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DIMENSIONS™

DC to AC Power Inverters

Owners Manual for Models:

ADI-12W6

ADI-12W8

Including Options:

- B3:** 3-Step Battery Charger
- F3:** 100VAC, 60HZ Output
- R:** LED Remote Control/Status Panel
- R3:** LED Remote Control/Status Panel with
Master Disconnect
- T:** Transfer Switch Relay

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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.

<p>ATTENTION:</p>  <p>Important operating instructions. Follow them closely.</p>	<p>DANGER:</p>  <p>Risk of personal harm and/or electrocution exists in this area. Use extreme caution.</p>
<p>SAFETY CERTIFICATION:</p>  <p>This is a UL and CUL Certified product that complies with all the safety standards required in the USA and Canada for land vehicle inverters.</p>	

1.2 Inverter Precautions:

- Inverters 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 should not be mounted in a location that may be exposed to rain or spray.
- The inverter should not be installed in a zero clearance enclosure.
- Damage to the inverter will occur if correct polarity is not observed when installing the DC input cables.
- Damage to the inverter will occur if an external AC power source is applied to the inverter's AC hardwire output.
- The inverter contains a circuit breaker and capacitor that may produce a spark. Do not mount in a confined battery or gas compartment.
- Be sure the inverter 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.

Specifications

Millennium Series Power Inverters

12W6
12W8

**Environmentally Friendly,
Quiet, Reliable, AC Power**



Output Voltage (VAC) 120 RMS \pm 5%
Output Frequency: 60 Hz \pm 0.05%
Output Waveform: Quasi-sine wave, with waveform stabilizer
Input Voltage: (VDC) 11 to 14
Operating Temperature: -20° to 40° C (0° to 104° F)
Efficiency: Up to 90%

Other Design Features:

- Large case TO247 MOSFET design
- Thermally-controlled cooling fan
- Enclosed AC and DC cable connections with strain relief
- Anodized case
- Remote "On/Off" switch hookup
- Remote control panel "R" or "R3" options with inverter power "On/Off" plus LED indication of external power, Inverter power, Low battery, Overload, and High temperature
- Optional Battery Charger "B3" (available with model 12W8 only) and Transfer Relay "T"
- 100VAC, 60Hz output with option "F3"

Unit Protection:

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

Battery Protection:

Automatic low battery shutdown at 10.5 VDC (with in-rush delay)

MODEL NUMBER	ADI-12W6	ADI-12W8
Output Power (Watts Cont.)	600	800
Output Current (Amps AC)	Up to 5	Up to 7
Peak Output (Amps AC)	11	15
Input Current (Amps DC)	Up to 60	Up to 80
Weight (lbs.)	13	18
Dimensions – LxWxH – (Inches)	15 x 8¾ x 4½	15 x 8¾ x 4½
BATTERY CHARGER "B3" - Optional	N/A	Three Step
Output Voltage (Volts DC)	N/A	Regulated Three Step
Output Current (Amps DC)	N/A	Up to 55
Input Current (Amps AC)	N/A	Up to 10
TRANSFER RELAY "T" - Optional	Fail-safe shore power Transfer Relay	
Current Rating (Amps AC)	15	
Transfer Time (milliseconds)	60 typical	

- **Usage:** Any 120 VAC, 60 Hz (100VAC, 60Hz - "F3" option) single-phase products within the inverter's power rating that do not require a pure sine waveform.
- **Warranty:** Full year parts and factory labor

Technical Description

3.1 DC to AC Power Inverter:

A power inverter supplies usable 120VAC, 60Hz power by inverting DC power storage in a bank of batteries. The inverter has an optional battery charger ("B3" option, 12W8 model only) and an automatic fast transfer switch ("T" option). See section 3.2 for all options available with this inverter model.

A customer-supplied remote "On/Off" switch connected to the violet wire extending from the inverter module controls the inverter. The "R" or R3" options provide inverter On/Off control and status display in a LED remote control/status panel, which is connected to the inverter module through a flat 8-conductor telephone type cable.

The system has two operational modes when a transfer switch "T" option is included: Inverter mode and external power mode (refer to section 3.2.1).

3.1.1 Inverter Mode: The inverter converts DC power from batteries to usable 120 VAC, 60 Hz power. 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 unit has a Digital System Processor (DSP) to control the output voltage and frequency as the DC input voltage and/or output load varies. The signal output waveform shape is not sinusoidal; it has a total harmonic distortion of 31% and a maximum single harmonic distortion of 25%.

3.2 Available Options

3.2.1 External Power Mode – “T” option: 120 VAC, 60 Hz external power can be applied directly to the inverter when connecting the AC plug cord extending from the inverter (available with the “T” option only) to an AC outlet. If external power is available, the internal transfer switch cannot be defeated; it automatically turns the DC to AC inverter OFF and activates the three-step battery charger “B3” if included (available with 12W8 model only). At this time the loads attached to the inverter output will operate directly from the external power line even if the inverter has been turned OFF manually. The internal transfer relay automatically switches the inverter back to “inverter power” mode in the absence of external power whenever the inverter was previously set to ON.

3.2.2 Battery Charger – “B3” Option (12W8 model only): The three-step battery charger feature requires the transfer switch “T” option to operate. External power 120 VAC, 60 Hz is applied as explained in section 3.1.2 The internal transfer switch automatically turns the DC to AC inverter OFF and turns the three-step built-in battery charger ON. The battery charger cannot be defeated at this time and will engage even if the inverter has been set OFF manually.

The 3-step charging process goes through the following stages: The bulk stage, here the electrical current is returned to the batteries until a factory set voltage limit is reached. The acceptance stage is then engaged immediately; the battery voltage is kept constant while decreasing the charging current gradually up to the transition point or when it reaches the pre-set timer limit. In the floating stage the batteries are recharged at a very low current rate to prevent them from self-discharging. Finally the condition stage is engaged every 20th complete battery charging cycles to ensure full restoration of active materials in all the plates of the battery cells.

3.2.3 100 VAC, 60 Hz Output – “F3” Option: The inverter accepts and supplies 100 VAC, 60 Hz single-phase quasi-sine waveform output.

3.2.4 LED Remote Control/Status Panel – “R” Option: Remote control panel “R” provides inverter status and allows remote ON/OFF operation. The remote control panel has an “On/Off” switch and five LED indicator lights: External power, Inverter power, Low battery, Overload and High temperature. The remote inverter control panel is connected to the inverter module by a flat 8-conductor telephone type cable.

3.2.5 LED Remote Control/Status Panel – “R3” Option: Remote control panel “R3” provides inverter status and allows remote ON/OFF operation. The “R3” option has a single red wire extending from the inverter module, which must have +12VDC for the inverter to operate (used as a master disconnect in recreation vehicles). The remote control panel has an “On/Off” switch and five LED indicator lights: External power, Inverter power, Low battery, Overload and High temperature. The remote inverter control panel is connected to the inverter module by a flat 8-conductor telephone type cable.

Inverter Physical Description

4.1 Inverter Module

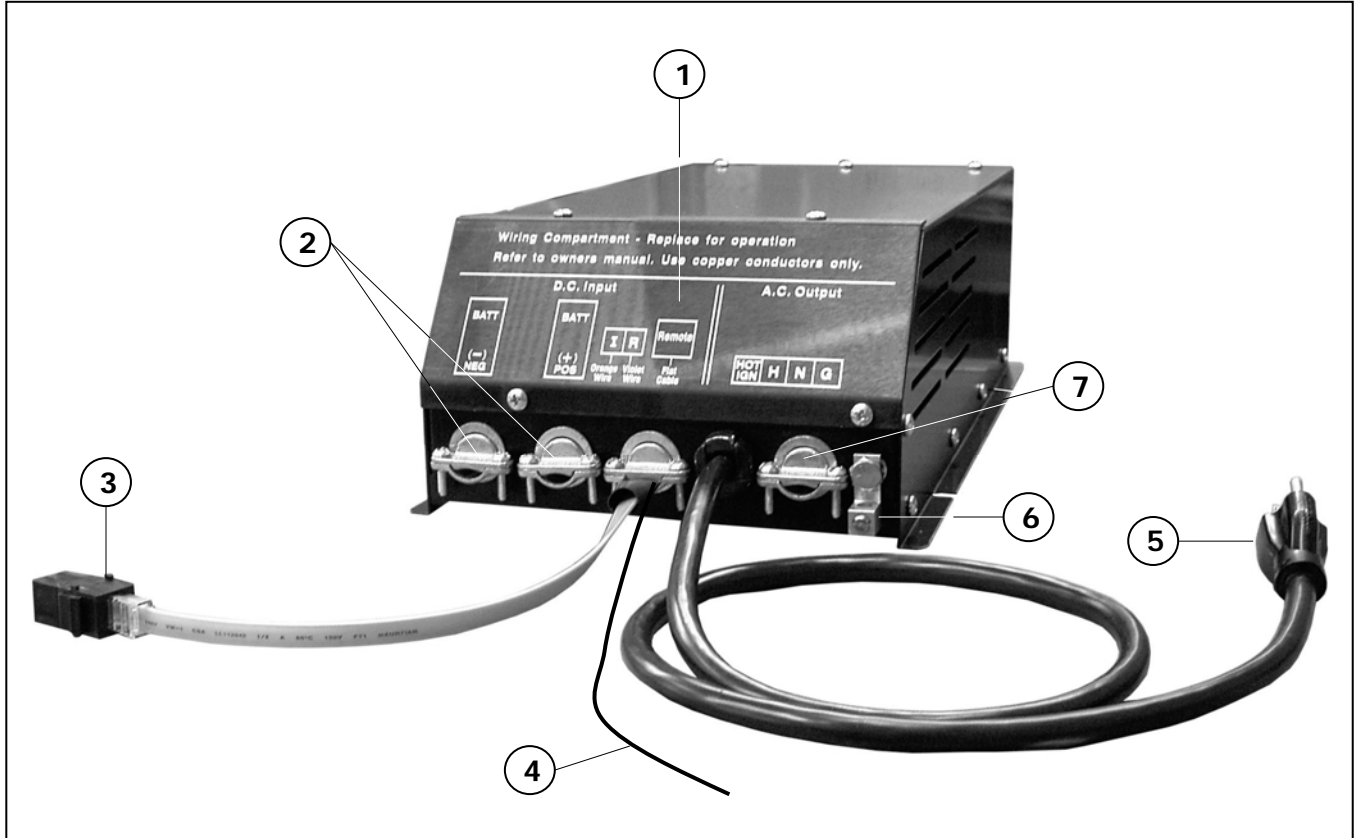


Figure 1: Inverter physical description

Item #	Description	Function
1	Field wiring compartment faceplate.	Covers the AC and DC wiring compartment. Remove the faceplate to access the wiring compartment.
2	DC cable entry opening	Allows the Red (+) and Black (-) cables to reach the inverter's DC input.
3	Remote panel cable connector	Plug the 8-pin telephone connector to the remote LED status panel.
4	Remote On/Off hookup wire - Violet wire (Red wire for "R3" option)	Turns the inverter "On/Off" when connected to +12VDC.
5	AC input cord	Connects to an external AC power source to automatically power AC loads and activate the battery charger (Option "B3").
6	Bonding lug	Connects to vehicle or chassis ground.
7	AC output hardwire strain relief	Access for AC output wiring.

4.2 LED Remote Control/Status Panel

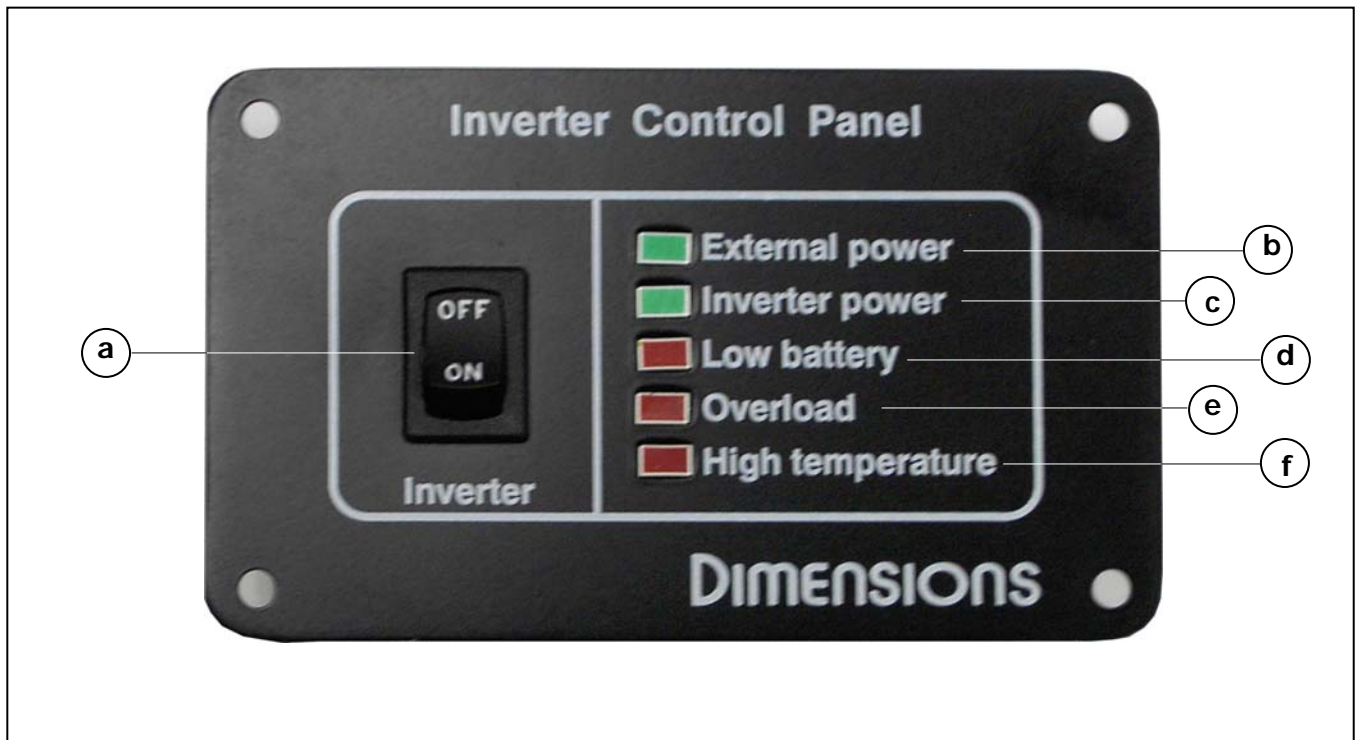


FIGURE 2: LED Remote Control/Status Panel




- (a) **"On/Off" Switch:** Turns the inverter on or off.
- (b) **External power:** Green LED that indicates the inverter is operating in external power mode.
- (c) **Inverter power:** Green LED that indicates the inverter is operating in inverter power mode.
- (d) **Low Battery:** Red LED that indicates a low battery voltage condition has occurred.
- (e) **Overload:** Red LED that indicates an overload condition has occurred.
- (f) **High temperature:** Red LED that indicates an excessive internal temperature condition has occurred.

Installation

5.1 Tools for Installation:


Tools required for installation: 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, tape measure.

5.2 System Components:

Picture	Model and Description	Qty.
	Inverter model: 12W6, 12W8 Options: B3, F3, R, R3 & T	1
	141287-1 LED Remote Control/Status panel assembly.	1
	611446-XX Remote inverter control panel flat cable. XX = Cable length in feet.	1

5.3 Mounting the inverter:

5.3.1 Inverter Mounting

	<i>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.</i>
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- 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 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 3.

5.3.2 Chassis Bonding Lug: Connect the bonding lug located at the right side of the inverter chassis to the earth grounding system using an 8-gauge copper wire.

5.3.3 Remote Control Panel Mounting: The remote control panel must be mounted in a convenient, visible and accessible location. Connect the 8-pin flat phone type cable connector coming from the inverter module to the receptacle on the rear of the panel. See figure 4.

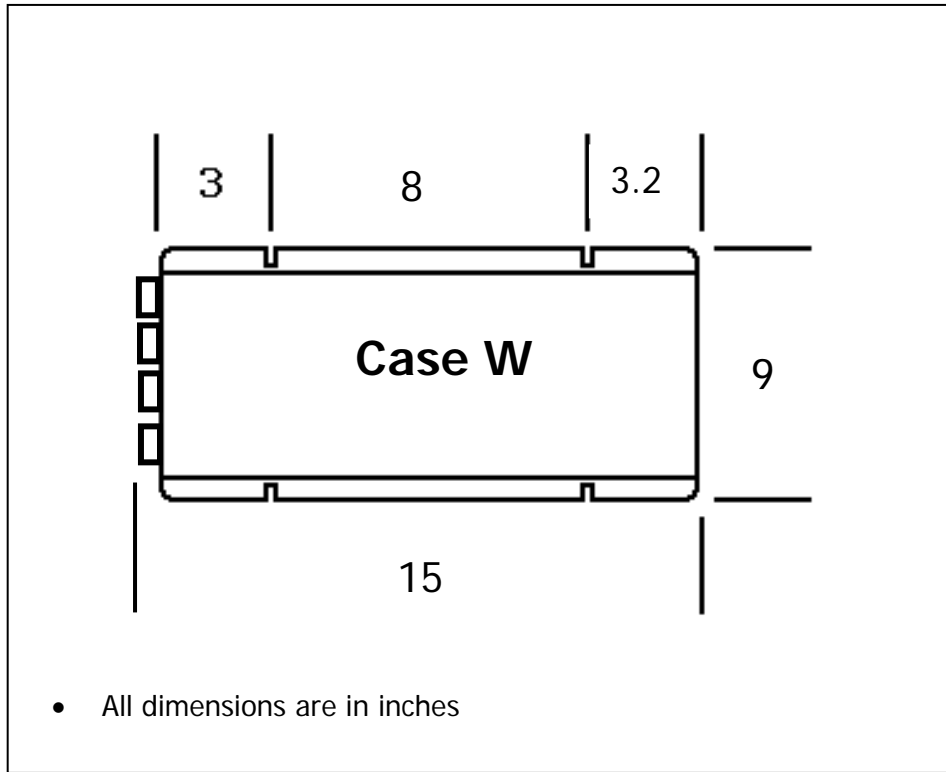


Figure 3: Footprint

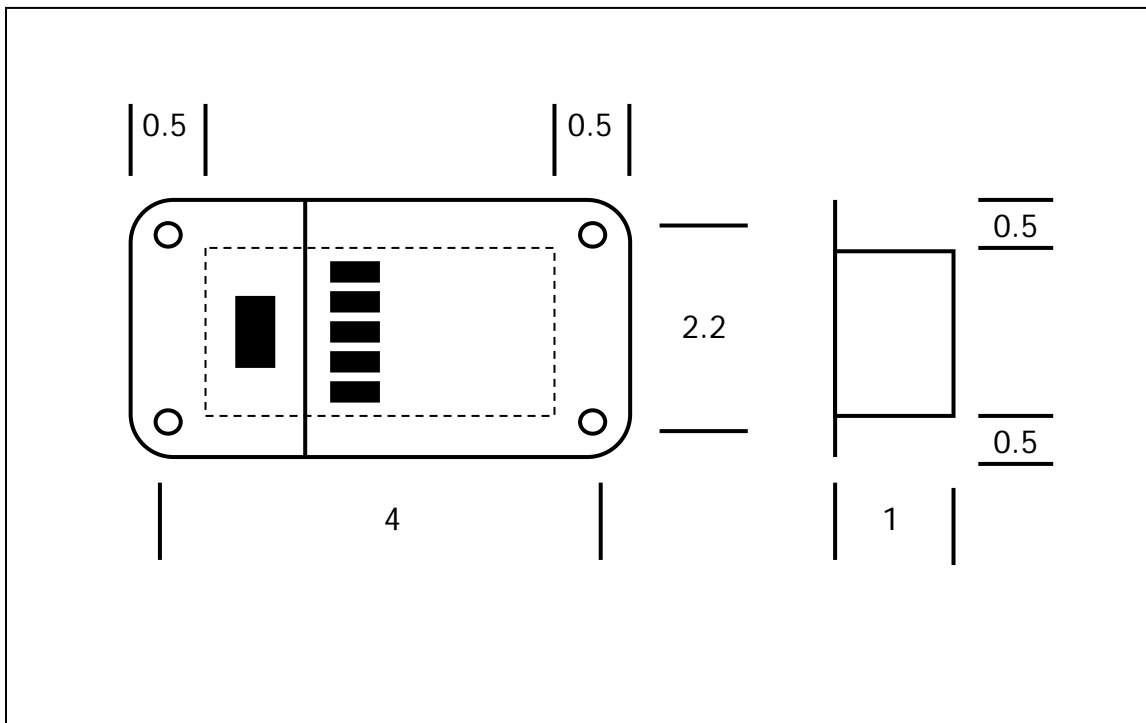


Figure 4 Control Panel Footprint

Inverter Wiring:

6.1 DC Wiring:

- 1 It is recommended in all cases to use stranded copper wires.
- 2 Use SGX cross-linked polyurethane insulation type that complies with the high temperature insulation requirements (125°C.) of SAE J-1127 and vehicle manufacturer requirements.
- 3 Wire gauge recommendations are minimum. For higher temperature rated applications inside engine spaces or large motor loads and other applications with high surge currents use wire gauge 1 to 2 sizes larger than shown on table I.
- 4 Keep the wire runs between battery and inverter as short as possible.
- 5 Use Bussmann fuse type ANN-XXX and fuseblock # 3576 where XXX is the size of the fuse.

6.1.1 Inverter Cable: This is the cable that runs from the inverter to the batteries. Estimate the “inverter cable” length and locate your inverter model on table I, cross-reference the wire gauge and fuse size.

Table I: Wire and Fusing Guide for 12VDC systems at 5% Voltage Drop at Full Output

Inverter Model	Full Load (Amps DC)	Inverter to battery estimated cable length in feet		
		1' – 10'	11' – 15'	16' – 20'
12W6	60	6-gauge, 150A fuse	4-gauge, 200A fuse	4-gauge, 200A fuse
12W8	80	6-gauge, 150A fuse	4-gauge, 200A fuse	2-gauge, 250A fuse

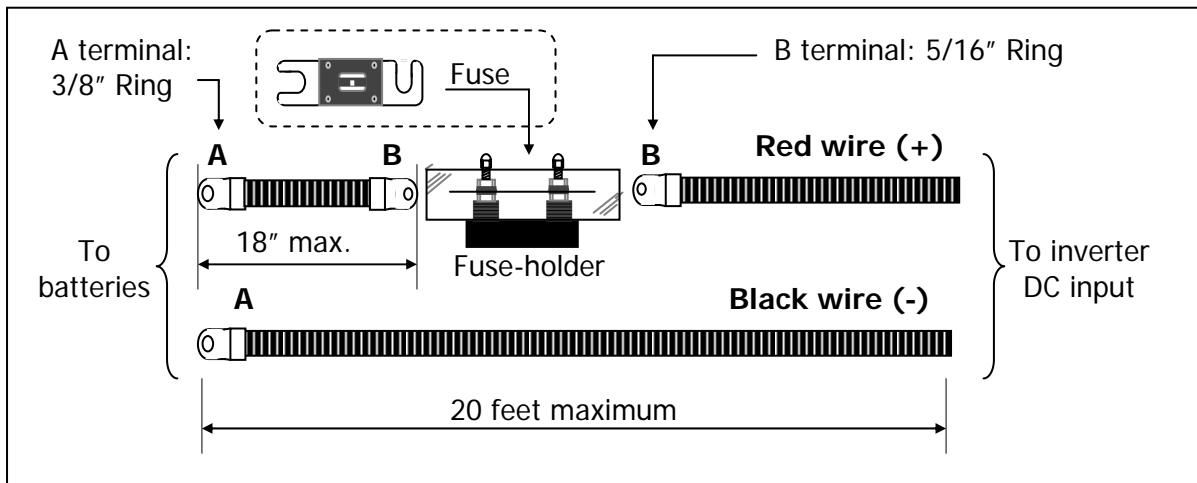


Figure 5: Inverter cable assembly

6.1.2 Charge Cable: This is the cable that runs from the auxiliary battery(s) to the vehicle alternator or OEM engine battery. Use 2-gauge cables and 250A fuse for small OEM alternators and 1/0-gauge and 350A for heavy-duty alternators.

6.2 Connecting the DC cables:



Damage to the inverter not covered under warranty will occur if correct polarity is not observed when installing the DC input cables.

- Remove the inverter field-wiring compartment faceplate to access the DC input lugs.
- Unscrew the DC input lug POS (+) and NEG (-) screws.
- Remove the fuse from the fuseholder for cable installation.
- Remove 5/8 inch of insulation from the un-terminated ends of the red and black cables.
- Insert the stripped end of the red wire into the DC input lug labeled POS (+) and the stripped end of the black wire into the DC input lug labeled NEG (-). Tighten the screws to 10 Ft. Lbs.
- Tighten the cover DC cable strain relief screws to 1 Ft. Lb.
- Connect the end of the short red cable to a POS (+) battery post.
- Connect the terminated end of the black cable (neg. return cable) directly to a battery NEG (-) post (DO NOT connect to the chassis).
- Install the in-line fuse in the fuseholder that is within 18" of the positive post of the battery bank (a one-time spark will occur when this final DC connection is made). To determine the fuse size, refer to section 6.1.1.


6.2.1 Remote "On/Off" switch (customer supplied):

- Connect the 18-gauge violet wire to the load side of a fused "On/Off" switch.
- Connect a fused (5 amp recommended) +12VDC battery voltage to the line side of the switch.

6.2.2 LED Remote Control/Status Panel ("R" or "R3" option):

- Plug one end of the flat remote signal cable into the panel receptacle, plug the other end of the cable to the inverter mating receptacle.
- "R3" option: Connect the red wire to a circuit which has +12VDC battery voltage when the master disconnect switch is not in the disconnect position.

Deep Cycle Battery Comments:

	<p><i>Do not use vehicle-starting batteries; deep discharge cycles typical with inverter applications can shorten the life of this type of batteries.</i></p>
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- Install at least one auxiliary deep cycle battery to feed the inverter directly. Depending on the application running time more batteries could be added if necessary. The vehicle alternator will recharge the batteries.
- It is recommended to mount the battery bank close to the inverter. The maximum recommended distance between the inverter and the battery bank is 20 feet.
- The battery compartment must be vapor-tight to the interior of the vehicle and vented directly to the exterior.
- Install several vent-plugs within one inch of the top of the battery compartment to allow for ventilation. Install a ventilation assembly as needed.
- Allow space around the battery and especially above the battery for inspection, and maintenance purposes.
- The battery should not be able to move more than 1 inch in any direction.


6.3 AC Wiring:

6.3.1 General: Remove the inverter field-wiring compartment cover plate to access the 120VAC*, 60Hz output terminal block and follow the color code connections:

- Hot (H) – Black Wire
- Neutral (N) – White Wire
- Ground (G) – Green Wire

6.3.2 AC Output: The 120 VAC*, 60 Hz current output produced by the inverter is not ground fault circuit interrupt (GFCI) protected and requires the installation of remote GFCI outlets. **Not applicable with inverters having the “F3” option**

- The GFCI outlets model recommended is Install GFCI outlets model Hubbell # GFR 5352XX (20A) or GFR 5252XX (15A).
- The 120VAC*, 60Hz output is presented behind the wiring compartment panel for direct hardwire leads.

	<p><i>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.</i></p>
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6.3.3 AC Input: Inverters having the charger “B3” option and/or the transfer switch “T” option must plug the AC input cord into an external 120VAC* 60Hz power source.

* 100 VAC, 60 Hz input/output for inverters having the “F3” option

6.4 DC Wiring Diagram

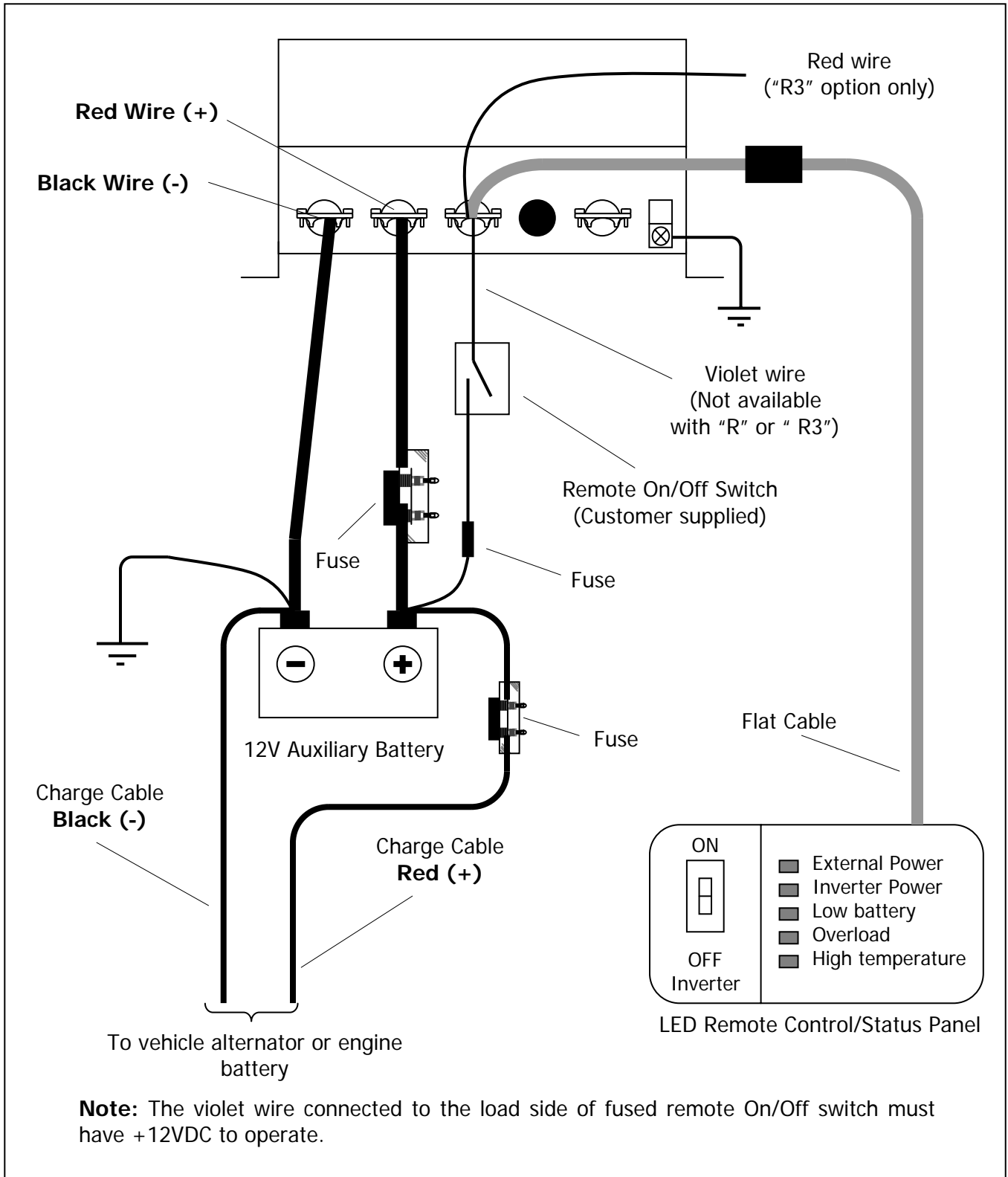


Figure 6: DC wiring diagram

6.5 AC Wiring Diagram

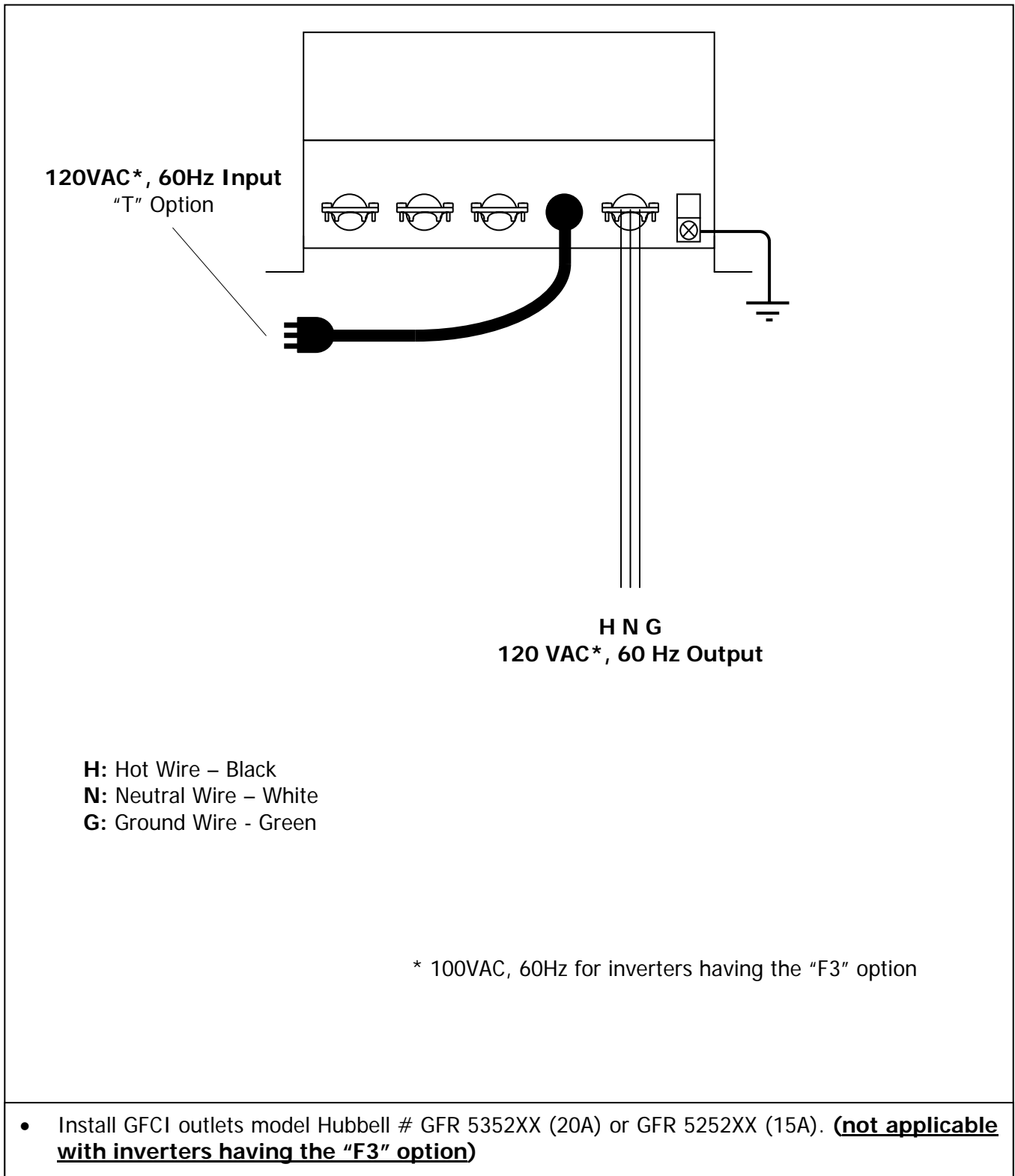


Figure 7: AC wiring diagram

Operation and Troubleshooting

7.1 Operation

7.1.1 Turning the Inverter “ON”:

- To turn the inverter ON by switching on the remote On/Off switch.
- If the inverter has the “T” or “B3” options the green LED “Inverter Power” will come on only in the event that there is no external power 120VAC, 60 Hz (100 VAC, 60 Hz if “F3” option) applied, otherwise the green LED “External Power” LED will come on.
- Turn the inverter OFF if not in use. There is an approximated 1 to 2 amps 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 readings on quasi-sine inverters. Other voltmeters that use averaging circuitry will give incorrect readings.
- Unplug all loads and connect a 100-watt light bulb to the inverter output. Observe the LEDs light coming on at the Remote Control Panel then check the troubleshooting table.

Table II

PROBLEM	POSSIBLE CAUSES OR SOLUTIONS
No LEDs - No AC output power: The Inverter is not connected to the batteries; the battery voltage is below 9 volts DC or 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 customer supplied remote On/Off circuit.
Low battery– Red LED: 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. This message will automatically clear or the inverter will shut off.
Overload – Red LED: Indicates that the inverter has shut off due to an overload condition.	The inverter output wiring is shorted or loads exceed the inverter rating. This message will automatically clear or the inverter will shut off. Remove the short circuit or excessive load from the output, and then switch the inverter off then on. If the condition persists, call Sensata Technologies.
High temperature – Red LED: Indicates that the inverter has shut off due to high internal temperature.	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. The unit will automatically turn back on when it has cooled to 40°C (104°F).

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 are 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, Power Controls White Bear, 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 the factory.
- Credit will be issued for returned goods to the original purchaser within 60 days of purchase, provided the inverter is returned to Sensata unused and not mounted. The amount of credit will be issued at Sensata's discretion based on the condition of the product.
- Customer must be in good standing with Sensata Technologies.
- 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 Sensata vendors will be covered under that manufacturer's credit return policy.
- Customer pays return freight.

PLEASE SHIP AUTHORIZED RETURNS TO:

Sensata Technologies | Power Controls White Bear | 4467 White Bear Parkway | St. Paul, MN 55110
Return Freight Prepaid

LIMITED WARRANTY:

Sensata Technologies extends the following warranty to the original purchaser of those goods subject to the qualifications indicated. Sensata warrants to the original purchaser for use that the goods or any component thereof manufactured by Sensata 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. Damages caused by the misuse, undue care or obvious wear through use will not be covered by this warranty.

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.

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, Power Controls White Bear, 4467 White Bear Parkway, St. Paul, MN 55110. Return Freight Prepaid.
THERE ARE NO EXPRESS WARRANTIES COVERING THESE GOODS OTHER THAN AS SET FORTH ABOVE. THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A 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. SENSATA TECHNOLOGIES WILL IN NO EVENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES.

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