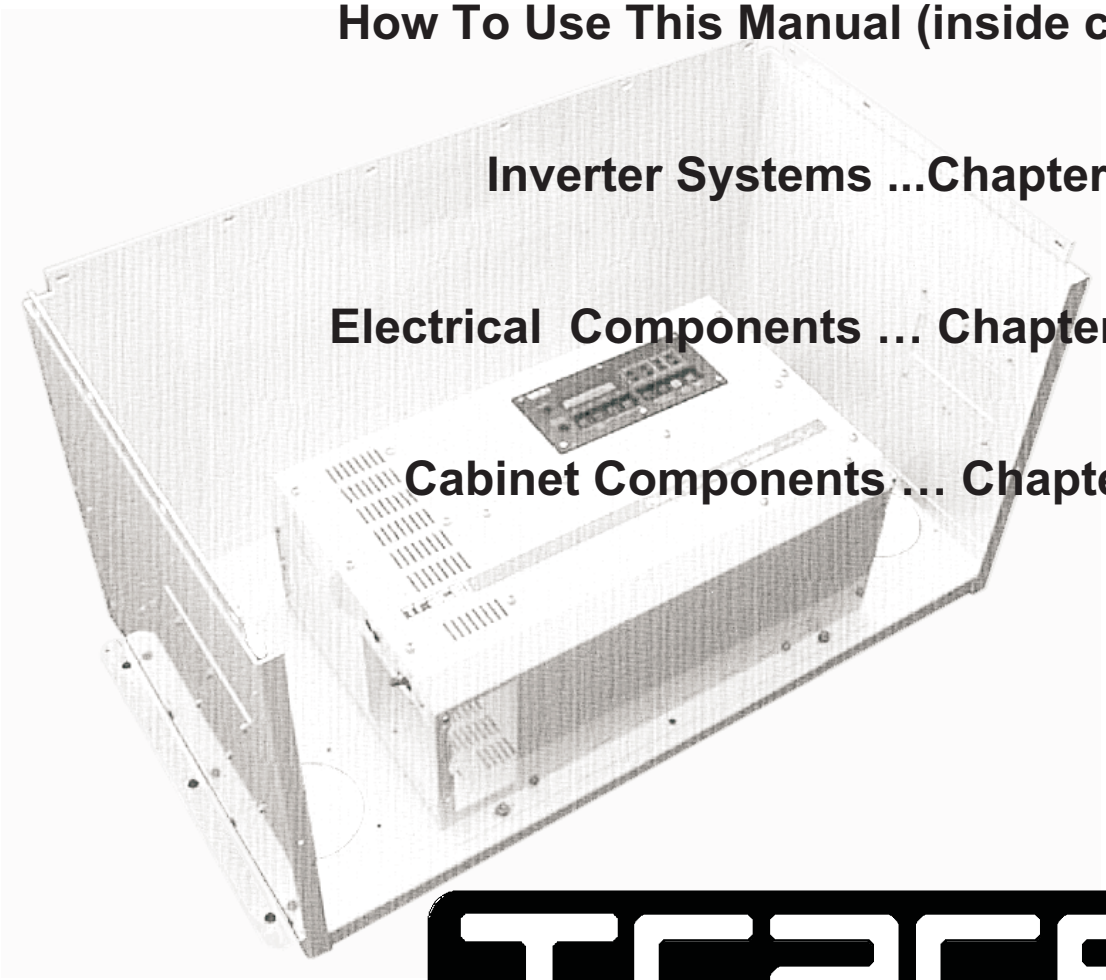
Power Module System Assembly Instructions



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Part Number 3471

How to Use this Manual

Go to Chapter Four and select the assembly instructions for the desired system.

Go to Chapter Five and select the assembly instructions for each electrical component listed in the system.

Go to Chapter Six and select the assembly instructions for each cabinet component listed on the system assembly instructions.

Gather all cabinet and electrical components and tools listed on the system assembly instructions.

Arrange all instruction sheets in the order suggested on the system assembly instructions.

Assembly your system.

Table of Contents

Introducing the Power Module System

The Trace Modular Power System incorporates all the components of an alternative energy installation (except external AC and DC power sources) in a package designed to permit seamless integration of the components. The modular approach enables you to order individual components or complete systems fully assembled, tested, and inspected.

The Power Module System allows isolation of components, wiring, and safety circuitry in a secure cabinet that can be weatherproofed for exterior installations. Cabinets can be stacked up to four high for integration of batteries, inverters, controllers, circuit breakers, and associated devices. Each module can house individual or multiple components.

The base configuration is supplied as individual components or in complete assemblies (inverters are shipped separately) from the factory. Assembled systems can include as many or as few components as desired. For example: use one standalone module to house vented liquid lead-acid batteries, and another to house electronic components; or stack multiple modules to house sealed batteries and all other components in one installation.System components provided with the modules can include AC and DC breakers, disconnects, inverters, controllers, busses, DC shunt and bonding blocks, grounding blocks, wiring, and fasteners for field installation. These components (and batteries) can also be shipped or acquired separately.

When ordering parts, always use the PMO- prefix.

Other Power Module System features include:

- Powder-coated aluminum enclosures
- Stainless steel mounting hardware
- Removable front-panel for easy access
- Louvered front-panel for maximum ventilation
- Single or multiple Sinewave or DR Series inverters w/hardware
- Accessories include:

  - ✓ cabinet weather proofing kit (PMO-ODTEK)
  - ✓ bolt-down bottom mounting brackets (PMO-FEET)
  - ✓ access panel locks w/keys (PMO-LOCKS)
  - ✓ module extender for extra-high batteries (PMO-EXT)
  - ✓ durable battery tray for isolating batteries from base (PMO-TRAY)
  - ✓ C40 multipurpose controller (PMO-C40)
  - ✓ voltage-limiting C40 multipurpose controller (PMO-VLC40)
  - ✓ C40 installation kit (PMO-C40K)
  - ✓ ground-fault disconnect (PMO-GFP)
  - ✓ add-on module for additional battery capacity (PMO-ADD)
  - ✓ 20 to 60 amp Heineman™ DC breakers
  - ✓ 15 to 60 amp Square D™ AC breakers
  - ✓ DC negative bonding block with shunt (PMO–DCBB)
  - ✓ modular power distribution block (PMO-PDBB)
  - ✓ utility/generator neutral bonding block (PMO-NEUTRAL)
  - ✓ lockable acrylic breaker covers (PMO-COVER)
  - ✓ sliding breaker fill-plates (PMO-SLIDER)

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Part Number 3471
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IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS !

This manual contains important safety and operating instructions. This manual also covers assembly of the Trace Engineering line of Power Modules with both Sinewave and DR series inverters, C40 charge controllers, AC and DC disconnects, PVGFP, and other devices. Specific operating and hookup instructions for each separate component are provided in the individual component manuals packaged with these assembly instructions. Before installation, review the applicable sections of this manual, and always follow the safety practices described below:

General Precautions

1. Before using the inverter/charger, read all instructions and cautionary markings on (1) the inverter/charger, (2) the batteries and (3) charge controllers, and (4) in this manual as well as the individual manuals provided for each component of the system.

2. CAUTION - To reduce risk of injury, charge only deep-cycle lead acid, lead antimony, lead calcium, gel cell, absorbed mat, or NiCad/NiFe type rechargeable batteries. Other types of batteries may burst, causing personal injury and damage.

3. Do not expose the Power Module to rain, snow, or liquids of any type without proper installation of the sealing kit, which is included with each Power Module

4. Qualified personnel (with electrical experience) should make all electrical connections. Incorrect installation may result in a risk of electric shock or fire.

5. To reduce risk of electric shock, disconnect all wiring before attempting any maintenance or cleaning. Turning off the inverter will not reduce this risk; the inverter by-pass breaker must be used and the power module must be totally disconnected from all sources. Solar photovoltaic modules produce current when exposed to light - cover them with opaque material before servicing any connected equipment.

6. If using a power module as a battery enclosure, support the additional weight the module must carry as described in the PMO-FEET section. The mounting feet are required as well as a concrete pad or timbers to support the bottom tray of each cabinet stack as shown in the section on PMO-FEET (page 6-17).

7. WARNING - WORKING IN THE VICINITY OF A LEAD ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL OPERATION. Provide ventilation to the outdoors from the battery compartment. The battery enclosure should be designed to prevent accumulation and concentration of hydrogen gas in “pockets” at the top of the compartment. Vent the battery compartment from the highest point.

8. NEVER charge a frozen battery.

9. No terminals or lugs are required for hook-up of the AC wiring. AC wiring must be no less than 10 AWG (2.6mm) gauge copper wire and rated for 75C or higher. Battery cables must be rated for 75C or higher and should be no less than #4/0 AWG (11.7 mm) for PM-XX250/X systems and #2/0 AWG (9.3 mm) gauge for PM-XX175/X systems. Crimped and sealed copper ring terminal lugs with a 5/16 hole should be used to connect the battery cables to the negative DC shunt terminals of the Power Module (lug not needed for the positive terminal). Soldered cable lugs are also acceptable.

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10. Torque all AC wiring connections to 20 inch-pounds. Torque all DC cable connections 10-12 foot-pounds. Be extra cautious to reduce the risk of dropping a metal tool onto batteries. It could short- circuit the batteries or other electrical parts resulting in sparks that could cause an explosion.

11. Tools required to make AC wiring connections: Wire strippers, ½" (13MM) open-end wrench or socket, Phillips screw driver #2, 3/16" (5mm) & 1/4" (6MM) slotted-screw driver, and a torque wrench.

12. The Power Module is intended to be used with a battery supply with a nominal voltage equal to the last two digits in the inverter/charger's model number. For example: a SW4024 is a 24 volt inverter, a DR1512 is a 12 volt inverter. (The first two digits are Power output in hundreds of watts)

13. Instructions for mounting: See mounting instruction section of this manual. For battery installation and maintenance: read the battery manufacturer's installation and maintenance instructions prior to operating.

14. DC GROUNDING INSTRUCTIONS - This Power Module should be connected to a grounded, permanent wiring system. For most installations, the negative battery conductor should be bonded to the grounding system at one (and only one point) in the system. All installations should comply with all national and local codes and ordinances.

15. Fully assemble each module from the bottom up before adding the next module, up to a maximum stack height of four modules. This includes attaching and tightening all mounting hardware. The strength and stability of the modular system is dependent on all fasteners being connected and tightened properly.

Personal Precautions

1. Someone should be within range of your voice to come to your aid when you work near batteries.

2. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.

3. Wear complete eye protection and clothing protection. Avoid touching eyes while working near batteries. Wash your hands when done.

4. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cool water for at least 15 minutes and get medical attention immediately.

5. Baking soda neutralizes lead acid battery electrolyte. Keep a supply on hand in the area of the batteries.

6. NEVER smoke or allow a spark or flame in vicinity of a battery or generator.

7. Be extra cautious to reduce the risk of dropping a metal tool onto batteries. It could short-circuit the batteries or other electrical parts which may result in a spark which could cause an explosion.

8. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a battery. A battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing severe burns.

9. This is a negative grounded system. Always connect the positive or hot wires before connecting the negative or neutral wires when installing all equipment. This will reduce the chance of shorting the wires to the cabinet or equipment when routing wires. This is particularly important when routing the battery cables.

10. As an additional precaution, the ends of the battery cables should be taped when routing through cabinet openings and conduit.

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11. If a remote or automatic generator start system is used, disable the automatic starting circuit and/or disconnect the generator from its starting battery while servicing to prevent accidental starting.

Underwriters Laboratory (U.L.) Compliance Requirements

The Power Module cabinet is listed (UL file#39FL under *"Rainproof Modular Enclosure for use as a photovoltaic Power System Accessory,"* UL1741. The modules are shipped with a listing sticker approved for use by UL. The sticker is valid if and only if the following compliance requirements are met in the final installation.

1. **Stability Requirements** The optional mounting feet (PMO-FEET) must be included for each assembled cabinet. The bottom module of each cabinet must be secured with at least six 1/2" anchor bolts through the mounting feet to a concrete pad or platform of sufficient mass and footprint to keep the completed cabinet and the intended contents from being pushed over. It is the user's responsibility to:

- ✓ insure that the concrete pad or platform meet these requirements;
- ✓ maintain the anchor bolts over time;
- ✓ replace components as needed.

Additional mounting of the upper module(s) to a wall may be needed to meet local earthquake code requirements.

2. **Grounding Continuity Requirements** Individual modules, doors, and lids must be assembled as per the details outlined in this manual with the fastening hardware supplied by Trace Engineering. The PM modules and lid must have a star washer on the outside between the head of the carriage bolt and the module, and on the inside between the module and the nut, to insure grounding continuity between modules. The door latch assemblies are factory installed with earth nuts and the powder-coat is removed on the module where the door latch contacts to insure grounding continuity of the doors. As an added insurance, the neoprene gasket is attached to the module between the door to insure that the latch remains in contact with the bare metal spot. It is the user's responsibility to insure that the gasket remains maintained over time and replace as needed.

3. **Baffle Requirements** The water baffle and screening is required on each door on a module containing electronic components for all installations. The kit (PMO-ODTEK) is factory installed as per the instructions outlined in this manual. After assembly, use the silicone rubber sealant included with the kit to treat all seams to insure lone-term weather-proofing perfoamance. It is the user's responsibility to maintain the weatherproofing accessories over time, and to replace components as needed.

4. The installer/user is responsible to insure that the power module cabinets are properly installed and that all electrical connections are made to meet local National Electric Code (NEC) and inspector's requirements.

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Power Module Installation

Read all precautions at the beginning of this manual and the individual component manuals before attempting to install the system. Because of tool clearances needed to make connections, It is easiest to make all external connections to the PM (charge controllers, PV array, and AC inputs/outputs, before installing the inverter. As a general rule, connections should be made along the back panel, than the side panels, and lastly to equipment mounted on the tray.

Install the inverter to the module tray using all six stainless steel bolts, washers and nuts supplied. Insure that the DC and AC sides of the inverter correspond with the DC and AC breaker locations in the Power Module. When all six fasteners are secured there is no need for additional bracing of the module tray, since the inverter chassis will add stiffness. Torque to 79 inch-pounds.

Connect the battery positive cable from the battery disconnect and the battery positive cables from all charge controllers to the inverter DC positive lug. Torque nut to 12 ft-lbs and place a protective cover over the terminal.

Connect the battery negative cable from the inverter, and the battery negative cables from all charge controllers to the inverter DC negative bonding block (DCBB page). Torque nut to 12 ft-lbs and place protective cover over the terminal.

Make AC connections from the AC input/output/bypass inverter breaker to the inverter. All wires are marked identical to the labels at the connectors inside the inverter. AC Utility In should be connected into AC1 and, if a generator is used as an additional AC input it should be connected to AC2, (it will normally have an additional AC input/output/bypass breaker).

Grounding Parameters: Connect D.C. Ground wire (8 AWG) to grounding rod. Connect the A.C. Ground at the main AC panel ground connection if used in a residential or commercial application. NEC and local codes determine the complete grounding requirements.

Powering Up the System

Before applying power to the Power Module for the first time, take time to check and confirm the following key items:

1. Check to see that the AC loads and AC source are connected properly into the inverter bypass box.

2. Confirm that the battery cable polarities are proper. Connection with improper polarity is an expensive mistake, very obvious and not covered under warranty.

3. Check the PV array connections at the array and at the Power Module. Be sure the PV array positive is connected to the bottom of the PV array disconnect as illustrated.

4. Confirm that all connections are tight and wire size is appropriate as described above and shown on the installation diagram. Once these checks have been completed, it is time to apply power to the system. Do so as follows:

A. Turn the battery DC disconnect(s) to the on (up) position.

B. Turn the solar array disconnect(s) to the on (up) position.

C. Turn the inverter(s) on as outlined in the individual component manual, and check for proper operation. If the inverter does not power up, go to step F.

D. Unlock the main AC breaker that will feed the inverter and activate the AC source used to provide power to the system (generator or main breaker).

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www.traceengineering.com
Part Number 3471
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E. Turn the inverter bypass breaker to the position noted in the residence wiring diagram on the bypass box that will turn the inverter system on. The Power Module system is now fully connected and operable. Should any problems arise that are not covered in this installation manual, contact Trace Engineering or your dealer. Note: Perform the next step only if the inverter fails to Power up when turned on.

F. Using a multi meter, check for appropriate battery voltage at the inverter DC terminals. (This will require removing the end cover from the inverter.) If the battery voltage is appropriate confirm proper battery cable polarity and connection, and make sure the batteries are not completely discharged. If the inverter still doesn't work contact your dealer or Trace Engineering.

Stacked Pair Inverters

If your P M includes a stacked pair of inverters the physical connection of the PM is no different. However, since 240 volts AC is available across the two inverter's AC outputs, connection of the AC loads to the system via the bypass breaker is a little different. Refer to the section on stacking inverters in the individual inverters owner's manual included with the system.

Connect the AC loads that will run from 120 volts AC, to the AC output of the individual inverters at the bypass breaker box. It is best to try and balance the AC loads between the two inverters if possible. The load(s) that is to run from 240 volt AC output should be connected across the two inverters outputs by connecting the neutral wire (white) to the neutral block in the bypass box, and one hot wire to each of the inverter bypass box AC load points

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Part Number 3471
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Power Module Systems

PM Systems

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Part Number 3471
Released: Thursday, April 29, 1999

Power Module Fastener Facts

Table 1, Fastener Description and Application

Where Used	Trace PN	Description	Quantity
Inverter to PM	425	1/4-20 x 3/4" SS bolt	6
	468	1/4" SS flat washer	12
	2147	1/4" SS external star washer	12
	444	1/4-20 SS hex nut	6
PM-FEET	3191	#10-24 x 1" SS carriage bolt	14
	485	1/4" SS internal star washer	14
	442	#10-24 SS hex nut	14
	465	#10 SS flat washer	14
PMO-ADD	3190	#10-24 x 1/2" SS carriage bolt	14
	485	1/4" SS internal star washer	14
	2147	1/4" SS external star washer	14
	465	#10 SS flat washer	14
	442	#10-24 SS hex nut	14
PM-LID	3191	#10-24 x 1" SS carriage bolt	6
	485	1/4" SS internal star washer	6
	2147	1/4" SS external star washer	6
	465	#10 SS flat washer	6
	3329	#10-24 SS wingnut	6

Table 2, Fastener Torque Values

Trace PN	Description	Torque value
3190	#10-24 x 1/2" SS carriage bolt	25 in-lbs
3191	#10-24 x 1" SS carriage bolt	25 in-lbs
465	#10 SS flat washer	N/A
442	#10-24 SS hex nut	25 in-lbs
3329	#10-24 SS wingnut	Finger tight
425	1/4-20 x 3/4" SS cap screw	80 in-lbs
468	1/4" SS flat washer	N/A
485	1/4" SS internal star washer	N/A
2147	1/4" SS external star washer	N/A
444	1/4-20 SS hex nut	80 in-lbs

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Single DR System

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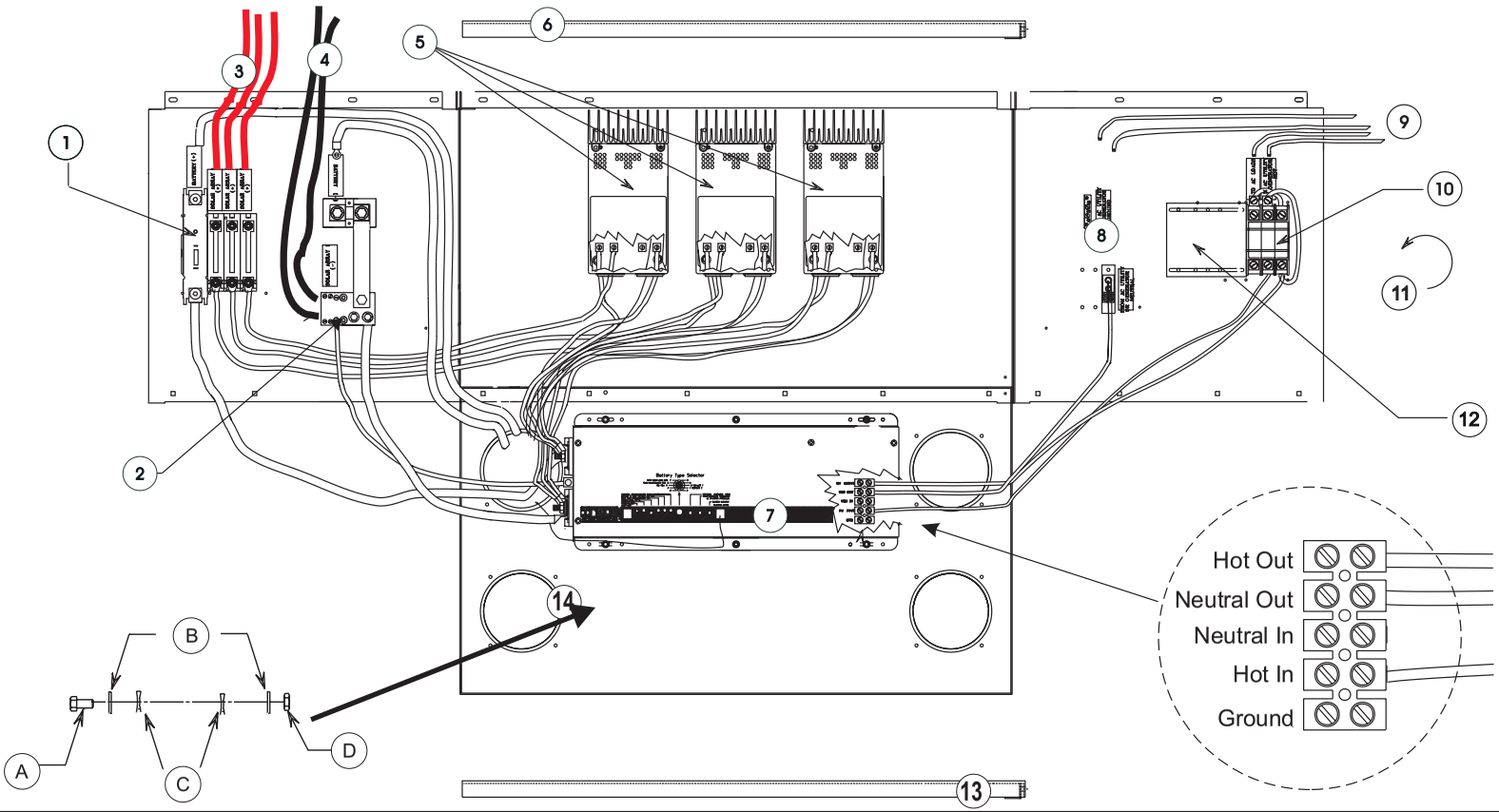
Released: Thursday, April 29, 1999



PM DR 175/250 Single nverter Diagram

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All configurations use 6 AWG THHN wire for AC and PV wiring. Inverter cables are 4/0 for DR2412 and 3624. DR1512, 1524, and 2424 inverters use 2/0 cable. User red heat shrink for positive and black heat shrink for negative. Refer to the DR Owner's Manual for cable sizing. Each assembly also includes the door (not shown). Refer to the individual components assembly descriptions. Follow the assembly sequence as shown on the reverse side of this page. When ordering parts for your system, always prefix the desired part number with the letters PMO-. AR means As Required; US means User Supplied.

#Qty	Part No.	Description
1 1	DC175	175 amp DC circuit breaker used with DR1512, 1524, OR 2424
	DC250	250 amp DC circuit breaker used with DR2412 or3624
2 1	DCBB	DC bonding block with shunt
3 US		PV wiring (not included)3

#Qty	Part No.	Description
4 AR	US	DC ground cabling; one to PV array ground, other to earth ground rod
5 AR	optional C40's (not included) up to three.	
6 1	LID	enclosure top
7 1	US	DR Inverter not included
8 1	AC Neutral	AC neutral bonding block, with AC ground bonding block
9 AR	US	AC wiring (not included)
10 1	IOX60	AC input/output/bypass lockout disconnect
11 2	COVER, PMO-	weather-tight, locking switch cover
12 2	SLIDER, PMO-	unused breaker opening cover
13 1	FEET, PMO-	brackets to secure the power module to the base or pad
14 4	Edge guard	Cut to length and install around cable passages in the base to prevent chaffing.
These fasteners are used for attaching the inverter to the floor of the cabinet:		
A 6	425	¼ - 20 X ¾" HH SS bolt
B 12	2147	¼" external tooth starwasher
C 12	468	¼" flat washer

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Arlington, WA 98223 USA
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Fax (360) 435-2229
www.traceengineering.com
Part Number 3471
Released: Thursday, April 29, 1999

PM DR 175/250 S Assembly Sequence

1. Feet (Page 6-17)
2. Edge guards
3. C40 if equipped (Page 5-7)
4. Neutral and ground bonding block (left panel for SW, right panel for DR, Page 5-21)
5. DC bonding block (left for DR, right for SW, Page 5-15)
6. DC shunt
7. DC bus bars
8. DC175/250 (Page 13)
9. DC20/60/110 (Page 12)
10. IOX60 (Page 19)
11. any additional AC or DC breakers
12. Slider (Page 23)
13. Cover (Page 13)
14. connect ground conductors
15. AC output cables
16. AC neutral cables
17. DC cables
18. Decals
19. Lid (Page 19)
20. Door (Page 15)

Assembly Instructions: Invert PM and install feet; turn PM upright to continue. Remove appropriate component instruction sheets and arrange in order of installation. Gather all tools and components listed in the instructions and place them nearby. Prepare components as instructed on the component assembly pages and set aside. When all cables, components, fasteners, etc. are prepared and handy, assemble each component in the sequence as shown, referring to the component assembly instructions as required.

When ordering parts, always use the PMO- prefix.

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Part Number 3471
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Part Number 3471
Released: Thursday, April 29, 1999

Dual DR System

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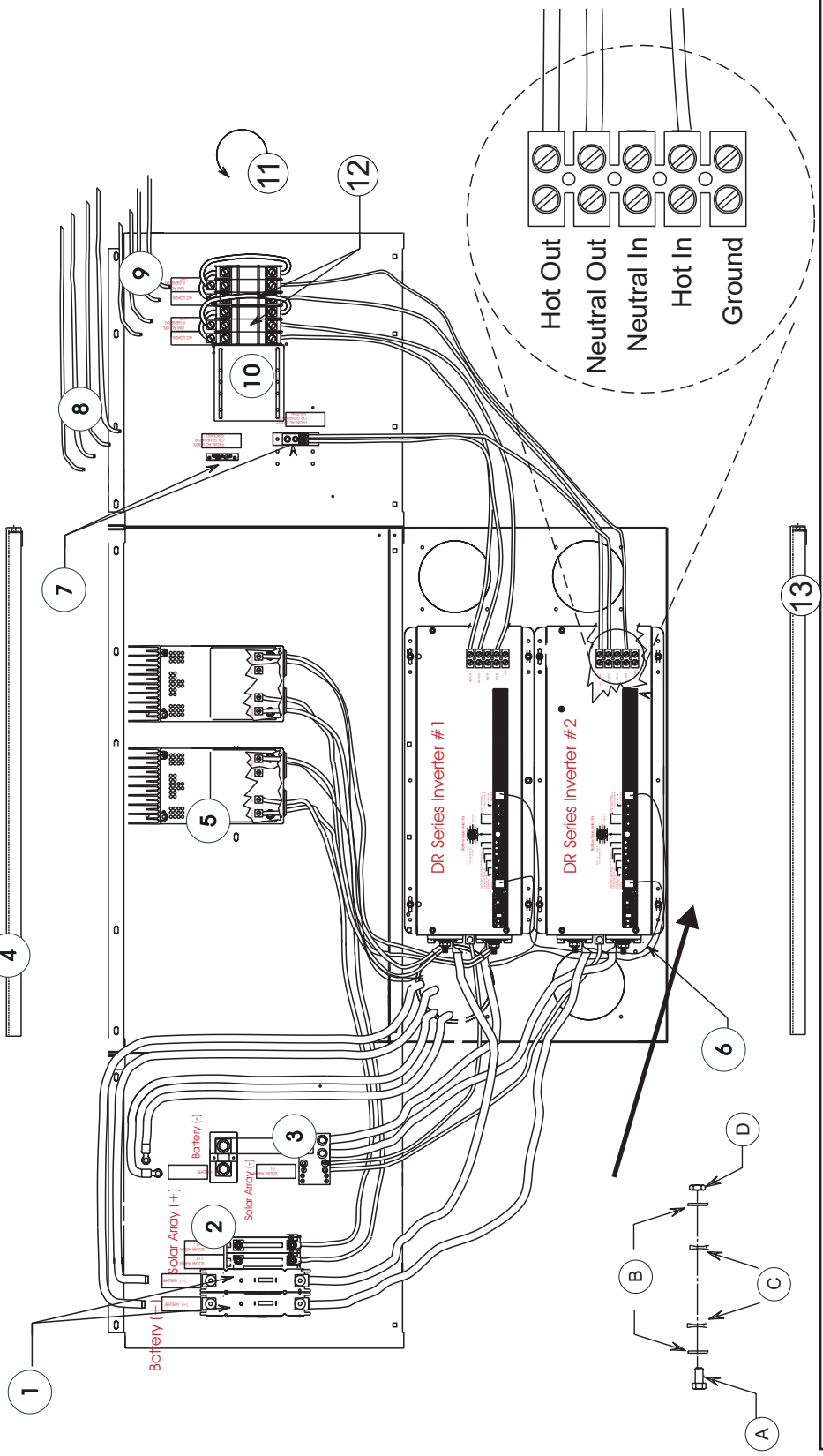
Part Number 3471
Released: Thursday, April 29, 1999



PM DR

175/250 Dual Diagram

All configurations use 6 AWG THHN wire for AC and PV wiring. Inverter cables are 4/0 for DR2412 and 3624. DR1512, 1524, and 2424 inverters use 2/0 cable. User red heat shrink for positive and black heat shrink for negative. Refer to the DR Owner's Manual for cable sizing. Each assembly also includes the door (not shown). Refer to the individual components assembly descriptions.

Follow the assembly sequence as shown on the reverse side of this page.

#Qty	Part No.	Description
1 2	PMO-DC175	used with DR1512, 1524, or 2424
	PMO-DC250	used with DR2412 or 3624
2 AR	DC20, 60, 110 amp	DC breakers
3 1	PMO-DCBB	D C bonding block
4 1	PMO-LID	
5 AR	PMO-C40, VLC40, C40K	
(optional - includes one DC60 each)		
6 2	DR Inverter	not included
7 1	PMO-NEUTRAL	neutral bonding block
8 AR	US	AC 6 AWG THHN
9 AR	US	AC wiring 6AWG THHN
10 1	PMO-SLIDER	covers unused breaker slots

#Qty	Part No.	Description
11 2	PMO-COVER	flip-up cover for breakers
12 2	PMO-IOX60	input, output, bypass, disconnect circuit breaker
13 1	PMO-FEET	brackets to secure the module to the floor or base

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Part Number 3471
Released: Thursday, April 29, 1999

PM DR 175/250 Dual Assembly Sequence

1. Feet
2. edge guards
3. C40 (if equipped)
4. neutral and ground bonding block (left panel for SW, right panel for DR)
5. DC bonding block (left for DR, right for SW)
6. DC shunt
7. DC bus bars
8. DC175/250
9. DC20/60/110
10. IOX60
11. any additional AC or DC breakers
12. Slider
13. Cover
14. connect ground conductors
15. AC output cables
16. AC neutral cables
17. DC cables
18. Decals
19. Lid
20. Door

Remove appropriate component instruction sheets and arrange in order of installation. Gather all tools and components listed in the instructions and place then nearby. Prepare components as instructed on the component assembly pages and set aside. When all cables, components, fasteners, etc. are prepared and handy, assemble each component in the sequence shown above, referring to the component assembly instructions as required. Invert PM to install feet.

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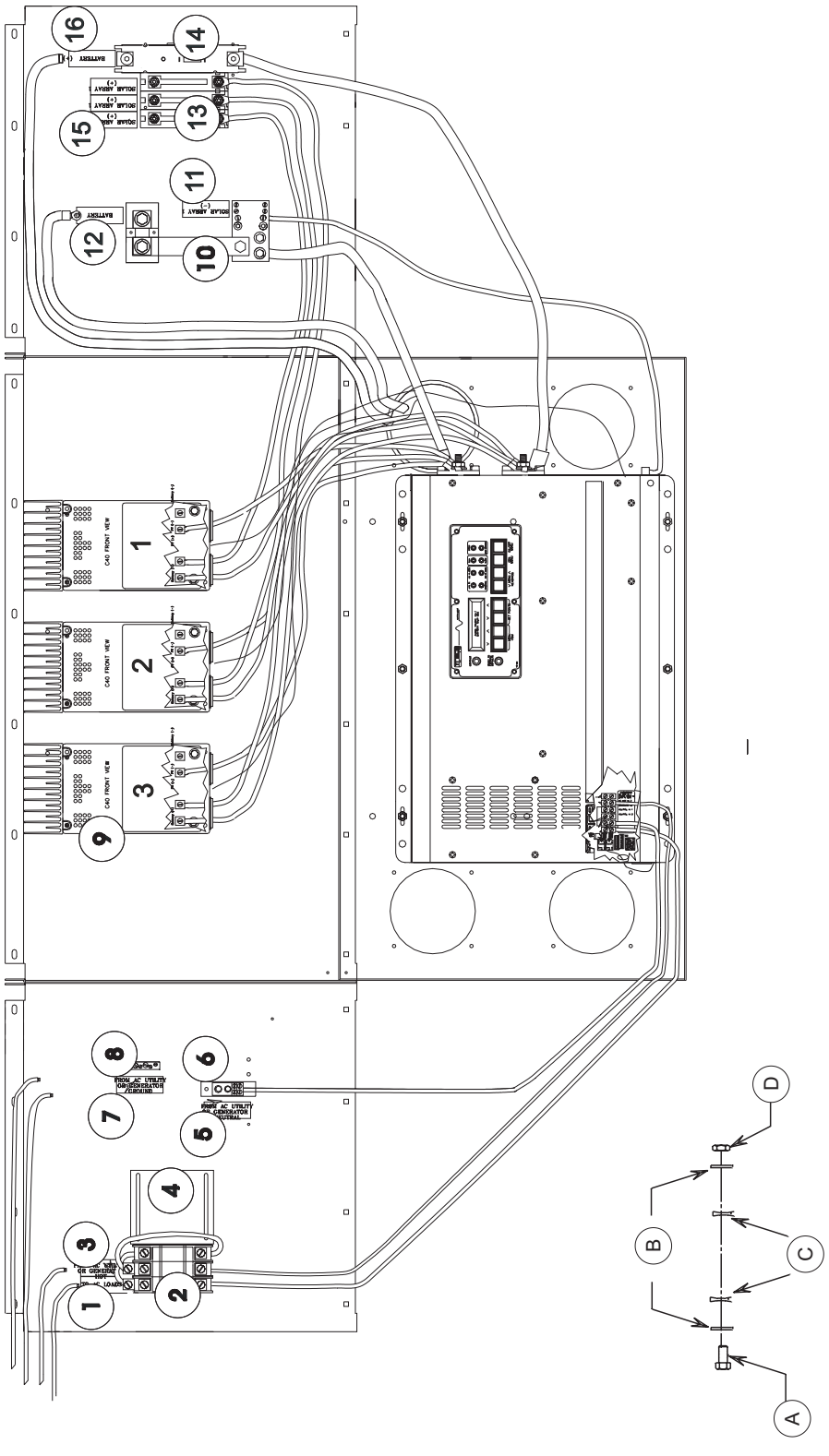

PM SW 175/250 S Diagram

All configurations use 6 AWG THHN wire for AC and PV wiring. Inverter cables are 4/0 for DR2412 and 3624. DR1512, 1524, and 2424 inverters use 2/0 cable. User red heat shrink for positive and black heat shrink for negative. Refer to the DR Owner's Manual for cable sizing. Each assembly also includes the door (not shown). Refer to the individual components assembly descriptions. Follow the assembly sequence as shown on the reverse side of this page.

#Qty	P/N	Description
1 1		
2 AR	IOX60	decal "To AC Hot Loads"
w/lockout		AC input/output/bypass disconnect
3 AR	3200	decal "From AC Hot Utility/Generator"
4 2	Slider	unused breaker opening cover
5 1	3194	decal "From AC Utility/Generator
Neutral"		
6 1	Neutral	AC neutral bonding block
7 1		decal "From AC Utility/Generator
Ground"		
8 1	N/A	ground bonding block (part of Neutral)

9 AR	C40		optional charge, load, diversion controller
10 1	DCBB		DC ground bonding block and shunt
11 1	3238		decal "Solar Array (-)"
12 1	3232		decal " Battery (-)"
13AR	2957-20		DC 20-amp circuit breaker
	2298-60		DC 60-amp circuit breaker
	2249-110		DC 110-amp circuit breaker
14AR	2079-175/250		DC 175 or 250 amp circuit breaker
15AR			decal "Solar Array (+)"
16AR	3231		decal "Battery (+)"
A 6	425		¼ - 20 X ¾" HH SS bolt
B 12	468		¼" flat washer
C 12	2147		¼" external tooth flat washer
D 6	444		¼ - SS HH nut

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Part Number 3471
Released: Thursday, April 29, 1999

SW System Assembly Sequence

1. Feet
2. edge guards
3. C40 (if equipped)
4. neutral and ground bonding block (left panel for SW, right panel for DR)
5. DCBB bonding block (left for DR, right for SW)
8. DC175/250
9. DC20/60/110
10. IOX60
11. any additional AC or DC breakers
12. Slider
13. Cover
14. ground conductors
15. AC output cables
16. AC neutral cables
17. DC cables
18. Decals
19. Lid
20. Door

Invert PM to install feet; revert to continue. Remove appropriate component instruction sheets and arrange in order of installation. Gather all tools and components listed in the instructions and place then nearby. Prepare components as instructed on the component assembly pages and set aside. When all cables, components, falters, etc. Are prepared and handy, assemble each component in the sequence shown, referring to the component assembly instructions as required.

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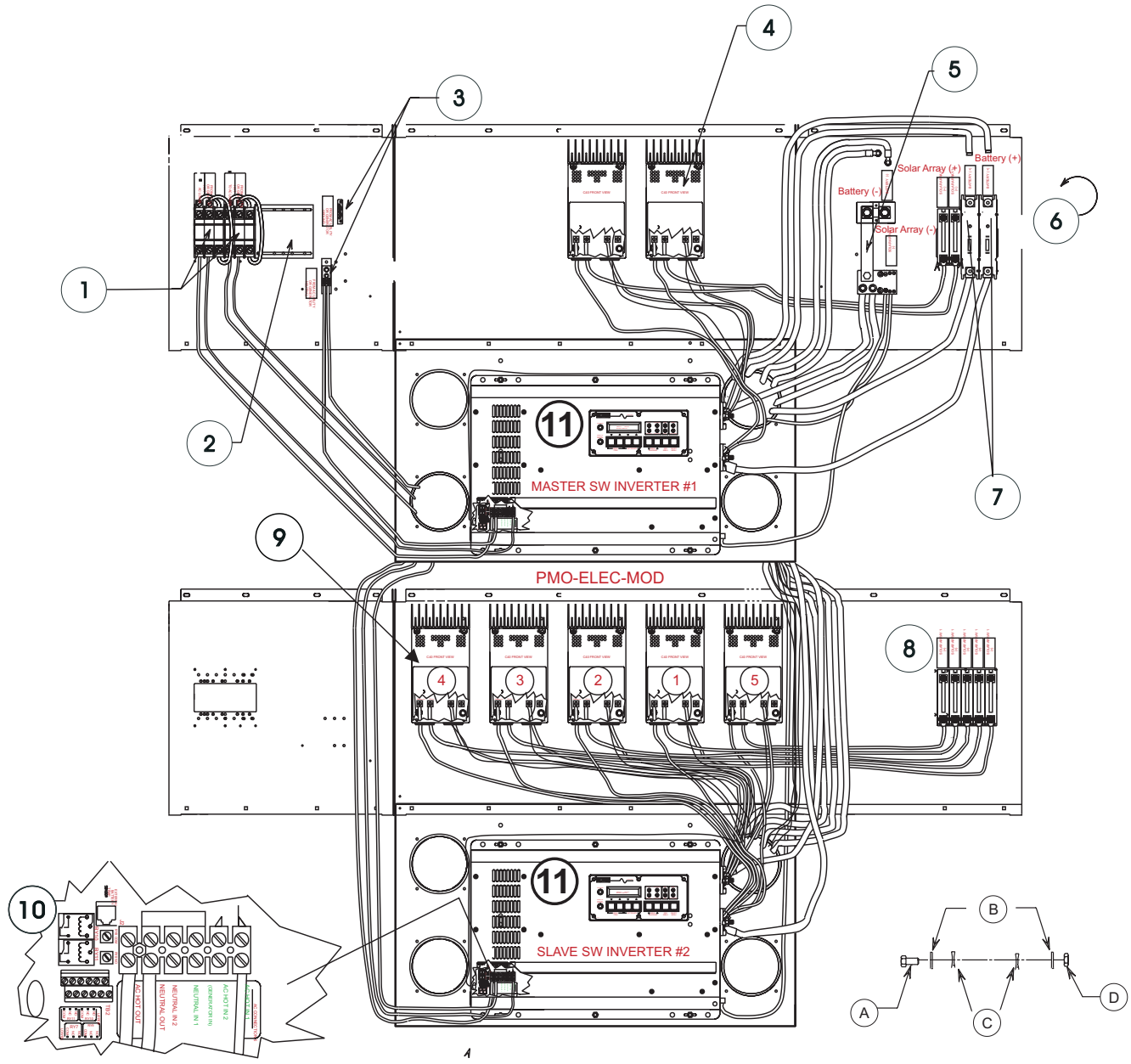
Part Number 3471
Released: Thursday, April 29, 1999



PM SW 175/250 Dual Diagram

All configurations use 6 AWG THHN wire for AC and PV wiring. Inverter cables are 4/0 for SW2512, 4024 and 5548. Use 2/0 for SW4048. Use red heat shrink for positive and black heat shrink for negative. Each assembly also includes the door (not shown). Refer to the individual components for assembly descriptions. Follow the assembly sequence as shown on the reverse side of this page. All AC & DC breakers are located in the top cabinet. Lower cabinet contains PV Solar Array DC breakers if equipped with C40 Controllers. Install inverters last, beginning with the bottom cabinet, after securing the modules in place. Use the fasteners listed in A, B, C, D. Starwashers are used to lock fasteners and assure ground continuity.

#	Qty	Part No.	Description
1	2	IOX60	AC input/output/bypass disconnect
2	2	SLIDER	
3	1	NEUTRAL	AC neutral and ground bonding block
4	AR	C40	optional
5	1	DCBB	DC ground bonding block
6	2	COVER	
7	2	2079-250	250-amp DC breaker or
		2116-175	175-amp DC breaker
8	AR	2298	PV Solar DC disconnects
9	AR		C40's
10			AC connections detail
11	2		Sinewave inverters
A	6	425	¼ - 20 X ¾" HH SS bolt
B	12	2147	¼" external tooth starwasher
C	12	468	¼" flat washer
D	6	444	¼ - SS HH nut

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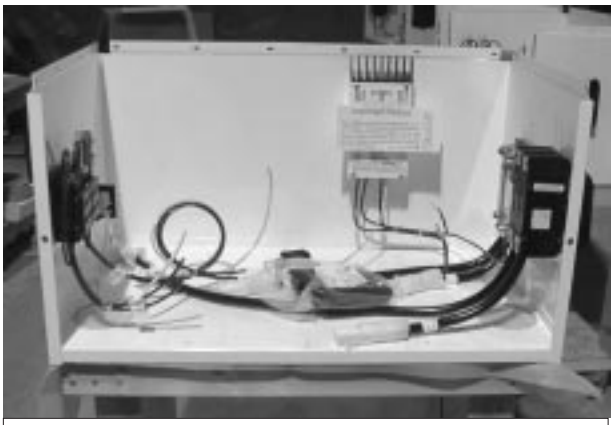
PM SW 175/250 Dual System Assembly Sequence

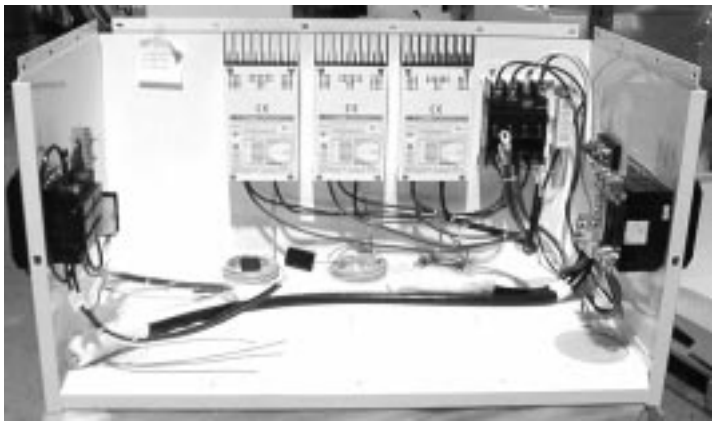
1. Feet (Page 6-14)
2. Edge guards
3. C40 (Page 5-7 if equipped)
4. Neutral and ground bonding block (Page 5-21, left panel for SW, right panel for DR)
5. DC bonding block (Page 5-15, left for DR, right for SW)
6. DC175/250 (Page 5-14)
7. DC20/60/110 (Page 5-12)
8. IOX60 (Page 5-19)
9. any additional AC or DC breakers
10. Slider (Page 6-23)
11. Cover (Page 6-18)
12. connect ground conductors
13. AC output cables
14. AC neutral cables
15. DC cables
16. Decals
17. Lid (Page 19)
19. Door (Page 15)

Invert PM to install feet; revert to continue. Remove appropriate component instruction sheets and arrange in order of installation. Gather all tools and components listed in the instructions and place then nearby. Prepare components as instructed on the component assembly pages and set aside. When all components are prepared and handy, assemble each component in the sequence shown above, referring to the component assembly instructions as required.

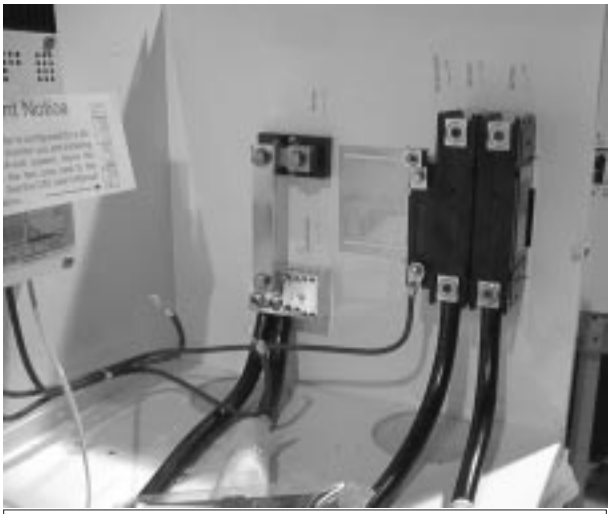


PM 175/250 D Front View

PM 175/250 D Left Panel



Front view of PM SW 175/250 D showing standard components plus PVGFP and three C40's w/BTS's



PM SW 175/250 D right side panel including DCBB, DC175/250, and PV

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Released: Thursday, April 29, 1999

Three-Phase Power Module

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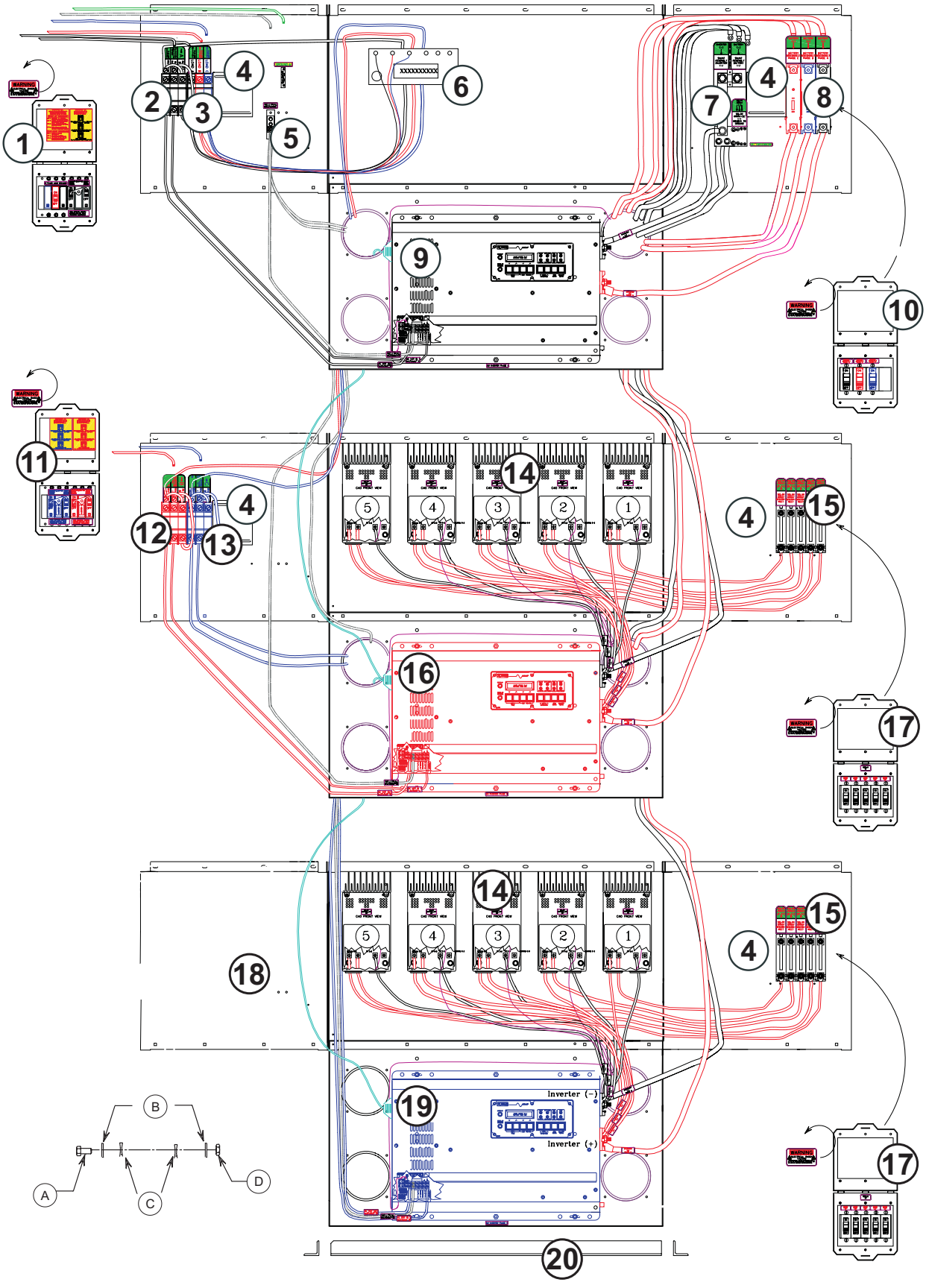
Three-Phase Power Module



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Sinewave 3 - Phase System

The Three-Phase Sinewave Power Module system consists of one PM module joined to two PM-ADD enclosures. System includes three Door panels w/latches, screen and edge guard kit, one LID and an outdoor sealing kit (not shown). The top most SW inverter is the master (Phase A) inverter connected to the two slave inverters with a special 3-phase interface cable.

#	Qty	P/N PM OR PMO-	Description
1	1	COVER	acrylic breaker cover, see detail
2	1	IOX60	60-amp, Phase A bypass breaker
3	1	AC60-3	60-amp, 3-phase AC breaker
4	5	SLIDER	unused breaker opening cover
5	1	NEUTRAL	neutral bonding block includes ground bonding block shown above
6	1	MONITOR	3-phase monitor (optional); pass bypass breaker output from each inverter through the monitor, then to bottom of 60-amp, 3-phase AC breaker.
7	1	DCBB	ground bonding block; connect a black, 4/0 cable from the bottom of this block to each inverter battery negative terminal. Connect a black 4/0 cable from the top of this assembly to each negative battery bank terminal
8	3	DC175or250	DC circuit breaker; connect a red 2/0 or 4/0 cable from the battery bank positive terminal to the top of each breaker; connect a red 4/0 cable from the bottom of each breaker to the positive battery terminal of each Inverter.
9	1	SWXXXX	Phase A Sinewave inverter (master inverter)
10	1	COVER	Lockable acrylic cover over the DC breakers; include Warning decal
11	1	COVER	Cover for Phase B and C bypass breakers w/bypass warning decal
12	1	IOX60	Phase B bypass breaker
13	1	IOX60	Phase C bypass breaker
14	AR	C40's	Optional C40 charge controllers. Mount in the sequence shown.
15	AR	DC20/60/110	Optional PV array DC circuit breakers.
16	1	SWXXXX	Phase B Sinewave inverter (slave)
17	2	COVER	Lockable cover used over PV array breakers; see detail
18	1	BLANK	Covers unused breaker opening in left wing panel of Phase C inverter enclosure.
19	1	SWXXXX	Phase C Sinewave inverter (slave)
20	1	FEET	Set of drilled brackets for mounting system to an appropriate foundation
	3	DOOR	Door assemblies (not shown)
	1	ODTEK	Sealing kit (not shown)
	1		Screen and edgeguard kit (not shown)
	1		Fastener kit; contains fasteners for stacking module and securing inverters
	1	LID	Lid for top module (not shown)
	1		Three-phase interface cable (adjacent to 9-16-19)

INVERTER FASTENING DETAIL:

A	6	425	¼ - 20 X ¾" HH SS bolt
B	12	2147	¼" external tooth starwasher
C	12		¼" flat washer
D	6	444	¼ - SS HH nut

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Part Number 3471
Released: Thursday, April 29, 1999

3-Phase Assembly Sequence

1) Assemble each PM module according to the instructions found on each respective assembly sheet: Phase C module assembly instructions; Phase B module assembly instructions; Phase A module assembly instructions.

2) Mount a 3-phase Sinewave inverter into Phase C module using the six bolts, 12 starwashers, 12 lock washers, and12 nuts provided for this purpose.

3) Secure Phase C module to prepared pad using the lag bolts and washers as described on the FEET assembly instructions sheet.

4) Attach the prepared Phase B module to the Phase C module using all 14 fasteners. See Phase B module assembly instructions

5) Place the Phase C module AC wiring between the Phase C inverter and the bypass breaker in the Phase B module. Refer to the IOX60 sheet for instructions.

6) Mount the Phase B inverter on the floor of the Phase B enclosure; don't bolt it down yet. Connect Phase B module AC wiring between the Phase B inverter and the IOX60 bypass.

7) Mount the Phase A module on top of the Phase B module. Secure with all 14 fasteners.

8) Connect Phase B and Phase C DC cabling between the inverters and the DC250 breakers in the Phase A cabinet.

9) Place the Phase A inverter in place on the floor of the Phase A module; don't bolt it down yet.

10) Connect all Phase A AC cabling to the remaining IOX60 bypass.

11) Connect all Phase A DC cabling remaining to the DC breakers and C40's where used.

12) Secure the Phase A inverter to the floor of the Phase A module with the fasteners provided for this purpose.

13) Plug the 3-Phase interface cable into the connector labeled "Series Stacking" on each inverter. The connector marked "A" plugs into the Phase A inverter, "B" into Phase B inverter, and "C" into Phase C inverter.

14) Install the weatherproofing gasket on the facing edge of all three modules, and across the bottom edge of all three panels.

15) Turn all AC and DC breakers to the OFF position. DO NOT SKIP THIS STEP.

16) Turn the shorepower 3-phase AC circuit breaker to which you are attaching the Trace 3-Phase Power Module to the OFF position and lock it to ensure that it cannot be turned to the On position.

17) Connect the AC cabling between the Trace 3-Phase Power Module and the shorepower 3-phase supply circuit breaker.

18) Inspect all AC and DC wiring connections and cabling to verify that all connections are properly completed.

19) When satisfied that all cabling connections are correct, perform the start-up procedure as described in the Trace Engineering Three-Phase Power Module Installation and Operation Guide.

20) When satisfied with the operation of the Trace Three-Phase Power Module System, install the LID onto the Phase A module and secure with all 6 fasteners.

21) Install a prepared DOOR panel on the Phase C module, then the Phase B module, and finally on the Phase A module. Lock all six door LATCHES and remove keys. Provide the owner the Trace Engineering Three-Phase Power Module Installation and Startup Guide, plus the SymCom Model 777 Electronic Overload Relay installation instructions, the Trace Engineering Sinewave Owners Manual, and all other warranty cards and instructions.

22) Have a refreshing beverage and enjoy!

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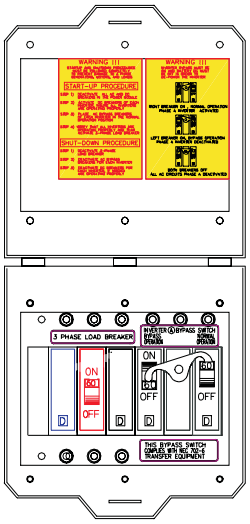
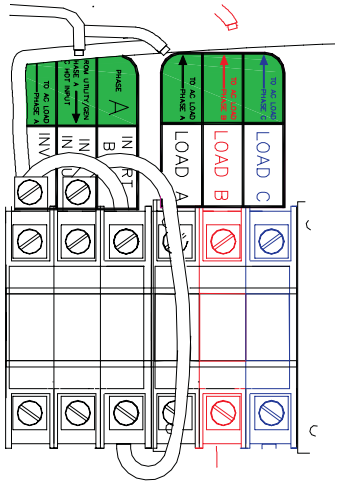
Part Number 3471
Released: Thursday, April 29, 1999

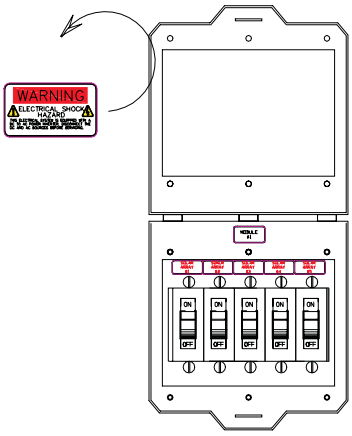


#1 Cover Detail

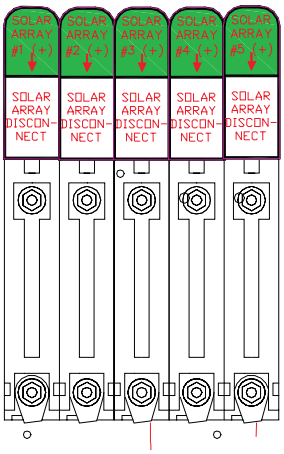


#2&3 Detail

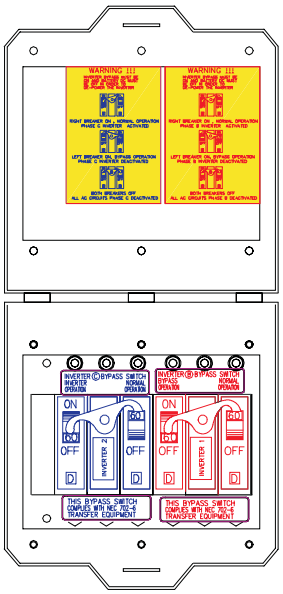
#6 Three-Phase Monitor



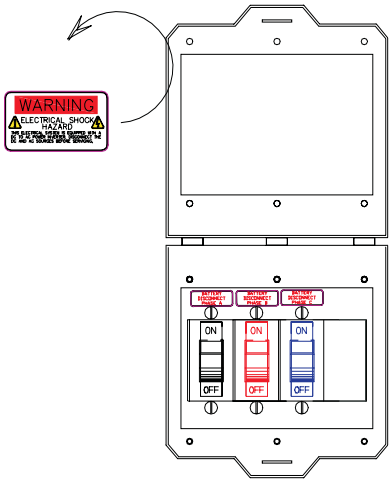
#17 Cover Detail



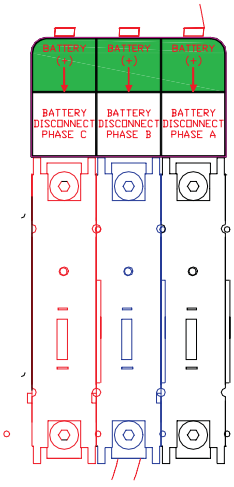
#15 PV Array Breakers Detail



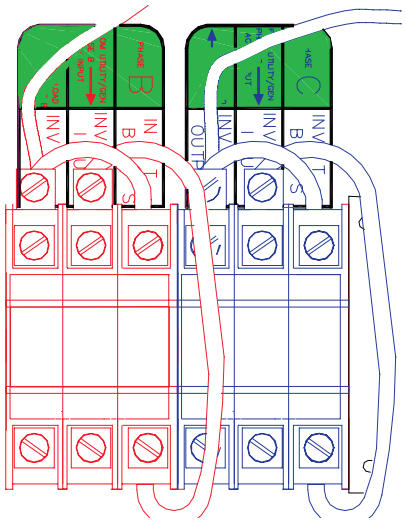
#11 Phase B & C Cover



#10 Phase A Detail



#8, DC Breakers



#12 & 13 Detail

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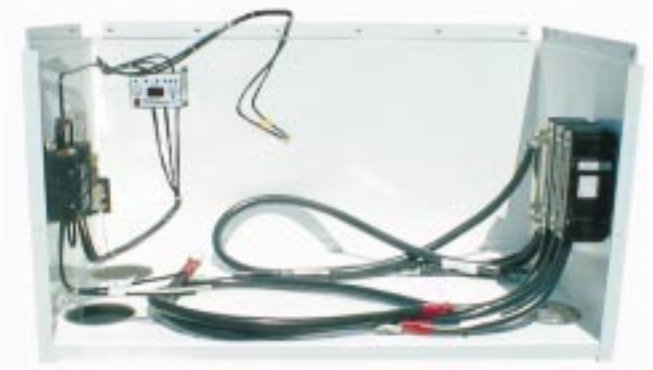
Part Number 3471
Released: Thursday, April 29, 1999

Phase C Module Assembly Instructions

Phase C module consists of a PM-ADD (page 6-5) with two Blanks, edge guards, screens, one Sinewave inverter, one DOOR with latches, FEET, a “Phase C” decal, any excess C40’s and PV Array breakers, and associated assembly hardware. Install the FEET first (page 6-17), then the edge guards and screens, then the Blanks (page 6-9). Place the module on the pad or platform and mark the location of each of the 10 anchor bolts (page 6-18). Remove the module and install the inverter in it. Drill anchor holes in the pad and install expansion anchors. Place Phase C module on the pad and install the lag screw anchors to secure it in place. Attach “Phase C” decal to the front center of the tray.



Phase B Module Assembly Instructions

Phase B module consists of a PM-ADD (which includes a DOOR), equipped with two 60-amp IOX60 bypass breakers, one COVER, one SLIDER, one BLANK, and edge guards. Assemble the Phase B module on the workstand by first installing the two IOX60 bypass breakers (page 5-19), then add a SLIDER to the unused breaker openings (page 6-23), and edgeguards to the openings in the bottom. Then install a BLANK (page 6-9) on the right side-panel and a COVER (page 6-13) over the side-panel with breakers. Complete by adding the appropriate decals.

If any C40’s (page 5-9) and their associated DC breakers (page 5-12) are to be installed, the BLANK will not be required. Instead, an additional SLIDER and COVER will be necessary.

Tools Required: 5/16 & 3/8” wrench and/or socket w/ratchet, # 1 & # 2 straight-blade screw drivers, crimping and stripping tools.

Phase A Module Assembly Instructions

Phase A module includes a PM with FEET, DOOR, and LID, the Phase A bypass breaker (page 5-19), a 60-amp 3-phase AC breaker (page), a neutral bonding block to which all three neutrals from the inverters are connected (page 5-21), a DCBB (page 5-16), a DC175/250 circuit breaker (page 5-13) for each of the three inverters, two SLIDERs (page 6-23), two COVERs (page 6-13), any optional equipment such as C40,s (page 5-9), PVGFP (page) or the 3-Phase Monitor, and related cabling and fasteners. When adding optional equipment, it may be necessary to locate some of the additional equipment in the free space available in the other modules.

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Part Number 3471
Released: Thursday, April 29, 1999

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Electrical Components Assembly Instructions

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Part Number 3471
Released: Thursday, April 29, 1999

Table of Contents

5916 195th Street, NE
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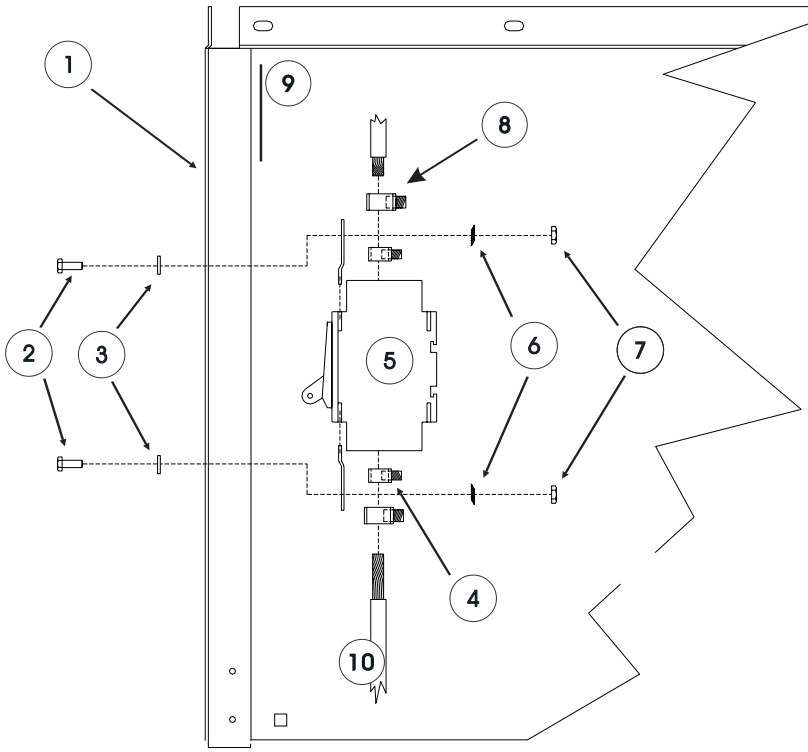
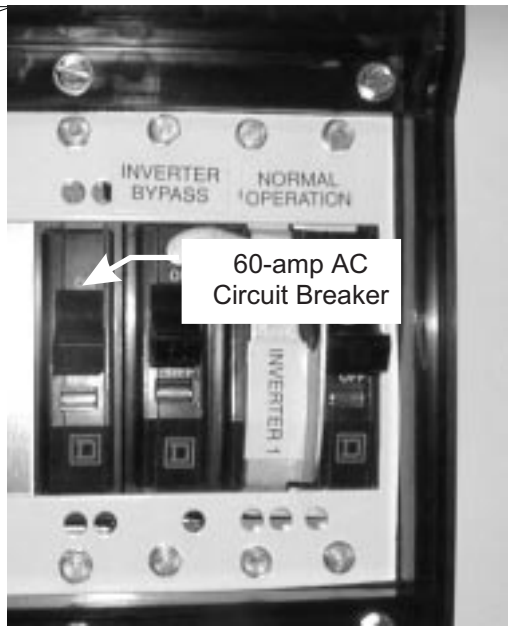
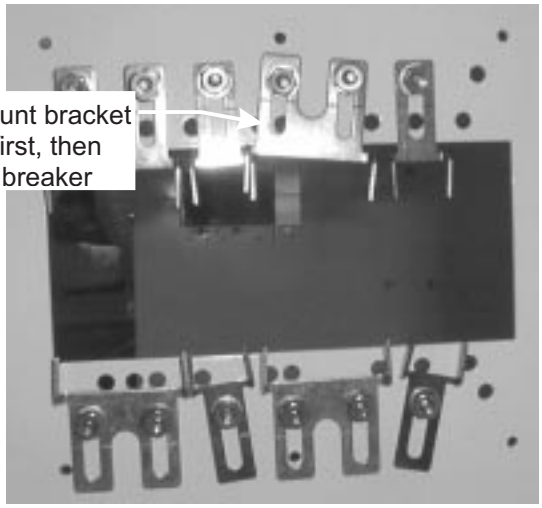
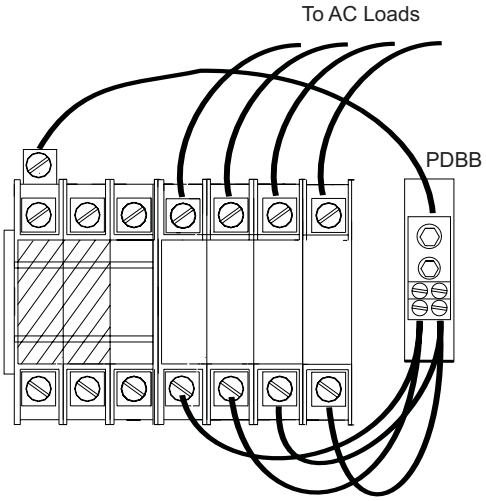
Part Number 3471
Released: Thursday, April 29, 1999









Preferred when used as subpanel. Maximum three 20-amps or four 15-amp breakers.

PMO-AC15/20/60 Front View

Used to connect an external AC source or load, these breakers are installed as shown in the diagram above, and wired according to your purpose. See diagrams on this and the next page. Strip wire approximately .425" both ends and cut to appropriate length.

#	Qty	Part No.	Description
1	1	3371	decal, "AC LOADS"
2	2	401	6-32 X 3/8" HH SS bolt
3	2	492	#6 starwasher, external teeth
4	2		wire lugs.
5	1	3299	15 amp QOU breaker
		3258	20 amp QOU breaker
		3087	60 amp QOU breaker
6	2	466	#6 SAE SS washer
7	2	440	6-32 HH SS nut
8	1	3171	service crimp
9	1	3202	decal: "To AC Hot Loads"
10	21"	2322	6 AWG Black THHN wire

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Telephone (360) 435-8826
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Part Number 3471
Released: Thursday, April 29, 1999

AC15, 20, 60 Assembly Sequence

1. Remove set screws from lugs on top and bottom of circuit breaker

2. Rotate lugs 180° and replace set screws.

3. Attach service lugs to top lugs only

4. Attach a mounting bracket to the top and bottom of the PM in the desired location. Insert a 6-32 x 3/8" bolt (401) equipped with a #6 starwasher (492) into the appropriate bolt hole (top and bottom) from the outside of the side panel; slide the bracket over the bolt from the inside so that the ears are offset to the inside of the enclosure. Slide a #6 SAE flat washer (466) over the bolt, followed by a 6/32 nut (440). Do not tighten, just catch a few threads.

5. Tilt the top of the circuit breaker while sliding it onto the ears of the top mounting bracket. Repeat for the bottom mounting bracket.

6. Align the circuit breaker with either the top or the bottom of the breaker opening.

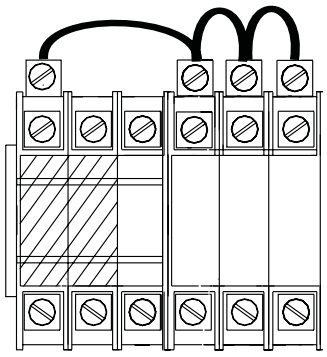
7 Tighten the mounting brackets onto the PM and torque to 10-15 foot pounds.

8. When all circuit breakers and bypass disconnects are mounted, install a SLIDER of unused breaker openings.

9. Install PM-SLIDER over the exterior of the circuit breaker opening (do not over tighten)

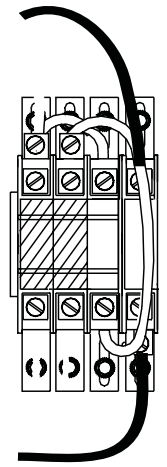
10. Apply a decal (3371 "AC Loads") over each AC load circuit breaker.

11 Attach AC cabling and torque to 45 inch-pounds



As AC subpanel, three 20-amp or four 15-amp maximum

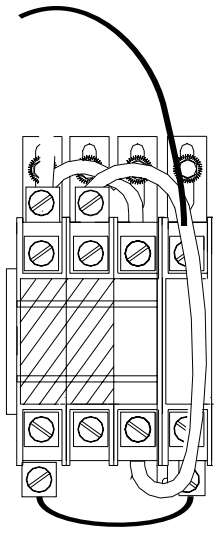
From Generator



To AC2

As Generator Breaker

To AC Loads



As independent bypass to AC loads

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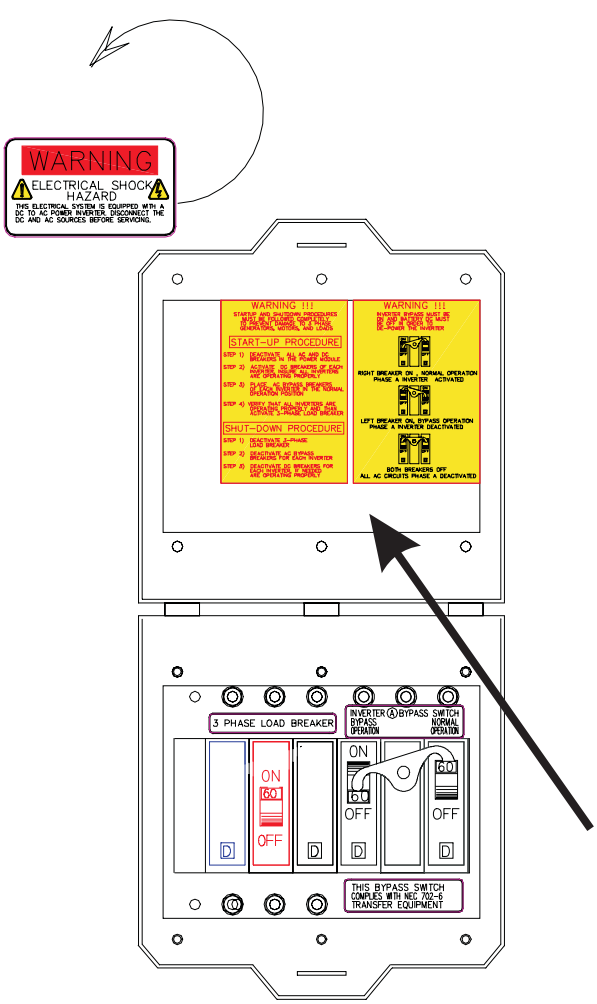
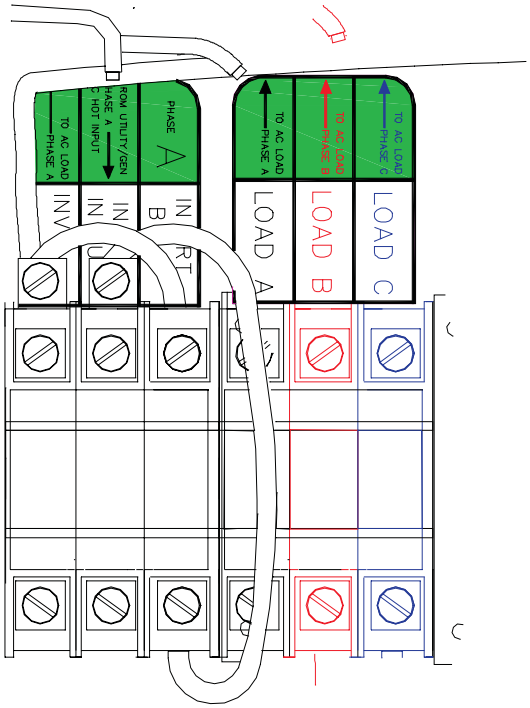
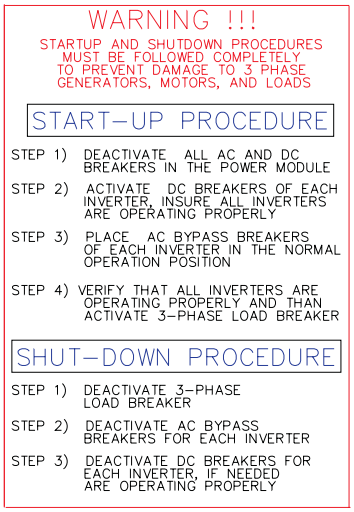
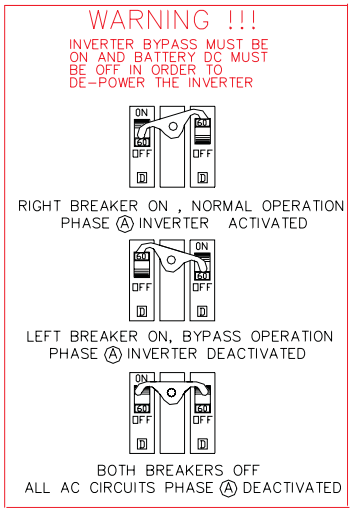




AC60 3-phase breaker shown on right next to the Phase B bypass breaker





PMO-AC60 3-Phase Breaker

The 60-amp, three-phase AC breaker is used with three-phase power modules only. It is mounted in the left wing panel of the Phase A module, next to the Phase A bypass breaker. It accepts its input from the three-phase monitor, (when used) or directly from each individual inverter bypass breaker (IOX60). A decal describing the startup and shutdown procedure is mounted above the breaker on the inside of the breaker cover.

The AC-60 three-phase circuit breaker is shown in the top illustration. The exterior of the breaker installation is shown on the left illustrating the decals that describe the start-up and shut-down procedure and the appropriate position of the bypass breaker.

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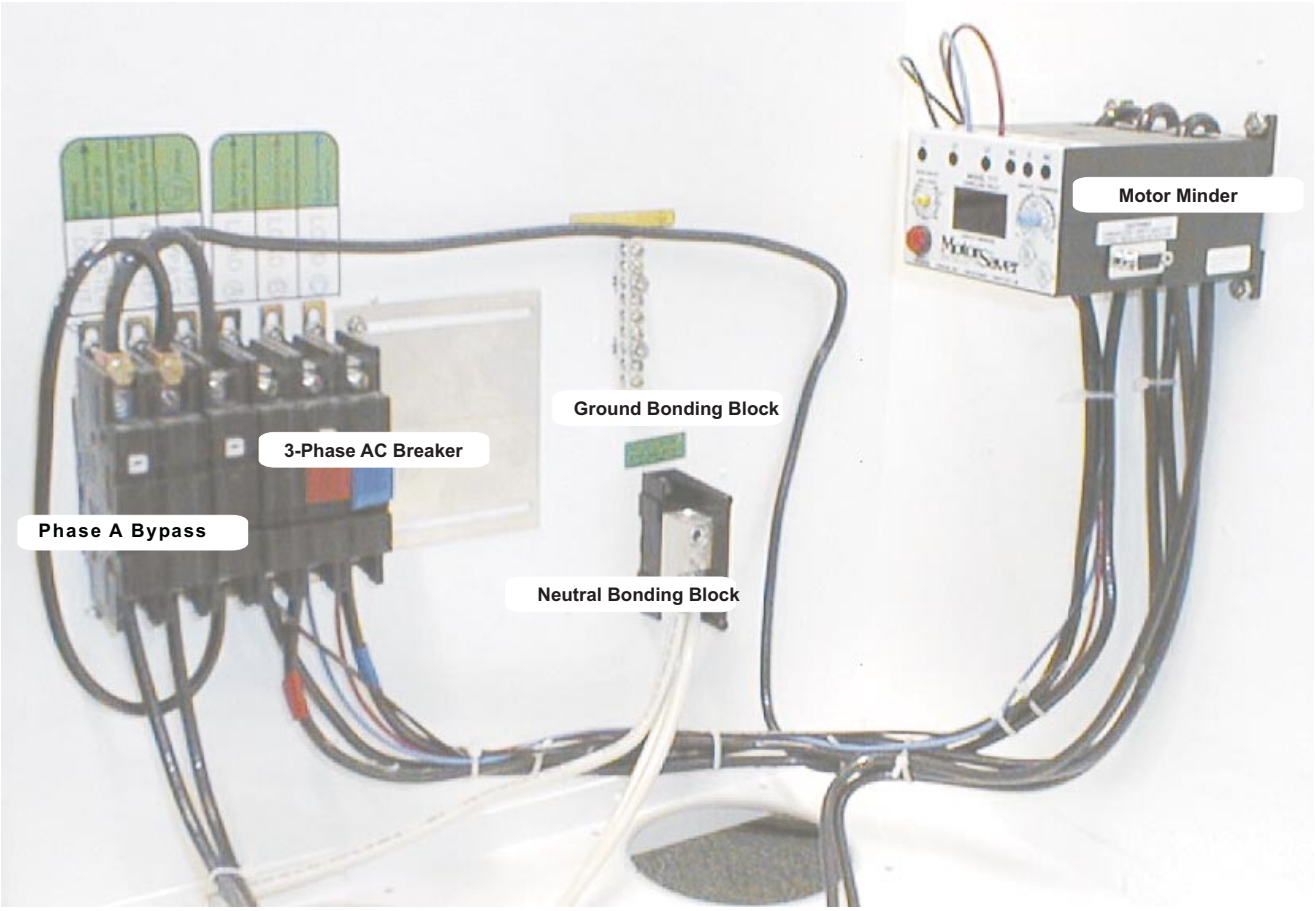

AC15, 20, 60 Assembly Sequence

1. Remove set screws from lugs on top and bottom of circuit breaker

2. Rotate lugs 180° and replace set screws.

3. Attach service lugs to top lugs only

4. Attach a mounting bracket to the top and bottom of the PM in the desired location. Insert a 6-32 x 3/8" bolt (401) equipped with a #6 starwasher (492) into the appropriate bolt hole (top and bottom) from the outside of the side panel; slide the bracket over the bolt from the inside so that the ears are offset to the inside of the enclosure. Slide a #6 SAE flat washer (466) over the bolt, followed by a 6/32 nut (440). Do not tighten, just catch a few threads.

5. Tilt the top of the circuit breaker while sliding it onto the ears of the top mounting bracket. Repeat for the bottom mounting bracket.

6. Align the circuit breaker with either the top or the bottom of the breaker opening.

7 Tighten the mounting brackets onto the PM and torque to 10-15 foot pounds.

8. When all circuit breakers and bypass disconnects are mounted, install a SLIDER over unused breaker openings.

9. Install PM-SLIDER over the exterior of the circuit breaker opening (do not over tighten)

10. Apply a decal (3371 "AC Loads") over each AC load circuit breaker.

11. Attach AC cabling

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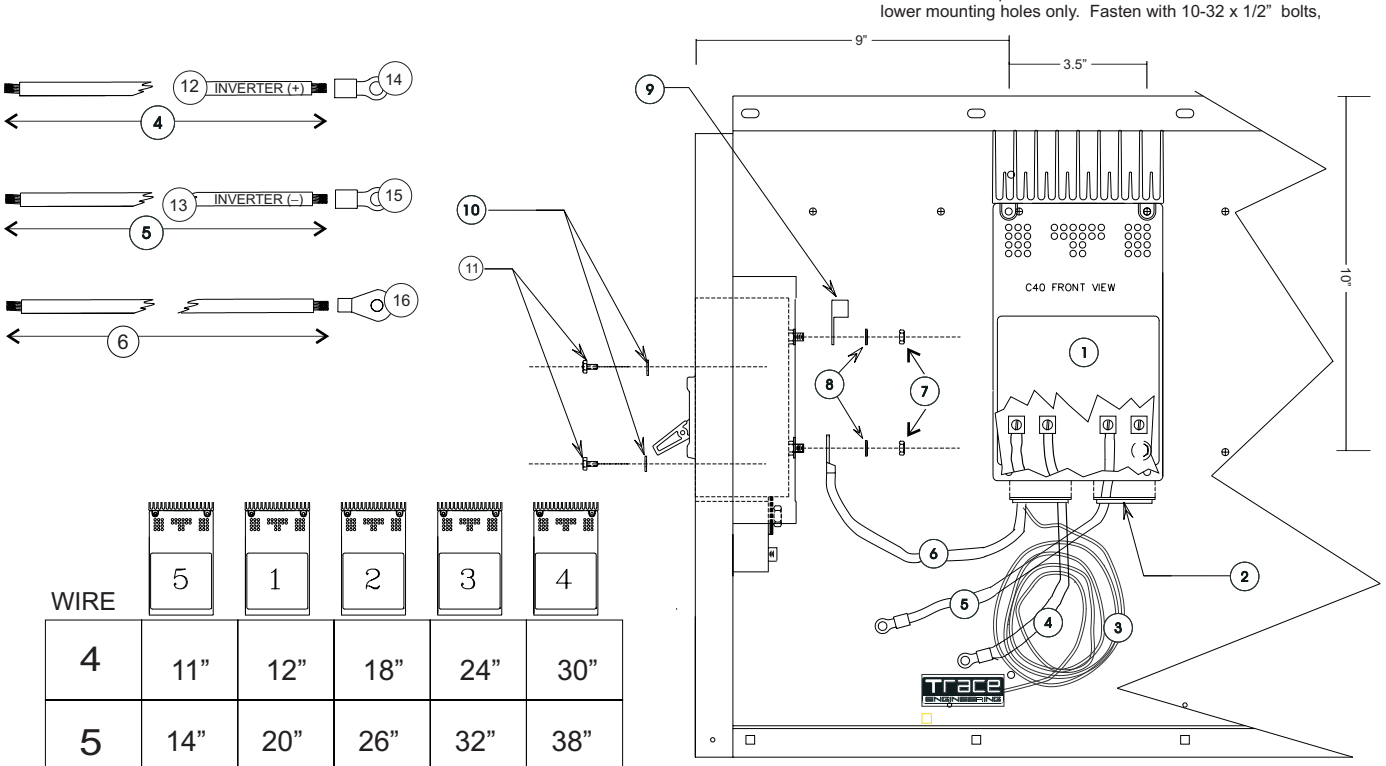

WIRE					
4	11”	12”	18”	24”	30”
5	14”	20”	26”	32”	38”
6	23”	27”	33”	39”	45”

PMO-C40, C40K & VLC40 for DR Systems

Place double-sided tape on the back panel of the C40 in the location shown. Drill the dimples in the back plane of the PM in the approximate location shown. When installing multiple C40's, install them in the sequence shown above the wire length table. Bundle excess or loose wires.

Wiring Instructions

1. Follow the assembly instructions before wiring. Route the positive wire through conduit (not included) to the DC side of the Power Module and connect to the top of the PV array disconnect. Do not connect the array positive directly to the C40 charge controller. Use a minimum of 6 AWG wire. If more than one charge controller is utilized, the modules in the array should be divided equally between the controllers.

2. Connect the PV array negative to the bonding block. Connect the frames of the PV Modules to the bonding block through ground wiring. The PV negative and battery negatives are connected at the negative bonding block. Do not connect the charge controller battery negative directly to the battery.

3. Route all battery temperature sensor cables through the opening in the tray of the module at the bottom right rear behind the DC disconnect breakers. This allows the BTS cable(s) to be routed along with the battery cables. There may be multiple temperature sensors depending on the total number of charge controllers and inverters in the system. Utilize all available temperature sensors to maximize system performance. Connect the temperature sensors to the charge controllers through one of the openings in the rear of the PM with a plastic grommet protecting the edge. Place all temp sensors on the same battery and in the middle of the battery bank.

#	Qty	Part No.	Description
1	AR	C40 or VLC40	
2	2	3220	1.375” bushing
3	AR	PMO-BTS	battery temperature sensor
4	AR	2323	6 AWG cable* Red cable to DC175/250
5	AR	2323	6 AWG cable* Black cable to DCBB
6	AR	2323	6AWG cable* Red cable to PV disconnect
7	2		6-32 SS nut
8	2	485	¼” starwasher
9	1	1974-1	2/0 lug
10	2	492	#6 starwasher
11	2	401	6-32 HH SS capscrew
12	AR	3240	decal “Inverter (+)”
13	AR	3238	decal “Inverter (-)”
14	AR	2430	#6 AWG ring terminal
15	AR	2430	#6 AWG ring terminal
16	AR	716-1	#6 AWG ring terminal ¼” hole

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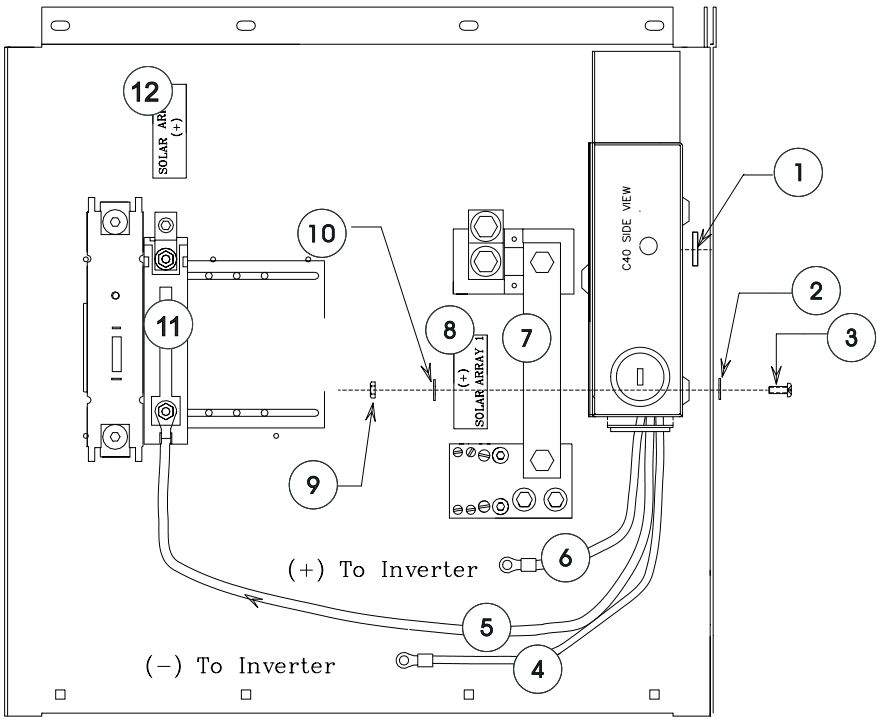

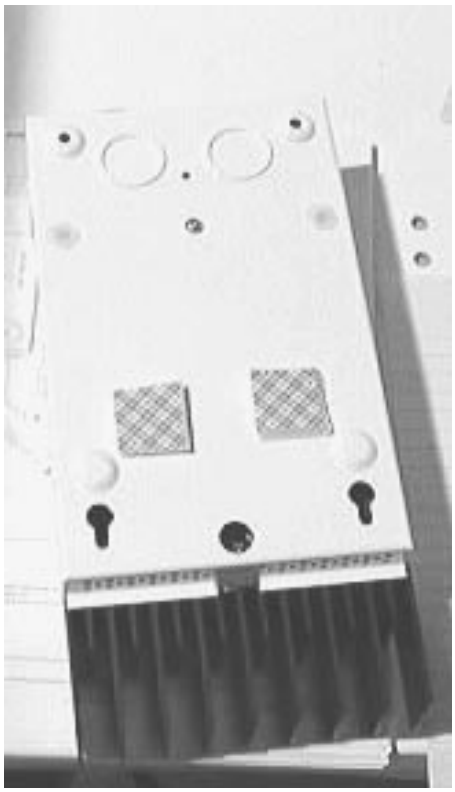

PMO-C40, C40K & VLC40 for DR Systems

This view illustrates the installation, mounting, and cabling of the C40 options looking toward the left-hand cabinet panel. PMO-C40 multipurpose controller includes a user-selectable PV Charge Controller mode, a DC Load Control mode, and a Diversion Load Control mode (the controller can operate in only one mode at a time). In addition, the PMO-C40 includes a 60 amp DC Heineman™ CD breaker, #6 AWG wiring with ring terminals, and all mounting hardware. A 22-page operating manual for the C40 controller is also included. The PMO-VLC40 is a voltage limiting controller. It includes all of the items that come with the PMO-C40, but uses a modified C4O for systems that use PV modules generating high open circuit voltage (over 70 volts DC) without batteries. The VLC40 automatically limits voltage to less than 70 volts DC. PMO-C40K Installation Kit. The PMO-C40K installation kit includes everything that the PMO-C40 includes except the C40 itself, and the C40 operating manual.

#	Qty	Part No.	Description
1	6”	3304	1” double-backed tape
2	4	486	#10 starwasher
3	4	411	10-32 x ½” HH SS bolt
4 ring		2323	6 AWG cable w/ #3238 decal & 2430 terminal
5		2323	6 AWG cable w/ ring terminal & 716-1
6 ring		2323	6 AWG cable w/ #3204 decal & 2430 terminal
7	1	PMO-DCBB	DC bonding block
8	1	3224	Solar Array decal
9	4	442	10-32 HH SS capscrew
10	4	486	#10 star washer
11	1	2298	60-amp DC breaker
12	1	3233	”Solar Array 1” decal

Tools Required: knife or scissors,#1 and #2 straight-blade screwdriver, 5/16 & 7/16” socket, wrench, or nut driver, wire-stripping pliers, ¼” socket or wrench.

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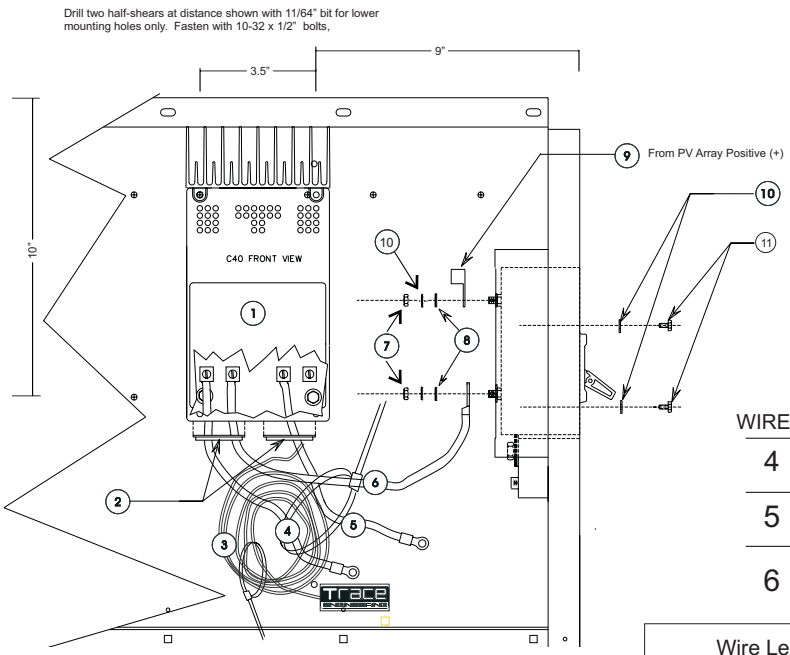

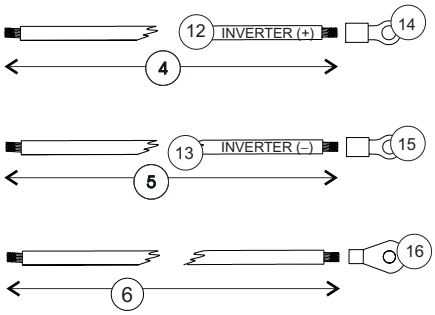

WIRE	4	3	2	1	5
4	41"	35"	29"	23"	17"
5	32.5"	26.5"	20.5"	14.5"	8.5"
6	45"	39"	33"	27"	14.5"

Wire Length Table. Wire length is based upon the mounting location of the C40. Do not exceed four C40's with DC175 disconnect, or five C40's with a DC250 disconnect. Do not exceed DC disconnect's current rating.

PMO-40, C40k & VLC40 for Sinewave Systems

The wiring scheme shown in this view meets NEC code requirements by using the battery disconnect of the inverter as the overload/disconnect device. Alternative methods of wiring the C40's may be needed depending upon your application. Kits are shipped with maximum wire lengths pre-cut. Trimmed the uncrimped end to the length found in the Wire Length table according to the C40's mounting position.

Place double-sided tape on the back panel of the C40 in the location shown. Drill the dimples in the back plane of the PM in the approximate location shown. When installing multiple C40's, install them in the sequence shown above the wire length table. Bundle excess or loose wires. This option requires the use of a bare grounding conductor between the DCBB and a rod or pipe driven into the earth.

#	Qty	Part No.	Description
1	AR	PMO-C40/K	charge, load, or diversion controller
2	2	3220	1.375" thermoplastic knockout bushing
3	1	PMO-BTS	battery temperature sensor with cable
4	AR	2323	6 AWG THHN red cable to inverter positive terminal
5	AR	2323	6 AWG THHN Black negative cable to inverter negative terminal
6	AR	2323	6 AWG THHN Red positive cable to PV circuit breaker
7	2	442	6-32 HH SS nut
8	2	486	#10 starwasher
9	1	1974-1	2/0 barrel lug Connect the PV (+) to this lug.
10	4	492	#6 starwasher
11	2	401	6-32 HH SS bolt
12	AR	3240	decal "Inverter (+)"
13	AR	3238	decal "Inverter (-)"
14	AR	2430	#6 AWG ring terminal
15	AR	2430	#6 AWG ring terminal
16	AR	716-1	#6 AWG ring terminal w/ ¼" hole
17		XXX	wire tie (not shown)

*Refer to wire length table to determine length of each cable by its position. Mount C40s in sequence shown above table. AR = as required.

Wiring Instructions

1. Follow the assembly instructions before wiring. Route the PV array positive wire through conduit (not included) to the DC side of the PM and connect to the top of the PV array disconnect. Do not connect the array positive directly to the C40 charge controller. If more than one charge controller is utilized, the modules in the array should be divided equally between the controllers.

2. Connect the PV array negative to the ground bonding block (DCBB). Connect the frames of the PV modules to the ground bonding block through the negative array cables. The PV negative and battery negatives are connected at the ground bonding block. Do not connect the charge controller battery negative directly to the battery.

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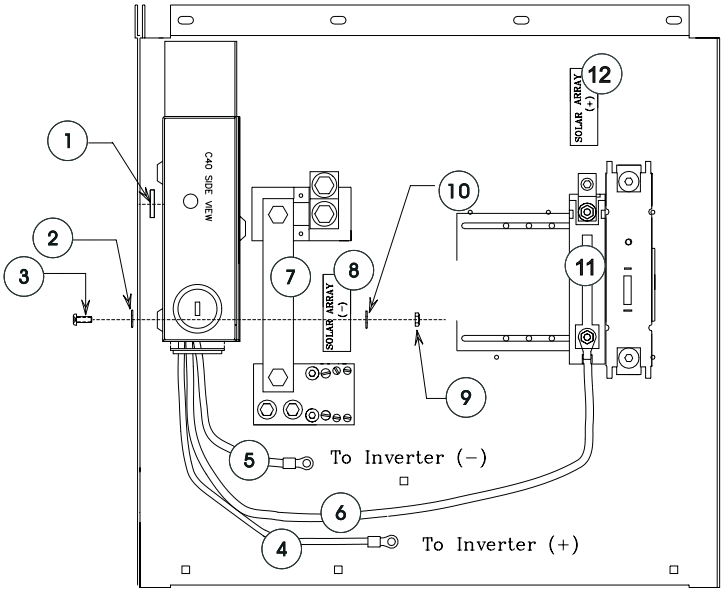

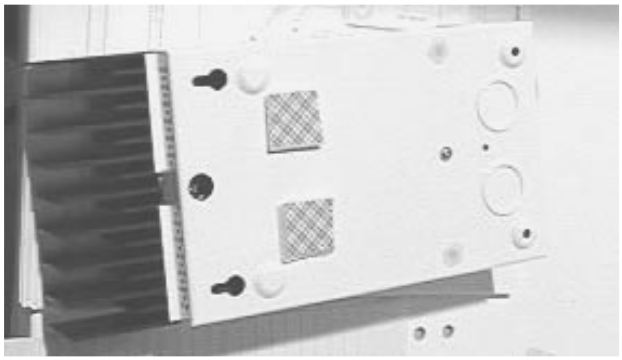

3. Route all battery temperature sensor (BTS) cables through the opening in the tray of the module at the bottom right rear behind the DC disconnect breakers. This allows the BTS cables to be routed along with the battery cables. There may be multiple temperature sensors depending on the number of charge controllers and inverters in the system. Utilize all available temperature sensors to maximize system performance. Connect the temperature sensors to the charge controllers through one of the openings in the rear of the PM with a plastic grommet protecting the edge. Place all temp sensors on the same battery and in the middle of the battery bank.

The top view illustrates the installation, mounting, and cabling of the C40 option looking toward the right-hand cabinet panel. The C40 multipurpose controller has three modes: PV charge control mode, DC load control mode, and diversion load control mode (the controller can operate in only one mode at a time). In addition, the C40 option includes a 60-amp Heineman™ DC breaker, #6 AWG wiring with ring terminals, and all mounting hardware. A 24-page operating manual for the C40 controller is also included. The VLC40 is a voltage limiting controller. It includes all of the items that come with the C40, but uses a modified C40 for systems that use PV modules generating high open-circuit voltage (over 70 volts DC) without batteries. The VLC40 automatically limits voltage to less than 70 volts DC. The PMO-C40K installation kit includes everything that the PMO-C40 includes except the C40 and the C40 operating manual.

#	Qty	Part No.	Description
1	6”	3304	1” square of double-backed tape
2	2	486	#10 starwasher
3	2	411	10-32 x ½” HH SS bolt
4	AR	2323	6 AWG cable w/ 3204 decal & 2430 ring terminal to inverter positive terminal
5	AR	2323 3228	6 AWG cable with 2430 ring terminal & decal to inverter negative terminal
6	AR	2323	6 AWG cable & 716-1 ring terminal to 60-amp Heineman DC breaker
7	1	DCBB	DC bonding block
8	1	3224	“Solar Array (-)” decal
9	2	442	10-32 HH SS capscrew
10	2	486	#10 star washer
11	1	2298	60-amp Heineman™ DC breaker
12	1	3233	”Solar Array (+)” decal

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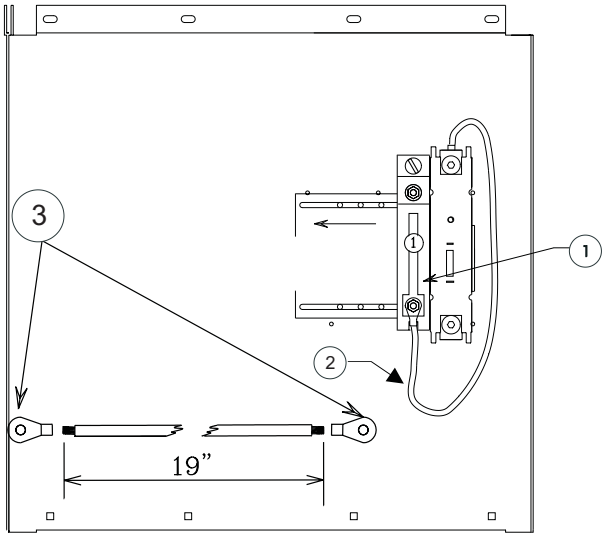
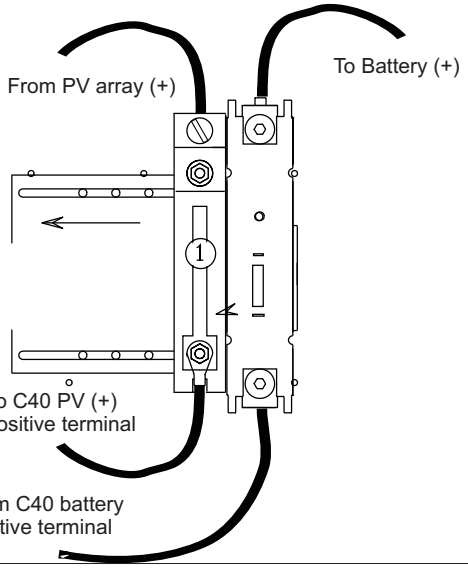
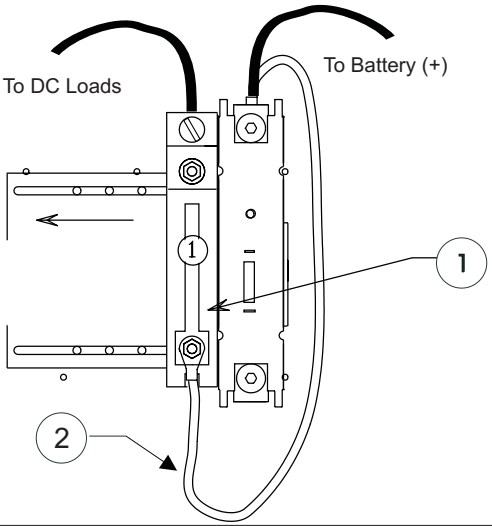
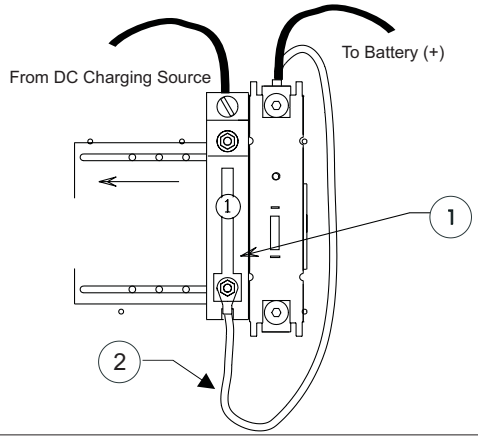




DCXX as a disconnect for an PV array positive.



DCXX as a disconnect between battery positive and load



DCXX as disconnect between charging source and battery

PMO-DC20/60/110

Assembly: DC20/60/110 circuit breaker/disco connects are installed adjacent to the DC175/250 breakers on the right side panel for SW systems and on the left side panel for DR systems. Begin the installation by removing the topmost nut and one flat washer on the back of the circuit breaker and install the barrel lug over the stud. Replace the flat washer followed by the starwasher and the nut, then tighten. Insert the breaker in the side panel from the inside and secure with two 6-32 x 3/8” machine screws with #6 internal tooth starwashers. When used with the C40 charge controller, connect the C40 Battery (+) terminal to the bottom of the DCXX and your PV array positive to the barrel lug at the top of the DCXX to complete the installation. When a charge controller is not used, connect your PV positive to the top of the breaker, and route a 6 AWG cable from the bottom of the DCXX to the top of your DC175/250 breaker.

Tools Required: ¼”, 7/16” & 3/8” socket or wrench; #2 flat-blade screwdriver; wire stripper, crimping tool.

#	Qty	Part No.	Description
1	1	2957	20 amp breaker or
		2298	60 amp breaker or
		2249	110 amp breaker
2	19”	2323	#6 AWG Red THHN wire used with 20, 60-amp
		3302	#2 AWG Red THHN use with 110-amp
3	2	716-1	#6 AWG ring terminal w/ ¼” hole
		3300	#2 AWG ring terminal
4	1	1974-1	barrel lug terminal

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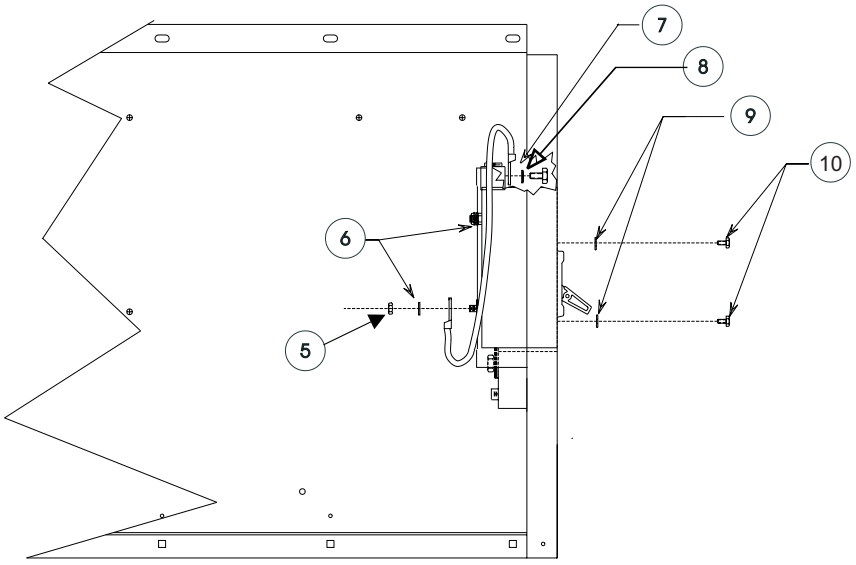

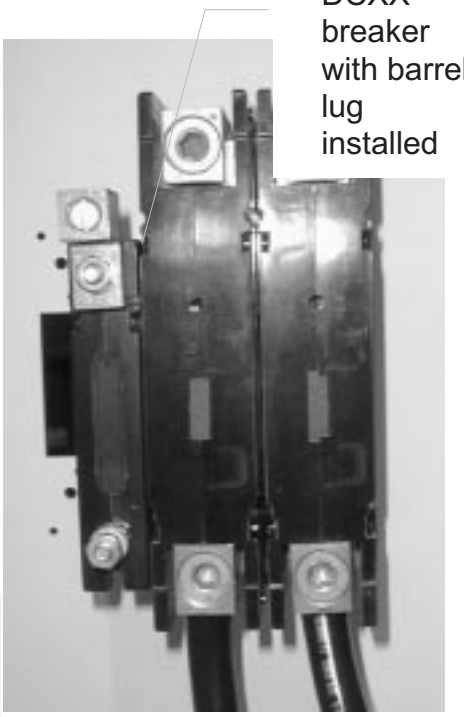

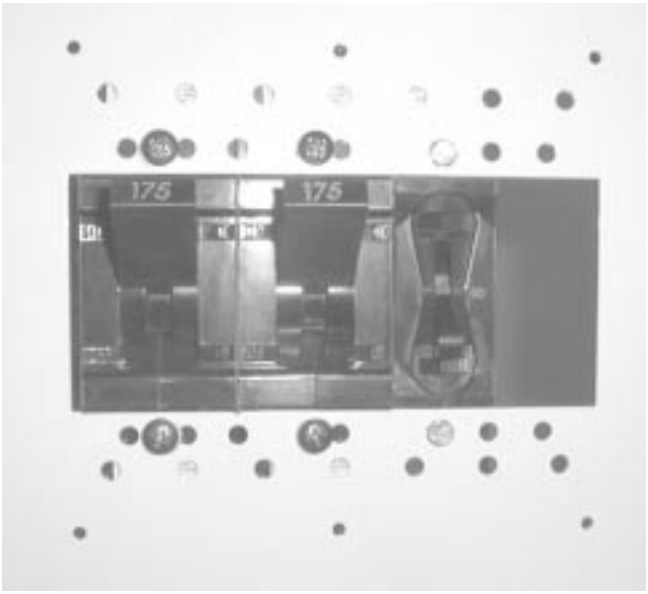

PMO-DC20/60/110

Tools Required: ¼", 7/16" & 3/8" socket or wrench, 1/4" flat-blade screwdriver. **Assembly:** DC20/60/110 DC circuit breaker/disconnect is installed adjacent to the DC175/250 breakers on the right side panel for SW systems and on the left side panel for DR systems. Begin the installation by removing the topmost nut and one flat washer on the back of the circuit breaker and install the barrel lug over the stud. Replace the flat washer followed by the starwasher and the nut, then tighten. Insert the breaker in the side panel from the inside and secure with two 6-32 x 3/8" machine screws with #6 internal tooth starwashers. Install the 6 AWG cable between the hot side of one of the DC175/250 breakers and the bottom of the DC20/60/110 and the DC60. For PV systems, connect the DC60 between the PV array and the C40 charge controller.

#	Qty	Part No.	Description
5	2		1/4-20 SS nut
6	2	485	¼" internal tooth starwasher
7	1	486	#10 external tooth starwasher
7	1	2292	1/4-20 x 7/16" HH SS bolt
8	2	492	#6 internal tooth starwasher
9	2	401	6-32 X 3/8"HH SS machine screw

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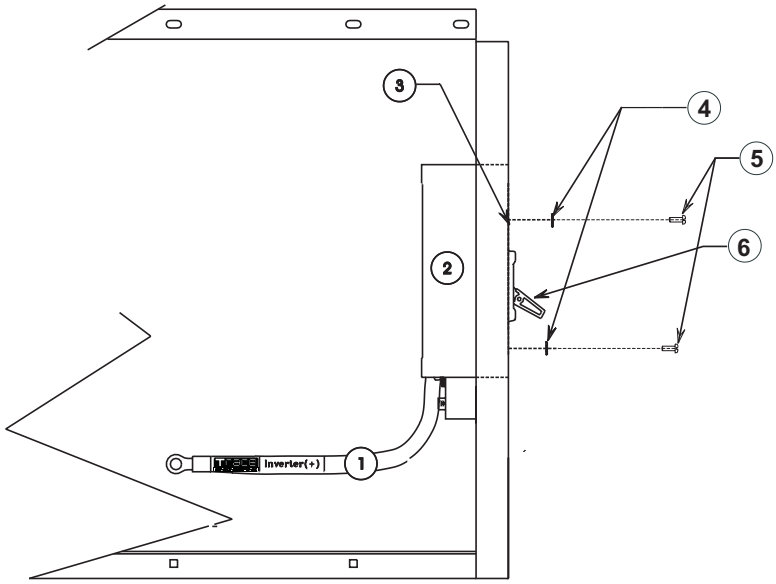

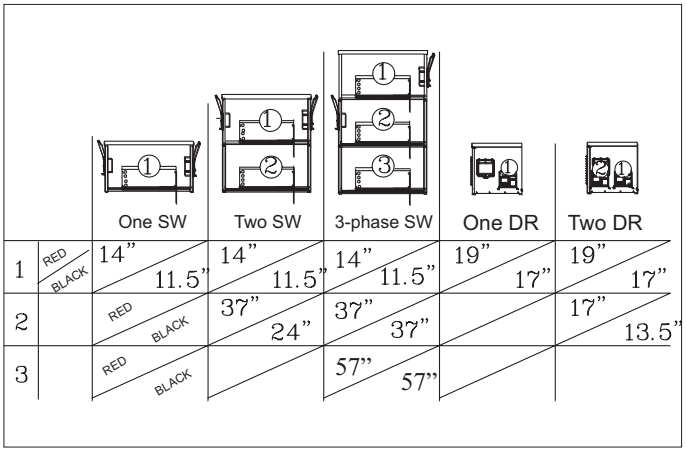

PMO-DC175/250

DC 175/250 amp direct current circuit breakers. One required for each inverter installed. Route DC supply through these breakers. Refer to wire length table to determine the length of battery cables. Fabricate cables as shown in 7 through 10 below:

#	Qty	Part No.	Description
1	AR	3204	decal: "Inverter (+)"
2	AR	2079	250 amp circuit breaker, DR2412, DR3624; SW2512, SW4024, SW5548
		2116	175 amp circuit breaker, DR1512, DR1524, DR2424; SW4048
3	1	2385	decal:"Battery Disconnect"
4	6	425	1/4-20 X ¾" HH SS capscrew
5	12	2147	¼" external tooth starwasher
6	1	2358	decal "Inverter #1" on breaker handle
	1	3369	decal "Inverter #2" on breaker handle
	1	2259	decal "inverter #3" on breaker handle

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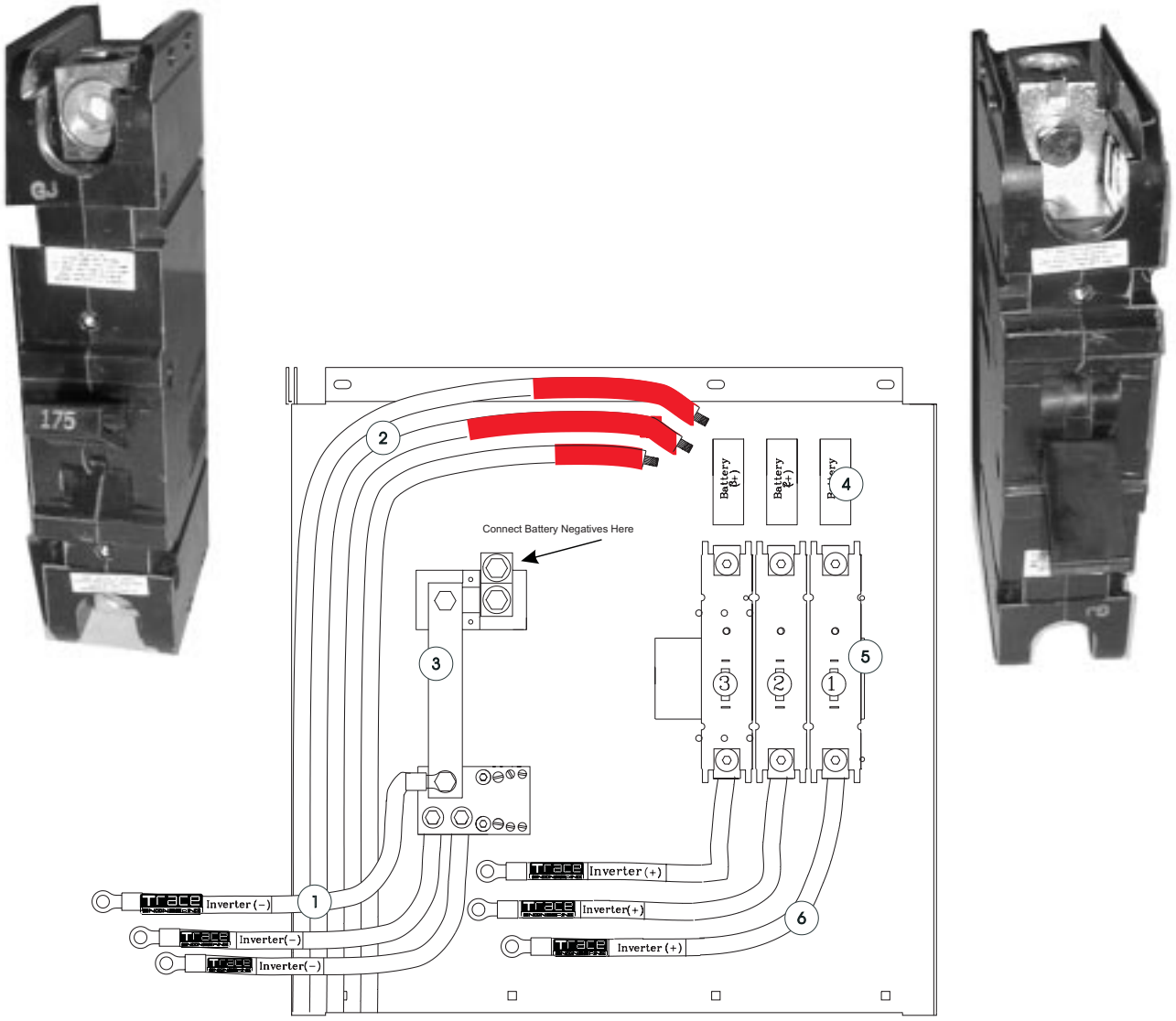
Before reversing lug

After reversing lug



PMO-DC175/250

Use 250-amp circuit breaker for DR2412, 3624; use 175-amp circuit breaker for DR1512,1524, 2424, and SW4048. Wire length depend on the number of inverters and mounting position in the power module cabinet. Refer to wire length table to determine length of Inverter (+) and Inverter (-) cables for your installation. One PMO-DC250 (175) is needed for each inverter installed. Rotate cable lugs on top and bottom 180 degrees prior to installing the breaker in the enclosure (see illustrations above) Strip insulation from cables 0.425-inch on each end and install ring terminals. Apply appropriate color heat shrink and tubular lugs.

#	Qty	Part No.	Description
1	1	3238	decal; “Inverter (-)” on battery cable
2	AR	US	battery cables (not included)
3	1	DCBB/Kit/SW	DC Negative Bonding Block (not included)
4	1	3231	decal: “Battery (+)”
5	1	2079	circuit breaker, 250-amp DC
		2116	circuit breaker, 175-amp DC
6	1	3204	decal; “Inverter (+),” (battery cable not included)
7	2	2087	Heat Shrink Black w/logo
8	2	722-1	ring terminal for 4/0 AWG cable
		722-2	ring terminal for 2/0 AWG cable
9	2	2086	heat shrink, red w/logo

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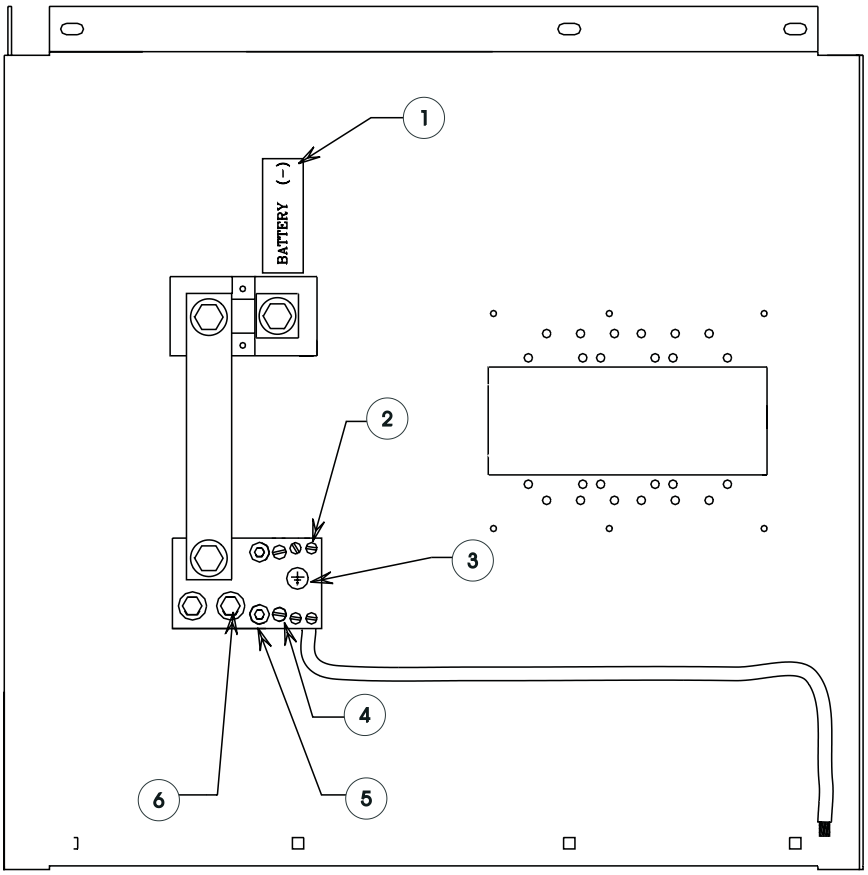

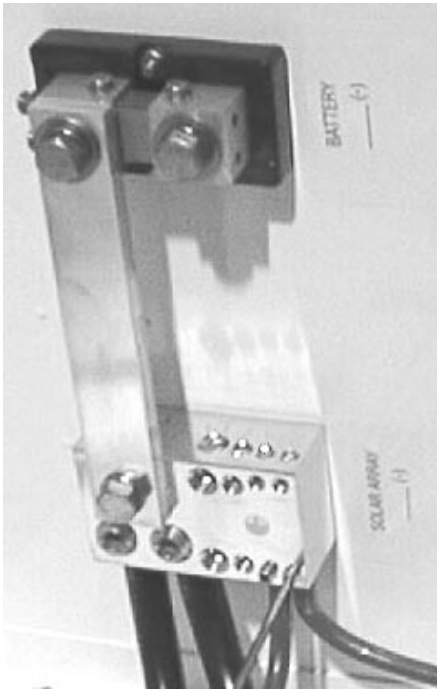

PMO-DCBB/Kit/SW/DR

The PMO-DCBB kit includes a DC negative bonding block with a 500-amp, 50-millivolt shunt and a bus bar. Add the /SW or /DR suffix to specify the type of inverter used.

Tools Required: 5/16, 3/8, 9/16, wrenches; 13/64" drill bit, 1/8 & 5/16" Allen wrench, straight slot screwdriver

Assembly Sequence Pre-assemble the bonding block by installing the set screws using a flat-bladed screwdriver and Allen wrenches as required. Place a #10 internal-tooth starwasher (486) over a 10-32 x 3/8" machine screw. Drill out the dimples and insert a machine screw in one of the lower holes from the outside of the side panel. Place a ¼" external tooth starwasher over the machine screw on the inside of the side panel. Support the aluminum bonding block on the inside of the side panel and start the machine screw in the appropriate pre-drilled and tapped hole in the bonding block. Repeat the procedure for the other tapped hole in the bonding block. Don't forget to place an external tooth starwasher between the bonding block and the enclosure on each machine screw. This assures an electrical bond between the bonding block and the enclosure. Tighten to 10-12 foot pounds. It may be easiest to insert the negative battery cables to the bonding block prior to installing it on the side panel. When the bonding block is installed, drill out two dimples above the block for the shunt. Insert a 10-32 x ¾" machine screw equipped with an external tooth starwasher through the drilled-out dimple and into the holes in the shunt base. Secure the shunt base with #10 internal tooth starwasher and a 10-32 SS nut. Do not tighten at this time. Align the five bus bars and secure one end of them to the bonding block with one of the 3/8-16 x ¾" bolts equipped with a 3/8" lock washer. Swing the bars into position over the hole in the shunt and secure with the other 3/8-16 x ¾" bolts. Tight to 10-12 foot pounds. Apply decal 2507 (ground symbol) to the bonding block

#	Qty	Part No.	Description
1	1	3232	decal: "Battery (-)"
2	1	3000	bonding block: DR system
		3001	bonding block: SW system
2	4	2213	set screw, 1/4-20 x ½" zinc
3	1	2507	decal: earth ground symbol
4	2	2212	set screw, 5/16-18 x ½" zinc
5	2	2211	set screw, 7/16-14 x ½" , zinc
6	2	3167	set screw, 5/8-11 x 1" zinc plate

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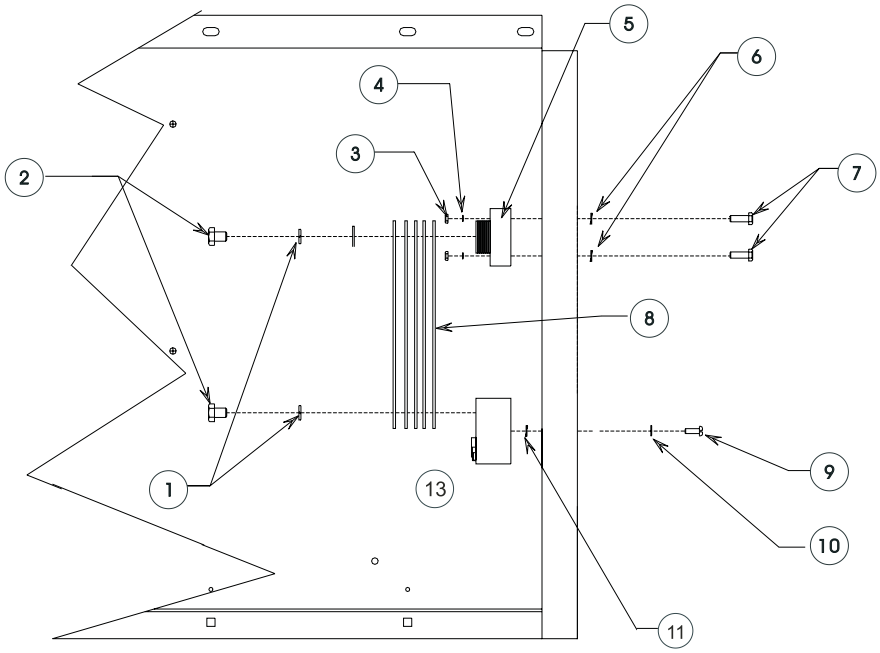
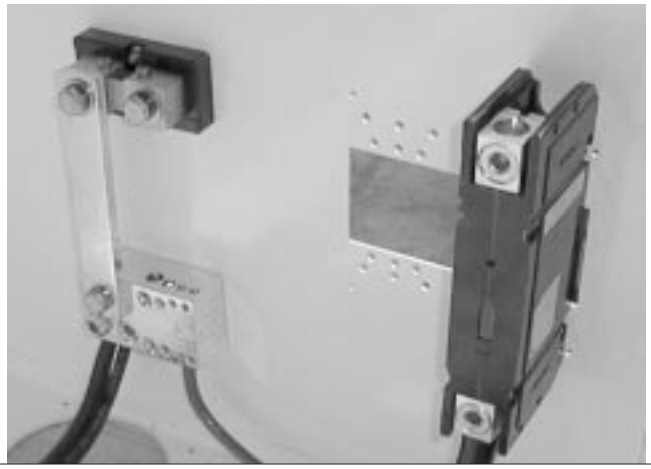
Released: Thursday, April 29, 1999





DCBB shown with DC175/250 installed

PMO-DCBB/Kit/(SW)(DR)

All DC negative ground cables are attached to this ground bus. Battery ground cables must be routed through the shunt in order to enable accurate current reporting by the inverters. Connect inverter DC negative cables to the bottom of the DCBB, shown in the photo above with a DC175/250 installed. Connect a bare ground conductor from the bottom of the DCBB to a copper or iron rod driven into the ground to form a ground rod.

#	Qty	Part No.	Description
1	1	3017	lock, washer 3/8" SS split ring
2	3	3016	bolt, 3/8-16 x ¾" SS HH
3	2	442	nut, 10-32 SS
4	2	486	star washer, #10 internal tooth SS
5	1	2377-1	shunt, 500v/50mA for PVGFP
6	2	486	star washer, #10 internal tooth SS
7	2	2845	machine screw, 10-32 x ¾" HH SS
8	5	2997	buss bars for shunt
9	2	3362	machine screw, 10-32 x 3/8" HH SS
10	2	486	star washer, #10 internal tooth SS
11	2	2147	star washer, external tooth ¼" SS

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Part Number 3471
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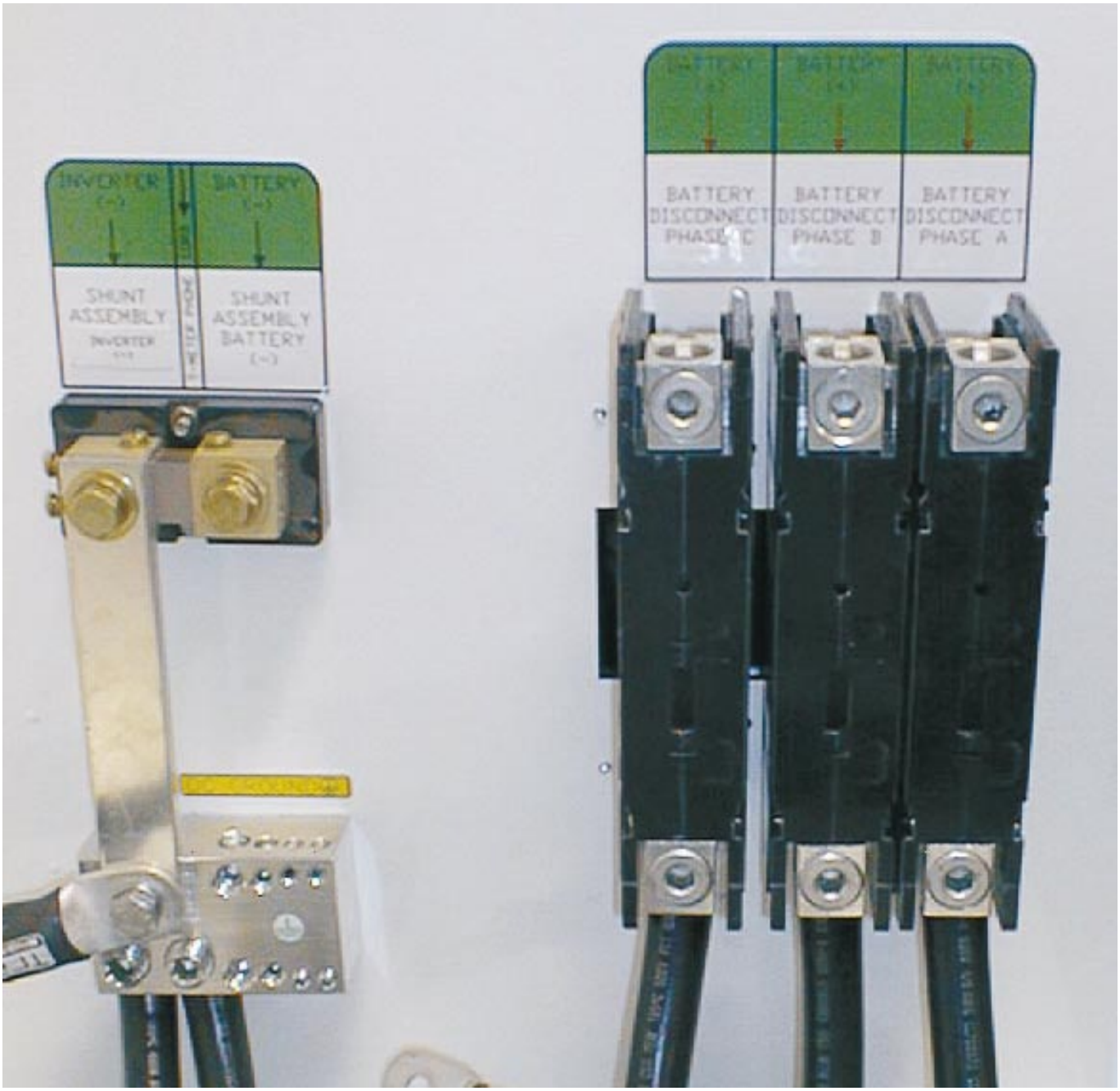

PMO-DCBB

The DCBB, shown here in a 3-phase installation alongside three DC175/250 inverter positive breakers, provides a ground bond for all of the inverter negatives. The 50mV, 500-amp shunt that is a part of the DCBB provides an interface for an ammeter or battery monitor such as the Trace Meter. All DC current must pass through the shunt on the DCBB in order for the battery amp-hour meter to be accurate.

All three inverter negative terminals are connected by 4/0 or 2/0 cables to the bottom of the DCBB bonding block as shown in the photo above.

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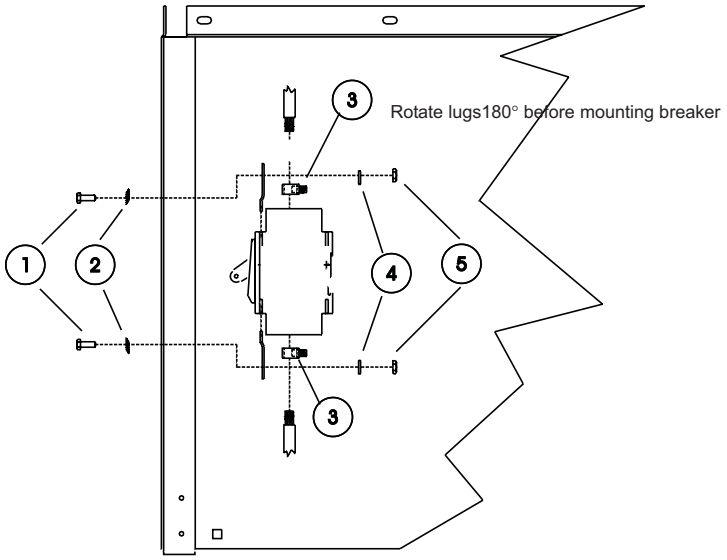
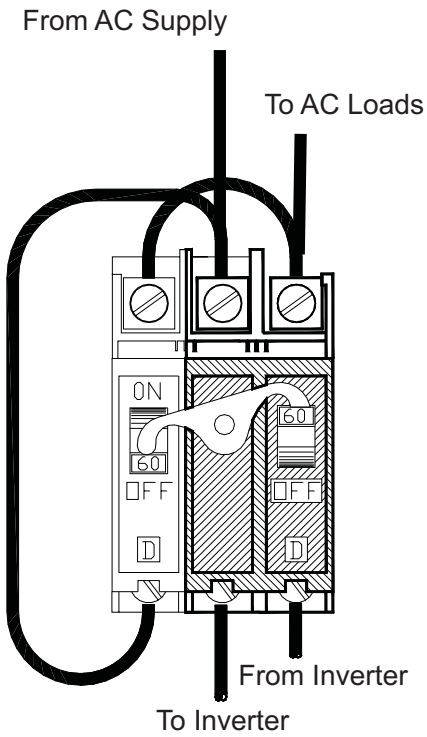
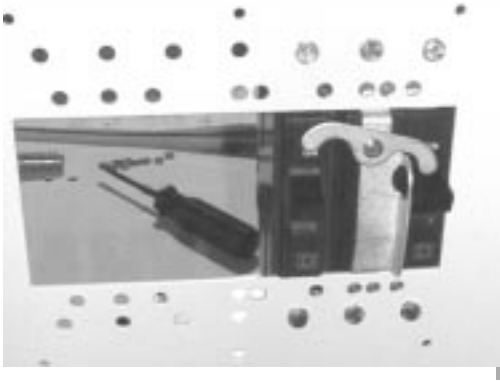
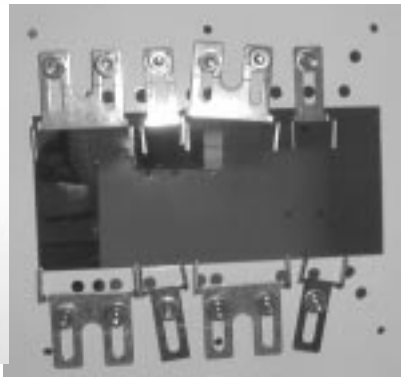




To bypass inverter, throw left-hand breaker to On position. For Inverter power, throw right-hand breaker to the On position





PMO-IOX60 Input/Output/Bypass Breaker

The IOX60 bypass breaker is a pair of 60-amp breakers (one SPST and one DPST) assembled with a lockout rocker that allows only one of the breakers to be in the On position at a time. This enables you to bypass the inverter when another source of AC power is available which is useful when servicing the inverter. In normal operation, AC power passes through the inverter to the AC loads, enabling the inverter to monitor the AC supply and charge the batteries. In the event of an interruption of external AC power, the inverter can automatically come On and supply AC power to the AC loads. Install the rocker by inserting the lower tang into the bottom of the breaker, then bend the upper tang into place. See the directions provided with the breaker.

#	Qty	Part No.	Description
1	6	401	machine screw, 6-32 x 3/8" HH SS
2	6	492	star washer, internal tooth #6
3	2	3171	service clamp
4	6	466	#6 flat washer SAE SS
5	6	440	6-32 nut SS

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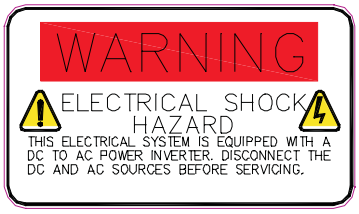
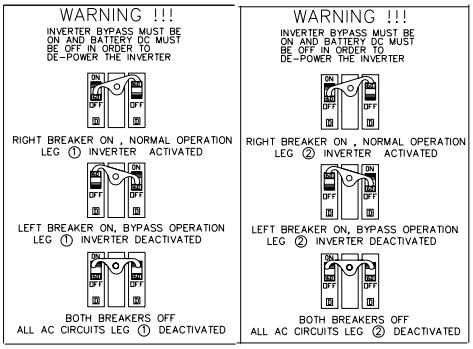
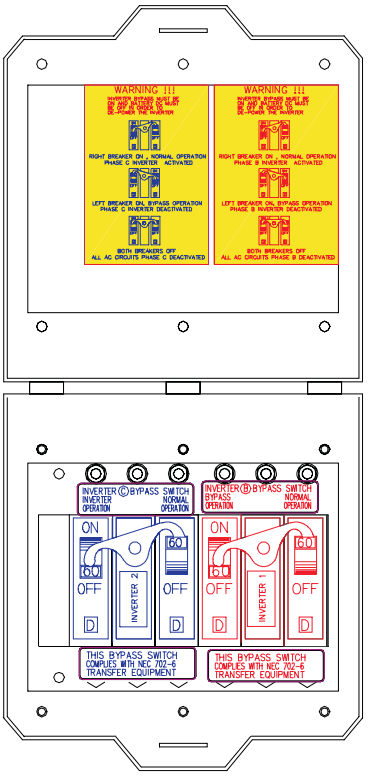
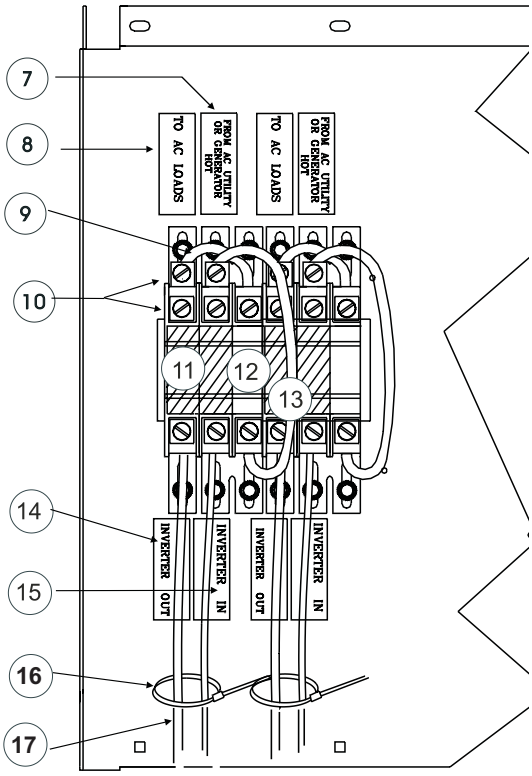
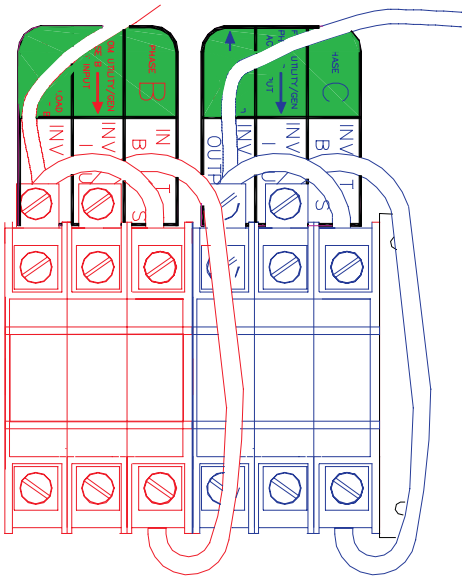






LEFT INTERIOR VIEW





PMO-IOX60

#	Qty	Part No.	Description
1	1	2383	decal “Residence Wiring Switch”
2	1	2356	decal “Inverter Bypass”
3	1	2357	decal “Normal Operation”
4	1	2346	bypass interlock
5	1	2358	decal “Inverter 1”
6	1	2359	decal”Inverter 2”
7	1	3200	decal “From AC Hot Utility/Generator”
8	1	3202	decal “To AC Hot Loads”
9	6”	2322	6 AWG Blk THHN stranded wire
10	1	3171	service clamp — rotate 180° before installing breaker
11	1	3097	breaker, 60-amp QOU260
12	1	3087	breaker, 60-amp QOU160
13	15”	2322	6 AWG Blk THHN stranded wire
14	1	3239	decal “Inverter Out”
15	1	3235	decal “Inverter In”
16	2	706	cable tie: 3.9” x .10”
17		2322	wire 6 AWG Blk THHN stranded

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Part Number 3471
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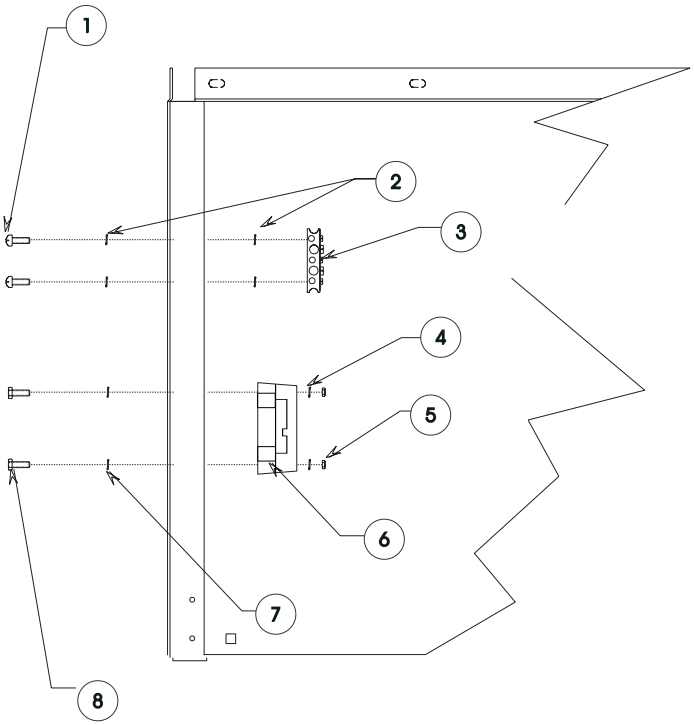

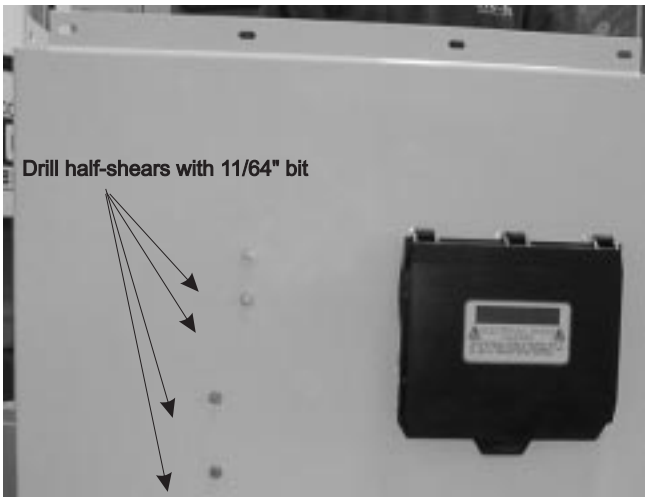

PMO-NEUTRAL

PMO-Neutral includes a neutral bonding block capable of accepting four neutral leads ranging from 14 AWG to 4 AWG and one 2/0 AWG cable. If additional capacity is required, a second neutral bonding block can be 'snapped' to the first. A ground bonding block is also included as part of the PMO-Neutral option. Drill the appropriate dimples with an 11/64 inch bit to mount the bonding blocks.

#	Qty	Part No.	Description
1	2	3363	MS 10-32 X 1" HH SS
2	2	486	#10 star washer internal tooth SS
3	1	3364	Ground bar kit Square D
4	2	486	#10 star washer external thread SS
5	2	442	10-32 HH SS nut
6	1	PMO-PDBB	bonding block
7	2	486	#10 star washer SS internal tooth
8	2	2845	10-32 X ¾" MS HH SS

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Part Number 3471
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Released: Thursday, April 29, 1999

Cabinet Components

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Released: Thursday, April 29, 1999

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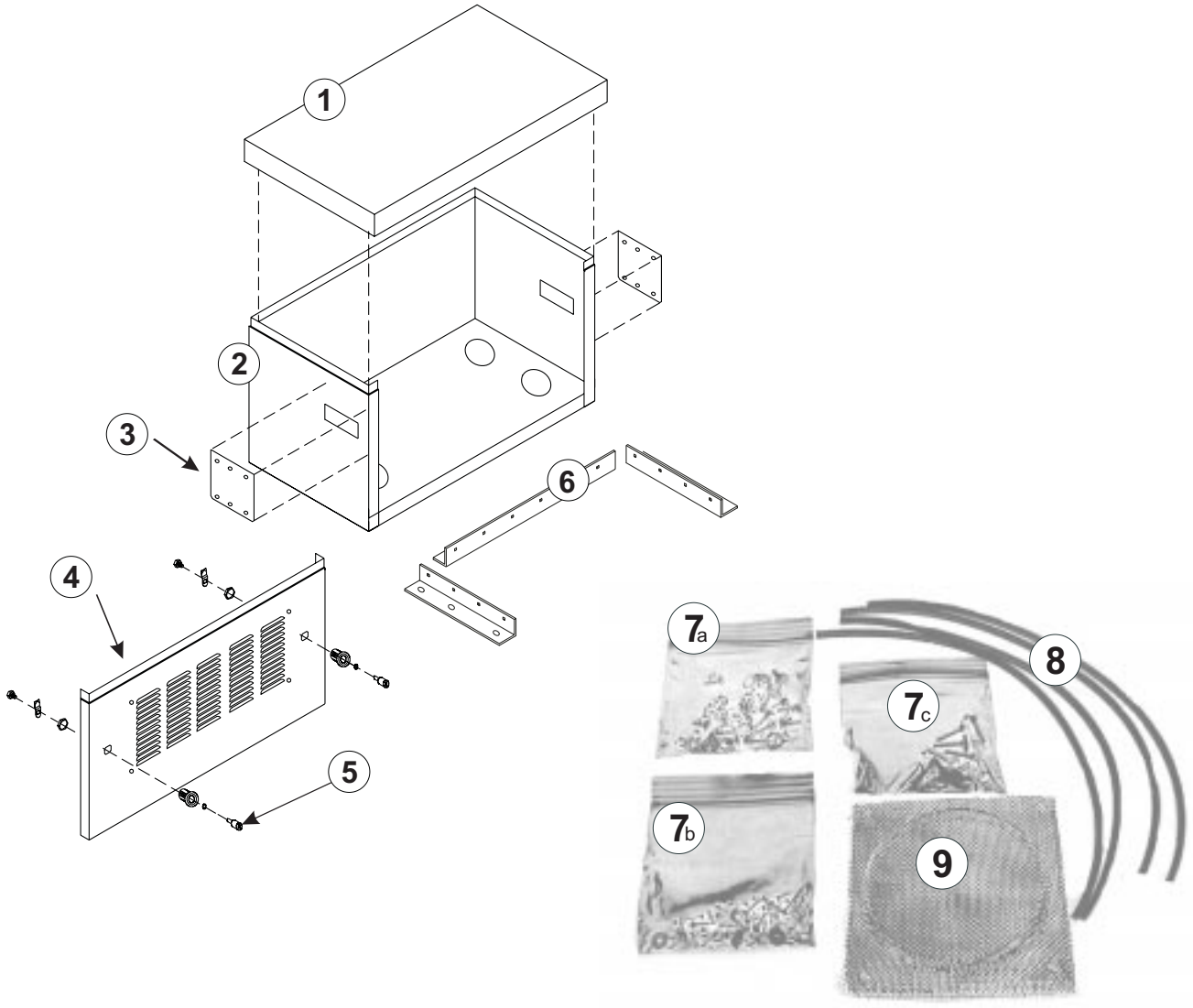

PM

The PM is the basic power module component. PM components are fabricated from 0.090 T6061 aluminum plate, and are powder-coated to prevent corrosion (except the blanks for unused breaker openings). Included are the lid, the back and sides, two blanks, the door and associated baffles and screens, door latches, neoprene gaskets, and aluminum brackets for securing the module to a concrete pad or wooden platform. The gaskets, baffles, and screens for the door and cabinet bottom prevent insects and small animals from entering the cabinets. Install the neoprene perimeter gasket only after all PM's and PM-ADD's have been set atop each other to ensure complete sealing.

#	Qty	Part No.	Description
1	1		LID
2	1		ELEC-MOD (back & sides)
3	2		BLANK
4	1		DOOR
5	1		LATCH
6	1		FEET
7a	1		PM mounting hardware includes 16 each: 401 bolts, 440 nuts, 466 flat washers, 492 internal starwashers
7b	1		inverter fastener assortment includes 6 each: 425 bolts, 444 nuts, 485 internal starwashers, 468 flatwashers, 2147 external starwashers.
7c	1		module fastener assortment includes 14 each: 3190 carriage bolts, 3192 nuts, 485 internal starwashers, 2147 external starwashers, 465 flat washers.

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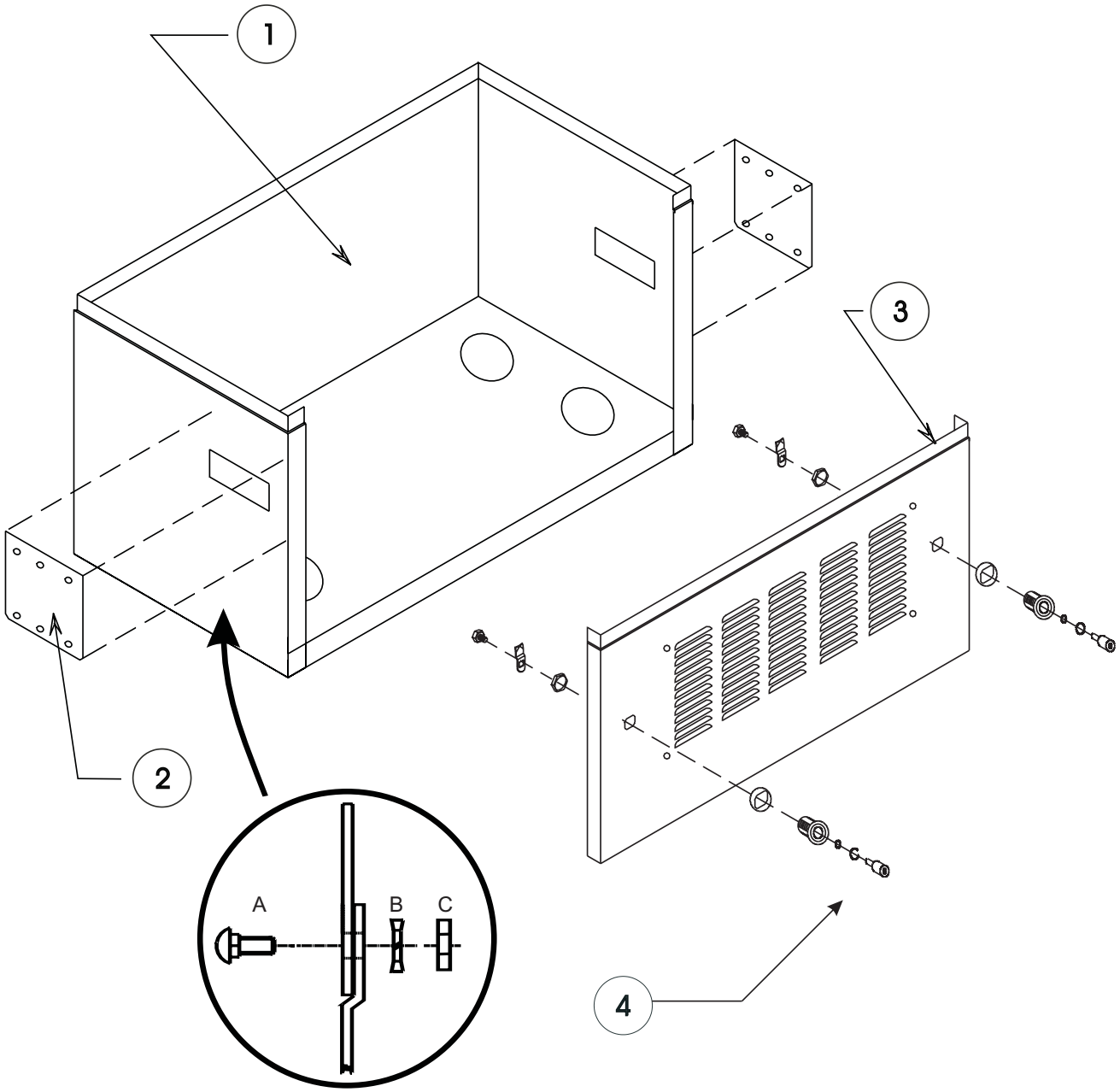

PM ADD

PM ADD is an enclosure which does not include FEET or a LID. It is used as stacking enclosure atop a PM. Identical in every other respect, PM ADD is used for adding equipment including batteries, an inverter, charge controllers, or what ever you like. It is fabricated from the same high-quality material as the PM module.

#	Qty	Part No.	Description
1	1	ELEC-MOD	Side, back & floor panel
2	2	BLANK	Cover for unused breaker openings
3	1	DOOR	Ventilated door panel w/ baffle & screen
4	2	LATCH	Cam-type latches, locks are optional

Use the fasteners shown in the inset above and listed below to secure the ADD to the enclosure or base.

A	3190	14	10-24X1/2" carriage bolts
B	465	14	#10 SAE flat washer

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Part Number 3471
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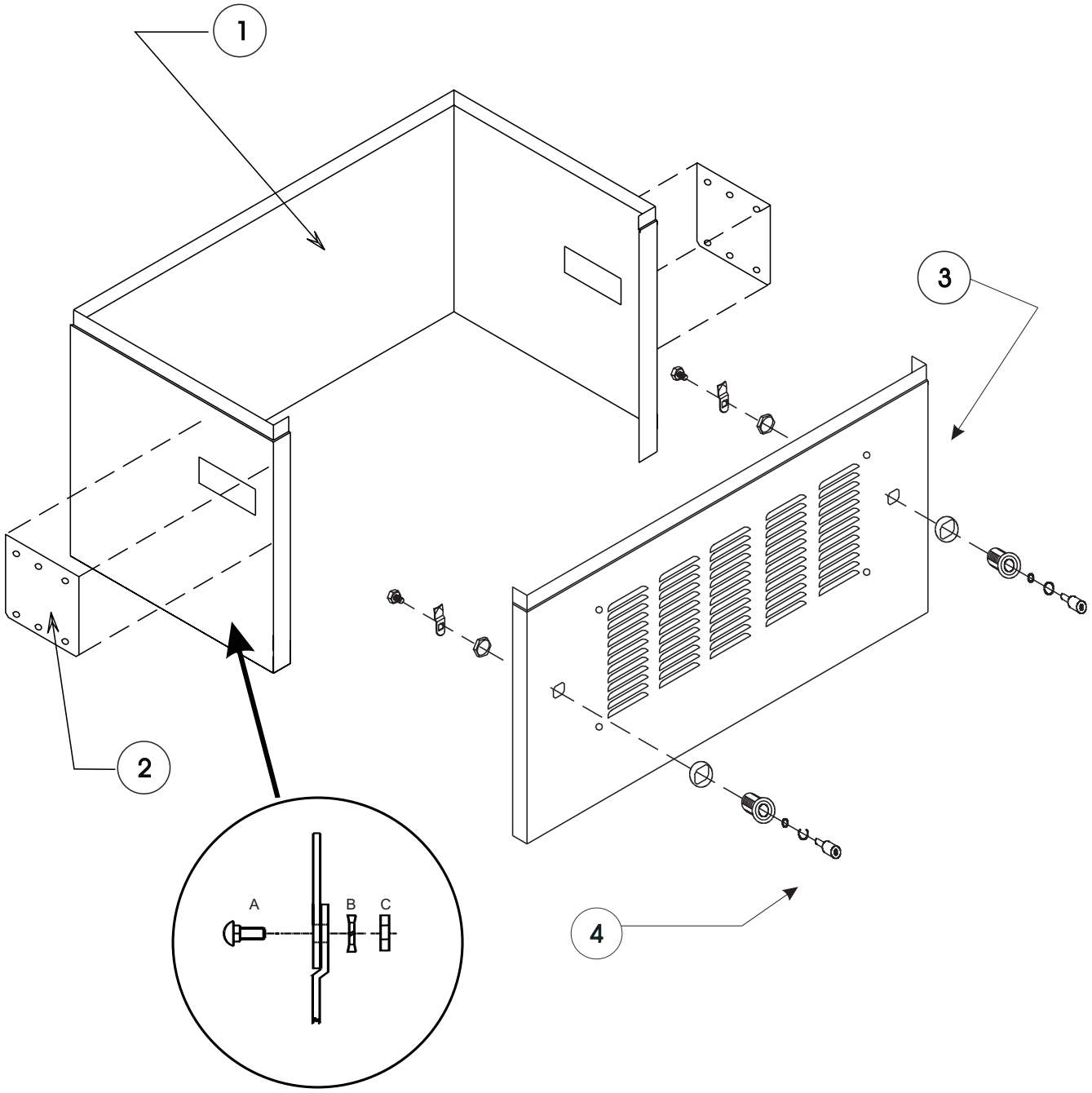

PM-EXT

PM-EXT is an extension that fits atop a regular PM or PM-ADD to add height. It is used for unusually high batteries or other components that require more clearance than afforded by the PM or PM ADD. PM-EXT is constructed of the same high-quality materials, and is powder-coated for long life.

#	Qty	Part No.	Description
1	1	electro-mode	extension for a PM
2	2	BLANK	plug for unused breaker opening
3	1	DOOR	
4	2	Latch	to retain door - locks optional
The following fasteners are used to secure the EXT to an enclosure or braces around the bottom edge.			
A	14	3190	10-24 X ½" carriage bolts
B	14	465	#10 SAE flat washer
C	14	3192	10-24 nut

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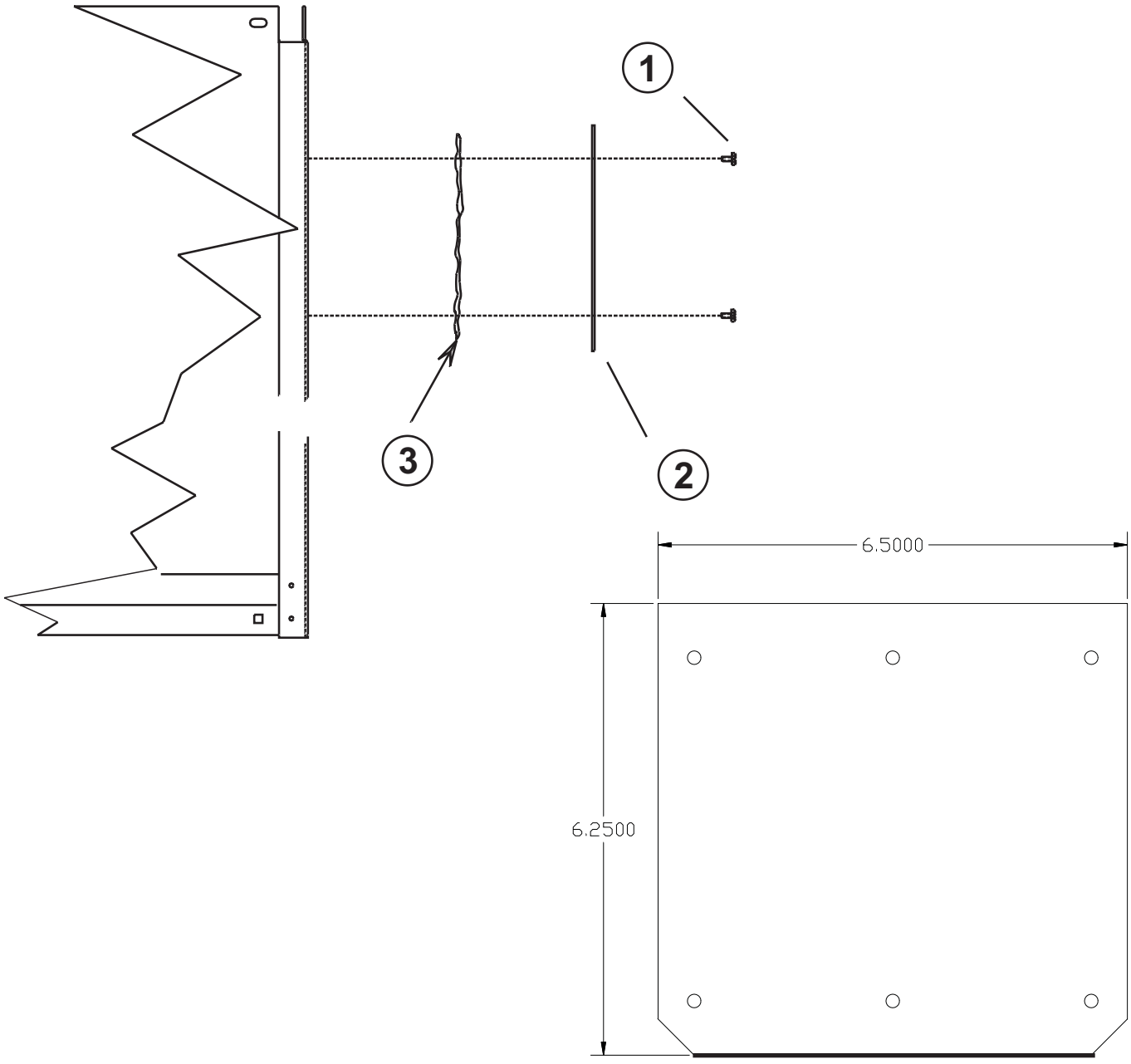

PMO-BLANK

PMO-BLANK is a 0.080” aluminum plate used to cover the circuit breaker openings in the wing panels of the PM and PM-ADD. Install these blanks on the outside of the wing panel using the six self-tapping stainless steel screws. Place a bead of silicone between the blank and the wing panel to prevent the entry of moisture or pesky little bugs.

#	Qty	Part No.	Description
1	6	3212	8-32 x 3/8” self-tapping SS screws
2	1	PMO-BLANK	
3		RTV silicone	

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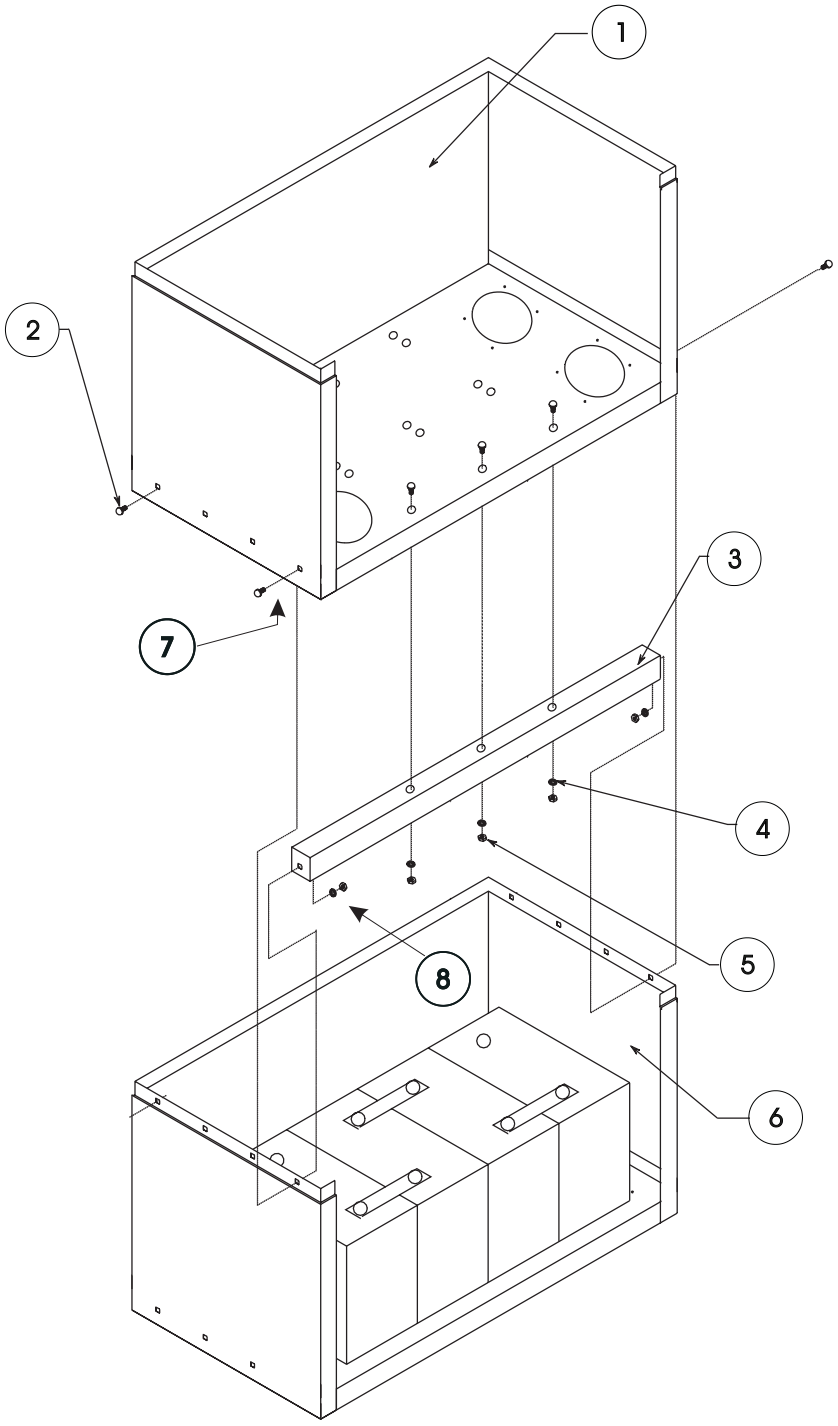

PMO-BRACE

Brace is an aluminum channel used to reinforce the bottom of the PM and PM-ADD to support extra-heavy loads, such as a battery bank. Install the brace using the fasteners provided, and tighten to 25 inch-pounds.

#	Qty	Part No.	Description
1	1	PM	Power Module
2	5	3191	10-24 x 1" SS carriage bolt
3	1	3284	tray brace
4	1	465	#10 SAE SS flatwasher
5	5	3192	10-24 SAE nut
6		PM or PM-ADD	cabinet

Tools Required;

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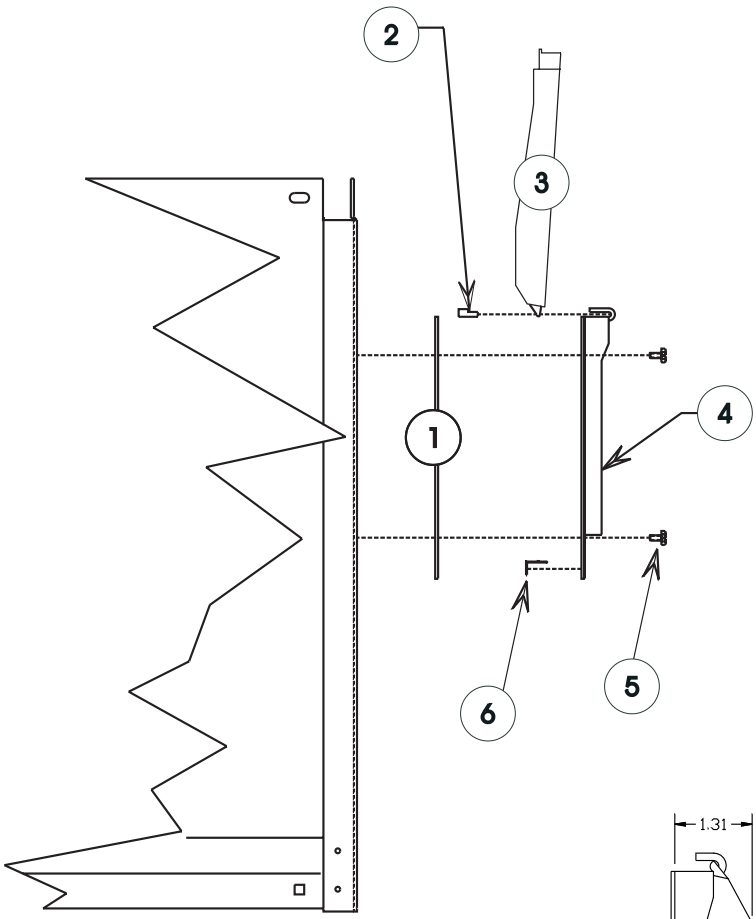

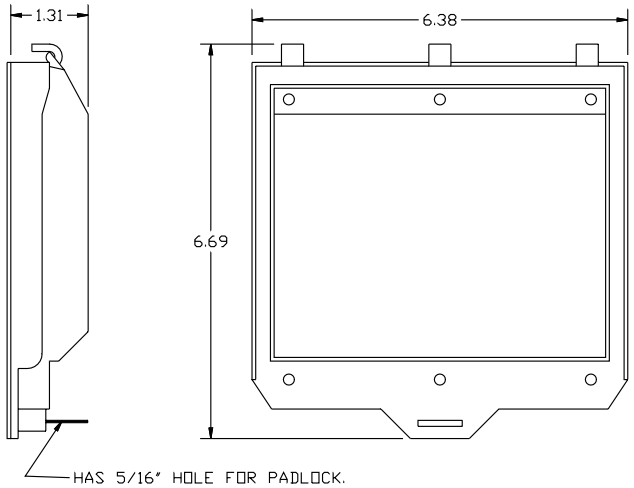

PMO-COVER

PMO-COVER is a lockable, black hinged cover that prevents unauthorized tampering with the breakers. These covers are provided with a foam gasket to provide protection from the insects and the elements, and a lock hasp to prevent unauthorized tampering. The cover lid is also an ideal location for appropriate warning decals and identification labels.

#	Qty	Part No.	Description
1			neoprene gasket
2	1		retaining clip
3	1		cover
4	1		base
5	6		8-32 x 3/8" self tapping HH screws
6	1		locking clip

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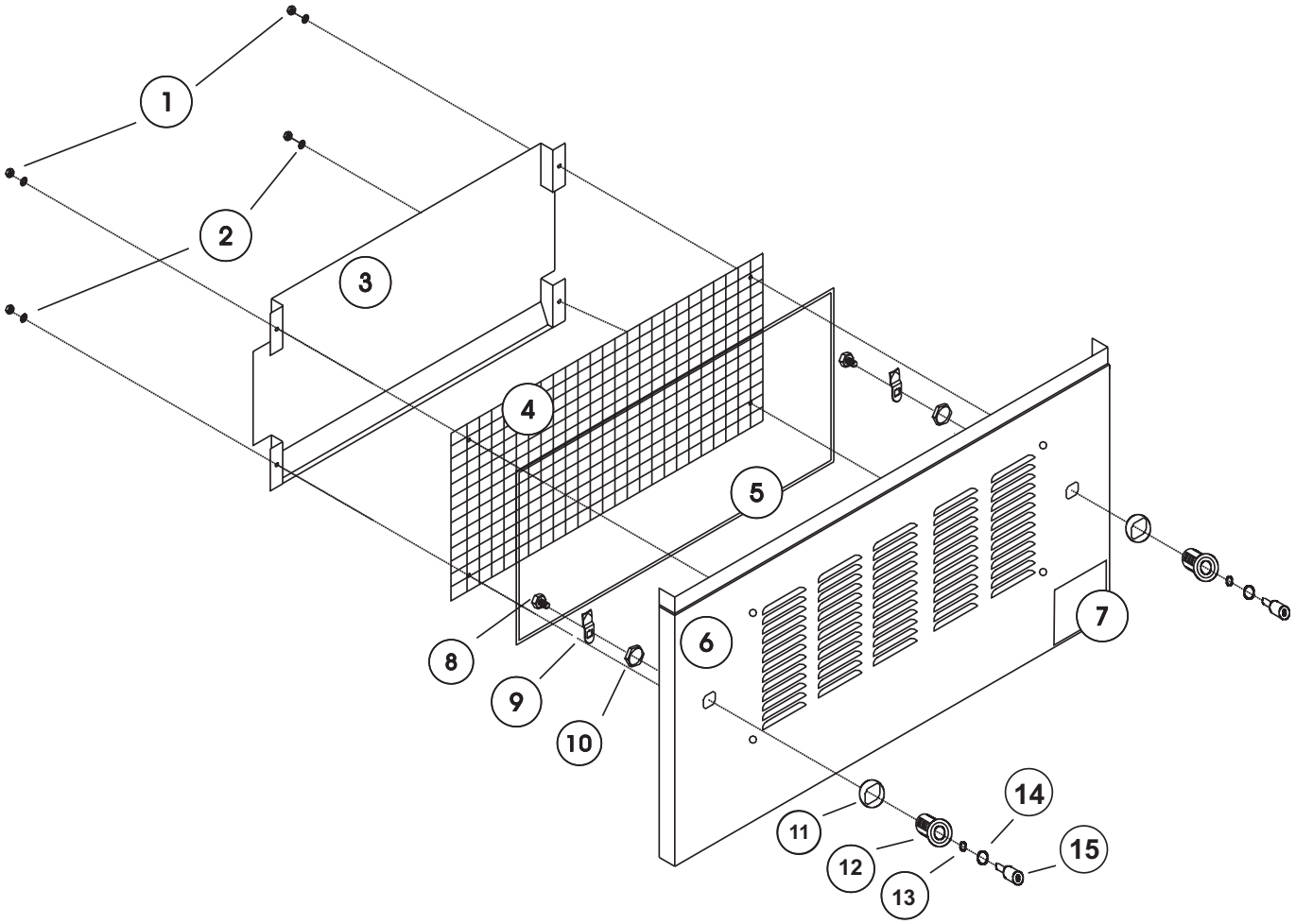

PM-DOOR

DOOR provides locking (locks optional) weather-tight access to the power module. The screen and water baffle prevent insects and water from entering. The door is fabricated from powder-coated 0.090 aluminum for long life. See reverse for door assembly instructions. See Latch for latch assembly instructions. The “Trace Power Systems” decal is usually affixed only to the module that receives a lid.

#	Qty	Part No.	Description
1	4	440	6-32 SS HH nut
2	4	466	#6 SAE flat washer SS
3	1	3214	water baffle
4	1	3215	12” x 24” wire bug screen
5	1	1710	RTV 108 silicone
6	1	Door	
7	1	3355	UL1741 label
bottom	1	2320-1	decal “Trace Power Systems” applied to of door when and included with PM-LID
8-15		Latch	cam-type latches; locks and keys optional

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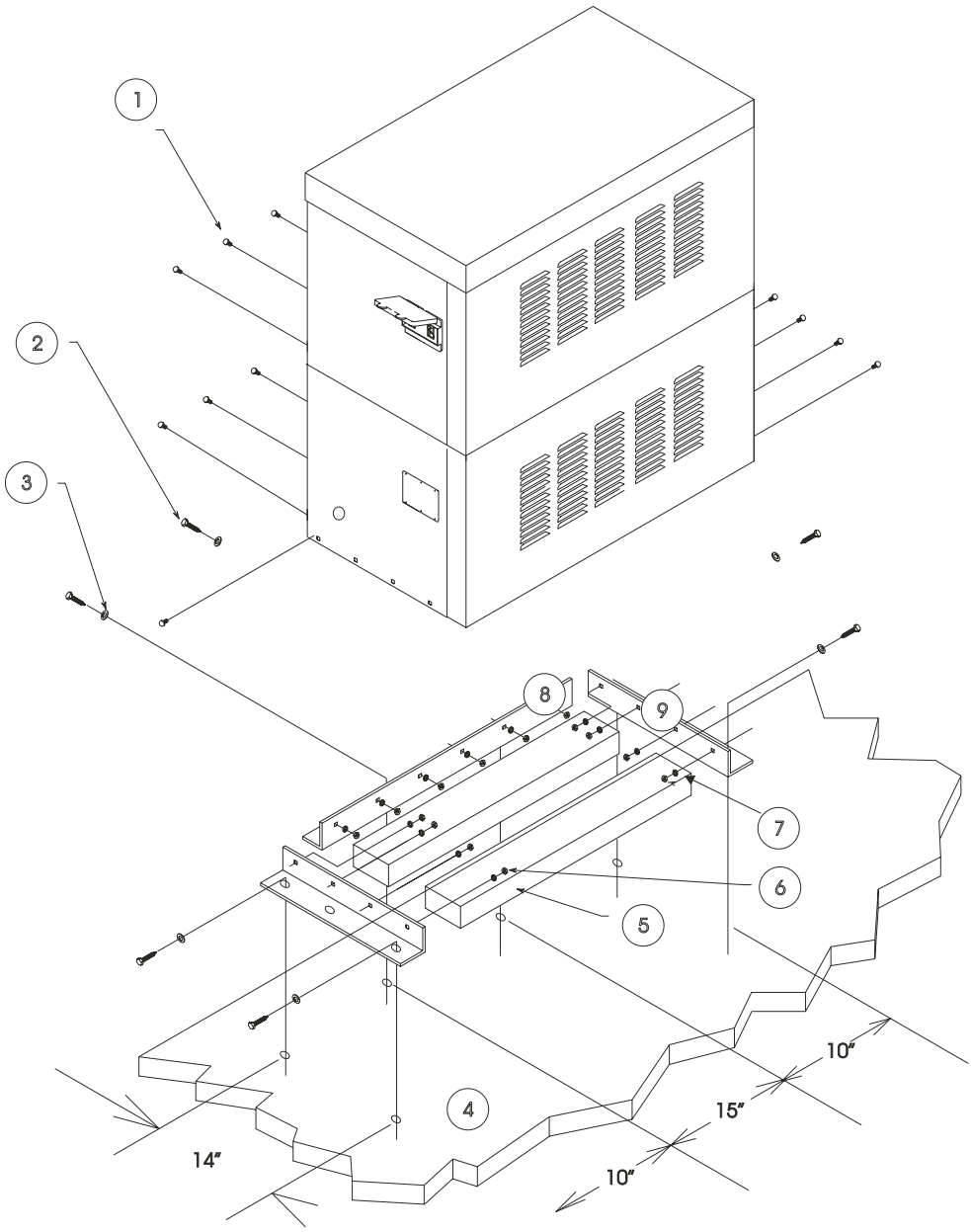

PM-FEET

FEET are required to meet the UL listing requirement for installation. The items with part number US are 'User-Supplied' and are not included in the kit. Secure the enclosures to a concrete slab or timbers before installing any additional equipment, especially batteries. .**Tools Required:** 5/16" open, closed, or socket wrench; torque wrench

Assembly: Set the PM (sides and bottom) inverted upon the work table and attach the feet (if unit is to be the only or the bottom unit of the stack). Secure the feet to the PM with 14 10-24 x 1.5" carriage bolts provided. Place an internal-tooth starwasher on the bolt, insert through the PM and then the bracket, place a flatwasher over the bolt and secure with a 10-24 nut. Repeat 13 times to secure the brackets on three sides. Tighten to 10-12 foot pounds with 5/16" wrench, socket, or nut driver. Starwashers have a sharp and a smooth side. Always place the sharp side against the powder-coated metal.

#	Qty	Part No.	Description
1	14	3190	10-24 x 1.5" carriage bolts
2	6	US	½" x 1½" anchor bolts or lag screws
3	6	US	½ " flat washers
4		US	concrete slab or 4" x 4" timbers
5		US	2" x 4" x 32" pressure-treated lumber
6	14	3192	10-24 SAE SS nut
7	14	465	#10 SAE flat washers
8	1	3209	33.5" x 1.5" x 3/16" 6061 T6 aluminum angle
9	2	3208	17" x 1.5" x 3/16" 6061 T6 aluminum angle

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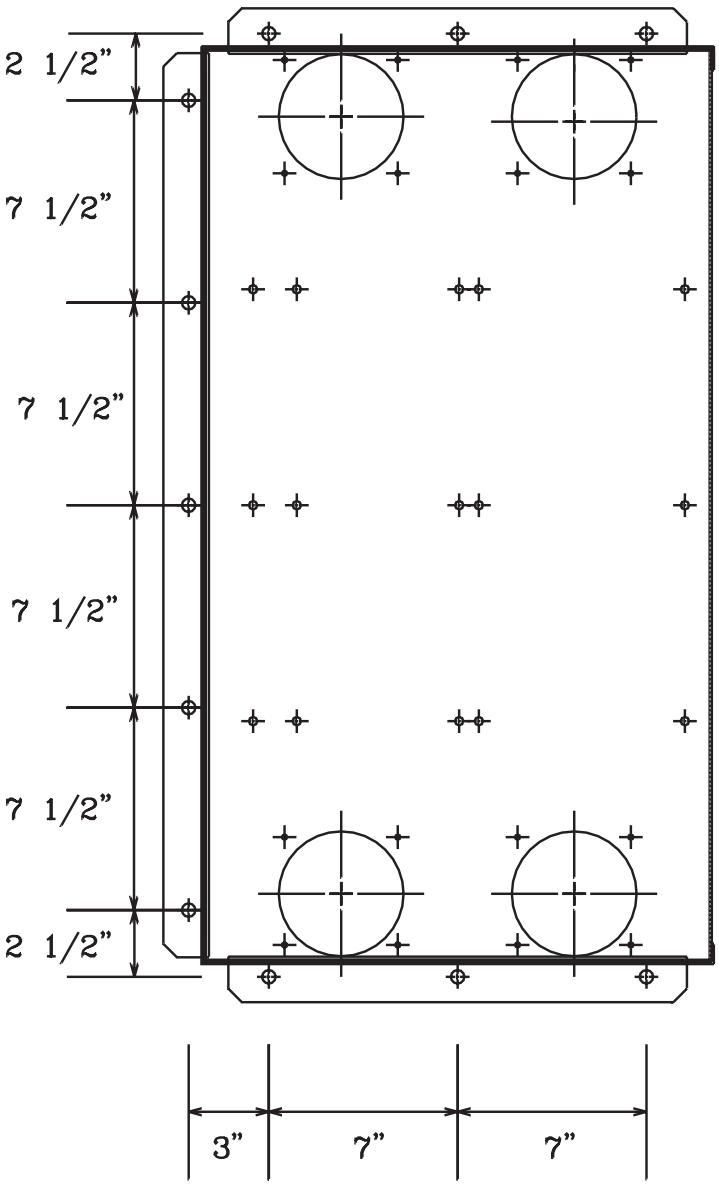

FEET Mounting Diagram

4.3 Base Mounting Instructions

1. Use a 4" concrete slab or treated 4x4 timbers supported by gravel as a pad upon which to mount the modules. If the PM will be mounted outdoors, insure that there is adequate drainage or install a perforated pipe in gravel around the pad leading to a drain field. Be sure that the slab or flooring is strong enough to support the total weight of the modules and prevent the modules from being overturned. Special consideration should be given to flooding and earthquake prone installations. It may be necessary to raise the modules or to fasten them to a supporting wall.

2. Mount Feet to the bottom of the module using 14 -3190 10-24 x 1/2" carriage bolts,14- 465 flat washers and 14-485 10-24 nuts.

3. Using the mounted feet as a template, mark at least six holes for the lag bolts in the concrete or wood platform. A minimum of two bolts should be located on each foot. Alternatively, layout the holes according to the plan shown here.

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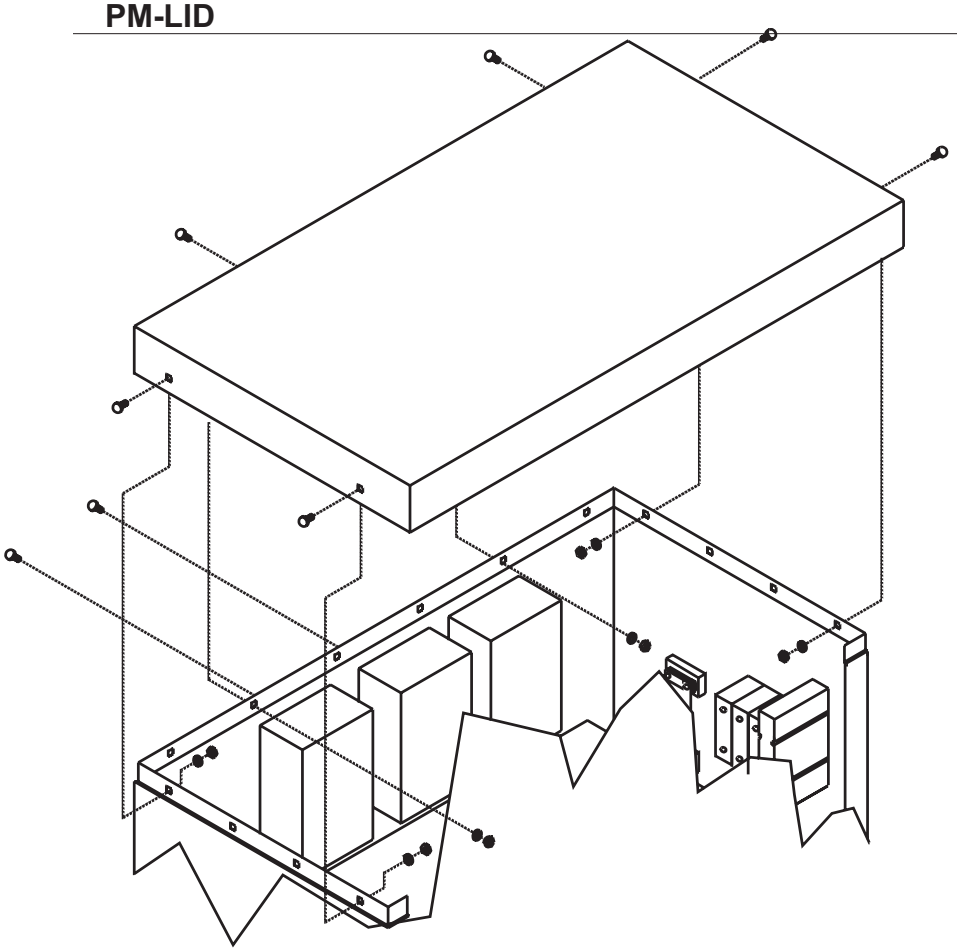

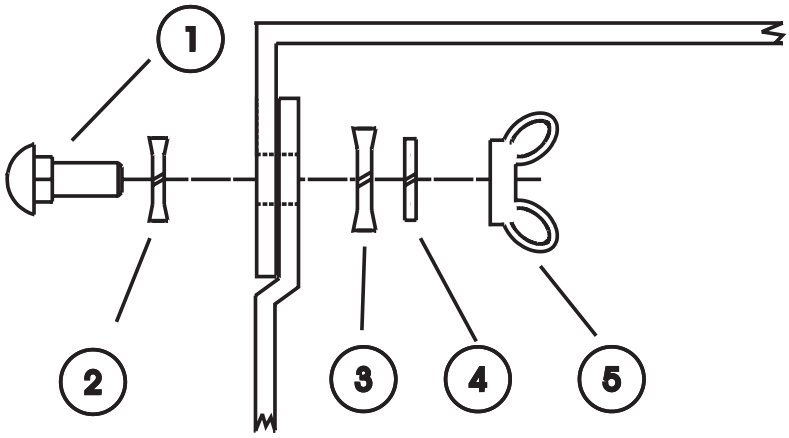

PM-LID

LID also includes FEET, screen mesh for the bottom, plus the door label. At least six fasteners are required to hold the lid to the PM. Slide the lid forward from the rear, then install fasteners. Door slides under the leading edge of the lid and is fastened with latches

#	Qty	Part No.	Description
1	6	3191	10-24 x 1" SS carriage bolt
2	6	485	¼" internal tooth star washer SS
3	6	2147	¼" external tooth star washer SS
4	6	465	#10 SAE flat washer SS
5	6	3329	10-24 wingnut

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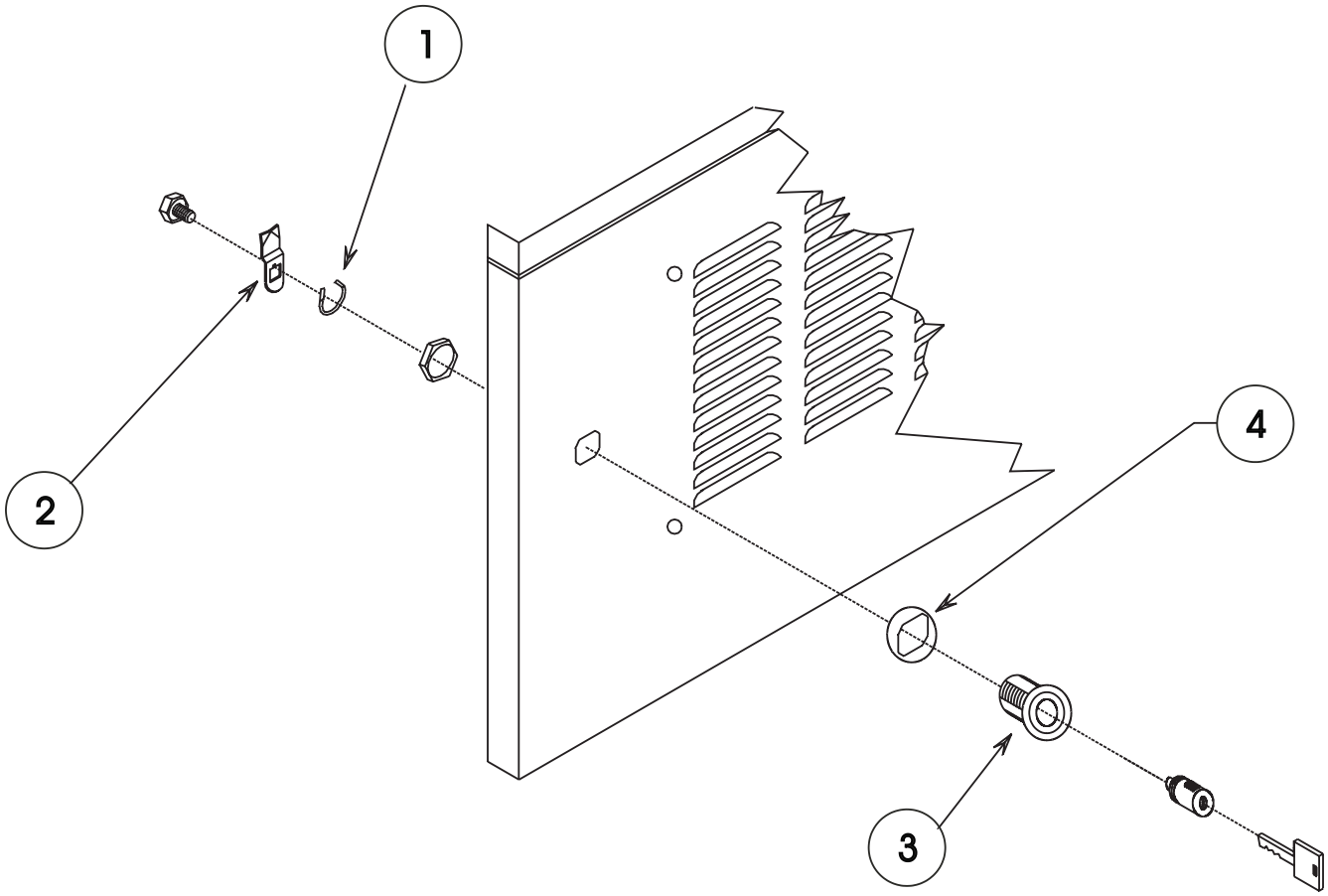

PM-LATCHES & LOCKS

LOCKS converts the existing cam latches to locking latches. In the above illustration, the locking cam is shown in the open position. Orient keys & locking cams in the vertical position upon installation. Locked position is ¼ turn to left (left side) or right (right side). Keys should be in the horizontal position when the unit is locked.

#	Qty	Part No.	Description
1	2		retaining clip
2	2	3260	locking cam
3	2	3259	keyed lock housing
4	2	3218	lock housing seal (locking mechanism optional)

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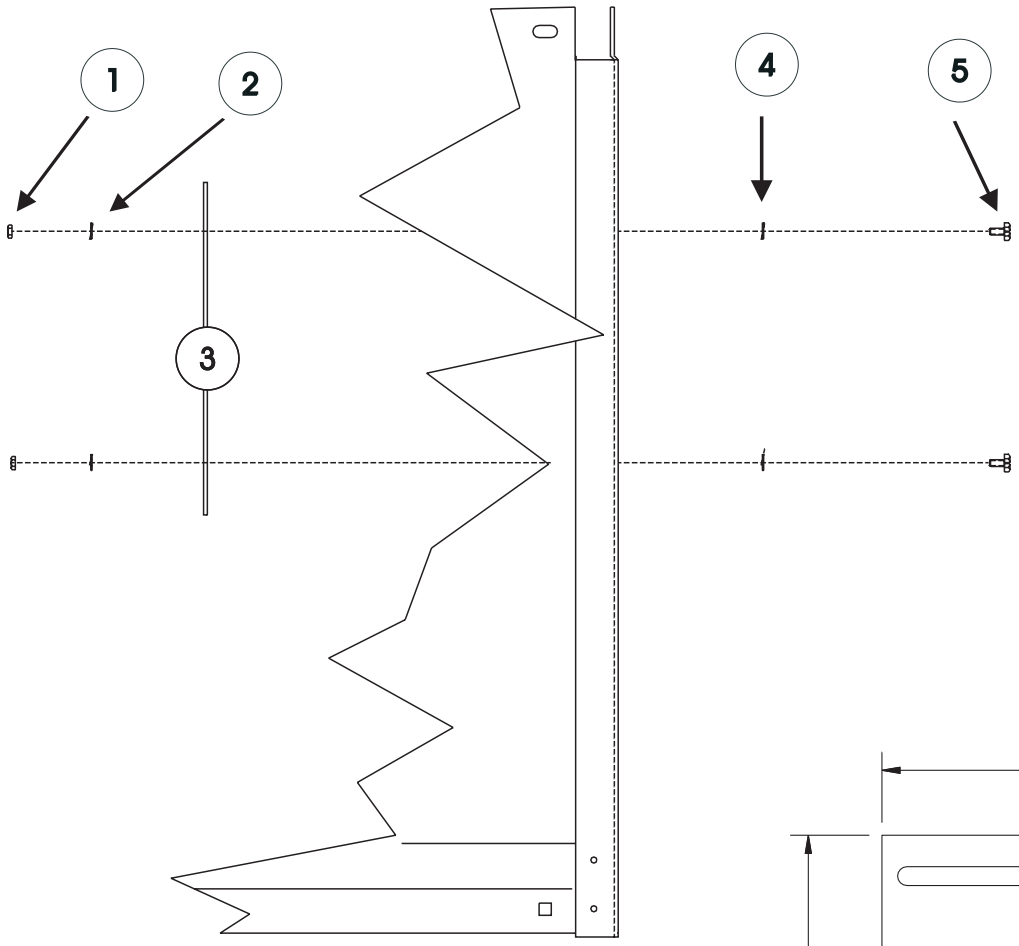

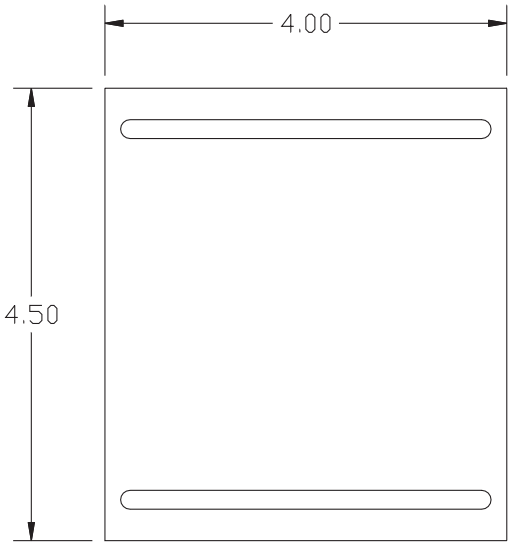

PMO-SLIDER

The PMO-SLIDER accessory is two slotted aluminum plates that cover unused circuit breaker spaces in the cabinets. Each cover is held in place by four dome-headed, stainless-steel carriage bolts that cannot be removed from the exterior of the enclosure. The covers prevent small animals, birds, and insects from entering the cabinet.

#	Qty	Part No.	Description
1	8	440	6-32 HH SS nut
2	8	466	#6 SAE SS flat washer
3	2	3210	slider blank
4	8	466	#6 SAE SS flat washer
5	8	401	6-32 x 3/8" HH SS machine screw

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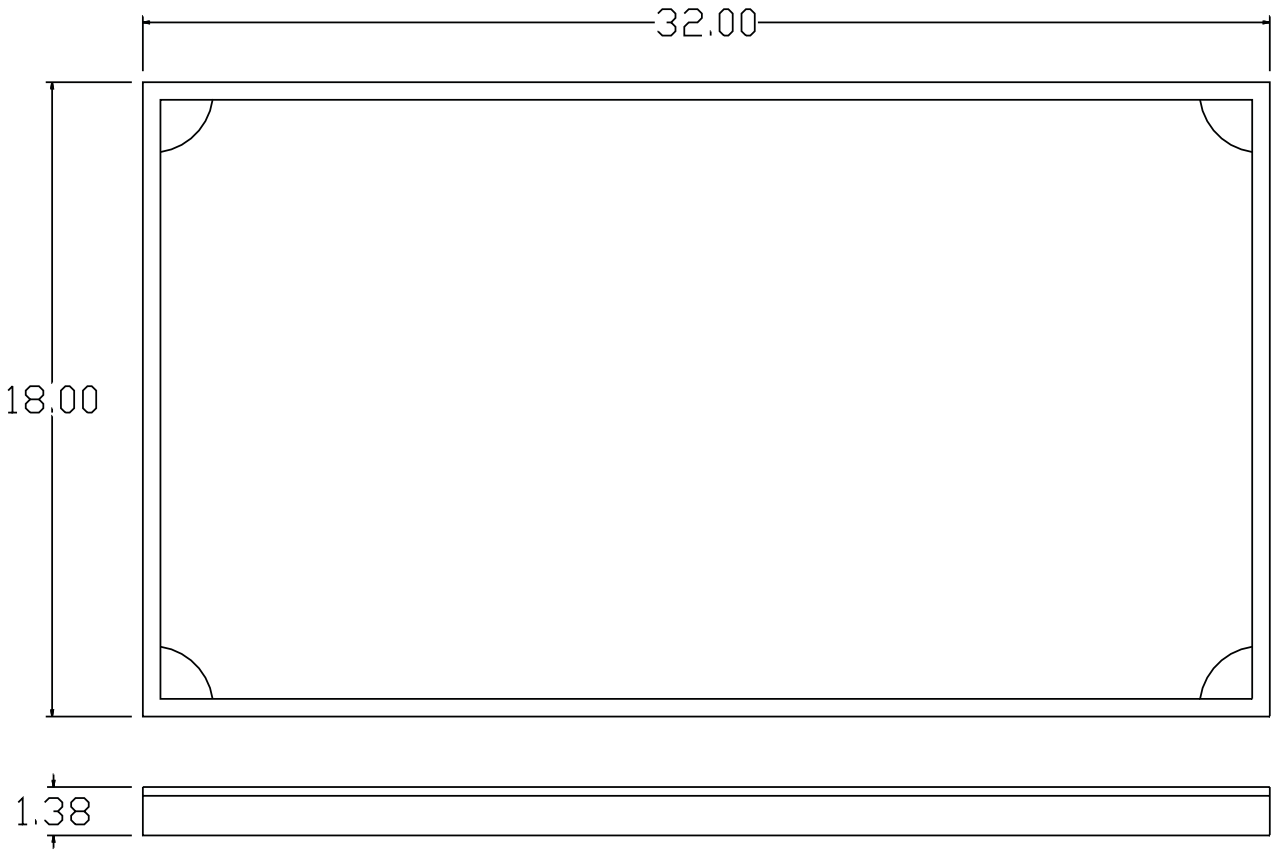

PMO-TRAY

PMO-TRAY is a glass-fiber reinforced battery tray intended to be placed between the batteries and the bottom of the PM to prevent acid from the batteries from spilling on the cabinet and causing corrosion.

#	Qty	Part No.	Description
	1	TRAY	18” X 32” glass-fiber reinforced tray

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Life Support Policy

As a general policy, Trace Engineering, Inc. does not recommend the use of any of its products in life support applications where failure or malfunction of the Trace Engineering product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness. Trace Engineering, Inc. does not recommend the use of any of its products in direct patient care. Trace Engineering, Inc. will not knowingly sell its products for use in such applications unless it receives in writing assurances satisfactory to Trace Engineering, Inc. that (a) the risks of injury or damage have been minimized, (b) the customer assumes all such risks, and the liability of Trace Engineering, Inc. is adequately protected under the circumstances.

Examples of devices considered to be life support devices are neonatal oxygen analyzers, nerve stimulators (whether used for anesthesia, pain relief, or other purposes), autotransfusion devices, blood pumps, defibrillators, arrhythmia detectors and alarms, pacemakers, hemodialysis systems, peritoneal dialysis systems, neonatal ventilator incubators, ventilators for both adults and infants, anesthesia ventilators, and infusion pumps as well as any other devices designated as *critical* by the U.S. FD

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