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The Emergency Lighting Experts

WHITEPAPER

EMERGENCY LIGHTING TRANSFER SWITCHES

The Complete Guide to UL924 & UL1008

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INTRODUCTION

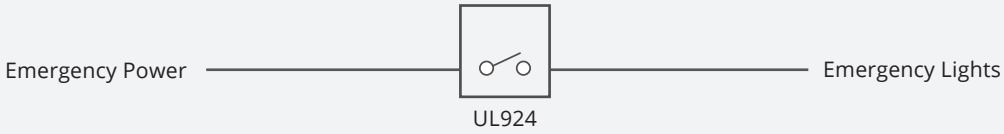
Emergency lighting transfer switches enable general illumination lighting fixtures to act as emergency lighting fixtures when an emergency power source is available. These devices sense normal power and automatically connect the emergency power source to its lighting loads during a power outage.

The National Electrical Code recognizes two different types of emergency lighting transfer devices: UL1008 and UL924 devices. Changes in the 2017 version of the NEC code have caused much confusion related to the applications and requirements for these devices. **This document will clarify the differences between these devices and highlight how these devices may be used to create NEC compliant solutions.**

UL924 - AUTOMATIC LOAD CONTROL RELAYS (ALCR)

UL924 type devices are simple, cost effective devices that are constantly connected “Normally On” emergency power to a lighting load when the device senses that non-emergency power has gone out. They key to understanding an ALCR is to understand that it **does not transfer power between two sources, it shunts around a control to force a light into the on state.** There are versions available that can be installed in conjunction with 0-10V/DALI loads.

UL924 TRANSFER SWITCH



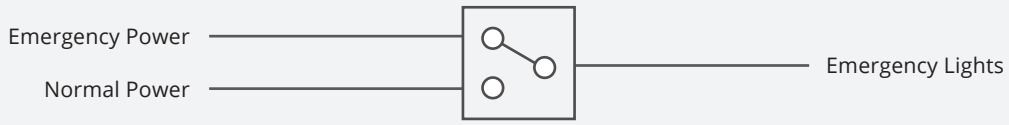
DIMMING & ADDITIONAL FEATURES

An ALCR device may be used with line voltage dimmers, provided that all dimmed lights are intended to be emergency lights. In the case where a subset of the line-voltage dimmed lights are to be considered emergency lights, a UL1008 device must be used. See example 4A and 4B. Additionally, UL924 products may be furnished with additional features such as 0-10V/DALI dimming interfaces as well as fire alarm inputs.

UL1008 - BRANCH CIRCUIT EMERGENCY LIGHTING TRANSFER SWITCH (BCELTS)

UL1008 type devices are more complex devices that have connections to both normal power and emergency power. The BCELTS switches the controlled output between the normal power and emergency power, thus fulfilling the role of a transfer switch. The added cost of a UL1008 transfer switch is due to the testing regime required to safely and reliable switch between 2 non-synchronized power sources.

UL1008 TRANSFER SWITCH



INSTALLATION CONSIDERATIONS

Because of the complexity of design, there are over current devices and protection circuits that may need to be replaced, it is important to mount a BCELTS device in a location which is easily accessed.

NEC CHANGES / CLARIFICATIONS

The governing code which we shall reference is the NEC, part of the National Fire Protection Agency Article 70. The NEC covering emergency lighting is Article 700, sections 4 and 5. These codes are revised every three years and, as of this writing, the latest is 2017. Changes made to the 2017 code specific to transfer devices was the further definition of the Branch Circuit Emergency Lighting Transfer Switch (BCELTS). Earlier revisions of the NEC had already contained definition and use of the automatic load control relay (ALCR) for emergency lighting. The latest 2017 revisions further clarify the difference between the two and set requirements for the use of each type.

The following excerpts are taken from the 2017 NEC code and include clarification between BCELTS and ALCR and commentary text:

NEC SECTION 700.25: BRANCH CIRCUIT EMERGENCY LIGHTING TRANSFER SWITCH

Emergency lighting loads supplied by branch circuits rated at not greater than 20 amperes shall be permitted to be transferred from the normal branch circuit to an emergency branch circuit using a listed branch circuit emergency lighting transfer switch. The mechanically held requirement of 700.5(C) shall not apply to listed branch circuit emergency lighting transfer switches. (New for 2017)

NEC SECTION 700.26 AUTOMATIC LOAD CONTROL RELAY

If an emergency lighting load is automatically energized upon loss of the normal supply, a listed automatic load control relay shall be permitted to energize the load. The load control relay shall not be used as transfer equipment. (Existing prior to and included in 2017)

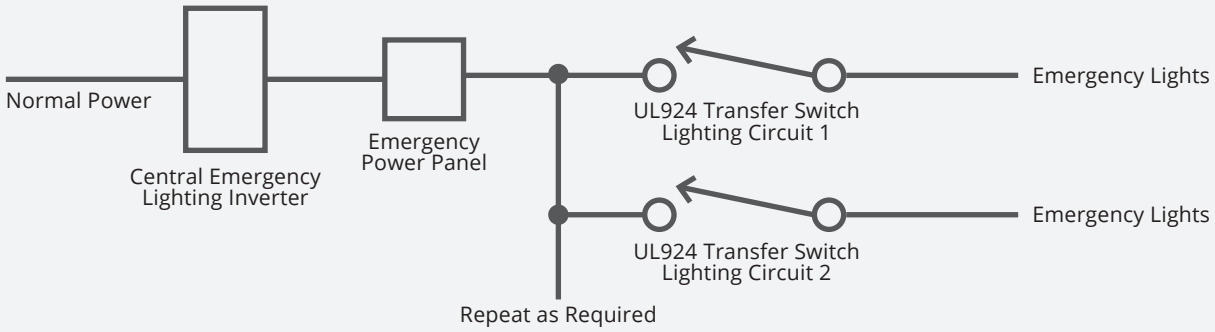
NEC COMMENTARY TEXT

Automatic load control relays were traditionally part of emergency unit equipment, but stand-alone devices are now listed under ANSI/UL 924, Standards for Emergency Lighting and Power Equipment. Proper application of these devices depends upon their function in an emergency circuit. Load control relays listed to UL 924 are not to be used to transfer a load between two non-synchronous power sources: only transfer equipment listed to UL 1008 is suitable for this application. These power sources might be out of phase with one another. Load control relays do not have the mechanisms required by UL 1008 to prevent inadvertent connection of the normal and emergency sources, and they do not undergo the fault-current evaluation that is required of UL 1008 for transfer switches

EXAMPLES TO ILLUSTRATE DIFFERENT EMERGENCY LIGHTING DESIGNS:

EXAMPLE 1: UL1008 TRANSFER SWITCH WITH BUILDING GENERATOR & DOWN-STREAM UL924 TRANSFER SWITCHES

In this example, the UL 1008 transfer switch would be very large (200A or greater) and would reside in the main electrical room of a building or next to the generator. When normal power is lost, the generator spins up to speed and the UL 1008 switch is then transferred from normal power to emergency power. It is noteworthy to add that this process may take too long in many cases due to the generator size as the building code requires emergency lights to come on within 10 seconds (NEC Article 700.12). Generator solutions are generally reserved for large installations which use whole building generators capable of providing power for extended power outages.



Example 1 is a cost-effective way to achieve code compliance. The arrangement of a single UL1008 device with several UL924 devices means that the UL1008 device performs the transfer of normal power to emergency power while the UL924 devices shunt the loads in the on state. Also note that the emergency lights in this example may also be 0-10V/ DALI dimmed loads when utilized with a UL924 device that incorporates a dimming interface.

EXAMPLE 2: EMERGENCY LIGHTING CENTRAL INVERTER WITH DOWN-STREAM UL924 TRANSFER SWITCHES

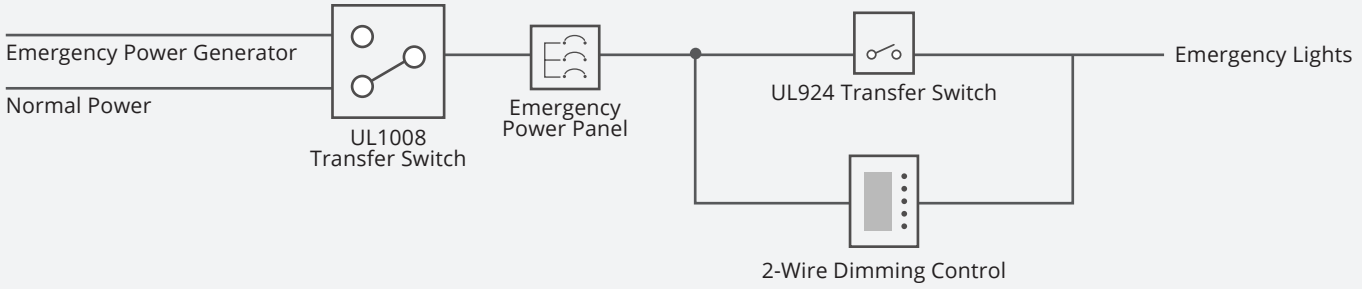
For many applications, a central inverter may be preferred due to the cost, maintenance and convenience of the installation. The central inverter contains all of the necessary provisions to charge its internal batteries, sense incoming power and energize (discharge the batteries) when normal power is lost. This example may be the most cost- effective solution for small- to mid-sized sites where there are several zones that must be controlled.

Operation:

In Example 2, the inverter's output would be permanently energized , considered "normally on." The output then feeds the input to the UL 924 relay so that the emergency lighting load current is always provided by the inverter. The normal power for the UL 924 device is simply a sense line which causes the UL 924-style relay to close.

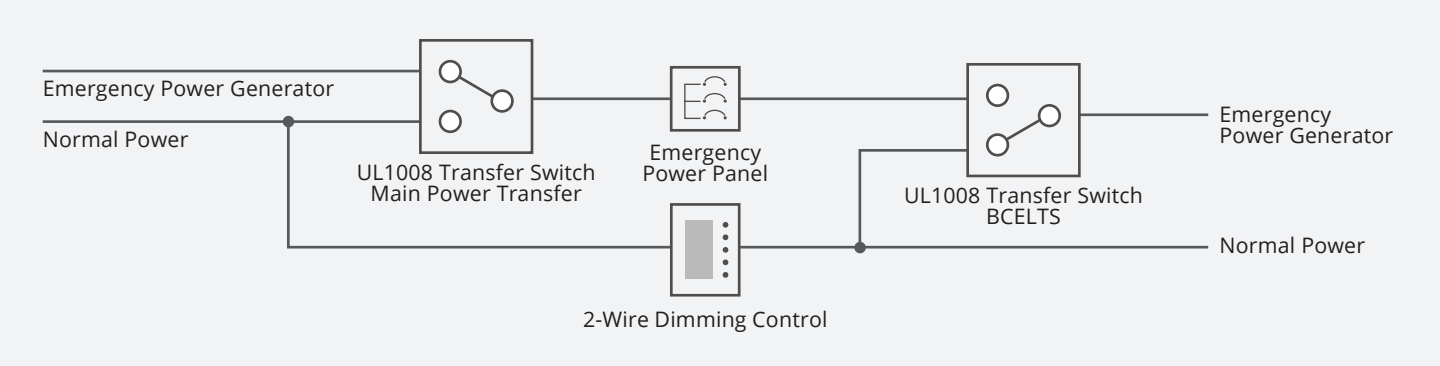
Example 2 is fully code compliant to the latest NEC 2017 standard since the UL 924 switch does not transfer between two non-synchronous sources. All of the elements of the transference of power between normal power and emergency power are handled internal to the central inverter. The inverters' output carries all the load current of the emergency lights in normal mode and emergency mode. The UL 924 device simply turns the lights on and off by sensing loss of normal power.

EXAMPLE 3A: UL1008 TRANSFER SWITCH WITH LINE VOLTAGE DIMMING & DOWN-STREAM UL924 ALCR



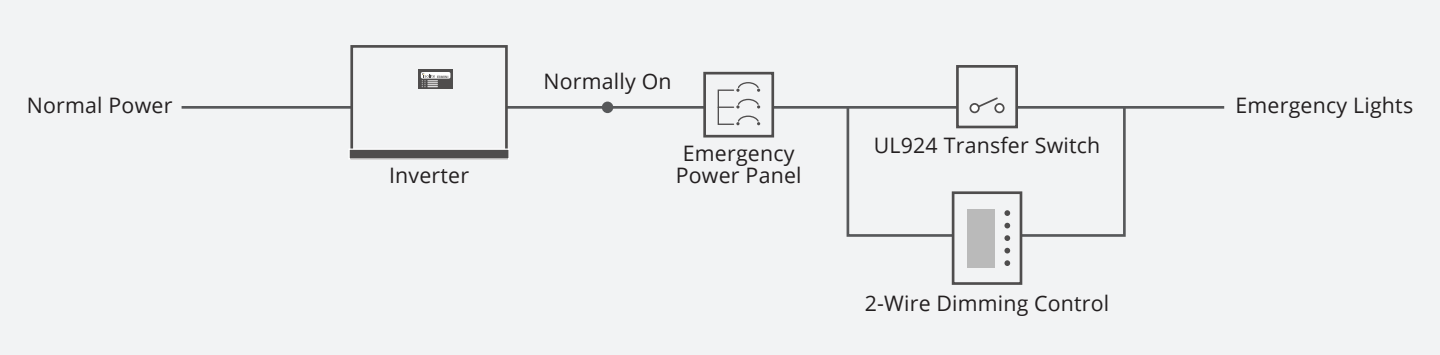
When an upstream 1008 transfer device is utilized to transfer between normal and emergency power, a downstream UL924 device may be used so long as the entire controlled zone is intended to be on during an emergency. If only a subset of the loads in the zone are to fulfill emergency functionality, see example 3B.

EXAMPLE 3B: UL1008 TRANSFER SWITCH WITH LINE VOLTAGE DIMMING & DOWN-STREAM UL1008 BCELTS



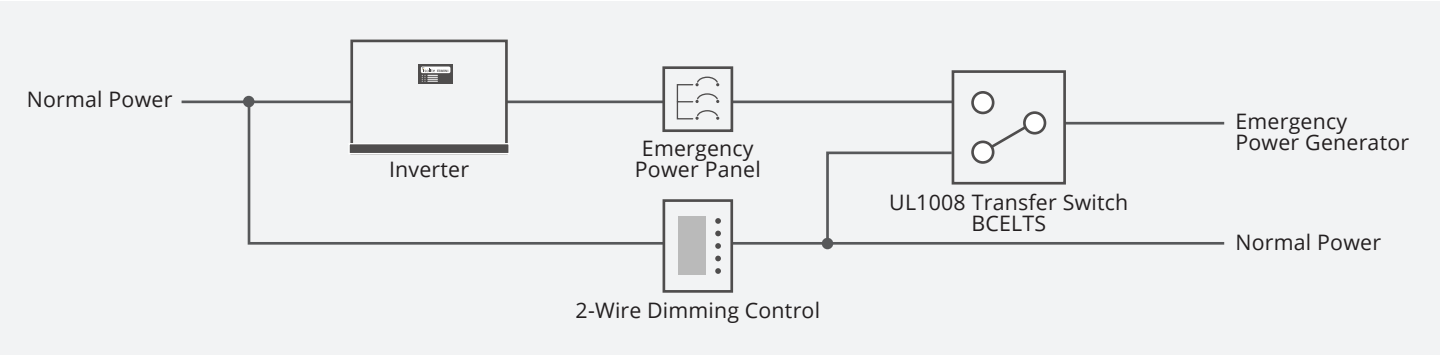
A more common scenario for deploying emergency lighting in the presence of line voltage dimming is to have only a subset of the controlled zone transfer to full on during an emergency. In this situation a UL1008 device must be used in order to facilitate the transfer to emergency power.

EXAMPLE 3C: CENTRALIZED INVERTER WITH DOWN-STREAM UL924 DEVICE



As in example 3A, a UL924 device may be used to facilitate a transfer to emergency levels when utilizing an upstream centralized inverter; no UL1008 device is required in this situation. Do note that the sense wires on the UL924 device must be connected to normal power, not the normally on output from the inverter.

EXAMPLE 3D: CENTRALIZED INVERTER WITH DOWN-STREAM UL1008 DEVICE



As described in example 3C, an inverter may take the place of a UL1008 device to facilitate the transfer between normal and emergency power. In situations where not all controlled lights are intended to be used for emergency lighting, a UL1008 still must be used to facilitate the transfer into emergency mode. All examples (3A, 3B, 3C, 3D) are fully NEC compliant.

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