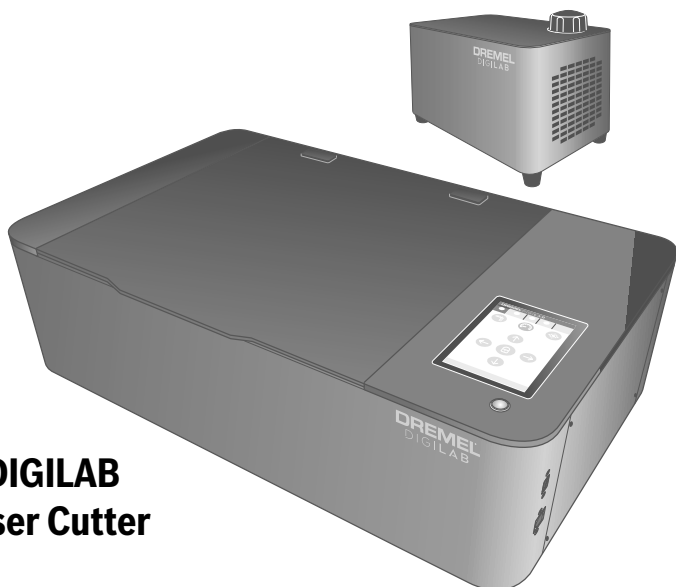


IMPORTANT READ BEFORE USING



Operating / Safety Instructions



**Dremel DIGILAB
LC40 Laser Cutter**

DREMEL®

P.O. Box 081126 Racine, WI 53408-1126

Call Toll Free for Consumer Information & Service Locations

1-844-4DRML3D (1-844-437-6533) www.dremel.com

ENGLISH VERSION

Safety Symbols

The definitions below describe the level of severity for each signal word. Please read the manual and pay attention to these symbols.





	This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.
	DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

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GENERAL SAFETY WARNINGS



WARNING Read all safety warnings, instructions, illustrations and specifications provided with this laser cutter. Failure to follow all instructions listed below may result in electric shock, fire and/or serious injury.

READ ALL INSTRUCTIONS

SAVE ALL WARNINGS AND INSTRUCTIONS FOR FUTURE REFERENCE

Work Area Safety

Keep work area clean and well lit. Cluttered or dark areas invite accidents.

Do not operate laser cutter in explosive atmospheres, such as in the presence of flammable liquids, gases or dust. Laser beam may ignite the dust or fumes.

Set up and operate the laser cutter in a well-ventilated area. Place laser cutter on flat nonflammable surface and away from flammable material. Provide at least 8 inches of unobstructed spacing around laser cutter to allow ventilation. Laser cutters may create fumes that irritate eyes and airways. Obstructing airflow into or out of laser cutter may result in serious personal injury.

Always use a properly configured, installed, maintained, and operating fume/smoke exhaust system as recommended by the manufacturer when operating the laser cutter. Caustic fumes and smoke from the cutting and engraving process must be extracted from the laser system and exhausted outside or properly filtered to reduce the risk of personal injury.

Always keep a properly maintained and inspected fire extinguisher in the area. Typically, Carbon Dioxide (CO₂) chemical fire extinguishers should be used.

Laser cutters must be operated only by persons familiar with their operation and manufacturer's instructions. Operation of laser cutters by persons unfamiliar with their operation and manufacturer's instructions can result in electric shock, fire and/or serious injury.

Do not allow unsupervised children and bystanders to interact with the laser cutter while it is operating. Persons unfamiliar with the operation of the laser cutter may change its setup, which may increase the risk of electric shock, fire and/or serious injury.

Electrical Safety

Laser cutter plugs must match the outlet. Never modify the plug in any way. Do not

use any adapter plugs with earthed (grounded) laser cutters. Unmodified plugs and matching outlets will reduce risk of electric shock.

While operating the laser cutter, avoid body contact with earthed or grounded surfaces, such as pipes, radiators, ranges and refrigerators. There is an increased risk of electric shock if your body is earthed or grounded.

Do not expose laser cutters to rain or wet conditions. Water entering a laser cutter may increase the risk of electric shock.

Before every operation of a water-cooled laser cutter, make sure that the coolant connections and laser tube are leak-free. Water leaks may increase the risk of electric shock.

Do not abuse the cord. Never use the cord for carrying, pulling or unplugging the laser cutter. Keep cord away from heat, oil, sharp edges or moving parts. Damaged or entangled cords increase the risk of electric shock.

Do not operate laser cutters in damp locations. Use of laser cutters in damp locations may increase the risk of electric shock.

Personal Safety

Stay alert, watch what you are doing and use common sense when operating a laser cutter. Do not use a laser cutter while you are tired or under the influence of drugs, alcohol or medication. A moment of inattention while operating laser cutters may result in serious personal injury.

Use personal protective equipment. Always wear eye protection appropriate for class of laser engraver. Protective equipment such as heat and cut resistant gloves used when work pieces are hot or have sharp edges will reduce personal injuries.

Dress properly. Do not wear loose clothing or jewelry. Keep your hair, clothing and gloves away from moving parts. Loose

GENERAL SAFETY WARNINGS

clothes, jewellery or long hair can be caught in moving parts.

Be careful removing work pieces from the laser cutter. Cutting with a laser increases the temperature of the work piece and the temperature of the work piece may remain high after laser cutter stops operating. Touching hot work pieces before they cool down may result in burns.

Do not let familiarity gained from frequent use of laser cutters allow you to become complacent and ignore laser cutter safety principles. A careless action can cause severe injury within a fraction of a second.

Laser Cutter Use and Care

Prevent idle laser cutter from being used by children and do not allow persons unfamiliar with the laser cutter or these instructions to operate the laser cutter. Laser cutters can be dangerous in the hands of untrained users.

Maintain laser cutters. Check for misalignment or binding of moving parts, breakage of parts and any other condition that may affect the laser cutter's operation. If damaged, have the laser cutter repaired before use. A poorly maintained laser engraver may result in a risk of shock, fire and/or serious injury.

Use the laser engraver in accordance with these instructions, taking into account the working conditions and the work to be performed. Use of the laser engraver for operations different from those intended could result in a hazardous situation.

Service

Have your laser cutter serviced by a qualified repair person using only identical replacement parts. This will ensure that the safety of the laser cutter is maintained.

LASER CUTTER SAFETY WARNINGS

⚠ WARNING **Never expose yourself to the laser beam since it may cause physical burns and can cause severe eye damage.** Proper use and care of this laser cutter system are essential to safe operation.

Never operate the laser cutter system without constant supervision of the cutting and engraving process. Exposure to the laser beam may cause ignition of combustible materials and start a fire.

Never use PVC or other nonconductive duct materials for the exhaust system. Static charges may build up and may cause a risk of fire or explosion.

Always use fire rated rigid or flexible metal or metalized ducting in the exhaust system. Non-fire rated exhaust ducting may increase the risk of fire.

Always inspect the exhaust fan and duct work for obstructions and ensure proper air flow exists before each use. Unobstructed and properly maintained exhaust fan and duct work will reduce the risk of fire and effectively extract caustic fumes and smoke.

Never engrave or cut any unknown material. Only engrave materials

recommended by the manufacturer. The vaporization/melting of many materials, including but not limited to PVC and polycarbonates, can give off hazardous fumes. Always refer to the Safety Data Sheet (SDS) from the material manufacturer to determine the response of any work material to extreme heat (burning/fire hazard) to prevent hazards.

Always use the air assist as recommended by the manufacturer, especially while cutting. Cutting movements are relatively slow and apply an extremely large amount of heat to the work piece. Avoid the build-up of heat in order to reduce the risk of fire.

Keep the interior of the laser cutter, including the table tray, clean and free of debris. Clean the laser. A build-up of cutting and engraving residue and debris is dangerous and may increase the risk of fire.

Never look into the beam of the alignment laser. Eye injury can result.

Never operate the alignment laser without the focus lens or other optical elements of laser cutter in place. The unfocused beam may be reflected out of

LASER CUTTER SAFETY WARNINGS

the chassis and increase the risk of eye injury.

Do not operate the laser machine with any of the panels removed. Remember that the laser beam is invisible! Exposure of the laser beam will greatly increase the risk of injury and/or fire.

Before using the laser machine, test the ground fault circuit interrupter (GFCI) provided with the supply cord to insure it is operating correctly. A properly operating GFCI reduces the risk of electrical shock.

Do not attempt to modify or defeat the safety interlock system for any reason. This could result in exposure to hazardous laser radiation.

Do not use laser cutter with extension cords. The GFCI on the machine power cord will not prevent electrical shock from the extension cords.

Comply with all codes, regulations and laws, including those for hazardous or noxious exhaust ventilation systems. Consult with federal, state and/or local authorities and applicable homeowner or condominium associations to ensure compliance of ventilation and exhaust systems. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

Consult a qualified installer or service agency for information or assistance if installation of exhaust/venting is beyond your skill level. Improper installation, adjustment, alteration, service, maintenance, or use can cause fire, electric shock or other conditions which may cause personal injury, property damage or even death.

Maintain all manufacturer recommended clearances during exhaust installation. Failure to maintain proper clearances could result in personal injury, death and/or property damage.

Wear proper personal protective equipment such as safety glasses, protective clothing and work gloves when performing exhaust connections. Failure to do so may result in personal injury.

Discontinue use and seek fresh air if respiratory or eye irritation occurs. Ensure ventilation, exhaust, and/or filtration systems are working according to manufacturer specifications and make any necessary adjustments before further use. Exposure to fumes may cause allergy, asthma, breathing difficulties or other adverse health effects.

Always use provided work piece support structure when cutting or scoring. Fabrication without honeycomb plate may lead to fire or release of stray radiation.

Do not use irregularly shaped work piece. Risk of stray radiation or fire.

Do not stack work pieces. Stacking work pieces increases the risk of fire.

Use only recommended accessories. Follow instructions that accompany accessories. Use of improper accessories may cause hazards

Ensure tools and parts such as spacer puck, wrench, debris, etc. are removed from the honeycomb plate before starting a laser job. Objects or debris may interfere with the laser head and lead to stray radiation or risk of fire.

This product is provided with a GFCI built into the power cord plug. If replacement of the plug or cord is needed, use only identical replacement parts.

Do not try to clean exhaust ducting. The high concentration of particles may become airborne and create inhalation exposure.

Do not spill water on the Hex Box™ unit. Damage to electronics may occur.

Choice of material used during laser cutter operation and subsequent health consequences are the sole responsibility of user. Health effects of materials used may not be documented nor available.

ADDITIONAL SAFETY WARNINGS

⚠ CAUTION Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Do not tap or scratch LCD screen with sharp objects. The LCD screen may become damaged.

Do not move the laser head by hand when locked. Moving a locked laser head by hand

may result in damage to the gantry system and/or personal injury.







Use care when removing the tube guard. The LED lights may be damaged by contact with tube guard edges.

Never remove the mirrors for cleaning. Take extra caution to not move the orientation of the mirrors as this will affect laser beam alignment and would require time intensive laser beam realignment.

SAVE ALL WARNINGS AND INSTRUCTIONS FOR FUTURE REFERENCE.

SYMBOLS

IMPORTANT: Some of the following symbols may be used on the Dremel LC40 Laser Cutter. Please study them and learn their meaning. Proper interpretation of these symbols will allow you to operate the tool better and safer.

Symbol	Designation / Explanation
V	Volts (voltage)
A	Amperes (current)
Hz	Hertz (frequency, cycles per second)
Ø	Diameter
~	Alternating current (type or a characteristic of current)
	Alerts user to read manual
	Earthing terminal (grounding terminal)
	Warns of laser radiation. Avoid direct eye exposure. Class 3R laser product.
	Warns of high voltage. Contact with high voltage can cause death or serious injury.
	This fire warning icon calls attention to fire risks that are present while operating the laser.
	This symbol designates that this tool is listed by Underwriters Laboratories, to United States and Canadian Standards.

FCC COMPLIANCE

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Changes and Modifications not expressly approved by the manufacturer or registrant of this equipment can void your authority to operate this equipment under Federal Communications Commission's rules.

INDUSTRY CANADA (IC)

This device complies with Industry Canada's licence-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference; and
- (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

See About This Device screen (page 42) for access to additional FCC & IC compliance information.

INFORMATION ON INTELLECTUAL PROPERTY

The Dremel LC40 is intended for laser cutting/engraving materials to create objects using digital files and digital designs that you create or own, or have the right to use when you operate the Dremel LC40. When cutting/engraving materials to create objects using the Dremel LC40, it is your responsibility to ensure that you do not infringe any third party intellectual property rights or violate any applicable laws or regulations, such as U.S. or foreign intellectual property laws.

The Dremel LC40 may not be used to create objects using digital files or digital designs protected by intellectual property rights owned by third parties without such third parties' permission to use such digital files or digital designs for the creation of such objects. Using the Dremel LC40 to do any of the following, which are provided to you as examples and must not be viewed as an exhaustive list, may require the permission of third parties: to create a duplicate or

facsimile (in whole or in part) of any digital design not owned by you, to create an object from a digital file you do not own, or to make an object from a scan of a physical object that you did not create. It is your responsibility to obtain such permission. In some cases, you may not be able to obtain such permission. Where such permission cannot be obtained, you must not create such objects. You must not modify, reverse engineer, decompile, or disassemble the Dremel LC40, except as permitted by applicable law.

If you use the Dremel LC40 in any way other than as recommended and described in these Operating/Safety Instructions, you do so at your own risk. Using the Dremel LC40 to make objects that infringe any intellectual property rights owned by third parties could result in civil or criminal prosecution and penalties, and you could be liable for money damages, fines, or imprisonment.

SPECIFICATIONS

LASER SYSTEM

Laser Type: Sealed CO2 Laser Tube
Laser Power: 40W
Laser Classification: IEC 60825-1 Class 3R
Beam Size: 6.5 mm diameter @ 1.2 m
Working Current: 20mA
Wavelength: 10.6 µm

DREMEL LC40 LASER CUTTER WEIGHT & DIMENSIONS

Dimensions: 32" x 20" x 8.25"
(812.5 mm x 508 mm x 209.55 mm)
Weight: 63.3 lbs (28.7 kg) (without Hex Box™ or accessories)
Shipping Weight: 100 lbs (45 kg)

HEX BOX™ WEIGHT & DIMENSIONS

Dimensions: 7.25" x 11" x 7.25"
(184 mm x 279 mm x 184 mm)
Weight: 10 lbs (4.5 kg)
Total Water Capacity: 35 oz (1 liter)

ELECTRICAL REQUIREMENTS

LC40 input rating: 120V, 60Hz, 6 A
Hex Box™ rating: 12V DC, 4.7 A

OPERATING ENVIRONMENT

Recommended Environmental
Temperature: 60-85 °F (16-29 °C)
Sturdy, flat, nonflammable, and level
workspace that holds weight of the Laser,
material, and Hex Box™.
For indoor use only.

SUPPORTED OPERATING SYSTEM AND SYSTEM SPECIFICATIONS

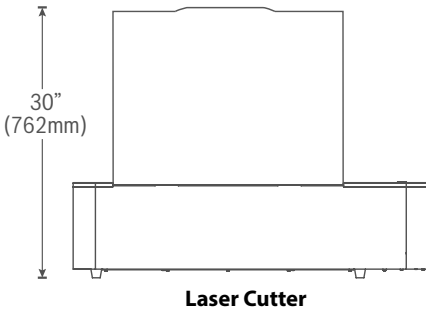
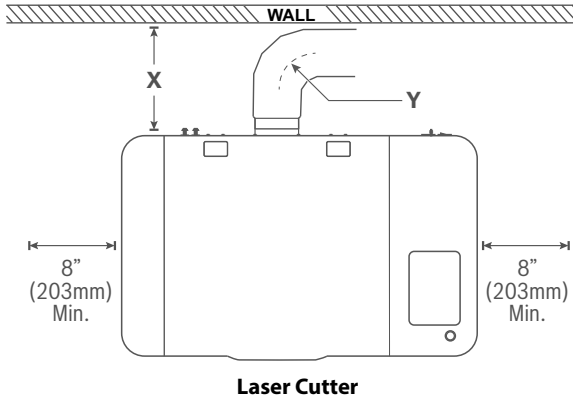
Compatibility: Mac & PC
•Apple® Mac® OS® X v10.9 or later
(Mavericks)
•Microsoft® Windows® 10
•Microsoft® Windows® 8.1
•Microsoft® Windows® 7 SP1
Browser Compatibility: Chrome, Safari,
Firefox, & Internet Explorer
Min Screen Resolution: 1024 x 768 Pixels
Ability to Connect Through Network
(Ethernet or Wireless) without Internet
Connection
Wireless connection frequency: 2.4 GHz

OPERATING CAPACITIES

Engraving Area: 18.4" x 12"
(467 mm x 304.8 mm)
Cutting Area: 20" x 12"
(508 mm x 304.8 mm)
Max Engraving Height: 1.25" (32 mm)
Max Cutting Height: ¼" (6 mm) Wood
and Acrylic

SPECIFICATIONS

DREMEL LC40 LASER CUTTER & HEX BOX™ CLEARANCE REQUIREMENTS



X – must be at least 26" (660 mm) when using onboard fan and at least 10" (254 mm) when using external booster fan. See Exhaust Management section (p. 24) for details.

Y – 6" (152 mm) min. bend radius. See Exhaust Management section (p. 24) for details.

MATERIAL USAGE

Table 1 Dremel LC40 Laser Cutter Commonly Used Materials**

Acrylic†	Denim fabric	Mat board
Aluminum, anodized	Felt (wool)	Oak, solid
Plywood**†	Glass	Paper
Cork	Leather, vegetable tanned	Rubber, laser grade
Cardboard	Maple, solid	Walnut, solid
Cotton fabric		

* Must be California 93120 Phase 2 & TSCA Title VI compliant for formaldehyde

† Birch and walnut Plywood and Acrylic are available from Dremel.

** When using materials other than those commonly used, ask the manufacturer for the SDS (Safety Data Sheet) for each material.

Table 2 Dremel LC40 Laser Cutter Prohibited Materials

ABS	Painted material, varnished materials
Beryllium oxide	Particleboard, paneling
Carbon	Polycarbonate
Chlorinated plastics	Polychloroprene (CR or chloroprene rubber, marketed under the brand name of Neoprene)
Coated carbon fiber	Polypropylene foam, Polypropylene sheet
Coated materials	Polystyrene foam
Epoxy based or phenolic resins	Polyurethane, Polyurethane foam
Fiberglass	Polyvinyl chloride (PVC) Found in many common products such as but not limited to; flooring, siding, piping, roofing membranes, credit cards, toys, flexible tubing.
Fluorine based plastics: PTFE (Teflon) Fluorinated ethylene propylene (FEP)	POM Delrin/acetyl
Galvanized metal	Rubber
HDPE (High Density Poly Ethylene)	Styrofoam
Leather, Artificial or Chrome tanned leather	Wood that has been: • Coated • Fumigated • Pressure treated • Stained
Materials containing: • Astanine • Bromine • Chlorine • Fluorine • Formaldehyde (excluding plywood listed in Table 1) • Flame-retardants • Halogens • Iodine	
Mirrored surfaces	
Nylon	

While the Dremel LC40 Laser Cutter can cut and etch a variety of materials, some materials such as most metals, cannot be marked and will give less than desirable results. Other materials may not have acceptable finish quality.

RESOURCES

Resource	Description	Location
Quick Start Guide	Provides an illustrated walkthrough of how to un-box the Dremel LC40 Laser Cutter and start a job.	Printed version is located in the box with the Dremel LC40 Laser Cutter. It is also available on digilab.dremel.com/support/laser-support
Dremel LC40 Laser Cutter LCD Interface	Provides step-by-step instructions for setting up the Dremel LC40 Laser Cutter. Also allows control of the Laser Head, run recent jobs, and adjust machine settings.	On the Dremel LC40 Laser Cutter machine
Dremel LC40 Control Software	Provides the interface for setting up, saving, and sending cutting and engraving jobs to the Dremel LC40 Laser Cutter.	Enter the IP address of the Dremel LC40 Laser Cutter into the browser.
Dremel Website	Access project inspiration and downloads, Dremel product information, and customer support.	dremel.com
DigiLab Website	Access information about Dremel DigiLab products, education projects, and more.	digilab.dremel.com
Dremel Customer Support	Contact Dremel for product support, maintenance, and service.	1-844-437-6533 dremel.com/digilab-support

GLOSSARY OF TERMS

Term	Definition
Air Assist	Air delivery system that helps to control flareups. Air is supplied by the Hex Box™.
Alignment Laser	An additional laser diode whose beam results in a red dot that is used to help align the mirrors.
Auto Array	A software function that creates a grid of the desired size by repeating the selected image.
.bin File	A binary file format used to save and load workspace projects to and from a computer.
Cut	Also called "vector", used for cutting through work piece. This function requires a vector, or line file to execute.
Design Software	Graphics editing software used to create and manipulate images for laser cutting and engraving.
Engrave/Etch	Function, also called "raster", used to darken or remove the surface of a material, rather than cut through it. This function requires an image file to execute.
Exhaust	The fumes and smoke generated during laser fabrication.

GLOSSARY OF TERMS

Exhaust Hose	Duct that is connected to the Dremel LC40 Laser Cutter unit to vent exhaust outside or into a filtration unit or to outside ventilation.
Exhaust Shroud	A metal tubing connection that is screwed onto the rear of the Dremel LC40 Laser Cutter unit over the exhaust vent fan.
Exhaust Port	An opening on the rear of the laser unit that allows the vent fan to draw air out of the workspace.
Firmware	Software that is embedded on the computer hardware of the Dremel LC40 Laser Cutter and controls its operation. Updates to the firmware will be provided by Dremel and applied to the Dremel LC40 Laser Cutter directly over the internet.
Fumes	Visible or invisible submicroscopic particulate matter produced and discharged from incomplete combustion, chemical reaction and/or heating of metals or metallic compound. Also refer to smoke.
Grayscale	Also called "dither", takes a black and white image and assigns different densities of dots to visually create a number of different shades of gray. Darker areas of the image will have more dots, while lighter areas will have less dots.
Hex Box™	A separate and interconnected part of the Dremel LC40 Laser Cutter system that integrates the water circulation and air assist functions of the Dremel LC40 Laser Cutter.
Honeycomb Plate	An aluminum tray that rests on the bed and supports the work piece as it is cut and engraved.
Job	A project that is sent to the laser for fabrication.
Laser Head	An assembly of components, including a mirror, lens, and cone, which the laser passes through before making contact with the material.
LC40 Control Software	The laser control software that is provided on the machine and accessed by a computer through the network connection.
Laser Tube	A glass tube located at the rear of the laser unit that generates the laser beam.
Lens	A glass lens in the Laser Head that focuses the beam of the laser for optimal cutting and engraving.
Material	The substance of which the work piece or work is composed.
Material Library	A listing of materials for which suggested laser settings are predefined in the Dremel LC40 Control Software.
Mirrors	A set of mirrors that direct the laser beam of the laser from the tube to the work piece.
Project	A planned piece of work created in the Dremel LC40 Control Software which can be sent to the Dremel LC40 Laser Cutter as a job.
Raster	Digital art composed of horizontal and vertical rows of pixels.
Score	Function used to make a mark on the surface of the material when you want to emphasize the outline of text or an object
Smoke	The gaseous products that are produced during a combustible event made visible by the presence of a suspension of particles.

GLOSSARY OF TERMS

Spacer Puck	A small cylinder that is placed between the work piece and Laser Head to assist in focusing the laser.
Touch Screen	Touch activated full color display.
Vector Art	Art created using vector illustration software programs, such as Adobe Illustrator® or Corel Draw®.
Vent Fan	A fan located in the exhaust port that helps draw air out of the workspace. Also referred to as Onboard Fan.
Work piece	Also called "work" or "material". It is the object to be cut or engraved with the laser.
Workspace	a) The area inside of the laser unit that is open for work piece placement and the movement of the Laser Head. b) A screen in the Dremel LC40 Control Software where a job is created. It provides a graphical representation of the intended job and its position relative to the general boundaries of the laser working area.
X-Axis Guide Rails	A set of rails at the rear of the laser bed that allow movement of the Laser Head to the left or right side of the workspace.
Y-Axis Guide Rails	A set of rails on either side of the laser bed that allow movement of the Laser Head to the front or rear of the workspace.

INTRODUCTION

Welcome to the world of Dremel Digilab. Our mission is to mentor you through the digital fabrication process and share best practices for bringing your ideas to life.

Laser cutting and engraving are processes that will invoke experimentation and persistence. The Dremel team is here to make your job easier with online tips, documentation, and live support. The Dremel LC40 Laser Cutter brings robust functionality such as network connectivity, recommended settings for commonly used

materials, and multi-sensor checks. To get started with the Dremel LC40 Laser Cutter follow the initial setup routine on the touch screen to guide you through the hardware and software setup of the machine.

You can register your Dremel LC40 Laser Cutter and create a user profile by going to dremel.com/support/product-registration. Your profile gives you access to a variety of laser projects and support. Once setup and registration is complete, you are ready to start making.

TOOLS & SUPPLIES NEEDED FOR SETUP



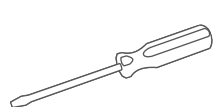
Distilled Water



Funnel



Scissors



Screwdriver

Based on exhaust management method selected you may need the following:

- Building code approved sealant or duct tape
- Wire cutters
- Exhaust vent hood
- Additional flexible and/or hard duct, elbows and hose clamps.

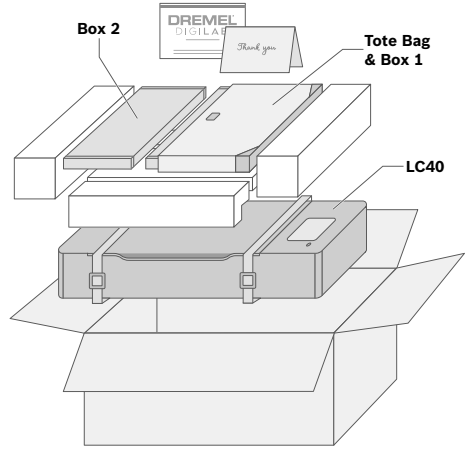
UNPACKING

⚠ WARNING Two person lift required. Lifting the laser cutter alone may result in personal injury.

Create a workstation. Prepare a flat, sturdy table or workbench that can support the weight of the LC40 and Hex Box™. The workstation should be close to an electrical outlet and allow for necessary ventilation described in the SETUP section "Exhaust Management" page 24.

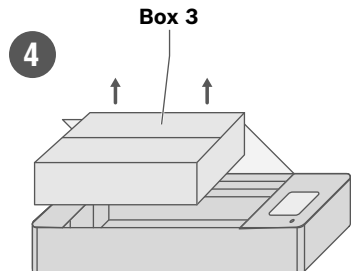
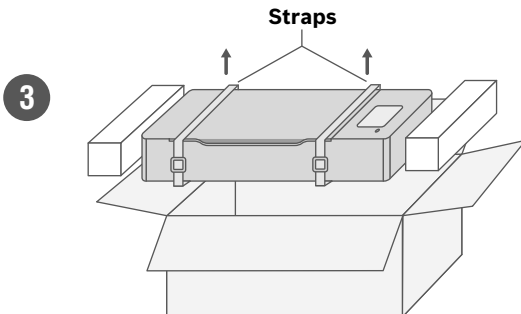
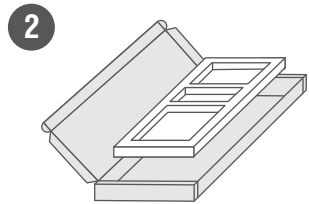
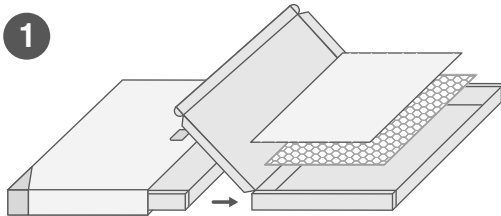
Open the top of the box.

1. Remove Reusable Tote Bag from packaging and pull out box 1. Open Lid to reveal the project sample material and the Honeycomb Plate.
2. Remove Instructional Manual, Water Hoses, Air Tube, Screws, Hex Box™ Cap, Hex Keys, Spacer Puck from box 2.
3. Remove foam to reveal the Dremel LC40 Laser Cutter. Use two people to lift Dremel LC40 Laser Cutter out of box by straps and place on workstation. After the Dremel LC40 Laser Cutter has been taken out of the box, hook straps to the Reusable Tote Bag. **DO NOT CUT STRAPS.**



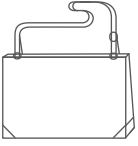
4. Open the Lid of the Dremel LC40 Laser Cutter to reveal box 3 with Hex Box™, Exhaust Duct, and Exhaust Shroud.

Note: Save the Dremel LC40 packaging for future transport and storage.

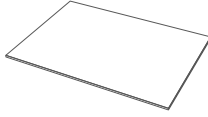


KIT CONTENTS

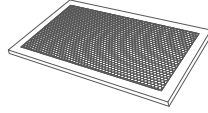
The Dremel LC40 Laser Cutter is shipped with the following included parts and accessories:



Reusable Tote Bag



Project Sample Material



Honeycomb Plate



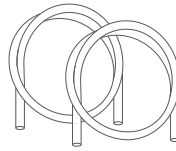
Quick Start Guide



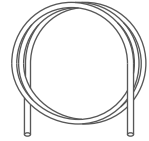
Operating/Safety Instructions



Ethernet Cable



Water Hose
(1 blue & 1 clear)



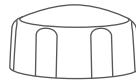
Air Tube
(black)



(2) Hose Clamps



Hex Box™
Connector Cord



Hex Box™
Water Tank Cap



Hex Key



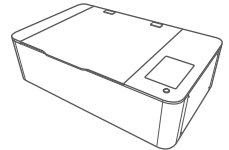
Lens Cleaning Wipes



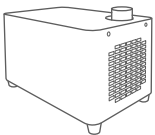
Spacer Puck



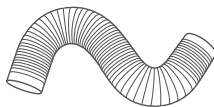
Alignment Paper



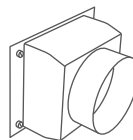
Dremel LC40
Laser Cutter



Hex Box™



Exhaust Hose



Exhaust Shroud

GETTING TO KNOW YOUR DREMEL LC40 LASER CUTTER

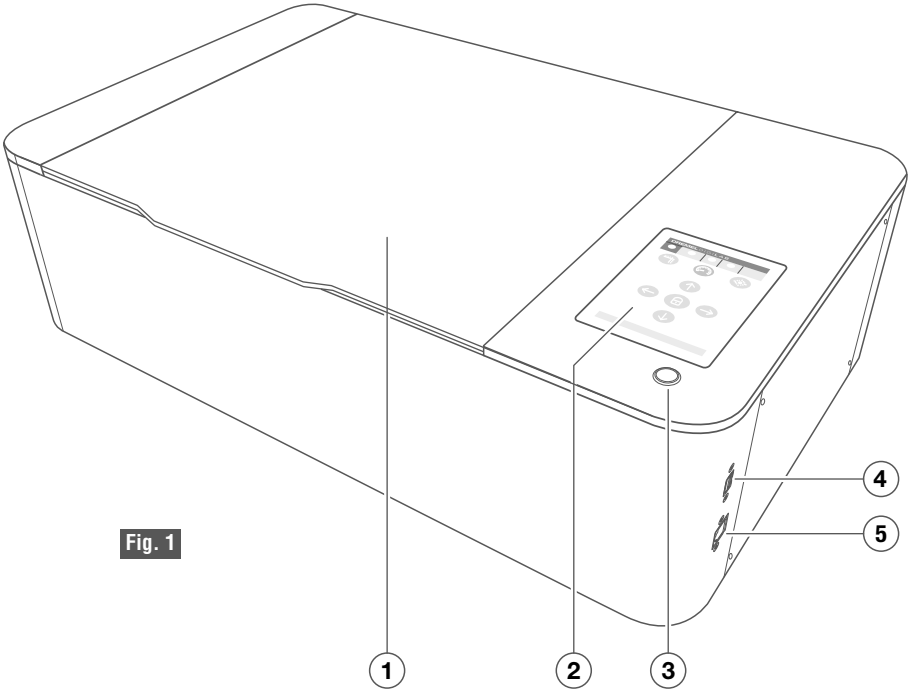


Fig. 1

Dremel LC40 Laser Cutter

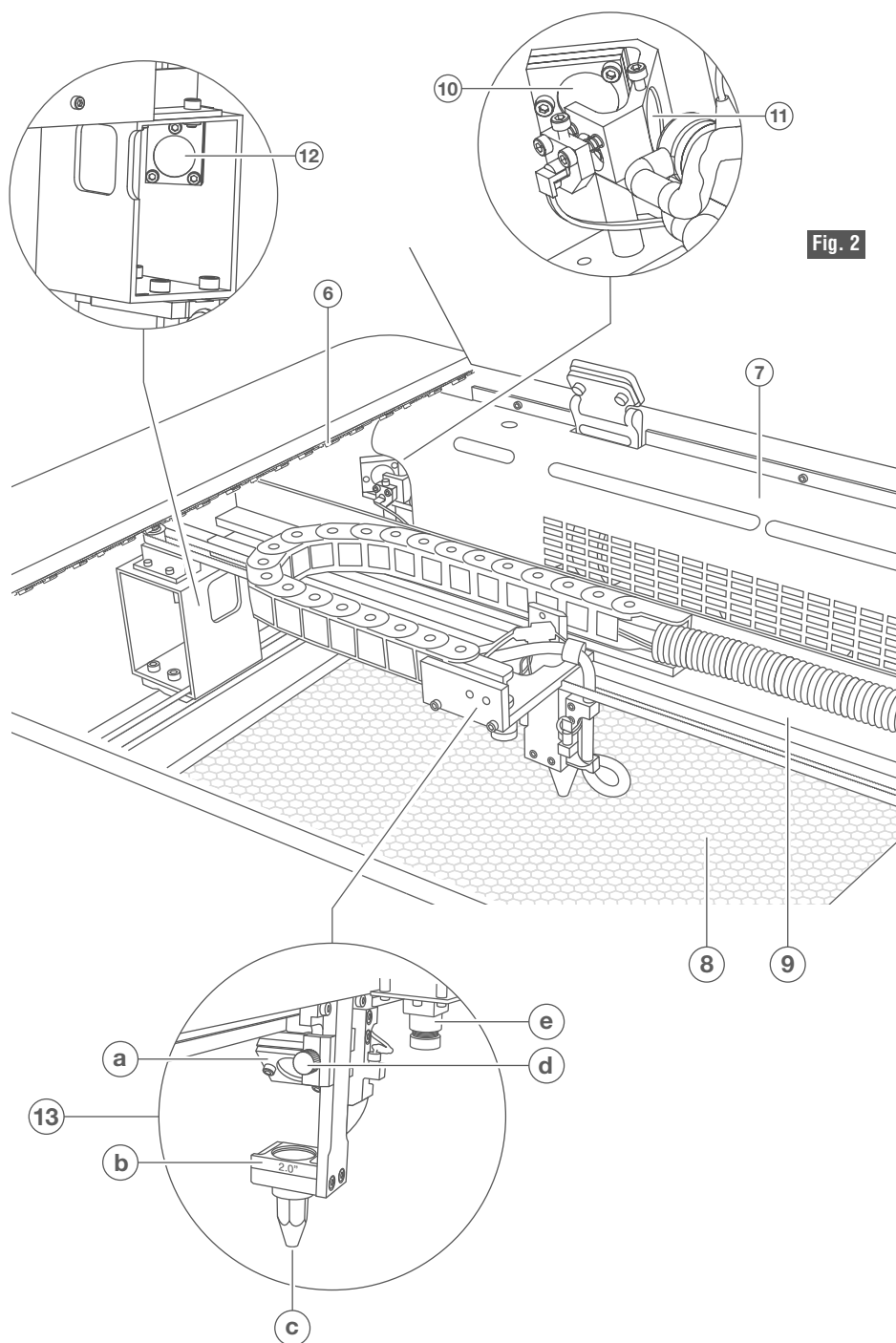
1. Lid
2. LCD Touchscreen
3. Start Button
4. USB Port (for service only)
5. Ethernet Port
6. LED Lights
7. Laser Tube Guard
8. Honeycomb Plate
9. Gantry
10. Mirror 1
11. Beam Combiner Lens
12. Mirror 2
13. Laser Head
 - a. Mirror 3
 - b. Focus Lens
 - c. Air Assist Nozzle
 - d. Laser Head Knob
 - e. Wide Angle Camera

14. Power Switch
15. Power Cord
16. Hex Box™ Power Outlet
17. Air Inlet
18. Exhaust Shroud
19. Water Outlet
20. Water Inlet

Hex Box™

21. Water Tank Cap
22. Water Tank
23. Power Inlet
24. Air Outlet
25. Water Outlet
26. Water Inlet

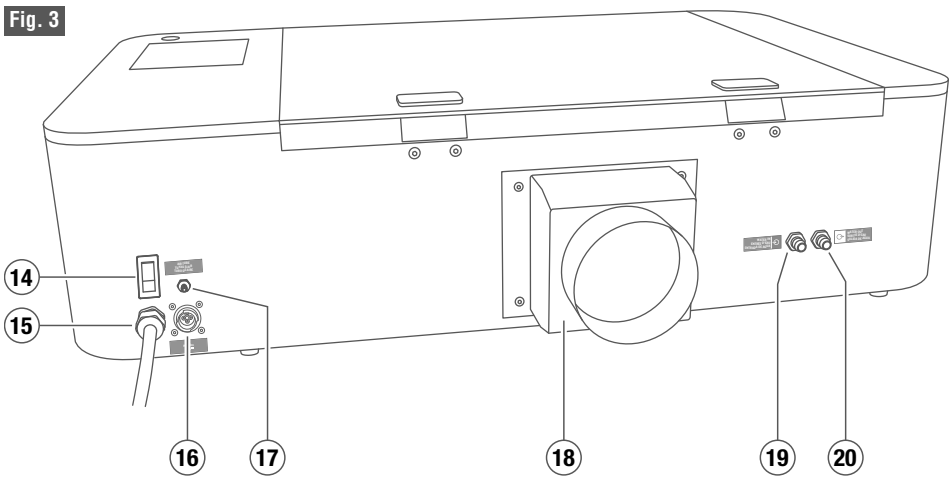
GETTING TO KNOW YOUR DREMEL LC40 LASER CUTTER



GETTING TO KNOW YOUR LASER CUTTER

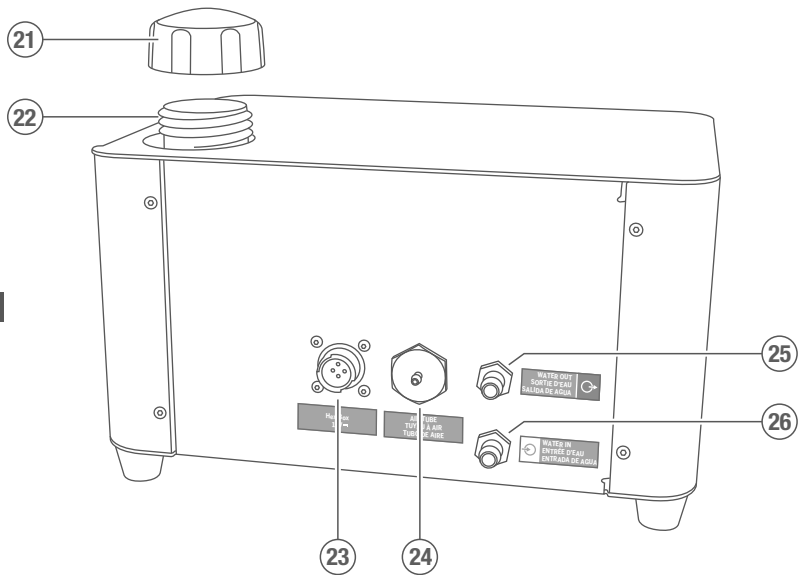
REAR VIEW OF DREMEL LC40 LASER CUTTER

Fig. 3



REAR VIEW OF HEX BOX™

Fig. 4



SETUP

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠ WARNING Disconnect the plug from the power source before making any assembly, adjustments or changing accessories. Such preventive safety measures reduce the risk of starting the laser cutter accidentally.

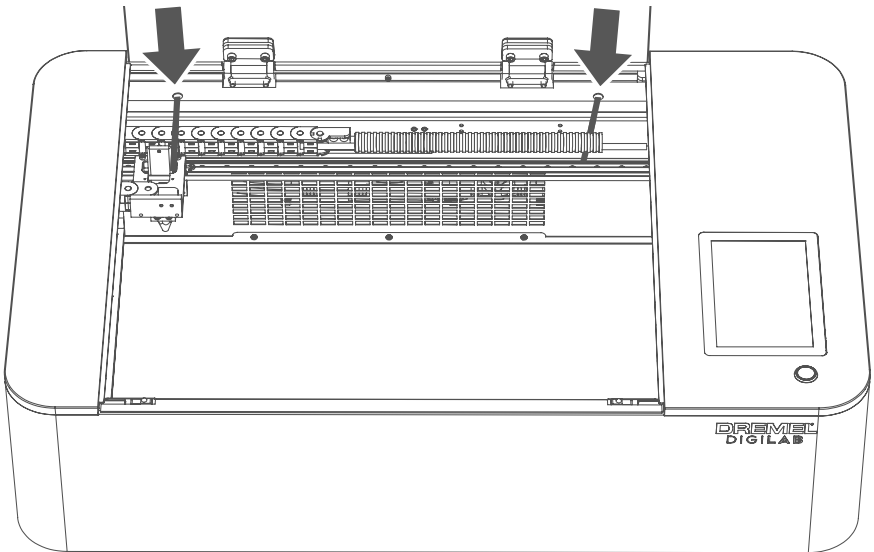
Cut and Remove Zip Ties

Once all interior packaging has been removed from the laser, locate both zip ties securing the Laser Head and Gantry.

One zip tie can be found at each end of the Gantry.

Using a small pair of scissors or diagonal cutting pliers, carefully cut and remove both zip ties. DO NOT cut any other cord or wire. Be aware that the Laser Tube is extremely fragile. Be careful NOT to damage any part of the machine during this process.

Fig. 5



SETUP

Install Honeycomb Plate

Place the Honeycomb Plate inside the laser on the laser bed. Be careful not to damage any part of the Dremel LC40 Laser Cutter during this process. The head can be moved out of the way by hand if necessary.

The Honeycomb Plate sits flat at the bottom of the Dremel LC40 Laser Cutter. There is a slight recess in the bed to help align the Honeycomb Plate (Fig. 6).

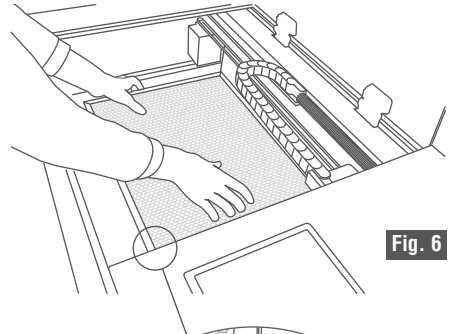
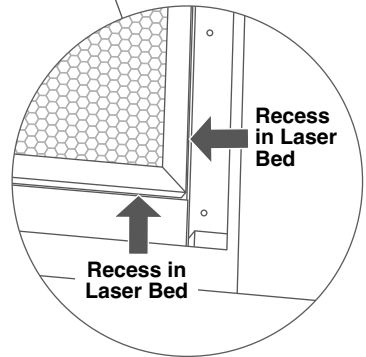


Fig. 6



Remove Camera Lens Cap

Remove the cap from the camera lens on the Laser Head (Fig. 7).

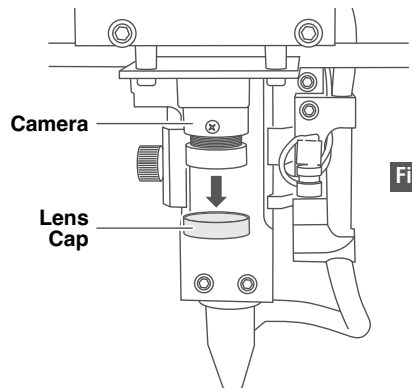


Fig. 7

SETUP

Attach Water Hoses

1. Place the Hex Box™ adjacent to the Dremel LC40 Laser Cutter on a flat stable surface adequate to bear the weight. The maximum distance the Hex Box™ can be placed from the Dremel LC40 Laser Cutter is 5 feet.
2. Remove the short silicone tubing capping the Water Inlet and Water
3. Match the blue and clear water tubes to the appropriate inlet and outlet fittings on the Dremel LC40 Laser Cutter and the Hex Box™, Fig. 8 & 9. The fittings are labeled with colors to help identify the appropriate tubes.

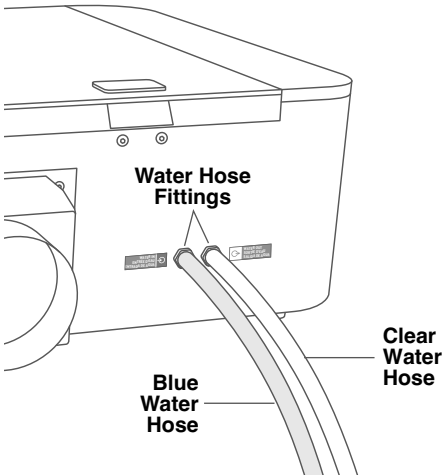


Fig. 8 — Rear of Dremel LC40 Laser Cutter

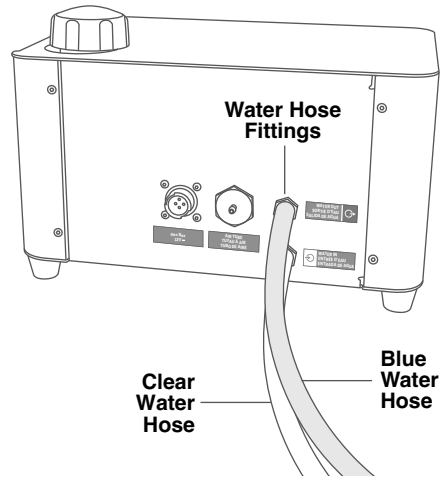
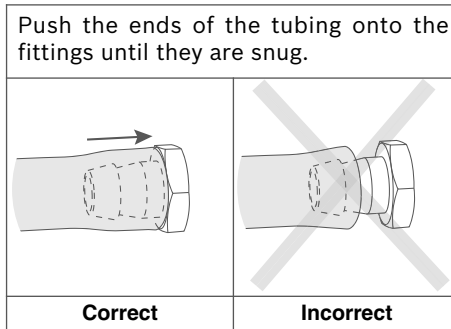


Fig. 9 — Rear of Hex Box™



SETUP

Attach Air Tube

Connect the Air Tube to the fittings on the Dremel LC40 Laser Cutter and the Hex Box™. There are labels on the Dremel LC40 Laser Cutter and the Hex Box™ to help identify the correct fittings. Fig. 10 & 11.

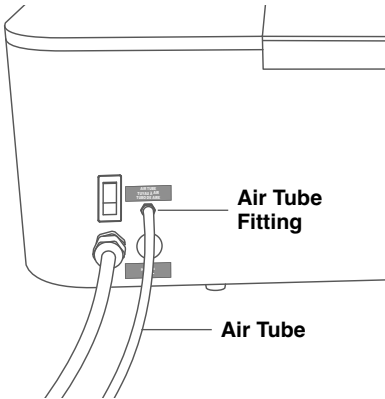


Fig. 10 – Rear of Dremel LC40 Laser Cutter

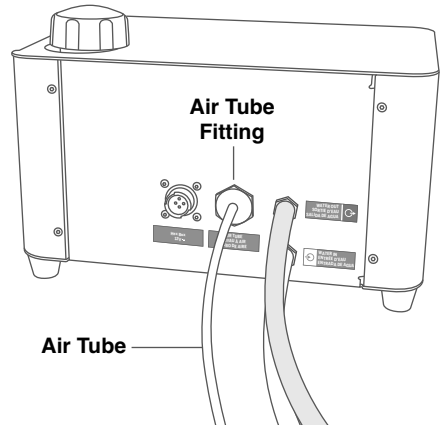
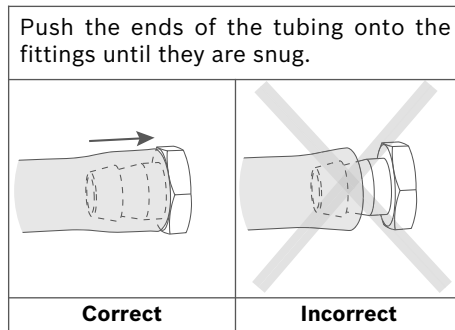


Fig. 11 – Rear of Hex Box™



SETUP

Connect Hex Box™ Connector Cord

Connect the Hex Box™ connector cord to the Dremel LC40 Laser Cutter and the Hex Box™. Fig. 12 & 13.

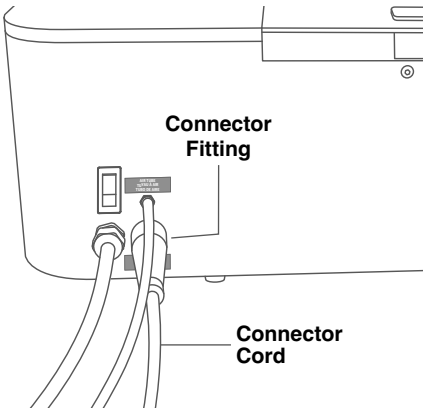


Fig. 12 – Rear of Dremel LC40 Laser Cutter

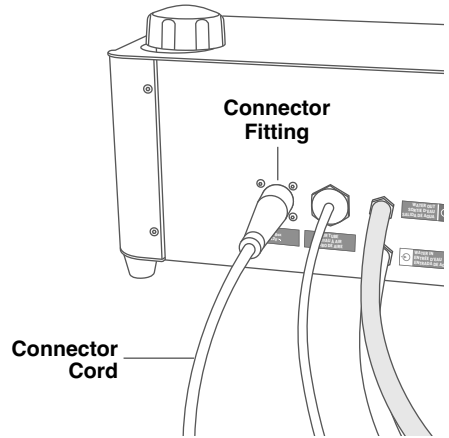


Fig. 13 – Rear of Hex Box™

Attach Exhaust Shroud

Using a screwdriver, attach the Exhaust Shroud to the back of the Dremel LC40 Laser Cutter, Fig. 14. Ensure that the Exhaust Shroud is flush and tight against the back surface of the Dremel LC40 Laser Cutter.

Attachment of the Exhaust Hose to the Exhaust Shroud is explained in the Exhaust Management section.

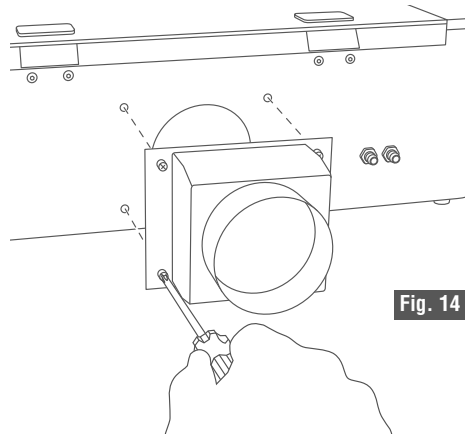


Fig. 14

SETUP

Exhaust Management

⚠️ WARNING Observe all provided warnings and safety instructions when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠️ WARNING Always use a properly configured, installed, maintained, and operating fume/smoke exhaust system as recommended by the manufacturer when operating the laser cutter. Caustic fumes and smoke from the cutting and engraving process must be extracted from the laser system and exhausted outside or properly filtered to reduce the risk of personal injury.

⚠️ WARNING Discontinue use and seek fresh air if respiratory or eye irritation occurs. Ensure ventilation, exhaust, and/or filtration systems are working according to manufacturer specifications and make any necessary adjustments before further use. Exposure to fumes may cause allergy, asthma, breathing difficulties or other adverse health effects.

⚠️ WARNING Comply with all codes, regulations and laws, including those for hazardous or noxious exhaust ventilation systems. Consult with federal, state and/or local authorities and applicable homeowner or condominium associations to ensure compliance of ventilation and exhaust systems. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠️ WARNING Consult a qualified installer or service agency for information or assistance if installation of exhaust/venting is beyond your skill level. Improper installation, adjustment, alteration, service, maintenance, or use can cause fire, electric shock or other conditions which may cause personal injury, property damage or even death.

⚠️ WARNING Always use fire rated rigid or flexible metal or metalized ducting in the exhaust system. Non-fire rated exhaust ducting may increase the risk of fire.

⚠️ WARNING Maintain all recommended clearances during exhaust installation. Failure to maintain proper clearances could result in personal injury, death and/or property damage.

⚠️ WARNING Wear proper personal protective equipment such as safety glasses, protective clothing and work gloves when performing exhaust connections. Failure to do so may result in personal injury.

Proper ventilation and/or filtration of the Dremel LC40 Laser Cutter's exhaust is mandatory. During operation, the Dremel LC40 Laser Cutter melts and/or burns material and may generate fumes and/or smoke that may be hazardous to health. An effective ventilation and/or filtration system is necessary to remove these products. Always ensure the selected exhaust management method is operating before starting a job, and let it run for at least 10 minutes after the job is finished to evacuate exhaust out of the Dremel LC40 Laser Cutter. Wait at least 30 seconds after the job is finished before lifting the glass Lid.

SETUP

Choosing the Exhaust Management Method

There are five options for managing the exhaust generated during the laser fabrication process:

- A. Onboard Fan
- B. External Booster Fan (design flow rate at least 90 CFM)
- C. Light Duty Filtration Unit
- D. Heavy Duty Filtration Unit
- E. Commercial/Industrial Mechanical Exhaust System (design flow rate at least 90 CFM)

When selecting an appropriate exhaust management method, multiple factors must be considered, such as the intended operating location of the Dremel LC40 Laser Cutter, the size of room where it will be operated, and the frequency and

duration of laser fabrication. Consult Table 3 below to determine an appropriate exhaust management method.

Room size in Table 3 is based on ceiling height of 8.5 feet. Adjust room size for actual ceiling height. If room size or laser fabrication time is not known, err on the side of caution and select the higher fabrication time and/or smaller room size. Home, office, and classroom scenarios in Table 3 are based on standard models from the EPA, ASHRAE, and CDPH, results may vary based on your use location and operating parameters. Always operate the Dremel LC40 Laser Cutter in a well-ventilated area. Installer of Dremel LC40 exhaust management system is responsible for complying with applicable codes and regulations including those for hazardous or noxious exhaust ventilation systems.

Table 3: Exhaust Management Method Selection

Exhaust Management Method	Maximum Laser Fabrication Time in hours/day (hr/day) and hours/week (hr/wk)					
	Home/Residential		Office/Commercial			Classroom
	Room Size 30-450 sq ft*	Room Size > 450 sq ft*	Room Size 50-450 sq ft*	Room Size 450-650 sq ft*	Room Size > 650 sq ft*	Room Size > 500 sq ft*
A: Onboard Fan	✗	2 hr/day 5 hr/wk	✗	2 hr/day 8 hr/wk	2 hr/day 11 hr/wk	✓
B: External Booster Fan	✓	✓	✓	✓	✓	✓
C: Light Duty Filtration Unit	✗	✓	✗	2 hr/day 14 hr/wk	✓	✓
D: Heavy Duty Filtration Unit	①	①	①	①	✓	✓
E: Commercial/Industrial Mechanical Exhaust System	N/A	N/A	✓	✓	✓	✓

✓ = OK up to 3.75 hours/day, 18 hours/week of laser fabrication time. For additional details contact Dremel customer service.

✗ = Do not use for Dremel LC40 Laser Cutter.

① = Consult filtration system manufacturer.

N/A = Exhaust management method not applicable for this use location.

* Room size is based on ceiling height of 8.5 feet. Adjust room size for actual ceiling height. Do not use Dremel LC40 Laser Cutter in rooms smaller than specified in Table 3.

SETUP

Choosing a Location for Dremel LC40 Laser Cutter Operation:

Select a location suitable to accommodate the selected exhaust management method from Table 3. Always operate the Dremel LC40 Laser Cutter in a well-ventilated area. Do not operate the Dremel LC40 Laser Cutter in a basement, closet or other location that is not well-ventilated. Depending on the installation conditions, a source of make-up air may be needed to replace air evacuated by Dremel LC40 Laser Cutter exhaust management system. For an appropriate make-up air solution, consult an HVAC professional. Ensure make-up air source complies with exhaust discharge requirements below.

The location should provide adequate support surface for the Dremel LC40 Laser Cutter and Hex Box. Ensure adequate space around the Dremel LC40 Laser Cutter for working access and clearance for exhaust management system (see Dremel LC40 Laser Cutter & Hex Box™ Clearance Requirements in Specifications section on page 9).

Requirements for Exhaust Management Systems A: Onboard Fan and B: External Booster Fan

Exhaust discharge requirements

- Discharge the exhaust outdoors where it will not cause a public nuisance, and not less than the following distances:
 - o 10 feet from property lines; 10 feet from operable openings into buildings (e.g. windows, doors, air intakes); 3 feet from exterior walls and roofs; 10 feet above adjoining grade
- Protect the exhaust opening using an Exhaust Vent Hood with a corrosion-resistant screen or grille (not provided). Openings in the screen or grille should be between $\frac{1}{4}$ " and $\frac{1}{2}$ " and should be protected against local weather conditions. Do not use louvered vent coverings as they can obstruct exhaust flow. Install Exhaust Vent Hood according to manufacturer instructions.

Exhaust duct requirements

- Exhaust ducts shall be UL 181 fire rated and must be compliant with codes and regulations for hazardous or noxious exhaust ventilation systems.
- Ducts must be installed so they are not damaged or ruptured. Install flexible connection between Dremel LC40 laser cutter and any hard duct to isolate vibration from duct and prevent duct damage. Up to six inches of provided Exhaust Hose may be used to create flexible connection.
- Seal all seams and connections with building code approved sealant or duct tape.
- Periodically inspect duct for wear or damage. If any duct appears worn, constricted or damaged, replace before further use.
- Minimize the length of duct and number of bends/elbows. Ensure duct is properly supported and complies with relevant building and fire codes.
- Exhaust ducts must be 4" diameter or greater. When using duct diameter greater than 4", transition to larger diameter immediately at exit from Laser Cutter Exhaust Shroud.
- All elbows and/or bends must have bend radius at least 1.5 to 2 times duct diameter (Fig. 15) as specified in Setting up Exhaust Management Method sections below.

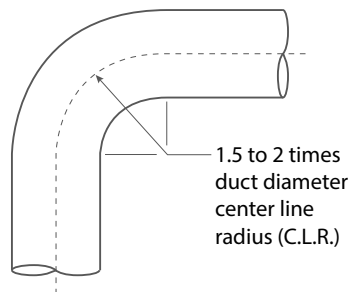


Fig. 15: Bend radius for elbows and/or bends

SETUP

Setting up Exhaust Management Method A: Onboard Fan

Exhaust management method A uses the Onboard Fan to vent exhaust to the outside of the building. The Exhaust Hose is provided for your convenience and should only be used for temporary operation. For permanent installations, use smooth hard duct to decrease resistance to exhaust flow. When using the onboard fan be sure to choose correct ventilation option on the Touch Screen during the Dremel LC40 Laser Cutter startup sequence. The instructions provided below are for installing the materials provided by Dremel. Consult manufacturer instructions for all other materials.

Items supplied with Dremel LC40 Laser Cutter: (1) 10 ft. Exhaust Hose & (2) Hose Clamps.

Additional items needed: Exhaust Vent Hood, building code approved sealant or duct tape, materials as needed per Vent Hood installation instructions and relevant building and fire codes.

1. Identify an exhaust discharge point that complies with exhaust discharge requirements listed above. Ensure that no more than 10 feet of exhaust duct is needed between the Dremel LC40 Laser

Cutter and the discharge point.

2. Select Exhaust Vent Hood that complies with exhaust discharge requirements listed above. Install Exhaust Vent Hood according to the manufacturer's instructions and relevant building and fire codes.
3. Attach the Exhaust Hose to the Dremel LC40 Laser Cutter Exhaust Shroud with the Hose Clamp provided.
4. Extend the Exhaust Hose the required length to reach the Exhaust Vent Hood keeping it as straight as possible.
 - All bend radii must be at least two times the duct diameter.
 - Minimize the number of 90-degree bends; no more than two (2) 90-degree bends may be used.
 - 90-degree bends must be at least 20 inches away from Onboard Fan.
5. Cut the excess Exhaust Hose off with wire cutters so that only the minimum required length is used.
6. Securely connect the end of the Exhaust Hose to the Exhaust Vent Hood with included Hose Clamp. Stretch the duct and keep it as straight as possible to improve exhaust flow through the duct.

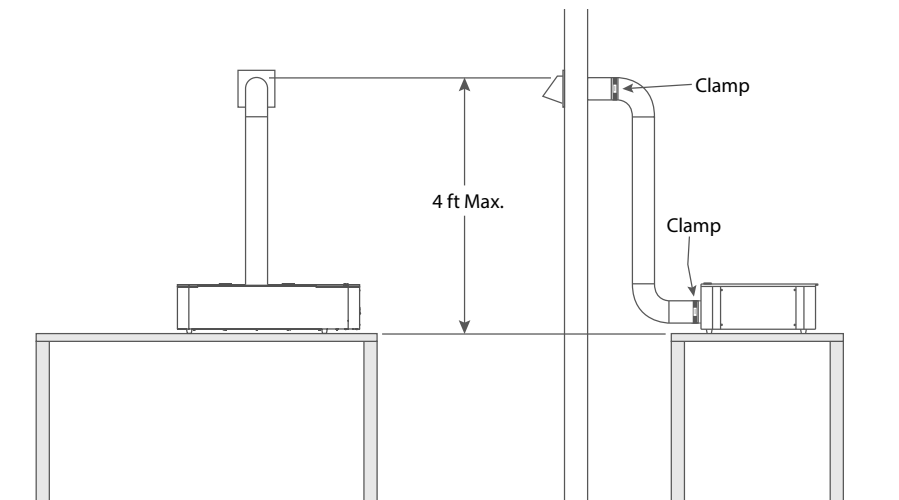


Fig. 16: Exhaust management system example using the Dremel LC40 Laser Cutter onboard fan.

SETUP

7. Seal all seams and connections with building code approved sealant or duct tape.

NOTE: When using smooth hard duct, install flexible connection between Dremel LC40 laser cutter and hard duct to isolate vibration from duct and prevent duct damage. Up to six inches of provided Exhaust Hose may be used to create flexible connection.

Setting up Exhaust Management Method B: External Booster Fan

Exhaust management method B uses an external booster fan to vent exhaust to the outside of the building. When selecting an external booster fan, choose a centrifugal inline fan with sealed housings, such as one designed for radon mitigation applications. For use with 4" diameter duct, the fan must have an airflow capacity of at least 90 cubic feet per minute (CFM) at 1.21 inches w.c. For use with 5" diameter duct, the fan must have an airflow capacity of at least 90 cubic feet per minute (CFM) at 1.33 inches w.c. When using the external booster fan be sure to choose correct ventilation option on the Touch Screen during the Dremel LC40 Laser Cutter startup sequence. The

instructions provided below are for installing the materials provided by Dremel. Consult manufacturer instructions for all other materials.

Items needed: External Booster Fan, flexible duct or smooth hard duct and elbows, building code approved sealant or duct tape, Exhaust Vent Hood.

1. Identify an exhaust discharge point that complies with exhaust discharge requirements listed above.
 2. Select Exhaust Vent Hood that complies with exhaust discharge requirements listed above. Install Exhaust Vent Hood according to the manufacturer's instructions and relevant building and fire codes.
 3. Connect the Dremel LC40 Laser Cutter Exhaust Shroud to the External Booster Fan inlet and External Booster Fan outlet to Exhaust Vent Hood with flexible duct or smooth hard duct according to duct manufacturer instructions, relevant building and fire codes, and Table 4 below.
- If using flexible duct, you may use the provided Hose Clamps to secure duct to Laser Cutter Exhaust Shroud and External Booster Fan inlet.

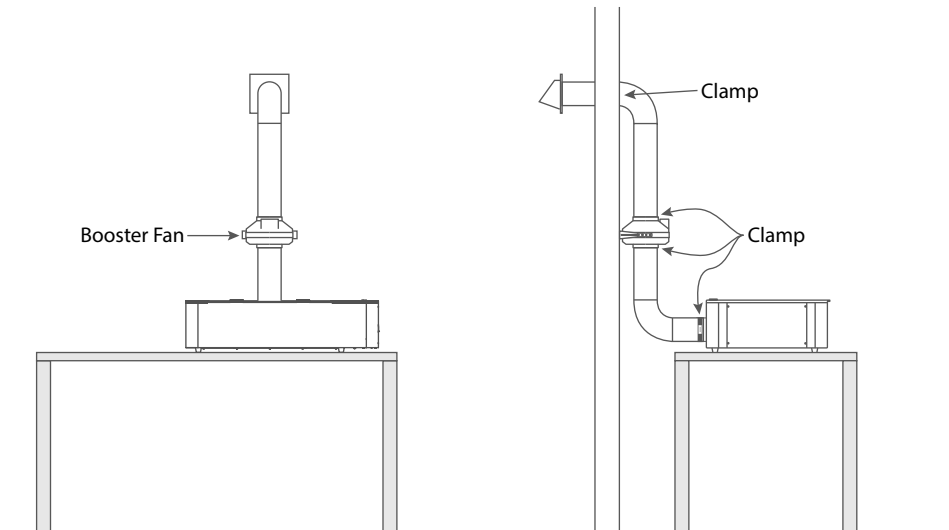


Fig. 17: Exhaust management system example using an External Booster Fan.

SETUP

- If using hard duct, install flexible connection between Dremel LC40 laser cutter and any hard duct to isolate vibration from duct and prevent duct damage. Up to six inches of provided Exhaust Hose may be used to create flexible connection.
- 90-degree elbows must be at least 20 inches away from External Booster Fan.

If you are unsure how to setup the exhaust duct, consult an HVAC professional.

4. Secure booster fan according to manufacturer's instructions. Installation of the booster fan should be as close to the discharge point as possible to minimize leakage into the space from positively pressurized ductwork.
5. Seal all seams and connections with building code approved sealant or duct tape.

Setting up Exhaust Management Method C or D: Filtration Units

Exhaust management methods C and D use a filtration unit (not supplied) to filter the Dremel LC40 Laser Cutter exhaust. When selecting a filtration unit be sure it is suitable for use with laser cutters/engravers. The filtration unit should be Underwriters Laboratory listed. When using an external filtration unit be sure to choose correct ventilation option on the Touch Screen during the Dremel LC40 Laser Cutter startup sequence. Choose a well-ventilated area to set-up the Dremel LC40 Laser Cutter and filtration unit. Follow the manufacturer's instructions for changing filter(s) in filtration unit.

Items supplied with Dremel LC40 Laser Cutter: (1) 10 ft. Exhaust Hose & (2) Hose Clamps.

- Additional Items needed: Building code approved sealant or duct tape, filtration unit.
1. Set up filtration unit according to manufacturer's instructions and relevant building and fire codes.
 2. Supplied 10' Exhaust Hose and Hose Clamps may be used if compatible with selected filtration unit.
 3. Seal all seams and connections with building code approved sealant or duct tape.

Requirements for Exhaust Management Method E: Commercial/Industrial Mechanical Exhaust System

Connection of Dremel LC40 Laser Cutter to a Commercial/Industrial Mechanical Exhaust System should only be performed by a trained HVAC professional. Exhaust must be discharged outdoors and installation must comply with all codes and regulations for hazardous or noxious exhaust ventilation systems. The design flow rate of exhaust from the Dremel LC40 Laser Cutter must be a minimum of 90 cubic feet per minute (CFM). When using a Commercial/Industrial Mechanical Exhaust System be sure to choose correct ventilation opt When using a Commercial/Industrial Mechanical Exhaust System be sure to choose correct ventilation option on the Touch Screen during the Dremel LC40 Laser Cutter startup sequence.

Table 4: Allowable duct length and number of bends/elbows

* = Do not use for Dremel LC40 Laser Cutter.	Number of Bends/Elbows	Allowable Duct Length (feet)			
		4" Diameter Duct		5" Diameter Duct	
		Flexible Duct	Hard Duct	Flexible Duct	Hard Duct
Bend radius at least 2*D	2	33	92	155	290
	3	13	72	135	270
	4	*	52	115	250
Bend radius at least 1.5*D	2	13	72	135	270
	3	*	42	105	240
	4	*	12	75	210

SETUP

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

Plug in the Dremel LC40 Laser Cutter

Plug the Power Cord from the back of the Dremel LC40 Laser Cutter into a grounded outlet, Fig 18.

Note: The Dremel LC40 Laser Cutter draws about 6.0 Amps at its maximum power. Be careful not to connect too many other devices on the same circuit. Make sure not to exceed the current rating of the circuit.

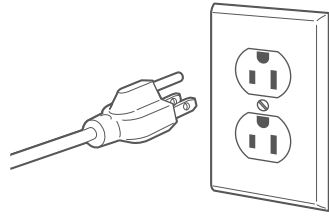


Fig. 18

Test GFCI Unit

⚠ WARNING Before using the laser machine, test the ground fault circuit interrupter (GFCI) provided with the supply cord to insure it is operating correctly. A properly operating GFCI reduces the risk of electrical shock.

⚠ WARNING Do not use laser cutter with extension cords. The GFCI on the machine power cord will not prevent electrical shock from the extension cords.

The Dremel LC40 Laser Cutter is equipped with a GFCI unit mounted on the cord, Fig. 19.

1. Press 'TEST' button. Red should disappear from the indicator window.
2. Press and release 'RESET' button. Red should reappear in the indicator window.

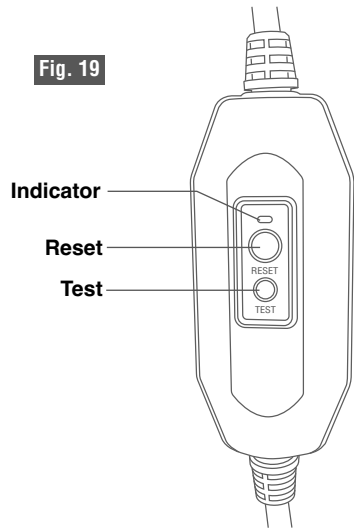
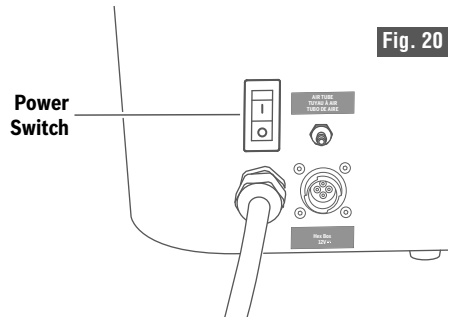


Fig. 19

SETUP

Turn On the Dremel LC40 Laser Cutter

Locate the Power Switch at the back of the unit (above the Power Cord) and turn the Dremel LC40 Laser Cutter on, Fig. 20.




Get Started

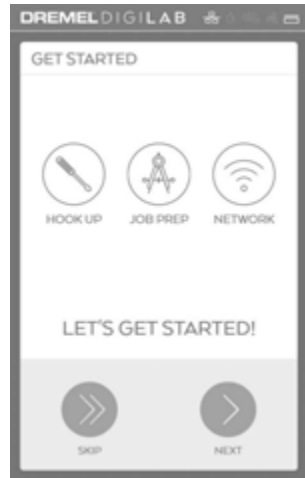
When the unit is powered on for the first time (or if a factory reset is performed) the Touchscreen will present the following screens:

- Select a country
- Select a language
- End-user license agreement (EULA)

After following the directions in the prior screens, the Get Started screen will appear.

 Tapping the Next button starts the hook up screens. The screens review previous steps outlined in the Operating/Safety Instructions.

After confirming all hoses and connections are correct, stop at the Start Pump screen and follow the instructions below.



SETUP

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

Fill Hex Box™ with Distilled Water

⚠ CAUTION Do not spill water on the Hex Box™ unit. Damage to electronics may occur.

1. Start the water pump by tapping the Start Button on the Dremel LC40 Laser Cutter's LCD screen.



START PUMP
AND FILL TANK, ADD WATER
UNTIL TUBE AND TANK ARE
FULL. STOP PUMP.



3. When the water level lowers, continue adding distilled water to the Water Tank until there are no visible bubbles in the Laser Tube and water level in the tank has stabilized at full.
4. When the tank is full, tap next button to proceed to the stop water pump screen.
5. Stop the water pump by pressing the stop button on the Dremel LC40 Laser Cutter's LCD screen.

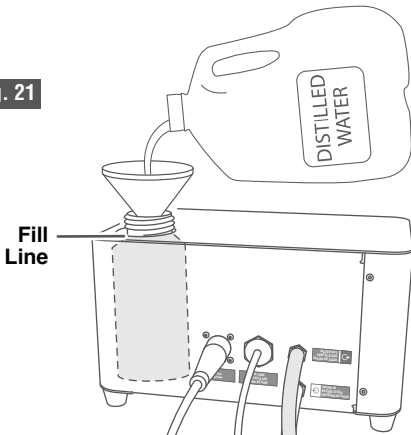


STOP PUMP
ONCE TUBE AND TANK ARE
FULL.



2. Using a funnel, fill the Hex Box™ with distilled water until the Water Tank is full, Fig. 21.

Fig. 21



6. Screw on the Hex Box™ Cap.

SETUP

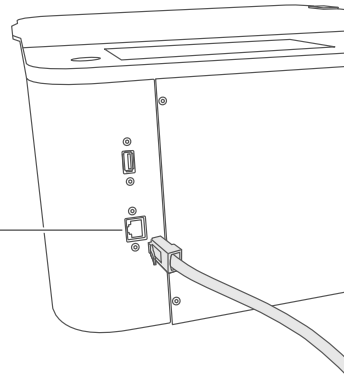
Connect a Computer to the Dremel LC40 Laser Cutter

For a hardwire connection:

1. Connect the Ethernet Cord to the Dremel LC40 Laser Cutter (Fig. 22) and the computer.
2. Open an internet browser window on the computer.
3. Type in the "IP" number displayed at the bottom of the Dremel LC40 Laser Cutter's LCD screen into the browser's URL bar.

Fig. 22

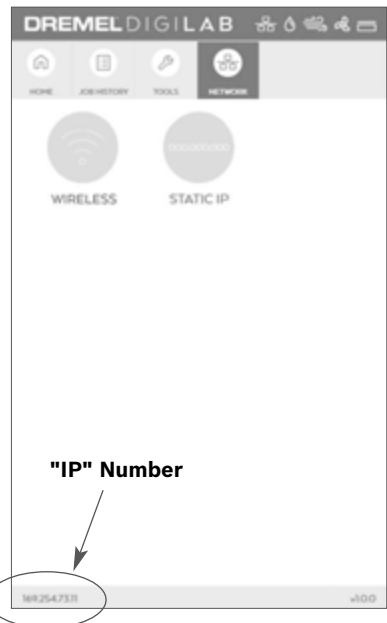
Ethernet Port



For a wireless connection:

1. Select Network on the Dremel LC40 Laser Cutter's LCD screen (Fig. 23), then select Wireless from the Network menu.
2. Select a network from the list of available networks, then enter password to connect the Dremel LC40 Laser Cutter.
3. Open an internet browser window on the computer.
4. Type in the "IP" number displayed at the bottom of the Dremel LC40 Laser Cutter's LCD screen into the browser's URL bar.

Fig. 23



For a static IP address: Connect to the network by assigning a persistent IP address that is assigned for the machine. This address will be maintained permanently and will not change if the machine is rebooted.

TIP: If the Dremel LC40 Control Software is taking a while to load, or not working properly try refreshing the browser to reload the software.

SETUP

Network Setups

PEER TO PEER ETHERNET CONNECTION

Scenario 1: Connecting the Dremel LC40 Laser Cutter to a single computer using Ethernet connection.

- Optional: If the computer has a second Ethernet Port or built-in wireless, the computer can access both the internet and the Dremel LC40 Laser Cutter.
- The Dremel LC40 Laser Cutter does not have access to the Internet (optional for Dremel LC40 Laser Cutter connection) unless the computer bridges/shares the Internet connection.

Note: The Dremel LC40 Laser Cutter does have the option to set a Static IP address using the LCD software interface.

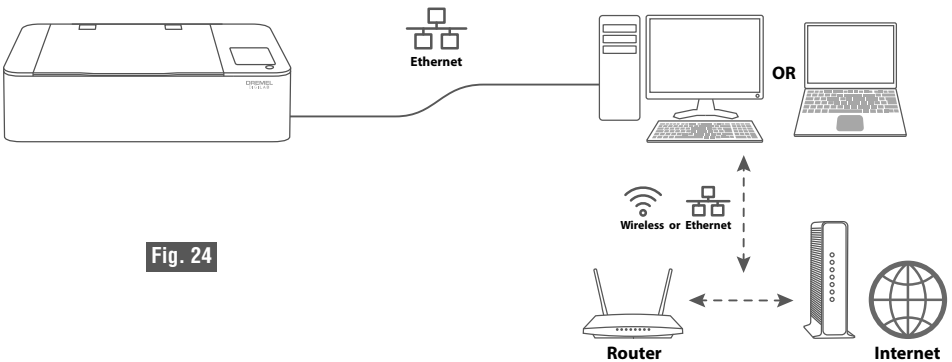


Fig. 24

Scenario 2: Connecting two or more Dremel LC40 Laser Cutters to a single computer using Ethernet connection.

A computer that has two or more Ethernet ports may connect to additional Dremel LC40 Laser Cutters.

- Optional: If the computer has an additional, separate Ethernet Port or built-in wireless, the computer can access both the internet and the laser unit.
- The Dremel LC40 Laser Cutter does not have access to the Internet (optional for Dremel LC40 Laser Cutter connection) unless the computer bridges/shares the Internet connection.

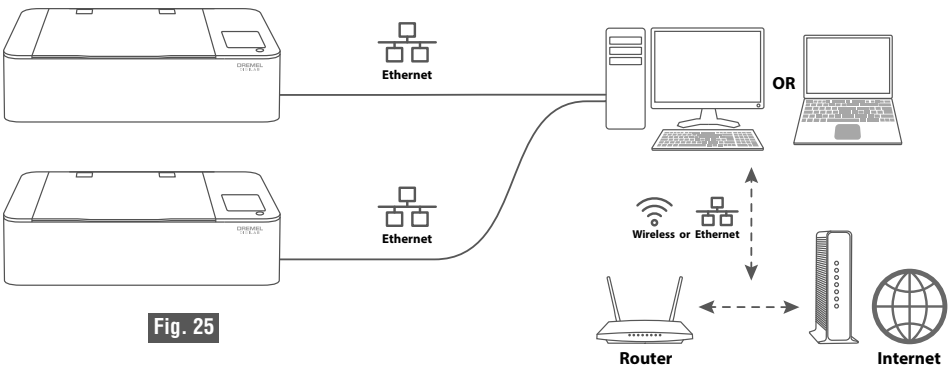


Fig. 25

SETUP

LOCAL AREA NETWORK (LAN) CONNECTION USING A ROUTER

Scenario 3: Connecting the Dremel LC40 Laser Cutter to one or more computers using a router with wireless and/or Ethernet Connection.

In this scenario, the user does have an Internet connection through the router.

- One or more computers access the Dremel LC40 Laser Cutter as well as the Internet through the Router.
- The Dremel LC40 Laser Cutter gets access to the Internet from Router.

Note: The Dremel LC40 Laser Cutter does have the option to set a Static IP address using the LCD software interface OR the Router can assign a Static IP address.

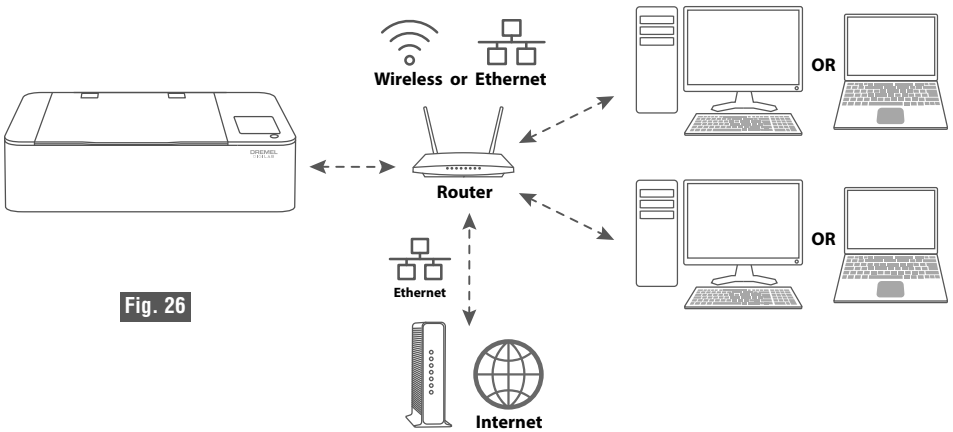


Fig. 26

Scenario 4: Connecting two or more Dremel LC40 Laser Cutters to one or more computers using a router with wireless and/or Ethernet Connection.

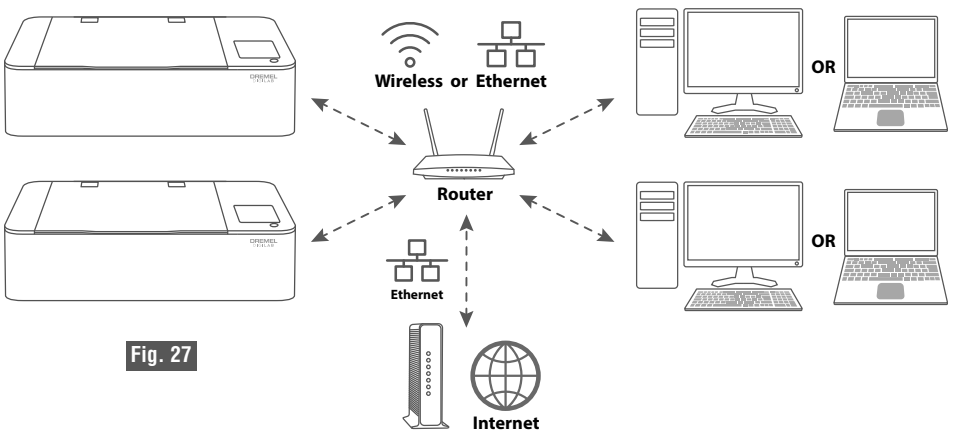
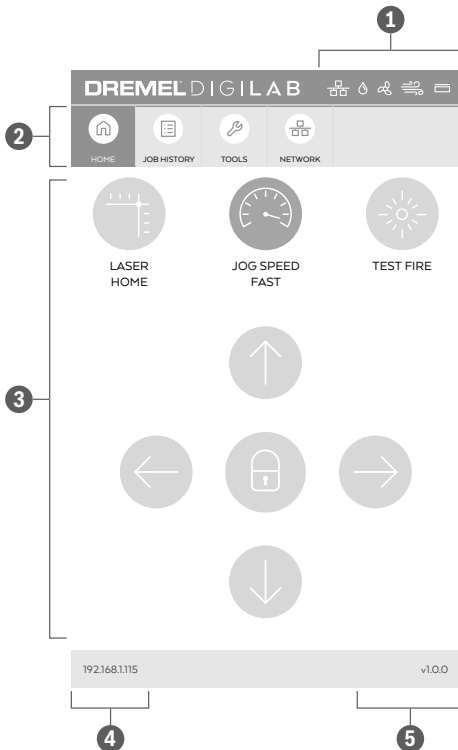


Fig. 27

LCD TOUCH SCREEN

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠ CAUTION Do not tap or scratch LCD screen with sharp objects. The LCD screen may become damaged.









The LC40 Touch Screen allows control of the basic functions of the laser without the need to connect to a computer.

- 1 Status Bar** – Displays information about selected conditions of the LC40.
- 2 Menu Bar** – Displays the icons and names of the Touch Screen menus.
- 3 Control Interface** – Information or additional action pertaining to selected menu item.
- 4 IP Address** – A unique number used to connect the Dremel LC40 Laser Cutter over a network to a web browser.
- 5 Firmware Version** – Displays the currently installed firmware version.

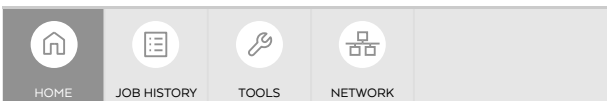
LCD TOUCH SCREEN

1 Status Bar

Status Icon	Name	What it means
	Ethernet	Dremel LC40 Laser Cutter is connected to a computer or a network router via Ethernet Port. The icon will disappear when there is no Ethernet connection.
	Wireless	Dremel LC40 Laser Cutter is connected to a computer or network router via wireless. The icon will disappear either when there is no wireless connection or when the Ethernet icon is active. When LC40 is connected with both Ethernet and Wireless, only the Ethernet icon will display.
	Water Cooling	WHITE: Cooling system functioning normally. RED: Cooling system needs attention.
	Vent Fan	WHITE: Vent fan functioning normally. RED: Vent fan needs attention.
	Air Assist	WHITE: Air assist functioning normally. RED: Air assist needs attention.
	Lid	WHITE: Lid is closed. RED: Lid is open.

Note: Water Cooling, Vent Fan and Air Assist icons will only update in real time. (When the Hex Box™ is activated by the Dremel LC40 Laser Cutter).

2 Menu Bar



HOME – Access to Laser Head position controls and to test fire the laser.

JOB HISTORY – Lists previously run jobs and provides option to re-run them.

TOOLS – Information about the unit and settings.

NETWORK – Information and access to network connection settings.

When necessary, the LCD touch screens will offer options to return to the previous screen or advance to the next screen.



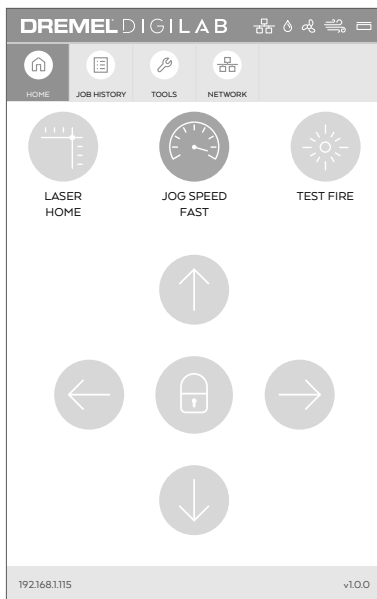
Tap to return to previous screen.



Tap to proceed to the next screen.

LCD TOUCH SCREEN

HOME > UNLOCKED



LASER HOME – Moves the Laser Head back to its origin location. Button will flash when homing is necessary.



JOG SPEED – Toggles between fast and slow Laser Head movement speed. Fast is default speed.



TEST FIRE – Enable the laser to fire for a short period to identify its location relative to the material.



Directional Arrows

Moves the Laser Head in direction of arrow.



Laser Head Locked (default)

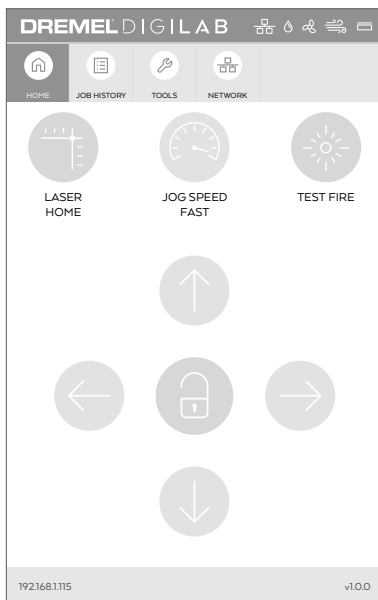
CAUTION Do not move the laser head by hand when locked. Moving a locked laser head by hand may result in damage to the gantry system and/or personal injury.

A closed lock icon indicates that the Laser Head is locked and can only be moved using the directional arrow buttons.

Pressing the lock button toggles between locked or unlocked Laser Head setting.

LCD TOUCH SCREEN

HOME > LOCKED

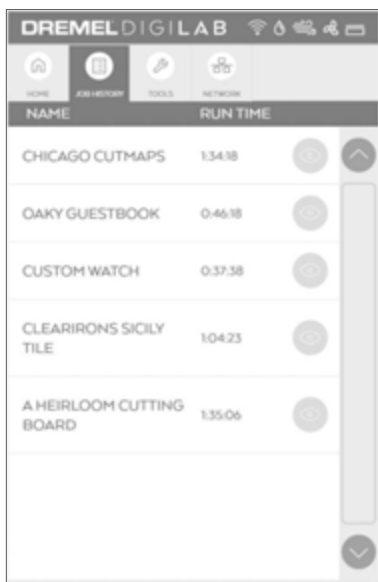


Laser Head Unlocked

An open lock icon indicates that the Laser Head can be moved by hand.

Note: When Laser Head is unlocked the Directional Arrows and Speed virtual buttons are nonfunctional.

JOB HISTORY



This tab displays jobs received by the Dremel LC40 Laser Cutter.

As received from the factory, this list is empty. The Factory Reset option will clear Job History. Job creation is explained in the Software Section.

Once a job is sent from the software to the laser, it will appear in the job history tab.

NAME — the name of project job(s) within the Job History list.

RUN TIME — required time to complete project.



Allows a preview of the job and opens the sub-menu for the job.

LCD TOUCH SCREEN

JOB HISTORY



This screen displays options for the Job selected from the list.



DELETE – Delete files from the Job History list.



RUN PERIMETER – Executes the run perimeter.

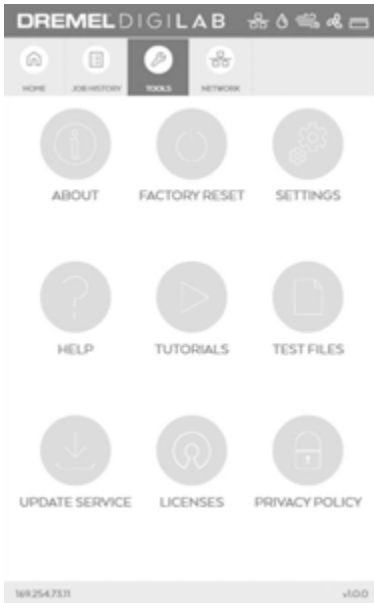


NEXT – Changes the text to LOADING. The Job will prepare to start.

Note: If a job is rerun, the system safety checklist will appear (see Operation Screens, page 54).

LCD TOUCH SCREEN

TOOLS > MENU SCREEN



This screen displays available tools for management of the Dremel LC40 Laser Cutter.



ABOUT – Displays Dremel LC40 Laser Cutter information such as model number, serial number, firmware version, usage, and network information.



FACTORY RESET – Remove all information stored on LC40 and return it to factory defaults.



SETTINGS – Shows language and display settings.



HELP – Displays service menu with customer service contact information.



TUTORIALS – Displays short tutorials on operation of the laser.



TEST FILES – Displays and allows execution of test files to verify proper operation of the laser.



UPDATE SERVICE – Displays available service updates from Dremel. Updates are pushed to the unit and cannot be requested. The user has the option to accept or ignore the update.



LICENSES – Displays the lists of OPEN SOURCE software licenses associated with the unit.



PRIVACY POLICY – Displays a website address for further details on Dremel privacy policy.

LCD TOUCH SCREEN

TOOLS > ABOUT THIS DEVICE



This screen displays Dremel LC40 Laser Cutter hardware and software information.

MODEL NUMBER – Displays unit model number.

SERIAL NUMBER – Displays unit serial number.

FIRMWARE NUMBER – Displays the currently installed firmware version.

USAGE – Displays total hours of time that jobs have been run.

WIRED IP – Displays Ethernet IP address, if connected.

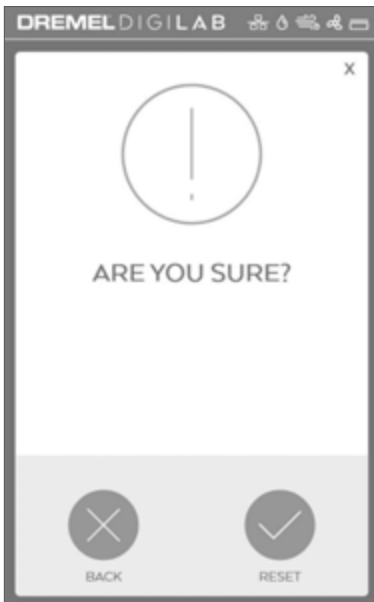
WIRELESS IP – Displays IP address assigned by wireless router.

MAC ADDRESS – Displays unique identifier assigned to a network interface controller.

FCC ID – Displays FCC ID

IC ID – Displays IC ID

TOOLS > FACTORY RESET



This screen allows for verification of factory reset selection.



BACK – Tap to cancel factory reset and return to Tools > Menu Screen.



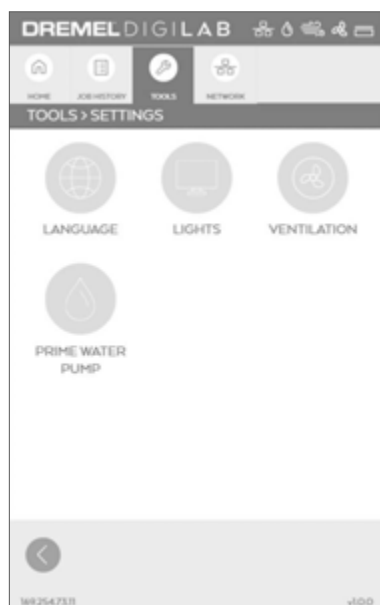
RESET – Tap to perform factory reset.

NOTE - The following actions occur when Factory Reset is performed:

- EULA screen will appear on next power up and needs to be accepted.
- Country and Language selection will appear on next power cycle.
- Job history on the LCD software Interface will be cleared.
- Default material settings will be restored for the Laser browser interface software.
- User custom material settings will be cleared.
- Network configuration will be restored to default with all custom settings cleared.
- Saved wireless network and password will be cleared.
- Ventilation setting will revert back to default of EXTERNAL FILTRATION/VENTILATION SYSTEM.

LCD TOUCH SCREEN

TOOLS > SETTINGS



This screen displays available settings



LANGUAGE – Displays a sub-menu where LCD menu warnings language can be selected.



LIGHTS – Displays a sub-menu where cabinet LED lights can be turned “ON” and “OFF”.

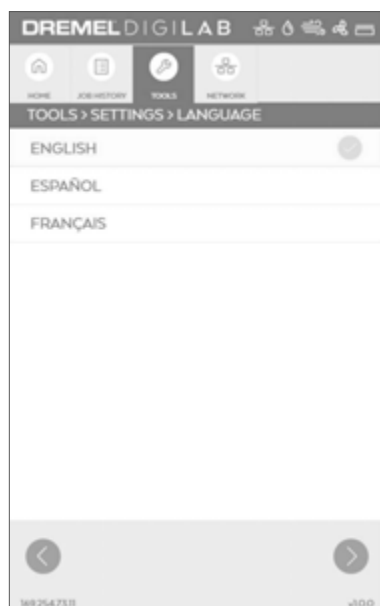


VENTILATION – Displays a sub-menu screen where ventilation type can be selected.



PRIME WATER PUMP – Displays a sub-menu with water pump controls.

TOOLS > SETTINGS > LANGUAGE

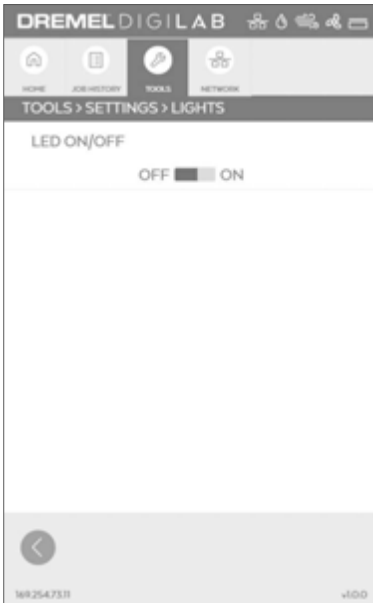


This screen displays and allows selection of different languages.

Note: Choosing the language on this screen does not set the software language on the computer, only the LCD warning screens are affected.

LCD TOUCH SCREEN

TOOLS > SETTINGS > LIGHTS



This screen displays the option to turn ON or OFF the LED lights that illuminate the workspace.

LED ON/OFF – Turns “ON” and “OFF” LED lights. LED lights are “ON” by default. If the main Power Switch is cycled, the light setting will return to the default.

TOOLS > SETTINGS > VENTILATION



This screen provides an option to select between the internal vent fan and external ventilation systems such as a booster fan, a standalone filtration system, or an external fume ventilation system.

To assure proper removal of fumes produced during operation of Dremel LC40 Laser Cutter, the ventilation selection must match the actual fume extraction set up. Dremel LC40 must be set up according to instructions provided in the Exhaust Management chapter of the Setup section beginning on page 24 to assure proper ventilation.

ONBOARD FAN – Select when only the vent fan contained within the Dremel LC40 Laser Cutter is used to exhaust workspace fumes.

EXTERNAL SYSTEM – Select if laser unit is connected to a booster fan, standalone filtration system, or an external fume ventilation system.

LCD TOUCH SCREEN

TOOLS > SETTINGS > PRIME WATER PUMP



This screen provides control to start the water pump during priming of the laser cooling system.



START – Starts the coolant pump.



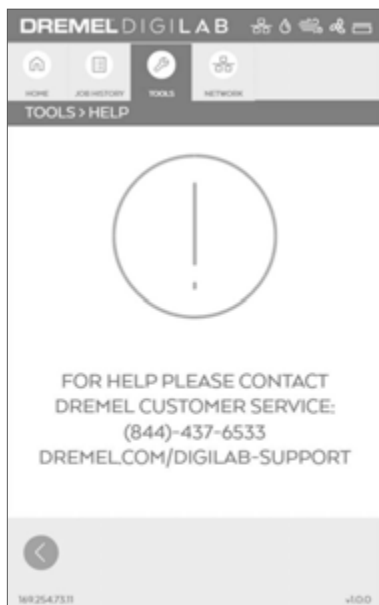
This screen provides control to stop the water pump during priming of the laser cooling system.



STOP – Stops the pump.

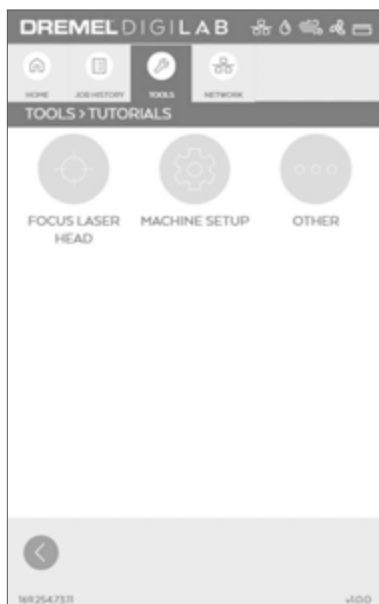
LCD TOUCH SCREEN

TOOLS > HELP



This screen displays customer service contact information.

TOOLS > TUTORIALS



This screen provides access to available tutorial.



FOCUS LASER HEAD – Instructions for adjusting the Laser Head to focus the laser beam on the work piece surface.



MACHINE SETUP – Instructions for the initial setup of Dremel LC40.



OTHER – Instructions for cleaning of the mirrors and lens.

LCD TOUCH SCREEN

TOOLS > TUTORIALS



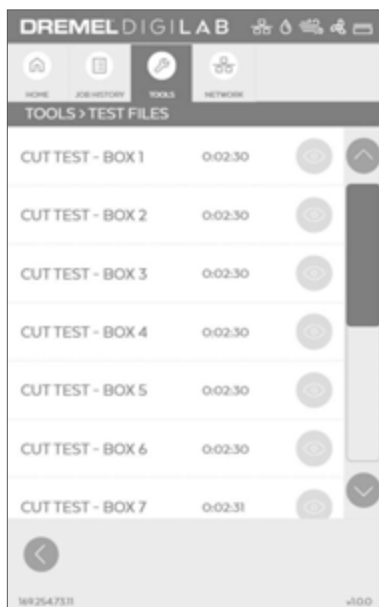
Sequence of screens stepping through JOB PREP.



Sequence of screens stepping through HOOK UP.

LCD TOUCH SCREEN

TOOLS > TEST FILES



This screen displays available test files and allows their execution.

Test files are used to verify proper operation of select functions and features of Dremel LC40 Laser Cutter.

- Test Files "CUT TEST - BOX 1" thru "CUT TEST - BOX 12" are used to identify optimized cut and score settings.
- Test Files "ENGRAVE TEST" are used to identify optimized engrave settings.



Preview the test file.



This sample screen illustrates how the option to run a test file can be selected.



NEXT — To start running the job.

LCD TOUCH SCREEN

TOOLS > UPDATE SERVICE



This screen provides network connectivity and status of update service from Dremel.

LOCAL NETWORK – Shows whether ethernet or wireless is connected to the local network.

UPDATE SERVICE – Indicates if the unit is able to communicate with the update service (Internet connection is required).

UPDATE STATUS – Provides information regarding any new software updates.

LAST CONNECTION TIME – Shows how long ago the last update service connection was made. If unit is actively connected to update service, then the LAST CONNECTION TIME will not be shown.

If an update is available, an UPDATE AVAILABLE screen and UPDATE PENDING screen will be shown.

The update prompt, which appears on the Home menu screen, allows a user the option of accepting the update or deferring for another time.

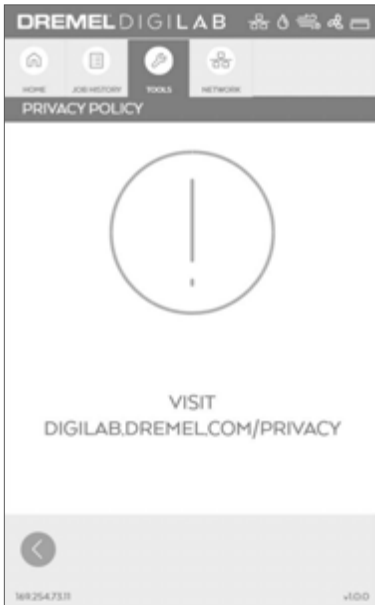
TOOLS > LICENSES



Displays information regarding open source software licenses.

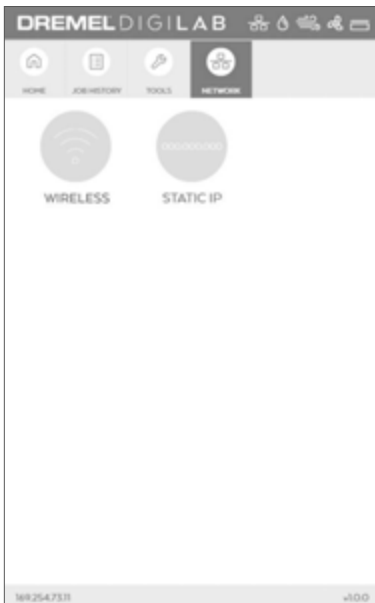
LCD TOUCH SCREEN

TOOLS > PRIVACY POLICY



Provides the web address where the current and complete privacy policy can be reviewed.

NETWORK > MENU SCREEN



This screen displays the Network connection menu. Available options allow connection or disconnection from the wireless network and set up a static IP address.



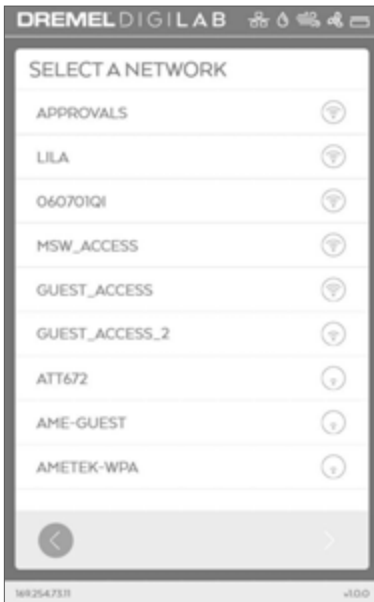
WIRELESS – Setup or modify a wireless local area network connection for the Dremel LC40 Laser Cutter to connect to.



STATIC IP – Setup the Dremel LC40 Laser Cutter to use a Static IP address or default to a DHCP (Dynamic Host Configuration Protocol address) IP address.

TOUCH SCREEN

NETWORK > WIRELESS



This screen displays wireless networks detected by the Dremel LC40 Laser Cutter.

Selecting an available network will start the connection process.



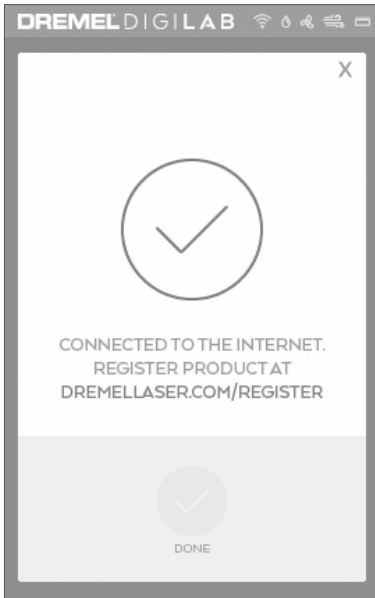
Wireless network signal strength indicator.



This screen displays the password prompt that appears when a password protected wireless network is selected.

TOUCH SCREEN

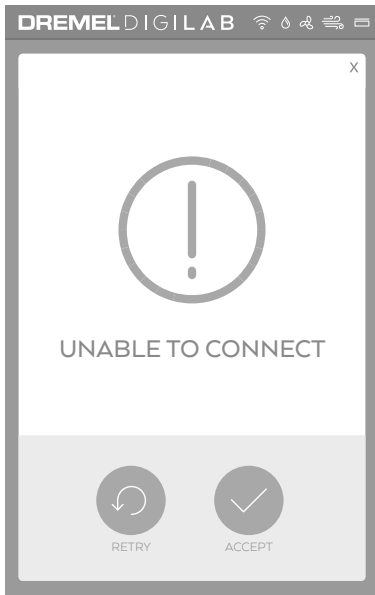
NETWORK > WIRELESS



This screen displays a notification that appears when a successful wireless network connection is made.



DONE – Return to Network menu screen.



This screen displays a notification that appears when connection to the wireless network is unsuccessful.



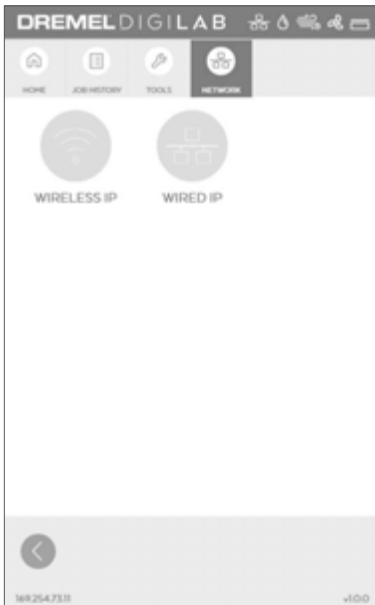
RETRY – Allows adjustment of the network information and an attempt to connecting again.



ACCEPT – Return to Network screen.

TOUCH SCREEN

NETWORK > STATIC IP



This screen displays network set up options.



WIRELESS IP – Allows setup and configuration of the Wireless Network Connection.



WIRED IP – Allows setup and configuration of the Wired Ethernet Network Connection.



This screen displays options for setting a static IP address for a wireless or a wired (LAN) network.

STATIC IP – Allows selection of Static IP address.

DHCP – Allows selection of Dynamic Host Configuration Protocol address IP address. Values displayed on IP Address, Netmask, and Gateway are ignored but saved for future use.

AUTO DNS – Allows the Dremel LC40 Laser Cutter to use the domain name system server as determined by the network router.

MANUAL – Allows for inputting a specific DNS server IP address.



Edit settings



SAVE – Save Static IP settings.

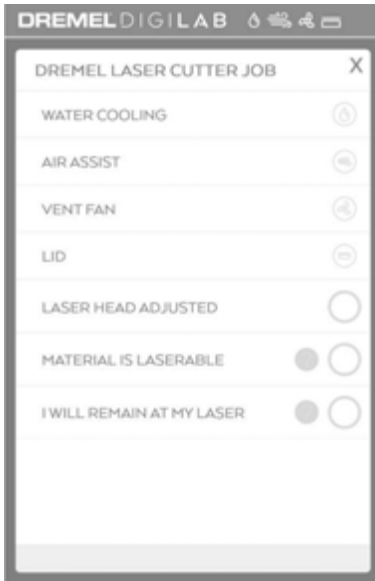


CANCEL – Cancel Static IP setup.

TOUCH SCREEN

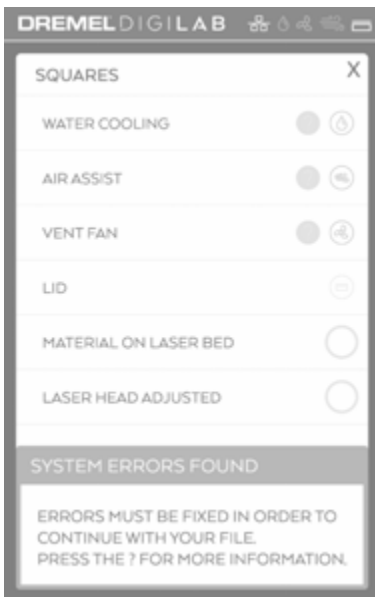
OPERATION SCREENS

These screens appear during operation.



CHECKLIST SCREEN

This screen displays system checks performed automatically by the Dremel LC40 Laser Cutter and operator inputs that must be completed before a job can be started.



CHECKLIST SCREEN – ERRORS DETECTED

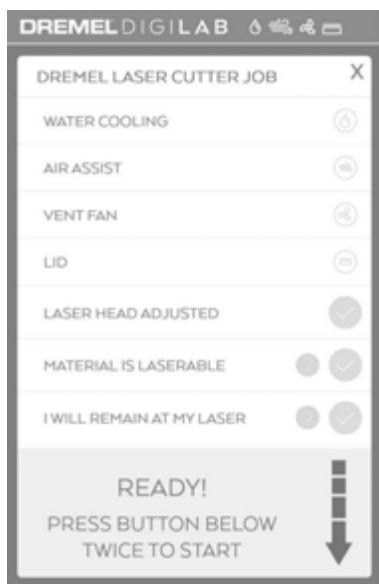
Displays errors detected in systems of the Dremel LC40 Laser Cutter while it is preparing to start a job. The status bar will also display red icons for system or systems where errors were found.



Link to a trouble shooting tutorial related to the system where an error was found.

TOUCH SCREEN

OPERATION SCREENS

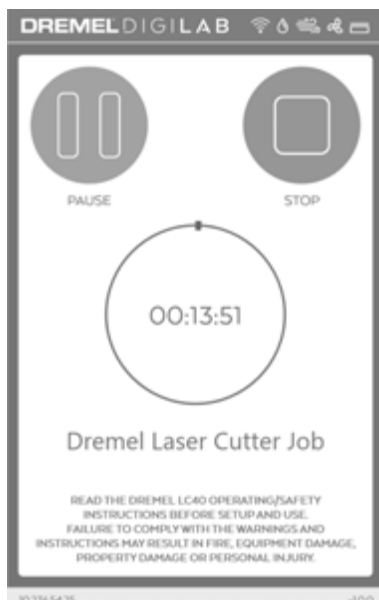


If all icons at the top are white, then items in the checklist should be green.



Manual checks that can be completed after the work piece is placed in the workspace and Laser Head adjusted using the spacer puck.

To start the job the Lid must be closed and the Start Button rapidly pressed twice.



JOB IN PROGRESS

This screen displays the job file name, time remaining to complete the job, and two control buttons.



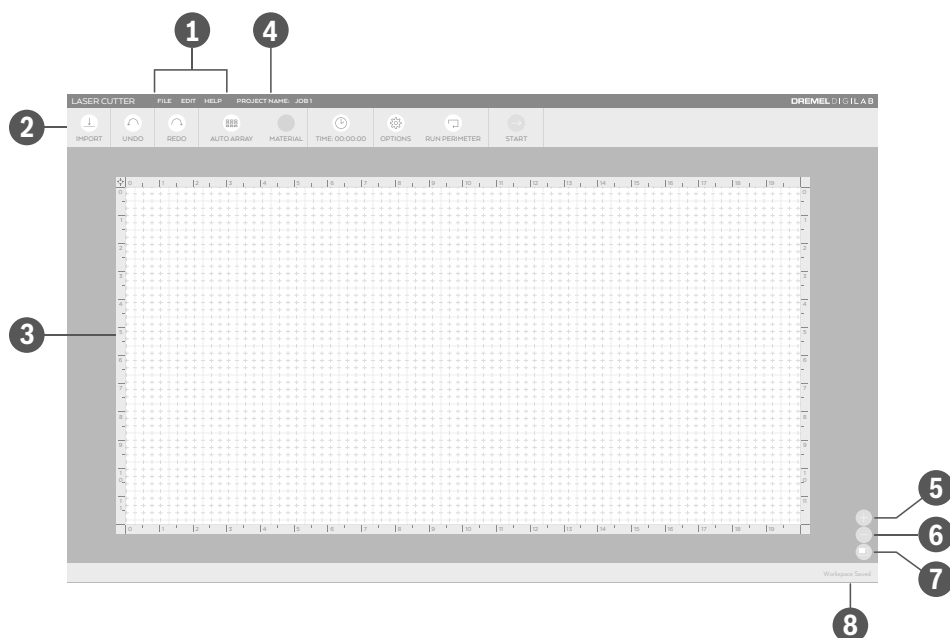
PAUSE - Temporarily pause the job, which can be resumed from the same place.



STOP – Cancel the current job.

DREMEL LC40 CONTROL SOFTWARE

This section introduces the major interface features of the LC40 Control Software. The LC40 Control Software is a combination of print driver and control software that communicates with, downloads jobs to, and controls the laser system. There is no download required to operate the LC40 Control Software. The LC40 Control Software will link a web browser with the Dremel LC40 Laser Cutter using the IP address (found at the bottom of the LCD home screen) on the local connection (Wireless or Ethernet).



- 1 Menu Bar** — includes the following menu options: File, Edit (shown when a project is opened), and Help.
- 2 Tool Bar** — includes the following tools: Import, Undo, Redo, Auto Array, Material, Time, Options, Run Perimeter, and Start.
- 3 Workspace** — On-screen area where a job is created. Provides a graphical representation of the intended job and its position relative to the general boundaries of the laser working area.
- 4 Project Name** — displays the name of the current project.
- 5 Zoom In** — enlarges workspace screen detail.
- 6 Zoom Out** — reduces workspace screen detail.
- 7 Return to Default Size** — auto size to fit window.
- 8 Status** — displays status of the current project.

DREMEL LC40 CONTROL SOFTWARE

Menu Bar

A**B****C**

LASER CUTTER

FILE

EDIT

HELP

PROJECT NAME: JOB 1

A. FILE

OPEN — select to open a file.

IMPORT — import a file or use the camera capture feature to create a file or place a picture of your laser bed in the background of your workspace.

B. EDIT

REDO — to redo most recent action/change.

UNDO — to undo most recent action/change.

COPY — select to copy the object that is highlighted.

DUPLICATE — select to duplicate the object that is highlighted.

PASTE — select to paste the object that is highlighted.

FLIP HORIZONTAL — select to flip horizontal the object that is highlighted.

FLIP VERTICAL — select to flip vertical the object that is highlighted.

ROTATE RIGHT — select to rotate right the object that is highlighted.

ROTATE LEFT — select to rotate left the object that is highlighted.

SELECT ALL — select to select all.

DESELECT ALL — select to deselect all.

C. HELP

ABOUT YOUR LASER — select to see more details about your Dremel LC40 Laser Cutter.

MANUAL — select to access the Dremel LC40 Laser Cutter Operating/Safety Instructions.

TUTORIALS — select to access tutorials for your Dremel LC40 Laser Cutter.

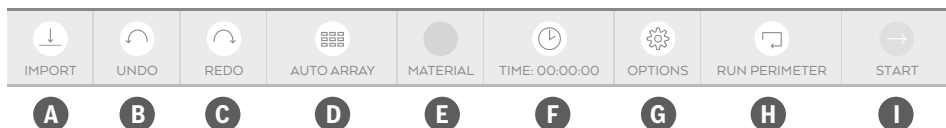
FAQS — select to access a list of frequently asked questions with answers.

PROJECT INSPIRATION — select to browse project inspiration.

CUSTOMER SERVICE — select to access customer service contact info.

DREMEL LC40 CONTROL SOFTWARE

Tool Bar

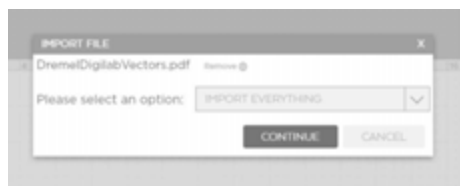


A IMPORT

Click to import a file or use the camera capture feature to create a file or place a picture of the Honeycomb Plate in the background of the workspace. Alternatively, the file can be dragged and dropped directly into the workspace.



FILE – Use import/file to bring in a file as typically done in other software programs. For PDF files the options are to bring in only cut files, only engrave files, or both. Select the option from the drop down menu. All other file types will default to either engrave or cut based on their optimal application.



CAPTURE – Use import/capture to access the camera capture feature. This can be used to capture a picture of the actual work piece on the Honeycomb Plate and place the image into the background of the LC40 Control Software workspace. Additionally, the camera can take a picture of a sketch placed on the Honeycomb Plate, and transform that sketch into a file which can be engraved or cut.

B UNDO

Click to undo most recent action/change.

C REDO

Click to redo most recent action/change.

D AUTO ARRAY

Choose the object to duplicate. Then click and highlight the number of times to duplicate the object.



DREMEL LC40 CONTROL SOFTWARE

E MATERIALS

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠ WARNING Never engrave or cut any unknown material. Only engrave materials recommended by the manufacturer. The vaporization/melting of many materials, including but not limited to PVC and polycarbonates, can give off hazardous fumes. Always refer to the Safety Data Sheet (SDS) from the material manufacturer to determine the response of any work material to extreme heat (burning/fire hazard) to prevent hazards.

Click to select a material from the list of Dremel provided commonly used materials, or choose "more" to add/delete/edit the list of favorite materials. Use the star to denote a default material that will be saved and used for all jobs, until changed. The settings that are populated when a material is selected will be applied to all files brought in, unless edited in the print settings box, or changed in the materials list.



F TIME

Click to calculate a rough estimate of how long the job will take to complete.



G OPTIONS

Displays more advanced settings and defaults.



DREMEL LC40 CONTROL SOFTWARE

H RUN PERIMETER

Laser head will move along the exterior perimeter of the job. Click again to stop this motion, otherwise it will continue running.

PAUSE – Appears once a job starts and will pause the job.

I START

This button will send the job to the laser.

STOP – Appears once the job starts and will cancel the job.

PRINT SETTINGS

A print settings box will pop up when clicking on an imported file. There are two tab options at the top (Cut/Score and Engrave), and only the ones that are applicable for that file type will be highlighted. This box can be moved anywhere on the screen simply by dragging it. The gear button in the top right corner will expand “advanced” settings for more control. The “X” will minimize the box and can be reopened by clicking on the pencil that appears.

CUT

This function is used when cutting through a work piece. This function is also called “vector” since a vector, or line file is needed in order to execute. The Laser Head will follow the lines of the file. The LC40 Control Software will detect up to 21 different colors in a line file and allow adjustment of the print settings based on those colors. The order that the different colors are cut can be adjusted in the print preview screen once ready to send.



Print Settings box (Cut)

HEAT – Adjust how quickly the laser is firing, or how much heat is generated on the surface of the work piece. Turning up the heat will cause charring for materials like wood or paper, but will create a glossy edge for a material like acrylic.

SPEED – Adjust how quickly the Laser Head moves. Slowing the Laser Head down allows it to cut deeper into the work piece, while turning the speed up prevents the cut from going as deep.

DEPTH – adjust to control how deep the laser will go into the work piece. Turning up the depth will increase the likelihood that the work piece will be cut all the way through.

OF PASSES – adjust to control how many times the laser traces over the lines. Increasing the number of passes means the laser will execute that job, then immediately execute it in the exact same location however many times entered. Increasing the number of passes can be an effective way to ensure the work piece is cut completely through, especially as the thickness of the material increases.

SCORE

This function is used when it is preferred not to cut all the way through the work piece. This function requires a vector, or line type file and is most useful when emphasizing the outline of text or an object. It is very similar to “cut,” but the software will default to less powerful settings, in an attempt to mark the work piece, but not cut all the way through it.

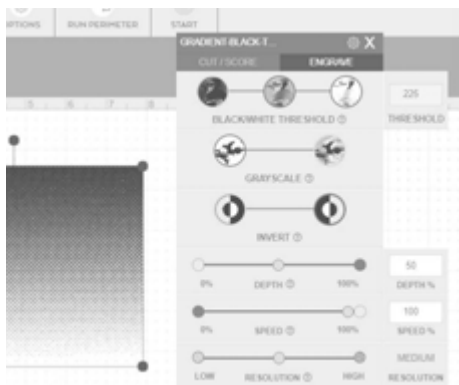


Print Settings box (Score)

DREMEL LC40 CONTROL SOFTWARE

ENGRAVE

This function darkens or removes the surface of the work piece, rather than cutting through it. This function is also known as “raster” and will require an image file to execute. The Laser Head will move side to side like an inkjet printer.



Print Settings box (Engrave)

BLACK/WHITE THRESHOLD – Use this to adjust the amount of black that is included in the image. The furthest left setting will include a larger amount of black from the file, while the furthest right setting will include less black, or a larger amount of white.

GRAYSCALE – Takes a black and white image and assigns different densities of dots to visually create a number of different shades of gray. Darker areas of the image will have more dots, while lighter areas will have less dots. This is useful for images that have a lot of different colors, and it is desired that the finished product appear more realistic. This setting can be toggled on or off.

INVERT – This setting will transform the image so that the white areas become black, and the black areas become white.

DEPTH – Adjust to control how deep the laser will go into the work piece. Increasing the depth will remove more material, so that a noticeable void is felt when touching the work piece, creating almost a 3D effect.

Reducing the depth will keep the surface of the work piece relatively flat or even.

SPEED – Adjust how quickly the Laser Head moves. Slowing the Laser Head down will generally make the engraving darker or deeper, while increasing the speed typically results in a lighter finish.

RESOLUTION – 3 different resolution options are available: low, medium, high. This setting adjusts the DPI (dots per inch) in the image, the low setting will be faster and lighter than the high setting. In low setting the resolution is pixelated, or individual dots are easy to see. The high setting will result in a less pixelated final result.

JOB PREVIEW

After pressing “start” the PREVIEW screen allows review of all the settings and placement of the files before sending the job to the laser. Changes can be made to the order the files execute. By default, engraving is completed first then cutting. If other settings need to be adjusted, exit out of this box before sending the job. If everything looks correct, the job can be sent to the laser. The physical Start Button on the laser must be pressed twice before the job will begin.



Job Preview Screen

TESTS & ALIGNMENTS



WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

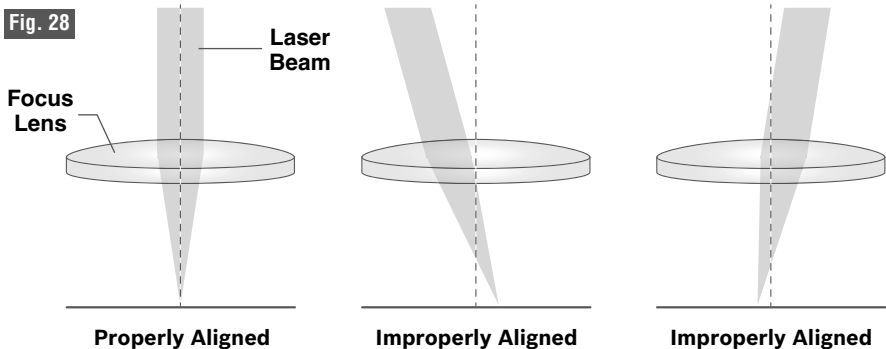
Mirror Alignment Overview

Alignment of the mirrors is performed before the Dremel LC40 Laser Cutter is shipped. However, before the Dremel LC40 Laser Cutter unit is used for the first time and periodically during its use, the mirror alignment should be checked and adjusted if necessary.

Misalignment most often occurs when:

- Gantry is manually moved while the motors are locked,
- Air Assist Nozzle is displaced,
- Laser Tube is replaced,
- mirrors / lens are replaced, or
- during shipping.

Alignment of the mirrors is necessary to ensure that the Laser Beam remains properly aligned with the Focus Lens as the Laser Head moves to all four corners of the workspace. After alignment, the Laser Beam should be centered on the Focus Lens and perpendicular to it. Improperly aligned Laser Beam will result in the focus point being out of line with the centerline of the Laser Head (Fig. 28).



TOOLS & SUPPLIES NEEDED FOR TESTS & ADJUSTMENTS

- 1.5 mm Hex Key
- 2 mm Hex Key
- 2.5 mm Hex Key (included)
- 3 mm Hex Key
- Alignment Paper (included)
- Wipes

TESTS & ALIGNMENTS

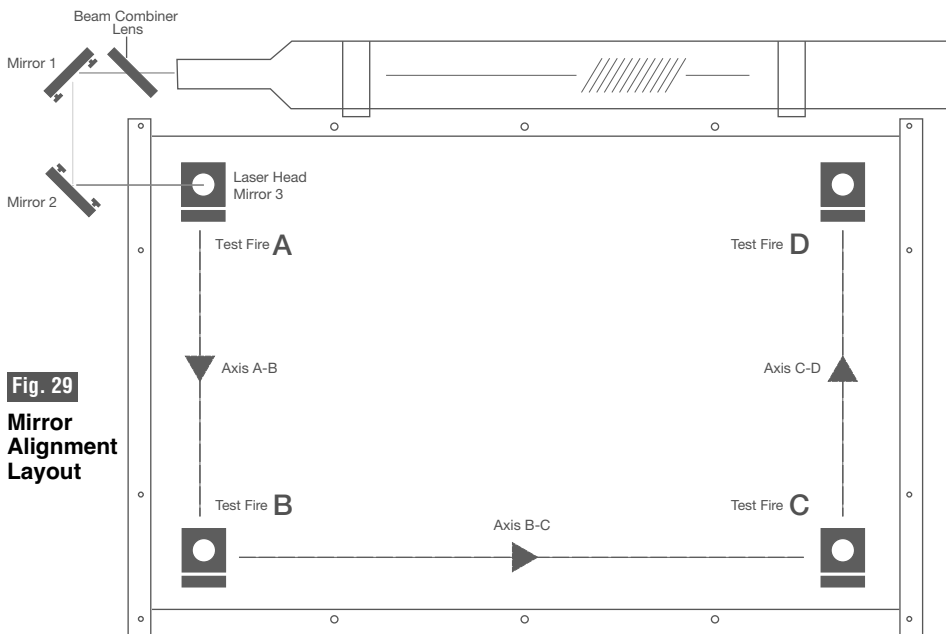


Fig. 29

Mirror Alignment Layout

4 Corner Mirror Alignment Test

Before running the first job, check to make sure that the mirrors are properly aligned. This test should also be performed as a troubleshooting measure for power loss, clipping (Laser Beam hitting Air Assist Nozzle), or incomplete cutting. For this alignment test the Dremel LC40 Laser Cutter must be “test fired” once in each corner of the machine. This is done to make sure the Laser Beam is following the correct path to the mirrors, to the Laser Head, and ultimately through the Focus Lens to the work piece.

Note: Dremel LC40 Laser Cutter Lid must be closed for each test fire.

Materials needed:

- Thermal paper (supplied).
- 2.5mm hex wrench (supplied).

1. Open the Lid.

2. Place the thermal paper: Take a small piece of thermal paper approximately the same size as the face of the lens and place it over the focus lens under Mirror #3. Fig. 30.

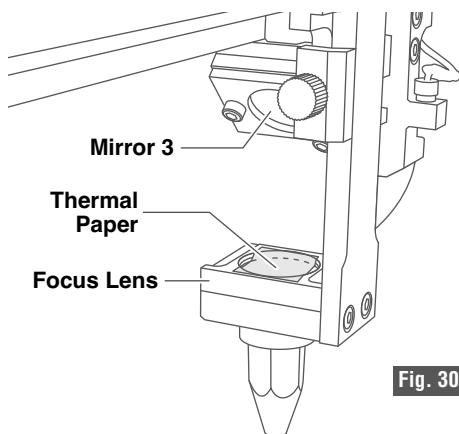


Fig. 30

3. Press the paper down with a finger so that a circle appears that demonstrates the outer rim of the lens. Sometimes pencil lead or crayon will help to show the edges of the lens and mirrors.

TESTS & ALIGNMENTS

4. Position the Laser Head: Move the Laser Head into the upper left corner (Location A) of the workspace, Fig. 29.
5. Close the Lid.
6. Using the LCD touch screen display, test fire the Dremel LC40 Laser Cutter (by tapping Test Fire on the Home screen) from the Test Fire screen. The Fire button will appear after all of the system checks are passed. Press the button one time and observe where the spot lands on the thermal paper. If the spot does not appear, repeat. If it still does not appear, change position so it is possible to look through the openings in the Tube Guard and confirm that the Laser Tube is actually firing.
7. Repeat Test Fire in other three corners: Without removing the thermal paper, repeat firing the Dremel LC40 Laser Cutter once in each of the other corners of the machine (Lower Left B, Lower Right C, Upper Right D). Fig. 29.
 - a. Open the Lid.
 - b. Position the Laser Head.
 - c. Close the Lid.
 - d. Repeat as in step 5. Observe which mark is from which location.
8. Check Results: With the fourth corner test fire complete, open the Lid and observe the thermal tape. The four spots should overlap each other (Fig. 32). If the spots do not overlap as shown, perform the Mirror Alignment Procedure on page 65.
9. Once the spots are aligned, place thermal paper under the Air Assist Nozzle on the Honeycomb Plate at all four corners. Fire the Dremel LC40 Laser Cutter into each piece of

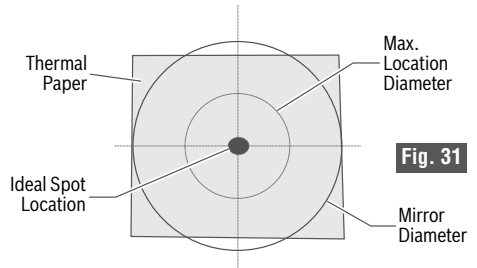
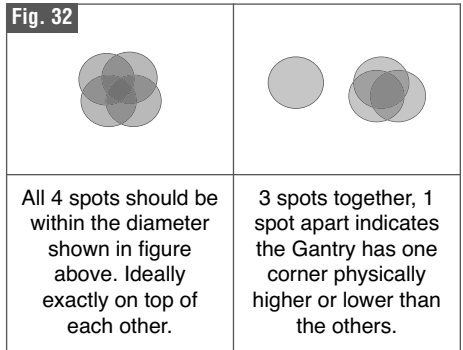


Fig. 31

Fig. 32



thermal paper using test fire and verify that a circular spot appears on the paper. This ensures that the Air Assist Nozzle is not clipping the laser path. If the spot is not circular, fine-tune the Air Assist Nozzle by loosening the set screw and adjusting.

10. Once the mirror alignment test is successfully completed, the Dremel LC40 Laser Cutter is ready for use.

TESTS & ALIGNMENTS

Mirror Alignment Procedure

Steps:

1. Gantry Alignment
2. Preparation
3. Verify centering and no clipping at Mirror #1
4. Align Axis A-B (Y-Axis) using red dot generated by the Alignment Laser (fig. 36).
5. Align Axis B-C (X-axis)
6. Centering on focus lens. (Z-axis)

Materials needed:

- Thermal paper (supplied). When supply is exhausted, purchase adhesive backed thermal paper.
- 2.5mm hex wrench (supplied).

Step 1: Gantry Alignment

The first task of mirror alignment is to ensure that the Gantry is perpendicular to the Y axis rails. Often misalignment occurs when the Gantry is bumped or moved while the motors are in a locked state.

1. To verify alignment, push the Gantry all the way forward until it contacts the front stops and backward until it contacts the rear stops.
2. The Gantry should touch the stops at the same time on both the left and right side. If it touches evenly, move to Step 2: Preparation.
3. If the Gantry does not touch both sides, the motor connector under the tube guard needs to be loosened.
 - a. Do this by removing 3 screws of the Tube Guard and lifting the Tube Guard up off of the posts. (see Tube Guard Removal, page 70)
 - b. Loosen the screw on the left side of the motor connector.
 - c. Shift the Gantry tight against the front stops and hold evenly.
 - d. Tighten the screw on the motor connector while holding the Gantry.

- e. Replace the Tube Guard using great care not to damage any wires or the Laser Tube.

4. Rerun the four corners mirror alignment test to see if further alignment is necessary.

Step 2: Preparation

Prepare your tools and workspace.

1. Power On Dremel LC40 Laser Cutter: The machine must be powered on to continue this procedure. Allow the machine time to boot up the touch screen operating system.
2. Gather Tools: A 2.5 mm hex wrench (supplied) and thermal paper (supplied) are required to perform the mirror alignment procedure.

NOTE: DO NOT over-tighten or over-loosen adjustment screws. Tightening or loosening any of the three adjustment screws on the mirrors or the red dot diode will move the position in a particular direction depending on the positioning of the other screws. Some experimenting is required to understand the relationship of each screw and how adjusting one affects the alignment laser's red dot positioning.

When adjusting the screws, use the absolute minimum turn of the hex wrench to move the red dot or the mirror into position. If one or two turns of the screw from the just seated screw position does not move the red dot into position, it is recommended to release all three screws back to the just seated position and start over. Over tightening the screws can damage the mirror holding plate. Check for any loose screws at either the mirror holders, the lens, or anywhere on the Gantry to ensure efficiency during alignment procedure.

TESTS & ALIGNMENTS

Step 3: Verify No Clipping at Beam Combiner and at Mirror #1.

1. Open the Lid.
2. Place Thermal Paper: Take a small piece of thermal paper (approximately 1 inch (25 mm) should be plenty) and place it firmly over the Beam Combiner Lens near the aperture side of the Laser Tube, Fig. 33.
3. Press the paper down with your finger so that a circle appears that demonstrates the outer rim of the lens. Sometimes pencil lead or crayon will help to show the edges of the lens and mirrors.
4. Close the Lid.
5. Using the Touch Screen Display, test fire the Dremel LC40 Laser Cutter from the Test Fire screen. The Fire button will appear after all of the system checks have passed. Press the button one time and observe where the spot lands on the thermal paper. (From here forward called *Test Fire*)
6. The spot should be centered on the Beam Combiner Lens. Remove the thermal paper.
7. Repeat steps 2 – 5 at Mirror #1 (Fig. 34).
8. The spot should be centered at Mirror #1 and not clipped by the Beam Combiner Lens. If it is not, there is a problem with the tube mounting as there is very little to adjust between the tube and the mounting of Mirror #1.
9. Remove the thermal paper and clean all tape residue from the Beam Combiner Lens and Mirror #1.

Fig. 33

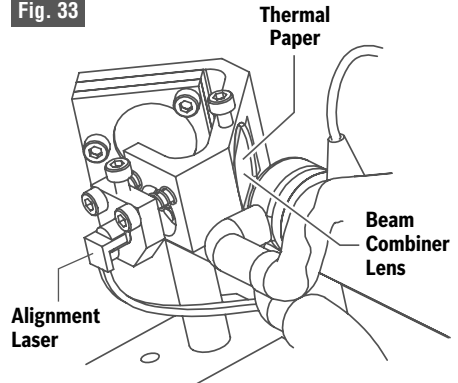


Fig. 34

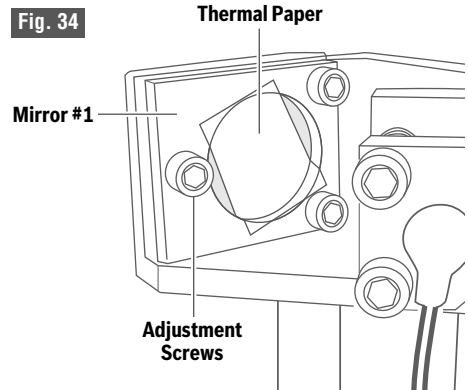
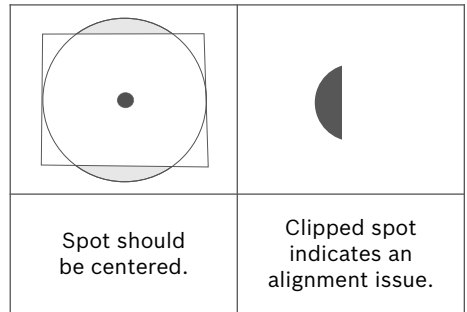


Fig. 35

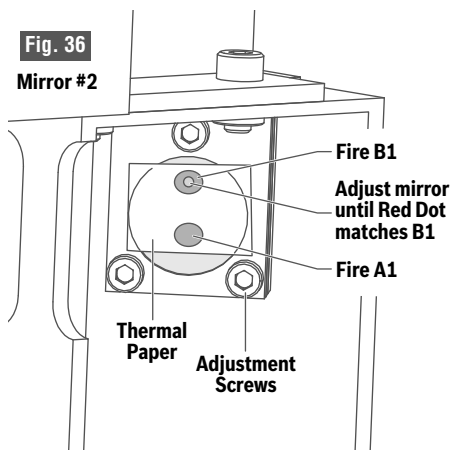


TESTS & ALIGNMENTS

Step 4: Align Axis A-B (Y-Axis) using Alignment Laser's Red Dot.

Conceptually, you will be aligning the invisible cutting beam and the Alignment Laser's visible red dot with the axis of the shaft from A to B. When the beams are perfectly parallel with the A-B axis, do not continue to change Mirror #1. Further changes to Mirror #1 will then negate the alignment to the axis.

1. Open the Lid.
2. Place Thermal Paper: Take a small piece of thermal paper (approximately 1 inch (25 mm) should be plenty) and place it firmly over Mirror #2, Fig. 36.
3. Press the paper down with a finger so that a circle appears that demonstrates the outer rim of Mirror #2. Sometimes pencil lead or crayon will help to show the edges of the lens and mirrors.
4. Move the Gantry to position B, Fig. 29.
5. Close the Lid.
6. *Test Fire* Observe where the spot lands through the Lid. Without removing the paper it may be necessary to mark this spot. This is Spot B1.
7. Adjust only the visible red dot to match the spot.
 - a. Do not move the Gantry at this time, and do not adjust Mirror #1 yet.
 - b. Using the 2.5mm hex wrench, make micro adjustments to the three adjustment screws of the Alignment Laser, and position the red dot exactly over the burn mark at position B on Mirror #2.
 - c. If the red beam is not hitting the mirror at all, it may be necessary to use a larger card or paper to determine where the red dot is.
 - d. Go slowly and do not overtighten screws. Small turns of the screws are required to move the beam at long distances.



- e. It is best to align the red dot at the furthest distances B and C to avoid small angle issues introduced at A or D.
8. Without removing the paper, move the Gantry to A.
 9. *Test Fire*. If possible change position to see if the test fire lands on the thermal paper without opening the Lid. If it is not possible it may be necessary to use the suggested marks in step 6. This is Spot A1.

If the two spots are exactly on top of each other, then the Y axis is aligned. Do not make any more changes to M1. Move on to B-C X axis alignment.
 10. If the 2 spots are not on top of each other at A and B, continue as follows:
 - a. Move the Laser Head back to position B.
 - b. Note that the red dot can now be used to predict where the next laser fire shots will be if it is aligned as in step 7.
 - c. While at position B, slowly adjust Mirror #1. Not the red dot!
 - d. Change the mirror so that the red dot moves halfway toward Spot A1.
 - e. Leave the Gantry at B, Close the Lid and tap *Test Fire*.

TESTS & ALIGNMENTS

- f. The new Spot B2 should have moved toward Spot A1 and match the red dot.
- g. If the red dot does not match the new Spot B2, tweak the red dot (not Mirror #1) as in step 7.
- h. Move the Gantry to A, close the Lid and *Test Fire*. Observe the new Spot A2. It should be only a little closer to Spot B1.
- i. Note: If at any time spots become confusing, shift the paper or remove it completely and start with a clean piece. Spots will have to be redone and *Test Fired* at both A and B.
- j. Continue this cycle of:
 - i. Fire Spot B,
 - ii. Tweak the red dot,
 - iii. Fire Spot A,
 - iv. Adjust Mirror #1 while the Gantry is at Spot B,
 - v. Until the spots created are perfectly on top of each other. The spots on Mirror #2 may not be perfectly centered, but should certainly not extend off of the edge of Mirror #2.
4. Note that it is possible that Mirror #2 can be adjusted far enough out of range and potentially damage the rubber of Mirror #3 when the Dremel LC40 Laser Cutter is fired. Look for the Alignment Laser. It should give an indication of where the Laser Beam is pointing. Adjust Mirror #2 so that the red dot is hitting the thermal paper.
5. Close the Lid and tap *Test Fire*. Without removing the paper it may be necessary to mark this spot. This is Spot C1.
6. Adjust only the red dot beam to match the Spot C1. As this is the furthest distance it will take extremely small movements of the screws to move the red dot.
7. Move the head back to position B.
8. Close the Lid and tap *Test Fire* observing and marking the spots as necessary. This is Spot B1.
9. As before if Spot C1 and Spot B1 are not exactly on top of each other adjust the red dot using Mirror #2 this time to adjust the location of the red dot half way to Spot B1.
10. See steps above and repeat this cycle of:
 - a. Fire Spot C,
 - b. Tweak the red dot,
 - c. Fire Spot B,
 - d. Adjust Mirror #2 while in position until the spots created are perfectly on top of each other. The spots on Mirror #3 may not be perfectly centered, but should not extend off of the edge of Mirror #3.

Step 5: Align Axis B-C (X-Axis) using Alignment Laser's Red Dot.

Alignment of the B-C axis is often much easier than the A-B axis due to proximity of the Gantry and experience learned on the first axis. It cannot be stressed enough that the A-B axis should be aligned before attempting to align the B-C. As with A-B and Mirror #1, once B-C is aligned, do not continue to adjust Mirror #2. Further adjustment of Mirror #2 will negate the alignment of B-C.

1. Open the Lid.
2. Place Thermal Paper as before on Mirror #3.
3. Move the Gantry to Position C.

TESTS & ALIGNMENTS

Step 6: Align Axis Lens holder (z-Axis) using Alignment Laser's Red Dot

Centering of the beam on the lens is the most critical component of alignment. However, as the distance from Mirror #3 to the lens is very short, it is difficult to make drastic changes to the position of the laser spot. Resist the urge to adjust Mirror #2 or Mirror #1, because as indicated before, it will only create misalignment.

1. Open the Lid.
2. Place Thermal Paper: Take a small piece of thermal paper (approximately 1 inch (25mm) should be plenty) and place it firmly over the lens.
3. Press the paper down with a finger so that a circle appears that demonstrates the outer rim of the lens. Sometimes pencil lead or crayon will help to show the edges of the lens and mirrors.
4. Move the Gantry to Position C.
5. Move the lens to its lowest position using the Spacer Puck on the Honeycomb Plate.
6. Close the Lid and tap *Test Fire* without removing the paper as it may be necessary to mark this spot. This is Spot L1.
7. Tweak the red dot to match the spot on the paper. Due to the reflections of all of the mirrors the red dot may not move with the same screw turns as it did previously.
8. Adjust Mirror #3 continuing to test fire until the spot is nearly perfectly centered.
 - a. Note: do not overly tighten Mirror #3.
 - b. In rare instances, it may be necessary to access the Mirror #3 mounting screws.
 - c. Fully remove the lens holder assembly by loosening the Laser Head Knob, Fig. 37.

- d. Loosen the two Mirror #3 mounting screws (Fig. 38) enough to rotate the lens in the direction of the missing spot. While holding the lens, retighten. The screws tend to rotate the mirror in the direction of tightening.

- e. Replace lens holder assembly.

9. After the spot is centered rerun the 4 Corners Tests. The spots should now be nearly on top of each other. Also be sure to check that the Air Assist Nozzle is not clipping the laser path and adjust if necessary.

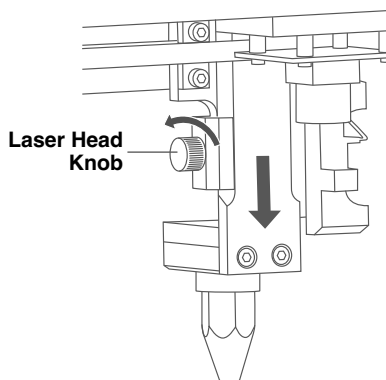


Fig. 37

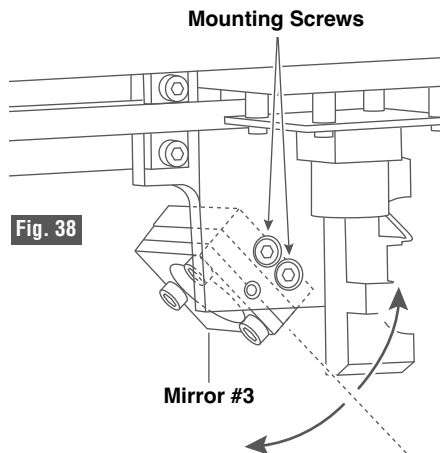


Fig. 38

LASER TUBE GUARD REMOVAL

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

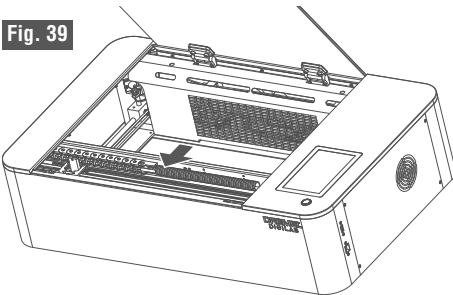
⚠ WARNING Disconnect the plug from the power source before making any assembly, adjustments or changing accessories. Such preventive safety measures reduce the risk of starting the laser cutter accidentally.

⚠ WARNING Do not touch the any part of the laser tube and its connections. Laser tube and its connections may be hot if laser was used recently.

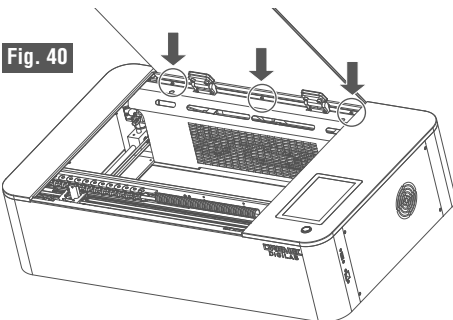
⚠ CAUTION Use care when removing the tube guard. The LED lights may be damaged by contact with tube guard edges.

For some tasks, the Tube Guard requires removal so that components can be accessed. Examples are Gantry alignment (motor connector adjustment), fan cleaning, and Laser Tube replacement. If removal is required, follow the steps below.

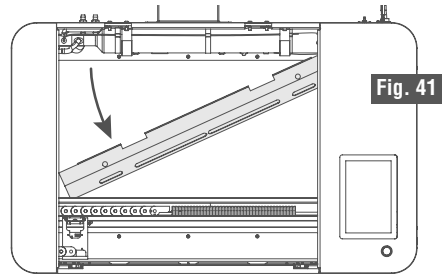
1. Move the Gantry to it's furthest forward point, Fig. 39.



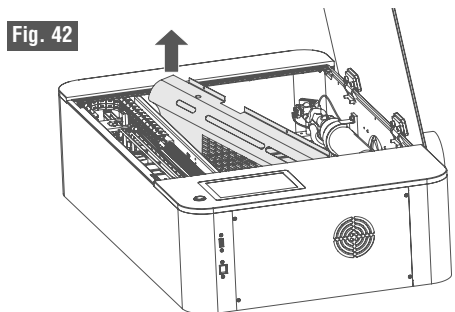
2. Loose the 3 captive fasteners of the Tube Guard, Fig. 40.



3. Lift the Tube Guard slightly off of the posts that retain the bottom of the guard.
4. Rotate the Tube Guard counter clockwise as shown in Fig. 41.



5. Lift the front left corner of the Tube Guard until it clears the plastic, Fig. 42. Use caution not to damage the LED Lights. Continue to tip and rotate.



Reverse steps to install.

OPERATING THE LASER CUTTER

⚠️ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠️ WARNING Always use a properly configured, installed, maintained, and operating fume/smoke exhaust system as recommended by the manufacturer when operating the laser system. Caustic fumes and smoke from the engraving process must be extracted from the laser system and exhausted outside.

⚠️ WARNING Always inspect the exhaust fan and duct work for obstructions and ensure proper air flow exists before each use. Unobstructed and properly maintained exhaust fan and duct work will reduce the risk of fire and effectively extract caustic fumes and smoke.

⚠️ WARNING Never engrave or cut any unknown material. Only engrave materials recommended by the manufacturer. The vaporization/melting of many materials, including but not limited to PVC and polycarbonates, can give off hazardous fumes. Always refer to the Safety Data Sheet (SDS) from the material manufacturer to determine the response of any work material to extreme heat (burning/fire hazard) to prevent hazards.

⚠️ WARNING Choice of material used during laser cutter operation and subsequent health consequences are the sole responsibility of user. Health effects of materials used may not be documented nor available.

⚠️ WARNING Discontinue use and seek fresh air if respiratory or eye irritation occurs. Ensure ventilation, exhaust, and/or filtration systems are working according to manufacturer specifications and make any necessary adjustments before further use. Exposure to fumes may cause allergy, asthma, breathing difficulties or other adverse health effects.

This product uses a laser beam to rapidly heat, melt and partially or completely vaporize the material, creating a number of gases and particulate matter. These byproducts of laser operation can, in some cases, pose health risks to those exposed to them.

To reduce or minimize exposure to their health hazards, always use an appropriate exhaust ventilation and/or filtration system and carefully choose your material. When using materials other than those suggested by Dremel, ask the manufacturer for the Safety Data Sheet (SDS) for each material. The SDS "Hazards Identification" section will provide information to help determine if the material or its by-products are harmful. If the material does not have an SDS, consult the manufacturer to determine if the material generates toxic gases and/or dust, and if it presents fire or explosion hazards.

Representative materials listed in Table 1 may be used with a properly installed and

maintained exhaust ventilation and/or filtration system when used as described in Table 3. However, these materials can vary in composition depending on manufacturer and other factors. Dremel has not tested all possible combinations and not all materials have documented health effects when used with a laser cutter. As such, the user is solely responsible for material choice and subsequent health consequences.

The Dremel LC40 Laser Cutter may be used with several exhaust management methods to manage the exhaust created during laser fabrication. Always ensure the exhaust management system is properly functioning. Refer to the Exhaust Management section on page 24 for proper exhaust ventilation and/or filtration methods. Exhaust ventilation and/or filtration systems may not be able to remove all hazardous substances or reduce their concentration to acceptable levels, so never use materials that are prohibited (see Table 2). Always check <https://digilab.dremel.com/support/faq> for the latest material information.

OPERATING THE LASER CUTTER

Laser Cutting / Engraving Prohibited Uses & Restrictions

The Dremel LC40 Laser Cutter may be used only for lawful purposes. Dremel does not recommend nor endorse the use of the Dremel LC40 Laser Cutter to create material that is:

- i. Prohibited by local, state or federal law;
- ii. Unsafe, harmful, dangerous, poses an immediate threat to the well-being of self/others, or is otherwise inappropriate for the environment; or
- iii. In violation of another's intellectual property rights. For example, the Dremel LC40 Laser Cutter will not be used to reproduce material that is subject to copyright, patent or trademark protection.
- iv. Used as a structural component - The use of parts made must be thoroughly evaluated by a competent professional prior to being included in any structure;
or
- v. In contact with or consists of food; Prior material use may transfer and contaminate food.

Never attempt to cut or engrave human or animal tissue.

OPERATING THE LASER CUTTER

Before the Dremel LC40 Laser Cutter can be used, a project must be created. The project is then sent to the Dremel LC40 Laser Cutter as a job and fabrication begins. When done, the work piece is ready for removal from the unit. The following steps cover the process from beginning to end.

Sequence of Operations:

- 1) Create a Project.
- 2) Place work piece on the Honeycomb Plate.
- 3) Focus the Laser Head.
- 4) Send the job to the Dremel LC40 Laser Cutter.
- 5) System check.
- 6) Run the Job.
- 7) Finish the job.

Step 1: Create a Project

Projects are constructed by opening the workspace in the LC40 Control Software and importing a file (or files). The files are available from (3) sources:

- A) Creating files in a graphics program.
- B) Importing previously created files.
- C) Using the camera capture feature.

Most files are created through the use of software such as CorelDRAW®, Adobe Illustrator® or other graphic software. Depending on the software and how the file was created, a project is developed to run a job that will allow the Dremel LC40 Laser Cutter to cut, engrave and/or score the material. Table 5 below lists several file types which can be imported into the LC40 Control Software. Please refer to the graphic software manufacturer's instructions regarding creation of vector or image files.

Table 5 **Compatible File Types and Laser Processes**

Extension	File Type	Laser Process		
		Cut	Engrave	Score
.SVG	Vector	X		X
.PDF	Vector/Image	X	X	X
.JPEG	Image		X	
.PNG	Image		X	

OPERATING THE LASER CUTTER

Source A) & B) File Preparation Details

Most designers use software such as CorelDRAW® or Adobe Illustrator® to create the design files to import into the LC40 Control Software, but pictures that have been taken with a camera can also be used. Any software can be used that exports PNG, JPEG, PDF, or SVG files.

The LC40 Control Software accepts both vector (SVG or PDF) and image (JPEG, PDF, PNG) based files. It is best to think of “cut” and “engrave” separately when designing for the Dremel LC40 Laser Cutter. Vector file types are optimal to cut something out of a material, or trace along lines with the Dremel LC40 Laser Cutter. Image file types are optimal to engrave into the surface of a material with various levels of intensity.

In order to use the file created in the design software, simply “save as” or “export” your file as one of the above file types. It is best to save parts of the file that will have applied different laser settings or applications to, as different files before importing.

By default, the LC40 Control Software will recognize different colors in vector files and allow the application of different settings based on those colors. For a single image file, the same print settings need to be applied to the entire file.

For example, to engrave the dark area in this image in a dark shade, and the white in this image in a light shade, it is best to export the dark area and the white text and circle outline as two separate files:



dark engrave (image file) + light engrave (image file) = light and dark engrave

A similar output could be obtained by bringing in a single image file and applying “grayscale”. In this case, however, the engraving will fill the object with tiny dots, rather than appearing solid.

Similarly, to engrave the dark area and cut out the white text, it would be best to save the text outline as an SVG or PDF and the dark area as an image file:



dark engrave (image file) + text outline (vector file) = text and circle cut out

Multiple files can be sent to the Dremel LC40 Laser Cutter as a single job. Simply import multiple files. If multiple files are exported from the same source file, the LC40 Control Software will place them on top of one another by default.

OPERATING THE LASER CUTTER

Source C) On-board Camera Capture

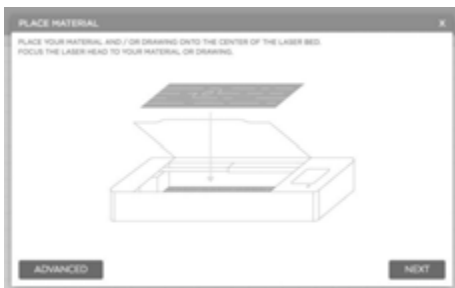
There are two ways to use the camera capture feature. The first way is to use the camera to pull a picture of the material into the background of the LC40 Control Software. Being able to see the size and location of the work piece in the software helps with aligning imported files, and reduces wasted materials. This is especially useful when wanting to cover the entire surface, to place a file in an exact location (center, near an edge or corner, etc), or if it is a small piece of material.

In order to use this function (Option 1):

1. In the LC40 Control Software, go to **IMPORT** menu. Click on **IMPORT>CAPTURE**.

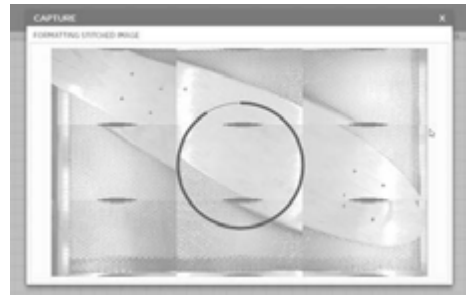


2. Follow the on screen instructions — Place the material onto the center of the Honeycomb Plate and close the Lid. Click “NEXT”.

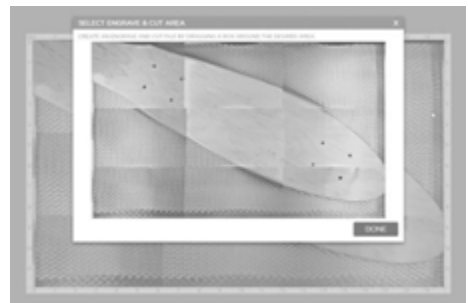


3. The LED Lights in the laser will flash off, and a red dot will appear. If the red dot is not on top of the work piece, adjust the work piece and start again with step 1.

4. The camera will then capture 9 different images of the bed and stitch them together.



5. Click “Done” to place this image into the background of the workspace.



6. The background image can be cleared at any time by going to **Import>Clear Capture**.



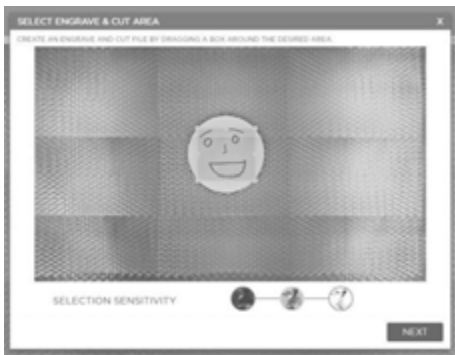
OPERATING THE LASER CUTTER

The second way to use the camera capture is to trace a drawing or sketch. For this application, it's best to use a black marker on white paper.

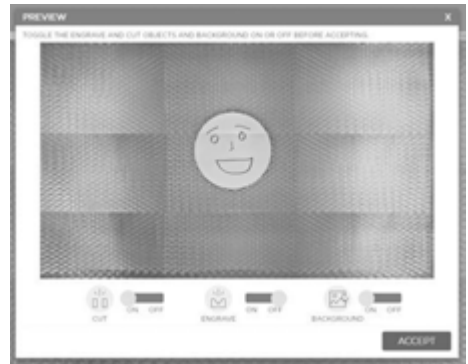
Steps 1 - 4 are the same as in the previous capture method.

Follow steps 1 - 4 on previous page.

5. Drag a box around the area of the sketch that will be turned into a laser file. Choose to make the selection sensitivity higher or lower by switching between the 3 threshold options and click "next".



6. Choose whether the file will be engraved or cut, and whether the background image should appear in the software by toggling the switches on or off and then click "done".



7. The background image can be cleared at any time by going to Import>Clear Capture. The cut or engrave files can be cleared by hitting "delete" on the keyboard.

Import Project Files

Once the project file(s) are created they can be imported into the Dremel LC40 Laser Cutter and executed.

1. Import, drag and drop a file, or use the camera capture to begin a project.



Import PDF or SVG files for objects you would like to cut or score.

Import JPEG, PNG, or PDF files for objects you would like to engrave.

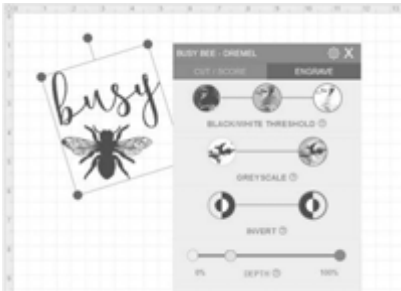
More than one object can be sent to the Dremel LC40 Laser Cutter in a single job by importing multiple objects into the same workspace.

OPERATING THE LASER CUTTER

2. Select the material type and thickness. The material library will automatically populate suggested cut and/or engrave print settings based on the material and thickness selected.



3. Move, scale, and adjust objects to the desired orientation. More precise adjustments can be made in the bottom left side of the screen.



4. Adjust print settings as needed. If the settings are changed in this box, they will override Dremel recommended settings until a new material is selected. The top right side of the print settings box will unlock more precise setting options. Review job and job execution order to make sure the desired result.



5. Send the job to the Laser.



If you would like to save a job to your computer to repeat again later go to File/Save. The job will be saved in a .bin format and will contain each object, its location, and its print settings.

OPERATING THE LASER CUTTER

Step 2: Place Material on the Honeycomb Plate

⚠ WARNING Observe all provided warnings and safety instructions when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage or personal injury.

⚠ WARNING Never engrave or cut any unknown material. Only engrave materials recommended by the manufacturer. The vaporization/melting of many materials, including but not limited to PVC and polycarbonates, can give off hazardous fumes. Always refer to the Safety Data Sheet (SDS) from the material manufacturer to determine the response of any work material to extreme heat (burning/fire hazard) to prevent hazards.

⚠ WARNING Always use provided work piece support structure when cutting or scoring. Fabrication without Honeycomb Plate may lead to fire or release of stray radiation.

⚠ WARNING Do not use irregularly shaped work piece. Risk of stray radiation or fire.

⚠ WARNING Do not stack work pieces. Stacking work pieces increases the risk of fire.

Place the work piece inside the laser on the Honeycomb Plate, Fig. 43. Always place the work piece on the Honeycomb Plate for cutting jobs. For engraving or scoring thicker pieces of material, the Honeycomb Plate can be removed and the work piece placed directly on the surface that supports the Honeycomb Plate. If it is an irregularly shaped work

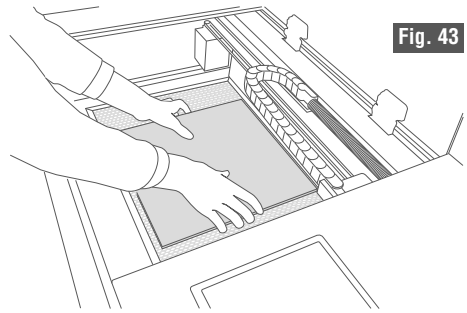


Fig. 43

piece (such as a cylinder), place the work piece anywhere on the laser bed and use the camera capture feature in the LC40 Control Software to align the design with the work piece. Be careful not to damage any part of the machine during this process. The Laser Head can be moved out of the way by hand if necessary, by pressing the “unlock” button on the LCD Touch Screen.

Make sure the work piece sits flat on the Honeycomb Plate. If the work piece is not flat, the Laser Beam will be out of focus. If the difference in flatness of the lowest spot to the highest spot or your work piece is more than 1/8" the Laser Head could touch or move the work piece out of position. Depending on the job, the work piece can be aligned with the top left corner of the Honeycomb Plate, or placed at any location on the Honeycomb Plate.

OPERATING THE LASER CUTTER

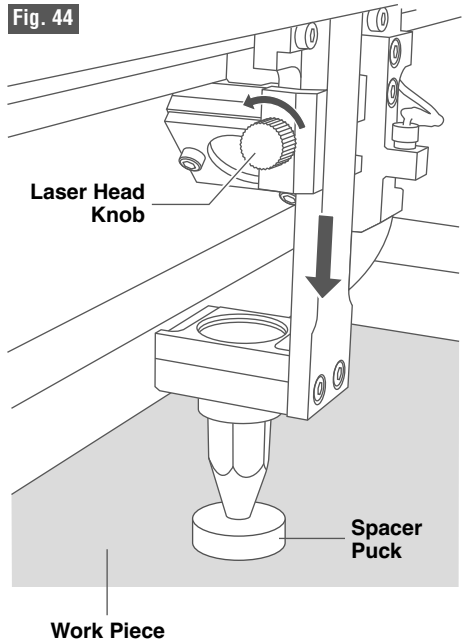
Step 3: Focus the Laser Head

The bottom of the Laser Head must be at the correct distance from the top surface of the work piece in order to cut or engrave a clean image.

To focus the Laser Head (Fig. 44):

1. Move the Laser Head so that it hovers over your work piece, either by pressing the arrow buttons on the LCD Touchscreen, HOME menu, or by pressing “unlock” and moving the Laser Head manually with your hand.
2. Loosen the Laser Head Knob (left hand side of the focus lens). Loosening the knob frees up the focus lens to move up and down.
3. Raise the Laser Head and place the Spacer Puck between the Laser Head and the work piece.
4. Let the Laser Head rest on the Spacer Puck and tighten the Laser Head Knob to fix the Laser Head in place.
5. Remove the Spacer Puck.

Note: If the work piece to be engraved is too thick to fit in the laser with the Honeycomb Plate, remove the Honeycomb Plate and place the work piece directly on the surface that supports the Honeycomb Plate. However, this is only recommended when engraving. Do not do this if the material needs to be cut.



OPERATING THE LASER CUTTER

Step 4: Send the Job to the Laser

Close the Dremel LC40 Laser Cutter Lid. The “Run Perimeter” feature on the LCD laser screen or in the LC40 Control Software can be utilized to ensure that the work piece and the design are aligned. The “Run Perimeter” feature moves the Laser Head around the perimeter of the job as it is set up in the software.



Send the job file to the laser so the laser can perform its system checks. From the LC40 Control Laser Software toolbar click "START" to run the job.

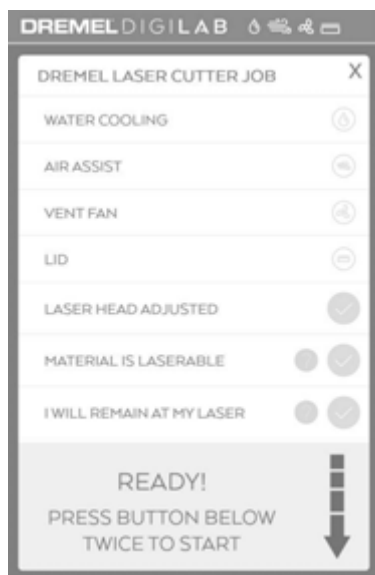


Step 5: System Check

Review the screen to make sure that all four system icons are white, indicating the system is ready to run.

If any icons are red, the Dremel LC40 Laser Cutter Touch Screen will notify you that these systems need to be fixed before beginning the job. Touch the “?” next to the appropriate line item for help diagnosing and correcting each error.

Refer to Touch Screen information starting on page 36 for additional information.



OPERATING THE LASER CUTTER

Step 6: Run the Job

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠ WARNING Always use a properly configured, installed, maintained, and operating fume/smoke exhaust system as recommended by the manufacturer when operating the laser system. Caustic fumes and smoke from the engraving process must be extracted from the laser system and exhausted outside.

⚠ WARNING Never operate the laser cutter system without constant supervision of the cutting and engraving process. Exposure to the laser beam may cause ignition of combustible materials and start a fire.

⚠ WARNING Always use the air assist as recommended by the manufacturer, especially while cutting. Cutting movements are relatively slow and apply an extremely large amount of heat to the work piece. Avoid the build-up of heat in order to reduce the risk of fire.

⚠ WARNING Do not operate when access door is open. An open door can lead to stray radiation, increased exposure to hazardous vapors or burn hazard.

Note: If an external ventilation system is being used, make sure that it is operating before starting the job.

Ensure tools and parts such as Spacer Puck, wrench, debris, etc. are removed from the Honeycomb Plate before starting a laser job.

On the Touch Screen, verify that all system warning icons are still white.

Press the Start Button twice to start the job (Fig. 45).

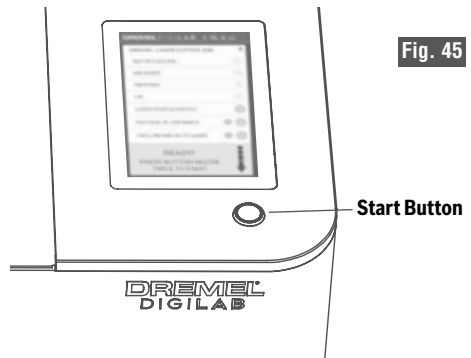


Fig. 45

Step 7: Finish the Job

Once the job is complete, wait at least 30 seconds before lifting the glass Lid and removing the finished part and remaining material from the Dremel LC40 Laser Cutter.

1. Verify that the Laser Head is not firing and has stopped moving.
2. Wait 30 seconds, and then open the Lid to get access to the parts.

3. If the Laser Head is above the part, unlock the Laser Head by pressing the "Unlock" button on the HOME menu of the Touch Screen and then move the Laser Head to the top left corner by hand.
4. Carefully remove all pieces from the Honeycomb Plate. Be careful not to damage any part of the Dremel LC40 Laser Cutter during this process.

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⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠ WARNING Disconnect the plug from the power source before making any assembly, adjustments or changing accessories. Such preventive safety measures reduce the risk of starting the laser cutter accidentally.

Water Tank Maintenance

1. Change water every 30 days to remove particles and compensate for evaporation.
2. Check water level daily. Remove cap to check water level. Add distilled water if needed.
3. Check to verify water is circulating by removing the cap to the water bottle. Check daily.
4. Check water tank for mold. Clean with bleach if mold develops.

Cleaning Mirrors and Lenses

Clean mirrors and lenses every 4 to 5 hours of use. When using material that produces a large amount of smoke, such as wood, cleaning is recommended more frequently. Use extreme caution when cleaning the lens. If any scratches or pitting can be seen on the surface, the lens must be replaced. These imperfections reduce power and will result in less energy reaching the work piece.

Contaminant left on the lens may result in damage to the lens surface.

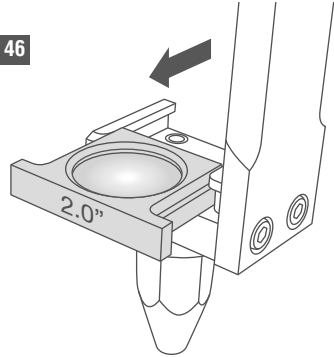
Materials needed for cleaning mirrors and lenses:

- Finger cots or latex/vinyl gloves, powder free.
- Cotton tipped swabs or lens wipes with alcohol free solution.

Procedure for cleaning the focus lens:

1. Remove the lens from the lens holder, Fig. 46.
2. Dip the swab or lens wipe in the lens cleaner solution, use a gentle circular motion to clean the lens surface.

Fig. 46



3. Use dry swabs or wipes to gently dry the lens surface.
4. Reassemble the focus lens in the lens holder.

Procedure for cleaning mirrors:

⚠ CAUTION Never remove the mirrors for cleaning.

Take extra caution to not move the orientation of the mirrors as this will affect laser beam alignment and would require time intensive laser beam realignment.

Remember to check alignment after cleaning the mirrors.

Procedure for cleaning the Laser Beam Aperture and Beam Combiner Lens

The Laser Aperture and Beam Combiner Lens should be cleaned every 4 - 5 hours of use. For locations of the Laser Beam Aperture and Beam Combiner Lens, refer to Fig. 2, page 17 and Fig. 47.

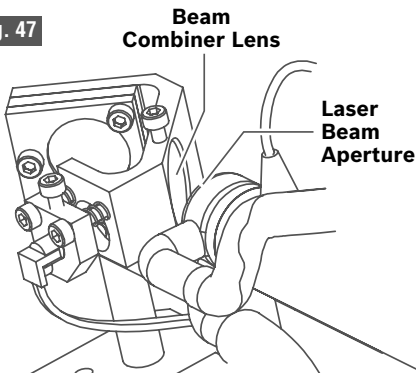
1. Cleaning the Laser Aperture and Beam Combiner Lens requires removal of the

MAINTENANCE

Laser Tube Guard. See page 70 for removal of the Laser Tube Guard.

2. Do not remove the Beam Combiner Lens. The Laser Aperture cannot be removed from the laser tube. Be extra cautious when cleaning the Laser Aperture. Any damage to the Laser Aperture will result in a damaged laser tube.
3. Dip the swab or lens wipe in the solvent. Use a gentle circular motion to clean the surface of the Laser Aperture and Beam Combiner Lens.
4. Use dry swabs or wipes to gently dry the surface of the Laser Aperture and Beam Combiner Lens.
5. Reassemble the Laser Tube Guard.

Fig. 47



Guide Rails X and Y

- a. Clean the X and Y guide rails weekly.** Clean more often if debris is visibly accumulating.

It's important to keep the left and right side rails clean to allow the moving parts of the Dremel LC40 Laser Cutter to glide freely without sticking or binding. Also, clean the guide rail between the two side rails supporting the moving Gantry. Keeping these rails clean is important to maintain the high precision of the Dremel LC40 Laser Cutter.

- b. Use a clean soft cotton cloth to wipe down the rails.** Re-lubricate with a light coating of white lithium grease.

Enclosure and Top Cover

The enclosure and glass Lid for the laser should be cleaned at least monthly.

Cleaning the enclosure:

- Wipe down the external surfaces of the enclosure with a soft cotton towel. Use light pressure to avoid scratching the surface.

Cleaning the glass Lid and side covers:

- Use glass cleaner and a soft towel to clean the Lid.
- The plastic side covers should only be cleaned with glass cleaner or a mild soap solution. Use a soft towel and light pressure. Do not use a paper towel, as this is more abrasive and can scratch the surface. Do not use alcohol to clean the plastic side covers.
- Use caution when cleaning the display screen as it is made of glass. Use light pressure.

Cleaning the interior:

The interior of the Dremel LC40 Laser Cutter should be kept clean of debris. Check at least once per week and clean if necessary. Keeping the interior clean will reduce the risk of particles flaming during use and will reduce the chance of airborne dust interfering with the laser path.

- Remove the Honeycomb Plate and wipe or vacuum the interior clean of any debris.
- Pay particular attention to the Laser Tube Guard as the small outlet openings can become clogged with debris.

Y-Axis Belts

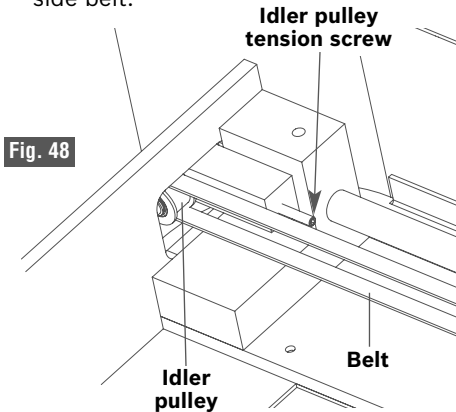
- a. Checking belt tension.** Check the rubber belts for tension every six months. The rubber belts work together to move the Gantry front to rear. It's important that they have relatively the same amount of tension.

MAINTENANCE

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

Tension is difficult to measure but there should not be sagging in one belt and complete tension in the other. Laser Cutters are delivered with the proper amount of belt tension. It is advisable to check belt tension when the Dremel LC40 Laser Cutter is new to establish a good baseline for future reference. Simply depress the belt lightly with your fingers and note the deflection. The belt should deflect about 1/4-1/2 inch with a light force.

- b. Tensioning the belt.** Push on the idler pulley mount by hand to loosen the belt and to ensure the spring loaded pulley is free to move and not binding. Moderate to strong force is recommended. Tighten or loosen the idler pulley tension screw using a 1.5mm hex key (not supplied) as necessary. Repeat for the opposite side belt.



Exhaust Fan

⚠ WARNING Do not try to clean exhaust ducting. The high concentration of particles may become airborne and create inhalation exposure.

a. Clean the exhaust fan and Exhaust Shroud.

After prolonged use, the fan performance can diminish due to dust build up on the fan blades and Exhaust Shroud. If the laser has been used for a lot of woodcutting, cleaning will need to be done more frequently. Debris can stick to any surface in its path. If fan noise or vibration is detected, a cleaning is required.

Disconnect the exhaust duct from the Exhaust Shroud. With a clean soft cloth, wipe the inside of the Exhaust Shroud to remove all residue. With a soft cloth, clean the dust off the fan blades. It will be necessary to remove the fan from the enclosure.

b. Inspect the exhaust duct.

Periodically inspect exhaust duct for wear or damage. If any duct appears worn, constricted or damaged, replace before further use.

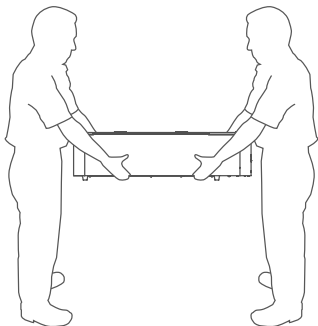
TROUBLESHOOTING

For troubleshooting tips, please visit dremel.com/digilab-support.

SHIPPING AND STORAGE

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠ CAUTION **Two person lift required.** Lifting the Dremel LC40 Laser Cutter alone may result in personal injury.



Shipping the Dremel LC40 Laser Cutter

Refer to the unboxing section on page 14 of the manual for help in returning the Dremel LC40 Laser Cutter to its original packaging configuration.

1. Unplug and wind up the Power Cord.
2. Unplug the Hex Box™ connector cord.
3. Disconnect the Ethernet cable.
4. Disconnect the Air Tube.
5. Disconnect the exhaust duct.
6. Drain the cooling water. Place the Hex Box™ in a suitable container to capture the system water. Place the container in a location below the Dremel LC40 Laser Cutter. Remove the cap from the Water Tank. Disconnect the clear inlet water hose from the Hex Box™ and allow the water to drain. This will drain the water from both the Hex Box™ and the Laser Tube. It is important to drain as much water as possible in case of freezing weather. Tilting the Hex Box™ back and forth will help drain the water.
7. If shipping the Dremel LC40 Laser Cutter in its original carton. Remove the 4 screws securing the Exhaust Shroud and place the Exhaust Shroud in its carton.

8. Remove the Honeycomb Plate and place it in its package.
9. When placing the Dremel LC40 Laser Cutter in its original carton try to replace the foam pads in the order they came out. It is important the foam pads securely capture the Gantry system. Secure the Gantry with plastic ties to minimize any movement of the Gantry during transportation.
10. Return the Hex Box™ to its original shipping location inside the Dremel LC40 Laser Cutter enclosure. If it cannot be placed inside, it must be secured to the pallet outside of the Dremel LC40 Laser Cutter.
11. When shipping the Dremel LC40 Laser Cutter the unit must be secured to a pallet to prevent damage.

Storing the Dremel LC40 Laser Cutter

1. Unplug and wind up the Power Cord.
2. Unplug the Hex Box™ connector cord.
3. Disconnect the Ethernet cable.
4. Disconnect the Air Tube.
5. Disconnect the exhaust duct.
6. Drain the cooling water. Place the Hex Box™ in a suitable container to capture the system water. Place the container in a location below the Dremel LC40 Laser Cutter. Remove the cap from the Water Tank. Disconnect the clear inlet water hose from the Hex Box™ and allow the water to drain. This will drain the water from both the Hex Box™ and the Laser Tube. It is important to drain as much water as possible in case of freezing weather. Tilting the Hex Box™ back and forth will help drain the water.
7. Store in a clean, dry dust free environment within a temperature range of 60-85 °F (16-29 °C). Keep the laser covered to minimize dust build up inside the Dremel LC40 Laser Cutter enclosure.

SERVICEABLE PARTS

⚠ WARNING Observe all provided warnings and safety instructions prior to and when using the Dremel LC40 Laser Cutter. Failure to do so may result in fire, equipment damage, property damage and/or personal injury, up to and including death.

⚠ WARNING Have your laser cutter serviced by a qualified repair person using only identical replacement parts. This will ensure that the safety of the laser cutter is maintained.

⚠ WARNING Use only recommended accessories. Follow instructions that accompany accessories. Use of improper accessories may cause hazards.

The following parts are available for service:

Part Number	Description
2610047848	Lens assembly
2610047854	Mirror assembly
2610047890	Laser Tube assembly
1619PB2675	Drive Belt
2610048945	Spacer
2610048961	Exhaust Hose
2610048951	Honeycomb Plate
1600A011SL	Water pump
1600A011SK	Air pump
2610048946	Alignment paper
2610048944	Lens Cleaner Wipes

Firmware & Open Source Software

Firmware Updates

Dremel recommends that firmware is updated whenever Dremel provides an update.

Dremel will provide firmware updates to improve performance and add additional features for the laser cutter throughout the life of the product. The laser cutter will be able to obtain new firmware by connecting the network connection (Ethernet or Wireless) to the Internet to allow the firmware to check for new firmware updates. The laser cutter will automatically download (in a background process) when a firmware update is available. The laser cutter will provide a prompt on the LCD display to allow it to proceed with the update.

Open Source Software used in this Dremel product

This product contains software components that are licensed by the holder of the rights under any version of the GNU General Public License (GPL), GNU Lesser General Public License (LGPL) or any other open source software license which requires that source code be made available. A complete machine-readable copy of the corresponding source code is available by sending a written request to:

Dremel
Attn: Open Source Software Officer
P.O. Box 081126
Racine, WI USA 53408-1126

The request should include: (i) the name of the Dremel product, (ii) the serial number (if applicable), (iii) the software version (if applicable), (iv) your name, (v) your company name (if applicable) and (vi) your return mailing and email address (if available).

We may charge you a nominal fee to cover the cost of the physical media and distribution.

Send the request (i) within three (3) years of the date product was received that included the software which is subject of your request or (ii) in the case of code licensed under the GPL version 3 for as long as Dremel offers spare parts or customer support for that product.

Warranty regarding further use of the Open Source Software:

DREMEL provides no warranty for the Open Source Software programs contained in this device, if such programs are used in any manner other than the program execution intended by DREMEL. The licenses listed below define the warranty, if any, from the authors or licensors of the Open Source Software. DREMEL specifically disclaims any warranties for defects caused by altering any Open Source Software program or the product's configuration.

You have no warranty claims against DREMEL in the event that the Open Source Software infringes the intellectual property rights of a third party. Technical support, if any, will only be provided for unmodified software.

Dremel® Limited Warranty

Your Dremel LC40 is warranted against defective materials or workmanship for a period of one year from the date of Purchase with the exception of the following consumables: All lenses, mirrors and Laser Tube. The consumables (all mirrors, lenses and Laser Tube) are warranted against defective materials or workmanship for a period of 60 days from the date of Purchase. In the event of the product fails to conform to this written warranty, please take the following action:

1. DO NOT return your product to the place of purchase.
2. Please contact customer service
3. Carefully package the product by itself, in original packaging, with no other items, and return it, freight prepaid, along with:
 - a. A copy of your dated proof of purchase (please keep a copy for yourself).
 - b. A written statement about the nature of the problem.
 - c. Your name, address and phone number to:

CONTINENTAL UNITED STATES	CANADA	
Dremel Service Center 4915 21st Street Racine, WI 53406 Phone: 1 (800) 437-3635	Giles Tool Agency 47 Granger Av. Scarborough, ON M1K 3K9 Phone: 1-416-287-3000	West Coast Tool 4008 Myrtle Street Burnaby, B.C. V5C 4G2 Phone: 1-604-873-5394
OUTSIDE CONTINENTAL UNITED STATES See your local distributor or write to Dremel, 4915 21st Street Racine, WI 53406.		

We recommend that the package be insured against loss or in-transit damage, for which we cannot be responsible.

This warranty applies only to the original registered purchaser. DAMAGE TO THE PRODUCT RESULTING FROM TAMPERING, ACCIDENT, ABUSE, NEGLIGENCE, UNAUTHORIZED REPAIRS OR ALTERATIONS, PRODUCT USE IN VIOLATION OF THE "GENERAL SAFETY AND USE WARNINGS," UNAPPROVED ATTACHMENTS OR OTHER CAUSES UNRELATED TO PROBLEMS WITH MATERIAL OR WORKMANSHIP ARE NOT COVERED BY THIS WARRANTY.

No employee, agent, dealer or other person is authorized to give any warranties on behalf of Dremel. If Dremel inspection shows that the problem was caused by problems with material or workmanship within the limitations of the warranty, Dremel will repair or replace the product free of charge and return the product prepaid. Repairs made necessary by normal wear or abuse, or repair for products outside of the warranty period, if they can be made, will be charged at regular factory prices.

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This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. The obligation of the warrantor is solely to repair or replace the product. The warrantor is not liable for any incidental or consequential damages due to any such alleged defect. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusion may not apply to you.

For prices and warranty fulfillment in the continental United States, contact a Dremel service location.

Robert Bosch Tool Corporation
1800 West Central Road
Mount Prospect, Illinois 60056



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