Please read this Safety Information BEFORE installing the equipment.
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SAFETY INFORMATION

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker-Hannifin Corporation, its subsidiaries and authorized distributors provide product or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalogue and in any other materials provided from Parker or its subsidiaries or authorized distributors.

To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

Requirements

IMPORTANT Please read this information BEFORE installing the equipment.

WARNING - Operation of this equipment requires detailed installation and operation instructions provided in the product manual intended for use with this product. This information is provided in the memory stick included in the container this device was packaged in. It should be retained with this device at all times.

Intended Users
This manual is to be made available to all persons who are required to configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, and to enable the user to obtain maximum benefit from the equipment.

Application Area
The equipment described is intended for use as power conversion in an energy storage system.

Personnel
Installation, operation and maintenance of the equipment should be carried out by qualified personnel. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

Training
Qualified personnel must be trained in Safety-Related Work Practices, Job Hazard Analysis, First Aid and CPR, Arc Flash Hazards, and PPE Requirements (both classroom and on-the-job training are required in accordance with NFPA 70E requirements). Retraining is required in intervals not to exceed three years.
Product Warnings and Symbols

<table>
<thead>
<tr>
<th>Caution</th>
<th>Caution</th>
<th>Earth/Ground</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of electric shock</td>
<td>Refer to documentation</td>
<td>Protective</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conductor Terminal</td>
</tr>
<tr>
<td>Direct Current Supply</td>
<td>Alternating Current Supply</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Phase Symbol</td>
</tr>
<tr>
<td>ON Symbol</td>
<td>OFF Symbol</td>
<td></td>
</tr>
</tbody>
</table>

WARNING: The 890GTR is not provided with a GFDI device. This inverter must be used with an external GFDI device as required by the Article 690 of the National Electrical Code for the Installation location.

Hazards

**DANGER! – Ignoring the following may result in injury**

1. This equipment can endanger life by exposure to high voltages.
2. The equipment must be permanently earthed due to the high earth leakage current, and the supplies and loads must be connected to an appropriate safety earth.
3. Ensure all incoming supplies are isolated before working on the equipment. Be aware that there may be more than one supply connection to the inverter.
4. There may still be dangerous voltages present at power terminals (battery inputs and DC bus) when the inverter is stopped.
5. For measurements use only a meter to IEC 61010 (CAT III or higher). Always begin using the highest range. CAT I and CAT II meters must not be used on this product.
6. Under normal circumstances the AC and DC Bus should discharge within 10 minutes. Use a meter capable of measuring up to 1000 VDC & 600 VAC RMS to confirm that less than 50V is present on the DC BUS and between all power terminals and earth before working on or near the DC Bus.
7. Unless otherwise stated, this product must NOT be dismantled. In the event of a fault the component must be returned.

**WARNING! - Ignoring the following may result in injury or damage to equipment**

**SAFETY**

Where there is conflict between EMC and Safety requirements, personnel safety shall always take precedence.

- Never perform high voltage resistance checks on the wiring without first disconnecting the inverter from the circuit being tested.
- Whilst ensuring ventilation is sufficient, provide guarding and /or additional safety systems to prevent injury or damage to equipment.
- All control and signal terminals are SELV, i.e. protected by double insulation. Ensure all external wiring is rated for the highest system voltage.
- All exposed metalwork in the Inverter is protected by basic insulation and bonded to a safety earth.
- When replacing an inverter in an application and before returning to use, it is essential that all user defined parameters for the product's operation are correctly installed.
- RCDs are not recommended for use with this product but, where their use is mandatory, only Type B RCDs should be used.
EMC

- In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.
- This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.
- This is a product of the restricted sales distribution class according to IEC 61800-3. It is designated as "professional equipment" as defined in EN61000-3-2. Permission of the supply authority shall be obtained before connection to the low voltage supply.

WARNING! – Control Unit Removal / Fitting
Isolate supply before plugging or unplugging control unit to the inverter

WARNING! – Unit is connected to multiple energy sources.

WARNING!

CAUTION!

APPLICATION RISK
- The specifications, processes and circuitry described herein are for guidance only and may need to be adapted to the user's specific application. We cannot guarantee the suitability of the equipment described in this Manual for individual applications.

RISK ASSESSMENT
Under fault conditions, power loss or unintended operating conditions, the inverter may not operate as intended.
In particular:
- Stored energy might not discharge to safe levels as quickly as suggested, and can still be present even though the inverter appears to be switched off.

An inverter is a component within a system that may influence its operation or effects under a fault condition. Consideration must be given to:
- Stored energy
- Supply disconnects
- Sequencing logic

WARNING! – Ignoring the following may result in serious injury or damage to equipment

OSHA Electric Power Generation, transmission, and distribution safety standards (29 CFR 1910.269) consideration:

Workers may be exposed to arc flash hazards, electric shocks, and burns that can cause injury and death when making battery or grid connections. Do not work on connections to the battery container or the grid without proper safety considerations.


Dangerous electrical potentials which can result in electrocution and arc flash hazards are present while the battery container is connected. Workers must pay attention to both battery power conductors and overhead power lines. While fatal electrocution is the main hazard, other hazards include using tools and equipment that can contact power lines.

- Look for overhead power lines and buried power line indicators.
- Stay at least 10 feet away from overhead power lines and assume they are energized.
- De-energize and ground lines when working near them.
- Use non-conductive wood or fiberglass ladders when working near power lines.
QUICKSTART

BEFORE YOU START

This document covers the steps necessary for a basic start-up of the 890GTR inverter. Inverter start-up should be performed by competent electrical technicians who are familiar with AC inverters and their applications. For detailed installation, safety and applications refer to the 890GTR Product Manual HA502996.

Ensure that all local electric codes are met while installing the inverter. Check that all live parts are covered to protect against electric shock.

This document expects that the inverter is already installed in its intended location and that all relevant installation procedures have been followed. Please ensure that the inverter has adequate ventilation so that ambient temperature does not exceed 45°C (112°F) under normal operating conditions.

We suggest you check to see if any new firmware is available at www.parker.com/egt.

ABOUT THIS QUICKSTART

This QuickStart will:

- Familiarise you with the terminals and operation of the unit.
- Provide *basic* installation details and a quick set-up procedure.
- Show you how to setup and start the inverter.

* Because the 890GTR is a system product and we have no knowledge of your application, we detail the quickest way to power-up the inverter using a simple earthing scheme with minimal control wiring. Refer to the full 890GTR Product Manual HA502996 for items not covered in this QuickStart.

Provided with every 890GTR unit is:

- Quickstart.
- Memory stick containing a cd with the Product Manuals.
- Customer ordered Options.

This QuickStart assumes that:

- You are a competent technician with experience of installing this type of equipment.
- You are familiar with the relevant standards and Local Electric Codes (which take precedence).
- You have read and understood the Safety Information provided at the front of this QuickStart.
- You realise that this guide contains only basic information and that you may need to refer to the 890GTR Product Manual to complete your installation.
OVERVIEW

Exhaust Fan Assemblies with Guards
Can be removed for replacement and maintenance see Fan Maintenance page 6-4 of main product manual.

Inverter
No end-user serviceable parts contained within

Support Rails
Supplied with required hardware to mount in cabinet

Power Connectors
Not supplied with product.
View for reference only

Auxiliary Power Output Fuse
Can be removed for replacement see Fuse Replacement page 6-7 of main product manual
**Electrical Installation**

- **HVIL** (High Voltage Interrupt Loop) & Emergency Stop
  AMP Mini Mate-N-Lok, 6 way, Female

- **DC Power Connector**
  Amphenol Powerlok, 300 series, 2 position with X Polarization

- **Ground Studs**
  M6x1

- **Status Lights**
  DC Ready Status Light
  AC Ready Status Light
  Inverter is Synchronized to Grid

- **Programming Port**
  Mini-USB
  For installing configuration software into the inverter

- **I/O**
  RJ45 Ethernet Socket
  For communicating with inverter over Modbus TCP

- **Discrete I/O**
  Phoenix Base Strip MC15/9-g-3,81
  Additional Analog & Digital Signals.

- **AC Power Connector**
  Amphenol Powerlok, 300 series, 3 position with X polarization

- **Auxiliary Power Out**
  IEC Appliance Outlet C13
  120VAC 50/60Hz

- **Control Power In**
  IEC Appliance Inlet C14
  120VAC 50/60Hz. To be supplied by end-user.

**Status Lights**

- Inverter is Synchronized to Grid
- Control Power Exists
- Inverter has Tripped

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**Additional Notes**

- Use Copper Conductors Only
- Refer to instruction manual for wire size and tightening torque

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Wiring Requirements

**WARNING: Parker Inverters must be installed using wiring methods according to the requirements of ANSI/NFPA 70, Canadian Electrical Code Part I, or other appropriate local or national electrical codes. It is the responsibility of the installer to ensure installation is designed and performed in compliance with these standards.**

<table>
<thead>
<tr>
<th>Function</th>
<th>Wire size**</th>
<th>Mating Connector</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Ground</td>
<td>Minimum 21.2 mm² wire (4 AWG)</td>
<td>Wire Lug</td>
<td>Tightening torque 6-7 Nm (4.4-5.2 lb-ft)</td>
</tr>
<tr>
<td>AC Ground</td>
<td>Minimum 13.3 mm² wire (6 AWG)</td>
<td>Wire Lug</td>
<td>Tightening torque 6-7 Nm (4.4-5.2 lb-ft)</td>
</tr>
<tr>
<td>DC Bus Connection</td>
<td>Minimum 33.6 mm² (2 AWG)</td>
<td>Amphenol Powerlok, 300 Series, 2 Position with X Polarization</td>
<td>Maximum continuous current = 160A&lt;sub&gt;DC&lt;/sub&gt;</td>
</tr>
<tr>
<td>AC Bus Connection</td>
<td>Minimum 33.6 mm² (2 AWG)</td>
<td>Amphenol Powerlok, 300 Series, 3 Position with X Polarization</td>
<td>Maximum continuous current = 128A&lt;sub&gt;RMS&lt;/sub&gt;</td>
</tr>
<tr>
<td>HVIL &amp; Emergency Stop</td>
<td>Minimum 0.3 mm² (22 AWG)</td>
<td>AMP 172168-1 (Mini Mate-N-Lok Housing)</td>
<td>AMP 770988-1 (crimp socket, 18-22 AWG)</td>
</tr>
<tr>
<td>Discrete I/O</td>
<td>Minimum 0.14 mm² (28 AWG)</td>
<td>Phoenix Contact 1803646 (MC 1,5/9-ST-3,81)</td>
<td></td>
</tr>
<tr>
<td>Auxiliary Power Out</td>
<td>Minimum 2.1 mm² (14 AWG)</td>
<td>IEC type C14 (male)</td>
<td>Rated output = 120V, 750VA, 50/60Hz</td>
</tr>
<tr>
<td>Auxiliary Power In</td>
<td>Minimum 2.1 mm² (14 AWG)</td>
<td>IEC type C13 (female)</td>
<td>120V (+/-5%), 150VA, 50/60Hz</td>
</tr>
<tr>
<td>Communication Port</td>
<td>Cat5 w Shield Ethernet Cable</td>
<td>RJ-45</td>
<td></td>
</tr>
<tr>
<td>Programming Port</td>
<td>Mini-USB</td>
<td>Mini-USB</td>
<td></td>
</tr>
</tbody>
</table>
**DC connection notes:**

1. Verify correct polarity before connecting to the DC bus. Improper DC polarity could result in damage to the inverter and/or DC supply.

2. DC supply must provide a method to pre-charge the DC bus capacitors contained within the inverter. Failure to properly precharge the inverter will result in high inrush currents possibly damaging the inverter.

3. External fusing or breaker is required for the DC connection.

4. Lethal voltages and energies are present in this equipment. It is the responsibility of the installer to follow the requirements of ANSI/NFPA 70, Canadian Electrical Code Part I, and/or other appropriate local and national electrical codes.

5. It is the responsibility of the operator of this equipment to ensure adequate safety procedures and Arc Flash precautions are followed.

**AC connection notes:**

1. AC polarity (phase rotation) is automatically detected and accommodated by the inverter.

2. AC supply must have appropriate disconnection and fusing. Refer to NEC and all applicable codes.

3. Lethal voltages and energies are present in this equipment. It is the responsibility of the installer to follow the requirements of ANSI/NFPA 70, Canadian Electrical Code Part I, and/or other appropriate local and national electrical codes.

4. It is the responsibility of the operator of this equipment to ensure adequate safety procedures and Arc Flash precautions are followed.

**Estop/HVIL connection notes:**

1. Although the Estop and HVIL circuits are galvanically isolated from the inverter control circuits, it is recommended that they are referenced to ground potential.

2. Estop circuit requires external 24 Vdc but is polarity insensitive.

3. HVIL circuit utilizes isolated contacts in both AC and DC power connectors. External 24 Vdc power supply is recommended. The following figure illustrates two possible connections schemes:
Example E-Stop & HVIL Circuit
Start-up Sequence

Proper power up and starting sequence is required to successfully connect the DC supply with the Grid. Failure to follow an acceptable sequence could result in damage to the inverter or associated equipment.

1. **Apply control power**—connect 120 Volt 50/60 Hz ac power to “control power in”. This supply is typically an Uninterruptable Power Supply (UPS) for black start and VRT features. Maximum control power requirements: 120 Watts (150 VA).

2. **Ensure Estop/EPO circuit is satisfied**—an external 24 Volt DC supply is required to engage the main AC contactor. This input is usually used in conjunction with a normally closed Estop pushbutton. Additionally, the High Voltage Interrupt Loop contacts should be included in the Estop circuit.

3. **Close dc bus pre-charge contactor**—the DC bus capacitors need to be pre-charged through a current limited circuit (i.e. resistor) to prevent excessively high in-rush currents. Failure to properly pre-charge the bus could result in damage to the inverter or associated equipment.

4. **Ensure dc bus voltage is equal to DC supply voltage (+/-5%)**—verify the dc bus is properly charged by query of the DC LINK VOLTS parameter through the Modbus communication link.

5. **Close dc main contactor**—once the DC bus is fully charged, then the main DC contactor can be closed. This contactor is part of the DC supply.

6. **Disengage dc pre-charge contactor**—opening the pre-charge contactor after closing the DC main contactor is recommended to prevent damage to the pre-charge circuit in case the main contact opens unexpectedly.

7. **Ensure both start and stop bits are cleared**—the Modbus Start Request and Stop Request parameters are rising edge sensitive and it is good practice to initialize them before attempting a start.

8. **Clear faults**—send a Fault Reset command to clear any extraneous faults that may have occurred during the startup sequence.

9. **Verify faults are all cleared**—read the Tripped bit to ensure all faults are cleared. Correct any persistent faults before proceeding.

10. **Toggle start bit true then false**—the Start Request bit is rising edge sensitive. It is good practice to return the start bit to false once a request is sent.

11. **Wait 2 seconds**—there are two 1 second delays built into the start up configuration. Therefore it may take at least two seconds before the inverter actually starts and indicates a Running condition.

12. **Verify inverter running**—read the Running bit to make sure the inverter is enabled and connected to the grid.

13. **Select Control Mode**—select either Id/Iq or KW/KVAR control.

14. **Set Output Demand**—set either Id/Iq or KW/KVAR to desired level.
COMPLIANCE
A comprehensive guide to product compliance is available in the 890GTR Product Manual.

General Installation Considerations

Supply requirements
To maintain compliance with the EC Directive 2006/95/EC under EN 50178 (1998) the following conditions must be met:
- The system battery voltage must not exceed 825V DC
- Battery source to be transient limited <2.5kV impulse
- Primary Source 3 phase (Grid side) rated at 400V OV Category III
- Auxiliary Source 120/240 OV Category II and must not be derived from 400V ‘Y’ supply

Earthing Requirements

IMPORTANT Protective earthing always takes precedence over EMC screening.

Protective Earth (PE) Connections

Note In accordance with installations to EN60204, only one protective earth conductor is permitted at each protective earth terminal contacting point.

Local wiring regulations take precedence and may require the protective earth connection of the transformer to be connected locally, i.e. not as specified in these instructions. This will not cause shielding problems because of the relatively high RF impedance of the local earth connection.

EMC Earth Connections
For compliance with EMC requirements, we recommend that the “0V/signal ground” be separately earthed. When a number of units are used in a system, these terminals should be connected together at a single, local earthing point.

Control and signal cables for the all analogue inputs, and communications require screening with the screen connected only at the inverter end. However, if high frequency noise is still a problem, earth the screen at the non-inverter end via a 0.1μF capacitor.

Note Connect the screen (at the inverter end) to the inverter protective earth point, and not to the control board terminals.

Cabling Requirements - Planning Cable Runs
- Use the shortest possible grid cable lengths.
- Keep electrically noisy and sensitive cables apart.
- Keep electrically noisy and sensitive parallel cable runs to a minimum. Separate parallel cable runs by at least 0.25 metres. For runs longer than 10 metres, separation should be increased proportionally. For example if the parallel runs were 50m, then the separation would be (50/10) x 0.25m = 1.25m.
- Sensitive cables should cross noisy cables at 90°.
- Never run sensitive cables close or parallel to the grid or dc link conductors for any distance.
- Never run supply, dc link or grid cables in the same bundle as the signal/control and feedback cables, even if they are screened.
- Ensure EMC filter input and output cables are separately routed and do not couple across the filter.