



DISCONNECT SWITCHES FOR INTERCONNECTION WITH SMALL POWER PRODUCERS AND COGENERATORS

060559

Department: Electric T&D

Section: T&D Engineering and Technical Support

Approved by: J. S. Goh (JSG9)

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Rev. #01: This document replaces PG&E Document 060559, Rev. #00. For a description of the changes, see Page 18.

This document is also included in the following manual:

- *Interconnection Handbook*

Purpose and Scope

This document shows the installation of low voltage (0–600 V) cogeneration load-break disconnect switches on overhead and underground services and provides lists of approved disconnect devices for producer installation. Disconnect devices provide a visible open clearance point when isolation of the generator from the PG&E system is necessary.

General Information

1. A disconnect device must be provided as a means of electrically isolating the PG&E system from the generator and to establish a clearance point for maintenance and repair work in accordance with PG&E safety rules and practices. This disconnect device may be located in the main interconnection line, or in the generator connecting line. Stand-alone generators must be wired directly into the main interconnection line on the PG&E side of the power producer's main bus. Non-standalone generators may be wired into the power producer's main bus.

The disconnect device will be installed by PG&E at the power producer's expense if it is to be located in PG&E-owned wiring. If the device is to be located in the power producer's wiring it must be furnished and installed by the power producer. Only devices specifically approved by PG&E for this purpose may be used. PG&E employees shall inspect and approve the installation before parallel operation will be permitted.

The disconnect device must not be used to make or break parallels between the PG&E system and the generator(s). Only PG&E employees shall operate the device. For this reason, the device enclosure and operating handle (when present) shall be kept locked at all times with PG&E padlocks.

The device shall be physically located for ease of access and visibility to PG&E employees preferably within 10 feet of the meter. When installed in the applicant's wiring, the device shall be normally located in close proximity to the metering.

2. General duty disconnect switches shown in Table 7 on Page 8 may only be installed by the producer where the voltage is 240 V or less. Heavy duty disconnect switches must be used for all applications above 240 V and all pole-mounted PG&E installations. Use molded case disconnect switches (see Table 4 on Page 4) for all pedestal-mounted PG&E underground installations.
3. All disconnect switches connected on primary lines, shall be assigned a switch number. A switch number plate shall be attached by PG&E to the door of PG&E and producer-installed disconnect switches.
4. The ampere rating of a disconnect switch installed in the service shall not be less than the ampere rating of the producer's main disconnect device. The ampere rating of a disconnect switch installed in the generator lead shall be equal to or greater than the rated current of the generator and the rated ampacity of the generator lead conductors.
5. The neutral conductor shall not be switched.
6. Three-pole switches may be used in single-phase applications.

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7. Disconnect switches with an interlock (Table 8 on Page 9 and Table 9 on Page 9) allow the switch to be opened by the producer, but cannot be closed until reset by PG&E. Unfused, interlocked disconnect switches (Table 8 on Page 9) may be used instead of those shown in Table 7 on Page 8, if requested by the producer. Fused, interlocked disconnect switches (Table 8 on Page 9) are recommended for use in generator leads of single-phase, standalone generators, where fusing of the generator lead is required by the local inspection authorities. Fused, interlocked disconnect switches may also be used for non-standalone, single-phase generators if requested by the producer. Where three-phase generator lead protection is required, three-phase breakers with visible contacts (Table 9 on Page 9) may be used as the disconnect switch. Standalone generators (generators which can produce electricity without excitation current from the utility power system) cannot be connected on the load side of the disconnecting device because fire or other emergency crews must be able to disconnect the customer's service with a single device.
8. All disconnect devices must be locked with a PG&E corporation lock. If the disconnect device is operable without opening the enclosure, lock the operating handle. If the enclosure must be opened to operate the disconnect device, lock the enclosure.
9. For applications not shown, contact the Distribution department.

References

Document

Boxes for Electric Underground	028028
Cable Grips	015683
Connectors for Insulated Cables, Underground Distribution Systems	015251
Corrosion Resistant Ground Rods and Ground Rod Clamps	013109
Installation of Grounds on Wood Pole Transmission and Distribution Lines	021904
Molding, Conduits, and Attachments for Use on Wood Poles and Crossarms	021924
Standard Sizes, Types, and Uses of Insulated Distribution Wire and Cable	054457
Straight and Tap Splices for 600 V Insulated Cable, Single Conductor	051034
Tags for Identifying Underground Cables and Equipment	033582
Power Producers Interconnection Handbook, Section 4	PG&E Publication

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators**Table 1 Bill of Materials for Disconnect Switches for Interconnection With Small Power Producers and Cogenerators**

Item	Description	Code	Document
1	Switch, Overhead Disconnect, 200 Amp, 600 V, With Conduit Hub (see Table 3 on Page 4)	–	–
2	Switch, Underground Disconnect (see Table 4 on Page 4)	–	–
3	Bracket, Pole, Wesco Utility Sales Catalog Number WECOPMB	180152	–
4	Bracket, Pedestal, Wesco Utility Sales Catalog Number WECOPED	393176	–
5	Enclosure, Electric Pedestal, Reliable Electric Company Catalog Number R-UP-10HLP-M	393171	–
6	Stake, Enclosure, Electric Pedestal, Reliable Electric Company Catalog Number DM-60HS	393175	–
7	Molding, 2", U-Shaped, PVC 0.150" Minimum Thickness	360672	021924
8	Protector, Cable	382045	021924
9	Grip, Cable (as required)	–	015683
10	Padlock, Corporation	170040	020861
11	Wire, Ground, Bare Copper, #6 AWG, Solid	290072	–
12	Bolts, Machine, Hex, With Nuts, Galvanized (size as required)	–	–
13	Lag Screw, Washer Head, 1/4" x 2-1/2"	196212	058778
14	Switch Number Plate (specify lettering - see Note 2 on Page 1)	–	–
15	Bushing, Conduit Sealing (see Table 5 on Page 4)	–	–
16	Nipple, Conduit (see Table 2 on Page 4)	–	–
17	Wire, Ground, Bare Copper, #2 AWG, Solid S.D.	290074	–
18	Ground Rod, 5/8" x 8' x 0"	187013	013109
19	Clamp, Ground Rod, 5/8"	187012	013109
20	Connector, Compression-Type, Predrilled (size as required)	–	015251
21	Plastic Insulating Sealant, 3-3/4" Wide x 1/8" Thick	507030	–
22	Tape, PVC, 3/4" Wide	384095	–
23	Connector, Tap, Compression-Type (size as required)	–	015251
24	Adapter, Terminal, PVC, 1", Male Thread to Slip Fit	360309	–
25	Bushing, 1" Conduit, Threaded, Galvanized Iron	390103	–
26	Conduit, Rigid, PVC, 1", Schedule 80	360305	–
27	Strap, 1" Pipe, Galvanized, Rigid, Heavy Duty	176018	–
28	Locknut, Conduit, Steel, Galvanized, 2"	390272	–
29	Nipple, Conduit, Bushed, 2"	390737	–

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Application Guide and Ordering Information for PG&E-Installed Disconnect Switches

Table 2 Application Guide and Codes for All PG&E Installed Disconnect Switches

Installation				Disconnect Switch Code	Sealing Bushing Code	Conduit Nipple Code	Mounting Bracket		Pedestal Code	Stake Code
Type	No. of Phases	Ampere Rating	Figure Number				Quantity Required	Code		
OH	1	0-200	1	349189	391637	20655	4	180152	-	-
	3			349192	391638	21876			-	-
UG	1	0-100	4	340218	-	-	1	393176	393171	393175
	3			340219	-	-				
	1	101-225		340220	-	-				
	3			340221	-	-				

Table 3 Data and Codes for 600 V Heavy Duty Disconnect Switches With Conduit Hubs for Overhead Installation

Type	Ampere Rating	Disconnect Switch		Size (inches)	Conduit Hub		Assembly Code No.
		Manufacturer and Catalog Number			Manufacturer and Catalog Number		
		Square D	WESCO Utility		Square D	WESCO Utility	
2-Pole	200	-	RHU-264-SPGE	2	-	RIH-200	349189
3-Pole		HU364RB-SPLO	RHU-364-SPGE	2-1/2	B250	RIH-250	349192

Table 4 Data and Codes for Molded Case Disconnect Switches With Visible Contacts for Underground Installation

Type	Ampere Rating	Voltage Rating	Maximum Wire Size	Code	Mfr. & Cat. No.
					Square D
2-Pole	100	240	1/0 AWG	340218	FAL 22000-V
3-Pole				340219	FAL 32000-V
2-Pole	225	600	4/0 AWG	340220	KAL 26000-V
3-Pole				340221	KAL 36000-V

Table 5 Data and Codes for Conduit Sealing Bushings for Overhead Disconnect Switches

Switch		Installation				Conduit Size (inches)	Code	O.Z. Mfg. Co. Catalog Number
Ampere Rating	Fig. No.	No. of Phases	Riser Cable Size	No. of Riser Conductors	Conductor OD (inches)			
200	1	1	4/0 AWG	4	0.606	2.0	391637	KR200-4/C-0.606
		3		6		2.5	391638	KR250-6/C-0.606

Table 6 Codes for Mounting Brackets for Overhead and Underground Installations

Installation	Code	WESCO Catalog Number
Overhead	180152	PMB
Underground	393176	PED

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

PG&E Installed Overhead Disconnect Switch Installation and Wiring Diagrams

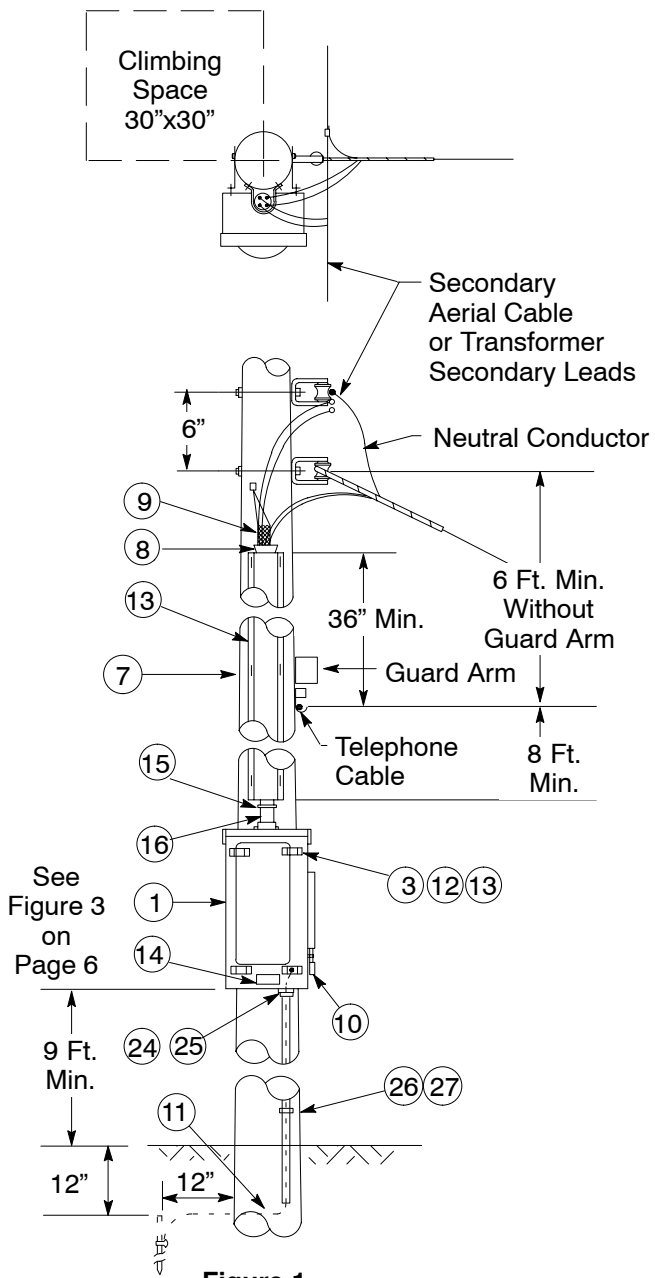


Figure 1
Overhead Disconnect Switch Installation

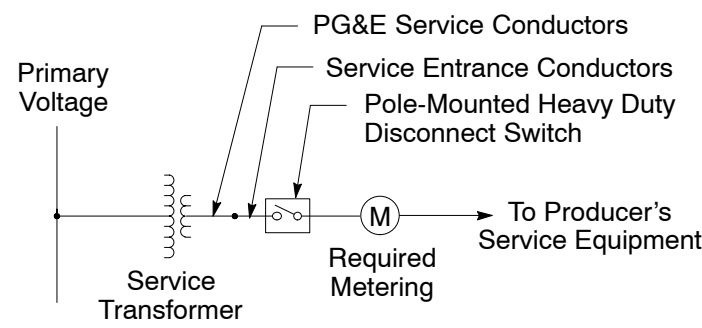


Figure 2
Overhead Disconnect Switch
Wiring Diagram

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

PG&E-Installed Overhead Disconnect Switch Installation and Wiring Diagrams (continued)

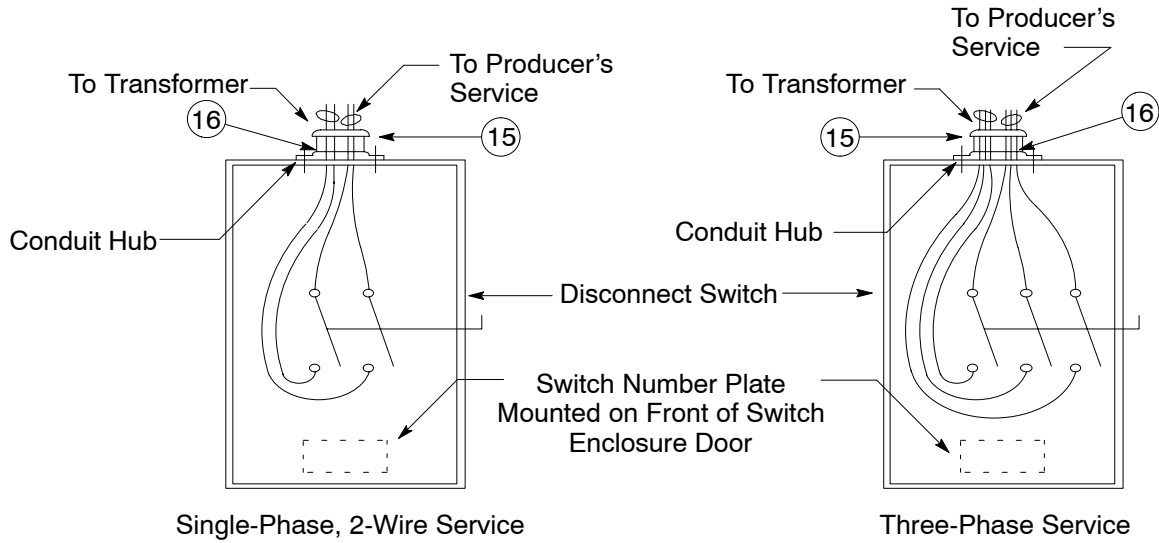
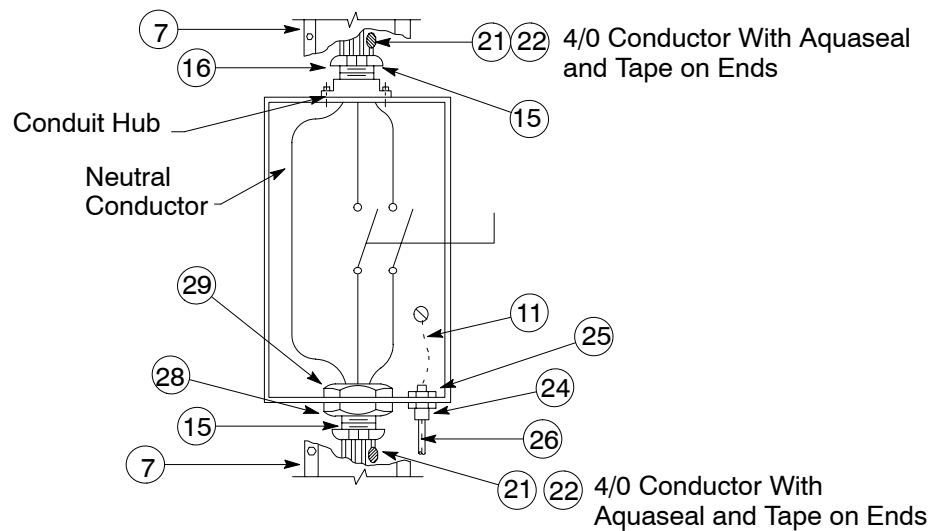


Figure 3
Disconnect Switch Assembly For Overhead Services
(see Detail A for underground services)



Detail A
Overhead Disconnect Switch
Installation for Underground Services

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

PG&E-Installed Underground Disconnect Switch Installation and Wiring Diagrams

Notes

1. The switch number plate is mounted on the pedestal cover.
2. For service in conduit, interset a splice box adjacent to the pedestal. Install conduit from the box to the pedestal. Splice the neutral directly through the splice box. See Document 028028 for box size.
3. The switch leads should be the same wire size as the service conductors, but the maximum lead size is limited to 4/0 AWG.

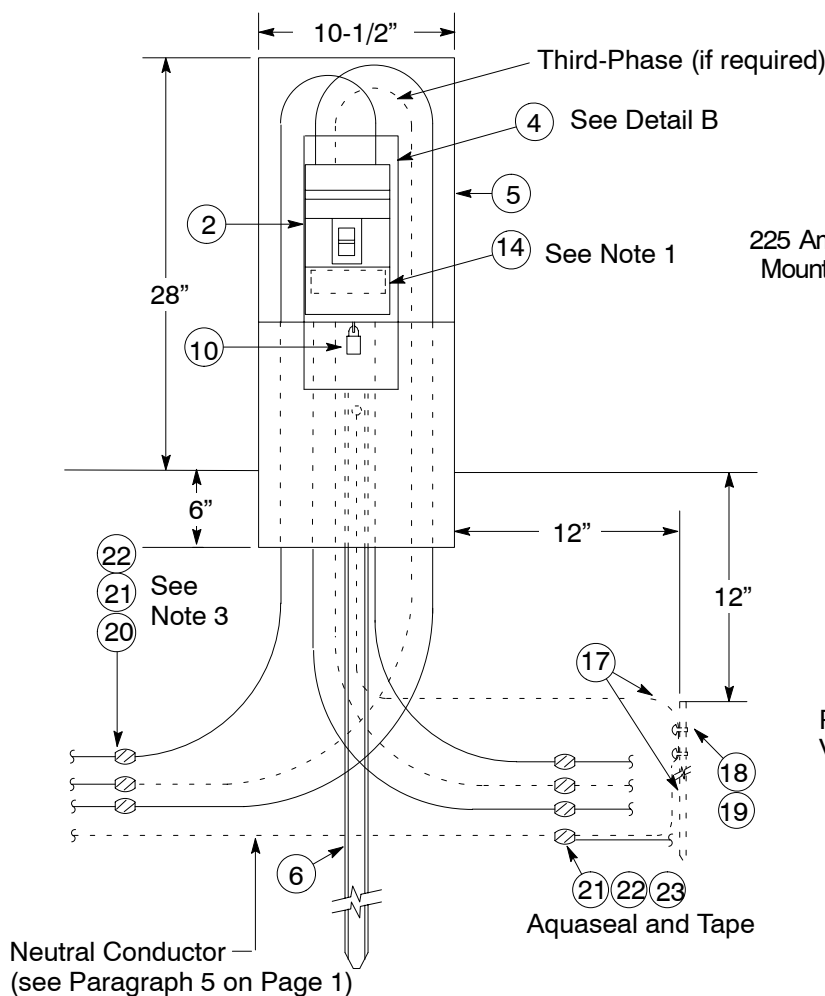
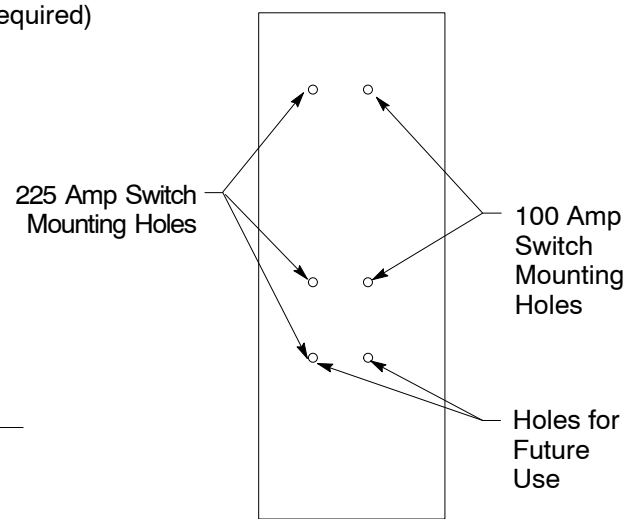


Figure 4
Underground Disconnect Switch Installation
Direct Buried Service
 (see Note 2 for service in conduit)



Detail B
Pedestal Mounting Bracket

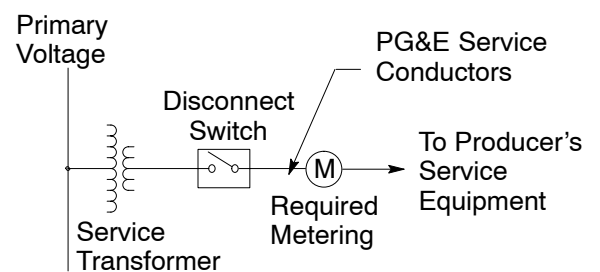


Figure 5
Underground Disconnect
Switch Wiring Diagram

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

General Duty, 240 V, Type 1 (indoor)

Table 7 Disconnect Switches ^{1, 2}

Amp Rating	VBI	Vacu-Break®	Murray	General Electric	Square D	Cutler-Hammer	
2-Pole, 2-Wire, Fusible							
30	Use 2-Pole, 3-Wire Switch	Use 2-Pole, 3-Wire Switch	Use 2-Pole, 3-Wire Switch	Use 2-Pole, 3-Wire Switch	Use 2-Pole, 3-Wire Switch	Use 2-Pole, 3-Wire Switch	
60							
100							
200							
400						DG225FGK	
600						DG226FGK	
2-Pole, 3-Wire, Fusible							
30	GF221N	JN321	GHN321N	TG3221	D221N	DG221NGB	
60	GF222N	JN322	GHN322N	TG3222	D222N	DG222NGB	
100	GF223N	JN323	GHN323N	TG3223	D223N	DG223NGB	
200	GF224N	JN324	GHN324N	TG3224	D224N	DG224NGB	
400	GF225N	JN325	GHN325N	TG3225	D225N	DG225NGB	
600	GF226N	JN326	GHN326N	TG3226	D226N	DG226NGB	
3-Pole, 3-Wire, Fusible							
30	Use 3-Pole, 4-Wire Switch	Use 3-Pole, 4-Wire Switch	Use 3-Pole, 4-Wire Switch	Use 3-Pole, 4-Wire Switch	Use 3-Pole, 4-Wire Switch	Use 3-Pole, 4-Wire Switch	
60							
100				TG3325			DG325FGK
200							
400				TG3326		DG326FGK	
600							
3-Pole, 4-Wire, Fusible							
30	GF321N	JN421	GHN421N	TG4321	D321N	DG321NGB	
60	GF322N	JN422	GHN422N	TG4322	D322N	DG322NGB	
100	GF323N	JN423	GHN423N	TG4323	D323N	DG323NGB	
200	GF324N	JN424	GHN424N	TG4324	D324N	DG324NGB	
400	GF325N	JN425	GHN425N	TG4325	D325N	DG325NGB	
600	GF326N	JN426	GHN426N	TG4326	D326N	DG326NGB	
3-Pole, 4-Wire, Non-Fusible							
30	GNF321	JU321	GUN321	TGN3321	DU321	DG321UGB	
60	GNF322	JU322	GUN322	TGN3322	DU322	DG322UGB	
100	GNF323	JU323	GUN323	TGN3323	DU323	DG323UGB	
200	GNF324	JU324	GUN324	TGN3324	DU324	DG324UGB	
400	GNF325	JU325	Use Heavy Duty Switch	TGN3325	DU325	DG325UGB	
600	GNF326	JU326		TGN3326	DU326	DG326UGB	

¹ For other disconnect switches that are not on this list, the following switches are also approved for installation:

- 1) Siemens
- 2) Square D
- 3) Cutler-Hammer

² This table shows some of the types of disconnect switches. For complete switch models, please see Pages 10–13.

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

Table 8 Catalog Numbers of WESCO 600 V, Fused, Interlocked, Heavy Duty Disconnect Switches for Single-Phase Cogenerator Leads

Type	Ampere Rating	Catalog Number
2-Pole	30	RHF-261-IPGE
	60	RHF-262-IPGE
	100	RHF-363-IPGE
	200	RHF-264-IPGE
	400	RHF-265-IPGE

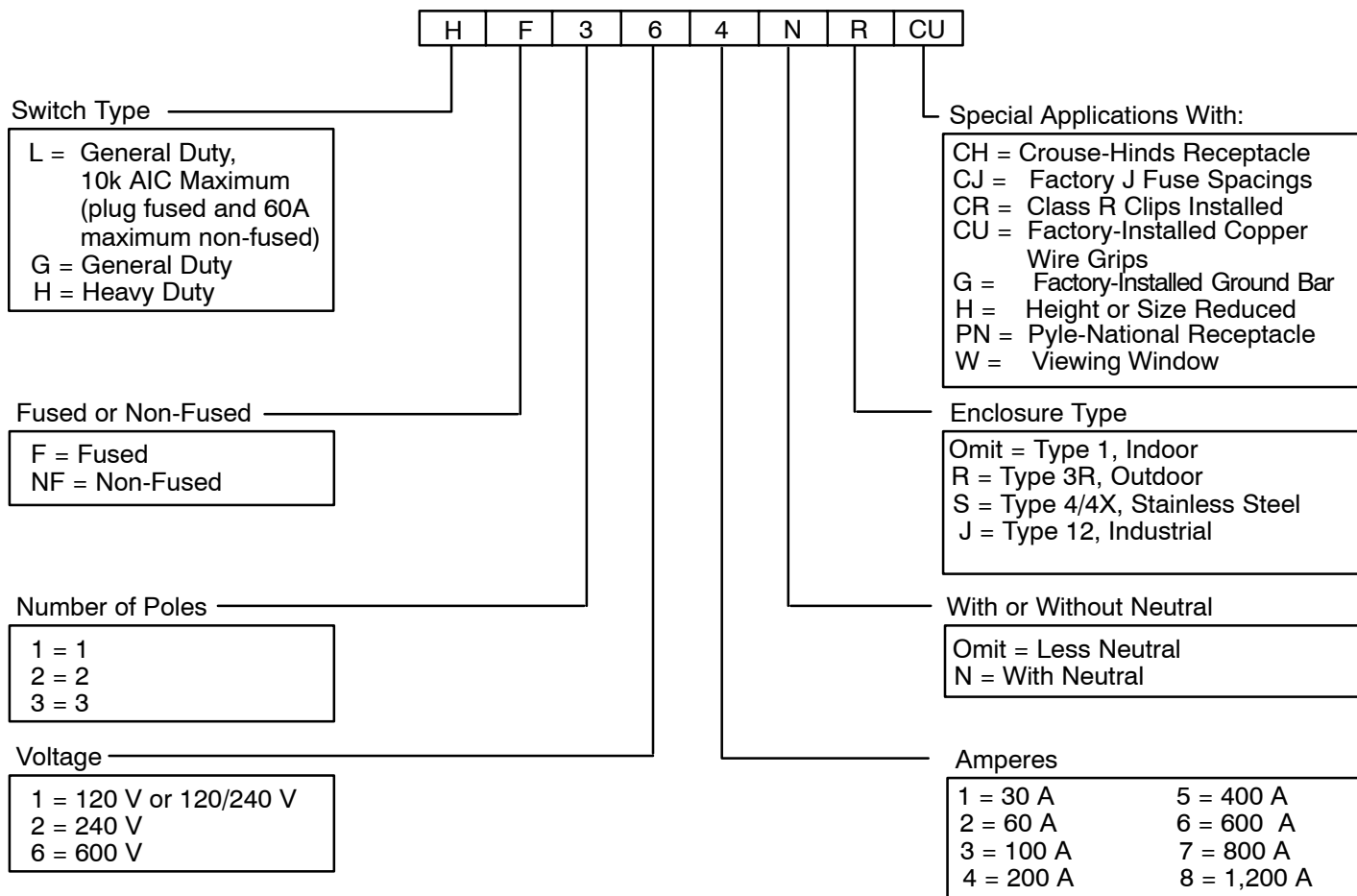
Table 9 Three Phase Breakers With Visible Contacts for Cogenerator Leads and Switchboard Installations

Manufacturer and Breaker Type			
Cogenerator Leads			Switchboard Installations
Westinghouse	Klockner-Moeller	Square D	Boltswitch
Saf-T-Vue	NZM	Visi-Blade	Series VL and SL

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

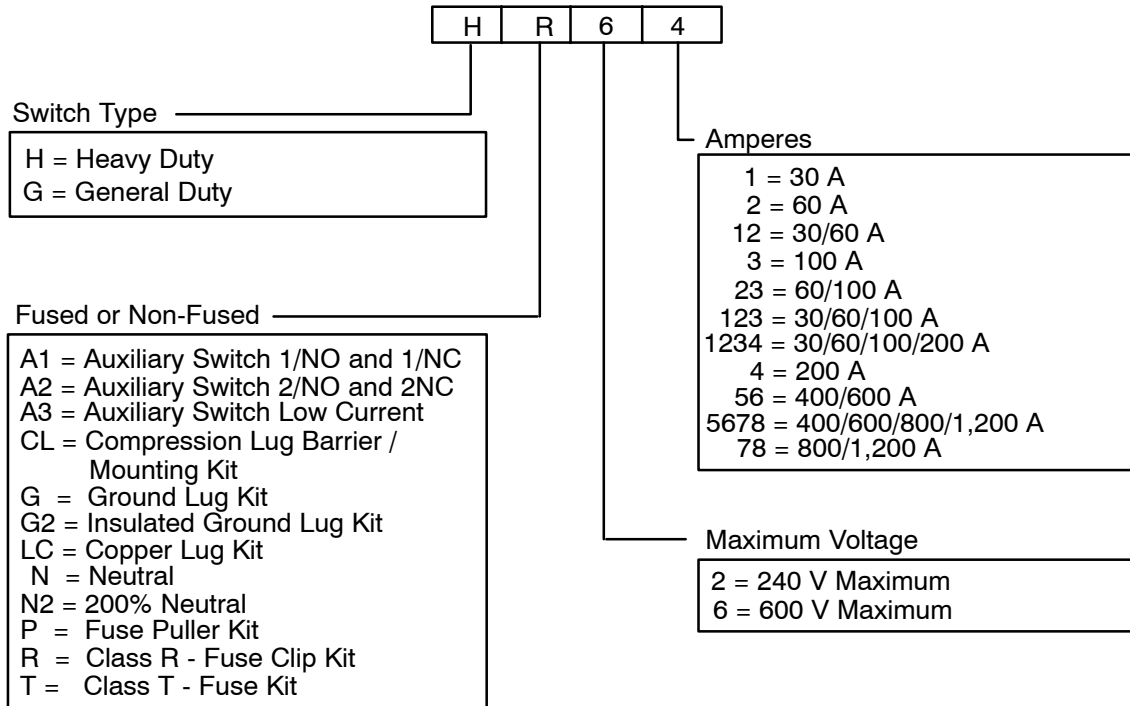
Siemens Catalog Numbering System

Type VBII Safety Switch Catalog Numbering System



Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

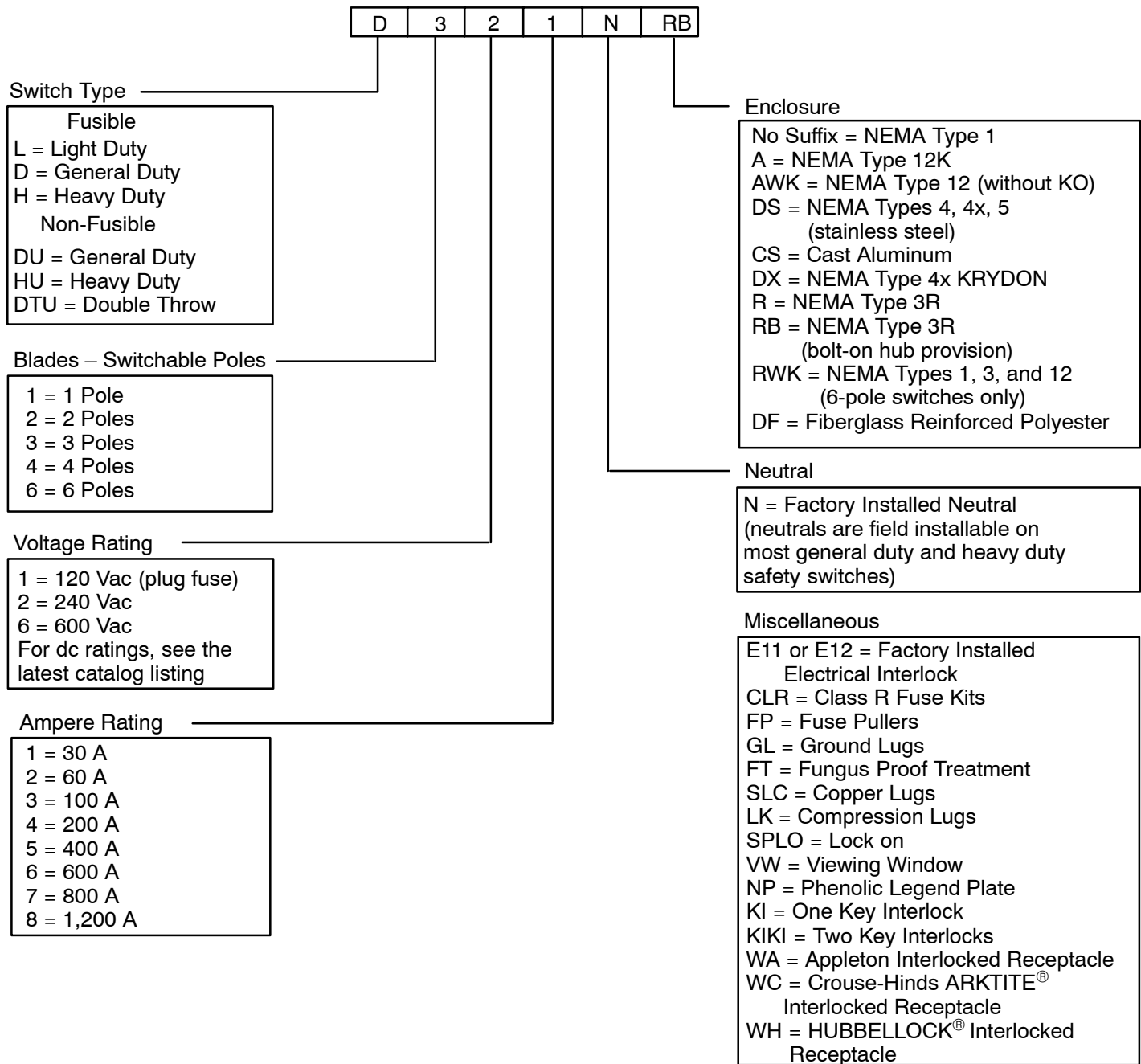
Siemens Accessories Catalog Numbering System



Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

Square D Catalog Numbering System for Safety Switches

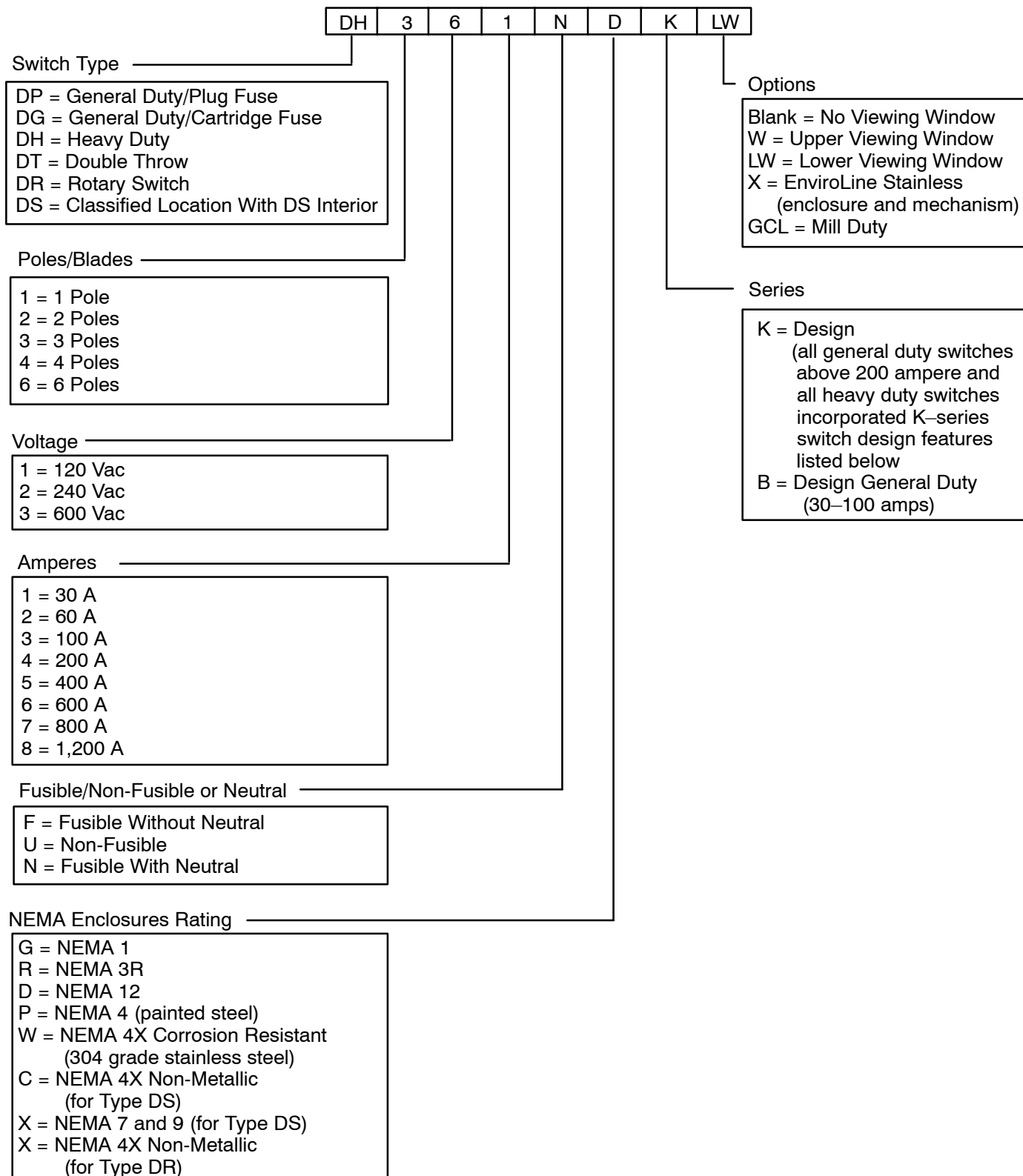
Typical Safety Switch Catalog Number



Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

Cutler-Hammer Catalog Numbering System

Safety Switches and Enclosed Circuit Breakers



Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

Producer-Installed Disconnect Switches and Wiring Diagrams

Notes

1. Producer-installed 240 and 600 V disconnect devices may be connected within 10' on the load side of the meter (see Figure 6 on Page 15 and Figure 9 on Page 16) or on the source side of the meter (see Figure 6 on Figure 7 and Figure 8 on Pages 15 and 16).
2. Non-standalone generators may be interconnected on the load side of the main disconnecting device provided all of the following conditions are met:
 - A. The applicable electric codes permit interconnection on the load side of the main disconnect device.
 - B. The disconnect switch is physically located for ease of access and visibility to PG&E employees in close proximity to the PG&E meter.
 - C. The disconnect switch is connected as shown in Figure 9 on Page 16.
3. Interconnections in sealable compartments may be made, but should be avoided if possible. If made, qualified Division employees must remove seals, observe the interconnection, and reseal. Interconnections in sealable compartments must be made in accordance with the following:
 - A. Generator leads may be connected to the meter buses by bolting spade terminals to the bus bars (see Figure 10 on Page 17). One attachment hole per bus bar may be drilled provided the diameter of the hole does not exceed more than 30% of the bus width. Spade terminals must be tinned alloy suitable for Cu-to-Al connections.
 - B. Generator leads may be connected to the service conductors with split-bolt connectors (see Figure 11 on Page 17). The split-bolt connectors must be UL approved and must be suitable for Cu-to-Al connections.
 - C. Connections in sealable compartments shall have no less than 1/2" clear air space between insulated live parts and any grounded or ungrounded metal and no less than 3/4" between uninsulated live parts of opposite polarity. The clear air space must be maintained when the terminals are rotated 30° clockwise and counterclockwise from their normal position.
 - D. Connectors may be taped if the required clearances cannot be maintained, provided:
 1. The tape is not wrapped over a sharp edge.
 2. The tape is not subject to compression.
 3. The tape wrap is not less than 0.028" thick and is applied in three or more layers.
 4. The fastening bolts are accessible for tightening without removal of the tape.
 5. Polyvinyl chloride, 8.5 mil, electrical insulating tape meeting ASTM Specification D-3005, Type II is used.
 - E. The minimum bending radius for the generator lead conductors shall be equal to four times the diameter of the conductor, measured from the inner surface of the conductor.
 - F. Generator lead conductors shall not cross over the service conductors or buses unless there is a solid insulating barrier, conduit or other suitable means to separate or otherwise prevent physical contact of the generator lead conductors with the service conductors.

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

Producer-Installed Disconnect Switches and Wiring Diagrams (continued)

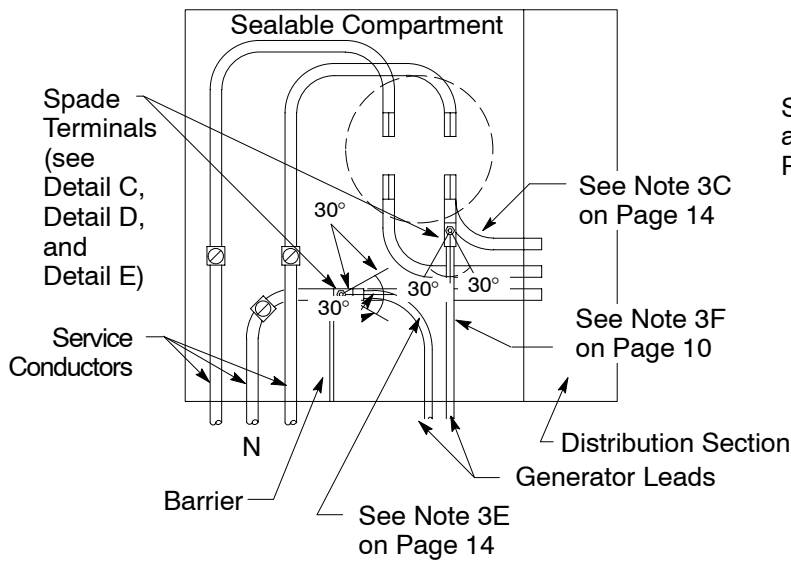


Figure 6
Typical Bolted-Terminal Interconnection
 in a Sealable Compartment (see Note 3 on Page 14)
 120 V Installation Shown

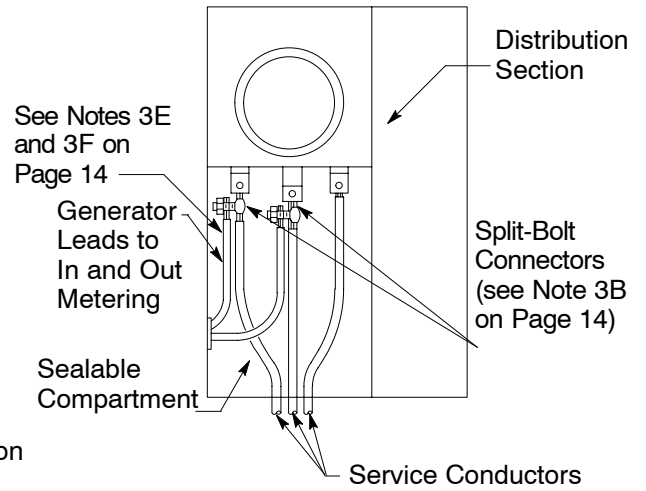
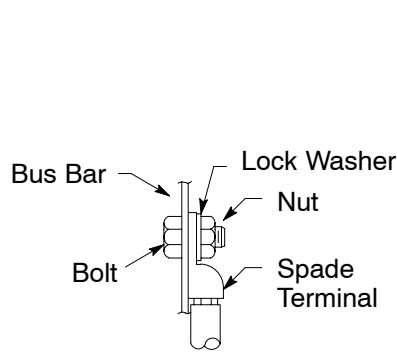
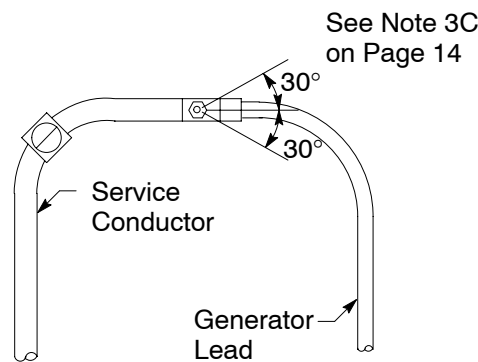


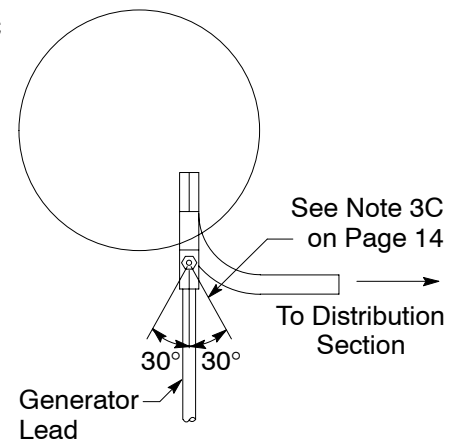
Figure 7
Typical Split-Bolt Interconnection
 in a Sealable Compartment (see Note 3 on Page 14)
 120 V Installation Shown



Detail C
Two Meter, Buy-Sell
Interconnection Shown



Detail D



Detail E

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

Producer Installed Disconnect Switches and Wiring Diagrams (continued)

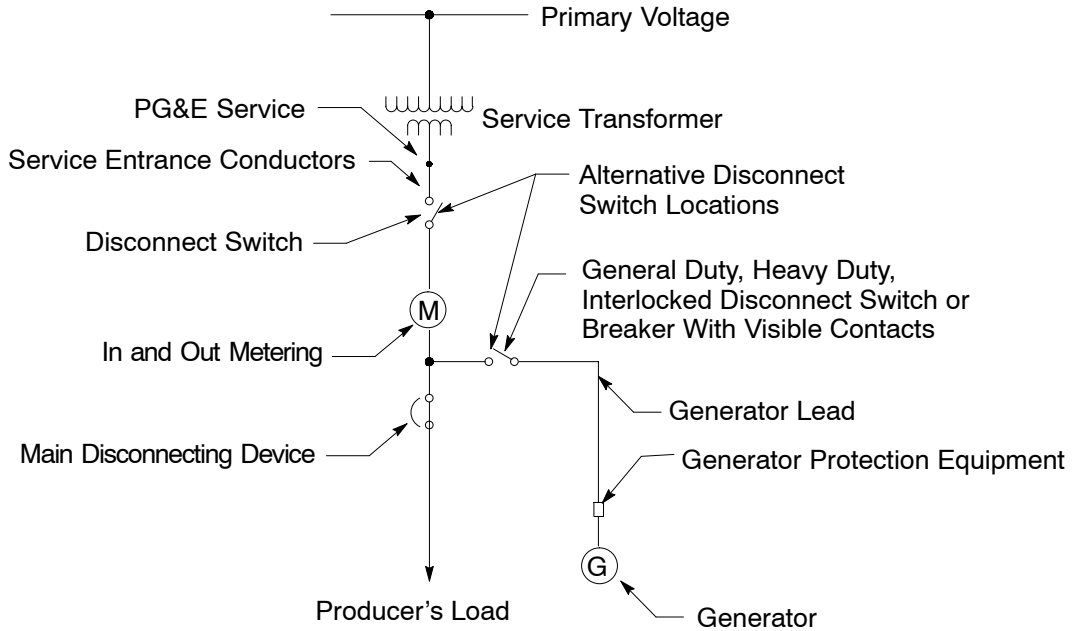


Figure 8
Preferred Interconnection Surplus Sale
Disconnect Switch Wiring Diagram

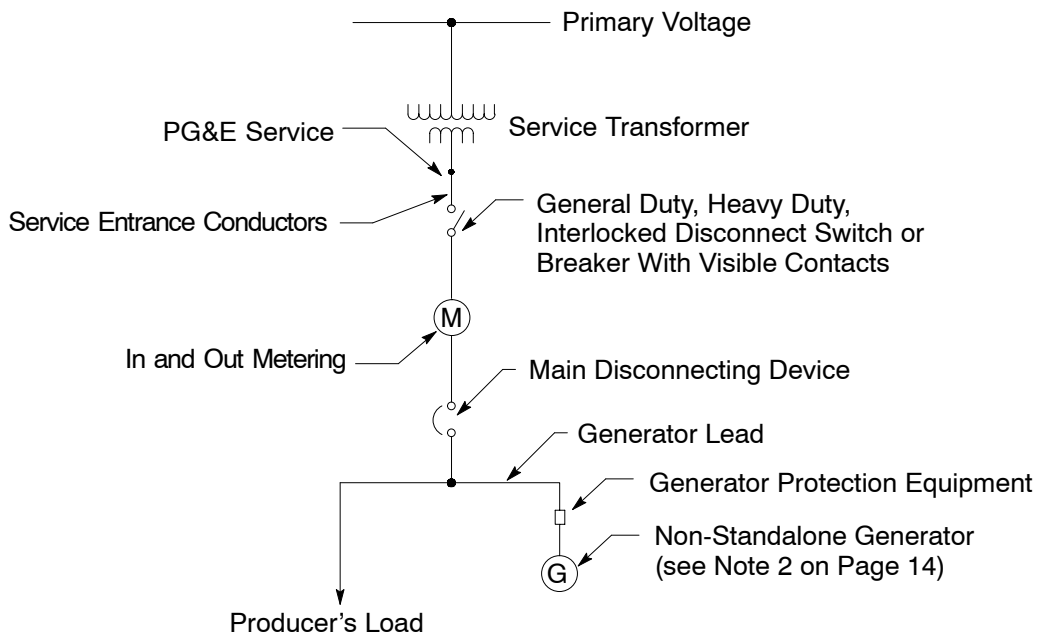


Figure 9
Alternate Interconnection Surplus Sale
Disconnect Switch Wiring Diagram

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

Producer Installed Disconnect Switches and Wiring Diagrams (continued)

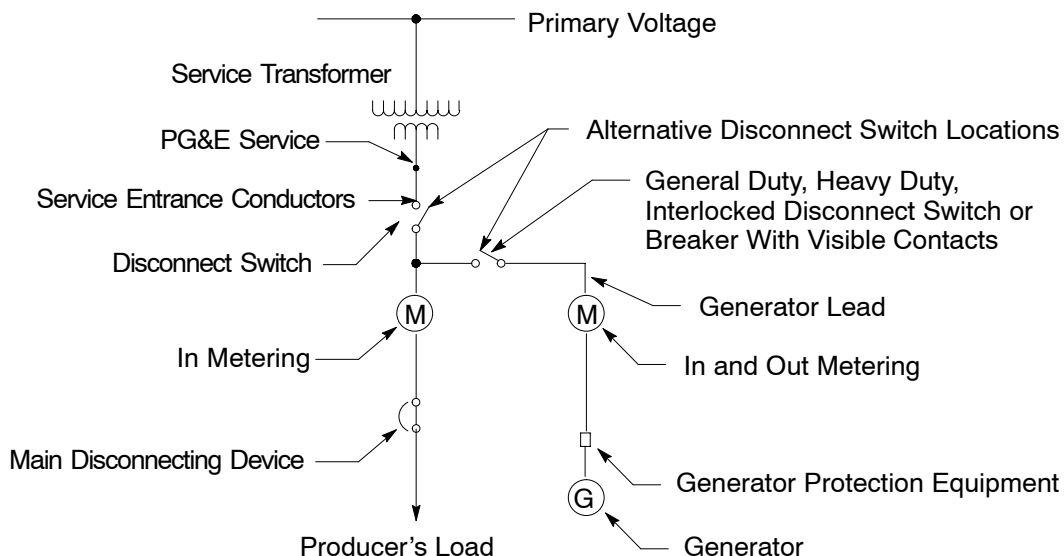


Figure 10
Two Meter, Buy-Sell Interconnection
Disconnect Switch Wiring Diagram

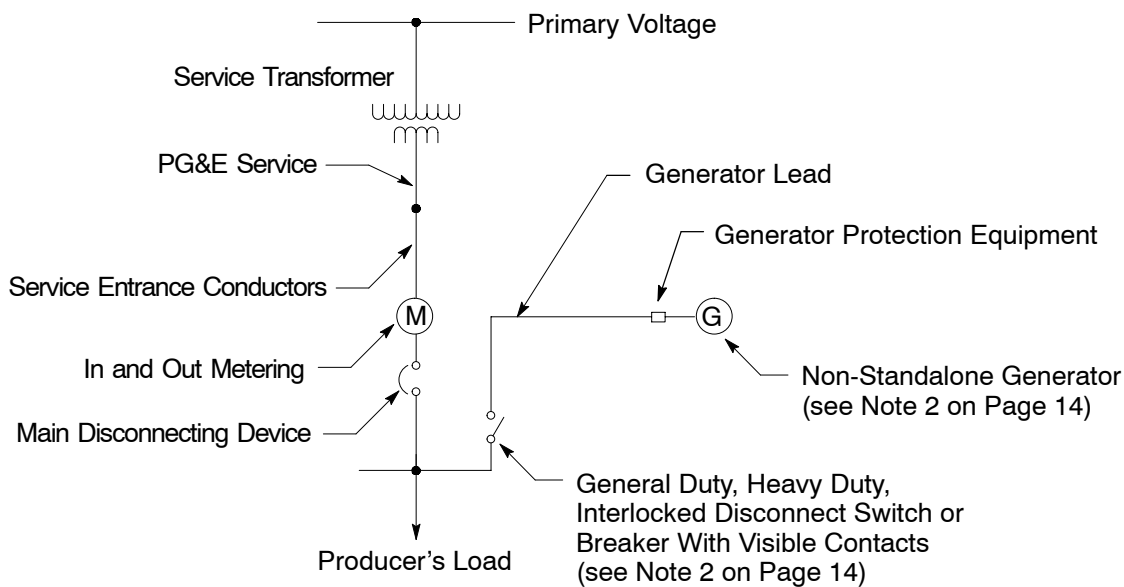


Figure 11
Load-Side Interconnection Surplus Sale
Disconnect Switch Wiring Diagram

Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

Revision Notes

Revision 01 has the following changes:

1. Changes in disconnect switches in Table 7 on Page 8 and on Pages 10–13.