Inverter Systems, Inc.

Vigilant Series

Installation Instructions

And

User Manual

850 Watts to 2400 Watts

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READ AND FOLLOW ALL SAFETY INSTRUCTIONS

IMPORTANT SAFEGUARDS

When using electrical equipment, you should always follow basic safety precautions, including the following:

1. *Read and follow all safety instructions.*
2. *Do not install the Vigilant inverter system outdoors.*
3. *Do not install near gas or electric heaters or in other high-temperature locations.*
4. *Use caution when servicing batteries. Battery acid can cause burns to skin and eyes. If acid is spilled on skin or in the eyes, flush with fresh water and contact a physician immediately.*
5. *Equipment should be mounted in locations where it will not be readily subjected to tampering by unauthorized personnel.*
6. *The use of accessory equipment not recommended by the manufacturer may cause an unsafe condition and may void the warranty.*
7. *Do not use this equipment for other than intended use.*
8. *All servicing of this equipment must be performed by qualified service personnel.*

SAVE THESE INSTRUCTIONS IMPORTANT SAFETY INSTRUCTIONS

The installation and use of this product must comply with all national, federal, state, municipal, or local codes that apply.
For technical assistance, contact Customer support.
Technicians are available during normal working hours (EST)

Specifications

Input

- Input voltage: 120 or 277 VAC.
- Switched input terminals
- Low voltage (0 to 10 volt) dimming provisions
- Input surge protection: Meets ANSI 62.41 and UL 924

Output

- Output voltage: 120 or 277 VAC (must be the same as input)
- Output regulation: (static) ±5%
- Minimum loading: none required
- Output distortion: Less than 3% THD linear load
- Output frequency: 60 Hz, ±5%
- Overload: 115% momentary
- Efficiency > 89%

Battery

- Battery charger: Fully automatic and temperature compensated
- Recharge time: Per UL guidelines
- Battery protection: Automatic low-battery voltage shut-off. Automatic restart upon utility return
- Battery switch: Also used as battery isolator
- Standard battery: Sealed lead-calcium: 10-year life
- Battery voltage: 24 VDC
- Runtimes: 90 minutes standard.
- Operating temperature: 20°C to 30°C (68°F to 86°F)
- Relative humidity: 95% non-condensing

Note: Battery performance rated at 25°C (77°F)

Receiving, Moving and Storing Systems and Batteries

Vigilant series inverter systems and batteries are shipped separately. Carefully inspect all cartons upon receipt for evidence of shipping damage.

Notify carrier immediately of leaking or damaged cartons for possible concealed damage.

Moving Units and Batteries

CAUTION: Batteries and Electronics cabinets are very heavy. Proper equipment should always be used to move batteries and units to avoid damage and personal injury.

WARNINGS:

- ***ALWAYS EAR PERSONAL EYE PROTECTION WHEN WORKING WITH BATTERIES***
- ***Batteries contain liquid caustic or acid electrolytes which CAN CAUSE SEVERE BURNS. Care must be taken when moving batteries to avoid tipping and spillage of electrolyte material. In case of accidental spill.***

FIRST AID:

- ***EYES: Flush immediately with flowing water for at least 15 minutes. Seek medical attention.***
- ***EXTERNAL: Flush immediately with water. Seek medical attention.***

Temporary Storage of Units and Batteries

For temporary storage of inverter systems and batteries prior to installation, select a clean, cool, dry location with normal ventilation for human habitation and level floors.

IMPORTANT: Lengthy storage of batteries will cause irreversible damage to the cells.

Failure to connect inverter system batteries to an energized charging circuit within 90 days from the date of shipment will void the battery warranty.

Storage Temperature: *Store all batteries at 10° to +30° C (50° to +86° F). Batteries will have a longer shelf life if stored at 10° to +30° C (50° to +86° F). The electronics and battery cabinets may be stored at -20° to +60° C (-4° to +140° F).*

DANGER - EXPLOSIVE - CAN CAUSE BLINDNESS OR OTHER SEVERE INJURIES.
Every type of battery can produce hydrogen gas, even sealed, maintenance-free batteries. The gas is vented through the vent caps and into the air.

Do not allow smoking, sparks, or flames in battery storage location because hydrogen is concentrated under the vent cap of each cell of the battery. Hydrogen is highly explosive, and is hard to detect because itis colorless, odorless, and lighter than air.

Installation Requirements

Environment

Install the Vigilant series inverter system in a clean, cool, dry place with normal ventilation.

Operating Temperature: The Vigilant series inverter systems are rated and ETL Listed for 20° to 30° C (+ 68° to +86° F) operation. Installation in environments at the temperature extremes of the designed operating range may affect unit performance or reduce service life.

The Vigilant Series Inverter System has a designed operating range of 0° to 40° C (+32° to +104° F) at up to 95% relative humidity.

Battery performance and service life is maximized if the operating temperature is maintained at 25° C (77°F).

Ventilation: The air around the unit must be clean, dust-free, and free of corrosive chemicals or other contaminants. Do not place the inverter system or batteries in a sealed room or container.

Batteries: The temperature should be near 25° C (77° F) for optimum battery performance. Batteries will be less efficient at temperatures below 18° C (65° F), and high temperatures will reduce battery life. Typically, at 35° C (95° F), battery life will be half of what it would be at normal temperature of 25° C (77° F). At 45° C (113° F), battery life will be one-fourth of normal.

WARNING: Every type of battery can produce hydrogen gas, even sealed, maintenance-free batteries. The gas is vented through the vent caps and into the air, mainly when the unit is charging the batteries. The batteries produce the most hydrogen when maximum voltage is present in fully charged batteries. The amount of current that the charger supplies to the batteries (not the battery ampere-hour) determines how much hydrogen is produced.

Do not allow smoking, sparks, or flames in battery storage location because hydrogen is concentrated under the vent cap of each cell of the battery. Hydrogen is highly explosive, and is hard to detect because it is colorless, odorless, and lighter than air.

⚠ CAUTION
NEVER INSTALL BATTERIES IN A SEALED ROOM OR ENCLOSURE

Cabinet Installation

Table 1: Weights and Dimensions

Size (Watts/VA)	850	1200	1700	2400
Input / Output Voltage	120/120 or 277/277			
System DC Voltage	24 VDC			
Overall size (W x H x D) (inch)	28 x 30 x 8	28 x 42 x 8	28 x 42 x 8	28 x 54 x 8
# of Electronic cabinets / Weight	1 @ 85lbs	1 @ 90lbs	1 @ 110lbs	1 @ 125lbs
# of Battery cabinets / Weight	0	1 @ 25lbs	1 @ 25lbs	2 @ 25lbs
# of Batteries	(2) 100AH	(4) 75AH	(4) 100AH	(6) 100AH
Battery weight (each) (lbs.)	65	55	65	65
Total System Weight (lbs.)	215	335	395	565
Battery Wiring Diagram – Figure #	5	6	6	7

The number of cabinets used in each system is dependent on the system's capacity:

- 850W will use the Electronics cabinet only.
- 1200W and 1700W will use the electronics cabinet and one (1) Battery cabinet
- 2400W will use the Electronics cabinet and two (2) Battery cabinets
- Battery cabinets are shipped separately and must be field installed
- Battery cabinets are to be bolted to the bottom of the electronics cabinet (using supplied hardware) and to the wall. Wall mounting hardware (¼-20 or ¼-28) is not provided. See figures 1 & 2 below.
- Split grommets are supplied and to be installed between cabinets, after battery cables are fed through the holes to the lower cabinets.

Figure 1 – Front view

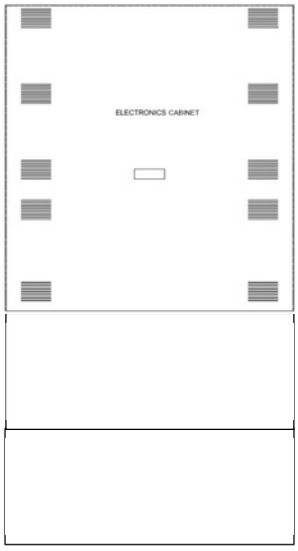
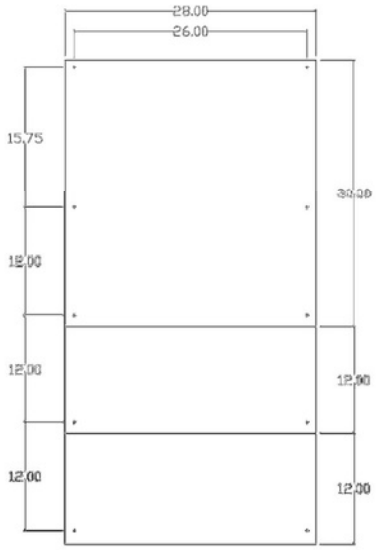


Figure 2 – Mounting holes locations

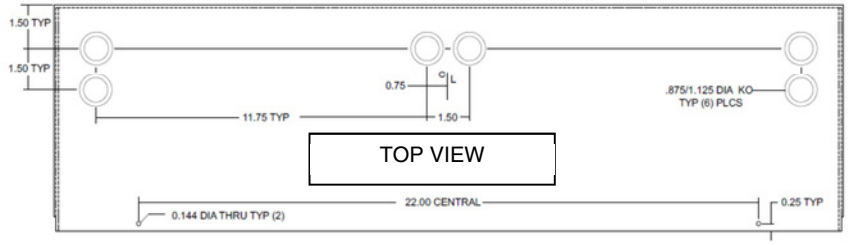


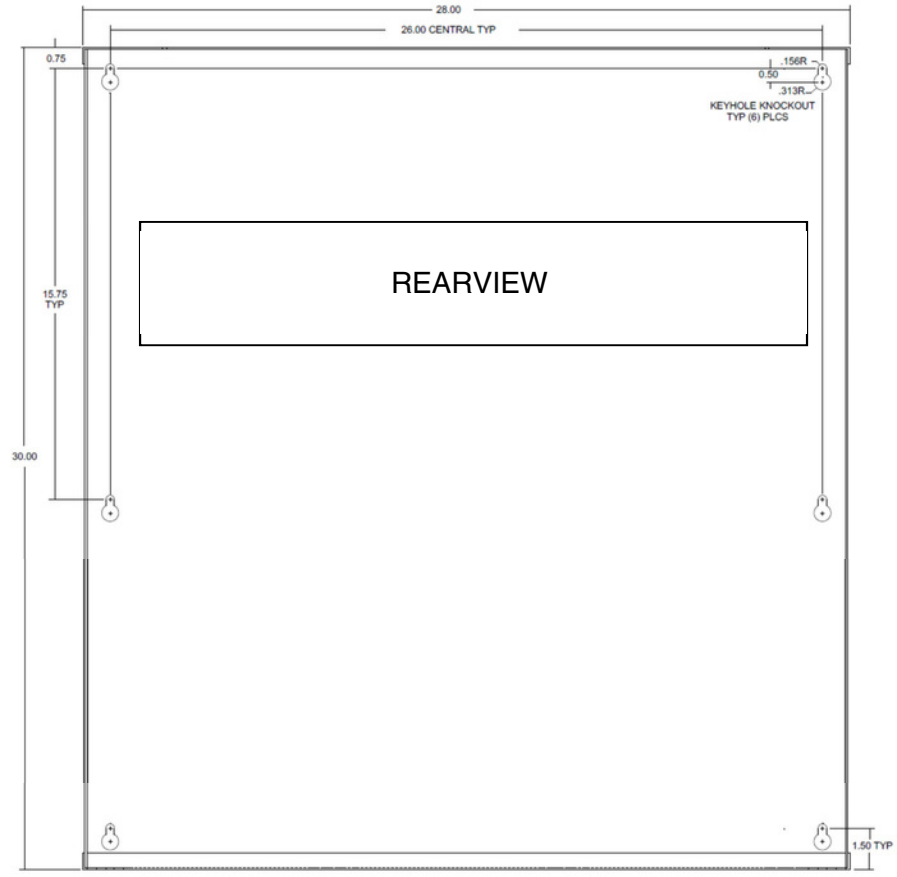
Use the rear keyholes to mount the cabinets directly to the wall or a metal frame capable of supporting the total weight as listed in table 1. See figure 2 above for size and locations.

Make sure the Vigilant series system is fastened to a surface that is rated to hold the size and weight of the system.

Once the cabinet(s) is(are) securely mounted, run and attach input and output conduits using the provided knock outs on the top of the unit. NEC regulation requires that input and output wires be in separate raceway. Be sure to follow all federal, state, and local codes as it pertains to emergency circuit raceways.

Figure 3 - Electronics Cabinet Dimensions - 30”L x 28”H x 8”D





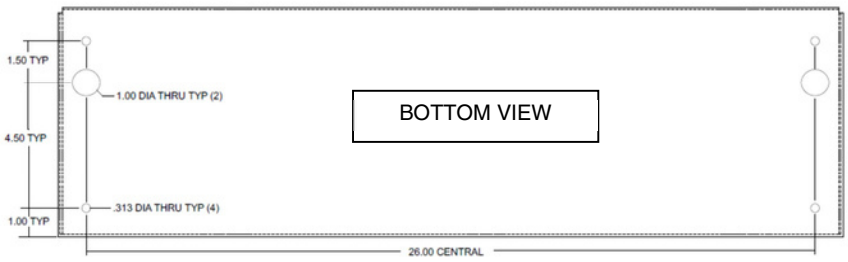
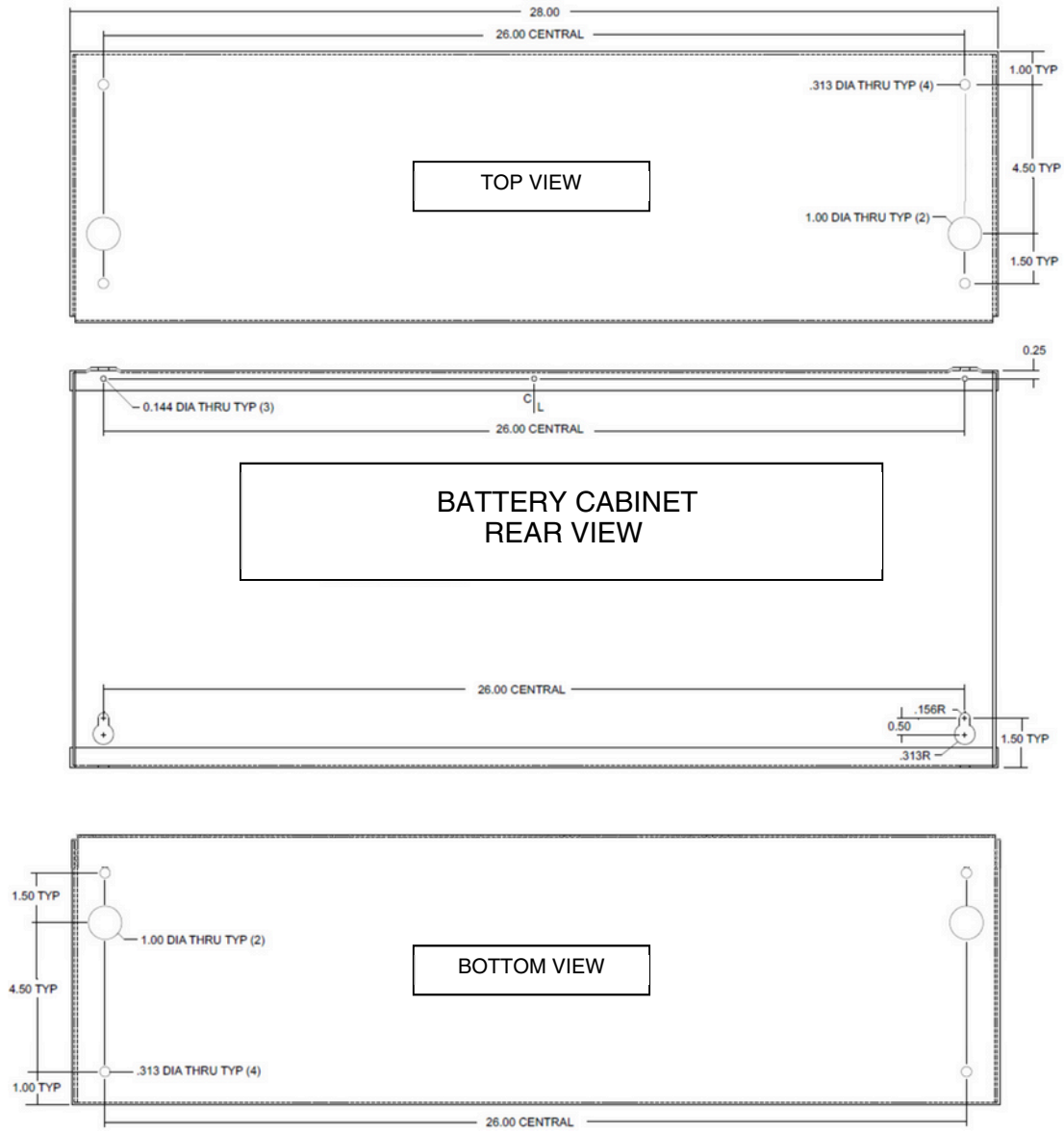


Figure 4 - Battery Cabinet Dimensions - 30”L x 12”H x 8”D



Battery Installation and Connection

Important Safety Precautions

1. **Wear protective clothing, eye-wear, rubber gloves and boots. Batteries contain corrosive acids or caustic alkalis and toxic materials and can rupture or leak if mistreated. Remove rings and metal wristwatches or other metal objects and jewelry. Don't carry metal objects in pockets where the objects can fall onto the batteries or into the inverter system.**

2. **Tools must have insulated handles so that they will not short battery terminals. Do not allow a tool to short a battery terminal to another battery terminal or to the cabinet at any time. Do not lay tools or metal parts on top of the batteries, and do not lay any objects where they could fall onto the batteries or into the cabinet.**

3. **Install the batteries as shown on the battery wiring diagram provided in this manual or with the battery cable kit. When connecting cables, never allow a cable to short across a battery's terminals, the string of batteries, or to the cabinet.**

4. **Align the cables on the battery terminals so that the cable lug will not contact any part of the cabinet even if the battery is moved. Keep the cable away from any sharp metal edges.**

5. **Install the battery cables so they cannot be pinched by the inverter system cover/door.**

6. **Where conductors may be exposed to physical damage, protect conductors in accordance with NEC requirements.**

7. **Full voltage and current are always present at the battery terminals. The batteries used in this system can produce dangerous voltages, extremely high currents, and possible risk of electric shock. Batteries may cause severe injury if the terminals are shorted together or to ground (earth). Be extremely careful to avoid electric shock and burns caused by contacting battery terminals or shorting terminals during battery installation. Do not touch uninsulated battery terminals.**

8. **A qualified electrician who is familiar with battery systems and required precautions must install and service the batteries. Any battery used with this unit shall comply with the applicable requirements for batteries in the standard for emergency lighting and power equipment, UL 924. Cabinets are designed to be used with, and batteries must be replaced by identical cells or a manufacture approved equivalent. If using substitute batteries not supplied by manufacture, the unit's ETL listing will be void, and the equipment may fail to perform properly. The installation must conform to national and local codes as well. Keep unauthorized personnel away from batteries.**

Installation Considerations

This section explains how to install the Vigilant Series system's batteries, fuses, and cables. A qualified electrician who is familiar with battery installations and applicable building and electrical codes should install the batteries.

Battery Installation Procedure

Select which wiring diagram to use from the diagrams below.

IMPORTANT: Be careful to observe correct polarity on the battery terminals. Red wires are positive and black wires are negative ***MAKE SURE THE DC BREAKER IS IN THE OFF POSITION BEFORE PROCEEDING.***

Figure 5
850 VA Model

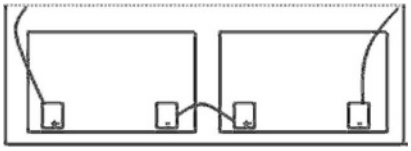


Figure 6
1200 & 1700 VA Models

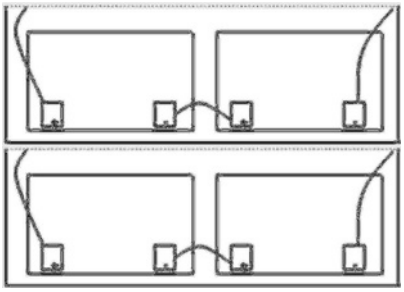
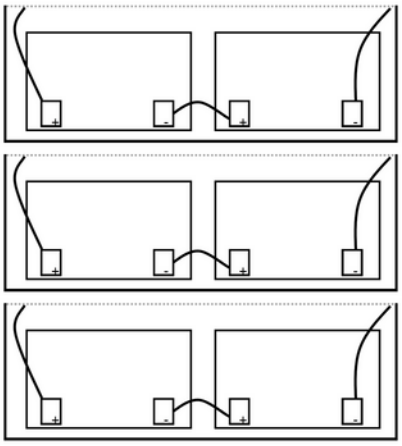


Figure 7
Diagram for 2400 VA



DO NOT TURN ON THE DC INPUT SWITCH AT THIS TIME.

Take the Battery Temperature Sensor and place it under the battery handle between the top two batteries

Battery Voltage Check

Using a digital volt-ohm meter, check for correct nominal battery voltage between the black (Negative) and red (Positive) wires in each battery section. Voltage reading should be 24 volts DC ±10%

AC Connections

CAUTION

- All Vigilant series inverter systems contain hazardous AC and DC voltages. Because of these voltages, a qualified electrician must install the inverter system, AC line service, and batteries. The electrician must install the AC line service according to local, state and NEC codes and must be familiar with batteries and battery installation.
- Before installing, maintaining, or servicing the unit, disconnect AC line input at the service panel and turn off the Main DC Switch and the Main AC Switch to make sure the unit will not supply output voltage.
- Remove rings, watches, and other jewelry before installing the AC wiring. Always wear protective clothing and eye protection and use insulated tools when working near batteries. Whenever servicing an energized unit with the inside panel open, electric shock is possible; follow all local safety codes. TEST BEFORE TOUCHING!

AC Input and AC Output Connections

Table2–Electrical Ratings

SYSTEM SIZE (VA/WATTS)	120 VOLTS INPUT		277 VOLTS INPUT	
	MAX AMPS	MAX INPUT BREAKER	MAX AMPS	MAX INPUT BREAKER
850	8.5	10	3.7	10
1200	11.4	15	5	10
1700	16.7	20	7.3	10
2400	22.5	25	10	15

Note: It is important to size the feeder circuit breaker from the panel according to the ratings above. Using an oversized circuit breaker may cause system damage and void the warranty.

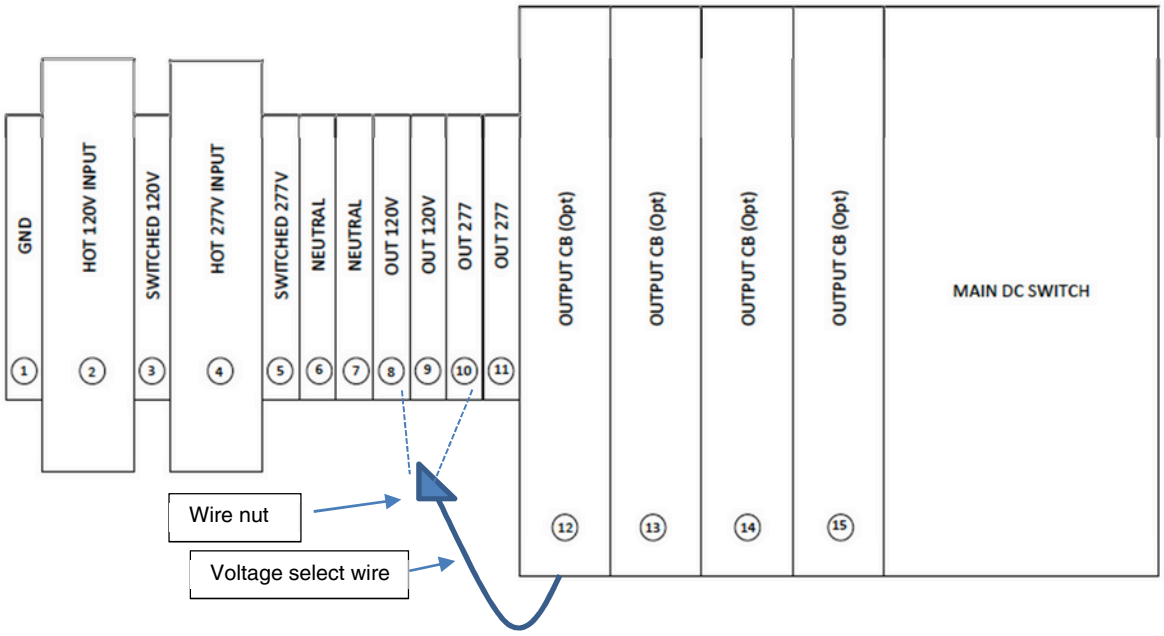
Make all AC input and output connections to the Vigilant series inverter system as indicated on the labels within the cabinet. If system was supplied with internal output circuit breaker distribution option, make output wiring connections directly to the circuit breakers.

1. Make sure power from circuit breaker panel is off.
2. Open or remove the system's front cover/door. Make sure all breakers are in the off position.
3. Extend conduit and an un-switched 24-hour AC supply of rated voltage to the unit.
4. Extend conduit and load circuit (s) to unit.
   Note: load wires must be in a separate conduit from the input circuit and completely isolated from all other circuits.
5. Determine the desired operation of your inverter system:
   Option 1 - Connected load will be always on.
   Option 2 - Connected load can be switched on and off locally and remain on during a power failure.
   Option 3 - Connected load will be off during normal operation and come on during a power failure

Refer to Figure 8 below to make all AC input and output connections.

NOTE: This unit is supplied as either 120 or 277; it is not dual voltage. The input voltage must match the output voltage. Do not turn on AC supply at this time.

Figure 8 – Input / Output Terminal Block



Note: For 120 volts only systems, the 277V input / output terminals will not be supplied.

AC Input Connections

Please choose either the 120V or 277V wiring instructions below depending on your application. Choose one or the other, combining any of these instructions will result in permanent equipment failure and void the Warranty.

120 Volts Wiring Instructions

Option 1 – Connected load is always on

- Connect your AC input line wire to terminal #2 and your input neutral wire to terminal #6.
- Connect a jumper, of the same wire size and type as the AC input line, between terminal #2 and #3.

Option 2 – Connected load can be switched on and off.

- Connect your AC input line wire to terminal #2 and your input neutral wire to terminal #6.
- Connect your switched leg to terminal #3.

NOTE: The switched leg must be on the same branch circuit as the AC input line.

Option 3 – Connected load is off and will only come on during a power failure.

- Connect your AC input line wire to terminal #2 and your input neutral wire to terminal #6.

120 Volts AC Output Connections

Connect AC output neutral wire to terminal #7. If the Vigilant series system was supplied with output circuit breakers, see figure #8 above and remove the wire nut from the voltage select wire, and connect the wire to terminal #9 as shown. Then connect load wires directly to the top side of the output breakers.

If output circuit breakers are not present, connect hot load wire to either terminals #8 or #9.

277 Volts Wiring Instructions

Option 1 – Connected load is always on

- Connect your AC input line wire to terminal #4 and your input neutral wire to terminal #6.
- Connect a jumper, of the same wire size and type as the AC input line, between terminal #4 and #5.

Option 2 – Connected load can be switched on and off.

- Connect your AC input line wire to terminal #4 and your input neutral wire to terminal #6.
- Connect your switched leg to terminal #5.

NOTE: The switched leg must be on the same branch circuit as the AC input line.

Option 3 – Connected load is off and will only come on during a power failure.

- Connect your AC input line wire to terminal #4 and your input neutral wire to terminal #6.

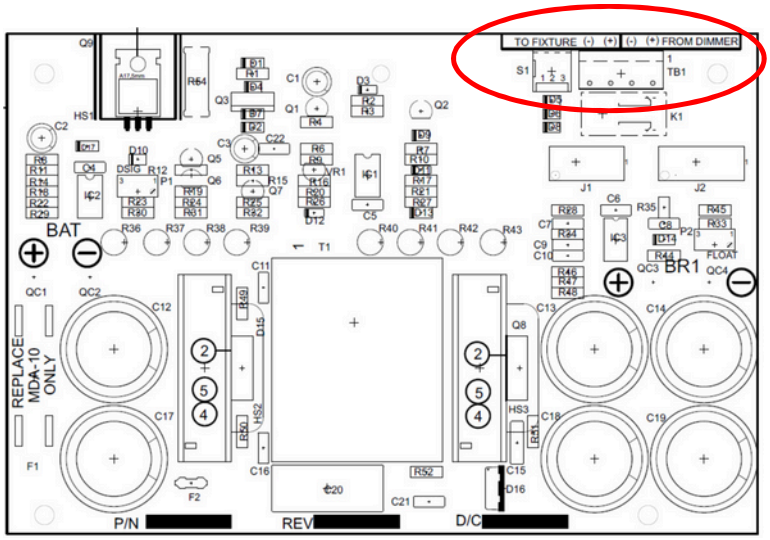
277 Volts AC Output Connections

Connect AC output neutral wire to terminal #7. If the Vigilant inverter system was supplied with output circuit breakers, see figure #8 above and remove the wire nut from the voltage select wire, and connect the wire to terminal #11 as shown. Then connect load wires directly to the top of the output breakers. If output circuit breakers are not present, connect hot load wire to either terminals #10 or #11.

Low Voltage (0-10VDC) Dimming Provisions

If needed, the Vigilant inverter system is supplied with a low voltage (0 to 10 volts) dimming circuit interface that allows for the connected light fixtures to be in a dimmed state when in emergency mode. This allows for more fixtures to be connected and yields a more uniform light distribution. The connections are located in the upper right-hand corner of the control PC board. See figure 9 below.

Figure 9 – Low Voltage Dimming Connections



Make the appropriate connections directly to the pc board being careful to observe polarity. S1 is located immediately to the right of the terminal block and will control the desired brightness. All 3 dip switches are factory set to the off position and will illuminate the lights at 100%. Turning #1 on will decrease the light output to 75%; turning both #1 and #2 will decrease the light output to 50%; turning on all 3 switches will decrease it to 25%.

Final Installation Checklist

1. Ensure the Inverter cabinet is securely fastened to a wall or other structure.
2. Ensure that the input circuit breaker in the building service panel serving as the AC disconnect to the system is in the OFF position.
3. Ensure that the Main DC Switch is in the OFF position.
4. Check for proper ground connections in the Inverter cabinet, the building service panel, and the external load distribution panel.
5. Check for any loose wiring connections in the Inverter cabinet, the building service panel, and the external load distribution panel.
6. Check that a battery voltage of 24 vols DC is present between the black and red wires in each of the battery cabinets.

If this inverter is equipped with the optional Self-Test feature, System Start-Up Procedure and System Final Test are replaced with the Self-Test Instruction Supplement supplied with this inverter.

System Start-Up Procedure

IMPORTANT: The Vigilant Inverter System is a sophisticated electronic backup power supply. Care must be taken to follow the steps below in their exact sequence. Failure to do so will result in erroneous alarm messages and possible equipment failure.

1. If not already off, remove the front cover to the electronics cabinet.

2. Turn on the input circuit breaker in the building service panel serving as the AC disconnect to the system.

3. At this point the Green “AC Line” LED should be illuminated.

4. Turn on all output circuit breakers located within the vigilant inverter system, and/or in the external Load distribution panel (if any). Lighting loads should now be energized if the Option 1 wiring method above was used.

5, Turn ON the Main DC Switch. the orange “Charger On” LED should come on.

6. Install and secure all cabinet covers. Installation is now complete.

System Final Test

At this point, the connected load should be energized, the “AC Line” and “Charger On’ LEDs should be lit. Depending on the state of charge of the batteries the inverter may or may not come on when the test switch is depressed. Allow a 24-hour charging period before testing the inverter system.

Allow a minimum of 96 hours charging before running a full 90-minute discharge test.

To simulate a power failure, simply press the test switch for a momentary test; or, by opening the AC input circuit breaker for a prolonged test. The inverter and the cooling fans (if any) will begin operating, the "AC Line" LED and the “Charger On” LEDs will go off and the "Inv On" LED will come on. All connected loads should be energized and operational regardless of which wiring option was chosen.

NOTE: For 277V Units, in the event the connected loads don’t energize, please allow about 5 minutes to pass before re-testing. This will give the system time to cool down and allow the inverter to reset.

Allow the inverter to run for several minutes or until satisfied with its operation. Close the AC input breaker to end the test and return the unit to standby mode.

IMPORTANT:

During prolonged power outage, or system shutdown, the system's batteries must be disconnected by turning off the MAIN DC SWITCH to prevent permanent premature damage.

Routine Battery Inspection and Maintenance

Sealed Lead-Calcium Batteries

Lead-Calcium cells are the most common type of battery used today in standby equipment. By design it is as maintenance free as a battery can be. It is recommended, however, that some simple steps be taken to increase system life and maximize reliability:

A quarterly visual check of the batteries should be conducted to look for deformities in the cases and terminal corrosion. Any defective batteries should be replaced. All corroded terminals, regardless how slight, are to be cleaned and retightened at once to prevent failure of the entire battery bank.

NFPA 101 Life Safety Code requires that a full 90-minute test be run, witnessed and recorded on a yearly basis. This requirement is also mandatory to maintain the battery warranty.

Warranty Information

Lengthy storage of batteries will cause irreversible damage to the cells. Failure to connect the system's batteries to an energized charging circuit within 90 days from the date of shipment will void the battery warranty.

During prolonged power outage, or system shutdown, the system's batteries must be disconnected to prevent permanent premature damage.