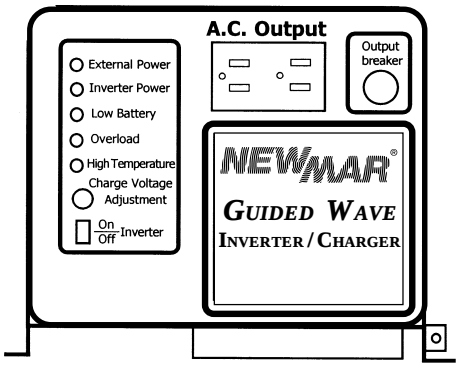
Inverter/Chargers

Guided Wave Series

Models:

12-1200IC
12-1799IC
24-1300IC



INSTALLATION/OPERATION MANUAL

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APR 2002

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I) OVERVIEW

Your NEWMAR Inverter/Charger uses 12 VDC or 24 VDC (depending on model) battery power to produce 120 VAC, 60 Hz power for operating virtually any AC appliance. It incorporates field-proven technology which provides reliable service in harsh commercial and recreational marine applications.

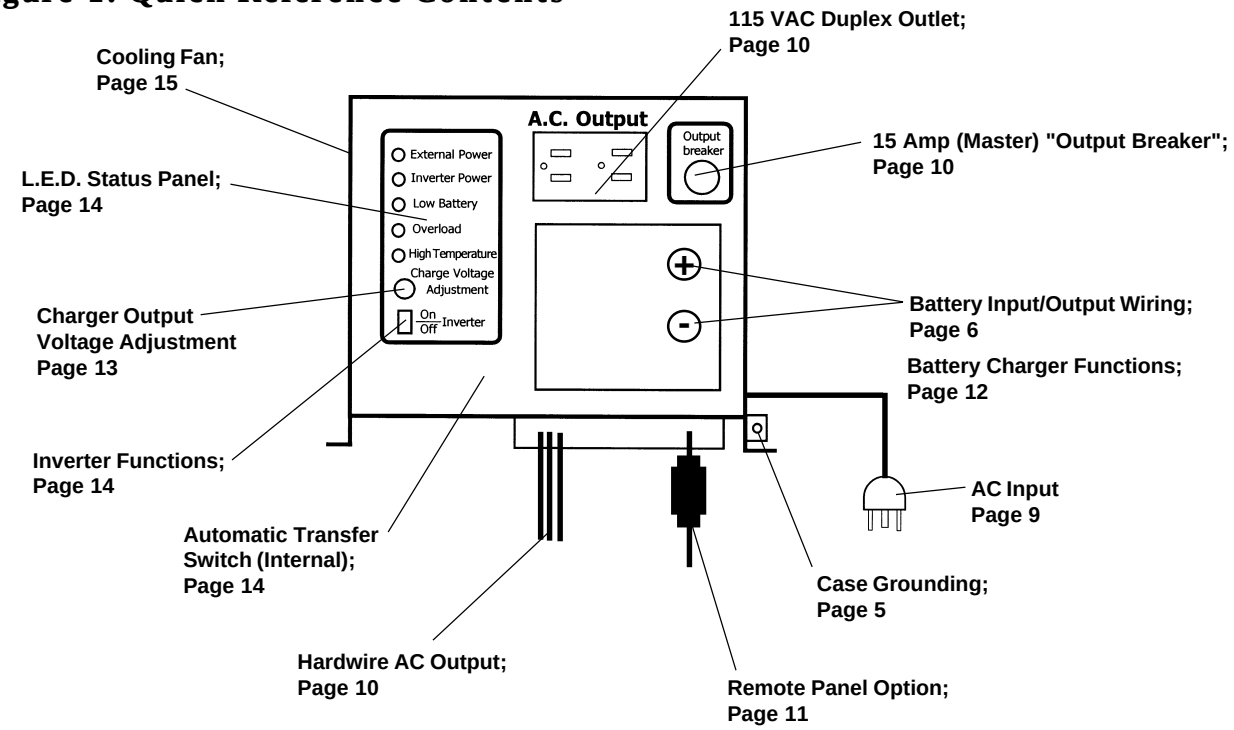
The **Guided Wave** series inverter/charger produces a quasi-sinusoidal output to match the RMS value of AC utility power and enables the operation of almost all appliances such as refrigerators, microwave ovens, dishwashers and power tools. (For highly sensitive loads such as computers and plasma screens, our Perfect Wave series is recommended, as it produces a pure sine wave.)

All units incorporate a built-in two stage battery charger for rapid and safe replenishment of batteries whenever shore or generator AC power is available.

All models feature numerous circuit and safety protections, such as thermally controlled cooling fans and ground fault protected duplex outlets, utilize automatic AC transfer relays and are housed in rugged, rust-resistant powder-coated aluminum cases suitable for permanent bulkhead or horizontal mounting. An optional remote indicator and control panel (model ICR-1) is available, as well.

In addition, your Inverter/Charger is UL listed and warranted for two full years, parts and labor. Careful attention to these instructions should enable you to enjoy many years of trouble-free service.

Figure 1: Quick Reference Contents



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II) IMPORTANT SAFETY CAUTIONS AND WARNINGS

CAUTION: Inverters produce hazardous voltages. To avoid risk of harm or fire the unit must be properly installed. There are no user-serviceable parts inside. Do not remove the inverter housing.

CAUTION: The inverter should not be mounted in a location that may be exposed to rain or spray.

CAUTION: The inverter should not be installed in a zero-clearance enclosure.

CAUTION: Damage to the inverter will occur if correct polarity is not observed when installing the DC input cables.

CAUTION: Damage to inverter will occur if an external AC source is applied to the inverter's AC output socket or its hard-wire AC output.

CAUTION: The inverter contains a circuit breaker and capacitor that may produce a spark. Do not mount in a confined battery or gas compartment.

CAUTION: Working in the vicinity of lead-acid batteries is dangerous. Batteries generate explosive gasses during operation. There is a risk of acid exposure. There is also a risk of high current discharge from shorting the battery that can cause fire and explosion.

CAUTION: UL and ABYC specify that the DC input shall be fused no farther than 18" from the battery. This is the responsibility of the installer.

CAUTION: Be sure both the inverter and, if used, the external AC input circuit breaker or fuse are turned "OFF" during installation.

WARNING: The inverter/charger is not ignition protected so it must not be located in an area where ignition protected equipment is required.

EXTERNAL CONNECTIONS TO THE INVERTER/CHARGER SHALL COMPLY WITH UL RECOMMENDATIONS AND/OR UNITED STATES COAST GUARD ELECTRICAL REGULATIONS (33CFR183, SUB-PART I)

THE INSTALLATION AND PROTECTION OF VESSEL WIRING ASSOCIATED WITH INVERTER/CHARGERS SHALL COMPLY WITH ABYC STANDARDS E-8) AC ELECTRICAL SYSTEMS ON BOATS, E-9) DC ELECTRICAL SYSTEMS ON BOATS, A-20) BATTERY CHARGING DEVICES AND A-25) INVERTERS.

III) INSTALLATION

IMPORTANT: Do not attempt to begin the installation until you have read and understood this section completely. If you have any questions regarding the installation of the inverter/charger, contact NEWMAR's technical service before proceeding.

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A) Materials Provided

The inverter/charger is provided with an installation kit containing the following:

(2 ea.) Cable clamps
(1 ea.) Warning label for AC distribution panel
(1 ea.) Installation/Operation Manual
(1 ea.) Customer satisfaction/warranty card

If items any are missing, please contact the factory. Upon completion of the installation, please fill out the warranty card and return it to the factory. (Be sure to include the serial number of the unit, located on the top of the housing.)

B) Location

The inverter/charger should be located as close to the batteries as possible, ideally no more than about 4-6 feet. The maximum allowable distance is 20 feet. Do not mount the unit directly over the batteries as battery fumes may cause excessive corrosion. *WARNING: The inverter/charger is not ignition protected so it must not be located in an area containing gasoline engines or the like, nor in any other area where ignition protected equipment is required.* The area should be well ventilated and free from moisture, exhaust manifolds and battery fumes.

Do not locate the unit where water, spray or condensation can occur, as this will shorten its life. It should not be located where there is a possibility of dust or debris being drawn into the unit through the fan. A minimum of 2" clearance around the unit is recommended for proper cooling.

If the inverter/charger is located in an extreme heat area, such as an unventilated engine room, and maximum operating temperature is exceeded, an automatic thermal protection circuit will shut the unit completely off. It will automatically return to service when it has cooled sufficiently, however this thermal cycling will shorten the life of the inverter/charger, so if this condition occurs repeatedly, it should be relocated. For optimum performance and longer life the unit should not be located in an area of high temperature.

C) Mounting

The inverter/charger may be mounted on either a horizontal or vertical surface; performance will be unaffected by its orientation, however, per UL safety recommendations, when mounted vertically the front panel controls should be facing downward. It may be mounted on either a metal or non-metal surface. Four 1/4" screws (wood or machine screws, depending on mounting surface) with washers are required to secure the unit to the mounting surface.

IMPORTANT: Although the inverter/charger is constructed of materials and in a manner which makes it resistive to the corrosive effects of the marine environment the unit is not waterproof. Do not mount the charger where there is a possibility of water entering the unit. Evidence of water entry into the charger will void the warranty.

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D) Case Grounding

The case of the inverter/charger *must* be properly grounded to ship's ground*.

> **Per ABYC A-20: A DC chassis grounding conductor shall be connected from the case of the battery charger to the engine negative terminal or its bus, and must not be more than one size under that required for the DC current-carrying conductors.*

For example, if the installed battery wiring (see Wire Size Chart in the following section) is 1 AWG, then the minimum size of the grounding cable is 2 AWG. Use stranded copper wire for case grounding. A screw compression lug located on the right-hand side of the unit is provided for attaching the ground wire to the case. The lug accommodates wires up to 1/0 AWG. A flat blade screwdriver is required to tighten the lug.

E) Battery Selection and Sizing

The inverter/charger should only be wired to deep cycle lead-acid batteries of flooded, gel or AGM construction. The battery bank should be a dedicated inverter (or house) bank. It should not be connected to batteries which are designed primarily for engine or generator starting. Those batteries are not designed for repeated deep discharges which are common with inverter operation.

There are quite a number of variables which can influence the proper size of a battery system (expressed as amp-hour capacity) which is used in conjunction with an inverter. Some of these include:

- Battery type
- Discharge rate
- Intermittent or continuous operation
- Ambient temperature
- Time between recharge cycles
- Depth of discharge

No single formula can practically cover all these variables, however, a general calculation may be used which assumes no extraordinary variable (such as very high or low temperatures in the battery environment) to make an educated estimation of the proper battery size. The result can then be adjusted up or down to compensate for unusual circumstances.

Use the following procedure to calculate the required amp-hour capacity for your battery system:

> *Note: It is assumed that the batteries are a suitable deep-cycle type, that discharge will not exceed 50%, and that batteries will be fully recharged after each cycle of inverter use.*

1) Determine the maximum amount of time in hours that the inverter will run the loads before an external source of AC becomes available and batteries can be fully recharged.

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2) Survey all AC appliances and determine how many watt-hours will be consumed by each during that same period. For instance, if a 100 watt TV will be powered for 3 hours, that equals 300 watt-hours. If a 1,500 watt microwave will also be run for half an hour, then that is another 750 watt-hours (i.e., 1,500 x .5). Bear in mind that some loads, such as refrigerators, are intermittent, so an average must be used.

3) Add up the total watt-hour consumption of all appliances, then apply this simple rule to determine total DC (battery) amp-hours consumed:

12 Volt Inverters: Divide Watt-Hours by 10
24 Volt Inverters: Divide Watt-Hours by 20

Note: These divisors allow for standard inefficiency during voltage conversion.

4) Finally, since it is generally recommended that batteries never be discharged below 50%, the result must be multiplied by 2 to obtain the proper total battery capacity.

Example # 1: You have a 12 volt inverter. Your total consumption between recharge cycles is 2,400 watt-hours, so...

2,400 ÷ 10 = 240 (Amp-Hours Consumed)
240 x 2 = 480

So, in this example, a properly sized battery system will be rated for at least 480 amp-hours.

Example # 2: You have a 24 volt inverter. Your total consumption between recharge cycles is 3,600 watt-hours, so...

3,600 ÷ 20 = 180 (Amp-Hours Consumed)
180 x 2 = 360

In this case, you need a battery system rated for at least 360 amp-hours.

F) Battery (DC) Wiring

CAUTION: Ensure that hydrogen gas does not accumulate near the battery by keeping the area well ventilated. A substantial spark may result when connecting the final battery wiring due to an initial charging of the internal input capacitor.

Refer to Figure 2 on the following page for a typical battery wiring scheme.

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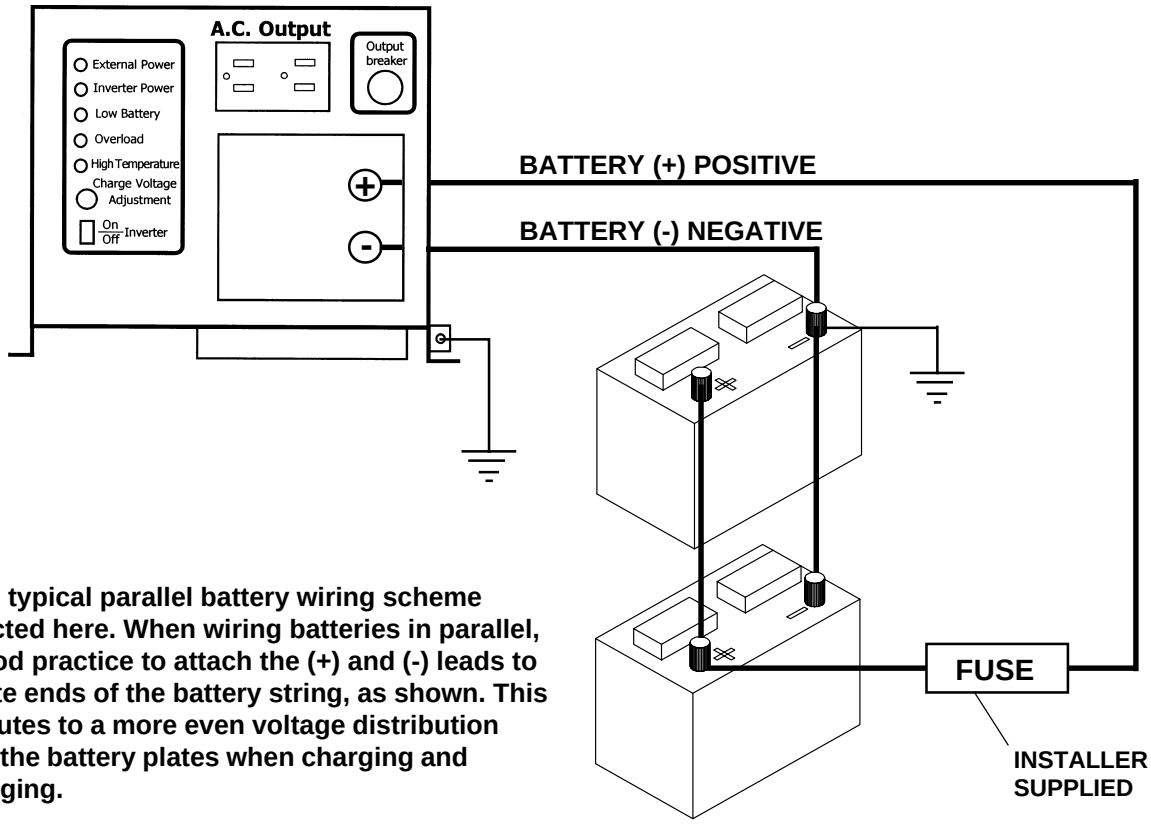
FIGURE 2: Typical Battery Wiring



Note: A typical parallel battery wiring scheme is depicted here. When wiring batteries in parallel, it is good practice to attach the (+) and (-) leads to opposite ends of the battery string, as shown. This contributes to a more even voltage distribution among the battery plates when charging and discharging.

Use only stranded copper wire for DC input/output. Refer to the following chart for the proper wire size depending on inverter/charger model and the length of wire required*:

Wire Size Chart

Model	Length of Wire from Charger to Batteries (in feet)			
	10'	15'	20'	Over 20'
	Minimum Wire Gauge (AWG)			
12-1200IC	#4	#2	#2	*Not Recommended*
12-1799IC	#1	#1	#1/0	*Not Recommended*
24-1300IC	#8	#8	#6	*Not Recommended*

**Meets minimum requirements of ABYC 10% voltage drop table for inverter maximum input current, 3% voltage drop table for charger maximum output, and allowable amperage for 105° C rated insulation conductors <50 VDC inside engine space. Consult ABYC E-9 for lower temperature rated insulated conductors.*

CAUTION: Ensure that leads are properly fused no further than 18" from the battery. (Refer to ABYC recommendations regarding fuse type and location.) Refer to the chart on the following page for the proper battery fuse value for each model:

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DC Fuse Chart

Model	Fuse Value
12-1200IC	150 Amp
12-1799IC	200 Amp
24-1300IC	100 Amp

To gain access to the DC wiring lugs of the inverter/charger, remove the wiring access cover from the front of the unit (plate is screened with the "Guided Wave" trademark/logo), which is held in place by two phillips-head screws.

A pair of large screw compression lugs for DC wiring are located in the compartment on the far right. Use 1/4" flat blade screwdriver for loosening and tightening these terminals. *CAUTION:* Do not attempt to loosen or tighten these terminals when the DC wiring is connected to a battery. There is a possibility of shorting through the screwdriver between the case and the (+) terminal, which will cause a violent spark and possible injury.

DC wires are fed through the two access ports on the right-hand side of the unit labeled "(+) POSITIVE" and "(-) NEGATIVE". After the wires have been attached to the terminals, tighten the cable strain relief securely with a phillips screwdriver to protect against any possible loosening of the DC wires.

Install a properly sized and located DC fuse (as per ABYC recommendations cited above) in the positive leg of the battery wiring, then attach the wires to the battery, carefully observing correct polarity. *Note: It is normal to encounter a spark when connecting the final battery wiring due to the initial charging of an internal input capacitor.*

CAUTION: A reverse polarity connection will result in damage to the inverter/charger which is not covered under the warranty.

G) Charging Multiple Battery Banks

If desired, the charger may be wired to charge multiple battery banks. This can be accomplished using NEWMAR's BI-100 Battery Integrator. The device acts as a "smart" switch, connecting independent battery banks only when a charging voltage is present, then disconnecting them for selective discharge. This allows you to also charge an engine start bank, for instance, whenever external AC is present, but draw current only from the house or dedicated inverter bank whenever the inverter is operating.

Note: Standard diode-type isolators are not recommended for splitting the output of the internal charger among multiple battery banks, as the voltage drop through the diodes will result in chronic undercharging of the additional banks.

A separate BI-100 is required for each additional battery bank to be charged. Contact the factory for more information on this product.

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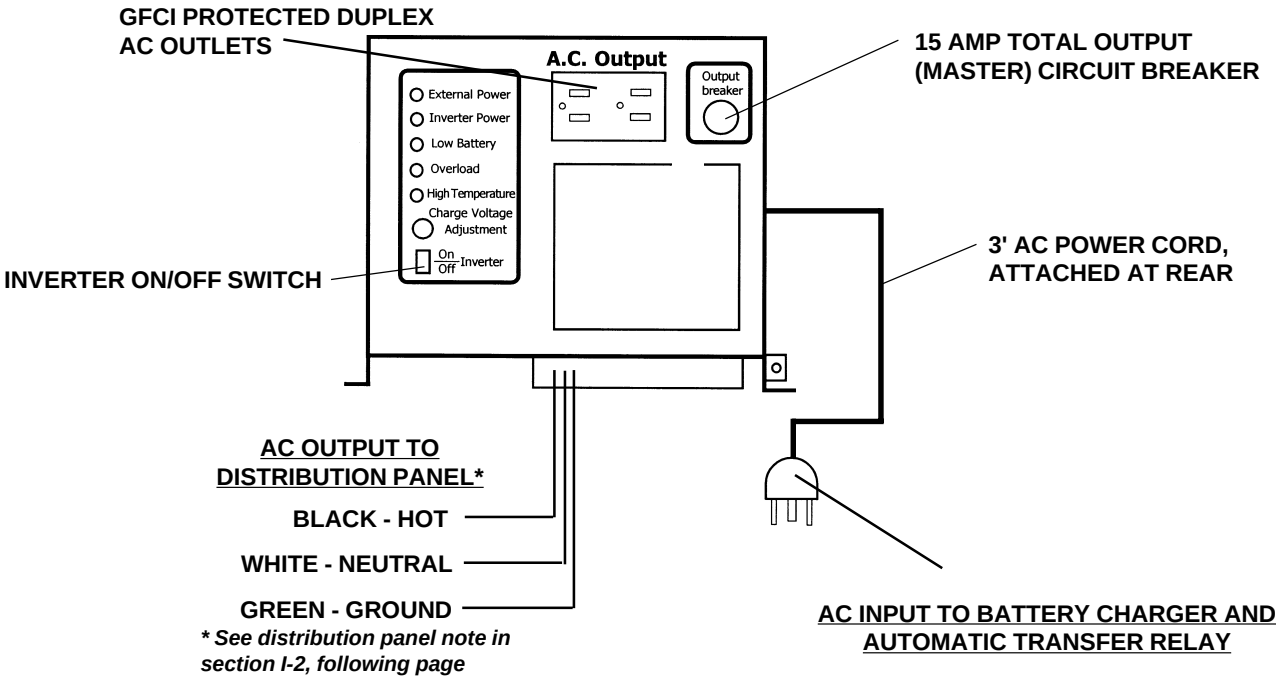
H) AC Input Wiring

Refer to Figure 3 for all AC input and output wiring options in this section and in section I.

Figure 3: AC Input and Outputs



The inverter/charger is provided with a three-wire 12 AWG AC cord with molded plug . It should be plugged into a properly grounded and over-current protected outlet which is "hot" whenever shore or generator AC power is available. The AC input serves two functions:

1) It provides power for the internal battery charger whenever external AC is available.

2) It allows routing of an external AC source through the inverter/charger so that, by use of a built-in automatic transfer switch, AC is available directly from the unit at all times either from the inverter or shore/generator power.

Note: There is a set of AC wires located in the compartment on the bottom front of the unit which is labeled "AC Wiring Compartment". These are for optional hard-wiring of *AC Output only*. *Do not* attempt to hard-wire AC input through these wires. Applying AC from an external source to the AC output wires will cause severe damage and void the warranty.

If hard-wiring of AC input is desired the plug may be removed. Use stranded copper 12 AWG wire only and pay careful attention to color-coding as follows:

Black.....Hot
White.....Neutral
Green.....Ground (safety, earth)

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AC input wiring for the inverter/charger must be routed through a 15 amp fuse or circuit breaker on an AC distribution panel with proper safety/earth chassis ground in accordance with all applicable local codes and ordinances.

I) AC Output Options

AC output is available from both the front panel AC duplex outlets and via the AC hard-wired output, which is typically routed through an AC distribution panel.

1) AC Outlets: A duplex outlet is provided for USA standard three-prong plugs. The maximum current draw through both outlets (and AC hard-wire output, explained below) combined at any one time is 15 amps (1800 watts). The outlets are over-current protected by a resettable 15 amp output breaker on the front panel beside the outlets.

The outlets are protected by a GFCI (Ground Fault Circuit Interrupter) which automatically disconnects the outlets when any significant amount of AC is detected on the ground circuit which could present a shock hazard. *Note:* The AC hard-wire output is <u>not</u> GFCI protected.

2) AC Output Hard-Wiring

CAUTION: Integrating the inverter output with existing AC branch circuits must only be attempted by a qualified marine electrician. Options may include isolating breakers on an existing panel or installing a separate, dedicated inverter AC sub-panel.

Three 14 AWG AC output wires are located in the "AC Wiring Compartment" on the bottom front of the inverter. To access them remove the compartment cover using a phillips screwdriver. *Before* attaching the output wires:

1) Pop out one of the circular knock-outs in the compartment cover. (It may be necessary to punch it out by firmly tapping it with a hammer and chisel/screwdriver.)

2) Install one of the provided cable clamps in the hole.

3) Pass the external AC wires through the clamp.

4) The internal wires have been factory-fitted with 16-14 AWG butt splices. Use a crimping tool to connect the wires.

5) Replace the compartment cover and tighten the cable clamp to secure the wiring.

Note: Installation of the remote panel also requires access to this compartment, so if that option is being installed, do that first before replacing the cover.

CAUTION: Do not connect any other source of AC power directly to the output of the inverter. <u>This will result in damage not covered under the warranty</u>.

<u>IMPORTANT INSTALLATION NOTE:</u> Per ABYC section A-25 a label must be installed at the main electrical panel to warn anyone who may work on that panel that an inverter has been

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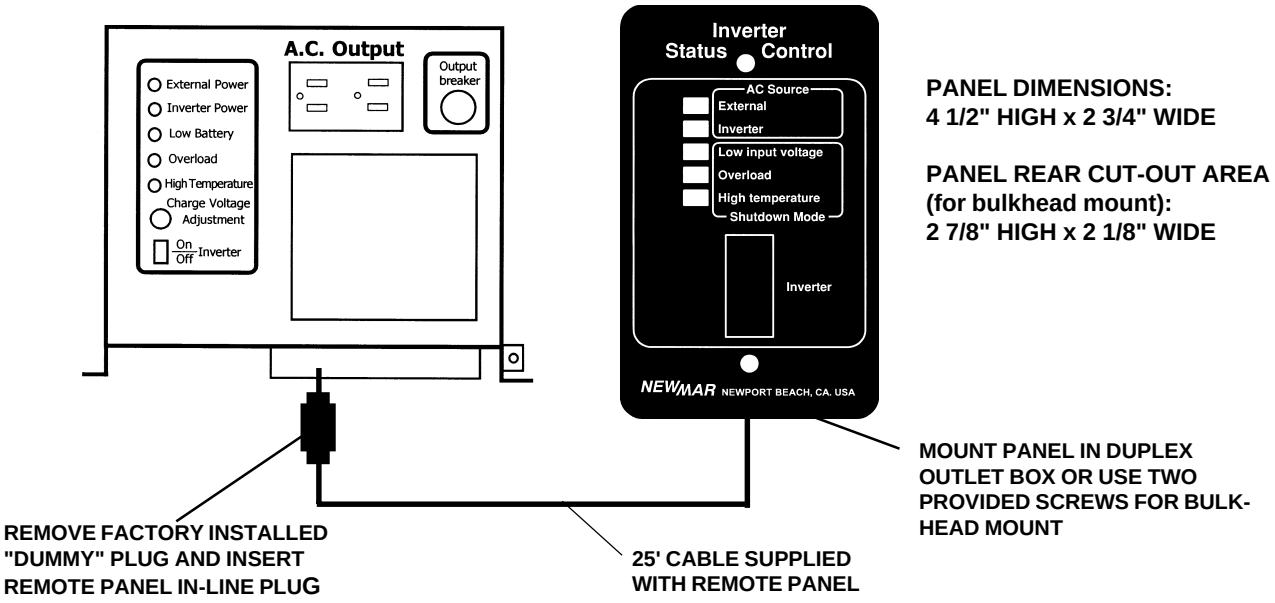
installed. This is because it might be falsely assumed that after the AC main has been shut off the panel is no longer "hot", when it may still be, due to the automatic functioning of the inverter. A set of AC distribution panel warning labels has been provided in the installation kit. Choose the preferred black or white background label and affix it in a clearly visible location at the panel.

CAUTION: The AC outlets and AC hardwire output on the inverter remain “live” when derived from an external source, even when the inverter is shut off.

J) Remote Panel (Optional)

Remote monitoring of inverter functions, as well as inverter output activation/shut-off, may be obtained using model ICR-1 Remote Panel, available from NEWMAR. The panel duplicates all of the LED status indicators (discussed in section V following) which are on the front panel and incorporates a secondary on-off switch for the inverter.

FIGURE 4: Remote Panel Installation



The panel face and mounting hole pattern have been designed for an exact fit within a duplex outlet box. If preferred, it may be mounted directly to a bulkhead with the two provided black-oxide wood screws. Note the cut-out dimensions specified in Figure 4 and take special care when making the cut-out as the tolerances between the mounting holes and rear-mounted circuit board are quite small.

The ICR-1 is supplied with 25 feet of cable. If additional length is required, contact the factory for an extension cable.

The inverter/charger is supplied from the factory with an in-line connector assembly which is located in the same compartment as the AC output wires. The connector is a telephone jack type and has a “dummy” plug attached which enables all of the inverter functions when no remote panel is used. Remove and *save* this plug prior to attaching the remote

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panel plug. (The dummy plug is required to restore proper functioning of the unit if the remote panel must be disconnected for any reason in the future.)

To install the in-line plug:

1) Remove the "AC Wiring Compartment" cover (if it has not already been removed to attach AC output wires).

2) Pop out one of the circular knock-outs in the compartment cover. (It may be necessary to punch it out by firmly tapping it with a hammer and chisel/screwdriver.)

3) Install one of the provided cable clamps in the hole.

4) Pass the connector and cable of the remote panel through the clamp, then tighten it down securely.

5) Snap the plug into the in-line assembly and replace the compartment cover.

Note: In order for the remote panel's Inverter On-Off switch to operate, the on-off switch on the inverter front must be in the “ON” position. Refer to section V-B for more information on the operation of the ON/OFF switch.

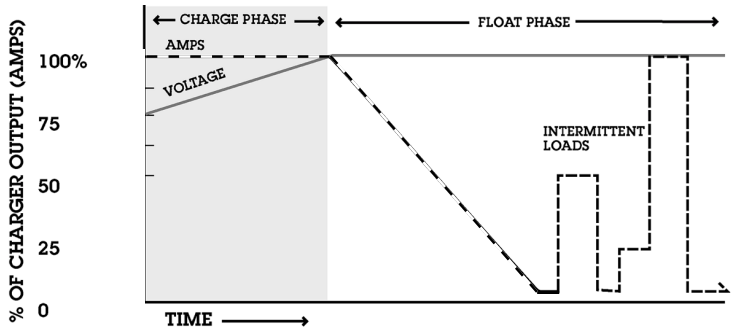
IV) BATTERY CHARGER OPERATION AND ADJUSTMENT

A) Charger Operation

Operation of the built-in two-stage battery charger is fully automatic and the charger is operational whenever external AC is applied.

Figure 5 illustrates a typical output curve of the charger into batteries which are deeply depleted (and not under load, initially) as well as output when a load is applied to fully charged batteries.

FIGURE 5: Typical Two Stage Charging Output Graph



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Note that as depleted batteries are first encountered, the charger responds with high "bulk" current output. This high current output continues until the finishing or "float battery voltage is achieved (13.8 VDC for 12 volt models; 27.6 VDC for 24 volt model).

At this point, the battery would measure full charge if tested with a voltmeter, but it is only what is called a “surface charge”. For this reason the charger continues to deliver amperage (as shown in the graph) but output begins to fall off as the battery plates become saturated. When current output is at or near zero, batteries are at or near full voltage.

Note that once batteries are fully charged and intermittent DC loads are applied (as shown in the graph) battery voltage remains constant. This is due to the charger’s excellent output regulation. The charger senses any DC load demand (while external AC voltage is applied) and responds instantaneously with the required current output while maintaining constant output voltage. This is unlike older technology chargers which respond with significant current output only when DC load demands have caused a substantial drop in battery voltage.

Therefore, once batteries are fully charged, any DC load on the system (within charger rating) will come directly from the charger—not the batteries—so there is no need to “top off” batteries if there have been DC appliances or electronics in use and it becomes necessary to disconnect the charger before getting under way.

While the output regulation of the charger will minimize battery gassing and water loss, monthly checks of the electrolyte level (for wet lead acid batteries) are still strongly recommended. Some water loss is an inevitable aspect of the charging process, and maintaining the correct electrolyte level in your batteries is the most important thing you can do to assure their maximum performance and long life.

B) Adjusting Charger Output Voltage (Optional)

The finishing or "float" output voltage of the internal battery charger has been factory preset at 13.8 VDC (12 volt models) or 27.6 VDC (24 volt model). This voltage assures full charge while staying just below the gassing point of most typical marine batteries.

If a special application requires it, the output voltage may be adjusted up or down somewhat. Use a small flat tip screwdriver to turn the potentiometer on the front panel which is labeled "Charge Voltage Adjustment":

- Turn clockwise to raise the finishing voltage
- Turn counter-clockwise to lower the finishing voltage

The factory-set output voltage and approximate user-adjustment range are as follows:

Model	Factory Set Output Voltage	Adjustment Range
12-1200IC	13.8 VDC	12.8 - 14.5 VDC
12-1799IC	13.8 VDC	12.8 - 14.5 VDC
24-1300IC	27.6 VDC	25.6 - 29.0 VDC

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CAUTION: This adjustment should be made only by a qualified marine electrician. Special tools and procedures are required for accurate adjustment of output voltage. Consult with the battery manufacturer for charging voltage recommendations before making this adjustment. Over or undercharging will result in battery damage.

V) INVERTER OPERATION

A) Start-Up/Operation

When all battery and AC wiring has been correctly installed, check for proper operation as follows:

1) With no external AC applied, turn the power switch on the front of the unit to "On". The "Inverter" L.E.D. should illuminate.

Note: If the remote panel is used, the power switch on that panel must also be turned on for the inverter to operate. In addition, every L.E.D. indication on the remote panel should be identical to the indication on the front panel of the inverter. Verify that this is so during start-up tests and initial operation.

2) Plug an AC appliance into each of the two receptacles (outlets) on the front of the inverter and verify proper operation. If the appliance does not operate, the black GFCI test button may have been inadvertently pushed during installation. Press the red reset button and the appliance should then operate.

3) Check the proper hard-wire output (if used) by plugging the appliance into a receptacle which is fed by the AC distribution system.

4) Apply external (shorepower or generator) AC to the input of the inverter. *After a delay of approximately 5 seconds* the internal automatic transfer switch should activate and the "External Power" L.E.D. should illuminate.

5) Remove the external AC source. The automatic transfer switch should activate immediately, and the "Inverter" L.E.D. should again illuminate.

Having completed this initial test the external AC source may be reapplied and all inverter/charger functions should then be operational with no further attention required, other than occasional status checks, as desired.

A Note Regarding Use with Microwave Ovens

Because the inverter produces a quasi-sine rather than true sine wave output, microwave ovens will typically cook more slowly using the inverter than if operating on utility power. This is normal, and some experimentation may be necessary at first to determine correct cooking times.

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B) Inverter ON/OFF Switch Functions

It is important understand the functioning of the ON/OFF switch of the inverter, so that there can be no incorrect assumption about when AC is being applied within the unit, at the duplex outlets or the AC hard-wire output.

1) The ON/OFF switch (either on the front or remote panel) controls *only* whether the internal DC-AC inverter is operating. *Whenever external AC is applied* the internal battery charger is operational and AC is "live" at both the duplex outlets and the AC hard-wire output, even if the switch is "OFF". Only shutting off the external AC at its source will prevent AC flow through the inverter. (Note that, when external AC is applied the "External" L.E.D. remains illuminated, regardless of which position the ON/OFF switch is in.)

2) If a remote panel is connected and:

a) the front panel switch is ON, then the inverter can be controlled with the remote ON/OFF switch.

b) the front panel switch is OFF, then the inverter remains off, regardless of the position of the switch on the remote panel.

C) Inverter Shutdown Indications and Causes

Three "Shutdown Mode" L.E.D.s are provided to indicate an abnormal condition which has caused the inverter to cease functioning temporarily. The indicators and likely causes are as follows:

1) "Low Input Voltage" L.E.D.: Batteries may be permanently damaged by extreme discharge. Therefore, the inverter monitors battery voltage and shuts off when it reaches a critical low point (10.5 VDC for models 12-1200IC and 12-1799IC; 21.0 VDC for model 24-1300IC). Typically, this occurs when operating the inverter for long periods without any external AC source coming on line to recharge the batteries. If this condition occurs soon after the inverter is turned on, it may be due to an under-sized, old/weak battery system or to under-sized/over-length battery wiring. Verify proper battery capacity and health, verify proper wire size and length (see Battery Wiring section), then recharge fully.

2) "Overload" L.E.D.: This may be due to either of two causes; short circuit or too much wattage demand. Remove all AC loads. If the indicator remains lit, then a short circuit is likely. Check AC output wiring carefully. If load removal causes this L.E.D. to be extinguished then the demand is probably exceeding the inverter's rating. Check the total wattage of all appliances being used at one time and this is within the unit's rating.

3) "High Temperature" L.E.D.: The inverter employs an integral cooling fan which operates automatically to keep the unit within rated operating temperature—under

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normal operation, and when properly installed. It is also protected, however, by an internal thermal switch which shuts the unit completely off when it gets too hot. This is typically due to being located in a high temperature area or a small enclosure which restricts air flow, or due to a blockage of the air intake of the cooling fan. Ensure free flow of air around and into the unit. Relocate it if necessary. *Note*: The thermal switch is self-resetting, so the inverter/charger will automatically return to service when it cools to a safe operating temperature. Nevertheless, thermal cycling of this sort will shorten the life of the unit, and should not be allowed to continue if it is noted.

VI) SPECIFICATIONS

MODEL	**12-1200IC**	**12-1799IC**	**24-1300IC**
Inverter Output:			
VAC	115V, 60 Hz.	115V, 60 Hz.	115V, 60Hz.
Watts (Surge)	3300	6000	3000
Watts (Cont.)	1200	1800	1300
Wave Type	Quasi-Sine	Quasi-Sine	Quasi-Sine
Inverter Input:			
VDC	11-14	11-14	22-28
Max Amps	120	180	65
Charger Output:			
VDC (@ Float)	13.8	13.8	27.6
Max Amps	50	65	25
Charger Input:			
VAC	115V, 60 Hz.	115V, 60 Hz.	115V, 60Hz.
Max Amps	9	13	9
Weight: Lbs.	27	27	26

Case Size (all models):	**H**	**W**	**D**
	7.5"	8.2"	15.0"

Internal Charger Type: Two stage; "Bulk/Float"

Operating Temperature (all models): -22° C to +40° C (0° F to 104°F)

Mechanical Features (all models):
- Thermally controlled cooling fan
- GFCI protected duplex outlets
- Powder coated aluminum case with integral mounting flanges
- Conformal coated printed circuit boards

Protection Features (all models):
- Automatic low battery shutdown
- Output circuit breaker
- Auto high temperature shutdown/recovery
- Short circuit protection
- Overload protection
- Current limiting (battery charger)

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Compliance:

- UL 458 Listed

Options

- Remote control and indicator panel; provided with 25‘ of cable. Model: ICR-1
- Battery Integrator for charging multiple output banks. Model: BI-100
- Digital DC Energy monitor for precise indication of battery volts, amps, amp-hours used and remaining. Includes programmable high/low voltage remote alarms. Model: DCE

VII) BATTERY CARE TIPS

Regular maintenance and proper care will assure you reliable service from the most depended upon and sometimes most neglected items, your batteries and battery charger. NEWMAR battery chargers are designed to keep your batteries fully charged but your batteries also need proper regular maintenance to provide a maximum life of service.

ALWAYS READ AND FOLLOW THE BATTERY MANUFACTURER'S INSTRUCTIONS

Battery Installation

Batteries must be securely mounted to prevent them from falling over when the vehicle or boat is in motion. A loose battery can do serious damage. Batteries should be mounted in a battery box to contain any acid spill. Batteries give off a certain amount of hydrogen gas when they are charging. When concentrated, this gas is highly explosive. Therefore make sure they are in an accessible place with adequate ventilation for any hydrogen gas discharge.

Cleaning Batteries

Dirt and electrolyte salts can build up on the top of your batteries. This accumulation conducts electricity stored in the battery and can cause the battery to discharge by itself. Therefore, at least twice a year, it is a good idea to disconnect the battery cables and scrub the battery with a baking soda solution. Rinse with fresh water and dry with a clean cloth.

You may wish to purchase a set of terminal post corrosion prevention rings. These are alkali-saturated felt rings that slip over the battery post to reduce corrosion. Do not apply grease to any part of the battery terminals, but you may use an occasional light spray of silicone lubricant.

Routine Checks and Maintenance

Batteries should periodically be “exercised” (slowly discharged and then recharged) to keep them in top condition. New batteries may need to be exercised before they will be capable of their full rating.

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If your batteries are not the sealed type, distilled water should be added to them whenever needed. The electrolyte should cover the plates by about 1/2", allowing a small air space at the top. Do not fill the cells up to the filler cap as this could cause the battery to sputter out electrolyte when it is being charged. Only distilled water should be used never plain tap water. Tap water contains chemicals and elements that can alter the properties of the electrolyte, including specific gravity. Some chemicals may also create an insulating coating on the battery plates which will retard current flow.

The rate that water is lost by the battery is dependent on several factors; battery condition, ambient temperature, battery use, charge voltage, etc. It is normal for batteries which are not maintenance-free to require topping off about once a month.

A battery's state of charge may be monitored by checking the specific gravity or by open circuit voltage. You may use the following table to evaluate the condition of your batteries:

Battery Condition Table

Specific Gravity Measured by Hydrometer	**Open Circuit Voltage**		**State of Discharge @ 80° F**
	12 Volt System	**24 Volt System**	
1.265	12.6 or more	25.2 or more	Fully Charged
1.225	12.4	24.8	25 % Discharged
1.190	12.2	24.4	50 % Discharged
1.155	12.0	24.0	75 % Discharged
1.120	11.7 or less	23.4 or less	100 % Discharged

** Note: Wait at least 5 minutes after charging or discharging before checking specific gravity or open circuit voltage. The battery's voltage needs to stabilize in order to get an accurate reading.*

Troubleshooting Your Battery System

If your battery will not accept or hold a charge, one of the following conditions may exist:

1. **A BAD BATTERY**. You may have a battery with an open or shorted cell, a battery without any "life" left. Check by charging the battery until all cells have a specific gravity of 1.225 or greater at 80° F. If you are unable to obtain 1.225 in each cell, replace the battery.

2. **A BAD BATTERY CHARGER**. If the battery open circuit voltage is low and/or the hydrometer indicates your batteries are low, the battery charger should be providing current to the batteries. If it is not, check the input fuse and check to see that you have charging voltage on the output with no battery attached. *Note: You will not get an accurate voltage reading on the output of the charger with no batteries attached. This is checked merely to ensure that you do not have an open circuit on the output.*

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The battery charger has a thermal power reduction circuit to protect the charger from overheating. If you suspect this is the case, refer to the INSTALLATION section for information about proper charger location.

3. **ELECTRICAL LEAKAGE**. You may have a previously unsuspected source of current drain from the battery. To check for a leakage of this sort, disconnect the battery ground cable and connect an ammeter between the negative battery post and ground. If you have a reading over .1 amp, there is a source of current drain from the batteries which must be located and removed.

VIII) REFERENCE APPENDIX

- For more information about boat wiring to conform to U.S. Coast Guard regulations, write:

  Superintendent of Documents
  Government Printing Office
  Washington, DC 20402

  Request : 33 CFR 183 Subpart I

- For information about American Boat and Yacht Council recommendations for boat wiring, write to:

  American Boat and Yacht Council
  3069 Soloman's Island Road
  Edgewater, MD 21037

  Request: Standards and Recommended Practices for Small Craft.
  AC systems: Section E8
  DC systems: Section E9
  A-20: Battery Charging Devices
  A-25: Inverters

- For additional installation instructions, refer to:
  ANSI NFPA 302

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