

INSTALLATION & OPERATION MANUAL

**BCA610 SERIES
AC SOURCE
BATTERY CHARGER**



AC SOURCE BATTERY CHARGER

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS — This manual contains important safety and operating instructions for the battery charger.

BATTERY CHARGER PRECAUTIONS

1. Do not expose the battery charger to rain or snow unless it is a sealed model.
2. Use of an attachment not recommended or sold by the battery charger manufacturer may result in a risk of fire, electric shock, or injury to persons.
3. Do not disassemble the battery charger; return it to the manufacturer or an authorized service center when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire. Voltages in excess of 350 volts are present inside the charger anytime it is plugged into an AC outlet, even if it is switched off.
4. To reduce risk of electric shock, unplug the battery charger from the AC outlet before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.
5. Never place battery charger directly above battery; gases from battery will corrode and damage battery charger.
6. Never allow battery acid to drip on the battery charger.

BATTERY SAFETY

1. WARNING — RISK OF EXPLOSIVE GASES
 - i. WORKING IN VICINITY OF A LEAD-ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT EACH TIME BEFORE SERVICING EQUIPMENT IN THE VICINITY OF THE BATTERY, YOU READ THIS USER GUIDE AND FOLLOW THE INSTRUCTIONS EXACTLY.
 - ii. To reduce risk of battery explosion, follow these instructions and those published by the battery manufacturer and manufacturer of any equipment you intend to use in vicinity of battery. Review the cautionary marking on these products.
 2. PERSONAL PRECAUTIONS
 - iii. Someone should be within range of your voice or close enough to come to your aid when you work near a battery.
 - iv. Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.
 - v. Wear complete eye protection and clothing protection. Avoid touching eyes while working near battery.
 - vi. If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately
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- vii. NEVER smoke or allow a spark or flame in the vicinity of a battery.
- viii. Be extra cautious to reduce risk of dropping a metal tool onto battery. It might spark or short-circuit the battery or other electrical part that may cause a fire or explosion.
- ix. Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to melt metal, causing a severe burn.
- x. NEVER charge a frozen battery.
- xi. If it is necessary to remove a battery from service, always remove grounded terminal from battery first. Make sure all accessories connected to the battery are off, to prevent an arc when reconnecting the new battery.
- xii. Be sure area around battery is well ventilated.
- xiii. Clean the battery terminals. Be careful to keep corrosion from coming in contact with eyes.
- xiv. Study all the battery manufacturer's specific precautions such as removing or not removing cell caps while charging and recommended rates of charge

GROUNDING AND AC POWER CORD CONNECTION INSTRUCTIONS

The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

DANGER Never alter the AC power cord or plug provided. If it will not fit the output, use an approved adapter or have the proper AC power cord installed by a qualified electrician. Improper connection can result in the risk of electric shock.

Medical Equipment Notice

Analytic Systems does not recommend the use of their products in life support applications where failure or malfunction of this product can be reasonably expected to cause failure of the life support device or to significantly affect its safety or effectiveness. Analytic Systems does not recommend the use of any of its products in direct patient care. Examples of devices considered to be life support devices are neonatal oxygen analyzers, nerve stimulators (whether used for anesthesia, pain relief, or other purposes), auto-transfusion devices, blood pumps, defibrillators, arrhythmia detectors and alarms, pacemakers, hemodialysis systems, peritoneal dialysis systems, neonatal ventilator incubators, ventilators for both adults and infants, anesthesia ventilators, and infusion pumps as well as any other devices designated as "critical" by the U.S. FDA

Introduction

The BCA610 AC source battery charger provides up to 600 watts of precision charging power to charge your one or two bank battery system. The batteries must share a common ground.

This unit can be built to operate from any conventional AC mains power of 110 or 220 VAC .In the absence of a battery, the BCA610 can also function as a power supply up to its continuous current rating. See *Specifications* for the output current rating of your unit.

Suitable for all your battery charging needs, this unit can be configured to charge a 12, 24, 32, or 48 volt battery bank. With the output voltage adjust and user-selectable charging profiles, you have optimal control in how you charge your batteries. Additionally, voltage temperature compensation protects your expensive battery banks from overly harsh charging, prolonging their lifespan.

Internally, the recently updated single board design incorporates time-tested switch mode technology for unmatched efficiency and ultra-quiet operation. Additional filtering on the input and output reduce conducted and radiated EMI noise to very low levels.

Designed with safety in mind, this unit's safety features include reverse input connection, input fuse, over temperature shutdown, short circuit protection, input/output under voltage shutdown, reverse battery connection and output overvoltage crowbar.

Specifications

Input				
Nominal Voltage	110 VAC		220 VAC	
Actual Voltage	90 – 133 VAC		180 - 265 VAC	
Frequency			45 - 65 Hz	
Noise on Input			< 50 mV	
Input Amps (max)	9.3 A		4.7 A	
Input Fuse	MDA-12		MDA-6	
Output				
Nominal Voltage	12 VDC	24 VDC	32 VDC	48 VDC
Float Voltage	13.6 ± 0.05 VDC	27.2 ± 0.05 VDC	36.3 ± 0.05 VDC	54.4 ± 0.05 VDC
Absorption Voltage	14.4 VDC VDC	28.8 VDC	38.4 VDC	57.6 VDC
Charging Amps	40 A	22 A	16.5 A	11 A
Absorption to Float	6.0 Amps	3.3 Amps	2.48 Amps	1.65 Amps
Battery Size (Amp Hours)*	160 – 240	88 – 132	66 – 99	44 - 66
Output Adjust			± 1.0 Volts	
Noise on Output			< 50 mV	
Output Crowbar	16.0 ± 0.5 V	32.0 ± 1.0 V	42.7 ± 1.3 V	63.9 ± 2.0 V
Equalize Voltage	15.5 VDC	31 VDC	41.3 VDC	62 VDC
Temperature Compensation Coefficient	-30mV / °C	-60mV / °C	-80mV / °C	-120mV / °C
Output Fuses	ATC-40 x 2	ATC-30 x 2	ATC-20 x 2	ATC-15 x 2
General				
Battery Banks	1 or 2			
Stages	2 or 3			
Transient Resp.	< 2V for 10A Surge			
Efficiency	> 75 % @ maximum output			
Temp. Range	-25°C to +40°C: Continuous Operation +40°C to +85°C: Intermittent Operation			
Isolation	Input-Output & Input-Case: 1500 VDC Output-Case 500 VDC (1500Vdc @ 48 V Out)			
Length	14.5 in / 36.8 cm			
Width	9.9 in / 25.1 cm			
Height	3.0 in / 14.0 cm			
Clearance	1 Inch (2.5 cm) all around			
Material	Marine Grade Aluminum			
Finish	Black Anodize / Black Powder Epoxy			
Fastenings	18-8 Stainless			
Weight	7.2 lb / 3.3 kg			

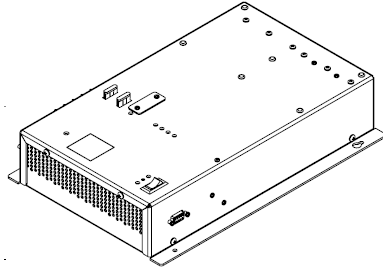
* Specifications subjects to change without notice.

* This is Analytic Systems' suggested range. Please consult your battery manufacturer for their recommendations.

Installation

Mounting

Mount the unit in a DRY and WELL VENTILATED location with at least 4 inches of clearance all around it. The ideal mounting configuration is to mount the unit flat on a horizontal surface. #10 screws are recommended for attaching the unit to the surface.



There is 1500 volts of isolation between the input and output, and the input and case. There is 500 volts (1500V for 48V output units) of isolation between the output and case. Therefore, the unit may be mounted on any surface without fear of electrolysis or ground fault.

AC Input Connection

The unit is equipped with a 5-foot long power cable terminating in either a North American outlet compatible NEMA 5-15 plug or European outlet compatible CEE-7/7 plug to serve as an AC Input Connection.

If you must extend the power cable be sure to use a 3 conductor grounded type extension cable. For hard wiring to a source of power, cut off the plug, and strip the wires as necessary. The wire colors are:

110 VAC	220 VAC
Brown - AC Hot	Brown - AC Hot / Phase 1
Blue - AC Neutral	Blue - AC Neutral / Phase 2
Green - Ground	Green/Yellow - Ground

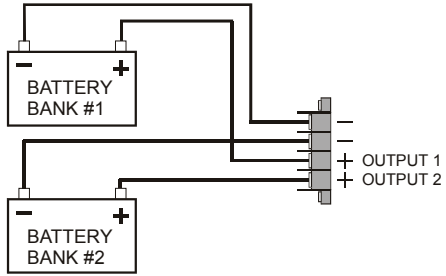
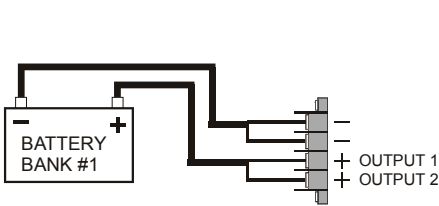
All connections should be made inside an appropriate junction box with appropriately rated circuit breakers used in the circuit panel to feed power to the BCA 610. See *Specifications* for the maximum input current and recommended fuses.

DC Output Connection

This unit is equipped with a Molex 4-pin BEAU Terminal Strip to serve as a DC Output Connection. This connector has two positive output terminals and two negative output terminals. See the unit's label for the wiring of this connection.

Connect the battery bank(s) to the terminals using an appropriate gauge of wire for the charging amps. Ensure that the total average load connected to the batteries does not exceed the unit's charging amps. See *Specifications* for this unit's charging amps.

This connection can support up to 2 battery banks. Hook up the battery bank(s) as shown below. If you are hooking up 2 battery banks keep in mind that they **MUST** share a common ground!



Single Bank Connection

Dual Bank Connection

Battery Temperature Sensor Connection

This unit is equipped with a pair of RJ45 “telephone jack” connectors to serve as connections for up to 2 *Analytic Systems* battery temperature sensors. If only 1 sensor is being used, it must be plugged into “BATT 1” port. This sensor communicates the temperature of the battery to the charger, and is required for the voltage temperature compensation function, over temperature shutdown and user-initiated equalize cycle.

There are multiple ways to install the sensor at the battery. Regardless of which method you use, the sensor must be firmly secured to the battery. The sensor should not lose physical contact with the battery at any point in the charging cycle.

To install the sensor at the battery, you may:

- Slide the sensor so it is flush between the side of the battery and battery platform.
- Place the battery on top of the sensor to hold it in place.
- Apply a small amount of silicone RTV sealant to the sensor and stick it to the top of the battery.



Pictured: *Analytic Systems* Battery Temperature Sensor

Operation

The BCA610 is designed for simple and intuitive operation. Before operating, make sure this unit is properly installed and connected. See *Installation* for more information.

To charge a battery

1. Select the type of charging profile using the Stage Select switch on the top panel. See *Charging Profiles* for more information.
2. Move the Power Switch to ON. The alarm buzzer will sound and the LOW VOLTAGE OUTPUT LED will glow red briefly, then the POWER LED will glow green.
3. The CHARGING LED will glow green and the unit will charge the battery at the voltage and current listed on the label.
4. Once the battery is fully charged, the CHARGING LED will turn off. The unit will maintain the battery at full charge for as long as it is connected.

To adjust the charging voltage

1. Disconnect the battery temperature sensor(s) from the unit, if connected.
2. Move the Power Switch to ON.
3. Loosen the two screws and remove the cover plate on the top panel to access the output voltage adjust potentiometer.
4. Using a small flat-blade screwdriver, rotate the potentiometer.
5. The charging voltage can be adjusted over a range of $\pm 10\%$. Rotate the potentiometer clockwise to increase the output voltage; counterclockwise to decrease the charging voltage.
6. Using a voltmeter or multimeter, check the charging voltage at the battery terminal.
7. When satisfied with the new voltage, return the cover plate to its original position, reinstall the screws and reconnect the battery temperature sensor(s)

To end operation

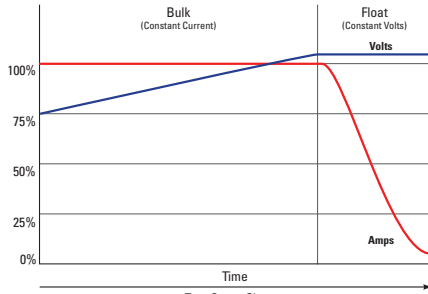
1. Move the Power Switch to OFF.
 2. Wait for all the LEDs stop glowing.
 3. Once all of the LEDs are off, it is safe to disconnect the unit from the power source and battery. The unit is now ready for storage or service.
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Charging Profiles

This unit features two user-selectable charging profiles. You can choose which type of charging profile, two stage or three stage, is used to charge your batteries using the Stage Select switch on the front panel. Below are explanations of the two profiles:

Two Stage Charging

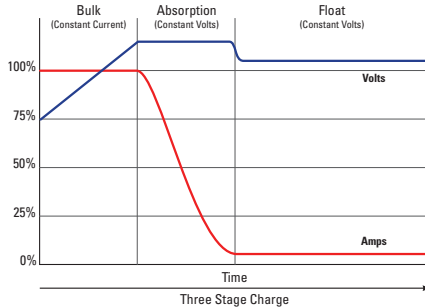
In two stage charging, the battery is charged with a constant current until the battery voltage reaches the “float voltage”. The current then diminishes as necessary to maintain the battery at this voltage. Once the current drops to 10% of it’s initial value, the battery is then held at the “float voltage”



Two stage charging is recommended in most instances since it is gentler on the battery. The battery is subjected to lower charging voltages, a reasonable load can be put on the battery without altering the charger’s ability to keep the battery at optimal charge.

Three Stage Charging

In three stage charging, the battery is charged at a constant current until the battery voltage reaches the “absorption voltage”. The battery is maintained at this voltage while the current diminishes. Once the current drops to 10% of it’s initial value, the battery is then held at the “float voltage”



Three stage charging is faster than two stage. However, the battery is subjected to higher voltages. In addition, the charger cannot differentiate between current going to a load on the battery and current being absorbed by the battery, so it can overcharge a battery powering a load.

Troubleshooting

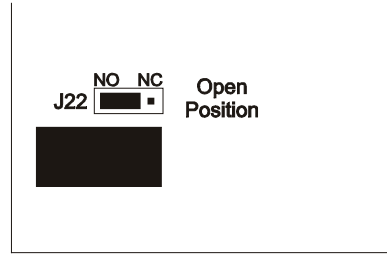
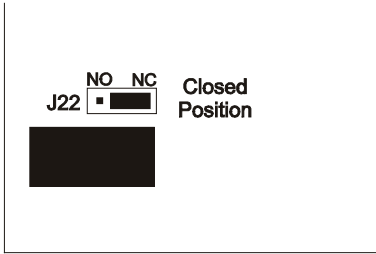
This unit is fitted with LED indicators and an alarm buzzer to display and diagnose any problems in operation. In the event of a malfunction, the unit will sound the buzzer to alert you prior to shutting itself down. You should immediately check which LEDs are glowing to determine the cause of the alarm.

LED Indicator	Meaning
BATTERY OVERTEMP	The battery temperature is too high for safe charging.
Fix:	<p>The battery may be defective or there may not be adequate ventilation to cool the battery.</p> <p>Check that the battery is not defective. If it is working correctly, reposition the battery for better air circulation.</p>
OVERTEMP	The unit's internal temperature is too high for normal operation.
Fix:	<p>The internal cooling fan may have failed or there may not be adequate ventilation to cool the charger. Check that the cooling fan is still working; if it is not then the unit must be returned to an authorized service center for repair.</p> <p>If it is working correctly, remount the battery charger for better air circulation.</p>
LOW INPUT	The battery charger's input voltage is too low for normal operation
Fix:	<p>Check that the power source is properly rated for the battery charger. Check that the input cables and connection are free of damage and corrosion.</p> <p>If all of the above are in proper working order, the cause is likely an internal component failure and the unit must be returned to an authorized service center for repair.</p>
LOW OUTPUT	The battery charger's output voltage is too low for normal operation.
Fix:	<p>The charging current might be exceeding the unit's maximum rating causing the output voltage to drop to maintain the current at that level. Check that the charging current is not over its limit, by using a multimeter at the output terminals. If it is, reduce the load connected to the charger.</p> <p>Check that the output cables and connections are free of damage and corrosion.</p> <p>If all of the above are in proper working order, the cause is likely an internal component failure and the unit must be returned to an authorized service center for repair.</p>

Dry Contact Relay

To use your dry contact output fail relay you must connect a 9-pin D connector to the unit. You must use pins one and six as is indicated on page 9 in the remote connector diagram.

The relay is factory preset to fail in the closed position when the low output LED and buzzer come on. If you wish to have the relay fail in the open position when the low output LED and buzzer come on, you must take the cover off the unit and move the jumper to the other position on J22. J22 is located next to the relay.



To change the position of the jumper, first turn the unit off and disconnect the unit from both the power and batteries. Next, turn the unit on for 30 seconds to discharge the capacitors, then turn it off again. Remove the eight screws holding on the cover. Turn the unit upside down, remove the cover and locate J22. It will be next to the relay as is shown in the above diagram. Simply move the jumper to the desired position as is shown in the above diagram. Replace the cover and re-install the eight screws. Reconnect the unit to the power and batteries.

BATTERY TEMPERATURE SENSORS

Up to 2 battery temperature sensors can be connected to the charger to allow temperature compensation of the battery charging voltage (1 is supplied with the unit). If only the 1 sensor is used, it MUST be plugged into the 'BATT 1' connection on the side of the unit. If no sensor is used, the charger will default to standard output voltage.

For installation instructions of the temperature sensor, please see the section entitled Remote Battery Temperature Sensor Installation.

Remote Control Option



A remote control panel may be connected to the battery charger using a 9-pin D-connector, which attaches to the side of the battery charger. The remote control panel and D connector are part of the remote control option. The remote control panel allows the unit to be operated remotely as well as duplicating all the diagnostic indicators and audible alarm.

IMPORTANT: This remote is to be used only on Battery Chargers manufactured by Analytic Systems.

REMOTE CONNECTOR

This connector is located on the side of the unit. Important: To prevent the possibility of High Voltage Electrical Shock, do not power up the battery charger unless all wiring from the unit to the remote is securely connected. Do not remove the dust cover from the DB-9 connector if the remote is not being used.

Equalize Option

The purpose of the Equalize Option is to deliberately overcharge the battery at a low rate of current to ensure that all cells are fully charged and to reduce the chance of sulfation of the battery. During the Equalize cycle, the cells, which are fully charged, will produce Hydrogen gas, and the cells, which are undercharged, will be brought up to full charge. An Equalize cycle should be done once every 2-3 months, or whenever battery capacity appears to be diminished. The Equalize Option also includes a battery temperature sensor to compensate the charging voltage for battery temperature, as well as to shut the charger down if the battery should become overheated. A 2nd temperature sensor can be added to allow monitoring of both batteries if the charger is connected to 2 banks of batteries.

An Equalize cycle can be initiated at any time by simply pressing the equalize start button located next to the ON/OFF switch. This button is deliberately recessed to prevent accidental operation. It is most easily pressed by using a ballpoint pen. If the charger is in the middle of charging the battery (the Charging LED is on), the Equalize LED will flash. Once the main charging cycle is complete, the Equalize cycle will begin and the Equalize LED will stay on all

the time. If the Charging LED is off when the button is pressed, the Equalize cycle will begin immediately.

The charger will charge the battery at approximately 10% its normal rate (i.e. 4 amps for a 40 amp charger) until the battery reaches equalize voltage and then the current reduces as necessary to maintain the battery at that voltage. Three hours after the Equalize cycle begins, the charger will return to the float mode where the battery can be maintained indefinitely. If the battery temperature reaches 120 degrees F (50 degrees C) the equalize cycle will end and the charger output reduced to a very low voltage until the battery cools, and then the charger will return to the float mode.

Remote Battery Temperature Sensor Installation

The remote battery temperature sensor allows the monitoring of the battery bank so that the charging profile can be adjusted to optimally charge the battery bank depending on the temperature of the battery bank. NOTE: The temperature sensor must be used during an equalize cycle or damage to the battery may occur.

The battery temperature sensor may be installed in many different ways, so long as the sensor stays in contact with the battery. The preferred method is as follows:

The batteries to be charged will be placed on a platform made of wood. Prior to placing the batteries on the wooden platform a cavity is hollowed out such that the sensor will fit inside the cavity and be flush with the battery. Place the sensor inside the cavity facing the proper way (this is shown on the sensor). Next connect the sensor wiring to the telephone jack marked "Batt 1" on the side of the unit. Note: If there is only one temperature sensor, it gets plugged into "Batt 1". If there is a second temperature sensor, it should be plugged into the phone jack labeled "Batt 2".

If a battery blanket is used the sensor may be tucked inside the blanket with the proper side of the sensor facing the battery. The sensor may be placed on top of the battery but it should be secured to the battery so as to prevent it from losing contact with the battery.

Battery Charger Temperature Compensation

The charger is calibrated with the sensor input preset to 77 degrees (25 degrees C). For example, for a 12V battery, this voltage is 13.6 volts, and 27.2 volts for a 24V battery. See the specifications for the temperature compensation coefficient.

Limited Warranty

1. The equipment manufactured by Analytic Systems Ware (1993) Ltd. (the "Warrantor") is warranted to be free from defects in workmanship and materials under normal use and service.
2. This warranty is in effect for:
 - a. 3 Years from date of purchase by the end user for standard products offered in our catalog.
 - b. 2 Years from date of manufacture for non-standard or OEM products
 - c. 1 Year from date of manufacture for encapsulated products.
3. Analytic Systems will determine eligibility for warranty from the date of purchase shown on the warranty card when returned within 30 days, or
 - a. The date of shipment by Analytic Systems, or
 - b. The date of manufacture coded in the serial number, or
 - c. From a copy of the original purchase receipt showing the date of purchase by the user.
4. In case any part of the equipment proves to be defective, the Purchaser should do the following:
 - a. Prepare a written statement of the nature of the defect to the best of the Purchasers knowledge, and include the date of purchase, the place of purchase, and the Purchasers name, address and telephone number.
 - b. Call Analytic Systems at 800-668-3884 or 604-946-9981 and request a return material authorization number (RMA).
 - c. Return the defective part or unit along with the statement at the Purchasers expense to the Warrantor; Analytic Systems Ware (1993) Ltd., 8128 River Way, Delta, B.C., V4G 1K5, Canada.
5. If upon the Warrantor's examination the defect proves to be the result of defective material or workmanship, the equipment will be repaired or replaced at the Warrantor's option without charge, and returned to the Purchaser at the Warrantor's expense by the most economical means. Requests for a different method of return or special handling will incur additional charges and are the responsibility of the Purchaser.
6. Analytic Systems reserves the right to void the warranty if:
 - a. Labels, identification marks or serial numbers are removed or altered in any way.
 - b. Our invoice is unpaid.
 - c. The defect is the result of misuse, neglect, improper installation, environmental conditions, non-authorized repair, alteration or accident.
7. No refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so.
8. Only the Warrantor shall perform warranty service. Any attempt to remedy the defect by anyone else shall render this warranty void.
9. There shall be no warranty for defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion except for equipment specifically stated to be waterproof.
10. No other express warranty is hereby given and there are no warranties that extend beyond those described herein. This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purposes for which such goods are used, or fitness for a particular purpose, or any other obligations on the part of the Warrantor or its employees and representatives.
11. There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any person or persons, or damage to property, or loss of income or profit, or any other consequential or resulting damage which may be claimed to have been incurred through the use or sale of the equipment, including any possible failure of malfunction of the equipment, or part thereof.
12. The Warrantor assumes no liability for incidental or consequential damages of any kind