LPM^{DM}100GT–6 System Components

In order to complete the high quality, laser digital conversion of flexible packaging films, the LPM^{DM}100GT–6 system integrates laser modules, exhaust blowers, chillers, sensors, an electrical and air panel, and software controls with existing slitter/rewinder roll handling equipment.

As material supplied by the slitter/rewinder passes under the system's lasers, they fire to score, cut, and perforate it according to directions contained in the pattern file. You can interact with and change this file with the control software on the operator interface terminal (OIT). The rolls of finished material are then moved to other packaging equipment to create the final packages.

To complete this processing, the system includes these components:

- Six 100 W laser modules, expandable to more modules as needed

  Each module can run in one of two modes: LDM for straight downweb scoring and perforating, and LPM for processing small crossweb patterns and features.
- The safety enclosure housing the laser modules, their stand, and work support
- A chiller to cool the lasers during processing and ensure proper functionality
- An air panel that provides purge air to the laser modules to pressurize them, keep dust and debris from entering their housing, and protect their internal optics
- An exhaust system to keep dust and debris out of the work area
- A touch screen operator interface terminal (OIT) for access to the LaserSharp control software.

The system contains all of the safety interlocks and shielding required to safely operate the lasers, as well as the software and controls needed to start, direct, and stop processing according to the directions contained in job and pattern files.

LaserSharp Digital Converting Process

In the LaserSharp digital converting process, electronic controllers read instructions from software files. The controllers then use that information to direct the laser modules to cut, score, or slit the processing materials loaded into the work area.

In general, the digital converting process follows these steps:

1 After powering up the laser system and material handling equipment, the operator opens the job or pattern recipe file in the LightGuide control software to load it into memory.

2 The operator then presses **Start** on the machine housing or OIT screen to start processing.

3 The roll-handling equipment moves unprocessed material into the work area under the lasers.

4 As the material enters the work area, the registration sensor detects the marks printed on the material's edge.

5 The controller fires the lasers according to the instructions stored in the job and pattern files to process the material.

During processing, the exhaust manifold removes dust and debris from the work area and processing material.

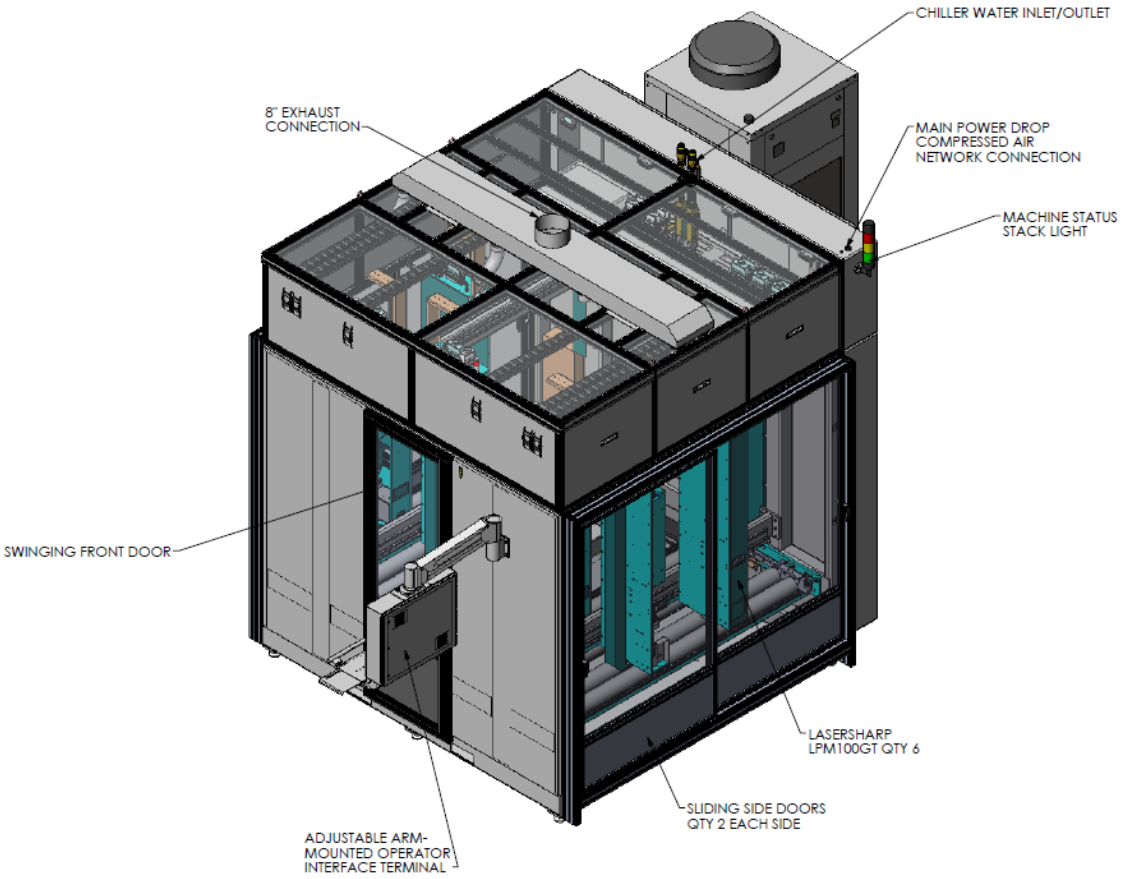
6 The material moves out of the work enclosure through the outfeed and is re-rolled by the roll-handling equipment.

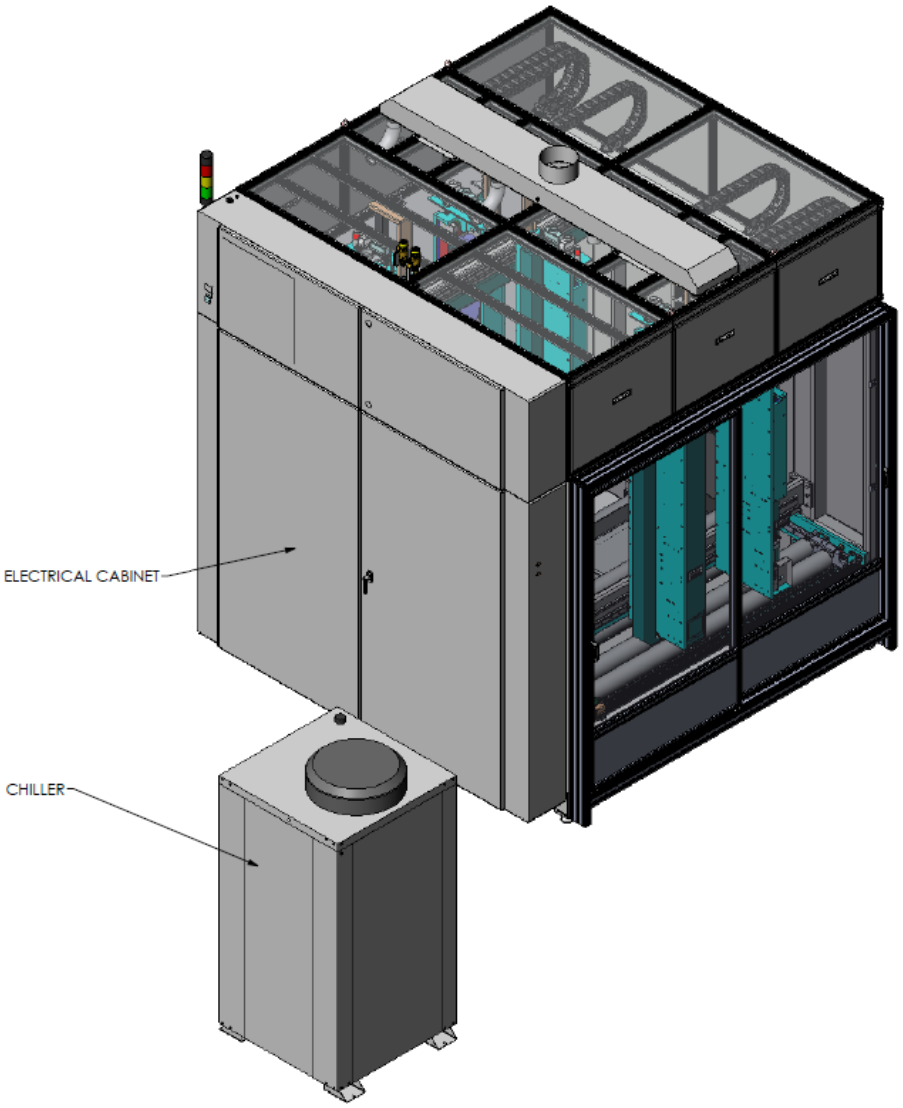
Finished rolls are then collected and moved to any sorting or packaging processes external to the laser processing system.

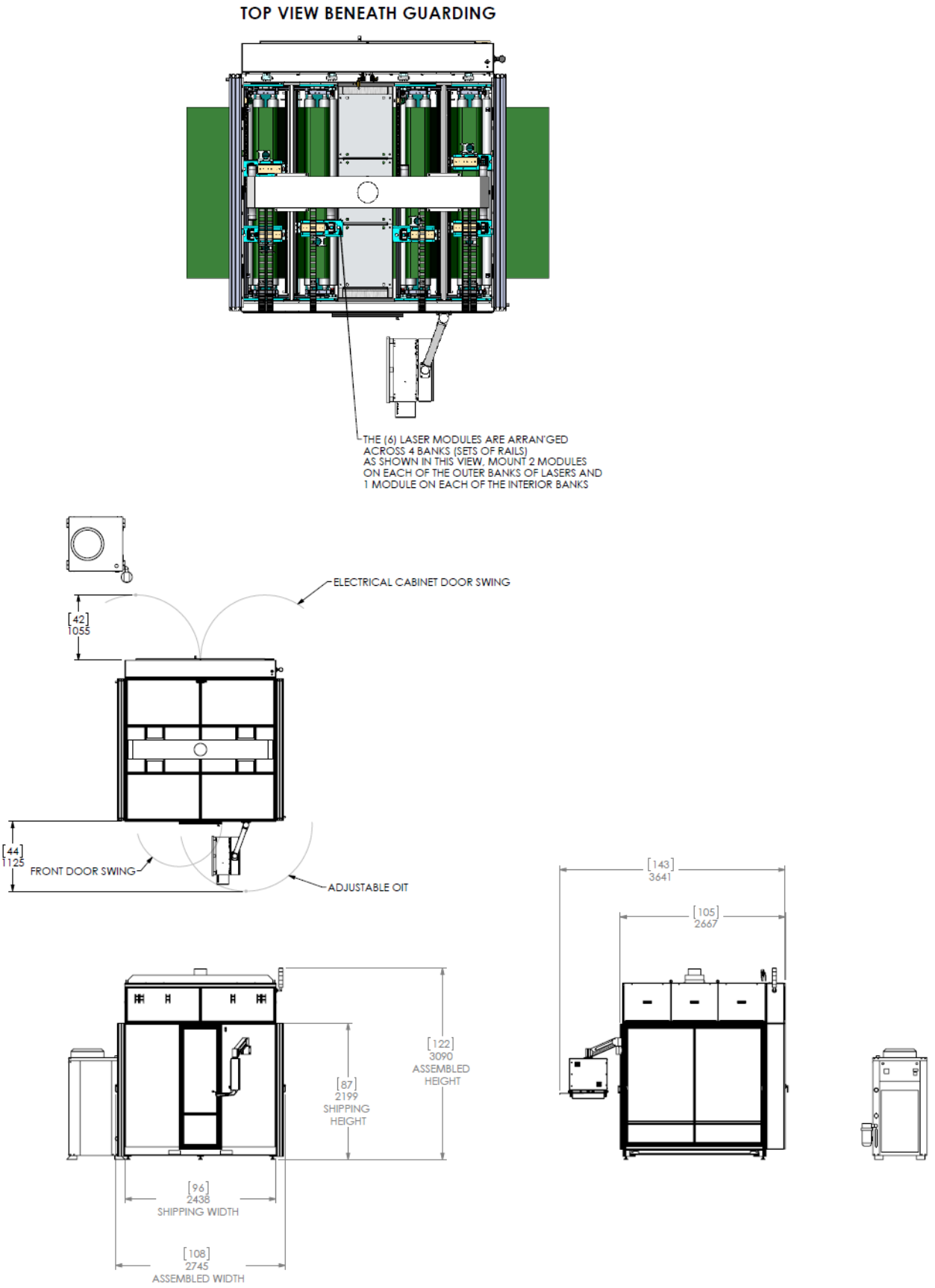
System Diagrams

These diagrams identify the system's physical components and the location of various inlets, outlets, indicators, keys, and switches.

DANGER
The laser can cause serious injury. When a work area enclosure door is open, a safety interlock mechanism disables the laser. Do not attempt to modify or override any safety mechanism.




ELECTRICAL CABINET
CHILLER


TOP VIEW BENEATH GUARDING
THE (6) LASER MODULES ARE ARRAN'GED
ACROSS 4 BANKS (SETS OF RAILS)
AS SHOWN IN THIS VIEW, MOUNT 2 MODULES
ON EACH OF THE OUTER BANKS OF LASERS AND
1 MODULE ON EACH OF THE INTERIOR BANKS
ELECTRICAL CABINET DOOR SWING
[42]
1055
[44]
1125
FRONT DOOR SWING
ADJUSTABLE OIT
[143]
3641
[105]
2667
[122]
3090
ASSEMBLED
HEIGHT
[87]
2199
SHIPPING
HEIGHT
[96]
2438
SHIPPING WIDTH
[108]
2745
ASSEMBLED WIDTH

Laser Module

The laser module is the workhorse of the system: it generates and directs the laser beam across the system's processing area.

Each laser module is made up of these major components:

- **Laser**: The laser generates the cutting beam when powered up by the system.
- **Focus assembly**: The focus assembly converges the laser beam so that it is properly focused for optimum cutting in the processing area.
- **Scanhead**: As the beam passes through the scanhead, its mirrors move the beam around the processing material to cut contoured scores, through cuts, perforations, and so on.
- **Controller**: The electronic controller collects information from the system's sensors (such as registration sensor triggers or vision camera position data). It uses this information in combination with directions from the pattern, job, and system files to fire the laser and direct its processing to create precise, accurate parts.

The laser module is pressurized to keep dust and debris from entering the housing. All required maintenance (such as cleaning the protection window) is external; there are no user serviceable parts inside the laser module housing.

The LPM[DM]100GT–6 includes six 100 W laser modules. Each module can be independently repositioned across the web for flexibility in the placement of scores, slits, small patterns, and perforations.

Process Modes

Each laser module on the system can operate in one of two modes: **LDM** or **LPM**. The laser modules are controlled independently; you can process in the LDM mode on one module while processing in the LPM mode on another to increase productivity and throughput.

The two modes differ in their processing capabilities:

- Use the **LDM** mode to process straight downweb scores, perforations, or cuts.
- Use the **LPM** mode to process patterns across the width of the web or work area.

The system displays the laser module's current processing mode on the LightGuide control software screen under the Module View. To switch between processing modes, either open a job file that uses a specific mode or activate and deactivate the appropriate entries in the Module View.

For more information, see *Changing Laser Module Modes* on page 35.

Position Sensor

Each laser module on the system is equipped with a position sensor readout. The sensor monitors the horizontal location of the laser module and allows you to precisely reposition it across the processing material as needed.

A magnetic sensor monitors the position of the laser module as it moves, and transmits this positional data to the digital display on the front of the module.

Generally, the sensor displays the laser module's relative position, but you can program it to use specific offsets or absolute distances. For more information, refer to the Siko documentation for the MA503/1 sensor supplied with your system.

TIP
You can reset or "zero" the position value displayed on the digital readout at any position. LasX service technicians measure laser module distance left to right across the web.

- The 0 or zero position is the location of the module when it is moved fully to the left side of the work enclosure and the position value is reset.
- Position values increase as you move the module to the right side of the work enclosure.

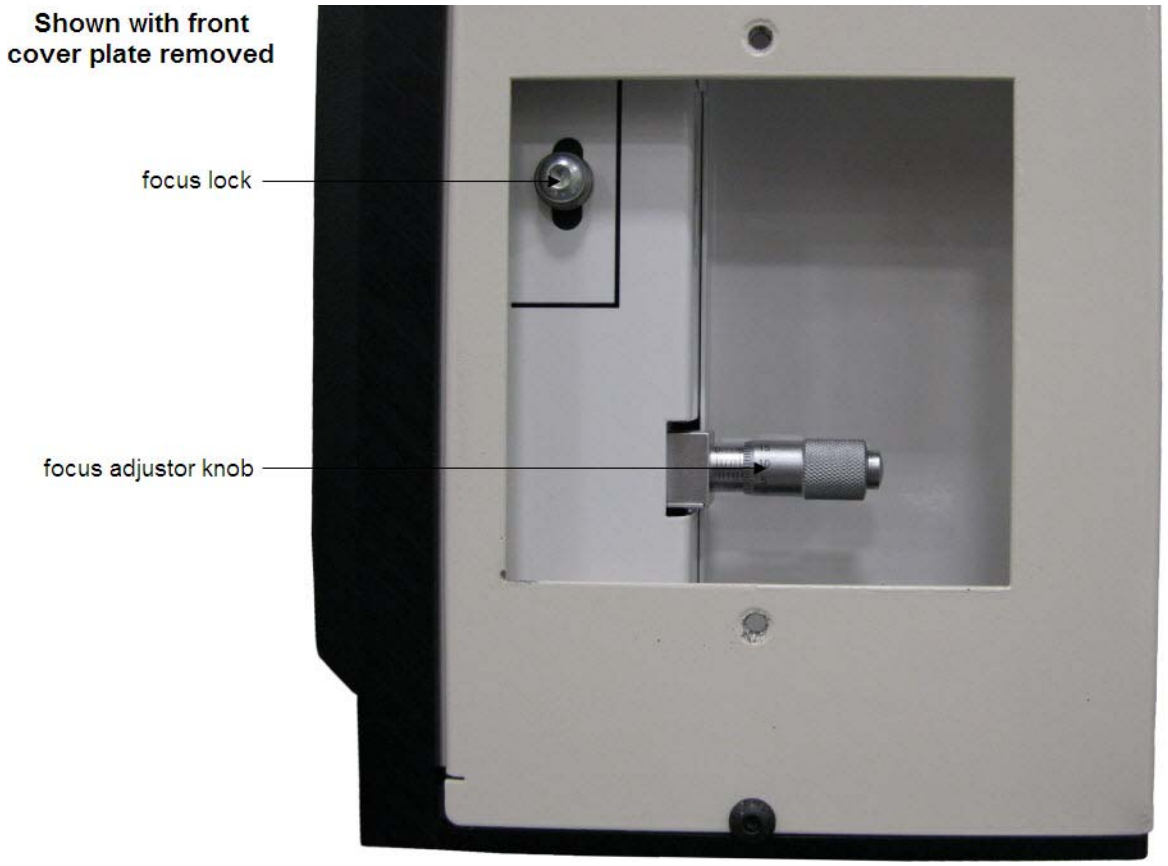
The position sensor on each module is powered by the system's power supply; no battery replacement is needed.

For more information about changing the laser module's location across the web, see *Repositioning the Laser Module* on page 31.

Adjusting the Laser Beam's Focus

Each laser module is equipped with a focus adjuster that allows you to fine-tune the laser beam's focus for better performance. This adjuster moves the scanhead inside the module up or down to bring the beam into better focus.

NOTE
The laser module's focus should only be adjusted under the direction or supervision of LasX service personnel or other authorized technicians. When you adjust the focus, you must also recalibrate the grid.



To fine-tune the laser beam's focus, follow these steps:

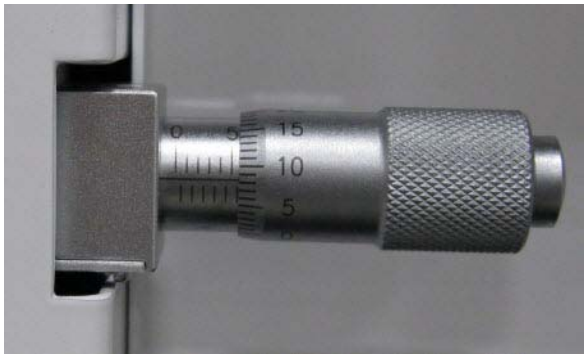
1. Stop all current processing and push the blue **Laser Disable** button to disable the lasers.
2. Open the work enclosure access door.
3. Remove the front plate over the focus assembly on the front of the laser module. Loosen and remove the two screws, then remove the plate and set it aside.
4. Insert a 4 mm Allen wrench or hex key into the focus lock at the top of the adjuster. Rotate the wrench counter-clockwise to release the lock.

   A 1/4 to 1/2 turn should be sufficient to release the lock.

CAUTION
Never adjust the focus without first releasing the lock. Adjusting the focus without releasing the lock can damage the laser module.

5 Turn the focus adjustor knob to raise or lower the scanhead inside the laser module, focusing the laser beam.

- The horizontal scale displays in millimeters (mm)
- Each increment on the vertical scale on the adjustor knob represents 1/100th of a millimeter, or 10 microns. One full turn of the adjustor knob raises or lowers the scanhead by ½ millimeter.



6 Use the Allen wrench or hex key to reset the focus lock. Rotate the wrench clockwise with a 1/4 to 1/2 turn to lock the focus adjuster. Do not overtighten the lock.

7 Reinstall the front plate cover on the front of the laser module housing, then secure it in place using the same screws.

8 Close the work enclosure access door.

9 Push the amber **Laser Enable** button to enable the lasers, then test the focus by processing a test pattern.

If the focus is still not correct, repeat the steps above.

10 Recalibrate the grid.

Disposing of Worn or Broken Laser Module Lenses

The zinc selenide lens is optimally engineered for performance and should be handled and cleaned with care. In crystal form, the zinc selenide is not toxic and can be handled safely. However, if the lens is broken, the powdered zinc selenide can be carcinogenic if ingested, inhaled, or if it comes in contact with the skin. Follow good work practices to minimize the accidental inhalation or ingestion of zinc selenide dust.

Worn or Scratched Lenses

System performance can degrade if the lens is worn or scratched. Over time, its coating is also naturally removed by laser processing and cleaning during routine maintenance. These defects can cause the window lens to absorb more of the laser's heat during processing, leading to burns, melting, or breakage.

Every 6 months, inspect the lens closely for wear. During inspection, look for the following:

- Scratches on the surface
- Areas where the coating is discolored, worn, or removed entirely
- Slight burns
- Melted areas

If any of these are present, wipe the lens and its holder with a wet cloth or damp paper towel. Next, contact LasX Industries for repair or replacement.

Broken Lenses

If the lens is broken or severely damaged by heat, take extra care and follow these guidelines to properly dispose of it:

- Wear gloves to keep any dust from contacting your skin.
- Gather up any large pieces and place them in an appropriate container, such as a paper bag or cardboard box.
- Wipe up smaller pieces or dust from the breakage with a wet cloth or damp paper towel.
- Dispose of the broken or scrap pieces in a properly licensed industrial disposal facility.
- Never discard the aluminum holder assembly—it is separate from the lens and is reusable. Return it to LasX Industries for refurbishment.

  Additional charges apply for the replacement of the aluminum holder.
- Wash your hands after handling the broken pieces to avoid any accidental ingestion of dust.

Maintenance

Other than inspecting and cleaning the lens, the laser module requires little maintenance. Never remove the laser module's housing; there are no user serviceable parts inside.

During processing, the laser beam can produce smoke, fog, vapor, or other contaminants as it vaporizes the material's coating. This dust and debris can coat the laser module lens, decreasing system performance. Inspect the lens frequently and clean it only when needed to keep the system processing in top form.

For more information, refer to these topics:

- *Inspecting the Laser Module Lens* on page 40
- *Cleaning the Laser Module Lens* on page 42

Adjustable Work Support Roller Position

The upper work support process rollers can be moved to one of three positions for processing or maintenance:

- Use the inner **Service Mode** position to gain access to the bottom of the laser module to inspect or clean its lens.

  This position moves the work support rollers entirely out of the way for better access.

- The middle position is reserved for use with the optional Unicorn fixed-beam focus assembly. If you do not have the Unicorn focus assembly, this position is not used.

  The Unicorn focus assembly converts the laser module into a purely downweb processor, giving the laser beam a smaller spot size superior for straight line downweb scoring, perforating, and slitting. The middle position moves one of the rollers directly under the Unicorn focus assembly when it is in place to act as a backstop for the laser beam.

- Use the outer **LPM Mode** position for normal processing.

  This position moves the rollers so that the laser module processes between the two rollers.

Registration Sensors

The registration sensors are mounted over the leading rollers under the front laser module banks near the front sides of the system. This sensor detects the fiducial registration marks printed on the edge of the processing material. When it detects a registration mark, it then triggers the laser controller to begin the digital conversion process.

The registration sensor works by detecting the contrast changes between the registration marks and the processing material's background. You can train the sensor to recognize differences in contrast if the color of the registration mark or processing material changes.

Each registration sensor can be repositioned across the web as needed.

Moving the Registration Sensors

The registration sensors are mounted to the rails over the leading rollers on the front sides of the system. However, you can reposition the registration sensor if needed: loosen the screw on the sensor's mount and slide the sensor across the web.

To reposition the registration sensor, follow these steps:

1. Stop all current processing and push in the blue **Laser Disable** button to disable the lasers.
2. Open the work enclosure access door.
3. Loosen the large screw on the sensor's mount to release the lock.
4. Slide the registration sensor across the web to reposition it.

   Place the sensor so that the fiducial registration marks are in the center of the sensor's spotlight.
5. Tighten the large screw on the sensor's mount to secure it in the new position.
6. Repeat the steps above to reposition the registration sensor on the other side of the system, if needed.
7. Close the work enclosure access door.

If you are switching to a material that uses a different color of fiducial registration mark, you may need to adjust the sensor's threshhold value. For more information, see *Setting the Sensor Threshold Value* on page 27.

Setting the Sensor Threshold Value

The sensor's contrast detection works in combination with its threshold value. When the current detected contrast value reaches this threshold value, the sensor is triggered and signals the laser controllers to begin the digital conversion process.

To set the sensor's threshold value, follow these steps:

1. On the registration sensor, press the **Mode** button until the LED next to **Teach** turns on.
2. Jog the web forward until the sensor is directly over a registration mark.
3. Press the **On/Select** button to set the contrast for the registration mark or fiducial point.
4. Jog the web forward so that the registration sensor's spotlight is over the material's background (but not directly over a registration mark).
5. Press the **Off/Enter** button to set the contrast for the material background.

   When teaching is complete, "Good" appears in the registration sensor's display.

Cleaning the Registration Sensor

The registration sensor detects marks printed on the edge of the processing material to begin the digital conversion process. Excessive dirt or debris on the sensor's face can interfere with its ability to detect these marks.

Clean the registration sensor frequently to keep it free from dust and processing debris. To clean the sensor, follow these steps:

1. Stop all current processing and push in the blue **Laser Disable** button to disable the lasers.
2. Open the work enclosure access door.
3. Wipe the face of the registration sensor with a soft damp cloth.
4. Close the work enclosure access door.
5. Restart the production line.

Operator Interface Terminal

The operator interface terminal, or OIT, houses the laser system's computer monitor with which you access LightGuide to work with pattern and job files. The buttons on its housing allow you to control the system itself—use these buttons to start and stop jobs, control system components, and immediately stop the system in case of an emergency.

Use the buttons on the OIT to complete these tasks:

- Press **Emergency Stop** to immediately stop all processing in case of an emergency.

  When the emergency is resolved, pull out the **Emergency Stop** button to cancel the emergency stop condition.

- Press **Laser Enable** to enable the lasers for processing.

  The amber button shines steadily when the lasers are disabled and turns off when pushed to indicate that the lasers are ready for operation.

- Press **Laser Disable** to disable the lasers.

  Disabling the lasers drops all power to the lasers to avoid operator injury during maintenance or material replenishment activities. When these activities are complete, pull out the **Laser Disable** button to reset the laser modules.

Stack Light

The stack light, located on the top of the system housing, provides a quick means of determining the status of the system.

The stack light contains three lights: red, amber, and green.

- **Red**: When the red light is shining steadily, the system is in e-stop. The production line has intentionally been stopped due to an emergency condition.

  A blinking red light indicates an alarm condition—the production line cannot be started due to an alarm. Alarms include application errors, broken safety interlocks, or non-functioning control software. Refer to the Message module on the OIT to determine the source of the alarm condition.

- **Amber**: When the amber light is shining steadily, the LPM400–2 is idle. The system is ready for operation and no alarms are present.

- **Green**: When the green light is shining steadily, the system is in operation and is busy processing.