Lester Electrical

24 Volt Fully Automatic Battery Chargers
Instruction Book and Parts List

- Patented electronic circuit monitors the battery state of charge and automatically turns charger off when the batteries reach full charge.
- Line voltage compensation produces consistent charger output with AC supply voltage variations.
- Convection cooled design for maximum reliability and minimum maintenance.

Specifications	
BATTERY TYPE:	FLOODED (wet or dry)
CODE NO:	**21710**
AC VOLTS:	100-125
AC AMPS:	4.4
FREQUENCY, Hz:	50/60
PHASE:	SINGLE
DC VOLTS:	24
DC AMPS:	8 tapering to 3
BATTERY CAPACITY:	90 TO 105 AMP HOUR
RECHARGE TIME:	8 HOURS
BATTERY SIZE:	Two series connected 6 cell, 12-volt deep-cycle batteries.

READ THIS BOOK

This book contains information for the use and safe operation of this charger. Read this book carefully before beginning operation. Keep this book and tell all operators to read and understand this book. If the operator can not read this book, insure he understands the operation of this charger and machine before using. If you do not follow the instructions, you can cause injury, and/or damage to equipment, furniture, or buildings.

PLEASE SAVE THESE IMPORTANT SAFETY AND OPERATING INSTRUCTIONS

For correct operation of the equipment, it is important to read and be familiar with this entire manual before installing and operating the charger.
DO NOT DISCARD THIS MANUAL AFTER READING.

Look for this symbol to point out safety precautions.
It means: *BECOME ALERT—YOUR SAFETY IS INVOLVED.*
If you do not follow these safety instructions, injury and/or property damage can occur.

NOTICE: Read and familiarize yourself with this entire manual before installing or operating the charger. Follow all instructions on the battery, charger, and battery powered equipment. This manual contains important safety and operating instructions for your battery charger.

⚠DANGER: Use of an attachment not recommended or sold by the battery charger manufacturer may result in a risk of fire, electrical shock or injury to person(s).

INTRODUCTION

This battery charger is designed to recharge deep-cycle, conventional Flooded (replaceable electrolyte) batteries.

A patented electronic circuit turns the charger on and off automatically.

Batteries used on industrial and commercial floor cleaning equipment are subject to severe deep-cycle duty on a daily basis. For this reason, it is important that only deep-cycle batteries be used.

OPERATING INSTRUCTIONS

⚠CAUTION: This charger is for use only on 12 cell 90-105 Ah (20-hr. rate), flooded (replaceable electrolyte), 2.50 volts per cell maximum voltage rechargeable, deep-cycle battery systems. Batteries improperly matched with the charger may burst, causing personal injury and damage to the batteries or charger.

INITIAL INSTALLATION

Circuit breaker or fuse protection in the 120 volt AC outlet to which the charger is to be plugged should allow 5 amps per charger. Do not overload electrical outlet. Use of an extension cord with the charger should be avoided unless absolutely necessary. Use of an improper extension cord could result in a risk of a fire and electric shock. If an extension cord is needed, use a three-conductor, No. 16 AWG (or larger) cord with ground, properly wired, in good electrical condition and keep as short as possible. Make sure that the pins on the plug of the extension cord are the same number, size, and shape as that of the plug on the battery charger. Locate all cords so that they will not be stepped on, tripped over, or otherwise subjected to damage or stress. Do not operate the battery charger with a damaged cord or plug. Do not operate the battery charger if it has received a sharp blow, was dropped or otherwise damaged in any manner. Refer to a qualified service agent.

Provide adequate ventilation for both batteries and charger. The convection-cooled design requires an unobstructed flow of cooling air for proper operation. Keep all charger ventilation openings at least two inches (2") (50mm) away from walls and other objects.

⚠WARNING: Battery chargers can ignite flammable materials and vapors. Do not use near fuels, grain dust, solvents, thinners or other flammables.

⚠WARNING: KEEP DRY; Do not expose to rain or spray. For storage, keep charger in a dry building. Replace worn, cut or damaged electrical cords and plugs immediately.

AC INPUT

This battery charger must be grounded to reduce the risk of electric shock. It is equipped with an electric cord having an equipment-grounding conductor and a grounding-type plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with the National Electrical Code and all local codes and ordinances.

⚠DANGER: Improper connection of the equipment-grounding conductor can result in a risk of electric shock. DO NOT REMOVE THE GROUNDING PRONG FROM THE PLUG.

GROUNDING INSTRUCTIONS

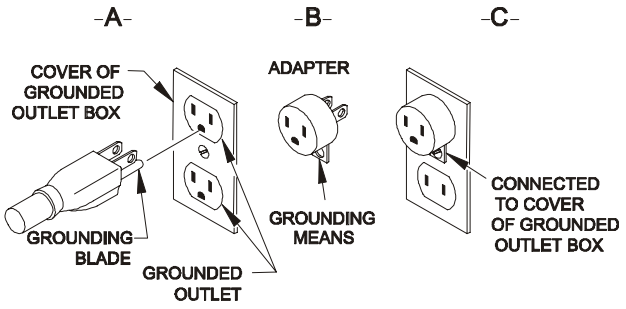
This battery charger is equipped with a grounding plug as illustrated in Figure A, for use on a nominal 120 volt, 60 Hertz circuit. A temporary adapter, as illustrated in Figures B and C, may be used to connect this plug to a two-pole receptacle as shown in Figure B if a properly grounded outlet is not available. The temporary adapter should be used

only until a qualified electrician can install a properly grounded outlet. The green-colored rigid ear extending from the adapter must be connected to a permanent ground such as a properly grounded outlet box.

⚠DANGER: Before using the adapter as illustrated, be certain that the center screw of the outlet plate is grounded.

NOTE: Use of adapter shown in Figures B and C is NOT permitted in Canada and not recommended in U.S.A.

GROUNDING METHODS



BATTERY TYPE

Battery manufacturers frequently use the same battery cases for different battery types. Flooded (replaceable liquid) electrolyte deep-cycle batteries have removable cell caps. Water lost during charging of the battery is replaced through these openings.

Refer to the battery manufacturer's information panel on the battery case to determine the type battery you have. If the information panel is missing or not legible, do not use the battery. Refer to your dealer if you do not understand what type battery you are using.

NORMAL OPERATION

Instructions printed on the cover of the charger are for daily reference.

1. Select the correct charger for the type of battery to be charged.

⚠CAUTION: Make sure the battery pack is a 24-volt, 12-cell, series connected, 20 to 90 Ah or 90 to 105 Ah (20 hour rate), rechargeable deep-cycle system.

⚠This flooded (replaceable electrolyte) charger has a voltage of at least 2.50 volts per cell.

⚠CAUTION: Many DC plugs do not have a standard wiring pattern. Before connecting the charger to the equipment, verify that the charger plug wiring pattern matches the equipment being charged. Damage may result if a plug that is wired for other applications is used on your equipment. Contact your dealer or the equipment manufacturer for more information.

⚠DANGER: To prevent electrical shock, do not touch uninsulated parts of the charger DC output connector, battery connector, or battery terminals. Make sure all electrical connectors are in good working condition. Do not use connectors that are cracked, corroded, or do not make adequate electrical contact. Use of a damaged or defective connector may result in a risk of overheating, fire, or electrical shock.

2. Move "POWER" switch to "OFF" position.
3. Connect the power supply cord to a properly grounded, single-phase outlet.
4. Connect charger's DC output plug to the equipment-charging receptacle. Do not connect the DC plug unless the "POWER" switch is in the "OFF" position.
5. Move the "POWER" switch to "ON" and the RED and GREEN lights will come on steady for a few seconds to test the light. If the lights do not come on, either the AC cord is not plugged in or the AC outlet is not live. Test for a live AC outlet by connecting a suitable household appliance into the specific outlet.

⚠WARNING: Charger is not to be used while the battery-powered equipment is operating.

⚠WARNING: Lead-acid batteries generate gases that can be explosive. To prevent arcing or burning near the batteries, do not disconnect the DC charging cord from the batteries when the charger is operating. If the charge

cycle must be interrupted move the "POWER" switch to "OFF", and disconnect the charger power supply cord before disconnecting the DC output cord from the batteries. Keep sparks, flame, and smoking materials away from the batteries.

⚠WARNING: Always shield eyes when working near batteries. Do not put wrenches or other metal objects across the battery terminals or the top of the battery. Arcing or explosion of the battery can result!

The charger will output power three to five (3-5) seconds after turning the switch "ON" as indicated by the RED light turning off, the slow blinking GREEN light (once per second), and a slight transformer hum.

If both lights go off about five seconds after AC is applied, check to see if the DC plug is correctly connected to the battery. If the DC plug is connected properly, either an open circuit exists inside the battery-powered equipment or the battery voltage is too low, below 7 volts (see Troubleshooting).

The charger has an under-voltage protection mode, which will terminate the charge if the battery voltage does not go above 18 volts in 10 minutes. This prevents destroying 12 volt systems with this 24-volt charger. When this occurs, the RED light will come on steady.

6. The normal initial charge rate should be 8 (+/-1) amps. As the batteries become charged, the current decreases. When the batteries reach approximately 80% of full charge, the GREEN light will blink rapidly (eight times per second), the charge rate will have decreased depending on the changing condition of the batteries.

   The charger will determine when the batteries are as full as they are capable of being and will turn off. When the batteries will no longer perform as desired in the battery-powered equipment, they should be replaced.

7. The charger is equipped with a thermal breaker that automatically turns the charger off if it overheats. Should the charger turn off before the batteries are fully charged, check to be sure that all the ventilation openings are free from obstructions. After the charger cools down, it will automatically restart. If the charger repeatedly overheats, refer to a qualified service agent.

8. The charger turns off automatically when the batteries are fully charged as indicated by a steady GREEN light. Re-charges time vary with battery size and the depth of discharge. Allow 8 hours for normal charging. Larger batteries (greater than 90 ampere-hours) or severely discharged batteries may require up to 16 hours to be properly charged and equalized. If the charger operates for 16 hours and is unable to fully charge the batteries, an internal timer turns the charger off and begins to blink the RED light rapidly.

   A maximum voltage shutoff for flooded batteries is an additional safety feature of the charger. When the battery potential increases above 2.83 volts per cell, the charge cycle is terminated and the RED light begins to blink slowly.

9. After the charger has turned off, move the "POWER" switch to "OFF", then disconnect the DC output cord from the equipment-charging receptacle.

⚠CAUTION: To avoid damage to the charger cord and battery connector, disconnect it by grasping the plug handle or body and pulling it straight out of the battery connector. Do not pull on the charger cord. Do not twist, rock or pull the plug sideways.

⚠WARNING: To prevent arcing or burning near the batteries, do not disconnect the output cord from the batteries while the charger is operating. If the charge cycle must be interrupted, first slide the "POWER" switch to "OFF", then disconnect the output cord from the batteries. Keep sparks, flame, and smoking materials away from batteries. NO smoking.

⚠WARNING: Do not leave the DC output connector plugged in while unattended for more than two (2) days. Severe overcharging and damage to the batteries may result if the charger fails to turn "OFF".

⚠CAUTION: Always wear protective eye shields and clothing when working with batteries. Batteries contain acid that can cause bodily harm. Do not place wrenches or other metal objects across

the battery terminals or battery top. Arcing or explosion of the battery may result. Someone should be in the range of your voice or close enough to come to your aid when you work near a lead-acid battery. Have plenty of fresh water and soap nearby in case battery acid contacts your skin, eyes or clothing.

⚠WARNING: Risk of explosive gases. Working in vicinity of a lead-acid battery is dangerous. Batteries generate explosive gases during operation. For this reason, it is of utmost importance that each time before using the charger, you follow the instructions exactly

⚠CAUTION: Do not disassemble the charger. Take it to a qualified service agent when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.

⚠DANGER: To reduce the risk if electric shock, always disconnect both the power supply cord and the output cord before attempting any maintenance or cleaning.

⚠CAUTION: Do not operate the charger if it is damaged or appears to be malfunctioning. Personal injury or damage to the charger and/or batteries may result.

PROPER CARE OF DEEP-CYCLE BATTERIES

Batteries used on battery powered machines are subject to severe deep-cycle duty on a daily basis. For this reason it is important that only deep-cycle batteries be used. Although these batteries are designed to withstand such duty, the following precautions must be observed to obtain the best performance and maximum cycle life.

1. New batteries should be given a full charge before their first use because it is impossible to know their state of charge and how long the batteries have been stored.
2. New batteries are not capable of their rated output until they have been cycled (charged and discharged) a number of times.
3. Do not excessively discharge batteries. Excessive discharge can cause polarity reversal of individual cells resulting in complete failure shortly thereafter. Limited discharge of new batteries will minimize the chance of cell reversal.
4. **Check the level of the electrolyte in conventional flooded (liquid electrolyte) lead acid batteries monthly. Maintain the proper electrolyte level by adding water when necessary.**

   The correct level is between ¼" below the bottom of the tube in each cell and just above the plates. See Figure #1. Electrolyte levels lower during discharge and rise during charge. Therefore, it is mandatory that water be added to cells ONLY when they are fully charged; do not overfill. Old batteries require more frequent additions of water compared to new batteries.
5. Keep tops of batteries clean and dry to prevent excessive self-discharge. Keep battery terminals clean and reasonably tight.

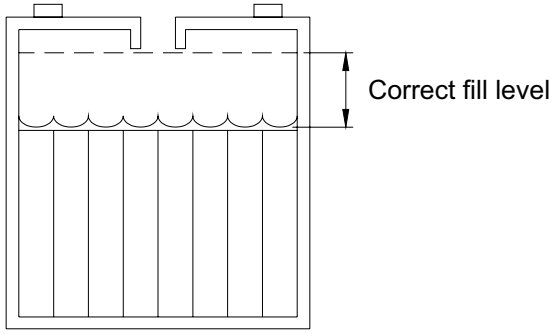


FIGURE #1

PERSONAL PRECAUTIONS

1. Someone should be within the range of your voice or close enough to come to your aid when you work near a lead-acid battery.
2. Have plenty of fresh water and soap or soda nearby in case battery acid contacts skin, clothing, or eyes.
3. Wear complete eye protection and clothing protection. Avoid touching eyes while working near battery.
4. 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 as soon as possible.
5. NEVER smoke or allow a spark or flame in the vicinity of a battery.

6. Be extra cautious to reduce the risk of dropping a metal tool onto the battery. It might spark or short-circuit the battery or other electrical part that may cause an explosion.
7. Remove all 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 weld metal, causing a severe burn.
8. NEVER charge a frozen battery. **It may explode**.

TROUBLESHOOTING

⚠CAUTION: Do not disassemble the charger. Take it to a qualified service agent when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.

⚠DANGER: To reduce the risk if electric shock, always disconnect both the power supply cord and the output cord before attempting any maintenance or cleaning.

⚠CAUTION: Do not operate the charger if it is damaged or appears to be malfunctioning. Personal injury or damage to the charger and/or batteries may result.

The following procedures are intended only to determine if a malfunction may exist in the charger, or in the machine and batteries.

Use the following chart to help you troubleshoot problems with the battery and charger system. There are 8 different modes that are indicated by two lights. Each light has four different modes:
OFF (light is off), SLOW BLINK (light blinks on and off once per second), FAST BLINK, (light blinks on and off eight times per second), and STEADY (light is full on).

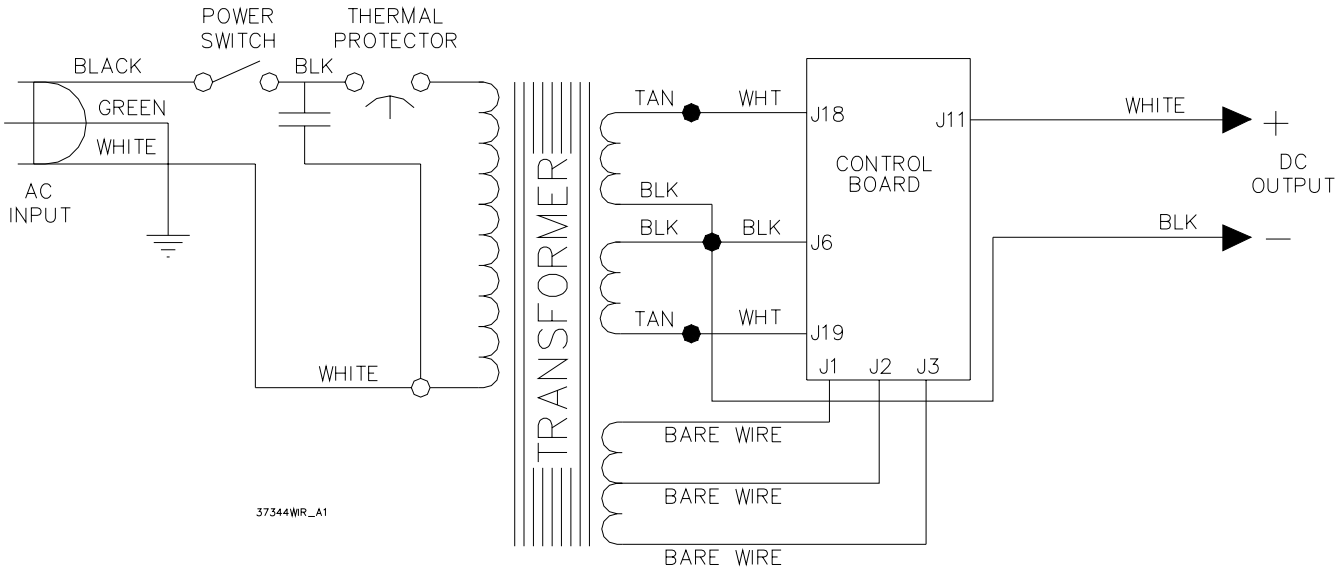
Red Light	Green Light	Function
Off	Off	No AC power or no battery connected
Steady	Steady	Light test when AC connected
Off	Slow Blink	Charging (less than 80% charged)
Off	Fast Blink	Charging (over 80% charged)
Off	Steady	Normal charge completed
Steady	Off	Undervoltage shutoff, < 18.0 volts
Slow Blink	Off	Overvoltage shutoff, > 33.96 volts
Fast Blink	Off	Max timer shutoff, > 16 hours

1. If the GREEN and RED lights do not illuminate within three seconds after the AC power is applied to the charger, it indicates one of the following:
   a. Charger "POWER" switch is not in "ON" position.
   b. Charger is not plugged into a live AC outlet.
   c. Defective Power switch
   d. Defective power cord
2. If both lights go off and stay off three to five (3-5) seconds after the charger connections are completed, it indicates one of the following and the charger is prevented from turning on:
   a. DC plug not connected to the batteries.
   b. Fault in machine Wiring. Poor or open connections in the machine wiring that connects to the batteries; corroded terminals, loose or worn plugs and receptacles, loose or worn fuseholders. (Have your dealer repair the machine.)
   c. Battery connections in machine wrong (reverse polarity).
   d. One or both batteries deeply discharged or no longer serviceable (voltage below 7 volts for a 24 volt system).
   e. Charger DC output circuit problem. Charger will need serviced.
3. If the charger turns off before the batteries are fully charged, it indicates one of the following:
   a. Charger internal thermal breaker turned the charger off due to overheating because charger ventilation openings are blocked. After the charger has cooled down, it will automatically restart. If the charger repeatedly overheats, it may be malfunctioning.
   b. The AC power was interrupted during the charge cycle.
   c. The DC cord-charging plug accidentally disconnected during charge.

d. Fault in machine wiring. The machine charging circuit has high resistance, corroded or loose connections. Loose or worn charging receptacle,

4. A decrease in equipment range where the machine loses power earlier and earlier in the day indicates one of the following:
   a. Using the machine before batteries are fully charged and charger has turned off shortens battery life and begins reducing daily range.
   b. Conventional flooded (replaceable liquid) electrolyte batteries are being under charged using the wrong charger. Battery capacity lost in this manner is permanent and is not recovered with additional charge cycles.
   c. Severe overcharging occurs if Sealed (maintenance free) batteries are charged using the wrong charger. Battery capacity lost in this manner is permanent and occurs very rapidly. Check with your dealer about battery replacement.
   d. The battery has been allowed to sulfate. Charge the battery no less frequently than once every three days when the machine is lightly utilized. Once sulfation is allowed to take place it may be partially reduced by returning, temporarily, to daily charging.
   e. The electrolyte level in conventional liquid electrolyte lead-acid batteries was allowed to drop below the top of the battery plates. Immediately upon discovering add distilled water to <u>just cover the tops of the plates</u> and fill to the proper level with distilled water at the completion of the very next charge cycle. Battery capacity lost in this manner is permanent and is not recovered with additional charge cycles.
   f. This is the normal wear out process for all types of deep-cycle batteries
5. If battery voltage does not exceed 18 volts after 10 minutes of charging, the charger turns off and the RED light will turn on steady indicating one of the following:
   a. Improper batteries used with charger. Must be a 12-cell, series connected 2.50 volts per cell 24-Volt battery system.
   b. Failed cells in the battery do not allow the battery voltage to rise above 18 volts.
6. The charger operates through 16 hours before turning off. The RED light will begin to blink very rapidly indicating one of the following:
   a. Batteries of higher than 105 amp-hour capacity (20-hr. rate) can require more than 16 hours to charge.
   b. New batteries can require more than 16 hours to charge.
   c. Very deeply discharged batteries (100% discharged) can require more than 16 hours to charge.
   d. Several failed cells in the batteries that do not allow the charge rate to taper below 4 amps.
7. If battery voltage exceeds 2.83 volts per cell, the charger turns off and the RED light begins to slow blink indicating one of the following:
   a. Improper batteries used with charger. Must be a 12 cell, 2.50 volts per cell battery system.
   b. Battery design may be inappropriate for this use. Check with your dealer for deep-cycle batteries only.
   c. Sulfation of batteries may have occurred.

WIRING DIAGRAM



REPLACEMENT PARTS LIST

BATTERY TYPE		FLOODED (WET OR DRY)
MODEL NUMBERS		21710
QTY	**DESCRIPTION**	**PART NUMBER**
N/A	Case Assembly	N/A
N/A	Transformer	N/A
1	Cordset, DC, 16/2, 108”, SB50 Red Plug	29056S
1	Cordset, AC, 18/3, 102”, 5-15P	23083S
1	Control Board Assembly	22535S
1	Power Switch	22458S
1	Bushing Strain Relief for DC Cord	18363S
1	Bushing Strain Relief for AC Cord	04275S
1	DC Plug Key	04119S
1	DC Plug	04087S

L I M I T E D W A R R A N T Y

Lester Electrical warrants each new Lester Battery Charger for defects in material and workmanship for a period of two (2) years from the date of manufacture of the complete unit. Repairs can be made at the Lester factory. To do so, first obtain a "Return Material Authorization" number by calling the Service Department of Lester Electrical ***(402 477-8988)*** *or by e-mailing* ***service@lesterelectrical.com*** *and send the defective unit with transportation charges prepaid to:*

Lester Electrical
625 West A Street
Lincoln, NE 68522-1794 USA
Attention: Service Department
RMA #_____

For repairs made at other than the Lester factory, Lester will provide only the replacement parts. Defective parts should be sent with transportation charges prepaid to the Lester factory at the address noted above.

If the unit or parts are found in the reasonable judgment of Lester to be defective in material or workmanship, repair or replacement will be made by Lester without charge for parts or labor. Repair or replacement will be at the discretion of Lester, with replacements being made using current models or parts performing the equivalent function. Labor charges other than those incurred at the Lester factory are not covered under this warranty. All expenses associated with delivering defective items to the Lester factory and the expense of returning repaired or replaced items from the Lester factory to the owner will be paid for by the owner. All warranty work accomplished at the Lester factory will be completed with a reasonable time after receipt of defective items.

This warranty does not cover any semiconductor parts, such as diodes, which are vulnerable to electrical overloads beyond the control of Lester. Warranty on parts not manufactured by Lester, which include, but are not limited to, timers and ammeters, is limited to the period specified in the original manufacturer's warranty.

This warranty does not cover any charger that has been subject to misuse, neglect, negligence, or accident, or operated in any way contrary to instructions specified on the charger case and in the owner's manual. No claim of breach of warranty shall be cause for cancellation of the contract of sale of any Lester charger. Lester assumes no responsibility for loss of time, inconvenience, or other damage, consequential or otherwise, resulting from a defective charger. All implied warranties (including merchantability) are limited in duration to the two years from date of manufacture warranty period.

Some states do not allow the exclusion or limitation of incidental or consequential damages; or limitations on how long an implied warranty lasts, so the above limitations may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Lester's obligation under this warranty is strictly and exclusively limited to the repair or replacement of defective items. Lester issues this warranty in good faith and with full confidence in the workmanship and quality of Lester products.