XANTREX
Smart Choice For **Power**

Installation Guide

SWI Stacking Interface Cable

for SW and PS Series Inverters

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Xantrex Technology Inc., is a world-leading supplier of advanced power electronics and controls with products from 50-watt mobile units to 1 MW utility-scale systems for wind, solar, batteries, fuel cells, microturbines, and backup power applications in both grid-connected and stand-alone systems. Xantrex products include inverters, battery chargers, programmable power supplies, and variable speed drives that convert, supply, control, clean, and distribute electrical power.

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Due to continual improvement through product updates, photographs and/or illustrations used in this manual may not *exactly* match your unit. Xantrex Technology Inc., reserves the right to update this product without notice or releasing an updated manual when *fit, form or function* are not affected.

Date and Revision

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Part Number

975-0013-01-01

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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 the manual, and on the inverter, 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 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.
- Do not install 120 volt AC stand-alone inverters onto 120/240 volt AC multi-branch circuit wiring. This could pose a fire hazard due to an overloaded neutral return wire in this configuration.
- When stacking inverters, always connect the chassis of each inverter together using the chassis ground lug; otherwise, a hazardous voltage may be present between each chassis.

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. 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.

SAVE THESE INSTRUCTIONS

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Contents

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SWI Stacking Interface Cable Kit

The SWI Stacking Interface Cable is an accessory for SW and PS Series inverters. This cable allows the AC output of two (identical) inverters to be connected in a series configuration, providing both 120 and 240 VAC, 60 Hz power for the loads. The AC input to the inverters is provided by the L1 and L2 legs of the utility grid (or 120/240 VAC generator) with L1 connected to the input of one inverter and L2 connected to the corresponding input of the other inverter (i.e., AC1 of both inverters).

Stacking is also an excellent choice for providing power to multi-wire branch circuits where stand alone (120 VAC) inverters may require extensive rewiring within the building.

The SWI Stacking Interface Cable kit consists of:

- This Installation Guide
- One 42-inch stacking interface cable, complete with two 25-pin D connectors

CAUTION: Do not use a standard computer cable in place of the SWI stacking interface cable.

Figure 1-1
Stacking Interface Cable

Notes:

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Series Stacking

The STACKING port allows two SW or PS Series inverter/chargers to be used in the same system in a "SERIES" configuration to operate 240 VAC loads. Series stacking can also be used to connect to 240 VAC only power systems providing both 120 and 240 VAC outputs. A series stacking interface cable (SWI) is required to connect the series stacking port of the inverters. In this mode, the inverters act independently of each other; however, their output is phase locked and synchronized 180 degrees out-of-phase. Both units can independently charge the batteries or provide battery backup power during a utility outage. 230 VAC/50 Hz units can not be stacked.

NOTE: Use tape to label the inverters as INVERTER 1 (L1) and INVERTER 2 (L2), for future reference.

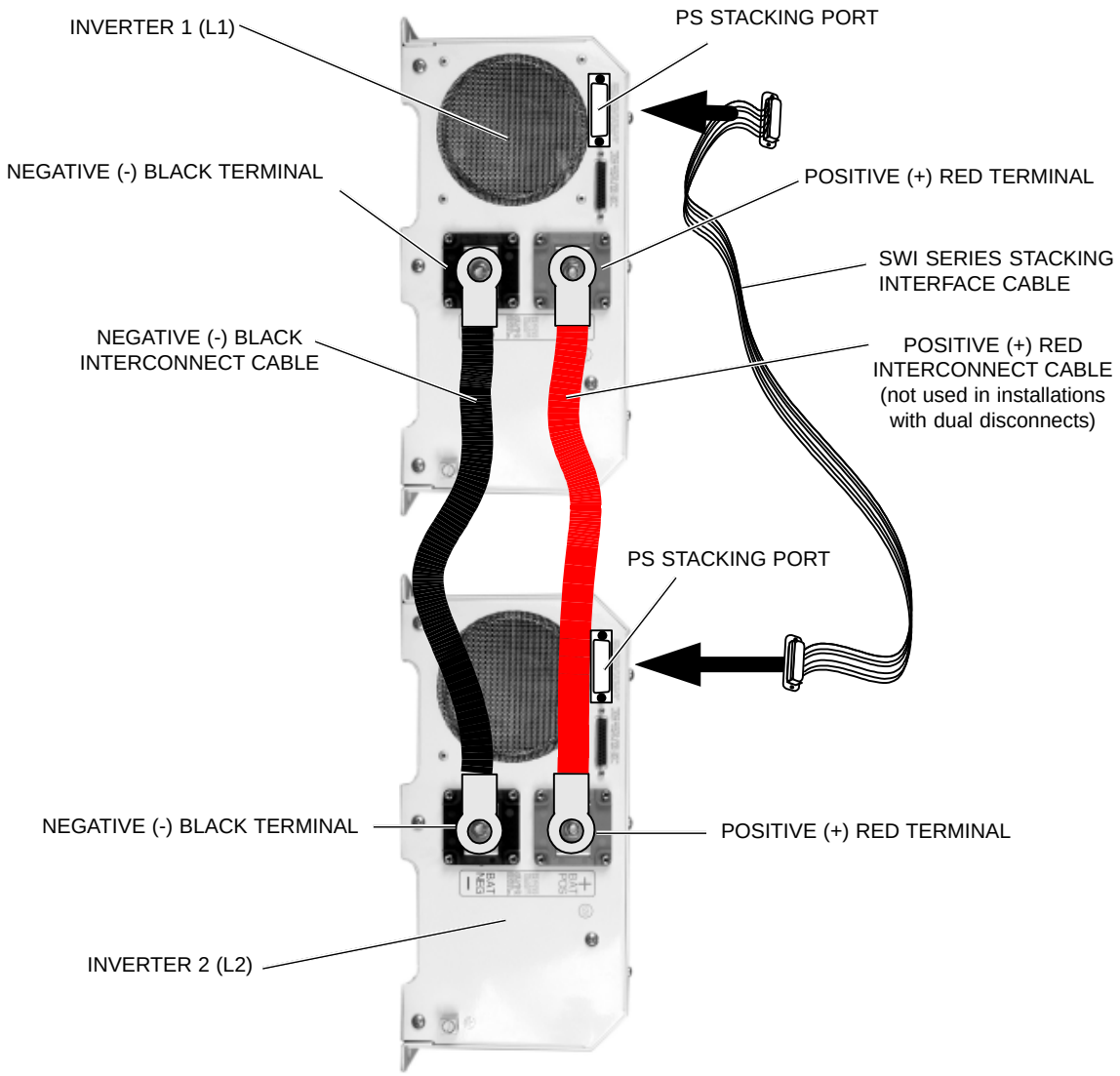

Figure 2-1
PS Series DC Interconnect Cables and SWI Series Stacking Cable

Series Stacking (continued)

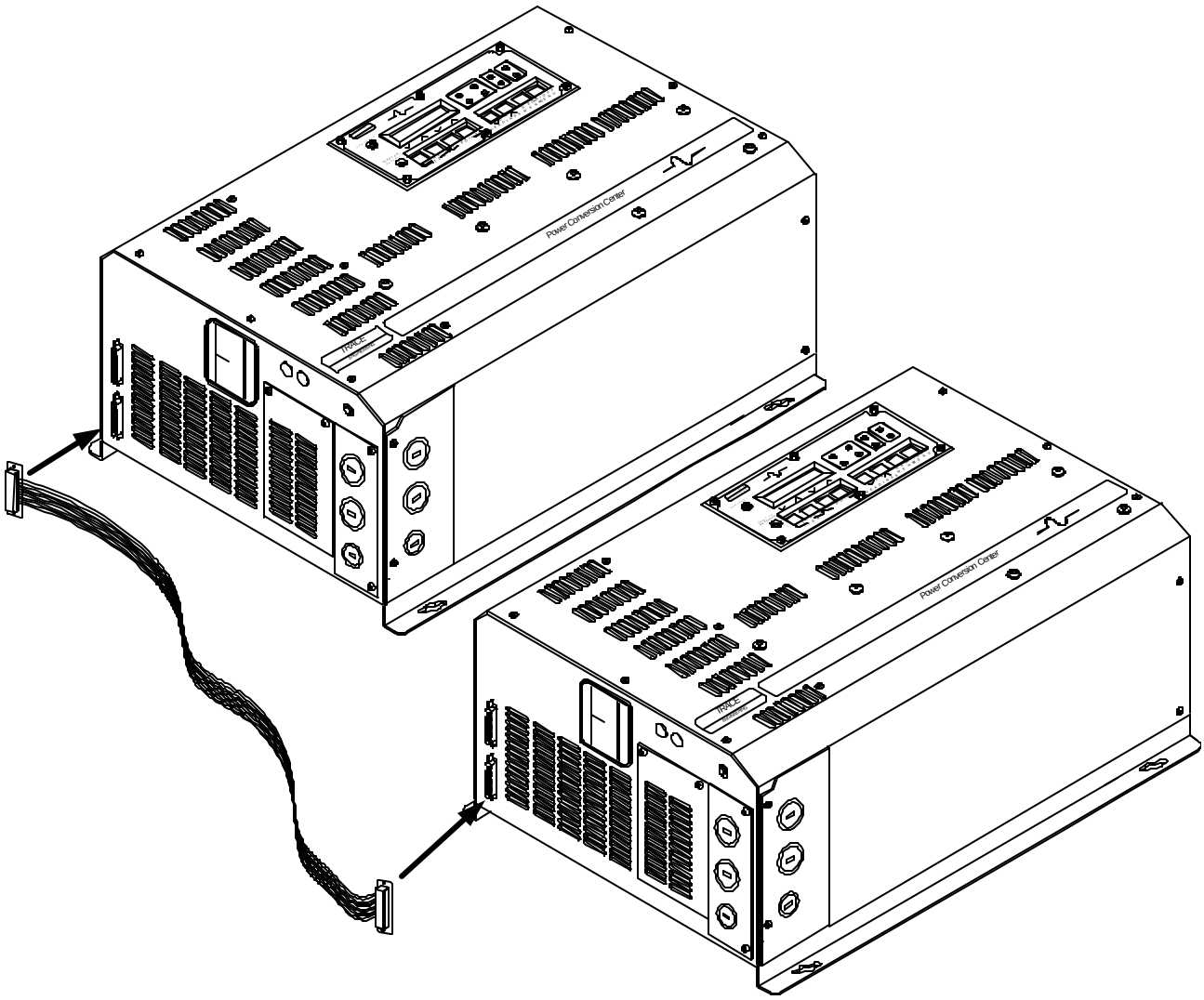

Figure 2-2
SW Series Stacking Interface Cable

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Series Stacking (continued)

The STACKING port allows two SW or PS Series inverter/chargers to be used in the same system in a "SERIES" configuration to operate 240 VAC loads. Series stacking can also be used to connect to 240 VAC only power systems providing both 120 and 240 VAC outputs. A series stacking interface cable (SWI) is required to connect the series stacking port of the inverters. In this mode the inverters act independently of each other; however their output is phase locked and synchronized 180 degrees out-of-phase. Both units can independently charge the batteries or provide battery backup power during a utility outage. 230 VAC/50 Hz units can not be stacked.

NOTE: Use tape to label the inverters as INVERTER 1 (L1) and INVERTER 2 (L2), for future reference.

Series Stack DC Wiring (one disconnect device)

When stacking two inverters using one DC disconnect device, connect the units and batteries as follows:

- Tie the inverter's negative terminals together using an appropriate length of cable (sized to fit).
- Connect one of the inverter's negative terminals to the negative terminal of the battery bank.
- Tie the inverter's positive terminals together using an appropriate length of cable (sized to fit).
- Connect one of the inverter's positive terminals to the DC disconnect.
- Connect the DC disconnect to the positive terminal of the battery bank.
- Connect the Series Stacking Cable (SWI) to the STACKING port of both inverters.
- Connect the DC chassis ground lugs of both inverters together using a heavy gauge wire.
- Connect the negative end of the battery bank to a solid earth ground (refer to inverter installation manual).

NOTE: Connect the positive and negative wires to the batteries as show in the illustration below. This ensures an even charge and discharge through the battery bank.

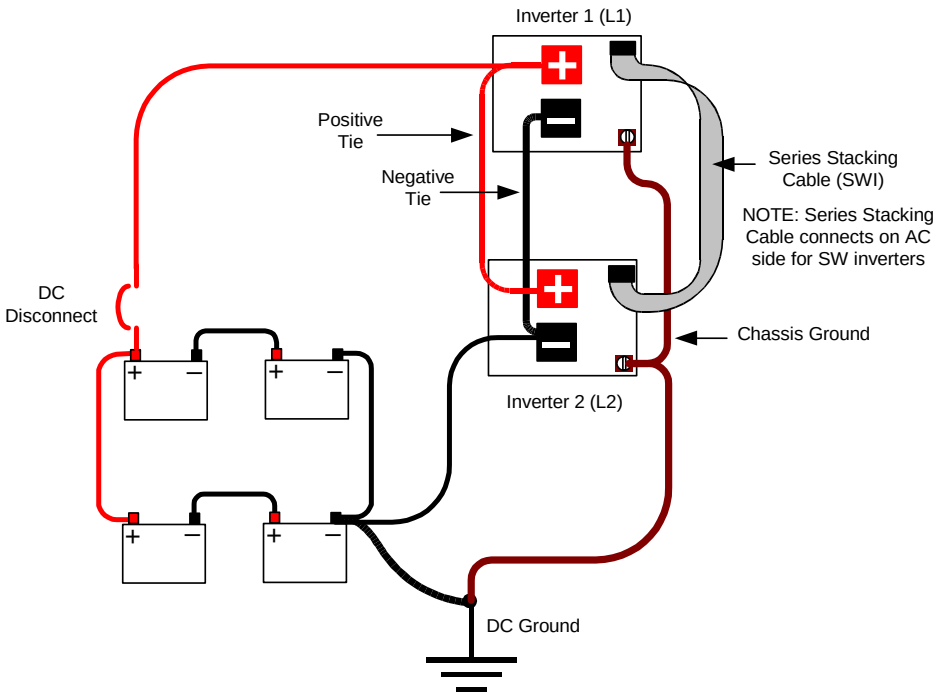

Figure 2-3
Series Stacking Using One DC Disconnect (Block Diagram)

Series Stacking (continued)

Series Stack DC Wiring (two disconnect devices)

When stacking two inverters using two DC disconnect devices, connect the units and batteries as follows (refer to Figure 2-4):

- Tie the inverter's negative terminals together using an appropriate length of cable (sized to fit).
- Connect a cable from the L1 inverter's negative terminal to the negative terminal of the battery bank.
- Connect a cable from the L2 inverter's negative terminal to the negative terminal of the battery bank.
- Connect a cable from the L1 inverter's positive terminals to the DC disconnect.
- Connect a short cable from the DC disconnect to the positive terminal of the battery bank.
- Connect a cable from the L2 inverter's positive terminal to the DC disconnect.
- Connect a short cable from the DC disconnect to the positive terminal of the battery bank.
- Connect the Series Stacking Cable (SWI) to the STACKING port of both inverters.
- Connect the inverter's DC chassis ground lugs together using a heavy gauge wire.

NOTE: Connect the positive and negative wires to the batteries as show in the illustration below. This ensures an even charge and discharge through the battery bank.

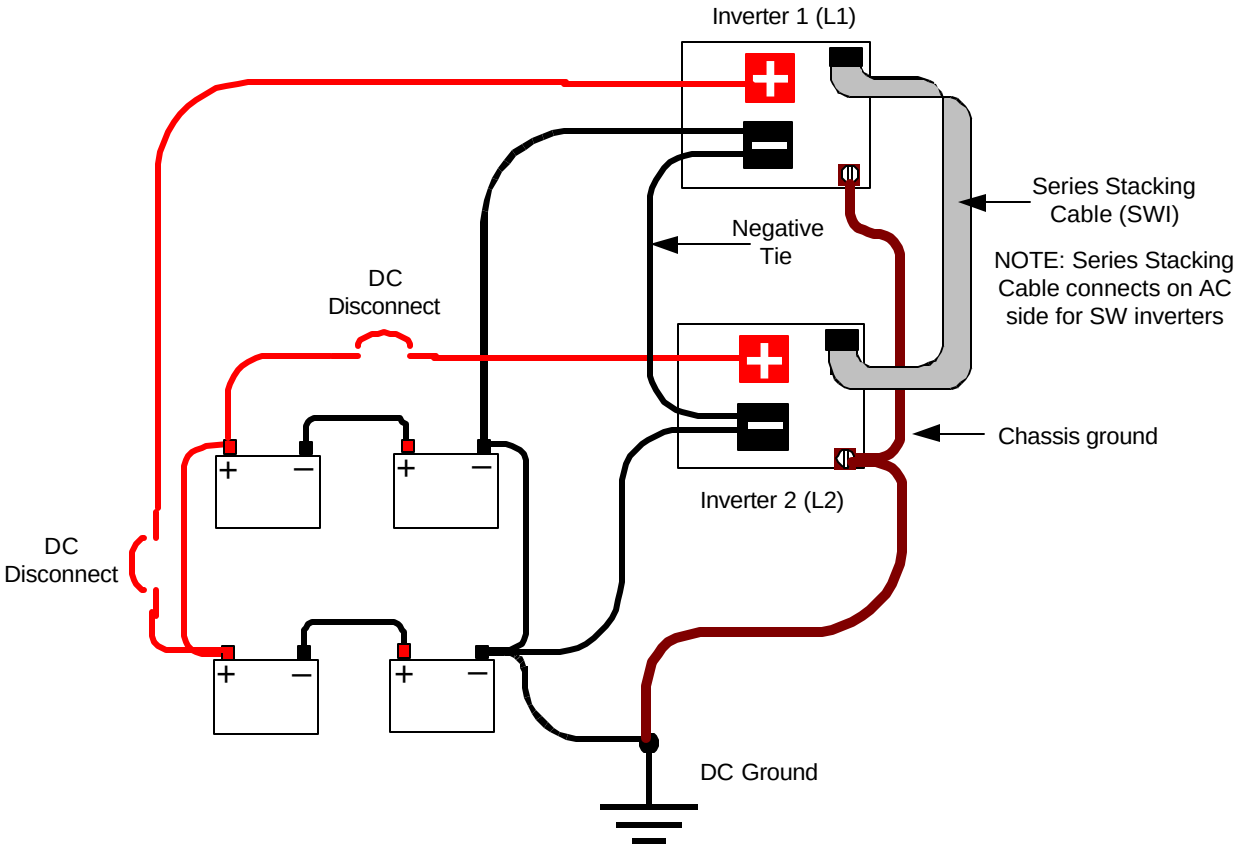

Figure 2-4
Series Stacking Using Two DC Disconnects (Block Diagram)

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Series Stacking (continued)

Wiring with a Conduit Box

When wiring a stacked pair of inverters using a conduit box, a longer DC cable must be supplied to connect the negative terminals of the inverters together. This does not come with the kit and must be obtained separately. The following illustration shows how the inverters are wired in a conduit box. This wiring arrangement is basically the same as the previous illustration (Figure 2-Series Stacking (continued)

Battery Connections for Stacked Inverters

When using inverters in a stacked configuration, the same battery bank must be used for both inverters. To ensure even charging of the batteries, each inverter must be connected to both strings (i.e., positive cable to string 2, and negative cable to string 1 for inverter L1; and positive cable to string 1 and negative cable to string 2 for inverter L2) as shown in the diagram below. 4).

NOTE: SWCBs (SW Conduit Boxes) or PSCBs (PS Conduit Boxes) may be required to meet code when stacking inverters.

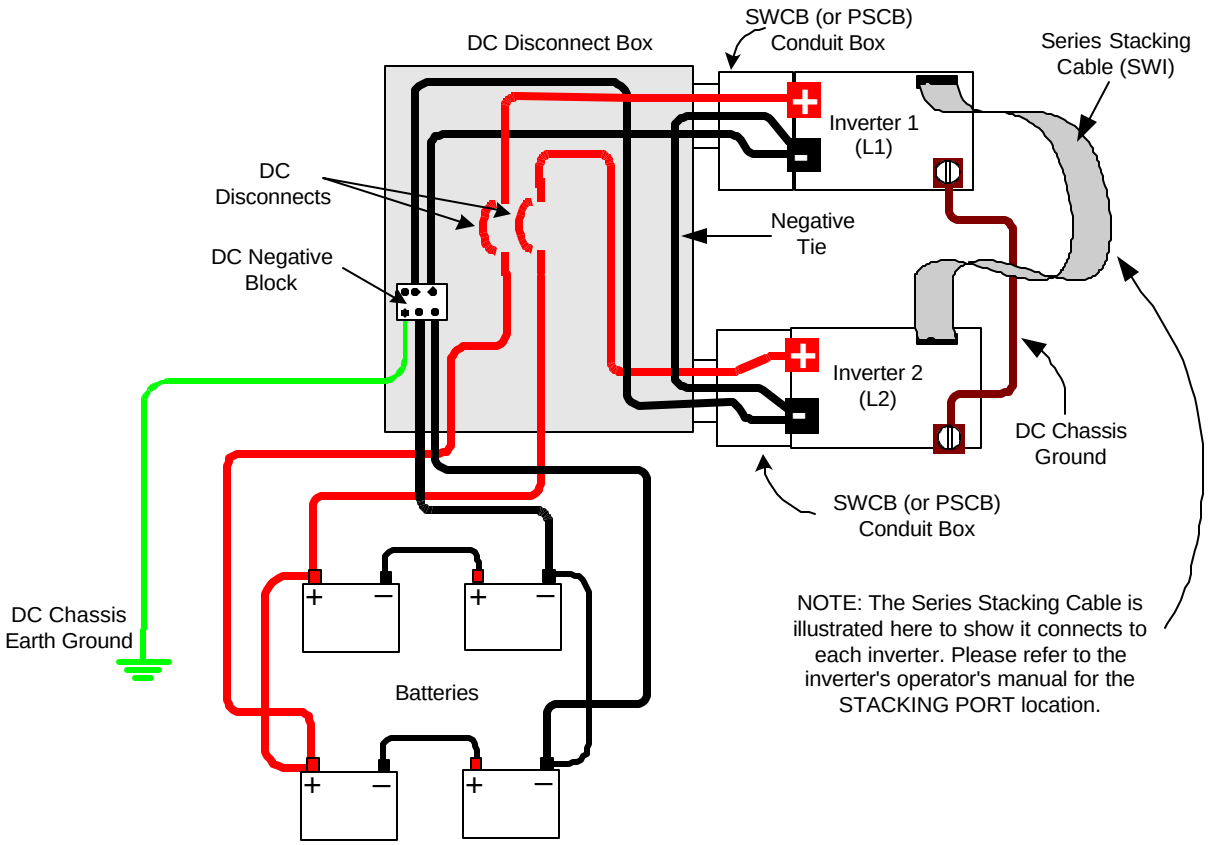

Figure 2-5
DC Wiring using a DC Disconnect Box

Series Stacking (continued)

Battery Connections for Stacked Inverters (continued)

When using inverters in a stacked configuration, the same battery bank must be used for both inverters. To ensure even charging of the batteries, each inverter must be connected to both strings (i.e., positive cable to string 2, and negative cable to string 1 for inverter L1; and positive cable to string 1 and negative cable to string 2 for inverter L2) as shown in the diagram below.

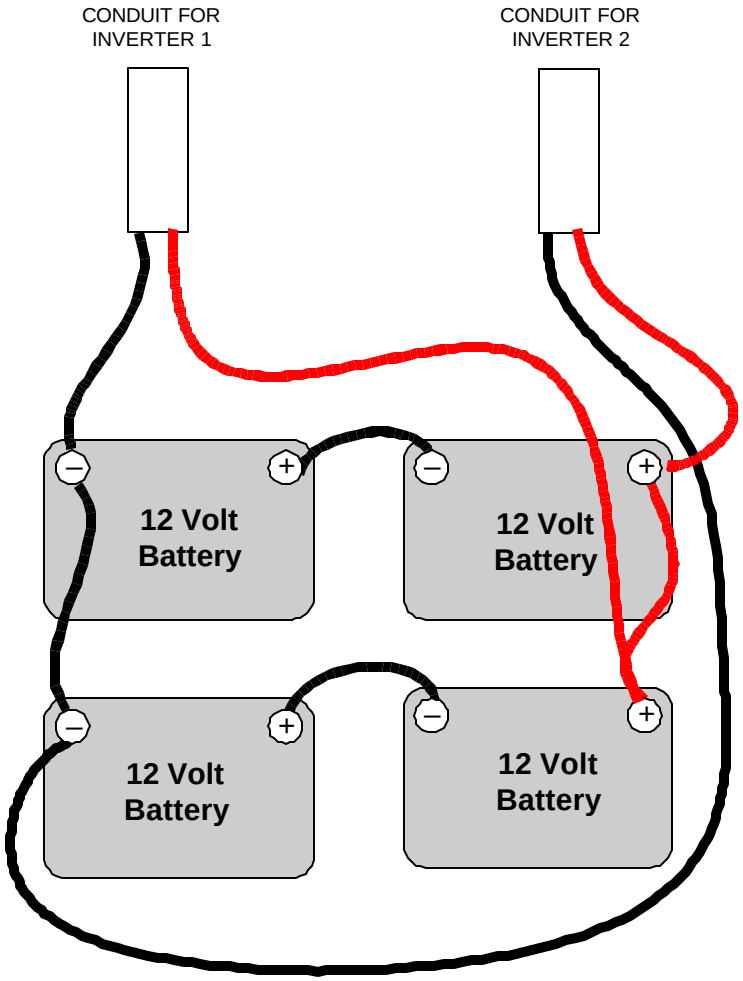

Figure 2-6
Example of Battery Connections for Stacked Inverters

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Series Stacking (continued)

Series Stacking AC Wiring

Series stacking is used in applications where either 240 volt loads (or a combination of both 240 and 120 volt loads) need to be powered from the inverters. One inverter, connected to the utility's L1 line, provides one 120 volt AC output and a second inverter connected to the utility's L2 line provides the second 120 volt AC output (180 degrees out-of-phase from the first inverter). The combined out-of-phase voltages can power 240 volt AC loads as well as 120 volt loads, up to the power rating of the inverters.

Input Wiring (SW Series) (Figure 2-7)

Utility Input

- Connect a wire from the ground bus in the main service panel to the GROUND terminal in the L1 inverter. Connect a second ground wire from the L1 inverter's AC GROUND terminal to the GROUND terminal in the L2 inverter.
- Connect a wire from the neutral bus in the main service panel to the NEUTRAL IN terminal in the L1 inverter. Connect a second wire to the NEUTRAL OUT terminal and route this wire to the L2 inverter's NEUTRAL IN terminal. Keep this wire as short as possible.
- Connect a wire from the main service panel's hot L1 line to the **L1** inverter's AC HOT IN 1 terminal.
- Connect a wire from the main service panel's hot L2 line to the **L2** inverter's AC HOT IN 1 terminal.

Generator Wiring

- Connect a wire from the generator's ground terminal to the AC GROUND terminal in the L1 (or L2) inverter.
- Connect a wire from the generator's neutral terminal to the NEUTRAL IN 2 terminal in the L1 (or L2 Inverter).
- Connect the generator's hot wire (120 VAC) to the AC HOT IN 2 terminal in the **L1** inverter.

If a 120/240 VAC generator is used in the system its hot (L2) output must be connected to the L2 inverter as follows:

- Connect a wire from the generator's L2 hot terminal to the AC HOT IN 2 terminal in the **L2** inverter.

Series Stacking (continued)

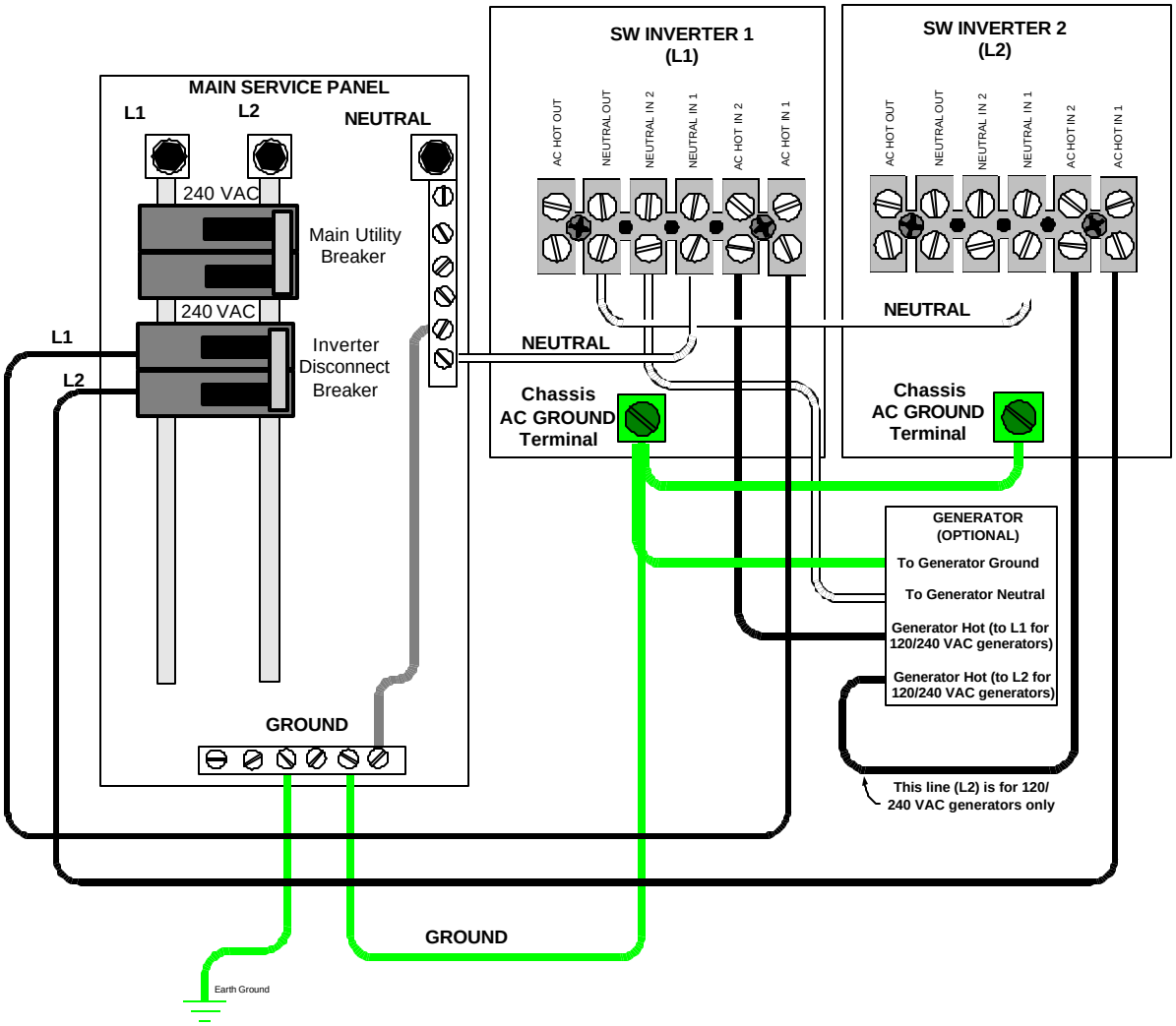

Figure 2-7
AC Input Wiring (SW Series Inverter)

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Series Stacking (continued)

Input Wiring (PS Series)

Utility Input

- Connect a wire from the ground bus in the service panel to the GROUND terminal in the L1 inverter. Connect a second ground wire from the inverter's AC GROUND terminal, to the GROUND terminal in the L2 inverter.
- Connect a wire from the neutral bus in the main service panel to the NEUTRAL IN terminal in the L1 inverter. Connect a second wire to the NEUTRAL OUT terminal and route this wire to the L2 inverter's NEUTRAL IN terminal. Keep this wire as short as possible.
- Connect a wire from the main service panel's hot L1 line to the L1 inverter's AC HOT INPUT terminal.
- Connect a wire from the main service panel's hot L2 line to the L2 inverter's AC HOT INPUT terminal.

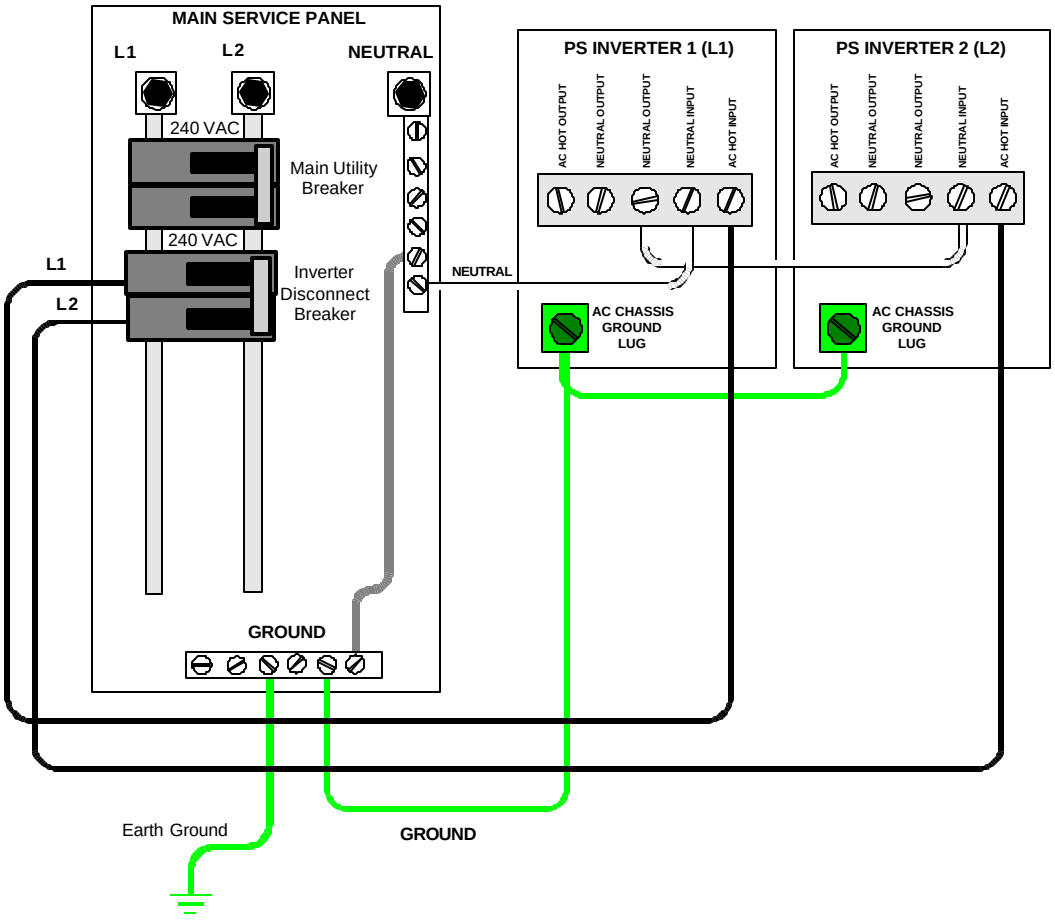

Figure 2-8
AC Input Wiring (PS Series Inverter)

Series Stacking (continued)

Output Wiring (SW Series)

The output of each inverter provides 120 VAC. The voltage between the HOT outputs from the L1 and L2 inverter is 240 VAC.

- Connect a GROUND wire from the L1 (or L2) inverter's AC GROUND lug to the sub-panel's ground bus.
- Connect the NEUTRAL wire from the L1 (or L2) inverter's NEUTRAL OUT terminal to the neutral bus in the sub-panel.
- Connect the AC HOT OUTPUT (120 VAC) from the **L1** inverter to the L1 terminal in the sub-panel.
- Connect the AC HOT OUTPUT (120 VAC) from the **L2** inverter to the L2 terminal in the sub-panel.

WARNING: ENSURE THE ONLY NEUTRAL/GROUND BOND IS IN THE UTILITY SERVICE PANEL. REMOVE ANY BONDING FROM THE SUB-PANEL IF IT IS PRESENT.

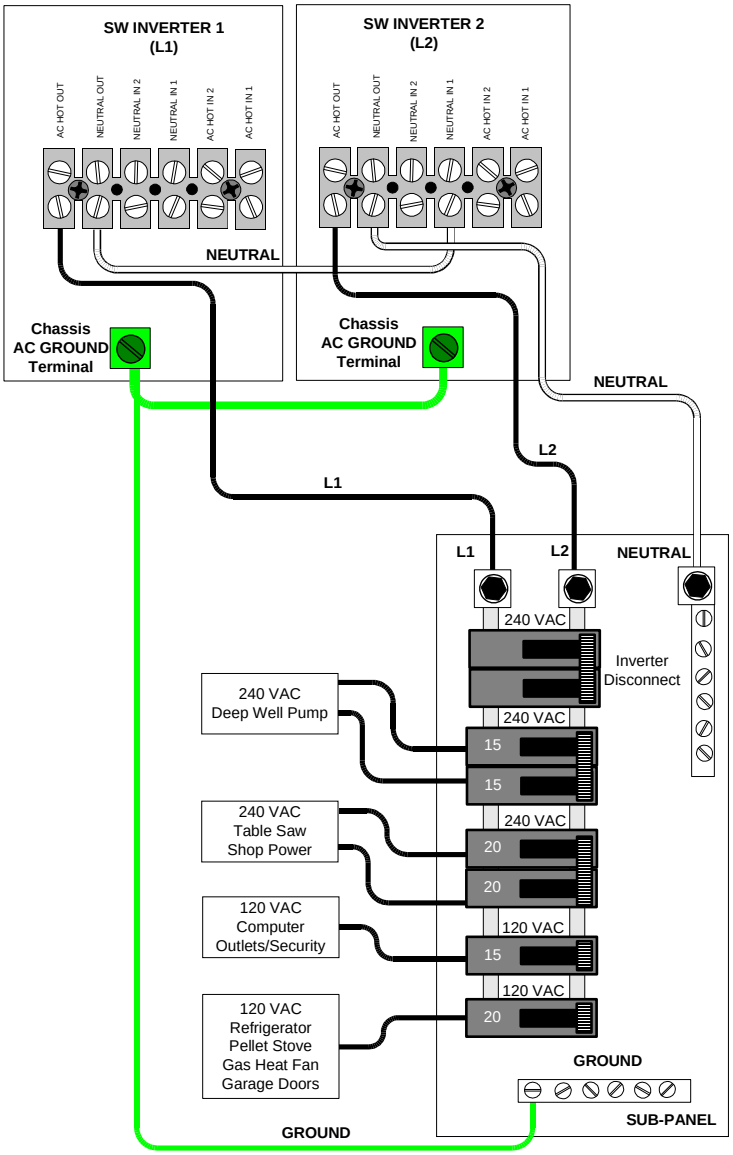

Figure 2-9
AC Output Wiring (SW Series Inverters)

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Series Stacking (continued)

Output Wiring (PS Series)

The output of each inverter provides 120 VAC. The voltage between the HOT outputs from the L1 and L2 inverter is 240 VAC.

- Connect a GROUND wire from the L1 inverter's AC GROUND lug to the sub-panel's ground bus.
- Connect a NEUTRAL wire from the L1 (or L2) inverter's NEUTRAL OUTPUT to the neutral bus in the sub-panel.
- Connect a wire from the HOT (120 VAC) output from the **L1** inverter to the L1 terminal in the sub-panel.
- Connect a wire from the HOT (120 VAC) output from the **L2** inverter to the L2 terminal in the sub-panel.

WARNING: ENSURE THE ONLY NEUTRAL/GROUND BOND IS IN THE UTILITY SERVICE PANEL. REMOVE ANY BONDING FROM THE SUB-PANEL IF IT IS PRESENT.

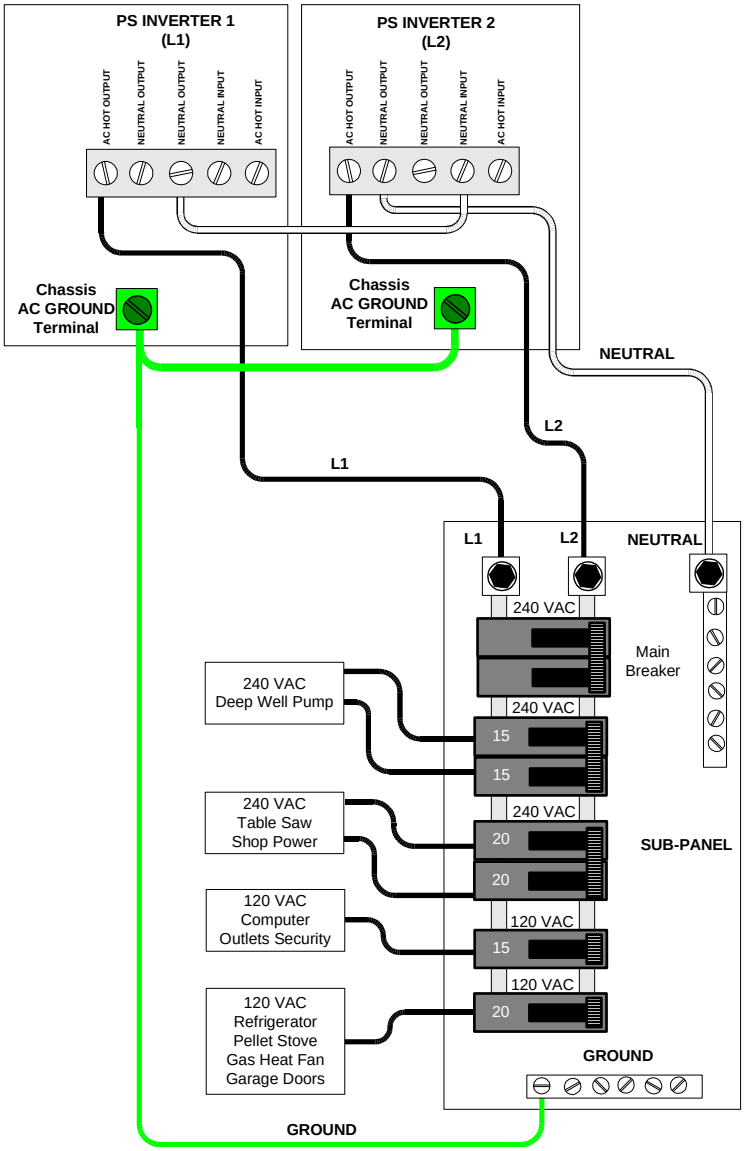

Figure 2-10
AC Output Wiring (PS Series Inverters)

Series Stacking (continued)

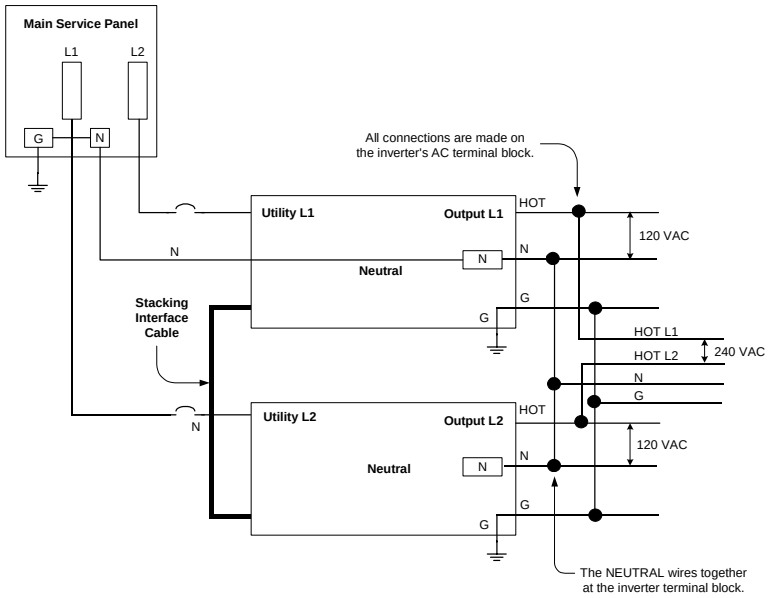

Figure 2-11
Series Stacked Inverters AC Wiring

240 VAC Only Source

A 240 VAC source does not allow for the connection of 120 VAC input inverters as no neutral line is supplied from the utility. In order to use stacked inverters, a neutral line must be added by using a center tapped autotransformer (such as a T240) on the inverter's input. This will create the necessary neutral return line for the inverters, and half the voltage for each inverter to 120 VAC. The output of the inverter supplies both 120 and 240 VAC to the loads. A Trace Series Stacking cable (SWI) and autotransformer (capable of handling the systems power requirements) are required in this configuration.

Wire the inverters as shown in the diagram below for 240 VAC only sources.

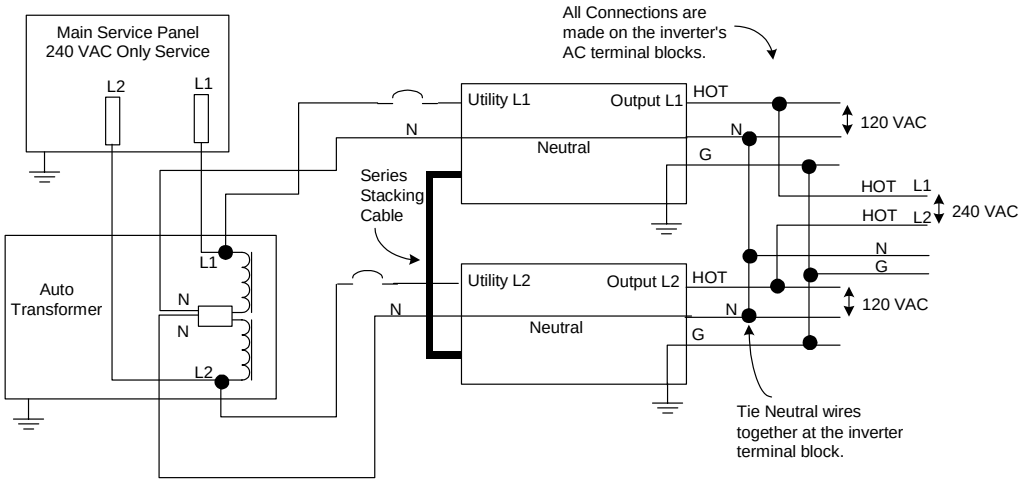

Figure 2-12
Series Stacked Inverters Connected to a 240 VAC Only Source

WARNING: WHEN STACKING INVERTERS, ALWAYS CONNECT THE CHASSIS OF EACH INVERTER TOGETHER USING THE CHASSIS GROUND LUG; OTHERWISE, A HAZARDOUS VOLTAGE MAY BE PRESENT BETWEEN EACH CHASSIS.

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Operating Stacked Inverters

Stacked inverters must operate together in order to provide the 120/240 VAC to the loads. The Series Stacking Interface cable ensures the output from each inverter is 180 degrees out-of-phase for operating 240 VAC loads.

NOTE: Until the units are tested, do no connect loads to the inverters 120 or 240 VAC output.

Start-up and Test

1. Ensure the main service panel's circuit breakers feeding the inverters are OFF.
2. Switch ON both inverters. The inverter should be providing 120/240 VAC to the sub-panel.
3. Use an AC voltmeter and measure the voltage between the L1 terminal and neutral bus in the sub-panel. This voltage should be 120 VAC (± 3%).
4. Measure the voltage between the L2 terminal and neutral bus in the sub-panel. This voltage should be 120 VAC (± 3%).
5. Measure the voltage between the L1 and L2 terminals in the sub-panel. This voltage should be 240 VAC (± 3%).
6. Switch ON the main service panel's circuit breakers feeding the inverters.
7. Verify the inverters are charging the batteries and powering the sub-panel (refer to the operator's manual).
8. Switch both inverters OFF.
9. Replace all covers and panels on the inverters and sub-panel.

   The stacked inverter system is now ready for use.

NOTE: If the inverters are not operating properly, please refer to the operator's manual for setup and troubleshooting information.

Settings

When operating PS or SW Series inverters in a series stacked configuration the following settings must be changed (via an SWRC/SWCA for PS Series inverters) for proper operation.

Automatic and Manual Generator Control

When multiple inverters are used with a generator, the inverter connected to the generator via the Generator Relay Module (GRM) is designated as the "generator controlling" inverter. The most efficient battery charging is achieved by setting the charging parameters of each inverter slightly differently (using an SWRC/SWCA for PS Series inverters).

Bulk and Float Charging

- Set the *BULK VOLTS DC* to the same setting on both inverters.
- Set the *FLOAT VOLTS DC* to the same setting on both inverters.
- Set the Absorption time for a shorter period on the "generator controlling" inverter. When the "generator controlling" inverter reaches the *FLOAT VOLTS DC* level, it will shut down the generator.

Equalize Charging

- Set both inverters to the same *EQUALIZE VOLTS DC* setting.
- Set the *EQUALIZE TIME* on the "generator controlling" inverter to a shorter equalize time.
- To start an Equalize charge (manually or automatically), set both inverters to *EQ* (accessible by pressing the green GEN MENU button on the SWRC). This allows both inverters to charge at the equalize voltage.
- During the equalize charge the BULK LED will slowly flash on each inverter, indicating the *EQ* selection has been set via the *SET GENERATOR* menu item.

Automatic Equalize Charging

If the inverters are set to automatically charge the batteries via the generator, the equalize process will begin during the next, automatically started, generator run period. When the equalizing process has completed, the generator automatically stops and the cursor returns to the *AUTO* position in the *SET GENERATOR* menu item on the "generator controlling" inverter. The "non-generator controlling" inverter must be set from *EQ* to *OFF* from the *SET GENERATOR* menu item or the inverter will start another equalize charge the next time the generator is started.

Manual Equalize Charging

If the batteries were equalized using a manually started generator or from the utility grid, the FLOAT LED illuminates, indicating the equalization process is complete. Set the cursor to *OFF* on both inverters under the *SET GENERATOR* menu item when the equalization process is complete.

NOTE: If using multiple battery temperature sensors (BTS) ensure they are all connected to the same location (battery).

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