DIMENSIONS

DC to AC POWER INVERTERS

Quasi-Sine Wave 3-Phase Output

MODEL: 24TX60

OWNER'S INSTRUCTIONS

Sensata Technologies

OWNERS MANUAL

INVERTER MODEL

24TX60

Table of Contents

1 Safety Instructions

Important: Read this manual before installation, it contains important safety, installation, and operating instructions. Save this manual and keep it in a safe place.

1.1 Warning and Danger Symbols:

To reduce the risk of electrical shock and to ensure the safe operation of your Dimensions power inverter, the following symbols are used throughout the manual.

ATTENTION:	**DANGER:**
 Important operating instructions. Follow them closely.	 Risk of personal harm and/or electrocution exists in this area. Use extreme caution.

1.2 Inverter System Precautions:

- Inverter Systems produce hazardous voltages. To avoid risk of harm or fire, the unit must be properly installed.
- There are no user serviceable parts inside, do not remove the cover.
- The Inverter System should not be mounted in a location that may be exposed to rain or spray.
- The Inverter System should not be installed in a zero clearance enclosure.
- Damage to the Inverter System will occur if correct polarity is not observed when installing the DC input cables.
- Damage to the Inverter System will occur if an external AC power source is applied to the inverter's AC hardwire output.
- The Inverter System contains a capacitor that may produce a spark. Do not mount in a confined battery or gas compartment.
- Be sure the Inverter System is turned OFF during installation.

1.3 Battery Precautions:

- Working in the vicinity of lead-acid batteries is dangerous. There is a risk of acid exposure.
- Batteries generate explosive gases during operation.
- There is risk of high current discharge from shorting a battery that can cause fire and explosion. Use insulated tools during installation.
- Remove all rings, watches, jewelry or other conductive items before working near the batteries.
- Inspect the batteries once a year for cracks, leaks or swelling.
- Dispose of the batteries according to local regulations. Do not incinerate batteries; risk of explosion exists.

Sensata Technologies

Dimensions 3-Phase Power Inverters

Environmentally Friendly, Quiet, Reliable, AC Power

Output Voltage (VAC)	220Y/120 RMS
Output Frequency:	60 Hz ± 0.02%' 3 phase/1 phase
Output Waveform:	Quasi-sine wave, single pulse per phase, pulse width modulated
Input Voltage: (VDC)	22 to 28
Operating Temperature:	-20° to 40° C (-0° to 104° F)
Efficiency:	Better than 85%

Other Design Features:

- Vent-less for moisture and dust resistance
- Will withstand vibrating environment
- Thermally controlled cooling fan
- Elapsed time hour meter
- Remote panel with LED indication for Inverter Power, Low input voltage, Overload and High temperature.
- Remote ON/OFF switch hook up (12 VDC input)

Unit Protection:

- Automatic electronic short circuit/overload protection
- Automatic high temperature shutdown
- Output circuit breaker

Battery Protection:

Automatic low battery shutdown at 22VDC (with 2.5 second delay)

MODEL NUMBER	24TX60
Output Power (Watts Continuous)	6,000
Output Current (Amps AC per phase)	Up to 16
Peak Output (Amps AC per phase)	40
Output Rating (horsepower)	5
Input Current (Amps DC)	Up to 300
Weight (lbs.)	164
Dimensions in.(LxWxH)	18.4 x 27.2 x 10.8

Usage: Any 220VAC, 60 Hz, single or 3 phase product and/or 120VAC, 60Hz, single phase equipment within the inverter's power rating that does not require a pure sine waveform.
Warranty: Full 2 year parts and factory labor

3 Technical Descriptions:

3.1 Inverter System:

The remote “On/Off” switch controls the inverter and the remote status LED’s provides the system status.

3.1.1 Inverter Power Mode: The inverter converts 24VDC power from batteries to usable 220 VAC, 3-phase; or 220 VAC single phase; or 120 VAC, single phase; all at 60 HZ, having a quasi-sine wave form. The direct current (DC) that enters the inverter is filtered by a large input capacitor and switched “On” and “Off” by the Metal Oxide Silicon Field Effect Transistors (MOSFET) at a rate of 60 cycles per second, and directed into the transformer which steps the voltage up to 120 volts. The signal output waveform shape is not sinusoidal; it has a total harmonic distortion of 35% and a maximum single harmonic distortion of 25%.

3.2.1 Inverter Remote On/Off: The remote On/Off control circuitry requires +12VDC volts to operate.

3.3.1 Inverter Circuit Protection: The inverters have internal protection against output short circuit, output overload low input voltage and high temperature conditions. Also, there are thermally controlled cooling fans.

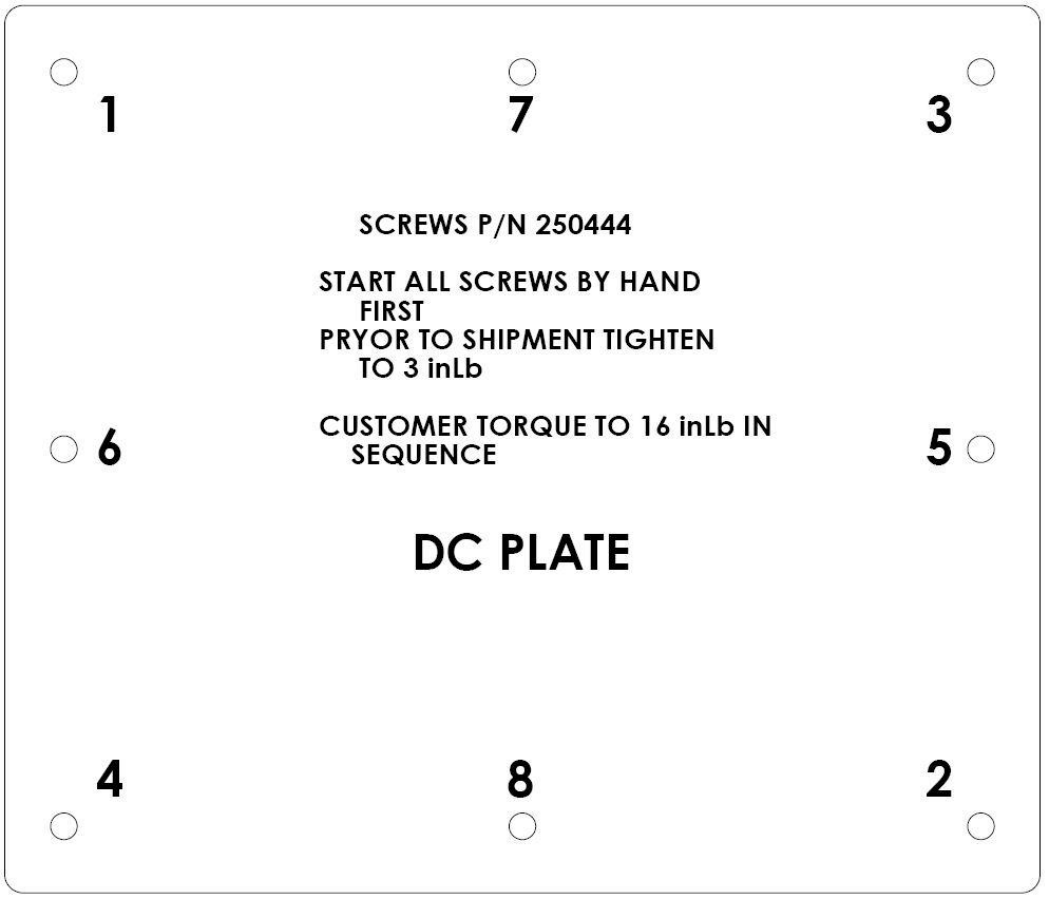
3.4.1 Inverter Cable assembly kit: The inverter has a cable kit that includes several parts that are required to be installed to maintain the chassis seal. Please see the picture below for piece parts. The kit also includes an orange wire (not pictured).

3.5.1 Inverter chassis is "designed to meet" Nema 4X: This chassis requires special handling and attention if the design objectives are to be met. We need to install the chassis system correctly or water will find a way to get inside. The inverter has silicone seals for the top, side and DC cover plate. There is NO reason to take off the top or side cover plates!
The DC cover plate will need to be installed correctly. The DC box has DC power cables that have Heyco strain relief connectors that are to be tightened as follows: Sealing nut (outside of the DC box) is to be at 80 in lbs. and the locking nut (inside the box) is to be set at 60 in lbs. The AC cable has the same Heyco strain relief that is connected to the chassis end at the factory to the same specs. There is a special pressure release valve installed at the factory.

! NOTE: The DC cover plate screws must be started by HAND first to make sure that you have the correct orientation for the screws and then tightened to 16 in lbs in a specific sequence.

! NOTE: The inverter serial number and date code are inside the DC box.

FIGURE 1: DC COVER PLATE (Tightening sequence and torque specification.)



4 Inverter Physical Descriptions:

4.1 Inverter Module

FIGURE 2: Chassis physical description and installations dimensions.

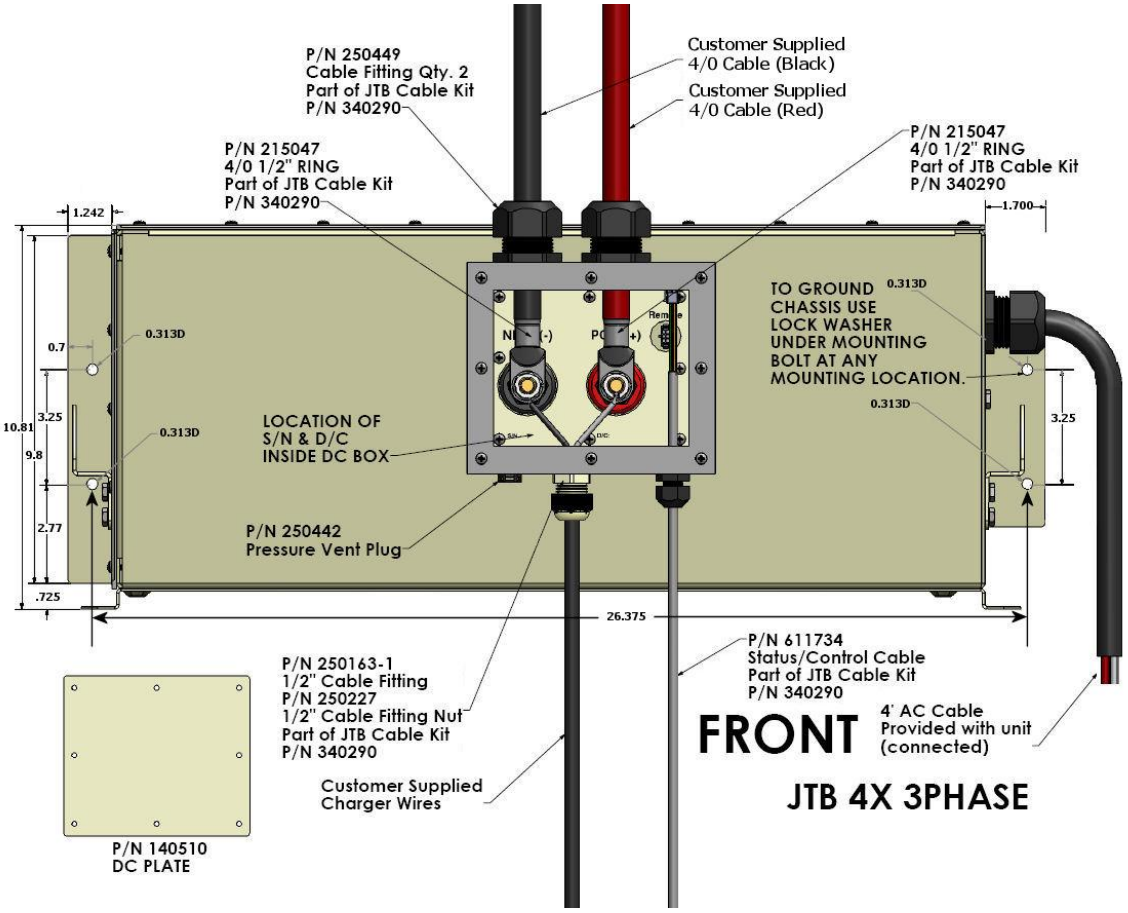
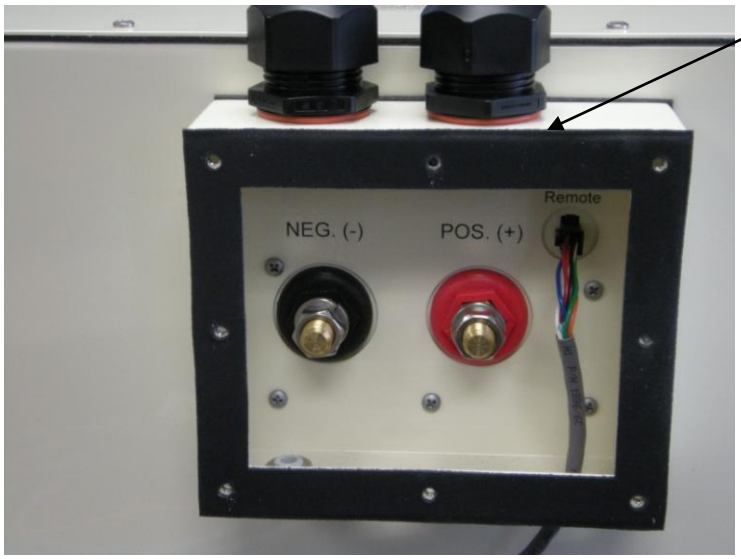


FIGURE 3: DC Box (! See torquing requirements for cover plate; round seal goes on outside of box DC cable Heyco strain reliefs)



5 Status Panel Descriptions:

5.1 LED Remote Status Panel (Sensata Part Number 245035)

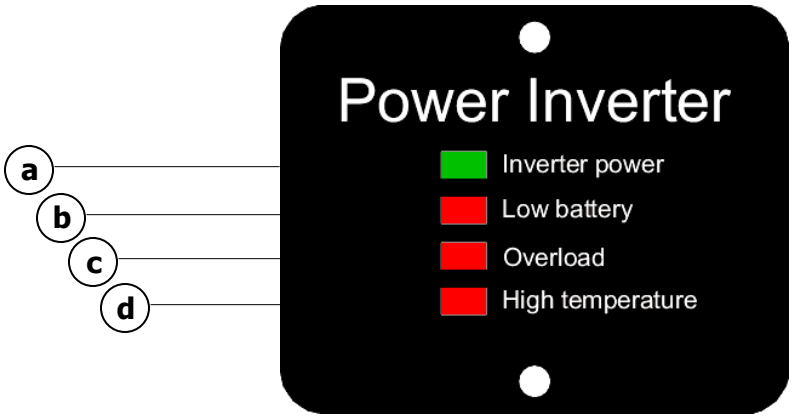
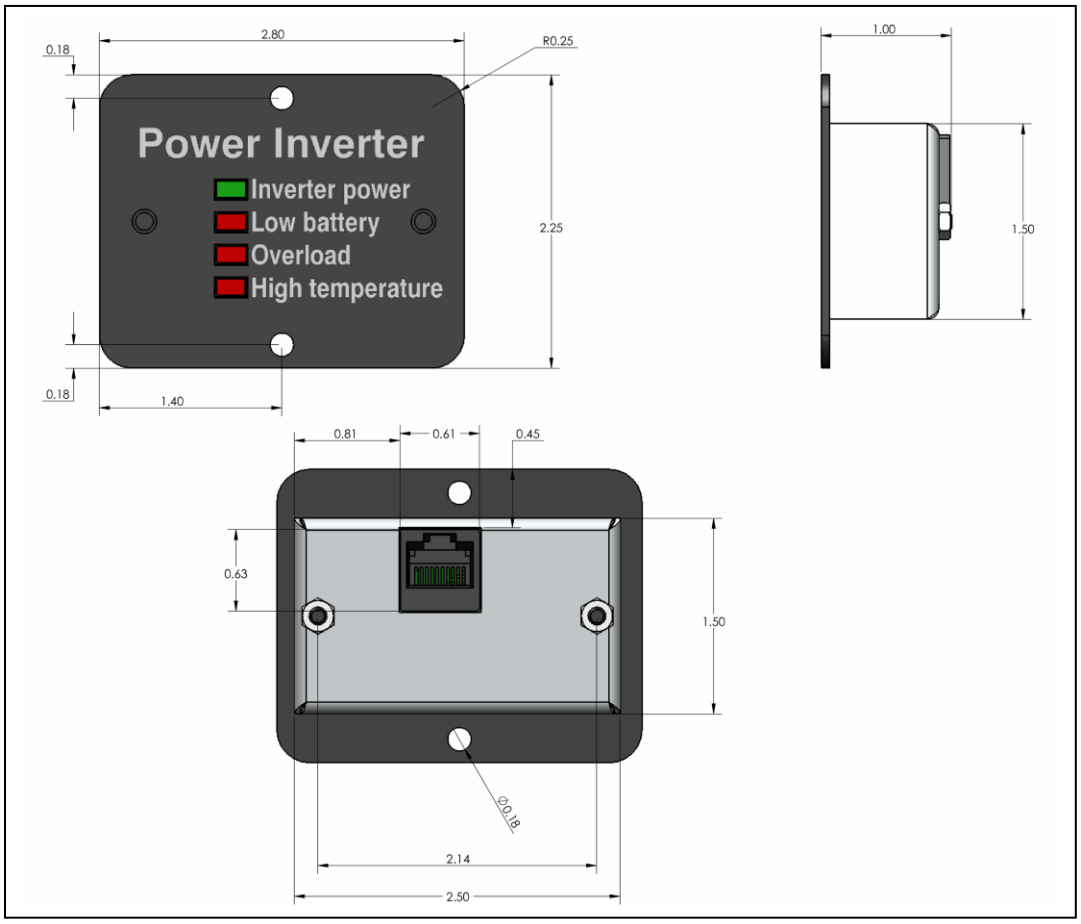


FIGURE 4: LED Status Panel

(a) **Inverter power:** Green LED that indicates the inverter is operating from in “Inverter Mode”.
(b) **Low battery:** Red LED that indicates the inverter is in a “Low Battery” voltage condition.
(c) **Overload:** Red LED that indicates the inverter is in an “Overload” condition.
(d) **High Temperature:** Red LED that indicates the inverter has a “High Temperature” condition.



6 Installation

6.1 Tools for Installation:

Tools required for installation: 3/4” socket wrench, connectors (butt type and insulated), drill, Crimpers (for insulated and non-insulated connectors), volt meter with probes, electrical tape, #2 Phillips screwdriver, wire cutters, wire strippers, cable ties, and a tape measure.

6.2 Mounting the inverter:

⚠	*The inverter mounting location should provide adequate ventilation and clearance to maintain room temperature during operation. At least 1/2 inch of clearance is required on all sides.*

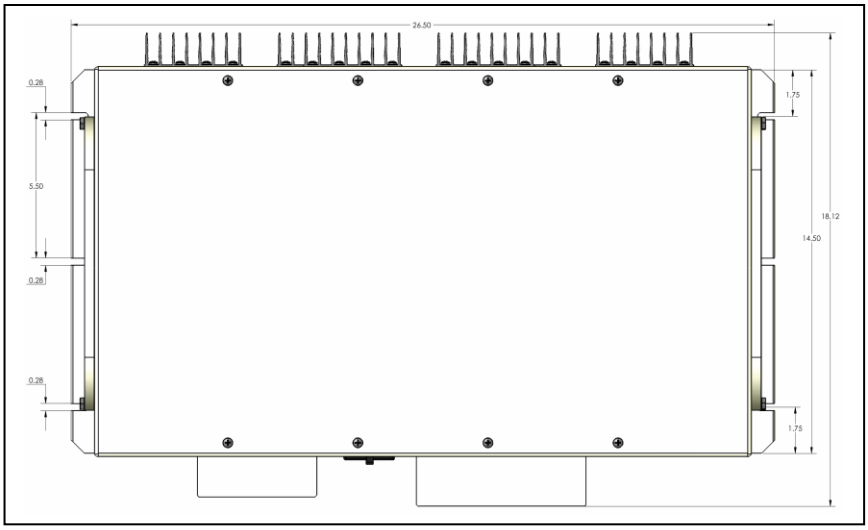


Figure 5 (Inverter Footprint)

- Locate a suitable, secure vertical or horizontal mounting surface as close to the batteries as possible without being in the same airtight compartment.
- If mounting the inverter on a vertical surface, it is recommended that the front control panel be pointing down whenever possible.
- Locate the mounting holes on the chassis flanges and fasten them using ¼ inch diameter screws to secure the inverter. See figure 5.

6.2.1 The following instructions should be thoroughly read and understood before installation.

6.2.2 *CAUTION:* Inverters produce hazardous voltage, and to avoid risk of harm or fire the unit must be properly installed.

CAUTION: The inverter should not be mounted in a location that may be exposed to rain or spray.

CAUTION: The inverter should not be installed in a zero clearance enclosure.

CAUTION: When working near batteries, safety goggles should be worn.

CAUTION: Be sure the inverter is turned "OFF" during installation. **NOTE:** All wiring must follow the National Electric Code, provincial or other codes in effect at the time of installation, regardless of suggestions in this manual. All wires should be copper conductors.

6.3 Mounting

6.3.1 Locate a suitable, secure flat mounting surface as close to the 24 volt auxiliary batteries as possible without being in the same air tight compartment. The maximum recommended distance between the mounting location and the battery is 10 feet.

6.3.2 The location should provide adequate ventilation and clearance to maintain room temperature while the unit is operating. At least 1/2 inch of clearance is required on all sides.

6.3.3 Secure the unit with 1/4" screws or bolts in the mounting holes on the legs of the unit.

6.4 DC Wiring

6.4.1 *CAUTION:* Assure that hydrogen gas does not accumulate near the battery by keeping the area well ventilated. A spark may result when connecting the final battery wiring due to initial charging of the internal input capacitor.

6.4.2 Use stranded copper cable between the battery and the inverter as indicated. Keep the distance to less than 10 feet. A line fuse must be installed between the battery and the inverter. UL requires that the fuse be within 18 inches of the battery.

	Cable gauge	**Line fuse**
24TX60	4/0	500 amp

6.4.3 Use only an approved fuse holder with a U.L. listed fuse as indicated above.

6.4.4 Using smaller input cable or longer length will greatly degrade the inverter peak performance.

IMPORTANT NOTE FOR VEHICLE INSTALLATION: Do not use the vehicle chassis as the negative return in place of a return cable. Use the same size cable as the positive connection and run directly to the battery.

6.4.5 Install the cables at the battery, inverter and then fuse holder. Make sure that clean, tight connections are made. Use care not to touch the positive and negative cables together. A violent spark will result and could result in exploding batteries and fire.

6.4.6 The battery input terminals are located in the wiring compartment. A mounting spark may result when connecting the battery wire, due to an initial charging of the internal input capacitor.

6.4.7 *CAUTION:* Connecting the inverter to the wrong polarity of the battery will cause damage that is not covered under warranty.

6.4.8 3-phase DC Input Lug Torque; UL 486E states 30 ft/lbs. for brass, therefore, the recommended torque is or 30 ft. lbs. (360 in. lbs.).

6.5 Remote ON/OFF Switch

NOTE: The inverter will not switch on unless the violet wire has +12 VDC applied to it.

6.5.1 All material used for the remote switch should be U.L. listed and installed per low voltage, Class 2, wiring code. The remote switch hookup can not provide additional current to operate an indicating lamp.

6.5.2 The remote switch should be single pole and have at least a 5 amp rating, such as Leviton No. 1330-2. The wire used should be at least 18 gauges.

6.5.3 The switch should be mounted at a convenient location.

6.5.4 The remote switch should be connected to the violet wire marked “Remote Switch Hookup” in the wiring compartment. Positive (+) 12 battery voltage must be connected to the other side of the switch. Cable clamp strain relief should be used to secure the field wires.

6.5.5 This model designation has a remote On/Off switch circuit modified to accept +12 VDC. The remote switch must be connected to the violet wire marked "Remote Switch Hookup".

6.6 220Y/120 VAC Output

6.6.1 *CAUTION:* Do not connect another source of AC power directly to the output of the inverter. This will result in damage to the inverter that is not covered under warranty!

6.6.2 The A.C. output is presented at the A.C. wiring compartment. The 3 phase outputs are labeled “L1”, “L2”, “L3”. There is also an A.C. neutral labeled “N” and a chassis ground labeled “G”.

6.6.3 To obtain 220 VAC, 3 phase output, a connection must be made to L1, L2, and L3.

6.6.4 To obtain 220 VAC, single phase output, a connection should be made to any two of the hot leads, as L1 and L2, or L1 and L3, or L2 and L3.

6.6.5 To obtain 120 VAC, single phase output a connection should be made to any one hot lead and to AC neutral “N”; as L1 and N, or L2 and N, or L3 and N.

6.6.7 Remote AC outlets should be mounted at a convenient location in a listed outlet box with approved strain relief, if used.

7 Operation and Troubleshooting

7.1 Operation To operate the inverter, switch the output circuit breaker switch to "ON". Also switch "ON" the remote on/off switch (if used).

⚠	*The battery voltage must be higher than 9 volts for the inverter to operate.*

7.1.2 Turning the inverter "ON": To turn the inverter ON, set the On/Off switch to the "On" position. The green "Inverter Power" LED will light.

⚠	*Turn the inverter OFF when not in use. There is an approximated 1 to 2 amp DC draw from the batteries at idle or no load.*

7.2 Troubleshooting

Call or e-mail Customer Service Department for free consultation during business hours (central time zone) at: 1-800-553-6418 or 1-651-653-7000; fax: 1-651-653-7600;
E-mail: inverterinfo@sensata.com

- A TRUE RMS voltmeter is required for accurate AC output voltage measurements on a quasi-sine inverter. A voltmeter that uses averaging circuitry will give incorrect measurements.
- Unplug all loads and connect a 100-watt light bulb to the inverter output. Observe the LED Status Panel then check troubleshooting Table V.

Table V

PROBLEM	POSSIBLE CAUSES OR SOLUTIONS
No LEDs: No power output. The inverter is not connected to the batteries; the battery voltage is below 9 volts DC or there is a fault in the remote On/Off circuit.	Check the in-line fuses for continuity. Make sure the DC wires are clean and tight. Check the DC voltage at the inverter DC input. Check or bypass the remote On/Off circuit.
Low battery: Red LED indicator. Indicates that the inverter has shut off due to a low battery voltage condition.	Fault in the battery wiring, battery capacity and voltage or the in-line fuse. The inverter will shut off after 2.5 seconds. Switch the inverter off then on to clear the error.
Overload: Red LED indicator. Indicates that the inverter has shut off due to an overload condition.	The inverter output wiring is shorting or loads exceed the inverter rating. The inverter will shut off after 2.5 seconds. Switch the inverter off to clear the error. Remove the short circuit or excessive load from the output, and then switch the inverter on.
High Temp: Red LED indicator light. Indicates that the inverter has shut off due to high internal temperature. The unit will automatically turn back on when it has cooled to 40°C (104°F).	Verify that the inverter is in a vented compartment and that the fan is not blocked. High ambient temperatures combined with poor ventilation may also contribute to the shut down.

8 Warranty

SHIPPING TERMS: F.O.B. St. Paul Minnesota. Freight prepaid and billed, subject to prior credit approval.

MINIMUM ORDER: $50.00 Net Price

LOSS OR DAMAGE: Loss or damage in transit is the responsibility of the carrier. Any claim should be filed with the delivering transport company. Invoice, Bill of Lading and Delivery receipt with damage noted therein must accompany any claims for freight damage. Claims for shortage and lost shipments must be made in writing to Sensata Technologies, St. Paul, MN within 10 days of date of shipment. Claims not reported within this time frame will not be honored.

PRICES: Prices are subject to change without notice. All orders are subject to acceptance at the factory. We reserve the right to invoice prices in effect at time of shipment.

TERMS: Net 30 days with approved credit, credit card or C.O.D.

RETURN GOODS POLICY

- No returned materials will be accepted without an accompanying Returned Materials Authorization Number (RMA) from factory.
- Credit will be issued for returned goods to the original purchaser within 60 days of purchase, provided the inverter is returned to Dimensions unused and not mounted. The amount of credit will be issued at Dimensions discretion based on the condition of the product.
- Customer must be in good standing with Dimensions.
- Inverters that are discontinued, high-voltage (over 24vdc), special-order or used are excluded and will not be eligible for credit. Non-inverter items such as cable assemblies, fuses and fuse holders, will not be eligible for credit
- Support components supplied by Dimensions vendors will be covered under that manufacturer's credit return policy.
- Customer pays return freight.

PLEASE SHIP FREIGHT PREPAID AUTHORIZED RETURNS TO:
Sensata Technologies / 4467 White Bear Parkway / St. Paul, MN 55110

LIMITED WARRANTY: Sensata warrants to the original purchaser for use that the goods or any component thereof manufactured by Dimensions will be free from defects in workmanship from the date of purchase for the period listed on the product label, provided such goods are installed, maintained and used in accordance with Sensata and the original manufacturer's written instructions.

Components not manufactured by Sensata, but used within the assembly provided by Sensata, are subject to the warranty period as specified by the individual manufacturer of said component, provided such goods are installed, maintained and used in accordance with Sensata and the manufacturer's written instructions.

Sensata's sole liability and the Purchaser's sole remedy for a failure of goods under this limited warranty and for any and all claims arising out of the purchase and use of the goods shall be limited to the repair or replacement of the goods that do not conform to this warranty. The return of the purchase price in cash is at the sole discretion of Sensata.

To obtain repair or replacement service under the limited warranty, the purchaser must contact the factory for a Return Material Authorization (RMA). Once obtained, send the Return Material Authorization Number along with the defective part or goods to: Sensata Technologies, 4467 White Bear Parkway, St. Paul, MN 55110, freight prepaid.

THERE ARE NO EXPRESS WARRANTIES COVERING THESE GOODS OTHER THAN AS SET FORTH ABOVE. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE ARE LIMITED IN DURATION TO ONE YEAR FROM DATE OF PURCHASE.

SENSATA TECHNOLOGIES ASSUMES NO LIABILITY IN CONNECTION WITH THE INSTALLATION OR USE OF THE PRODUCT, EXCEPT AS STATED IN THIS LIMITED WARRANTY. AIRPAX DIMENSIONS WILL IN NO EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

WARNING: LIMITATIONS ON USE: Sensata products are not intended for use in connection with Life Support Systems and for Avionic use. Sensata makes no warranty or representation in connection with their products for such uses.

NOTES

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