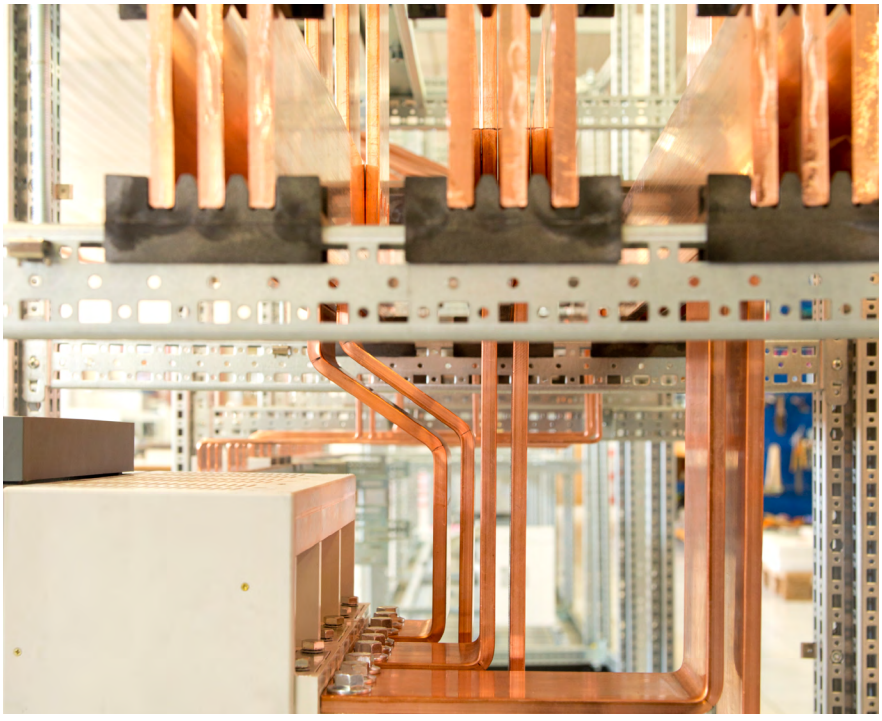

Figure 1: Copper bus can carry high ampacities in less volume than cable.

Figure 2 shows an ASCO 2,500-Amp 7000 SERIES ATS. This unit uses copper bus to carry power from and to source and load circuits, respectively. This unit was engineered-to-order with current-limiting fuses on the Normal source and Infrared Ports for viewing its Normal and Emergency lugs.

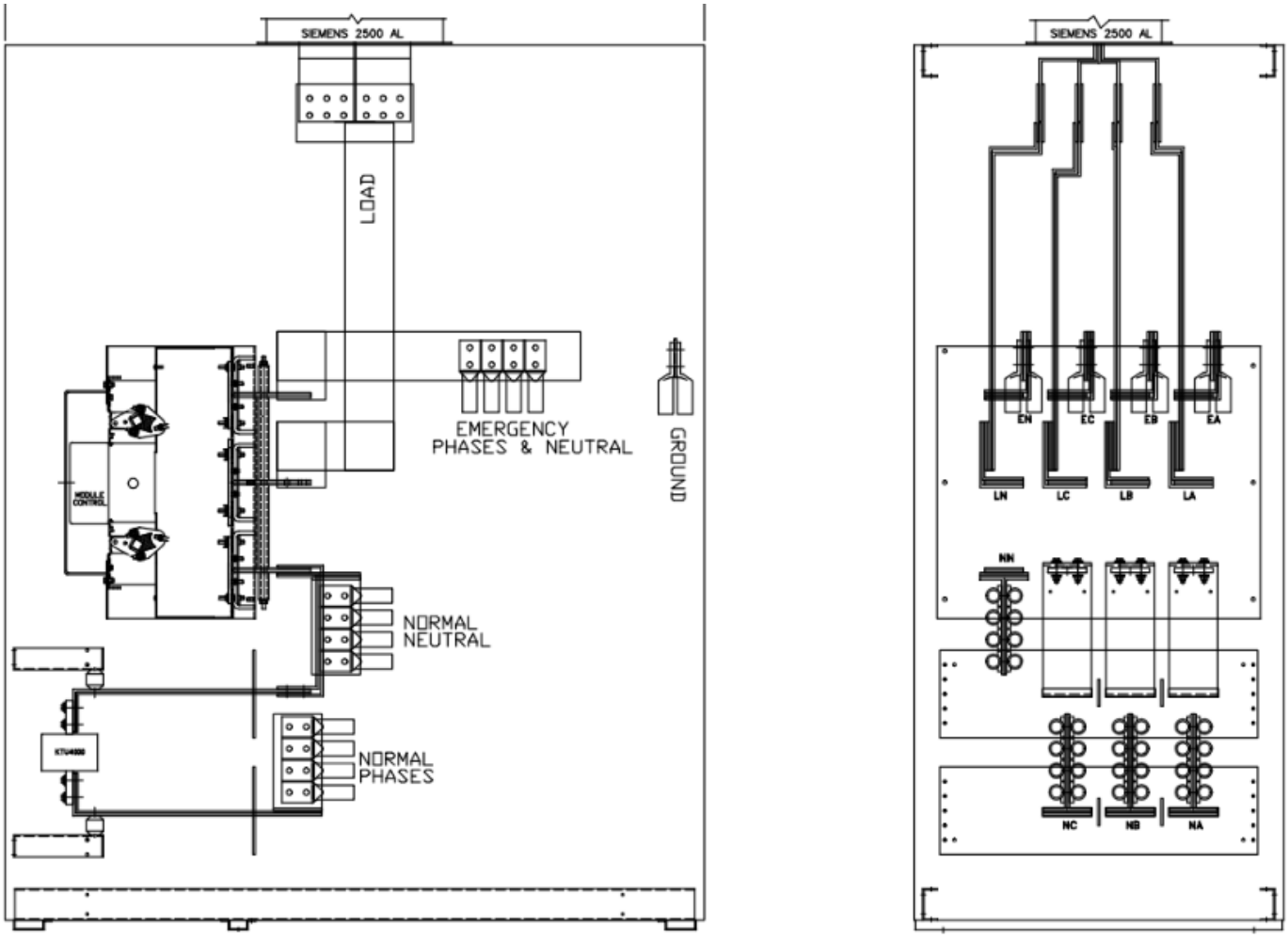

Figure 2: Side and rear sections of an ASCO 7000 SERIES ATS with bis riser and fusing on the Normal source. Overhead bus connects to this switch through the flange assembly at the top of the section.

Integrated Distribution Breakers

A common application for custom-engineered ATS is the incorporation of circuit breakers for power distribution. By integrating breakers with the ATS, customers streamline their design, procurement, installation, commissioning, and service of their backup power systems, often at lower overall cost.

Common distribution breaker applications include (1) the addition of I-Line panels to house molded case circuit breakers; (2) the use of insulated case circuit breakers, with or without draw-out capability; or (3) manually operated or electrically operated circuit breakers. Figure 3 shows a 3,000 Amp ASCO SERIES 7000 ATS with a single-row I-Line panel for load distribution. Figure 4 shows a 3,000 Amp ASCO SERIES 7000 ATS with Schneider Electric NW distribution breakers as well as circuit breakers on the Normal and Emergency sources. The brand and type of circuit breaker(s) can usually be provided to match a customer's specification.

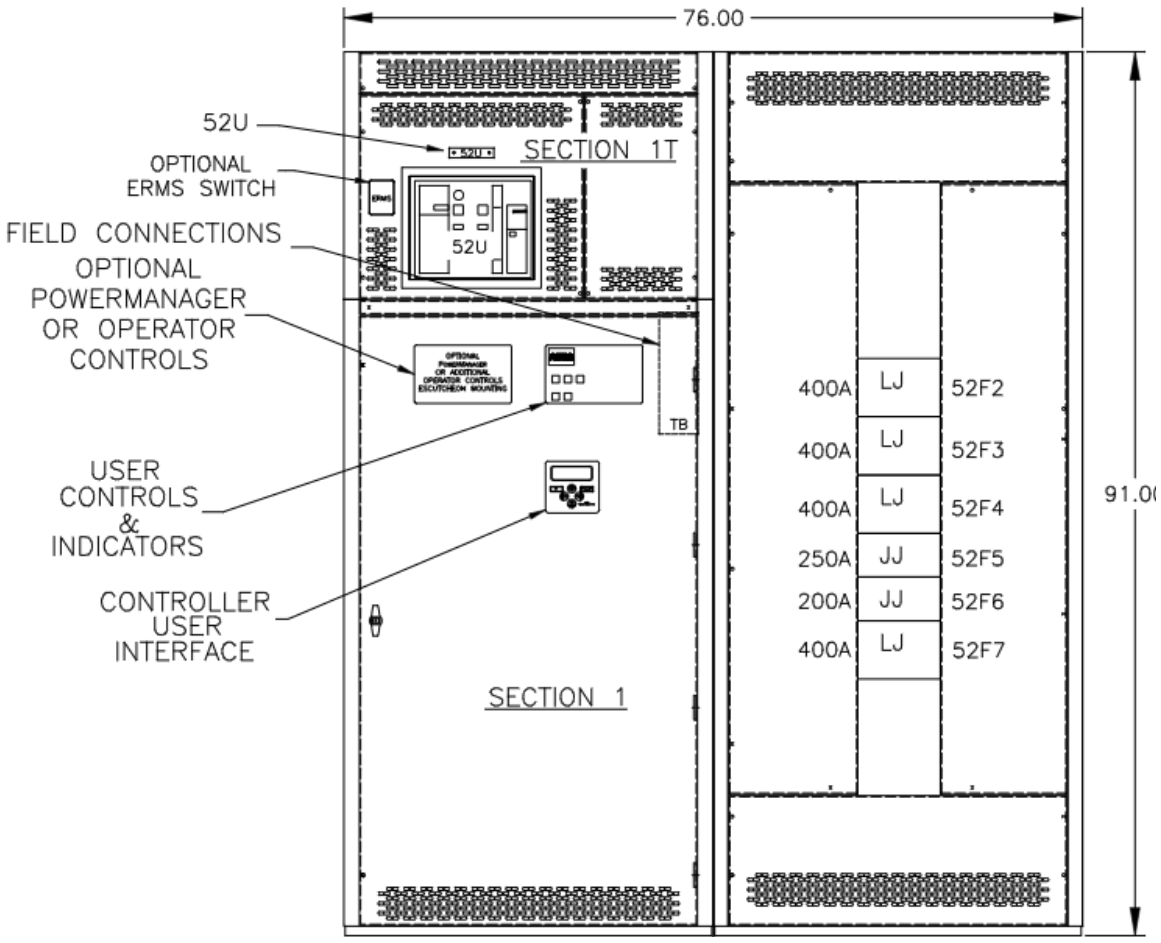

Figure 3: 3,0000 Amp ASCO SERIES 7000 ATS with a single-row I-Line distribution panel.

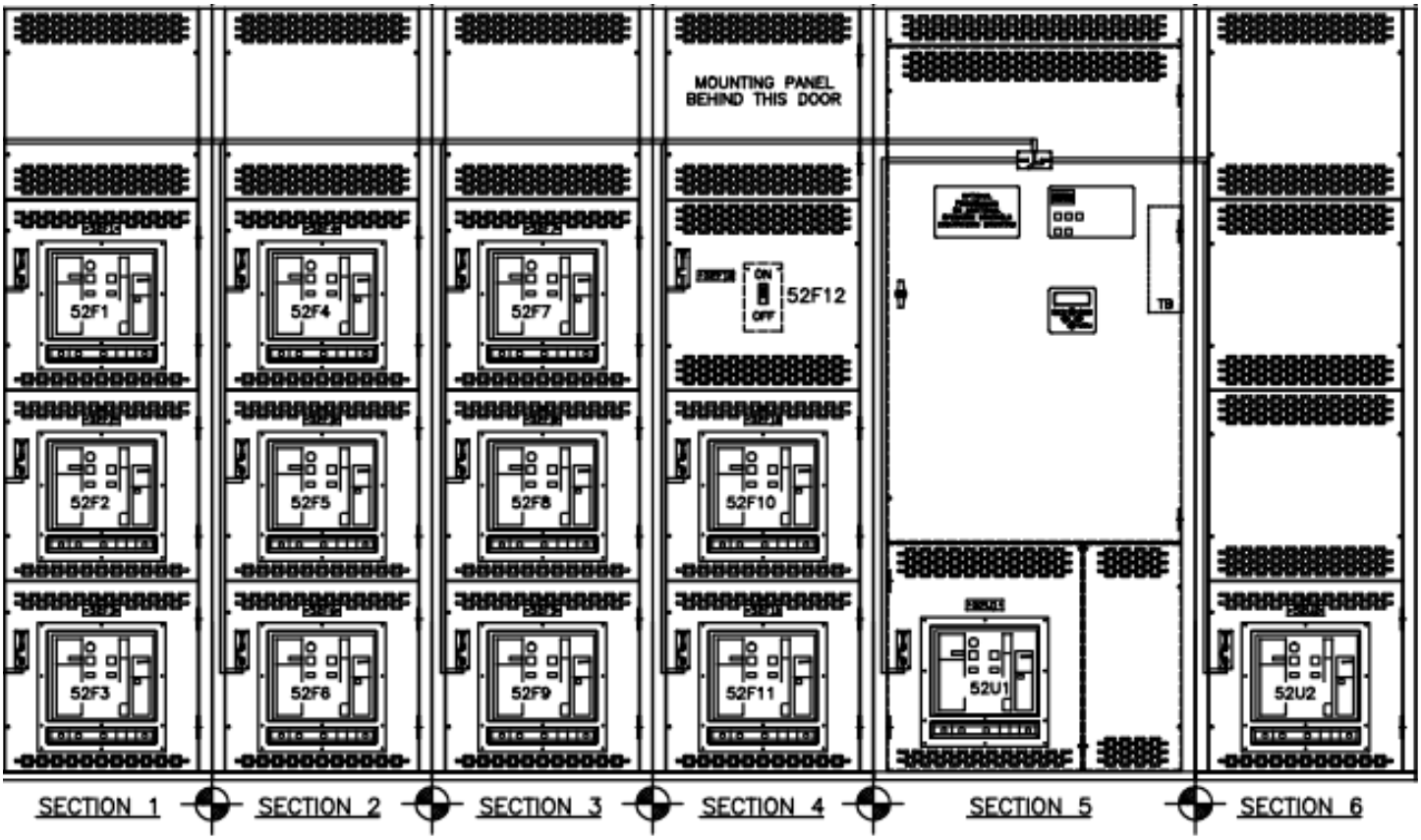

Figure 4: 3,000 Amp ASCO SERIES 7000 ATS with a single-row I-Line distribution panel.

Power Metering

Because ATS and ATS equipment lineups are uniquely located between power sources and loads, they provide an optimal location for measuring electrical performance. Installing power meters can provide operating and monitoring benefits. For custom-engineered ATS, power meters offer advantages according to installation location and type.

Location

A power meter can be installed upstream or downstream of a transfer switch. To monitor incoming utility power, power meter sensing can be placed on the Normal leg of the transfer switch, which can be read by a power meter mounted in the switch or at a remote location. To monitor generator output, power meter sensing can be located on the Emergency leg of the transfer switch. To verify utility power charges, a revenue-grade power meter can be installed before or after a service disconnect breaker.

On the distribution side, power flow can be measured on the load leg of the ATS to monitor total connected load. Power flow through specific circuits can also be measured using power meters. For instance, a power meter can be installed to monitor power consumed by a critical load, or meters can be installed on multiple distribution circuits to assess individual and total loads. The resulting data can be used to predict when load will reach circuit capacity.

Type

Power metering configurations include (1) physical power meter device that can monitor bus or cables, and (2) power meters built into circuit breakers with electronic trip units. The former offers flexibility because they can be specified independent of the type of breaker used. Meters can be selected from the ATS manufacturer's own offerings, sometimes as an accessory to the ATS. When a customer chooses to use a meter built by another manufacturer at multiple installations, an ATS manufacturer may develop an orderable accessory to streamline procurement and installation of the customer's required configuration. When circuit breakers offer integrated power meters, power data may be transmitted from the trip units to building or power monitoring systems using communication accessories provided by a breaker manufacturer.

Utility-Specified Compartments

Utility companies may require dedicated enclosures for housing and accessing service-related equipment. These compartments provide dedicated access to utility equipment and isolate it from equipment owned by others. Incorporating utility compartments and meter fixtures into custom-engineered ATS line-up streamlines procurement and installation while providing a utility-ready solution. Typical applications can include the following:

Utility Lug Termination Compartment – By providing a lug termination compartment, the utility is afforded a dedicated space to connect its service to an end user's system.

Utility Current Transformer Compartment – A utility may elect to use its own metering solution to measure and monitor the amount of power supplied to a customer. To obtain measurement data, the utility may require provisions for installing a current transformer on the service cable or bus. A utility company may also specify the current transformer that must be supplied, or may supply this equipment directly.

Utility Instrument Compartment – A utility company may specify the type of meter that must be housed and the type of socket required to mount it. A utility will usually install its own meter in the socket after the ATS lineup is installed in the facility.

Compartmented equipment sections are available in UL 891 and UL 1558-listed designs, and can be included in an ATS lineup to simplify future expansion. Figure 5 shows an ASCO, 3,000 Amp, 7000 SERIES, Automatic Bypass-Isolation Transfer Switch with a current transformer compartment, a utility termination section, and an I-Line load distribution panel. It also shows a dedicated section for communications equipment that will connect the ATS lineup to an ASCO Critical Power Management System.

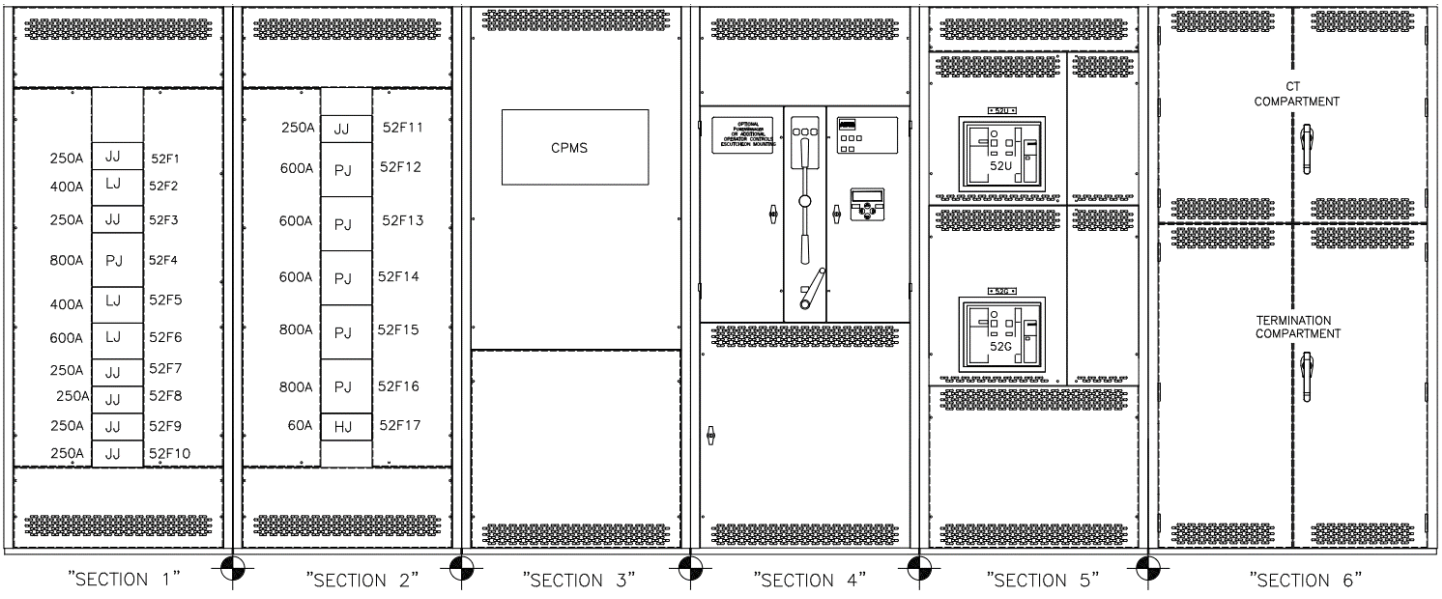

Figure 5: This ASCO 3,000 Amp 7000 SERIES Automatic Isolation-Bypass Switch lineup includes power distribution circuit breakers in Sections 1 & 2, a Continuous Power Monitoring System (Section 3), circuit breakers for the Normal and Emergency sources (Section 5), and current transformer and utility termination compartments in Section 6.

Multiple-Source Systems

Transfer switches are most often used to transfer load between two sources, such a utility power feed and a standby generator. Nevertheless, some facilities are supplied by three or more sources of power.
For example:

- A facility may be supplied by a utility feed and two redundant generators, either of which can carry the anticipated emergency load.
- A facility may be supplied by a utility feed and a standby generator, and provisioned with connections for a portable generator.
- A building complex may source power from a utility, a standby generation system, and an alternative energy microgrid.

While several power system configurations could serve each need, the simple transfer switch configuration in Figure 6 is easy to deploy. This configuration can be extended to serve additional sources by adding a transfer switch on each emergency feed.

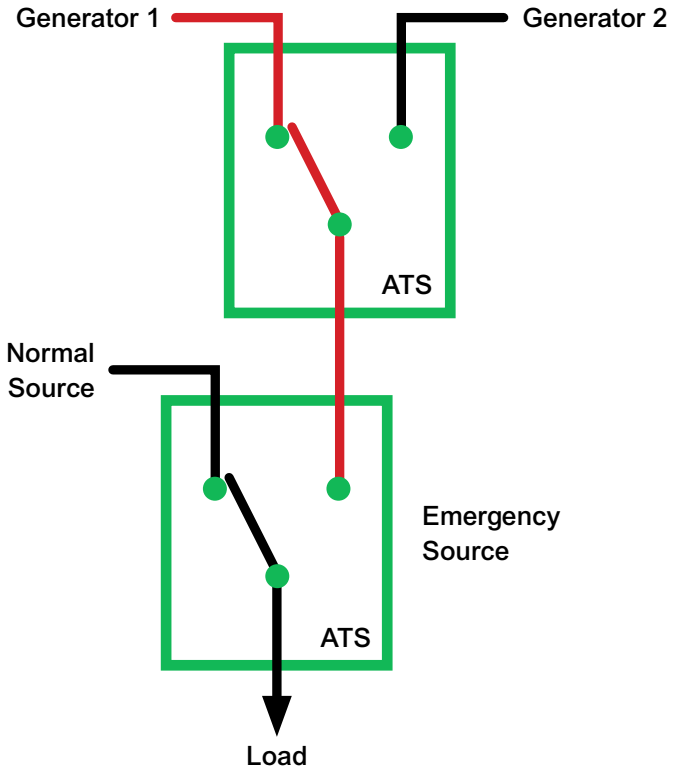

Figure 6: Additional power sources can be accommodated by simply adding another transfer switch.

CUSTOM ENGINEERING FOR A WIDE-RANGE OF OPTIONS

The preceding narrative has described transfer switch enhancements that are commonly provided for custom applications. Additional applications for custom transfer switches include those that use customer-specified breakers (usually specified to match those already in use at customer facilities). Transfer switches can also incorporate breakers with atypical trip settings, and can provide custom communications. The later support comprehensive power equipment monitoring, control, and compliance functions. Interfaces are available for connecting controls to the ASCO Critical Power Management System (Figure 7), the Schneider EcoStruxure environment, or to market-leading power and building management control systems.

Figure 7: Connect power equipment to the ASCO Critical Power Management System and other market-leading power and building management control systems.

OTHER BENEFITS OF CUSTOM-ENGINEERED ATS

Reduced Space: When equipment is provided by different vendors and installers, each piece is mounted in a separate location, often in a separate enclosure for each component. Integrating equipment into an ATS or ATS lineup can increase the spatial density of the equipment to reduce the overall amount of required floorspace. This frees space for other uses and drives down overhead costs.

Reduced Lead and Construction Times: If equipment in the ATS system in Figure 8 were purchased separately, an engineer or designer would have to develop installation details and directions. In addition, the equipment may have to be purchased through separate channels, multiplying the effort required to procure. Installation may also require technicians from separate service providers. A unified solution from a single manufacturer streamlines equipment design, procurement, and installation because all the related services can be undertaken through a single source. This can save time and reduce costs for installing for critical power equipment.

Reduced Installation Labor: When power equipment components are integrated into a transfer switch or transfer switch lineup, installation is simplified because components are installed in frames prior to shipment. As a result, the populated equipment sections are installed onsite and factory-supplied and factory-terminated power cables and control wiring are used to efficiently connect them. The resulting reduction in labor translates to reduced installation costs.

Lower Overall Installed Cost: Many custom-engineered transfer switching solutions provide all the necessary power equipment at a lower initial cost than separately purchased and installed equipment. Because pre-installation tasks are streamlined and installations costs are reduced, integrated solutions typically cost less than installing separate power devices.

Enhanced Quality Control: Because the equipment is factory-assembled and provided as a single deliverable, most equipment sections and their components will be tested at the factory, where problems can be corrected prior to shipment to the job site.

SUMMARY

Transfer switches can be customized to add features and consolidate equipment. Integrating normally separate equipment into a transfer switch or transfer switch lineup reduces the space, time, and cost of providing backup power to a facility. Examples of value-added features include the use of bus riser to connect transfer switches to circuits, integrated distribution breakers, power meters, and utility instrument compartments.

Because a wide-range of features can be designed into custom transfer switches, they can provide features and functions that exactly match customer and application needs. Because transfer switch lineups are delivered as a single product, their use typically enhances project quality while reducing lead and construction times, installation labor, and overall cost. Because they are obtained from a single source, they can streamline the procurement of maintenance and repair services. Qualified manufacturers can provide custom features that increase the value of their equipment and should be consulted to assess whether customization could add value to a specific project.

For related reading, see:

Transferring Motor Loads Between Power Sources
Transferring Loads with Zero Power Interruption
When to Separately Ground a Backup Generator

For transfer switch information, see the Transfer Switch Overview on ASCO's *Transfer Switch Webpage*.

For transfer switch support, contact the *ASCO Customer Care Team*.

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