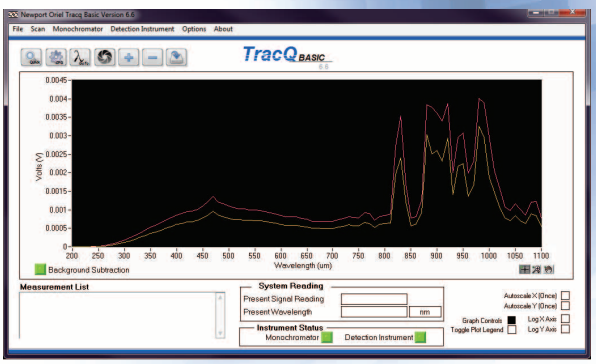
TracQ™ Basic Data Acquisition and Spectroscopy Software



TracQ Basic main application window.

Many common spectroscopic measurements require coordinated operation of a detection instrument and light source, as well as data acquisition and mathematical operations. Not all users have the time to program custom routines to fit their applications. TracQ Basic™ provides the solution, combining customizable instrument control, data acquisition and processing in a user-friendly software package. TracQ Basic is compatible with Oriel monochromators and many common detection instruments.

Oriel's TracQ Basic software is an instrument control package that includes data acquisition and processing. TracQ Basic allows users to acquire spectroscopic measurement data quickly and easily, without requiring any programming knowledge. TracQ Basic is true radiometry software, which enables users to acquire basic signal vs. wavelength measurements or use the built-in algorithms for spectroscopic measurements. Data acquisition and processing occur in real time.

TracQ Basic integrates Oriel monochromators and spectrographs with various detection instruments. Software prompts guide users through the measurement process. Instruments are controlled and scan parameters are set up through simple, intuitive dialog boxes. The front panel of the software allows users to monitor the instrument status, present wavelength, signal reading and the selected wavelength units.

- Controls Oriel™ Monochromators, spectrographs and various detection systems
- Performs radiometric measurements
- Acquires, processes and displays data in real time
- Compatible with Windows™ 7 32-bit and 64-bit operating systems

TracQ Basic performs the following measurements:

- Signal vs. Wavelength
- Time Interval Data Logging
- External Quantum Efficiency (EQE)
- Lamp Radiometry
- Optical Power
- Absorbance
- Transmittance

TracQ Basic includes many features, such as:

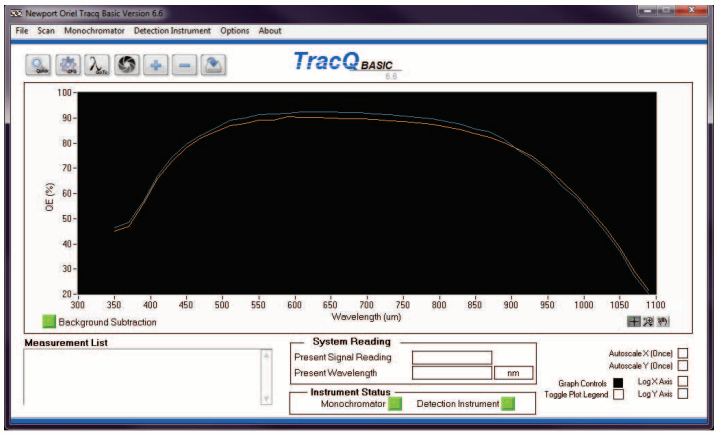
- Monochromator grating selection
- Automatic bandpass selection
- Motorized filter selection
- Wavelength unit selection
- Wavelength offset
- Output port selection
- Monochromator shutter control
- QE detector and preamplifier gain setups
- Detector spectral responsivity file integration
- Background subtraction

ORIEL® INSTRUMENTS
A Newport Company

APPLICATION EXAMPLES

Quantum Efficiency Measurements

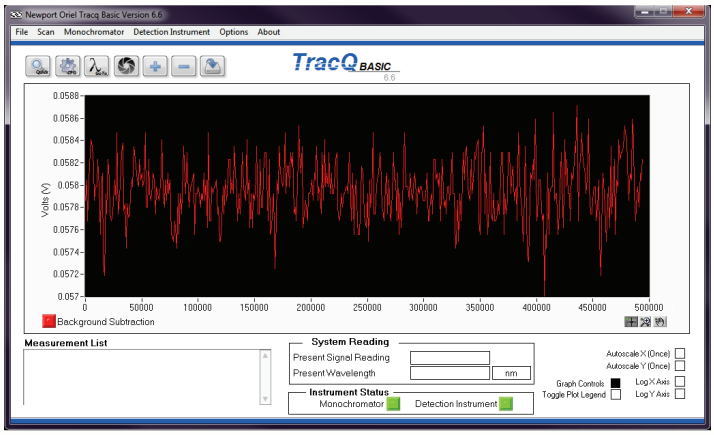
- Sensor characterization
- Solar cell research and development



Quantum Efficiency (QE) measurements of two Silicon solar cells are shown here.

Time Interval Measurements

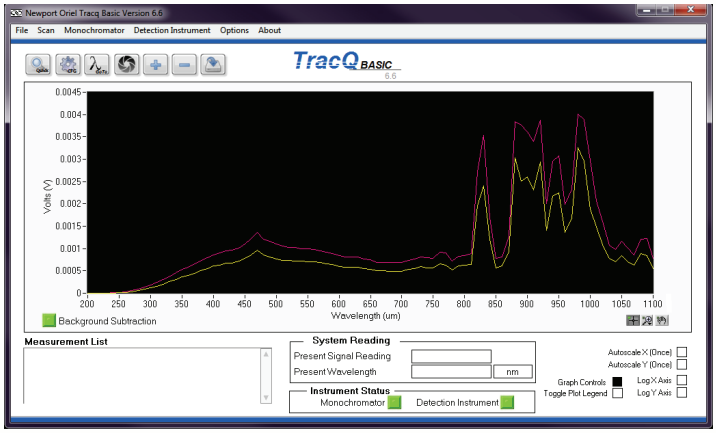
- Light source stability
- Signal modulation readings



Time Interval scan of a Cornerstone 130 monochromator set to output 840 nm with a Xenon lamp. The lamp was allowed to warm up for 30 minutes prior to taking data. Data taken immediately after an arc lamp is ignited would show instability until an appropriate temperature equilibrium woudl be reached inside the Oriel research lamp housing.

Signal vs. Wavelength

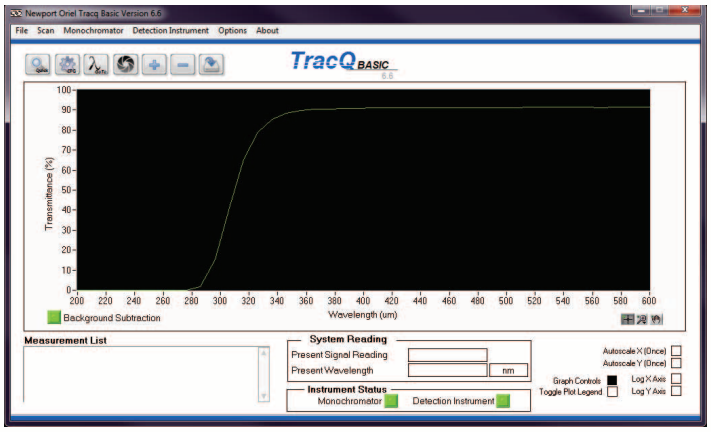
- Background subtraction
- Reference data for spectroscopic measurements
- Voltage, current or power measurements (detector dependent)



Signal vs. wavelength for an Oriel Cornerstone monochromator. This data was taken using .600 um and .760 um wide slits at the monochromator's input and output ports. These scans illustrate the tradeoff between resolution and throughput when selecting slits.

Transmittance Measurements

- Optical material characterization
- Concentration of solutions



Transmittance data is shown for an optical filter.

Optical Power Measurements

Optical power may be obtained by using a Newport unamplified calibrated detector with a 1918-R, 1936-R or 2936-R power meter. When an amplified detector needs to be utilized for an application, the output is in voltage. By loading the spectral responsvity characteristics of an optical detector into TracQ Basic, the software can convert voltage readings to power in watts. This is particularly useful when an amplified detector is required, such as for use with a lock-in digital amplifier and optical chopper.

The LIDA-SRS-KIT is a lock-in digital amplifier kit that includes an optical chopper and TracQ Basic at no additional cost. When the chopper frequency is synchronized to the instrument, it is able to separate small signals from large background levels of noise.

A number of amplified detectors are available from Oriel for use with the LIDA-SRS-KIT. Each calibrated, NIST-traceable detector includes a spectral responsivity data file which TracQ Basic uses to calculate output power.

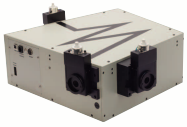
FEATURES

Instrumentation Control

TracQ Basic works with compatible detection systems and Oriel monochromators/spectrographs via their USB, RS232 or IEEE-488 (GPIB) interfaces to automate the data acquisition process. The software commands switch gratings, filters and output ports at specified wavelengths or adjust motorized slit widths at each port, for instruments equipped with these features. Various detection instrument parameters, such as filtering, measurement mode, autorange, time constant and more are also controlled by TracQ Basic.

MS260i 1/4 m Imaging Spectrographs

Cornerstone™ 130 1/8 m Monochromators



Cornerstone™ 260 1/4 m Monochromators

MS257™ 1/4 m Monochromator and Imaging Spectrographs

Legacy Oriel Merlin Radiometers

1918-R

LIDA-SRS-KIT

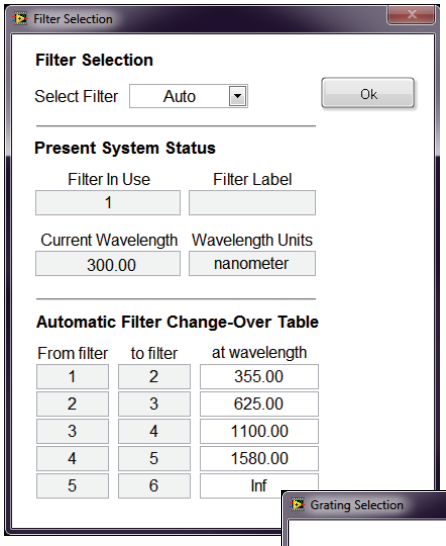
2936-R

1936-R

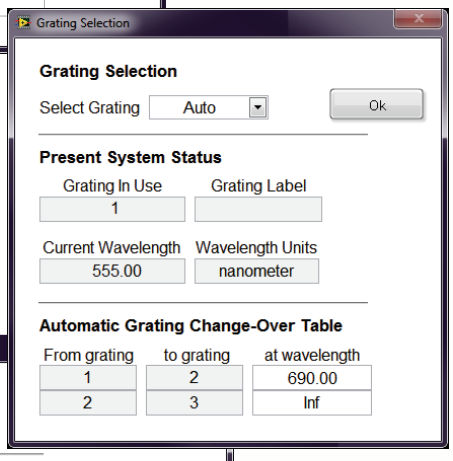
Automatic Grating, Filter and Output Port Selection

Users have the ability to select a specific grating and filter, or use the automatic selection tables when performing a scan. All that is required is to enter the wavelength(s) at which the grating or filter is changed.

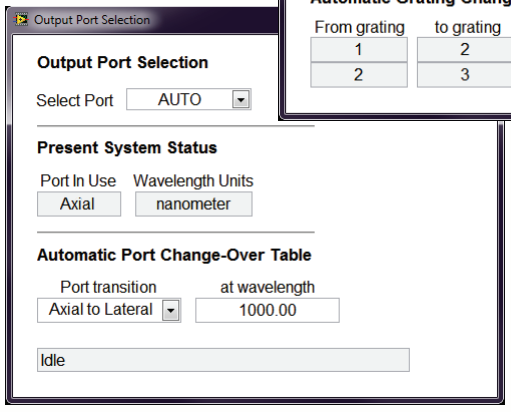
For monochromators and spectrographs featuring dual output ports, the port is selected by a motorized mirror built into the instrument. Two output ports allow continuous scanning over a broad wavelength range without needing to break down the setup to swap detectors. This mirror is controlled through TracQ Basic. The user can enter the wavelength at which the output port is switched.



Monochromator filter control screen.



Automatic grating selection settings table



The automatic output port selection feature is available with Cornerstone 260 and MS257 monochromators

Integrates Spectral Responsivity Data

Spectral responsivity data for a calibrated detector may be loaded into TracQ Basic. It must be in a text tab delimited file, with the left column listing the wavelengths in nanometers and the right column listing the responsivities in amps per watt.

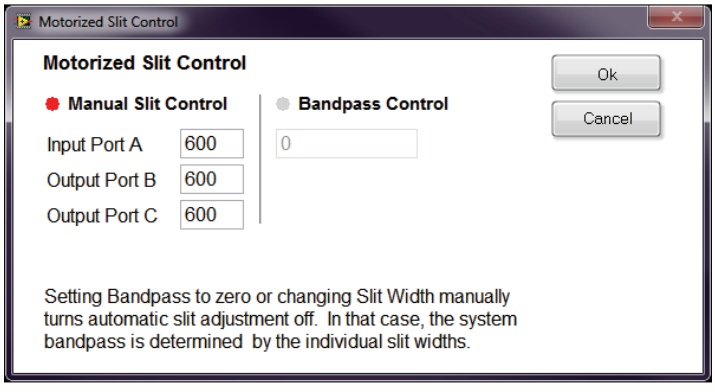
Amplified detectors provide a voltage output. Using the spectral responsivity data allows this type of detector to take optical power measurements. This is very useful when utilizing a lock-in digital amplifier. The LIDA-SRS-KIT can accept both current and voltage signals, but operates best with a voltage input. The legacy Merlin lock-in digital amplifiers accept only a voltage signal. The spectral responsivity data is required to make power measurements using a lock-in digital amplifier.

Automatic Bandpass Selection

A motorized slit assembly may be adjusted from 6 μm to 2 mm width in 6 μm steps. The slit width is controlled through the utility software, optional hand controller, optional TracQ Basic software or by using low-level commands.

An advantage of using motorized slits is that in addition to setting the slit widths individually, the software can be configured to an automatic bandpass setting. The software adjusts the slit widths to maintain the chosen bandpass as scans are performed using multiple gratings and either output port.

The mathematics involved in determining the slit width takes into account the input and output focal lengths of the instrument's design, as well as the angle of the grating at the specified wavelength.



Automatic bandpass selection is available with monochromators using motorized slits

Background Subtraction

Background light in the environment or light leakage in a system may result in data inaccuracy. For example, a dark box must be constructed to perform quantum efficiency measurements on a dye-sensitized solar cell. If the dark box is not completely light tight, the light leakage will introduce an offset into the measurements. In this situation, measurements should be taken of only the background light and saved. When background subtraction is enabled, these background measurements are subtracted from the reference or data scan.

Please note that in the case of very high background light levels, the detector will saturate. This may happen with unchopped light, or even with a lock-in digital amplifier, where chopped light must be utilized. Any unchopped background light, if intense enough, will essentially overwhelm the detector's sensor and negatively affect its ability to take readings. In cases such as this, enabling background subtraction will not resolve the situation. Excessively high background light levels must be eliminated by either using a closed optical path or making changes to the testing environment.

The time interval scan does not support background subtraction. In the case where a chopped signal is being detected, the chopper is used to separate the signal from the background radiation. When using the Newport 19xx/29xx power meter, an offset may be entered under the parameters setup for the detection instrument. The offset is set by clicking the "Set Zero" icon.

Gain Setting Integration

Oriel's amplified detectors include gain adjustment switches on their housings. For those using unamplified detectors, the model 70710 Preamplifier is available. TracQ Basic allows the user to enter the gain selections into the software. This is particularly useful during sensor characterization, when the calibrated reference detector may have different gain requirements than the device under test.

Supports Various Wavelength Units

TracQ Basic supports nanometers (nm), micrometers (um) or wavenumber (cm-1). Users should choose the wavelength units prior to taking any data. The units selected for spectroscopic data acquisition must be the same for all reference and background scans.

Monochromator Shutter Control

An electronic shutter is integrated into the housings of Oriel's motorized monochromators and spectrographs. The shutter is mounted inside the housing at the input port. TracQ Basic allows the user to control the shutter.

The shutter is used to close the light path when light is not required. This allows the light source to remain on - and therefore remain warmed up - so that it continues to provide stable performance. Additionally, restarting a lamp results in wear of the filament (with quartz tungsten halogen lamps) or wear of the anode/cathode (with arc lamps). Therefore, when the light is not needed during short periods, closing the shutter is suggested.

Multiple Communication Methods Supported

USB

- No GPIB card, serial port or USB converter cable needed
- USB 2.0 cable available from Newport
- USB driver is compatible with Win7 32 and 64 bit OS

RS232

- Simplifies setup, as no driver is used
- RS232 cable available from Newport
- Supports third-parts RS232/USB converter cables (must be LabVIEW™ compatible)

GPIB (IEEE-488)

- Simplifies setup, as no driver is used
- GPIB cable available from Newport
- Supports third-parts GPIB/USB converter cables (must be LabVIEW™ compatible)

TracQ Basic Supported Monochromators and Spectrographs

Series	Model	Interface
Cornerstone™ 130 1/8 m Monochromators	74000	RS232 and GPIB (IEEE-488)
	74004	USB
	CS130-RG-x-xx	RS232 and GPIB (IEEE-488)
	CS130-USB-x-xx	USB
Cornerstone™ 260 1/4 m Monochromators	74100	RS232 and GPIB (IEEE-488)
	74125	USB
	CS260-RG-x-xx-x	RS232 and GPIB (IEEE-488)
	CS260-USB-x-xx-x	USB
MS260i 1/4 m Imaging Spectrographs	74050	RS232 and GPIB (IEEE-488)
	74055	RS232 and GPIB (IEEE-488)
	74085	USB
	74086	USB
	MS260i-RG-x-xx-x	RS232 and GPIB (IEEE-488)
	MS260i-USB-x-xx-x	USB
MS257™ 1/4 m Monochromator and Imaging Spectrographs	77700	RS232 and optional GPIB (IEEE-488)
	77702	RS232 and optional GPIB (IEEE-488)
	77778	USB
	77780	USB
	77781	USB 2.0 and RS232
	77782	USB 2.0 and RS232

TracQ Basic Supported Detection Instruments

Series	Model	Interface
Oriel Merlin Lock-In Digital Amplifiers	70100	RS232
	70103	GPIB (IEEE-488)
	70104	RS232
	70105	GPIB (IEEE-488)
Newport Power Meters	1918-C, 1918-R	USB
	1936-C, 1936-R	USB
	2936-C, 2936-R	USB
Stanford Research Systems Lock-In Digital Amplifier	SR810	GPIB (IEEE-488)

TracQ Basic is included at no extra cost with the following instruments:

Series	Interface
LIDA-SRS-KIT Radiometry System	GPIB (IEEE-488)
Tunable Light Sources	USB, RS232 and GPIB (IEEE-488)
QEPVSI-b Quantum Efficiency Measurement System	USB

Ordering Information

Model	Description
TRACQ-BASIC-V066	TracQ Basic Data Acquisition & Spectroscopy Software, Version 6.6

Computer Requirements

TracQ Basic is provided on a USB memory stick. It includes the Newport Power Meter application for use with detection instrument models 19xx/29xx. Also included are the user manual, quick start guide, USB instrument drivers and the National Instruments™ Measurement and Automation Explorer (NI Max) application.

The appropriate communication ports for the instruments must be available on the computer. For GPIB communication, a GPIB card must be installed in the computer or a GPIB/USB converter cable utilized. When using GPIB or RS232 instruments on a computer with only USB ports, TracQ Basic supports USB converter cables that are compatible with National Instruments software.

Minimum System Requirements	
Operating System	Microsoft Windows 7 (32 or 64-bit)
Processor	2 GHz
RAM	1 GB
Hard Drive	800 MB free space
Peripherals	USB port

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