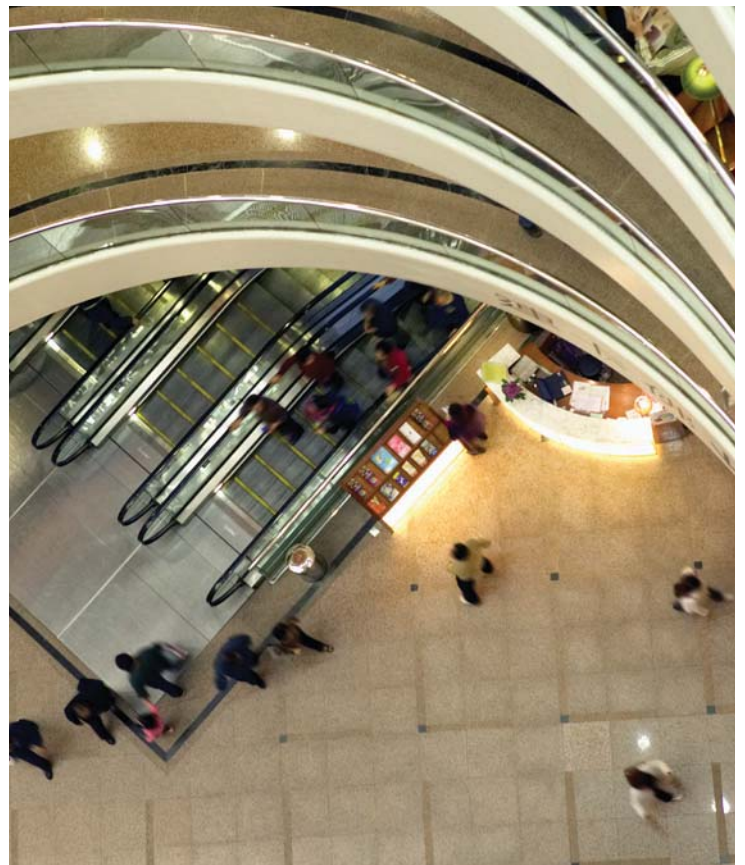
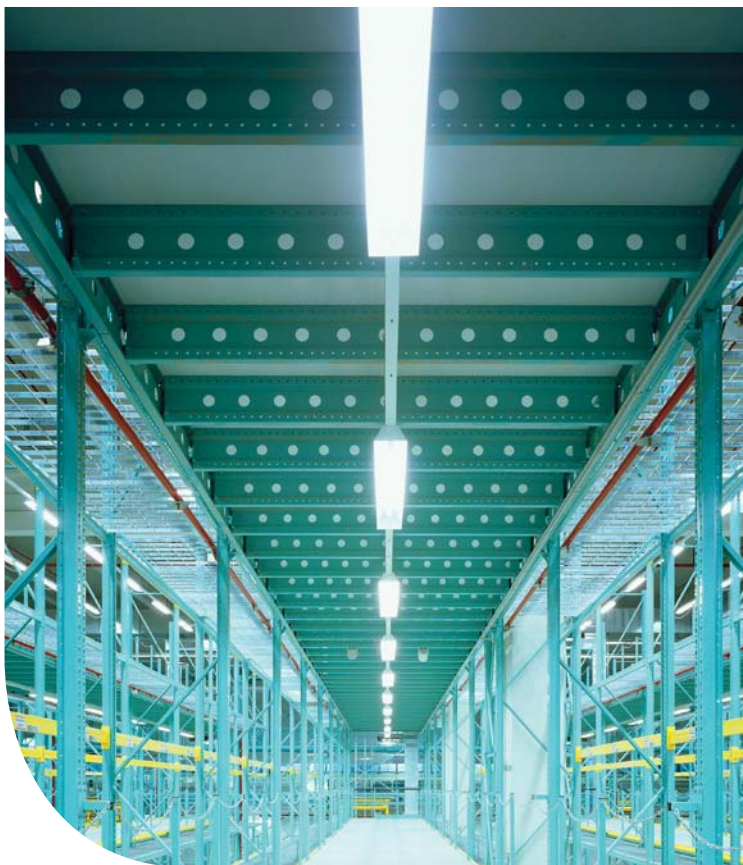
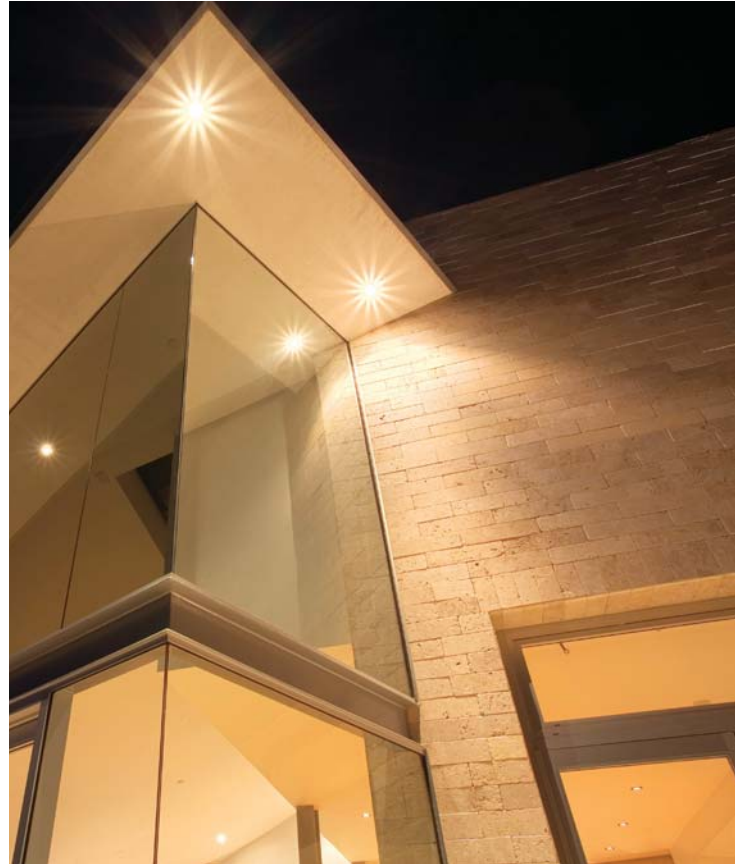


Smart Products. Ingenious Solutions.

Wiring Devices, Energy Management
Solutions and Commercial Data
Infrastructure Products

L-200





Technical Information

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INDUSTRY STANDARDS, RELEVANT DEFINITIONS, PERTINENT PRODUCT DATA, REPRESENTATIVE DIMENSIONAL DRAWINGS AND GENERAL PRODUCT REFERENCES ARE INCLUDED IN THIS SECTION.

List of Abbreviations used in Leviton Catalogs

ANSI — American National Standards Institute, Inc.
25 West 43rd St., New York, NY 10036
www.ansi.org

An independent organization that identifies industrial and public requirements for national consensus standards and coordinates and manages their development, resolves national standards problems, and ensures effective participation in international standardization. Various U.S. Government Agencies often adopt ANSI Standards. For example, the Department of Defense has made mandatory the use of ANSI Standard Y32.9-1972, "Graphic Symbols for Electrical Wiring and Layout Diagrams used in Architecture and Building Construction." Such Standards are often developed by specialized technical societies for ANSI. The Standard referred to above was prepared by the Institute of Electrical and Electronics Engineers (IEEE) and the American Society of Mechanical Engineers (ASME).

CSA International —
Montreal, QC, Canada; Cleveland, OH; Los Angeles, CA
www.csa-international.org

CSA International is a leading provider of product testing and certification services. "We test products for compliance to national and international standards, and issue certification marks for qualified products. Certification marks tell potential customers and users that a product has been evaluated by a formal process — involving examination, testing and follow-up inspection — and that it complies with applicable standards for safety and performance. CSA International is accredited by the Occupational Health and Safety Administration (OSHA) as a Nationally Recognized Testing Laboratory (NRTL). In Canada CSA International is accredited as a Certification Organization (CO) and as a Testing Organization (TO) by the Standards Council of Canada (SCC).

GSA — General Services Administration Federal Supply Service
1800 F Street NW, Washington, D.C. 20406
www.gsa.org

The U.S. Government administration responsible for the approval of Federal Specifications used in the purchase of products by all Federal Agencies.

The two most relevant Federal Specifications for Electrical Wiring Devices are:

W-C-596, for Electrical Power Connector, Plug, Receptacle and Cable Outlet

W-S-896, for Toggle and Lock, Flush Mounted Switches

Leviton devices that comply with these specifications, as verified by Underwriters Laboratories Inc., are also listed in this catalog.

NEC — National Electrical Code
Published by the NFPA (see listing)

The purpose of the Code is the practical safeguarding of persons and property from hazards arising from the use of electricity. This Code is sponsored by NFPA under the auspices of ANSI. It is revised every three years. OSHA (see listing) has adopted the NEC as the code to follow in order to comply with OSHA requirements.

NEMA — National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752, Rosslyn, VA 22209
www.nema.org

An organization of electrical manufacturers that establishes standards for manufacture and tests for performance and reliability of electrical products. NEMA tests are often the basis or prerequisite for approval by the Federal Government and/or by Underwriters Laboratories, Inc.

NFPA — National Fire Protection Association
1 Battery March Park, Quincy, MA 02269
www.nfpa.org

An organization devoted to promoting the science and improving the methods of Fire Protection. Membership is open to anyone interested. Every three years, the NFPA produces a new edition of the NEC (see listing). The NFPA also provides many other useful publications dealing with fire prevention.

OSHA — Occupational Safety and Health Administration
(U.S. Department of Labor), 200 Constitution Ave.
Washington D.C. 20210
www.osha.org

That part of the U.S. Department of Labor responsible for assuring that employers provide safe and healthful working conditions and equipment for employees, and that employees properly avail themselves of these conditions. In addition to specific regulations published in the Federal Register, OSHA has also adopted the National Electrical Code in part for existing installations and equipment and completely for new construction.

Note: OSHA does not approve products. Compliance with OSHA regulations is contingent on two factors: The approval or listing of the product by an authorized testing laboratory, such as UL (see listing), and the proper installation and/or use of the product in accordance with OSHA guidelines.

UL — Underwriters Laboratories Inc.
Northbrook, IL; Melville, NY; Santa Clara, CA
www.ul.com

"An independent, not-for-profit organization testing for public safety." Tests by UL are the basis for acceptance by various government agencies. Listing by UL denotes initial testing and periodic retesting to assure continuing conformance to standards.

NOM — Norma Official Mexicana
(Mexican Official Standard) SECOFI
Avenida Puent de Tecamachalco #6
Col. Lomas de Tecamachalco 53950
Naucalpan, Edomex Mexico

INDUSTRY STANDARDS FOR ELECTRICAL WIRING DEVICES — National Electrical Code Requirements for Wiring Devices

National Electrical Code NFPA No. 70-1996 (Selected Articles)

Article 90 — Introduction

Article 100 — Definitions

Article 110 — Requirements for Electrical Installations

110-18	Arcing Parts
110-21	Marking

Article 200 — Use and Identification of Grounded Conductors

200-9	Means of Identification of Terminals
200-10	Identification of Terminals

Article 210 — Branch Circuits

210-4	Multiwire Branch Circuits
210-6	Branch Circuit Voltage Limitations
210-7	Receptacles and Cord Connectors
210-8	Ground Fault Protection for Personnel
210-21	Outlet Devices
210-24	Branch Circuit Requirements
210-50	Required Outlets, General
210-52	Dwelling Unit Receptacle Outlets
210-60	Guest Rooms
210-63	Rooftop Heating, Air Conditioning and Refrigeration Equipment Outlet
210-70	Lighting Outlets Required

Article 220 — Branch Circuit, Feeder and Service Calculations

220-4	Branch Circuits Required
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Article 250 — Grounding

250-45	Equipment Connected by Cord and Plug
250-50	Equipment Grounding Conductor Connections
250-51	Effective Grounding Path
250-59	Cord and Plug Connected Equipment
250-74	Connecting Receptacle Grounding Terminal to Box

Article 310 — Conductors for General Wiring

310-15	Ampacities
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Article 380 — Switches

380-1	Scope
380-2	Switch Connections
380-8	Accessibility and Grouping
380-9	Faceplates for Flush-Mounted Snap Switches
380-14	Rating and Use of Snap Switches
380-15	Marking

Article 410 — Lighting Fixtures, Lampholders, Lamps, Receptacles

410-29	Cord-Connected Showcases
410-56	Receptacles, Cord Connectors and Attachment Plugs
410-57	Receptacles in Damp or Wet Locations
410-58	Grounding-Type Receptacles, Adapters, Cord Connectors and Attachment Plugs

Article 422 — Appliances

422-22	Disconnection of Cord- and Plug-Connected Appliances
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Article 511 — Commercial Garages, Repair and Storage

511-10	Ground Fault Circuit Interrupter Protection for Personnel
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Article 517 — Health Care Facilities

517-3	Definitions
517-12	Wiring Methods
517-13	Grounding of Receptacles and Fixed Electric Equipment
517-16	Receptacles with Insulated Grounding Terminals
517-18	General Care Areas
517-19	Critical Care Areas
517-19(e)	Additional Protective Techniques
517-20	Wet Locations
517-21	Ground Fault Circuit Interrupter Protection for Personnel
517-31	Emergency System
517-44	Sources of Power
517-61	Wiring and Equipment
	(a) Within Hazardous (Classified) Anesthetizing Locations
	(b) Above Hazardous (Classified) Anesthetizing Locations
	(c) Other-Than-Hazardous (Classified) Anesthetizing Locations
517-62	Grounding
517-64	Low-Voltage Equipment and Instruments

Article 518 — Places of Assembly

518-3(b)	Temporary Wiring Receptacles
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Article 550 — Mobile Homes and Mobile Home Parks

550-5(c)	Attachment Plug Cap
550-8	Receptacle Outlets

Article 555 — Marinas and Boatyards

555-3	Receptacles
555-7	Grounding

Article 625 — Electrical Vehicle Charging System Equipment

625-22	(New Article) GFCI Protection for Cord- and Plug-Connected Electric Vehicle Supply Equipment
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Article 680 — Swimming Pools, Fountains and Similar Installations

680-4	Definitions
680-5	Transformers and Ground Fault Circuit Interrupters
680-6(a)	Receptacles
680-6(b)	Lighting Fixtures, Lighting Outlets, Switching Devices and Ceiling Fans
680-7	Cord- and Plug-Connected Equipment
680-40	Outdoor Installations
680-41	Indoor Installations
680-51	Lighting Fixtures, Submersible Pumps and Other Submersible Equipment
680-62	Cord- and Plug-Connected Equipment
680-62	Therapeutic Tubs (Hydrotherapeutic Tanks)
680-62(a)	Ground Fault Circuit Interrupter
680-62(c)	Methods of Bonding

ASSOCIATIONS, ORGANIZATIONS AND STANDARDS

The following listings define the common acronyms used for a variety of organizations.

Standards Development Organizations

Primarily involved in the development and/or promulgation of standards

NFPA	National Fire Protection Agency
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
ANSI	American National Standards Institute
CANENA	Consejo de Armonizacion de Normas Electrotecnicas de Norte America (Council for Harmonization of Electrotechnical Standardization of North America)
SAE	Society of Automotive Engineers
ISA	Instrument Society of America
SME	Society of Manufacturing Engineers
ISO	International Standards Organization
ASME	American Society of Mechanical Engineers

Codes and Standards

Installation codes and product safety, performance and interchangeability standards.

NEC	National Electrical Code
NOM	Normas Oficiales de Mexicanas (Official Mexican Standard)
NMX	Normas Mexicanas
CEC	Canadian Electrical Code
CEE	European Electrotechnical Committee

Industry Associations

For the purpose of standardization, trade, and professional development, etc.

NMDA	National Marine Distributor Association
NEMA	National Electrical Manufacturers Association
ABYC	American Boat and Yacht Council
EIA/TIA	Electronics Industry Association/ Telecommunications Industry Association
NAED	National Association of Electrical Distributors
NAW	National Association of Wholesalers
BICISI	Building Industry Consulting Services International
IBI	Intelligent Building Institute
EPRI	Electric Power Research Institute
NEMRA	National Electrical Manufacturers Representative Association
IAEI	International Association of Electrical Inspectors
IFMA	International Facilities Management Association
BOMA	Building Owners Management Association
SEMI	Semi-Conductor Equipment and Material International
CEMRA	Canadian Electrical Manufacturers Representatives Association
NMRA	National Marine Representative Association
EFI	Electro-Federation Incorporated
NECA	National Electrical Contractors Association
IECA	Independent Electrical Contractors Association
ECOC	Electrical Contractors of Canada
CANAME	Camara Nacional de Manufacturas Electricas (Mexico)

Certification Agencies

Primarily involved in certification of products or manufacturers to standards developed by the certification agency or by others.

UL	Underwriters Laboratories Inc.
CSA	Canadian Standards Association
ANCE	National Association of Normalization and Certification of the Electrical Sector (Mexico)
TUV	TUV Rheinland of N.A., Inc.
VDE	Verband Deutscher Elektrotechniker (Germany)
BSI	British Standards Institute
FM	Factory Manual

NRTL	National Recognized Testing Laboratories
OSHA	Occupational Safety and Health Administration
FCC	Federal Communications Commission
DESC	Defense Electronic Supply Center
IAPA	Independent Accident and Protection Association (Canada)
CE	European Compliance (This is not a certification agency, but CE is the European Compliance Mark)
ETL	ETL Testing Laboratories

California Energy Commission (CEC) Title 24 Energy Efficiency Standards

www.energy.ca.gov/title24

Recognizing the need to reduce the state's energy consumption, the CEC established in 1978 tough energy efficiency standards for residential and nonresidential buildings in California. The Title 24 standards are updated periodically to incorporate new energy efficiency technologies, with 2008 standards in effect January 1, 2010. Title 24 provisions are important guidelines for energy conservation in any state.

New Single and Low-Rise Residential Structures (2008 Standard):

Bathroom, attached and detached garage, laundry room, utility room in single residences as well as lighting in common areas of low-rise residential buildings with four or more dwelling units must be from high efficacy lighting (fluorescent, compact fluorescent or high intensity (HID) lamps:

- All installed lighting must be high efficacy, or controlled by a vacancy sensor certified to CEC

For all other rooms (Any room that is not a Kitchen, Bathroom, Garage, Laundry Room, or Utility Room):

- All hardwired lighting must be high efficacy, or controlled by a vacancy sensor, or controlled by a dimmer
- All outdoor lighting attached to buildings must be high efficacy, or controlled by a motion sensor in addition to one of the following methods:
- Photocontrol not having an override or bypass switch, or Astronomical time clock not having an override or bypass switch, or Energy management control system (EMCS) not having an override or bypass switch that allows the luminaire to be always on.

Leviton Residential CEC compliant products:

IPP15 Manual-On Occupancy Sensor

OSS10 Manual-On Occupancy Sensor with nightlight

Nonresidential Buildings (2008 Standard):

- Occupant Sensors, Motion Sensors, and Vacancy Sensors...and shall have a visible status signal that indicates the device is operating properly or has failed. Visible status signal may have override switch that turns the signal off.
- Multi-Level Lighting Controls...shall have at least one control step that is between 30% and 70%...allow the power of all lights to be manually turned off.
- Shut-off Controls...Occupancy sensor required as compliance method for: Offices \leq 250 sq ft; Multipurpose room $<$ 1000 sq ft; Classrooms any size; Conference rooms any size...Shall allow lights to be manually shut off regardless of sensor status.
- Demand Responsive Lighting Controls... Retail buildings with sales floor areas $>$ 50,000 sq ft: Require automatic demand responsive lighting controls; uniformly reduce lighting power consumption \geq 15%; EXCEPTION: Buildings where $>$ 50% lighting power controlled by daylighting controls.
- PAF- Multi-Level Occupancy Sensor...shall 1st stage activate 30-70% of lighting power

Leviton Nonresidential CEC compliant products:

WSC04/WSC15 LevNet RF™ Wireless Self-Powered PIR Occupancy Sensor.

OSCxx-MOW Multi-Tech Ceiling Mount Occupancy Sensors

ODC05 Self-Contained Ceiling Mount Occupancy Sensors

For more Title 24 compliant products, see Energy Management Section

EUROPEAN AGENCIES: IEC AND CEE

The IEC

The IEC is the International Electrotechnical Commission. Formed in 1906, it is a worldwide organization primarily involved in the international standardization of electrical standards and equipment. As of 1994, 48 countries are represented in the IEC. IEC member countries produce and consume the majority of the world's electrical energy. They also manufacture and use the majority of the world's electrical products.

The IEC works towards standardization of the following areas:

- Universal technical language; including definitions, and electrical symbols
- Systems for ratings, testing requirements and methods of testing
- Electrical system characteristics; including voltages, frequencies and tolerances
- Dimensional requirements and tolerances
- Universal electrical safety requirements

The CEE









The CEE is the European Electrotechnical Committee. The CEE works on safety standards, definitions for conformity and certifications for electrical equipment. Cooperation between the CEE and the IEC has led to worldwide publications for standards pertaining to electrical equipment.

CERTIFICATION AND MARKINGS

Certification marks indicate a product has been tested to the requirements of a specific certification agency. Manufacturers may choose a particular product identity (e.g. Specification Grade) even though no outside certification agency is involved. The following table illustrates the variety of certification markings typically used for 15A and 20A Straight Blade Receptacles.

Typical Product Certification Marks —

15 & 20 Amp Straight Blade Receptacles. Products with these markings must meet the specific testing standards indicated.

Certification Mark	UL498	CSA, C22.2, No. 42M	UL 498 Hospital Grade	CSA, C22.2, No. 42M, Hosp. Grade	DESC W-C-596F	Certification Agency
Spec Grade*	No Product Testing Required — Manufacturer's Term Only					Manufacturer Only
	X	X				
	X					Underwriters Laboratories Inc. Recognized Component for OEM use.
	X					Underwriters Laboratories Inc.
		X				Canadian Standards Association
	X		X			Underwriters Laboratories Inc.
		X		X		Canadian Standards Association
	X				X	Underwriters Laboratories Inc. and Defense Electronic Supply Center
	X		X		X	Underwriters Laboratories Inc. and Defense Electronic Supply Center

*Includes variations such as Industrial Spec. Grade, Premium Spec. Grade, etc.

NOTE: The C-UL listing mark is applied to products for the Canadian market evaluated by UL to Canadian safety standards. The C-UL US listing mark indicates compliance with both U. S. and Canadian safety standards.

Cross References/Related Products

The cross-reference guides supplied by manufacturers are convenient for determining compatible devices but they are not official confirmation of compliance to any standard or testing criteria. Similarly, common catalog numbers used by different manufacturers in no way imply compliance to any standard or testing criteria.

UL, CSA AND NEMA STANDARDS PERTAINING TO LEVITON DEVICES

UL Standards Pertaining to Leviton Devices

UL20	General-use switches
UL50	Enclosures for electrical equipment
UL94	Flammability testing for materials
UL486E	Equipment and wiring terminals
UL498	Plugs, connectors, receptacles, inlets, outlets, taps and adapters
UL508	Industrial equipment (including motor control switches)
UL514A	Metallic boxes/covers/wallplates
UL514C	Non-metallic boxes/covers/wallplates
UL817	Cordsets
UL943	GFCI's
UL1363	Temporary power taps
UL1436	Outlet circuit testers
UL1449	Surge suppression devices
UL1567	Switches and receptacles used with AL wire
UL1682 & 1686	Pin & Sleeve devices
UL1776	High-pressure cleaning equipment
FSWC596F	Federal Spec receptacles
FSWS896	Federal Spec switches

Note: Straight blade and locking NEMA configurations are defined by UL 1681 and NEMA WD 6.

Each UL standard consists of requirements that cover three characteristics of the product being reviewed:

1. Construction	Material properties and general design
2. Performance	Mechanical and electrical testing
3. Markings	Identification of manufacturer, applicable ratings, etc.

CSA Standards Pertaining to Leviton Devices

C22.2, No. 0.17	Polymeric materials
C22.2, No. 42	General-use receptacles, attachment plugs
C22.2, No. 55	Special-use switches
C22.2, No. 111	General-use switches
C22.2, No. 182.1	Industrial-type, special-use attachment plugs, receptacles and connectors. Pin and sleeve devices
C22.2, No. 182.2	Industrial locking type

NEMA Standards Pertaining To Leviton Devices — In Accordance With NEMA Standard WD-1

WD 1-1.01 CORD CONNECTOR
A cord connector is a portable receptacle which is provided with means for attachment to a flexible cord and which is not intended for permanent mounting.
NEMA Standard 7-13-1967

WD 1-1.02 GROUNDED CONDUCTOR (SYSTEM GROUND)
A grounded conductor is a circuit conductor (normally current carrying) which is intentionally connected to earth ground. (It is identified as the white conductor.)
NEMA Standard 7-13-1967

WD 1-1.03 GROUNDING CONDUCTOR (EQUIPMENT GROUND)
A grounding conductor is a conductor which connects noncurrent-carrying metal parts of equipment to earth ground to provide an intentional path for fault current to ground (It is bare, or, when covered, is identified as the green or green with yellow stripes conductor.) **NEMA Standard 7-13-1967**

WD 1-1.04 LAMPHOLDER
A lampholder is a device which is intended to support an electric lamp mechanically and to connect it electrically to a circuit. **NEMA Standard 7-13-1967**

WD 1-1.05 MALE BASE (INLET)
A male base is a plug which is intended for flush or surface mounting on an appliance or equipment and which serves to connect utilization equipment to a connector.
NEMA Standard 7-13-1967

WD 1-1.06 OUTLET
An outlet is a point on the wiring system at which current is taken to supply utilization equipment. **NEMA Standard 7-13-1967**

WD 1-1.07 PLUG
A plug is a device with male blades which, when inserted into a receptacle, establishes connection between the conductors of the attached flexible cord and the conductors connected to the receptacle. **NEMA Standard 7-1-1967**

WD 1-1.08 POLARIZATION (PLUGS AND RECEPTACLES)
Polarization is a means of assuring the mating of plugs and receptacles of the same rating in only the correct position. **NEMA Standard 7-1-1967**

WD 1-1.09 POLE
The term "pole" as used in designating plugs and receptacles refers to a terminal to which a circuit conductor (normally current carrying) is connected. In switches, the number of poles indicates the number of conductors being controlled. **NEMA Standard 7-1-1967**

WD 1-1.10 RECEPTACLE
A receptacle is a device with female contacts which is primarily installed at an outlet or on equipment and which is intended to establish electrical connection with an inserted plug. **NEMA Standard 7-1-1967**

WD 1-1.11 SLANT SYMBOL (/)
The "slant" line (/) as used in wiring device ratings indicates that two or more voltage potentials are present simultaneously between different terminals of a wiring device. **NEMA Standard 7-1-1967**

WD 1-1.12 SWITCH
A switch is a device for making, breaking, or changing the connections in an electric circuit.

A. Single-pole Switch (Single-pole, Single-throw)
A switch which makes or breaks the connection of one conductor.

B. Double-pole Switch (Double-pole, Single-throw)
A switch which makes or breaks the connection of two conductors of a single branch circuit.

C. Three-way Switch (Single-pole, Double-throw)
A switch which changes the connection of one conductor and which is normally used in pairs to control one utilization equipment from two locations.

D. Four-way Switch (Double-pole, Double-throw Reversing)
A form of double-pole switch which is used in conjunction with two three-way switches to control one utilization equipment from three or more locations.
NEMA Standard 7-13-1967

WD 1-1.13 TERMINAL (ON A WIRING DEVICE)
A terminal is a fixed location on a wiring device where a conductor is intended to be connected.
NEMA Standard 7-13-1967

WD 1-1.14 WIRE (PLUGS AND RECEPTACLES)
The term "wire" as used in designating plugs and receptacles indicates the number or either normally current-carrying or equipment grounding connected conductors.
NEMA Standard 7-13-1967

HIGH-ABUSE WIRING DEVICES — UL LISTED HOSPITAL GRADE

Why was it developed?

Hospital Grade Listed devices were developed to provide maximum safety in high-abuse applications where constant strenuous use of the device is common. These highest reliability devices are built to protect against possible human negligence and keep the devices safe and functional.

What are the applications for Hospital Grade, High Abuse Devices?

Rough use occurs not just in hospitals, but every place where people can't or won't be cautious with devices...the cleaning person who yanks the floor waxer plug down the hall, the mechanic who pulls the drill plug from the wall, or the child who removes the electric lawnmower plug from 40 feet away! In addition, Leviton realized that devices in rough use situations are often exposed to many corrosive liquids, such as cleaning fluids, rug shampoos, chlorinated water, sprays, salt air and chemical fumes. Our corrosion resistant devices permit use in environments where these conditions are common.

Demanding Tests for UL Hospital Grade Listing

Leviton has designed a line of wiring devices that withstand impact, wear, crushing, and corrosive environments that would destroy ordinary heavy-duty devices. Leviton's comprehensive line of Hospital Grade and Industrial Grade plugs, connectors and receptacles include devices that have passed a series of demanding UL Hospital Grade tests. This assures the end-user of top performance in the harshest industrial environments. Here are examples of how Leviton devices meet or exceed the requirements of the most rigorous testing!

Receptacles

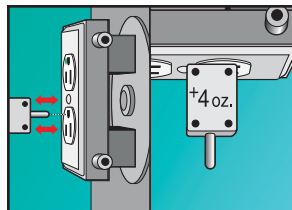
Abrupt Removal of Plug Test

A steel-bodied test plug with brass blades is inserted into the receptacle. A 10-pound weight dropped from at least 24 inches yanks the plug out of the receptacle. This test is done eight times with the receptacle rotated into different positions to create the greatest stress on its face and contact. After this, the grounding contact must retain a four ounce, 0.184" diameter grounding pin, with the receptacle face down, for one minute. "There shall be no breakage of the receptacle that interferes with the receptacle function or the integrity of the enclosure. The receptacle shall maintain the grounding path integrity through the receptacle."



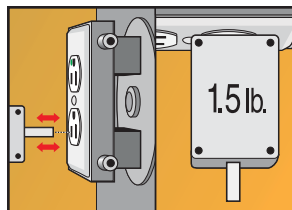
Ground Pin Test

The grounding contact of the receptacle is conditioned by 20 insertions with a 0.204" diameter oversized pin. "After conditioning, a 0.184" diameter pin shall be inserted in the grounding contact and shall be capable of supporting at least four ounces for one minute."



Power Blade Retention Test

A test plug with oversized blades of .075" is inserted into the current-carrying opening of the connector for 20 conditioning cycles. After the conditioning cycles, "the contact shall be capable of supporting for one minute 1 1/2 lbs., secured to a single .055" thick solid steel blade without holes."



Plugs and Connectors

500 lb. Crush Test

A wired plug or connector is placed between two steel plates and subjected to a force which is steadily increased to 500 pounds. "There shall be no breakage, deformation or other effect that may interfere with the function of the device." Leviton knows that in real industrial environments, plugs and connectors are crushed by forces exceeding 500 lbs. Leviton performs the crush test with force of 2500 lbs. to ensure that our devices withstand the really heavy hits on the job.



Impact Test

A wired plug or connector is subjected to impact from a 10 lb. weight dropped from a height of 18 inches. "There shall be no breakage, deformation or other effect that may interfere with the function of the device." Plugs and connectors are subjected to severe impacts in industrial settings. Therefore, Leviton exceeds the UL requirement by dropping the weight from a height of 36 inches.



Cord Pull Test

The cord must remain securely fastened after straight pulls of 30 pounds, and rotating pulls (in a 3-inch circle) of 10 pounds for two hours. "Displacement of conductors, insulation, and outer jacket of the flexible cord AWG 18 SVT shall not exceed 1/32 inch. There shall be no cuts, rips, or tears in cord insulation." Heavy-duty cord stress is typical abuse for industrial plugs and connectors. Leviton increases the weight in the straight cord pull test to 175 lbs. with AWG 14 ST and in the rotating pull test to 20 lbs., ensuring positive strain relief under industrial conditions.



Mechanical Drop Test

A sample wired plug or connector is suspended horizontally by its attached cord and released so that it impacts a hard wood surface 45 inches below the point of suspension — repeated for 1300 cycles. "There shall be no breakage, deformation or other damage which would interfere with the functioning of the device."



GLOSSARY OF ELECTRICAL WIRING DEVICE TERMS

General Terms

Adapter — An accessory used for interconnecting non-mating devices or converting an existing device for modified use.

Ballast — A transformer that steps down AC line voltage to voltage that can be used by fluorescent or other types of lighting. Ballasts may be electromagnetic or electronic.

Cord Connector — A portable receptacle designed for attachment to or provided with flexible cord, not intended for fixed mounting.

Flanged Inlet — A plug intended for flush mounting on appliances or equipment to provide a means for power connection via a cord connector.

Flanged Outlet — A receptacle intended for flush mounting on appliances or equipment to provide a means for power connection via an inserted plug.

Fluorescent Starter — A device with a voltage-sensitive switch and a capacitor that provides a high-voltage pulse to start a fluorescent lamp. Rated in watts.

Lampholder — A device with contacts that establishes mechanical and electrical connection to an inserted lamp.

Plug — A device with male contacts intended for insertion into a receptacle to establish electrical connection between the attached flexible cord and the conductors connected to the receptacle.

Receptacle — A device with female contacts designed for fixed installation in a structure or piece of equipment and which is intended to establish electrical connection with an inserted plug.

Switch — A device for making, breaking, or changing the connections in an electric circuit.

Wallplate — A plate designed to enclose an electrical box, with or without a device installed within the box.

Adapter Variations

Cube Tap — An adapter that converts one receptacle opening into multiple openings.

Current Tap — An adapter designed for medium base lampholders which has one or two receptacle openings. Available with or without integral switch.

Duplex — An adapter that provides two female receptacle openings when plugged into a single receptacle opening.

Grounding — An adapter that converts a two-wire receptacle opening into a two-pole, three-wire grounding receptacle opening.

Lampholder — A threaded adapter that converts the thread size of the lampholder in which it is inserted so that the lampholder can accept an incandescent lamp bulb of a different size thread.

Molded-On — An adapter that is factory molded to a length of flexible cord.

Series — An adapter wired in series to a flexible cord containing an in-line switch used to control electrical equipment plugged into the adapter.

“W” Type — Same as “Y” type, except having three cord connectors arranged in the form of the letter “W”.

“Y” Type — An adapter in the form of a letter “Y”, having two cord connectors on one end and a male plug on the other end.

Cord Connectors

Angle — A connector that allows the attached flexible cord to exit at right angles.

Corrosion Resistant — A connector constructed of special materials and/or suitably plated metal parts that is designed to withstand corrosive environments. Corrosion resistant devices must pass the ASTM B117-13 five-hundred hour Salt Spray (Fog) Test with no visible corrosion.

Dust Proof — A connector designed so that dust will not interfere with its operation. The IP Suitability Rating designates the degree of protection a device offers against the ingress of foreign objects (e.g. IP 20).

Explosion Proof — A connector constructed to meet the requirements of hazardous locations as defined by the National Electrical Code, NFPA-70.

Hospital Grade — A connector designed to meet the performance requirements of high-abuse areas typically found in health care facilities. These connectors are tested to the Hospital Grade requirements of Underwriters Laboratories Inc. Standard 498.

Locking — A connector designed to lock an inserted plug with a matching blade configuration when the plug is rotated in a clockwise direction. The plug can only be removed by first turning it in a counter-clockwise direction.

Midget — A connector designed with a smaller body diameter than standard connectors with a similar rating.

Molded On — A connector that is factory molded to a length of flexible cord.

Pin and Sleeve — A connector with hollow, cylindrical sleeve-type contacts.

Straight Blade — A non-locking connector into which mating plugs are inserted at a right angle to the plane of the connector face.

Weatherproof — A connector specially constructed so that exposure to weather will not interfere with its operation.

Flanged Inlets

Corrosion Resistant — An inlet constructed of special materials and/or suitably plated metal parts that is designed to withstand corrosive environments. Corrosion resistant devices must pass the ASTM B117-13 five-hundred hour Salt Spray (Fog) Test with no visible corrosion.

Flush-Mounted — An inlet intended to be installed flush with the surface of a panel or a piece of equipment.

Locking — An inlet designed to lock an inserted matching connector when the connector is rotated in a clockwise direction. The connector can only be removed by first turning it in a counter-clockwise direction.

Midget — An inlet designed with a smaller body diameter than standard connectors with a similar rating.

Pin and Sleeve — An inlet with round pin-type contacts intended to mate with a connector having hollow cylindrical female contacts.

Straight Blade — A non-locking inlet into which mating connectors are inserted at a right angle to the plane of the connector face.

Surface-Mounted — An inlet designed to be surface mounted on a panel or piece of equipment.

Watertight — An inlet specially constructed so that water will not enter under specified test conditions. The IP Suitability Rating designates the degree of protection a device offers against the ingress of moisture and water (e.g. IP 55, IP 44).

Weatherproof — An inlet specially constructed to protect it from the effects of weather in outdoor locations.

Flanged Outlets

Corrosion Resistant — An outlet constructed of special materials and/or suitably plated metal parts that is designed to withstand corrosive environments. Corrosion resistant devices must pass the ASTM B117-13 five-hundred hour Salt Spray (Fog) Test with no visible corrosion.

Flush-Mounted — An outlet intended to be installed flush with the surface of a panel or a piece of equipment.

Locking — An outlet designed to lock an inserted plug with a matching blade configuration when the plug is rotated in a clockwise direction. The plug can only be removed by first turning it in a counter-clockwise direction.

Midget — An outlet designed with a smaller body diameter than standard devices with a similar rating.

Pin and Sleeve — An outlet with hollow cylindrical female contacts intended to mate with a plug having round pin contacts.

Straight Blade — A non-locking outlet into which mating straight-blade plugs are inserted at a right angle to the plane of the outlet face.

Surface-Mounted — An outlet designed to be surface mounted on a panel or piece of equipment.

Watertight — An outlet specially constructed so that water will not enter under specified test conditions. The IP Suitability Rating designates the degree of protection a device offers against the ingress of moisture and water (e.g. IP 55, IP 44).

Weatherproof — An outlet specially constructed so that exposure to weather will not interfere with its operation.

GLOSSARY OF ELECTRICAL WIRING DEVICE TERMS

Fluorescent Starters

Automatic Reset — A starter that automatically restarts a new replacement fluorescent lamp after the circuit is energized.

Direct Current — A thermal-type starter designed for use on direct current (DC) circuits.

Glow Discharge — A starter that provides a rapid lamp start-up and will continue to try to start a failed fluorescent lamp, causing the lamp to flicker until it is replaced.

Manual Reset — A starter that automatically deactivates a failed fluorescent lamp to eliminate flickering. A reset button provides a means of activating the circuit after lamp replacement.

Lampholders

Bayonet — Designed for incandescent lamps having an unthreaded metal shell with two diametrically opposite keyways that mate with the keyways on the lampholder. Pushing down on the bulb and turning it clockwise in the lampholder locks the bulb in place.

Candelabra — A small screw-base threaded lampholder designed for candelabra-base incandescent lamps commonly used in chandeliers, night lights, and ornamental lighting.

Circline — A four-contact, double-ended lampholder designed for use with tubular, circular fluorescent lamps.

Compact Fluorescent — A lampholder designed for the Compact Fluorescent Lamps (CFLs) that are increasingly being used to replace incandescent lamps for energy efficiency.

Dimmer — An electronic device with either a round knob, slide lever or finger-tip controlled buttons used to dim/brighten incandescent lighting. Available in a variety of wattages; fluorescent version also available.

Double-Contact Recessed — Designed for high-output fluorescent lamps.

Edison Base — An internally-threaded lampholder, with the inner shell approx. 1" in diameter. Designed for widely-used standard medium base lamps.

Electrolier — Similar to the Edison Medium Base lampholder, but with a smaller outer diameter.

Incandescent — Designed for use with all manufactured incandescent lamps, most of which have threaded bases.

Intermediate — A lampholder with a threaded screw shell designed for intermediate base lamps that have a $1\frac{3}{32}$ " threaded base (smaller than the standard 1" dia. medium base). Mostly used in decorative lighting.

Key — A lampholder with a flat or round "key" knob that operates an internal switching mechanism ("Keyless" lampholders do not provide an internal switching mechanism).

Lumiline — A specially designed lampholder for tubular Lumiline-type incandescent lamps, typically used in bathrooms and retail display cases.

Medium Base — Same as the Edison base lampholder. An internally-threaded lampholder, with the inner shell approx. 1" in diameter. Designed for widely-used standard medium base lamps.

Miniature — Designed for the smallest available incandescent lamps with a screw-in base, approx. $\frac{3}{8}$ " dia. Widely used in flashlights and toys, etc.

Mogul — The largest screw-in type lampholder, designed for mogul incandescent lamps with a screw base of approx. $1\frac{1}{2}$ " dia. Used in street lights and numerous commercial/industrial applications.

Medium Bi-Pin — A fluorescent lampholder with two contacts, used in pairs. For type T-8 tubular fluorescent lamps, approx. 1" in diameter.

Miniature Bi-Pin — Similar to medium bi-pin lampholders, but designed for type T-5 tubular fluorescent lamps, approx. $\frac{5}{8}$ " in diameter.

Outlet Box — Medium-base incandescent lampholder designed for mounting in $3\frac{1}{4}$ " or 4" electrical boxes. Available with or without pull-chain mechanism, and with or without built-in receptacle.

Pull-Chain — An incandescent lampholder with an internal switching mechanism that is activated by pulling down on a beaded chain or cord.

Push-Through — An incandescent lampholder with an insulated lever that is pushed from either side to activate an internal ON/OFF switching mechanism.

Slimline Single-Pin — A fluorescent lampholder with a single contact designed for Slimline fluorescent lamps such as the T-12 ($1\frac{1}{2}$ " dia.), T-8 (1" dia.), and the smaller version T-6 ($\frac{3}{4}$ " dia.).

Snap-In — An incandescent or compact fluorescent lampholder with factory-assembled spring clips that securely snap into a panel cutout without requiring additional fasteners.

Surface-Mounted — A lampholder of any type that mounts on a flat or plane surface.

Plugs

Angle — A plug that allows the attached flexible cord to exit at right angles.

Corrosion Resistant — A plug constructed of special materials and/or suitably plated metal parts that is designed to withstand corrosive environments. Corrosion resistant devices must pass the ASTM B117-13 five-hundred hour Salt Spray (Fog) Test with no visible corrosion.

Dust Proof — A plug designed so that dust will not interfere with its operation. The IP Suitability Rating designates the degree of protection a device offers against the ingress of foreign objects (e.g. IP 20).

Explosion Proof — A plug constructed to meet the requirements of hazardous locations as defined by the National Electrical Code, NFPA-70.

Hospital Grade — A plug designed to meet the performance requirements of high-abuse areas typically found in health care facilities. These plugs are tested to the Hospital Grade requirements of Underwriters Laboratories Inc. Standard 498.

Locking — A plug designed to lock into a matching connector or receptacle configuration when the plug is rotated in a clockwise direction. The plug can only be removed by turning it in a counter-clockwise direction.

Midget — A plug designed with a smaller body diameter than standard plugs with a similar rating.

Molded On — A plug that is factory molded to a length of flexible cord.

Pin and Sleeve — A plug with round pin contacts.

Straight Blade — A non-locking plug that is inserted at a right angle to the plane of the matching device face.

Weatherproof — A plug specially constructed so that exposure to weather will not interfere with its operation.

Receptacles

AL/CU — 30A, 50A or 60A receptacles designated for use with aluminum or copper circuit conductors, identified by "AL/CU" stamped on the device. Receptacles without this designation must never be used with aluminum circuit conductors.

Clock Hanger — A single, recessed receptacle with a specialized cover plate that provides a hook or other means of supporting a wall clock.

CO/ALR — 15A or 20A receptacles designated for use with aluminum or copper circuit conductors, identified by "CO/ALR" stamped on the device. Receptacles without this designation must never be used with aluminum circuit conductors.

Corrosion Resistant — A receptacle constructed of special materials and/or suitably plated metal parts that is designed to withstand corrosive environments. Corrosion resistant devices must pass the ASTM B117-13 five-hundred hour Salt Spray (Fog) Test with no visible corrosion.

Display — Receptacle with a special cover plate intended for flush mounting on raised floors or walls.

Duplex — Two receptacles built with a common body and mounting means; accepts two plugs.

Dust Proof — A receptacle designed so that dust will not interfere with its operation. The IP Suitability Rating designates the degree of protection a device offers against the ingress of foreign objects (e.g. IP 20).

Explosion Proof — A receptacle constructed to meet the requirements of hazardous locations as defined by the National Electrical Code, NFPA-70.

Fan Hanger — A single receptacle with a specialized cover plate that provides a hook or other means of supporting a wall fan.

Four-In-One or "Quad" — A receptacle in a common housing that accepts up to four plugs. Four-In-One receptacles can be installed in place of duplex receptacles mounted in a single-gang box, providing a convenient means of adding receptacles without rewiring.

GLOSSARY OF ELECTRICAL WIRING DEVICE TERMS

GFCI (Ground Fault Circuit Interrupter) — A receptacle with a built in circuit that will detect leakage current to ground on the load side of the device. When the GFCI detects leakage current to ground, it will interrupt power to the load side of the device, preventing a hazardous ground fault condition. GFCI receptacles must conform to UL Standard 943 Class A requirements, and their use is required by the National Electric Code NFPA-70 in a variety of indoor and outdoor locations.

Hospital Grade — A receptacle designed to meet the performance requirements of high-abuse areas typically found in health care facilities. These receptacles are tested to the Hospital Grade requirements of Underwriters Laboratories Inc. Standard 498.

Interchangeable — A receptacle or combination of receptacles with a common mounting dimension that may be installed on a single or multiple-opening mounting strap.

Isolated Ground — Receptacles intended for use in an Isolated Grounding system where the ground path is isolated from the facility grounding system. The grounding connection on these receptacles is isolated from the mounting strap.

Lighted (Illuminated) — A receptacle with a face that becomes illuminated when the device is connected to an energized electrical circuit.

Locking — A receptacle designed to lock an inserted plug with a matching blade configuration when the plug is rotated in a clockwise direction. The plug can only be removed by first turning it in a counter-clockwise direction.

Pin and Sleeve — A receptacle with cylindrical sleeve-type contacts.

Safety or Tamper-Resistant — A receptacle specially constructed so that access to its energized contacts is limited. Tamper-resistant receptacles are required by the National Electric Code NFPA-70 in specific pediatric care areas in health care facilities. They are also required in new or renovated residential construction. Please contact your local building inspector's office for more information on code acceptance in your area.

Single — A receptacle that accepts only one plug.

Snap-In — A receptacle with factory-assembled spring clips that securely snap into a panel cutout without requiring additional fasteners.

Split-Circuit — A duplex receptacle that allows each receptacle to be wired to separate circuits. Most duplex receptacles provide break-off tabs that allow them to be converted into split-circuit receptacles.

Straight Blade — A non-locking receptacle into which mating plugs are inserted at a right angle to the plane of the receptacle face.

Surface-Mounted — Any receptacle that mounts on a flat or plane surface.

Surge-Suppression — A receptacle with built-in circuitry designed to protect its load side from high-voltage transients and surges. The circuitry will limit transient voltage peaks to help protect sensitive electronic equipment such as PC's, modems, audio/video equipment, etc.

Triplex — A receptacle with a common mounting means which accepts three plugs.

Weatherproof — A receptacle specially constructed so that exposure to weather will not interfere with its operation.

Switches

AC/DC — A switch designated for use with either Alternating Current (AC) or Direct Current (DC)

AC Only — A switch designated for use with Alternating Current (AC) only.

Dimmer — A switch with electronic circuitry that provides DIM/BRIGHT control of lighting loads.

Door — A momentary contact switch, usually installed on a doorjamb, that is activated when the door is opened or closed.

Double-Pole, Single-Throw (DPST) — A switch that makes or breaks the connection of two circuit conductors in a single branch circuit. This switch has four terminal screws and ON/OFF markings.

Double-Pole, Double-Throw (DPDT) — A switch that makes or breaks the connection of two conductors to two separate circuits. This switch has six terminal screws and is available in both momentary and maintained contact versions, and may also have a center OFF position.

Feed-Through — An in-line switch that can be attached at any point on a length of flexible cord to provide switching control of attached equipment.

Flush-Mounted — A switch designed for flush installation with the surface of a panel or equipment.

Four-Way — A switch used in conjunction with two 3-Way switches to control a single load (such as a light fixture) from three or more locations. This switch has four terminal screws and no ON/OFF marking.

Horsepower Rated — A switch with a marked horsepower rating, intended for use in switching motor loads.

Interchangeable — A switch or combination of switches with a common mounting dimension that may be installed on a single or multiple-opening mounting strap.

Lighted Handle — A switch with an integral lamp in its actuator (toggle, rocker or push button) that illuminates when the switch is connected to an energized circuit and the actuator is in the OFF position.

Locking — A switch equipped with a locking mechanism that requires a key to operate the switching functions.

Low-Voltage — A switch rated for use on low-voltage circuits of 50 volts or less.

L-Rated — A switch specially designated with the letter "L" in its rating that is rated for controlling tungsten filament lamps on AC circuits only.

Maintained Contact — A switch where the actuator (toggle, rocker, pushbutton or key mechanism) makes and retains circuit contact when moved to the ON position. The contacts will only be opened when the actuator is manually moved to the OFF position. Ordinary light switches are maintained contact switches.

Manual Motor Controller — A switch designed for controlling small DC or AC motor loads, without overload protection.

Mercury — A type of switch that uses mercury as the contact means for making and breaking an electrical circuit.

Momentary Contact — A switch that makes circuit contact only as long as the actuator (toggle, rocker, pushbutton or key mechanism) is held in the ON position, after which it returns automatically to the OFF position. This is a "Normally Open" switch. A "Normally Closed" switch will break circuit contact as long as it is held in the OFF position, and then automatically return to the ON position. Available in "Center OFF" versions with both Momentary ON and Momentary OFF positions.

Pendant — A type of switch designed for installation at the end of a length of portable cord or cable.

Pilot Light — A switch with an integral lamp in its actuator (toggle, rocker or pushbutton) that illuminates when the switch is connected to an energized circuit and the actuator is in the ON position.

Pull — A switch where the making or breaking of contacts is controlled by pulling downward or outward on the actuator mechanism.

Push Button — A switch with an actuator mechanism that is operated by depressing a button.

Rotary — A switch where rotating the actuator in a clockwise direction makes the circuit connection, and then rotating the actuator in either the same or opposite direction breaks the connection.

Single-Pole, Double-Throw (SPDT) — A switch that makes or breaks the connection of a single conductor with either of two other single conductors. This switch has 3 terminal screws, and is commonly used in pairs and called a "Three-Way" switch.

Single-Pole, Single-Throw (SPST) — A switch that makes or breaks the connection of a single conductor in a single branch circuit. This switch has two screw terminals and ON/OFF designations. It is commonly referred to as a "Single-Pole" Switch.

Slide — A switch with a slide-action actuator for making or breaking circuit contact. Dimmer switches and fan speed controls are also available with slide-action mechanisms for lighting and fan speed control

Surface-Mounted — Any switch that mounts on a flat or plane surface.

Three-Position, Center OFF — A two circuit switch, either maintained or momentary contact, where the OFF position is designated as the center position of the actuator.

Three-Way — A switch, always used in pairs, that controls a single load such as a light fixture from two locations. This switch has three terminal screws and has no ON/OFF marking.

Time Delay — A switch with an integral mechanism or electronic circuit that will automatically switch a load OFF at a predetermined time interval.

GLOSSARY OF ELECTRICAL WIRING DEVICE TERMS

Timer — A switch with an integral mechanism or electronic circuit that can be set to switch an electrical load ON at a predetermined time.

Toggle — A switch with a lever-type actuator that makes or breaks switch contact as its position is changed.

T-Rated — A switch specially designated with the letter “T” in its rating that is rated for controlling tungsten filament lamps on direct current (DC) or alternating current (AC) circuits.

Wallplates

Combination — A multiple-gang wallplate with openings in each gang to accommodate different devices.

Decora® — Wallplates with Decora-size openings for compatibility with Leviton's entire line of Decora devices. Available in a variety of multiple-gang configurations. Screwless-design snap-on versions also available.

Flush — A wallplate designed for flush-mounting with wall surfaces or the plane surfaces of electrical equipment.

Gang — A term that describes the number of devices a wallplate is sized to fit (i.e. “2-gang” designates two devices).

Midway — Wallplates that are approx. $\frac{3}{8}$ ” higher and wider than the standard size that can be mounted onto larger volume outlet boxes and/or used to hide wall surface irregularities. These wallplates are approx. $\frac{1}{4}$ ” deep to ensure a proper fit when used with protruding devices.

Oversized — Wallplates that are approx. $\frac{3}{4}$ ” higher and wider than the standard size and are used to conceal greater wall irregularities than those hidden by Midway wallplates. These wallplates are approx. $\frac{1}{4}$ ” deep to ensure a proper fit when used with protruding devices.

Modular — Individual-section wallplates with different openings that can be configured into a multi-gang plate.

Multi-Gang — A wallplate that has two or more gangs.

Tandem — A wallplate with individual gangs arranged vertically one above the other.

Weatherproof (with Cover Closed) — A UL Listed cover that meets specific test standards for use in wet and damp locations with the cover closed.

Weatherproof (with Cover Open) — A UL Listed cover that meets specific test standards for use in wet and damp locations with the cover open or closed.

Surge Suppression

Clamping Voltage — The peak voltage that can be measured after a Surge Protective Device has limited or “clamped” a transient voltage surge.

Clamping voltage must be determined by using IEEE Standard C62 testing and evaluated by UL Standard 1449.

Joule Rating — The measurement of a Surge Protective Device's ability to absorb heat energy created by transient surges. Note that the Joule rating is not a part of IEEE or UL Standards. It is not as significant a specification as Clamping Voltage, Maximum Surge Current and other parameters recognized by these agencies.

Transient Voltage Surges — High-speed, high-energy electrical disturbances present on AC power lines and data and communication lines, generated by utility switching, motor-load switching and lightning strikes.

Response Time — The interval of time it takes for a surge protective device to react to a transient voltage surge. Note that this parameter is not a part of IEEE or UL Standards and is only based on estimations made by manufacturers.

Surge Protective Device — See “Transient Voltage Surge Suppressor (TVSS)” definition.

Transient Voltage Surge Suppressor (TVSS) — A device designed to protect sensitive electronic equipment such as computers and computer peripherals, logic controls, audio/video equipment and a wide range of microprocessor-based (computer chip) equipment from the harmful effects of transient voltage surges. Also referred to as a Surge Protective Device (SPD).

Maximum (Peak) Surge Current — The peak surge current a Surge Protective Device can withstand, based on IEEE Standard C62.45 test waveforms.

MOV (Metal Oxide Varistor) — The primary component used in most Surge Protective Devices to clamp down transient voltages.

UL 1449 Listing — The industry standard for Surge Protective Devices. A Surge Protective Device must have a UL 1449 Surge Suppression rating on its label in order to verify that the device has been tested with IEEE standardized waveforms. Devices without this identification should not be considered reliable surge protective devices.

SWITCHES

Types of Switches

Switches used in branch circuit wiring are rated in two general categories: AC ONLY and AC/DC. Originally, the electrical power furnished to residences and businesses by utility companies was Direct Current or DC. Because DC current was always flowing at full value, the making or breaking of a circuit created a rather strong arc during switch operation. For this reason, the contacts had to be widely gapped and the operation had to be “quick make, quick break” to avoid excessive pitting or welding of the contact points. Alternating current operates between zero and full power 120 times per second. Because of the oscillating characteristic of AC power, the arc from an AC circuit is self-extinguishing on the “break” of the current. This means a slower breaking action is possible on an AC switch, as opposed to the breaking action required of a switch made for use with continuous full-power DC. The pulsating nature of AC can, however, cause a “chattering” or very fast series of “makes” and “breaks” if the circuit is closed too quickly. For this reason an AC ONLY switch works with a somewhat slower “fast make” and “break” than an AC/DC switch. Because the make and break actions of an AC/DC switch must be fast, it can be rather noisy, and must use contact metals capable of enduring such comparatively violent action while still offering acceptable electrical conductivity. An alloy of copper is most often used. Silver and its oxides are better conductors than copper and its oxides. Silver is much softer than copper and therefore cannot be used in the AC/DC switch. However, silver can be used in the AC ONLY switch because of its gentler “fast make” characteristic, especially when silver is alloyed with cadmium oxide, a good conductor that’s quite hard.

Switch Ratings

AC ONLY switches are often called AC Quiet switches because they can be made to operate very quietly, unlike AC/DC switches. AC ONLY switches are rated at their full current value for lighting, including tungsten filament, quartz metal-halide, and fluorescent; and 80% current value or full horsepower rating value for motor (inductive) loads. AC/DC switches used for incandescent lighting should have a “T” rating (tungsten-filament rating). The “T” rating assures end-users of the longevity of the switch through the surge currents of a “make” action across a tungsten filament. Such capacity is already inherent in the design of AC Quiet switches. AC/DC switches are rated at only 50% of their current capacity for motor loads. A 20 amp AC/DC switch could be used to control a 10 amp motor load, while a 20 amp AC Quiet switch can operate a 16 amp motor load. In the past, MERCURY switches were available that operated by making and breaking contact within a hermetically sealed capsule containing a pool of mercury. MERCURY switches were actually silent in operation. However, due to health concerns about mercury, these switches are no longer manufactured and sold. MERCURY switches may still be in service in some installations.

Horsepower Ratings

Switches marked with Horsepower (HP) Ratings are suitable for controlling the motor loads of the HP ratings shown on the switch, as well as loads with a lower HP rating. To qualify for an HP rating, a switch is tested at six times the full motor load current corresponding the HP rating marked on the switch. For DC motor load controllers, the test is made at 10 times the full motor load current corresponding to the DC HP rating marked on the switch. The test is conducted on six samples and consists of 50 On-Off operations at the load. For a $3/4$ HP rating at 120/240 VAC, two sets of six samples each are tested in addition to the regular overload endurance, heating and insulation tests. The test circuit characteristics are:

	For $3/4$ HP Rating @ 120 VAC	For $3/4$ HP @ 240 VAC
Closed Circuit Volts	120 VAC	240 VAC
Current	82.8 amps	41.4 amps
Power-Factor	0.40 – 0.50	0.40 – 0.50

Note: The current at 240 VAC is $1/2$ that at 120 VAC.
All switches must be in good operating condition after the tests have been completed. There must be no excessive arcing, welding or burning of the contacts nor arc-over to ground (the switch frames are grounded during the Stalled Rotor Test).

DIMMERS

A common misconception about box-mounted dimmers is that they are simply variable resistors (rheostats) that absorb power to dim the lights. In fact, a rheostat would be too bulky, inefficient and heat producing to ever be practical as a wall-mounted dimmer. In the 1950’s, the advent of solid state technology and a type of semi-conductor called the TRIAC fostered the development of full-range dimmers and fan speed controls that were versatile, efficient and compact enough to fit in a standard wallbox.

Leviton has always taken an active role in the development of lighting control technologies. Leviton introduced the Trimatron™ Rotary Dimmer that was only half as deep as conventional dimmers, allowing easier installation and wiring in a crowded wallbox. Today, Leviton offers innovative all-digital lighting controls that feature scene lighting and multi-location control capabilities for sophisticated residential and commercial installations. Leviton’s complete line of controls for incandescent, low-voltage and fluorescent lighting includes Decora® and architectural specification grade devices, as well as traditional rotary devices. There is also a wide selection of Fan Speed Controls

See Page 223 for information on Leviton’s comprehensive line of Lighting and Fan Speed Controls.

RECEPTACLES

Types of Receptacles

Receptacles generally are made to accommodate either of two types of plugs. *Straight-Blade* plugs are pushed in and pulled straight out. *Locking* plugs are pushed in and rotated slightly in a clockwise direction to a position where they cannot be pulled straight out. They must be rotated counterclockwise back to the insertion position in order to be withdrawn. This locking action is intended to prevent accidental disconnection of the circuit by pulling the plug straight out unintentionally.

Grounding

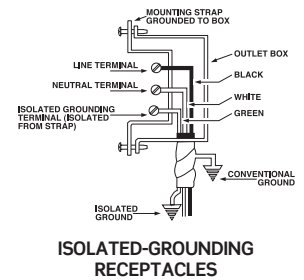
Originally, residential electrical circuitry was “2-pole, 2-wire” and did not have an equipment grounding means at the receptacle. The only grounding point was at the service entrance, where the neutral (white) conductor was grounded. The receptacle slot for the neutral wire, according to NEMA configuration 1-15R, must be longer than the slot for the phase or hot wire (typically black or red). This enables certain items of equipment, like TV sets and home appliances, to have their external metal parts or casing grounded through the white neutral connection. Such equipment uses a polarized plug where the neutral plug blade is wider than the hot plug blade, ensuring that it mates properly with the NEMA 1-15R configuration receptacle. Receptacles designed for 2-pole, 2-wire circuits do not have mounting straps that are connected to a grounding terminal. Leviton still offers 2-pole, 2-wire receptacles for replacement use only in existing non-grounding systems.

Experience proved that a single grounding point through the neutral conductor was not sufficiently safe. Conditions could occur where fault currents and differences in potential lead to shocks, overheating, equipment burnout and fire. Therefore, the 2-pole, 3-wire circuit was developed. A third conductor, called the grounding conductor, does not carry current during normal circuit operation. It is connected to the neutral bus bar at the service entrance and runs along with the current-carrying neutral and hot conductors. The grounding conductor is connected only to outlet boxes, chassis and other non-current carrying components that may carry current in case of damage or defects in the wiring system. It is sometimes referred to as the “equipment grounding conductor.”

The grounding contacts on the 2-pole, 3-wire receptacles are most commonly shaped like a “U”, which is how the term “U-ground” evolved. The grounding contacts on these receptacles are securely fastened to the mounting strap. In Leviton receptacles, the grounding contacts are permanently riveted to the mounting strap, and in most Leviton Hospital Grade and Industrial Grade receptacles they are an integral part of the strap. Many Leviton receptacles offer dual ground connection options to help ensure that the receptacle is properly connected to the grounding system: An integral green grounding screw for direct connection to the green or bare grounding wire, and a patented Groundamatic® self-grounding clip riveted to the strap to provide automatic ground connection when the receptacle is mounted in a properly grounded metal wallbox.

Isolated-Ground Receptacles

Although the conventional grounding system provides safety for personnel and equipment, it may be a source of electrical interference that can cause problems in modern electronic equipment. Because the conventional grounding network runs through an entire facility, it can unintentionally function as a pick-up of transient electrical signals or “noise.” These transient signals will then be introduced to equipment through the ground connection. Microprocessor-based equipment, including computers, cash registers, medical equipment and audio/video equipment, may malfunction as a result of this noise. Isolated-Grounding Receptacles can help eliminate problems caused by electrical interference in a conventional ground system. The ground contacts on Isolated-Ground Receptacles are electrically isolated from the mounting strap and therefore they are isolated from the conventional ground system. The green ground screw is connected to a pure ground path that is separate from a facility’s grounding network. The isolated ground network is relatively free of electrical noise because it is not a facility-wide grounding path and it’s connected to ground at a single point.



Mounting Straps

There are basically two kinds of mounting straps for receptacles. The “through” type passes between the receptacle body and cover. The “wrap-around” type acts as a cradle for the receptacle, surrounding its side, ends and bottom surfaces.

Power Contact Design

The “contact” does more than make contact with the plug blade — it must grip the plug blade for maximum electrical conductivity and mechanical strength. Leviton receptacles feature double-wipe contacts that grip both sides of each blade, including the U-ground contacts that are often single-wipe in receptacles made by other manufacturers. Leviton Hospital Grade and Industrial Grade receptacles feature triple-wipe contacts for added strength and durability in high-abuse applications. Leviton contacts are made of the copper alloys that offer maximum strength and electrical conductivity.

Wiring of Leviton Receptacles



Side Wiring
Loop wire around terminal screw. Screw head locks wire against terminal. For copper or copper/clad aluminum conductors.



Quickwire™ Connection
Insert wire into wire well. Wire is automatically clamped by spring action, insuring good electrical connection. For copper conductors only.



Quickwire™ and Screw
Option of (1) side wiring or (2) Quickwire connection. NOTE: For continuous wiring, both sets of terminals (screw and Quickwire) can be used together.



Back & Side Wiring
Option of (1) side wiring or (2) back wiring: Insert wire into well. Tighten screw, thus clamping wire against terminal. Back wiring for copper or copper/clad aluminum conductors.



Two-Circuit Conversion
To power each outlet of a duplex receptacle separately, simply break off the tab between the two terminals.

GROUND FAULT CIRCUIT INTERRUPTERS (GFCIs)

The Need for Ground Fault Protection

Circuit breakers and fuses protect equipment and building structures from overheating and fire caused by short circuits and high-current overloads. However, the current level needed to trip a breaker is many times greater than the amount of current needed to deliver a powerful, and possibly lethal electrical shock. For example, the hot conductor in an electrical device can become exposed through a break in its insulation, and it may end up touching the device’s metal enclosure. The leakage current that now flows through the metal enclosure will be conducted to ground through any available path — including the body of a human being that happens to touch the faulty device. This condition is called a Ground Fault, and the current flowing through the person to ground can be life threatening, though there is usually nowhere near enough current to trip a circuit breaker.

How a GFCI Works

When there is a ground fault condition, all of the current flowing through the “hot” conductor is not returning through the neutral conductor. A Ground Fault Circuit Interrupter (GFCI) monitors the difference in current flow between hot and neutral conductors. If the GFCI senses even a very tiny difference in current flow between the conductors (a ground fault), it interrupts the flow of electrical current through the device by opening its internal double-pole contacts. According to UL Standard 943 Class A, the GFCI must trip when there is a ground fault of 5 milliamps ($\pm 1\text{mA}$). The GFCI must also trip within approximately 25 milliseconds. GFCI receptacles are rated for 15 or 20 amp circuits. They are used in place of standard box-mounted duplex receptacles. GFCI receptacles can also be feed-through wired to provide ground fault protection to feed-through wired receptacles downstream.

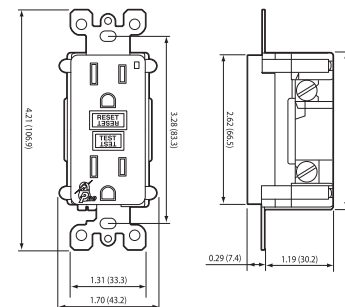
See Page 149 for information on Leviton’s comprehensive line of Ground Fault Circuit Interrupter Devices.

UL 2006 Code Requirements (Effective July 28, 2006)

- If a miswiring (line-load reversal) occurs during installation, the GFCI must not be capable of supplying power to either the GFCI’s face or to feed-through terminals
 - GFCIs must provide a visual and/or audible indication OR be able to render themselves incapable of delivering power when they no longer offer ground fault protection based on a failure to pass their internal test
- Note that the National Electrical Code strongly recommends monthly testing of all GFCIs.**

Leviton SmartlockPro® GFCI with Lockout Action

The TEST and RESET functions on Leviton’s SmartlockPro® GFCI work together so that a tripped GFCI cannot be reset if the GFCI circuit is no longer providing ground fault protection. The RESET button is blocked if GFCI protection has been compromised, eliminating the possibility of end-users incorrectly assuming that a reset GFCI is providing ground fault protection when it actually is not.



SmartlockPro® GFCI RECEPTACLE 7599 Series

ENCLOSURE TYPE DESIGNATIONS

Enclosures serve the dual purpose of protecting personnel from incidental contact with the enclosed electrical equipment and protecting the enclosed equipment against specified environmental conditions. Enclosures are rated for use in specific environmental conditions by NEMA, UL, CSA and the IEC. The major rating systems used are the NEMA Type Numbers and the IEC Enclosure Classification Designation.

The IEC Enclosure Classification Designation — IP Suitability Ratings

The IP Suitability Ratings are a system for classifying the degree of protection provided by enclosures of electrical equipment. The higher the number in the rating, the greater the degree of protection provided by the enclosure. Note that the rating will ONLY apply to properly installed equipment. The chart below defines the numerals in the IP Code.

1. The First Numeral indicates the degree of protection for persons against access to hazardous parts inside the enclosure and/or against the ingress of solid foreign objects.
2. The Second Numeral indicates the degree of protection of equipment inside enclosures against damage from the ingress of water.

Elements of the IP Code

Code Letters	Meaning for the Protection of Equipment	
	First Number	Second Number
Ingress Protection	Against Ingress of Solid Foreign Objects	Against Ingress of Water with Harmful Effects
IP	0 - Non protected	0 - Non protected
	1 - \geq 50 mm diameter	1 - Vertically dripping
	2 - \geq 12.5 mm diameter	2 - Dripping (15° tilted)
	3 - \geq 2.5 mm diameter	3 - Spraying
	4 - \geq 1.0 mm	4 - Splashing
	5 - Dust-protected	5 - Jetting
	6 - Dust-tight	6 - Power jetting
		7 - Temporary immersion
	8 - Continuous immersion	

Note: > denotes greater than or equal to. Example: IP 54 Suitability Rating = Ingress Protection/Dust-protected/Splashing.

ENCLOSURE TYPES FOR NON-HAZARDOUS LOCATIONS

National Electrical Manufacturers Association NEMA Standards Publication No. 250-1991 Enclosures for Electrical Equipment (1000 Volts max.)

Type Designation Intended Use and Description

	An enclosure is a surrounding case constructed to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide a degree of protection to enclosed equipment against the specified environmental conditions.
Type 1	Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling dirt.
Type 2	Enclosures are intended for indoor use primarily to provide a degree of protection against limited amounts of falling water or dirt.
Type 3	Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust, and damage from external ice formation.

Underwriters Laboratories Inc. UL50 Standard for Enclosures for Electrical Equipment (10th Edition)

Type Designation Intended Use and Description

	Enclosure — A surrounding case constructed to provide a degree of protection against incidental contact with the enclosed equipment and to provide a degree of protection to the enclosed equipment against specified environmental conditions. A complete enclosure shall be provided for all live parts that may be housed in it. The enclosure shall be tight and, unless designed for a specific installation, such as a cast metal junction or pull box intended to be installed in poured concrete, shall be provided with means for mounting.
Type 1	Indoor use primarily to provide a degree of protection against limited amounts of falling dirt.
Type 2	Indoor use primarily to provide a degree of protection against limited amounts of falling water or dirt.
Type 3	Outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust and damage from external ice formation.

Canadian Standards Association CAN/CSA C22.2 No. 94-M91 Special Purposes Enclosures

Type Designation	Intended Use and Description
	Enclosures — provide a degree of protection against accidental contact with the enclosed equipment, and to the enclosed equipment against specified environmental conditions.
Type 1	No CSA equivalent.
Type 2	An enclosure for indoor use, constructed so as to provide a degree of protection against dripping and light splashing of noncorrosive liquids, and falling dirt.
Type 3	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against rain and snow, undamaged by the external formation of ice on the enclosures.

National Electrical Manufacturers Association NEMA Standards Publication No. 250-1991 Enclosures for Electrical Equipment (1000 Volts max.)

Type Designation	Intended Use and Description
Type 3R	Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet, and damage from external ice formation.
Type 3S	Enclosures are intended for outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust, and to provide for operation of external mechanisms when ice laden.
Type 4	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water, and damage from external ice formation.
Type 4X	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose directed water, and damage from external ice formation.
Type 5	Enclosures are intended for indoor use primarily to provide a degree of protection against settling airborne dust, falling dirt, and dripping noncorrosive liquids.
Type 6	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during occasional temporary submersion at a limited depth, and damage from external ice formation.
Type 6P	Enclosures are intended for indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during prolonged submersion at a limited depth, and damage from external ice formation.
Type 12	Enclosures are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids.
Type 12K	Enclosures with knockouts are intended for indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids.
Type 13	Enclosures are intended for indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and noncorrosive coolants.

TESTING STANDARDS About PSI Ratings

PSI is an abbreviation for pounds per square inch. With respect to water washdowns in processing plants and industrial marinas, a PSI value should specify the distance from the nozzle at which the value was taken. Consider the following situation: 1,000 PSI measured 2 inches from the plug/connector or 2 ft. from the plug/connector will deliver dramatically different forces.



Leviton Wetguard devices are tested and exceed IEC and UL watertight standards. These independent tests have defined parameters as noted below:

IEC IP Water Penetration Test:

Water is sprayed from a distance of 3 meters and at a rate of 100 liter/minute on a joined plug and connector using a 12.5mm diameter nozzle. The water spray is directed at the connector/plug joint and cable entries.

Result: Wetguard Plugs and Connectors are rated to IP67 when connected.



UL NEMA Water Penetration Test:

Water is sprayed from a distance of 12 ft. and at a rate of 65 gallons/minute on a joined plug and connector using a 1 inch diameter nozzle. The water spray is directed at the connector/plug joint and cable entries.

Result: Wetguard Plugs and Connectors are rated to NEMA 4X, 6, and 6P when connected.

ENCLOSURE TYPES FOR NON-HAZARDOUS LOCATIONS

Underwriters Laboratories Inc.

UL50 Standard for Enclosures for Electrical Equipment (10th Edition)

Type Designation	Intended Use and Description
Type 3R	Outdoor use primarily to provide a degree of protection against rain, sleet, and damage from external ice formation.
Type 3S	Outdoor use primarily to provide a degree of protection against rain, sleet, windblown dust, and to provide for operation of external mechanisms when ice laden.
Type 4	Indoor or outdoor use primarily to provide a degree of protection against windblown dust and rain, splashing water, hose-directed water, and damage from external ice formation.
Type 4X	Indoor or outdoor use primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water and damage from external ice formation.
Type 5	Indoor use primarily to provide a degree of protection against settling airborne dust, falling dirt, and dripping noncorrosive liquids.
Type 6	Indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during occasional temporary submersion at a limited depth, and damage from external ice formation.
Type 6P	Indoor or outdoor use primarily to provide a degree of protection against hose-directed water, the entry of water during prolonged submersion at a limited depth, and damage from external ice formation.
Type 12	Indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids.
Type 12K	Indoor use primarily to provide a degree of protection against circulating dust, falling dirt, and dripping noncorrosive liquids.
Type 13	Indoor use primarily to provide a degree of protection against dust, spraying of water, oil, and noncorrosive coolant.

Canadian Standards Association

CAN/ CSA C22.2 No. 94-M91 Special Purposes Enclosures

Type Designation	Intended Use and Description
Type 3R	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against rain and snow, undamaged by the external formation of ice on the enclosure.
Type 3S	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against rain, snow and windblown dust, the external mechanism(s) remain operable while ice covered.
Type 4	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against rain, snow, windblown dust, splashing and hose-directed water; undamaged by the external formation of ice on the enclosure.
Type 4X	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against rain, snow, windblown dust, splashing and hose-directed water; undamaged by the external formation of ice on the enclosure.
Type 5	An enclosure for indoor use, constructed so as to provide a degree of protection against dripping and light splashing of noncorrosive liquids and settling dust, lint, fibers, and flyings.
Type 6	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against the entry of water during occasional temporary submersion at a limited depth; undamaged by the external formation of ice on the enclosure.
Type 6P	An enclosure for either indoor or outdoor use, constructed so as to provide a degree of protection against the entry of water during prolonged submersion at a limited depth; undamaged by the external formation of ice on the enclosure; resists extended corrosion.
Type 12	An enclosure for indoor use, constructed so as to provide a degree of protection against circulating dust, lint, fibers, and flyings; dripping and light splashing of noncorrosive liquids; not provided with knockouts.
Type 12K	An enclosure for indoor use, constructed so as to provide a degree of protection against circulating dust, lint, fibers, and flyings; dripping and light splashing of noncorrosive liquids; and provided with knockouts.
Type 13	An enclosure for indoor use, constructed so as to provide a degree of protection against circulating dust, lint, fibers, and flyings; seepage and spraying of noncorrosive liquids including oils and coolants.

NEMA AND IEC ENCLOSURE CLASSIFICATIONS

Comparing NEMA Enclosure Type Numbers and IEC Enclosure Classification Designations (IP Suitability Rating)

IEC

IEC Publication 529, "Classification of Degrees of Protection Provided by Enclosures," defines the IP (Ingress Protection) Suitability Rating. The IP Suitability Rating is a system for classifying the degree of protection provided by enclosures of electrical equipment. The higher the number in the rating, the greater the degree of protection provided by the enclosure. The first numeral of the code indicates the degree of protection for persons against access to hazardous parts inside the enclosure and/or against the ingress of solid foreign objects. The second numeral indicates the degree of protection of equipment inside enclosures against damage from the ingress of water. The IP Suitability Rating defined by IEC 529 does not specify any degree of protection against mechanical damage of equipment, risk of explosions, or conditions such as moisture (i.e. condensation), corrosive vapors, fungus, or vermin.

NEMA

NEMA Standards Publication 250 defines the NEMA Enclosure Type Numbers. Unlike the IEC Enclosure Classification Designations, NEMA Standards Publication 250 does tests for environmental conditions such as corrosion, rust, icing, oil and coolants. For this reason and because the tests and evaluations for other characteristics are not identical, the IEC Enclosure Classification Designations cannot be exactly equated with NEMA Enclosure Type Numbers. The table below provides an equivalent conversion from NEMA Enclosure Type Numbers to IEC Enclosure Classification Designations. Note that the NEMA Types meet or exceed the test requirements for the associated IEC Classifications. Therefore, this table cannot be used to convert from IEC Classifications to NEMA Types.

Converting NEMA Type Numbers to IEC Classification Designations

(Note: This table cannot be used to convert IEC classification designations to NEMA type numbers).

NEMA Enclosure Type Number Designation	Equivalent IEC Enclosure Classification
1	IP10
2	IP11
3	IP54
3R	IP14
3S	IP54
4 and 4X	IP56
5	IP52
6 and 6P	IP67
12 and 12K	IP52
13	IP54

Materials Used in Wiring Devices

The following is an overview of the materials commonly used in wiring devices. Note that specific brand names of materials used in Leviton devices are subject to change due to a variety of factors. These changes will never compromise the quality, performance and durability features of our wiring devices. Leviton is committed to maintaining the positive qualities of the materials being replaced and choosing new materials with superior qualities as they become available.

Brass

The type of brass commonly used in wiring devices is referred to as standard or "70/30" brass. It is an alloy of 70% copper and 30% zinc that provides the strength and conductivity needed for power and ground contacts, wiring terminals and terminal screws. It is also used for some mounting straps and wallplates.

The Olin Corporation offers a series of alloys sometimes referred to as High Performance Brass or "Olin Brass." Olin brass is a copper alloy consisting of more than 90% copper. It is more resilient than 70/30 brass and used by Leviton to form the power contacts in some Industrial Grade and Hospital Grade devices.

Phosphor Bronze

Phosphor Bronze, an alloy of copper and tin, is superior in strength to 70/30 brass. The advantage of using phosphor bronze parts is that they can be thinner than comparable parts made of standard brass without any loss in strength. For example, Leviton uses a phosphor bronze alloy of 95% copper and 5% tin to form power contacts in some Industrial Grade receptacles. Phosphor bronze power contacts at .031" outperform brass power contacts of a thicker gauge.

Beryllium Copper

An alloy of copper and .5% beryllium is used to form some of the components in Leviton Industrial Grade devices. Beryllium Copper provides excellent strength, durability, electrical conductivity. It also retains its resiliency at elevated temperatures. These properties make Beryllium Copper ideal for the contact arm in heavy-duty switches.

Silver-Cadmium Oxide

Although pure silver is an excellent conductor (superior to copper), it cannot be used for switch contacts. Over time, arcing caused by actuation would weld the silver contacts together. Silver-cadmium oxide, an alloy of 90% silver and 10% cadmium oxide, is widely used by Leviton to form switch contacts. Microscopic particles of cadmium oxide in the silver will decompose due to the heat buildup, preventing the contacts from welding together.

Zinc-Plated Steel

In addition to being strong and durable, zinc-plated steel provides a higher degree of corrosion resistance than standard cold-rolled steel. Leviton uses zinc-plated steel mounting straps in many of its devices. Leviton also offers zinc-plated steel wallplates for power receptacles, available with either a brass or aluminum finish.

Nickel-Plated Metals

Nickel-plating adds a high degree of corrosion resistance to either brass or steel. All the metal parts in Leviton Corrosion Resistant devices (blades, contacts, terminals, mounting straps and screws) are nickel-plated for maximum corrosion resistance. In some cases, cupronickel screws are used, which provide a high degree of corrosion resistance.

Leviton uses an electroless nickel-plating process. The standard plating process uses an electrical charge to coat the metal with nickel. This can produce uneven results, leaving some areas of the metal more coated than others. The more effective electroless process involves submerging the metal in a chemical bath where salts decompose and deposit nickel on the metal substrate. Every surface of the metal is evenly coated. Leviton uses this electroless process to ensure that its Corrosion Resistant wiring devices provide maximum performance in extremely damp and corrosive environments.

Stainless Steel

Type 430 Standard Stainless Steel

Type 430 stainless steel is resistant to the corrosive effects of moisture. Leviton offers a wide selection of wallplates made from this material. Leviton's Raintight-While-In-Use Covers are supplied with stainless-steel mounting screws to help ensure a long service life in wet applications. Note that Type 430 Stainless Steel does have magnetic properties that may interfere with magnetic-sensitive equipment.

Type 302/304 Non-Magnetic Stainless Steel

Type 302/304 Non-Magnetic Stainless Steel is suitable for applications where sensitive equipment may be affected by magnetic material. For example, navigational equipment in marine applications and MRI equipment in health care environments are susceptible to magnetic interference. In addition to being non-magnetic, Type 302/304 stainless Steel is more corrosion resistant than Type 430 stainless steel. Types 302 and 304 differ in composition, but there is virtually no difference between them in terms of non-magnetic and corrosion-resistant properties.

NEMA AND IEC ENCLOSURE CLASSIFICATIONS

Leviton offers a complete selection of wallplates made of Type 302/304 Non-Magnetic Stainless Steel. These wallplates are ideal for any application where magnetic interference must be avoided. Leviton's Corrosion Resistant wiring devices feature non-magnetic stainless steel assembly screws to ensure their suitability in marine applications. For health care applications where non-magnetic devices are desired, Leviton's Corrosion Resistant devices should also be used.

CO/ALR Devices

Aluminum is used for residential wiring in Europe because it is a good conductor and considerably cheaper than copper. Houses with aluminum wiring were built in the United States, but the practice stopped at least twenty years ago. It was discovered that poor connections between aluminum wire and steel or brass terminal screws led to serious fires. There are still homes with aluminum wiring, and the National Electrical Code stipulates that only CO/ALR devices are to be used in these applications.

Aluminum wire tends to oxidize over time, and the oxide layer does not conduct electricity. This results in a poor connection with the wiring device terminal screws, particularly if they are steel. The connections gradually heat up to the point where fires are started inside the walls. For this reason, all standard wiring devices contain the warning, "For use with copper or copper-clad wire ONLY. Do not use with aluminum wire." The only exception to this are CO/ALR wiring devices.

Leviton offers a selection of CO/ALR devices for use with aluminum wire. In CO/ALR devices, the terminal screws are plating with the element Indium. Indium is an extremely soft metal that forms a gas-sealed connection with the aluminum wire, eliminating problems caused by oxidation.

Thermoset and Thermoplastic Material

There are significant benefits in using thermoplastics in wiring devices instead of thermosets. Each type of thermoplastic also has particular characteristics that may make it ideally suited for a specific application.

Thermosets

Thermoset components are manufactured by compression molding, where powdered material is molded by heat and pressure. Thermoset materials cannot be remolded. The major types of thermoset materials are Phenolic, Urea and Melamine. Phenolic is primarily used for dark colors, while Urea is used for lighter colors.

All thermoset materials provide dimensional stability when used in wiring devices. Phenolic is also a flame-resistant material. Thermosets do not provide a high degree of resistance to impacts, chemicals and solvents, and therefore they are not suitable for heavy-duty applications. Thermosets are not used in Leviton Industrial Grade devices. Urea is still widely used to manufacture wallplates.

Thermoplastics

Thermoplastic components are manufactured by injection molding where pellets of the material are heated to a liquid which can flow into a mold. Unlike thermosets, thermoplastics can be remolded. These materials are the preferred choice for heavy-duty applications because they provide superior resistance to impacts, chemicals and solvents compared to thermosets. The following is a list of the major types of thermoplastic materials, along with some well-known brand names.

- Nylon: Zytel® 101 Type 66 and Zytel Supertough ST 801 Type 66
- Polycarbonate: Lexan®, Calibre®, Makrolon®
- Polyester: Valox®, Rynite®
- ABS
- Acrylic
- Polypropylene

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Lexan® and Valox® are registered trademarks of the General Electric Co.

Calibre® is a registered trademark of the Dow Chemical Co.

Makrolon® is a registered trademark of Bayer, Inc.

CHEMICAL RESISTANCE OF MATERIALS COMMONLY USED IN WIRING DEVICES*

CHEMICALS	Nylon	Melamine	Phenolic	Urea	Polyvinyl Chloride	Poly-carbonate	Rubber	Polyester	Poly-propylene
Acids	C	B	B	B	A	B	B	A	A
Alcohol	A	A	A	A	A	A	B	A	A
Caustic Bases	A	B	B	B	A	C	C	B	A
Gasoline	A	B	A	C	A	B	B	A	A
Grease	A	A	A	A	A	B	B	A	A
Kerosene	A	A	A	A	A	B	A	A	A
Oil	A	A	A	A	A	B	A	A	A
Solvents	A	A	A	A	C	C	C	B	B
Water	A	A	A	A	A	A	B	A	A

A - Completely resistant — Good to excellent for general use.

B - Resistance is fair to good — Recommended for limited service.

C - Slow attack. No recommended for use.

*This chemical resistance code applies to general applications. Additional testing is performed to determine resistivity to chemicals in specific environments.

Thermoplastic Enhancements

UV Stability

Thermoplastics provide varying degrees of UV (Ultraviolet Light) stability. For example, standard grade nylon will lose tensile strength and durability when exposed to sunlight and weathering. Discoloring will also occur. There are additives that will increase the UV stability of thermoplastics. UV Stabilized thermoplastics should be used when a device is intended for extensive outdoor use. For example, Leviton uses UV-stabilized Lexan in its Raintight-While-In-Use Cover, with excellent results.

Glass-Reinforced Thermoplastics

Several types of thermoplastics are available in glass-reinforced versions, including Rynite®, Lexan®, Valox® and nylon. Glass reinforcement increases the rigidity of the material and also raises the operating temperature. For example, Leviton Momentary and Maintained Contact Switches feature glass-reinforced thermoplastic construction, making these switches ideally suited for rugged applications.

ANSI ARCHITECTURAL SYMBOLS

1. LIGHTING OUTLETS

	Ceiling	Wall
1.1	Surface or Pendant Incandescent, Mercury-Vapor, or Similar Lamp Fixture 	Wall
1.2	Recessed Incandescent, Mercury-Vapor, or Similar Lamp Fixture 	Wall
1.3	Surface or Pendant Individual Fluorescent Fixture 	Wall
1.4	Recessed Individual Fluorescent Fixture 	Wall
1.5	Surface or Pendant Continuous Row Fluorescent Fixture 	
1.6	Recessed Continuous Row Fluorescent Fixture 	
1.7	Bare-Lamp Fluorescent Strip 	
1.8	Surface or Pendant Exit Light 	Wall
1.9	Recessed Exit Light 	Wall
1.10	Blanket Outlet 	Wall
1.11	Junction Box 	Wall
1.12	Outlet Controlled by Low-Voltage Switching when Relay is Installed in Outlet Box 	Wall

2. RECEPTACLE OUTLETS

	Grounded	Ungrounded
2.1	Single Receptacle Outlet 	
2.2	Duplex Receptacle Outlet 	
2.3	Triplex Receptacle Outlet 	
2.4	Quadruplex Receptacle Outlet 	
2.5	Duplex Receptacle Outlet — Split Wired 	
2.6	Triplex Receptacle Outlet — Split Wired 	
2.7	Single Special-Purpose Receptacle Outlet 	
2.8	Duplex Special-Purpose Receptacle Outlet 	
2.9	Range Outlet (typical) 	

	Grounded	Ungrounded
2.10	Special Purpose Connection or Provision for Connection 	
2.11	Multi-outlet assembly 	
2.12	Clock Hanger Receptacle 	
2.13	Fan Hanger Receptacle 	
2.14	Floor Single Receptacle Outlet 	
2.15	Floor Duplex Receptacle Outlet 	
2.16	Floor Special-Purpose Outlet 	

3. SWITCH OUTLETS

3.1	Single-Pole Switch	S
3.2	Double-Pole Switch	S2
3.3	Three-Way Switch	S3
3.4	Four-Way Switch	S4
3.5	Key-Operated Switch	SK
3.6	Switch and Pilot Lamp	SP
3.7	Switch for Low-Voltage Switching System	SL
3.8	Maser Switch for Low-Voltage Switching System	SLM
3.9	Switch and Single Receptacle	
3.10	Switch and Double Receptacle	
3.11	Door Switch	SD
3.12	Time Switch	ST
3.13	Circuit Breaker Switch	SCB
3.14	Momentary Contact Switch or Pushbutton for Other Than Signaling System	SMC
3.15	Ceiling Pull Switch	

4. RESIDENTIAL OCCUPANCIES

4.1	Pushbutton	
4.2	Buzzer	
4.3	Bell	
4.4	Combination Bell-Buzzer	
4.5	Chime	
4.6	Annunciator	

NEMA STRAIGHT BLADE CONFIGURATIONS For General-Purpose Nonlocking Plugs and Receptacles

2-Pole, 2-Wire

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE		50 AMPERE		60 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125V	1	1-15R	1-15P								
250V	2		2-15P	2-20R	2-20P	2-30R	2-30P				
277V AC	3	Reserved For Future Configurations									
600V	4	Reserved For Future Configurations									

2-Pole, 3-Wire Grounding

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE		50 AMPERE		60 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125V	5	5-15R	5-15P	5-20R	5-20P	5-30R	5-30P	5-50R	5-50P		
250V	6	6-15R	6-15P	6-20R	6-20P	6-30R	6-30P	6-50R	6-50P		
277V AC	7	7-15R	7-15P	7-20R	7-20P	7-30R	7-30P	7-50R	7-50P		
347V AC	24	24-15R	24-15P	24-20R	24-20P	24-30R	24-30P	24-50R	24-50P		
480V AC	8	Reserved For Future Configurations									
600V	9	Reserved For Future Configurations									

3-Pole, 3-Wire

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE		50 AMPERE		60 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125/250V	10			10-20R	10-20P	10-30R	10-30P	10-50R	10-50P		
3Ø 250V	11	11-15R	11-15P	11-20R	11-20P	11-30R	11-30P	11-50R	11-50P		
3Ø 480V	12	Reserved For Future Configurations									
3Ø 600V	13	Reserved For Future Configurations									

3-Pole, 4-Wire Grounding

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE		50 AMPERE		60 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125/250V	14	14-15R	14-15P	14-20R	14-20P	14-30R	14-30P	14-50R	14-50P	14-60R	14-60P
3Ø 250V	15	15-15R	15-15P	15-20R	15-20P	15-30R	15-30P	15-50R	15-50P	15-60R	15-60P
3Ø 480V	16	Reserved For Future Configurations									
3Ø 600V	17	Reserved For Future Configurations									

NEMA STRAIGHT BLADE CONFIGURATIONS

For General-Purpose Nonlocking Plugs and Receptacles

4-Pole, 4-Wire

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE		50 AMPERE		60 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
3ØY 120/208V	18	18-15R	18-15P	18-20R	18-20P	18-30R	18-30P	18-50R	18-50P	18-60R	18-60P
3ØY 277/480V	19	Reserved For Future Configurations									
3ØY 347/600V	20	Reserved For Future Configurations									

4-Pole, 5-Wire Grounding

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE		50 AMPERE		60 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
3ØY 120/208V	21	Reserved For Future Configurations									
3ØY 277/480V	22	Reserved For Future Configurations									
3ØY 347/600V	23	Reserved For Future Configurations									

NEMA LOCKING CONFIGURATIONS For Locking Type Plugs and Receptacles

2-Pole, 2-Wire

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125V	L1	L1-15R	L1-15P				
250V	L2			L2-20R	L2-20P		
277V AC	L3			Reserved For Future Configurations			
600V	L4			Reserved For Future Configurations			

2-Pole, 3-Wire Grounding

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125V	L5	L5-15R	L5-15P	L5-20R	L5-20P	L5-30R	L5-30P
250V	L6	L6-15R	L6-15P	L6-20R	L6-20P	L6-30R	L6-30P
277V AC	L7	L7-15R	L7-15P	L7-20R	L7-20P	L7-30R	L7-30P
347V AC	L24			L24-20R	L24-20P		
480V AC	L8			L8-20R	L8-20P	L8-30R	L8-30P
600V AC	L9			L9-20R	L9-20P	L9-30R	L9-30P

3-Pole, 3-Wire

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125/250V	L10			L10-20R	L10-20P	L10-30R	L10-30P
3Ø 250V	L11	L11-15R	L11-15P	L11-20R	L11-20P	L11-30R	L11-30P
3Ø 480V	L12			L12-20R	L12-20P	L12-30R	L12-30P
3Ø 600V	L13					L13-30R	L13-30P

3-Pole, 4-Wire Grounding

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
125/250V	L14			L14-20R	L14-20P	L14-30R	L14-30P
3Ø 250V	L15			L15-20R	L15-20P	L15-30R	L15-30P
3Ø 480V	L16			L16-20R	L16-20P	L16-30R	L16-30P
3Ø 600V	L17					L17-30R	L17-30P

NEMA LOCKING CONFIGURATIONS

For Locking Type Plugs and Receptacles

4-Pole, 4-Wire

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
3ØY 120/208VL18				L18-20R	L18-20P	L18-30R	L18-30P
3ØY 277/480VL19				L19-20R	L19-20P	L19-30R	L19-30P
3ØY 347/600VL20				L20-20R	L20-20P	L20-30R	L20-30P

4-Pole, 5-Wire Grounding

Voltage	No.	15 AMPERE		20 AMPERE		30 AMPERE	
		Receptacle	Plug	Receptacle	Plug	Receptacle	Plug
3ØY 120/208VL21				L21-20R	L21-20P	L21-30R	L21-30P
3ØY 277/480VL22				L22-20R	L22-20P	L22-30R	L22-30P
3ØY 347/600VL23				L23-20R	L23-20P	L23-30R	L23-30P

HORSEPOWER RATINGS FOR NEMA CONFIGURATIONS — For Plugs and Receptacles Only

STRAIGHT BLADE CONFIGURATIONS

NEMA	AC HP Rating	Rating
1-15	0.5	15A-125V
2-15	1.5*	15A-250V
2-20	2*	20A-250V
2-30	2*	30A-250V
5-15	0.5	15A-125V
5-20	1	20A-125V
5-30	2	30A-125V
5-50	2	50A-125V
6-15	1.5*	15A-250V
6-20	2*	20A-250V
6-30	2*	30A-250V
6-50	3*	50A-250V
7-15	2	15A-277V AC Only
7-20	2	20A-277V AC Only
7-30	3	30A-277 V AC Only
7-50	5	50A-277V AC Only
10-20	2 L-L*/1 L-N	20A-125/250V
10-30	2 L-L*/2 L-N	30A-125/250V
10-50	3 L-L*/2 L-N	50A-125/250V
11-15	2	15A-250V 3Ø
11-20	3	20A-250V 3Ø
11-30	3	30A-250V 3Ø
11-50	7.5	50A-250V 3Ø
14-15	1.5 L-L*/0.5 L-N	15A-125/250V
14-20	2 L-L*/1 L-N	20A-125/250V
14-30	2 L-L*/2 L-N	30A-125/250V
14-50	3 L-L*/2 L-N	50A-125/250V
14-60	3 L-L*/2 L-N	60A-125/250V
15-15	2	15A-250V 3Ø
15-20	3	20A-250V 3Ø
15-30	3	30A-250V 3Ø
15-50	7.5	50A-250V 3Ø
15-60	10	60A-250V 3Ø
18-15	2	15A-120/208V 3ØY
18-20	2	20A-120/208V 3ØY
18-30	3	30A-120/208V 3ØY
18-50	7.5	50A-120/208V 3ØY
18-60	7.5	60A-120/208V 3ØY

L-L Denotes phase-to-phase HP rating.

L-N Denotes phase-to-neutral HP rating.

*Suitable for 208V motor applications at HP rating.

LOCKING CONFIGURATIONS

NEMA	AC HP Rating	Rating
L1-15	0.5	15A-125V
L2-20	2*	20A-250V
L5-15	0.5	15A-125V
L5-20	1	20A-125V
L5-30	2	30A-125V
L6-15	1.5*	15A-250V
L6-20	2*	20A-250V
L6-30	2*	30A-250V
L7-15	2	15A-277V AC Only
L7-20	2	20A-277V AC Only
L7-30	3	30A-277V AC Only
L8-20	3	20A-480V AC Only
L8-30	5	30A-480V AC Only
L9-20	NA	20A-600V AC Only
L9-30	NA	30A-600V AC Only
L10-20	2 L-L*/1 L-N	20A-125/250V
L10-30	2 L-L*/2 L-N	30A-125/250V
L11-15	2	15A-250V 3Ø
L11-20	3	20A-250V 3Ø
L11-30	3	30A-250V 3Ø
L12-20	5	20A-480V 3Ø
L12-30	10	30A-480V 3Ø
L13-30	NA	30A-600V 3Ø
L14-20	2 L-L*/1 L-N	20A-125/250V
L14-30	2 L-L*/2 L-N	30A-125/250V
L15-20	3	20A-250V 3Ø
L15-30	3	30A-250V 3Ø
L16-20	5	20A-480V 3Ø
L16-30	10	30A-480V 3Ø
L17-30	NA	30A-600V 3Ø
L18-20	2	20A-120/208V 3ØY
L18-30	3	30A-120/208V 3ØY
L19-20	5	20A-277/480V 3ØY
L19-30	10	30A-277/480V 3ØY
L20-20	NA	20A-347/600V 3ØY
L20-30	NA	30A-347/600V 3ØY
L21-20	2	20A-120/208V 3ØY
L21-30	3	30A-120/208V 3ØY
L22-20	5	20A-277/480V 3ØY
L22-30	10	30A-277/480V 3ØY
L23-20	NA	20A-347/600V 3ØY

L-L Denotes phase-to-phase HP rating.

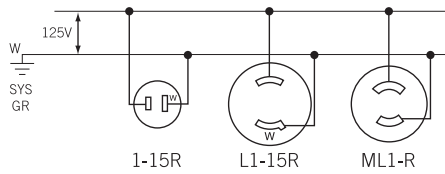
L-N Denotes phase-to-neutral HP rating.

*Suitable for 208V motor applications at HP rating.

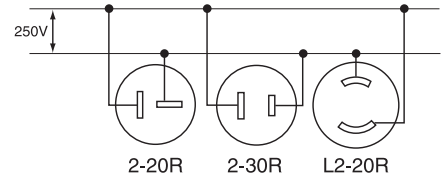
CIRCUIT WIRING DIAGRAMS

Wiring Diagrams for NEMA Configurations

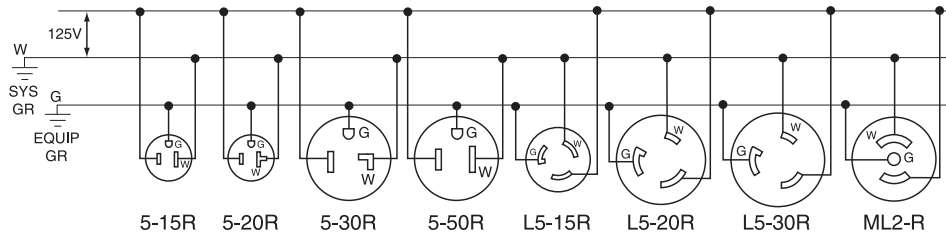
125V — 2-POLE, 2-WIRE



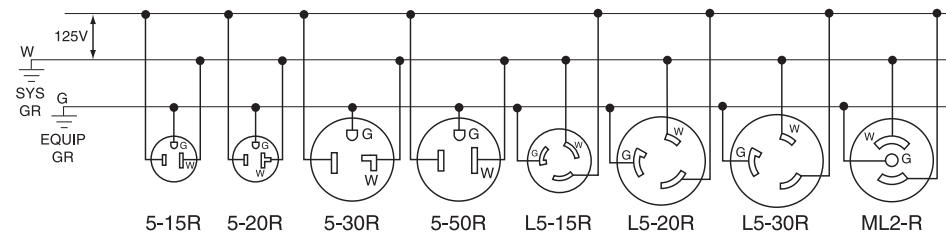
250V — 2-POLE, 2-WIRE



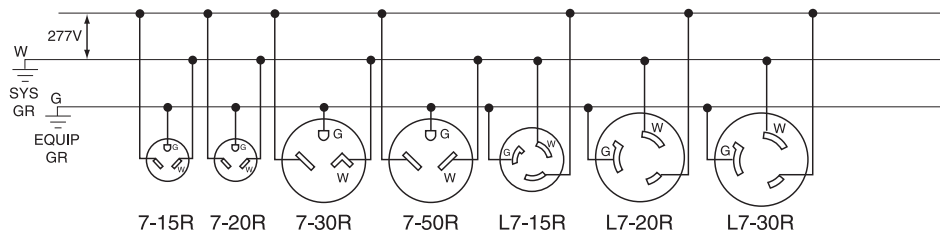
125V — 2-POLE, 3-WIRE GROUNDING



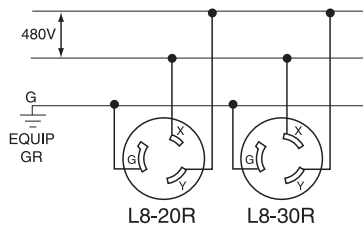
250V — 2-POLE, 3-WIRE GROUNDING



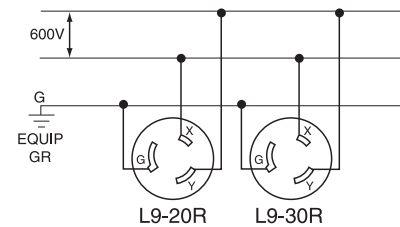
277V AC — 2-POLE, 3-WIRE GROUNDING



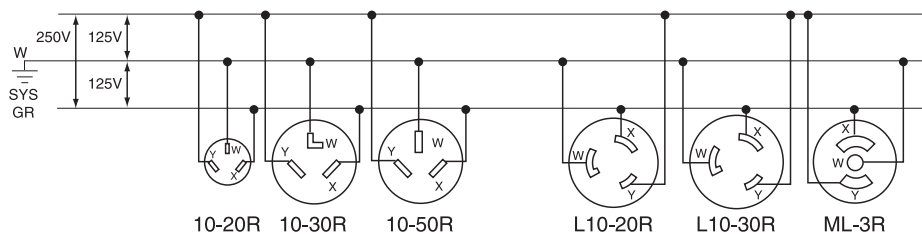
480V AC — 2-POLE, 3-WIRE GROUNDING



600V AC — 2-POLE, 3-WIRE GROUNDING



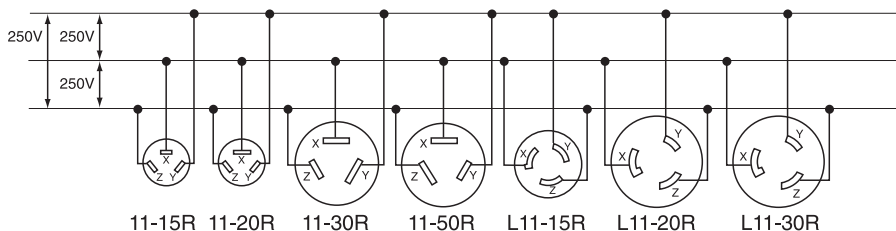
125/250V — 3-POLE, 3-WIRE



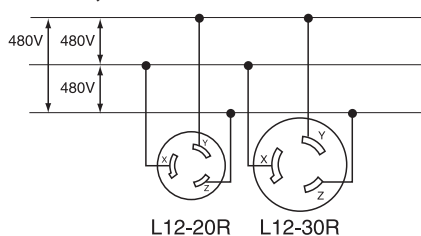
CIRCUIT WIRING DIAGRAMS

Wiring Diagrams for NEMA Configurations

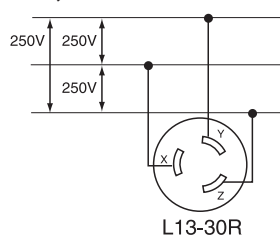
3Ø 250V — 3-POLE, 3-WIRE



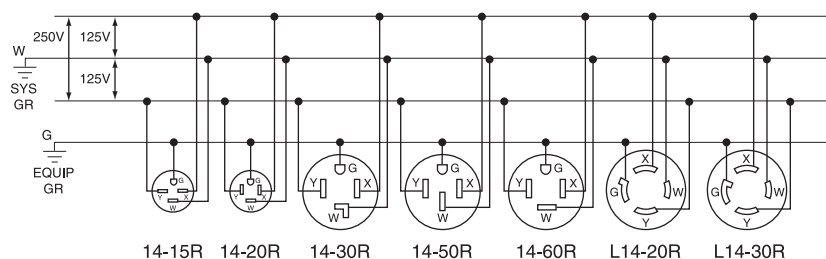
3Ø 480V — 3-POLE, 3-WIRE



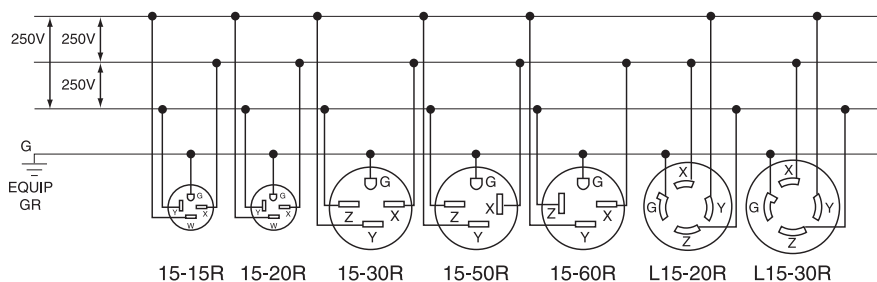
3Ø 600V — 3-POLE, 3-WIRE



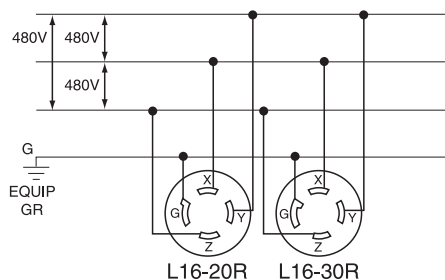
125/250V — 3-POLE, 4-WIRE GROUNDING



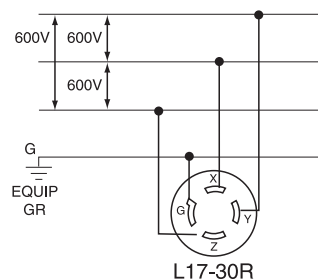
3Ø 250V — 3-POLE, 4-WIRE GROUNDING



3Ø 480V — 3-POLE, 4-WIRE GROUNDING



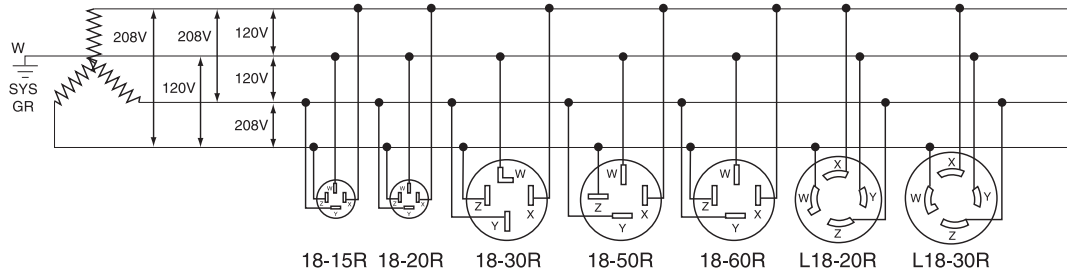
3Ø 600V — 3-POLE, 4-WIRE GROUNDING



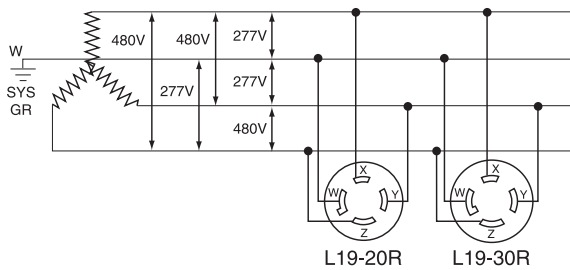
CIRCUIT WIRING DIAGRAMS

Wiring Diagrams for NEMA Configurations

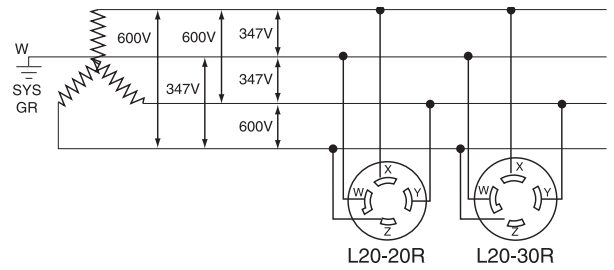
3ØY 120/208V — 4-POLE, 4-WIRE



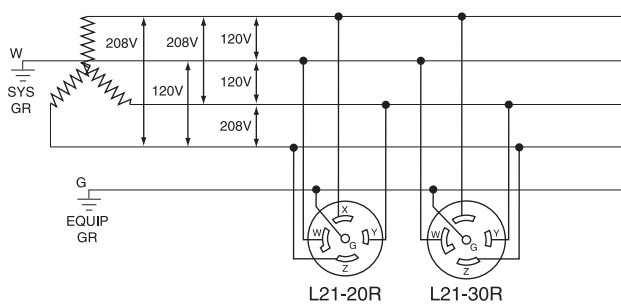
3ØY 277/480V — 4-POLE, 4-WIRE



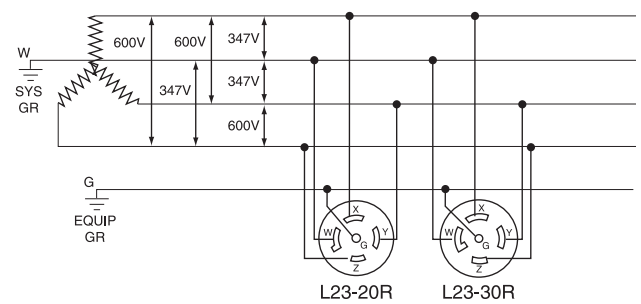
3ØY 347/600V — 4-POLE, 4-WIRE



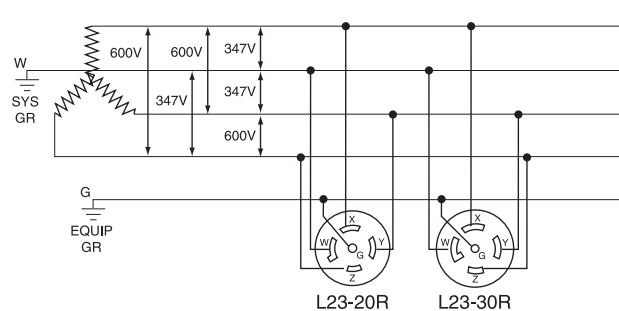
3ØY 120/208V — 4-POLE, 5-WIRE GROUNDING



3ØY 277/480V — 4-POLE, 5-WIRE GROUNDING

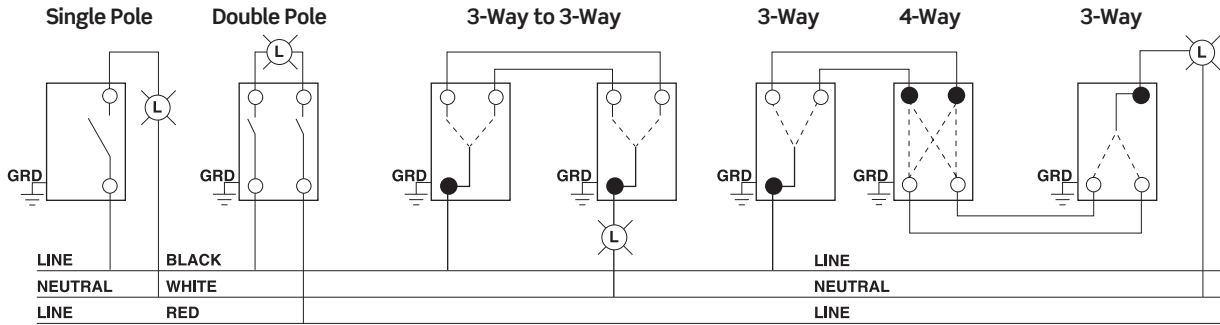


3ØY 347/600V — 4-POLE, 5-WIRE GROUNDING

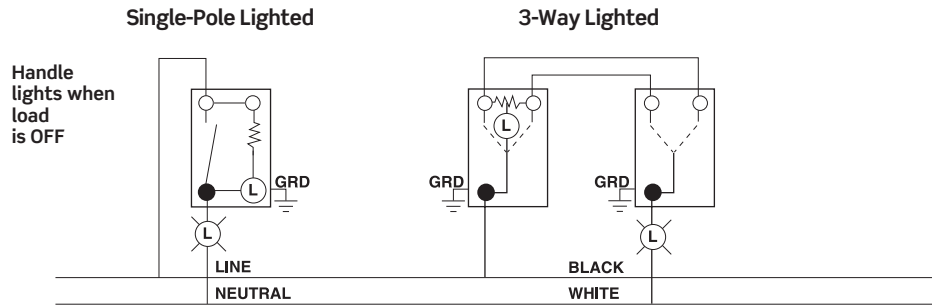


SWITCH WIRING DIAGRAMS

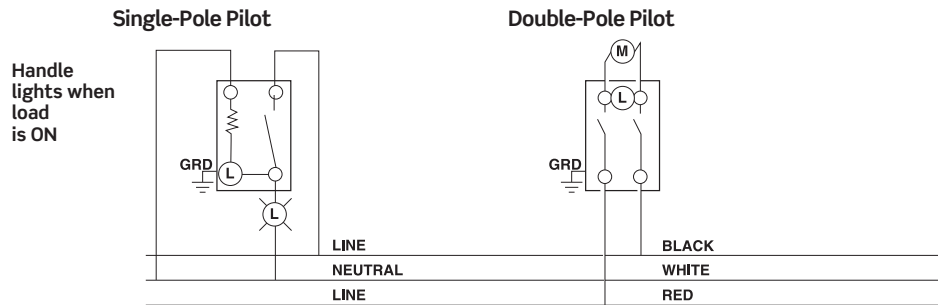
STANDARD TOGGLE TYPE SWITCHES



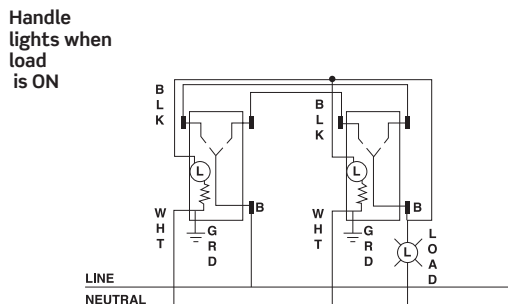
LIGHTED HANDLE SWITCHES



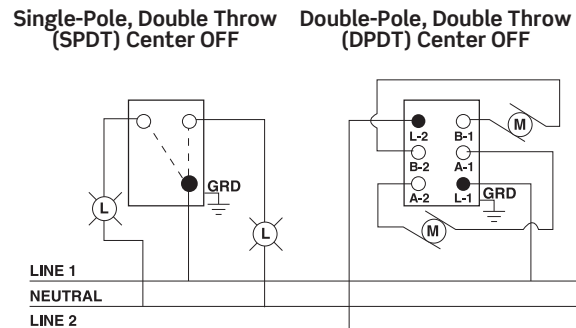
PILOT LIGHT SWITCHES



3-WAY PILOT SWITCHES



3-POSITION SWITCHES MOMENTARY AND MAINTAINED



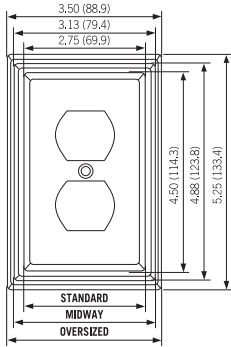
DIAMETER RANGES OF JACKETED CORD IN ACCORDANCE WITH STANDARD UL62

Acceptable Range For Overall Diameter of Jacketed Cord Indicated in Inches and Millimeters (in parentheses)

TYPE OF CORD	AWG SIZE	2-CONDUCTOR	3-CONDUCTOR	4-CONDUCTOR	5-CONDUCTOR
SV, SVO, SVT, SVTO	18	.22-.26 (5.6-6.6)	.23-.27 (5.8-6.9)	—	—
	SJ, SJO, SJT, SJTO	18	.28-.32 (7.1-8.1)	.30-.34 (7.6-8.6)	.33-.37 (8.4-9.4)
	16	.31-.34 (7.9-8.6)	.33-.36 (8.4-9.1)	.35-.40 (8.9-10.2)	—
	14	.34-.38 (8.6-9.7)	.36-.40 (9.1-10.2)	.39-.44 (9.9-11.2)	—
	12	.41-.46 (10.4-11.7)	.43-.48 (10.9-12.2)	.47-.52 (11.9-13.2)	—
	10	.54-.61 (13.7-15.5)	.57-.64 (14.5-16.3)	.63-.70 (16.0-17.8)	—
S, SO, ST, STO	18	.34-.39 (8.6-9.9)	.36-.40 (9.1-10.2)	.39-.43 (9.9-10.9)	.46-.51 (11.7-13.0)
	16	.37-.41 (9.4-10.4)	.39-.43 (9.9-10.9)	.41-.46 (10.4-11.7)	.49-.55 (12.4-14.0)
	14	.50-.55	.52-.58 (12.7-14.0)	.56-.62 (13.2-14.7)	.63-.71 (14.2-15.7) (16.0-18.0)
	12	.57-.63 (14.5-16.0)	.59-.66 (15.0-16.8)	.64-.71 (16.3-18.0)	.70-.77 (17.8-19.6)
	10	.62-.69 (15.7-17.5)	.65-.72 (16.5-18.3)	.70-.78 (17.8-19.8)	.76-.84 (19.3-21.3)
	8	.78-.88 (19.8-22.4)	.83-.93 (21.1-23.6)	.93-1.05 (23.6-26.7)	1.00-1.15 (25.4-29.2)
	6	.92-1.05 (23.4-26.7)	.97-1.10 (24.6-27.9)	1.05-1.20 (26.7-30.5)	1.18-1.33 (30.0-33.8)
	4	1.06-1.21 (26.9-30.7)	1.13-1.28 (28.7-32.5)	1.25-1.45 (31.8-36.8)	—
	2	1.21-1.40 (30.7-35.6)	1.30-1.50 (33.0-38.1)	1.45-1.65 (36.8-41.9)	—

DIMENSIONS - WALLPLATES

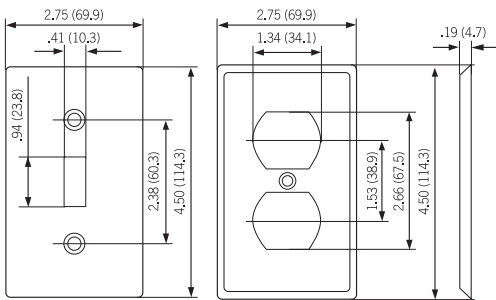
WALLPLATE SIZE COMPARISON



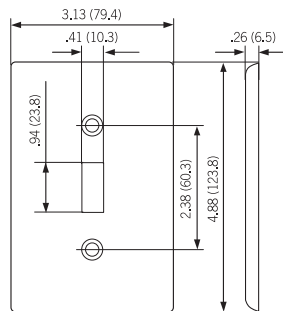
WALLPLATE DIMENSIONS

Gangs	Standard 4.50 H x D* (114.3 H x D*)	Midway 4.88 H x .260 D (123.8 H x 6.5 D)	Oversized 5.25 H x .260 D (133.4 H x 6.5 D)
1	2.75 (69.9)W	3.13 (79.4)W	3.50 (88.9)W
2	4.56 (115.9)W	4.94 (125.4)W	5.31 (134.9)W
3	6.38 (161.9)W	6.75 (171.5)W	—
4	8.19 (208.0)W	NOTE: This chart is based on the standard calculation of adding 1.81" (46.0) width for each gang in multi-gang wallplates.	
5	10 (254.0)W		
6	11.81 (300.0)W		

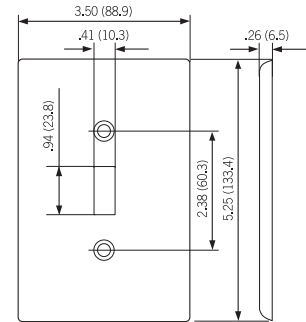
*DEPTHS OF STANDARD WALLPLATES: Plastic — .22 (5.6)
Metal — .19 (4.7)



STANDARD SIZE WALLPLATE
81001 Series and 81003 Series



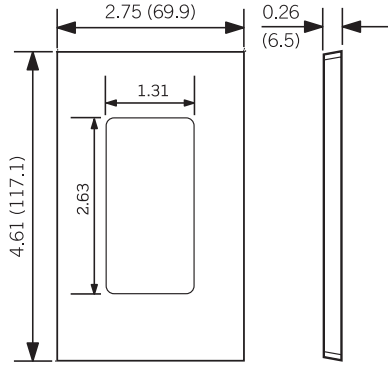
MIDWAY SIZE WALLPLATE
80501 Series



OVERSIZED WALLPLATE
85101 Series

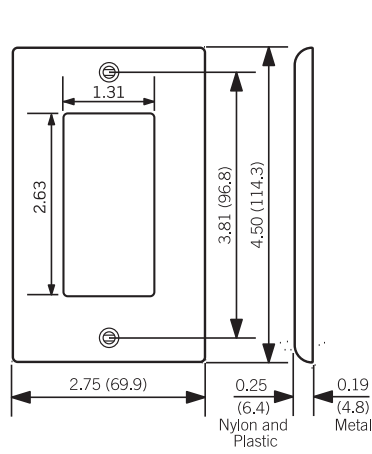
DECORA WALLPLATES

**Standard Size
Single-Gang Screwless Snap-On Wallplate**



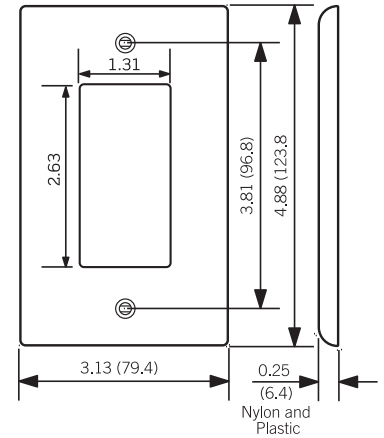
80301 Series

**Standard Size
Single-Gang**



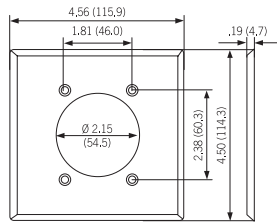
80401 Series

**Midway Size
Single-Gang**

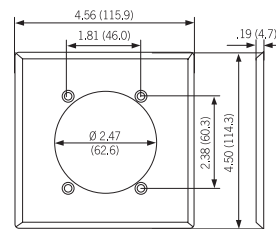


80601 Series

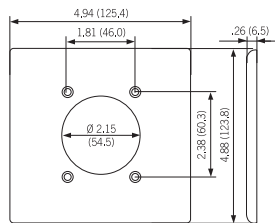
POWER RECEPTACLE WALLPLATES



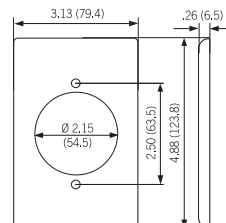
4934 Series



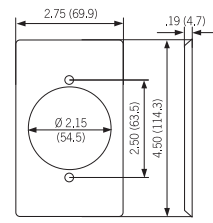
S701



80526 Series



80528 Series



4927 Series

TELEPHONE WIRING DEVICES CODES AND STANDARDS

Industry Standards

At Leviton, our concern since deregulation has been the proliferation of poor quality devices and equipment being attached to the network. These devices meet few of the customary standards for mechanical integrity and combustibility and have caused a number of problems for those who have installed them.

The responsibility for ensuring that no sub-standard devices are connected to the network rests on everyone's shoulders. In fact, the FCC recently issued a Public Notice strongly reminding manufacturers, carriers and customers that the manufacture and installation of substandard devices and equipment will not be tolerated — and that a substantial fine is the penalty for noncompliance. Recently, organizations such as the Federal Communications Commission (FCC), Underwriters Laboratories (UL), the Canadian Standards Association (CSA), and the Telecommunications Industry Association (TIA) have been developing standards for premise wiring systems. Additionally, Article 800 of the National Electrical Code (NEC), published by the National Fire Protection Association (NFPA), mandated "listing" of equipment connected to telecommunications networks. Leviton has always played a role in the standards-making process and will continue to do so. We wholeheartedly support this new standards environment.



Industry Basics: Drawing the Line

The dividing line between public network and customer premises is called the demarcation point. Equipment, including wiring, on the network side of the demarcation point is the property and responsibility of the local telephone company (telco). Equipment and wiring on the customer side is the responsibility of the customer, who may procure equipment, materials, and service from the provider of their choice. A subscriber network interface (SNI) often called a "demarcation jack", is recommended to be installed at the demarcation point. A standard registered jack is often used at this point so that the network and the premise wiring system can be quickly separated from each other. The location of the SNI depends on local rules and on such factors as the number of units in the facility, access, and the type and age of connecting hardware. The SNI may be inside the building or outside.

FCC Part 68 Requirements

The equipment standards outlined in FCC Part 68 were developed long before divestiture to assure consumers, manufacturers and carriers that terminal equipment and wiring could be connected without degrading the network. Part 68 describes minimum requirements for the mechanical or physical properties of wiring devices such as the amount of gold on jack contacts, electrical performance, dimensional integrity, material properties, and spring characteristics of contacts. Only equipment meeting FCC Part 68 standards may be manufactured and connected to the network. The vast changes that have occurred in the industry because of evolving deregulation have made it necessary to modify Part 68. To this end, FCC Wiring Docket 88-57 was issued in 1990. There have been numerous attempts to change this docket; however, as of this writing, the following guidelines are true:

- Since 1984, Part 68 specified that all connections to the network be made through the standard plugs and standard telephone company-provided jacks described in Subpart F or Part 68. Now, Docket 88-57 permits customers to connect to the carrier's jack or wiring.
- The demarcation point has been redefined to be not more than 12 inches from the protector, or when no protector is present, 12 inches from the point of entry to the premises. In the past, the demarcation point could extend into the customer premise hundreds of feet, if necessary, depending on the wiring application. The new 12-inch ruling limits the carrier's access to the customer premise.
- The carriers are not responsible for customer wiring unless they have an agreement for such responsibility. Because the customer can now install a jack at the network interface, the customer is responsible for any wiring errors and malfunctions that occur.

- The "extraordinary procedures," acceptance testing, and carrier notification for wiring clause has been eliminated. The carrier is no longer required to take steps to protect the network from harm when there is a violation of Part 68, a failure during testing of newly installed wiring, or when harm has actually occurred. Once again, because the carriers now have less access to the customer premise, they will also have less responsibility in maintaining the network.
- Customer-provided, as well as carrier-provided plugs and jacks must meet Subpart F of part 68 when newly installed on or after January 1, 1991. Prior to this ruling, Part 68 could be interpreted to require that only the jack at the network interface conform to Part 68.

Beware of the Number Game

FCC Part 68, Subpart F, specifies that contacts in the telephone jacks must have 50 micro-inches of gold over 100 micro-inches of nickel. Some manufacturers claim .5 microns of gold plating on their jack contacts. At 39.37 micro-inches per micron, that's only 19.7 micro-inches — less than half of what is required to meet FCC Part 68 specifications. If jack contacts have not been plated with the right thickness or quality of gold, corrosion at these critical points can cause signal degradation, equipment failure, and even damage to the public telephone network. Data networks are more at risk because even slight imperfections result in transmission error or data loss.

Reduce Risks — Specify Leviton

There are no two ways about it. The risk to your operation and equipment is so great that it only makes sense to insist on top-quality station products. When you specify Leviton jacks, you're assured maximum contact life with minimum resistance. We start with durable phosphor-bronze contacts and plate them with a full 50 micro-inches of lubricated hard gold over 100 micro-inches of nickel (or the electrical performance equivalent as specified in FCC Part 68 requirements). Jack openings are built within precise tolerances. High-quality thermoplastic rated UL 94V-0 resists distortion from changes in temperature and humidity, physical stress, and aging. Spring contacts are engineered to maintain positive contact pressure over the life of the device.

Telecommunications Industry Association Standards

If FCC regulations protect the telephone network from harm and UL requirements protect the consumer from harm, who is responsible for providing performance standards for the telecommunications industry? Recently, the FCC asked the Telecommunications Industry Association (TIA), a sister organization of the Electronic Industries Association (EIA), to take on this task, and they accepted the challenge. The TIA was asked to define minimum standards for such things as how to wire a building, what kind of wire to use, and so on. The following standards went into effect in 1991.

- **Pathway Standard (EIA/TIA 569-A):** This standard for installing pipe and conduit in commercial buildings is now available through TIA and the American National Standards Institute (ANSI).
- **Residential/Light Commercial Wiring (EIA/TIA 570):** A draft of this standard, which applies to premises with up to four telephone lines, has been reviewed by ANSI and TIA committees and released.
- **Commercial Wiring Standard (EIA/TIA 568-A):** The Commercial Wiring Standard applies to premises with more than four telephone lines. This draft has also been reviewed and released by ANSI and TIA committees. At time of printing, the standards are undergoing major revisions and are currently up for ballot.

We're the "Standards" People

Because Leviton is an active participant in the formation of North American codes and standards, you can be assured that our product development activities fully support this emerging standards environment. In fact, we have prepared several publications which describe standard practices and provide installation guidelines for contractors. Many Leviton distributors also sponsor training programs dealing with telecom wiring. And, of course, Leviton's Applications Engineering Group is always ready to assist you with any questions you may have about standards and codes, standard practices, or any installation problem.

WIRE COLOR CODES AND JACK PIN DESIGNATIONS

Electrical Network Connection

From 1 to 25 single or multiple-pair circuits bridged to the network or other connected equipment.

Mechanical Arrangement

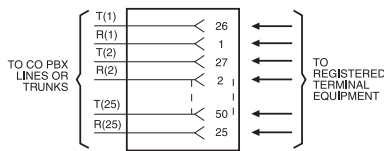
Circuits are provided on numbered tip and ring positions on a miniature 50-pin ribbon connector (Amphenol-type). Pins 1 (ring) and 26 (tip) are considered position 1. Pins 2 (ring) and 27 (tip) of the ribbon connector are position 2. This pairing continues through twenty-five pairs.

Typical Usage

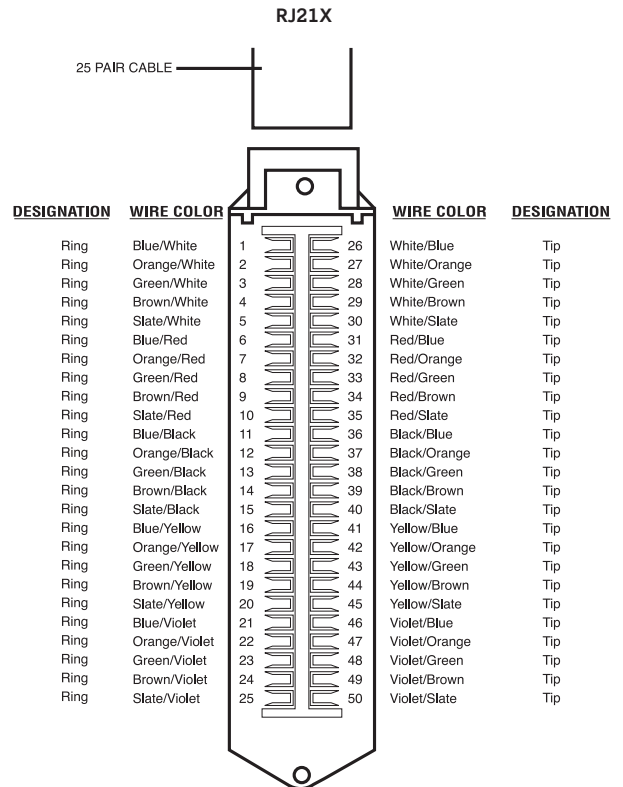
Many key and PBX systems specify the RJ21X, or 'Amphenol-type' as the network interface device. Many of these systems also use the RJ21X as a connector for stations or telephone sets, wired from the KSU or PBX Main Distribution Frame.

Note: Sometimes an RJ11 or RJ14C can be installed in place of an RJ21X. While many smaller systems that require only a few lines may show the RJ21X as the 'official' jack required under registration, less complex jacks such as the RJ11 or RJ14C can often be specified (perhaps in multiples). If the system requires only a few lines but the RJ21X is specified on the registration label, under FCC Part 68 you may specify the RJ11C, RJ14C, RJ25C, or RJ61X instead.

Many Leviton jacks can be used for the RJ21X configuration where 'intermixing' is permitted. Substitution of these special jacks is often both economical and practical. Contact Leviton Network Solutions Division for information about versions to meet your requirements.



25-PAIR COLOR CODING/ISDN CONTACT ASSIGNMENTS

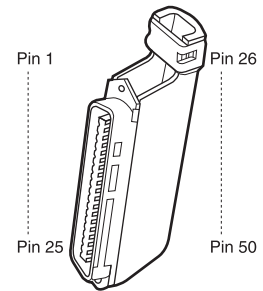
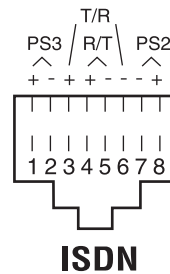


ISDN Assignment of Contact Numbers as specified by ISO Document 8877: 1987 (E)

Contact assignments for plugs and jacks:

Contact Number	TE	NT	Polarity
1	Power source 3	Power sink 3	+
2	Power source 3	Power sink 3	-
3	Transmit	Receive	+
4	Receive	Transmit	+
5	Receive	Transmit	-
6	Transmit	Receive	-
7	Power sink 2	Power source 2	-
8	Power sink 2	Power source 2	+

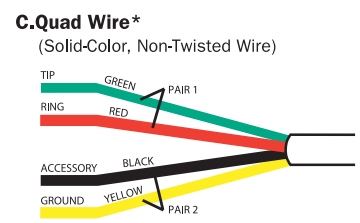
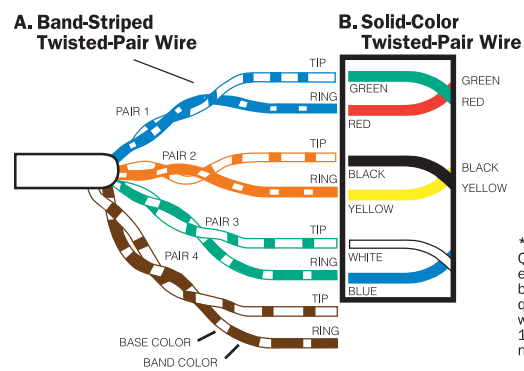
Note: For use in TE to TE interconnections, power source/sink 3 shall conform to the requirements specified in CCITT Recommendation 1.430, section 9.2 for power source/sink 2.



WIRE COLOR CODES

Standard 4-Pair Wiring Color Codes			
PAIR 1	T	White/Blue	
	R	Blue/White	
PAIR 2	T	White/Orange	
	R	Orange/White	
PAIR 3	T	White/Green	
	R	Green/White	
PAIR 4	T	White/Brown	
	R	Brown/White	

Note: For 6-wire jacks use pair 1, 2 and 3 color codes. For 4-wire jacks use pair 1 and 2 color codes.

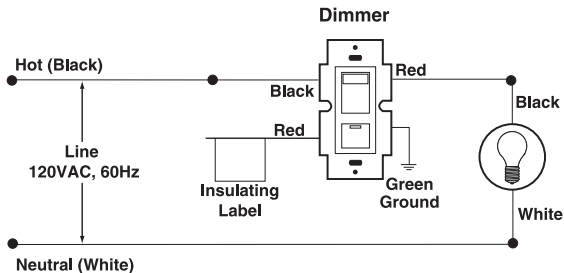


***CAUTION**
Quad wire is no longer acceptable for installation in multi-line environments. If encountered during a retrofit, quad wire should be replaced with 100Ω UTP. Connecting new quad to installed quad will only amplify existing problems and limitations associated with quad wire; leaving existing quad in place and connecting 100Ω UTP to it may also be ineffective, as the quad wire may negate the desired effect of the UTP.

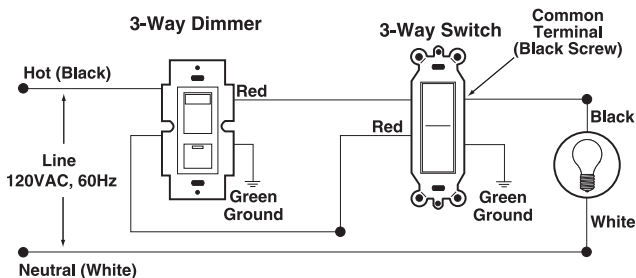
FREQUENTLY ASKED QUESTIONS

General Product FAQs

- In reference to switching, what do the terms “single pole”, “3-way” and “multi-location” mean?



A **single pole switch** means to be able to control one lighting fixture from one switch location.



3-way switching means controlling 1 light fixture from 2 locations. This is typically found at both ends of a stairway or hallway.

Multi-location switching means controlling 1 fixture from 2 or more remote locations, usually ideal for large rooms. Leviton Vizia[®], Acent[®], and True Touch[™] dimmers can be used with up to 5 remote units to provide full-range dimming and ON/OFF switching at all locations.

- In terms of wiring devices; what does back wired, side wired and quickwire mean?

-Back Wired is a wiring termination that can be accomplished by inserting a pre-stripped solid or stranded conductor into a wiring device terminal opening, followed by tightening the adjacent terminal screw, which will compress the conductor between the terminal and a pressure plate.

-Side Wired is a wiring termination that is accomplished by a $\frac{3}{4}$ " turn looping pre-stripped solid or stranded conductor under terminal screws.

-Quickwired is a wiring termination that is accomplished by inserting pre-stripped solid, #14 AWG conductors into a device terminal opening. The wire is secured by an internal clamping mechanism.

- Why are some device's wire leads not copper colored?

The wires that appear to be silver in color are tinned copper, and are a result of the tinning process. Tinned copper wires are suitable for use with copper wiring.

- Can copper wiring devices be used with aluminum wire?

NO! Aluminum wire tends to oxidize over time, and the oxide layer does not conduct electricity. This results in a poor connection with the wiring device terminal screws, particularly if they are steel. The connections gradually heat up to the point where fires are started inside the walls. For this reason, all standard wiring devices contain the warning, "For use with copper or copper-clad wire ONLY. Do not use with aluminum wire." The only exception to this is CO/ALR wiring devices.

Leviton offers a selection of CO/ALR devices for use with aluminum wire. In CO/ALR devices, the terminal screws are plating with the element Indium. Indium is an extremely soft metal that forms a gas-sealed connection with the aluminum wire, eliminating problems caused by oxidation.

- The markings UL, NOM and CSA can be found on some Leviton devices. What do they represent?

-UL (Underwriters Laboratories Inc) - An independent, not-for-profit organization testing for public safety. Tests by UL are the basis for acceptance by various government agencies. Listing by UL denotes initial testing and periodic retesting to assure continuing conformance to standards.

NOM - Norma Oficial Mexicana (Mexican Official Standard) NOM standards are the official Mexican product safety requirements. Electrical, electronic, medical, wireless, and telecom products sold in Mexico must be tested to the national, mandatory NOM standards by an accredited Mexican laboratory.

CSA - CSA Standards define construction, performance, and marking requirements for wiring devices for use in accordance with the Canadian Electrical Code, Part 1. Products covered by CSA Standards are regularly checked and tested by the Canadian Standards Association's Factory Audit Program.

Combination Switches

- Why are there two black screws on my combination switch?

There are two black screws provided so that if you wish you can feed power separately to the switches or switches and receptacles.

- Does the brass tab on the 5224-2 need to be broken?

The brass tab must be broken if you are going to feed each switch with a separate power source. If there is only a single power feed in the wallbox then you will keep the tab intact and attach the power feed to either one of the black screw terminals.

- I'm replacing a single pole switch with a 5225 single pole switch/receptacle, but only have two wires and a ground in the wall box. Can the 5225 be installed at this switch location?

The 5225 will require a line, load, and a neutral connection in order for the receptacle to work. If ground is available, that should be connected as well. If the existing switch had no neutral connected, then check your wall box for neutral connections that may be passing through the wall box that you can connect to the device.

- Can the switch on the 5225 control the receptacle?

For the switch to control the receptacle, you would connect the line hot wire to the brass screw and the neutral wire to the silver screw.

VPT24

- Is the VPT24 compatible with fluorescent and compact-fluorescent lighting?

Yes it is.

- Does the VPT24 require a connection to neutral?

Yes. Neutral is required in order for the timer to function.

- How can I delete all programming on the device?

To delete programming only, press and hold set followed by Override until delete stops flashing. Then let go of buttons and all programming will be deleted.

FREQUENTLY ASKED QUESTIONS

General Dimmer FAQs

- **Why are the light bulbs buzzing after I installed a new incandescent dimmer?**

Because of the way all dimmers deliver power at settings other than full brightness, the filaments inside a light bulb may vibrate when lighting is dimmed. This filament vibration causes the hum. To silence the fixture, a slight change in the brightness setting will usually eliminate bulb noise. The most effective way to quiet the fixture is to replace the light bulb.

- **Is it normal for a dimmer to feel warm when in use?**

In service, it is normal for dimmers to feel warm to the touch: it is completely acceptable as long as the temperatures remain within the limits established by UL and the manufacturer. Underwriters Laboratories (UL) has specified limiting parameters for this type of heat buildup. The average dimmer operates at approximately 140°F; UL allows a maximum temperature of 195°F. When dimmers are ganged together, each dimmer's load must be derated to offset the resulting heat build-up from the presence of several units in the same wallbox.

- **There is no ground wire in the box, what do I do with the green wire?**

When there is no ground available within the wallbox, the 2008 NEC article 404.9 exception to (b) permits a dimmer without a ground connection to be installed as a replacement. For this type of installation, cap or remove the dimmer ground wire.

- **Does Leviton offer a dimmer for dimmable compact fluorescent bulbs (CFL's)?**

Yes, Leviton offers a dimmer, Cat. No. 6673, dimmable CFL bulbs. It also detects and adjusts performance for incandescent bulbs.

- **Can a dimmer control a fan?**

NO. Fan controls have special circuitry to regulate motors. Dimmer controls are not engineered or intended to control fans, and will cause damage to the fans motor. Always use fan speed controls to control fans and fan/light controls to control light fixtures with fans.

- **How do I tell magnetic and electronic low-voltage transformers apart?**

Transformers may have magnetic (core and coil, toroidal) or electronic (solid-state) clearly indicated on the product. However this is not a required marking and will not be found on all products. The best way to determine transformer type is to contact the manufacturer.

- **What is "ganging" and "derating"?**

Ganging means installing dimmers side-by-side in one larger-size wallbox. Dimmers are always ganged vertically and must be "derated" to prevent heat buildup. Consult the product instruction sheet for derating chart.

- **Can more than one dimmer be ganged together in a multi-gang wallbox?**

Yes. Two or more dimmers can be placed in the same wallbox, but the reduction of the dimmers' capacity is required. Consult the product instruction sheet for derating chart.

- **What is a heat sink and how does it work?**

The metal mounting strap on the dimmer removes heat from the device. Dimmers designed for heavier lighting loads use architectural metallic fins as heat sinks. Leviton mounting straps are the most efficient available, allowing cool, continuous operation for up to 2000 Watt loads.

Dimming Incandescent Lights by:	Reduces Energy Consumption by:
10%	10%
25%	20%
50%	40%
75%	60%

- **What is a "Preset" dimmer?**

A preset dimmer contains a separate switch that turns light ON and OFF without changing the dimmer setting.

- **Do dimmers really save energy?**

One of the easiest ways to reduce electricity consumption is via a combination of dimmers and task lighting. Not

only do dimmed lights draw less electricity, they produce less heat - and that can reduce cooling costs, which can really add up in warmer climates. As a general rule: the more you dim, the more you save. Dimming also enables bulbs to last longer.

- **Can I use a dimmer at each switch location in a 3 or 4-way application?**

NO. Only one mechanical dimmer can be used in a 3 or 4-way application with a standard 3 and 4-way. For multi-location dimming use controls from Leviton's Vizia +®, Acenti® or True Touch® series with up to 5 remote units to provide full-range dimming and ON/OFF switching at all locations.

6696

- **Is 6696 compatible with fluorescent and compact-fluorescent lighting?**

No. The 6696 is rated for 300 Watts of incandescent lights only.

- **Is the transmitter or receiver switch available separately?**

No. The 6696 is only available for purchase as a complete set.

- **Can I use one transmitter for more than one receiver?**

Yes you can, provided that the transmitter and the receivers are on the same letter code.

- **How far can the transmitter and receiver be placed apart?**

The operating range between transmitter and receiver is 50 feet.

- **If the receiver does not respond and turn the lights on when the transmitter is operated, what can be done?**

Be sure that both the transmitter and receiver are set to the same letter code.

6681

- **The dimmer has two black leads and one green? Where do these leads go?**

The black wires are interchangeable, so one connects to the hot wire coming from the panel; the other black connects to the hot leg of the load, and the green to ground.

- **The 6681 dimmer gets warm to the touch. Is this a problem?**

In service, it is normal for dimmers to feel warm to the touch: it is completely acceptable as long as the temperatures remain within the limits established by UL and the manufacturer. Underwriters Laboratories (UL) has specified limiting parameters for this type of heat buildup. The average dimmer operates at approximately 140°F; UL allows a maximum temperature of 195°F. When dimmers are ganged together, each dimmer's load must be derated to offset the resulting heat build-up from the presence of several units in the same wallbox.

- **I do not have a ground in my box, may I use this dimmer?**

Yes. A ground is not required to operate this dimmer.

FREQUENTLY ASKED QUESTIONS GFCI FAQs

• What is a GFCI?

A GFCI is a receptacle or outlet designed to protect people from hazardous ground faults. A ground fault occurs when electrical current travels through any abnormal path to ground, which can be dangerous if the current travels through a person. This can happen when any appliance plugged into an outlet becomes damaged. Electrical current “leaking” from the faulty appliance can travel through anyone touching it, especially in a wet environment, causing a serious electrical shock.

• How does a GFCI work?

The GFCI monitors the flow of electricity from the outlet to any electrical device plugged into it. If the GFCI detects that some current is not returning to the receptacle, and is going out through another path, the GFCI will quickly turn off power to the receptacle.

• Where are GFCIs required?

GFCIs (Ground Fault Circuit Interrupters) are required in many locations, particularly where water and electricity may meet. The NEC (National Electrical Code) requires GFCIs in kitchens, bathrooms, garages and outdoor locations.

• What does Leviton’s SmartLockPRO® GFCI protection provide?

If a SmartLockPRO® GFCI is miswired during installation (line-load reversal), it cannot be reset, blocking delivery of power to its feed-through terminals and face. The GFCI is completely dead and the green LED will be ON to indicate a line-load reversal. Once the GFCI is wired properly and the unit can be reset, the LED acts as a power indicator that remains ON as long as the GFCI is operating correctly and providing power.

-The SmartLockPRO® GFCI features Leviton’s unique patented lockout action as an end-of-life indication. If a SmartLockPRO® GFCI is damaged so that it cannot respond properly to a ground fault, the GFCI prevents reset.

• Can a GFCI be used outdoors?

Yes, only if the GFCI meets the UL 498 requirements for weather-resistant receptacles. Also, covers must be used with weather resistant GFCI receptacles in damp or wet locations per Section 406.8 of the NEC code. Leviton’s **W7599** and **W7899** are both ideal for outdoor applications.

• Can I use a GFCI in a 2 wire (ungrounded) circuit?

Yes. Section 406.3(D)(3) of the 2008 National Electric Code permits a non-grounding type receptacle to be replaced with a grounding type receptacle without a grounding connection. However, the grounding receptacle **must** be GFCI-protected. The diagram below shows a typical non-grounding (2-prong) receptacle replaced with a GFCI. The GFCI must be marked, “No Equipment Ground.” The GFCI can feed through to a grounding receptacle, which must be marked “GFCI Protected. No Equipment Ground.” For increased electrical safety, Leviton strongly recommends installing a GFCI in every non-grounding circuit. A ground wire provides protection by offering a parallel path back to ground for any fault current. Without a ground wire, fault current will try and take other paths to ground and a GFCI will trip and cut power under these hazardous conditions. Ground faults are more likely to occur in non-grounding circuits and a GFCI will help protect family members from this potentially hazardous condition.

• How many receptacles can be installed and protected in a residential application on the load side of a SmartLockPro® GFCI?

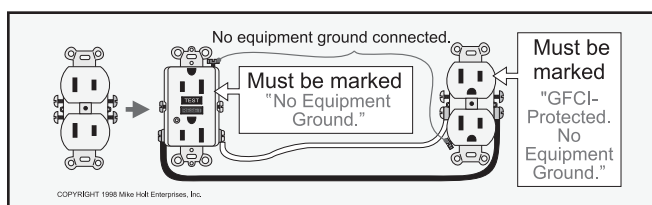
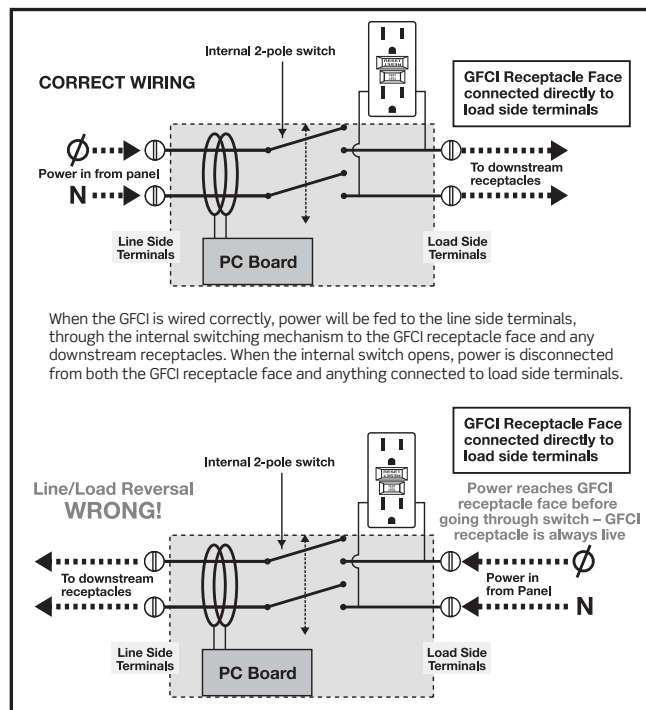
There is no limit as far as the number of receptacles that can be protected from the load side of the GFCI. Since our GFCIs are rated for 20 Amp feed-through they are capable of protecting a whole residential 20 Amp circuit.

• What does Class A mean when applied to a GFCI?

Class A is an interrupter that will interrupt the circuit to the load when the ground-fault current is 6 mA or more but not when the ground-fault current is 4 mA or less.

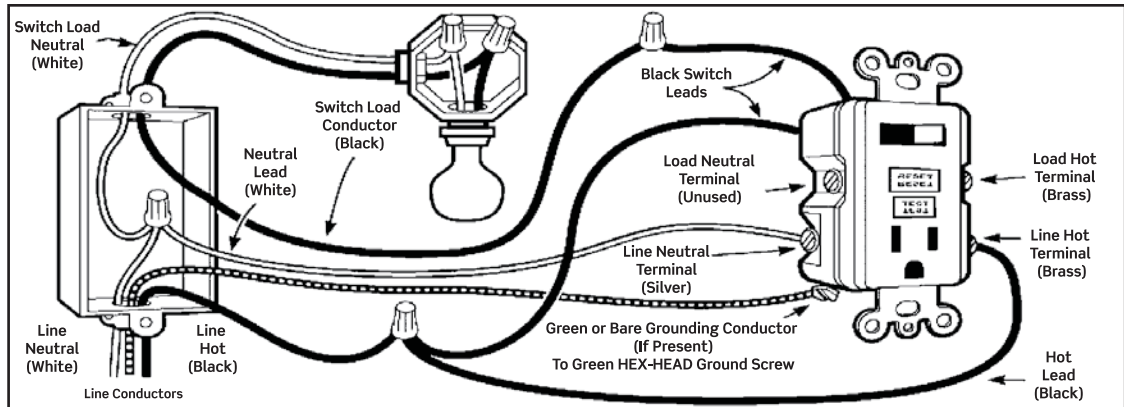
• What is Line-Load reversal?

When the line and load leads are reversed (**below**), the GFCI receptacle face is now wired directly to the power coming from the panel, completely bypassing the internal switching mechanism. The face **is not** GFCI protected and remains live even after the internal switch opens. This is a potentially hazardous condition, and the fact that the device appears to be operating properly creates a false sense of protection for end-users. UL now requires a diagnostic indication to alert installers that there is a line/load reversal.

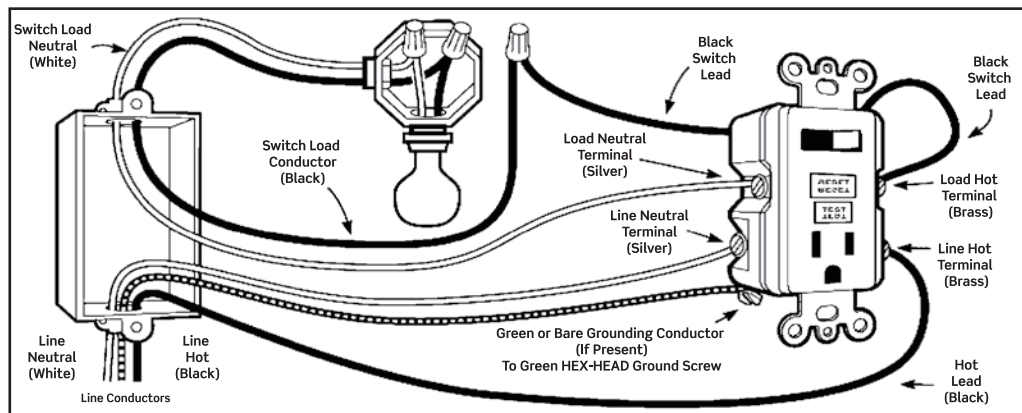


7299

- How do you wire a 7299 with the load NOT protected?



- How do you wire a 7299 with the load protected?



- Can I wire the 7299 so that the switch controls the receptacle?

No. The 7299 is not capable of being wired to have the switch control the receptacle.

- Is the 7299 available in a 20 amp version?

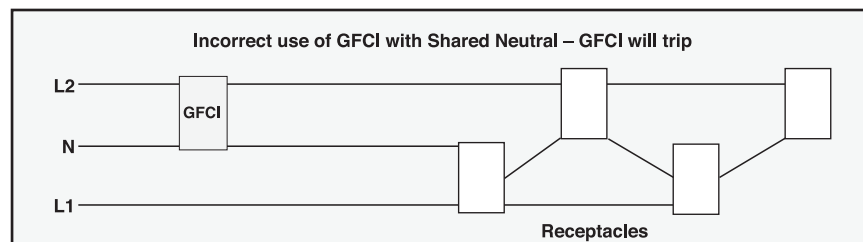
The 7299 is only offered in 15 amps.

- I just installed a 7599 but it will not 'test' or 'reset'. Why is this?

Being unable to test and reset your GFCI is a sign of a 'Line-Load' reversal in the device wiring.

- Can GFCI's Be Used in Circuits with a Shared Neutral?

Using a single neutral conductor for more than one circuit can be looked at as a way to save money on wiring. Because a GFCI receptacle looks for a balance of current flowing in a single hot conductor and a single neutral conductor, it will not operate properly when more than one hot conductor is sharing a neutral downstream from a GFCI. Current flowing in the neutral from the circuit not protected by the GFCI will cause the GFCI to see an imbalance typically associated with a ground fault and the GFCI will trip. A hazardous condition would exist in the circuit not protected by the GFCI as it may appear as though the power is off even though the hot leg is still live. In circuits wired this way, the neutral needs to be split at or before reaching the GFCI receptacle and a dedicated neutral must be run from the GFCI receptacle to all downstream receptacles protected by the GFCI.



WARRANTY INFORMATION

LIMITED ONE YEAR WARRANTY AND EXCLUSIONS

Leviton warrants to the original consumer purchaser and not for the benefit of anyone else that this product at the time of its sale by Leviton is free of defects in materials and workmanship under normal and proper use for one year from the purchase date. Leviton's only obligation is to correct such defects by repair or replacement, at its option, if within such one year period the product is returned prepaid, with proof of purchase date, and a description of the problem to Leviton Manufacturing Co., Inc., Att: Quality Assurance Department, 201 North Service Road, Melville, New York 11747. This warranty excludes and there is disclaimed liability for labor for removal of this product or reinstallation. This warranty is void if this product is installed improperly or in an improper environment, overloaded, misused, opened, abused, or altered in any manner, or is not used under normal operating conditions or not in accordance with any labels or instructions. There are no other or implied warranties of any kind, including merchantability and fitness for a particular purpose, but if any implied warranty is required by the applicable jurisdiction, the duration of any such implied warranty, including merchantability and fitness for a particular purpose, is limited to one year. Leviton is not liable for incidental, indirect, special, or consequential damages, including without limitation, damage to, or loss of use of, any equipment, lost sales or profits or delay or failure to perform this warranty obligation. The remedies provided herein are the exclusive remedies under this warranty, whether based on contract, tort or otherwise.

LIMITED TWO YEAR WARRANTY AND EXCLUSIONS

Leviton warrants to the original consumer purchaser and not for the benefit of anyone else that this product at the time of its sale by Leviton is free of defects in materials and workmanship under normal and proper use for two years from the purchase date. Leviton's only obligation is to correct such defects by repair or replacement, at its option, if within such two year period the product is returned prepaid, with proof of purchase date, and a description of the problem to Leviton Manufacturing Co., Inc., Att: Quality Assurance Department, 201 North Service Road, Melville, New York 11747. This warranty excludes and there is disclaimed liability for labor for removal of this product or reinstallation. This warranty is void if this product is installed improperly or in an improper environment, overloaded, misused, opened, abused, or altered in any manner, or is not used under normal operating conditions or not in accordance with any labels or instructions. There are no other or implied warranties of any kind, including merchantability and fitness for a particular purpose, but if any implied warranty is required by the applicable jurisdiction, the duration of any such implied warranty, including merchantability and fitness for a particular purpose, is limited to two years. Leviton is not liable for incidental, indirect, special, or consequential damages, including without limitation, damage to, or loss of use of, any equipment, lost sales or profits or delay or failure to perform this warranty obligation. The remedies provided herein are the exclusive remedies under this warranty, whether based on contract, tort or otherwise.

LIMITED FIVE YEAR WARRANTY AND EXCLUSIONS

Leviton warrants to the original consumer purchaser and not for the benefit of anyone else that this product at the time of its sale by Leviton is free of defects in materials and workmanship under normal and proper use for five years from the purchase date. Leviton's only obligation is to correct such defects by repair or replacement, at its option, if within such five year period the product is returned prepaid, with proof of purchase date, and a description of the problem to Leviton Manufacturing Co., Inc., Att: Quality Assurance Department, 201 North Service Road, Melville, New York 11747. This warranty excludes and there is disclaimed liability for labor for removal of this product or reinstallation. This warranty is void if this product is installed improperly or in an improper environment, overloaded, misused, opened, abused, or altered in any manner, or is not used under normal operating conditions or not in accordance with any labels or instructions. There are no other or implied warranties of any kind, including merchantability and fitness for a particular purpose, but if any implied warranty is required by the applicable jurisdiction, the duration of any such implied warranty, including merchantability and fitness for a particular purpose, is limited to five years. Leviton is not liable for incidental, indirect, special, or consequential damages, including without limitation,

damage to, or loss of use of, any equipment, lost sales or profits or delay or failure to perform this warranty obligation. The remedies provided herein are the exclusive remedies under this warranty, whether based on contract, tort or otherwise.

LIMITED TEN YEAR WARRANTY AND EXCLUSIONS

Leviton warrants to the original consumer purchaser and not for the benefit of anyone else that this product at the time of its sale by Leviton is free of defects in materials and workmanship under normal and proper use for ten years from the purchase date. Leviton's only obligation is to correct such defects by repair or replacement, at its option, if within such ten year period the product is returned prepaid, with proof of purchase date, and a description of the problem to Leviton Manufacturing Co., Inc., Att: Quality Assurance Department, 201 North Service Road, Melville, New York 11747. This warranty excludes and there is disclaimed liability for labor for removal of this product or reinstallation. This warranty is void if this product is installed improperly or in an improper environment, overloaded, misused, opened, abused, or altered in any manner, or is not used under normal operating conditions or not in accordance with any labels or instructions. There are no other or implied warranties of any kind, including merchantability and fitness for a particular purpose, but if any implied warranty is required by the applicable jurisdiction, the duration of any such implied warranty, including merchantability and fitness for a particular purpose, is limited to ten years. Leviton is not liable for incidental, indirect, special, or consequential damages, including without limitation, damage to, or loss of use of, any equipment, lost sales or profits or delay or failure to perform this warranty obligation. The remedies provided herein are the exclusive remedies under this warranty, whether based on contract, tort or otherwise.

Power Quality Division - "True Whole House Surge Protection" Limited Warranty

Service Entrance: \$10,000 for Connected "White Appliances"

51110-PTC and 51120 Panels - 10 Year Product Replacement Metersocket Arresters - 15-Year Product Replacement

Lifetime Connected Equipment Protection

\$50,000	5950 Modular Strips
\$25,000	5300 Power Strips, 5400-TLS Power Control Center 5350 Stand-alone Telco/CATV/Satellite Protectors 51110-PTC and 51120-PTC panels. 5500 Rackmounts
\$5,000	4950 Strips, 4900 Plug-ins and 1511 single outlet

This warranty is for the benefit of the original consumer purchaser only and will continue for as long as such original purchaser uses the Leviton "True Whole House Surge Protection" package.

SUPPRESSION PRODUCT REPLACEMENT

Lifetime materials and workmanship on Plug-in Surge Suppression Device (SPD), 15- year materials and workmanship on Metersockets and 10-year materials and workmanship on 51110-PTC and 51120 Service Entrance SPD Panels. Subject to the provisions below, this warranty covers all defects in workmanship or materials in your Leviton SPD. If the SPD is damaged by a power surge and Leviton determines that such damage was caused by the performance failure of the Leviton Surge Suppressor; Leviton will, at its option, repair or replace the unit.

WARRANTY INFORMATION

CONNECTED EQUIPMENT COVERAGE

The Leviton "True Whole-House Surge Protection" program provides the following connected equipment coverage:

1. Meter Base (50240), Surge Arrester (55175) or Panel-mount Service Entrance SPD (51110-PTC & 51120); Up to \$10,000 to repair or replace (whichever is less) residential "standard white appliances" which sustain surge damage. Maximum coverage per household: \$10,000. A "standard white appliance" is defined as washer, dryer, stove, refrigerator, freezer, dishwasher, microwave ovens and indoor HVAC equipment. This portion of the warranty applies to electro-mechanical components and to any microprocessor components. Coverage is applicable only when the Service Entrance SPD (1) was active and fully functional immediately prior to the claim event, (2) sustained surge damage as a result of the claim event and (3) is installed within 100 feet of conductor of structure being protected. The Cat. No. 55175-ASA will provide \$1,000 connected equipment for well-pumps.

The 51110-PTC and 51120-PTC Panel Protector will provide \$10,000 coverage for Residential Standard White Appliances as well as \$25,000 coverage for connected Dial-up telephone, Satellite Receiver and CATV equipment ports.

2. Plug strips; Up to \$25,000 to repair or replace (whichever is less) properly connected equipment damaged as the result of SPD failure (the SPD must also sustain surge damage). The above remedy is your exclusive remedy under this warranty, whether based on contract, tort, including negligence or otherwise. Claims must be made within 30 days of damage or loss. Leviton reserves the right to audit the damage, site and/or cost of repairs and may require a notarized proof of loss.

WHAT IS A "POWER SURGE"?

"Power Surge" means an electrical transient or spike on the AC power or communication lines, including those caused by indirect lightning, against which surge suppressors of this type are generally designed to protect as recognized by industry standards.

WARRANTY CLAIM PROCEDURES

If any of the SPD products have defects or sustain damage covered by your "True Whole-House Surge Protection" warranty, call Leviton at 800-648-3332. To file a claim for power surge damage to connected equipment:

1. Meterbase: If Red Light is ON - Call Utility for replacement of unit.
2. Power Strips: Send the damaged Leviton SPD product(s), freight pre-paid, to Leviton Manufacturing for testing and confirmation of damage.
3. After Leviton confirms SPD damage, have damaged equipment repaired at an authorized service center.
4. Submit receipts along with your claim package to Leviton Manufacturing Co. Inc., 860 Harold Place, Chula Vista, CA 91914
5. Leviton reserves the right to repair or replace equipment at the prorated fair market value of the equipment damaged.

WHAT DOESN'T THIS WARRANTY COVER?

This warranty will not apply to any defects or damage to the Leviton SPD or any properly connected equipment arising because: (1) The Leviton SPD was tampered with, modified or altered in any way, or (2) the Leviton SPD or the connected equipment was not used under normal operating conditions or in accordance with any labels or instructions. This warranty does not cover any damage to properly connected equipment resulting from a cause other than a "power surge." This warranty specifically does not cover damage associated with a direct lightning strike to the structure, sustained over-voltage; equipment installed outdoors, vandalism, theft, normal wear and tear, obsolescence, abuse or catastrophic events. This specifically excludes sprinkler systems and hard-wired security alarm systems. Well-pumps are covered only when a 55175-ASA arrester with alarm is installed direct at the equipment. This warranty does not cover, garage door operators or outdoor equipment including outdoor HVAC units and window-mounted air conditioners. Leviton disclaims liability for any installation labor, incidental, indirect, special or consequential damages, including, without limitation, lost business profits, loss of data and all freight, mileage, travel time, and insurance charges associated with warranty coverage claims arising out of the sale or use of the Leviton SPD or out of the performance (or failure or delay) of Leviton's warranty. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights that vary from state to state. Valid in U.S.A and Canada.

INTERNATIONAL ELECTRICAL OUTLET LISTING

Country	Voltage	Frequency/Cycle
Afghanistan	220 V	50 Hz
Albania	220 V	50 Hz
Algeria	230 V	50 Hz
American Samoa	120 V	60 Hz
Andorra	230 V	50 Hz
Angola	220 V	50 Hz
Anguilla	110 V	60 Hz
Antigua and Barbuda	230 V	60 Hz
Argentina	220 V	50 Hz
Armenia	220 V	50 Hz
Aruba	127 V	60 Hz
Australia	240 V	50 Hz
Austria	230 V	50 Hz
Azerbaijan	220 V	50 Hz
Bahamas, The	120 V	60 Hz
Bahrain	230 V	50 Hz
Bangladesh	220 V	50 Hz
Barbados	115V	50 Hz
Belarus	220 V	50 Hz
Belgium	230 V	50 Hz
Belize	110 V / 220 V	60 Hz
Benin	220 V	50 Hz
Bermuda	120 V	60 Hz
Bhutan	230 V	50 Hz
Bolivia	220 V / 230 V	50 Hz
Bosnia and Herzegovina	220 V	50 Hz
Botswana	231 V	50 Hz
Brazil	110 V / 220 V	60 Hz
Brunei	240 V	50 Hz
Bulgaria	230 V	50 Hz
Burkina Faso	220 V	50 Hz
Burma	230 V	50 Hz
Burundi	220 V	50 Hz
Cambodia	230 V	50 Hz
Cameroon	220 V	50 Hz
Canada	120 V	60 Hz
Cape Verde	220 V	50 Hz
Cayman Islands	120 V	60 Hz
Central African Republic	220 V	50 Hz
Chad	220 V	50 Hz

INTERNATIONAL ELECTRICAL OUTLET LISTING

Country	Voltage	Frequency/Cycle
Chile	220 V	50 Hz
China	220 V	50 Hz
Colombia	110 V	60 Hz
Comoros	220 V	50 Hz
Congo, Democratic Republic of the	220 V	50 Hz
Congo, Republic of the	230 V	50 Hz
Cook Islands	240 V	50 Hz
Costa Rica	120 V	60 Hz
Cote d'Ivoire	220 V	50 Hz
Croatia	230 V	50 Hz
Cuba	110 V / 220 V	60 Hz
Cyprus	240 V	50 Hz
Czech Republic	230 V	50 Hz
Denmark	230 V	50 Hz
Djibouti	220 V	50 Hz
Dominica	230 V	50 Hz
Dominican Republic	110 V	60 Hz
Ecuador	120 V / 127 V	60 Hz
Egypt	220 V	50 Hz
El Salvador	115 V	60 Hz
Equatorial Guinea	220 V	50 Hz
Eritrea	230 V	50 Hz
Estonia	230 V	50 Hz
Ethiopia	220 V	50 Hz
Falkland Islands (Islas Malvinas)	240 V	50 Hz
Faroe Islands	220 V	50 Hz
Fiji	240 V	50 Hz
Finland	230 V	50 Hz
France	230 V	50 Hz
Gabon	220 V	50 Hz
Gambia, The	230 V	50 Hz
Gaza Strip	230 V	50 Hz
Georgia	220 V	50 Hz
Germany	230 V	50 Hz
Ghana	230 V	50 Hz
Gibraltar	240 V	50 Hz
Greece	220 V	50 Hz
Greenland	220 V	50 Hz
Grenada	230 V	50 Hz
Guatemala	120 V	60 Hz

INTERNATIONAL ELECTRICAL OUTLET LISTING

Country	Voltage	Frequency/Cycle
Guinea	220 V	50 Hz
Guinea-Bissau	220 V	50 Hz
Guyana	240 V	60 Hz
Haiti	110 V	60 Hz
Honduras	110 V	60 Hz
Hong Kong	220 V	50 Hz
Hungary	230 V	50 Hz
Iceland	220 V	50 Hz
India	230 V	50 Hz
Indonesia	127 V / 230 V	50 Hz
Iran	230 V	50 Hz
Iraq	230 V	50 Hz
Ireland	230 V	50 Hz
Isle of Man	240 V	50 Hz
Israel	220 V	50 Hz
Italy	230 V	50 Hz
Jamaica	110 V	50 Hz
Japan	100 V	50 Hz / 60 Hz
Jordan	230 V	50 Hz
Kazakhstan	220 V	50 Hz
Kenya	240 V	50 Hz
Kiribati	240 V	50 Hz
Korea, South	220 V	60 Hz
Kuwait	240 V	50 Hz
Laos	230 V	50 Hz
Latvia	220 V	50 Hz
Lebanon	110 V / 220 V	50 Hz
Lesotho	220 V	50 Hz
Liberia	120 V	60 Hz
Libya	127 V	50 Hz
Liechtenstein	230 V	50 Hz
Lithuania	220 V	50 Hz
Luxembourg	220 V	50 Hz
Macau	220 V	50 Hz
Macedonia	220 V	50 Hz
Madagascar	220 V	50 Hz
Malawi	230 V	50 Hz
Malaysia	240 V	50 Hz
Maldives	230 V	50 Hz
Mali	220 V	50 Hz

INTERNATIONAL ELECTRICAL OUTLET LISTING

Country	Voltage	Frequency/Cycle
Malta	240 V	50 Hz
Mauritania	220 V	50 Hz
Mauritius	230 V	50 Hz
Mexico	127 V	60 Hz
Micronesia, Federated States of	120 V	60 Hz
Monaco	127 V / 220 V	50 Hz
Mongolia	220 V	50 Hz
Montenegro	220 V	50 Hz
Montserrat	230 V	60 Hz
Morocco	127 V / 220 V	50 Hz
Mozambique	220 V	50 Hz
Namibia	220 V	50 Hz
Nauru	240 V	50 Hz
Nepal	230 V	50 Hz
Netherlands Antilles	127 V / 220 V	50 Hz
Netherlands	230 V	50 Hz
New Caledonia	220 V	50 Hz
New Zealand	230 V	50 Hz
Nicaragua	120 V	60 Hz
Niger	220 V	50 Hz
Nigeria	240 V	50 Hz
Norway	230 V	50 Hz
Oman	240 V	50 Hz
Pakistan	220 V	50 Hz
Panama	110 V	60 Hz
Peru	220 V	60 Hz
Philippines	220 V	60 Hz
Poland	230 V	50 Hz
Portugal	230 V	50 Hz
Puerto Rico	120 V	60 Hz
Qatar	240 V	50 Hz
Romania	230 V	50 Hz
Russia	220 V	50 Hz
Rwanda	230 V	50 Hz
Saint Kitts and Nevis	230 V	60 Hz
Saint Lucia	240 V	50 Hz
Saint Vincent and the Grenadines	230 V	50 Hz
Samoa	230 V	50 Hz
Saudi Arabia	127 V / 220 V	60 Hz
Senegal	230 V	50 Hz

INTERNATIONAL ELECTRICAL OUTLET LISTING

Country	Voltage	Frequency/Cycle
Serbia	220 V	50 Hz
Seychelles	240 V	50 Hz
Sierra Leone	230 V	50 Hz
Singapore	230 V	50 Hz
Slovakia	230 V	50 Hz
Slovenia	220 V	50 Hz
Somalia	220 V	50 Hz
South Africa	220 V / 230 V	50 Hz
Spain	230 V	50 Hz
Sri Lanka	230 V	50 Hz
Sudan	230 V	50 Hz
Suriname	127 V	60 Hz
Swaziland	230 V	50 Hz
Sweden	230 V	50 Hz
Switzerland	230 V	50 Hz
Syria	220 V	50 Hz
Taiwan	110 V	60 Hz
Tajikistan	220 V	50 Hz
Tanzania	230 V	50 Hz
Thailand	220 V	50 Hz
Togo	220 V	50 Hz
Tonga	240 V	50 Hz
Trinidad and Tobago	115V	60 Hz
Tunisia	230 V	50 Hz
Turkey	230 V	50 Hz
Turkmenistan	220 V	50 Hz
Uganda	240 V	50 Hz
Ukraine	220 V	50 Hz
United Arab Emirates	220 V	50 Hz
United Kingdom	230 V	50 Hz
United States	120 V	60 Hz
Uruguay	220 V	50 Hz
Uzbekistan	220 V	50 Hz
Vanuatu	230 V	50 Hz
Venezuela	120 V	60 Hz
Vietnam	127 V / 220 V	50 Hz
Virgin Islands	115 V	60 Hz
Yemen	220 V / 230 V	50 Hz
Zambia	230 V	50 Hz
Zimbabwe	220 V	50 Hz