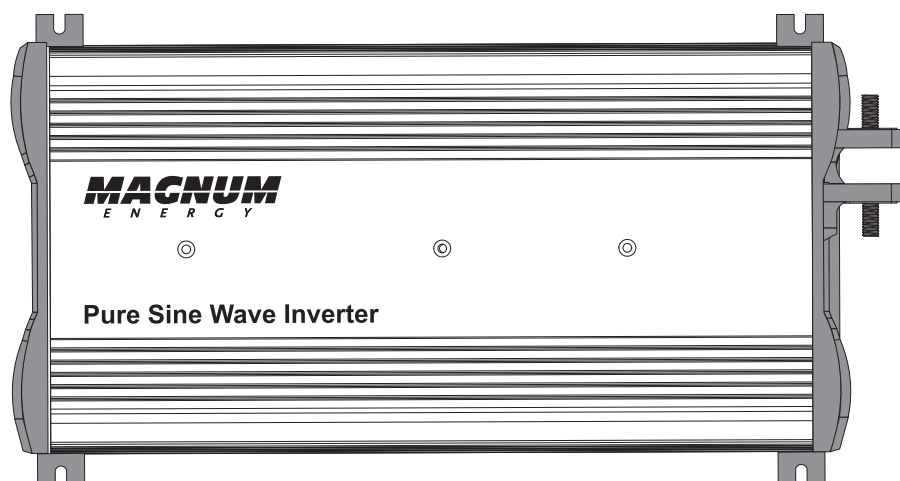




CSW1012

Pure Sine Wave Inverter



Owner's Manual

Disclaimer of Liability

Since the use of this manual and the conditions or methods of installation, operation, use and maintenance of the CSW1012 inverter is beyond the control of Magnum Energy, Inc., this company does not assume responsibility and expressly disclaims liability for loss, damage or expense, whether direct, indirect, consequential or incidental, arising out of or in any way connected with such installation, operation, use, or maintenance.

Note as well that while every precaution has been taken to ensure the accuracy of the contents of this manual, the specifications and product functionality may change without notice. Magnum Energy, Inc. assumes no responsibility for errors or omissions.

Restrictions on Use

The CSW1012 inverter may only be used in life-support devices or systems with the express written approval of Magnum Energy. Failure of the CSW1012 inverter can reasonably be expected to cause the failure of that life-support device or system, or to affect the safety or effectiveness of that device or system. If the CSW1012 inverter fails, it is reasonable to assume that the health of the user or other persons may be endangered.

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Statement of Appreciation

From all of us at Magnum Energy –

Thank you for purchasing this CSW1012 inverter.

We understand that you have many purchasing options in the marketplace, and are pleased that you have decided on a Magnum Energy product.

At Magnum we are committed to providing you with quality products and services, and hope that your experience with us is pleasant and professional.

Record the unit’s model and serial number in case you need to provide this information in the future. It is much easier to record this information now, instead of trying to gather it after the unit has been installed.

Model:	Serial Number:
CSW1012	AU

Magnum Energy® is a registered trademark of Magnum Energy, Inc.

Important Product Safety Instructions

This manual contains safety instructions that must be followed during the installation and operation of this product. Read all instructions and safety information contained in this manual before installing or using this product.

Safety Symbols

To reduce the risk of electrical shock, fire, or other safety hazard, the following safety symbols have been placed throughout this manual to indicate dangerous and important safety instructions.



WARNING: Indicates that failure to take a specified action could result in physical harm to the user.



CAUTION: Indicates that failure to take a specified action could result in damage to the equipment.



Info: Indicates information that emphasizes or supplements important points of the main text.

Product Safety Alerts



WARNINGS:

- All electrical work must be performed in accordance with local, state and federal electric codes.
- This product is designed for indoor/compartment installation. Do not expose to rain, snow, moisture, or liquids of any type.
- Use insulated tools to reduce the chance of electrical shock or accidental short circuits.
- Remove all jewelry such as rings, watches, bracelets, etc., when installing or performing maintenance on the inverter.
- Always disconnect the batteries or energy source prior to installing or performing maintenance on the inverter. Live power may be present at more than one point since an inverter utilizes both batteries and AC.

FCC Information

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and if not installed/used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception—which can be determined by turning the equipment off and on—the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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1.0 Overview

Congratulations on your purchase of the CSW1012 pure sine wave inverter provided by Magnum Energy, Inc. This inverter is designed to be powerful, yet simple to operate, and will provide you with reliable AC power for trouble-free use. Please read this chapter to familiarize yourself with the features and benefits of your CSW1012 inverter.

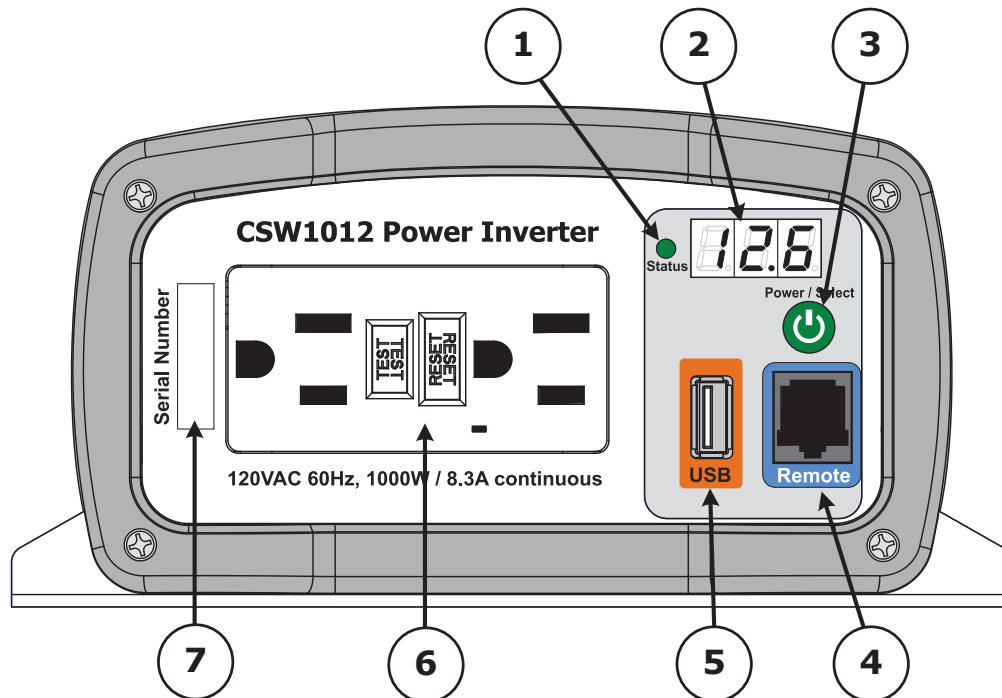


Figure 1-1, Front Panel Features

The front panel of the CSW1012 inverter is equipped with the following features:

1. **Status Indicator** – an at-a-glance LED that provides the inverter’s status—lights green, red, or amber (see Section 4.0 Operation).
2. **Digital Display** – a three-character alphanumeric display that shows the inverter’s measured battery voltage, total AC output power, and any error or warning codes.
3. **Power/Select Button** – a momentary button switch that allows the inverter to be quickly turned on or off.
4. **Remote Port** – a RJ11 connector that allows an optional remote switch to be connected via a remote cable. **Note:** *Remote switch is sold separately (PN: CSW-RS).*
5. **USB Port** – allows USB-enabled devices to be powered and charged.
6. **GFCI** – a Ground Fault Circuit Interrupter protected AC outlet (with LED indicator and test/reset capability). The GFCI outlet quickly stops the flow of electricity in the event a ground fault occurs on the device that is plugged into the inverter.
7. **Serial Number** – the unique identification number assigned to each unit (with a model-specific prefix).

1.0 Introduction

The back panel of the CSW1012 inverter is equipped with the following features:

8. **Cooling Fan** – an intake cooling fan that automatically turns on when the inverter’s internal temperature rises above 122 °F (50 °C). The fan turns off when the inverter’s internal temperature falls below 122 °F (50 °C).
9. **DC Negative Terminal (black)** – the inverter’s connection to the negative terminal on the 12 VDC battery bank.
10. **DC Positive Terminal (red)** – the inverter’s connection to the positive terminal on the 12 VDC battery bank.
11. **Model Number** – the model number of the inverter (i.e., CSW1012), and regulatory compliance information.
12. **DC Chassis Ground Screw** – the connection that is used to tie the exposed chassis of the inverter to the DC grounding system. The grounding screw (8-32 x 3/8 Phillips PH) either connects to the vehicle’s chassis, to the DC grounding bus, or to the engine’s negative bus.
13. **Mounting Flanges (front and rear)** – used to mount and secure the inverter to a shelf/wall.

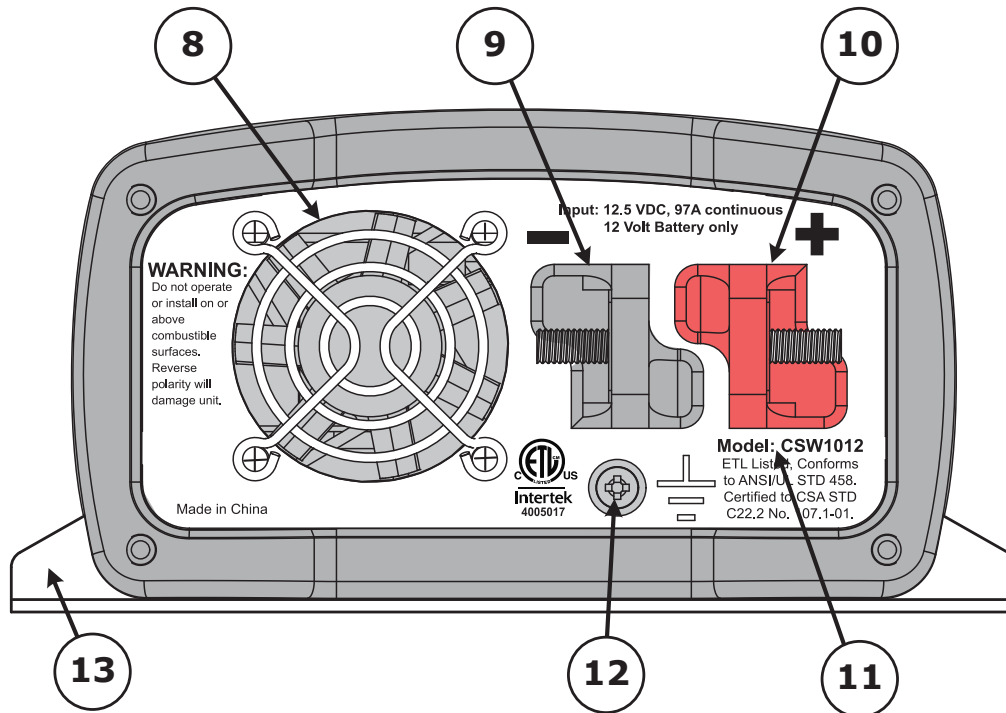


Figure 1-2, Back Panel Features

Regulatory Compliance

The CSW1012 inverter is intended to be used for land vehicles (RVs or trucks) or marine craft. It has been tested and listed to UL 458, 5th Edition (Power Converters/Inverters and Power Converter/Inverter Systems for Land Vehicles and Marine Crafts) for use in the US; and is also certified to CSA C22.2 No. 107.1-01 (General Use Power Supplies) for use in Canada. It has been tested and certified to these product safety standards by Intertek Testing Services (known as ETL), which is a Nationally Recognized Testing Laboratory (NRTL). NRTLs are qualified organizations that meet Occupational Safety and Health Administration (OSHA) regulations to perform independent safety testing and product certification.

2.0 Installation

Review this section and the Important Product Safety Instructions before proceeding with the installation of your inverter.



WARNING: Installations should be performed by qualified personnel, such as a licensed or certified electrician. The installer determines which safety codes apply and ensures all applicable installation requirements are followed. Applicable installation codes vary depending on the specific location and application.



WARNING: Review the "Important Product Safety Information" on page ii and adhere to all cautionary markings located on the inverter and on the batteries.

2.1 Pre-Installation

Before proceeding, read the entire Installation section to determine how best to install your CSW1012 inverter. The more thorough you plan in the beginning, the better your inverter needs will be met. The simplified system diagram shown in Figure 2-1 should be reviewed to assist you in planning and designing your installation. This drawing is not intended to override or to restrict any national or local electrical codes. This drawing should not be the determining factor as to whether the installation is compliant, that is the responsibility of the electrician and the onsite inspector.

2.1.1 Installation Guidelines

- Before connecting any wires, determine the cable routes throughout the home or vehicle/boat, both to and from the inverter.
- Always check for existing electrical, plumbing, or other areas of potential damage BEFORE drilling or cutting into walls.
- Make sure all wires have a smooth bend radius and do not become kinked.
- If installing this inverter in a boat, RV or truck, ensure the conductors passing through walls, bulkheads, or other structural members are protected. This minimizes insulation damage (such as chafing) which can be caused by vibration or constant rubbing.

2.1.2 Unpacking and Inspection

Carefully remove the inverter from its shipping container and inspect all contents. Verify the following items are included:

- CSW1012 inverter
- CSW1012 Owner's Manual

If items appear to be missing or damaged, contact your authorized Magnum Energy dealer or Magnum Energy.

***** Save your proof-of-purchase as a record of your ownership; it is needed if the unit should require in-warranty service. *****

2.1.3 Tools Required

Installing the inverter is simple and requires the following:

- Adjustable wrench (10mm)
- #10 Mounting screws (x4)
- Phillips screwdriver
- Level
- Pencil
- Drill
- Drill bits

2.0 Installation

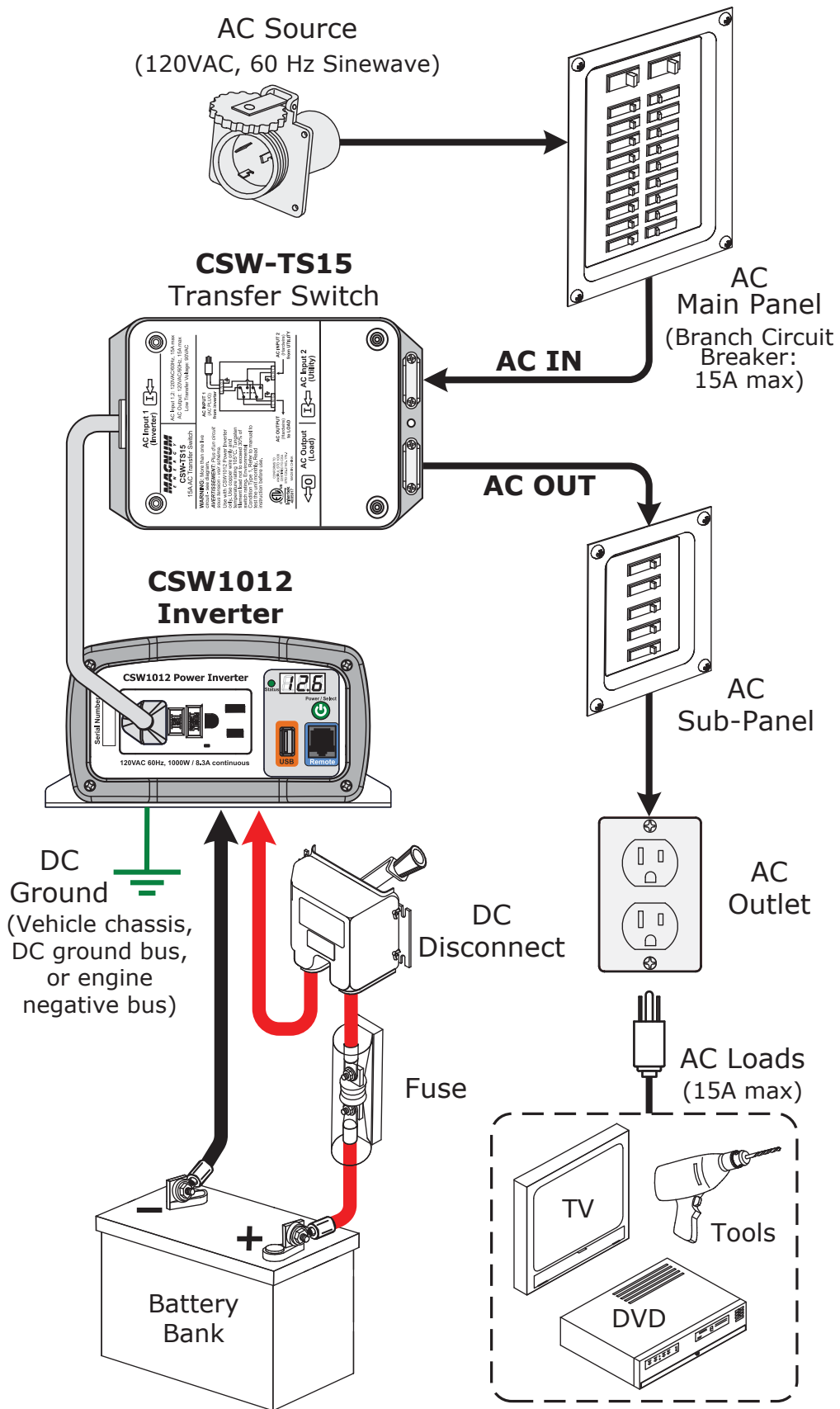


Figure 2-1, Basic System Diagram

2.2 Locating and Mounting the Inverter



WARNINGS:

- Do not mount the inverter near any flammable or combustible fluid or components.
- Provide adequate clearance/ventilation to the inverter. Do not cover or obstruct any air vent openings and/or install in a zero-clearance compartment.

2.2.1 Locating the Inverter

The inverter should only be installed in a location that meets the following requirements:

Clean and Dry – The inverter should not be installed in an area that allows dust, fumes, insects, or rodents to enter or block the inverter’s ventilation openings. This area also must be free from any risk of condensation, water, or any other liquid that can enter or fall on the inverter. Inverter failure under these conditions is not covered under warranty.

Cool – The inverter should be protected from direct exposure to the sun or to any equipment that produces extreme heat. The ambient air temperature should be between 32° F (0° C) and 104° F (40° C); realize that the inverter’s output specifications are rated at 77° F (25° C), so the cooler the better within this range.

Ventilated – In order for the inverter to provide full output power and avoid over-temperature fault conditions, do not cover or block the inverter’s ventilation openings, or install this inverter in an area with limited airflow. Allow as much clearance around the inverter’s intake cooling fan as possible. Allow a minimum airspace clearance of 3” (7.6 cm) around the unit to provide optimum ventilation.

If installed in an enclosure, a fresh air intake opening must be provided directly to the back side (cooling fan) and allow adequate space for the exhaust vents underneath the inverter. This will allow cool air from the outside to flow into the inverter, and heated air to exit away from the inverter and the enclosure. When mounted in an enclosed compartment, airflow must be at least 59 cfm in order to maintain no more than a 68° F (20° C) rise in compartment temperature.

Safe – Keep any flammable/combustible material (e.g., paper, cloth, plastic, etc.,) that may be ignited by heat, sparks, or flames at a minimum distance of 2 feet (60 cm) away from the inverter.

Do not install in any area that contains extremely flammable liquids like gasoline or propane, or in locations that require ignition-protected devices.

Close to the battery bank – As with any inverter, it should be located as close to the batteries as possible. Long DC wires tend to lose efficiency and reduce the overall performance of an inverter. However, the unit should not be installed in the same compartment as the batteries or mounted where it will be exposed to gases produced by the batteries. These gases are corrosive and will damage the inverter; also, if these gases are not ventilated and if allowed to collect, they could ignite and cause an explosion.

Accessible – Do not block access to the front or back of the inverter. Allow enough room to clearly view the digital display and to access the AC and DC wiring connections—they will need to be checked and tightened periodically. See Figure 2-3 for the CSW1012 inverter’s dimensions.

2.0 Installation

2.2.2 Mounting the Inverter

Review the information in this section before mounting the inverter.

Orientating the Inverter

When mounted indoors, the CSW1012 inverter can be mounted on/underneath a horizontal surface (shelf or table) or on a vertical surface (wall or bulkhead) with the DC terminals facing left, right, or up—do not mount with the DC terminals facing downward (see Figure 2-2). When mounted in an RV, mount flat on a horizontal surface only.

Securing the Inverter

After determining your mounting position, use the base of the inverter's chassis as a template to mark your mounting screw locations (or, refer to the dimensions in Figure 2-3). Remove the inverter and drill pilot holes into the mounting surface. Secure the inverter to the surface using the appropriate corrosion-resistant hardware (sized #10 – not supplied). If this unit is used in a mobile application, you may want to place flexible washers or bushings between the mounting surface and the inverter's mounting flanges to reduce vibration.

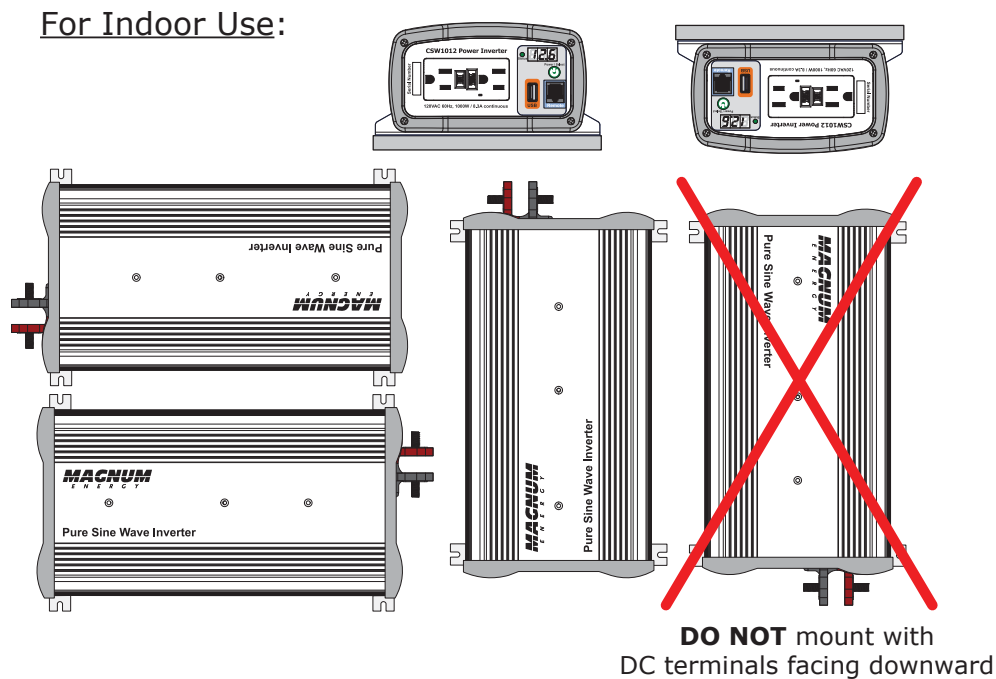


Figure 2-2, Approved Mounting Positions

2.2.3 CSW1012 Inverter Dimensions

Use the dimensions in Figure 2-3 to assist in mounting the CSW1012 inverter.

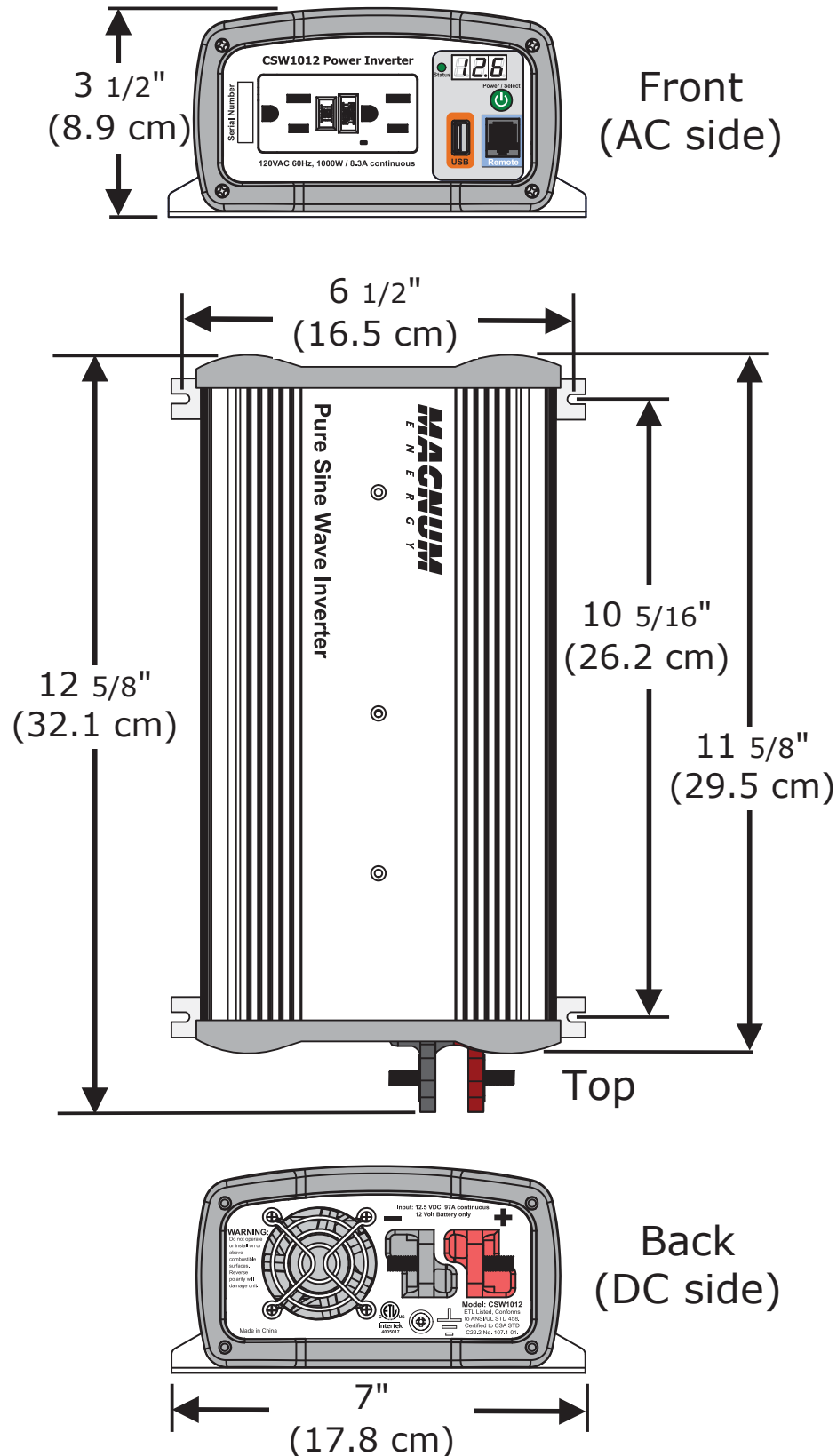


Figure 2-3, CSW1012 Dimensions

2.0 Installation

2.3 Wiring the Inverter – General Requirements

This section describes the requirements and recommendations for wiring the CSW1012 inverter. Before wiring the inverter, carefully read all instructions.



WARNING: Wiring should meet all local codes/standards and be performed by qualified personnel (i.e., licensed electrician).

2.3.1 Wiring Requirements

- All conductors that are at risk for physical damage must be protected by tape or placed in a raceway.
- Always check for existing electrical, plumbing, or other areas of potential damage prior to making cuts in structural surfaces or walls.
- Where DC wiring must cross AC or vice-versa, try to make the wires at the crossing point perpendicular (90 degrees) to one another.
- DC overcurrent protection must be provided as part of the installation.
- Use only copper wires with a minimum temperature rating of 75°C.

2.3.2 Torque Requirements

Torque all DC cable connections from 79 to 96 lbf-in (8.9 to 10.9 N-m).

2.4 DC Wiring

This section describes the inverter's required DC wire sizes, the recommended disconnect/overcurrent protection, and how to make the DC connections to the inverter and the battery bank.



WARNING: Even though DC voltage is “low voltage”, significant hazards may be present, particularly from short circuits of the battery system.



CAUTION: The inverter is NOT reverse polarity protected—which means that if the negative and positive battery voltage is connected backwards to the inverter, the inverter will likely be damaged. You should verify the correct voltage polarity using a voltmeter BEFORE connecting the DC wires.



CAUTION: Before wiring the DC cables, review the safety information at the beginning of this manual and the information below to ensure a safe and long-lived system.



CAUTION: DO NOT connect the battery cables to the inverter until all wiring is complete and the correct DC voltage and polarity have been verified.

Refer to Figure 2-4 when connecting the DC wires to the battery, and to Figure 2-5 when connecting to the inverter. Also, consider the following requirements to ensure maximum performance:

- The DC positive and negative cables connected to the inverter from the battery bank should be tied together with wire ties/straps or electrical tape approximately every 6 inches (15.3 cm). This helps improve the surge capability and reduces the effects of inductance, which improves the inverter waveform and reduces the wear of the inverter's filter capacitors. Keeping the battery cables close together also reduces the chance of radio frequency interference.

2.0 Installation

- Crimped and sealed copper ring terminal lugs with at least a 6mm (1/4") bolt hole to connect the DC wires to the inverter's DC terminals.
- The battery bank voltage MUST be between 10.5-15.5 for the inverter to operate. If the voltage exceeds 16.0V, the inverter may be damaged.
- To ensure the maximum performance from the inverter, all connections from the battery bank to the inverter should be minimized. The exceptions are the DC fuse and disconnect or the DC circuit breaker—required at the battery to protect the DC wiring—in the positive line. Any other additional connection will contribute to additional voltage drops, and these extra connection points may loosen during use.
- All wiring to the battery terminals should be checked periodically (once a month) for proper tightness. The torque requirement for the DC terminals is between 79 to 96 lbf-in (8.9 to 10.9 N-m). If you don't have a torque wrench, ensure all DC terminals are tight.
- Be aware that overtightening or misthreading the nuts on the DC terminals can cause the bolts to strip and snap/break off.
- Make sure cables have a smooth bend radius and do not become kinked. Follow existing wire runs where possible.
- A brief spark or arc may occur when connecting the battery cables to the inverter DC terminals; this is normal and due to the inverter's internal capacitors being charged.
- Before routing the wiring, color code the DC cables/wires with colored tape or heat shrink tubing: RED for positive (+); WHITE for negative (-); and GREEN (or bare copper) for DC ground, to avoid polarity problems.
- Do not attempt to use the chassis in place of the battery negative connection for grounding. The inverter requires a reliable return path directly to the battery.

2.4.1 DC Wire Sizing

It is important to use the correct sized DC wire to achieve maximum efficiency from the system and to reduce fire hazards associated with overheating. Always keep your wire runs as short as practical to prevent low voltage shutdowns and to keep the DC breaker from nuisance tripping (or open fuses) because of increased current draw. The correct minimum DC wire size (and corresponding overcurrent device) is required in order to reduce stress on the inverter, minimize voltage drops, increase system efficiency, and ensure the inverter's ability to surge heavy loads.

If the distance from the inverter to the battery bank is ≤ 5 feet, use a minimum DC wire size of #2 AWG (33.6 mm²). If the distance between the inverter and the battery is >5 feet, the DC wire will need to be increased. Longer distances cause an increase in resistance, which affects the performance of the inverter. From 5-10 feet, use a minimum wire size of #1/0 AWG (53.5 mm²) wire; from 10-15 feet, use a minimum wire size of #2/0 AWG (67.4 mm²) wire.

Table 2-1, DC Wire/Overcurrent Device for Rated Use

Inverter Model	Minimum DC Wire Size [rating]*	Maximum DC Fuse Size	DC Grounding Wire Size*
CSW1012	#2 AWG (33.6 mm ²) [170 amps]	150 amps with time delay	#2 AWG (33.6 mm ²)

* Copper wire rated with 75°C (167°F) insulation at an ambient temperature of 30°C (86°F) in free air.

2.0 Installation

2.4.2 DC Overcurrent Protection

For safety reasons and to comply with electrical code regulations, DC overcurrent protection must be provided as part of the installation. The DC overcurrent protection device must be installed in the positive DC cable line, it can be a fuse (with a disconnect switch) or a circuit breaker and must be DC-rated. It must be correctly sized according to the size of DC cables being used, which means it is required to open before the cable reaches its maximum current carrying capability, thereby preventing a fire. The NEC requires both overcurrent protection and a disconnect switch.

Because batteries can deliver thousands of amps in an instant during a short, you are required to install a DC-rated fuse (or circuit breaker) that has a interrupt current rating (known as Amps Interrupting Current or AIC) that can withstand the short-circuit current without explosion or damage. If a fuse is used as an overcurrent device, a Class-T type or equivalent is highly recommended when used with inverters. A Class-T fuse is rated for DC operation, can handle very high short-circuit currents (up to 100,000 amps), and has a time delay that allows for momentary current surges from the inverter without opening the fuse. In some installations, if the combined short-circuit current of all the batteries in the bank is determined to be 2,700 amps or less, then an ANL type of fuse may be used—if in doubt, use a Class-T fuse. See Table 2-1 for the fuse size (coordinated with the DC wire size) recommended for the CSW1012.

2.4.3 DC Grounding

The inverter should always be connected to a permanent, grounded wiring system. The idea is to connect the metallic chassis of the various enclosures together to have them at the same voltage potential, which reduces the possibility for electric shock. For the majority of installations, the inverter chassis and the negative battery conductor are connected to the system's ground bond via a safety grounding conductor (bare wire or green insulated wire) at only one point in the system. Per the NEC, the DC grounding conductor is required to be no less than the wire size of the DC positive/negative cables. Use a ring terminal or box lug to connect the DC ground wire to the DC ground screw (Figure 1-2, item 12). If the inverter is in a vehicle, DO NOT connect the battery negative (-) cable to the vehicle's frame/safety ground—only connect to the inverter's negative battery terminal. See Table 2-1 for the ground wire size (coordinated with the DC wire size) recommended for the CSW1012.

2.4.4 DC Cable Connections

Do not put anything between the battery cable ring lug and the battery post (see Figure 2-4), or the flat metal part of the inverter's DC terminal (see Figure 2-5). When connecting the battery cable, it should be placed directly against the battery post or inverter terminal. Incorrectly installed hardware causes a high resistance connection which could lead to poor inverter performance, and may melt the cable and terminal connections.

Use an insulated 10mm wrench or socket to tighten the M6-1.0 Hex nuts to 79 to 96 lbf-in (8.9 to 10.9 N-m) for each inverter input terminal.



Info: The DC terminal and Hex nuts are made of stainless steel, which have a high likelihood of galling or thread seizing while being tightened. To reduce the risk of the bolt and nut seizing—causing the bolts to strip or to snap/break off—use an anti-seize lubricant, tighten the fasteners slowly (at low rpms) without interruption, and apply only light pressure.

2.4.5 Wiring the Battery Bank



WARNING: Lethal currents will be present if the positive and negative cables attached to the battery bank touch each other. During the installation and wiring process, ensure the cable ends are insulated or covered to prevent touching/shorting the cables.



Info: DO NOT connect the DC wires from the battery bank to the inverter until 1) all DC wiring is complete, 2) the correct DC overcurrent protection has been installed, and 3) the correct DC voltage and polarity have been verified.

Depending upon the voltage of the batteries (6 or 12 VDC), the batteries must be wired in series, parallel, or series-parallel to provide the correct voltage. The interconnecting DC wires must be sized and rated exactly the same as those used between the battery bank and the inverter.

Place the batteries as close as practical to the inverter, preferably in an insulated and ventilated enclosure. Allow adequate space above the batteries to access the terminals and vent caps (as applicable). Also, allow at least 1" of space between the batteries to provide good air flow. DO NOT mount the batteries directly under the inverter.



CAUTION: Install batteries in a well ventilated area. Batteries can produce explosive gasses. For compartment or enclosure installations, always vent batteries to the outside.



Info: To ensure the best performance from your inverter system, batteries should be of the same size, type, rating, and age. Do not use old or untested batteries.

2.4.6 Appliances and Run Time

The CSW1012 inverter can power a wide range of household appliances including small motors, hair dryers, clocks, and other electrical devices. As with any appliance using batteries for power, there is a certain length of time that it can run—this is called "run time." Table 2-2 below provides estimates of power consumption and run time for various appliances using a 12V-120AH battery bank.

Table 2-2, Appliance Power Consumption and Run Time

Load	Consumption	Estimated Run Time
Cordless Phone	5W	180 hrs
Clock/Radio	8W	135 hrs
Table Lamp	40W/60W	27 hrs/18 hrs
Freezer (8.8 cu ft)	80W	15 hrs
20" LCD TV	100W	11.5 hrs
Refrigerator (18 cu ft)	120W	9 hrs
Sump Pump (1/2 hp)	350W	3 hrs
Microwave (mid-size)	1000W	49 min
Coffee Maker	1200W	37 min

2.0 Installation

2.4.7 Wiring the Inverter to the Battery Bank



CAUTION: The inverter is NOT reverse polarity protected—if this happens the inverter will be damaged and will not be covered under warranty. Before connecting the DC wires from the batteries to the inverter, verify the correct battery voltage and polarity using a voltmeter. If the positive terminal of the battery is connected to the negative terminal of the inverter and vice versa, severe damage will result. If necessary, color code the cables (with colored tape): red for positive (+), and white for negative (-) to avoid polarity confusion.



Info: The DC overcurrent device (i.e., circuit breaker or fuse) must be placed in the positive (red) DC cable line between the inverter's positive DC terminal and the battery's positive terminal (red)—as close to the battery as possible. For maximum protection, install it within 18 inches (45 cm) of the battery.

Follow the steps below to wire the inverter to the battery bank:

1. Route an appropriately sized DC negative wire (marked white) from the negative terminal of the battery bank to the inverter's negative terminal (Item 9, Figure 1-2).
2. Mount the fuse/disconnect assembly (or circuit breaker) as near as practical to the batteries and leave open (i.e., no power to inverter).



WARNING: DO NOT close the DC circuit breaker or connect the fuse to connect battery power to the inverter at this time. This will occur after the installation is complete.



CAUTION: If connecting live battery cables to the inverter DC terminals, a brief spark or arc may occur; this is normal and due to the inverter's internal capacitors being charged.

3. Route and connect an appropriately sized DC positive wire (marked red) from the inverter's positive DC terminal (Item 10, Figure 1-2) to one end of the fuse/disconnect assembly (or circuit breaker).
4. Connect a short wire (same rating as the DC wires) to the other side of the DC circuit breaker (or one end of the fuse/disconnect assembly) and the other end of the short wire to the positive terminal of the battery bank (see Figure 2-1 for reference). This is essential to ensure even discharging across the entire battery bank.
5. Ensure the DC wire connections (on the batteries, inverter, and DC circuit breaker/fuse lugs) are flush on the surface of the DC terminals, and the hardware (washer(s) and nut) used to hold these connections are stacked correctly (see Figures 2-4 and 2-5). Verify all DC connections on the inverter are torqued from 79 to 96 lbf-in (8.9 to 10.9 N-m).
6. Once the DC connections are completely wired and tested, coat the terminals with an approved anti-oxidizing spray.
7. If the batteries are in an enclosure, perform a final check of the connections to the battery terminals, then close and secure the battery enclosure.
8. Route an appropriately sized DC grounding wire (see Table 2-1 for ground wire size) from the inverter's DC chassis ground screw (Item 12, Figure 1-2) to a dedicated system ground. It is recommended that you connect the cable to the chassis ground screw with a copper, tin-plated

2.0 Installation

ring terminal that accommodates a #8 screw, and is UL/CSA approved. Recommended tightening torque is 20 lbf-in (2.3 N-m).



CAUTION: Ensure the total cable distance from the inverter to the battery is within the requirement of Section 2.4.1 (DC Wire Sizing).

9. Once the entire installation is complete, and all connections are verified, close the fuse disconnect (or circuit breaker) to provide power to the inverter.

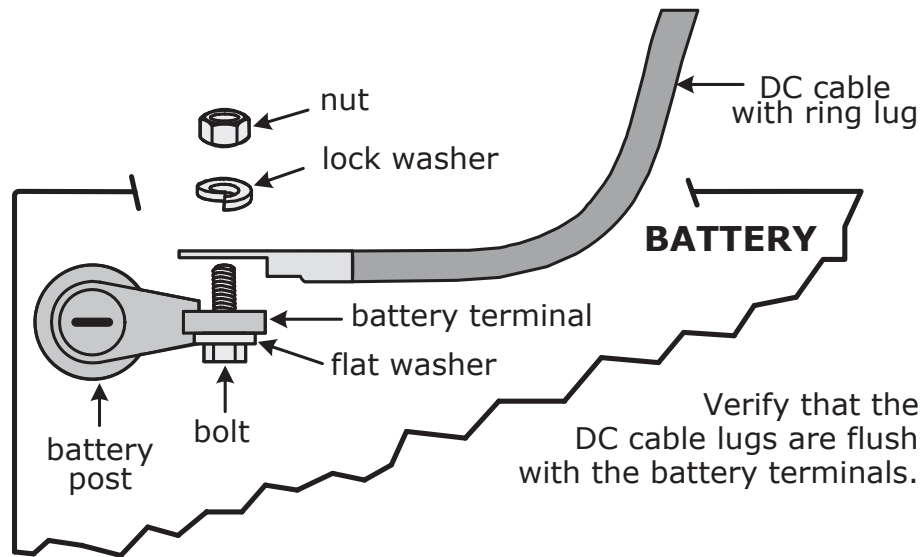


Figure 2-4, DC Cable to Battery Terminals

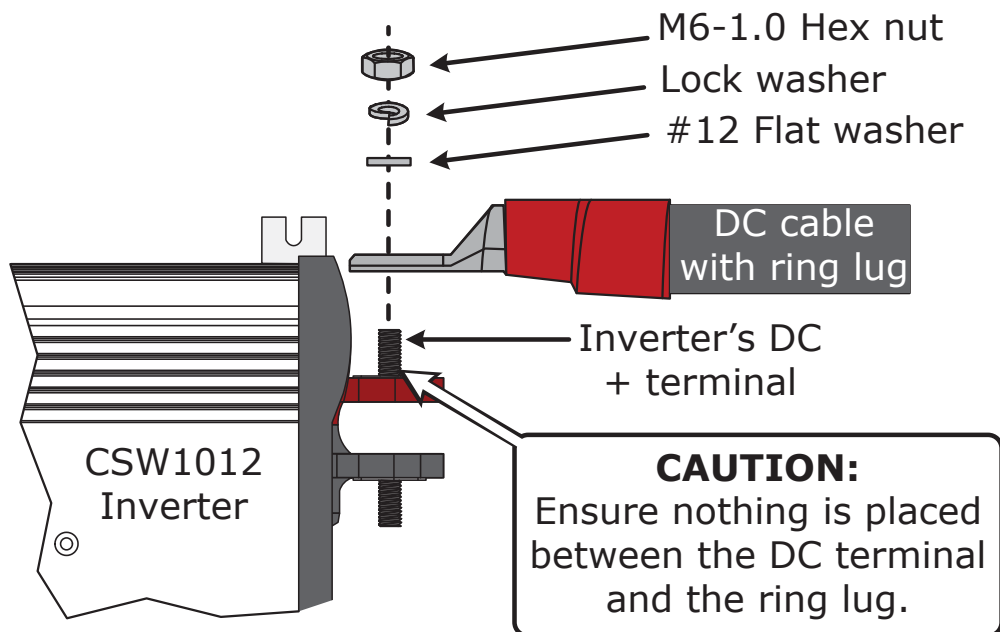


Figure 2-5, DC Cable to Inverter's DC Terminals

2.0 Installation

2.5 Testing the Inverter

Before proceeding, you must first test whether the inverter was successfully installed. Use the functional test below to test the inverter, and then perform the GFCI test that follows to ensure the protection device is functioning properly.

2.5.1 Inverter Functional Test

After all electrical connections to the inverter, batteries, and loads have been completed, follow these steps to test the installation and the inverter's operation.

1. Press and hold the Power/Select button until a beep sound is heard (about 1 second). The Status light turns on.
2. Check that the digital display alternately shows the inverter's measured battery voltage and output power.
3. Plug a small AC load (e.g., 40W light bulb or small appliance) into the GFCI's outlet.
4. Check that the AC load is on (i.e., the bulb lights).

Note: *If the bulb does not light, the GFCI may have tripped. Reset the GFCI by pressing the RESET button.*

If the inverter passes all steps, it is functioning properly and ready for use. If the inverter fails any of the steps, refer to the troubleshooting information in Section 4.0.

2.5.2 GFCI Test

Use the steps below to periodically test the GFCI to ensure it is functioning properly.

1. Press the Power/Select button to turn on the inverter.
2. Plug a small AC load (e.g., 40W light bulb) into the GFCI's outlet.
3. Check that the AC load is on (i.e., the bulb lights).
4. Press the GFCI's TEST button. The GFCI's RESET button should pop out, and the power should shut off (light bulb goes out).

Note: *If the bulb remains lit or the RESET button does not pop out, the GFCI may not be functioning properly.*

5. Press the RESET button. The AC load should come back on (bulb lights again).

3.0 Operation

The CSW1012 inverter uses a front panel that contains a power/select button, a status indicator, a digital display for viewing system status, a remote port, a USB port, and a GFCI AC output receptacle.

Power/Select Button

The Power/Select button is used to turn the inverter on and off. To turn the unit on, press and hold the button for 1 second until you hear a “beep”. The digital display alternately shows the unit’s measured battery voltage and AC output power, and the status indicator lights green. Press the power/select button to turn the unit off.



WARNING: The power/select button is not a power disconnect switch and will not remove the DC power from the inverter. Disconnect all power to the inverter before working on the inverter.

Status Indicator

The Status indicator on the front panel may light green, amber, or red to indicate the inverter’s status. When the status indicator lights:

- **Green** – the inverter is operating normally.
- **Amber** – a warning has been detected. The inverter will shut down at any time. Check the error code on the digital display.
- **Red** – an error has been detected and the unit has shut down. Check the error code on the digital display.

When the status indicator lights amber or red, use the digital display and the troubleshooting tables in Section 4.0 to resolve the issue.

Digital Display

The digital display has one line of three alphanumeric characters that alternately shows the inverter’s measured battery voltage (in volts) and AC output power (in kilowatts) under normal operating conditions. It also displays error/warning codes that alert you to problems with the unit, and are used in conjunction with the troubleshooting tables in Section 4.0 to resolve any issues with the inverter’s operation. See Table 3-1 below.

Table 3-1, Examples of Digital Display Readings

Display	Meaning
12.5	Measured battery voltage.
0.80	Total AC output power in kW (800W as shown).
E01	Error or warning code. See Troubleshooting section for details.

Remote Port

The Remote Port is used to connect an optional ON/OFF remote switch (sold separately) that works in parallel with the power/select button.

USB Port

The USB Port enables you to power and charge a USB-enabled device (provides 5 VDC/750 mA).



CAUTION: Some USB-powered products may be damaged when connected to this USB port. If in doubt, check with the product’s manufacturer.

GFCI Outlet

The two GFCI-protected AC outlets are used to plug in and power an AC load. Protects the user against hazardous electrical shocks.

3.0 Operation

3.1 Understanding Loads

The inverter can power most loads within its power rating, however, there are special conditions that can cause a load to behave differently than expected. Following are some common problems encountered when using this inverter.

USB loads – When using the USB connector, be sure that the device you will be connecting will accept 5 volts ($\leq 750\text{mA}$) and can be charged or powered using another power source. The USB port can safely power and charge a lot of devices such as: MP3 players, mobile phones, and portable video game players. However, some devices such as GPS receivers and some cameras may not work and may even be damaged. Refer to the owner's guide for each device to determine its compatibility.

Motor loads not starting – Some appliances, particularly those with induction motors, require a much higher start-up surge than they do when running. Pumps, freezers and refrigerators (compressors) are the most common. The CSW1012 may not be able to start some of these appliances even though their rated current draw is within the inverter's limits. If a motor-operated appliance refuses to start, observe the VOLTS indicator on the digital display while you are trying to start the appliance. If the display shows a battery drop below 11 volts while the inverter is trying to start the motor, this may explain why the appliance won't run. Make sure the length and diameter of the battery cables are appropriate. Check that the battery connections are good and that the battery is fully charged. If the cables are sized correctly, the connections are good, and the battery is charged, you may need a larger battery bank (see Loads turning on and off).

Loads turning off and on – If a load starts but quickly turns off, then the battery may not be able to deliver the necessary amperage to drive the load. If the battery bank cannot deliver the necessary amperage to drive a heavy load, the inverter will shut OFF due to low voltage ($<10.5\text{ VDC}$). The battery voltage can then slowly rise back above the low voltage reconnect voltage (11.8 VDC) causing the inverter to resume operation. As soon as the heavy load draws the batteries down, this cycle will continue unless the load is reduced or more batteries are added.

Loads too large – Although the CSW1012 inverter can provide high surge power up to two times the rated output power, some appliances may still trigger the inverter shutdown/protection system. In these instances, a higher power inverter may be required.

Running several loads at once – Sometimes the total surge requirement of all the loads is higher than the CSW1012 inverter can deliver. You may want to turn them on individually to ensure that the inverter does not have to deliver the starting current for all the loads at once.

3.2 System Maintenance

Battery Charging

When possible, recharge your batteries when they are about 50% discharged or earlier. This gives them a much longer life cycle than recharging when they are almost completely discharged.

Inverter Maintenance

Routine maintenance is required to keep the CSW1012 inverter operating properly. Periodically you should:

- Clean the exterior of the unit with a damp cloth to prevent the accumulation of dust and dirt.
- Tighten the screws on the DC input terminals.

4.0 Troubleshooting

Use Table 4-1 below to determine what condition triggered the error/warning code on the unit's digital display, and what corrective action is needed.

Table 4-1, CSW1012 Inverter Error Codes

Code	Condition	Corrective Action
E01	Unit has sensed the input is voltage is low (<10.5 VDC) and unit will shut down in 30 seconds.	Immediately recharge the battery (to at least 11.8 VDC), and then restart unit.
E02	Unit has sensed the input voltage is high and has shut down.	Check the battery voltage, or if an external charger is connected to the battery bank.
E03	Unit output has sensed an overload or short circuit and was shut down.	Check the load connected to the output. Reduce the load and restart the unit.
E04	Unit has sensed the internal temperature was high and has shut down.	Turn the unit off, and then wait 15 minutes before restarting. Check if any object has blocked the unit's air flow.
E05	Unit has sensed the input voltage is low and has initiated a warning alarm (@11.2 VDC).	Recharge the battery (to at least 11.8 VDC) as the unit will shut down shortly.
E06	Unit has sensed that the connected load is close to the overload shutdown limit.	Reduce the connected load.
E07	Unit has sensed the internal temperature is high, and is close to the thermal shutdown limit.	Reduce the load and check if any of the unit's ventilation is blocked.

Use Table 4-2 below to troubleshoot any of the listed problems/symptoms.

Table 4-2, Troubleshooting Guide

Problem	Symptom	Solution
No output voltage. Status indicator is off.	The unit is off.	Turn on the unit per instructions in the Operation section.
	No power to inverter.	Check if fuse or disconnect switch (if installed) is either blown or turned off.
No AC output. Status indicator is green.	GFCI was tripped.	Check the connected load and reset the GFCI.
No output. Status indicator is amber.	Check error code on the digital display.	Verify the error condition and make the necessary correction.

5.0 Specifications

5.0 Specifications

Table 5-1, CSW1012 Specifications

Electrical Specifications – AC Output	
Continuous power*	1,000 Watts
Surge power (peak)**	2,000 Watts
(10 sec)**	1,000 - 1,500 Watts
(1 sec)**	1,500 - 2,000 Watts
(0.2 sec)**	>2,000 Watts
AC output voltage (@12.5VDC)	120 VAC RMS \pm 5%
AC output current	8.3 AAC
AC output voltage range	104-127 VAC
AC output frequency	60 Hz \pm 0.5 Hz
AC output waveform)	Pure sine wave
Total Harmonic Distortion (THD)	<3%
Electrical Specifications – DC Output	
USB	5V, 750 mA
Electrical Specifications – DC Input	
DC input voltage (nominal)	12.5 VDC
Operation voltage range	10.5 - 15.5 VDC***
Input current	94 DCA
No load draw	<1.2 ADC
Optimum efficiency	>90%
High voltage shutdown	15.5 VDC
Low voltage alarm	Audible, 11.2 VDC
Low voltage shutdown	10.5 VDC (recover at 11.8 VDC)
Display Specifications	
Bi-color status indicator	Green, Amber, Red
Digital display	Input voltage/current, output power
General Specifications	
AC receptacles	Dual GFCI with LED indicator
Operating temperature	32° F to 104° F (0° C to 40° C)
Storage temperature	-4° F to 140° F (-20° C to 60° C)
Relative humidity	5 - 90% non-condensing
Operating altitude	Up to 9,843' (3000m) above sea level
Inverter size (L x W x H)	12 ⁵ / ₈ "x7"x3 ¹ / ₂ " (32.1x17.8x8.9 cm)
Shipping size (L x W x H)	15 ¹ / ₂ "x8 ³ / ₄ "x5 ⁵ / ₈ " (39.2x22.3x14.3 cm)
Inverter weight	6.6 lb (3.0 kg)
Shipping weight	7.5 lb (3.4 kg)
Warranty	One Year
Regulatory Approval	
Conforms to UL458, Certified to CSA C22.2 No. 107.1, meets FCC Class B	

* Specifications met when DC voltage at nominal (12.5v) and temp at 25°C.

** Surge ratings are based on resistive load (output voltage may drop).

*** Damage can occur if input voltage exceeds 16 VDC.

6.0 Limited Warranty

Magnum Energy, Inc., warrants the CSW1012 inverter to be free from defects in material and workmanship that result in product failure during normal usage, according to the following terms and conditions:

1. The limited warranty for this product extends for a maximum of 12 months from the product's original date of purchase.
2. The limited warranty extends to the original purchaser of the product and is not assignable or transferable to any subsequent purchaser.
3. During the limited warranty period, Magnum will repair or replace at our option any defective parts, or any parts that will not properly operate for their intended use, with factory new or remanufactured replacement items if such repair or replacement is needed because of product malfunction or failure during normal usage. The limited warranty does not cover defects in appearance, or cosmetic, decorative, structural or non-operative parts. Magnum's limit of liability under this warranty shall be the actual cash value of the product at the time the original purchaser returns the product for repair, determined by the price paid by the original purchaser. Magnum shall not be liable for any other losses or damages.
4. Upon request from Magnum, the original purchaser must prove the product's original date of purchase by a dated bill of sale, itemized receipt.
5. The original purchaser shall return the product prepaid to Magnum. After the completion of service under this limited warranty, Magnum will return the product prepaid to the original purchaser via a Magnum selected non-expedited surface freight within the contiguous United States and Canada; this excludes Alaska and Hawaii.
6. If Magnum repairs or replaces a product, its warranty continues for the remaining portion of the original warranty period or 90 days from the date of the return shipment to the original purchaser, whichever is greater. All replaced products and parts removed from repaired products become the property of Magnum.
7. This limited warranty is voided if:
 - the product has been modified without authorization.
 - the serial number has been altered or removed.
 - the product has been damaged from abuse, neglect, accident, high voltage or corrosion.
 - the product was not installed/operated according to instructions.

6.1 How to Receive Warranty Service

If your product requires warranty service, contact Magnum at:

- Telephone: 425-353-8833, or
- Email: warranty@magnumenergy.com

If returning your product directly to Magnum, you must:

1. Return the unit in the original, or equivalent, shipping container.
2. Receive a Return Materials Authorization (RMA) number from Magnum prior to the return of the product for service.
3. Place RMA numbers clearly on the shipping container or the packing slip.

When sending your product for service, please ensure it is properly packaged.

Damage due to inadequate packaging is not covered under warranty.

We recommend sending the product by traceable and insured service.

**BEFORE RETURNING ANY UNIT, A RETURN MATERIAL
AUTHORIZATION (RMA) NUMBER IS REQUIRED**



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