



PRODIGY/ PRISM ICP SPECTROMETERS PRE-INSTALLATION GUIDE



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Due to design changes and product improvements, the information in this document is subject to change without notice. Teledyne Leeman Labs reserves the right to change hardware and/or software design that may subsequently affect the contents of this Pre-installation Guide.

*****WARNING*****

The methods and analytical procedures described in this guide are designed to be carried out by properly trained personnel in a suitably equipped laboratory. In common with many laboratory procedures, the methods described may involve hazardous materials or substances of unknown toxicity. For the correct and safe execution of the methods, it is essential that laboratory personnel follow standard safety procedures for the handling of hazardous materials.

While the greatest care has been exercised in the preparation of this information, Teledyne Leeman Labs expressly disclaims any liability to users of these procedures for consequential damages of any kind arising out of or connected with the use of these procedures.

There are many sources of safety information available. Consult your chemical and laboratory supply catalogs. You may also refer to the CRC Handbook of Laboratory Safety, published by CRC Press, Inc., Boca Raton, Florida.

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INTRODUCTION

This Pre-Installation information is designed to help you prepare your laboratory for the installation of the Prodigy Series of ICP Spectrometers which include both the Prodigy and Prism models. Detailed information on each required item is provided. If anything in this guide is unclear, or if you have any questions, please contact our Customer Support Group at 1-800-LEEMANS (533-6267) (in the USA) or 603-886-8400.

Since revisions to instrument design may affect laboratory requirements, please ascertain from your Leeman Labs representative that you are referring to the most recent edition of this guide, and that there have been no changes to the contents of this document.

The Leeman Labs Service Representative is a skilled professional who will install your equipment, verify that it is operating to specifications, and train your personnel in its basic operation. Your preparation enables you to use his/her visit to the best advantage. Field Service Representatives reserve the right to decline installation if the facility's preparation does not meet the physical requirements described in this guide.


The on-site training provided by our Field Service Representatives to your personnel is extremely valuable and may save days or weeks of experimentation. Therefore, your personnel should be available full-time and free from all other duties during his/her visit.

Our Field Service Representative is qualified to instruct the operator on the Leeman Labs software program and basic instrument operation. If special requirements, such as in-depth training in EPA protocols, assistance with chemistry problems or method development are required, Leeman Labs offer a variety of support services. Your Leeman Labs Sales Engineer is trained to be an information resource in this regard. Please feel free to discuss your specific needs with him or her, and to request appropriate information from Customer Support Department.

The installation of your new spectrometer is included in the system purchase price. A successful installation requires that you meet all the site preparation requirements. **Please note** in the event that the installation service engineer arrives on-site and the laboratory has not met the pre-installation pre-requisite, the additional time and travel costs will be billed at the prevailing service rates.

RECEIPT OF THE INSTRUMENT

Leeman Labs ICP Spectrometers have successfully passed stringent Quality Control and Performance Specifications prior to shipment. The spectrometer is carefully packed to ensure safe travel to your lab, but occasionally damage occurs during shipping.



A visual inspection of the shipping container and boxes should be done before signing the shipper's document. If any box is visibly damaged or any of the shipping indicators (tip and tells) shows excessive shifting, make a note of this on the shipper's document, then notify the shipping company **immediately**. Be assured Leeman Labs will work with you to correct any problems. However, if damage has occurred, correction of that damage will be at the expense of the responsible party as defined by the purchase order.

Do not unpack any boxes without consulting the Leeman Labs Customer Support Department. The Leeman Labs Installation Engineer is responsible for the checkout of the shipment against the packing list. He or she cannot be responsible for this task, nor can Leeman Labs be responsible for any missing items, if boxes have been opened or removed before the arrival of the installation engineer

PRE-INSTALLATION PLANNING AND PREPARATION

The Prodigy is a Laboratory bench top ICP Spectrometer housed in a single cabinet, optional accessories include a stand alone autosampler, water recirculator and computer system. The minimum surface area required to accommodate the spectrometer is 59" x 21.7" (97.8cm x 550mm). This area doesn't include space for the accessories. The computer and printer require a surface area of approximately 36" x 30" (92cm x 76cm) and 16.5" x 18" (420mm x 457mm) for the autosampler. The back of the spectrometer should be kept a minimum of 5" from the wall. The ideal location for the autosampler is to the right of the spectrometer or on a moveable cart that can be positioned near the peristaltic pump. The weight of the spectrometer is 290 lb. (127kg).

When the spectrometer is delivered it should be stored inside and protected against the weather. Damage to the instrumentation because of poor storage practice may void the warranty.

Figure 1 shows the dimensions and utility input requirements and other site planning information for the Prodigy ICP spectrometer:

SITE PLANNING INFORMATION

Spectrometer/ICP Source

(mounted in a single base chassis on 1" (25 mm) rubber feet)

Length:	Base 52.2" (1326 mm) Upper 59"
Depth:	Base 21.7" (550 mm)
Height:	
(to the top of the chimney):	28" (710 mm)
Diameter of the chimney:	6" (152 mm)
Weight:	290 lb. (127 kg)

Accessories

Water Recirculator

Length:	15" (380 mm)
Height:	24" (610 mm)
Depth:	21" (533 mm)
Weight:	50 lb. (23 kg)

Stand Alone Autosampler

Length:	16.5" (420 mm)
Height:	12.5" (317 mm)
Depth:	18" (457 mm)
Weight:	26 lb. (12 kg)

Environmental Conditions:

Temperature:	15-30°C
Maximum Temperature Variation:	2°C/Hr, 10°C/day
Relative Humidity:	20-80% (non-condensing)

Electrical Requirements:

Grounded single-phase power supply:	190-230V, 30A, 0/60Hz
Outlet type:	Hubbell Twist-Lock (NEMA L6-30R)
Additional Outlets: (for computer, monitor & printer)	115V, 15A, 60Hz or 220V, 10A, 50Hz

Exhaust

Exhaust draw:	100 cuft/min
Vent diameter:	6-8"
Vent height:	3-4" above chimney

Argon

Purity:	Industrial grade, 99.995% minimum
Delivery pressure:	85-95 psi
Consumption:	14-20 l/min coolant 1 l/min nebulizer 1 l/min auxiliary

Purge Optics

Slow:	1 l/min
Fast:	14 l/min

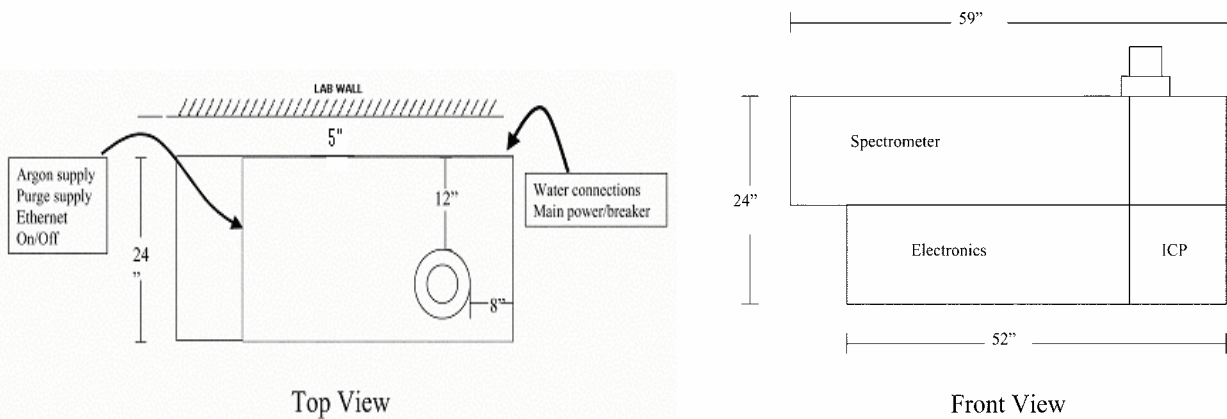


Figure 1: Prodigy Site Planning Information

UTILITIES

ELECTRICAL POWER REQUIREMENTS

The basic ICP spectrometer requires one dedicated 220 Vac (190-230Vac, three wire, single phase, 50/60 Hz, EMI free) input with available demand of 30 amperes for the source. We recommend the line be protected with a 30 ampere circuit breaker and that the circuit breaker be located near the spectrometer.

Outlet type: Hubbell Twist-Lock (part number 2620A) receptacle (NEMA L6-30R), within 9 feet (2.75 meters) of the power supply.

The Prodigy ICP spectrometer does not normally require an external voltage regulator, however, in certain locations power problems may dictate the use of an external voltage regulator. Before selecting an external voltage regulator call Leeman Labs Customer Support Department.

Avoid placement of the ICP on the same transformer line with other equipment (graphite furnace AA or electrical melt furnaces) that draw significant current. This may cause power fluctuations that will adversely affect the instrument data.

In addition, the optional accessories (water recirculator, camera chiller, autosampler, computer, printer, and computer monitor) will require dedicated power lines of 115V, 15A, 60 Hz or 220V, 10A, 50 Hz.

NOTE: Clean incoming power for the spectrometer is very important. If line voltage sags, spikes, or brown spots have been experienced in the past, or, if you are uncertain that the quality of the incoming power may not meet our requirements, please notify the Customer Support Department for assistance.

GROUNDING

In accordance with the U.S. National Electrical Code, the power line ground is connected to the spectrometer frame to prevent possible electrical shocks to operating personnel.

ARGON GAS REQUIREMENTS

Argon of 99.995 percent purity (industrial grade) or better is required. Use either gaseous or liquid argon (liquid is more economical for large sample loads). Argon is an inert gas and not toxic. However, always follow the safety information provided by your gas supplier.

Delivery pressure to the ICP must be regulated, using a dual stage regulator, to a maximum of 90 psi and a minimum of 80 psi. The use of a dual stage regulator will prevent input pressure sag when the instrument is in full operation.

For argon supplies close to the instrument, 10 ft (3m) of plastic clad aluminum tubing or copper tubing, terminating in a 1/4" NPT male fitting is provided. Do not use plastic tubing to feed argon gas to instrument, plastic tubing can cause contamination of the optics and camera. If remote location of argon requires longer tubing it can be ordered from Leeman Labs.

ARGON CYLINDERS (GAS)

A multiple cylinder manifold is a convenient way to avoid constant cylinder changes. A manifold should hold at least four 300 ft³ (8500L) size cylinders. From the gas usage values below, your gas supplier can recommend the best manifold design for your needs.

Use a regulator capable of delivering from 80 psi to a maximum of 95 psi.

Attach retaining straps to all argon cylinders and exercise care in handling all compressed gas cylinders.

ARGON USAGE

U sage of Argon:

Coolant ~ 14-20 l/min (Axial view instruments require a minimum of 18 l/min.)

Nebulizer ~ 1.0 l/min

Auxiliary ~ 2.0 l/min

Usage of Argon for Optics Purge:

Fast ~ 14 l/min

Slow ~ 1.0 l/min

Delivery Pressure ~ 85 - 95 psi

NITROGEN GAS REQUIREMENTS

A Nitrogen gas supply is required for the PRODIGY H (halogen) model instrument. The Nitrogen gas purity should be 99.995 or better. The input pressure will be 20 psi and have a usage of less than 2 LPM.

OPERATING ENVIRONMENT

Place the instrument in a structurally sound work area, free from dust, vibration and corrosive vapor with sufficient space to accommodate the spectrometer and its accessories. Dimensions and weight for the Prodigy are shown in figure 1 on page 5.

The Prodigy is designed for operation at ambient temperatures between 15°C (60°F) - 30°C (86°F) and relative humidity between 20 – 80% (non-condensing). Be sure to place the spectrometer where it will not be exposed to direct sunlight or direct airflow (hot or cold).

TEMPERATURE VARIATION

The temperature rate of change in the laboratory should be limited to 2°C (3.6°F) per hour, with a maximum daily change 10°C (18°F). This temperature variation allows for the most stable operation of the instrument. Avoid air drafts and air conditioning ducts. Greater temperature variations will affect instrument stability. Protection (such as blinds) from direct sunlight via windows is recommended.

Other causes of temperature shifts may include heat adjustments to the laboratory from morning to night, increase in room temperature due to direct sunlight, automatic air conditioner adjustments, and insufficient temperature control for instrument loading.

RELATIVE HUMIDITY

Humidity plus heat plays a major role in operating stability. Humidity may vary between 20 and 80%, but must be a non-condensing environment. The laboratory humidity range should be monitored to determine if additional climate controls to prevent condensation on the oscillator coil are required.

NOTE: Condensation on the oscillator coil can cause arcing and possible damage to the spectrometer.

HEAT GENERATION and COOLING

The more closely the temperature and humidity of the laboratory are controlled, the more stable your analytical measurements will be.

The plasma, ICP source, spectrometer electronics, and recirculating pump, generate heat. Below are estimates of the heat produced which will require removal during normal operation. These numbers are for 2 KW operation. At 1 KW total BTU output is about 2/3 of that at 2 KW.

Heat Produced:

ICP Source w/Power Supply	14,700 BTU/hour
Spectrometer Electronics	1,500 BTU/hour
Water Recirculator	2,000 BTU/hour

Total heat generated	18,200 BTU/hour
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Heat Removed

Water Cooling	6,500 BTU/hour
ICP Source Ventilation (100 ft ³ /min)	6,500 BTU/hour

Total heat removed	13,000 BTU/hour
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Net to be removed by air conditioning

With Remote Water Recirculation	5,200 BTU/hour
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With Water Recirculation in the same room	11,700 BTU/hour
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NOTE: It is important that all parts of the spectrometer are ventilated properly.

EXHAUST VENTING

Installation of a 6-8" (150-200 mm) stainless steel or corrosion resistant flexible exhaust above the chimney is required for proper ventilation. The outer diameter of the Prodigy chimney is 6" (150 mm). Place the exhaust opening 31.5 – 32.5" (80-82.5 mm) **above the benchtop**. Do not attach the exhaust directly onto the spectrometer chimney; this will cause the plasma to become unstable.

Minimum exhaust draw must be 100 cubic ft/min (170 m³/hour). If other instruments share the same exhaust, the ICP exhaust source must meet the minimum requirement when all instruments are in operation.

If analyzing samples containing HF, stainless steel should not be used. Oil samples (organic sample types) will not require this level of corrosion resistant ducting.

OSCILLATOR COOLING WATER SUPPLY

The quality of water used for cooling the ICP power tube and load coil is critical for trouble-free operation of the spectrometer. Instrument performance and reliability will be directly affected by the electrical conductivity of the water. Conductive water (<5000 OHM-CM) causes excessive current flow through the water, which reduces the power transfer to the plasma. The ideal source of cooling water is distilled water.

The temperature of the cooling water should be near room temperature. If the cooling water temperature is significantly below ambient and the relative humidity is high, condensation will occur on the cooling coils within the oscillator.

COOLING SYSTEM

The use of a closed-loop system, such as a recirculator or chiller, is highly recommended. Closed-loop systems consistently provide cleaner, more thermally stable operation and far fewer problems than tap water. Cooling the oscillator with tap water is not recommended.

The resistance of the water used should not be less than 5000 ohm-cm. The minimum required delivery pressure is 30 psi (1.9 bar) at 2 liter/min. (0.5 gallons/min.). Maximum pressure is 50 psi (3.1 bar). This flow rate and pressure must be maintained at the instrument, or the flow switch interlocks will activate, shutting down the ICP spectrometer.

RECIRCULATORS VERSUS CHILLERS

Both non-refrigerating recirculators and chillers will function well as closed-loop cooling systems for the oscillator. There are two notes of caution when using either of these systems.

1. The BTU capacity of the system must be matched to the load of the oscillator (6,500 BTU/hour).
2. If a chiller is used, the temperature set point of the chiller must be above the atmospheric dew point, or condensation will occur within the oscillator possibly resulting in arcing. For this reason, it is recommended that if a chiller is used, the chiller be set at a point slightly higher (approximately 5 °F) than ambient temperature.

Leeman Labs can provide various recirculator and chiller systems. If you have any questions please call 1-800-LEEMANS (533-6267).

WATER RECIRCULATORS OR CHILLER CONNECTIONS AND LOCATION

Two 10 ft (3 m) flexible tubes are provided with 3/8" female Swagelok fittings at the ICP Source end and 2 3/8" female Swagelok for connection to the recirculator.

Remote placement of the recirculator or chiller is recommended. In this case the inner ID of the water lines must be maintained all the way to the instrument, or pressure drops will occur. If a flow rate of a minimum of 2 liters/minute at 30 psi is not maintained, interlock failure will occur. The chiller should be placed in a non-freezing environment. Additional water line tubing can be ordered from Leeman Labs.

Camera CHILLER CONNECTIONS AND LOCATION

Two 10 ft (3 m) flexible silicone tubes are provided with polypropylene quick disconnect fittings. Connect the tubing to the left side of the Prodigy.

Place the chiller below the instrument. The chiller should not be more than 36" lower than the instrument. If the chiller is too low the pump will not be able to force water through the camera, this will cause the camera to over heat. The chiller should be filled with clean distilled water only. The operating temperature of the chiller should be set to 20°C-28°C. Additional water line tubing can be ordered from Leeman Labs.

WASTE DRAIN

Provide a one gallon (4 liter) unbreakable, container resistant to the matrix of the samples being analyzed, or a free-flowing drain for excess solutions draining out of the ICP. Nalgene supplies a suitable carboy for waste.

Waste solutions from ICP analysis often contain HNO₃ and/or HCl (or other acids), and should be considered hazardous waste requiring disposal according to local regulations. Aqueous and organic materials should not be collected in the same container.

If an open container is used, the top of the container should be covered to minimize acid fumes, which can corrode electronics and computer disk drives. The addition of marble chips to the waste container will help to neutralize the excess acid and reduce the acid vapor risks.

STANDARDS

All ICP spectrometers are comparative measuring systems, meaning that sample readings are compared with the response of known standards to make an analysis. The quality of standards used for calibration is a major determinant on the quality of the resulting sample analysis.

Many labs prefer to use standards specially prepared for their applications. These include calibration standards, check standards, QC standards, and blanks. If you would like to purchase standards, or discuss your application, please call our chemists in the Plasma-Pure Standards Laboratory at 1-800-ICPSTDS (427-7837) in the USA or 603-886-8400.

Standards for instrument checkout will be provided by Leeman Labs. Calibration standards are the responsibility of the customer and must be provided prior to the arrival of the Leeman Labs Installation Engineer.

Organic sample type will require customer purchase from Conostan or other organic standards sources. Contact Leeman Labs for recommendations or assistance.

NOTE: AA standards are not suitable for use for analytical calibration on an ICP because they may contain significant concentrations of noncertified analytes.

CONSUMABLE SUPPLIES

The instrument is shipped with a supply of pump tubing and printer paper sufficient for installation. Leeman Labs offers several types of consumable kits. If you did not purchase a consumable kit with the instrument, you will need to order extra pump tubing, printer paper, torches, etc. Also, for convenience and to minimize downtime, an additional nebulizer, spray chamber, and torch are strongly recommended.

Consumable Parts Kits can be ordered through the Customer Support Department at 1-800-LEEMANS or 603-886-8400. For additional consumable kits, consult your Leeman Labs ICP Supplies and Accessories Catalog.

TRAINING SEMINARS

Leeman Labs offers an extensive customer training programs several times a year, including ICP training seminars. The course is divided between classroom time and laboratory time, where theory, software, routine maintenance and hands on operation are covered in detail. Leeman Labs strongly recommends that at least one operator attend the training course, since it will prepare the attendee to operate the spectrometer more efficiently, obtain better analysis results, and avoid problems that can be incurred due to the user's unfamiliarity with the instrument. However, your operator should work with the new instrument for at least one month prior to attending a training course. For more information, or to enroll in a training course, please contact our Training Coordinator at:

Phone: (800) 533- 6267

Phone: (603) 886-8400

PRE-INSTALLATION COMPLETION FORM

This form assures that you have satisfied all pre-installation requirements. Installation of your Leeman Labs ICP spectrometer cannot be scheduled until this form has been completed and returned. Any time lost during installation, caused by failure to meet the pre-installation requirements, will be billed to your account. If you have any questions regarding these requirements, please contact the Leeman Labs Customer Support Department at:

United States Customers (800) 533-6267 or Fax (603) 886 4322
International Customers (603) 886-8400 or Fax (603) 886 4322

Please complete the form below as each requirement is met, sign your name and date each box. Mail or fax the completed form to:

Teledyne Leeman Labs
Customer Support Department
6 Wentworth Drive
Hudson, NH 03051
FAX (603) 886 - 4322

NOTE: The installation of the ICP spectrometer will not be scheduled until the Pre-installation Completion Report has been completed and either FAXED or mailed to Teledyne Leeman Labs.

Operator's Name: _____
(PLEASE PRINT)

Company Name: _____

Address: _____

City: _____ State: _____ Zip _____

Telephone No.: _____ Extension: _____

Fax No.: _____

Email: _____

ITEM	OPERATOR'S SIGNATURE	DATE
Electrical Power		
One grounded single-phase power supply, 190-230V, 30A Circuit Breaker, 50/60 Hz		
Two 115V, 15A, 60 Hz (North America) or 220V, 10A, 50 Hz (Europe) double plug outlet for the computer and printer		
ICP Exhaust		
Exhaust placement 31.5-32.5" above benchtop with 6-8" diameter.		
Water Cooling Source		
115 or 220V, 15A line required for recirculator or chiller.		
115 or 220V, 15A line required for Camera chiller		
Argon Supply - either compressed gas cylinders or liquid argon:		
Cylinder Connections		
Cylinder Manifold Type: _____		
Regulator Type: _____		

ITEM	OPERATOR'S SIGNATURE	DATE
Liquid Argon Tanks		
Regulator Type: _____		
Nitrogen gas supply		
Regulator Type: _____		
Waste Drain:		
A one gallon (minimum Capacity) container meeting OSHA and/or any other regulations		

Environmental conditions that may affect the performance; please indicate if any exist at the installation site.

- Will the instrument be in direct sunlight? Yes No
- Will the instrument be near heat vents? Yes No
- Will the instrument be near air conditioning vents? Yes No
- Is there a direct source of dust? Yes No
- Is there potential for condensation? Yes No
- Will the lab bench for the ICP be on a rug? Yes No

Your signature below indicates that all site requirements listed on the previous pages have been met.

Operator's Signature : _____ Date: _____

Install # _____

READER'S COMMENT FORM

Guide Title: PRODIGY ICP Spectrometer Pre-installation Guide

Part Number: 150-00233

Please use this form to communicate your views about this manual.

Please rate this Pre-installation guide:

	Excellent	Good	Fair	Poor
Clarity	_____	_____	_____	_____
Completeness	_____	_____	_____	_____
Ease of Use	_____	_____	_____	_____
Illustrations	_____	_____	_____	_____
Organization	_____	_____	_____	_____

If you have found errors in this installation guide, please list them with their appropriate page numbers:

Please provide us with the following information:

Your Name: _____

Company Name: _____

Address: _____

Please FAX your comments to us at (603) 886-4322. Thank you for your assistance.