



DRI

Stacking Interface for DR Series Inverters



Installation Manual

DRI

DR Interface

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Disclaimer of Liability

Since the use of this manual and the conditions or methods of installation, operation, use and maintenance of the unit are beyond the control of Xantrex/Trace Engineering, the company does not assume responsibility and expressly disclaims liability for loss, damage, or expense arising out of or any way connected with such installation, operation, use, or maintenance.

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.
- 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.

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 via a DC disconnect device in the OFF position. 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.

DRI Stacking Cable Kit

The DRI Stacking Cable Kit is an accessory for Trace DR Series inverters. This kit 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 inverter's loads. The AC input to the inverters is provided by the L1 and L2 legs of the utility (or 120/240 VAC generator) power with L1 connected to the input of one inverter and L2 connected to the input of the other inverter.



NOTE: Only 120 VAC/60 Hz models can be stacked. This option is not available for 230VAC/50 Hz "E" models.

Stacking is also an excellent choice for providing power to multiwire branch circuits where stand alone (120 VAC) inverters may require extensive house rewiring.

The DRI consists of:

- This Installation Manual
- Two DC interconnect cables (red and black)
- One series stacking interface cable (telephone type cable)



CAUTION: DO NOT USE STANDARD TELEPHONE CABLE IN PLACE OF THE SERIES STACKING INTERFACE CABLE.



NOTE: Refer to the DR operator's manual for additional information and specifications.



Figure 1
DRI Components

2.0 INSTALLATION

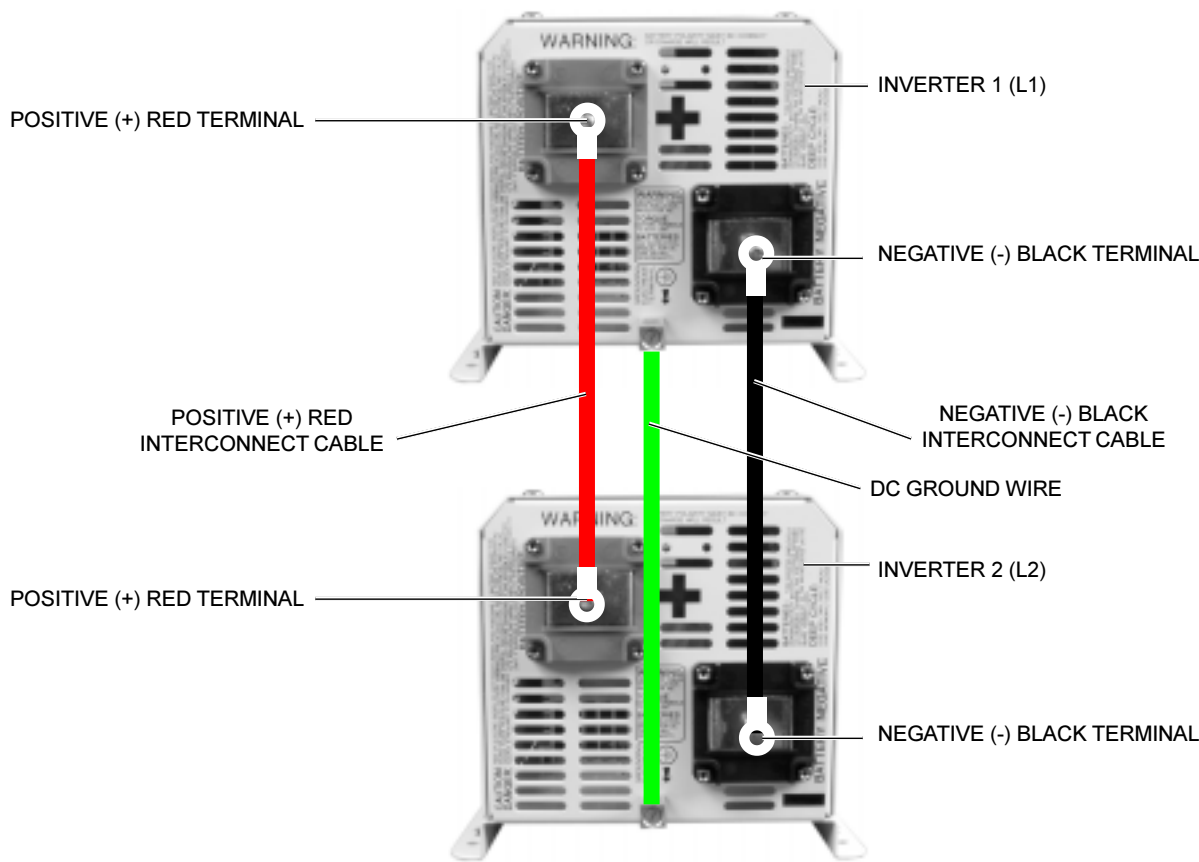


Figure 2
Positive and Negative Interface Cables with Grounds Connected

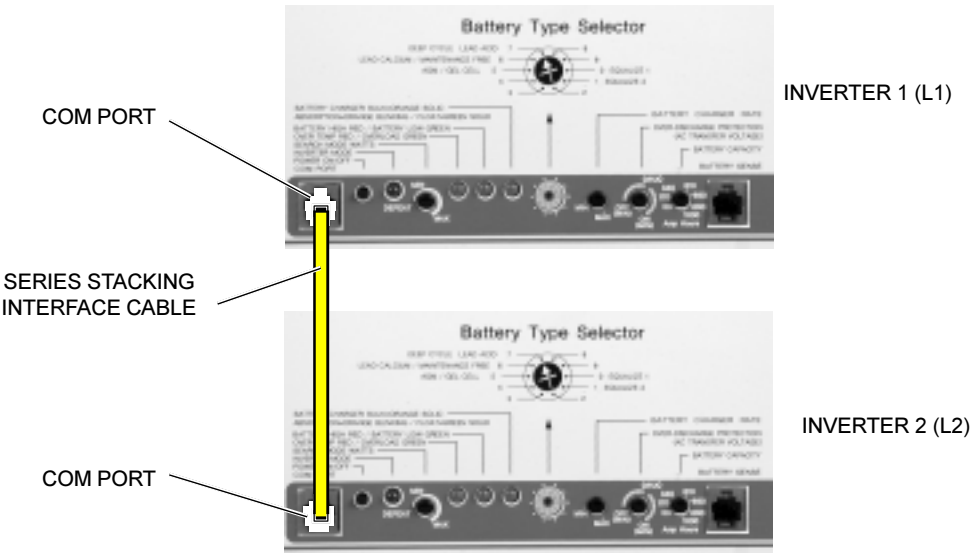


Figure 3
Series Stacking Interface Cable

Series Stacking

The COM port allows two DR 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 (DRI) is required to connect the series stacking port of the inverters. In this mode one of the inverters will act as a “primary” and the other inverter acts as a “secondary” unit. The first unit switched ON becomes the primary unit. The primary unit ensures the secondary’s output is 180 degrees out of phase for 240 VAC operation. Both units can charge the batteries or provide battery backup power during a utility outage.

Series Stack DC Wiring (one disconnect device)

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



NOTE: To easily identify the inverters, label one inverter as INVERTER 1 (L1) and the second inverter as INVERTER 2 (L2).

- Connect the inverter’s negative terminals together using the black cable (supplied).
- Connect INVERTER 2’s negative terminals to the negative terminal of the battery bank.
- Connect the inverter’s positive terminals together using the red cable (supplied).
- Connect the INVERTER 1’s positive terminals to the DC disconnect.
- Connect the DC disconnect to the positive terminal of the battery bank.
- Connect the DC GROUND lugs of the inverters together using a heavy gauge wire.
- Connect the Series Stacking Cable (DRI) to the COM port of both inverters.



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



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.

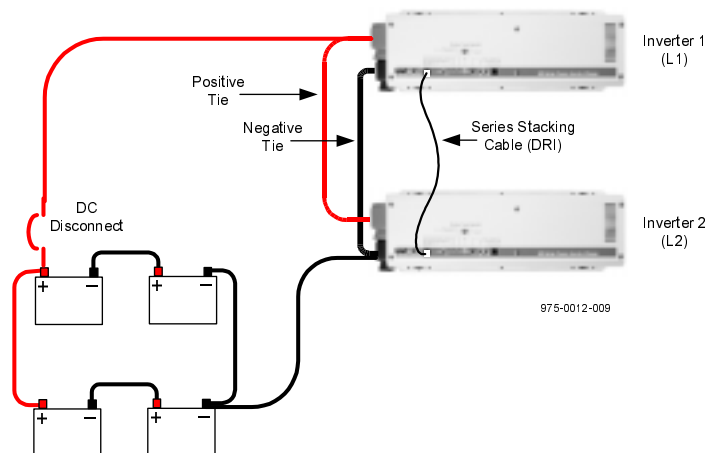



Figure 4
Series Stacking Using One DC Disconnect

2.0 INSTALLATION


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:

 **NOTE:** To easily identify the inverters, label one inverter as INVERTER 1 (L1) and the second inverter as INVERTER 2 (L2).

- Connect the inverter's negative terminals together using the black cable.
- Connect INVERTER 1's negative terminals to the negative terminal of the battery bank.
- Connect INVERTER 2's negative terminals to the negative terminal of the battery bank.
- Connect INVERTER 1's positive terminals to the DC disconnect.
- Connect the other side of the DC disconnect to the positive terminal of the battery bank.
- Connect INVERTER 2's positive terminals to the DC disconnect.
- Connect the other side of the DC disconnect to the positive terminal of the battery bank.
- Connect the DC GROUND lugs of the inverters together using a heavy gauge wire.
- Connect the Series Stacking Cable (DRI) to the COM port of both inverters.

 **NOTE:** Connect the positive and negative wires from the inverter as show in the illustration below. This ensures an even charge and discharge through the batteries.

 **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.**

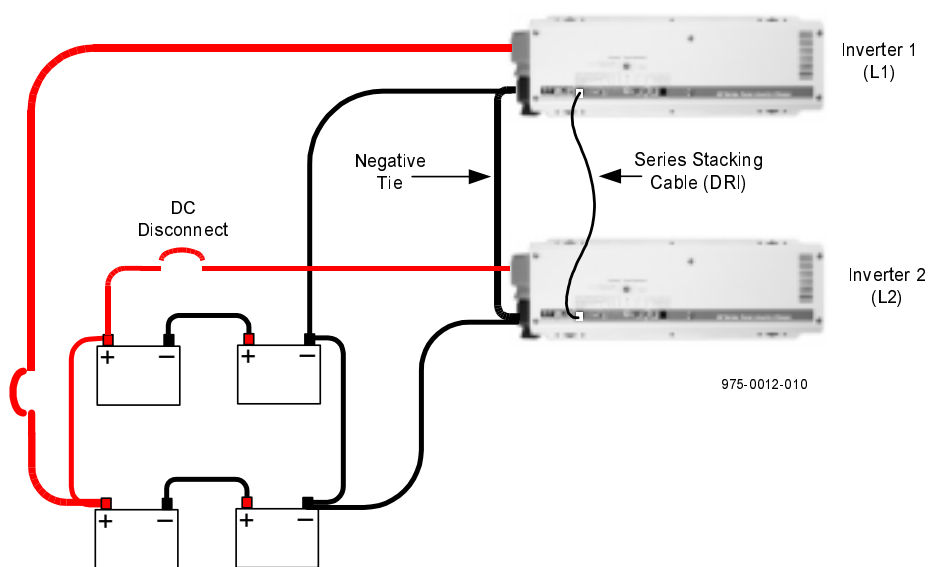


Figure 5
Series Stacking Using Two DC Disconnects

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 used 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 5).

NOTE: DRCBs (DR Conduit Boxes) may be required to meet code when stacking inverters.

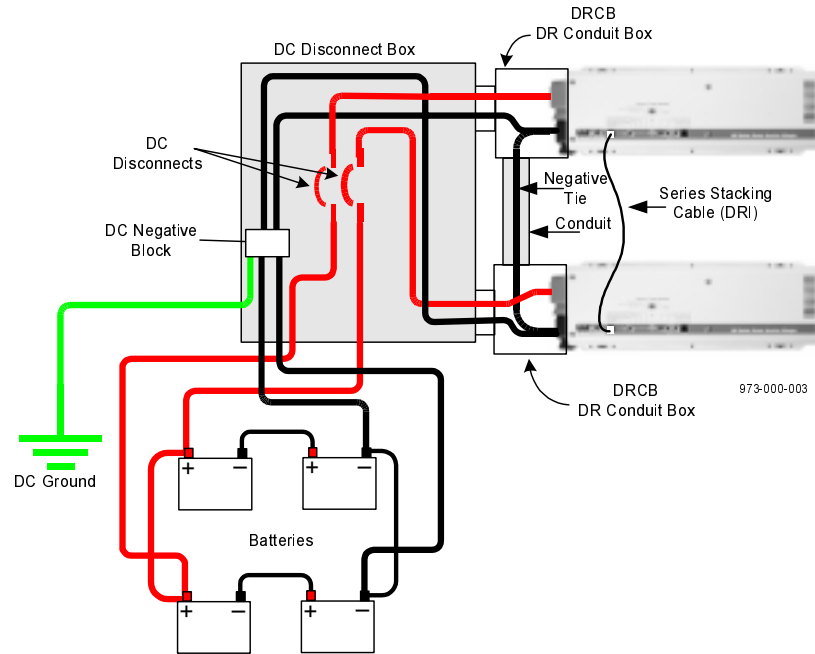


Figure 6
Conduit Box Option Wiring

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.

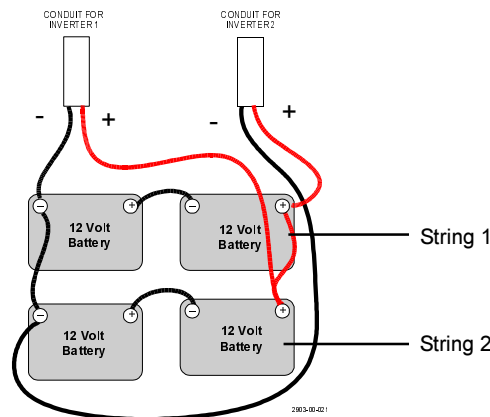


Figure 7
Example of Battery Connections for Stacked Inverters (24 VDC Illustrated)

2.0 INSTALLATION

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 by inverters. One inverter (INVERTER 1 (L1)) receives its input from the utility's L1 line, provides one 120 volt AC output and a second inverter (INVERTER 2 (L2)) receives its input from the utility's L2 line, providing the second 120 volt AC output (180 degrees out-of-phase). 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.

AC Input to Inverters (refer to Figure 8)

- Connect a wire from the ground bus in the main panel to the GROUND terminal in INVERTER 1 (L1). Also connect a second ground wire from the inverter's GROUND terminal, to the GROUND terminal in INVERTER 2 (L2).
- Connect a wire from the neutral bus in the main panel to the NEUTRAL IN terminal in INVERTER 1 (L1). Connect a second wire to the NEUTRAL OUT terminal and route this wire to INVERTER 2's (L2) NEUTRAL IN terminal. Keep this wire as short as possible.
- Connect the hot L1 line from the main panel to INVERTER 1's (L1) HOT input terminal.
- Connect the hot L2 line from the main panel to INVERTER 2's (L2) HOT input terminal.

Series Stacking (continued)

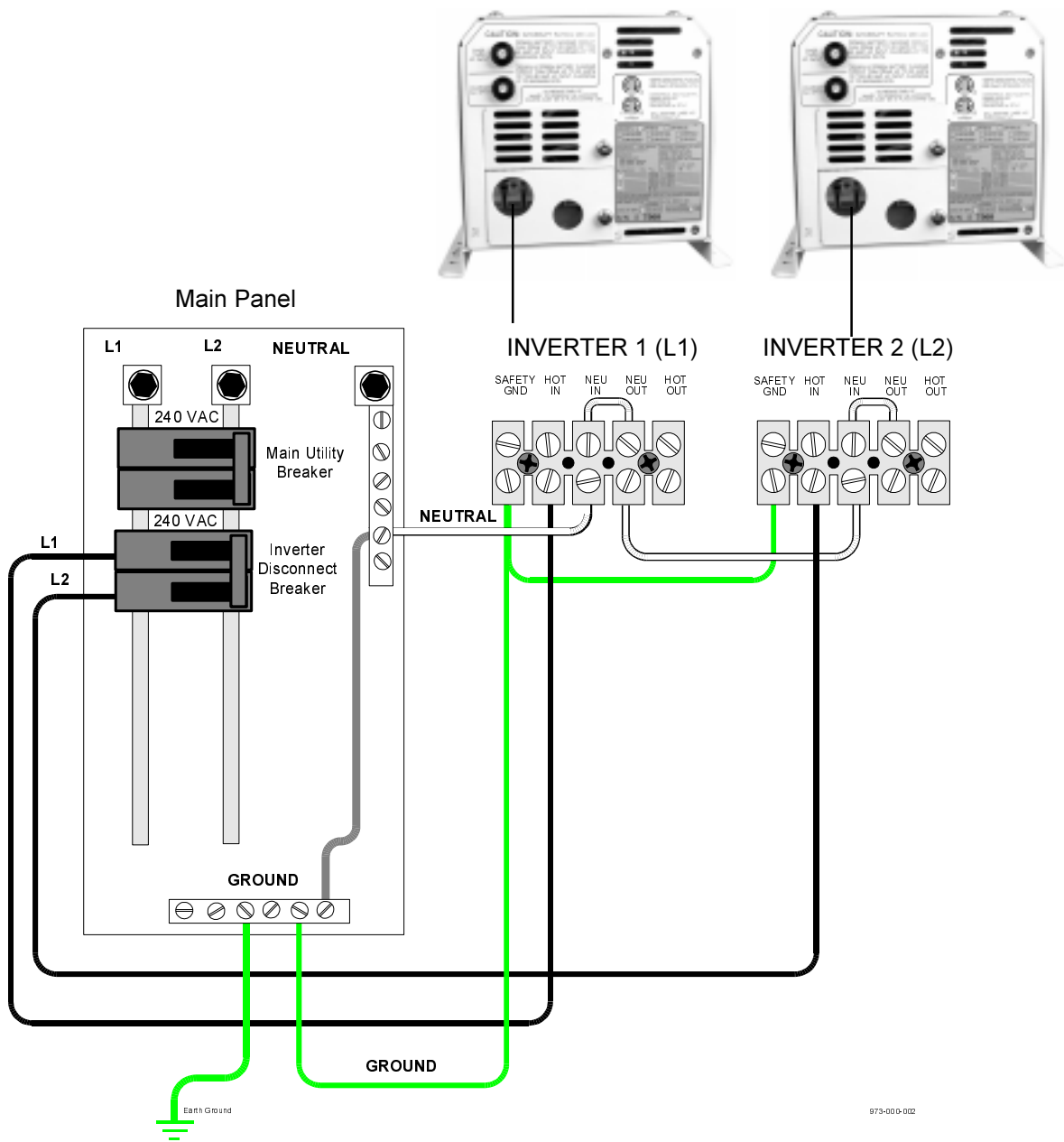


Figure 8
AC Input Wiring

2.0 INSTALLATION

Series Stacking (continued)

AC Output from Inverters (refer to Figure 9)

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

- Connect the GROUND wire from INVERTER 1 (L1) to the sub-panel's ground bus.
- Connect the NEUTRAL wire from INVERTER 2 (L2) to the neutral bus in the sub-panel.
- Connect the HOT (120 VAC) output from INVERTER 1 (L1) to the L1 main input lug in the sub-panel.
- Connect the HOT (120 VAC) output from INVERTER 2 (L2) to the L2 main input lug in the sub-panel.
- Torque all connections in the sub-panel to the manufacturer's specifications.



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

Series Stacking (continued)

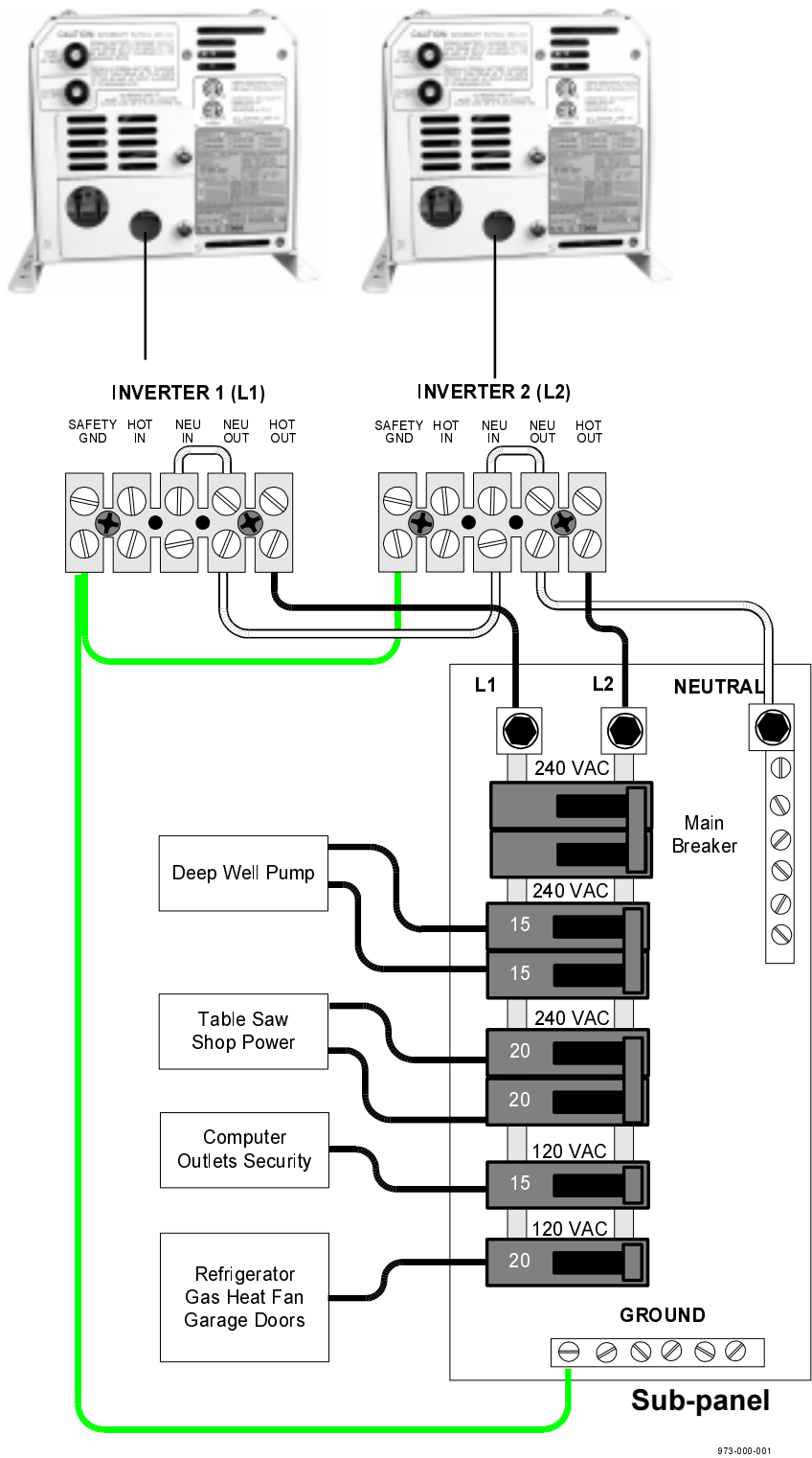


Figure 9
AC Output Wiring

2.0 INSTALLATION

Series Stacking (continued)

Series Stacking AC Wiring (continued)

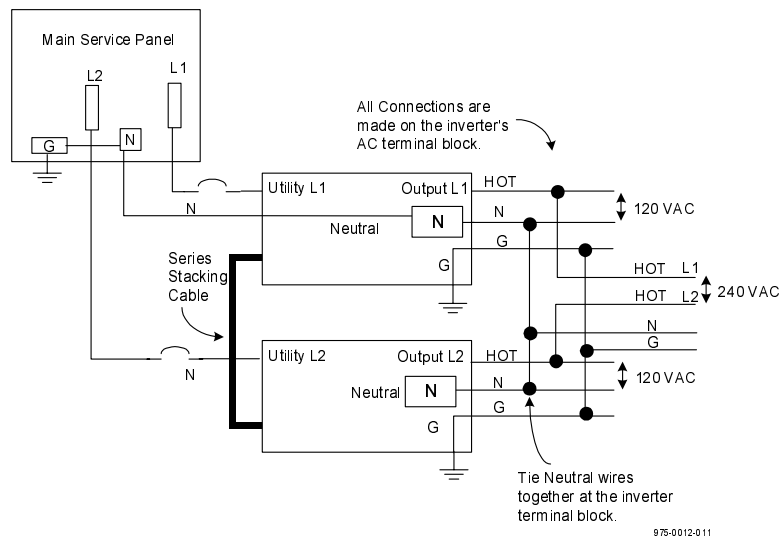


Figure 10
Series Stacked Inverters AC Wiring

240 VAC Only Source

A 240 VAC only 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 the stacked inverters, a neutral line must be added by using a center tapped autotransformer (such as the Trace 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 kit (DRI) and autotransformer (capable of meeting the system's power requirements) are required in this configuration.

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

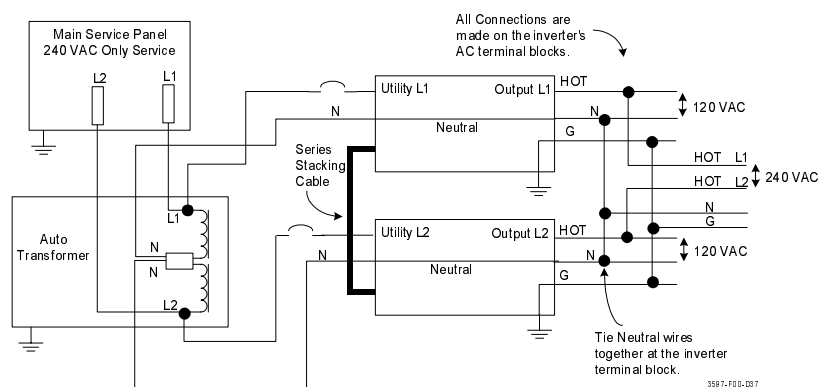


Figure 11
Series Stacked Inverters Connected to a 240 VAC Only Source



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.

Operating Stacked Inverters

Stacked inverters must operate together in order to provide the 120/240 VAC to the loads. The first unit switched ON becomes the primary unit. The primary controls the secondary unit and assures the inverters are 180 degrees out-of-phase.



NOTE: If the search mode is required, the load that “awakens” the inverters must be connected to the primary unit.



NOTE: Until the unit is tested, no loads must be connected to the inverters 120 or 240 VAC output.

Start-up and Test

- Switch ON the inverter that is designated as “primary” first.
- Switch ON the secondary inverter.

The inverter should be providing 120/240 VAC to the sub-panel.

- Use a true rms voltmeter and measure the voltage between the L1 terminal and neutral bus in the sub-panel. This voltage should be 120 VAC.
- Measure the voltage between the L2 terminal and neutral bus in the sub-panel. This voltage should be 120 VAC.
- Measure the voltage between the L1 and L2 terminals in the sub-panel. This voltage should be 240 VAC.
- Switch OFF both inverters.
- Replace all covers and panels on the inverters and sub-panel.
- Switch ON the primary and then secondary inverter.
- Switch ON the breakers (in the main panel) feeding the inverter. Ensure the inverters start to charge the batteries and power the sub-panel.

The stacked inverter system is now ready for use.



NOTE: The input source to the stacked pair should be 240 VAC with a neutral. If only 120 VAC is supplied to one inverter (primary), the other inverter (secondary) will enable its AC transfer relay. This will disconnect the AC output power to the loads connected to the secondary inverter.



NOTE: In the event of improper inverter operation, please refer to the operator’s manual for setup and troubleshooting information.



NOTE: Remote controls can not be used with stacked inverters.



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