

Pre-installation Manual
LightCELL™
Advanced Laser Machining Center

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If you call outside our office hours, your call will be taken by our answering system and will be returned when the office reopens.

If there are technical difficulties with your laser that cannot be resolved by support mechanisms outlined above, please E-mail or telephone Coherent Technical Support with a description of the problem and the corrective steps attempted. When communicating with our Technical Support Group, via the web or telephone, the model and Laser Head serial number of your laser system will be required by the Support Engineer responding to your request.

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Preface

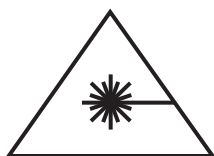
This manual contains pre-installation information for the Light-CELL Laser Machining Center manufactured by Coherent. This document is provided to customers as a site and facilities preparation guide in advance of system delivery and installation.

Included with the shipment of the Laser Machining Center is the Operator's Manual, p/n . Refer to the Operator's Manual for a complete description of controls and operating instructions.

Coherent strongly recommends that the integrator or user read all safety information contained in this Pre-installation Manual and in the Operator's Manual before operating the laser.



Read the Operator's Manual carefully before operating the LMC for the first time. Special attention must be given to the material in "Section Two: Safety", that describes the safety features built into the LMC.



Use of controls or adjustments or performance of procedures other than those specified in this manual may result in hazardous radiation exposure.



Use of the system in a manner other than that described herein may impair the protection provided by the system.

U.S. Export Control Laws Compliance

It is the policy of Coherent to comply strictly with U.S. export control laws.

Export and re-export of lasers and laser-based systems manufactured by Coherent are subject to U.S. Export Administration Regulations, which are administered by the Commerce Department. In addition, shipments of certain components are regulated by the State Department under the International Traffic in Arms Regulations.

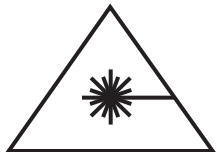
The applicable restrictions vary depending on the specific product involved and its destination. In some cases, U.S. law requires that U.S. Government approval be obtained prior to resale, export or

re-export of certain articles. When there is uncertainty about the obligations imposed by U.S. law, clarification must be obtained from Coherent or an appropriate U.S. Government agency.

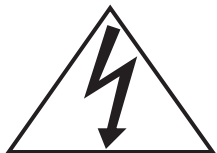
Symbols Used in This Manual and on the Laser System



This symbol is intended to alert the operator to the presence of important operating and maintenance instructions.



This symbol is intended to alert the operator to the danger of exposure to hazardous visible and invisible laser radiation.



This symbol is intended to alert the operator to the presence of dangerous voltages within the system enclosure that may be of sufficient magnitude to constitute a risk of electric shock.



This symbol is intended to alert the operator to the danger of Electro-Static Discharge (ESD) susceptibility.

SECTION ONE: SITE PREPARATION

Overview

The LightCELL Laser Machining Center (LMC) must be installed or reinstalled by a Coherent authorized representative. To maintain the precision of the machine, advanced beam alignment and leveling must be done whenever the machine is moved or shipped.

This section contains information required to plan the installation site, unpack and inspect the system, perform the physical installation, perform alignments and verifications necessary to confirm proper system operation, and provides a list of topics to be covered during basic operator training.

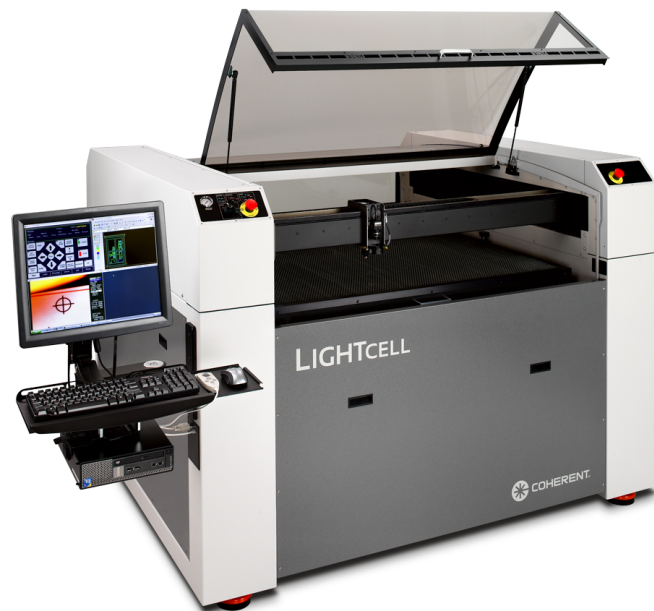


Figure 1-1. LightCELL LMC



Before installation, it is essential that the customer read this manual thoroughly. It is important that the customer become familiar with all aspects of the installation of the LMC system.

Pre-installation Checklist

All LMC systems are delivered with all of the hardware and software required for operation. However, there are space, environmental and specialized utility requirements that the customer must provide before installation.

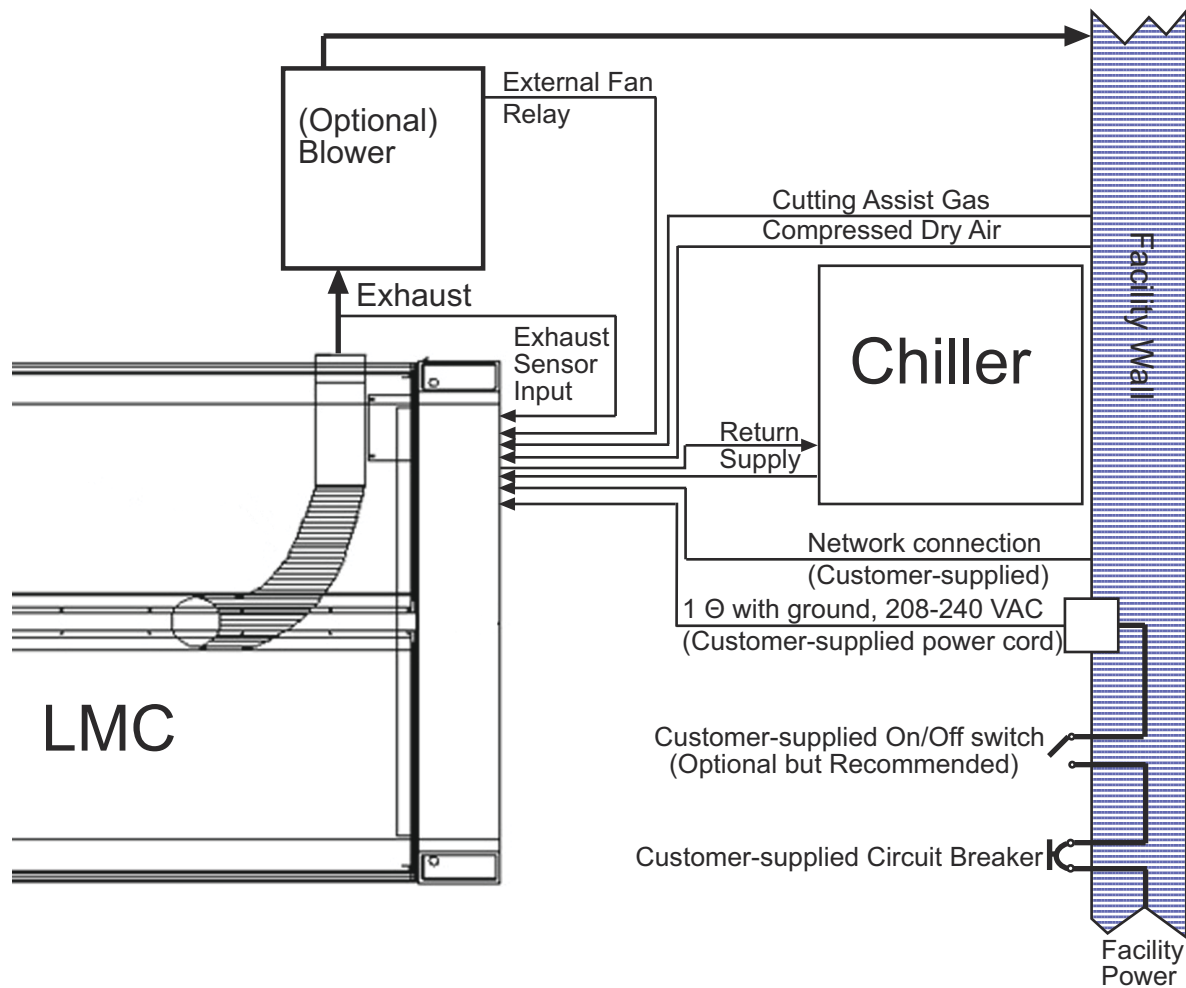


Figure 1-2. Typical Installation Block Diagram

This section provides a Pre-installation Checklist of the site requirements, which must be met prior to the installation by a Coherent service technician. The installation should be scheduled only after all listed requirements are satisfied. During the installation, the technician will precisely level the machine, confirm utilities, perform system tests and provide basic operator training.

Refer to the following pages for more detailed specifications for each site requirement.

- [] **Space:** The LMC requires a smooth, flat surface that is free from excessive vibrations.
- [] **Electrical:** The LMC requires specific wiring and must be connected by a qualified electrician.
- [] **Cooling:** An external, recirculating water cooling system is required. This may be a commercially available chiller or an existing cooling system.
- [] **Exhaust:** The LMC requires a ventilation system to remove cutting fumes from the work area and provide vacuum force at the cutting bed.
- [] **Assist Gas:** The system requires a source of dry, oil-free air or other gasses used for specific cutting applications.
- [] **Standard Compressed Air:** The cutting table is equipped with pneumatic locks to hold it in place. Low-flow, static-pressure compressed air is used to actuate this system and to open the exhaust gate. The same gas that is used for the assist gas may also be used in this closed system.
- [] **Remote Interlock:** The LMC can control external devices, such as the exhaust fan.
- [] **Accessory Kit:** The LMC comes with an accessory kit when delivered to the site. Included in the kit are parts to connect the LMC to the ventilation system, assist gas source and chiller.

Floor and Space Requirements

The LMC requires a floor with a smooth, flat surface that is free from excessive vibration. Vibration-producing equipment should be dampened at the source. The machine includes leveling feet and precise leveling of the machine will be performed by the installation technician.

The LMC system requires a minimum of 24" of clearance on all sides and additional space in the front and back for removing the cutting pallet (removing the pallet from the rear of the machine is optional, but allows for easier access).



Providing the recommended service access will provide ease and speed of service and repair of the LMC system.

Refer to Figure 1-3 for system and service clearance dimensions.

The exhaust ducting connects to the LMC machine at the right, rear corner, near the top of the machine. All other utilities (AC power, water, air, data cable) connect at the I/O Panel, on the right side, lower rear corner.

Figure 1-3 shows the minimum space required for the LMC to allow front removal of the cutting pallet. Add another 60 inches to the length if the pallet will also be loaded from the rear (See Figure 2-1).

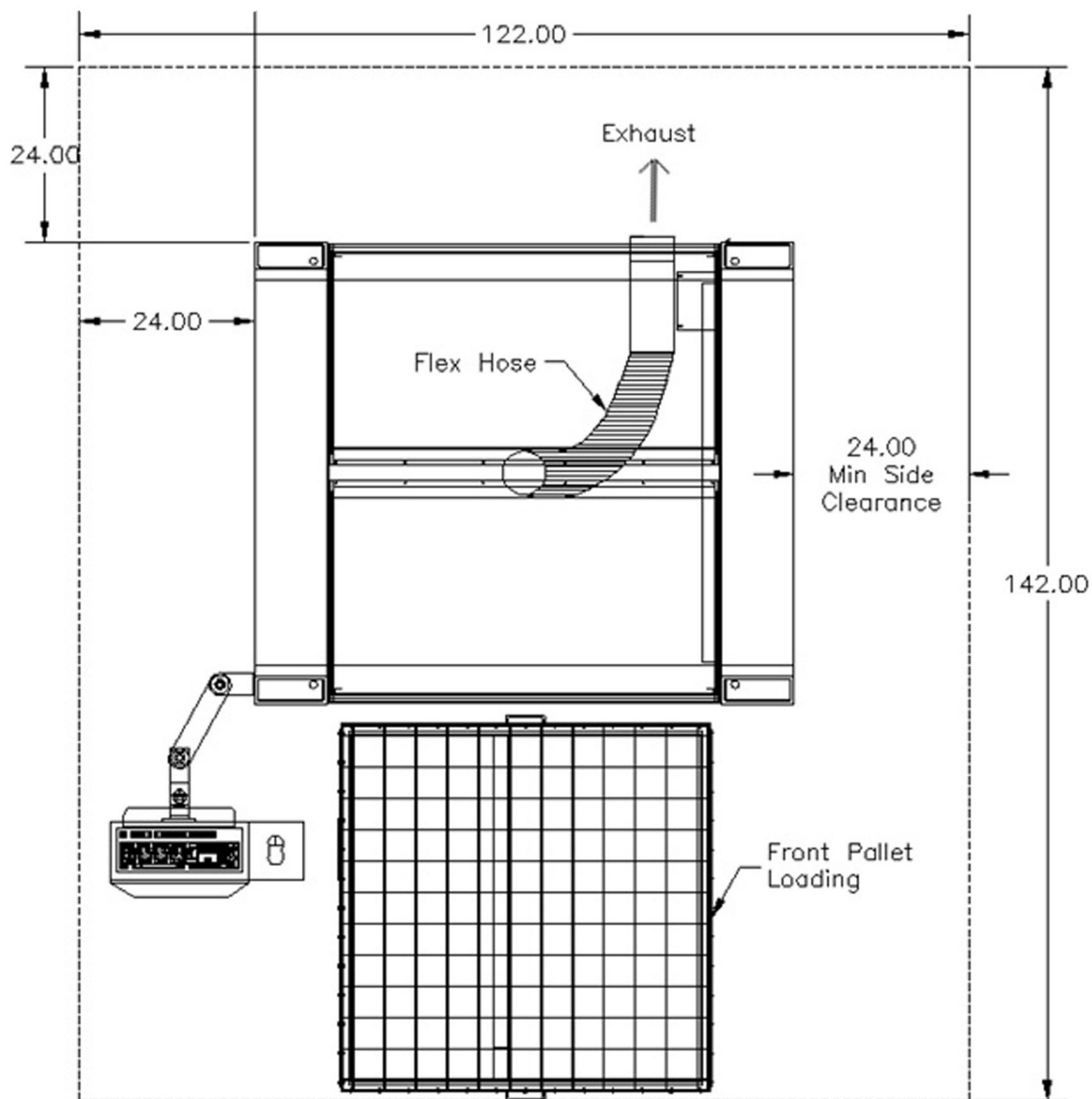


Figure 1-3. Floor Plan, Front Pallet Loading

Receive, Unpack and Inspect

The LMC packaging has been designed for robust shipment.

Upon receiving the system, inspect the outside of all containers immediately to ensure no damage occurred in transit. If there appears to be visible damage (holes in the containers, fluid damage, crushing etc.), immediately notify Coherent and a representative of the carrier. Request that a representative of the freight company be present when unpacking the contents.

The containers might appear in good condition, but the contents may be damaged. Make sure to inspect major components as they are unpacked. Unpacking instructions are found in the Installation Procedure found later in this section.

To unpack the LMC system, at least two people and the following tools will be required:

- Scissors or a package cutting knife
- Claw hammer or crow bar
- Forklift able to lift at least 771 kg (1700 lbs.).



Figure 1-4. Forklift Removing LMC From Shipping Crate



While in transit, shipping containers and contents may be exposed to cold temperatures. To prevent condensation from developing on and within the LMC system, move the crate(s) to a location near the installation area and allow to acclimate before opening and unpacking.

Make sure to provide a clear path from the receiving area to the installation site. Use the fork tubes provided to avoid damaging the LMC during transportation to the installation site.



Figure 1-5. LMC With Forklift Tubes Installed

Electrical Utilities

AC Power is connected to the LMC on the right side of the machine, near the lower, rear corner. The LMC includes a standard electrical connection box, but does not include external wiring.

Electrical service must be provided by a qualified electrician and must meet National Electric Code (NEC) standards or local regulations, whichever take precedence.

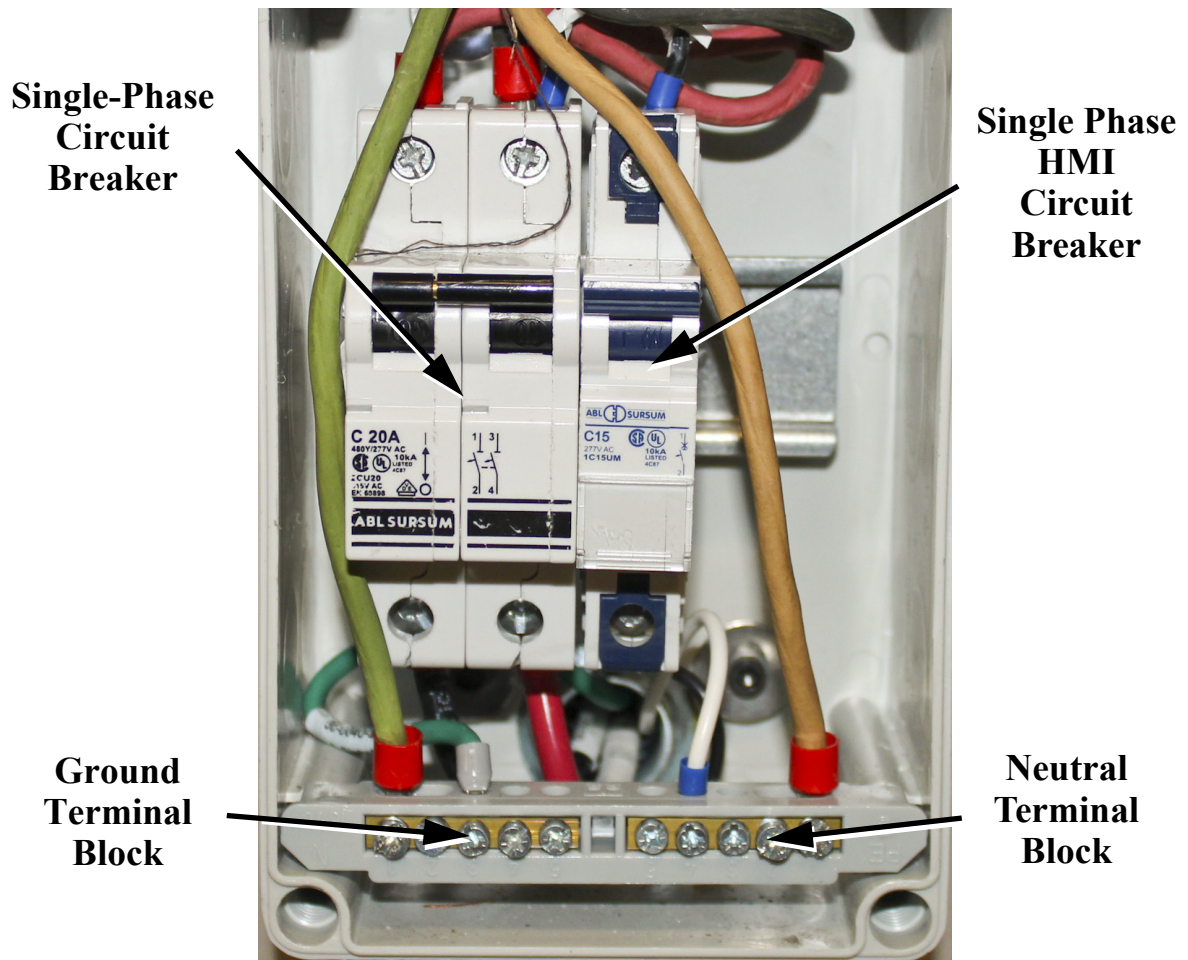
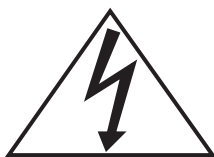


Figure 1-6. LightCELL LMC Electrical Connection Box



COHERENT MAKES NO RECOMMENDATION FOR PLUGS OR SOCKETS FOR ANY CONNECTION, AND ACCEPTS NO RESPONSIBILITY OR LIABILITY WHATSOEVER FOR THE ELECTRICAL CONNECTION BETWEEN THE LMC SYSTEM COMPONENTS AND PRIMARY ELECTRICAL POWER SUPPLY. IT IS SOLELY THE CUSTOMER'S RESPONSIBILITY TO EFFECT SAFE AND CODE-COMPLIANT ELECTRICAL CONNECTIONS.

The LMC requires a dedicated mains supply (line not shared with other loads). The LMC requires a 1-phase, 208–240 VAC, 20 Amps, 47-63 Hz electrical supply. Use 6 AWG, 4 conductor, 60°C copper wire for the LMC main supply. No power cord or mating connectors are provided with the system.

Table 1-1. Electrical Requirements

	AC VOLTAGE	PHASE	HERTZ	AMPS
LIGHTCELL	208-240	1	47-63	20
HMI	120	1	47-63	15

It is recommended that the LMC power cable be attached to a lockable electrical disconnect switch. The disconnect switch must disconnect all three phases, but never the Protective Earth (PE) ground. In-line fuses may be installed but are not required. A typical lockable disconnect switch is shown in Figure 1-7.

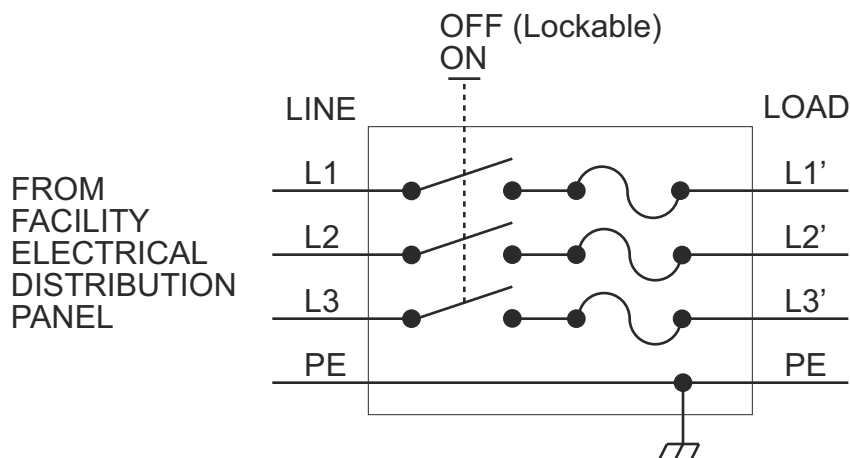


Figure 1-7. Electrical Disconnect Switch

Alternately, the mains connection may be made with a suitable customer-supplied mating plug and socket.

All LMC include a Human Machine Interface (HMI) touch screen computer control panel as a part of the system. The HMI is powered separately using single-phase with a neutral line and is protected with a separate circuit breaker. The HMI requires single-phase, 120 VAC, 15A, 47-63 Hz electrical supply.

To power a laser power meter, external laptop computer, trouble lights, power tools and other test equipment, it is recommended to provide 115V/20A, 50/60 Hz utility outlets near the LMC system.

The (optional) exhaust blower requires 3-phase, 230/460 VAC electrical service.

Other systems (e.g. liquid-cooling, gas supply, ventilation) may require electrical power for operation. Refer to the manufacturer's literature for specifications and site planning recommendations.

Liquid Cooling System

The LMC system requires an external, closed loop water cooling system. This can be satisfied by a commercially available chiller, or an existing cooling system. Coherent does not supply chillers, but can recommend a model to match your laser power.

Table 1-2 below lists the cooling requirements and recommended models for each LMC system.

The temperature of the cooling water should never be set below 77°F (25°C) or the room temperature (whichever is higher). The maximum rated operating temperature for the laser system is 95°F (35°C).

The accessory kit includes 25 feet (7.62 meters) of ½" (12.7mm) tubing for connecting the LMC to the chiller. Cut the tubing in half. The included filter is installed in-line before the input to the LMC. Also included are two ½" (12.7mm) chiller outlet fittings with ¾" NPT threads.

Install the filter, then connect:

- Outlet of chiller to input of LMC
- Inlet of chiller to output of LMC



Exhaust (Ventilation) System

The chiller temperature should never be set below the ambient dew point. Operating in this condition can cause condensation that will permanently damage the laser tube. Damage caused by condensation is not covered under warranty.

The LMC system requires an external ventilation fan or air cleaning system. This external fan can be connected to the LMC via hard or flexible ducting. For typical installations, we recommend that the fan be roof mounted. This will result in a system that has negative pressure in the ducting that is run inside the building.

Customer AC Inputs – To be connected by a qualified Electrician

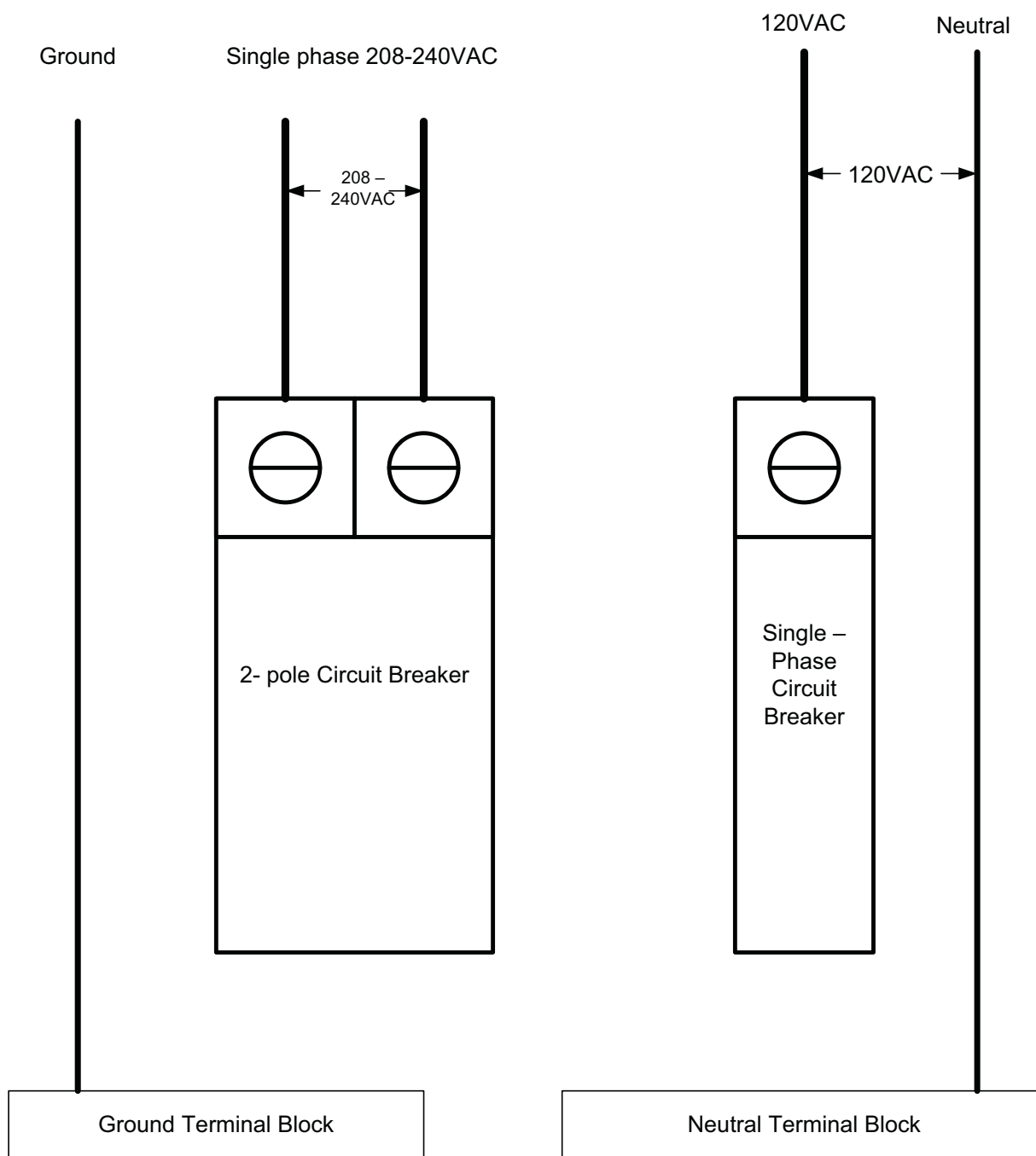


Figure 1-8. LightCELL LMC Customer AC Inputs

Table 1-2. Chiller Requirements

LMC MODEL	LASER POWER	CHILLER COOLING CAPACITY (MIN)	WATER FLOW (MIN)	RECOMMENDED POLYSCIENCE MODEL
LIGHTCELL	150 Watts	2.5 kW	1.5 gal/min	6706T

The external ducting connects to a 6" diameter duct at the rear of the machine. We recommend that the ducting size be increased to 8 to 10 inches in cases where the ducting is to be run more than 10 feet from the machine.

**Figure 1-9. LightCELL LMC Exhaust Hook-up**

The LMC system includes an internal fan that provides added hold-down pressure for the material being processed. A secondary vent above the cutting bed creates a laminar flow of air across the cutting bed and removes additional fumes that do not pass through the material. Always seal the open area of the bed before processing your material. This will increase the performance of the fume removal system.

The external (user supplied) exhaust fan must supply adequate air flow for the internal exhaust system to work properly.

The external fan must provide a minimum of 600 CFM @ 6" SP at the inlet to the machine. A long length of ducting may impede the airflow and reduce the static pressure, requiring a bigger fan.

For typical installations involving a roof-mounted fan, we recommend a high-pressure, direct-drive blower available from McMaster-Carr (Catalog #1953K66) or equivalent. For installations involving a local fan mounted close to the LMC, we recommend Catalog #1953K27 or equivalent.

Supplied exhaust components (See Table 1-3) are to be connected by the customer prior to LMC installation.

Each installation may require specific condition be met such as local regulations or heating, air conditioning and ventilation. Be sure to consult with an experienced HVAC contractor in your area for specific advice for your location..

Table 1-3. Supplied LMC Exhaust Components

ITEM	QUANTITY	TITLE	DETAIL
1	1	Exhaust Hose	Flex hose from plenum.
2	1	Exhaust Mount Bracket	Mounts on inside. See
3	2	Hose Clamps	Secure flexible hose to plenum connector sleeve.
4	1	Connector Sleeve	Mounted inside with exhaust mounting bracket.
5	2	Hose Adaptor	Mounted at the ends of flexible hose.
6	5	QF Clamp	Used on all joints.
7	2	Pipe Hanger	Hangs connector sleeve.

(Cutting) Assist Gas System

The LMC requires dry, filtered air or other gas to protect the cutting lens and assist in the cutting process. The assist gas connection to the LMC is a ¼" flexible tube. The gas supply must be regulated between 50 and 150 psi. If the pressure drops below 50 psi, the laser will be disabled through a gas pressure sensor. This is designed to protect the optics from failure if the gas supply is interrupted during a job. The gantry motion will continue, however the laser will stop firing.

Inert gasses, such as Nitrogen or Argon can be used for most materials and will reduce Heat Affected Zone (HAZ) damage for many materials. Oxygen can be used for metals to assist cutting, but should not be used for non-metal materials in most cases.

The flow rate for assist gas will depend on the application and machine setup.



All gasses supplied to the LMC must be dry and oil-free. Moisture in the system can damage the LMC's optics. If oil is introduced into the system, there is a risk of explosion if the laser is later used with oxygen.

Pierce Gas (Option)

If your LMC has been fitted with the pierce gas option there will be a second gas regulator and pressure gauge located on the right-hand side of the machine. A second gas input is supplied and is clearly labeled Pierce Gas. This gas and pressure is used for piecing if the option is selected in the job file. The main purpose for this option is to allow the user to change gas and pressure during a pierce for metal cutting. Often a better quality pierce can be achieved using a much lower pressure, where a better quality cut is achieved with high pressure and flow. If the second gas input is not used the second gas regulator will not be active and no adjustments are required.

Human Machine Interface (HMI) and Networking

All LMC systems include the Human Machine Interface (HMI), which consists of a computer, a touch-screen monitor, a keyboard and a mouse. These components are mounted on an extended adjustable computer arm. All LMC systems are shipped with HMI software installed on the computer. Each LMC also includes one free Laser-Link license by default, which is installed by the Coherent installation technician on either the HMI or a remote computer as needed. The Pro-Panel option includes 2 LaserLink licenses and is shipped with the Laser-Link program installed on the HMI computer.

LaserLink is Coherent CAD/CAM software which requires a Windows-based (XP, Vista or Windows 7) computer. The programming computer does not need to be dedicated to the LMC. If the LMC is connected to a network, it can access files processed anywhere on the network. A processor running Windows XP, with a minimum of 256MB RAM and 20MB of hard drive space, is required.

Laser-Link is used to import CAD files (DXF, DWG, HPGL, Gerber), raster files (BMP, JPG, PNG, GIF), edit geometry, assign machine settings from a user-editable database of settings and create process files to run jobs.

A 14-foot (4.27 meters) Ethernet cable, along with a coupling, is included in the accessories kit for networking. The LMC includes an Ethernet switch inside the machine.

Control Interfaces

The I/O Panel (located on the right side of the machine at the lower, rear corner. See Figure 1-10) includes the following connections:

- Network Communications Input – This is a standard RJ-45 Ethernet connector to an external PC or network.
- Remote Fan Relay – The LMC can control external devices such as the exhaust fan. See Figure 1-11. This connection allows the LMC to switch an external exhaust fan that has an appropriate motor starter or relay to start the motor. The switch (pilot duty relay - dry contacts) inside the machine does not supply power and cannot pass sufficient current to run a motor directly. The fan motor must be started by a relay. Pressing the Exhaust button on the Control Panel causes a switch closure between Pin 1 and Pin 2. A mating connector is supplied with the LMC. This switch is rated at 120VAC, 1A.
- Remote Interlock - The LMC can control the remote safety interlocks.
- Regulator Vent - Do NOT connect any hose to the Regulator Vent connector.
- Assist Gas Input - 3/8" (9.525mm) flexible tube.
- Laser Purge Gas Input - Not used.
- Exhaust Sensor Input - 3/8" (9.525mm) flexible tube.
- Control Air Input - 3/8" (9.525mm) flexible tube. The Light-CELL LMC does not require Control Air, as it does not feature pneumatic locks and auto-dampers.
- Inlet from Chiller- 1/2" (12.7mm) tubing
- Outlet to Chiller - 1/2" (12.7mm) tubing .

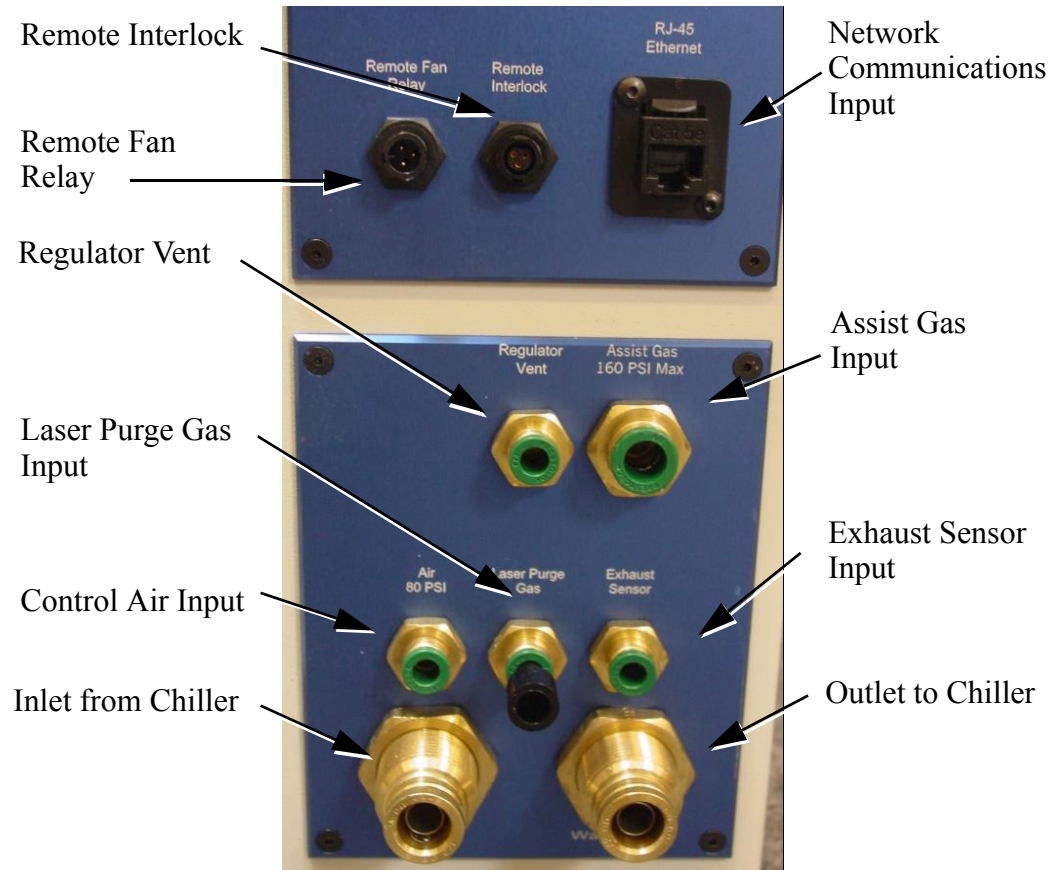


Figure 1-10. I/O Panel

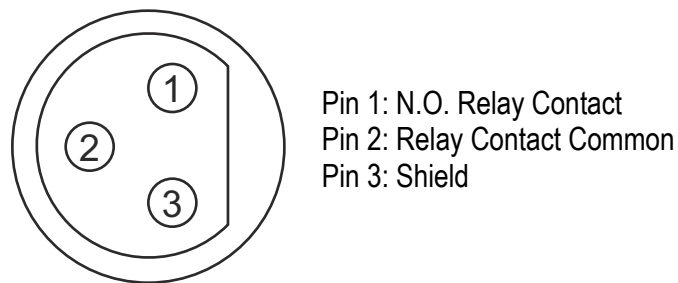


Figure 1-11. Control Interface Connector Pin Diagram

Table 1-4. Pre-installation Checklist

ACTIVITY	GENERAL REQUIREMENTS	REFERENCE(S)
Prepare System Environment	<ul style="list-style-type: none"> <input type="checkbox"/> Temperature and humidity is in specification. <input type="checkbox"/> Work area is well lit and clean. <input type="checkbox"/> Work area is properly ventilated and free of flammable or explosive gasses and air-bourne particles. <input type="checkbox"/> Floor at installation area is smooth, flat and free from excess vibration. <input type="checkbox"/> System/work area layout is planned, including space for pallet removal (front/rear) <u>and</u> service access to remove-able panels, controls and connections. 	“Floor and Space Requirements” on page 1-3.
Receive, Unpack and Inspect	<ul style="list-style-type: none"> <input type="checkbox"/> Receiving/unpacking area is clean and sufficiently large enough to uncrate system crate(s). <input type="checkbox"/> Forklift capable of lifting the 725 kg (1600 lbs.) LMC off the shipping pallet is available. <input type="checkbox"/> Unpacking tools are available. <input type="checkbox"/> Pathway from receiving area to installation area is clear. 	See “Receive, Unpack and Inspect” on page 1-5.
Prepare Electrical Utilities	<ul style="list-style-type: none"> <input type="checkbox"/> Electrical drop, disconnect switch and power cord is available for the LMC and (optional exhaust blower (3-phase power). <input type="checkbox"/> Electrical drop, disconnect switch and power cord is available for the HMI (single-phase power). <input type="checkbox"/> Utility outlets (115V/20A, typical) are available nearby (for power meter, laptop computer, power tools, test equipment, etc.). 	See “Electrical Utilities” on page 1-6.
Prepare Liquid Cooling System	<ul style="list-style-type: none"> <input type="checkbox"/> An external, re-circulating water cooling system that meets LMC requirements is installed and is functional. <input type="checkbox"/> Shut-off valves, a particle filter, fitting and hoses provided to connect to the LMC. 	See “Liquid Cooling System” on page 1-9.
Prepare Exhaust (Ventilation) System	<ul style="list-style-type: none"> <input type="checkbox"/> A fume extraction (ventilation) system that meets LMC requirements is installed and is functional. <input type="checkbox"/> Exhaust blower is installed and is functional. 	See “Exhaust (Ventilation) System” on page 1-9.
Prepare (Cutting) Assist / (Optional) Pierce Gas	<ul style="list-style-type: none"> <input type="checkbox"/> Dry, oil-free air or other gas used for specific cutting applications. <input type="checkbox"/> Pressure regulation up to 160 psi is required on the gas tank. 	“(Cutting) Assist Gas System” on page 1-12. “Pierce Gas (Option)” on page 1-13.

I certify that all items on the checklist are complete or will be complete on the date indicated below.

Authorized Signature

Name

Date

Table 1-5. Installation Testing Checklist

Company Name				
LMC Serial Number				
Model				
Configuration				
Primary Technical Contact				
CATEGORY	TEST	DESCRIPTION	DATE COMPLETE	TECH. INITIALS
Inspection	Damage	Inspect system for shipping damage		
	Utilities	Confirm Utilities as specified in site preparation guide		
Level	Ya Axis Level	Level Ya axis		
	Yb Axis Level	Level Yb axis		
	X Axis Level	Level X axis		
Software				
	Initialize	Power up LMC and initialize. Test communications		
	LaserLink	Install and configure LaserLink CAD/CAM software on user PC. Record version.		
Operation	Square	Cuts square samples and confirm square. Diagonals must be equal to $\pm 0.003''$.		
	Beam Alignment			
	Range			
	Level Bed			
Laser	Flow	Verify flow condition of chiller to laser. Confirm flow sensor operation.		
	Focus	Test and adjust focus sensor. Record focus offset.		
	Laser Power	Test laser power out of nozzle and record value.		

Table 1-5. Installation Testing Checklist (Continued)

SAFETY CATEGORY	REVIEW ITEM	DESCRIPTION	DATE COMPLETE	CUST. INITIALS
Fire	Bed / Plenum	Review proper cutting bed and plenum cleaning / maintenance procedures.		
	Assist Gas	Recommend Inert Gases for assist gas (e.g., Nitrogen or Argon)		
	Material	Review materials which will be cut.		
	Fire Extinguisher	Fire extinguisher must be readily available by machine (Halon-type recommended).		
	Operator	The LMC must not be run unattended. Turn off machine & exhaust at any sign of excessive smoke or material is not cutting through.		
Electrical	High Voltage	Voltages inside LMC can be lethal. Disconnect power to LMC if any service enclosures are removed.		
Mechanical	Moving Parts			
Ventilation	Hazardous Fumes			
Assist Gas	Clean, Dry Gases			
	High Pressure	Compressed gases can cause embolisms.		

Notes:

Customer Signature

Print Name

Date

SECTION TWO: FLOOR PLANS

Top View, Front Pallet Loading

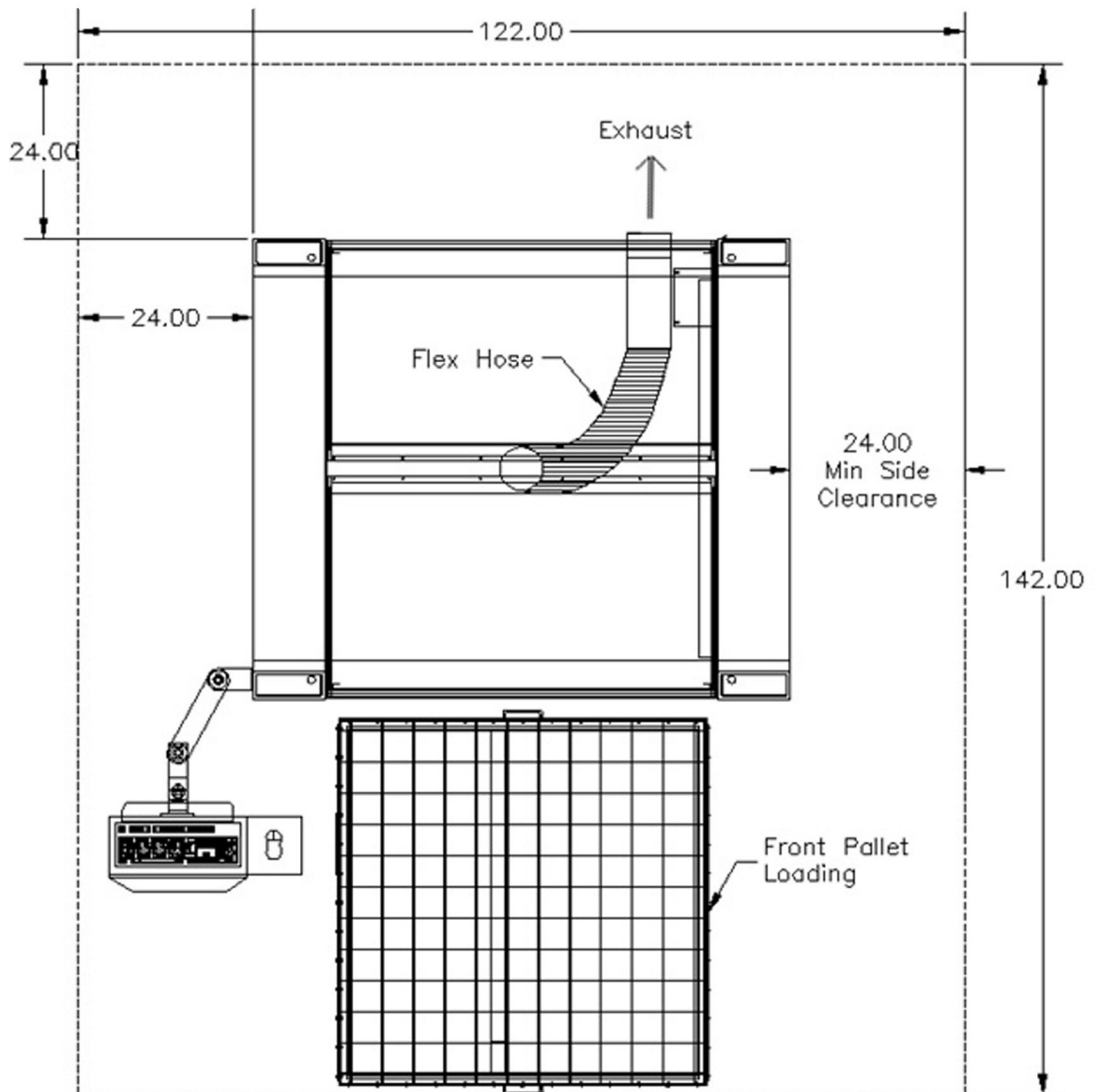


Figure 2-1. LightCELL Floor Plan, Front Pallet Loading

Top View, Front and Rear Pallet Loading

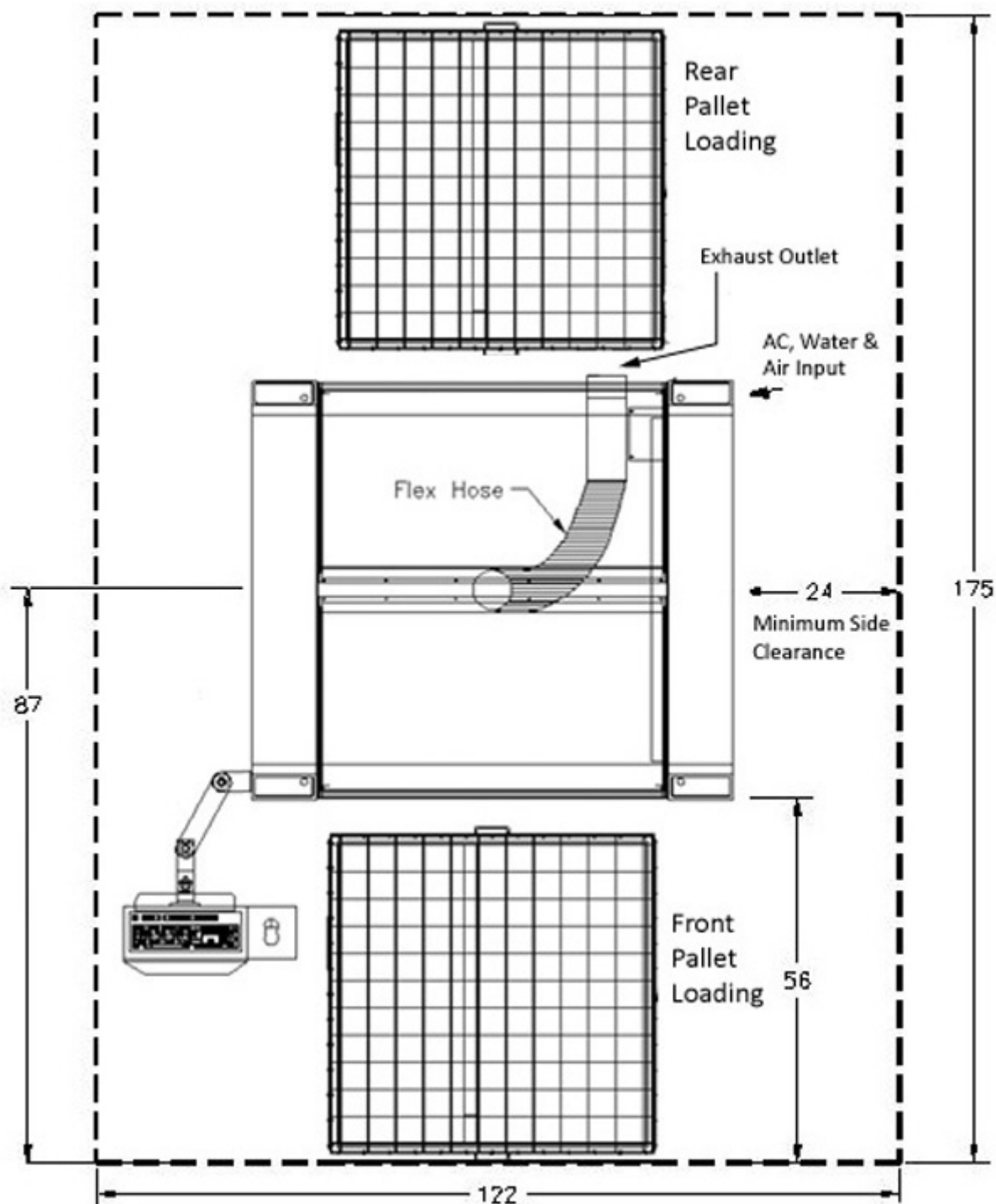


Figure 2-2. LightCELL Floor Plan, Front and Rear Pallet Loading

Front and Side View

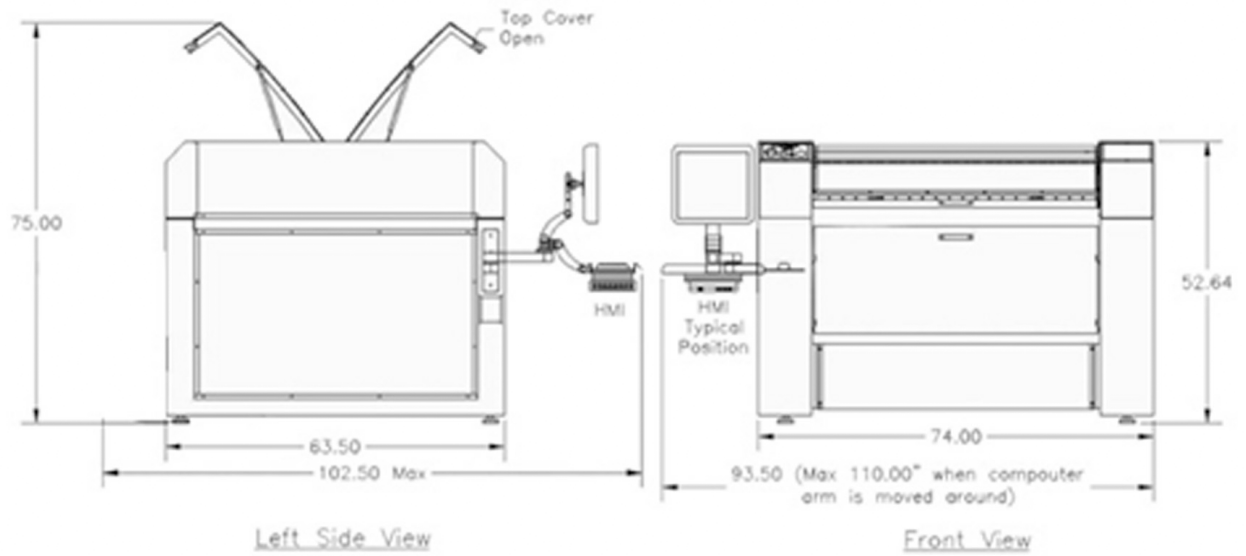


Figure 2-3. LightCELL Front and Side View

