LCI LOCHABER CORNWALL INC

CONTINUOUS BELT
IR BELT FURNACE

Model LA-309
Owner's Manual

Revision 0

MODEL: LA-309

SERIAL NUMBER: 1303091301

FACTORY ORDER NUMBER: 13-006

Infrared Furnace Setup, Operation, Theory & Troubleshooting Guide

This Owner's Manual contains product information specific to the newly installed equipment and software. In addition, this manual contains information regarding features and options which may or may not be included in your furnace system.

Use this Manual in conjunction with the Continuous Belt IR Furnace Reference Manual

Continuous Belt IR Furnace

Owner's Manual

Rev. 0

Model: LA-309

Serial Number: 1303091301

Part No. 13-006 - 676-110000-01 CD

Part No. 13-006 - 676-110000-02 Loose Leaf

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For information on parts, service and aftermarket products and reconditioned furnaces and to obtain technical support please contact FurnacePros Aftermarket Services at +1.714.935.0302.

TABLE OF REVISIONS

Rev	Sections	Description	Date
0	All	Initial Release	08/30/2013

INTRODUCTION

This manual covers the LCI infrared high quality controlled atmosphere infrared belt furnace designed for industrial production and laboratory infrared thermal processing. If you have acquired an RTC IR furnace rebuilt by LCI, this manual describes its operation with few exceptions.

Achieving high performance and high yields is attainable with careful adjustment of the temperature and gas flow controls provided on the furnace. Infrared furnaces are highly responsive to critical temperature settings. With lamps as the primary heat source, the equipment is literally heating with the speed of light. The unique gas management system provides an extremely even distribution and well regulated flow of gas throughout the process chambers. Understanding how to control both the heat and gas flow is essential to the effective operation of the furnace. When the interaction and performance of the control elements are well managed the tool can achieve its potential. For many, our furnaces become regarded more than just an effective tool; they are viewed as a fine instrument that can produce results over a variety of thermal processing situations.

There are many features in your equipment to help assure your success in achieving your goals. Many "firsts" involving the application of near infrared heating include: the first high temperature furnace capable of operating at 1000°C with extremely tight temperature control; the first thick film furnace; the first controlled atmosphere furnace capable of <5 ppm O2; and the first hydrogen furnace.

WHAT IS IN THIS MANUAL

This manual explains furnace equipment installation and setup, operation and troubleshooting of LCI IR series furnaces as well as RTC IR furnaces refurbished by LCI. Some equipment described in this manual is optional or may not apply to your model as configured. The manual also covers aspects of infrared processing theory and techniques to assist you in achieving highly repeatable and reliable thermal processes.

Study this manual carefully. Experience has shown that clients who thoughtfully master the contents of this manual can become expert in understanding the process system capabilities of our infrared furnaces. In doing so, many are able to push the initial process performance envelope and thus achieve higher degrees in both process reliability and throughput than previously anticipated.

Note that throughout this Owner's Manual the equipment is generally referred to as a furnace. A dryer is a furnace with only the top lamp elements installed or operated.

FORMATTING CONVENTIONS

This manual uses the following formatting conventions.

DANGER: This signifies a potential threat to human safety.

Warning: This signifies a potential threat to equipment damage or product loss.

Note: This signifies an important fact that could affect process control.

Examples are shown in italic text.

Bold text words or phrases embedded in this document, are terms with definitions in the glossary.

Bold Underlined text is used for pop-up windows, button descriptions & selector button/box choices.

Cross-references to "Section Titles" are bound with quotes.

(Optional ❒) accessories will be shown in parenthesis with a checkbox. If supplied, please check the box as appropriate.

ABOUT LCI

LCI Furnaces specializes in the manufacture and sales of high quality near infrared (0.5-5.5 µm) wavelength continuous belt dryers, ovens and furnaces worldwide. To improve our equipment design and performance, LCI encourages users to suggest ideas for improving designs and service. Additionally, we will discuss, in confidence, new thermal processing requirements, however difficult or routine they may be. If needed, LCI can design new equipment and features to meet the special and challenging needs our partners require. Should you have a furnace operating question, contact LCI Furnaces or FurnacePros Technical Support.

WHERE TO GET HELP

Corporate Offices & Factory

Address: 675 N Eckhoff St, Ste D, Orange, California 92868 USA
Phone: +1 (714) 935-9781
Fax: +1 (714) 935-9809

Technical Support & Service

Department: Aftermarket
e-mail: service@furnacepros.com
Phone: +1 (714) 935-0302 x220

Aftermarket Parts Ordering

Department: Aftermarket
e-mail: parts@furnacepros.com
Phone: +1 (714) 935-0302 x220

Equipment Sales, Upgrades & Factory Reconditioning

Department: Sales & Marketing
e-mail: info@lcifurnaces.com
Phone: +1 (714) 935-0813

Websites

New Furnaces: www.LCIfurnaces.com
Aftermarket Support: www.FurnacePros.com

EQUIPMENT LIST

Verify that the following equipment was received.

Qty	Unit	Description	Part Number
(1)	ea	LA-309 Furnace	13-006-LA-309
(1)	ea	Monitor, Dell P170 17” LCD Professional Flat Panel	P170
(1)	Length	Belt segment with splice wire	
(1)	ea	Latch and Key, Flowmeter (alt to installed twist latch)	
(1)	ea	Mouse, USB Optical	2MOUSEU2L

In addition verify that you received the following, shipped separately.

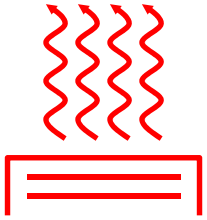
Qty	Unit	Description	Part Number
(2)	ea	Manual, Owner’s, 3-Ring Bound	13-006-676-110000-02
(2)	ea	Manual, Reference, Perfect Bound	675-110000-02
(1)	ea	CD Media, Reinstallation, ProControl™ Furnace software, including - Owner’s Manual, P/N 13-006-676-110000-01 - Reference Manual, P/N 675-110000-01	13-006-677-110000-01
(1)	ea	CD Media, Reinstallation, Windows®7 operating system	SERVICE TAG 6Y2XGS1
(1)	ea	CD, Drivers and Utilities, Dell Optiplex 990	

GENERAL SAFETY GUIDELINES

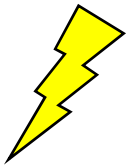
The following set of guidelines is intended to create awareness of potential health and safety hazards.

Normal Good Laboratory Practice

Normal good laboratory practices apply to the operation of IR furnaces. Do not use the space above the furnace as storage. Do not block the cabinet doors preventing the cooling of the electronic equipment inside. Do not operate with side covers off as this will prevent normal cooling of the electronic equipment thus voiding the warranty. Tuck electrical cords out of the way. Do not store flammables in the vicinity of the furnace and especially while operating the furnace with an oxygen atmosphere.

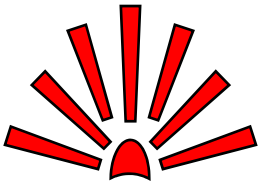


HIGH TEMPERATURES. In general, the operation of any furnace may expose operators or maintenance technicians to the risk of burns. After being processed in an infrared furnace, customer product may still be dangerous to handle. Each owner is responsible for providing a safe work environment and proper training in the handling of material being processed in a furnace.



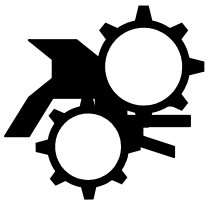
ELECTRICAL SHOCK HAZARD. IR furnaces operate at high voltages. Operation with side covers off constitutes a safety hazard. Ensure that main power is off while side covers are removed.

Electrical shock hazards exist for those technicians who service the furnace. High voltages are required to operate the furnace and precautions must be taken to reduce the exposure to these elements. Again, it is the responsibility of the furnace owner to assure that only properly trained service technicians, familiar with high voltage operations be allowed to service the equipment

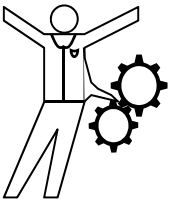


EXPLOSION Explosive dangers may exist in the high temperature process environment of the furnace. If the furnace operates with process gas containing hydrogen, measures must be taken to avoid the dangers of explosion. Furthermore, improper gas flow balance may draw oxygen rich air into the furnace, mixing with effluent gases and material from products, also creating a hazardous environment.

HAZARDOUS MATERIALS. Persons performing maintenance tasks such as replacement of lamps may become exposed to silica fiber compounds. Such tasks should be performed by qualified persons wearing gloves, eye protection and a facemask to prevent inhalation of particulates.



ROTATING EQUIPMENT. Roller dangers exist when working around the conveyor belt of the furnace. Care should be taken not to place hands or garments on or near the belt drive mechanisms when the conveyor system is operating as roller crush may occur. Operators should avoid walking near the open ends of the conveyor belt. Those who must be near the moving parts should wear close fitting clothing.



SAFETY EQUIPMENT

EMO Buttons

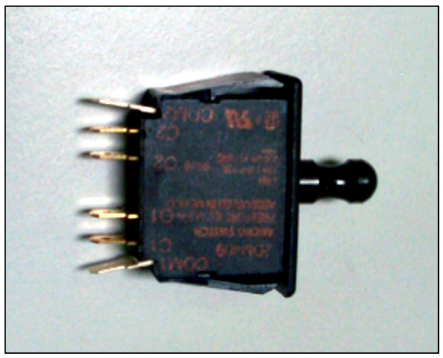
Each infrared furnace is fitted with at least two SEMI S2 compliant Emergency Machine Off buttons (EMO's), one located at each end of the furnace. Each Emergency Machine Off button (EMO) is attached directly to a switch that automatically shuts down all furnace electrical systems. In many cases, process gas flow will remain on after power is shut off.

Locate and insure their proper function prior to regular furnace operation.

Panel Interlock Switches

The furnace is equipped with a number of interlock switches located to prevent operation of the furnace with high voltage access covers out of place. One is located on each of the lower side panels closest to the furnace entrance safeguarding access to the high voltage at the chamber lamps.

Bypass this switch to allow furnace operation with the panels removed. Grasp the protruding switch and pull it out to override the switch (see Figures). Setting the panel switches in bypass mode is useful during SCR calibration and other troubleshooting.



Panel Switches Showing Normal Operation Position

Panel Switch Installed - Bypass Mode Position

DANGER: Bypassing the panel interlock switches increases maintenance personnel exposure to electrical hazards. The user must ensure that any interlock switches placed in override mode are returned to normal operation following any inspection or adjustment..

Dual Gas - Forming Gas: Nitrogen/Hydrogen Premix (DGO Option, ❒ not supplied)

The dual gas option provides for use of forming gas (FG) as a process gas. Use of FG is generally safe provided the concentration of hydrogen in the mixture is lower than the lower flammable limit of hydrogen. Hydrogen is flammable in concentrations of 4-74% in air; explosive range is 18-59% in air. Dual gas furnaces are equipped with an audible alarm to indicate low nitrogen and forming gas supply pressure.

DANGER: Except for furnaces specifically equipped with the hydrogen option, combustible gas should NOT be connect to the furnace. Forming gas or other gas mixtures which have a combustible gas component can be safely introduced into furnace provided the delivered concentration is below its lower flammable limit (LFL) in air.

HNO - Hydrogen/Nitrogen Mixing (HO/NHM Option, ❒ not supplied)

Hydrogen/nitrogen mixing requires the addition of combustible gas sensors at key points on the furnace as well as additional flow and pressure sensors to assure the hydrogen introduced in an oxygen free furnace environment. Exhaust stack ignitors are also added to harmlessly flame any free hydrogen that maybe evacuated from the furnace. Use of Hydrogen (H_2) in the heating chamber requires special furnace owner safety considerations including:

1. Furnace installation ensuring proper ventilation and safe source gases,
2. Special warm up and cool down procedures must be followed.
3. Gas flow balance is critical to the safety of all personnel working near a infrared furnace operating with hydrogen process gas. Escaping hydrogen gas, or the admission of oxygenated gas into the process section is extremely hazardous.

These three elements ensure that no additional H2 gas is allowed into the furnace and that the remaining H2 is diluted and removed as quickly as possible.

LIMITED WARRANTY

BUYER:	ALL IMPEX 2001 LLC	**PROJECT:**	13-006
PRODUCT:	LA-309 IR Furnace / Dell Optiplex	**SHIPMENT DATE:**	9/25/2013
SERIAL NUMBER:	1303091301 / 6Y2XGS1	**STARTUP DATE:**	10/20/2013

	EQUIPMENT	WARRANTY PERIOD
✓	IR Continuous Belt Furnaces & Dryers	Checkout/Startup by LCI: Twelve (12) months from date of initial startup, in no event exceeding 18 months from date of shipment.
	Refurbished Equipment, Cooling systems & Controls Upgrades	Furnace Warranty Expires: **10/21/2014**. Checkout/Statup by others: Twelve months (12) months from date of shipment.
✓	Computer	Dell Next Business Day Support: Extended warranty expires (12) months from date of initial startup, in no event exceeding 15 months from date of shipment. **1/1/2015**
	Aftermarket Parts	Sixty (60) days from date of shipment.

Lochaber Cornwall (LCI) warrants that the Equipment conforms to its specifications and is free from defects in workmanship and material under normal use and service, excluding chemical attack, wear and tear from abrasion or corrosion. During the Warranty Period LCI will at its option, repair or replace the defective part provided (1) BUYER promptly notifies LCI of any claimed defect, (2) BUYER receives return authorization and returns the product to LCI for inspection, and (3) the Product is determined by LCI to be defective and the remedy the responsibility of LCI. Minor deviations from the specifications shall not constitute defects or non-conformance.

Consumables such as fuses, filters, lamps, thermocouples and lubricants are expressly excluded from this warranty, excecpt to the extent LCI is notified a failure of any consumable item within the first 60 days from shipment of the furnace from LCI.

No parts shall be received by LCI without LCI prior written authorization. If LCI determines that the warranty does not apply, BUYER will be responsible for any repair or replacement costs and all associated freight charges.

LCI's LIABILITY IS LIMITED TO THE REPAIR OR REPLACEMENT OF THE EQUIPMENT FOUND TO BE DEFECTIVE AT SUCH LOCATION AS MAY BE DETERMINED IN THE SOLE DISCRETION OF LCI. ALL WORK UNDER THIS WARRANTY SHALL BE PERFORMED DURING NORMAL WORKING HOURS. ALL REPLACEMENT PARTS, WHETHER NEW OR REMANUFACTURED, ASSUME AS THEIR WARRANTY PERIOD ONLY THE REMAINING TIME PERIOD OF THIS WARRANTY.

BUYER shall bear the cost of return of any materials, components and equipment to LCI. LCI shall bear the cost of non-expedited shipping to BUYER of parts and materials replaced under this warranty. When a LCI representative visits BUYER's facility for warranty work, BUYER shall only reimburse related normal and customary travel and lodging expenses.

Unless otherwise specifically authorized in advance, payment of charges incurred by others shall not be borne by LCI. In any event, approved charges shall be limited to the cost LCI would have reasonably incurred had the equipment been returned to its plant for correction. LCI will not accept any backcharges for field corrections made without its prior written approval and instructions.

These warranties will not apply if the equipment or any components thereof have been subject to:

(1) operation, maintenance, overhaul, installation, storage or use which is improper or not in accordance with LCI's instructions;

(2) any alteration modification, or repair by anyone other than LCI or its authorized representative;

(3) any accident, misuse, neglect, or negligence after shipment; or

(4) damage due to uncontrollable external events or acts of God.

All payments must be made according to the agreement terms to activate this warranty. Warranties will commence for the remainder of the Warranty Period upon payment of any balance due LCI.

THE EXPRESS WARRANTIES MADE HEREIN ARE EXCLUSIVE AND ALL OTHER WARRANTIES, EXPRESS, STATUTORY OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE DISCLAIMED. IN NO EVENT SHALL LOCHABER CORNWALL, INC. OR ANY OF ITS SUBSIDERARIES BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES (SUCH AS SPECIAL OR INDIRECT) NOR FOR ANY LOSS OF PRODUCTION OR OTHER LOSSES arising out of, resulting from, or in any way connected with its work, the performance of the Equipment, any failure of the Equipment or any breach of the agreement.

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