DISCONNECT SWITCHES FOR INTERCONNECTION WITH SMALL POWER PRODUCERS AND COGENERATORS

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.
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

<table>
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<th>Document</th>
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<tr>
<td>Boxes for Electric Underground ............................................ 028028</td>
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<td>Cable Grips ........................................................................ 015683</td>
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<td>Connectors for Insulated Cables, Underground Distribution Systems .................................................. 015251</td>
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<td>Corrosion Resistant Ground Rods and Ground Rod Clamps ............................................................... 013109</td>
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<td>Installation of Grounds on Wood Pole Transmission and Distribution Lines ........................................ 021904</td>
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<td>Molding, Conduits, and Attachments for Use on Wood Poles and Crossarms ......................................... 021924</td>
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<tr>
<td>Standard Sizes, Types, and Uses of Insulated Distribution Wire and Cable ...................................... 054457</td>
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<td>Straight and Tap Splices for 600 V Insulated Cable, Single Conductor ............................................... 051034</td>
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<td>Tags for Identifying Underground Cables and Equipment .................................................................... 033582</td>
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<tr>
<td>Power Producers Interconnection Handbook, Section 4 ......................................................... PG&amp;E Publication</td>
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## Table 1  Bill of Materials for Disconnect Switches for Interconnection With Small Power Producers and Cogenerators

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

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<thead>
<tr>
<th>Type</th>
<th>No. of Phases</th>
<th>Ampere Rating</th>
<th>Figure Number</th>
<th>Disconnect Switch Code</th>
<th>Sealing Bushing Code</th>
<th>Conduit Nipple Code</th>
<th>Mounting Bracket Quantity Required</th>
<th>Pedestal Code</th>
<th>Stake Code</th>
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<tr>
<td>OH</td>
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<td>349192</td>
<td>391638</td>
<td>21876</td>
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<td>UG</td>
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<td>340218</td>
<td>–</td>
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<td>1</td>
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<td>393171</td>
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#### Table 3 Data and Codes for 600 V Heavy Duty Disconnect Switches With Conduit Hubs for Overhead Installation

<table>
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<tr>
<th>Type</th>
<th>Ampere Rating</th>
<th>Manufacturer and Catalog Number</th>
<th>Size (inches)</th>
<th>Manufacturer and Catalog Number</th>
<th>Assembly Code No.</th>
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<tr>
<td>2-Pole</td>
<td>200</td>
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<td>RHU-264-SPGE</td>
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<td>HU364RB-SPLO</td>
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<td>2-1/2</td>
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#### Table 4 Data and Codes for Molded Case Disconnect Switches With Visible Contacts for Underground Installation

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<tr>
<td>2-Pole</td>
<td>100</td>
<td>240</td>
<td>1/0 AWG</td>
<td>340218</td>
<td>FAL 22000-V</td>
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<td>3-Pole</td>
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<td></td>
<td></td>
<td>340219</td>
<td>FAL 32000-V</td>
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<td>2-Pole</td>
<td>225</td>
<td>600</td>
<td>4/0 AWG</td>
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<td>KAL 26000-V</td>
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<td>3-Pole</td>
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<td></td>
<td></td>
<td>340221</td>
<td>KAL 36000-V</td>
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#### Table 5 Data and Codes for Conduit Sealing Bushings for Overhead Disconnect Switches

<table>
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<tr>
<th>Switch</th>
<th>Installation</th>
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<tbody>
<tr>
<td>Ampere Rating</td>
<td>Fig. No.</td>
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<td></td>
</tr>
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<td>200</td>
<td>1</td>
</tr>
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</table>

#### Table 6 Codes for Mounting Brackets for Overhead and Underground Installations

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<th>Installation</th>
<th>Code</th>
<th>WESCO Catalog Number</th>
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<tr>
<td>Overhead</td>
<td>180152</td>
<td>PMB</td>
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<tr>
<td>Underground</td>
<td>393176</td>
<td>PED</td>
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**PG&E Installed Overhead Disconnect Switch Installation and Wiring Diagrams**

**Figure 1**
Overhead Disconnect Switch Installation

**Figure 2**
Overhead Disconnect Switch Wiring Diagram
**Figure 3**
Disconnect Switch Assembly For Overhead Services
(see Detail A for underground services)

**Detail A**
Overhead Disconnect Switch Installation for Underground Services
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)

Figure 5
Underground Disconnect Switch Wiring Diagram
**General Duty, 240 V, Type 1 (indoor)**

Table 7 **Disconnect Switches**

<table>
<thead>
<tr>
<th>Amp Rating</th>
<th>VBll</th>
<th>Vacu-Break®</th>
<th>Murray</th>
<th>General Electric</th>
<th>Square D</th>
<th>Cutler-Hammer</th>
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<tr>
<td><strong>2-Pole, 2-Wire, Fusible</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>Use 2-Pole, 3-Wire Switch</td>
<td>Use 2-Pole, 3-Wire Switch</td>
<td>Use 2-Pole, 3-Wire Switch</td>
<td>Use 2-Pole, 3-Wire Switch</td>
<td>Use 2-Pole, 3-Wire Switch</td>
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<tr>
<td>60</td>
<td>GF221N</td>
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<td>GHN321N</td>
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<td>GF222N</td>
<td>JN322</td>
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<td>DG222NGB</td>
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<td>JN323</td>
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<td>DG223NGB</td>
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<td>GF224N</td>
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<td>GHN324N</td>
<td>TG3224</td>
<td>D224N</td>
<td>DG224NGB</td>
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<td>GF225N</td>
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<td>TG3225</td>
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<td>DG225NGB</td>
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<td><strong>2-Pole, 3-Wire, Fusible</strong></td>
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<td>Use 3-Pole, 4-Wire Switch</td>
<td>Use 3-Pole, 4-Wire Switch</td>
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<td>DG325FGK</td>
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<td>TG4321</td>
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<td>DG321NGB</td>
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<td>Use 3-Pole, 4-Wire Switch</td>
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<td>DG324UGB</td>
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<td>JU325</td>
<td>Use Heavy Duty Switch</td>
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<td>DU325</td>
<td>DG325UGB</td>
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<td>600</td>
<td>GNF326</td>
<td>JU326</td>
<td>Use Heavy Duty Switch</td>
<td>TGN326</td>
<td>DU326</td>
<td>DG326UGB</td>
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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.
### Table 8  Catalog Numbers of WESCO 600 V, Fused, Interlocked, Heavy Duty Disconnect Switches for Single-Phase Cogenerator Leads

<table>
<thead>
<tr>
<th>Type</th>
<th>Ampere Rating</th>
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<tr>
<td>2-Pole</td>
<td>30</td>
<td>RHF-261-IPGE</td>
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### Table 9  Three Phase Breakers With Visible Contacts for Cogenerator Leads and Switchboard Installations

<table>
<thead>
<tr>
<th>Manufacturer and Breaker Type</th>
<th>Cogenerator Leads</th>
<th>Switchboard Installations</th>
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<tbody>
<tr>
<td>Westinghouse</td>
<td>Klockner-Moeller</td>
<td>Square D</td>
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<tr>
<td>Saf-T-Vue</td>
<td>NZM</td>
<td>Visi-Blade</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Series VL and SL</td>
</tr>
</tbody>
</table>
Siemens Catalog Numbering System

Type VBII Safety Switch Catalog Numbering System

Switch Type

L = General Duty, 10k AIC Maximum (plug fused and 60A maximum non-fused)
G = General Duty
H = Heavy Duty

Fused or Non-Fused

F = Fused
NF = Non-Fused

Number of Poles

1 = 1
2 = 2
3 = 3

Voltage

1 = 120 V or 120/240 V
2 = 240 V
6 = 600 V

Special Applications With:

CH = Crouse-Hinds Receptacle
CJ = Factory J Fuse Spacings
CR = Class R Clips Installed
CU = Factory-Installed Copper Wire Grips
G = Factory-Installed Ground Bar
H = Height or Size Reduced
PN = Pyle-National Receptacle
W = Viewing Window

Enclosure Type

Omit = Type 1, Indoor
R = Type 3R, Outdoor
S = Type 4/4X, Stainless Steel
J = Type 12, Industrial

With or Without Neutral

Omit = Less Neutral
N = With Neutral

Amperes

1 = 30 A
2 = 60 A
3 = 100 A
4 = 200 A
5 = 400 A
6 = 600 A
7 = 800 A
8 = 1,200 A
Siemens Accessories Catalog Numbering System

Switch Type

H = Heavy Duty
G = General Duty

Fused or Non-Fused

A1 = Auxiliary Switch 1/NO and 1/NC
A2 = Auxiliary Switch 2/NO and 2NC
A3 = Auxiliary Switch Low Current
CL = Compression Lug Barrier / Mounting Kit
G = Ground Lug Kit
G2 = Insulated Ground Lug Kit
LC = Copper Lug Kit
N = Neutral
N2 = 200% Neutral
P = Fuse Puller Kit
R = Class R - Fuse Clip Kit
T = Class T - Fuse Kit

Amperes

1 = 30 A
2 = 60 A
12 = 30/60 A
3 = 100 A
23 = 60/100 A
123 = 30/60/100 A
1234 = 30/60/100/200 A
4 = 200 A
56 = 400/600 A
5678 = 400/600/800/1,200 A
78 = 800/1,200 A

Maximum Voltage

2 = 240 V Maximum
6 = 600 V Maximum
Square D Catalog Numbering System for Safety Switches

Typical Safety Switch Catalog Number

```
D 3 2 1 N RB
```

Switch Type
- **Fusible**
  - L = Light Duty
  - D = General Duty
  - H = Heavy Duty
- **Non-Fusible**
  - DU = General Duty
  - HU = Heavy Duty
  - DTU = Double Throw

Blades – Switchable Poles
- 1 = 1 Pole
- 2 = 2 Poles
- 3 = 3 Poles
- 4 = 4 Poles
- 6 = 6 Poles

Voltage Rating
- 1 = 120 Vac (plug fuse)
- 2 = 240 Vac
- 6 = 600 Vac

For dc ratings, see the latest catalog listing

Ampere Rating
- 1 = 30 A
- 2 = 60 A
- 3 = 100 A
- 4 = 200 A
- 5 = 400 A
- 6 = 600 A
- 7 = 800 A
- 8 = 1,200 A

Enclosure
- **No Suffix** = NEMA Type 1
- **A** = NEMA Type 12K
- **AWK** = NEMA Type 12 (without KO)
- **DS** = NEMA Types 4, 4x, 5 (stainless steel)
- **CS** = Cast Aluminum
- **DX** = NEMA Type 4x KRYDON
- **R** = NEMA Type 3R
- **RB** = NEMA Type 3R (bolt-on hub provision)
- **RWK** = NEMA Types 1, 3, and 12 (6-pole switches only)
- **DF** = Fiberglass Reinforced Polyester

Neutral
- **N** = Factory Installed Neutral
  (neutrals are field installable on most general duty and heavy duty safety switches)

Miscellaneous
- **E11 or E12** = Factory Installed
  - Electrical Interlock
- **CLR** = Class R Fuse Kits
- **FP** = Fuse Pullers
- **GL** = Ground Lugs
- **FT** = Fungus Proof Treatment
- **SLC** = Copper Lugs
- **LK** = Compression Lugs
- **SPLO** = Lock on
- **VW** = Viewing Window
- **NP** = Phenolic Legend Plate
- **KI** = One Key Interlock
- **KIKI** = Two Key Interlocks
- **WA** = Appleton Interlocked Receptacle
- **WC** = Crouse-Hinds ARKTITE®
  - Interlocked Receptacle
- **WH** = HUBBELLOCK® Interlocked Receptacle
Cutler-Hammer Catalog Numbering System

Safety Switches and Enclosed Circuit Breakers

Switch Type
- DP = General Duty/Plug Fuse
- DG = General Duty/Cartridge Fuse
- DH = Heavy Duty
- DT = Double Throw
- DR = Rotary Switch
- DS = Classified Location With DS Interior

Poles/Blades
- 1 = 1 Pole
- 2 = 2 Poles
- 3 = 3 Poles
- 4 = 4 Poles
- 6 = 6 Poles

Voltage
- 1 = 120 Vac
- 2 = 240 Vac
- 3 = 600 Vac

Amperes
- 1 = 30 A
- 2 = 60 A
- 3 = 100 A
- 4 = 200 A
- 5 = 400 A
- 6 = 600 A
- 7 = 800 A
- 8 = 1,200 A

Fusible/Non-Fusible or Neutral
- F = Fusible Without Neutral
- U = Non-Fusible
- N = Fusible With Neutral

NEMA Enclosures Rating
- G = NEMA 1
- R = NEMA 3R
- D = NEMA 12
- P = NEMA 4 (painted steel)
- W = NEMA 4X Corrosion Resistant
  (304 grade stainless steel)
- C = NEMA 4X Non-Metallic
  (for Type DS)
- X = NEMA 7 and 9 (for Type DS)
- X = NEMA 4X Non-Metallic
  (for Type DR)

Options
- Blank = No Viewing Window
- W = Upper Viewing Window
- LW = Lower Viewing Window
- X = EnviroLine Stainless
  (enclosure and mechanism)
- GCL = Mill Duty

Series
- K = Design
  (all general duty switches above 200 ampere and
  all heavy duty switches incorporated K–series
  switch design features listed below)
- B = Design General Duty
  (30–100 amps)
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.
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
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
Producer Installed Disconnect Switches and Wiring Diagrams (continued)

![Diagram](image)

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

![Diagram](image)

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

- Primary Voltage
- Service Transformer
- PG&E Service
- Service Entrance Conductors
- Disconnect Switch
- In and Out Metering
- Main Disconnecting Device
- Producer's Load
- Alternative Disconnect Switch Locations
- General Duty, Heavy Duty, Interlocked Disconnect Switch or Breaker With Visible Contacts
- Generator Lead
- In and Out Metering
- Generator Protection Equipment
- Generator
- Non-Standalone Generator (see Note 2 on Page 14)
- General Duty, Heavy Duty, Interlocked Disconnect Switch or Breaker With Visible Contacts (see Note 2 on Page 14)
Revision Notes
Revision 01 has the following changes:

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