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HT2000 Installation Guide

Heart Transverter S.A. Energy for a Brighter Future



HT2000 Transverter (2000 Watt Inverter / Power Converter)

THIS INSTALLATION GUIDE FOR USE BY QUALIFIED PERSONNEL ONLY

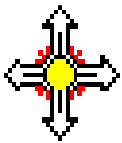
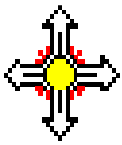


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1 SAFETY DECLARATIONS

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This guide includes safety installation instructions for the HT2000 Transverter.

The following safety symbol conventions are used throughout this guide to indicate potentially dangerous conditions or important safety instructions.



WARNING: Be Alert for a High Voltage Situation with the HT2000



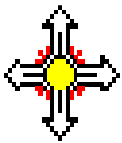
Caution: Indicates a Serious Procedure for safe and proper operation of the HT2000.

The HT2000 produces voltages and currents capable of causing severe injury or death. Caution must be taken when installing and operating the HT2000.

Read all of the instructions and cautions in the manual before installing the HT2000.

Ensure that all power (both AC and DC) have been disconnected **BEFORE** installing, servicing, or removing the HT2000 Transverter.

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2 GETTING STARTED WITH YOUR HT2000

2.1 Overview

Congratulations on your recent purchase of the HT2000 Transverter. We appreciate your support and will endeavor to provide you with the assistance you need to get the most out of your system. The HT2000 is designed to provide years of trouble free service with a **30 month** limited warranty. It is designed to have multiple HT2000 units stacked together to meet all your current energy needs and be adaptable to meet your energy needs well into the future. Figure 1 shows the basic HT2000 system that consists of a Transverter Remote Panel (TREM or REM) and 1 HT2000 unit. The TREM is used for locally controlling HT2000 operation. An optional Java Program, located on a User PC (called Transverter Engineering Application – TEA), gives the user easier access to control the HT2000 Transverter(s) remotely from a PC.

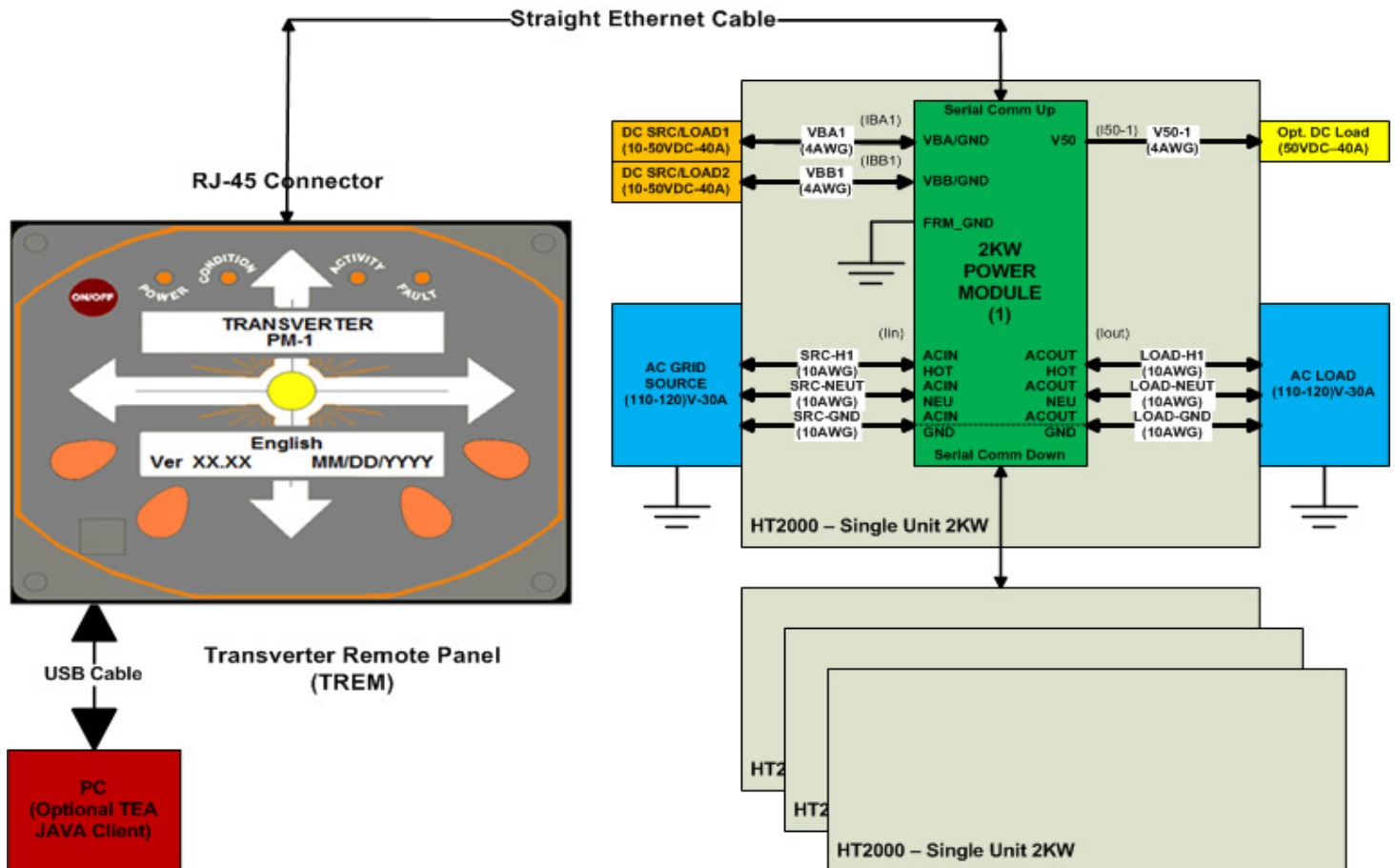
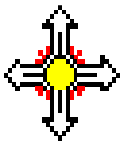


Figure 1 Heart Transverter HT2000 System (Basic system shown with expansion HT2000 PM's)

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Each HT2000 is a 2 KW power interface and UPS system. It serves as a bi-directional interface between any two DC sources/loads between 10 & 50 volts and an AC interface with an input/output of (110-117) Volts Single Phase AC. The HT2000 supports 2000 watts continuously, and is compatible with 50 or 60 Hz AC power systems. The HT2000 has automatic power factor compensation, pure sine wave output, precisely regulated AC and DC outputs, line conditioning, surge and brownout protection. These features ensure that all equipment connected to the HT2000 will run smoothly, last longer, and use less power.

Multiple HT2000 units can be Grouped together (connected in Parallel) to provide Additional $2(n)*2KW$ of Power on the same Single Phase AC Network. It can also be connected in multiple phases or banks to support 2 and 3 Phase AC Power networks. The outputs from each bank will be properly phased to provide two and three phase power. Figure 2 shows some examples of how the HT2000 can be utilized in Grid connected applications for two phase operation. Each HT2000 is interconnected with a Daisy Chain Straight Ethernet Cable (1 for Up, 1 for Down). The last HT2000 is only connected to the Serial Communication Up connector.

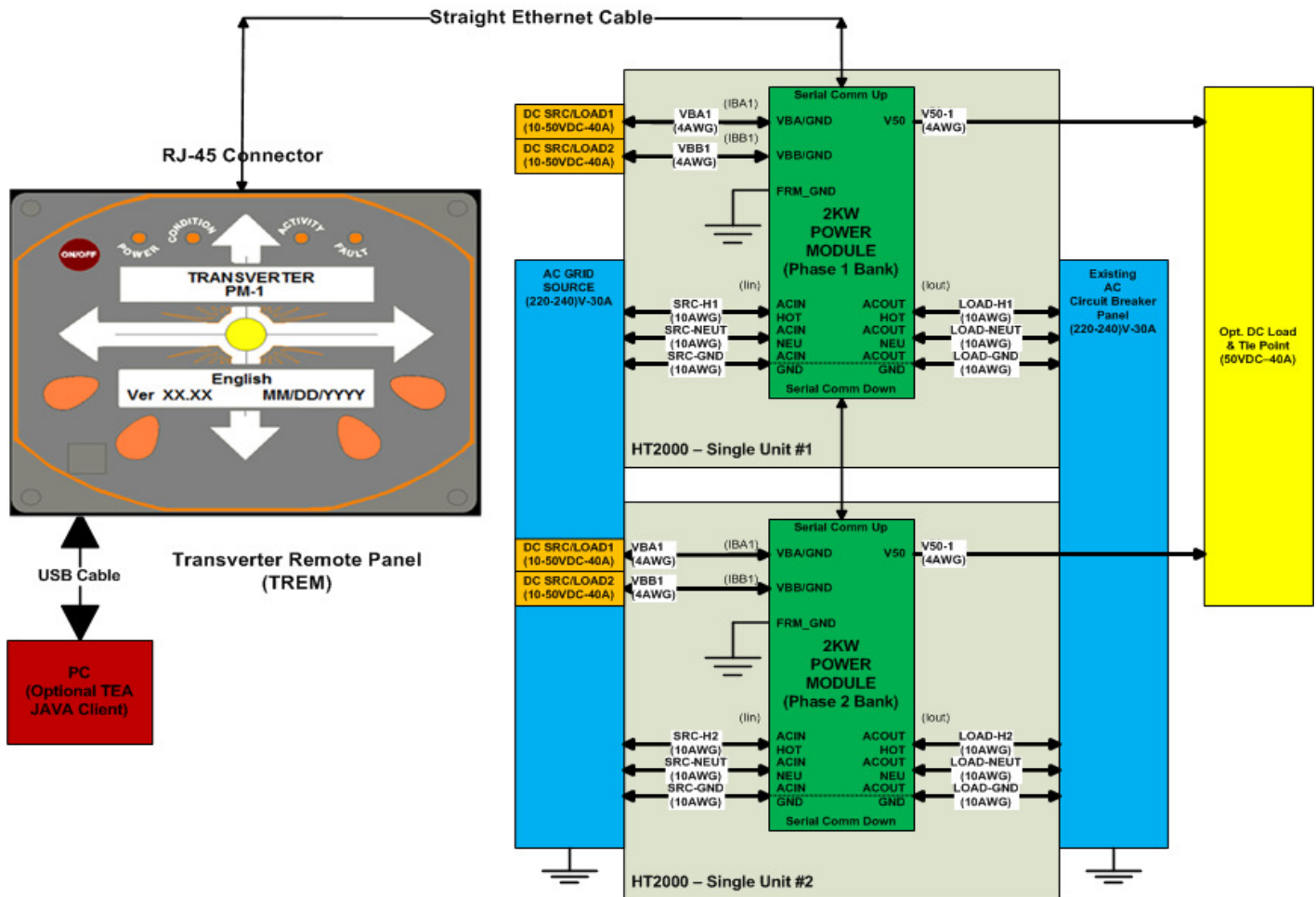
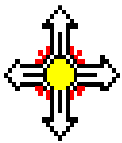


Figure 2 Heart Transverter HT2000 2 Phase System

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2.2 HT2000 Identification

Please fill in for your reference and future use:

Date Purchased _____

Dealer Name _____

Dealer Address _____

Dealer Phone Number _____

HT2000 Serial Number(s) _____

HT2000 HW Revision(s) _____

TREM Serial Number _____

TREM HW Revision _____

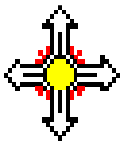
TREM Firmware Revision _____ Date _____

NOTES:

Your 13 digit serial numbers can be found on the side of the HT2000 (HT000xxxxxxx) and the bottom of TREM (TR000xxxxxxx)

The opening screen that is presented when the HT2000 is first powered up (Figure 1) shows the current firmware revision of your remote panel. (You can also see this version number at any time in the [Power ON/OFF screen](#) by pressing the ON/OFF button). The firmware release data is shown only in the opening screen in month (MM), day (DD), year (YYYY) format.

NOTE: Terminology and Acronyms used in this manual will provided in an [Appendix](#).



3 INSTALLATION

The HT2000 must be installed by a qualified Electrician to avoid electrical wiring mistakes as well as assure the HT2000 system to be safe in operation for both the user and the equipment. Some care should be given in picking a place for the HT2000 Power Module(s) to operate. It is desired to have the PM's reside in a well ventilated inside dry area, away from the weather elements and gas fume accumulation. Ideally, they are to be mounted on the same wall as your existing facility circuit breaker panel and near your DC input source(s). That way, connections to/from the HT2000 will be short in length and result in less power loss. In figure 3 is a representative installation of a Basic HT2000 System. In Figure 4 is a representative installation of a larger typical 2 phase AC Grid Tie system that the HT2000 can support (with a minimum of two HT2000 units) respectively. Cable Wiring should be coordinated to support multiple units for future expansion of up to as many as 12 units.

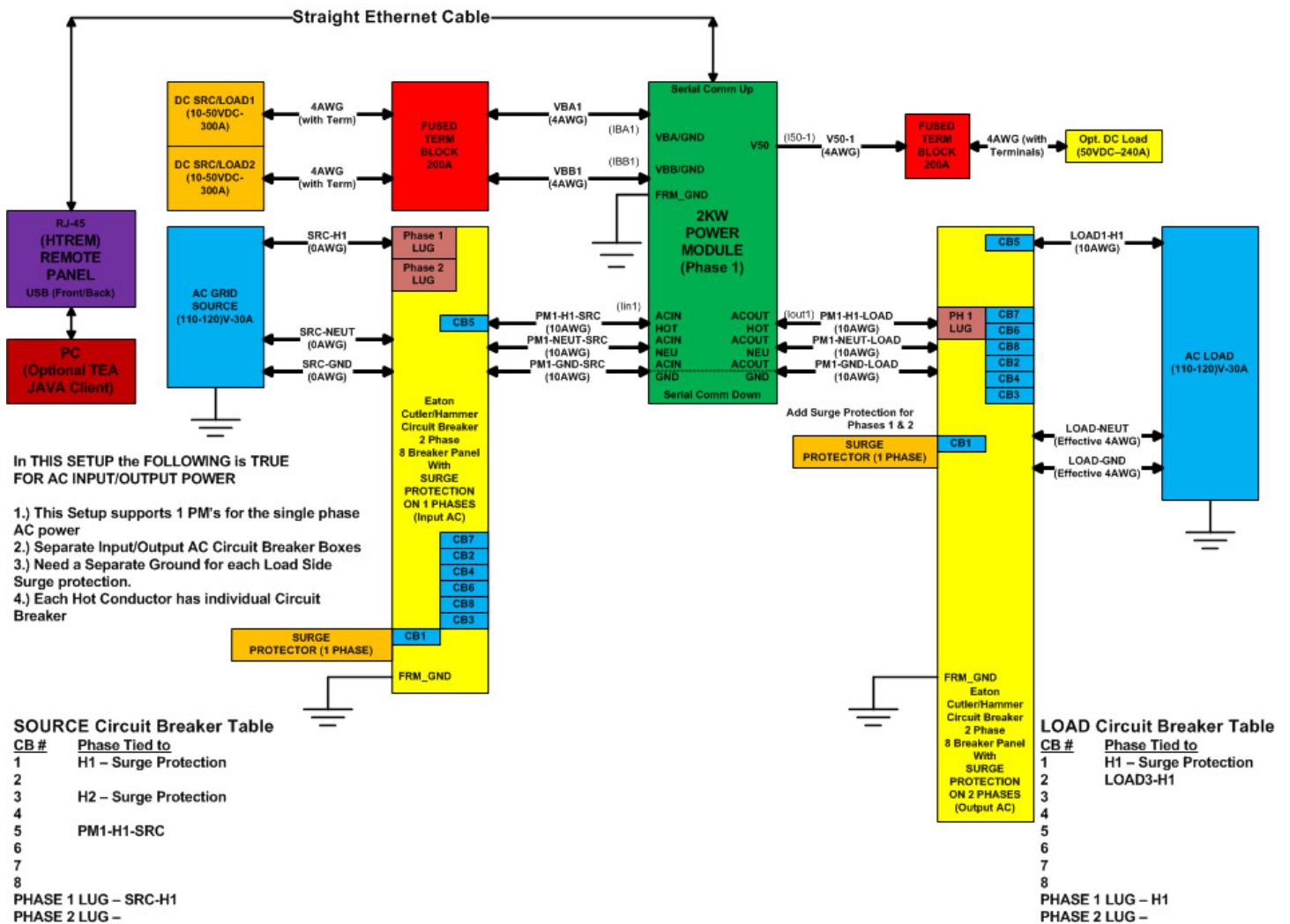


Figure 3 Heart Transverter HT2000 Basic (Single Phase) System Installation

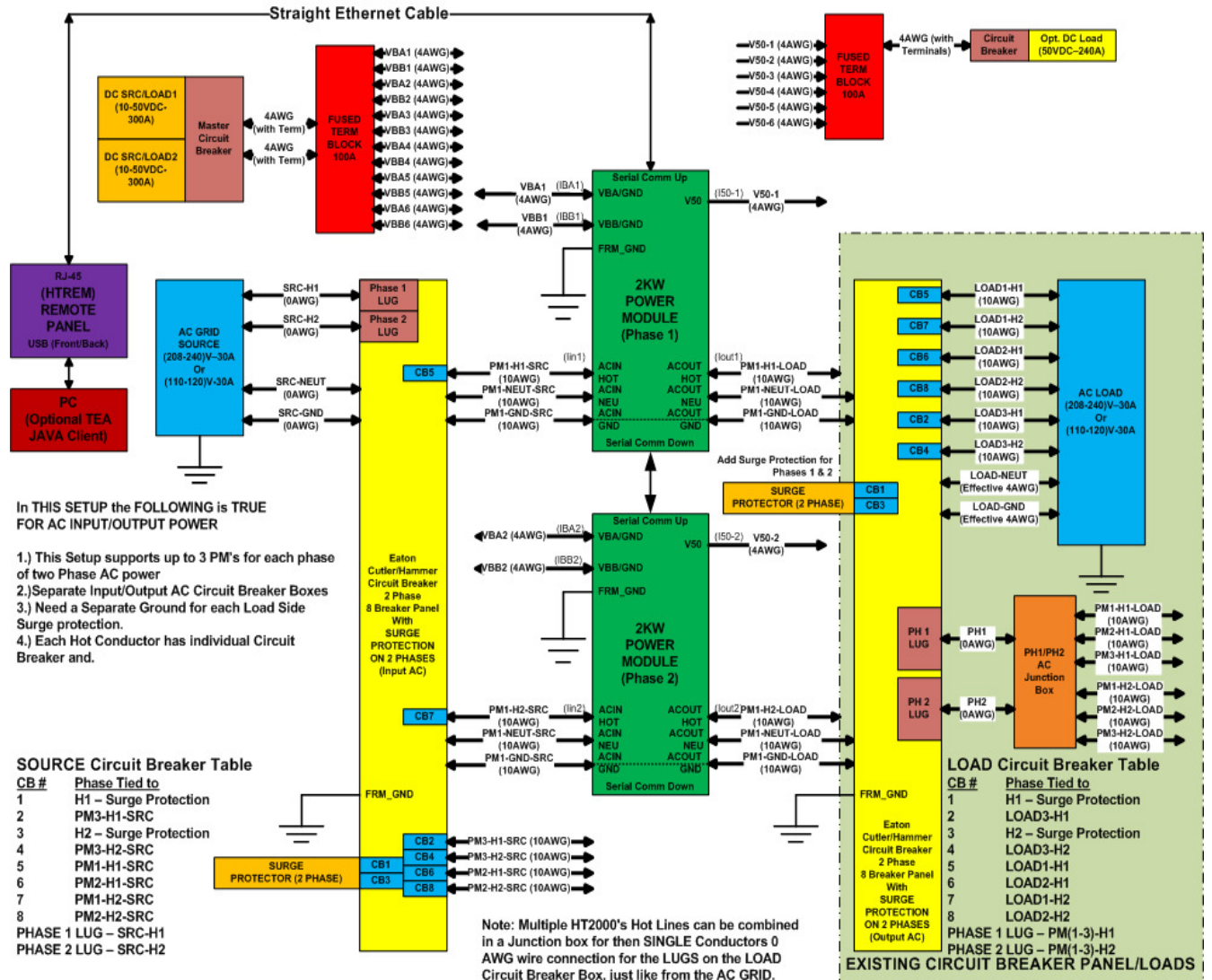
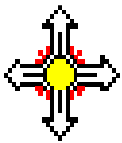


Figure 4 Heart Transverter HT2000 2 Phase System Basic Installation

These instructions are for the HT2000 Basic System Installation. Please make the necessary corrections and extensions for a Multiple HT2000 PM system.

==>>> IMPORTANT: All systems should be installed by qualified technicians.

Incorrect installation can result in damage to sensitive equipment and the HT2000 system as well as a Safety hazard to the end user.

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CAUTION: Verify that AC Input connection from the AC Grid has Voltage that is disabled and is NOT LIVE during connection to the HT2000. Failure to make sure of this step could be hazardous to the installer and all equipment involved when connecting the ACIN power connections to the HT2000.

3.1 AC GRID Source Check

The AC Grid connection to the HT2000 needs to be verified prior to the installation of the HT2000 and TREM units. That is, a quick check of the proper 1 or 2 phase AC wiring from the incoming Grid connection to make sure that single or two phase AC grid connection yields the correct voltage range below:

3.1.1 AC GRID Input Specifications

AC Grid Phase 1 Voltage (with respect to the AC Neutral) – 110 to 120 VAC.

AC Grid Phase 2 Voltage (with respect to the AC Neutral) – 110 to 120 VAC

AC Two Phase Voltage (with respect from Phase 1 HOT to Phase 2 Hot) – 208 to 240 VAC.

==>>> IMPORTANT: Once this voltage is checked, then eventual installation connection below will ensure proper AC Grid operation with the HT2000 Units. If the AC Grid voltages aren't right, then stop and fix before continuing with the HT2000 Installation.

3.2 DC Source Check

The DC Source connection to the HT2000 needs to be verified prior to the installation of the HT2000 and TREM units. That is, a quick check of the proper DC wiring from the Battery connections to make sure that VBA or VBB connection yields the correct voltage range below:

3.2.1 DC Input Specifications

DC input 1 Voltage (with respect to the DC GND) – 10 to 50 VDC.

DC input 2 Voltage (with respect to the DC GND) – 10 to 50 VDC. (only check if input going to be used)

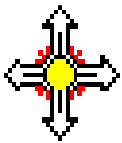
Once this voltage is checked, then eventual installation connection below will ensure proper DC Source operation with the HT2000 Unit.

==>>> IMPORTANT: Once this voltage is checked, then eventual installation connection below will ensure proper DC Source operation with the HT2000 Units. If the DC Source voltages aren't right, then stop and fix before continuing with the HT2000 Installation.

4 Power module mounting

The HT2000 can be mounted horizontally or vertically. In either mounting position, each HT2000 PM(s) should have six 3/8" bolts securing it firmly to the mounting surface. For bulk head mounting the Heart Transverter logo should be right side up. Again, locate the unit as close as possible to your existing electrical breakers in a well ventilated dry area free of any type of accumulated gases.

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5 Connecting AC inputs and outputs

5.1 AC Access Panel Removal

To access the AC In/Out Connections, take off the AC Access panel on the Top side of the HT2000 PM. This consists of removing two Phillips screws on the top of the Unit and then removing the cover. You now have access to the Terminal block (pins 1-5) inside for connection of the AC Input and AC Output wiring from the AC Grid and AC Load respectively.

====>>> **IMPORTANT:** The AC IN/OUT connections of the HT2000 share a common Earth Ground Connection in the Center Terminal Block. This Terminal Block Position #3, is sized to support 2 10AWG Earth Ground wires being secured into it.

5.2 AC output -- ACOU

This is where clean and stable power comes out of the HT2000. This output would connect to your AC load through a Circuit Breaker Panel that has Surge/Overcurrent Protection. This output set of connections consist of a Neutral (Terminal Block Pin 1), HOT (Terminal Block Pin 2), and Ground (Terminal Block Pin 3 shared connection). Please insert the wiring through the HT2000 Bulkhead opening labeled **AC OUTPUT** and connect to the AC OUT terminals of the HT2000.

5.3 AC input – ACIN

Your AC input connection will accept (100–120) volts AC at 50 or 60 HZ. The input should have a Circuit breaker panel (consisting of appropriately sized Circuit Breakers) with Surge or Overcurrent protection upstream or ahead of this connection. This input set of connections consist of a Ground (Terminal Block Pin 3 shared connection), Neutral (Terminal Block Pin 4); and Hot (Terminal Block Pin 5). This input should not be activated until the HT2000 is finished wiring the unit up. This is done by means of a Tag Lockout system for the SOURCE AC GRID Power. This type of Safety system is usually employed for personnel working around LIVE AC Grid power for safety. Please insert the wiring through the HT2000 Bulkhead opening labeled **AC INPUT** and connect to the AC IN terminals of the HT2000.

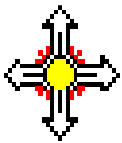
====>>> **IMPORTANT:** In remote locations, an AC generator can be connected to this input. More typically, the AC grid, power provided by your local utility company, is connected here.

5.4 Wiring Check

Now, Check to make sure that AC wiring connections are correct and very snug. Verify HOT/NEUTRAL/GND on both ACIN as well as ACOU power connections and that the wires can't be yanked out of the bulkhead access holes on the side of the HT2000 unit.

5.5 AC Access Panel Replacement

Now, the AC Access Panel needs to be replaced as we no longer need to access the AC Wiring Terminal Block on the HT2000 PM. To close access to the AC In/Out Connections, replace the AC Access panel on the Top side of the HT2000 PM. This consists of replacing the cover and fastening the two Phillips screws on the top of the Unit while holding the cover in place. You now have sealed off access to the AC Input and AC Output wiring from the AC Grid and AC Load respectively.



6 Connecting DC inputs and outputs

To access the DC In/Out Connections, there is no Access panel to remove/replace. The DC connections are on the opposite ends of the HT2000 PM in the form of Screw on lugs that are connected with a 1/2 inch Wrench.

====>>> **IMPORTANT:** NOTE: The DC IN/OUT connections of the HT2000 share a common Earth Ground Connection in the Center Terminal Block. This Terminal Block Position #3, is sized to support 2 10AWG Earth Ground wires being secured into it.

6.1 DC inputs – VBA & VBB



CAUTION: USE NOMINAL 10-50VDC input only. Exceeding the 50V maximum input voltage will damage the inverter and void the warranty.

There are two DC input connections, **VBA** and **VBB** (each with their respective grounds). These inputs accept a voltage between 10 and 50 volts DC. These connections need to be made with at least 4AWG wiring or larger (using the NEC appropriate wiring) to the dedicated DC source with appropriately Fuses Overcurrent protection. Also the wire cable terminal material used for connection should not create any Galvonic reaction to the HT2000 VBA and VBB terminals. These connections need to be properly labeled and the bolts are 1/2 inch nut with Flat washer holding the connection (cable with Steel/Aluminum LUG) in place. Fasten securely to assure proper operation.



WARNING: Connecting the battery to the HT2000 may/may not cause a spark at the VBA or VBB terminals. There is a RISK OF EXPLOSION in hazardous areas or locations where explosive gases may have accumulated.

Typically, **VBA** will be connected to a battery bank to supply back up power and to store energy for later use. **VBB** will be connected to a power source such as solar panels or wind generator. Note that other connection configurations are possible; please contact your dealer or Heart Transverter for any questions. The only requirements for the HT2000 is that whatever is connected to the DC inputs be voltages between 10 and 50 volts DC and that it is properly Fused for Overcurrent Protection. It is important to properly size the DC cables and keep them as short as possible. This will minimize the voltage drop to the HT2000. Excessive cable lengths make your system use more power than is necessary, therefore proper placement of all system components is important.

The requirements for determining the Battery Bank Setup, Solar Panel setup, and any other DC Source for connection to VBA or VBB is beyond the scope of this user's guide. That needs to be addressed by your dealer or Heart Transverter.

====>>> **IMPORTANT:** Once a DC source is connected to VBA/VBB, there can potentially be "live DC voltage" on those terminals, so extreme caution working around this Live voltage.

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6.2 DC output – V50

There is one 50 volt DC output. It can provide up to 40 amps. It is normally used to connect the Multiple bank PM's together (for Battery Bank balancing) along with one a matching ground from the VBA/VBB ground terminals. This output can be used to provide a clean 50V DC source.

===>>> **IMPORTANT:** Once batteries or other DC sources are connected to VBA or VBB, the V50 Output is live with that potential as well as VBA/VBB, so extreme caution is needed once live terminals are connected.

7 FRAME GROUND

There is one Frame Ground connection of the side of the HT2000 PM. This should be connected to EARTH Frame Ground with at least a #4 wire. It's purpose is to give Earth Frame Ground protection for the unit to ensure safe connection and operation for the installer and user.

8 Terminal Covers

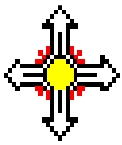
Please install the appropriate colored plastic terminal covers on the VBA (Red+/Black-), VBB (Red+/Black-); V50(Yellow); and DC Ground terminals. To install, please insert and twist with the appropriate orientation for cable entry/exit to the terminal.

9 REM Module

You will want to install the **REM** (see figure 4) in an easy to access location. It is designed to be easily flush mounted on any flat surface such as a wall or desktop, and must be located within 2 meters of the HT2000 power module. The Standard Ethernet Cable provided must be routed/connected to the **REM** and then four screws anchor the REM module to the desired flush surface.

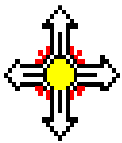
To access advanced features of the HT2000 power module, the **REM** can be connected to a computer via the front/rear panel USB connector,. In this case the **REM** must be within 5 meters (USB2.0 Specification) of the computer you will be using.

Congratulations, you have successfully installed the HT2000 System for operation. Please refer to the HT2000 Operations manual for actual operation of the HT2000 Transverter.



10 Appendix A: Acronym and Terminology Listing

<u>Term</u>	<u>Meaning</u>
AC	Alternating Current
ACIN	The physical connection for AC input on a power module.
ACOUT	The physical connection for AC output on a Power Module.
DC	Direct Current
DC Connect A	The physical connection for one DC input labeled "DC Connect A" on a power module.
DC Connect B	The physical connection for one DC input labeled "DC Connect A" on a power module.
IBA	Current of VBA DC Input.
IBB	Current of VBB DC Input.
LED	Light Emitting Diode
SoC	State of Charge (Battery Charge State)
PBA	Power of VBA DC Input (Watts)
PBB	Power of VBB DC Input (Watts)
PCB	Printed Circuit Board Assembly
PIN	AC power OUT
POUT	AC power IN
Thigh	Transverter High voltage PCB Assembly
TLow	Transverter Low voltage PCB Assembly
TRIAC	"Triode for Alternating Current." The TRIAC is a very convenient switch for AC circuits, allowing the control of very large power flows with milliampere -scale control currents.
USB	Universal Serial Bus
V50	A power module's single, 50 volt DC output. This may refer to the physical DC output connection on the power module, or to the voltage at that output.
V50A	Internally the DC input to DC connect A is converted to provide the V50 DC output. Since the characteristics of DC input A may differ from DC input B, the term V50A is used to refer to specific control values for the conversions of DC input A to the single V50 output.



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<u>Term</u>	<u>Meaning</u>
V50B	Internally the DC input to DC connect B is converted to provide the V50 DC output. Since the characteristics of DC input B may differ from DC input A, the term V50B is used to refer to specific control values for the conversions of DC input B to the single V50 output.
VBA	Usually refers to DC input on the Transverter's "DC connect A." Sometimes, for example when used with IBA, VBA refers specifically to the voltage of the DC input on DC connect A.
VBB	Usually refers to DC input on the Transverter's "DC connect B." Sometimes, for example when used with IBB, VBB refers specifically to the voltage of the DC input on DC connect B.