

Electrical Connectors Commonly Used in Theatrical Lighting



Introduction

Stage lighting and other electrical applications in theatre have specific needs and standards of operation.

In this article, we will examine four common connectors used in theatre.

Types of Common Connectors

Stage Pin – also known as 2P&G , “Bates”, Union Connector, or 3 Pin



Parallel Blade Grounded Connector – also known as Edison, NEMA 5-15, FUG, MUG, PBG or Straight Blade



Twistlock Connector- also known as L5-20, L6-20, L6-15 or NEMA 5-20



PowerCon- also known as True1, Neutrik, NL4



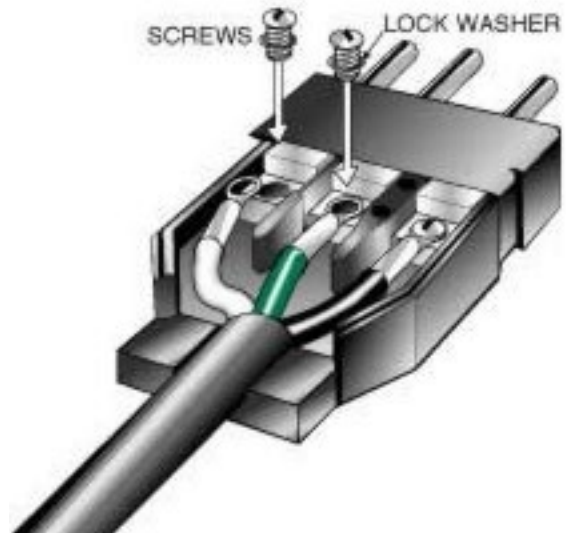
Wiring and Safety

In each of the connectors you will have:

A connection for the ground wire (Green)

A connection for the neutral wire (White)

A connection for the hot wire (Black)



SAFETY NOTE: The connections look different in each of the connectors so be certain you understand where the wires go if you are called upon to re-wire one.

On Stage Pin connectors, ground is the center pin, neutral to the left and hot on the right (sometimes, they are labeled)
In L6-20s the ground has a green screw but there is no indication where the hot wire goes. It is attached to the screw attached to the brass blade.

On Edison plugs, the ground is the pin, the hot is the narrow blade and the neutral is the wider blade.

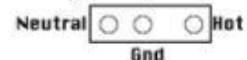
They are all rated for 120 Volts and 20 Amps

Hot, Neutral, and Ground in Common Connectors

In USA the common colors associated with wiring is;

Hot-Black
Neutral-White
Ground-Green

Stage Pin, 2P&G



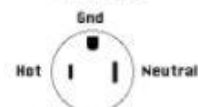
Stage Pin Connector
1 Pole, 3 Wire, 20 Amps

L5-20



L5-20 125 Volt
1 Pole, 3 Wire, 20 Amps
(Receptacle shown)

Edison



5-20 125 Volt
1 Pole, 3 Wire, 20 Amps
(Receptacle shown)

Common Connector Usage

Connector type is an option when choosing and installing a lighting system, so unless you are currently in the process of purchasing your lighting system, the choice has already been made for you. The decision as to the type of connector was made by the designer of your lighting system. If you are working with an existing lighting system, your lights were outfitted with connectors when they were purchased. You are likely to have Stage Pin (2 P & G), Twist Lock (LS-20) or perhaps, Parallel Blade Grounded Connector (Edison).

In conventional lighting systems, your lights are connected to dimmers with intensity controlled from your light board. However, newer lighting technologies like arc source lights and LEDs (multi parameter fixtures) use constant power (relays). It is common to see them powered using an adapter and then daisy chained via PowerCONs.

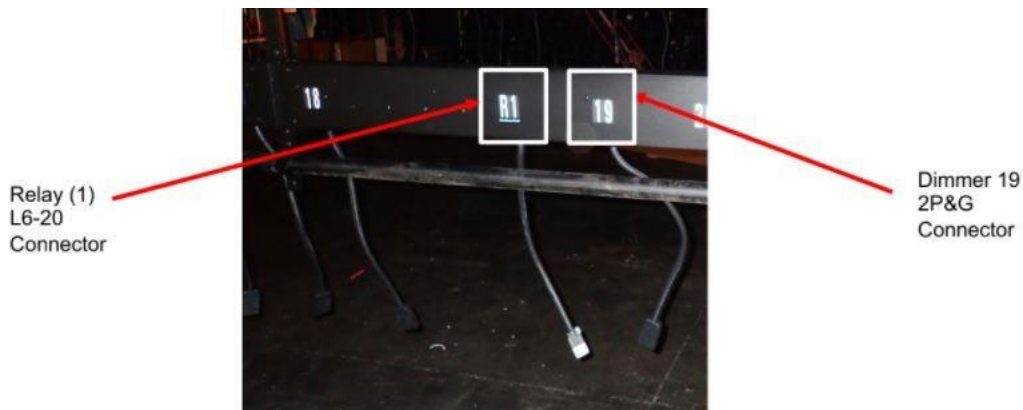
Adapter



PowerCONs



If you have a newer lighting system (less than 12 years old) it is possible that it was outfitted with some circuits designated as constants (Relays). The plug is often a Parallel Blade Grounded Connector but could be any of the common 20 amp plugs. (less likely a powerCON). Relays provide constant power required of multi-parameter fixtures. **IMPORTANT: you should never connect a multi-parameter fixture to a dimmer circuit.**



Relevant Industry Codes

ANSI E1.15 - 2006(R2011): Recommended Practices and Guidelines for the Assembly and Use of Theatrical Boom & Base Assemblies

ANSI E1.32 - 2012: Guide for the Inspection of Entertainment Incandescent Lamp Luminaries

ANSI E1.36 - 2007(R2012): Model Procedure for Permitting the Use of Tungsten-Halogen Incandescent Lamps and Stage and Studio Luminaires in Vendor Exhibit Booths in Convention and Trade Show Exhibition Halls

OSHA Standard Number 1926 Subpart K "Electrical"

Links and Resources

In spring of 2020, EdTA and USITT partnered on the creation and publication of an exam for technical theatre students, called the BACKstage Exam. This resource page on the USITT site offers more lighting and connector resources: <https://www.usitt.org/backstage#LE1>

All ANSI documents are available for free download at www.esta.org (Technical Standards Program)

Image Credits

Thank you to Lex Industries for use of the cable images.

About the Authors

Kristi Ross-Clausen is an AV & Theatre tech writer, speaker and teacher as well as a theatre safety advocate.

William "Donny" Covington is the Technical Theatre Director for Richardson High School in Richardson, Texas, and an instructor in the Technical Theatre Magnet Program.

Charles Crews is the Director of Technical Theatre at the Richardson Independent School District in Garland, Texas.

Mitchell Critel is an Assistant Professor of Theatre Design and Technology and Production Manager and Technical Director for the University of Evansville.

Weston Keifer is the Technical Director at the Robinson Fine Arts Center in the Plano Independent School District, Plano, Texas.

Dana Taylor is an adjunct faculty member for theatre and music at the University of Evansville.

Christopher Treviño is the Technical Services Associate, Arts and Humanities for the University of Texas, Dallas