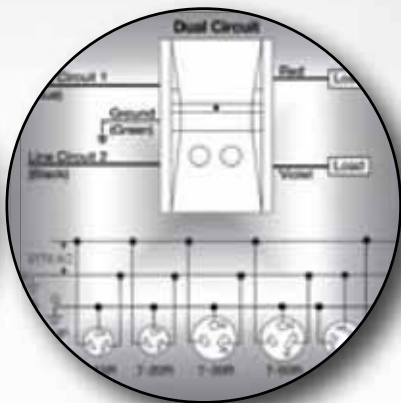
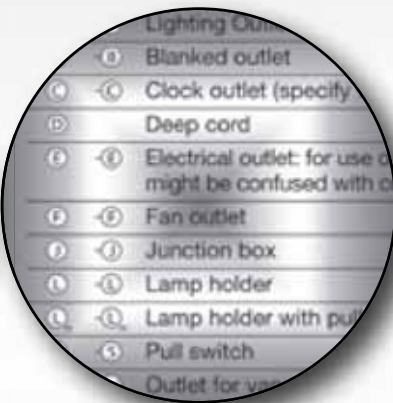
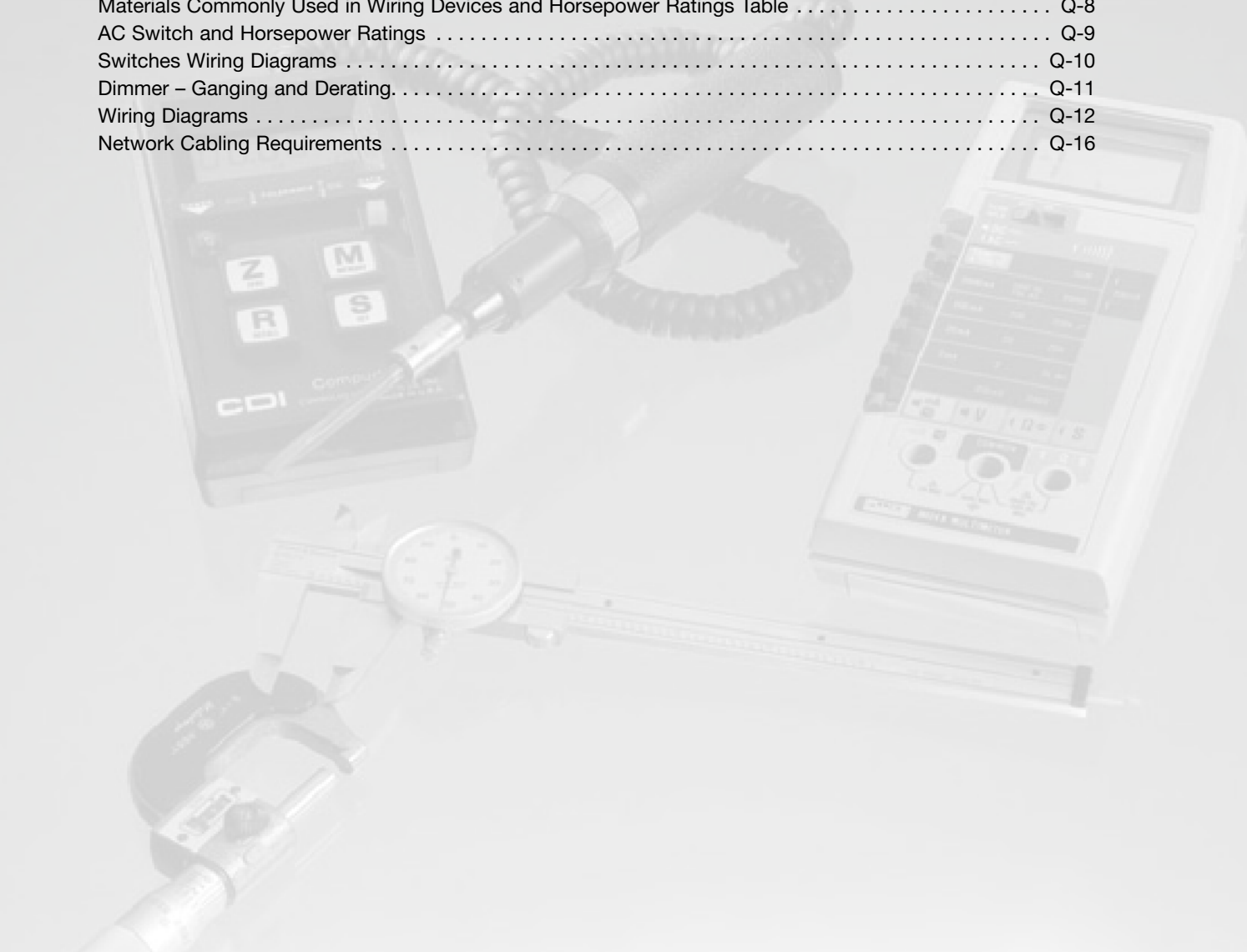


# Section Q

## Technical Information

INDEX	PAGE
Codes and Standards Organizations . . . . .	Q-2
Certification Agencies and Markings . . . . .	Q-3
Wiring Device Standards and Testing . . . . .	Q-4
RoHS, TR, WR and IP Meanings . . . . .	Q-6
Architectural Symbols For Electrical Wiring Devices . . . . .	Q-7
Materials Commonly Used in Wiring Devices and Horsepower Ratings Table . . . . .	Q-8
AC Switch and Horsepower Ratings . . . . .	Q-9
Switches Wiring Diagrams . . . . .	Q-10
Dimmer – Ganging and Derating . . . . .	Q-11
Wiring Diagrams . . . . .	Q-12
Network Cabling Requirements . . . . .	Q-16



# Technical Information

## Codes and Standards Organizations

### CERTIFICATION AGENCIES



Primarily involved in certification of products or manufacturers to standards developed by the certification agency or by others. For convenience, the following listings define common acronyms for a variety of organizations.

<b>ANCE</b>	National Association of Normalization and Certification of the Electrical Sector
<b>BSI</b>	British Standards Institute
<b>CE</b>	Self Certification Marking of European Community
<b>CCC</b>	China Compulsory Certification
<b>CSA</b>	Canadian Standards Association or CSA International
<b>FM</b>	Factory Mutual
<b>NRTL</b>	Nationally Recognized (by OSHA) Testing Laboratory
<b>TÜV</b>	TÜV Rheinland of N.A., Inc.
<b>UL</b>	Underwriters Laboratories Inc.
<b>VDE</b>	Verband Deutscher Elektrotechniker (Germany)

### GOVERNMENT AGENCIES

<b>DSCC</b>	Defense Supply Center – Columbus
<b>EU</b>	European Union
<b>FCC</b>	Federal Communications Commission
<b>IAPA</b>	Industrial Accident and Prevention Association (Canada)
<b>OSHA</b>	Occupational Safety and Health Administration

### BRYANT WIRING DEVICES QUALIFIED UNDER FED. SPEC. W-C-596

4700DR	5352BLK	70530NCCR	71630NC	9200IGI	BRY5382	BRY8300REDWR
4700DRCR	5352BU	70530NP	71630NP	9200IGRED	BRY5462	BRY8300RTR
4700DRI	5352GRY	70530NPB	71820NC	9200IGW	BRY5462BLK	BRY8300TR
4700DRIG	5352I	70530NPC	71820NP	9200RED	BRY5462CR	BRY8300W
4710	5352RED	70615DR	72120ER	9200W	BRY5462GRY	BRY8300WR
4721NP	5352W	70615DRIG	72120FR	9300GRY	BRY5462I	BRY8300WWR
4750DR	5361	70615ER	72120MB	9300I	BRY5462RED	BRY8366NP
4760	5361BLK	70615FR	72120NC	9300IL	BRY5462W	BRY8369NC
4779NC	5361BLKWR	70615MB	72120NCB	9300RED	BRY5466NP	BRY8466NP
4785ER	5361GRY	70620NP	72120NP	BRY5262	BRY5466NPSY	BRY8469NC
5242	5361GRYWR	70620FR	72120NPB	BRY5262BCR	BRY5469NC	FSL1NC
5242BLK	5361I	70620MB	72120NPC	BRY5262BLK	BRY5469NCSY	FSL1NP
5242GRY	5361IWR	70620NC	72130ER	BRY5262BLKWR	BRY5662	FSL2NC
5242I	5361RED	70620NP	72130FR	BRY5262BU	BRY5662BLK	FSL2NP
5242RED	5361REDWR	70620NPCR	72130NC	BRY5262BUWR	BRY5662CR	FSL3NC
5242W	5361W	70630ER	72130NP	BRY5262CR	BRY5662GRY	FSL3NP
5251	5361WWR	70630FR	72330FR	BRY5262GRY	BRY5662I	FSL4NC
5251AL	5361WWR	70630NC	8210	BRY5262GRYWR	BRY5662RED	FSL4NP
5251BLK	5364B	70630NP	8210GRY	BRY5262I	BRY5662W	QT5262
5251I	5364BY	70720ER	8210GRYWR	BRY5262IWR	BRY5666NP	QT5262AL
5252	5366N	70720FR	8210I	BRY5262RED	BRY5666NPSY	QT5262BLK
5252AL	5369B	70720MB	8210IWR	BRY5262REDWR	BRY5669NC	QT5262GY
5252BLK	5369BY	70720NC	8210RED	BRY5262W	BRY8200	QT5262I
5252BU	5461	70720NP	8210REDWR	BRY5262WR	BRY8200ALTR	QT5262LA
5252GRY	5461BLK	70730FR	8210W	BRY5262WWR	BRY8200GRY	QT5262R
5252I	5461GRY	70730NP	8210WR	BRY5266NP	BRY8200GRYL	QT5262W
5252RED	5461I	71020ER	8210WWR	BRY5266NPB	BRY8200GRYWR	QT5362
5252W	5461RED	71020FR	8266T	BRY5266NPCR	BRY8200GTR	QT5362AL
5261	5461W	71020NP	8269T	BRY5266NPOR	BRY8200I	QT5362BLK
5261BLK	5464B	71420ER	8295T	BRY5266NPSY	BRY8200ITR	QT5362GY
5261BLKWR	5469B	71420FR	8310	BRY5269NC	BRY8200IWR	QT5362I
5261GRY	5642	71420MB	8310GRYWR	BRY5269NCCR	BRY8200RED	QT5362LA
5261GRYWR	5642I	71420NC	8310I	BRY5269NCSY	BRY8200REDL	QT5362R
5261I	5661	71420NP	8310IWR	BRY5362	BRY8200REDWR	QT5362W
5261IGGRY	5661BLK	71430ER	8310RED	BRY5362BLK	BRY8200RTR	QT8200
5261IGW	5661GRY	71430FR	8310REDWR	BRY5362BLKWR	BRY8200TR	QT8200AL
5261IWR	5661I	71430MB	8310WR	BRY5362BU	BRY8200W	QT8200BK
5261RED	5661RED	71430MBWP	8310WWR	BRY5362BUWR	BRY8200WL	QT8200GY
5261REDWR	5661W	71430NC	8366T	BRY5362CR	BRY8200WR	QT8200I
5261W	5666B	71430NP	8366TSP	BRY5362GRY	BRY8200WTR	QT8200LA
5261WWR	5669B	71520ER	8369T	BRY5362GRYWR	BRY8200WWR	QT8200R
5342	70520FR	71520FR	8395T	BRY5362I	BRY8266NP	QT8200W
5342BLK	70520FR	71520MB	8410BRN	BRY5362IWR	BRY8266NPB	QT8300
5342GRY	70520MB	71520MBWP	8410W	BRY5362RED	BRY8269NC	QT8300AL
5342I	70520NC	71520NC	8466N	BRY5362REDWR	BRY8300	QT8300BK
5342RED	70520NCCR	71520NP	8466TSP	BRY5362W	BRY8300ALTR	QT8300GY
5342W	70520NP	71530ER	8495T	BRY5362WR	BRY8300GTR	QT8300I
5351	70520NP	71530FR	8666TSP	BRY5362WWR	BRY8300GRYWR	QT8300LA
5351AL	70530FR	71530MB	8695T	BRY5366NP	BRY8300GTR	QT8300R
5351BLK	70530FR	71530MBWP	9200GRY	BRY5366NPCR	BRY8300I	QT8300W
5351I	70530MB	71530NC	9200GRYL	BRY5366NPSY	BRY8300IG	
5352	70530MBWP	71530NP	9200I	BRY5369NC	BRY8300ITR	
5352AL	70530NC	71620NC	9200IG	BRY5369NCCR	BRY8300IWR	
	70530NCB	71620NP	9200IGGRY	BRY5369NCSY	BRY8300RED	










# Technical Information

## Certification Agencies and Markings

### UNDERSTANDING CERTIFICATION MARKS

Certification marks vary significantly with respect to testing required to achieve a particular mark. In some cases, (i.e.: Specification Grade), no outside certification agency is involved. The manufacturer decides which of their products they wish to be so identified. The following table for 15 and 20A straight blade receptacles demonstrates these wide differences. The understanding of these marks permits the user/specifier to make more meaningful product selections.

#### Understanding Product Certification Marks — 15 and 20 Amp Straight Blade Receptacles. Products that carry certification marks must meet the specific testing standards indicated.

Certification Mark	Description	UL 498	CSA, C22.2 No. 42	UL 498 Hospital Grade	CSA, C22.2 No. 42 M Hospital Grade	Fed. Spec. W-C-596
<b>Spec Grade*</b>	Self Certified, No Testing Required — Advertising/Trade Name					
	Used on recognized component parts that are part of a Listed product or system intended for the United States. Component "C" intended for Canada. Recognized components are intended for installation by Original Equipment Manufacturers (OEMs) within their Listed, and are not accepted by electrical inspectors for general-use field installations.	X				
	Used on recognized component parts that are part of a Listed product or system intended for the United States and Canada. Recognized components are intended for installation by Original Equipment Manufacturers (OEMs) within their Listed, and are not accepted by electrical inspectors for general-use field installations.	X				
	Products found with this mark means Underwriters Laboratories or CSA International found that representative samples of this product met Underwriters Laboratories' published Standards for Safety intended for the US market.	X				
	Products found with this mark are certified primarily for the Canadian market.		X			
	Products intended for US and Canada.	X	X			
	In addition to complying with general use requirements, this mark denotes these device have been specially designed and are subject to additional requirements of the standards.	X		X		
	In addition to complying with general use requirements, this mark denotes these device have been specially designed and are subject to additional requirements of the standards.		X		X	
	In addition to complying with general use grade requirements, this mark denotes receptacles also have been investigated for compliance with United States Federal Specification W-C-596.	X				X
	In addition to complying with general use and hospital grade requirements, this mark denotes receptacles also have been investigated for compliance with United States Federal Specification W-C-596.	X		X		X

Note: \*Includes such variation as Premium Spec, Super Spec, etc.  
\*\* End product test also required.

### CROSS REFERENCE NOTE

Recognize that cross reference guides supplied by some manufacturers should be used only to determine compatible devices (rating and configuration). It does not, in any way, deal with performance levels (which will vary widely by manufacturer). Common catalog numbers are often used for convenience of selection. The use of the same catalog number is solely the discretion of the manufacturer. It in no way implies compliance to any standard or testing criteria.

# Technical Information

## Wiring Device Standards and Testing

### WIRING DEVICE STANDARDS

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There are many different marketing terms in the electrical industry to describe the various electrical receptacles available from different manufacturers. Some of these terms include: Spec-Grade, Commercial, Heavy Duty, Industrial, Hard-Use, etc. There are no clear or universal definitions for these terms. There is no criteria established to differentiate one term from the next. Reliance solely upon these terms is not a reliable measure of performance or durability in a given application.

Underwriters Laboratories (UL) recognized a need to categorize receptacles based on application and expectations of performance. As a result, UL verifies performance to the following designations. Here are brief descriptions of each:



**General Use - UL 498** – All duplex receptacles are required to meet these general requirements. Devices bearing the UL mark for general use have been tested to insure they can safely provide power in typical everyday usage (vacuum, lamps, electronics, etc.).



Fed. Spec.

**Fed. Spec. - W-C-596** – The Federal Government wanted some way to determine that a receptacle performed better than average and would withstand the tougher demands of institutional use (post offices, military installations, prisons, etc.). Fed. Spec. listing identifies receptacles as having construction features, marking specifications and performance requirement (i.e., plug retention, increased cycle testing) beyond the requirements of the general use listing.



• Hospital Grade

**Hospital Grade** – In addition to compliance with general use requirements, Hospital Grade receptacles must meet performance criteria designed to test: ground reliability, assembly integrity, overall strength and reliability. Hospital Grade devices are marked with a green dot on their face.



Fed. Spec.

• Hospital Grade

**Hospital Grade Fed. Spec.** – Receptacles meeting this designation meet requirements and have completed test programs for both Fed. Spec. and Hospital Grade receptacles. All Bryant Hospital Grade devices are UL listed to this designation.

These UL designations are a better determinant of performance than marketing descriptions, for performance and durability.

# Technical Information

## Wiring Device Standards and Testing

### TESTING FOR HOSPITAL GRADE AND FED. SPEC. LISTING OF BRYANT RECEPTACLES, PLUGS AND CONNECTORS

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All Bryant Hospital Grade products are tested quarterly in our factories with Underwriters Laboratories.

#### RECEPTACLES

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**Fed. Spec. Test: Ground Pin Retention Test** - The grounding contact of the receptacle is conditioned by twenty insertions with a 0.204 inch oversized diameter pin. After conditioning, a 0.184 inch diameter pin is inserted in the grounding contact must be capable of supporting a weight of at least 4 ounces for one minute.

**Fed. Spec. Test: Power Blade Retention Test** - A test plug with a single oversized blade measuring 0.075 inch thick is inserted into each current carrying contact for twenty conditioning cycles. When the conditioning cycles are completed, each contact must be capable of supporting, for one minute, 1.5 pounds secured to a single 0.055 inch thick solid steel blade without holes.

**HG Test: Abrupt Removal of Plug Test** - A steel bodied test plug with blades made of brass is inserted into the receptacle. A 10 pound weight dropped from at least 24 inches, pulls the plug out of the receptacle abruptly. This test is done eight times with the receptacle rotated in different positions to create the greatest stress to the face and contacts. Then, with the receptacle facing down, the grounding contact must retain a 4 ounce grounding pin with a 0.184 inch diameter for one minute. After this test there shall be no breakage of the receptacle that interferes with the receptacle function or to the integrity of the enclosure.

**Fed. Spec. Test: Assembly Security Test** - A force of 100 pounds is applied through the slots of the receptacle into the base while the bridge is supported at its screw mounting positions. Each receptacle is then examined for damage.

#### PLUGS AND CONNECTORS

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**HG Test: Impact Test** - A plug or connector wired with the minimum size flexible cord is subjected to an impact from a 10 pound cylindrical weight having a flat face with a 2 inch diameter dropped from a height of 18 inches. After the test, there shall be no breakage or other damage that may effect the function of the device.

**HG Test: Mechanical Drop Test** - The cord connector is wired to #18 AWG flexible cord and suspended horizontally. It is released so it impacts a hardwood surface 45 inches below the point of suspension. This is repeated for 1,300 cycles. After the test, there shall be no breakage, deformation or other effect that may interfere with the function of the device.

**HG Test: 500 Pound Crush Test** - A wired plug or connector is placed between two hardwood slabs while subjected to a force which is progressively increased to 500 pounds. After the test, there shall be no breakage, deformation or other effect that may interfere with the function of the device.

**HG Test: Strain Relief Test** - While assembled to a plug or connector but not wired to the terminals; the cord must remain securely fastened after a straight pull of 30 pounds and a rotary motion within 3 inch circles with a 10 pound force applied for two consecutive hours. Displacement of conductors, insulation and outer jacket of the flexible cord shall not exceed 0.031 inch. There shall be no cuts, rips or tears in the insulation of the cord.

# Technical Information

## RoHS, TR, WR and IP Meanings



### RoHS – RESTRICTION OF HAZARDOUS SUBSTANCES

This EU Directive, 2002/95/EC, prohibits the use of mercury, cadmium, lead, chromium VI, PBB (polybrominated biphenyls) and PBDE (polybrominated diphenyl ethers) in certain electrical products. The regulatory maximums for these items are 0.01%, by weight, for cadmium and 0.1%, by weight, for the other five items in each "homogenous unit" contained within that product. There are certain exemptions available from the RoHS requirements.



### TAMPER RESISTANT RECEPTACLES

Per the 2008 National Electrical Code (NEC®) Article 406.11; All 125 volt, 15 and 20 amp receptacles in dwelling units shall be a listed tamper resistant type. Dwelling units are defined as a single unit, providing complete and independent living facilities for one or more persons, including permanent provisions for living, sleeping, cooking and sanitation. Listed devices are required to have a TR marking on the face visible when installed without a cover plate.



### WEATHER RESISTANT RECEPTACLES

Per the 2008 National Electrical Code (NEC®) Article 406.8; All 125 and 250 volt, 15 and 20 amp non-locking receptacles for use in damp or wet locations shall be a listed weather resistant type. Listed devices are required to have a WR marking on the face visible when installed.



### ELEMENTS OF THE IP CODE AND THEIR MEANINGS – In Accordance with Standard IEC 60529

IP Suitability Ratings are a system for classifying the degree of ingress protection provided by enclosures of electrical equipment. Generally, the higher the number, the greater the degree of protection; they apply ONLY to properly installed equipment.

**Example: IP67 = Ingress Protection/Dust-Tight/Temporary Immersion**

#### Meaning for the Protection of Equipment

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

The numerals stand for the following:

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

Note: ≥ Denotes greater than or equal to.

NEC® is a registered trademark of the National Fire Protection Association (NFPA).

# Technical Information

## Architectural Symbols For Electrical Wiring Devices

### GENERAL OUTLETS

#### Ceiling Wall

○	-○	Lighting Outlet
Ⓟ	-Ⓟ	Blanked outlet
Ⓒ	-Ⓒ	Clock outlet (specify voltage)
Ⓓ		Deep cord
Ⓔ	-Ⓔ	Electrical outlet: for use only when circle used alone might be confused with columns, plumbing symbols, etc.
Ⓕ	-Ⓕ	Fan outlet
Ⓙ	-Ⓙ	Junction box
Ⓛ	-Ⓛ	Lamp holder
Ⓛ <sub>s</sub>	-Ⓛ <sub>s</sub>	Lamp holder with pull switch
Ⓢ	-Ⓢ	Pull switch
Ⓥ	-Ⓥ	Outlet for vapor discharge lamp
Ⓧ	-Ⓧ	Exit light outlet or light

### CONVENIENCE OUTLETS

⊖		Duplex convenience outlet
⊖ <sub>1,3</sub>		Convenience outlet other than duplex 1-single, 3-triplex, etc.
⊖ <sub>wp</sub>		Weatherproof convenience outlet
⊖ <sub>r</sub>		Range outlet
⊖ <sub>s</sub>		Switch and convenience outlet
⊖ <sub>R</sub>		Radio and convenience outlet
⊖ <sub>sp</sub>		Special purpose outlet (Desc. in Spec.)
⊖ <sub>f</sub>		Floor outlet

### SWITCH OUTLETS

S		Single-pole switch
S <sub>2</sub>		Double-pole switch
S <sub>3</sub>		3-Way switch
S <sub>4</sub>		4-Way switch
S <sub>D</sub>		Automatic door switch
S <sub>E</sub>		Electroliner switch
S <sub>K</sub>		Key operated switch
S <sub>P</sub>		Switch and pilot lamp
S <sub>CB</sub>		Circuit breaker switch
S <sub>WCB</sub>		Weatherproof circuit breaker
S <sub>MC</sub>		Momentary contact switch
S <sub>RC</sub>		Remote control switch
S <sub>WP</sub>		Weatherproof switch
S <sub>F</sub>		Fused switch
S <sub>WF</sub>		Weatherproof fused switch

### SPECIAL OUTLETS

Any standard symbol as given above with the addition of a lower case subscript letter may be used to designate some special variation of standard equipment of particular interest in a specific set of architectural plans.

○ <sub>a,b,c,etc.</sub>	When used they must be listed in the Key of Symbols on each drawing and if necessary further described in the specifications.
⊖ <sub>a,b,c,etc.</sub>	
⊖ <sub>sa,b,c,etc.</sub>	

### PANELS, CIRCUITS AND MISCELLANEOUS

■	Lighting panel
▨	Power panel
—	Branch circuit; concealed in ceiling or wall
---	Branch circuit; concealed in floor
.....	Branch circuit; exposed
→	Home run to panel board. Indicated number of circuits by number of arrows.
Note: Any circuit without further designation indicates a 2-wire circuit. For a greater number of wires indicate as follows: ### (3-wires) #### (4-wires), etc.	
—	Feeders
Note: Use heavy lines and designate by number of corresponding to listing in feeder schedule.	
⊖	Underfloor duct and junction box. Triple system
Note: For double or single systems eliminate one or two lines. This symbol is equally adaptable to auxiliary system layouts	
Ⓞ	Generator
Ⓜ	Motor
Ⓢ	Instrument
Ⓣ	Power transformer (or draw to scale)
Ⓧ	Controller
Ⓢ	Isolating switch

### AUXILIARY SYSTEMS

■	Push Button	□	Buzzer
□	Bell	◇	Annunciator
⬅	Outside telephone		
↔	Interconnecting telephone		
Ⓢ	Telephone switchboard		
Ⓢ	Bell ringing transformer		
Ⓢ	Electric door opener		
Ⓢ <sub>p</sub>	Fire alarm bell	Ⓢ <sub>f</sub>	Fire alarm station
Ⓢ <sub>c</sub>	City fire alarm station		
Ⓢ <sub>a</sub>	Fire alarm central station		
Ⓢ <sub>s</sub>	Automatic fire alarm device		
Ⓢ <sub>w</sub>	Watchman's station		
Ⓢ <sub>w</sub>	Watchman's central station		
Ⓢ	Horn		
Ⓢ <sub>n</sub>	Nurse's signal plug	Ⓢ <sub>m</sub>	Maid's signal plug
Ⓢ	Radio outlet		
Ⓢ <sub>c</sub>	Signal central section		
□	Interconnection box		Battery
---	Auxiliary system circuits		
□ <sub>abc</sub>	<b>Special Auxiliary Outlets</b> Subscript letters refer to notes on plans or detailed description in specifications.		

# Technical Information

## Materials Commonly Used in Wiring Devices and Horsepower Ratings Table

TABLE I – MECHANICAL AND ELECTRICAL PROPERTIES OF MATERIALS

Properties	6/6 Nylon	6 Nylon	Polycarbonate	PC/PET	Phenolic	Urea
Tensile Strength (PSI)	11,000	6000+*	9,000	6,000	6,500-10,000	5,500-13,000
Elongation (%)	300+*	300*	130	120	0.4-0.8	.5-1.0
Flex. Mod. (Stiffness) (PSI)	175,000*	140,000*	340,000	325,000	1,000,000	1,500,000
Izod (Notched) ft.-lb./in.	2.1*	3.0*	15.0	12.0	.3-1.9	.25-.4
Hardness Rockwell	59M* 108R*	— 119R	70M 118R	— 115R	105-120M —	110-120M —
Heat Deflection Temp °F						
66 PSI	464	370	—	265	—	—
264 PSI	194	185	270	260	400	260-290
UL Thermal Index °C						
Electrical	125	125	125	105	150	100
Mechanical w/Impact	75	75	115	105	150	100
Mechanical w/o Impact	85	85	125	105	150	100
Flame Class UL 94	V-2	V-2	V-2	V-0	HB-V0	HB-V0
Dielectric V/mil	600	400	380	307	200-400	300-400
Specific Gravity	1.14	1.13	1.2	1.33	1.4	1.5
UL Comparative Tracking Index (Volts)	600+	600+	250+	230	175+	600+

Note: \*Conditioned to 50% relative humidity.

TABLE II – CHEMICAL RESISTANCE OF MATERIALS

Chemical	Nylon	Phenolic	Urea	Polycarbonate
Acids	C	B	B	A
Alcohol	A	A	A	B
Caustic Bases	A	B	B	C
Gasoline	A	A	C	A
Grease	A	A	A	B
Kerosene	A	A	A	A
Oil	A	A	A	B
Solvents	A	A	A	C
Water	A	A	A	A

Note: A—Completely resistant. Good to excellent, general use.  
 B—Resistant. Fair to good, limited service.  
 C—Slow attack. Not recommended for use.

### Advantages of Nylon

Bryant nylon wiring devices provide these safety benefits:

- Excellent insulator: Shock hazards are minimized by the superior dielectric strength of nylon and the heavy-duty molded interior walls of Bryant's completely-enclosed individual wire pocket areas.
- Resistant to chemicals: Nylon provides excellent resistance to chemicals such as alcohol, caustic bases, gasoline, grease, kerosene, oil, solvents and water. See Table II.
- High impact resistance: Bryant nylon devices are designed to withstand high impact in heavy duty industrial and commercial applications. Each molded piece supports an adjacent molded piece, resulting in unsurpassed resiliency and strength.

Devices housed in neoprene, urea or phenolic materials can crack or be damaged under great pressure. Such damage can be invisible and cause direct shorts and other hazards. In the unlikely event that a nylon device is damaged, the damage can be easily detected and the device replaced.

### Universal Cord Grip

Bryant's nylon plugs and connectors have a universal cord grip. One device can be used for most cord size applications. Adapter sleeves are available for flat cord and other small diameter cords. In addition to reducing the cord grip to the desired size, the sleeve helps protect the interior of the device by blocking entry of solvents, oil and other foreign matter.

TABLE III – HORSEPOWER RATINGS

NEMA Config.	AC HP Rating**	Nema Config.	AC HP Rating**
1-15	0.5	L1-15	0.5
2-15	1.5	L2-20	2
2-20	2	L5-15	0.5
2-30	2	L5-20	1
5-15	0.5	L5-30	2
5-20	1	L6-15	1.5
5-30	2	L6-20	2
5-50	2	L6-30	2
6-15	1.5	L7-15	2
6-20	2	L7-20	2
6-30	2	L7-30	3
6-50	3	L8-20	3
7-15	2	L8-30	5
7-20	2	L10-20	2 L-L/1 L-N
7-30	3	L10-30	2 L-L/2 L-N
7-50	5	L11-15	2
10-20	2 L-L/1 L-N	L11-20	3
10-30	2 L-L/2 L-N	L11-30	3
10-50	3 L-L/2 L-N	L12-20	5
11-15	2	L12-30	10
11-20	3	L14-20	2 L-L/1 L-N
11-30	3	L14-30	2 L-L/2 L-N
11-50	7.5	L15-20	3
14-15	1.5 L-L/0.5 L-N	L15-30	3
14-20	2 L-L/1 L-N	L16-20	5
14-30	2 L-L/2 L-N	L16-30	10
14-50	3 L-L/2 L-N	L18-20	2
14-60	3 L-L/2 L-N	L18-30	3
15-15	2	L19-20	5
15-20	3	L19-30	10
15-30	3	L21-20	2
15-50	7.5	L21-30	3
15-60	10	L22-20	5
18-15	2	L22-30	10
18-20	2		
18-30	3		
18-50	7.5		
18-60	7.5		

Note: \*\*The phase-to-phase horsepower ratings are noted by "L-L". The phase-to-neutral ratings are identified by "L-N".

# Technical Information

## AC Switch and Horsepower Ratings

Prior to 1950, Underwriters Laboratories, Inc. listed only AC/DC general use switches. These switches were designed with over-center, snap-acting mechanisms which opened the circuit by widely separating the contacts at a high speed. This was necessary because the switches were tested on DC which has a steady-state voltage.

With the introduction of AC only general use switches, it was unnecessary to have the high-powered, over-center, snap-acting mechanisms because the contacts did not have to be widely separated at high speed.

Bryant introduced, in the mid 1930's, the first AC only range switch. The experience gained in this development indicated the ideal AC switch should have a positive closing and a slow limited opening.

Positive closing is the closing of the contacts without bounce or chatter, which can occur due to the inertia of a high-speed closing of the contacts.

This is important, especially on the tungsten lamp load where, due to the low resistance of tungsten filament, an inrush current from 8 to 16 times the lighted (high resistance) rated current occurs. This inrush occurs in the first quarter cycle, 1/240 of a second, or when the contacts first close and would be bouncing (rapidly opening and closing of the circuit). Contact bouncing, at high current,

could cause considerable arcing which would dissipate the contact material and result in welding of the contacts.

Slow limited opening is the separation of the contact, under load, at a low rate and limiting the contact separation to a very small fraction of that required for DC control.

On AC, the voltage passes through zero voltage every 1/2 cycle, on 60 cycle frequency every 1/120 of a second. By opening the contacts slowly, the arc is suppressed by the zero voltage. By limiting the break, the contact gap is not ionized and air insulation prevents arc formation and restriking.

This control of the opening is essential on inductive and motor loads when, due to low power factor, voltage surges occur on opening the circuit.

Bryant AC switches are designed so the contacts are closed with controlled contact closing pressure by utilizing the flexibility of the resilient contact carrying arm.

The contacts, of a special non-oxidizing silver alloy, are opened by a simple cam operation which limits the speed and opening. The indexing of the handle is by an elastomer rocker or simple cantilever steel rod. This provides a minimum of parts, along with a solid and dependable design.

### AC TEST REQUIREMENTS

When AC general use switches were considered by the industry and Underwriters Laboratories, Inc., thought was given to the ratings and it was decided to rate the switches in accordance with NEC® branch circuit ratings of 15, 20 and 30 amperes. It was also decided to test the switch for all the loads that could be applied to a branch circuit. Therefore, all AC switches are tested on resistance, tungsten lamp and inductive loads to 100% of switch rating.

#### Underwriters Laboratories Test Requirements for AC General Use Switches

In order to be listed by Underwriters Laboratories, Inc., all 15, 20 and 30 ampere AC 120/277 volt switches must perform, without failure, the following sequence of tests.

1. An overload test of 100 cycles at 4.8 times rated current and 40-50% power factor and rated voltage. This overload test is performed at 144 amps, 277 volts for 30 ampere switches, at 6 cycles per minute.
2. 10,000 cycles on a plain resistance load at full rating of 15, 20 or 30 amperes, at 277 volts at 24 cycles per minute.
3. 10,000 cycles on an inductive load of either 15, 20 or 30 amperes at 277 volts, 80% power factor at 24 cycles per minute.
4. 10,000 cycles at 15, 20 or 30 amperes, 120 volts on a tungsten filament lamp load, at 6 cycles per minute.
5. Heat rise at test-rated load. In this test, temperature rise must not exceed 30 degrees C.
6. A switch shall withstand, without breakdown, 1500V for 1 minute between live parts of opposite polarity and between live parts and dead metal parts, with the switch at the maximum operating temperature reached in intended use.

### EXPLANATION OF "HORSEPOWER" RATINGS

#### Performance of Bryant Switches Exceed Underwriters Laboratories' Requirements.

Switches marked with Horsepower Ratings are suitable for controlling the Motor Loads of the HP ratings shown on the switch as well as for lower HP ratings.

To qualify for an HP rating, a switch is tested at six (6) times the full load Motor Current corresponding to the HP rating marked on the switch. (For DC Motor Controllers, the test is made at 10 times the full load Motor Current corresponding to the DC HP rating marked on the switch). The test consists of 50 on-off operations at this load and the test is conducted on six (6) samples. For 3/4 HP 120 volts-240 volts AC rating, two (2) sets of six (6) samples each are tested in addition to the regular overload endurance, heating and insulation tests. The test circuit characteristics are:

	For 3/4 HP 120 Volts AC	For 3/4 HP 240 Volts AC
Closed Circuit Volts	120 Volts AC	240 Volts AC
Current	82.8 Amps	41.4 Amps
Power-Factor	0.40-0.50	0.40-0.50

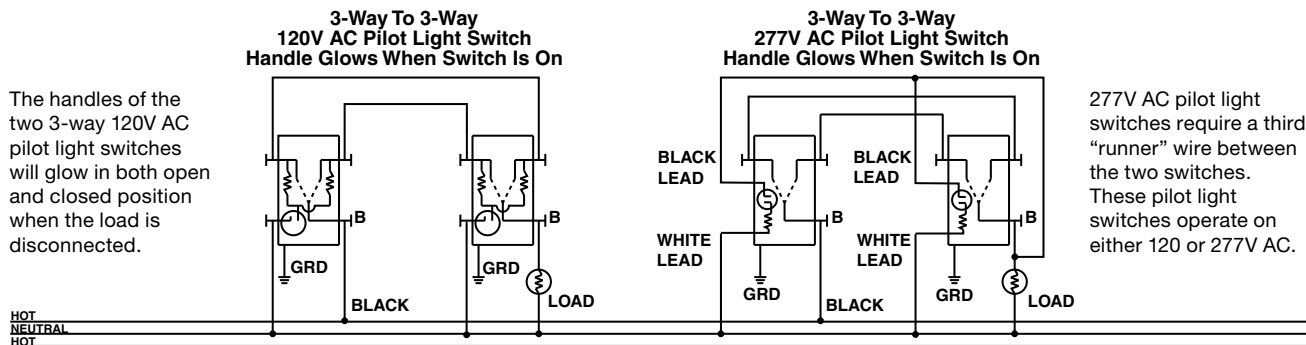
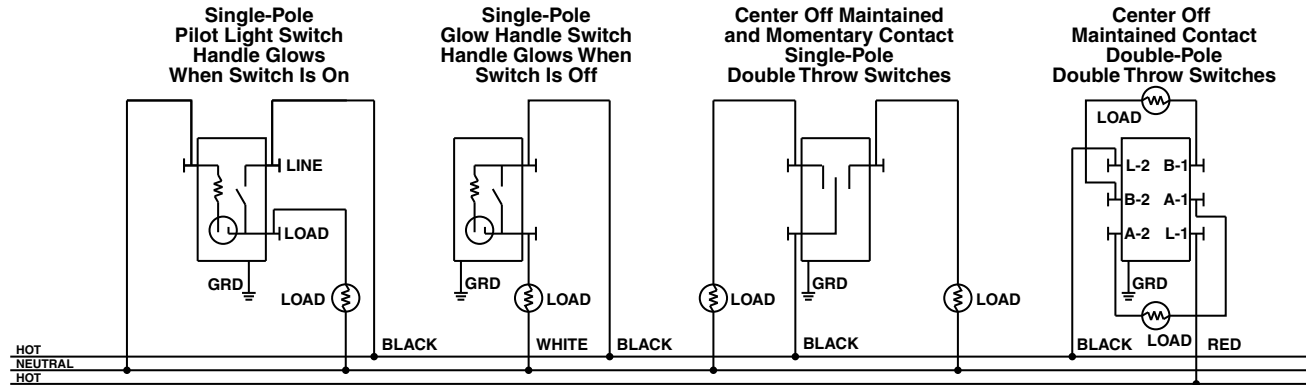
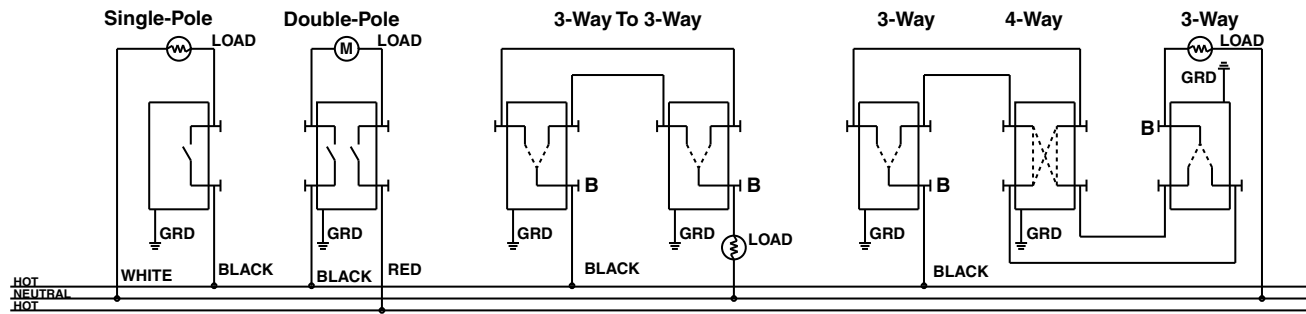
Note: Current at 240V AC is 1/2 that at 120V AC.

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).

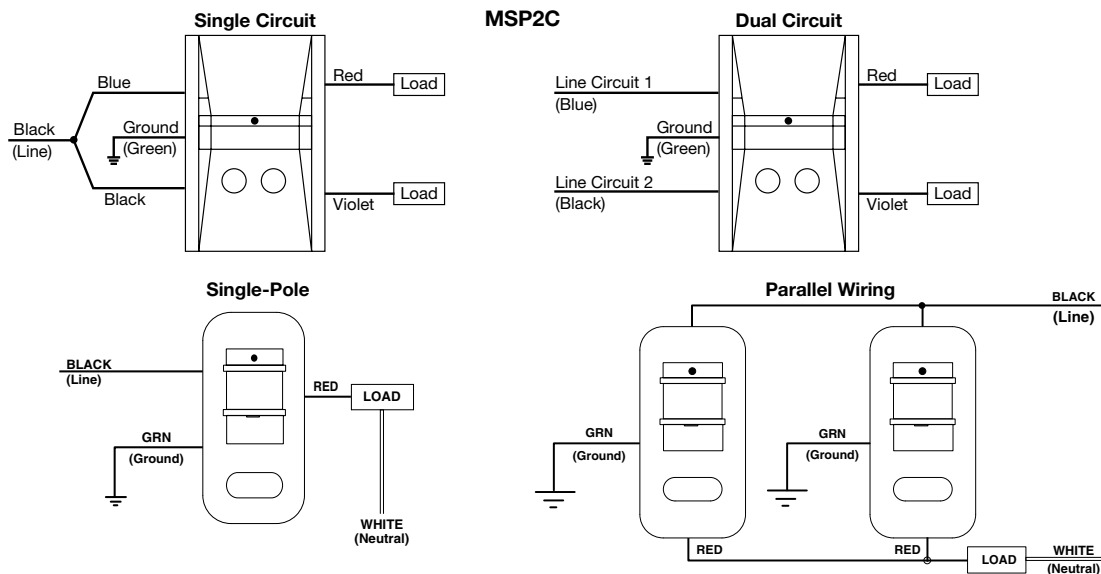
# Technical Information

## Switches Wiring Diagrams

### AC SWITCHES



### SENSOR SWITCHES

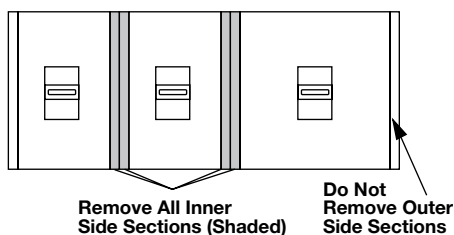
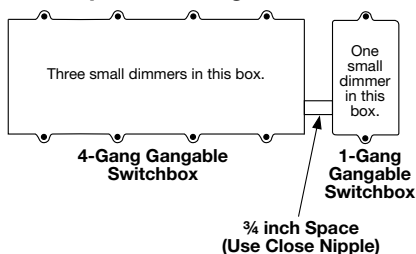


Note: Pre-wire to replace two 3-way switches. Load cannot exceed the rating of one switch. Series switches: MS1200, MSPI, RMS141 and RMS140.

# Technical Information

## Dimmer – Ganging and Derating

### Example of 4-Gang Installation



## ARCHITECTURAL GRADE SLIDE AND ROTARY SERIES

### Number of Switchboxes Required with Dimmer Side sections Intact

		Number of Small Controls (600W and 1000W)						
		0	1	2	3	4	5	6
<b>Number of Large Controls (1500W and 2000W)</b>	<b>0</b>	0	1	1+1	4	1+4	7	1+7
	<b>1</b>	1	3	5	6	8	9	11
	<b>2</b>	4	6	7	9	10	12	13
	<b>3</b>	6	8	10	11	13	14	16
	<b>4</b>	9	11	12	14	15	17	18

Number of Gangs Required

Note: When ganging an even number of small controls with no side sections removed (plus numbers in chart), use gangable switchboxes with tapped ears as shown below. Do not use plaster rings or gangbox covers. Space an additional switchbox  $\frac{3}{4}$  in. apart from the other switchbox(es). A  $\frac{3}{4}$  in. close nipple is recommended as a spacer between the switchboxes.

### Number of Switchboxes Required with Side sections Removed

		Number of Small Controls (600W and 1000W)						
		0	1	2	3	4	5	6
<b>Number of Large Controls (1500W and 2000W)</b>	<b>0</b>	0	1	2	3	4	5	6
	<b>1</b>	1	3	4	5	6	7	8
	<b>2</b>	3	5	6	7	8	9	10
	<b>3</b>	5	7	8	9	10	11	12
	<b>4</b>	7	9	10	11	12	13	14

Number of Gangs Required

Note: When removing side sections, remove only inner side sections. Do not remove side sections on outer ends of gang. The same installation rules apply to rotary dimmers (not shown).

## DERATING CHART

No side sections removed	One side section removed	Both side sections removed
600W	600W	500W
1000W	900W	700W
1500W	1250W	1000W
2000W	1800W	1500W

Note: When ganging any combination of small and large controls, place a small control on one extreme end of the gang, and a large control at the other end of the gang. When ganging with side sections intact, use offset mounting holes. When ganging with side sections removed, use center mounting holes. Allow a  $\frac{1}{2}$  in. gap (space) between controls for ease in attaching the faceplate.

## SPECIFICATION GRADE SLIDE AND ROTARY SERIES

### Switchboxes Required: Side sections removed

## DERATING CHART

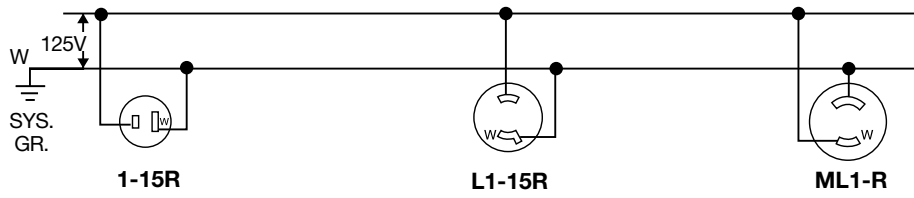
1 dimmer in wall box	2 dimmers in wall box	3 or more dimmers in wall box
600W	500W	400W
1000W	800W	650W
5A fan speed	4A fan speed	3A fan speed

# Technical Information

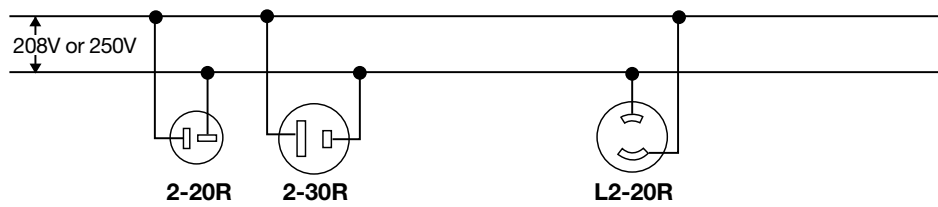
## Wiring Diagrams

### 2-POLE 2-WIRE

125V

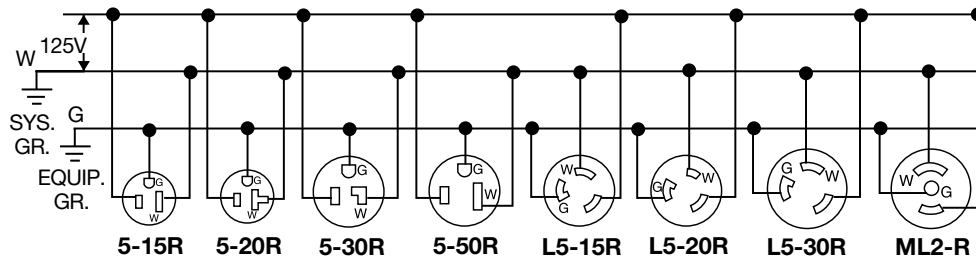


208V or 250V

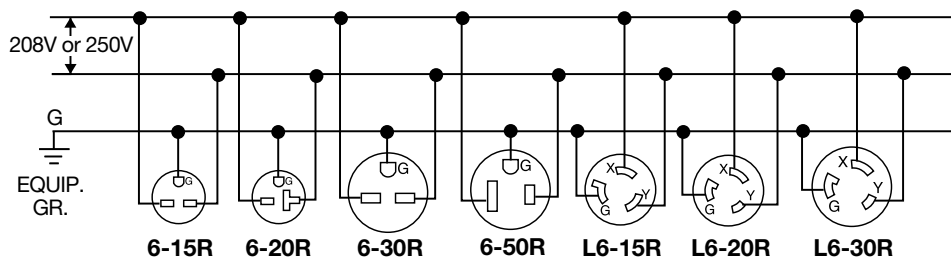


### 2-POLE 3-WIRE GROUNDING

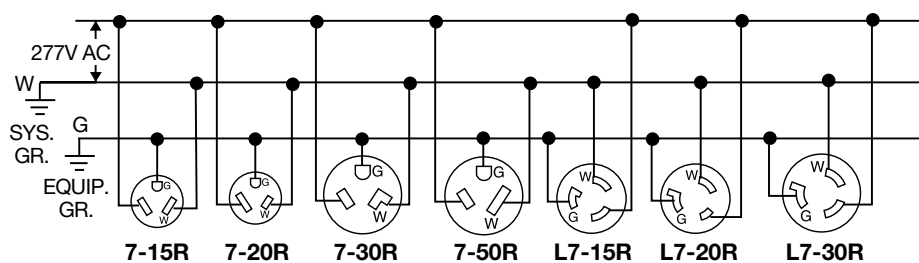
125V



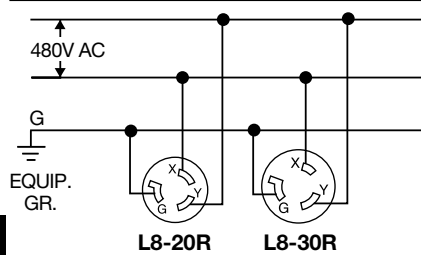
208V or 250V



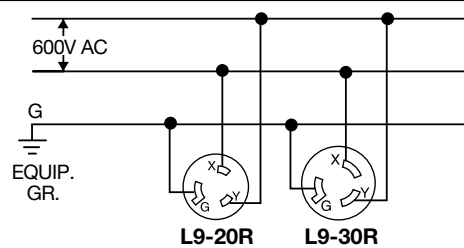
277V AC



480V AC



600V AC

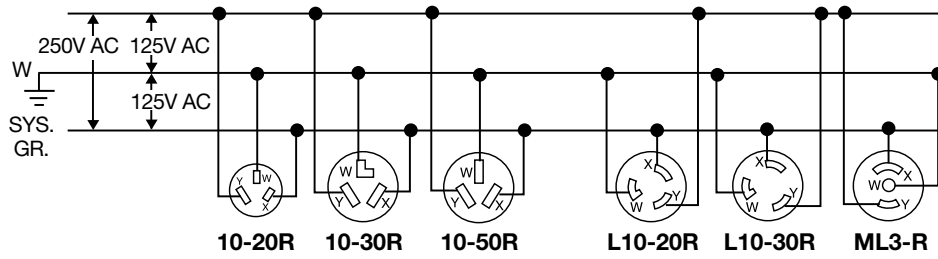


# Technical Information

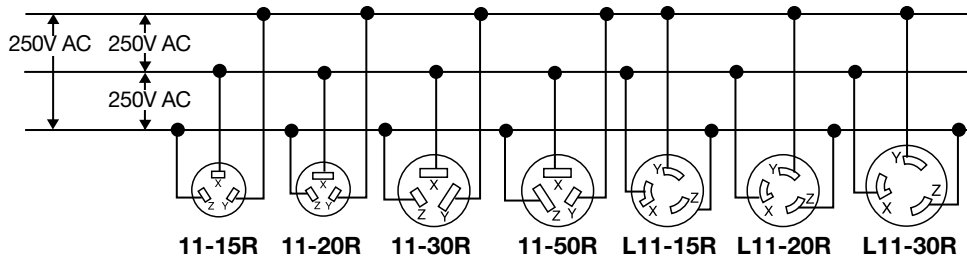
## Wiring Diagrams

### 3-POLE 3-WIRE

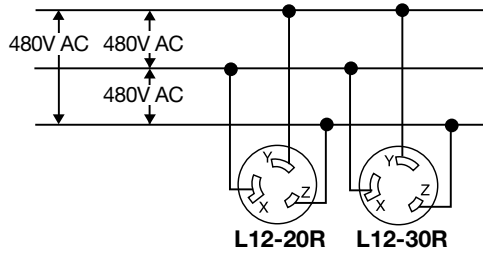
#### 125/250V AC



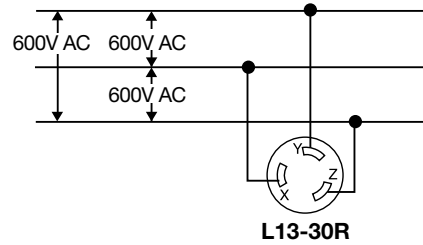
#### 3Ø 250V AC



#### 3Ø 480V AC

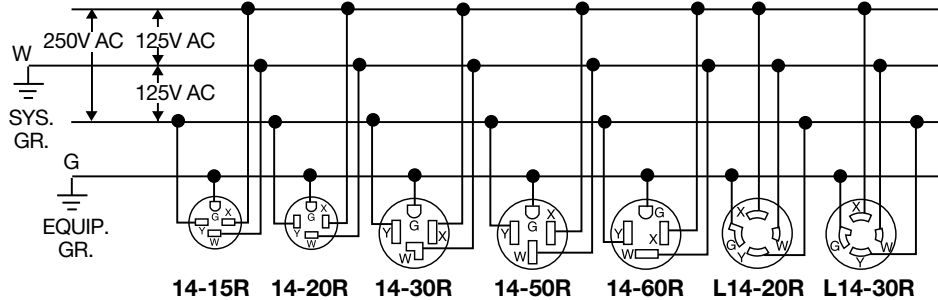


#### 3Ø 600V AC

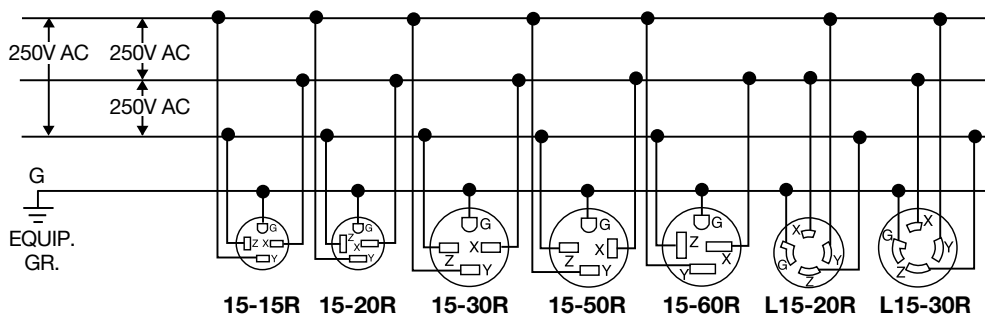


### 3-POLE 4-WIRE GROUNDING

#### 125/250V AC



#### 3Ø 250V AC

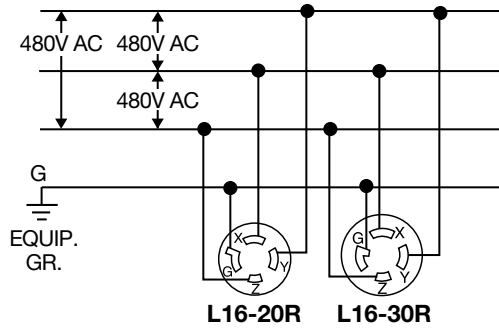


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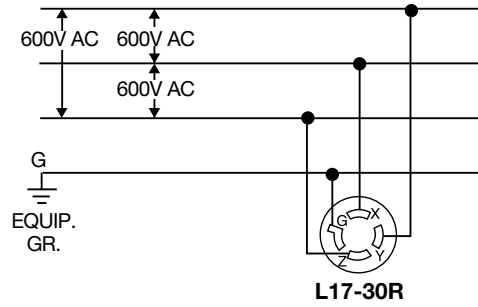
## Wiring Diagrams

### 3-POLE 4-WIRE GROUNDING

#### 3Ø 480V AC

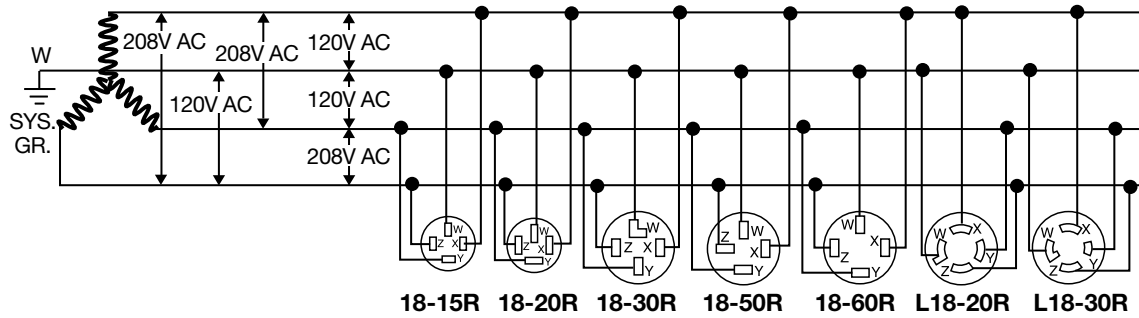


#### 3Ø 600V AC

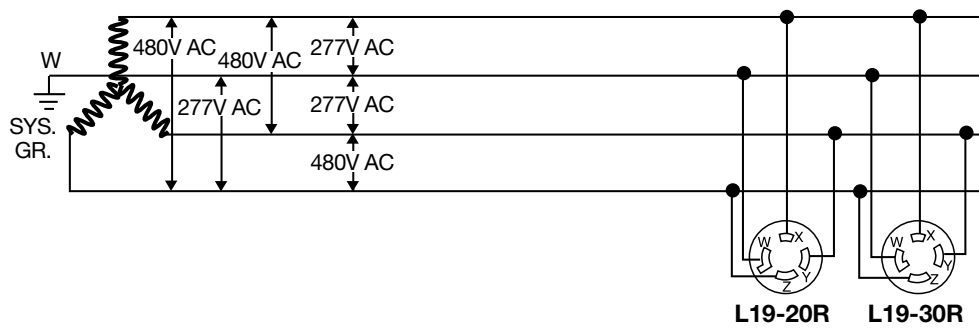


### 4-POLE 4-WIRE

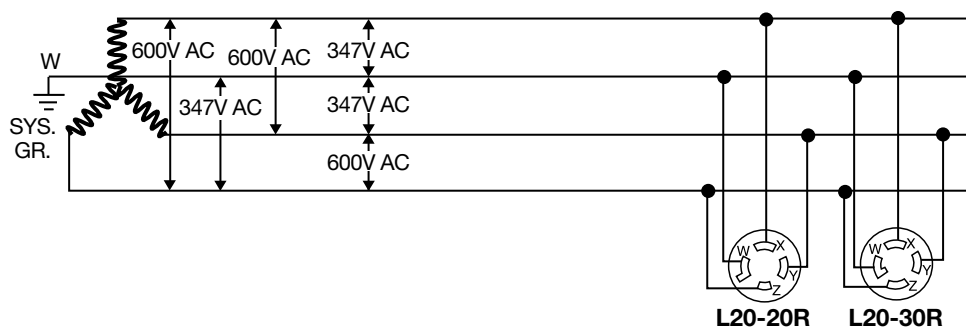
#### 3Ø 120/208V AC



#### 3Ø 277/480V AC



#### 3Ø 347/600V AC

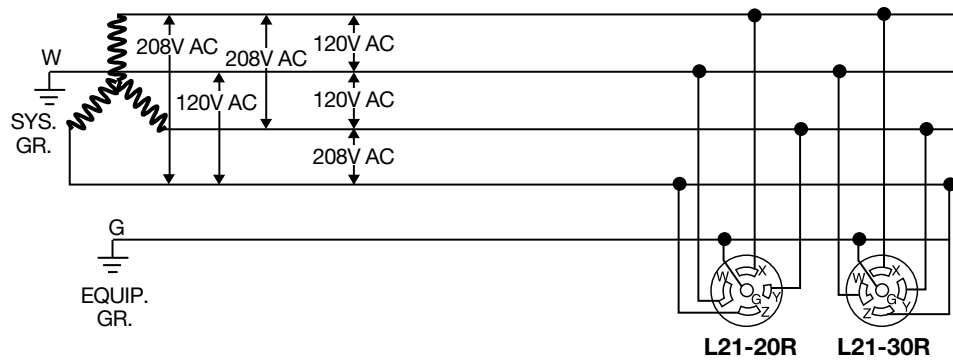


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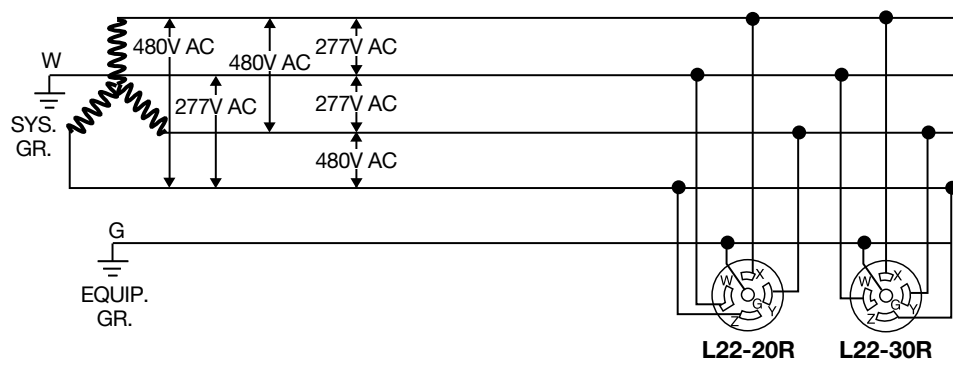
## Wiring Diagrams

### 4-POLE 5-WIRE GROUNDING

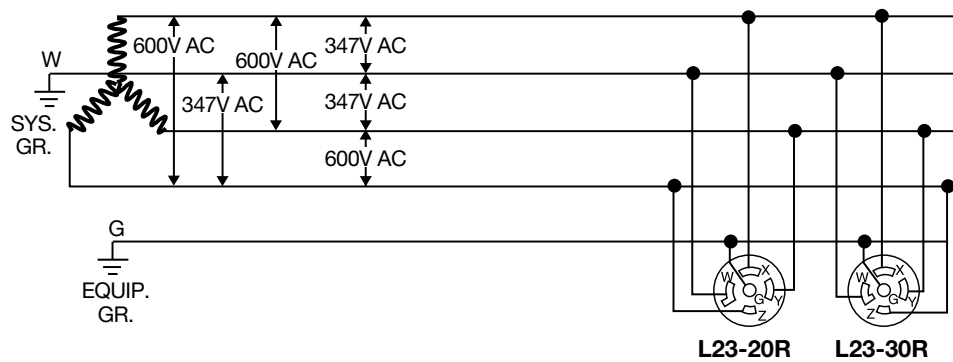
#### 3ØY 120/208V AC



#### 3ØY 277/480V AC



#### 3ØY 347/600V AC



# Technical Information

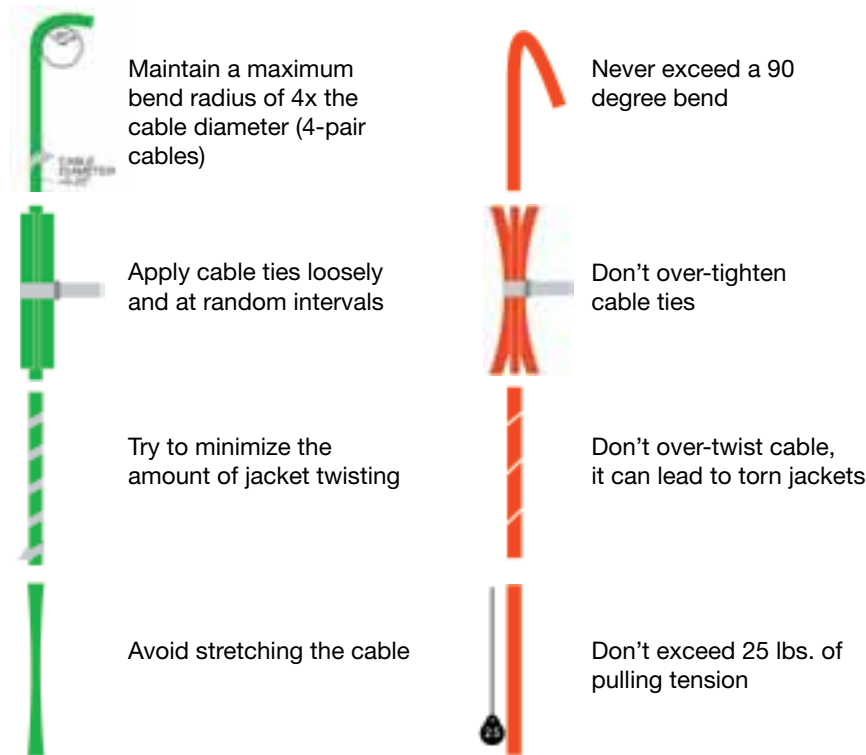
## Network Cabling Requirements

### SUPPORTED MEDIA - INTERNATIONAL

Designation	ANSI/TIA-568-C	ISO/IEC 11801 2nd Ed. 2002	CENELEC EN-50173-1: 2002
Category 3 (16 MHz)	Supported	Supported: Class C	Supported: Class C
120Ω Category 3 (16 MHz)	Not Supported	Supported: Class C	Supported: Class C
Category 5e (100 MHz)	Supported	Supported: Class D	Supported: Class D
Category 6 (250 MHz)	Supported	Supported: Class E	Supported: Class E
Category 6A (500 MHz)	Supported	Supported: Class EA*	Supported: Class EA*
Category 7 (600 MHz)	Not Recognized	Supported: Class F	Supported: Class F
50/125 - 62.5/125 Multimode	Supported	Supported	Supported
Singlemode Fiber	Supported	Supported	Supported
Singlemode Fiber to the Work Area	Not Supported	Supported	Supported
Work Area Outlet Configuration	4 Pairs T568A or B	4 Pairs T568A Only	4 Pairs T568A Only
Stranded Patch Cord Attenuation	120% of Horiz. Cable	150% of Horiz. Cable	150% of Horiz. Cable

Note: \*Category 6A requirements will be incorporated into ISO/IEC 11801 and CENELEC EN-50173 after the release of the ANSI/TIA-568-C Standards Series.

- Strip back only as much cable jacket as is required for termination and maintain pair twists as close as possible to the point of mechanical termination
- At a minimum, never allow untwisting of pairs as specified:  
Category 5e and 6/6A: 0.5 inch max.



Use appropriate methods for dressing and securing cables:

- Cable ties
- Cable support bar
- Wire management panels
- Releasable straps

Don't use a staple gun to position cable