LASER!

Contents:

Overview

LASER! is a "fix the machine" puzzle game. However, this machine is a "laser light" optics bench. You've potentially got a variety of laser beam filters splitters, combiners, mirrors and other parts to work with. However, the exact type and quantity of parts available for use on a given puzzle is set by the puzzle design. Your ultimate goal is to get one or more laser beams of the appropriate color to shine on one or more targets.

You work by dragging parts from the parts shelf to the workbench. However, the parts that were already on the workbench can't be moved. You can only move the loose parts on the parts shelf.

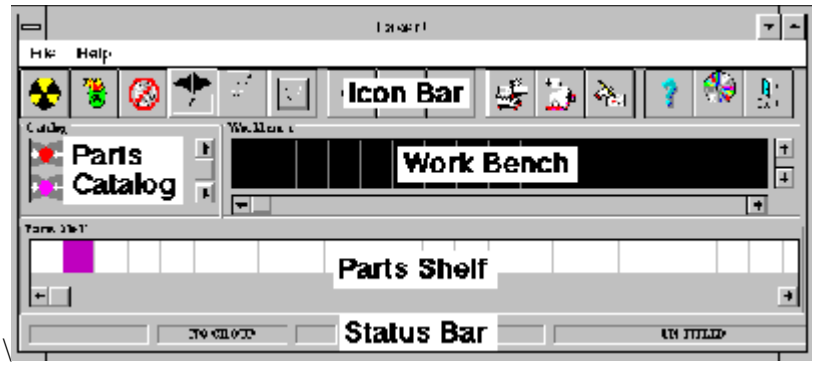
In addition to solving already created puzzles, you can create your own puzzles and puzzle groups for others to solve. While creating a puzzle, you've got a large parts catalog available. You can drag a unlimited number of any part made from the catalog to the workbench or parts shelf. You can also use the puzzle create mode as an experimental workbench to learn what the various parts do.

Hardware Requirements

LASER! will run on any PC that is capable of running Windows 3.1. Approximately 2 MEG of free memory must be available. VGA graphics is recommended as an absolute minimum, with higher resolutions adding greatly to the ease of use. Sixteen-color graphics mode is OK for now, but future component libraries may benefit from 256-color mode.

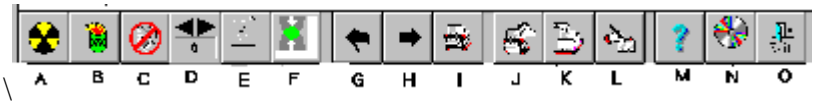
The Game Board

Five Easy Pieces



The Game Board is divided into five sections, as illustrated above.. The icon bar allows access to virtually all of LASER!'s functions. The status bar keeps you informed as to which puzzle you're working on.. The parts shelf is where the parts available to solve a puzzle are stored. The workbench is where the puzzle is actually solved. When in puzzle design mode, the parts catalog section will appear. THis gives you access to all available parts.

The Icon Bar



A: Turn lasers on/off
B: Reset workbench
C: Turn sound on/off
D: Set / Display animation speed
E: Set magnification mode
F: Current object
G: Previous puzzle
H: Next puzzle
I: Start/Stop puzzle sequence
J: Solve a puzzle
K: Edit a puzzle
L: Design a new puzzle
M: Help
N: Play CD
O: Exit LASER!

Turn lasers on/off

Press to turn on the light sources. While the laser system is running, the icon in this button will spin. When all the targets in the puzzle are successfully hit, the lasers will turn off by themselves. If all targets aren't hit, the lasers will continue to fire. Press this button again to cancel the test.

Reset workbench

When in puzzle solve mode, pressing this button will return all free pieces to the parts shelf. When in puzzle design mode, the reset button will behave like a NEW -- all pieces will be cleared from the workbench and the parts shelf.

Turn sound on/off

Turns sound on & off.

Set/Display animation speed

The up/down arrow will raise or lower the animation speed while the lasers are turned on. The indicator displays the current speed seting. THe available speeds range from 1 (slowest) to 10 (fastest).

Set magnification mode

This button will toggle between "full-size" and "full-puzzle" magnification. In the full-size setting, you'll see the components in full size. You'll use the scrollbars to get to various parts of the workbench. In the full-puzzle setting, the size of the pieces will be reduced so that the entire 25x25 puzzle grid is visible on the workbench no matter what size the LASER! screen is.

Current object

Whenever you're dragging an object from one place to another, the Current Object window will show you what kind of piece you're moving.

Previous puzzle

When solving a puzzle sequence (see below), this button will move you to the Previous puzzle.

Next puzzle

When solving a puzzle sequence, this button will move you to the Nect puzzle.

Start/Stop puzzle group

Press this button to start solving a puzzle group. You'll then choose the group from a normal file dialog box. When a group is being solved, the icon in this button will change to a stop sign. Press the stop sign to exit group mode and return to single-puzzle mode.

Solve puzzle

When in single-puzzle mode, press this button to pick any puzzle to solve. This button will not work when in puzzle group mode. While solving a puzzle group, you're limited to working on puzzles contained in the group.

Edit puzzle

Press this button to edit any puzzle. If you're in solve mode, you'll be placed into design mode. This button will not work when solving a puzzle group.

Design a new puzzle

Press to start designing a new puzzle. You'll be placed in design mode and given an empty workbench and parts shelf.

Help

There are two ways to use the Help button. If you click on Help, your mouse cursor will turn into a question mark. You can then click on virtually anything in the LASER! window for help on that object, region, or button. If you're dragging a component, you can drop it onto the help button for information on what the component is and does. All components that are dropped on the Help button are returned to the Parts Shelf.

Play CD

Play CD will open an audo CD control panel if you have audio CD capability on your computer. Complete details on how to use the control panel can be found later in the manual.

Exit LASER!

Exits the LASER! game.

The Workbench

The workbench is where the puzzle is actually created or solved. It consists of a 25x25 grid. Each block on the grid can hold one part. If you're viewing the workbench in full-size mode, the scroll bars will move your viewing area around the physical workbench grid. If you'fe in full-puzzle mode, you don't have to scroll. The grid is reduced in size so that the entire grid and its contents can be viewed. When in full-puzzle mode, you can still dreg pieces to and from the workbench. However, the smaller the workbench window, the more difficult it'll be to see what you're doing.

While in puzzle create mode, you can drag parts to the workbench from either the parts catalog or the parts shelf. You can also move any part on the workbench to either another workbench location, the parts shelf, or the parts catalog.

While in puzzle solve mode, only parts that start on the parts shelf can be moved to somewhere else on the workbench or back to the parts shelf.. If a part starts on the work bench, it's locked in position. .Since you're trying to solve a puzzle with supplied parts, you don't have access to the parts catalog while in this mode.

In all operating modes, whenever you drop a part on top of one already on the workbench, the dropped part will return to the parts shelf. Note: You MUST NOT drop parts outside of the LASER! window! If you do, you WILL LOSE the part!! This may be OK while designing a puzzle, because you can get another one from the catalog. However, while solving a puzzle, you'll be short of that part. To get it back, you'll have to re-load the puzzle! BE CAREFUL!!!!

The Catalog

The parts catalog window is an unlimited supply of every part available that you can access while designing a puzzle. It's not available while solving a puzzle. The scrollbar on the right side of the catalog window will let you scroll through all the parts.

The Parts Shelf

The parts shelf is where all the parts needed to sove a puzzle are stored.

The Status Bar

The status bar displays the filename and name of the puzzle that you're currently solving or working on. While solving a puzzle group, it also displays the group name and puzzle number.

Solving A Puzzle

Solving an Individual Puzzle

To solve any puzzle, just press the Solve Puzzle button on the toolbar or select Solve Puzzle from the menu. Then, select the desired puzzle from the file selection dialog box.

The parts that yu can use are on the Parts Shelf. Simply drag the part from the parts shelf to the work bench and drop it on any open square.

Press the Run/Stop button to test the system. If all the targets are hit, the system will turn off by itself and display a message indicating success. If the system doesn't work, you'll have to turn it off yourself by pressing the Run/Stop button again. A message will indicate how many targets were successfully hit.

Solving a Puzzle Group

To solve a puzzle group, press the Start/Stop Puzzle Group button. Then, pick the group you'd like to work on.

A puzzle in a group is solved the same as an individual puzzle. However, you can get to the next puzzle by simply pressing the Right Arrow button.

Puzzle groups also keep track of which puzzles were solved and which weren't. When solving a puzzle group, you'll notice a wincow on the status bar which indicates whether or not the currnet puzzle was solved.

To return to solving individual puzzles or to creating puzzles, press the Start/Stop Puzzle group button again. To start another group, you must stop the current group and then load another group as above.

Light Theory

Light consists of three primary colors -- red, green, and blue. When two of the primary colors are combined, a secondary color is formed. The three secondary colors are cyan, violet, and yellow. Combining all three primary colors, either directly or indirectly, will result in white light. The following table will clearly illustrate what primary components make up each of the seven colors available in LASER!.

	RED	**GREEN**	**BLUE**
Red	X		
Green		X	
Blue			X
Cyan		X	X
Violet	X		X

Yellow	X	X	
White	X	X	X

In real life, if a beam of light is split, each resulting beam would is than half as intense as the original. In addition to the split, a small portion would be lost in the splitting device. Likewise, if white light consisting of equal parts of red, green, and blue light passes through a perfect red filter (no such filter exists, as far as I know), the resulting light is one third as intense (two thirds, the blue and the green components, are absorbed by the filter).

Variable color intensities add yet another problem. A full-power red beam combined with a very weak blue beam won't produce violet -- at least, not as violet as the color should be. It'll be more red, depending on the power ratio between the red and blue beams.

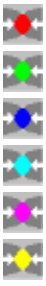
Currently, LASER! doesn't add the complexity caused by variable power levels. All light beams in LASER! are of equal power. When any red, no matter where it came from, is combined with any blue, a full-strength violet is generated.

If you think adding variable beam power along with a spectrum analyzer tool to see exactly what a beam consists of would make for a more enjoyable and challenging game, please let me know. On the other hand, if you think it'd make the game far too complicated to be enjoyable, let me know that too. Your comments will help me to decide whether or not to add that level to a future version.

The Components

Filters

Horizontal filters:



Vertical filters:

Filter Operation

A filter will allow only its own light components to pass through. All other components

will be absorbed. For example, a red filter passes only the red component of light. Any blue and green components are absorbed. A cyan filter passes blue and green components. Any red component in the light is absorbed. The following chart shows the results of passing eachavailable color of light through each available filter:

LIGHT \ FLTR	RED	GREEN	BLUE	CYAN	VIOLET	YELLOW
RED	Red	-NONE-	-NONE-	-NONE-	Red	Red
GREEN	-NONE-	Green	-NONE	Green	-NONE-	Green
BLUE	-NONE-	-NONE-	Blue	Blue	Blue	-NONE
CYAN	-NONE-	Green	Blue	Cyan	Blue	Green
VIOLET	Red	-NONE-	Blue	Blue	Violet	Red
YELLOW	Red	Green	Green	Green	Red	Yellow
WHITE	Red	Green	Blue	Cyan	Violet	Yellow

In addition to color, direction plays a part in whether or not light will get through a filter. The vertical filters only filter light that enters from the top or bottom. Horizontal filters only accept light from the left and right sides. Any light hitting the wrong side of a filter is absorbed.

Phosphors

Left-Firing Phosphors

Right-Firing Phosphors

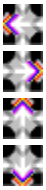
Upward-Firing Phosphors:

Downward-Firing Phosphors

Phosphor Operation:

The phosphor produces light of its output color regardless of what color light enters its input. There's only one input port and one output port on the phosphor. All light that hits the phosphor on any side other than the input is absorbed.

Combiners

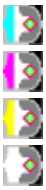


Combiner Operation:

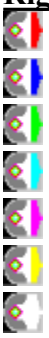
The combiner has three inputs and one output. All light entering all inputs is added together and sent through the output. For example, if red light enters one port and blue enters another, violet light (red + blue) comes from the output. Any light that hits the output side of the Combiner is absorbed.

Light Sources

Left-Firing Sources:



Right-Firing Sources



Upward-Firing Sources

Downward-Firing Sources

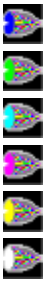
Light Source Operation:

The Light Sources are the source of all light rays in LASER!. A light source produces a beam of light in its output color and in its output direction. The light beam starts immediately when the system is turned on and remains constant until the system is turned off.

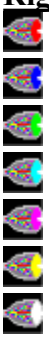
Any light that hits a light source is absorbed.

Targets

Left-Facing Targets

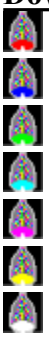


Right-Facing Targets



Upward-Facing Targets

Downward-Facing Targets



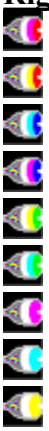
Target Operation:

The targets are what you must get the light to hit to solve the puzzle. A target is activated only if it's hit with the proper color light. Targets are sensitive on only one side. All light that hits the other three sides is absorbed. Likewise, if the active side of a target is hit with the wrong color, that light is absorbed too.

Multi-Targets

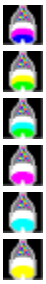
Left-Facing Multi-Targets

Right-Facing Multi-Targets



Upward-Facing Multi-Targets

Downward-Facing Multi-Targets



Multi-Target Operation:

The Multi-Target is a form of Target. However, the Multi-Target must be hit by two or more different colors of light in sequence to be activated. On the above targets, note that the front of the target consists of two or three bands of color. The color bands indicate the exact order of colors that must hit the target to activate it. For example, the red - violet - white target must be hit by first red, then violet, and finally white.

In all other respects, the Multi-Target behaves like a standard target. It has only one active side. All light hitting the other sides is absorbed. Likewise, light of the incorrect color hitting the active side is absorbed.

Blocker

Blocker Operation:

A blocker simply absorbs light. It doesn't emit or reflect any light at all.

Mirrors

Mirror Operation:

A mirror reflects all light that hits it. The new direction is exactly what you'd expect based on the direction of the incoming light and th angle of the mirror. Both sides of the mirror are silvered and are equally reflective.

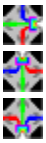
Half-Mirrors

Half-Mirror Operation:

The half-mirror is a mirror whose silver coating is so thin that only half the light is reflected. The other half passes right through the mirror. The result of this is two beams of light -- one traveling in the original direction and the other traveling in the reflected direction.

As in the mirror, both sides of the half-mirror are reflective. Because of this property, the half-mirror can be used as a simple beam combiner. There's an example of this in the Tutorial puzzle group.

Prisms



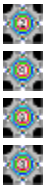
Prism Operation:

The Prism accepts light at its input port, breaks it into components, and sends them out as separate beams. The colored arrows indicate the colors of the output ports.

Only colors available at the input will come from an output port. For instance, white light at the input produces red, green, and blue output beams. However, violet light at the input only produces red and blue output beams.

The prism is a one-way device. All light hitting the output ports is absorbed.

Delay Lines



Delay Line Operation:

The Delay Line will pass all light. It won't alter the color or direction. However, it will delay the light by either 2, 4, 6, or 8 clock cycles. The delay time is printed in the center of the delay line.

Vari-Filter

Vari-Filter Operation:

The Vari-Filter is a "variable" filter. The VariFilter takes on the filter properties of the first beam of colored light to strike it. For instance, if it's hit by a violet beam traveling horizontally, the VariFilter turns into a violet horizontal filter.

There's one major exception to this rule: If the Vari-Filter is first hit by a beam of white light from any direction, it turns into a blocker.

Once the Vari-Filter turns into another part, it becomes completely stable and will not change again.

Creating a Puzzle

Creating a Puzzle Group

Playing an Audio CD

Modifying Part Images