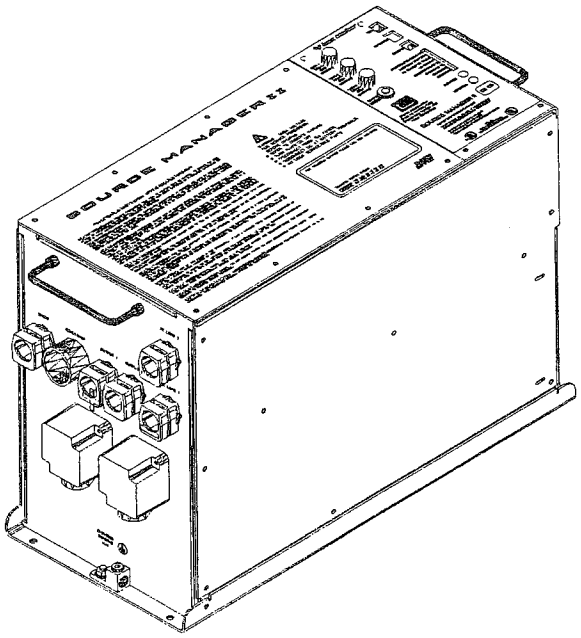
OWNER'S MANUAL

AC Source Manager II



AC Source Manager II 20	P/N 81-0280-12
AC Source Manager II 25	P/N 81-0281-12
AC Source Manager II 30	P/N 81-0282-12

INFORMATION IN THIS MANUAL IS SUBJECT TO CHANGE WITHOUT NOTICE

heart interface®

THANK YOU

Thank you for purchasing a Heart Interface AC Source Manager II. Heart Interface takes pride in manufacturing quality products specifically designed to meet your power requirements.

The AC Source Manager provides silent, efficient and reliable AC power for a variety of applications. It features "hands-free" operation, automatic 3-stage battery charging and Intelligent AC transfer switching. For your convenience, service is available worldwide by qualified service centers.

If you have any questions about your AC Source Manager II, please contact Heart Interface toll free: **(800) 446-6180**. Before calling, please have the model and serial number of your unit, the owners manual and the date of purchase of the unit available.

For technical support and additional information about Heart Interface products, visit our web site at **www.heartinterface.com** or send us e-mail:

techhelp@heartinterface.com **sales@heartinterface.com**

Safety Summary

Safety information for installation and operation is contained throughout this manual where it applies and is not included in this summary.

Definitions:

Warning statements identify conditions or practices which could result in personal injury, loss of life, damage to equipment or other property.

Fuse Replacement For continued protection against the possibility of fire, replace the fuse only with a fuse of the specified voltage, current and type ratings.

Power Source To avoid damage, operate the equipment only within the specified AC (line) and DC (battery) voltages.

Servicing To reduce the risk of electric shock do not open this unit. There are no user serviceable parts inside. Refer all service to qualified personnel.

Contents

INTRODUCTION

This owner's manual describes the AC Source Manager II from Heart Interface

Basic Functions

1. DC to AC power inverting.
2. Intelligent automatic transfer switching between inverter power, incoming AC power from the utility and generator AC power.
3. Automatic 3-Stage Battery charging plus manual battery equalizing.
4. Lock out selected circuits during inverter operation.

INVERTER

• The inverter section uses DC from a deep cycle battery bank to supply regulated 120 volt AC power at a crystal controlled frequency.

AC Source Manager II 20	**2000 watts**
AC Source Manager II 25	**2500 watts**
AC Source Manager II 30	**3000 watts**

Output power is continous rated at 75 degrees Fahrenheit.

The output is a modified sine wave and is compatible with most appliances, tools and other 120 VAC equipment. (Note: Certain laser printers, breadmakers, digital clocks and small battery chargers may not operate correctly on modified sinewave.)

An idle mode in the inverter reduces battery power consumption when loads are removed from the inverter. There is a low battery cutout protection circuit. A momentary surge current of more than three times the inverter current rating for starting electric motors. High efficiency insures the longest possible battery life between charges.

• The internal Intelligent Transfer Switch allows the AC Source Manager II to be connected to two external AC sources (usually the AC line power and an auxiliary generator) and transfer the source power through directly to the loads. When the external AC power source is removed, the transfer switch allows automatic connection to the inverter to supply the loads.

• AC Source Manager II battery chargers are electronically controlled and rated at maximum output current:

AC Source Manager II 20-100 Amps DC
AC Source Manager II 25-130 Amps DC
AC Source Manager II 30-140 Amps DC

Battery charging is automatically accomplished in 3 stages: Bulk Charge, Acceptance Charge and Float Charge. These battery chargers are designed to rapidly and optimally charge wet, gel, or Absorbed Glass Mat (AGM)** cell deep-cycle batteries.

Using a Remote Control Panel or Link Instrumentation, a manually engaged Equalizing Charge cycle is available.

Simple, automatic operation is made possible by the microprocessor in the AC Source Manager. In most cases, no attention or maintenance is required.

• The AC lockout circuits provide load management of two AC loads when the inverter is running.

Electronic Protection

Fast-acting electronic circuits protect the inverter from overloads and short circuits. Other protection includes a low and high battery voltage cutoff and automatic over temperature shutdown. When the fault condition is corrected, the unit will automatically reset.

Operation with External AC Power

When external AC power is available, the 3-stage battery charger, Intelligent Transfer Switching, and Power Sharing function automatically.

Priority of AC Inputs

1. Generator
2. Shore Power
3. Inverter

When external AC power is not available and the INVERT is turned On (either through the INVERT button on the unit or the INVERT button on the remote), the inverter will automatically turn ON battery charging. Battery charging is not possible with no external AC power.

If installed with the Remote Control Panel or Link Instrumentation, the unit will be set up and controlled from the remote. Refer to the remote manual for more information.

Circuit Breaker Protection

The INVERT/CHARGE breaker on the top of the unit protects against sustained inverter/charger over current conditions. If the breaker is triped the button pops out 1/2 inch. This breaker is reset by pushing the button back in.

Fuses

The 3 fuses on the top panel are AC input fuses and protect the AC source manager from input transients, overvoltage or incorrect connection.

Thermostat Controlled Cooling

The AC Source Manager is equipped with an internal thermostatically controlled fan that cools the unit so it can operate continually at its rated load.

Inverter Idle Circuit

This automatic energy saving feature reduces battery power consumption when no AC load is present. Response from idle is instantaneous. In most cases, the operation of the idle circuit is not noticeable. Use of the Remote Control Panel or Link Instrumentation allows the idle threshold to be adjusted. The unit does not output 120 volts when in idle. To bring the unit out of the idle condition, apply a load.

Low and High Battery Shutdown

If the battery voltage drops to 10.0 volts, the inverter will automatically shut off. Charge the batteries to 13.5 volts to automatically resume operation. Battery shut down also occurs for a high battery condition at 15.5 volts. Operation will resume automatically when the battery voltage drops below 15.5 volts. Check all DC sources on the system for the reason for the excessive voltage.

Power Sharing

The purpose of Power Sharing is to prevent nuisance tripping of the AC input circuit breaker at the source (generator or AC power from a power pole). Circuitry inside the Source Manager automatically reduces the AC power used by the battery charger and allows it to be used by the AC appliances. This circuitry returns the AC power to the battery charger when the appliance(s) is turned off.

The Power Sharing set point of each unit has a factory default setting of 50 Amps. This can be changed using the Remote Control Panel or Link Instrumentation.

INTRODUCTION

Temperature Sensitive Charging

The Source Manager is supplied with a battery temperature sensor. It is connected to the unit and attached to the batteries. The battery charging voltage is controlled based on the temperature sensed at the battery. The charger automatically adjusts the charge voltage to the best level, minimizing water loss in wet cell batteries. Charge voltage regulation optimizes the battery life cycle.

THEORY OF OPERATION

Overview

A motorhome has several energy sources. They have Shore power (public power), an on board generator, and inverter power to supply the AC energy. The chassis and coach batteries supply the DC energy. A motorhome may also employ LP gas for various energy needs. The purpose of the Source Manager is to manage shorepower, generator power, inverter power and the charging and monitoring of coach batteries.

The Source Manager II performs 4 functions. The first function is the unit serves as an "intelligent" transfer switch that selects between the three AC sources, prioritizes them and distributes the proper power to the load center. The second function is the unit charges the coach batteries by converting AC power from shore or generator to DC power The third function is the unit operates as an inverter that changes the DC power that is stored in the coach batteries to AC power. The fourth function is that the unit disconnects (locks out) selected circuits during inverter operation. To help the Source Manager II perform these functions and interface with the user the unit is equipped with a remote control monitor and a temperature sensor.

The Source Manager II comes in 3 versions listed below:

Model	Inverter Output Power	Charger current
SM 20	2000 watts	100 amps DC
SM 25	2500 watts	130 amps DC
SM 30	3000 watts	140 amps DC

The transfer functions and lock out functions work the same on all models.

AC Transfer

The AC transfer switch performs two functions it selects the source of power to be used and isolates the three sources from each other. When the motorhome is connected to 50 amp shore power the coach is actually supplied with two Legs of 120 Volt AC power at 50 amps each, along with a neutral return wire and an earth ground. This is also the case with the generator. The Source Manager transfers each "hot" leg and the neutral individually and simultaneously to the load center. The inverter output is connected to leg 1 and it is limited to powering only the loads that are on this leg. The front air-conditioner and floor heater are disconnected from the inverter power.

The generator is top priority of the AC input sources. If the generator is turned on the Source Manager II switches it into the system whether any other source is connected. It is also the normally closed position of the relays. The generator is top priority because it has to be turned on by the user and it is assumed that it was turned on because there was a need for more power than shore power or the inverter could provide. The Shore power is second priority and the inverter is third priority.

Neutral Bonding

National Electrical Code (NEC) requires that any source of AC power bond the neutral (return) to earth ground for safety purposes. shore power has neutral bonded to ground at the power pedestal at the campground. The generator bonds neutral to ground in the wiring compartment on the generator. The Source Manager is in a unique position. It is both a source of AC power and an appliance (battery charger). An appliance should not bond neutral to ground.

THEORY OF OPERATION

The Source Manager employs a neutral bonding relay. The neutral bonding relay bonds the output neutral to earth ground when the inverter is the source of AC power and lifts the neutral bond when the source of AC power is shore power or generator power.

Charger

The battery charger comes on when the coach is plugged into shore power or the generator is turned on. The charger operates off of the power supplied to the Source Manager on leg 2. It is directly connected to the coach batteries and is responsible for keeping them charged. The charger will draw between 20 and 27 amps from the AC source, depending on the model, when in the first stage of charge, bulk mode. It will draw much less power once the batteries have satisfied their charge requirement. In float mode the AC demand will be proportional to the DC demand placed on batteries.

The battery charger is a temperature controlled 3-stage charger. The 3 stages of charge are bulk, acceptance and float. The first stage is the process of getting the terminal voltage of the battery to the acceptance voltage. The acceptance voltage is set to the gassing point of the batteries approximately 14.5 volts DC at 75 degrees Fahrenheit for wet cell batteries. During this stage the batteries generally draw maximum DC amperage and are charged to 80% to 90% of their capacity. As the terminal voltage gradually increases to the acceptance voltage, the batteries charge demand is satisfied and charger amperage decreases. Once the acceptance voltage is reached, the batteries amperage demand is significantly reduced. To top off the batteries the charger maintains the acceptance voltage for 1 hour or the battery amp draw is 2% of coach battery capacity, approximately 8 amps. When the acceptance criteria are met the charger reduces the DC output voltage to the float level which is 13.5 volts DC at 75 degrees Fahrenheit for wet cell batteries.

Notice the charge and float voltages are conditional based on the ambient temperature. The gassing point of wet cell battery changes based on temperature. The Source Manager II is equipped with a temperature sensor that is connected to the TSC port on the Source Manager II and to a coach battery terminal. The temperature sensor sends information to the Source Manager II that causes the charger to lower the charge voltage when higher temperatures are detected and raise the charge voltage when lower temperatures are detected.

Power Sharing

The function of power sharing is to reduce the amount of AC power used by the battery charger in favor of the AC loads to prevent the AC input circuit breaker from tripping. The limit of AC per leg is 50 amp. If the charger is in bulk charge and is using 20 amps of AC power and the rear A/C is "on" drawing 15 amps and the clothes washer is being used also drawing 15 amps this is 50 amps on leg 2. If the water heater comes on to support the clothes washer and it draws 10 amps we are now at 60 amps. This condition would cause the 50-amp circuit breaker to trip. With the source manager it simply reduces the power to the charger by 10 amps automatically and allows the water heater to use it. When the water heater or the washer turn off the power automatically goes back to the charger.

Load lock out functions

When the shorepower is not connected and the generator is not turned on, the inverter will supply AC power to leg 1 to the AC load center. Leg 1 powers most of the receptacles and smaller appliances in the coach. Leg 1 also powers the front air conditioner and the floor heater. The air-conditioner and floor heater are heavy loads and will quickly discharge the batteries if operated on the inverter. The source manager disconnects these loads from AC power when the inverter is the source.

Remote control

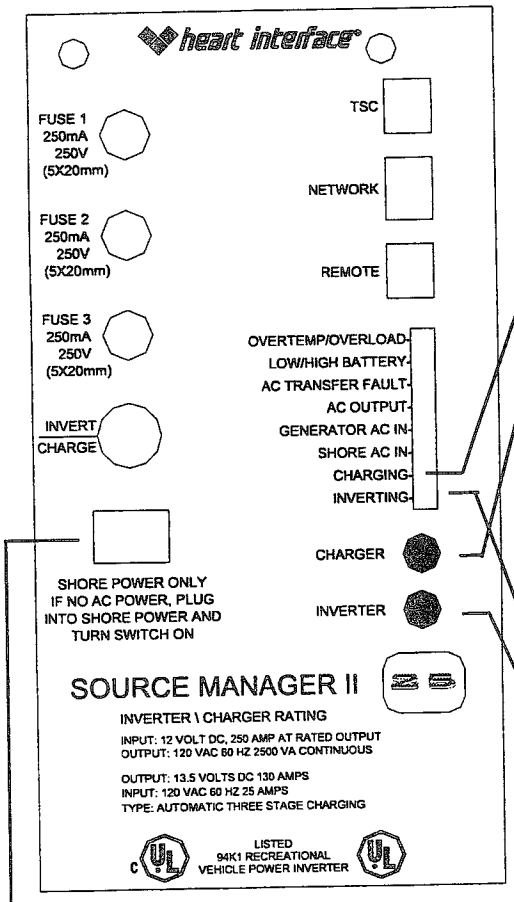
The motorhome is equipped with a Link 1000 remote control/ battery monitor. The Link 1000 performs several functions. It allows the user to turn off the inverter and the charger, change the Source Manager II parameters. It also monitors the battery voltage, amperage being used or charge amperage, the battery capacity and will display error conditions in the event of a problem. The Link 1000 is connected to the remote port on the Source Manager II, to the battery terminals and to the current shunt in the battery compartment.

Network port

The network port is to be used for future expansion of the system.

OPERATION

AC Source Manager II Top Panel



INVERTER BY-PASS Switch

The inverter by-pass switch is turned ON if there is no AC power available to the coach when it is plugged into shorepower. The engagement switch forces the internal relays into the shorepower position.

CHARGE Button - Green LED

The charger defaults to ON when AC power is applied from the generator or external source. This switch allows the user to turn the charger off when not using a remote.

- When external AC is applied, the charger automatically turns ON. The CHARGE LED will be solid green.
- When the LED is blinking slowly, (1 time per second) the charger is in standby, but external AC power is not available.
- Press the CHARGE switch to turn the charger OFF.
- When the LED is OFF, the charger has been manually turned OFF.

NOTE: When AC power is available, the default setting for the charger is ON. If the unit was manually turned OFF and AC power is interrupted and becomes available again, the charger will return to ON.

INVERT Button - Green LED

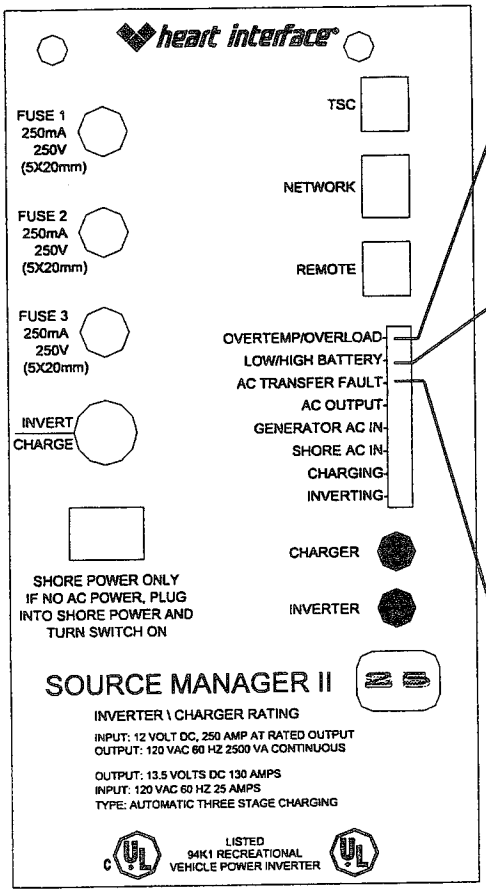
The INVERT push-button switch is located on the top of the unit.

- When the LED is solid green, the unit is in invert mode. This occurs by pressing and holding the INVERT switch for (3-5 seconds).
- When the LED is blinking slowly (1 time per second), the inverter is in standby with AC power applied and the transfer switch engaged
- Press the INVERT switch again to turn the inverter OFF.

OPERATION

STATUS LEDs

The Status LEDs provide operation information about the unit.



Overtemp/Overload- Red LED

Indicates Inverter/Charger Over temperature or Overload conditions.

Solid=Overtemp condition

Slow blink=Overload condition. To reset, correct the cause of overload and push the INVERT button.

OFF=Normal

LOW/HIGH Battery- Red LED

Indicates Low or High battery voltage condition and high battery ripple voltage shutdown condition.

Solid=Low or high battery voltage warning condition. The voltage is below 10.5VDC or above 15.0VDC.

Slow blink=Low or High battery voltage shutdown condition. The voltage is below 10.0VDC or above 15.5VDC.

Fast blink=DC ripple condition.

OFF=Normal

Note: When both the battery fault and Overtemp/Overload LED's are both blinking fast there is an AC backfeed condition (output of inverter connected to generator or pole power).

Inspect wiring for possible input/output wiring error before turning unit on again.

AC Transfer Fault- Red LED

Indicates when a fault condition with transferred AC power is detected.

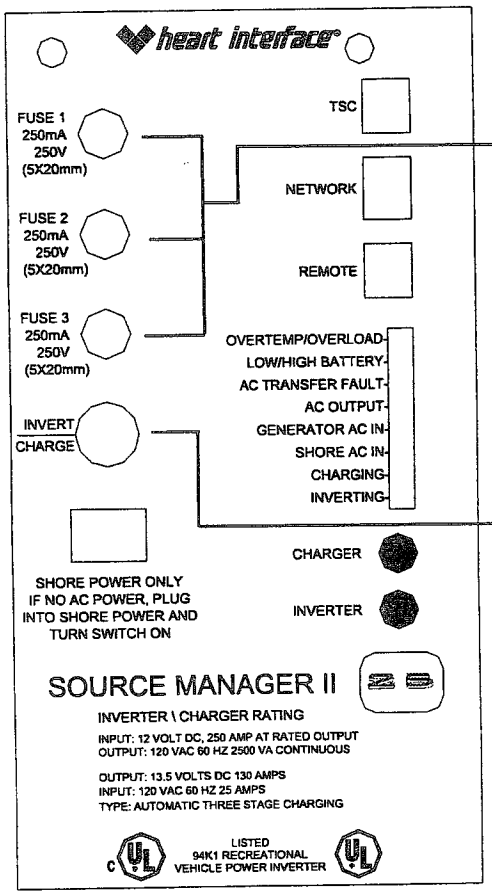
Solid=AC transfer over voltage condition detected.

Slow blink=AC transfer over current condition detected.

Fast blink=AC input neutral wire open

OFF=Normal

OPERATION



FUSES

F1- Protects against a shorepower over voltage condition or an internal fault

F2- Protects against a generator overvoltage condition or an internal fault

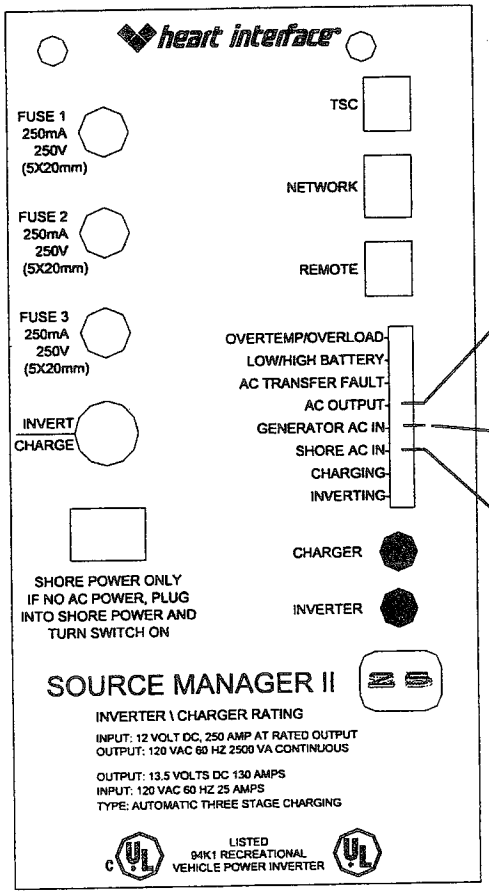
F3-Protects against a neutal overvoltage condition or an internal fault

Replace these fuses with a 1/4 amp 250 VAC 3AG slow blow.
(Littlefuse 313.250 or equivalent)

CIRCUIT BREAKER

The Inverter/Charge circuit breaker will vary in amperage based on the model of Source Manager. The circuit breaker will trip because of excessive load on the inverter output or if the charger draws excessive current when running on the generator or on shorepower

Model	Circuit breaker
SM-20	25 amp
SM-25	30 amp
SM-30	30 amp



AC Output - Green LED

Indicates the presence of AC power at the output of the AC Source Manager.
Solid=Output present, Inverter or 120 VAC single-phase power source detected.
Slow blink=Output present, 120/240 VAC split phase power source detected.
OFF=No output present.

Generator AC Input - Green LED

Indicates when AC Power from a generator power source is available.
Solid=Generator power is applied.
OFF=Generator power is not available/ qualified.

Shore AC Input - Green LED

Indicates when AC power from a shore power source is available.
Solid=Shore power is applied.
OFF=Shore power is not available/qualified.

BATTERIES

Battery Selection

Only similar batteries should be connected together in one bank. Do not connect old and new batteries together or wet and gel cell batteries together. It is not advisable to connect batteries of different case sizes or Amp-hour ratings in the same battery bank.

Always use properly sized wire and terminals for your interconnecting battery cables. For size information refer to NEC (National Electrical Code) requirements or contact your local electrician.

Deep Cycle Battery Bank Ratings And Sizing

Deep-cycle batteries are usually rated in Amp-hours. The Amp-hour rating is based on a 20-hour discharge rate, therefore, a 100 Amp-hour battery can deliver 5 Amps for 20 hours. If the discharge rate is greater than 5 Amps, the available Amp-hours are decreased. For example, if the load is increased to 100 Amps, only about 45 Amp-hours will be available at this rate of discharge. Some batteries are rated at a high discharge rate 75 amps for a certain amount of minutes. For instance, a T105 golf cart battery is rated at 75 amps for 107 minutes. Where another equivalent battery is rated at 217 amp-hr at the 20 hour rate.

Deep-cycle batteries can be discharged about 80% of capacity before damage occurs (swelling of the plates). Shallow cycling will result in much longer battery life. Calculating a battery bank size based on 50% discharge cycling is generally considered to be a good compromise between long battery life and capacity.

To achieve 50% cycling you should calculate your Amp-hour consumption between charging cycles and use a battery bank with twice that capacity**. Each AC appliance or tool has a rating plate on it and will be rated in either AC Amps or Watts or AC VA (Volt-Amps) apparent power. To calculate Amp-hour consumption, use one of the formulas on the next page to calculate the DC Amp-hour draw for a 12 volt system.

Calculate the Amp-hours for every AC appliance or tool that will be operated on the inverter. This will provide the total number of Amp-hours used between recharges. Size the battery bank using this number as a guideline. A good rule to follow is to size the battery bank a minimum of 2 times larger than the total Amp-hour load requirement. Plan on recharging when 50% discharged.

**Batteries are typically charged to 85% of full charge when charging with alternators without 3-stage regulators.

Battery Charger

The battery charger is designed to overcome the limitations of conventional chargers by utilizing three distinct charge stages, each designed for optimal charging of wet, gel cell and AGM deep-cycle batteries. Battery type selection is made on the front panel of the inverter/charger or through the Remote Control Panel or a Link Instrumentation.

BATTERIES

Typical Power Consumption

Appliance	Typical Wattage	Appliance Run Times / Amp Hours							
		5 Min.	15 Min.	30 Min.	1 Hr.	2 Hr.	3 Hr.	8 Hr.	24 Hr.
13" Color TV	50	.33	1	2	4	8	12	32	96
19" Color TV	100	.66	2	4	8	16	24	64	192
VCR	50	.33	1	2	4	8	12	32	96
Lamp	100	.66	2	4	8	16	24	64	192
Blender	300	2	6	12					
Laptop Computer	50	.33	1	2	4	8			
Curling Iron	50	.33	1	2					
3/8 Power Drill	500	3.3	10	20					
Icemaker*	200			2.6	5.2	10.4	15.6	41.6	83.2
Coffee Maker	1000	6.6	20	40	80	160			
3 cu' Refrigerator*	150			2	4	8	12	32	96
20 cu' Refrigerator*	750			21	42	84	126	336	672
Compact Microwave	750	5	15	30	60	120	180		
Full Size Microwave	1500	10	30	60	120	240	360		
Vacuum	1100	7.3	22	44	88	176	264		

Number in each box represents the total Amp hours used (@ 12 volt DC) based on various continuous run times.
*Note refrigeration is typically calculated using a 1/3-duty cyle.

Typical Power Consumption

The chart identifies typical power consumption for common AC loads. Use it as a guide when identifying your power requirements.

Many electric motors have momentary starting requirements well above their operational rating. Start up watts are listed where appropriate. Individual styles and brands of appliances may vary.

If using the same battery bank for the inverter and other DC loads, be sure to consider the power consumption of the DC loads when sizing the battery bank.

Battery Charging

Completely charging wet cell deep-cycle batteries requires the battery voltage to be raised beyond what is known as the gassing point. This is the voltage at which the battery begins to bubble and gas is given off. If charging stops short of this point, sulfate is left on the plates and deterioration of the battery begins. The gassing point will vary with battery temperature.

At 77 degrees F, the gassing point of a 12 volt battery is about 14.0 volts.

AGM and Gel cell batteries must not be charged to their gassing point. In fact, high voltage charging which gasses these batteries is harmful to them. They typically require a lower bulk charge voltage and a higher float voltage than wet cell batteries. Consult the battery manufacturer for specifications.

Amp-Hour Consumption Formulas

(AC Amps x 10) x 1.1 x hours of operation = DC Amp-hours

(Watts/ DC Voltage) x 1.1 x hours of operation = DC Amp-hours

(AC VA/ DC Voltage) x 1.1 x hours of operation = DC Amp-hours

DC Voltage is 12, 24 or 32 depending on your system.

In all formulas, 1.1 is the correction factor for inverter efficiency.

NOTE: Certain laser printers, breadmakers, digital clocks and appliance / tool chargers may not operate on modified sine wave.

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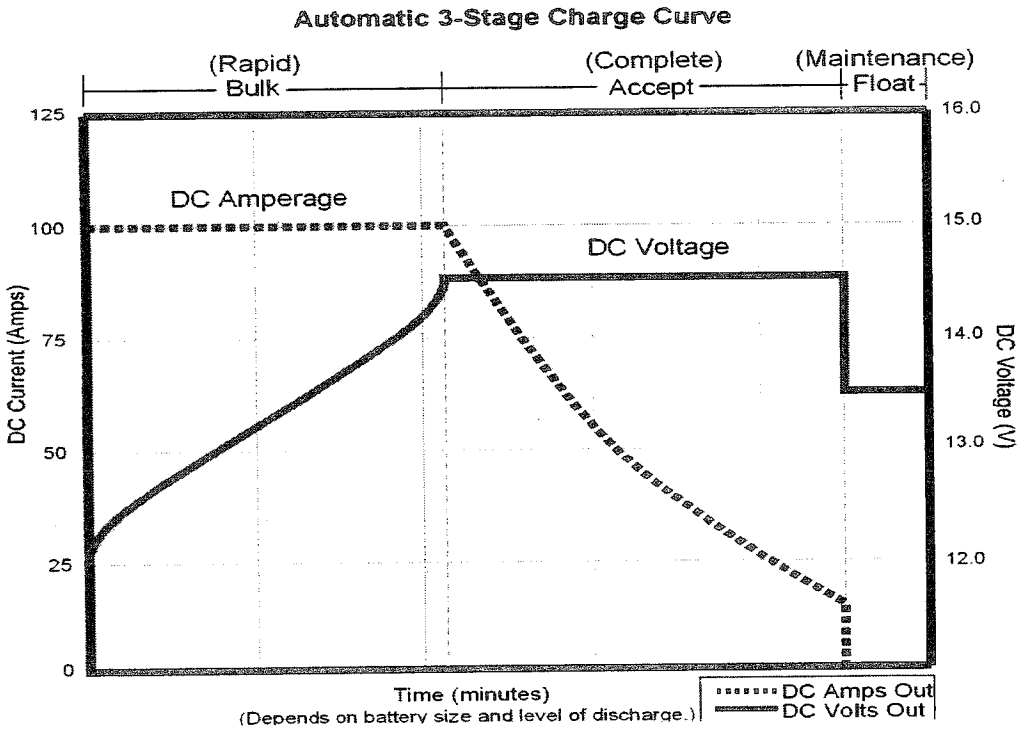
AC Source Manager II V1.6.p65 4/7/00

BATTERY CHARGING



Battery Chargers

The battery charger is designed to overcome the limitations of conventional chargers by utilizing three distinct charge stages, each designed for optimal charging of wet, gel cell and AGM deep-cycle batteries. Battery type selection is made on the front panel of the inverter/charger or through the Remote Control Panel or a Link Instrumentation. For more information on battery type selection, see page 7 or refer to the Remote Control Panel manual.

NOTE: **The battery charger is ON whenever AC power is connected to the charger input. The charger can be turned OFF using the CHARGE switch on the front of the unit. This sequence will occur each time external AC power is available. The charger can be turned ON/OFF using the Remote Control Panel or Link Instrumentation.**

Each time the battery charger is engaged, the 3-stage charger proceeds automatically. Use of the Remote Control Panel or Link Instrument provides the ability to periodically apply an equalizing charge.

Refer to Remote Control Panel or the Link Instrument Owner's Manual for more information.

The battery charger stages are:

Stage 1 - *Bulk Charge* During the bulk charge stage most of the energy that has been used during discharge is returned to the battery bank. This phase is engaged as soon as the battery charger is activated. Full rated charger current is delivered to the battery bank until the acceptance charge voltage limit is reached. This results in a relatively rapid recharge.

BATTERY CHARGING

Gel cell and Advanced AGM batteries can accept a higher rate of charge. Consult the manufacturer for specifications.

Stage 2 - Acceptance Charge The acceptance stage immediately follows the bulk charge stage. During this stage the battery voltage is held constant at the acceptance voltage limit and the current gradually ramps down. During this stage the battery is accepting its final amount of charge current and the last of the sulfate on the plates is removed.

The acceptance stage lasts until the charge current reaches the transition point. A timer will terminate the acceptance stage if this current level is not reached.

ACCEPTANCE TO FLOAT TRANSITION POINTS	
AC Source Manager20	2.0 Amps DC
AC Source Manager25	2.6 Amps DC
AC Source Manager30	2.8 Amps DC

Maximum acceptance time is 1 hour for wet and AGM cells and 3 hours for gel cells. Gel cell acceptance time can be longer because they are less likely to gas. Expect wet cell batteries to gas somewhat during acceptance, this is a necessary part of the charging process.

NOTE: The acceptance stage timer is not used when Link Instruments control the charger. Refer to the Link Owner's Manual.

Stage 3 - Float Charge When the acceptance stage is terminated, either because the charge current ramped down to the transition point or the timer engaged, the charge current will shut off. The unit monitors the battery voltage while it drifts down from the acceptance charge voltage limit. When it reaches the float voltage set point, the float charge stage is engaged.

The float charge stage holds the battery voltage constant at a preset lower level, where it is safe for long term battery maintenance. During the float charge stage, the full output current of the battery charger is available to operate any DC appliances that may be on the system, while constantly maintaining the float charge voltage.

The battery charger remains in the float charge stage indefinitely until the charger is disconnected from incoming AC power or turned OFF on the unit or with the Remote Control Panel or Link Instrumentation.

Stage 4 - Equalizing Charge This is the only battery charger stage which is not engaged automatically. It must be manually initiated each time. Applying an equalizing charge is possible only with a Remote Control Panel or Link Instrument.

Periodic equalizing is recommended by most wet cell deep-cycle battery manufacturers. There are no firm rules for how often an equalizing charge should be applied. Follow the battery manufacturer's recommendations for equalizing.

The equalizing charge is a timed, 8-hour cycle. The cycle can be ended early by interrupting the AC power to the charger at any time during the cycle. Equalizing should only be engaged after the batteries have been fully charged by a normal battery charging cycle.

BATTERY CHARGING

During this equalizing stage, the battery voltage will increase to the equalize voltage. This will cause the battery bank to gas profusely and will accomplish the following:

1. **Removal of residual sulfate on battery plates.** Each time a battery is cycled (discharged and charged), a small amount of sulfate is left on the plates. Over time, this gradual build-up of sulfate will compromise the performance of the battery. By applying an equalizing charge, the sulfate is returned back to the electrolyte, raising the specific gravity and fully exposing the active material of the plates.

2. **Bring all cells to the same potential.** All lead-acid batteries are made up of individual 2 volt cells. As the battery bank is cycled, slight differences in the cells result in different cell voltages, affecting the overall charge effectiveness. Equalizing brings all cells to the same voltage and the electrolyte in each cell to the same specific gravity.

3. **Mixing up of the electrolyte.** Electrolyte in battery cells tend to separate into layers of acid and water. The vigorous bubbling action of the battery during equalizing serves to physically mix the electrolyte. Refer to the Remote Control Panel and Link Owner's Manuals for additional cautions on equalizing.

WARNINGS

1. Do not equalize gel cell batteries. Check remote default settings.

2. Always monitor the equalize charge cycle. Provide proper ventilation for battery fumes. Do not allow any sparks during equalizing. If one or more cells begin to overflow, terminate the equalize cycle.

3. Check the battery electrolyte both before and after the equalizing charge. Do not expose the battery plates to air. Leave the battery caps on while equalizing. Top off after equalizing.

4. Remove all loads from the DC system before equalizing. Some DC loads may not tolerate the high charge voltage.

5. With the Remote Control Panel the battery state-of-charge LEDs sequence during equalizing. When the equalization cycle is complete, the charge automatically goes to float and the green float LED battery status light is on. ***With Link Instrumentation****, the red charge LED flashes during the equalizing cycle. When the equalization cycle is complete, the charger automatically goes to float and the green float LED is illuminated.*

CHARGER VOLTAGE SETTINGS

TEMP		TYPE 0		TYPE 1		TYPE 2		TYPE 3	
		Wet Cell		Gel 1 *		Gel 2 *		AGM	
°F	°C	ACCEPT	FLOAT	ACCEPT	FLOAT	ACCEPT	FLOAT	ACCEPT	FLOAT
120	49	12.5	12.5	13.0	13.0	13.0	13.0	12.9	12.9
110	43	13.6	12.7	13.5	13.0	14.0	13.4	13.9	12.9
100	38	13.8	12.9	13.7	13.2	14.1	13.5	14.0	13.0
90	32	14.0	13.1	13.8	13.3	14.2	13.6	14.1	13.1
80	27	14.2	13.3	14.0	13.5	14.3	13.7	14.2	13.2
70 **	21 **	14.4	13.5	14.1	13.6	14.4	13.8	14.3	13.3
60	16	14.4	13.7	14.3	13.8	14.4	13.9	14.4	13.4
50	10	14.4	13.7	14.3	13.8	14.4	13.9	14.4	13.4
40	5	14.4	13.7	14.3	13.8	14.4	13.9	14.4	13.4
30	-1	14.4	13.7	14.3	13.8	14.4	13.9	14.4	13.4

*** There are two gel battery settings. Check with the battery manufacturer to determine the proper setting for your batteries. Usually, Gel 1 is for long battery life; Gel 2 is for rapid charging.**

****Default setting when the temperature sensor is not connected.**

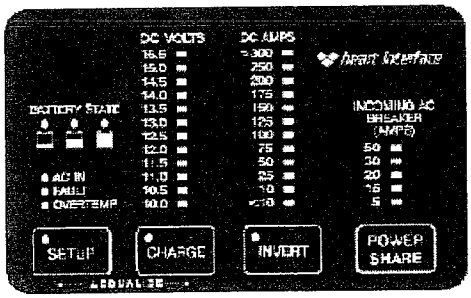
Part No. 90-0128-00
AC Source Manager II V1.5.p65 4/7/00

REMOTE CONTROL PANELS

Remote Control Panel

An optional remote control panel is available. The LED bargraphs on the remote control panel shows battery voltage and DC current in both inverter and charger modes.

Easy to see red, yellow and green LEDs show the battery state-of-charge. Power sharing, charger ON/OFF, inverter ON/OFF controls are provided. Set up features include selection of Idle Threshold, Battery Type and Battery Capacity.



Remote Control Panel

Advanced Remote Control Panels

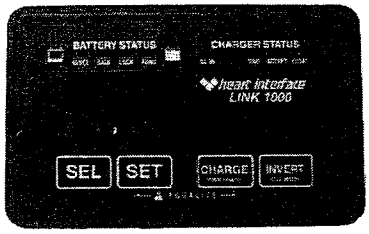
Link Instrument

Advanced remote control panels are also available: the Link 1000, 2000 and 2000R.

Link 1000

Link 1000 controls the Freedom Inverter/Charger and provides complete battery state-of-charge information including DC voltage, current, Amp-hours consumed, Time Remaining and historical data for a single battery bank.

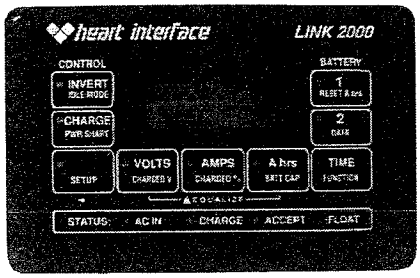
LINK 1000



Link 2000

The Link 2000 has the same features as the Link 1000, providing inverter/charger control and complete battery state-of-charge information. It monitors two battery banks.

LINK 2000



Link 2000R

The Link 2000R adds the ability to regulate an engine-driven alternator. The precision regulator in the LINK 2000R allows the alternator to be controlled as a 3-stage battery charging system.

If Link Instrument is used to control the inverter/charger, refer to the Link Owner's Manual for setup and control information.

Refer to the Remote Control Panel or LINK Owner's Manual for installation and operation instructions

Part No. 90-0128-00
AC Source Manager II V1.7.p65 4/26/00

INSTALLATION PRECAUTIONS

CAUTION This equipment is **not ignition protected** and employs components that can produce arcs or sparks. To reduce the risk of fire or **explosions, do not install in unvented compartments containing batteries or flammable gasses** or areas in which ignition-protected equipment is required.

WARNING

For continued protection against risk of electric shock, use only the ground-fault circuit interrupter (GFCI) type receptacles detailed in this manual. Other types may fail to operate properly when connected to this inverter, resulting in a potential shock hazard.

CAUTION To reduce the risk of electric shock and prevent premature failure due to corrosion, **do not mount where exposed to rain, dripping or spray.**

CAUTION To reduce the risk of fire, do not obstruct ventilation openings. Do not mount in a zero clearance compartment, overheating may result.

CAUTION ***Risk of electrical shock. Both AC & DC voltage sources are terminated inside this equipment.*** Before servicing disconnect all inputs and outputs.

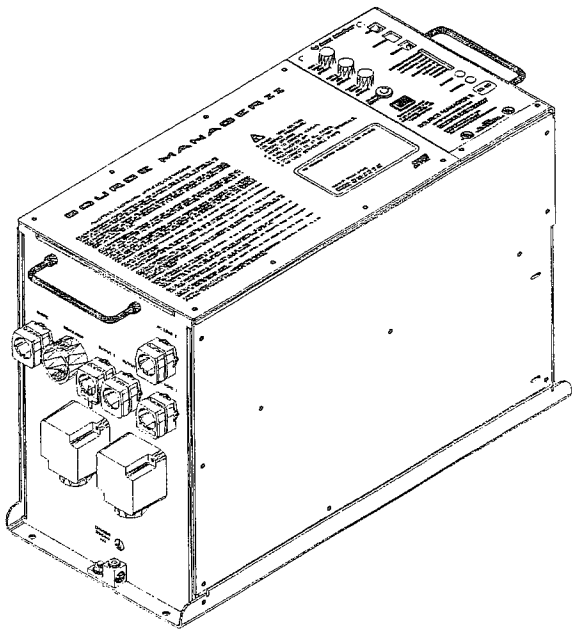
INSTALLATION

Location

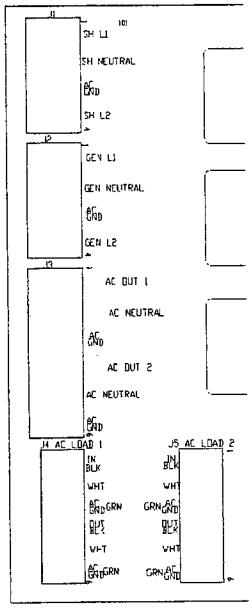
The Source Manager II is installed in the compartment under the bed. It is positioned on the right side adjacent to the AC load center. It is necessary to accurately position the Source Manager II over the ventilation opening provided in the floor. The ventilation opening is located directly under the fan and essential for adequate cooling.

Mounting

The Source Manager II is mounted with 4 5/16 inch 1 ½ inch long hex head screws that are located on the ends of the unit in the corners.



Source Manager II



AC Wiring Location

AC Input wiring

The Source Manager II is connected directly to the shore power inlet using a 4 wire 8 gauge cable and directly to the generator output using a 3 wire 8 gauge cable and a single 6 gauge neutral wire. These two large cables are routed up through the floor to the Source Manger II. The shore power AC input wiring is connected to the 4 position terminal on the left side of the unit in the rear. The generator wiring is connected to a 4 position terminal adjacent to and forward of the shore power terminal.

AC Output wiring

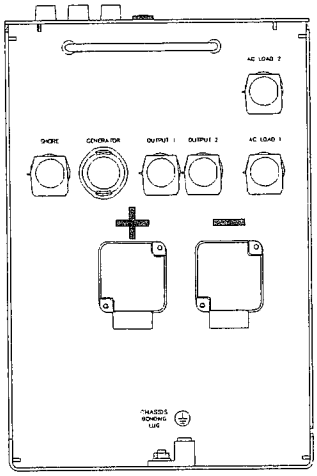
The AC output wiring is connected with two 3 wire 8 gauge cables to the 6 position terminal adjacent to and forward from the generator input terminals. These wires connect to the AC load center. Two 3 wire 12 gauge cables are connected between the AC load center and the Source Manager for the purpose of load management. AC load 1 controls the AC

power going to the front air conditioner and disconnects it when the inverter is operating. AC load 2 disconnects the floor heater from the inverter.

DC wiring

Warning: Observe proper battery polarity. The Source Manager II is not protected for reverse polarity. Improper wiring will damage the unit and void the warranty

Two 2/0 gauge cables are routed from the batteries through the floor to the battery terminals on the left side of the units. The batteries are connected using the appropriate polarity. The battery cables have strain relief where they come through the floor.



Source Manager II Side View

Grounding

A large grounding lug is located on the left side mounting flange. A single 6 gauge copper wiring is connected to the lug and the frame of the motorhome.

Remote control

A 4 wire phone cable is routed from the remote control panel in the dinette overhead to the phone jack labeled remote on the right side of the Source Manager II.

Temperature Sensor

A 4 wire phone cable is routed from a ring terminal connected to the house battery to the phone jack labeled TSC on the right side of the Source Manager II.

NORMAL LED INDICATIONS

Operation with shore power

Status LED	Condition
AC Transfer Fault	OFF
AC Output	ON Blinks on 240 VAC
Generator AC In	OFF
Shore AC In	ON
Charging	OFF
Inverting	Blinking

Operation on Inverter

Status LEDs	Condition
AC Transfer Fault	OFF
AC Output	ON
Generator AC In	OFF
Shore AC In	OFF
Charging	Blinking
Inverting	ON

Operation with generator power

Status LEDs	Condition
AC Transfer Fault	OFF
AC Output	ON
Generator AC In	ON Blinks on 240 VAC
Shore AC In	*
Charging	OFF
Inverting	Blinking

Troubleshooting

Warning: Make sure to disconnect shore power and turn off the generator and the inverter prior to accessing any area where AC voltages are present.

Overview

If a problem occurs with the Source Manager II the indicators on the unit and the indicators on the Link 1000 remote control battery monitor can be a valuable troubleshooting aid. A complete explanation of the Link 1000 remote control error codes is in the Link 1000 manual. The Source manager troubleshooting can be broken down into 4 categories. Battery faults, AC transfer faults, battery charging faults and inverter faults.

Battery faults

Battery faults are usually caused by low DC voltage at the Source manager input. Low battery faults are usually caused by loose, dirty or corroded battery connections, a blown DC fuse or discharged batteries. Battery faults caused by high DC voltage are uncommon but can still occur. A high battery fault, that occurs while driving, is usually caused by a defective alternator. Another cause of high battery shutdown is solar panels that are aggressively charging batteries that are fully charged. Other battery faults can be related to defective batteries that have internal shorts or are sulfated. The most common symptom of shorted batteries is that they will not stop taking a charge and usually overcharge. The voltage measurement on shorted batteries is usually as much as 0.5 to 1.0 volt DC lower than normal fully charged battery. Sulfated batteries charge and discharge quickly.

AC transfer faults

The most common AC transfer faults are caused by loose connections or tripped circuit breakers. A loose connection can be found at the campground plug-in pedestal, the shore cord, the 30 amp, 20 amp and 15 amp shore cord adapters, or the Hubble connector on the side of the coach. Loose connections can also be found where the wires are connected to the Source Manager II. The circuit breaker on the campground plug-in pedestal, the generator, the load center or the Source manager may be tripped and require reset. Fuses on the Source manager may be blown.

Charger faults

The most common charger faults are overcharging and lack of charging. If the batteries are gassing excessively or need water refills frequently, verify that the charger output voltage is set correctly for the type of batteries that are being used. The most common type of batteries used with the Source Manager are 6 volt DC golf cart batteries. The maximum bulk charge voltage applied to these batteries from the charger is 14.5 Volts DC. If the charger is charging within the proper voltage range then the problem is generally with the batteries. If the batteries are not charging the cause is usually that there is an interruption in AC power to the charger. The cause is probably a tripped circuit breaker or blown fuse.

Inverter faults

The most common Inverter faults are no inverter power or that the inverter power is not getting to the desired load. Bear in mind that when you are measuring the output of the inverter to get an accurate voltage reading a True RMS meter must be used.(Most True RMS meters will say "True RMS" on the front

of the meter) If a common averaging meter is used it will display a voltage but the value will be incorrect. An averaging meter will read the inverter output voltage as high (ie 130 to 160) when the batteries are low and it will read the output voltage as low (ie 90 to 110) when the battery voltage is high. A true RMS voltmeter will read 120 VAC +/- 5%. The absence of inverter power is generally caused by an overload or over-temperature condition. It may be that the inverter is simply not turned "on". The inverter output circuit breaker could be tripped. The problem of the loads not responding can be that they are not getting power or they may be incompatible with inverter power.

The LED indicators on the front panel will illuminate in certain combinations to alert the user as to fault conditions. Below is an explanation of the indicators.

* indicator solid green = single phase AC, blinking slow split phase AC power.

** indicator can be on or off

Low Battery Warning

Source Manager LEDs	Condition
Overtemp/Overload	**
Low/High Battery	Solid Red
AC Transfer Fault	Off
AC Output	On *
Generator AC In	Off
Shore AC In	Off
Charging	Blinking green
Inverting	Solid green

This combination of indicators means that the Source Manager II is in the inverter mode and warning the user that it is about to go into battery shutdown. Either the batteries are below 10.5 volts DC or above 15.0 volts DC.

Over temperature Warning:

Source Manager LEDs	Condition
Overtemp/Overload	Solid red
Low/High Battery	**
AC Transfer Fault	Off
AC Output	On*
Generator AC In	Off
Shore AC In	Off
Charging	Blinking green
Inverting	Solid green

This combination of indicators is a warning that the unit is about to shutdown from a high temperature overload.

Battery voltage shutdown

Source Manager LEDs	Condition
Overtemp/Overload	**
Low/High Battery	Slow Blinking Red
AC Transfer Fault	Off
AC Output	Off
Generator AC In	Off
Shore AC In	Off
Charging	Blinking green
Inverting	Off

Battery voltage shutdown. If the shutdown is caused by low battery the Source Manager II will automatically reset back to inverter mode when the battery voltage reaches the float voltage level of 13.2 volts. The unit can be manually reset by pressing the inverter switch on the Link 1000. If the shutdown is from high battery it will be necessary to lower the battery voltage to 14.5 volts DC before resuming operation. The Link 1000 will display an E01 for High battery shutdown and an E02 for Low battery shutdown

Over-temp Shutdown

Source Manager LEDs	Condition
Overtemp/Overload	Slow Blinking red
Low/High Battery	**
AC Transfer Fault	Off
AC Output	Off
Generator AC In	Off
Shore AC In	Off
Charging	Blinking green
Inverting	Off

The Source Manager II has shutdown from a over-temperature condition. It must be allowed to cool down before operating. The Link 1000 will display an EO3 for an over-temp shutdown.

Inverter Overload Shutdown

Source Manager LEDs	Condition
Overtemp/Overload	Fast Blinking red
Low/High Battery	**
AC Transfer Fault	Off
AC Output	Off
Generator AC In	Off
Shore AC In	Off
Charging	Blinking green
Inverting	Off

The Source Manager II was in inverter mode and shutdown from an overload. Reduce the load and reset by pressing the Inverter switch on the Link 1000. The Link 1000 will display a E06 for electronic inverter overload shutdown.

Backfeed Shutdown

Source Manager LEDs	Condition
Overtemp/Overload	Fast blinking red
Low/High Battery	Fast blinking red
AC Transfer Fault	Off
AC Output	On
Generator AC In	Off
Shore AC In	Off
Charging	Blinking green
Inverting	Off

The Source Manager has detected AC power from shore or generator on the inverter output wires. This is a backfeed condition and

TROUBLESHOOTING

is potentially damaging to the inverter. Remove shore power or turn off the generator and correct the wiring fault prior to operation. The Link 1000 will display a E05 for an AC backfeed shutdown.

Battery Overload

Source Manager LEDs	Condition
Overtemp/Overload	OFF
Low/High Battery	Fast blinking red
AC Transfer Fault	Off
AC Output	On*
Generator AC In	Off
Shore AC In	Off
Charging	Blinking green
Inverting	Off

The Source Manager II has detected a high ripple voltage on the battery. This is caused by excessively discharged batteries and a heavy DC load. Turn off the DC loads and allow the batteries to charge. The Link 1000 will display an E04 for a battery overload.

Transfer Fault 1

Source Manager LEDs	Condition
Overtemp/Overload	Off
Low/High Battery	Off
AC Transfer Fault	Fast blinking red
AC Output	Off
Generator AC In	**
Shore AC In	**
Charging	Blinking green
Inverting	Off

The Source Manager II has detected a loss of the neutral wire on the AC input. Transferring power in this condition can be detrimental to appliances. Check the wiring, especially the white wire continuity from the AC source to the Source manager II.

Transfer Fault 2

Source Manager LEDs	Condition
Overtemp/Overload	Off
Low/High Battery	Off
AC Transfer Fault	Solid red
AC Output	Off
Generator AC In	**
Shore AC In	**
Charging	Blinking green
Inverting	Off

The Source Manager has detected low voltage or high voltage on AC input Leg 2. Supply a different source of AC power.

Transfer Fault 3

Source Manager LEDs	Condition
Overtemp/Overload	Off
Low/High Battery	Off
AC Transfer Fault	Slow Blinking red
AC Output	Off
Generator AC In	**
Shore AC In	**
Charging	Blinking green
Inverting	Off

The Source Manager II has detected an overcurrent on Leg 1, Leg 2 or the Neutral. Reduce the loads and cycle AC power to reset.

The next three tables show troubleshooting guides that are used when there is no AC power to the loads and the Source Manager II is not detecting a fault

No AC to Loads shore power

Note: Mode and Corrective Action are not indicators on The Source Manager II

Source Manager LEDs	Condition
Mode	Shore Power
AC Transfer Fault	Off
AC Output	On
Generator AC In	Off
Shore AC In	ON
Charging	**
Inverting	Blinking green
Corrective Action	Check load breaker

No AC to loads generator

Source Manager LEDs	Condition
Mode	Generator
AC Transfer Fault	Off
AC Output	On
Generator AC In	On
Shore AC In	Off
Charging	**
Inverting	Blinking green
Corrective Action	Check load breaker

No AC to loads inverter

Source Manager LEDs	Condition
Mode	Inverter
AC Transfer Fault	Off
AC Output	On
Generator AC In	Off
Shore AC In	Off
Charging	**
Inverting	On
Corrective Action	Check inverter breaker on Source Manager

The problem may also be related to poor quality AC power from the shore or the generator.

Part No. 90-0128-00
AC Source Manager II V1.6.p65 4/7/00

SPECIFICATIONS

MODEL	SM II20	SM II25	SM II30
Heart Interface Part Number	81-0280-12	81-0281-12	81-0282-12
INVERTER			
Nominal Battery Voltage	12 VDC	12 VDC	12 VDC
Battery Voltage Range	10-15.5 VDC	10.0 - 15.5 VDC (+/-0.2)	10.0 - 15.5 VDC (+/-0.2)
Low Battery Cutout	10 +/- 0.5 VDC	10.0 VDC (+/-0.5)	10.0 VDC (+/-0.5)
Frequency Regulation	60 Hz Quartz Regulated	60 Hz Quartz Regulated	60 Hz Quartz Regulated
Inverter Output Power (Continuous at 75 deg F.)	2000 VA	2500 VA	3000 VA
Wave Shape	Modified Sine Wave	Modified Sine Wave	Modified Sine Wave
Surge Power	70 Amps	80 Amps	90 Amps
No Load Current Drain (Idle Mode)	.12 Amps	.12 Amp	.12 Amp
Power Factors Allowed	All	All	All
Full Load Efficiency	85%	85%	85%
Peak Efficiency	93%	93%	93%
PROTECTION			
Transfer Over-Current	Yes	Yes	Yes
Over/Under AC Output Voltage	Yes	Yes	Yes
Over/Under Battery Voltage	Yes	Yes	Yes
Short Circuit	Yes	Yes	Yes
Circuit Breaker	Yes	Yes	Yes
Over Current	Yes	Yes	Yes
Over Temperature	Yes	Yes	Yes
CHARGER			
AC Input Voltage Range	90-130 VAC	90-130 VAC	90-130 VAC
Charging Rate	100 Amps (3-stage)	130 Amps (3-stage)	140 Amps (3-stage)
Maximum AC Input Transfer Current	50 Amps AC	50 Amps AC	50 Amps AC
Maximum AC Input Charge Current	21 Amps	26 Amps	28 Amps
Bulk Charge Voltage	14.3**	14.3 VDC**	14.3 VDC**
Float Charge Voltage	13.4 VDC**	13.4 VDC**	13.4 VDC**
Equalizing Charge Voltage	16.3 VDC	16.3 VDC**	16.3 VDC**
Power Sharing	Yes	Yes	Yes
Temperature Sensitive Charging	Yes	Yes	Yes
Status Panel	Optional Remote or Link	Optional Remote or Link	Optional Remote or Link
Weight	66 lbs.	68lbs.	68 lbs.
Dimensions	21"L x 9.5"W x 14"H	21"L x 9.5"W x 14"H	21"L x 9.5"W x 14"H

GLOSSARY

Alternating Current (AC) An electric current that reverses direction at regular intervals. Sources of alternating current are shore power, generator power, inverter power or household current.

Ampere (Amp, A) The unit of measure of electron flow rate of current through a circuit.

Ampere-hour (Amp-Hr., AH) A unit of measure for a battery's electrical storage capacity, obtained by multiplying the current in amperes by the time in hours of discharge (Example: a battery which delivers 5 amperes for 20 hours delivers 5 amperes times 20 hours, or 100 Amp-Hr. of capacity.)

Ampere-Hour Capacity The ability of a fully charged battery to deliver a specified quantity of electricity (Amp-Hr., AH) at a given rate (Amp, A) over a definite period of time (Hr.). The capacity of a battery depends upon a number of factors such as: active material, weight, density, adhesion to grid, number, design and dimensions of plates, plate spacing design of separators, specific gravity and quantity of available electrolyte, grid alloys, final limiting voltage, discharge rate, temperature, internal and external resistance, age and life of the battery (bank).

AGM (Absorbed Glass Mat) Battery A lead acid, maintenance-free battery.

AWG (American Wire Gauge) A standard used to measure the size of wire.

Circuit An electric circuit is the path of an electric current. A closed circuit has a complete path. An open circuit has a broken or disconnected path.

Circuit (Series) A circuit which has only one path for the current to flow. Batteries arranged in series are connected with the negative of the first to the positive of the second, negative of the second to the positive of the third, etc. If two 6 Volt batteries of 50 ampere-hours capacity are connected in series, the circuit voltage is equal to the sum of the two battery voltages, or 12 Volts, and the ampere-hour capacity of the combination is 50 ampere-hours.

Circuit (Parallel) A circuit which provides more than one path for current flow. A parallel arrangement of batteries (of like voltage and capacity) would have all positive terminals connected to a conductor and all negative terminals connected to another conductor. If two 12 Volt batteries of 50 ampere-hour capacity each are connected in parallel, the circuit voltage is 12 Volts, and the ampere-hour capacity of the combination is 100 ampere-hours.

Combi Freedom Combi$_{TM}$ is a trademark of Heart Interface to indicate a combination inverter/charger.

Current The rate of flow of electricity or the movement rate of electrons along a conductor. It is comparable to the flow of a stream of water. The unit of measure for current is ampere.

Cycle In a battery, one discharge plus one recharge equals one cycle.

Direct Current (DC) Current that flows continuously in one direction such as that from batteries, photovoltaics, alternators, chargers and DC generators.

GLOSSARY

Equalize Charge A controlled overcharge of the batteries which brings all cells up to the same voltage potential, extends the battery life, restores capacity and mixes the electrolyte. This can only be done using the Freedom Remote Control Panel or a Link Instrument.

Gel Cell Battery A type of battery that uses a gelled electrolyte solution. These batteries are sealed and are virtually maintenance-free. Not all sealed batteries are the gel cell type.

GFCI (Ground Fault Circuit Interrupter) A protective device that rapidly de-energizes a circuit when current to ground exceeds a predetermined value.

Ground The reference potential of a circuit. In automotive use, the result of attaching one battery cable to the body or frame which is used as a path for completing a circuit in lieu of a direct wire from a component. This method is not suitable for connecting the negative cable of the inverter to ground. Instead, route the cable directly to the negative terminal of the battery.

LED (Light Emitting Diode) Indicator light.

LINK Instrument These panels monitor single and dual battery banks. Some models provide remote management of Freedom Inverter/Chargers. Available in 4 models: LINK 10, LINK 20, LINK 1000, LINK 2000, LINK 2000R.

NEC National Electric Code

Negative Designating or pertaining to electrical potential. The negative terminal is the point from which electrons flow during discharge.

Ohm A unit for measuring electrical resistance.

Ohm's Law Expresses the relationship between Voltage (V) and Current (I) in an electrical circuit with resistance (R). It can be expressed as follows: V=IR. If any two of the three values are known, the third value can be calculated by using the above formula.

Positive Designating or pertaining to electrical potential; opposite of negative. The positive battery terminal is the point where electrons return to the battery during discharge.

Power Sharing The feature of the charger to reduce its output when the AC power being consumed by the charger and external AC loads connected to the output of the inverter are in excess of the input breaker rating.

TSC Abbreviation for Temperature Sensitive Charging. The ability of the charger to adjust its charging voltage based on the temperature sensed at the battery bank if a temperature probe is used.

Volt The unit of measure for electric potential.

Watt The unit for measuring electrical power, i.e., the rate of doing work, in moving electrons by or against an electric potential.

Watt-Hour (Watt-HR, WH) The unit for measuring electrical energy which equals Watts x Hours.

Wet Cell Battery A type of battery that uses liquid as an electrolyte. The wet cell battery requires periodic maintenance.

WARRANTY

Your Heart Interface AC Source Manager is under limited warranty for 30 months from date of purchase.

Terms of this warranty are detailed on the warranty registration card. Please complete this card and return it to Heart Interface to register your warranty.

If the unit requires service, contact Heart Interface by telephone. The service technician will ask for the model and serial number and date of purchase of your unit. Please have this information ready.

Phone numbers: **(253) 872-7225**
(800) 446-6180
(outside 253 area code)

A return authorization number will be required on all returns. This number is issued by the service technician and should be written on the outside of the packaging

You must ship the unit to Heart Interface or a field service center freight prepaid.

INDEX

INDEX