

# DC to AC Power Inverter

## Model: 12-1200IC-EV



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**NEWMAR**  
*DC Power Onboard*  
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Manual-12-1200IC-EV  
 As of May 2010

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## 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 Inverter Safety Instructions:

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

### 1.2 Battery Safety Information:

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

## 2. TECHNICAL SPECIFICATIONS

INVERTER BASE MODEL	12-1200IC-EV
Dimensions - LxWxH (Inches):	12 x 11.5 x 6.9
Efficiency:	Up to 88%
Input Current (Amps DC):	Up to 120
Input Voltage (Volts DC):	11 to 14
Operating Temperature:	-20°C to 40°C (0°F to 104°F)
Output Current (Amps AC):	Up to 10
Output Frequency (Hz):	60 ± .05%
Output Power (Watts):	1200
Output Voltage (Volts AC):	120 ± 5%
Output Waveform:	Pure sine with < 5% THD
Peak Output (Amps AC):	30
Weight (Lbs):	32
BATTERY CHARGER: "B3"	
Input Current (Amps AC):	Up to 13
Output Current (Amps DC):	Up to 55
TRANSFER RELAY: "T"	
Current Rating (Amps AC):	13
Transfer Time (milliseconds):	Less than 16 typical
REMOTE PANEL READY: "R" Built-in connections	
171412-1 Charger status panel	Optional LED panel
171413-1 Inverter status panel	Optional LED panel

**2.1 Other Design Features:** Patented construction, and cooling methods with thermally controlled cooling fan, hospital grade GFCI outlet protection, AC hardwire output connections and Remote "On/Off" switch hookup. AC field wiring compartment box included with "H" option.

**2.2 Unit Protection:** Automatic electronic short circuit/overload protection, Automatic over temperature shutdown and output circuit breakers.

**2.3 Battery Protection:** Automatic low battery shutdown at 10.5VDC with in-rush delay.

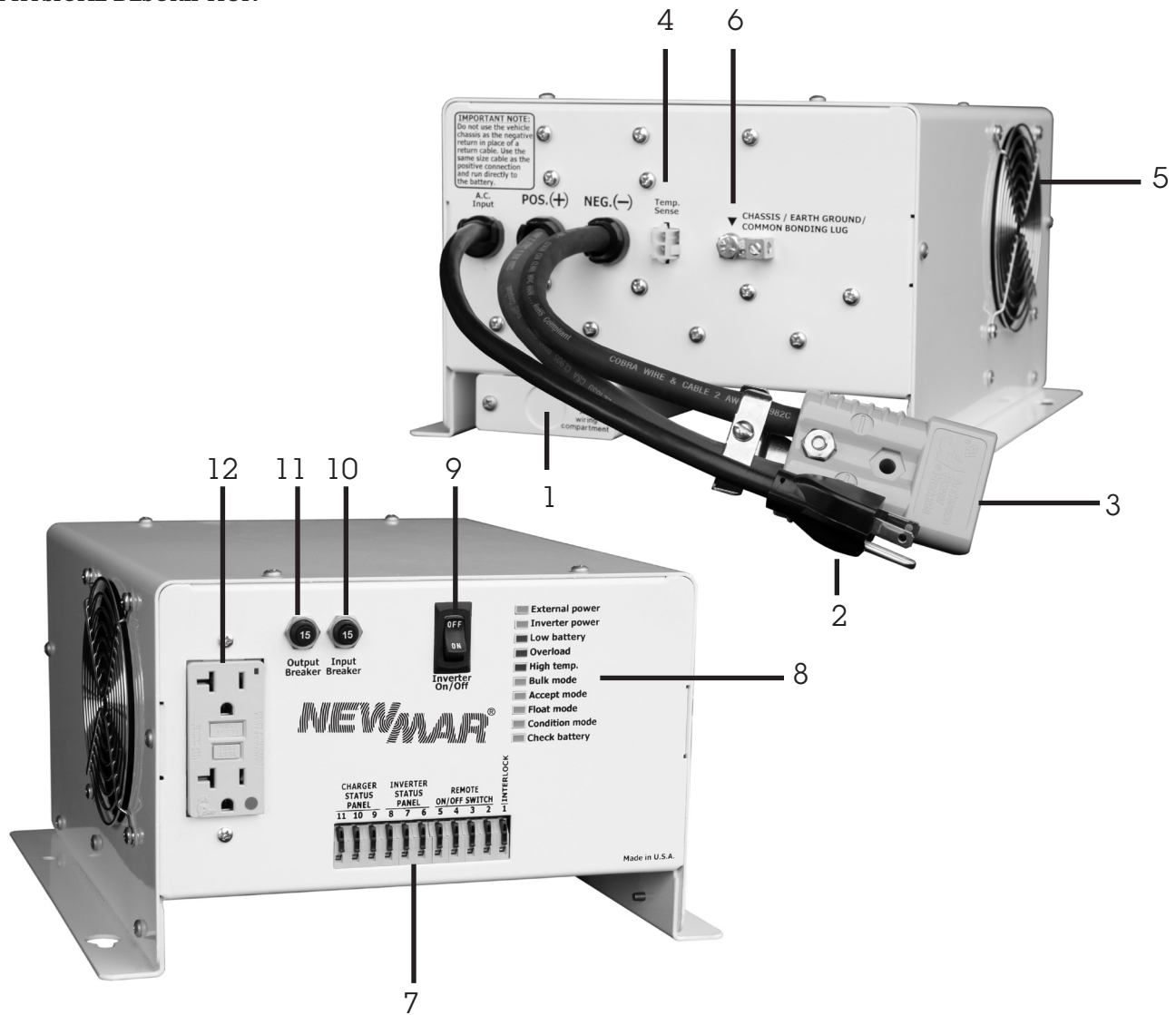
**2.4 Usage:** Any 120 VAC, 60 Hz single phase product within the inverter's power rating.

**2.5 Certifications:** UL Certified

\*Charge output is limited when temp. comp. cable is not connected

  
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## 6. PHYSICAL DESCRIPTION

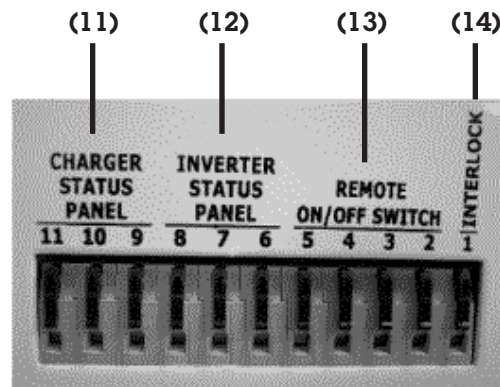
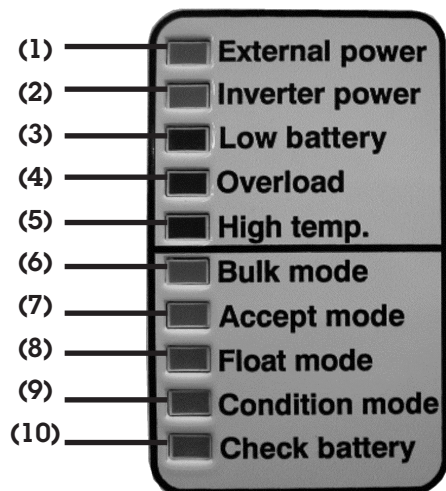


1. **AC Output Field Wiring Compartment:** Provides hardwire leads for remote AC outlet connections (not available if the plug-in cord is included)
2. **Plug-in AC cord:** Connects to a 120VAC outlet (not available with "H" option)
3. **Quick DC input disconnect:** Connects to the battery bank.
4. **Temp. Comp. Connector Port:** Connects to the temp. comp. cable
5. **Cooling Fan:** Temperature controlled triggers when necessary.
6. **Bonding Lug:** Connects to the ground system.
7. **Remote panel terminal board connections:** Used to connect the remote panels (charger and inverter) and the remote "On/Off" switch.
8. **LED Status Control Panel:** Provides inverter status (See figure 2 on page 7)
9. **Local "On/Off" Switch:** Switches the inverter ON or OFF.
10. **Input Breaker:** Trips to protect the inverter from spikes
11. **Output Breaker:** Trips to protect the inverter's internal circuitry from shorted AC loads or overload situations.
12. **GFCI Outlets:** Hospital grade style provides 120VAC Output.

  
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- (1) **External power:** Green LED on - External AC power line pass thru.
- (2) **Inverter power:** Green LED on - Inverter is operating from batteries
- (3) **Low battery:** Red LED on - Low battery voltage condition.
- (4) **Overload:** Red LED on - Overload condition.
- (5) **High temp.:** Red LED on - High temperature condition.
- (6) **Bulk mode:** Battery charger is on bulk mode.
- (7) **Acceptance mode:** Battery charger is on acceptance mode.

- (8) **Float mode:** Battery charger is on float mode.
- (9) **Condition mode:** Battery charger is on condition mode
- (10) **Check Battery:** Error message check batteries or battery cable
- (11) **Charger Status Panel:** Connects to terminals 11, 10 and 9
- (12) **Inverter Status Panel:** Connects to terminals 8, 7 and 6
- (13) **Remote On/Off Switch:** Connects to terminals 5, 4, 3 and 2 accordingly.
- (14) **Interlock:** Connects to terminal 1

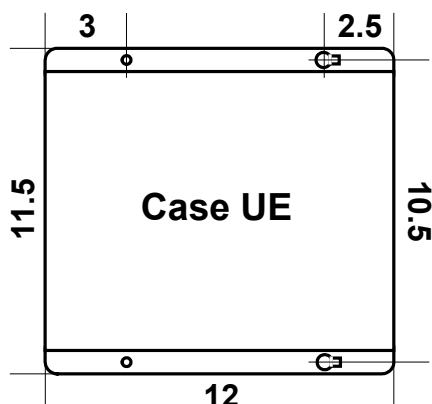
## 7. INVERTER MOUNTING

**Note:** Before mounting the inverter system, read the safety instruction section on page 3.

**7.1 Tools for Installation:** The following tools are needed for inverter installation: Crimper, Cable ties, Cutter, Drill, #2 Phillips Screw driver, Tape measure, Wire cutters, Wire Strippers.

### 7.2 Mounting Recommendations:

**Note:** 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.



- (1) Locate a suitable, secure vertical or horizontal mounting surface as close to the batteries as possible without being in the same airtight compartment.
- (2) If mounting the inverter on a vertical surface, it is recommended that the front control panel be pointing down whenever possible.
- (3) Locate the mounting holes on the chassis flanges and fasten them using 1/4 inch diameter screws to secure the inverter.
- (4) Wire the panel using insulated butt splice or equivalent. The terminal block on the inverter uses a stripped wire connection.

## 8. DC WIRE GAUGE & FUSING

**8.1 Inverter Cable:** An "inverter cable" kit (positive cable, negative cable and proper fuse) is needed to connect the inverter to a battery bank. An 8-gauge single strand cable is also recommended to connect the inverter's bonding lug to ground.

The inverter cable length and the size of the inverter will determine the cable gauge and the fuse size to use. The maximum inverter cable recommended is 20-ft; it must be fused within 18-in from the positive (+) terminal of the battery.

Cross reference the inverter model, and the estimated cable length in Table I to determine proper cable gauge, and fuse size. The inverter cable kit can be purchased directly from factory. See the accessories section on this manual.

**Table I:** Cable and Fusing Guide at 5% Voltage Drop at Full Output

Inverter Model	Full Load (Amps DC)	Inverter to Battery Estimated Cable Length in Feet		
		1' to 10'	11' to 15'	16' to 20'
12-1200	120	4-gauge, 200A fuse	2-gauge, 250A fuse	1-gauge, 300A fuse

**Warning:** Proper cable gauge must be used to prevent excessive voltage drop at the inverter DC input.

**8.2 Cable Recommendations:** To furnish an "inverter cable" kit, follow below recommendations:

1. Use stranded copper cables in all cases.
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. Cable gauge recommendations are minimum. For higher than normal temperature applications or large motor loads and other applications with high surge currents use cable gauge 1 to 2 sizes larger than recommended on table I above.
4. Keep the cable lengths between battery and inverter as short as possible.
5. Use Bussmann fuse type ANN or ANL and fuseblock # 3576. See the accessories section on this manual.

## 9. REMOTE "ON/OFF" SWITCH

A customer supplied remote "On/Off switch" can be wired to the terminal board located on front labeled "Remote On/Off Switch" using 18-gauge wires by two different methods:

- Positive Start: Use a jumper between terminal 4 and 5, connect the "On/Off Switch" between terminals 2 and 3.
- Negative Start: Use a jumper between terminal 2 and 3, connect the "On/Off Switch" between terminal 4 and ground, leave terminal 5 open.

**Note:** Terminal 1 (Interlock) must be fused at 1-Amp and connected to +12VDC or master disconnect switch.

## 10. TEMP. COMP. CABLE CONNECTION

Connect the ring terminated end to the negative side of a battery bank and the 2-pin connector end to the appropriate port located at the back of the inverter labeled "temp. sense". The temp. comp. cable collects critical information from the batteries for proper voltage and charge current at that moment.

**PLEASE NOTE: If the Temp. Comp. Cable is not connected; the battery charger output current will be limited to 25Amp DC.**



## 11. AC INPUT & OUTPUT CONNECTIONS

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

**11.1 Local 120VAC, 60Hz AC Output:** The inverter's local AC output power is provided at the GFCI protected outlet located on front.

**11.2 Remote 120VAC, 60Hz AC output outlets ("H" option only):** Remote AC output power outlets if needed can be hardwired directly to the AC output leads extending from the back of the inverter (AC field wiring compartment).

If the "A" option is included, use regular non-GFCI outlets, the hardwire AC output leads are already GFCI protected. If the "A" option is not included, it is recommended to use GFCI outlets to protect users from electrical shock.

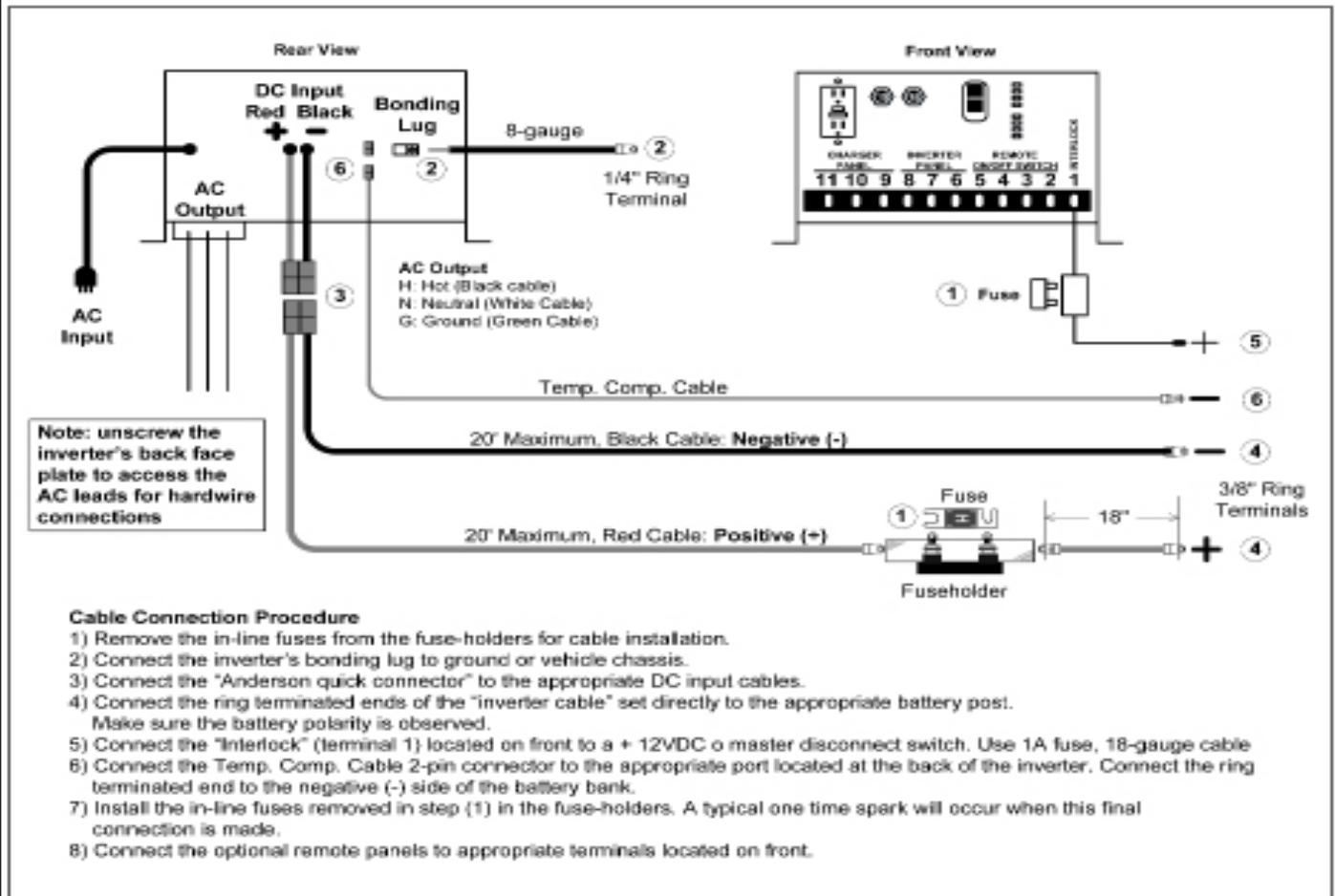
**11.3 120VAC, 60Hz AC Input ("T" option only):** Connect the plug-in cable extending from the back of the inverter to a non-GFCI AC outlet. The plug-in cord is not available with the "H" option.

If the "H" option is included, connect the AC input hardwire leads located in the field wiring compartment to a fuse breaker panel.

**Note:** To access the field wiring compartment, unscrew the small faceplate located at the back lower left corner of the inverter, and follow the AC wiring code: Green (ground), White (neutral) and Black (Hot).

**Note:** Connecting the plug-in cord to GFCI protected outlets may cause some interference with the inverter's GFCI front output outlets.

## 12. WIRING DIAGRAM



## 13. THEORY OF OPERATION

The local "On/Off Switch" located on front, or the "Remote On/Off Switch" if used controls the inverter. Both the Local and "Remote On/Off" switches are configured in parallel. To control the inverter remotely set the "Local On/Off switch" to OFF.

**Note:** +12VDC must be applied to terminal 1 for the inverter to operate. The module disconnect switch if available must be set ON.

**Operational modes:** "External Power" mode and "Inverter Power" mode.

**13.1 External Power Mode:** The green LED "External Power" will come on indicating that there is a valid external AC power line applied to the inverter AC input. If the inverter panel 171413-1 is included and the inverter is set ON, the green LED "Inverter" will blink to indicate that the inverter is in standby mode (shore power available.)

- Transfer Relay Switch: The loads attached to the inverter output will operate directly from the external AC power line independently of the inverter ON/OFF status. If the inverter is left ON (standby mode), the built-in transfer relay will automatically cycle back and forth between "Inverter Power" mode and "external power" mode depending on the availability of the external AC power line.
- Battery Charger: The battery charger cannot be defeated, and will engage automatically independently of the inverter ON/OFF status. The charging process goes through a 3-step charging modes: Bulk, acceptance and float mode. A conditioning mode automatically triggers every 10th complete charging cycle.

The proper LED light located on front of the inverter will come on to indicate the charging status mode. If the charger panel 171412-1 is included, the green LED "Charger" will blink to indicate "bulk" or "acceptance" mode. If the green LED keeps steady, the charger is in "float" mode.

**Note:** The battery charger will engage only, if the individual battery voltage is above 9-volt.

**13.2 Inverter Power Mode:** The green LED "Inverter" will come on. If the inverter panel 171413-1 is included the green LED will turn ON steady. The AC power produced by the inverter comes from the energy stored in the battery bank through a sophisticated electronic inversion process. A transformer, a Metal Oxide Silicon Field Effect Transistors (MOS-FET), a filter capacitor and a 16-bit, 16 MHz microprocessor control are used to generate clean useful AC power.

**Note:** The signal output waveform produced by the inverter when in "inverter mode" is pure sinusoidal. It has a total harmonic distortion of less than 5%.

## 14. TROUBLESHOOTING

1) No AC output power:

1.1) No LEDs on: Make sure +12VDC is applied to terminal 1 "Interlock".

- Check in-line fuse which is located within 18" from the battery's positive post.
- DC connections to be tight and clean.
- Battery voltage to be above 9 VDC
- Bypass or disconnect remote On/Off switch if used.

1.2) Green LED "Inverter Power" on: Disconnect all loads and connect a test light to the hardwire output leads (Black: Hot, White: Neutral, Green: Ground.)

- If test light is on: Bad GFCI.
- If test light is off: Possible bad inverter.

1.3) Green LED "External Power" on: Repeat 1.2 steps above.

2) Low Battery: The use of battery isolator is not recommended due to excessive voltage drop across terminals

- Battery voltage to be above 10.5 when vehicle's engine is OFF, and above 13 VDC when it is ON.
- Check for proper DC wire gage (see wire gauge & fusing section)

3) Overload: Unplug all loads, disconnect the AC output hardwire leads if used and reset the inverter On/Off:



- If the overload condition persist, possible bad inverter
- Overload conditions clears, check for short circuits or check load size versus inverter output wattage size.

4) High Temp.: Let the inverter to cool down to 40°C (104°F)

5) Check Battery: Reset the inverter (plug/unplug cord from shore power) and disconnect DC cables (Pos. and Neg.) and connect them back after a few minutes.

- Short cell battery or corroded Loose DC wires
- Battery voltage to be above 9 volts for the charger to engage
- Check voltage and current readings against below chart

Battery Type	Battery Charger Voltages @ 25°C(78°F) and Charge Time			
	Bulk	Accept	Float	Conditioning
Wet Cell		14.6Vdc	13.2Vdc	15Vdc max.
Sealed		14.2Vdc	13.2Vdc	14.4 to 15Vdc
Capacity < 400AH	Up to 6Hrs.	Up to 2Hrs.	N/A	Up to 3Hrs.
Capacity > 400AH	Up to 8Hrs.	Up to 3Hrs.	N/A	Up to 6Hrs.

#### FACTORY CONTACT INFORMATION

If a problem with the inverter persists after you have applied the above-outlined solutions, or if you have any questions about the installation and proper operation of the inverter, please contact NEWMAR's Technical Services Manager:

**Phone:** 714-751-0488 - From the hours of 7:00 A.M. to 3:30 P.M. weekdays, P.S.T.

**Fax:** 714-957-1621 - Anytime

**Email:** techservice@newmarpower.com - Anytime

We are happy to consult with you to resolve any problems or questions you may have. If during consultation, it appears the inverter must be returned to the factory for repair we will issue a Return Materials Authorization at that time.

#### 16. APPENDIX

Battery Specifications Chart

Group Number	Voltage Volts DC	Capacity Amp-Hour	Dimensions in inches			Weight LBS
			L	W	H	
GC2	6	220	10 3/8	7 3/16	10 5/8	70
L16	6	350	11 3/4	7 1/8	16 3/4	125
27/31	12	95	13	6 13/16	9 7/16	70
4D	12	180	20 3/4	8 3/4	9 7/8	140
8D	12	225	20 3/4	11 1/8	9 7/8	170

**Note:** The use of deep-cycle batteries is strongly recommended on inverter application; deep discharge cycles typical with inverter applications can shorten the life of other type of batteries.

