



True Sinewave Power Inverter

21040-03

Owner's Manual



For safe and optimum performance, the Power Inverter must be used properly. Carefully read and follow all instructions and guidelines in this manual and give special attention to the **CAUTION** and **WARNING** statements.

PLEASE KEEP THIS MANUAL FOR FUTURE REFERENCE

Disclaimer

While every precaution has been taken to ensure the accuracy of the contents of this guide, **Modul-System** assumes no responsibility for errors or omissions. Note as well that specifications and product functionality may change without notice.

Important

Please be sure to read and save the entire manual before using your **Modul-System Power Inverter**. Misuse may result in damage to the unit and/or cause harm or serious injury. Read the manual in its entirety before using the unit and save the manual for future reference.

True Sinewave Series:

21040-03 12V 400W 230VAC True Sinewave Inverter (Schuko - CEE 7/4)

P/N: MSIN400W Rev 1.3

Revision date: 2020-06-30

Service Contact Information

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1. INTRODUCTION

Thank you for purchasing the Modul-System Power Inverter. With our state of the art, easy to use design, this product will offer you reliable service for providing AC power for your vehicle, trailer or container. The Modul-System Power Inverter can run many AC-powered appliances when you need AC power anywhere. This manual will explain how to use this unit safely and effectively. Please read and follow these instructions and precautions carefully.

IMPORTANT SAFETY INFORMATION

This section contains important safety information for the Modul-System Power Inverter. Each time, before using the Modul-System Power Inverter, READ ALL instructions and cautionary markings on or provided with the inverter, and all appropriate sections of this guide. The Modul-System Power Inverter contains no user-serviceable parts. See Warranty section for how to handle product issues.

WARNING: Fire and/or chemical burn hazard

- Do not cover or obstruct any air vent openings and/or install in a zero-clearance compartment.
- **WARNING: Failure to follow these instructions can result in death or series injury**
- When working with electrical equipment or lead acid batteries, have someone nearby in case of an emergency.
- Study and follow all the battery manufacturer's specific precautions when installing, using and servicing the battery connected to the inverter.
- Wear eye protection and gloves.
- Avoid touching your eyes while using this unit.
- Keep fresh water and soap on hand in the event battery acid comes in contact with eyes. If this occurs, cleanse right away with soap and water for a minimum of 15 minutes and seek medical attention.
- Batteries produce explosive gases. **DO NOT** smoke or have an open spark or fire near the system.
- Keep unit away from moist or damp areas.
- Avoid dropping any metal tool or object on the battery. Doing so could create a spark or short circuit which goes through the battery or another electrical tool that may create an explosion.

WARNING: Shock Hazard. Keep away from children!

- Avoid moisture. Never expose unit to snow, water etc.
- Unit provides household AC, treat AC output sockets the same as regular wall AC sockets at home.

WARNING: Explosion hazard!

- DO NOT use the Modul-System Power Inverter in the vicinity of flammable fumes or gases (such as propane tanks or large engines).
- AVOID covering the ventilation openings. Always operate unit in an open area.

EMC INFORMATION

This equipment has been tested and found to comply with the limits for CE EMC standard. 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:

- Re-orient or relocate the receiving antenna.
- Increase the separation between the equipment and the 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.

LIMITATIONS ON USE

Do not use in connection with life support systems or other medical equipment or devices.

2. PRODUCT DESCRIPTION

The Modul-System Power Inverter package includes the items list below.

- Power Inverter base unit
- Owner's manual
- Cable boots
- Lighter plug cable
- Battery clips cable

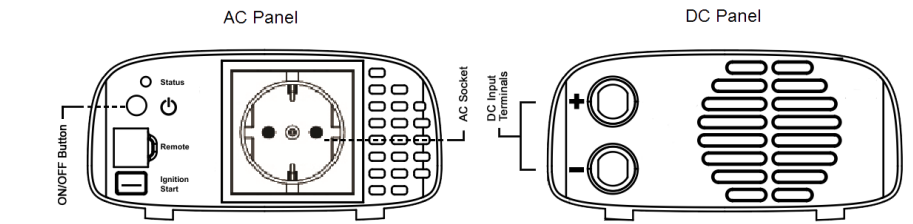
3. INSTALLATION

WARNING: Modul-System recommends that all wiring be done by a certified technician or electrician to ensure adherence to the applicable electrical safety wiring regulations and installation codes. Failure to follow these instructions can damage the unit and could also result in personal injury or loss of life.

CAUTION: Before beginning your power inverter installation, please consider the following:

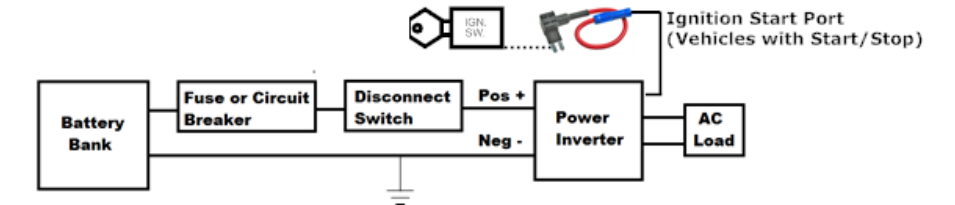
- The Power Inverter base unit should be used or stored in an indoor area away from direct sunlight, heat, moisture or conductive contaminants.
- When placing the unit, allow a minimum of 80 mm of space around the unit for optimal ventilation.

Understanding the unit features



Installation Preparation

Typical wiring block diagram of the Power Inverter:



Battery Bank:

- The use of deep cycle battery is highly recommended for power inverter application
- For battery size, you need to identify how long you wish to operate the load(s). Modul-System does recommend that you purchase as much battery capacity as possible, with a minimum of 40AH. See more on "Estimated Run time and Load" in Section 4.
- Please use 12V Battery Bank system for the 21040-03 Power inverter. Using 24V or higher voltage Battery Bank System will damage the inverter and may cause fire.

Fuse or Circuit Breaker:

- DC-rated fuse or DC-rated circuit breaker connected along the DC positive line is required.
- Select a fuse or circuit breaker with 40A minimum rating.
- Based on the size of the battery bank chosen on the 12V system above, determine the overall short circuit current rating of the battery bank from the battery manufacturer. The fuse or circuit breaker chosen has to be able to withstand the short circuit current that may be generated by the battery bank.

Disconnect Switch:

- Select a Disconnect Switch with the same or higher rating of the selected fuse or circuit breaker from the above.
- The Disconnect Switch is used to disconnect the DC power between the power inverter and the battery bank during service, maintenance or trouble shooting.

Installing the Power Inverter System

WARNING: Electrical Shock Hazard

The unit green 'On/Off' switch does not disconnect the DC power from the battery. Use the DC Disconnect Switch or disconnect the DC input cables connection to disconnect the DC power from the battery before working on any circuits connected to the unit. Failure to follow these instructions can result in death or serious injury.

CAUTION: Unit Damage

Reversing the battery connection to the DC Input terminals will damage the unit and it cannot be repaired. Damage caused by reverse polarity connection is not covered by the warranty.

Power Inverter Installation Using the provided Accessories for temporary use

Lighter Plug Cable:

- **CAUTION:** Due to the limitations of the 12V lighter plug socket in vehicles, the unit should be used with the DC cable with lighter plug only to supply AC power to products that require 150W (120VAC/1.3A or 230V/0.65A) or less. If the appliance requires more than 150W, use the DC Battery Clips Cable for battery connection.
- Attach the red ring-type connector to the positive (+) DC terminal (red) on the power inverter and connect the black ring type connector to the negative (-) DC terminal (black) on the Power inverter.
- Tighten the nut on each DC terminal.
- Insert the lighter plug of this cable to the fused 12V lighter plug socket.
- Unit is ready for use.

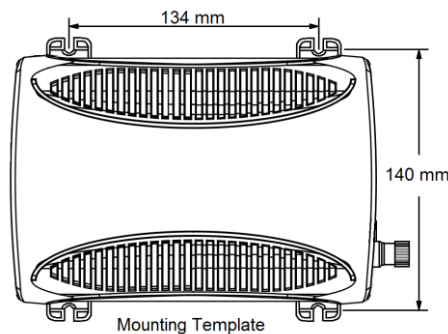
Battery Clips Cable:

CAUTION: Please be sure all the connections are tight before the use of the unit.

- Attach the red ring-type connector to the positive (+) DC terminal (red) on the power inverter and connect the black ring type connector to the negative (-) DC terminal (black) on the Power inverter.
- Attach the negative (black) clip to the negative (-) battery terminal.
- Attach the positive (red) clip to the fuse or circuit breaker of the 12V battery bank as indicated on 'Installation Preparation' diagram.
- Unit is ready for use.

Connect unit for Permanent use (cable not provided)

- Unit is for indoor use only, choose an appropriate mounting location.
- Orientation: Unit can be mounted in any direction.
- Use mounting template below to mark the positions of the mounting screws. Drill the 4 mounting holes and place the inverter in position and fasten the inverter to the mounting surface.
- Use of low resistance cable is required for all the DC connections between the inverter and the battery bank.
- Use minimum 10mm² cable with maximum cable length of 3 m for the Inverter system.
- Connect one end of the negative DC input cable to the Power Inverter DC negative (black) M6 terminal.
- Connect the other end of the negative DC input cable to the battery negative terminal or suitable chassis earth point.
- Make sure the Disconnect Switch is in the OFF position.
- Connect one end of the positive DC input cable to the Inverter DC positive (red) M6 terminal.
- Connect the other end of the positive DC input cable to one of the terminals of the Disconnect Switch.
- Connect a DC input cable between the other terminal of the Disconnect Switch and one side of the terminal of the fuse holder.
- Connect a DC input cable between the other terminal of the fuse holder and the battery positive terminal.
- Install the selected fuse to the fuse holder.
- Turn Disconnect Switch to ON position.



Power Inverter Test after installation:

- Press and hold the green 'On/Off' button on the unit to turn ON the unit.
- Check that the 'Status' indicator turns to solid green.
- Plug in a small AC load like a 40W table lamp to the AC socket to verify AC is available.
- The unit is successfully installed and functioning properly.

Remote Switch (optional) Connection:

- The unit comes with a Remote port and an optional Modul-System 'Remote Switch' accessory (21000-03) can be used to turn unit ON and OFF remotely. To install the 'Remote Switch', just connect the switch's RJ12 plug to the RJ12 'Remote' port located at the Front AC panel of the Power inverter. Please note polarity when connecting the plug.
- The Power On/Off push button on the remote shares the same function as the green 'On/Off' button on the main unit.

Use of the Ignition Start Function on unit:

For use with vehicles equipped with Start/Stop modes.

- An 'Ignition Start' port is located at the front AC Panel of the Inverter. This port is used for turning the unit ON and OFF using a +12V signal. An insulated female spade terminal (width 6.3 mm) is required to connect to the port.
- The 'Ignition Start' port must be used when fitting this Inverter to vehicles with Start/Stop functionality. It shall be wired using an ignition jumper to obtain the +12v signal from the vehicle's OEM fuse box.
- When the Inverter is switched on via the 'Ignition Start' port (or Remote Port), the Under Voltage Alarm is disabled (switched off) so it will not operate (sound) when the vehicle is in Start/Stop mode with a low automatic cranking battery voltage.
- Connecting to +12V will turn ON the unit and removing the +12V signal will turn it OFF.
- This +12V connection should be fused at its source with a 2A fuse minimum.
- The inverter low battery warning alarm and under voltage cut-outs operate differently when the inverter is turned ON via the 'Ignition Start' port or the Remote port.

Power Inverter Test after installation with Ignition Start Function or the Remote port:

- Turn on the vehicle ignition to turn ON the unit.
- Check that the 'Status' indicator turns to solid green.
- Plug in a small AC load like a 40W table lamp to the AC socket to verify AC is available.
- The unit is successfully installed and functioning properly.

4. UNIT OPERATION

WARNING: RISK OF EQUIPMENT DAMAGE

Do not connect an AC power source like utility power or generator to the AC outlets of the unit.

Turn ON and OFF the unit

- Press and hold the green 'On/Off' button for about a second to turn ON the unit.
- 'Status' indicator in green color indicates AC Output power is available.
- Press again the green 'On/Off' button to turn OFF the unit and the 'Status' indicator will turn off.

Understanding the 'Status' indicator and the unit warning and fault alarm

'Status' indicator:

- Illuminated in green indicates unit is ON. AC is available at the AC Output Socket.

- Illuminated in green and alarm is beeping once every 2 second indicates a warning signal from the unit. The unit is close to shutdown with one or more of the following warning conditions:
 - Over Temperature Warning:** Unit internal temperature is high. Unit requires better ventilation.
 - DC Over Voltage Warning:** DC Input Voltage is high and close to the unit over voltage shutdown limit. Checking the battery voltage.
 - DC Under Voltage Warning:** DC Input Voltage is low and is close to the unit under voltage shutdown limit. Checking on battery voltage or battery connection is required.
- Illuminated in red and alarm is beeping once every second indicates AC Output has shut down due to the following conditions:
 - Over Temperature Shutdown:** Reduce the AC load connected to the unit and provide more ventilation to the unit. AC Output will automatically restart when the internal temperature cools down.
 - DC Over Voltage Shutdown / DC Under Voltage Shutdown:** Check the battery voltage. On the first 30 seconds, AC Output will resume when battery voltage is corrected to the unit operating range. If the battery voltage shutdown condition is ignored, the unit will latch OFF completely after 30 seconds and restart the unit using green 'On/Off' button is required after the battery voltage is corrected.
 - AC Output Overload Shutdown:** Check AC Load connected to the unit. AC Output is short circuited or AC Power draw by the load is beyond the unit's limit. The indicator and alarm will beep for about 30 seconds before it is latched OFF completely. Restarting the unit using the green 'On/Off' button is required after the AC Load condition is corrected.

Understanding the Fan Operation

The fan on the unit is internal temperature activated. It will automatically turn on when AC output power exceeds the pre-set values (~ 200W) and turn off when AC output power is reduced to 150W. It will also automatically turn on when it senses the internal components have reached to around 80°C and turn off when temperature drops to below 60°C.

AC Load on Power Inverter

Although the Power Inverter can provide high surge power up to two times the rated output power, some appliances may still trigger on the unit protection system during start up or surge period. A higher power inverter is required for those appliances.

Estimated Run time on Load

Following run time is an estimate based on using a 12V-120AH battery bank. Actual runtime may vary.

Load	Consumption	Estimate Run time
Cordless Phone	5W	150 hrs
Clock / Radio	8W	100 hrs
Table Lamp	40W / 60W	27 hrs / 18 hrs
Small Freezer (8.8 cu. ft.)	80W	15 hrs
20" LCD TV	100W	11.5 hrs
Sump Pump (1/2 hp)	350W	Not applicable (start-up surge too high)

5. TROUBLESHOOTING

Problem	Symptom	Solution
No AC output and 'Status' light is OFF	The unit is off No power to inverter	Turn unit ON Check fuse or if the Disconnect switch (if installed) is either blown or turned OFF
'Status' indicator is in green (alarm beeps every 2 seconds)	Unit has detected a warning and is going to shutdown	Verify the warning condition and make adjustment. See "Understanding the 'Status' indicator and the unit warning and fault alarm" in this manual
'Status' indicator is in red (alarm beeps every second)	AC Output has shut down	Check unit condition and make correction. See "Understanding the 'Status' indicator and the unit warning and fault alarm" in this manual

6. SPECIFICATIONS

Note: Specifications are subject to change without notices.

Revision 1.3 Specifications			
Inverter	Turned on by power switch on the inverter face	Turned on by applying power to Ignition start port	Turned on by applying power to Remote port
AC Output Power	400W		
AC Output Current	1.74A		
AC Surge Power	800W		
AC Output Voltage	230VAC / 50Hz		
AC Output Waveform	Tine Sinewave (<5% THD)		
DC Input Voltage	12.5 VDC		
No Load Current	< 0.8A		
Nominal DC Operating Range	11.7-15.9 VDC	UVSD threshold charge 10.5-15.9 VDC	
DC Operating Range	8-15.9 VDC		
Under Voltage Alarm	ON 11.9 VDC	Off	
Under Voltage Alarm Recovery	12.5 VDC	Off	

Under Voltage Shutdown	11.7 VDC	Software coded so that when the DC input drops to the Under Voltage Shutdown threshold (10.5V), it will wait for 10 seconds before it triggers on the latching mechanism	
Under voltage Recovery	13.2 VDC	Non-latching 'Fault' Automatically switched back on 13.2 VDC	
Over Voltage Shutdown	15.9 VDC	15.9 VDC	15.9 VDC
Over Voltage Recovery	15.0 VDC	15.0 VDC	15.0 VDC
AC Output Socket	EU		
Unit Start Up Voltage	UVSD voltage 11.7V	UVR 13.2V <10.5V for more than 10 seconds	
Safety and Environmental			
Agency Markings	CE LVD, EMC, (E)		
Operating Temperature	0°C to 40°C		
Storage Temperature	-20°C to 60°C		
Relative Humidity	5 - 90% non-condensing		
Operating Altitude	Up to 2000 m above sea level		
Weights and Dimensions			
Weight	1.1 kg		
Dimensions	218 x 152 x 66 mm		

7. WARRANTY

Two Year Limited Warranty

The limited warranty program is the only one that applies to this unit, and it sets forth all the responsibilities of Modul-System. There is no other warranty, other than those described herein. Any implied warranty of merchantability of fitness for a particular purpose on this unit is limited in duration to the duration of this warranty.

This unit is warranted, to the original purchaser only, to be free of defects in materials and workmanship for two years from the date of purchase without additional charge. The warranty does not extend to subsequent purchasers or users.

Manufacturer will not be responsible for any amount of damage in excess of the retail purchase price of the unit under any circumstances. Incidental and consequential damages are specifically excluded from coverage under this warranty.

This warranty does not apply to damage to units from misuse or incorrect installation/connection. Misuse includes wiring or connecting to improper polarity power sources.

Return/Repair Policy:

If you are experiencing any problems with your unit, please contact our customer service department at info@modul-system.com or phone +46 31 746 87 00 before returning product. After speaking to a customer service representative, if products are deemed non-working or malfunctioning, the product may be returned to Modul-System within 30 days of original purchase. Any defective unit that is returned to manufacturer within 30 days of the date of purchase will be replaced free of charge.

If such a unit is returned more than 30 days but less than two years from the purchase date, manufacturer will repair the unit or, at its option, replace it, free of charge. If the unit is repaired, new or reconditioned replacement parts may be used, at manufacturer's option. A unit may be replaced with a new or reconditioned unit of the same or comparable design. The repaired or replaced unit will then be warranted under these terms for the remainder of the warranty period. The customer is responsible for the shipping charges on all returned items.

Limitations:

This warranty does not cover accessories, such as adapters and batteries, damage or defects result from normal wear and tear (including chips, scratches, abrasions, discoloration or fading due to usage or exposure to sunlight), accidents, damage during shipping to our service facility, alterations, unauthorized use or repair, neglect, misuse, abuse, failure to follow instructions for care and maintenance, fire and flood.

If your problem is not covered by his warranty, contact our Customer Service Department at info@modul-system.com or +46 31 746 87 00 for general information if applicable.



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