DP-100SL™

Site Preparation Guide

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Revision A

NOTICE

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The DP-100SL system is manufactured by Laser Imaging Systems GmbH & Co. KG, Prüssingstraße 41, 07745 Jena, Germany, and by Orbotech Ltd., P.O. Box 215, Yavne, Israel 81002. The system complies with the following standards:

EN 60825, EN 60204

21 CFR CH.I (4-1-92 EDITION) & 1040.10

The DP-100SL system is a Class 1 laser product.

CE

Table of Contents

Chapter 1

Introduction

About This Guide

This guide provides site preparation information for the DP-100SL. It is the customer's responsibility to ensure that the site at which the system is installed conforms to all instructions and guidelines described in this document, so as to enable proper system installation and full system performance.

Please contact the local Orbotech representative with any questions regarding the site preparation procedure.

About the DP-100SL™

The DP-100SL is a laser direct imaging system that receives PCB data from CAM workstations and plots it directly on resist-coated panels.

Loading and unloading of the PCBs is done manually. The standard configuration is a standalone system, as illustrated in Figure 1.1.

Figure 1.1 DP-100SL Laser Direct Imaging System

The DP-100SL is capable of exposing large format images on inner and outer layers, SBU and flex PCBs, printing highly accurate 2 mil lines and spaces at ¼ mil resolution.

The system is compatible with the existing production processes, operating in a yellow room environment; it can expose all UV-sensitive dry or liquid resists, with a wide range of substrate thicknesses. Clean room conditions prevail in the internal imaging area of the system, ensuring that both the panels and the optical elements are not contaminated during the printing process.

Intended Use

The DP-100SL is intended for the manufacturing of printed circuit boards. It is designed to allow exposure of UV-sensitive resists, films, and similar materials typical of the circuit board industry. However, because of the numerous interrelations between substrate and laser imaging as the exposing technique, the system may only be used with such UV-sensitive materials that have been specifically approved by the manufacturer.

Approved materials are listed in Appendix A— **Approved Materials**.

Substrate dimensions with resist:

- max. substrate size 660.4 mm x 812.8 mm (26" x 32")
- max. exposable area 609.6 mm x 812.8 mm (24" x 32")
- max. substrate thickness 5 mm (0.196")

The machine must not be used in any way other than specified in this manual or in the *DP-100SL User Guide*.

Safety Considerations

The DP-100SL is a Class 1 laser product containing high-voltage power supplies and laser light sources. There is no danger to persons or equipment when the system is operated in accordance with the directions provided by Orbotech in this and other publications. All high-voltage power supplies and laser sources are located behind protective panels. During system service, with panels removed, the system may reach **Class 4 laser radiation**. Under those conditions, the imager room should have fireproof walls and furniture and should be locked from the inside. During service a red warning light on the outside of the room should be activated, and all personnel in the vicinity of the system must wear protective goggles. For a description of the safety requirements in the site, refer to Chapter 3— **Facility Physical Requirements**.

Do not remove any of the system's protective panels.

Professional heavy-equipment movers should be employed to unload the system and transfer it to the site. The customer is responsible for providing necessary equipment such as forklifts with extra extension or cranes for the unloading and unpacking of the equipment. Size and weight of system units is listed in Table 2.1 on page 10.

System installation, disassembly, maintenance and repair must be performed only by authorizes Orbotech customer support engineers, in order to comply with all applicable safety requirements regarding the use of laser devices.

Laser Safety

The DP-100SL system is classified as a Class 1 laser product, in compliance with EN60825-1 standard.

Laser Definition

A *Coherent Paladin 355-4* class 4 laser is used as main light source. The *Paladin* is a 355 nm diode (UV) pumped solid-state mode-locked laser, with the following specifications:

Main Wavelength	355nm (350-360nm UV light)	quasi-cw power of 10W
Secondary Wavelengths:	1064nm (1060-1070nm UV light)	quasi-cw power less 0.2W
	532nm (520-540nm green light)	quasi-cw power less 0.2W
Minimal Beam Diameter	0.05 mm	
Minimal Beam Divergence	0.5°	
Pulse Rate	80MHz	
Pulse Energy	125nJ	
Pulse Length	5 ... 20 ps	
Max Power	10 W	

Note

A class 2 measuring sensor (wavelength 660nm) is also used.

The imager unit should be located in a room that can be closed off during periodic maintenance and repair. At the user level, the imager is a Class 1 laser device (no special protection needed) during all standard operations. However, during certain service procedures, Class 4 will be reached, and therefore a warning light must be installed (see Chapter 3).

System installation, disassembly, maintenance, and repair must be performed only by authorized Orbotech customer support engineers, in order to comply with all applicable safety requirements regarding the use of laser devices.

Orbotech recommends that you provide laser safety training to all employees who work on or around the laser system so that these employees understand the bio-effects of lasers and laser radiation.

Full eye protection by safety goggles is required when machine is open during service/maintenance (i.e. laser reaches Class 4) in compliance with standard DIN/EN207. (See "Safety Goggles" on page 14).

Fire Equipment

Portable fire extinguishers must be on hand and in visible location in the direct vicinity of the machine. Recommended type: carbon dioxide (CO_2).

Caring for Your System

- Only materials which have been approved by the manufacturer may be used with the system.
- The system must not be used for temporary storage of any objects. The shielding panels have a load capacity of up to 10 kg, designed for carrying necessary work materials.
- Do not place any objects on the movable cover plates.
- Leaning, sitting, or stepping on the system is strictly forbidden.
- The machine must not be used in any way other than specified in this manual or in the *DP-100SL User Guide*.

Noise Level

The system's noise level is 70 dB (A). The noise level of the vacuum pump - installed in separate room- is 86 dB (A).

Chapter 2

DP-100SL Physical Description

Configuration

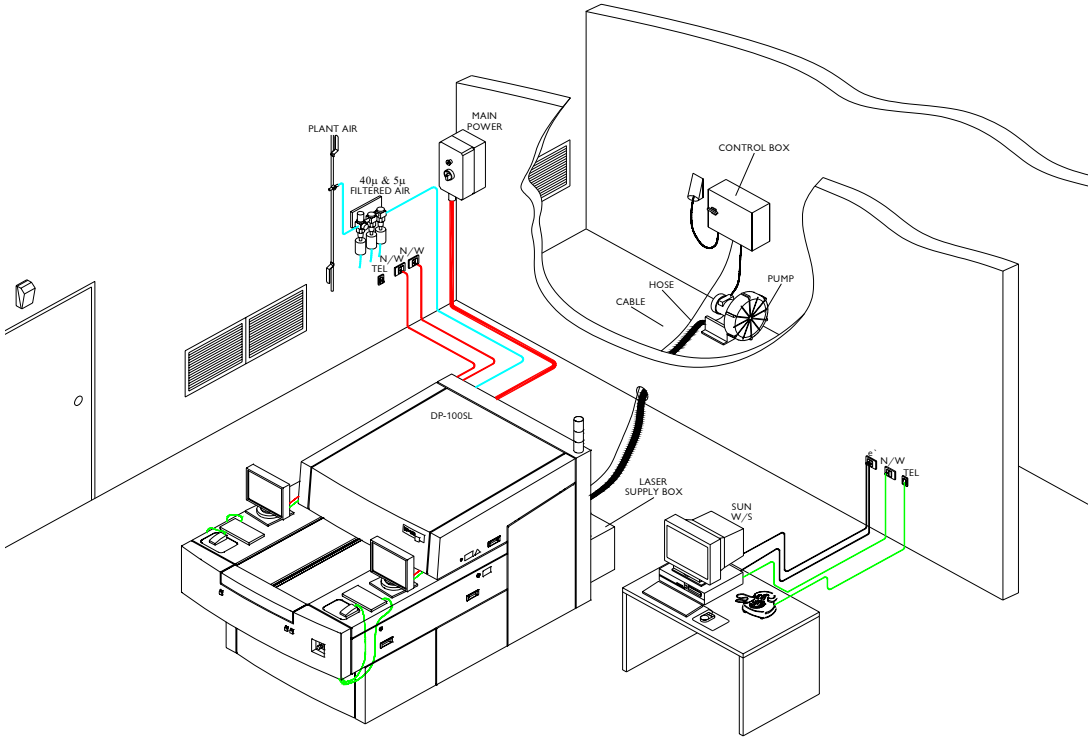

Figure 2.1 DP-100SL Site

The DP-100SL comprises the following main units:

- Laser Imager Unit - including Power Connection Unit/Box and Transformer (only in USA, Japan & Pacific)
- Laser Supply Box - containing Power Supply & Pump module and Heat Sink/Chiller
- Vacuum System - comprising Vacuum Pump & Control Box
- Sun workstation with a Raster Image Processor (RIP)

The imager unit is connected to the workstation via Fast Ethernet. It should be located in a yellow light room (as with standard contact printers) with clean room conditions of class 100,000 or better (US-Federal-Standard 209E).

Size and Weight

Table 2.1 lists weight and size information for the standard DP-100SL units.

Table 2.1 Size and Weight of Standard DP-100SL Units (ready for operation)

Unit	Width	Depth	Height	Weight
DP-100SL Imager (i.e. basic unit)	1654 mm 65.12 in	2644 mm 104.09 in	1755 mm 69.11 in	2000 kg 4409 lbs
Laser Supply Box (attached to basic unit)	1100 mm 43.31 in	810 mm 31.89 in	510 mm 20.08in	100 kg 220 lbs
Vacuum Pump* (in separate room)	334 mm 131.50 in	314 mm 123.62 in	337 mm 132.68 in	20 kg 44 lbs
Control Box (Vacuum) (mounted on wall, at height 39.4 in/1m from floor)	300 mm 11.81 in	160 mm 6.30 in	400 mm 15.75 in	5.1 kg 11.24 lbs
Sun Workstation** (monitor, kbd, computer)	410 mm 16.14 in	700 mm 27.56 in	420 mm 16.54 in	15 kg 33 lbs

* Dimensions refer to pump only (no add-ons included). Add-ons increase *Depth* dimension by 400 mm (15.75 in).

** Measurements do not include a table on which the workstation is placed. The customer must supply this table. Sun workstation measurements are liable to change without notice.

Hose Lengths

Table 2.2 lists information on the size of the hose/s.

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Table 2.2 DP-100SL Hose Lengths

Hose	Length (standard supplied)		Diameter
Compressed air line (from the machine to plant air supply)	10 m	33 ft	0.39” (10 mm) outside

Note

For vacuum pump hoses/lines refer to Table 6.1, “Vacuum Line Lengths,” on page 31.

Chapter 3

Facility Physical Requirements

Safety Requirements

Note

The customer is responsible for ensuring conformance with local safety regulations. As such, the requirements below can only be considered to be recommendations.

Warning

When the DP-100SL cover doors are removed (servicing mode), the laser becomes a Class IV hazard. In this situation, the laser beams diffused reflection is extremely hazardous. Goggles must be worn. Service must only be performed by an Orbotech qualified engineer.

The DP-100SL should be installed in a room that can be isolated to safeguard against laser hazards. These hazards can only arise during periodic maintenance and service, in specific situations (hood open and interlock neutralized). The safeguards described below are required during such service procedures, and do not have to be activated during normal usage of the system.

Preventing Access to the Imager Room during Service

The imager room door should have a lock that can be locked from the inside to prevent access to the room. A box with a key to be used for entry in case of emergency should be located next to the door, on the outside.

Safety Goggles

When the DP-100SL is open, as during service and maintenance, all personnel who come in contact with the machine must wear safety goggles.

Warning

DP-100SL reaches Class4 laser radiation when open.

Full eye protection by safety goggles is required, in compliance with DIN/EN207 standard. The customer is responsible for providing safety goggles for his operators.

If the DP-100SL is installed in an open space (not recommended), a method must be available to completely isolate the unit from the rest of the room during servicing procedures (example: relevant laser safety curtains).

External Warning Light

A red warning light should be placed on the outside of the imager room, above the entrance. The light will be activated under certain service conditions—when the laser is on, the hood up and the imager safety interlock neutralized. The DP-100SL provides a 24V AC max 500mA for the red light (see Figure 3.1, on page 15).

Note

It is the responsibility of the customer to provide and install a warning light as described above.

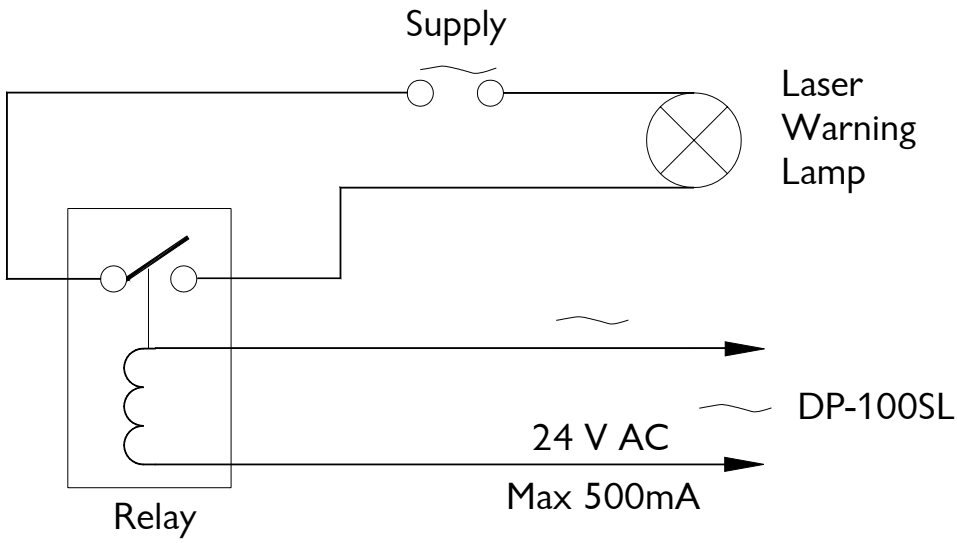

Figure 3.1 External Warning Light

Height Requirements

Height of the system with the hood raised is 2689 mm (105.8"). We recommend a ceiling height of at least 2800 mm (110.2").

During installation, the machine height may vary within a vertical range of approx. 80 mm (3.15"). Achievable height levels are:

- Between 964 mm (37.9") and 1044 mm (41.1") for the machine table.
- Between 1021 mm (40.2") and 1101 mm (43.4") for the upper edge of the machine shielding (mouse and keyboard placement level).

Where a different height is required, a pedestal can be used in the operator area or additional steel plates can be put beneath the machine's support legs.

Warning

Avoid potential hazards with the pedestal by taking precautions such as skid-proof surface, easily perceivable edges, sufficient size, etc.

Figures 3.2 and 3.3 (on pages 19 and 20), show system dimensions.

Floor Area

Figure 3.4, on page 21, shows dimensions and minimum recommended working areas for the system's units.

Working and Maintenance Area

The minimal floor space clearance required as work and maintenance areas for each unit is shown in Figure 3.4, on page 21.

Operator's Working Area

The user determines the floor space required for the operator. Refer to Figure 3.4, on page 21, for dimensions of the recommended working area.

Pump Room

The pump room requires a minimum floor space of 500 x 1000 mm (19.7 x 39.4 in).

Other Storage

Storage shelves and cabinets, as well as filing cabinets and other furniture, should be provided for storing digital data storage media and manuals.

Access – Doors and Hallways

Access through the plant hallways to the unpacking area should enable unrestricted transportation of the crates. We recommend unpacking the system outside the working area, in order to protect the clean environment conditions. Once it is unpacked, the system can be wheeled into the working area.

A minimum door width of 1800 mm (71") and height of 2010 mm (79") is required for the entrance to the working room.

Floors, Walls, Ceilings and Furniture

The floor must have sufficient strength to support the DP-100SL system, which weighs approximately 4409 lb. (2000 kg). Floor strength of 1800 Kg/m² is required, as contact areas between system legs and the floor are small.

The floor supporting the DP-100SL must be level, with a maximum permissible incline of 5 mm per 1 m (1" per 16 ft.). Ground floor location is recommended.

The system should not be located near heavy machinery that causes high shock or vibration levels. Maximum permissible floor vibrations are:

- Maximum amplitude of floor movement: 1.5 µm at 2 ~ 9 Hz.
- Amplitude of acceleration: 5 m/s² at 9 ~ 200 Hz (according to class 3M3 EN 60721-3-3).

Surface Coverings and Coatings

All surfaces should be matte (non-reflective). The following should be provided where possible:

Walls—painted with epoxy, or other low-porosity, non-shedding, washable paint.

Ceiling—painted in the same manner as the walls, or covered with non-shedding ceiling tiles.

Floors—covered with antistatic tile, rubber, or linoleum. Carpeting is not allowed.

Furniture—should be resistant to static buildup. Cloth-covered seats are preferable to plastic-ones. The feet of the furniture should **not** be insulated from the ground, for example by rubber caps.

Yellow Room Illumination

Safe lighting should be as per specifications of the resist manufacturer. *DuPont*, for example, recommends *Encapsulite Gold 10*. Normal illumination should also be provided for maintenance and service procedures.

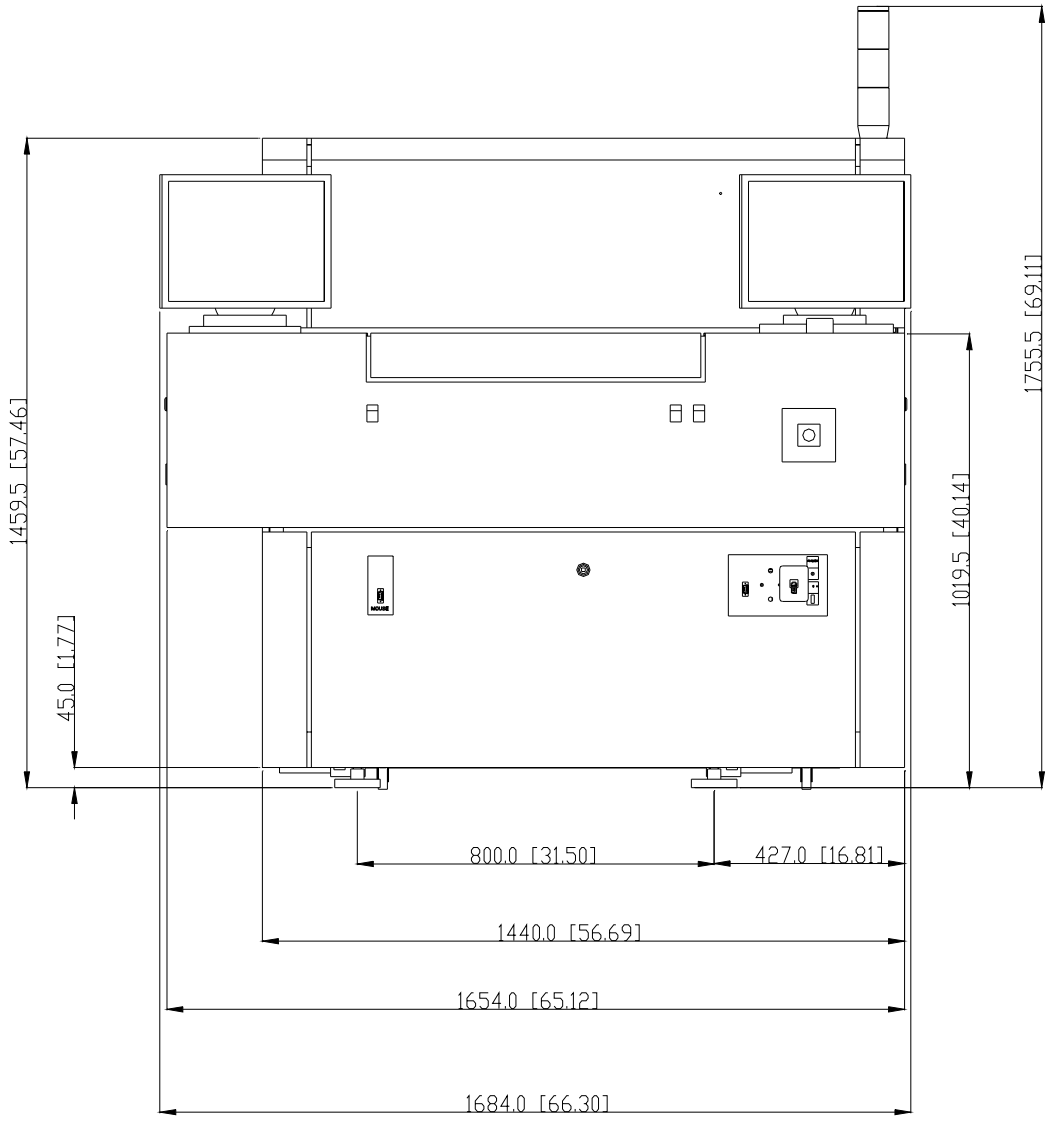

Figure 3.2 System Dimensions—Front View

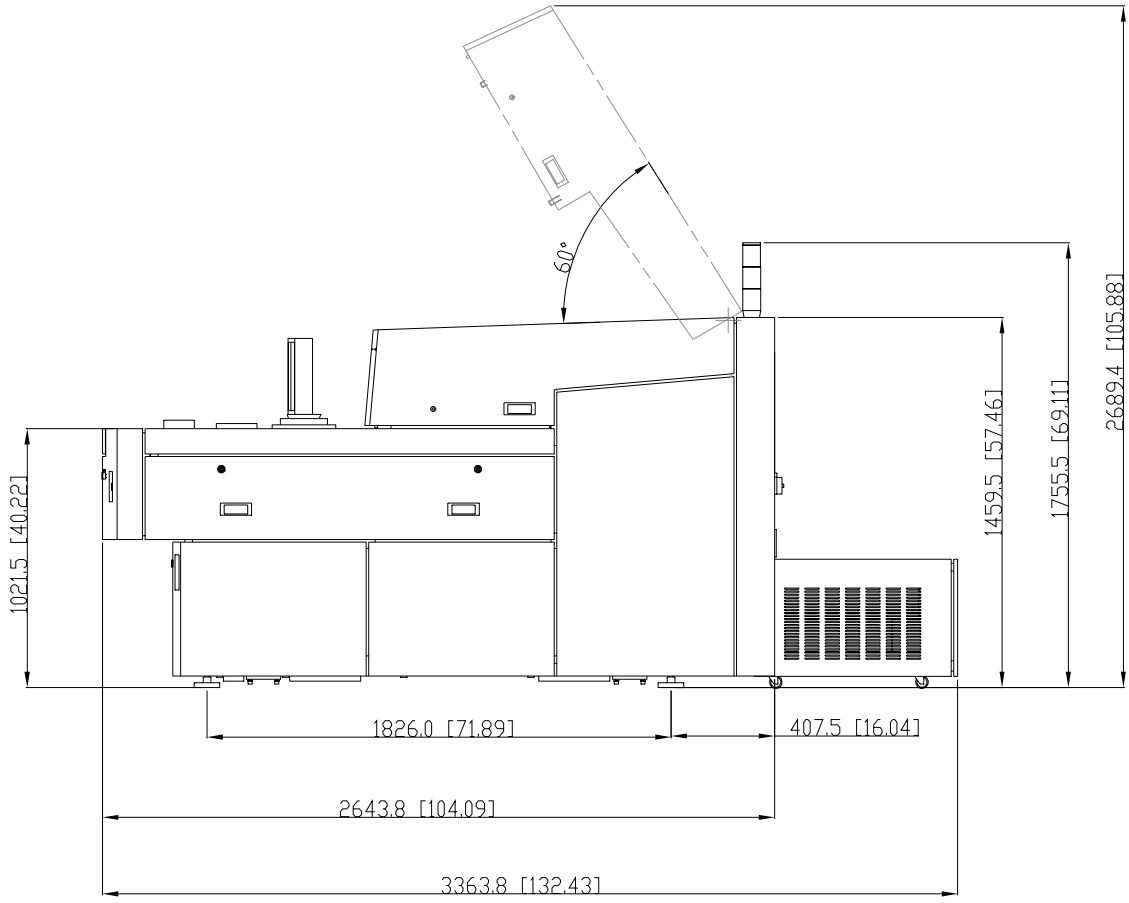

Figure 3.3 System Dimensions—Side View

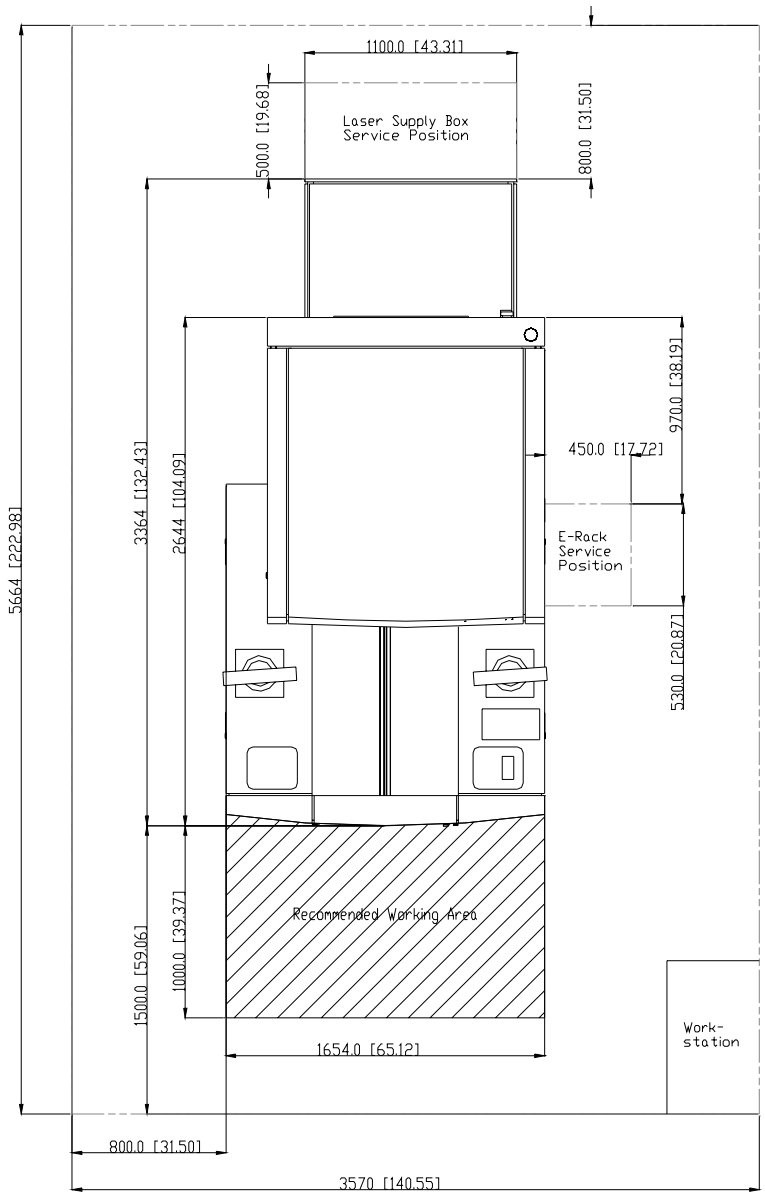

Figure 3.4 Site Dimensions—Standard Configuration

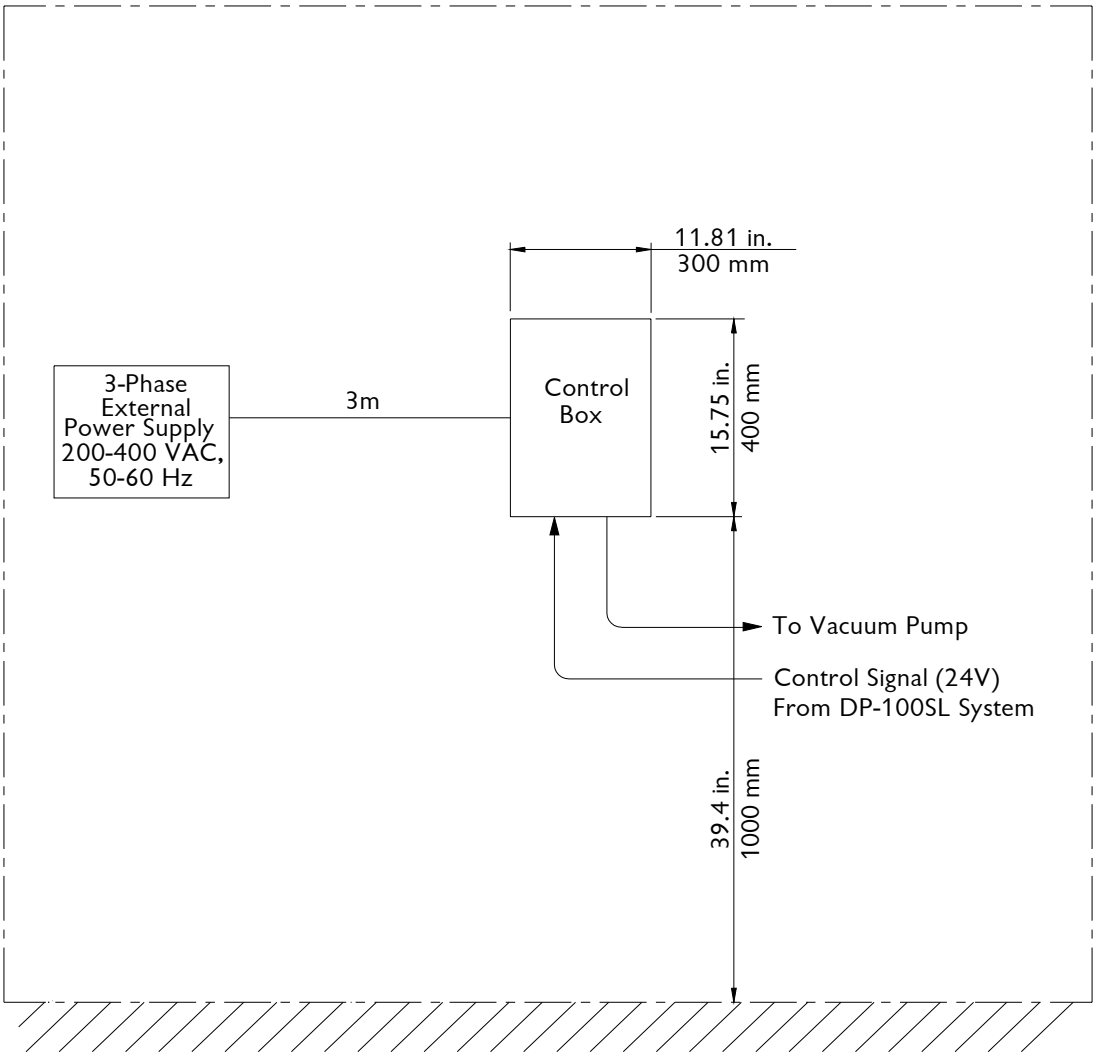

Figure 3.5 Mount Description for Vacuum Control Box

Chapter 4

Environment & Climate

Clean Room

Clean room level class 100K or better (class 10K is recommended) according to US-Federal-Standard 209E is required in order to reach the specified system specifications. No organic chemicals or ammonia may be present in the air of the clean room.

We strongly recommend to place the DP-100SL in an independent room environment (i.e. not be part of a larger room), with the following conditions:

- Ceiling-to-floor (laminar) filtered airflow to reduce particulate contamination.
- Class 10K clean room (per Fed Spec 209E).
- Inline active carbon filtration system.
- Dedicated standalone air makeup system that is free from organic chemicals and ammonia that may attack system components.

Climate Control

Room climate control must be designed so that operating temperatures and humidity, as described in Table 4.1 and Table 4.2 on page 25, are maintained when the system operates at full power (see Table 4.3 on page 25). Do not supply electrical power for the climate control system from the same source as the system.

The customer needs to install temp/humidity meter in the room.

Caution

The air flow should not be directed toward the machine.

Room Temperature

Table 4.1 Operating and Storage Temperatures

Unit	Operating Temperature	Storage Temperature*
DP-100SL	20 °C to 23 °C (68 °F to 73 °F)	0 °C to 35 °C (32 °F to 95 °F)

***** Storage temperature allowed only when in original packaging.

Caution

In order to achieve the specified system performance, the imager room temperature must be set within the above range, and must not fluctuate more than ±2 ºC from the set point during operational hours.

Vacuum room

Vacuum room must be ventilated. Temperature in the vacuum room should not exceed 35 ºC.

Humidity

Table 4.2 Operating Humidity

Unit	Operating Humidity	Storage Humidity*
DP-100SL	50% to 60%	10% to 80%, non-condensing

* Storage humidity allowed only when in original packaging.

Heat Dissipation

Table 4.3 Maximum Heat Dissipation for System Units

Unit	Heat Dissipation
DP-100SL	5 kW (228 BTU/minute) - To air
Pump	2.5 kW (114 BTU/minute) - To air

Ambient Air Conditions

You should install:

- A fresh air outlet above the laser supply box (i.e. power supply + heat sink).
- A warm air exhaust close to the main heat source (i.e. laser supply box).

Take note that:

- No organic chemicals allowed in the air.
- No ammonia allowed in the air.

Chapter 5

Electricity

Power Requirements

Table 5.1 Power Requirements for the DP-100SL machine

DP-100SL, 3 Φ + neutral + ground	400 V (Europe)	480 V (USA)	200 V (Japan)
Voltage	400 V+6% /-10%	480 V ±10%	200 V ±10%
Frequency	50±1 Hz	60±1 Hz	50/60 ±1 Hz
Current*	3 x 16 A	3 x 16 A	3 x 32 A
Maximum power consumption	6 kVA	6 kVA	6 kVA

* Recommended current specifications for electrical outlet.

Note

- The DP-100SL machine comes with a 10m connecting cable, that must be connected to a general clamp at the rear wall close to the DP-100SL.
- The transformer , when required, is located inside the DP-100SL machine.
- An additional ground connection must be installed in parallel to the machine's power connecting cable (the machine comes with an additional 10m cable, as mentioned). The earth-connection must be done at same point as for the earthing wire of power.

Table 5.2 Power Requirements for the Pump

Pump, 3 Φ + ground	**400 V (Europe)**	**208 V (USA)**	**200 V (Japan)**
Voltage	400 V+6% /-10%	208 V ±10%	200 V ±10%
Frequency	50±1 Hz	60 Hz	50/60 Hz
Current*	3 x 16 A	3 x 16 A	3 x 16 A
Maximum power consumption	2.5 kVA	2.5 kVA	2.5 kVA

* Recommended current specifications for electrical outlet.

Grounding

The DP-100SL ground should be connected to a special ground line, which is connected to the building ground. **A fixed installation to the ground has to be provided before switching on the system.** Ground connection impedance must be <0.5 Ohms.

Note

An additional ground connection must be installed in parallel to the machine's power connecting cable (the machine comes with an additional 10m cable, as mentioned). The earth-connection must be done at same point as for the earthing wire of power.

Voltage Transients

Table 5.3 and Table 5.4 show allowable voltage transients. Those should be tested when all machinery and air conditioning units are operating normally and the system is turned on.

Unless the following specs can be met by current on-site electrical installations, a line conditioner is required.

Table 5.3 Allowable Voltage Transients—USA

Amplitude	Measured At
±10%	Hot to Neutral
0.5 V	Neutral to Ground (common mode)

Table 5.4 Allowable Voltage Transients—Europe/Japan

Transient Duration (msec)	Transient Amplitude (Volts)	
	Japan	Europe
<5	<55	<110
5 to 50	<25	<50
>50	±10% nominal (according to Table 5.1)	±10% nominal (according to Table 5.1)

Electrical Protection

An automatic, slow-blow 3-phases circuit breaker (*) should be installed in series to the power line.

Note

(*) Release characteristic C in compliance with EN 60898 standard.

Table 5.5 Requirements for the circuit breaker

Unit	400 V (Europe)	480 V (USA)	200 V (Japan)
Machine	16 A	16 A	32A
Pump	16A	16A	16A

Power Connectors

The electrical supply must have a lockable main switch. The customer is responsible for providing this switch, as well as circuit breakers and receptacles according to prevailing local standards.

The customer must provide a power outlet for the servicing, which will be connected to the same power line as the machine.

Chapter 6
Vacuum Pump

The vacuum pump is provided by Orbotech with the system. All preparations required for installation, and the installation itself, are the responsibility of the customer. The vacuum pump should be installed in an isolated environment due to its noise level (86 dB (A)).

Note

Important: ensure this separate room is ventilated!

Smooth plastic water installation piping is recommended.

Vacuum line lengths are specified in Table 6.1 below.
Pipe routing should enable access to all connection points for maintenance in case of leakage.

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Table 6.1 Vacuum Line Lengths

Hose/Line	Max Length	Diameter
Pump to DP-100SL vacuum line	40 m (132 ft.)	4 in
(Smooth plastic water installation piping; customer supplied)	30 m (98 ft.) 20 m (66 ft.)	3 in (internal) 3 in (internal)
Orbotech standard	15 m (49 ft.)	2.5 in

Maximum allowed distance between system and pump is 40 m (132 ft.):

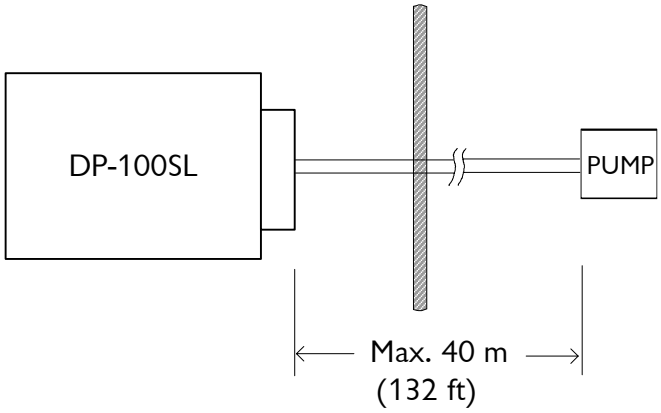

Figure 6.1 Vacuum pump—distance from DP-100SL

Chapter 7

Communication

Phone Lines

A phone line should be installed near the system for troubleshooting and for remote instructions to operators by Orbotech personnel. The customer will supply the telephone. A second line should be available for remote diagnostics via modem. Both lines should have direct outside dialing.

Network

The customer is responsible for preparing four *Ethernet* network connection points in the immediate vicinity of the system.

The connecting points are required for:

- DP-100SL basic unit
- CCD computer
- SUN workstation
- Service

Chapter 8
Air

Compressed Air

Table 8.1 shows the requirements for compressed air at the site.

Table 8.1 Compressed Air Requirements

Pressure	0.7 ~ 1.0 MPa (7 - 10 bar)
Air supply rate	55 liters/minute
Quality	Dry (water: 0.03 g/m³) Filtered (dust: 0.1 µm, 0.1 mg/m³) Free of oil (oil: 0.01 mg/m³)
Tube connectors	10 mm (outside diameter)

It is the customer's responsibility to maintain filtering of the outside supply to ensure an oil-free compressed air supply.

Filtration and Control

Compressed air must be sufficiently clean to prevent it from causing malfunction or damage. A filtration system similar to the one in Figure 8.1 is recommended.

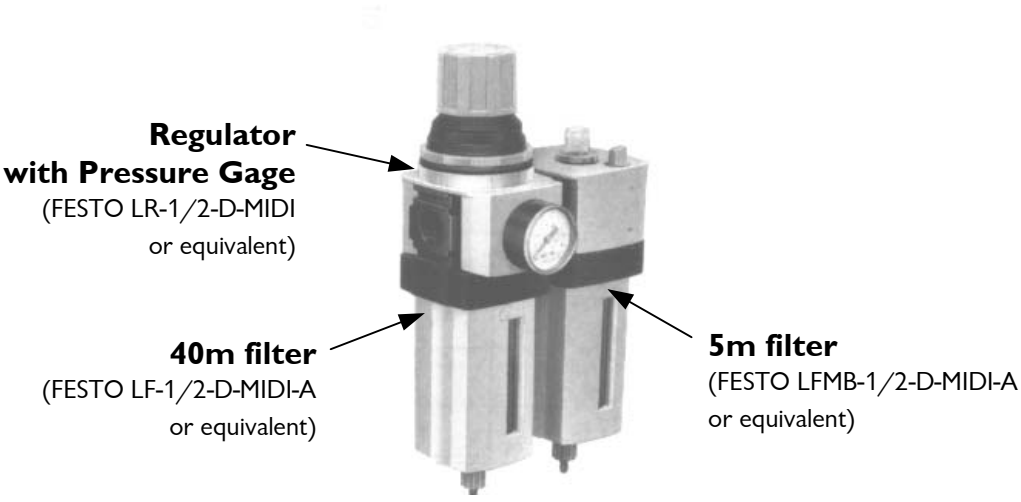

Figure 8.1 Recommended Air Filtration System

Chapter 9

Shipment and Delivery

Shipping Information and Responsibility

Orbotech or its agents will arrange shipment to the customer's facilities. It is the customer's responsibility to provide Orbotech with delivery instructions. The customer is responsible for transporting system units to a suitably prepared installation site, and verifying that the units can be freely moved into the installation site. Orbotech engineers will advise and instruct the customer on site preparation.

Caution

Equipment should be unpacked by authorized Orbotech engineers only.

Crates

The DP-100SL arrives in three wooden crates. Crates' approximate sizes and weights are given in Table 9.1 below.

Table 9.1 Shipping Crate Sizes

Unit	Width	Depth	Height	Weight
DP-100SL[a]	1920 mm 75.6 in	3020 mm 118.8 in	1990 mm 78.3 in	2,400 kg 5291 lbs
Laser Supply Box [b]	1270 mm 50 in	970 mm 38.2 in	740 mm 29.1 in	150 kg 331
Accessories[c]	1200 mm 47.2 in	1112 mm 43.8 in	1310 mm 51.6 in	300 kg 661 lbs

a. Includes the Laser Head
b. Contains Power Supply & Heat Sink modules
c. Including Power Vacuum & Control box

Equipment

The customer should provide necessary equipment such as forklifts or cranes for unloading of equipment.

- Forklift—capable of lifting 2500 kg / 5512 lbs; with a 190 cm (75 inch) extension
- Pallet jack
- J-Bar

Personnel

The customer must furnish professional riggers to unload the crates and transfer them to the site. The riggers will assist Orbotech personnel in unpacking the equipment.

No equipment should be unpacked before the arrival of Orbotech personnel.

Clearances

Check crate delivery routes and remove all obstructions. Ensure that all doors and hallways along the delivery route are large enough to provide sufficient clearance, that elevators (if needed) have the required capacity, and that corridors are free of slopes or sharp bends.

Appendix A
Approved Materials

This appendix lists the UV-sensitive materials approved for use with the DP-100SL system. All specified materials have been successfully tested in laser direct imaging jobs. Nevertheless, in order to assure successful system operation, you need to set the system up according to your working environment. If you select alternative materials for exposure, you must obtain prior approval of such materials from Orbotech.

Note

Refer to Orbotech's CSE for latest Approved Materials lists.

Dry Film Resists

Table A.I List of Approved Dry Film Resists

Type	Manufacturer	Approved for UV Marker
Riston LDI 330	DuPont	
Riston LDI 350		
Laminar 2000 UD 720	Shipley	
Laminar 2000 UD 730		✓
Laminar 2000 UD 740		✓
Laminar 2000 UD 750		✓
Laminar 5025		
Laminar 5032		✓
Laminar 5038		
Laminar 5050		

Table A.1 List of Approved Dry Film Resists

Type	Manufacturer	Approved for UV Marker
AQUAMER DI 110	Mac Dermid	
AQUAMER DI 115		
AQUAMER DI 120		
Ordyl U 430	Tokyo Ohka	
Ordyl U 440		
Ordyl U 450		
Ordyl alpha 340		
Ordyl alpha 450		
Photec SL 1030	Hitachi	
Photec SL 1040		
Photec HN 240		
Photec HN 340		
Photec HW 340		
LDI 1000	TAIYO INK	
DiaEtch 320	HTP	
Probimage 1020	Vantico	
SUNFORT AQ 2058	Asahi	
SUNFORT AQ 3058		
Imageline XV750	Coates	
Imagecure XV501T-4		
ETERTEC LI-7000	Eternal	
ETERTEC LI-7100		

Films

Table A.2 List of Approved Films

Type	Manufacturer
CU4 Kodak Contact 2000	Kodak
CA4 Kodak Contact 2000	Kodak
DC7 day-light-film	Agfa

Proof Materials

Table A.3 List of Approved Proof Materials

Type	Manufacturer
Dylux paper 535-1	DuPont
Dylux paper 503-1	DuPont
LCF (Laser Check Film)	DuPont

Appendix B

Customer Site Preparation Checklist

Safety Issues	Complete	Pending	Date	Notes
A red warning light installed outside the imager room, above the entrance.				
Portable carbon dioxide fire extinguishers near the system.				
Imager room has fireproof walls and furniture.				
Protective goggles available in imager room.				

Compressed Air Issues	Complete	Pending	Date	Notes
Air line pressure: 0.7 ~ 1.0 MPa (7 - 10 bar)				
Air supply rate of 55 liters/minute				
Quality: dry (water 0.03 g/m^3) filtered (dust: 0.1µm, 0.1 mg/m^3) free of oil (oil: 0.01 mg/m^3)				
10 mm ϕ tube connectors				

Electrical Issues	Complete	Pending	Date	Notes
Requirements for the DP-100SL machine (as listed in Table 5.1 on page 27).				
Main electrical power supply has a switch.				
Maximum voltage transient of _____				
Automatic slow blow circuit breaker installed in series in each power line.				
DP-100SL connected to special ground line which is connected to the building ground.				
Ground connection impedance less than 0.5 Ohms.				
Electrical power for air conditioning is from different source than the system.				
Requirements for the Pump (as listed in Table 5.2 on page 28).				

Imaging Room Issues	Complete	Pending	Date	Notes
Image room size at least: 3.57W x 5.30L x 2.80H (meters) 11.7W x 17.4L x 9.2H (feet)				
The door is at least 1800 mm (71") wide and 2010 mm (79") high.				
Room isolated to safeguard against laser hazards.				
Room doors have a lock that can be locked from the inside.				
A box with a key for emergency entry is located outside the room.				
Paint in room is non-shedding and washable.				

Imaging Room Issues (cont.d)	Complete	Pending	Date	Notes
The ceiling is painted with epoxy, or other low-porosity, non-shedding, washable paint, or covered with non-shedding ceiling tiles.				
Room is in Clean Room 100,000 class or better (according to US Federal Std. 209E).				
Clean room conditions is prepared prior to system installation.				
All surfaces have a non-reflective matte finish.				
The system is not located near heavy machinery.				
The amplitude of movement of vibrations must be less than 1.5 μm at 2 ~ 9 Hz.				
The amplitude of acceleration of vibrations is less than 5 m/s^2 at 9 ~ 200 Hz. Floor strength is at least 1800 kg/m^2.				
Floor incline no more than 5 mm per meter (1" per 16 ft.).				
The floor is covered with anti-static tile, rubber or linoleum. No carpeting.				
The Imaging room is its own room with its own environment (i.e. <u>not</u> part of a bigger room).				

Pump Room Issues	Complete	Pending	Date	Notes
Pump room size at least: 0.5 x 1 (meters) 1.64 x 3.28 (feet)				
Pump room is its own room with its own environment (must be ventilated!).				
Pump installed and connected.				

Pump Room Issues (cont.d)	Complete	Pending	Date	Notes
Control box installed and connected.				
Hoses routed correctly and accessible for maintenance.				

Imaging Room Environment Issues	Complete	Pending	Date	Notes
Room temperature with machine in operation: 68°F ~ 73°F (20°C ~ 23°C ±2°C).				
Room temperature with machine in original packing: 32°F ~ 95°F (0°C ~ 35°C).				
Temperature sensors installed in room.				
Room humidity with machine in operation: 50% ~ 60%.				
Room humidity with machine in original packing: 10% ~ 80% non-condensing.				
Humidity sensors installed in room.				
Ventilation: ceiling-to-floor or walls-to-floor filtered laminar airflow.				

Pump Room Environment Issues	Complete	Pending	Date	Notes
Room temperature: max. 35°C				

Furniture Issues	Complete	Pending	Date	Notes
Storage shelves and cabinets available for storage of digital media and manuals.				
Furniture is resistant to static buildup.				

Furniture Issues (Cont.d)	Complete	Pending	Date	Notes
The feet of the furniture are not insulated from the ground.				
All furniture surfaces have a non-reflective matte finish.				

Access and Transport Issues	Complete	Pending	Date	Notes
Easy access for movement of crates, through the hallways, to the imaging room from the storage room.				
Unpacking space outside the work area.				
Forklift and crane available for movement and installation.				

Communications Issues	Complete	Pending	Date	Notes
Four ethernet network connection points are available near the system.				
A phone line with IDD is installed near the system.				
A second phone line with IDD is installed for remote diagnostics via modem.				

Sun Workstation Issues	Complete	Pending	Date	Notes
Table-top space is allocated for workstation.				
A 1KW UPS is recommended.				

Material Issues	Complete	Pending	Date	Notes
Proof Paper				
Antifoam according to the LDI producer*				
Small pump to add antifoam into the developer*				
LDI photoresist				
6 liters of steam distilled water				
Table tooling hole dimensions were sent to Orbotech for OK.				
LDI resist passed successfully all the processing tests (including contact printing).				

* Depends on technology and resist

Checked by: Orbotech Representative: _____ Date: _____

Customer Representative: _____ Date: _____