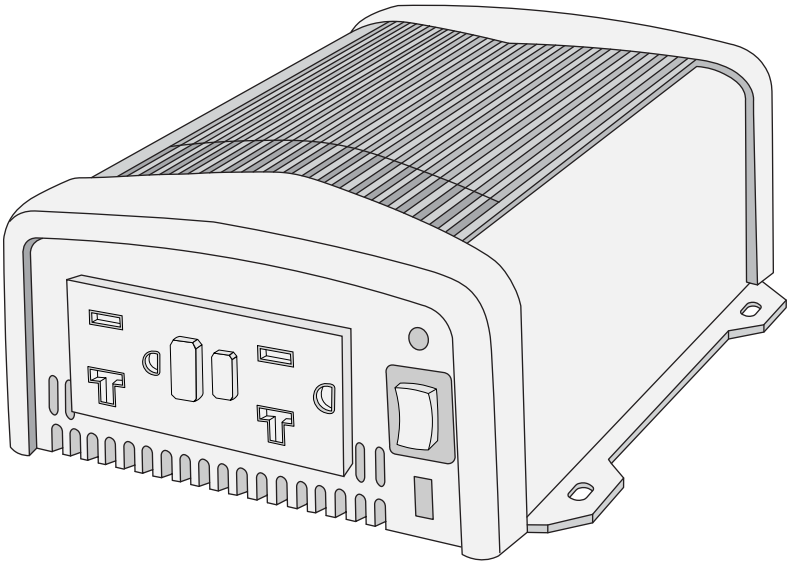
THE POWER OF

REDARC®

RS Series 12V Inverters



R-12-400RS-NA

RS SERIES INVERTERS (400 W)

REDARC Pure Sine Wave Inverters produce a pure sine wave output. This means that the power output from a REDARC Pure Sine Wave Inverter is not only the same as the mains supply, it's often better. The R-12-400RS-NA inverter is compliant for residential and industrial applications.

WARNINGS AND SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS — THIS MANUAL CONTAINS IMPORTANT SAFETY INSTRUCTIONS FOR THE REDARC RS SERIES PURE SINE WAVE INVERTERS.

DO NOT operate the Inverter unless you have read and understood this manual and the inverter is installed as per these installation instructions. REDARC recommends that the Inverter be installed by a suitably qualified person.

⚠ WARNING

RISK OF ELECTRICAL SHOCK. DO NOT DISASSEMBLE THE INVERTER — THE INTERNAL CIRCUITRY CONTAINS HAZARDOUS VOLTAGES. ATTEMPTING TO SERVICE THE UNIT YOURSELF MAY RESULT IN ELECTRIC SHOCK OR FIRE AND WILL VOID THE UNIT WARRANTY.

RISK OF ELECTRICAL SHOCK. DO NOT EXPOSE THE INVERTER TO RAIN, SNOW, SPRAY, BILGE OR DUST. DOING SO MAY RESULT IN DAMAGE TO THE INVERTER OR OTHER APPLIANCES INSTALLED IN THE SYSTEM OR RESULT IN ELECTRIC SHOCK OR FIRE.

RISK OF ELECTRICAL SHOCK. OPERATION OF THE INVERTER WITHOUT A PROPER AND RELIABLE GROUND CONNECTION MAY RESULT IN AN ELECTRICAL SAFETY HAZARD. ENSURE PROPER GROUND CONNECTION IS MADE DURING INSTALLATION AND IS MAINTAINED. FOR FIXED AND/OR TRANSPORTABLE (VEHICLE) INSTALLATIONS, INSTALL ACCORDING TO THE APPROPRIATE STANDARDS IN USERS REGION. IF GROUNDING PATH BREAKS AT ANY POINT, USER IS AT RISK OF SHOCK OR ELECTROCUTION.

RISK OF ELECTRICAL SHOCK. ALL ELECTRICAL WORK MUST BE PERFORMED IN ACCORDANCE WITH LOCAL AND NATIONAL CODES, STANDARDS AND WIRING RULES. INSTALLATION MUST BE PERFORMED BY QUALIFIED PERSONAL WHO MEET ALL LOCAL AND GOVERNMENTAL CODE REQUIREMENTS FOR LICENSING AND TRAINING FOR THE INSTALLATION, MAINTENANCE AND CONNECTION OF ELECTRICAL POWER SYSTEMS. SAFETY REGULATIONS RELEVANT TO THE INSTALLATION AND USE LOCATION SHALL BE FOLLOWED DURING INSTALLATION, OPERATION AND MAINTENANCE OF THE INVERTER, IMPROPER OPERATION MAY HAVE A RISK OF ELECTRIC SHOCK, FIRE OR DAMAGE TO EQUIPMENT AND PROPERTY.

FIRE HAZARD. ENSURE GROUND, AC AND DC CABLE SIZES CONFORM TO LOCAL AND NATIONAL STANDARDS AND WIRING CODES.

RISK OF ELECTRICAL SHOCK AND FIRE. BEFORE PROCEEDING, CAREFULLY CHECK THAT THE INVERTER IS NOT CONNECTED TO ANY BATTERIES AND THAT ALL WIRING IS DISCONNECTED FROM ANY ELECTRICAL SOURCES.

RISK OF ELECTRIC SHOCK WHEN REMOVING THE COVER FOR SERVICING, INTERNAL HEAT-SINKS ARE NOT BONDED TO GROUND, TEST BEFORE TOUCHING

DO NOT CONNECT THE OUTPUT TERMINALS OF THE INVERTER TO AN INCOMING AC SOURCE.

⚠ CAUTION

1. This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they are supervised or have been instructed on how to use the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.
2. Do not operate the inverter with damaged or substandard wiring. Selecting the wrong cable or fuse size could result in harm to the installer or user and/or damage to the inverter or other appliances installed in the system. The installer is responsible for ensuring that the correct cable and fuse sizes are used when installing this inverter. Refer to Section 2.2.4 (page 10) for more information.

3. Ensure that all the DC connections are tight — torque between 9 to 10 ft lb (11.7 to 13 Nm). Loose connections could result in overheating and can be a potential hazard.
4. Some components in the inverter can cause arcs and sparks. Do not put batteries, flammable materials, or anything that should be ignition-protected around the inverter. Doing so may result in fire or explosion. Be extra cautious so as to reduce the risk of dropping a metal tool onto a vehicle battery. Doing so might cause the battery to spark or might short-circuit the battery or other electrical parts that may cause an explosion.
5. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a battery. A battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.
6. If battery acid contacts your skin or clothing, remove the affected clothing and wash the affected area of your skin immediately with soap and water. If battery acid enters your eye, immediately flood the eye with running cold water for at least 10 minutes and seek medical assistance immediately.
7. NEVER smoke or allow a spark or flame in the vicinity of a battery. This may cause the battery to explode.
8. Batteries are capable of providing very large currents in the case of a short circuit. A fuse must be installed on the positive supply cable as close as practical to the battery. Failure to do so provides inadequate protection against fire in the case of a short circuit. Only use high quality copper cable and keep the cable length short, refer to Section 2.2.4 (page 10) for more information.

NOTICE

- Upon receipt, examine the box for damage. If you have found any damage on the box please notify the company you purchased this unit from.
- Install the inverter in a well-ventilated area with reasonable clearance. Do not install the inverter in a zero-clearance compartment or obstruct the ventilation openings. Doing so may result in the inverter overheating and ultimately damage the inverter.
- Reverse Polarity connection will blow the internal fuse and may damage the inverter permanently and will void warranty.
- Do not operate appliances that may feed power back into the inverter. Damage to the inverter may occur as a result.
- Ensure that the frequency output of the inverter matches the frequency requirements of all appliances and equipment to be used with the inverter. Attempting to use appliances that requires an AC frequency different to the inverter output may result in damage to your appliances. Output AC frequency is dip switch selectable, see section 2.1.2 (page 7).
- All RS Series Inverters are suitable for indoor use only.

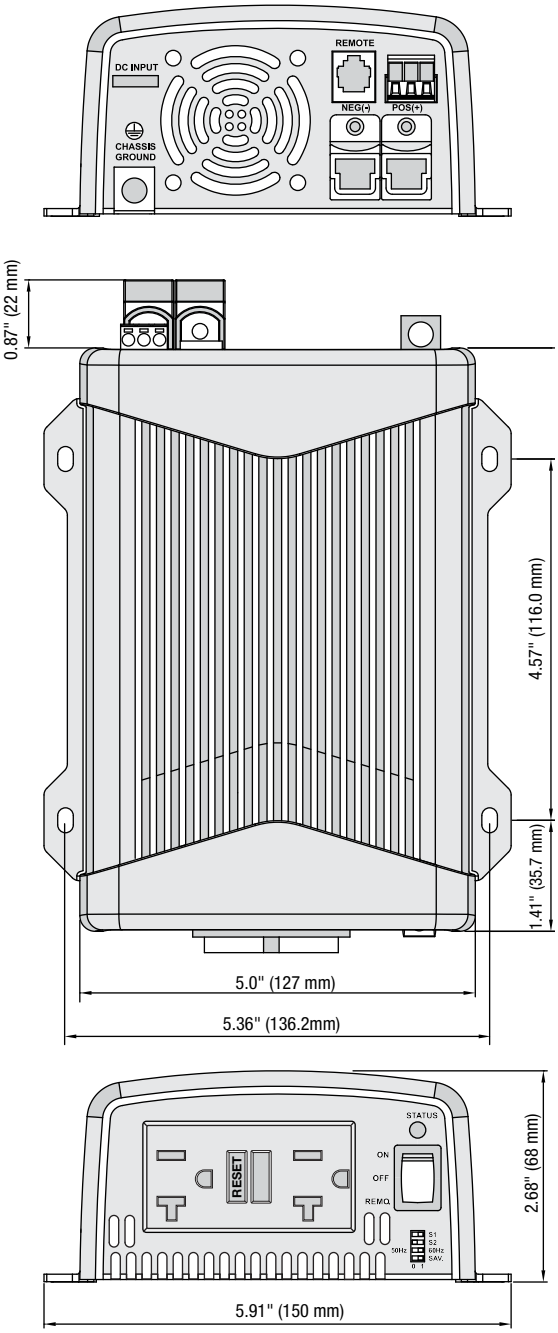
CONTENTS

1.1 Specifications

Input Characteristics	**Model**	R-12-400RS-NA
	Max. Rated Input Current	45 A
	Voltage	12 VDC
	Over-Voltage Protection	16.0 ± 0.3 VDC
	Under-Voltage Protection	10.5 ± 0.3 VDC
	Voltage Range	10.5 ~ 16.0 VDC
	No Load Current	≤ 1 A @ 12 VDC
	Power Saving Mode	< 0.2 A @ 12 VDC
Output Characteristics	**Continuous Output Power**	400 W (VA) (± 3%)
	Maximum output Power (1 min)	> 400 ~ 460 W (VA) (100% ~ 115%)
	Surge Power (1 sec)	< 800 W (VA)
	Frequency	50 / 60 Hz ± 0.5% (Dip Switch Selectable)
	Output Voltage	100 / 110 / 115 / 120 VAC (± 5%) (Dip Switch Selectable)
	Efficiency Max	88%
	Short-Circuit Protection	1 Sec Shutdown
	Output Waveform(1)	Pure Sine Wave (THD < 5% @ Normal Load)
Signal and Control	**Remote Controller Panel Input**	REMOTE-RS (optional)
Protection	**BAT. Low Shutdown**	10.5 ± 0.3 VDC
	BAT. Low Alarm	10.5 ± 0.3 VDC
	BAT. Low Restart	12.5 ± 0.3 VDC
	BAT. High Shutdown	16.0 ± 0.3 VDC
	BAT. High Alarm	16.0 ± 0.3 VDC
	BAT. High Restart	14.5 ± 0.3 VDC
	Input Protection(2)	Reverse Polarity (Internal Fuse)
	Others	Over / Under Temperature Protection (by heat sink) Temperature 176°F (80°C) / –4°F (–20°C)
Environment	**Operating Temp.**	–4 ~ 104°F — Derates to 140°F (–20 ~ 40°C — Derates to 60°C)
	Storage Temp.	–22 ~ 158°F (–30 ~ 70°C)
	Storage Temp. & Humidity	10 ~ 95% RH, non-condensing
Safety and EMC	**Safety Standards**	UL 458, C22.2 No. 107.1
	EMC Standards(3)	FCC Class B, CAN ICES-003(B)/NMB-003(B)
Weight		2.8 lb (1.3 kg)
Cooling		Temperature & Load Controlled cooling Fan
Dimension (W × H × D)		5.91 × 2.68 × 7.36" (150 × 68 × 187 mm)

(1) Normal load condition: Vin = 12.5 V / 25 V / 50 V, Vo = 100 / 110 / 115 / 120 VAC 80% load (PF = 1.0)
(2) Reverse polarity connection can blow the internal fuse and may damage the inverter permanently.
(3) Refer to page 16 for compliance information.

1.2 Dimensions



1.3 Voltage and Temperature Performance

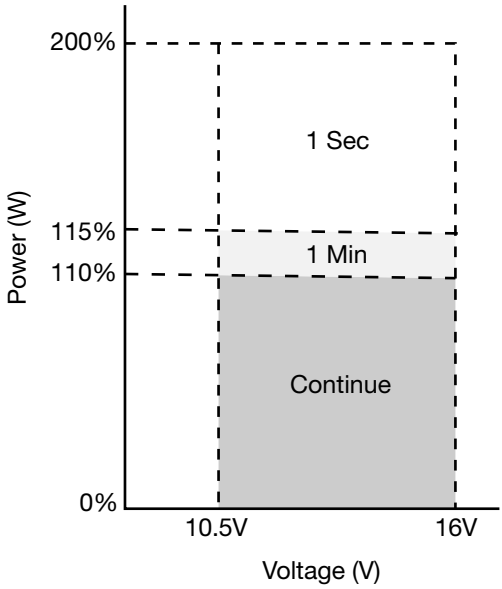


FIGURE 1.3.1: 400RS-NA Voltage Performance

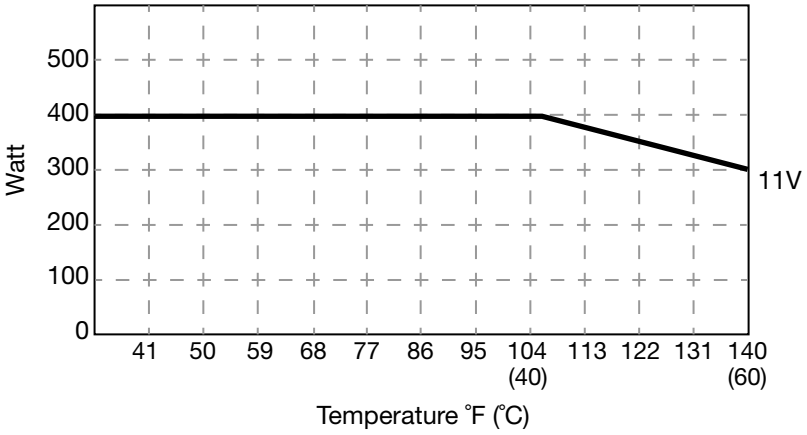
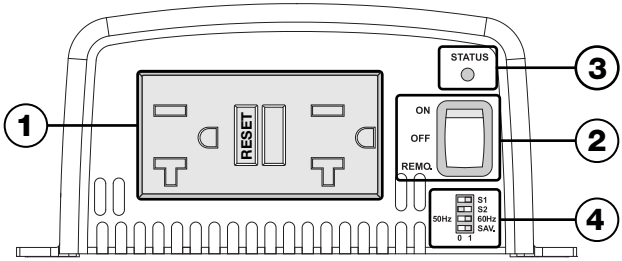


FIGURE 1.3.2: 400RS-NA Temperature Performance

2.1 Front Panel Operation

The R-12-400RS-NA is member of the most advanced line of mobile AC power systems available. To get the most out of the power inverter, it must be installed and used properly. Please read the instructions in this manual before installation and operating.



1	AC Output
2	ON / OFF / Remote Main Switch
3	Indicator LED
4	Function Switch

2.1.1 Main Switch (2)

The 3 stage switch is for turning the AC mains output to either ON, OFF or selecting the Remote mode. When setting the power switch to the first ON position or the second ON position (only to be used when operating the inverter through the REMOTE-RS inverter remote) the LEDs will glow GREEN.
After setting the power switch to the OFF position the inverter will stop and the LEDs will turn off.

2.1.2 Function Switch (3)

Power saving, Output frequency and Output voltage settings can be controlled using the dips switches found on the AC output end of the inverter.

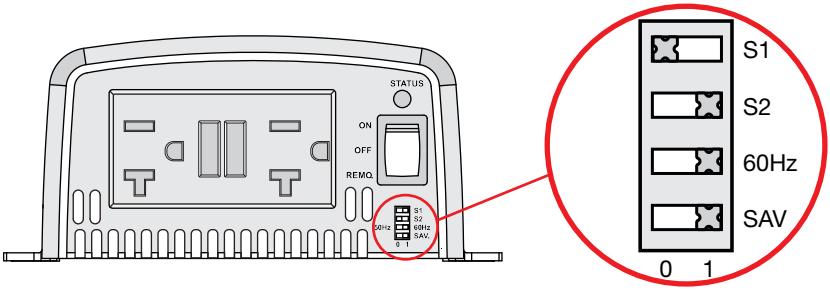


FIGURE 2.1.1: Dip switches default positions

Output Voltage:

Output Voltage (V)	Switch 1	Switch 2
100	0	0
110	0	1
115	1	0
120	1	1

Output Frequency:

Frequency (Hz)	Switch 3
50	0
60	1

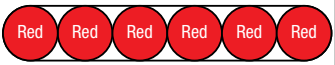
Power Saving:

Power Saving Mode	Switch 4
On	1
Off	0

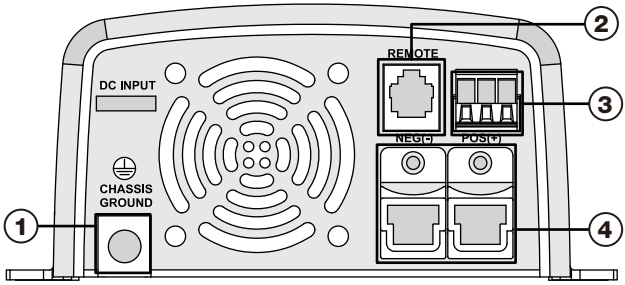
Power Saving Mode Behaviour:

Model	Sleep Power	Wake Up Power
R-12-400RS-NA	<20 W (VA)	>30 W (VA)

2.1.3 Indicator LED (4)

Status	LED Signal	Remedies
Power On / Normal		
Over Current / Over Load > 460 W (VA) (115%) (1 short beep)		**Reduce Load** If output does not recover once load has been reduced to within specification, try turning the inverter's power switch off and on again.
Over Voltage (Input DC voltage over spec.)		**Check input voltage** Reduce input voltage to meet inverter's specification.
Under Voltage (Input DC voltage under spec.) (1 long beep & 2 short beeps)		**Check input voltage and recharge battery.** Check all input connections and cables. Once input conditions are within specification, try turning power switch off and on again.
Over Load 400 ~ 460 W (VA) (100 ~ 115%) (2 long beeps)		**Reduce load** If output does not recover once load has been reduced to within specification, try turning off and on again using the power switch.
Over Temp. / Under Temp. (Heat sink temp. over 176°F (80°C) or under –4°F (–20°C))		**Improve ventilation** Make sure inverter's ventilation opening are not obstructed. Reduce ambient temperature.

2.2 Rear panel operation



1	Chassis Ground
2	Remote Port (RJ-11)
3	Remote Control Green Terminal
4	DC Input Connection

2.2.1 Chassis Ground (1)

Use 16 AWG (1.5 mm²) or a thicker cable to connect the vehicle earth or chassis ground. Perform this connection prior to any other connection.

2.2.2 Remote Port (RJ-11) (2)

The R-12-400RS-NA inverter can be used with the REMOTE-RS remote controls. To enable use, the main switch on the inverter must be set to the “REMOTE” position.

Pin Number	Signal Description (1)	
1	Reserved	--
2	GND	Same Polarity as Battery Negative
3	--	--
4	--	--
5	RMT	Remote controller panel (positive)
6	--	--

2.2.3 Remote Control Green Terminal (3)

Pin Number	Terminal Description
1	GND
2	Enable- (ENB)
3	Enable+ (ENB)

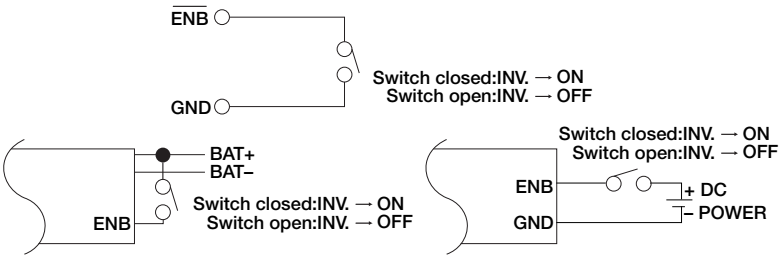


FIGURE 2.2.1: Wiring configurations for Remote Control Green Terminal

NOTICE

- Before Installing - Make sure that the inverter main switch is at "OFF" position (see section 2.1.1).
- Before using the remote function, make sure the main switch is set to "REMOTE"
- Use 20 – 24 AWG cable to connect the remote control terminals

2.2.4 DC Input Connection (4)

Prior to installation:

- DC Supply cables should be as short as possible (no longer than the values in table 2.2.4.1)
- The size of the cable should be thick enough to maintain a voltage drop of less than 2% when carrying the maximum input current. This will help prevent frequent low-input voltage warnings and shutdown.
- The following sizes of cables and fuses are recommended for connection of the supply batteries to inverter, see table 2.2.4.1 below for suitable cable sizing for your installation.

⚠ CAUTION

BATTERIES ARE CAPABLE OF SUPPLYING VERY LARGE CURRENTS. FUSES MUST BE PLACED AS CLOSE TO THE BATTERIES POSITIVE TERMINAL AS POSSIBLE TO PROTECT THE CABLE FROM POTENTIAL FAULTS.

TABLE 2.2.4.1: Recommended Cable & Fuse Sizing

Cable Length ft (m)	12 V Models	
	Cable Size AWG (mm²)	Inline Fuse Rating Midi
0 – 6.6 (0 – 2)	6 (13)	50 A
6.6 – 9.8 (2 – 3)	4 (21)	50 A
9.8 – 13.1 (3 – 4)	3 (27)	50 A

Fuse ratings are suitable to these recommended cable sizes.

3.1 Mounting

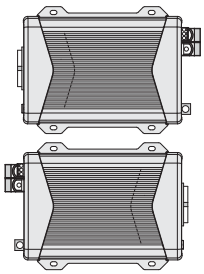
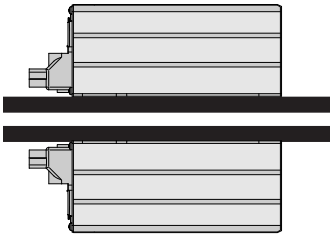
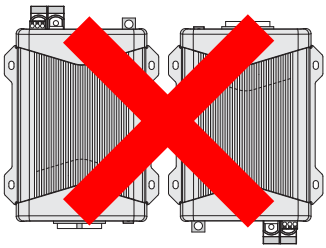
The power inverter should be used in an environment that meets the following requirements:

1. Dry — Do not allow water to drip on or enter into the inverter.
2. Cool — Ambient air temperature should be between 32°F (0°C) and 104°F (40°C), the cooler the better.
3. Safe — Do not install the inverter in a battery compartment or other areas where volatile fumes may exist, such as fuel storage areas or engine compartments.
4. Ventilated — Keep the inverter at a distance (at least 1" (25 mm)) away from surrounding objects. Ensure all ventilation openings are not obstructed.
5. Dust — Do not install the inverter in a dusty environment where the dust can enter into the unit, and especially not drawn into the product when the cooling fan is working.
6. Fused — Batteries can supply very large currents, a fuse must be fitted between the battery and the inverter with the fuse located as close to the batteries positive terminal as possible to protect the wiring.
7. Close to batteries — Avoid excessive cable runs between battery and inverter to reduce the voltage drop across the cable. For safety reasons however, even when installed in a well ventilated area the inverter should not be installed within 12" (300 mm) of the battery. The inverter must never be installed within the same enclosed compartment with the battery.
8. Use the recommended wire lengths and sizes (see section 2.2.4).
9. Do not mount the inverter where it will be exposed to the gasses produced by the battery. These gasses are very corrosive, and prolonged exposure will damage the inverter.

⚠ WARNING

RISK OF ELECTRICAL SHOCK. DO NOT EXPOSE THE INVERTER TO RAIN, SNOW, SPRAY, BILGE OR DUST. DOING SO MAY RESULT IN DAMAGE TO THE INVERTER OR OTHER APPLIANCES INSTALLED IN THE SYSTEM OR RESULT IN ELECTRIC SHOCK OR FIRE.
RISK OF ELECTRICAL SHOCK. DO NOT DISASSEMBLE THE INVERTER - THE INTERNAL CIRCUITRY CONTAINS HAZARDOUS VOLTAGES. ATTEMPTING TO SERVICE THE UNIT YOURSELF MAY RESULT IN ELECTRIC SHOCK OR FIRE AND WILL VOID THE UNIT WARRANTY.

TABLE 3.1.4.1: Recommended Mounting

		
Horizontal Wall Mount, Base Down	Horizontal Mount, Base down / up	Do not mount in a vertical configuration

3.2 Ventilation Fan

The fan is load and temperature controlled and will engage when the AC Power Consumption reaches a certain level and when the unit gets hot. Ensure that the fan is not obstructed and is at a distance of at least 0.98" (25 mm) from surrounding objects.

NOTICE

Install the inverter in a well-ventilated area with reasonable clearance. Do not install the inverter in a zero-clearance compartment or obstruct the ventilation openings. Doing so may result in the inverter overheating and ultimately damage the inverter.

3.3 Safety Before Installing DC Wiring Connections

3.3.1 Loads Are Disconnected

Make sure all loads are disconnected from the inverter's AC output and ensure that the inverter main switch is set to the OFF position before connecting DC cables.

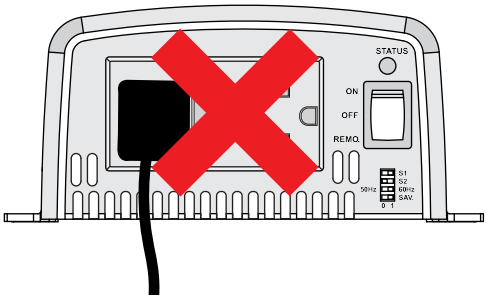


FIGURE 3.3.1: Ensuring loads are disconnected

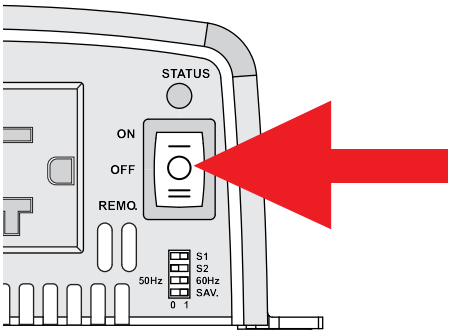


FIGURE 3.3.2: Switch is set to OFF position

⚠ WARNING

RISK OF ELECTRICAL SHOCK. BEFORE PROCEEDING, CAREFULLY CHECK THAT THE INVERTER IS NOT CONNECTED TO ANY BATTERIES AND THAT ALL WIRING IS DISCONNECTED FROM ANY ELECTRICAL SOURCES. DO NOT CONNECT THE OUTPUT TERMINALS OF THE INVERTER TO AN INCOMING AC SOURCE.

3.4 Check Cable and Fuse size

Make sure to use suitably rated cables and fuses for your installation, refer to Section 2.2.4 (page 10) for more information.

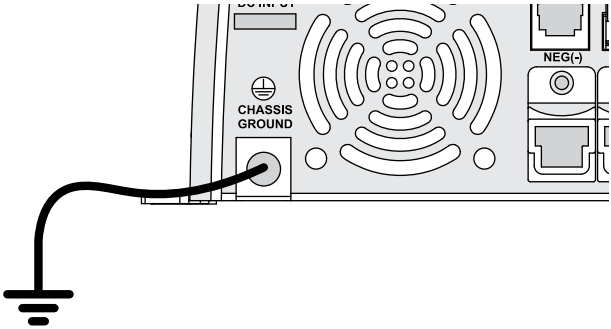
NOTICE

Use suitably rated cable as per section 2.2.4 (page 10). A cable below the recommended rated length will result in an increased voltage drop when the inverter is under load, which will ultimately effect the inverters performance.

Do not operate inverter with damaged or underrated cables or without an appropriately sized fuse. Under sized cables and/or an over-sized fuse may result in harm or damage to the installer and/or damage to the inverter or other appliances installed in the system.

3.5 Chassis Ground Connection

Connect Chassis Ground Terminal to the ground of vehicle, this applies to all negative ground vehicles. Chassis Ground must be connected to the ground of vehicle prior to making any other connections to the inverter.



⚠ CAUTION

REVERSE POLARITY CONNECTION WILL BLOW THE INTERNAL FUSE AND MAY CAUSE PERMANENT DAMAGE TO THE INVERTER. RISK OF FIRE. THESE INVERTERS CAN DRAW VERY LARGE DC CURRENTS. A BATTERY TYPE AND CONFIGURATION MUST BE SELECTED THAT CAN SAFELY AND RELIABLY SUPPLY BOTH THE STEADY STATE AND PEAK TRANSIENT CURRENTS DRAWN BY THE INVERTERS. THIS MAY REQUIRE MULTIPLE BATTERIES TO BE CONNECTED IN PARALLEL AND BE WIRED TO SHARE CURRENT EQUALLY. THE SELECTION OF BATTERIES AND WIRING MUST BE DONE BY A SUITABLE QUALIFIED PERSON.

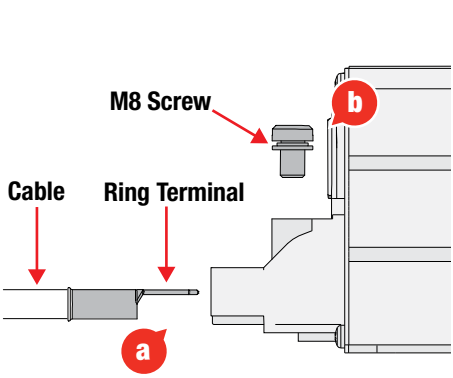
3.6 DC Wiring Connections

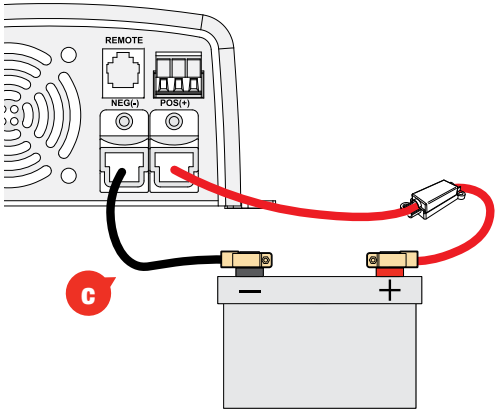
Before inserting DC cables, remove the bolts with attached washers in the terminal

a. Insert the crimped/terminated DC cable lugs into the input terminals, ensuring that the DC cables are connected into the correct terminal, positive (+) DC cable into positive terminal and negative (–) DC cable into the negative terminal.

b. Screw bolts and attached washers in tightly

c. Connect DC cables into an appropriate battery supply or other DC power source and connect to the DC cables to the correct positive (+) and negative (–) output.





⚠ CAUTION

ENSURE THAT ALL THE DC CONNECTIONS ARE TIGHT - TORQUE TO 1.5 FT-LBF (2.8 NM). LOOSE CONNECTIONS COULD RESULT IN OVERHEATING AND CAN BE A POTENTIAL HAZARD.

DO NOT OPERATE THE INVERTER WITH DAMAGED OR SUBSTANDARD WIRING. SELECTING THE WRONG CABLE OR FUSE SIZE COULD RESULT IN HARM TO THE INSTALLER OR USER AND/OR DAMAGE TO THE INVERTER OR OTHER APPLIANCES INSTALLED IN THE SYSTEM. THE INSTALLER IS RESPONSIBLE FOR ENSURING THAT THE CORRECT CABLE AND FUSE SIZES ARE USED WHEN INSTALLING THIS INVERTER. REFER TO SECTION 2.2.4 (PAGE 10) FOR MORE INFORMATION.

3.7 AC Safety Grounding

NOTICE

This product is fitted with a GFCI and is UL458 compliant.

All wiring, including grounding, must be performed by a suitably qualified person and must comply with all local and government code requirements that are application to the installation location and type.

3.8 Turning The Inverter On

3.8.1 Switch Controls

With the DC cables and Chassis Ground point correctly installed the switch on the inverter can be turned ON to the single line side. The second ON switch is to be used ONLY when controlling the inverter from two locations

3.8.2 LEDs and Connecting AC

The LED will illuminate green once switching the inverter on. If the inverter status is not green refer to Section 2.1.3 (page 8).

If the LED is green, switch unit OFF, it is safe for installer to plug the AC cord(s) into the GFCI socket(s) connect loads to the Inverter AC output. Turn the inverter switch to ON.

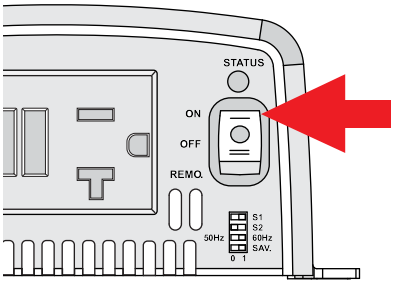


FIGURE 3.8.1: Switching Inverter ON

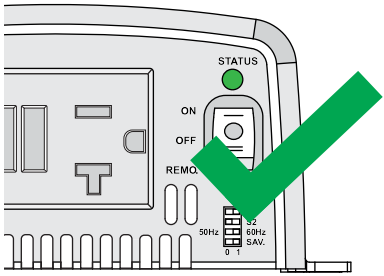
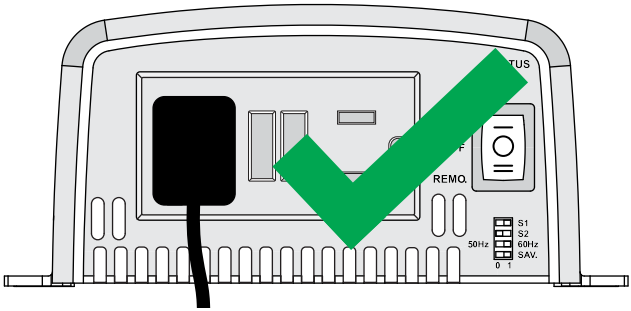


FIGURE 3.8.2: Correct Inverter Status

3.9 Connecting AC

If all LEDs are green, switch unit OFF, it is safe for installer to plug the AC cord(s) into the GFCI socket(s) connect loads to the Inverter AC output. Turn the inverter switch to ON.



3.10 Maintenance

Turn the unit OFF before cleaning. Very little maintenance is required to keep the inverter operating correctly. The exterior of the inverter 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.
A VACuum cleaner can be used to remove dust from ventilation openings and fan area.

COMPLIANCE

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference

2. This device must accept any interference that may cause undesired operation

Note: 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 and 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 equipment and receiver.
- Connect the equipment into 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.

Limited Warranty

For full warranty terms and conditions, visit the Warranty page of the REDARC website. Refer to the web address and contact details applicable to your region.

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NOTES

FREE TECHNICAL ASSISTANCE

For product and technical support contact your regional distributor, call our head office between 8:00 a.m. to 5:30 p.m. Australian Central Standard Time, Monday to Friday, or send us an email.

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