

HIGH GEAR
by
Cobra® **HG PI2000**

**Operating Instructions for Your
HighGear by Cobra
2000 Watt Power Inverter**



Nothing comes close to a Cobra™

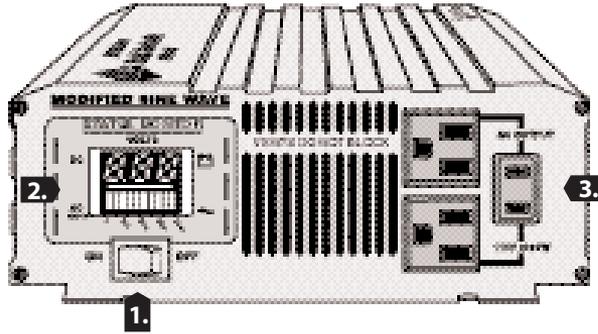
How Your HG PI2000 Power Inverter Works

How Your Cobra Power Inverter Works

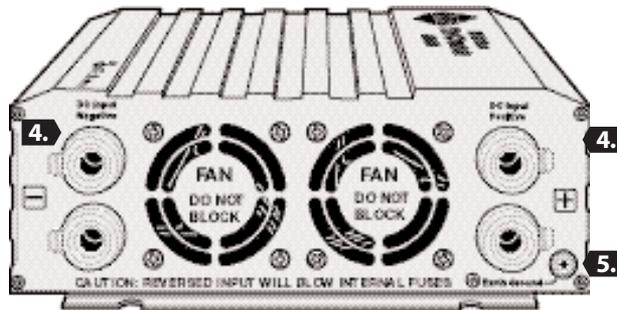
The Cobra Power Inverter is an electronic product that has been designed and built to take low voltage DC (Direct Current) power from your automobile or other low voltage power supplies and CONVERT it to standard 115 Volt AC (Alternating Current) power like the current you have in your home. This conversion process thereby allows you to use many of your household appliances and electronic products in automobiles, RVs, boats, tractors, trucks and virtually anywhere else.

Controls and Indicators

1. On/Off Power Switch
2. Battery Voltage and Current Meter
3. AC Outlets



4. Battery Cable Terminals
5. Ground Terminal



Thank you for purchasing the Cobra PI2000 inverter. Properly used, this Cobra product will give you many years of reliable service.

Customer Support

Should you encounter any problems with this product, or not understand its many features, please refer to this owner's manual. If, after referring to the manual, you still need help, call Cobra Customer Service at 773.889.3087.

Cobra Customer Service

Live operators are available M-F 8:00 am – 6:00 pm CST at 773.889.3087
Automated Technical Assistance available 24 hours a day, seven days a week. E-mail questions to: productinfo@cobraelectronics.com

Cobra on the World Wide Web: Frequently Asked Questions (FAQ) can be found at: www.cobraelectronics.com

How to Use Your HG PI2000 Power Inverter

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Features of This Product

- Automatic thermal protection/shutdown
- Reverse polarity protection
- Three AC receptacles
- Low battery alarm
- Low battery shutdown
- Battery voltage and current meters

To make the most of this inverter, it must be installed and used properly. Please read the installation and operating instructions carefully before installing and using it. Special attention must be paid to the CAUTION and WARNING statements in the manual. CAUTION statements specify conditions which could cause damage to the unit or other equipment. WARNING statements identify conditions that could result in personal injury or loss of life.

Cobra 2000W Output Waveform

The output waveform is referred to as "square wave" or "modified sine wave." It is a stepped waveform designed to have characteristics similar to the sine wave shape of utility power. A waveform of this nature is suitable for most AC loads (including linear and switching power supplies used in electronic equipment, transformers and motors).

Caution: Rechargeable Appliances

Certain rechargers for small nickel cadmium batteries can be damaged if connected to the Cobra 2000W inverter. Two particular types of equipment are prone to this problem:

1. Small battery-operated appliances such as flashlights, razors, and night lights that can be plugged directly into an AC receptacle to recharge.
2. Certain battery chargers for battery packs used in hand power tools. These chargers have a WARNING label stating that dangerous voltages are present at the battery terminals.

This problem does not occur with the vast majority of battery operated equipment. Most use a separate charger or transformer that is plugged into the AC receptacle and produces a low voltage output. If the label on the AC adapter or charger states that it produces a low voltage AC or DC output (less than 30 volts) the inverter will have no problem powering it safely.

Quick Checkout

Quick Checkout

This section provides you with basic information about the inverter and how to check its performance before installation. Be sure to have the following on hand:

- A 12 volt DC power source (such as a vehicle battery)
- A set of cables to connect the power source to the inverter
- A test load that can be plugged into the AC receptacle on the inverter

Power Source

The power source must provide between 11 and 15 volts DC and be able to supply enough current to run the test load. As a rough guide, divide the wattage of the test load by 10 to get the current (in amperes) the power source must deliver.

Cables (included)

The cables must be as short and thick as possible in order to reduce the voltage drop between the power source and the inverter when it is drawing current from the power source.

If the cable suffers an excessive voltage drop, the inverter may shut down when drawing higher currents because the voltage at the inverter dropped below 10 volts.

#4 AWG stranded copper cable is recommended. It should be no longer than 1.5 meters (4 ft.). For short term testing at a low power level, the following is recommended:

Testing

Test Load Power	Minimum Cable Size
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100 w	# 16 AWG copper
250 w	# 12 AWG copper
500 w	# 8 AWG copper

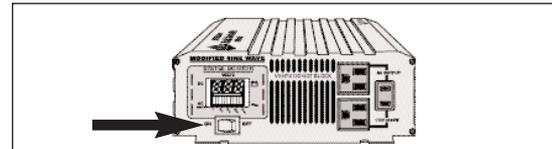
The end of the cable that connects to the inverter must have its insulation stripped off for about 1/2 inch (1.25cm) back from the end, exposing the bare copper.

The other end of the cable, which connects to the power source, must be terminated with a lug or other connector that provides a secure, low resistance connection.

For example, if the power source is a battery, the cable must be terminated with a battery terminal that clamps to the post on the battery.

Connection

1. Turn the ON/OFF switch on the inverter to the OFF position.
If the power source is a DC power supply, switch it off as well.



Testing

Connection

Connection

continued

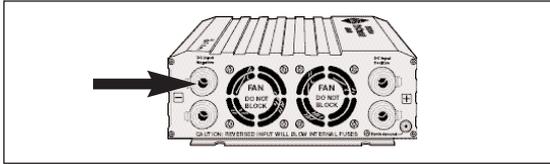
CAUTION: Loosely tightened connectors can cause excessive voltage drops and may result in overheated wires and melted insulation.

CAUTION: A reverse polarity connection (positive to negative) will blow the fuse in the inverter and may permanently damage the unit.

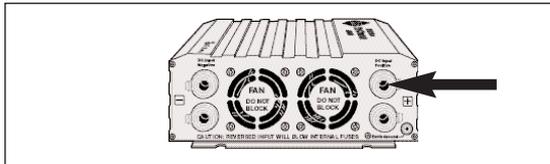
CAUTION: Remove any jewelry (watch, ring etc.). Be careful not to short circuit the battery with any metallic object (wrench, etc.).

NOTE: If only one power source is used, connect both cables from the negative terminal of the inverter to the negative terminal of the power source. Then connect both cables from the positive terminals of the inverter to the positive terminal of the power source.

2. Connect both sets of cables to the power input terminals on right side panel of the inverter. The red terminals are positive (+) and the black terminals are negative (-). Insert the bare ends of the cables into the terminals and tighten the screws to clamp the wires safely.



3. Connect each cable from the negative (black) terminal of inverter to the negative terminal of the power source. Make a secure connection. All power connections to your Cobra inverter must be positive to positive and negative to negative.
4. Connect the cables from the positive (red) terminals of the inverter to the positive terminal of the power source. Make a secure connection.

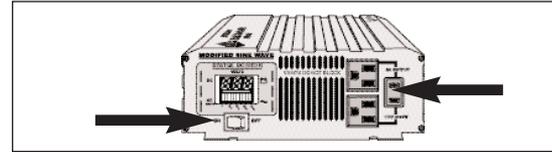


Connection

continued

WARNING: You may observe a spark when making the connection because current can flow to charge the capacitors in the inverter. **Do not make this connection in the presence of flammable fumes.** Explosion or fire may result.

5. If a DC power supply is being used as the power source, switch it On. Turn the ON/OFF switch on the inverter to the On position. Check the meters on the left side panel. The voltage should indicate between 11 and 14 volts, depending on the voltage of the power source.



6. Turn the inverter's ON/OFF switch to the Off position. The indicator lights may blink and the internal alarm may sound momentarily. This is normal. Plug the test load into the AC receptacle on the left side panel of the inverter. Leave the test load switched Off.
7. Switch the inverter's ON/OFF switch to the On position and turn the test load On. The inverter should supply power to the load. If it does not, please consult the troubleshooting section in this manual.

Installation

CAUTION: To avoid fire, do not cover or obstruct ventilation openings. Do not install inverter in a zero-clearance compartment. Overheating may result.

WARNING: This unit contains components which can produce arcs or sparks. To prevent fire or explosion, do not install in compartments containing a battery or flammable materials, or in a location which requires ignition protected equipment.

Installation

The inverter must be installed in an area that meets all of the following requirements:

- A. Dry- Do not place in an area where water can drip or splash on the inverter.
- B. Cool- Ambient air temperature should be between 30° F and 105° F (0° C and 40° C). The cooler the better.
- C. Ventilate- Allow at least 1 inch (3cm) of clearance around the inverter for proper airflow. Make sure that ventilation openings on the ends of the unit are not obstructed.
- D. Safe- Do not install the inverter in the same compartment as a battery or in any compartment that contains flammable liquids such as gasoline.
- E. Close to battery- Install unit as close to battery as possible (without being in the same compartment) to minimize the length of cable required to connect the inverter to the battery. It is better and cheaper to run longer AC wires than longer DC wires (cables).

Mounting

Mount the inverter on a flat surface placing the mounting bracket on the bottom. Mounting hardware should be corrosion resistant and at least #10 or larger. The inverter can be mounted horizontally or vertically.

Cables (included)

Power wire and wiring is very important to the performance of the inverter. Because the inverter has a low voltage, high current input, low resistance wiring is essential between the battery and inverter. This is so it can deliver the maximum amount of energy to the load.

Use only copper wire. Aluminum wire has about 1/3 more resistance than copper wire of the same size plus it is difficult to make good, low-resistance connections to aluminum wire.

We recommend two #4 copper cables (90° C insulation rating) as the minimum size for connections between the battery and inverter.

Keep the cable length as short as possible, no more than 4 ft. (1.5 meters). This will keep the voltage drop to a minimum.

Mounting

CAUTION: The inverter must only be connected to batteries with a nominal output voltage of 12 volts. It will not work with a 6 volt battery, and will be damaged if it is connected to a 16 volt battery.

WARNING: If you are making a permanent AC connection to the inverter, make sure that the AC wiring steps are performed before any DC wiring is done. (DC hook-up energizes internal components, regardless of the position of the ON/OFF switch). Working on AC connections in such a circumstance may result in an electric shock.

WARNING: 115 Volt AC power is potentially lethal. Do not work on AC wiring when it is connected to the inverter (even if it is switched off) unless the DC power source is physically disconnected from the inverter. Also, do not work on AC wiring if it is connected to another AC power source such as a generator or the utility line.

CAUTION: Electrical installations must meet local and national wiring codes, and should be performed by a qualified electrician.

CAUTION: Do not connect the inverter and another AC source (such as a generator or utility power) to the AC wiring at the same time. The inverter will be damaged if its output is connected to AC voltage from another source. Damage can even occur if the inverter is switched Off.

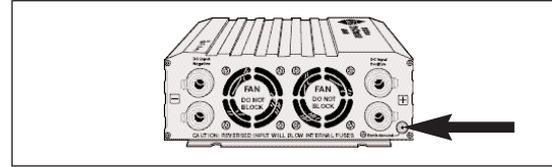
CAUTION: Do not connect the inverter to an AC branch circuit that has high-power consumption loads. It will not operate electric heaters, air conditioners, stoves, and other electrical appliances that consume more than 2000 watts.

If the cable has too much voltage drop, the inverter may shut down when drawing higher currents because voltage at the inverter may drop below 10 volts. If you must use longer cables choose thicker cables, such as #2 AWG, and trim the ends of the cable to fit the terminals.

Strip back the insulation about 1/2 inch (1.25cm), on the end of the cable that connects to the inverter, exposing the bare copper conductor. The other end of the cable that connects to battery must be terminated with a battery terminal that clamps to the post on the battery.

Ground Wiring

Warning: Do not operate the inverter without connecting it to ground. Electrical shock hazard may result.



Ground Wiring

There is a screw on the rear panel labeled Chassis Ground. This is to connect the chassis of the inverter to ground. The ground terminal in the AC outlet on the right side panel of the inverter is connected to the chassis.

The Chassis Ground screw must be connected to a grounding point, which will vary depending on where the unit is installed. Use a #8 AWG copper wire (preferably with green/yellow insulation) to connect the chassis ground screw to the grounding point.

- In a vehicle, connect the Chassis Ground to the chassis of the vehicle.
- In a boat, connect to the boat grounding system.
- In a fixed location, connect the Chassis Ground screw to earth ground by connecting to a ground rod (a metal rod pounded into the earth) or other proper service entrance ground.

DC Wiring

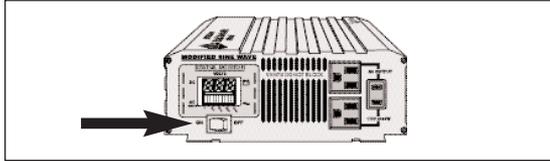
CAUTION: Loosely tightened connectors result in excessive voltage drop and may cause over heated wires and melted insulation.

CAUTION: Reverse polarity connections (positive to negative) will blow internal fuses in the inverter and may permanently damage the unit. Such damage is not covered by the warranty.

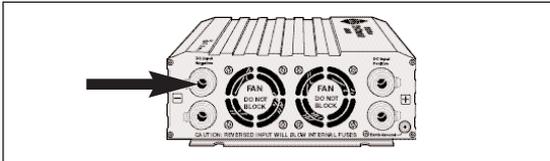
CAUTION: We recommend a main fuse in the battery's positive cable to protect against DC wiring short circuits (external to the inverter). The fuse should be as close to the battery as possible. We recommend a Buss Fuse ANL-250 or equivalent. The specific fuse ampere rating should be sized to allow operation of all your DC powered equipment.

DC Wiring

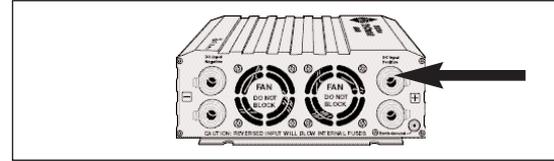
1. Be sure the ON/OFF switch on the inverter is in the OFF position.



2. Connect the cables to the power input terminals on the rear panel of the inverter. The red terminals are positive(+) and the black terminals are negative (-). Insert the bare ends of the cables into the terminals and tighten the screws to clamp the wires securely.



3. Connect the cable from the negative terminal of the inverter to the negative terminal of the battery. Make a secure connection.
4. Double check that the cable you just installed connects the negative terminal of the inverter to the negative terminal of the battery. Power connections to the inverter must be positive to positive and negative to negative.

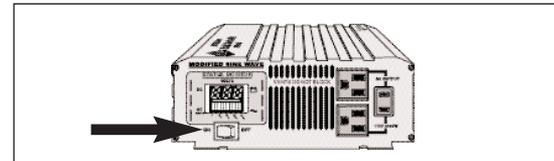


5. Connect the cable from the positive terminal of the inverter to the positive terminal of the battery's main fuse, or to the battery selector switch, if you are using one. Make a secure connection.

You might observe a spark when you make this connection since current can flow to charge capacitors in the inverter.

Operation.

Turn the inverter On by using the ON/OFF switch on the left side panel .



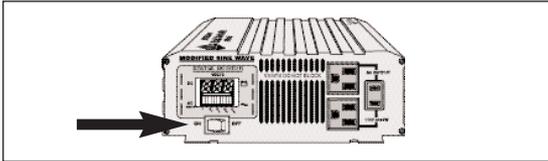
The inverter is now ready to deliver AC power to your loads. If several loads are to be operated by the inverter, turn them on separately, after the inverter has been turned On. This will ensure that the inverter does not have to deliver the starting currents required for all the loads at once.

WARNING: Do not make this connection in the presence of flammable fumes. Explosion or fire may result. Thoroughly ventilate the battery compartment before making this connection.

Controls and Indicators

ON/OFF Switch

Turns the control circuit in the inverter On and Off. **It does not** disconnect power from the inverter.



When the switch is in the Off position, the inverter draws no current from the battery. When it's in the On position, but no power is being supplied to the load, the inverter draws less than 500 milliamperes from the battery. This is low current draw. It would take more than a week to discharge a 100 ampere-hour battery at this rate.

Don't worry about excessive drain on the battery if you leave the inverter switched On for a few days. However, do switch it off if you are not planning to recharge the battery within a week or so.

Power Output

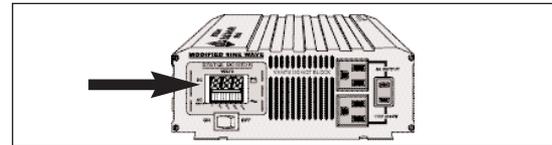
The inverter will deliver 2000 watts continuously. It can deliver 2400 watts for about 30 minutes. The inverter must cool for 15 minutes before it can resume operation at 2000 watts. Note: The wattage rating applies to resistive loads.

Operating Limits

The inverter will operate most AC loads within its power rating. Some induction motors used in freezers, pumps, and other motor-operated equipment require very high surge currents to start. The inverter may not be able to start some of these motors even though their rated current draw is within the inverter's limits. The inverter will normally start single phase induction motors rated at 1/2 HP or less

Input Voltage

The inverter will operate from input voltage ranging from 10 volts to 15 volts. Optimum performance will occur when the voltage is between 12 volts and 14 volts. If the voltage drops below 10.5V +/- 0.3V volts, an audible low battery warning will sound. The inverter will shut down if the input voltage drops below 9.5V +/- 0.3V volts. This protects the battery from being over-discharged. It will restart when the input voltage exceeds 10.5V +/- 0.3V volts.



The inverter will also shut down if the input voltage falls to 15.75V +/- 0.75V. This protects the inverter against excessive input voltage. Although the inverter has protection against over-voltage, it may still be damaged if the input voltage were to exceed 16 volts.

Operating Limits

Input Voltage

Troubleshooting Guide

Problem /Symptom	Possible Causes	Solution
Low output voltage on voltmeter (96 VAC to 104 VAC)	Using average reading	Use true RMS meter reading
Low output voltage and current indicator in red zone	Overload	Reduce the load
No output voltage and voltage indicator in lower red zone	Low input voltage	Recharge battery, check connections and cable
No output voltage, no voltage indication	Inverter switched Off, no power to inverter, fuse open	Turn inverter on, check wiring to inverter. Have qualified service technician check and replace
	Reverse DC polarity	Observe correct polarity
No output voltage voltage indicator in upper red zone	High input voltage	Make sure the inverter is connected to 12 V battery, check regulation of charging system.

Problem /Symptom	Possible Causes	Solution
Low battery alarm on all the time, voltage Indicator below 11 V	Poor DC wiring, poor battery condition	Use proper cable make solid connections, use new battery
No output voltage if load in excess of 2000W or 17.4 amperes	Thermal shutdown	Allow inverter to cool off Reduce load, continuous operation input current required Improve ventilation; make sure ventilation openings in the inverter aren't obstructed. Reduce ambient temperature
No output voltage	Short circuit or wiring error	Check AC wiring for short circuit or improper polarity

Maintenance

Very little maintenance is required to keep the inverter operating properly. The exterior of the unit should be cleaned periodically with a damp cloth to prevent accumulation of dust and dirt. At the same time, tighten the screws on the DC input terminals. Be sure vents and fans are free of dust or debris.

Maintenance

For each piece of equipment you will be operating from the inverter you must determine the battery's capacity (how long the battery can deliver a specific amount of current—in automotive batteries, usually 25 amperes). For example, a battery with a reserve capacity of 180 minutes can deliver 25 amperes for 180 minutes before it is completely discharged.

Calculate the total watt-hours of energy consumption (power x operating time). To determine how many 12 volt ampere hours will be consumed divide the watt hours by ten.

Equipment	Power Consumption	Operating Time	Watt-Hours (Power x Operating time)
Coffee Maker	750 watts	0.3 hour	225
Coffee Grinder	100 watts	0.1 hour	10
Microwave Oven	800 watts	0.5 hour	400
TV/VCR	115 watts	3 hours	345
Blender	300 watts	0.25 hour	75
Sewing Machine	150 watts	1 hour	150
Waterpik	90 watts	0.25 hour	22.5

Specifications

- CONTINUOUS OUTPUT POWER (4 HOURS) 2000W
- CONTINUOUS OUTPUT POWER (30 MINUTES) 2400W
- SURGE RATING (0.1SECOND) 4000W
- PEAK EFFICIENCY (12V—1/2 LOAD) 90%
- EFFICIENCY (FULL LOAD, 12V) >83%
- NO LOAD CURRENT DRAW <0.8 A (12.6V)
- OUTPUT WAVEFORM (RESISTIVE LOAD) PERFECT MODIFIED SINE WAVE
- OUTPUT FREQUENCY 60HZ±2HZ
- OUTPUT VOLTAGE 115V+/-5%
- INPUT VOLTAGE 10-15 VDC
- ALARM VOLTAGE (UNLOAD) 10.5 V ±0.3V
- SHUTDOWN VOLTAGE (UNLOAD) 9.5V ±0.3V
- OPERATING TEMPERATURE RANGE -10° C-40° C
- STORAGE TEMPERATURE RANGE -40° C to 85° C
- PROTECTION OVERLOAD, SHORT-CIRCUIT, OVERTEMP
- REVERSE POLARITY, UNDER/OVER VOLTAGE

Notes

All protection is automatically recovered.

To protect the battery, if the unit needs to be restarted after low voltage protection, the voltage of DC input should be above 12V.

To extend the life of the fan it will stop when there is no load. The speed of the fan increases as the load increases.

The unit is completely insulated in input and output for added safety.

Limited Three Year Warranty

COBRA ELECTRONICS CORPORATION warrants that its COBRA Power Inverter, and the component parts thereof, will be free of defects in material and workmanship for a period of 3 years from the date of consumer purchase. This warranty may be enforced by the first consumer purchaser, provided that the product is utilized within the U.S.A.

COBRA will, without charge, repair or replace, at its option, a defective inverter upon delivery to the COBRA factory Service Department, accompanied by proof of the date of first consumer purchase, such a duplicated sales receipt.

You must pay initial shipping charges required to ship the product for warranty service, but the return charges will be at COBRA'S expense, if the product is repaired or replaced under warranty.

Exclusions: This limited warranty does not apply; 1) to any product damaged by accident; 2) in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs; 3) if the serial number has been altered, defaced or removed; 4) if the owner of the product resides outside the U.S.A.

All implied warranties, including warranties of merchantability and fitness for a particular purpose are limited in duration to the length of this warranty.

COBRA shall not be liable for any incidental, consequential or other damages; including, without limitation, damages resulting from loss of use or cost of installation.

Some states do not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to you.



Cobra Electronics Corporation

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Chicago, Illinois 60707



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If You Think You Need Service

For technical assistance, please call our Automated Help Desk which can assist you by answering the most frequently asked questions about Cobra products.

(773) 889-3087

24 hours a day, 7 days a week.

A Consumer Service Representative can be reached through this same number 8:00 am - 6:00 pm, Monday through Friday, CST.

Technical assistance is also available on-line in the Frequently Asked Questions (FAQ) section at www.cobraelectronics.com or by e-mail to productinfo@cobraelectronics.com

If you think you need service call 1.773.889.3087

If your product should require factory service please call Cobra first before sending in your unit. This will ensure the fastest turn-around time on your repair.

You may be asked to send your unit to the Cobra factory. It will be necessary to furnish the following in order to have the product serviced and returned.

1. For Warranty Repair include some form of proof-of-purchase, such as a mechanical reproduction or carbon or a sales receipt. If you send the original receipt it cannot be returned.
2. Send the entire product.
3. Enclose a description of what is happening with the unit. Include a typed or clearly print name and address of where the unit is to be returned.
4. Pack unit securely to prevent damage in transit. If possible, use the original packing material.
5. Ship prepaid and insured by way of a traceable carrier such as United Parcel Service (UPS) or First Class Mail to avoid loss in transit to: Cobra Factory Service, Cobra Electronics Corporation, 6500 W. Cortland St., Chicago, IL 60707.
6. If the unit is in warranty, upon receipt of your unit it will either be repaired or exchanged depending on the model. Please allow approximately 3 to 4 weeks before contacting us for status. If the unit is out of warranty a letter will automatically be sent informing you of the repair charge or replacement charge. If you have any questions, please call 1.773.889.3087 for assistance.

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