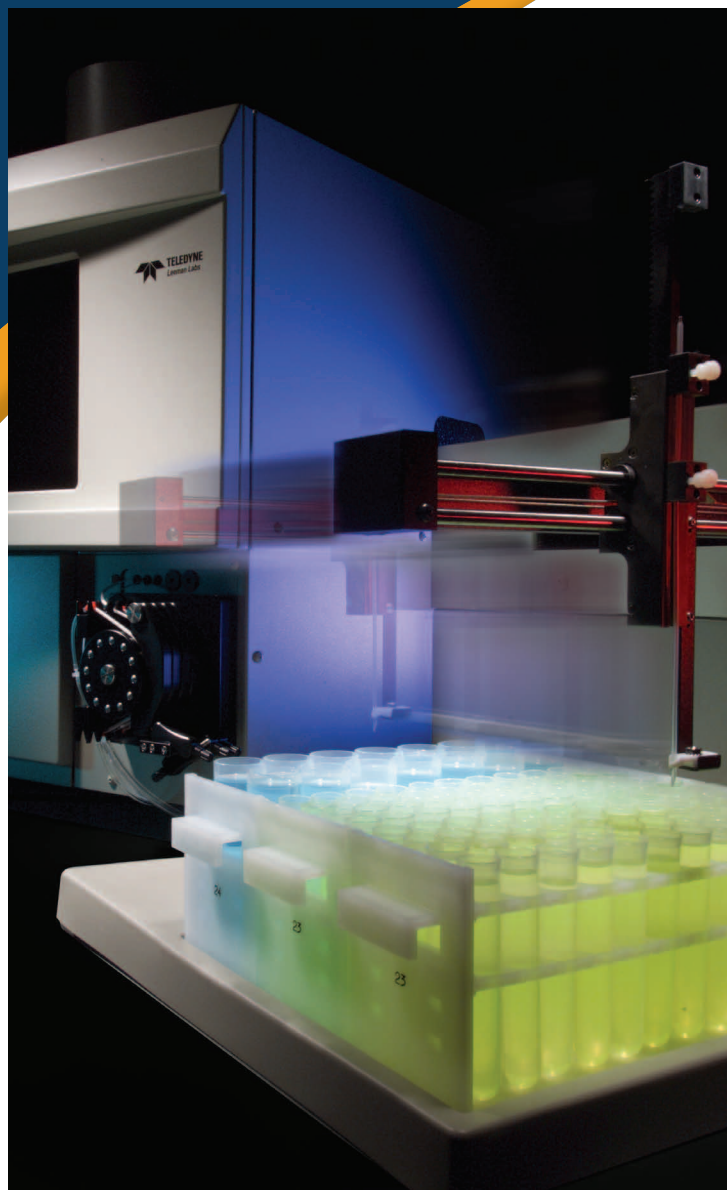


# *Prodigy*

## High Dispersion ICP



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Everywhere you look™



## High Performance Simultaneous ICP with State-of-the-Art Array Detection

### *The Prodigy ICP*

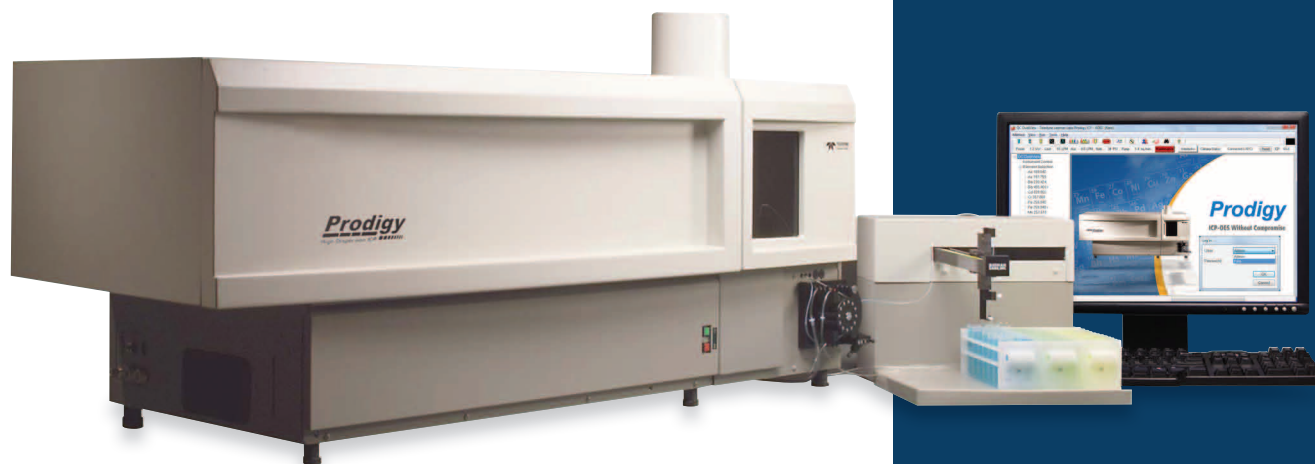
At Teledyne Leeman Labs atomic spectroscopy is our business, our only business. We are deeply committed to providing you with technically superior products and the highly responsive support you need to meet or exceed your elemental analysis needs.

Reduced capital equipment purchases and shrinking budgets mandate that any analytical instrument you acquire not only deliver the performance and operational robustness needed to meet your requirements today, but next month, next year or years from now as well.

The Prodigy was designed with these realities in mind. It offers industry leading performance, a wide range of sample introduction options, high throughput automation, the ability to analyze samples with reduced gas consumption and advanced functionality including the ability to analyze halogens.



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## Expect More

If you are looking for an ICP that is ready for every analytical challenge you face, you need to look no further than Prodigy. It is designed to exceed your expectations and deliver unprecedented performance.

### Speed & Sample Throughput

Get accurate results fast with Prodigy's simultaneous data acquisition and full wavelength coverage.

### Better Results

With Prodigy you will measure lower concentrations more accurately, be able to choose the best analytical wavelength, dilute samples less often and pass QC requirements easily.

### Ease-of-Use

Spend less time training new operators and tweaking instrument parameters. Get a helping hand with scheduled maintenance from Prodigy's on-screen prompts and audio/visual support.

### Versatility

Use the plasma orientation (Radial, Axial or Dual View) and the wavelengths best suited to your analytical requirements. Measure trace elements and major sample constituents at the same time.

### Dependable Operation

Run day in and day out without costly downtime. Typical lifetimes of Leeman ICPs exceed 10 years; throughout that period you can depend on the Prodigy to be durable, dependable and ready to run when you are.

### Responsive Support

Look to Leeman's experts in atomic spectroscopy to help you get the answers you need... when you need them.

Process samples in as little as 35 seconds each

## Finish First

The ICP is a laboratory workhorse; often called upon to run hundreds of samples per day. In order to meet increasing productivity demands, it is essential to have an ICP that gets your analyses started with minimal effort, that reliably meets your laboratory control requirements and processes countless samples with exceptional speed and accuracy. Prodigy is perfectly suited to meet this challenge.

**Start Fast** with drift-free analyses via *Image Stabilized ICP* and *Thermally-Stabilized Optics*. The ICP source is mounted directly to its spectrometer so torch position is never affected by changes in room temperature; it's always perfectly aligned. The thermally-stabilized optics system eliminates optical drift. Together, these features result in a level of stability that other ICPs can only hope to achieve. This is especially beneficial in labs where large changes in room temperature are a concern.

**Analyze your Samples Faster** than you ever dreamed possible: simultaneously collect peak, background, internal standard and IEC data for all desired elements in a single exposure.

Prodigy's state-of-the-art Large Format Programmable Array Detector (*L-PAD*) lets you determine any number of elements with no change in sample throughput. Other ICPs claim to be fast, but compare the sample throughput times.

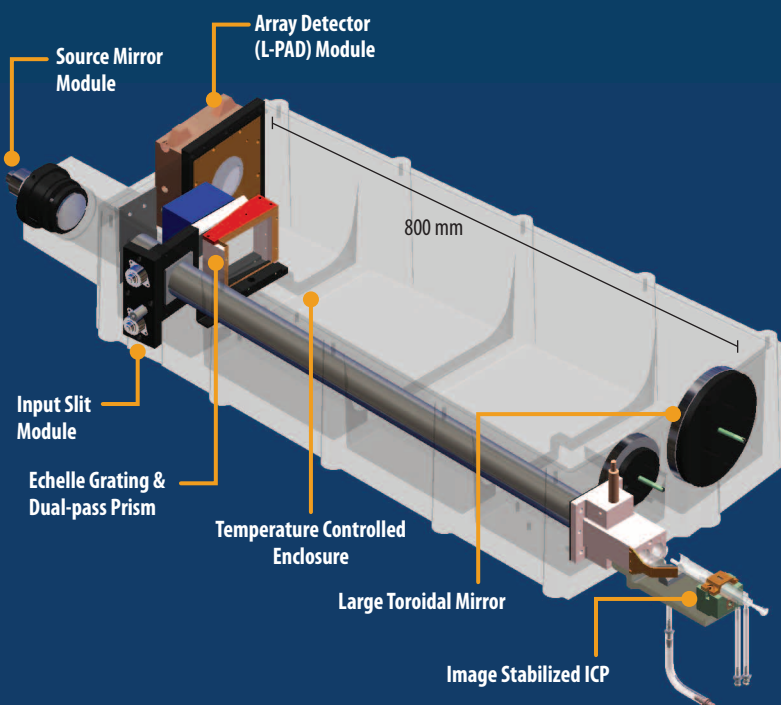
**Ensure Successful QC Checks** with Prodigy's unmatched long-term stability, superior resolution and lower detection limits. The same image stabilized ICP torch design that got you started fast will keep you on track and analyzing samples over time.

**Finish First** with Prodigy's built-in custom report generation capability. Whether you need to upload data to your LIMS or design custom reports, Prodigy's software helps you get the information to where it needs to be quickly.

## Performance and Reliability

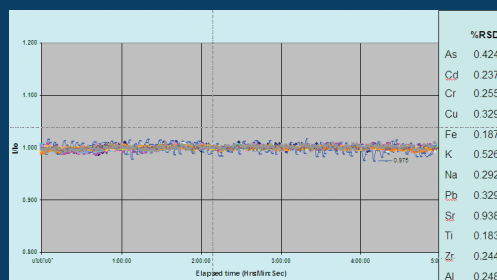
Most ICPs are capable of performing well when sample matrices are simple; the real test comes when samples get complex. The component most critical to analytical performance with complex matrices is the instrument's optical spectrometer.

It is the design integrity and performance of the spectrometer that have the greatest impact on resolution, wavelength range, stability, immunity to stray light and detection limits. See what makes Prodigy deliver exceptional performance in all matrices.



### Drift-Free Analysis

Prodigy is the only ICP to treat the plasma torch as an optical component. With Prodigy's *Image Stabilized ICP*, the torch is mounted directly to the polychromator and is held in place with the same integrity as any other optical component. This eliminates drift in the position of the plasma relative to the entrance slit and contributes to Prodigy's unexcelled long-term stability. Superior stability means fewer QC failures and higher productivity.

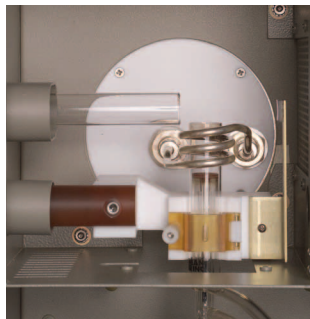


**Long-term stability plot**  
Average precision of less than 1% over 5 hours

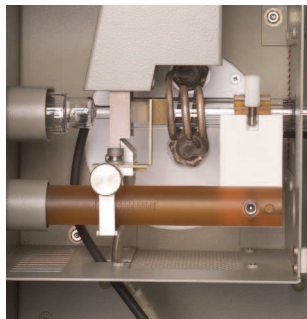


## Axial, Radial or Dual View

Prodigy is available in axial, radial or dual view configurations; each equipped with a computer controlled source mirror for automated optimization. In dual view mode, the mirror automatically selects the view and optimizes plasma viewing position in each mode. It ensures you are running at peak performance all of the time.



Radial Configuration



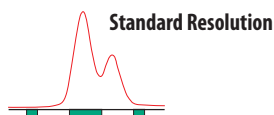
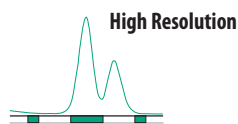
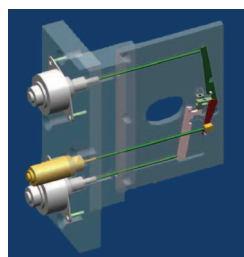
Axial/Dual View Configuration

## Any Wavelength, Any Time

Prodigy's high dispersion Echelle spectrometer and **Large Format, Programmable Array Detector (L-PAD)** provide continuous wavelength coverage from 165 – 1100 nm\*. This range of wavelengths provides unprecedented analytical versatility with choices of new wavelengths for significant improvements in analytical performance.

## Operator-Selectable Resolution

Choose the resolution to match your analytical requirements. Prodigy provides optional Operator Selectable Input Slits to increase resolution when spectral complexity occurs or increase sensitivity for applications free of spectral interference.



Operator-selectable input slits allow the user to achieve optical resolution of 0.005 nm. Shown is a Thallium doublet at 190.864 nm with high and standard resolution slits.

## Low Stray Light for Exceptional Detection Limits in Real World Matrices

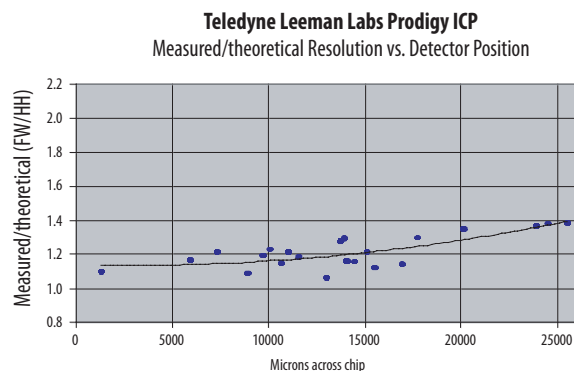
Prodigy's Long Focal Length Spectrometer results in significantly lower stray light levels than that of other ICPs. This translates into lower detection limits and superior performance for real world matrices.

Sample	Line	Mean (ppm)	Std. Deviation (ppm)
H <sub>2</sub> O blank	As 193	-0.007	0.0037
2% Ca	As 193	-0.0126	0.0109

This table shows the scattered light from a 2% calcium solution has almost no impact at primary arsenic wavelength (193.759 nm).

## Unmatched Image Quality

The resolution of a spectrometer is not only dependent on the characteristics of its grating, input slit and focal length. It is also dependent on the quality of the image (focus) at the detector surface. Prodigy's Echelle spectrometer uses advanced toroidal optics and a long focal length (800 mm) to ensure unmatched image quality and resolution across the focal plane. Many short focal length spectrometers suffer from significant degradation of image quality and resolution as one moves away from the centerline of the detector. The plot below shows that Prodigy's measured resolution is nearly identical to its theoretical resolution at all positions across the detector surface.



Prodigy's measured resolution is nearly equivalent to its theoretical resolution across the detector surface (i.e. wavelength range).

\*The wavelength range is extended to 134 – 1100 nm with the halogen option installed.

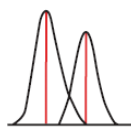
# Large Format Programmable Array Detector



## Photoactive Area

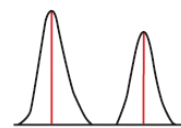
The L-PAD, shown on the right, has 4x the active area of competitive detectors to take advantage of Prodigy's very high dispersion. This combination of dispersion and photoactive area provides both full wavelength coverage and high resolution in a single analytical measurement.

Prodigy's large format programmable array detector (L-PAD) is designed specifically for atomic spectroscopy, incorporating all the characteristics critical to an ICP's performance. Its large size and in-pixel processing make it possible for Prodigy to provide high resolution and broad wavelength coverage as well as fast, wide dynamic range analysis. With Prodigy, the operator will benefit from fewer spectral interferences and unmatched versatility in adapting to new applications.



## Limited Dispersion

Small physical separation between wavelengths



## Superior Dispersion

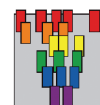
Large physical separation between wavelengths

## Why Size Matters with Array Detectors

### Fewer Spectral Interferences

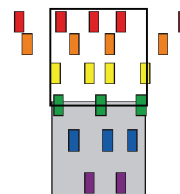
Accurate results depend on a spectrometer's ability to distinguish analyte lines from nearby interferences. Prodigy's high dispersion spectrometer provides greater spacing between adjacent wavelengths making this differentiation easier, however; the increased separation requires a larger detector to cover the entire spectrum.

Imagine the colored rectangles to the right represent wavelengths of the Echelle spectrum and the gray background represents the size of the array detector. With a small area detector, wavelengths and orders start to overlap and it becomes difficult to tell one wavelength from another, resulting in significant spectral interferences (shown in A). Even when a high dispersion spectrometer is used with a small detector, and the UV and Visible regions are measured sequentially, the wavelengths at the edges of the spectrum are lost (shown in B). Only with a high dispersion spectrometer coupled with a large detector, such as L-PAD, can you fully utilize high dispersion optics for complete wavelength coverage and high spectral resolution (shown in C).



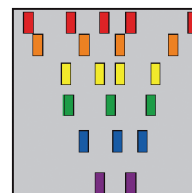
### A. Small Detector with Poor Dispersion

yields poor resolution and interorder overlaps, but acceptable wavelength coverage.



### B. Small Detector with Good Dispersion

yields better resolution, but limited wavelength coverage.



### C. Large Detector with Good Dispersion

yields exceptional resolution *and* full wavelength coverage.



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## In Pixel Processing

Charge coupled devices (CCDs) move charge from the pixels of interest (analyte peak or background) to a remote amplifier to measure signal. As this transfer occurs, all pixels must be processed or the signal is lost. This approach is slow and limits the dynamic range and signal to noise ratios that can be obtained.

L-PAD transfers the charge between two storage locations within each pixel. It then can measure the signal at the pixel of interest without affecting any other pixel. L-PAD reads each pixel non-destructively, so small signals are processed at their optimum signal to noise while large signals are processed quickly to prevent saturation. This approach is fast, provides a wide dynamic range and optimizes signal to noise ratios. This means you will complete your analysis quickly and with fewer over range measurements.

## Multiple Modes of Data Acquisition

Prodigy's versatile detection system captures the entire spectrum or only the spectral regions of interest. Choose between:

- Fully-quantitative analysis

- Semi-quantitative analysis

- Qualitative analysis with Full Spectrum Acquisition (Includes spectral addition, spectral subtraction and peak identification tools.)

- Time resolved data acquisition for chromatographic speciation and/or laser ablation

## Advanced Analytical Capabilities

L-PAD provides capabilities never before achievable with ICP-OES, such as true simultaneous measurement of all analyte, background, internal standard and interelement correction signals. This superior measurement approach is opening up new application areas for ICP, such as:

- Halogen accessory allows the low level determination of chlorine and bromine

- Access to wavelengths not formerly available to the ICP analyst (for example, 134 to 1100 nm with halogen option)

- Enhanced spectral addition and subtraction capability

- Elemental fingerprinting for forensics and retrospective QC

- Time resolved data acquisition for chromatography and laser work

- High precision elemental ratio measurements (0.01 – 0.02% RSD) ideal for laser ablation and earth science applications

- Specially engineered spectrometers for isolation enclosures

## Inherently Anti-Blooming

"Blooming" is an image distortion that can occur when some solid-state detectors are exposed to high intensity light and the excess charge is allowed to migrate from pixel to pixel. Because L-PAD has an additional N-epitaxial layer that sweeps excess charge from saturated pixels instead of allowing it to migrate to adjacent pixels, it is not susceptible to blooming.

## Largest Continuous Wavelength Coverage

Prodigy with L-PAD provides the largest coverage of any commercially available ICP — 165 to 1100 nm standard, or 134 to 1100 nm with the halogen option.

## Spectral Subtraction

Simplify sample spectra by removing matrix emission. Here is an example of spectral subtraction for bullet lead standard reference material C2416.

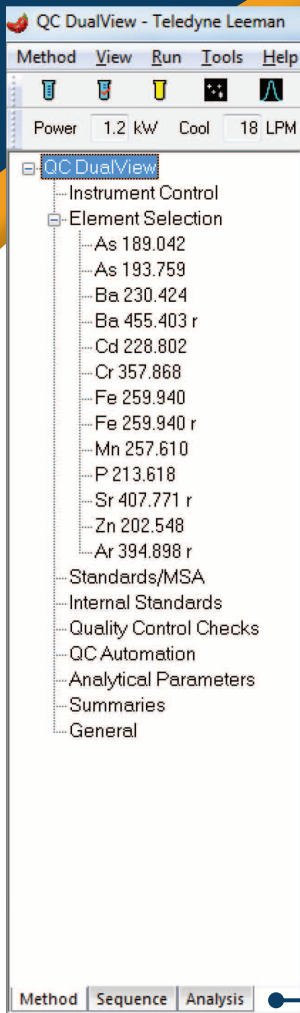


# Prodigy Software

Prodigy's software provides intuitive navigation between applications, network readiness, access security and regulatory compliance tools. It is based on familiar navigator conventions commonly employed on the Web with a simple tree structure and application tabs for associated functions. Frequent operations can be accessed with icons available at the top of each display.

Three Application tabs appear at the bottom of the navigator panel for Method Development (Method), setting up a Sample Sequence (Sequence) and Running an Analysis or Data Review (Analysis).

When the user clicks on the Method tab, the navigator displays method development parameters such as Instrument Control, Element Selection, Standards, QC Checks and QC Automation.



Familiar "navigator" panel

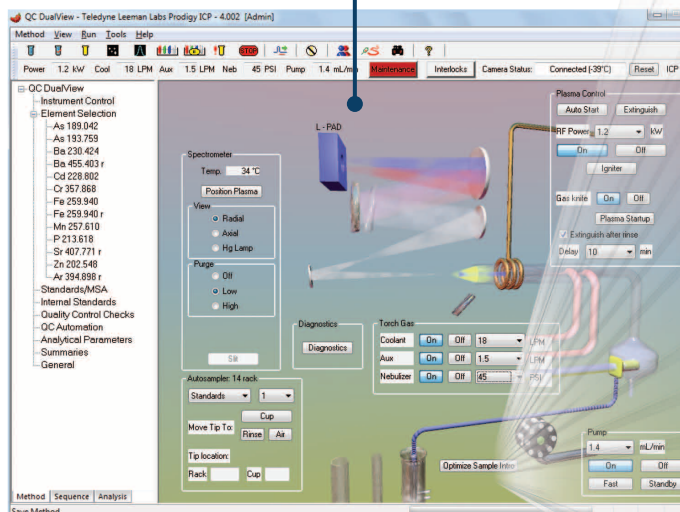


Operator access is controlled by the login procedure as part of 21 CFR 11 Compliance Tools

Prodigy software records all actions and instrument conditions for 21 CFR 11

## Instrument Control

With Prodigy, all instrument parameters are computer controlled and appear on a single graphical display. From automated start up to auto shutdown at the end of your analysis, advanced automation features will guide you through your analysis. For those who still prefer to do their own "tuning," optimal performance is achieved quickly with the Optimize Sample Intro feature that displays signals with calculated detection limits while allowing instrument parameters to be adjusted.



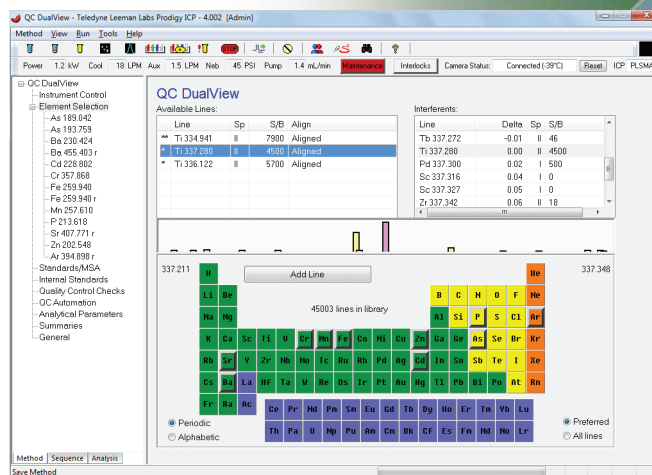
Status:	STOP	
Line	Cu 324.754	
Integration time	1.00 sec	
Concentration	10	
Peak		
LB	443929.3	RB
	5410.0	5954.0
Corr. intensity:	438247.0	
Estimated DL:	0.00172	
S/B:	77.12906	
BEC:	0.12965	
5 Sample Precision		
Mean:	435987.1	
SD:	1739.1	
RSD:	0.399	
Start	Stop	Close



Some key features of Prodigy's software are shown on the following pages. See how easy it is to set instrument parameters, add elements, set up automated sequences, analyze samples and report results.

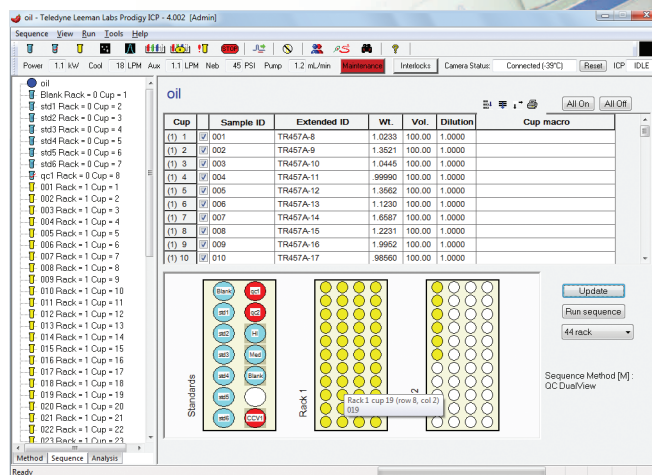
## Element Selection

Create methods with as many wavelengths as you desire. Simply click the element symbol on the Periodic Table and a list of wavelengths appears. Prodigy then provides you the choice of selecting the default wavelength or any other wavelength you prefer. At the same time Prodigy will warn you of possible spectral interferences on the line you select.



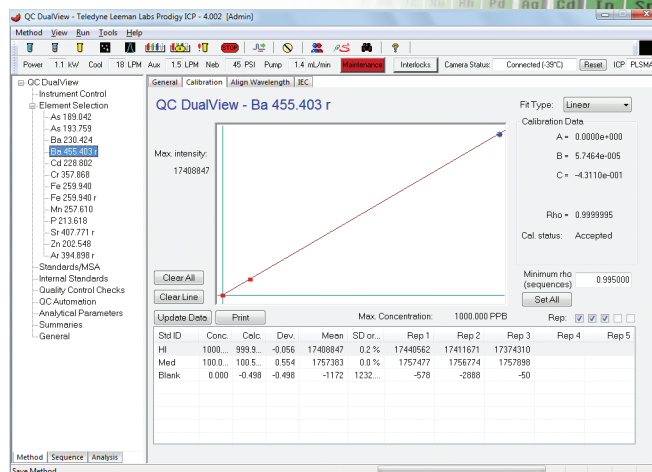
## Automated Analyses

Creating automated sequences is fast and simple. Import from LIMS or enter manually, the names of samples to be run. If the same names are used daily, save and recall the sample list. The navigation panel inserts standards and quality control checks as defined in the method automatically. When the sample list is updated, samples populate both the navigation panel (in order of anticipated analysis) and the autosampler rack map. Moving the cursor over a cup location will display its position and contents.

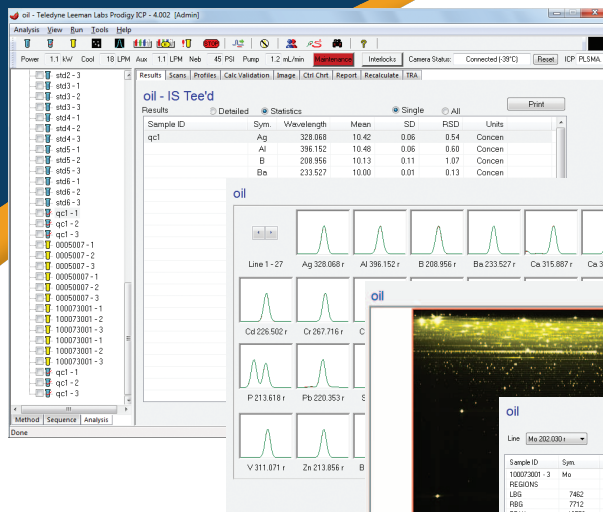


## Calibration

Any combination of elements and concentrations may be entered for each standard. After measurement, full detail for all standards is shown in the calibration display where replicate values with statistics appear in tabular form. Multiple calibration algorithms are available to provide the best fit to your data. Of course, the method of standard addition is fully supported. Standard, QC and calibration information for all method lines are available using the summary display.



With Prodigy's extended wavelength range, we were able to locate a new cesium emission line at 894.3 nm that yields a 600-fold improvement in detection limit over the 455.5 nm line."



Numeric Data

Spectral Thumbnails

Full Echellogram

Raw Data with Calculations

## Results

Icons appear for standards, quality control checks, samples, full spectrum, automated sequences and stat (high priority) samples. View the data for each reading either numerically, as spectral thumbnails or detailed spectra for each wavelength, or as raw data with calculations applied for validation. When a full spectrum is acquired built-in tools enable you to identify elements/wavelengths that had not been calibrated, eliminate matrices, find additional corroborating wavelengths and much more.

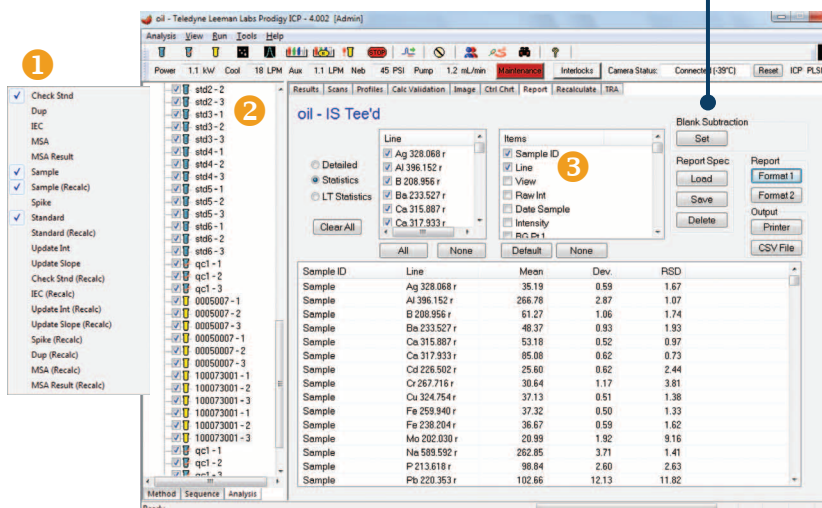
## Reporting

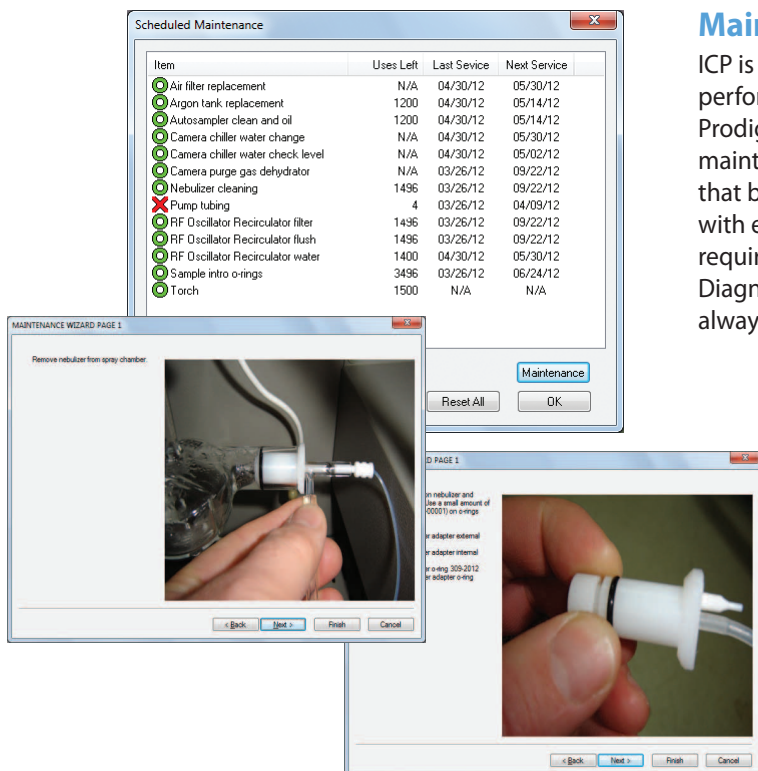
When it comes time to generate an analysis report, Prodigy provides a simple, yet versatile report generator.

Export reports to LIMS or other remote locations directly in the format desired

1. A pull-down menu specifies the sample types reported.
2. Check the samples on the navigation panel to include them in the report.
3. Next, select the desired lines and as many data items as you want. The items you select will populate the table at the bottom of the display in the order selected when you click Report.

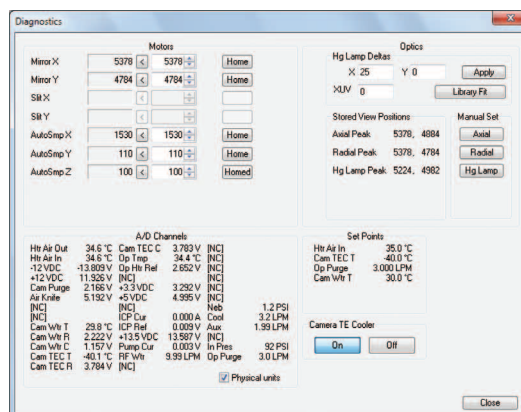
**Report with Confidence.** Today, more than ever, results must be defensible with verification of proper instrument conditions and operation, validation of calculations from raw data to final result, and tamper-proof data storage. Prodigy delivers precise, accurate results you can depend on.





## Maintenance

ICP is an analytical workhorse. Keeping it running at peak performance is essential to laboratory success. To help achieve this, Prodigy comes with an automated maintenance monitor. When maintenance is required, the Maintenance button turns red. Clicking that button displays the status for all the maintenance procedures, with expired operations highlighted. To help guide you through required maintenance, each step is detailed with audio/visual support. Diagnostics provides more than 30 test points to ensure Prodigy is always running at peak performance.



## More than Just an ICP

As you know, beyond the initial purchase price lies the true cost of ownership, and that's where the Prodigy ICP shines. Why? Because Teledyne Leeman Labs builds these instruments to last.

## After Sales Support

**Telephone Support:** Our technicians and support chemists can resolve most application, operation, maintenance, and troubleshooting questions over the phone. A toll free hot line staffed with specialists trained in emergency repair is available to you until 6:00 P.M. EST.

**Remote Diagnostics:** Remote diagnostics software uses the power of the internet to allow our Leeman field service technicians to dial in and run diagnostics on your instrument. This enables us to review all the necessary information to answer questions quickly and efficiently.

**On Site Support:** On the rare occasion of instrument failures, we will provide expert service within 48 hours.

## Service Agreements

A variety of optional service agreements are available depending on your requirements including:

**Full Maintenance:** A set rate comprehensive package that allows the user to budget for each instrument under the agreement.

**Limited Maintenance:** Allows the user to budget for costs associated with replacement parts and technical support. This agreement is designed for the user who performs their own maintenance.

**Preventative Maintenance:** Designed to keep your equipment in peak working condition and to note any items that may lead to future problems.

## Standards

Teledyne Leeman Labs prepares and validates a line of standards and reagents for both sample digestion and analysis (Plasma-Pure). Plasma-Pure standards provide analysts with accurate, stable standards, made from high purity materials (traceable to NIST standards). With Teledyne Leeman Labs you have an analytical partner, ready to provide support for the chemistry, as well as the mechanics, of your application.

## You're in Good Company

Are you getting the impression that we stand solidly behind our instrumentation? You're right. Our confidence comes from knowing that we haven't cut corners in the design, maintenance or testing of our products. We built our ICP spectrometer to the most exacting specifications. We built them to do the job, and to do it right. It's a reputation that we worked hard to earn, and that we work harder to maintain.

So what kind of companies and organizations rely on analytical instruments from Teledyne Leeman Labs? Our customers come from both the public and private sector. They are leaders in industry, government, and academia. Add to the list hundreds of cities, municipalities, and institutions of higher learning and you start to get a sense of the family of Teledyne Leeman Labs customers, and the impact that they have on our society.

We continue to invest heavily in research and development and look forward to providing our customers with additional products and technology advances in the years ahead.

ICP Spectrometers



Mercury Analyzers



DC Arc Spectrometers



Inorganic Standards



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