



# IPP

## Integrated Power Panel

### Version 1.2



## Installation and Wiring Guide



# Integrated Power Panel

Version 1.2

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# IMPORTANT SAFETY INSTRUCTIONS

This manual contains important safety instructions that should be followed during the installation and maintenance of this product.

To reduce the risk of electrical shock, and to ensure the safe installation and operation of this product, the following safety symbols have been placed throughout this manual to indicate dangerous conditions and important safety instructions.



**WARNING** - A dangerous voltage or condition exists in this area.  
Use extreme caution when performing these tasks.

**AVERTISSEMENT** - Une tension ou condition dangereuse existe dans cette zone.  
Faire preuve d'extrême prudence lors de la réalisation de ces tâches.



**CAUTION** - This procedure is critical to the safe installation or operation of the unit. Follow these instructions closely.

**ATTENTION** - Cette procédure est essentielle à l'installation ou l'utilisation de l'unité en toute sécurité. Suivre ces instructions de près.



**NOTE** - This statement is important. Follow instructions closely.

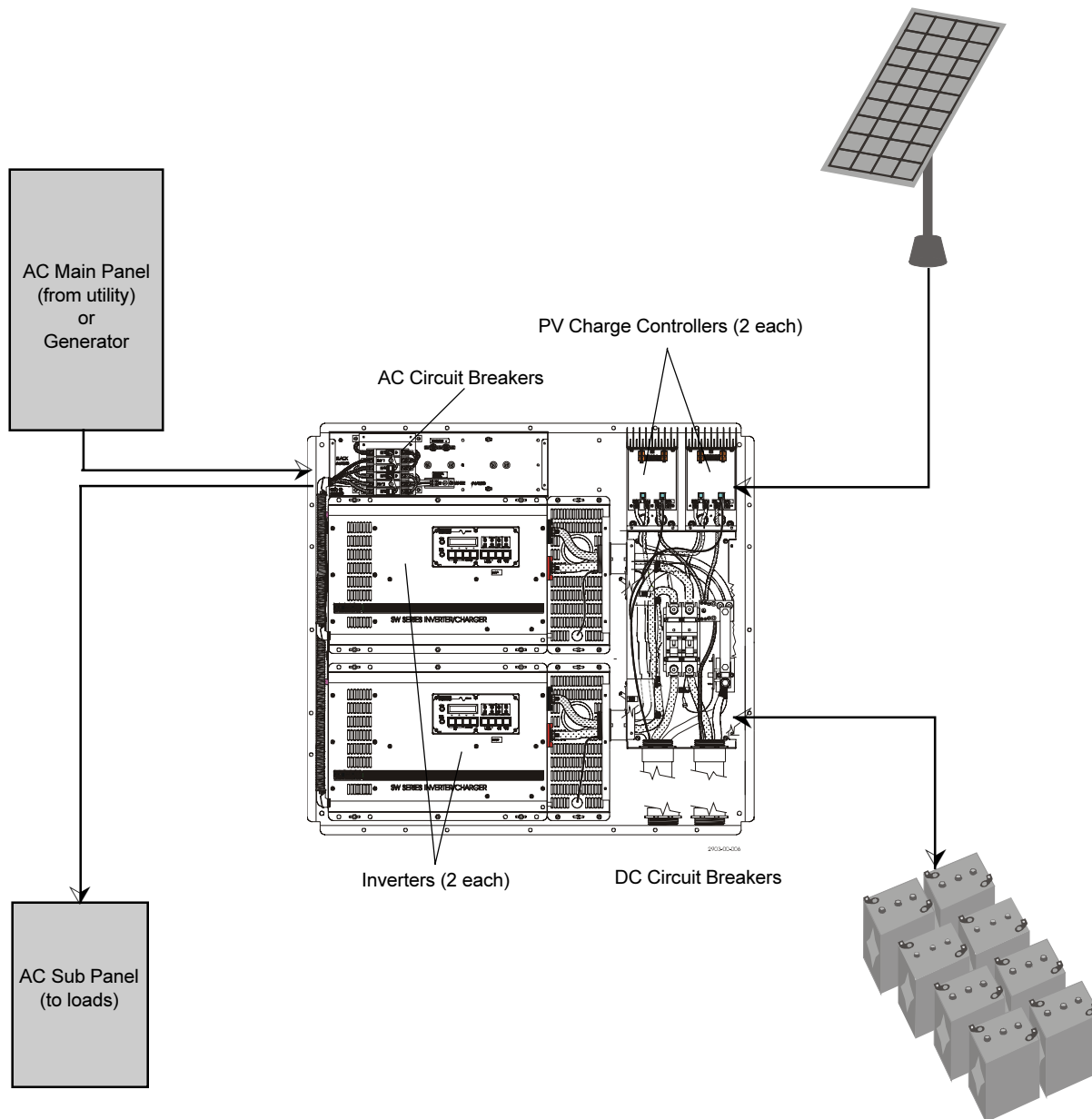
**NOTE** - Cette déclaration est importante. Suivre les instructions de près.

- All electrical work must be done in accordance with local, national, and/or international electrical codes.
- Before installing or using this device, read all instructions and cautionary markings located in (or on) the manual, the inverter, the controller, the batteries, and the PV array.
- Do not expose this unit to rain, snow or liquids of any type. This product is designed only for indoor mounting.
- To reduce the chance of short-circuits when installing or working with the inverter, the batteries, or the PV array, use insulated tools.
- Remove all jewelry such as rings, bracelets, necklaces, etc., while installing this system. This will greatly reduce the chance of accidental exposure to live circuits.
- The inverter contains more than one live circuit (batteries and AC line). Power may be present at more than one source.
- This product contains no user serviceable parts. Do not attempt to repair this unit unless fully qualified.

## SAVE THESE INSTRUCTIONS

# BATTERY SAFETY INFORMATION

- Always wear eye protection, such as safety glasses, when working with batteries.
- Remove all loose jewelry before working with batteries.
- Never work alone. Have someone assist you with the installation or be close enough to come to your aid when working with batteries.
- Always use proper lifting techniques when handling batteries.
- Always use identical types of batteries.
- Never install old or untested batteries. Check each battery's date code or label to ensure age and type.
- Batteries are temperature sensitive. For optimum performance, they should be installed in a stable temperature environment.
- Batteries should be installed in a well vented area to prevent the possible buildup of explosive gasses. If the batteries are installed inside an enclosure, vent its highest point to the outdoors.
- When installing batteries, allow at least 1 inch of air space between batteries to promote cooling and ventilation.
- NEVER smoke in the vicinity of a battery or generator.
- Always connect the batteries first, then connect the cables to the inverter or controller. This will greatly reduce the chance of spark in the vicinity of the batteries.
- Use insulated tools when working with batteries.
- When connecting batteries, always verify proper voltage and polarity.
- Do not short-circuit battery cables. Fire or explosion can occur.
- In the event of exposure to battery electrolyte, wash the area with soap and water. If acid enters the eyes, flood them with running cold water for at least 15 minutes and get immediate medical attention.
- Always recycle old batteries. Contact your local recycling center for proper disposal information.



**Figure 1**  
**Integrated Power Panel**  
 (layout varies depending upon type of inverter)

The Power Panel is a self-contained power conversion center designed around two styles of Trace inverters: the DR Series and the SW Series. The inverter type determines the physical component layout. Typically, a power panel contains at least one inverter, ac and dc disconnect circuit breakers, and a battery temperature sensor. Optional PV solar controllers and disconnects can be added to the system at the time of order, or added later. The inverters, controllers (if ordered) and protection circuitry are fully integrated into a single enclosure to ensure safety and reliability. Each power panel is ETL listed to UL standard 1741 (Draft), and comes pre-wired and tested at the factory to maximize system performance and ease of operation.

Installing a power panel is as simple as mounting it to the wall and connecting a dc source (PV array, batteries, etc.), an ac source (utility power, generator, etc.), and ac loads (via a sub-panel).

Power Panels feature:

- Trace DR Series or SW Series inverter/charger(s)
- AC circuit protection
- DC circuit protection

Trace DR Series inverters feature:

- 1500, 2400 or 3600 watt continuous output
- Modified sinewave output with voltage and frequency regulation
- High efficiency, high surge capacity and low idle current
- Three-stage battery charging for optimum battery performance
- Automatic low battery protection
- Fast switching for standby power applications
- Stackable capabilities for 120/240 V ac powering applications

Trace SW Series inverters feature:

- 2500, 4000 or 5500 watt continuous output
- Sinewave output with superior voltage and frequency regulation
- Intelligent generator control - automatic start and stop
- Programmable generator "quiet time" for areas with noise curfews
- Frequency matching and phase synchronization - parallel operation for maximum generator efficiency
- Microprocessor control for maximum flexibility and reliability
- Three-stage battery charging for optimum battery performance
- Automatic low battery protection
- Stackable capabilities for 120/240 V ac powering applications

Optional features:

- PV charge controller(s) with array disconnect(s)
- Battery cables with flex conduit

Trace products are built rugged and designed to provide you with years of trouble-free service. Recognized throughout the world as a leader in the field of alternative energy, Trace Engineering ensures your system fully meets your quality expectations and powering needs. We thank you for your purchase and welcome you to the exciting world of environmentally friendly, alternative powering.

## 2.0 INSTALLATION

### Pre-Installation

Before installing the power panel, read all instructions and cautionary markings located in this manual.



**NOTE:** The power panel is quite heavy (weighing up to 400 pounds depending upon configuration). Always use proper lifting techniques during installation to prevent personal injury.

**Mounting:** The power panel should be mounted indoors in a clean, dry environment. If the panel must be installed in close proximity to the batteries, make sure the area is adequately ventilated to the outside.

#### Tools required:

|                            |                 |
|----------------------------|-----------------|
| #2 Phillips screw driver   | Level           |
| 1/4" Slotted screw driver  | Wire strippers  |
| 1/2" open-end wrench       | Torque wrench   |
| Socket wrench and fittings | Electrical Tape |
| Multimeter                 | Pencil          |
| Hole saw                   | Utility knife   |

#### Hardware / Materials required:

- 4' x 8' sheet of 3/4" plywood
- #12 wood screws (or 3/4" x 1-1/4" lag bolts)
- #10 wood screws
- 1/4" x 3" lag bolts
- Conduit and appropriate fittings
- Wire nuts (if allowed by code)

#### Wiring:

All wiring and installation methods should conform to applicable electrical and building codes.

Pre-plan the wire and conduit runs. The ac terminal blocks accept up to a #6 AWG wire; the dc circuit battery disconnects accept cable sizes up to #4/0 AWG. Use #4/0 AWG for a 250 amp dc disconnect and #2/0 AWG for a 175 amp dc disconnect.

For maximum safety, run both ac and dc wires/cables in (separate) conduits.

#### AC Connections:

Use #6 AWG THHN wire for all ac wiring.

#### DC Connections:

Battery to inverter cabling should be only as long as required. If #4/0 AWG cables are used for example, do not exceed 5 feet (one way) in 12 V dc systems; 10 feet (one way) in 24 V dc systems; or, 15 feet (one way) for 48 V dc systems. For optimum performance, use pre-assembled battery cables from Trace, designed specifically for this application.

#### Grounding:

##### AC Grounding

The power panel should be connected to a grounded, permanent wiring system. Neutral and Ground conductors should only be bonded at the main service panel.

##### DC Grounding

The negative battery conductor should be bonded to the grounding system at only one point in the system. The size for the conductor is usually based on the size of the largest conductor in the dc system.



## Pre-Installation *(continued)*

### Batteries:

The battery voltage **MUST** match the voltage requirements of the inverter. To determine the correct voltage for the system, check the last two digits on the inverter's model number. For example, the DR1512 is a 12 volt inverter and requires a 12 V dc battery system. The SW4024 is a 24 volt inverter and requires a 24 V dc battery system.

### PV Arrays:

The optional controller is designed to work with a wide variety of PV array systems. **DO NOT** connect the controller to an array operating at more than 110 V dc.



**WARNING: WHENEVER A PV ARRAY IS EXPOSED TO SUNLIGHT, A SHOCK HAZARD EXISTS AT THE OUTPUT CABLES OR EXPOSED TERMINALS. TO REDUCE THE RISK OF SHOCK DURING INSTALLATION, DISCONNECT THE ARRAY, OR COVER IT WITH AN OPAQUE (DARK) MATERIAL BEFORE MAKING ANY CONNECTIONS TO THE POWER PANEL.**

### Main Service Panel:

The main input to the Power Panel requires a minimum 60 amp breaker for each 120 V ac inverter. A 15 amp breaker is required for all 230 V ac inverters.

### Sub-Panel:

Loads backed up by the Power Panel will need to be rerouted from the main service panel to a sub-panel. This can be done several different ways, depending upon the installation. Always refer to electrical codes for safe wiring practices.

### AC Circuit Breakers:

Always use a properly rated circuit breaker. Depending upon the application, circuit breakers used to protect the load can be removed from the main service panel and put into the sub-panel **ONLY** if the two panels are from the same manufacturer and are the same type of service panel.

### Wire Routing:

Determine all wire routes both to and from the Power Panel. Possible routing scenarios include:

- AC Input wiring from the main service panel to the Power Panel
- AC Input wiring from the generator to the Power Panel
- DC Input wiring from the PV array to the Power Panel
- DC Input wiring from the batteries to the Power Panel
- AC Output wiring from the Power Panel to the sub-panel
- Battery Temperature Sensor cable from the Power Panel to the batteries
- Remote Control cable to the Power Panel
- DC Ground from the batteries to an external ground rod
- Load circuit wiring rerouted from the main service panel to the sub-panel

Check for existing electrical or plumbing prior to making cuts in the walls. Cut holes in the walls at appropriate locations for routing wiring/cables.

### Plywood Backing:

A 4' x 8' x 3/4" plywood backing may be used to provide additional wall support. It should run the entire height of the wall (floor to ceiling). For aesthetic purposes, pre-paint the plywood.



**NOTE:** 3/4" plywood backing is required for supporting walls where the total weight exceeds 300 lbs (136 kg).

## 2.0 INSTALLATION

### Mounting:

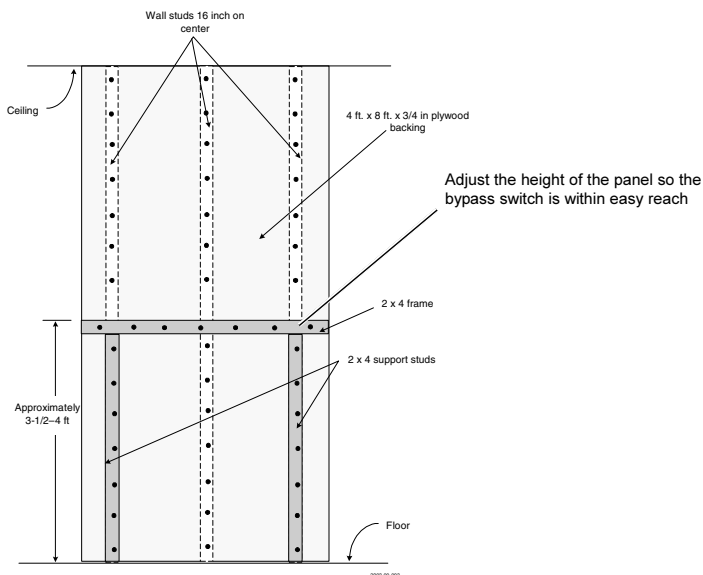


NOTE: The mounting recommendations and instructions contained in this section have been developed to meet seismic code requirements according to the 1997 Uniform Building Code for all seismic regions within the United States. This applies to light wood framed structures such as those commonly found in residential construction. If the Power Panel is to be mounted to a structure that is not a residential-type wood framed wall, and/or the mounting wall supports more than one floor and one roof simultaneously, or if the structure is classified as a commercial or industrial building, contact the local building inspector for further information before proceeding with this installation.

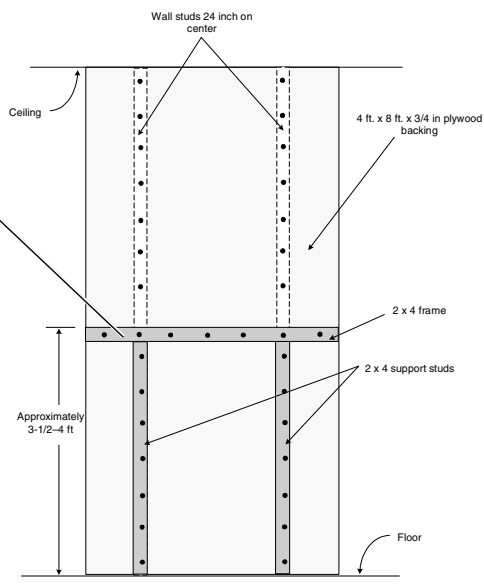
The Power Panel can be installed on either a load bearing or non-load bearing wall. Depending upon the Power Panel's components, it can weigh as much as 400 lbs (182 kg). A 4' x 8' x 3/4" sheet of plywood (floor to ceiling) is recommended to provide additional wall strength. The plywood backing is required for Power Panels weighing more than 300 lbs (136 kg) installed on load bearing walls.

### Procedure

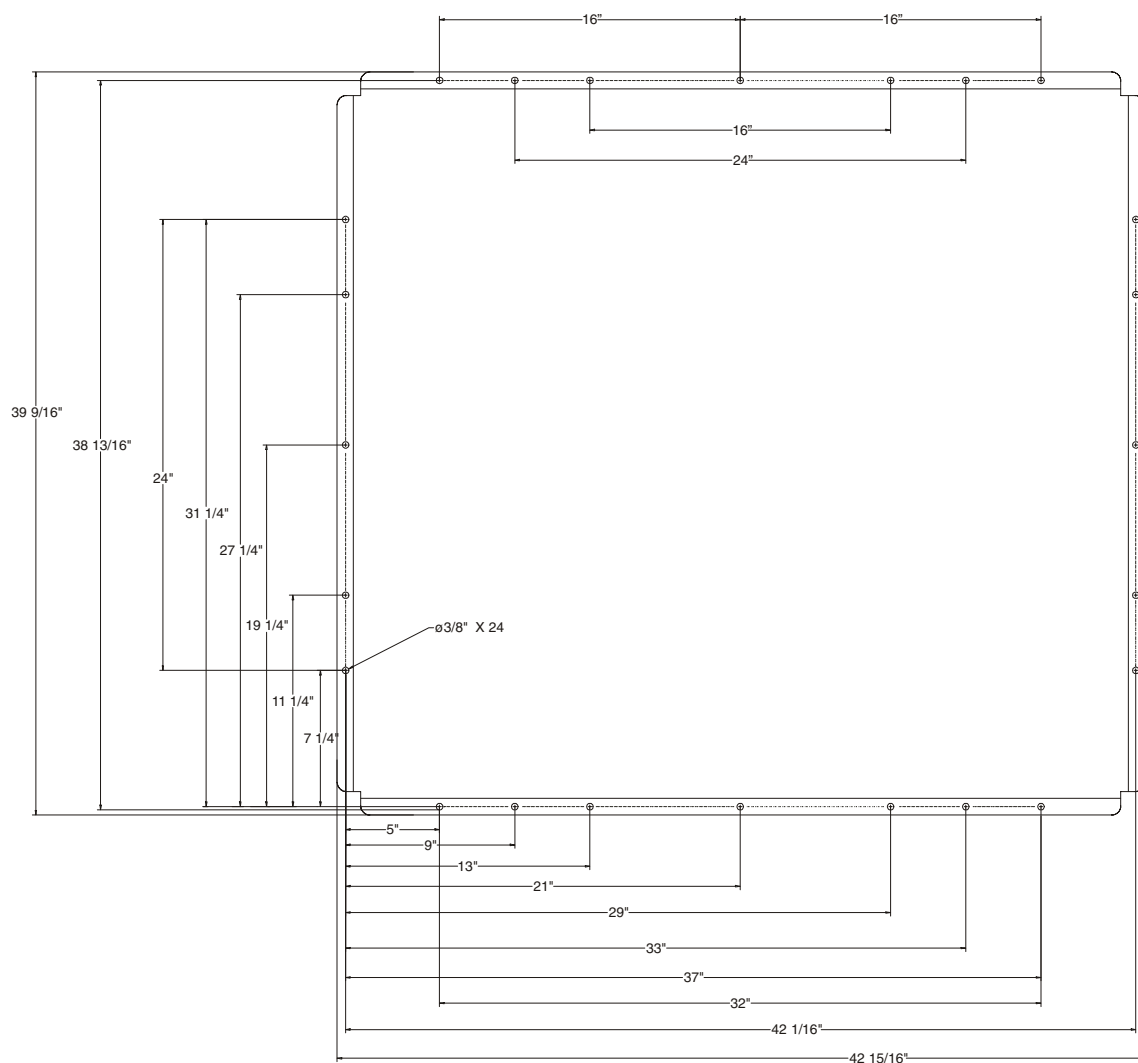
1. Locate the studs in the wall (either 16" or 24" on center) and mark their locations.
2. If plywood is used, apply adhesive to the back and center it on the wall. Secure it into the studs and around the perimeter using #12 wood screws on 6" spacing. Counter sink the screws. Paint the plywood to match the surrounding wall color if desired.
3. Using 2 x 4's, build a frame for holding the Power Panel in place while it is being secured. The top of the frame should be approximately 3-1/2 to 4 feet from the floor. Use 3" x 1/4" lag bolts (on 6" centers) to mount the 2 x 4. Keep all screws at least 3/4" away from the top of the horizontal 2 x 4 to allow the bottom flange of the Power Panel to slip behind it. See Figures 2 and 3.
4. Drill pilot holes according to the dimensions in Figure 4.
5. With the help of a friend, lift the Power Panel into position. It should be centered (and level) on the plywood. Secure the Power Panel using #10 wood screws (on 16" center) or #12 wood screws (on 24" center) through each of the holes in the backing panel. Avoid hitting the wood screws. Screws must penetrate 1-3/4" into the framing.



**Figure 2**  
**Power Panel Support Structure**  
**(16" on-center studs)**

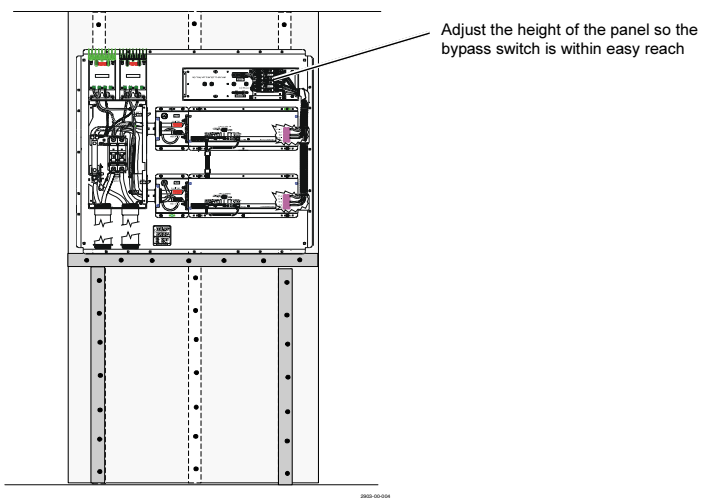


**Figure 3**  
**Power Panel Support Structure**  
**(24" on-center studs)**



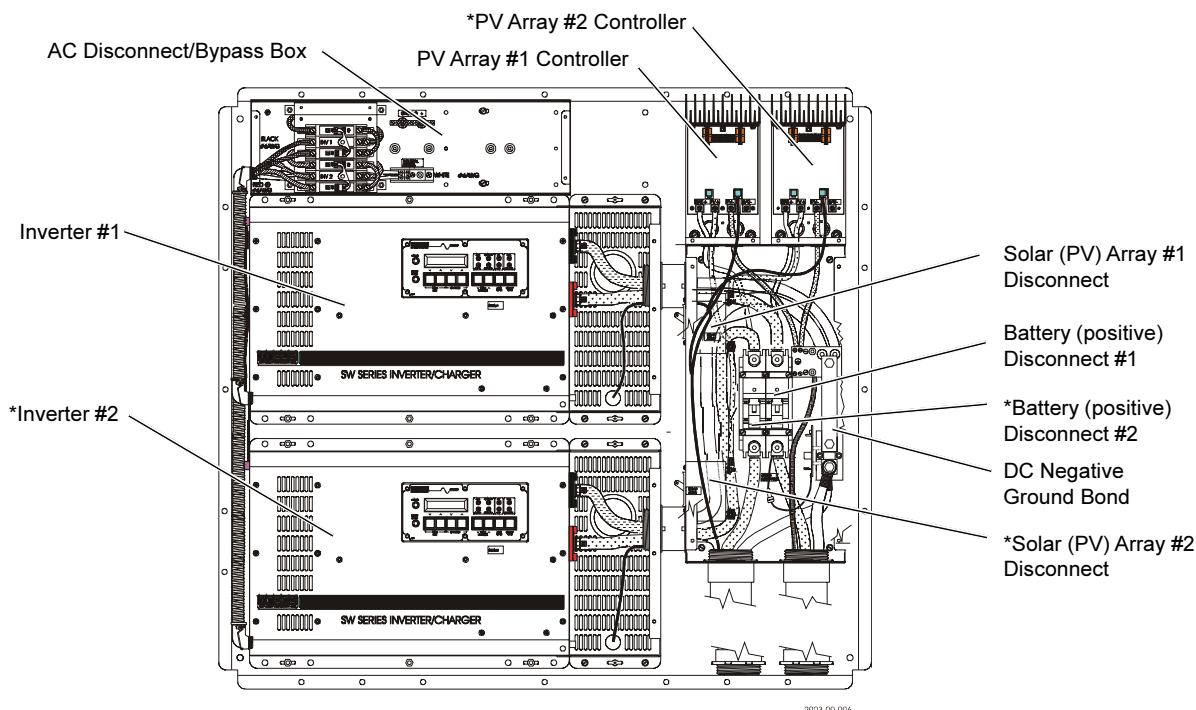
2903-00-020

**Figure 4**  
**Mounting Hole Dimensions**

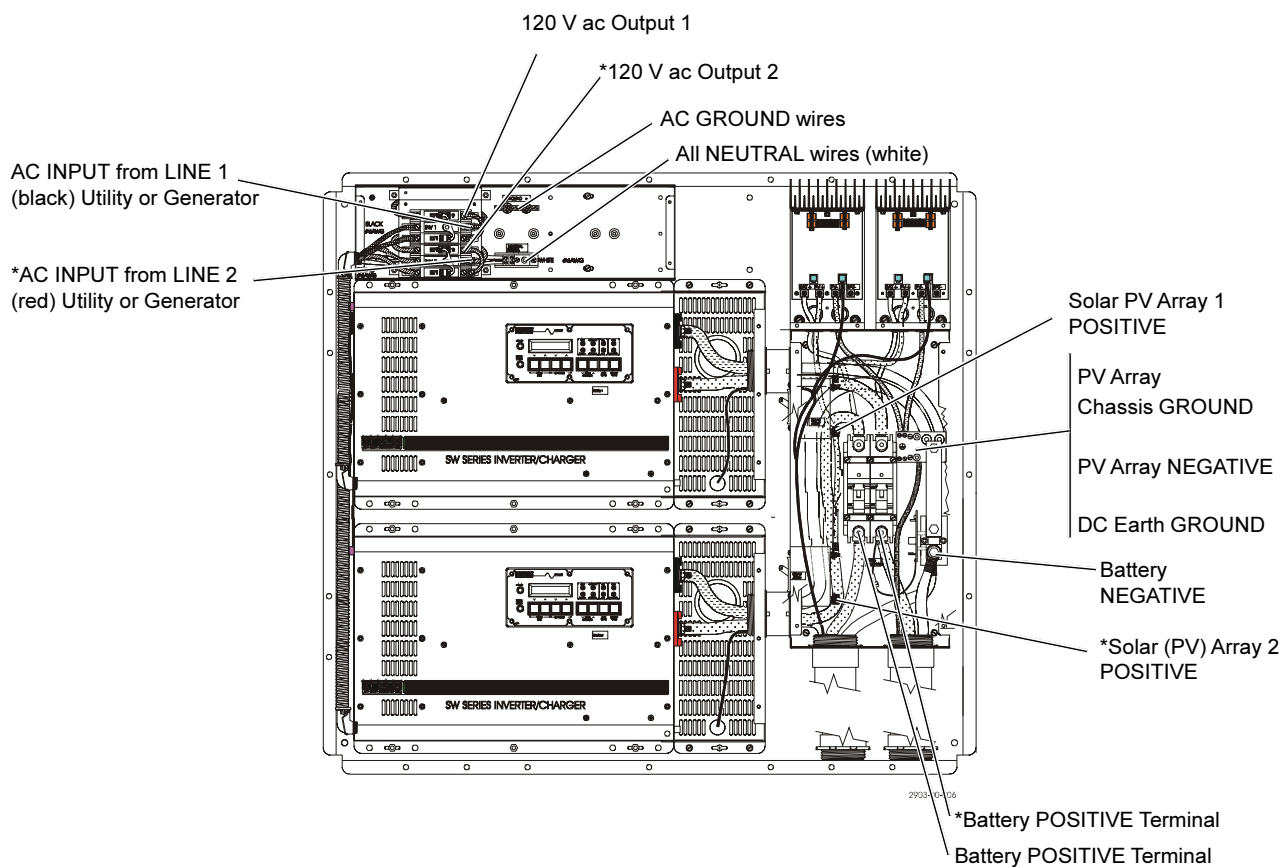


**Figure 4A**  
**Mounted Power Panel**


## 2.0 INSTALLATION

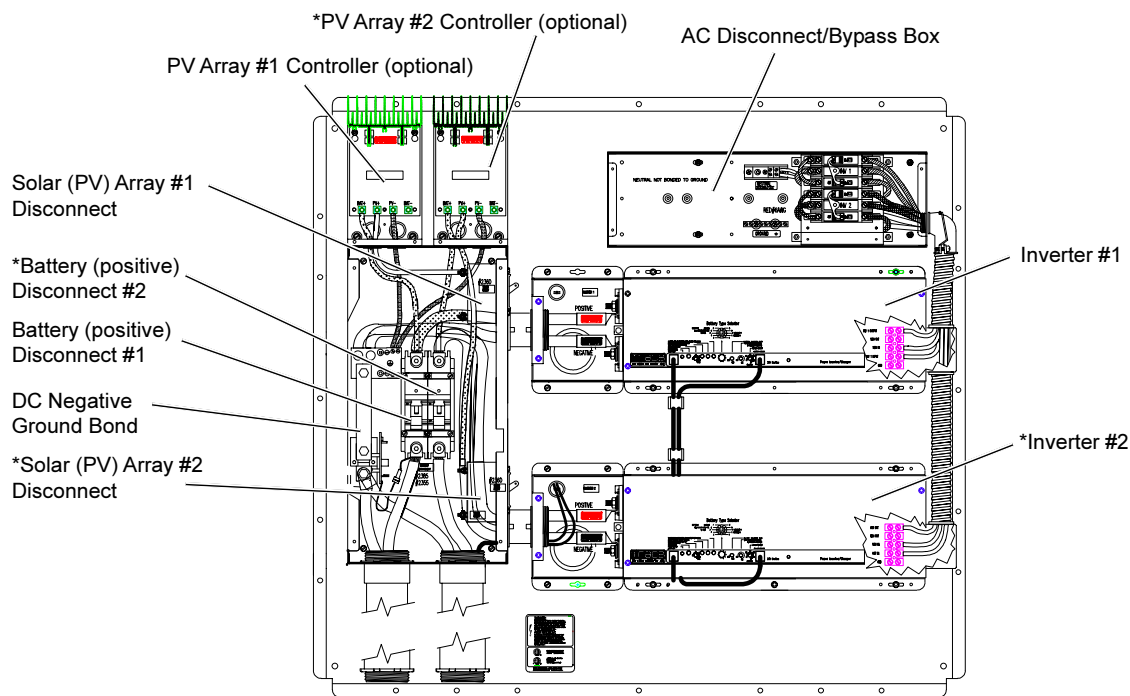


**Figure 7**  
**Component Locations (SW Model)**

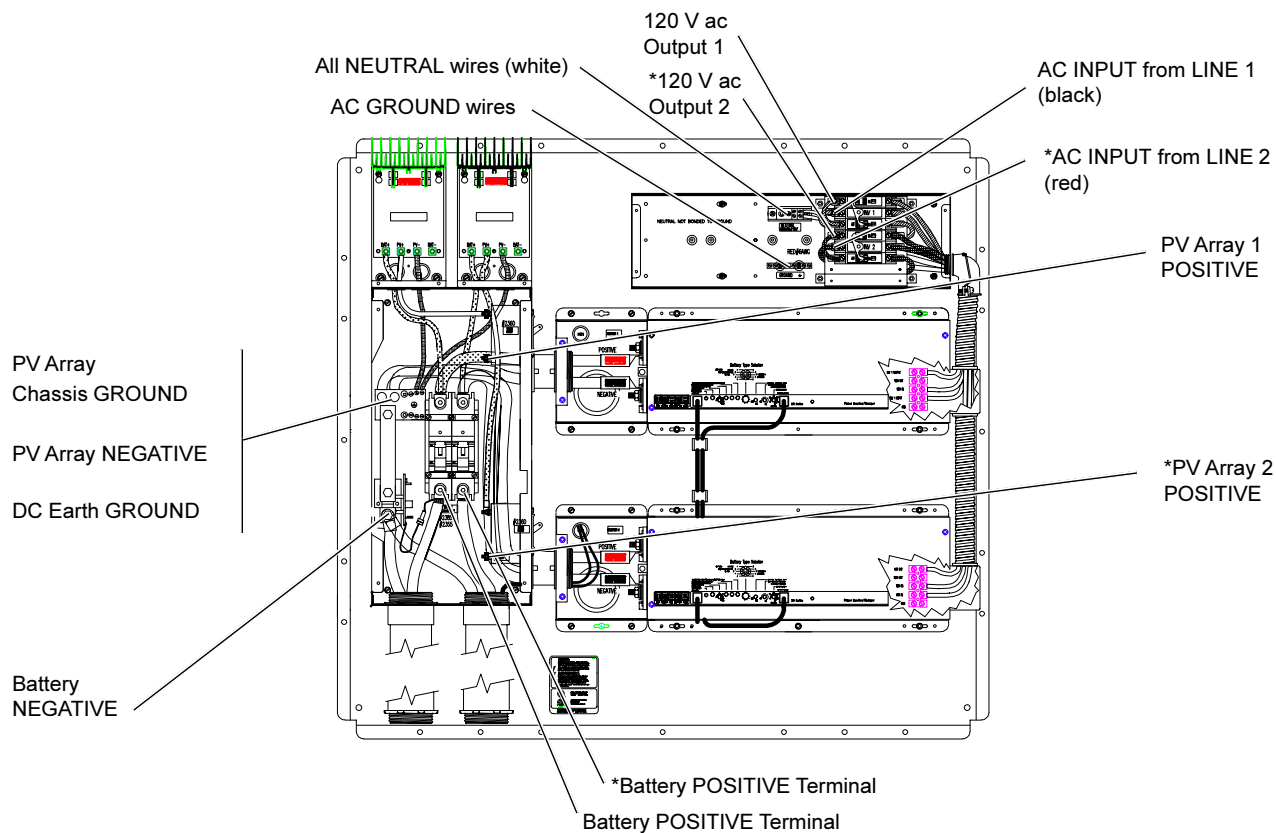


**Figure 8**  
**Wire Connection Locations (SW Model)**

 NOTE: Items marked with an astric (\*) are only applicable to dual inverter/controller models.



**Figure 5**  
**Component Locations (DR Model)**



**Figure 6**  
**Wire Connection Locations (DR Model)**



NOTE: Items marked with an astrict (\*) are only applicable to dual inverter/controller models.

## 2.0 INSTALLATION

### Wiring:

#### DC Wiring

The dc wiring enters the DC Disconnect Box through the conduit located on the bottom of the disconnect box. Use #6 AWG wire for the PV array connections.

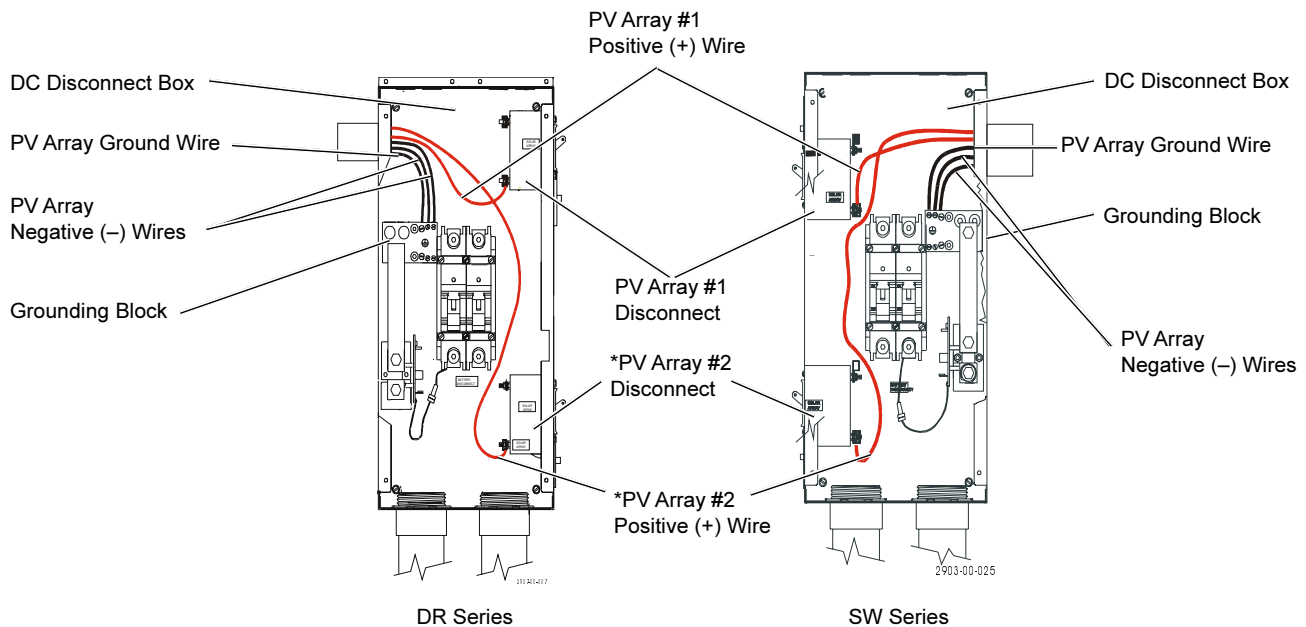
#### PV Array

If a PV array is used in the system, connect the wiring as follows:



**NOTE:** For dual controller models, split the PV array's output evenly between the two PV Array Disconnects.

1. Route the wires from the PV array through the conduit located at the bottom of the DC Disconnect Box.
2. Connect the positive (+) wire from the #1 array to the lower terminal of the PV Array #1 Disconnect breaker.
3. Connect the positive (+) wire for the #2 array to the lower terminal of the PV Array #2 Disconnect.
4. Connect the negative (–) wires from the array(s) to the Grounding Block.
5. Connect the ground wire(s) from the frame of the PV array to the Grounding Block.
6. Ensure all connections are snug.



**Figure 9**  
**Wire Connection Locations**



**NOTE:** Items marked with an astrict (\*) are only applicable to dual controller models. For clarity, wiring not used in this step may not be shown.

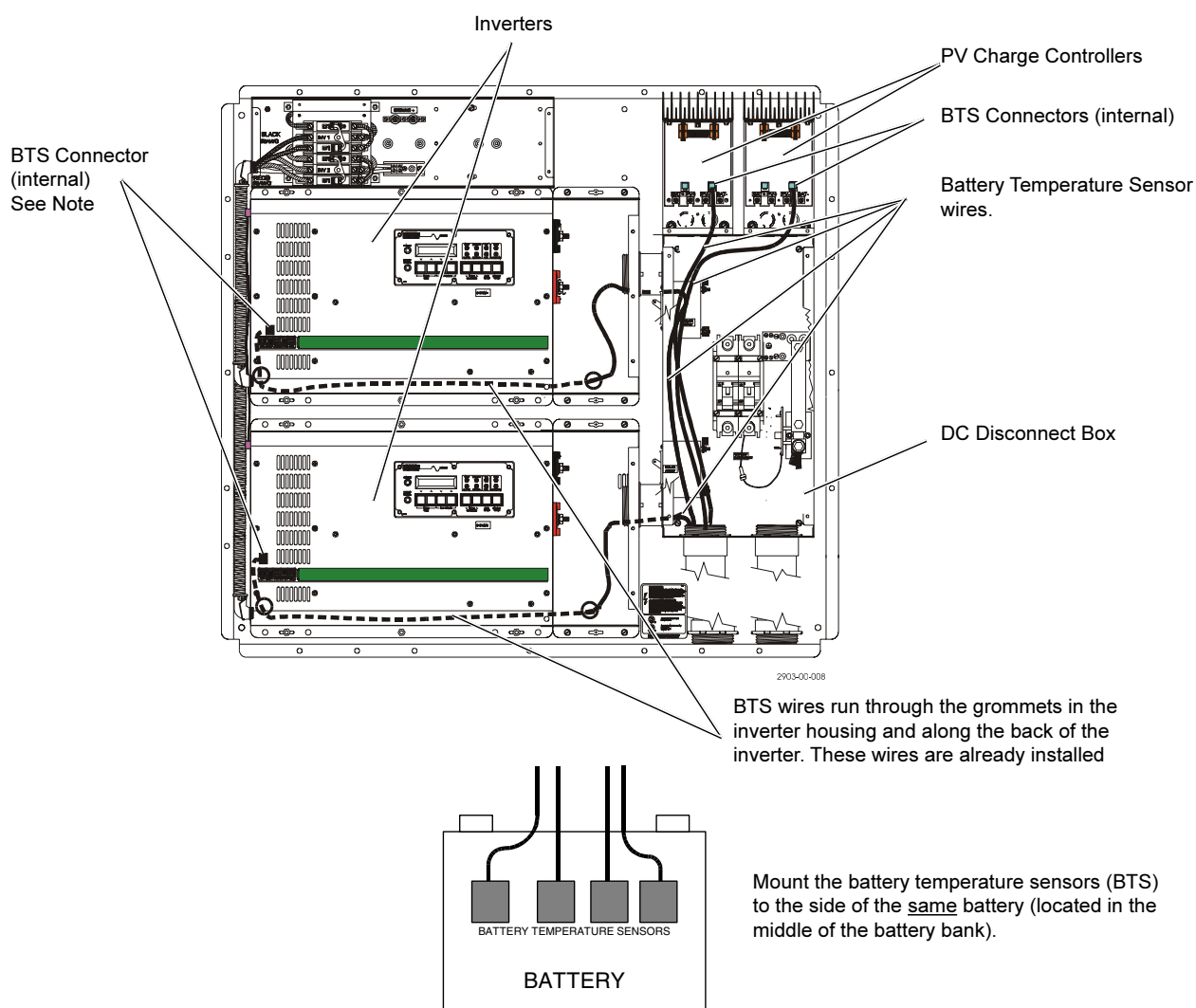
## Battery Temperature Sensor (BTS) Wiring (SW Models)

Battery Temperature Sensors (BTS) should be placed on the side of the battery. They transmit temperature information to the charger and adjust the charging rate according to the battery temperature. Up to four sensors can be connected in a dual inverter system with two charge controllers.

1. Locate the battery temperature sensors and route them down through the conduit in the DC Disconnect Box to the batteries.
2. Place all sensors onto the side of same battery (located in the middle of the battery bank) to prevent different charging rates based on temperature variances.



NOTE: Temperature sensor cables are already connected to the inverters and PV controllers (if ordered). The cables only need to be run through the conduit to the batteries.



**Figure 10**  
**Battery Temperature Sensor (BTS) Wiring**



NOTE: For clarity, wiring not used in this step may not be shown.  
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## 2.0 INSTALLATION

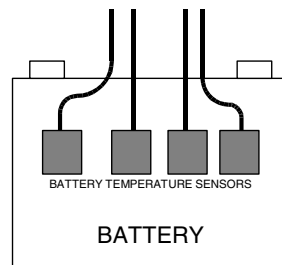
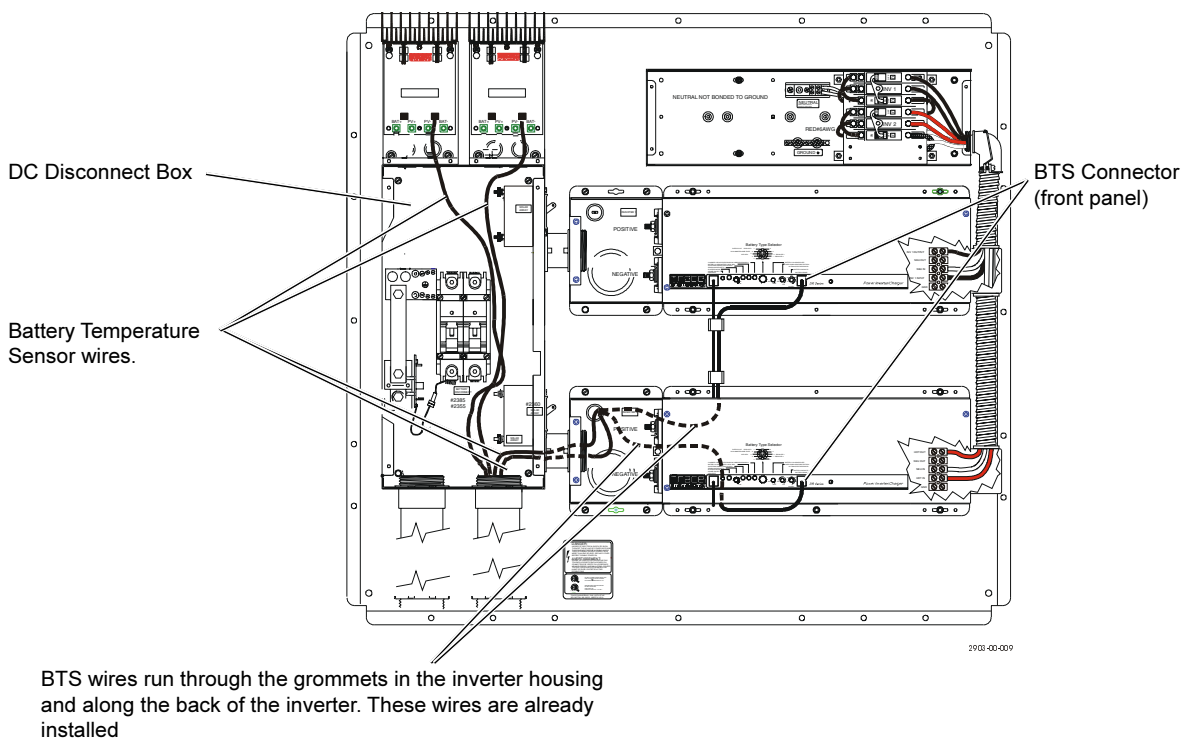
### Battery Temperature Sensor Wiring (DR Models)

Battery Temperature Sensors (BTS) should be placed on the side of the battery. They transmit temperature information to the charger and adjust the charging rate according to the battery temperature. Up to four sensors can be connected in a dual inverter system with two charge controllers.

1. Locate the battery temperature sensors and route them down through the conduit in the DC Disconnect Box to the batteries.
2. Place all sensors onto the side of same battery (located in the middle of the battery bank) to prevent different charging rates based on temperature variances.



NOTE: Temperature sensor cables are already connected to the inverters and PV controllers (if ordered). The cables only need be run through the conduit to the batteries.



Mount the battery temperature sensors (BTS) to the side of the same battery (located in the middle of the battery bank).

**Figure 11**  
**Battery Temperature Sensor (BTS) Wiring**




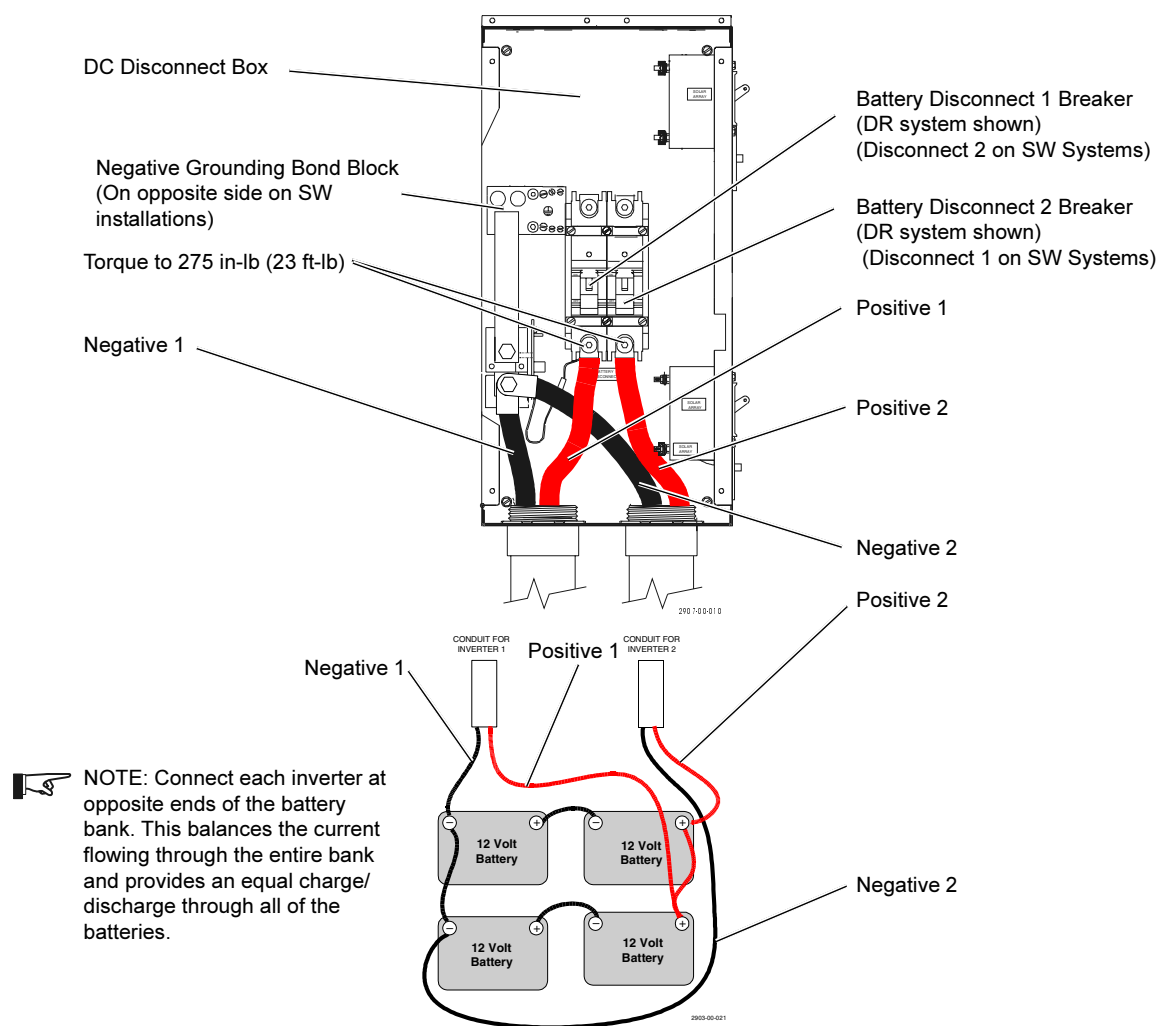
## Battery Wiring

Route the battery cables through the conduit to the DC Disconnect Box. Use a minimum of #4/0 AWG wire for a 250 amp battery disconnect breaker (or #2/0 AWG for a 175 amp battery disconnect breaker). Smaller diameter wire results in poor inverter performance and the risk of fire due to the wires overheating.

- Connect the Negative wires to the negative grounding bond block and tighten connections.
- Connect a Positive wire to one of the lower terminals on the Battery Disconnect breaker.
- Connect the other Positive wire to the lower terminal on the second Battery Disconnect breaker.
- Torque Battery breaker connections to 275 in-lb (23 ft-lb), (31 N-m). Refer to battery manufacturer's specifications for battery terminal torque specifications.
- After torquing, coat the battery connections with petroleum jelly or other anticorrosion grease designed for battery terminals. Do not put any anticorrosion grease between the terminals and the battery cable.

 **NOTE:** Use only one battery bank for both inverters. Refer to Figure 12 for an example of a battery hookup.

 **NOTE:** Refer to the inverter's Operator's manual for more detailed examples of battery hookups (i.e., 12 V, 24 V and 48 V).



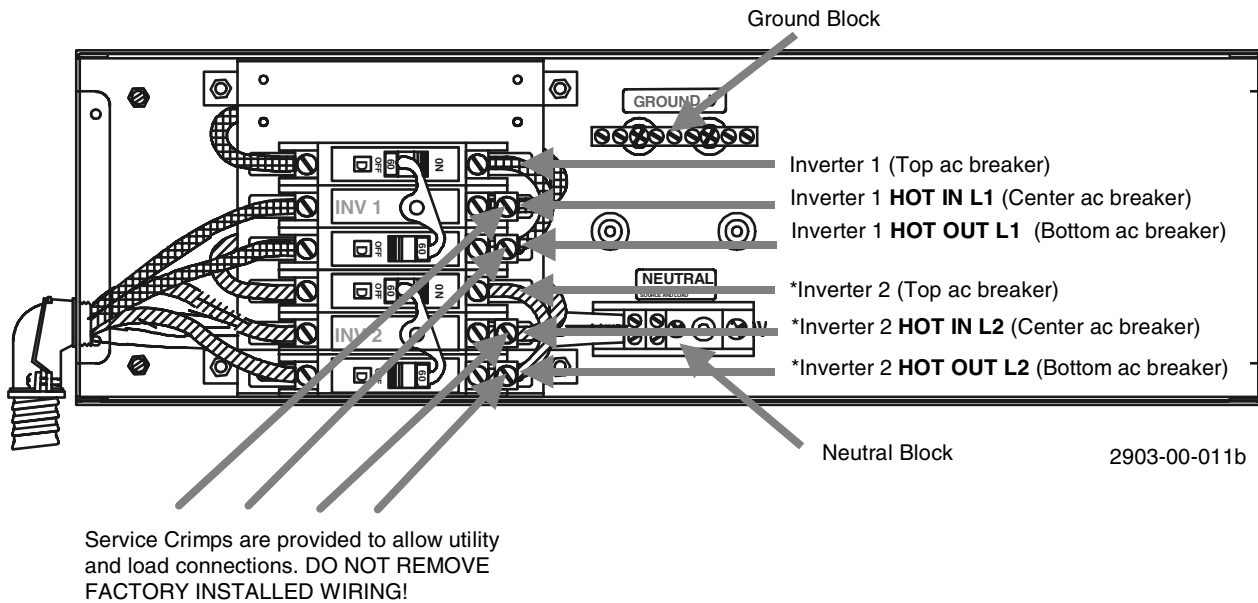
**Figure 12**  
**Battery Wiring (24 v dc System)**

## 2.0 INSTALLATION

### AC Wiring—SW Series Dual Inverter Models



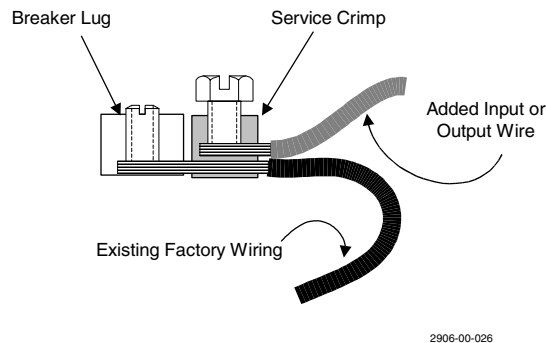
**WARNING: THIS SECTION DEALS WITH WIRING THE MAIN SERVICE UTILITY PANEL TO THE POWER PANEL. ENSURE THAT ALL AC POWER TO THE UTILITY PANEL IS SWITCHED OFF.**



**Figure 13**  
**SW Series AC Disconnect Component Identification**



**NOTE:** Service Crimps, provided on the breaker terminals, are for external input (utility) and output (load) wiring. Do NOT remove existing factory wiring or screws.



**Figure 14**  
**Breaker Terminal Lug Detail (side view)**

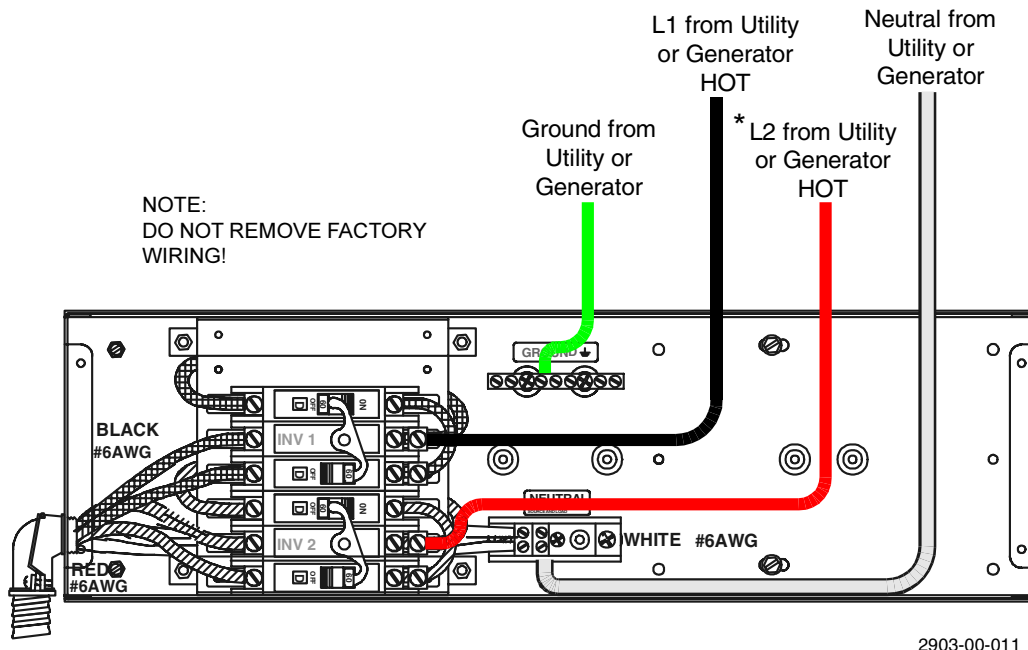
## AC Wiring—SW Series Dual Inverter Models *(continued)*

### AC Input Wiring To The AC Bypass Box

- Select a convenient knockout on the AC Disconnect/Bypass Box for installing conduit which will carry the wires from the main utility panel or generator.
- Install a 60 amp circuit breaker in the main utility service panel for each ac input to the inverters.
- Use #6 AWG THHN wire (minimum) and route it through the conduit to the AC Disconnect/Bypass Box.
- Connect the Ground from the main utility box to the ground terminal in the AC Disconnect/Bypass Box as indicated in Figure 15.
- Connect the L1 (Hot-black) wire to the INVERTER 1 HOT IN L1 (center ac breaker) as indicated in Figures 13 and 15.
- \*Connect the L2 (Hot-red) wire to the INVERTER 2 HOT IN L2 (center ac breaker) as indicated in Figures 13 and 15.
- Connect the Neutral wire from the main utility box to the Neutral block in the AC Disconnect/Bypass box as indicated in Figure 15.
- Torque service crimps to 45 in-lb (3.75 ft-lb), (5 N-m).



NOTE: The Ground and Neutral are bonded only at the main utility service panel.



**Figure 15**  
**AC Input Wiring**



NOTE: Items marked with an astric (\*) are applicable to dual inverter models only.

## 2.0 INSTALLATION

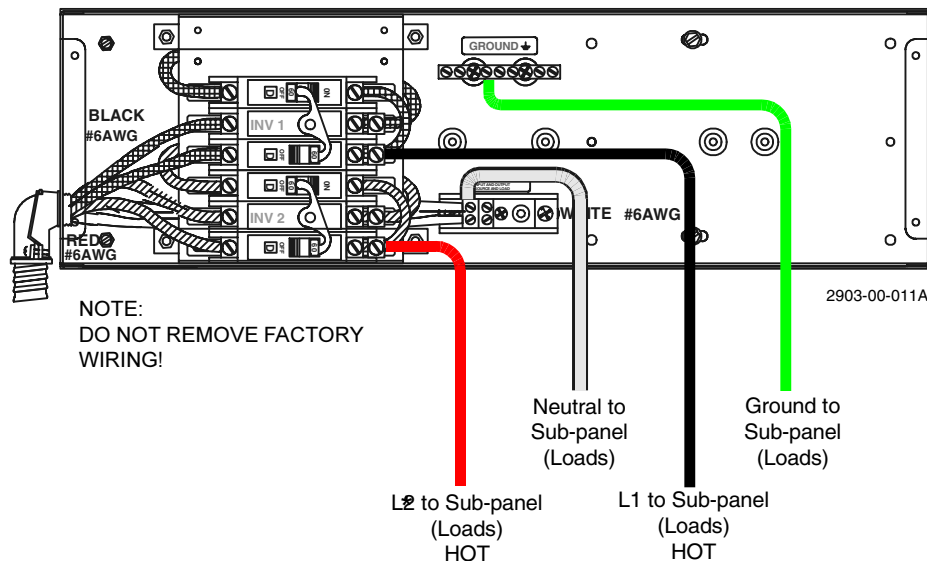
### AC Wiring—SW Series Dual Inverter Models *(continued)*

#### AC Output Wiring To AC Bypass Box

- Select a convenient knockout on the AC Disconnect/Bypass Box for installing conduit which will carry the wires from the inverter's output to the sub-panel.
- Use #6 AWG THHN wire (minimum) and route it through the conduit between the AC Disconnect/Bypass Box and the sub-panel.
- Connect the Ground wire to the Ground block in the AC Disconnect/Bypass Box. Connect the other end to the sub-panel's Ground Bar.
- Connect the L1 (Hot-black) wire to the INVERTER 1 HOT OUT L1 as indicated in Figures 13 and 16.
- \*Connect the L2 (Hot-red) wire to the INVERTER 2 HOT OUT L2) as indicated in Figures 13 and 16.
- Connect the Neutral wire to the Neutral block in the AC Disconnect/Bypass Box. Connect the other end to the sub-panel's Neutral Bar.
- Torque service crimps to 45 in-lb (3.75 ft-lb), (5 N-m).



NOTE: The Ground and Neutral are bonded only at the main utility service panel.



**Figure 16**  
**AC Output Wiring**



NOTE: Items marked with an astrict (\*) are applicable to dual inverter models only.

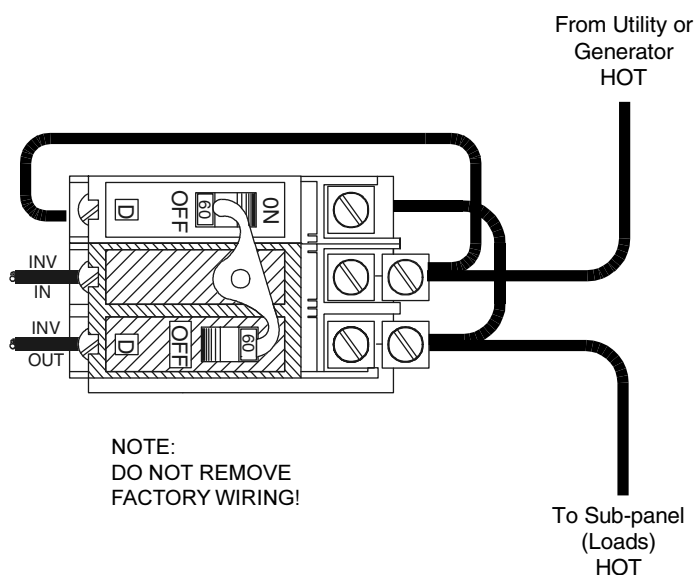
## AC Wiring—SW Single Inverter Models

### AC Input/Output Wiring To AC Bypass Box

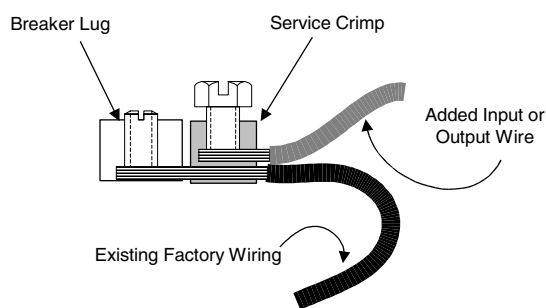
- Connect the Ground wire to the Ground block in the AC Disconnect/Bypass Box. Connect the other end to the sub-panel's Ground Bar.
- Connect the Hot (input) wire from the utility service panel to the AC Disconnect breaker as shown in Figure 17.
- Connect the Hot wire (output) to the AC Disconnect breaker as shown in Figure 17. Connect the other end of this wire to the input breaker in the sub-panel.
- Connect the Neutral wire to the Neutral block in the AC Disconnect/Bypass Box. Connect the other end to the sub-panel's Neutral Bar.
- Torque service crimps to 45 in-lb (3.75 ft-lb), (5 N-m).



NOTE: The Ground and Neutral are bonded only at the main utility service panel.



**Figure 17**  
**AC Input/Output Wiring (Single Inverter Models)**



2906-00-026

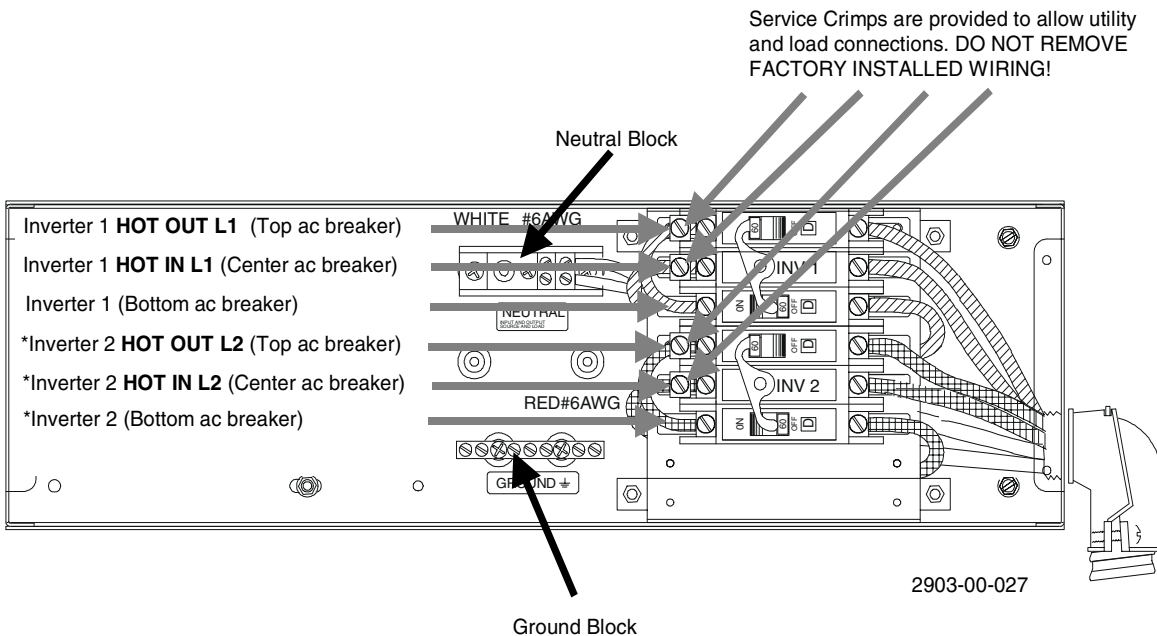
**Figure 17A**  
**Breaker Terminal Lug Detail (side view)**

## 2.0 INSTALLATION

### AC Wiring—DR Series Dual Inverter Models



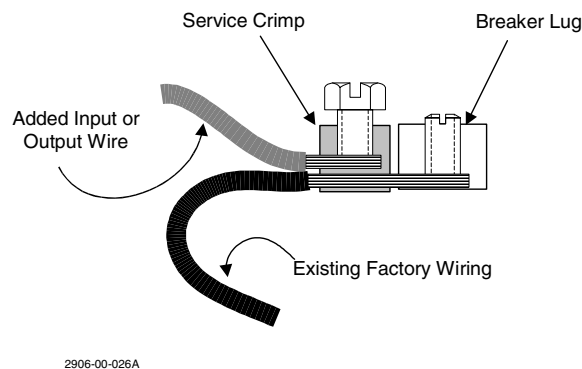
**WARNING: THIS SECTION DEALS WITH WIRING THE MAIN SERVICE UTILITY PANEL TO THE POWER PANEL. ENSURE THAT ALL AC POWER TO THE UTILITY PANEL IS SWITCHED OFF.**



**Figure 18**  
**DR Series AC Disconnect Component Identification**



**NOTE:** Service Crimps, provided on the breaker terminals, are for external input (utility) and output (load) wiring. Do NOT remove existing factory wiring or screws.



**Figure 19**  
**Breaker Terminal Lug Detail (side view)**

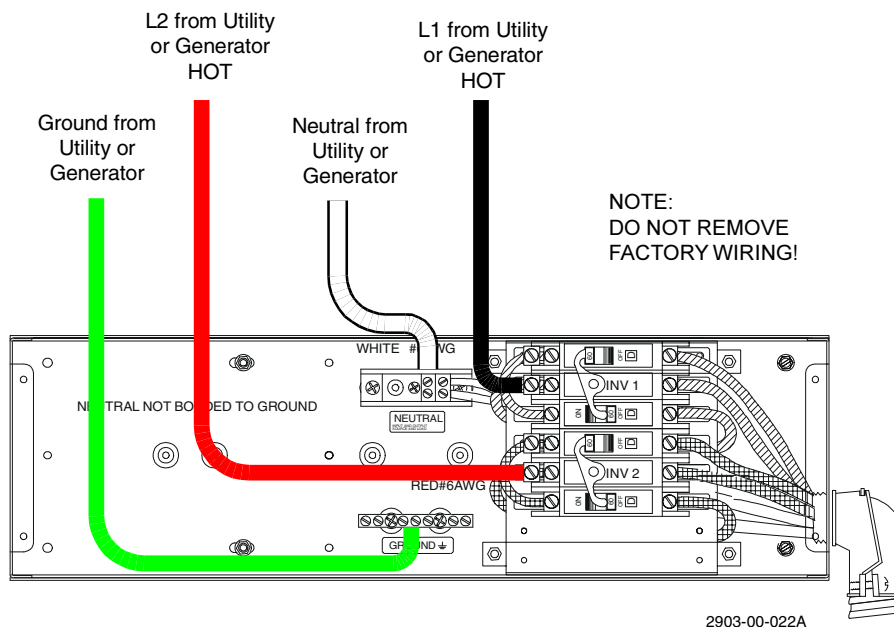
## AC Wiring–DR Series Dual Inverter Models *(continued)*

### AC Input Wiring To The AC Bypass Box

- Select a convenient knockout on the AC Disconnect/Bypass Box for installing conduit which will carry the wires from the main utility panel or generator.
- Install a 60 amp circuit breaker in the main utility service panel for each ac input to the inverter(s).
- Use #6 AWG THHN wire (minimum) and route it through the conduit to the AC Disconnect/Bypass Box.
- Connect the Ground from the main utility box to the ground terminal in the AC Disconnect/Bypass Box as indicated in Figure 20.
- Connect the L1 (Hot-black) wire to the INVERTER 1 HOT IN L1 (center ac breaker) as indicated in Figures 18 and 20.
- \*Connect the L2 (Hot-red) wire to the INVERTER 2 HOT IN L2 (center ac breaker) as indicated in Figures 18 and 20.
- Connect the Neutral wire from the main utility box to the Neutral block in the AC Disconnect/Bypass Box as indicated in Figure 20.
- Torque service crimps to 45 in-lb (3.75 ft-lb), (5 N-m).



NOTE: The Ground and Neutral are bonded only at the main utility service panel.




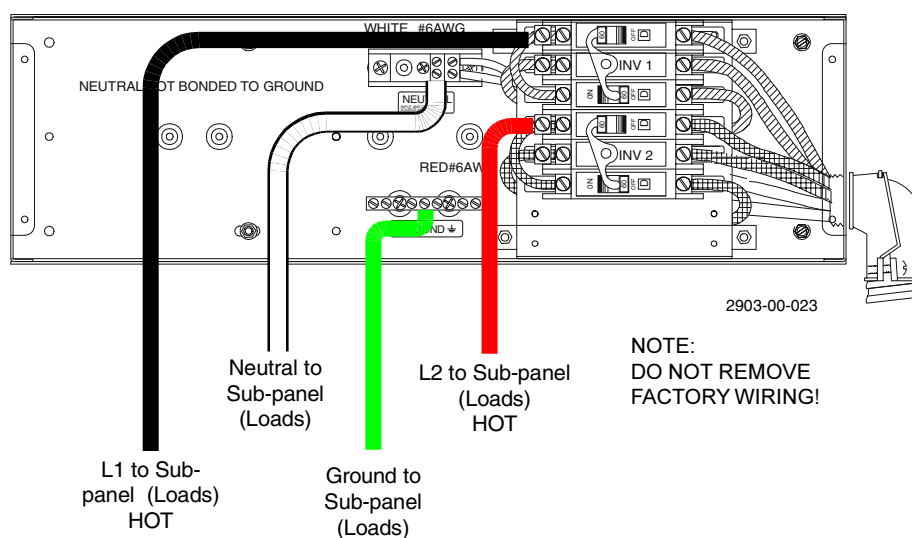
**Figure 20**  
**AC Input Wiring**

### AC Wiring–DR Series Dual Inverter Models *(continued)*

#### AC Output Wiring To The AC Bypass Box

- Select a convenient knockout on the AC Disconnect/Bypass Box for installing conduit which will carry the wires from the inverter's output to the sub-panel.
- Use #6 AWG THHN wire (minimum) and route it through the conduit to the between the AC Disconnect/Bypass Box and the sub-panel.
- Connect the Ground wire to the Ground block in the AC Disconnect/Bypass Box. Connect the other end to the sub-panel's Ground Bar.
- Connect the L1 (Hot-black) wire to the INVERTER 1 HOT OUT L1 (top ac breaker) as indicated in Figure 21.
- Connect the L2 (Hot-red) wire to the INVERTER 2 HOT OUT L2 (top ac breaker) as indicated in Figure 21.
- Connect the Neutral wire to the Neutral block in the AC Disconnect/Bypass Box. Connect the other end to the sub-panel's Neutral Bar.
- Torque service crimps to 45 in-lb (3.75 ft-lb), (5 N-m).

 NOTE: The Ground and Neutral are bonded at the main utility service panel only.



**Figure 21**  
**AC Output Wiring**



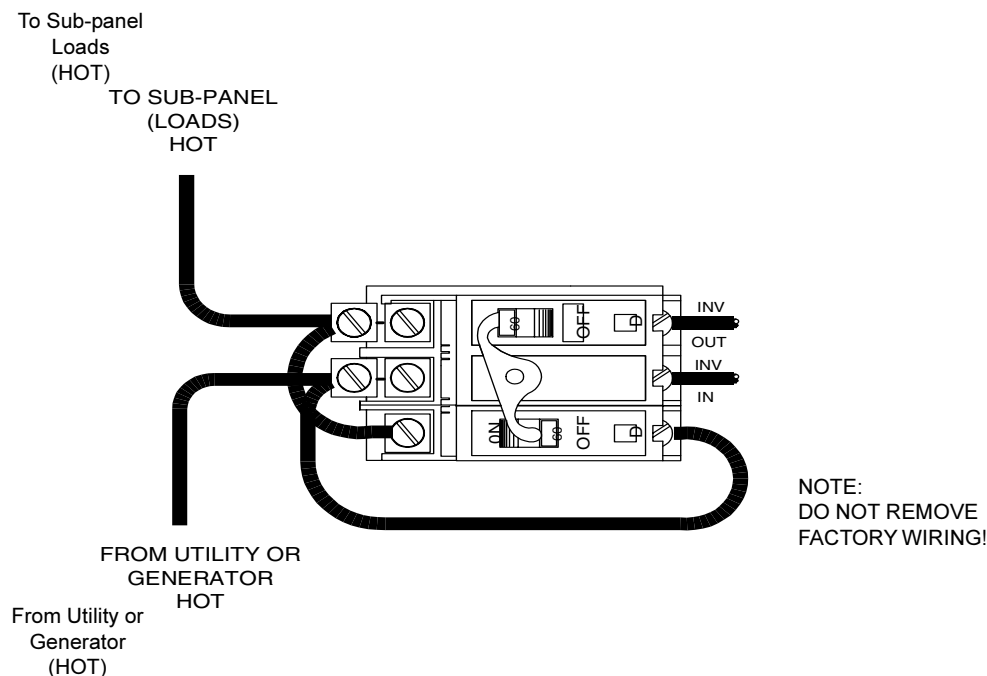
## AC Wiring–DR Series Single Inverter Models

### AC Input/Output Wiring To AC Bypass Box

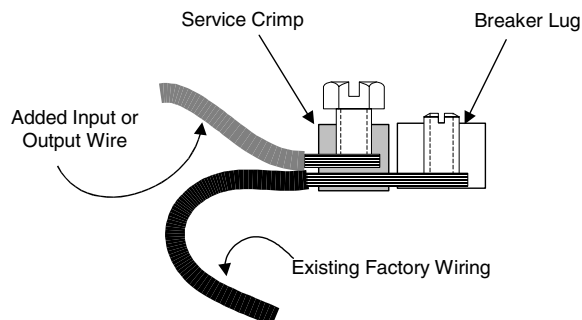
- Connect the Ground wire to the Ground block in the AC Disconnect/Bypass Box. Connect the other end to the sub-panel's Ground Bar.
- Connect the Hot (input) wire from the utility service panel as indicated in Figure 22.
- Connect the Hot wire (output) as indicated in Figure 22. Connect the other end of this wire to the input breaker in the sub-panel.
- Connect the Neutral wire to the Neutral block in the AC Disconnect/Bypass Box. Connect the other end to the sub-panel's Neutral Bar.
- Torque service crimps to 45 in-lb (3.75 ft-lb), (5 N-m).



NOTE: The Ground and Neutral are bonded only at the main utility service panel.



**Figure 22**  
**AC Input/Output Wiring (Single Inverter Models)**



2906-00-026A

**Figure 22A**  
**Breaker Terminal Lug Detail (side view)**

## 2.0 INSTALLATION

### AC Input/Output Wiring to the Utility and Sub-panel

The following diagrams illustrate wiring the Power Panels to the utility service box and to the sub-panel. Existing wiring can be used by routing the output of the sub-panel back into the main utility service box and wire-nut splicing these wires to the existing house wiring. Refer to Figures 23 (single inverter 120 V ac), 24A and 24B (dual inverter (120/240 V ac) for general wiring diagrams.



**WARNING: ENSURE ALL POWER IS DISCONNECTED IN THE MAIN UTILITY BREAKER BOX BEFORE PROCEEDING.**

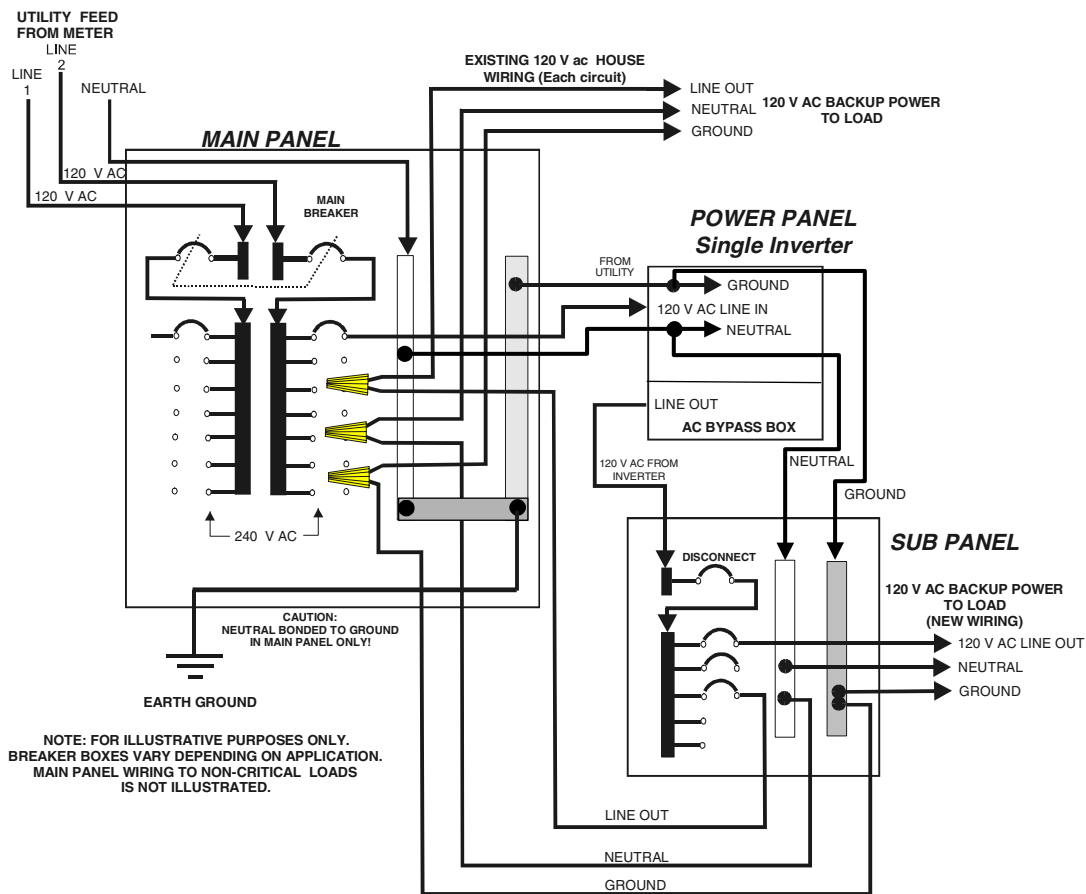
- Select the circuits that require backup power and disconnect them from the main utility breaker.
- Mark the breaker as "not used" in the main utility panel.
- Wire splice these connections to the output from the sub-panel.
- Mark the sub-panel with an appropriate name for this circuit.



**NOTE:** Check local codes. Wire-nut splices may not be allowed in the main utility panel in some areas. In these cases, use a separate junction box for these connections and cover with a blank plate.

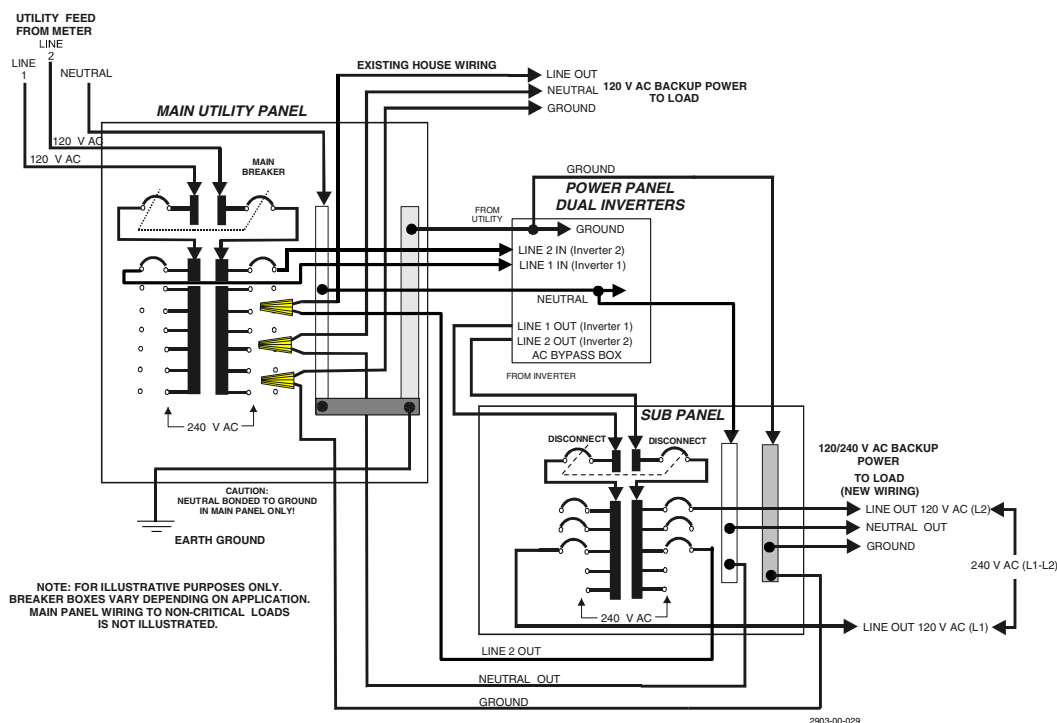


**WARNING: REPLACE CIRCUIT BREAKERS (IN THE SUB-PANEL) WITH EQUALLY RATED BREAKERS. NEVER INCREASE THE CIRCUIT BREAKER AMPERAGE RATING.**

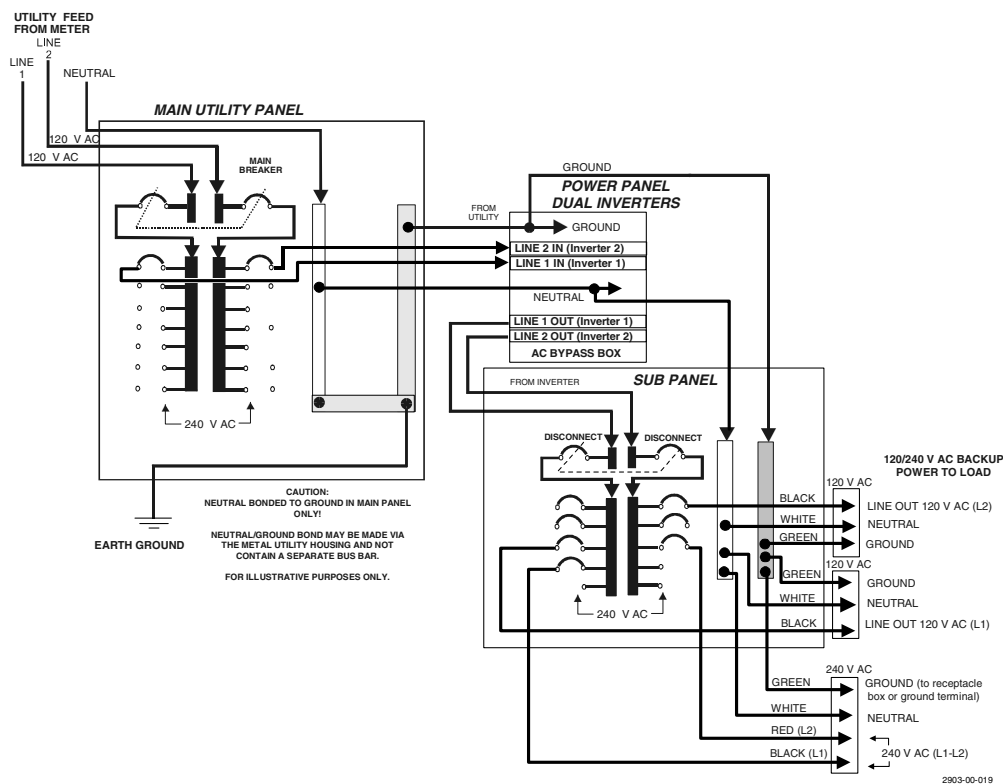


**Figure 23**  
**AC Input/Output Utility-Sub-panel Wiring (Single Inverter Models)**

## AC Input/Output Wiring to Utility and Sub-panel *(continued)*



**Figure 24A**  
**AC Input/Output Utility–Sub-panel Wiring (Dual Inverter Models)**  
**Wire-nut Connections in Main Utility Box**



**Figure 24B**  
**AC Input/Output Utility–Sub-panel Wiring for 120–240 V ac Circuits (Dual Inverter Models)**

### Wiring Check

Before placing the system into operation for the first time (or after repairs or rewiring is performed), recheck all system wiring before placing the system into operation.


- Check the ac loads (to the sub-panel) and source (from the utility main panel or generator) are connected properly in the AC Disconnect/Bypass box.
- Ensure there are no neutral/ground bonds (except in the main utility panel).
- Use a dc voltmeter to confirm the batteries are wired correctly and the polarities are correct.
- Check the PV array wiring is properly connected (positive wire to the lower terminals on the PV array disconnects).




**CAUTION: PERMANENT SYSTEM DAMAGE CAUSED BY IMPROPER WIRING IS NOT COVERED UNDER WARRANTY. DO NOT SKIP THE ABOVE STEPS!**

- After the checks are completed, install the covers on the Power Panel components, main utility and sub-panels.

## System Check


 NOTE: Do not proceed with this section until the wiring checks mentioned in the previous section have been performed.

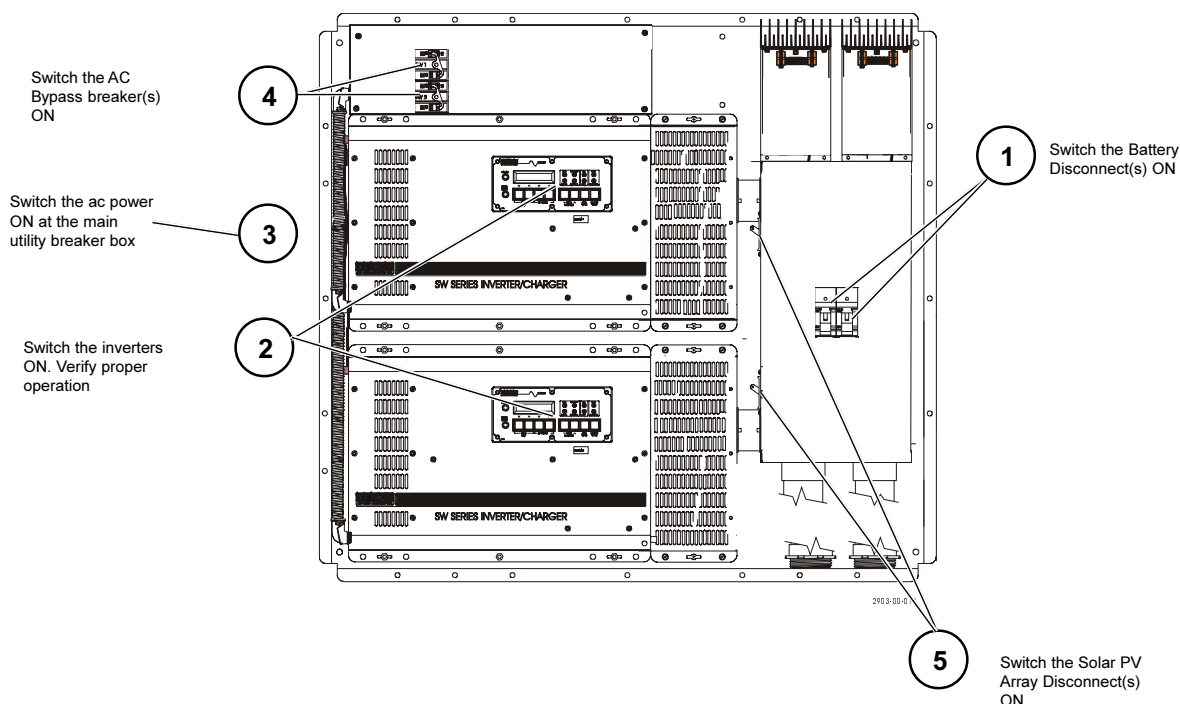
 NOTE: Refer to the appropriate Operator's manual (SW or DR) for detailed inverter/charger operation.

### Start-up Procedure:

1. Switch the Battery Disconnect(s) to the ON (upper) position. Check for correct inverter and controller (if installed) power-up sequence (refer to the Operator's manual).
2. Turn ON the inverter(s) and check for normal operation. Refer to the individual inverter/charger Operator's manual for operating instructions. The inverters should be operating in the inverter mode from the batteries. Refer to the troubleshooting section if the inverters are not operational. Do NOT proceed until the inverters are operating normally.
3. Switch ON the ac power from the main ac utility panel or generator.
4. Switch ON the AC Disconnect/Bypass breaker by switching the breaker(s) to the normal operating position.
5. Switch the Solar Array Disconnect(s) to the ON (upper) position.

The Power Panel is now fully operational. If you have questions not covered in this or the inverter's Operator's manual, contact Trace Engineering or your local dealer.

 NOTE: Refer to the troubleshooting section for instructions if the system does not appear to be functioning correctly.



**Figure 25**  
**Power Panel Operating Controls**

### AC Disconnect Module

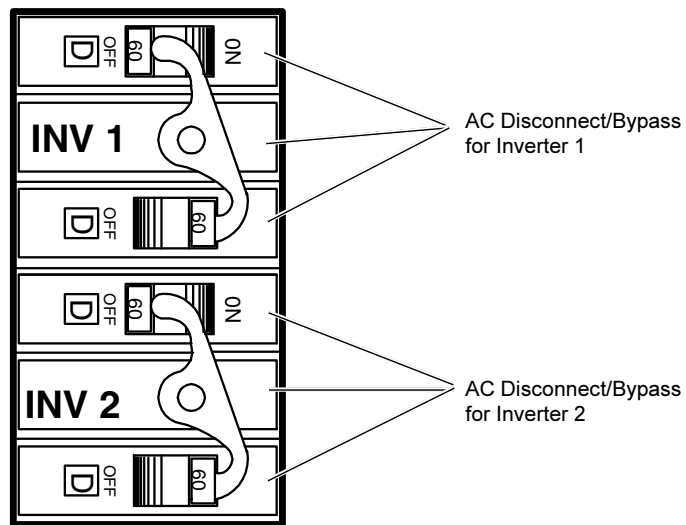
The AC Disconnect is a manual bypass switch that allows the inverter to be removed from the circuit without de-energizing the connected load. The Power Panel comes with either a single breaker pair for single inverter applications, or two breaker pairs (L1 and L2) to accommodate two inverters.

The AC Disconnect Module is wired between the primary ac source (utility power or generator) and the inverter's ac input and output. A lockout rocker allows only one breaker to be ON at any given time.

During normal operation, ac power passes from the power utility through the inverter to the ac loads. The inverter monitors the incoming power and keeps the batteries charged. If utility power fails, the inverter switches to battery power and continues to power the load. In dual inverter Power Panel installations, a set of breakers control the bypass function for each inverter independently. If one inverter is bypassed for servicing, the second inverter will continue to power the loads connected to it.

In the event of an inverter failure, the breakers can be switched to the Inverter Bypass position which allows the ac loads to be powered directly from utility power. The inverter can then be removed for servicing without affecting the connected loads.

To de-energize both circuits, switch both breaker pairs to the OFF position.



**Figure 26**  
**AC Disconnect Breakers (Dual Inverter Model)**

## AC Disconnect Module (continued)

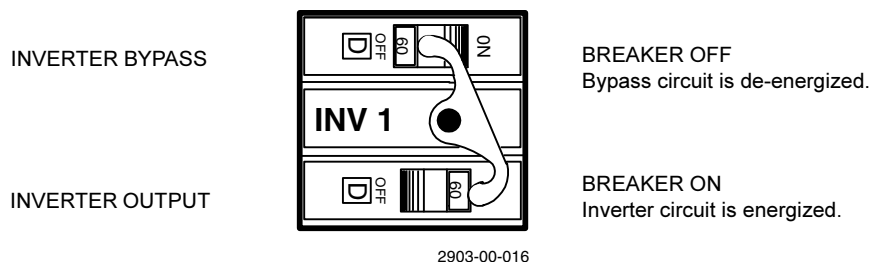
Under normal operation, the INVERTER OUTPUT breakers are ON.



NOTE: Only one AC Disconnect/Bypass breaker is illustrated below. For dual inverter models, the second breaker set controls inverter 2 in exactly the same way.

### Inverter In Circuit

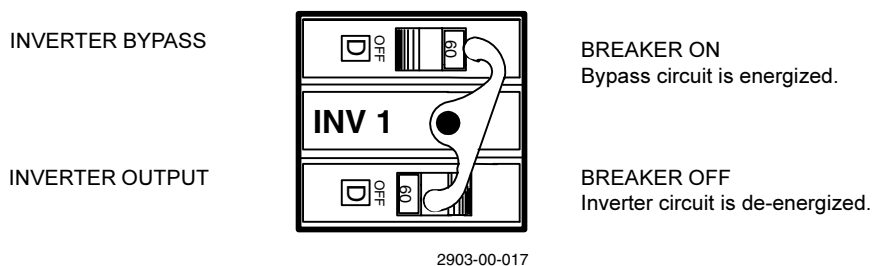
In this configuration, power passes through the inverter to the connected load. If an ac line failure occurs, dc from the batteries is routed through the inverter to maintain the load.



**Figure 27**  
**Inverter In Circuit (Normal Operation)**

### Inverter Out of Circuit

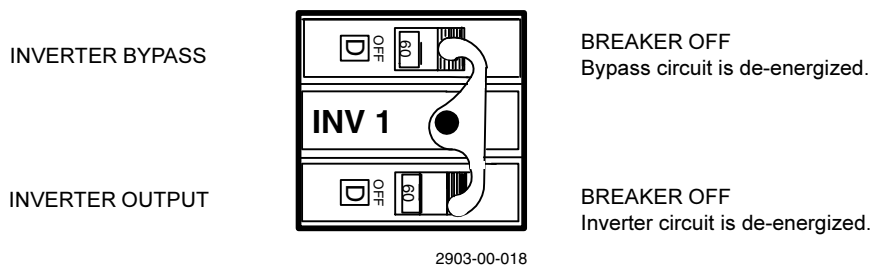
In this configuration, power passes directly to the connected load, bypassing the inverter. This allows the inverter to be removed from service without affecting the connected load. If an ac line failure occurs while the inverter is switched off, the load will be dropped.



**Figure 28**  
**Inverter Out of Circuit**

### Both AC Line and Inverter OFF

In this configuration, power from both the ac utility and inverter is removed from the circuit. This allows the inverter, the connected loads, or any other installed equipment beyond the AC Disconnect/Bypass switch to be serviced.



**Figure 29**  
**Both AC Line and Inverter OFF**

## 4.0 TROUBLESHOOTING

In the event the inverters do not power up when the dc disconnects are switched on, follow the procedure below to isolate the problem.



**WARNING: THESE STEPS INVOLVE REMOVING THE COVER ON THE DC SIDE OF THE INVERTER, EXPOSING DANGEROUS VOLTAGES AND SHOULD ONLY BE PERFORMED BY QUALIFIED PERSONS.**

- Remove the side cover from the dc side of the inverter (right-hand side extension cover for the SW series inverter and left-hand side extension cover for the DR series inverter).
- Use a dc voltmeter to check the battery voltage on the inverters dc battery input terminals.
- Check the connections from the PV array are properly wired. Verify the polarity is correct.
- If the measured voltage is appropriate for the battery configuration (12, 24 or 48 V dc), check the polarity of the voltage. Correct if necessary.
- Ensure the batteries are not completely discharged. If the batteries are discharged, they will need to be externally recharged until the inverters power-up on the dc battery voltage. Once the inverters power-up, switch on the ac disconnect and ac utility (or generator) power. Allow the inverters to completely recharge the batteries. Retest for proper dc operation.
- Check the battery cables and connections. All connections should be properly torqued.

If the above checks pass and the inverter still does not operate on dc battery voltage, contact the dealer or Trace Engineering for assistance.

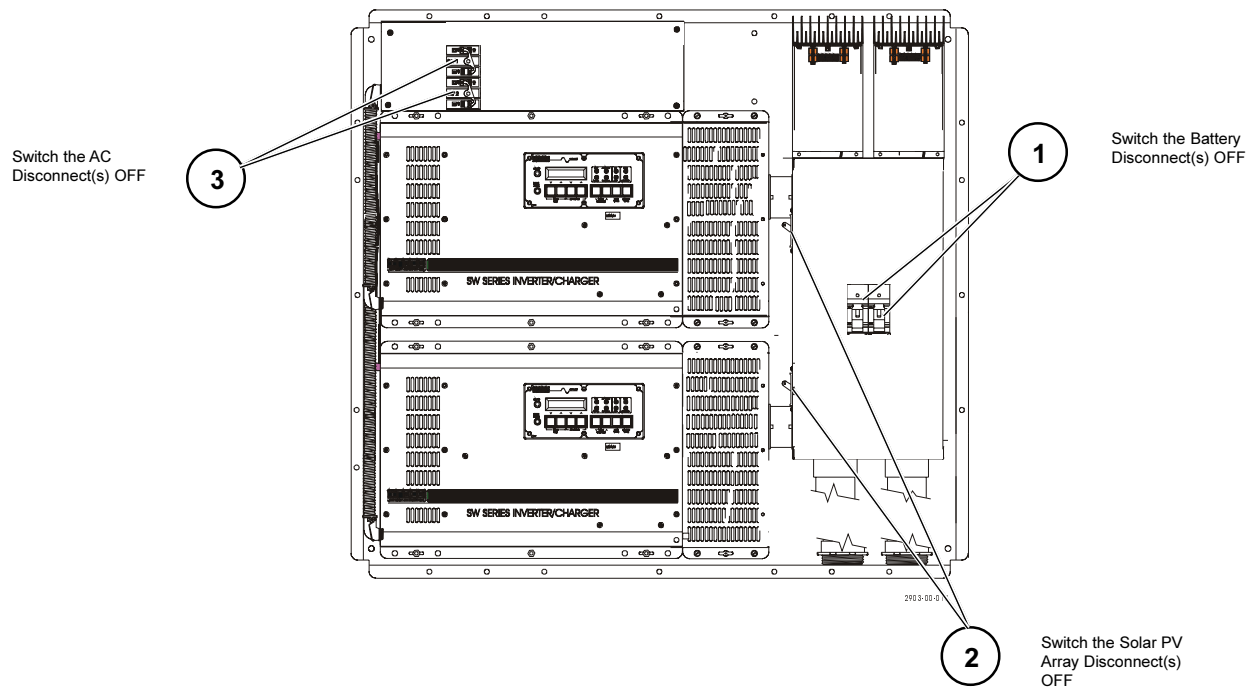


### Emergency Shutdown Procedure

To completely shutdown the system in an emergency, follow these steps:

1. Switch the BATTERY DISCONNECT(s) to the OFF position.
2. Switch the SOLAR PV ARRAY DISCONNECT breaker(s) to the OFF position.
3. Switch the AC DISCONNECT/BYPASS breaker(s) to the OFF position.

The system is completely shutdown with all sources of input dc and ac being removed from the inverter.



**Figure 30**  
**Emergency Shutdown**

## 6.0 SPECIFICATIONS

For complete electrical, mechanical and environmental specifications, please refer to the appropriate system unit Operator's manual.

### SW Series Power Panel General Specifications:

| PART NUMBER  | INVERTER(S)  | OUTPUT POWER | DC INPUT VOLTAGE | MINIMUM DC CABLE SIZE | AC OUTPUT VOLTAGE  | CHARGER AMPS VOLTAGE | WEIGHT             |
|--------------|--------------|--------------|------------------|-----------------------|--------------------|----------------------|--------------------|
| PP-SW2512/S  | SW2512       | 2.5 kW       | 12 V dc          | 4/0 AWG               | 120 V ac/60 Hz     | 150 amps             | 196 lbs (88.9 kg)  |
| PP-SW2512/D  | SW2512 (x 2) | 5.0 kW       | 12 V dc          | 4/0 AWG (x 2)         | 120/240 V ac/60 Hz | 150 amps (x 2)       | 292 lbs (132.5 kg) |
| PP-SW2612E/S | SW2612E      | 2.6 kW       | 12 V dc          | 4/0 AWG               | 230 V ac/50 Hz     | 145 amps             | 217 lbs (98.4 kg)  |
| PP-SW4024/S  | SW4024       | 4.0 kW       | 24 V dc          | 4/0 AWG               | 120 V ac/60 Hz     | 120 amps             | 217 lbs (98.4 kg)  |
| PP-SW4024/D  | SW4024 (x 2) | 8.0 kW       | 24 V dc          | 4/0 AWG (x 2)         | 120/240 V ac/60 Hz | 120 amps (x 2)       | 334 lbs (151.5 kg) |
| PP-SW3024E/S | SW3024E      | 3.3 kW       | 24 V dc          | 4/0 AWG               | 230 V ac/50 Hz     | 100 amps             | 217 lbs (98.4 kg)  |
| PPSW-3048E/S | SW3048E      | 3.3 kW       | 48 V dc          | 2/0 AWG               | 230 V ac/50 Hz     | 50 amps              | 217 lbs (98.4 kg)  |
| PP-SW4048/S  | SW4048       | 4.0 kW       | 48 V dc          | 2/0 AWG               | 120 V ac/60 Hz     | 60 amps              | 217 lbs (98.4 kg)  |
| PP-SW4048/D  | SW4048 (x 2) | 8.0 kW       | 48 V dc          | 2/0 AWG (x 2)         | 120/240 V ac/60 Hz | 60 amps (x2)         | 334 lbs (151.5 kg) |
| PP-SW4548E/S | SW4548E      | 4.5 kW       | 48 V dc          | 2/0 AWG               | 230 V ac/50 Hz     | 57 amps              | 245 lbs (111.1 kg) |
| PP-SW5548/S  | SW5548       | 5.5 kW       | 48 V dc          | 4/0 AWG               | 120 V ac/60 Hz     | 70 amps              | 248 lbs (112.5 kg) |
| PP-SW5548/D  | SW5548 (x 2) | 11.0 kW      | 48 V dc          | 4/0 AWG (x 2)         | 120/240 V ac/60 Hz | 70 amps (x 2)        | 396 lbs (179.6 kg) |

### DR Series Power Panel General Specifications:

| PART NUMBER  | INVERTER(S)  | OUTPUT POWER | DC INPUT VOLTAGE | MINIMUM DC CABLE SIZE | AC OUTPUT VOLTAGE  | CHARGER AMPS   | WEIGHT             |
|--------------|--------------|--------------|------------------|-----------------------|--------------------|----------------|--------------------|
| PP-DR1512/S  | DR1512       | 1.5 kW       | 12 V dc          | 2/0 AWG               | 120 V ac/60 Hz     | 70 amps        | 139 lbs (63.0 kg)  |
| PP-DR1512/D  | DR1512 (x 2) | 3.0 kW       | 12 V dc          | 2/0 AWG (x 2)         | 120/240 V ac/60 Hz | 70 amps (x 2)  | 178 lbs (80.7 kg)  |
| PP-DR1512E/S | DR1512E      | 1.5 kW       | 12 V dc          | 2/0 AWG               | 230 V ac/50 Hz     | 70 amps        | 139 lbs (98.4 kg)  |
| PP-DR1524/S  | DR1524       | 1.5 kW       | 24 V dc          | 2/0 AWG               | 120 V ac/60 Hz     | 35 amps        | 139 lbs (98.4 kg)  |
| PP-DR1524/D  | DR1524 (x 2) | 3.0 kW       | 24 V dc          | 2/0 AWG (x 2)         | 120/240 V ac/60 Hz | 35 amps (x 2)  | 178 lbs (80.7 kg)  |
| PP-DR1524E/S | DR1524E      | 1.5 kW       | 24 V dc          | 2/0 AWG               | 230 V ac/50 Hz     | 35 amps        | 139 lbs (98.4 kg)  |
| PP-DR2412/S  | DR2412       | 2.4 kW       | 12 V dc          | 4/0 AWG               | 120 V ac/60 Hz     | 120 amps       | 153 lbs (69.4 kg)  |
| PP-DR2412/D  | DR2412 (x 2) | 4.8 kW       | 12 V dc          | 4/0 AWG (x 2)         | 120/240 V ac/60 Hz | 120 amps (x 2) | 206 lbs (93.4 kg)  |
| PP-DR2424/S  | DR2424       | 2.4 kW       | 24 V dc          | 2/0 AWG               | 120 V ac/60 Hz     | 70 amps        | 148 lbs (67.1 kg)  |
| PP-DR2424/D  | DR2424 (x 2) | 4.8 kW       | 24 V dc          | 2/0 AWG (x 2)         | 120/240 V ac/60 Hz | 70 amps (x 2)  | 196 lbs (89.0 kg)  |
| PP-DR2424E/S | DR2424E      | 2.4 kW       | 24 V dc          | 2/0 AWG               | 230 V ac/50 Hz     | 70 amps        | 148 lbs (67.1 kg)  |
| PP-DR3624/S  | DR3624       | 3.6 kW       | 24 V dc          | 4/0 AWG               | 120 V ac/60 Hz     | 70 amps        | 153 lbs (69.4 kg)  |
| PP-3624/D    | DR3624 (x 2) | 7.2 kW       | 24 V dc          | 4/0 AWG (x 2)         | 120/240 V ac/60 Hz | 70 amps (x 2)  | 206 lbs (93.44 kg) |

Specifications subject to change without notice.

**Options and weights:****Power Panel Options**

| PART NUMBER  | DESCRIPTION   | WEIGHT           |
|--------------|---|------------------|
| PPO-C40      | C40 dc charge or load controller installed. Includes pre-wired 60 amp breaker                         | 4 lbs (1.81 kg)  |
| PPO-DVM/C40  | Digital meter with LCD display installed on the front of the controller                               | 1 lbs (0.454 kg) |
| PPO-CD15     | 15 amp dc load breaker pre-wired and installed in the dc disconnect                                   | 1 lbs (0.454 kg) |
| PPO-CD20     | 20 amp dc load breaker pre-wired and installed in the dc disconnect                                   | 1 lbs (0.454 kg) |
| PPO-CD60     | 60 amp dc load breaker pre-wired and installed in the dc disconnect                                   | 1 lbs (0.454 kg) |
| PPO-BC5-2/0  | 5 foot 2/0 AWG battery cable pair with ring terminals (battery side only) and flexible conduit        | 6 lbs (2.72 kg)  |
| PPO-BC10-2/0 | 10 foot 2/0 AWG battery cable pair with ring terminals (battery side only) and flexible conduit       | 12 lbs (5.44 kg) |
| PPO-BC5-4/0  | 5 foot 4/0 AWG battery cable pair with ring terminals (battery side only) and flexible conduit        | 10 lbs (4.54 kg) |
| PPO-BC10-4/0 | 10 foot 4/0 AWG battery cable pair with ring terminals (battery side only) and flexible conduit       | 19 lbs (8.62 kg) |
| PPO-BC15-4/0 | 15 foot 4/0 AWG battery cable pair with ring terminals (battery side only) and flexible conduit       | 29 lbs (13.2 kg) |
| PPO-SB       | "Heavy duty plastic shipping container. Can be used for making a battery box. (24" H x 42" W x 46" D) | 95 lbs (43.0 kg) |

**General Specifications SW and DR Series****Mechanical**

Overall size (H x W x D)

DR Model 39-9/16" x 43" x 8"

SW Model 39-9/16" x 43" x 9-3/4"

Material Indoor rated, power coated steel

Color White

## 7.0 SERVICE INFORMATION

Trace Engineering makes every effort to ensure your unit fully meets your independent powering needs.

If your product needs repair, contact our Service department at: (360) 435-8826 to obtain an RMA# and shipping information; or fax this page with the following information to: (360) 474-0616.

Please provide:

Inverter #1 Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Inverter #2 Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Charge Controller #1 Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Charge Controller #2 Model: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Purchase Date: \_\_\_\_\_

Dealer: \_\_\_\_\_

Phone: (     ) \_\_\_\_\_

Country: \_\_\_\_\_

Problem: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Include a telephone number where you can be reached during business hours and a complete return shipping address (P.O. Box numbers are not acceptable).

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_

State / Province: \_\_\_\_\_

Zip / Postal Code: \_\_\_\_\_

Phone: (     ) \_\_\_\_\_

Country: \_\_\_\_\_



visit our website at: [www.traceengineering.com](http://www.traceengineering.com)

Trace Engineering, Inc., does not recommend the use of any of its products in life support applications or direct patient care. This especially applies to situations where the product's failure or malfunction can be reasonably expected to cause the failure or malfunction of the life support device, or to significantly affect its safety or effectiveness.

Examples of life support devices include: 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. FDA.

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 (c) the liability of Trace Engineering, Inc., is adequately protected under the circumstances.

### Limited Warranty

Trace Engineering warrants its power products against defects in materials and workmanship for a period of two (2) years from the date of purchase and extends this warranty to all purchasers or owners of the product during the warranty period. Trace does not warrant its products from any and all defects:

- (1) arising out of material or workmanship not provided by Trace Engineering;
- (2) resulting from abnormal use of the product or use in violation of the instructions;
- (3) in products repaired or serviced by other than Trace Engineering repair facilities;
- (4) in components, parts, or products expressly warranted by another manufacturer.

Trace Engineering agrees to supply all parts and labor, or repair or replace defects covered by this warranty with parts or products of original or improved design, at its option, if the defective product is returned to any Trace Engineering authorized warranty repair facility or to the Trace Engineering factory in the original packaging, with all transportation costs and full insurance paid by the purchaser or owner.

All remedies and the measure of damages are limited to the above. Trace Engineering shall in no event be liable for consequential, incidental, contingent, or special damages, even if Trace Engineering has been advised of the possibility of such damages. Any and all other warranties, expressed or implied, arising by law, course of dealing, course of performance, usage of trade or otherwise, including, but not limited to, implied warranties of merchantability and fitness for a particular purpose, are limited in duration for a period of two (2) years from the original date of purchase.

Some countries or states do not allow limitations on the term of an implied warranty, or the exclusion or limitation of incidental or consequential damage, which means the limitations and exclusions of this warranty may not apply to you. Even though this warranty gives you specific legal rights, you may also have other rights which vary from state to state.



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