

Low Noise QCL Driver Instrument Operation and Applications

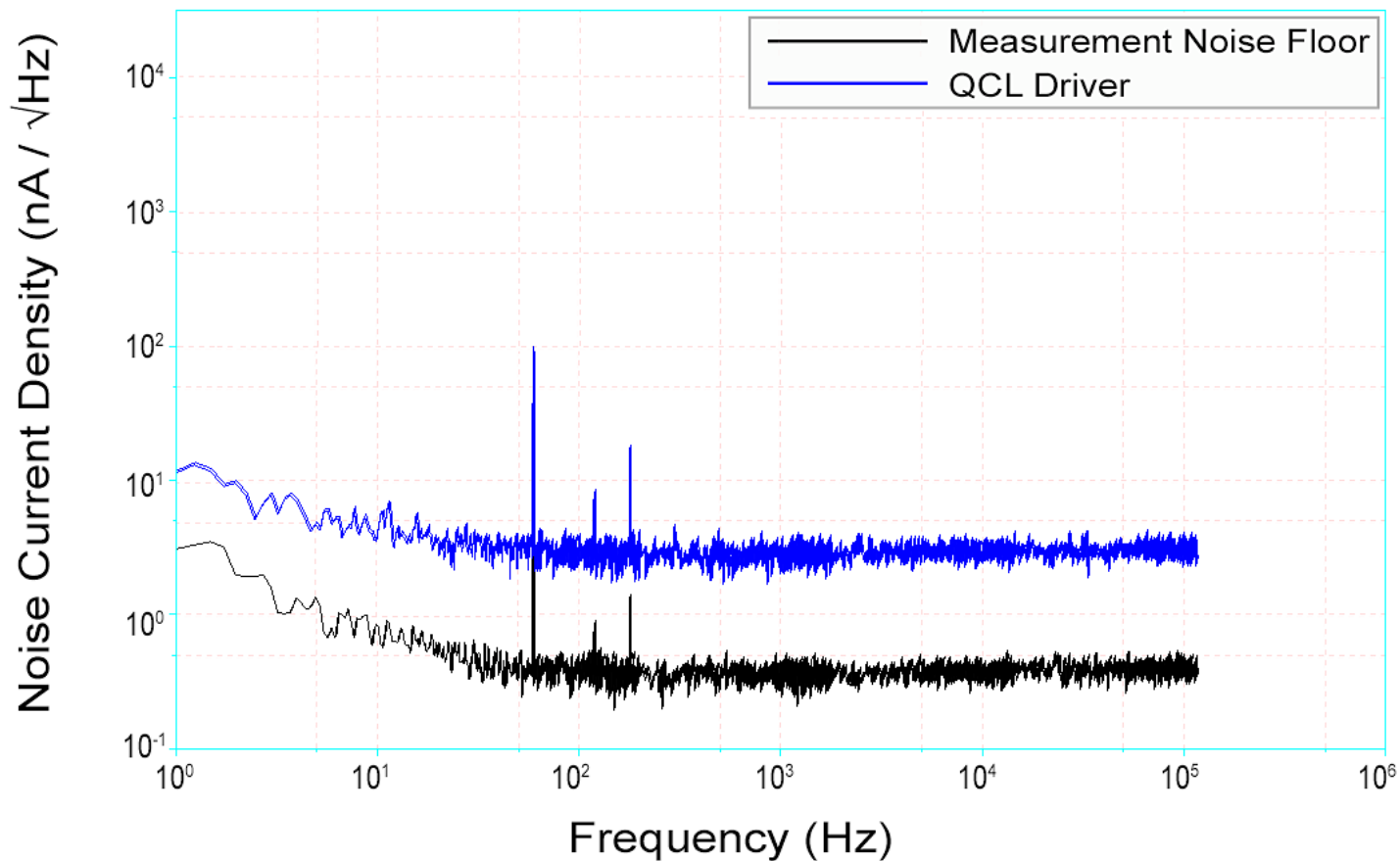
- ◆ Low Noise (QCL500 LAB or OEM):
 - » $<0.4\mu\text{A RMS}$ (100 kHz)
 - » $1\text{ nA} / \sqrt{\text{Hz}}$ current noise density
- ◆ For QCLs or anode-grounded laser diodes
- ◆ Four current levels:
500 mA, 1 A, 1.5 A, 2 A
- ◆ Constant current source
- ◆ Up to 20 V Compliance Voltage
- ◆ 2-3 MHz Bandwidth
- ◆ Robust safety features
- ◆ Patented technology



BASELINE DRIVER NOISE

(QCL1500 at 100 mA)

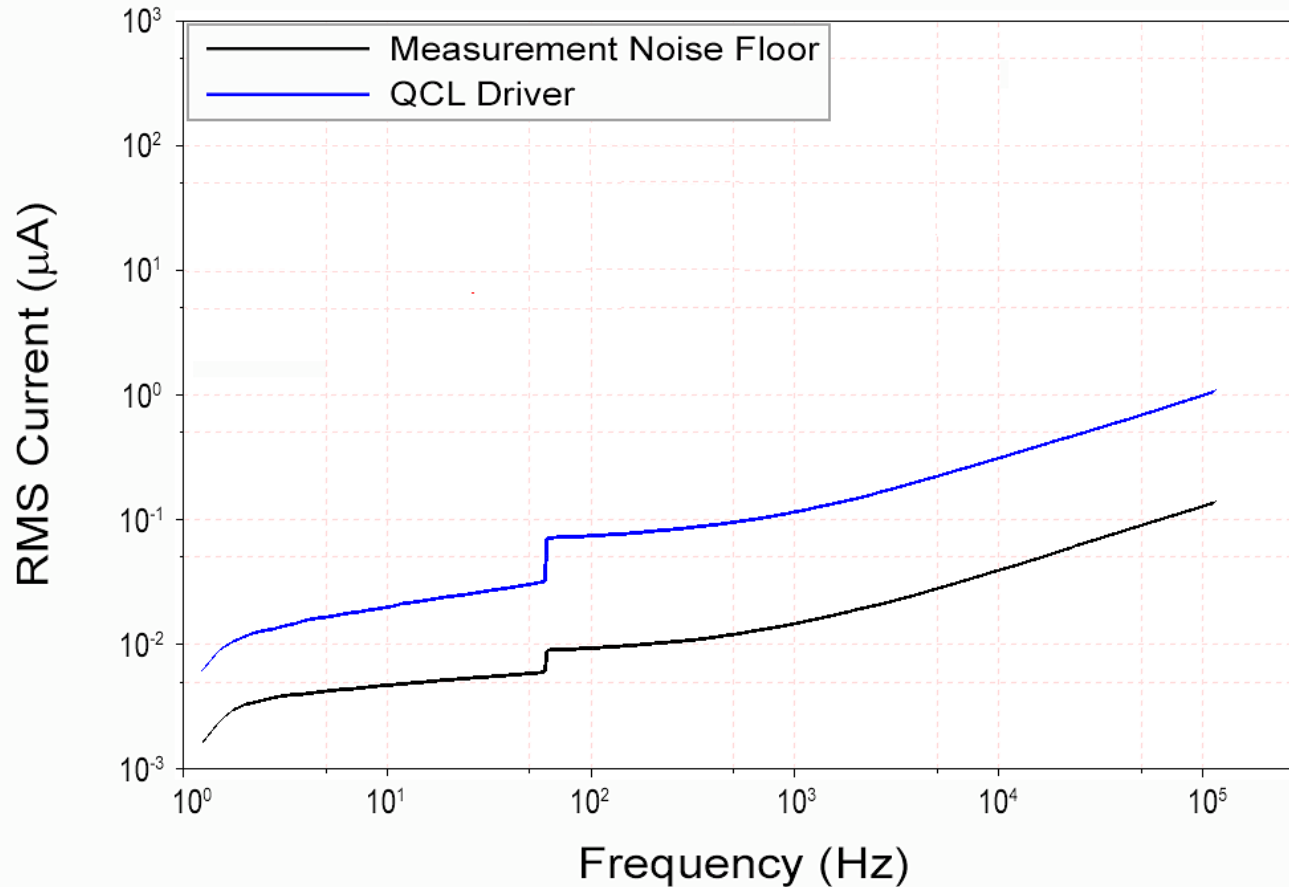
Noise Current Density vs. Frequency for QCL Driver



CUMULATIVE NOISE

(QCL1500 at 100 mA)

RMS Noise Current vs. Frequency for QCL Driver

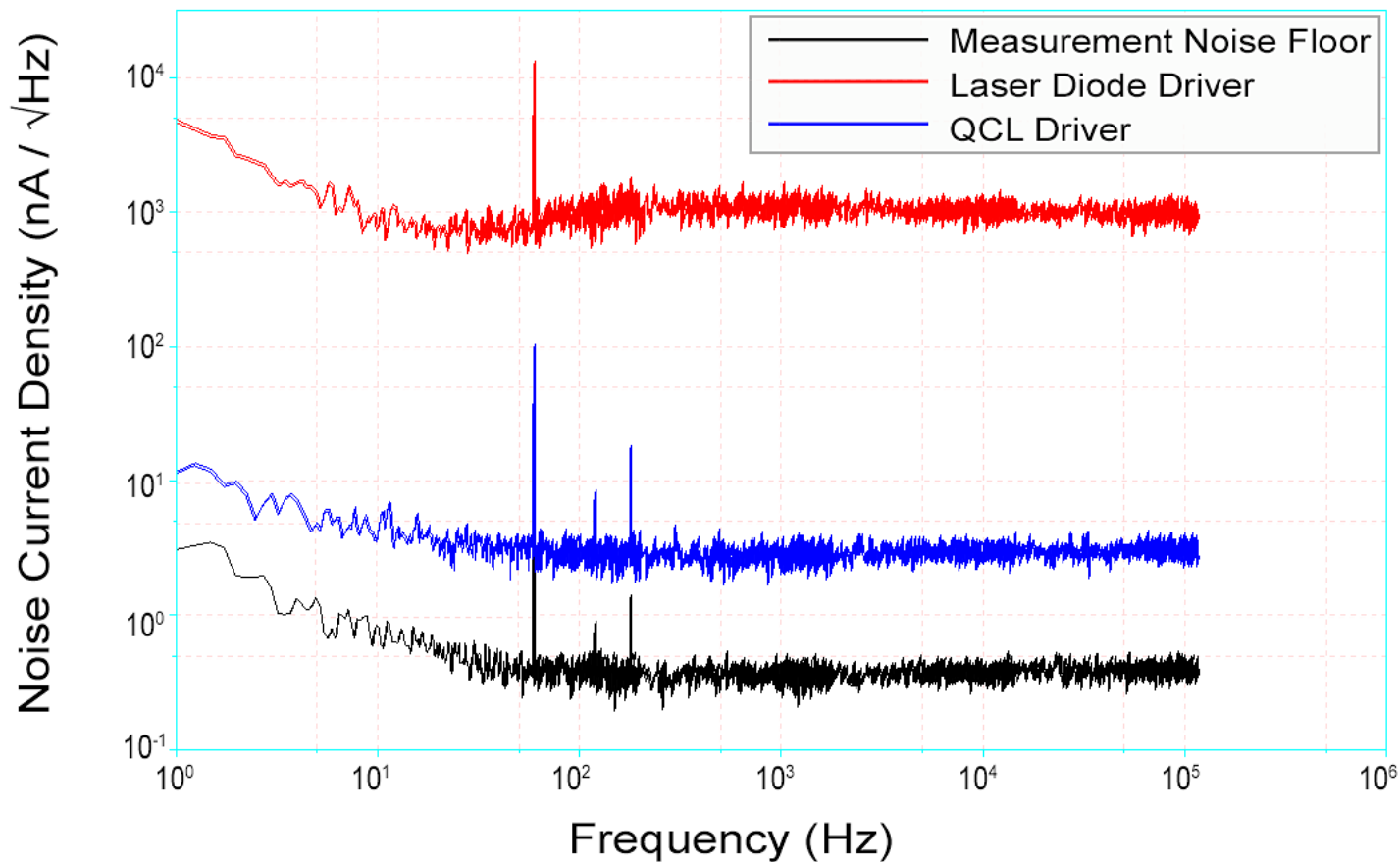


WAVELENGTH
ELECTRONICS

BASELINE DRIVER NOISE

(QCL1500 at 100 mA)

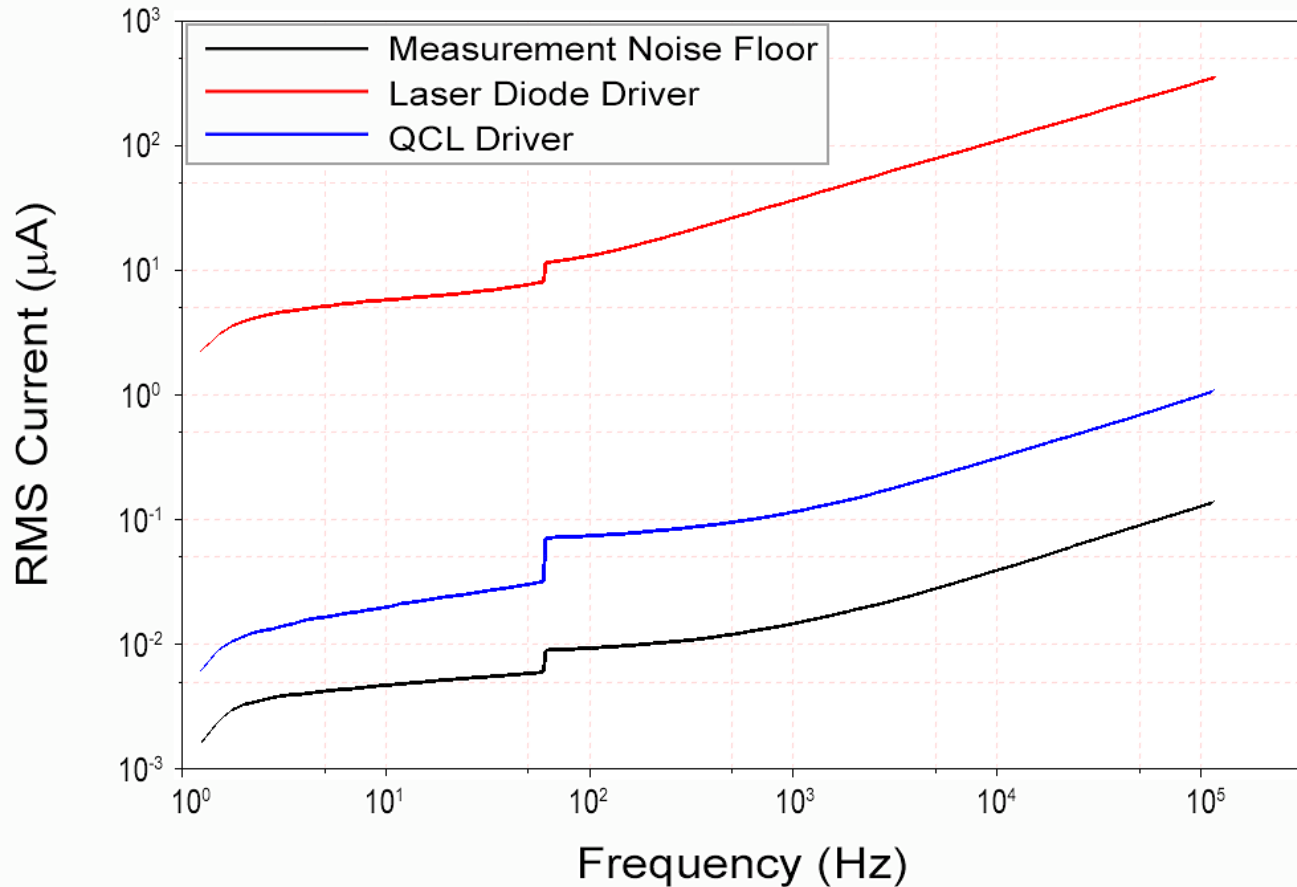
Noise Current Density vs. Frequency for LD and QCL Driver



CUMULATIVE NOISE

(QCL1500 at 100 mA)

RMS Noise Current vs. Frequency for LD and QCL Driver



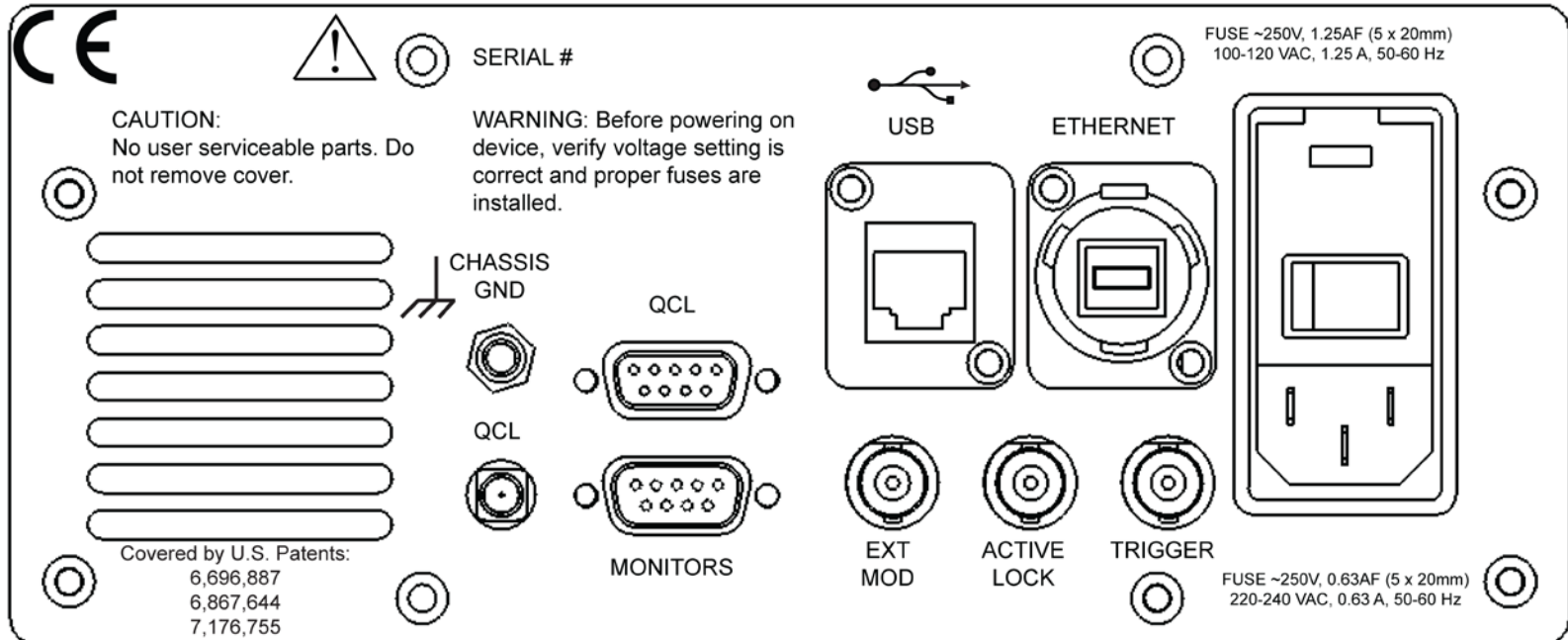
What does Low Noise mean in real life?

- ▶ The linewidth of the QCL narrowed.
- ▶ The center wavelength did not vary.
- ▶ The scans became much more repeatable, indicating the signal-to-noise ratio was significantly improved.
- ▶ Laser diode driver electronic noise was masking:
 - » optical noise
 - » mechanical jitter
 - » software bugs.
- ▶ Once fixed, sensitivity improved by an order of magnitude.

Related Application Notes

- ▶ **TN-LD02:** *How is Current Noise Measured at Wavelength Electronics?*
- ▶ **AN-LD08:** *Manage Ground Loops to Minimize Noise with the QCL Drivers*
- ▶ **AN-LD09:** *Troubleshooting Low Noise Systems*
- ▶ **AN-LD14:** *Quantum Cascade Laser Driver Basics*
- ▶ **AN-LD15:** *An Introduction to Quantum Cascade Lasers*

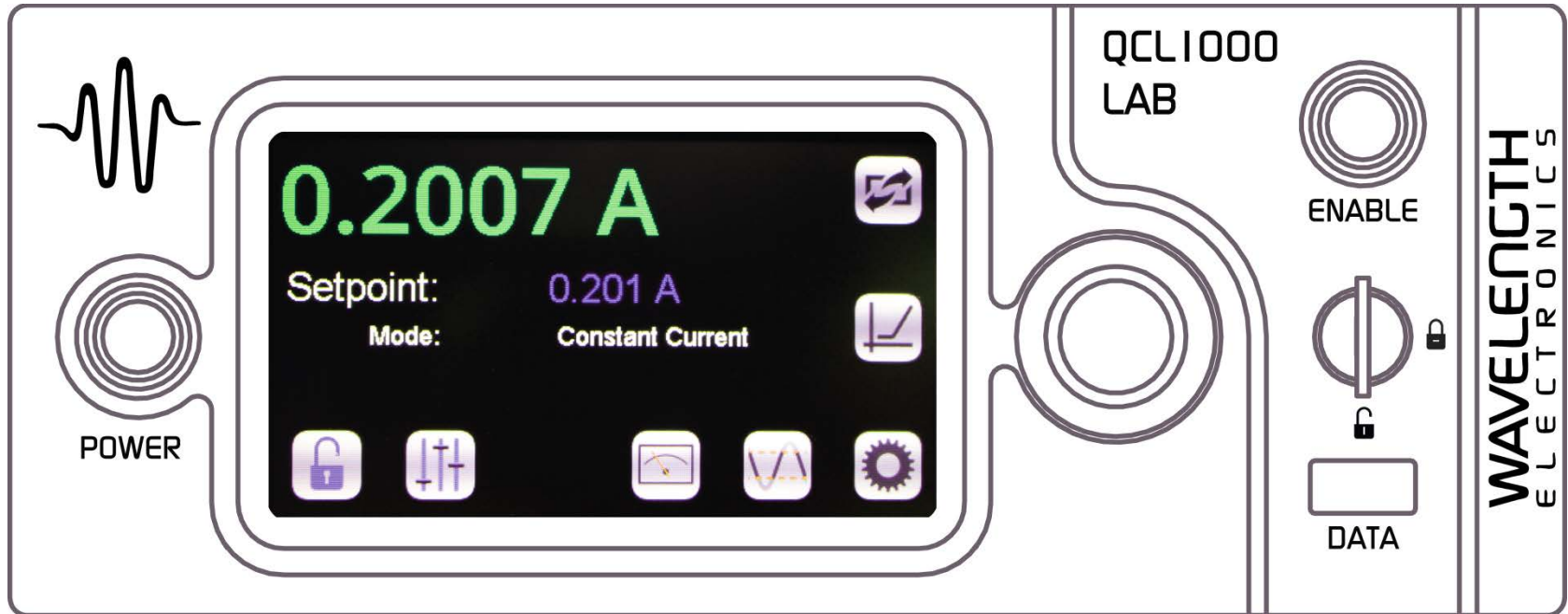
REAR PANEL



LIMIT SCREEN



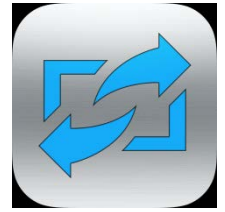
CONTROL SCREEN



ROBUST SAFETY FEATURES

- ▶ Adjustable soft-clamp Never-Exceed current limit
- ▶ Password protection for critical settings
- ▶ Key switch, active and passive interlocks
- ▶ Current ramp
- ▶ Slow start delay
- ▶ Brown-out & overvoltage protection
- ▶ Driver over-temperature protection
- ▶ Relay shorts output when current is disabled
- ▶ Open circuit & short-circuit protection

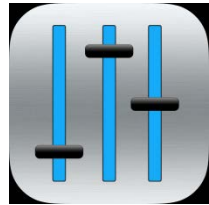
ICONS



Save/
Recall



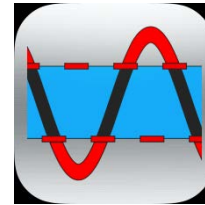
Lock



Control



Monitor



Limit



Settings



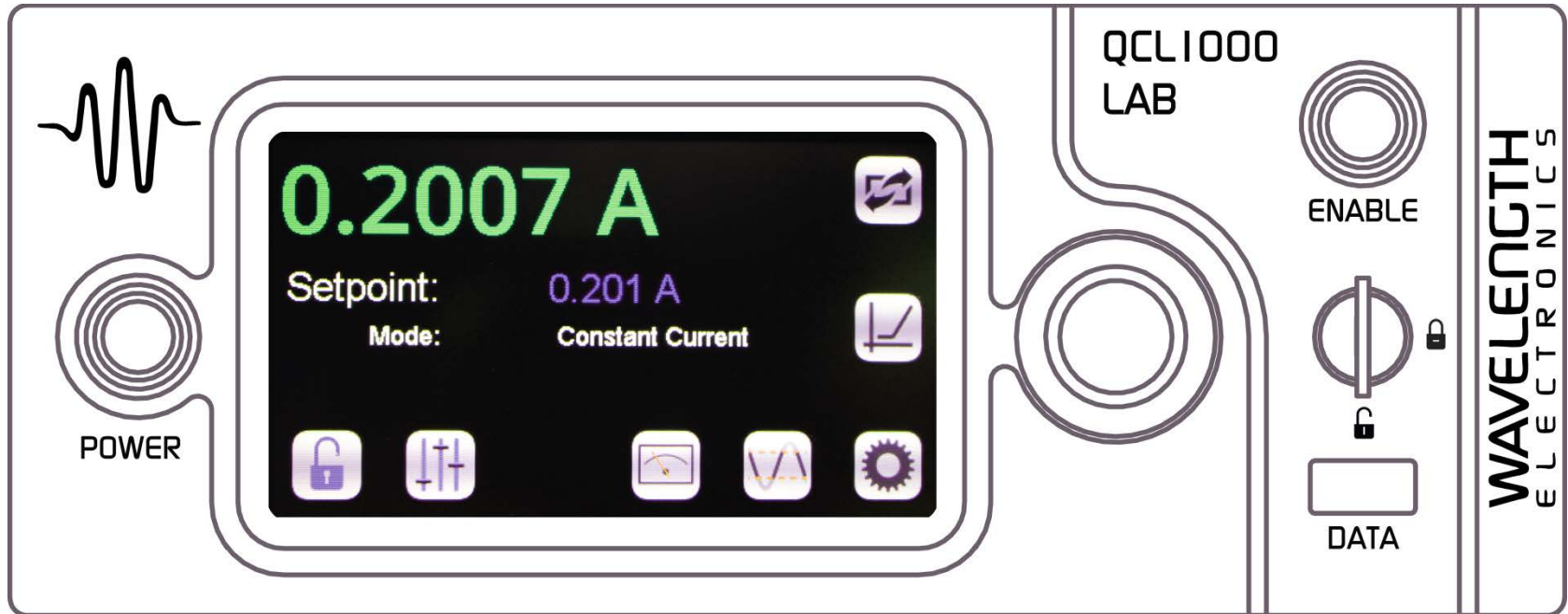
Password
Protected



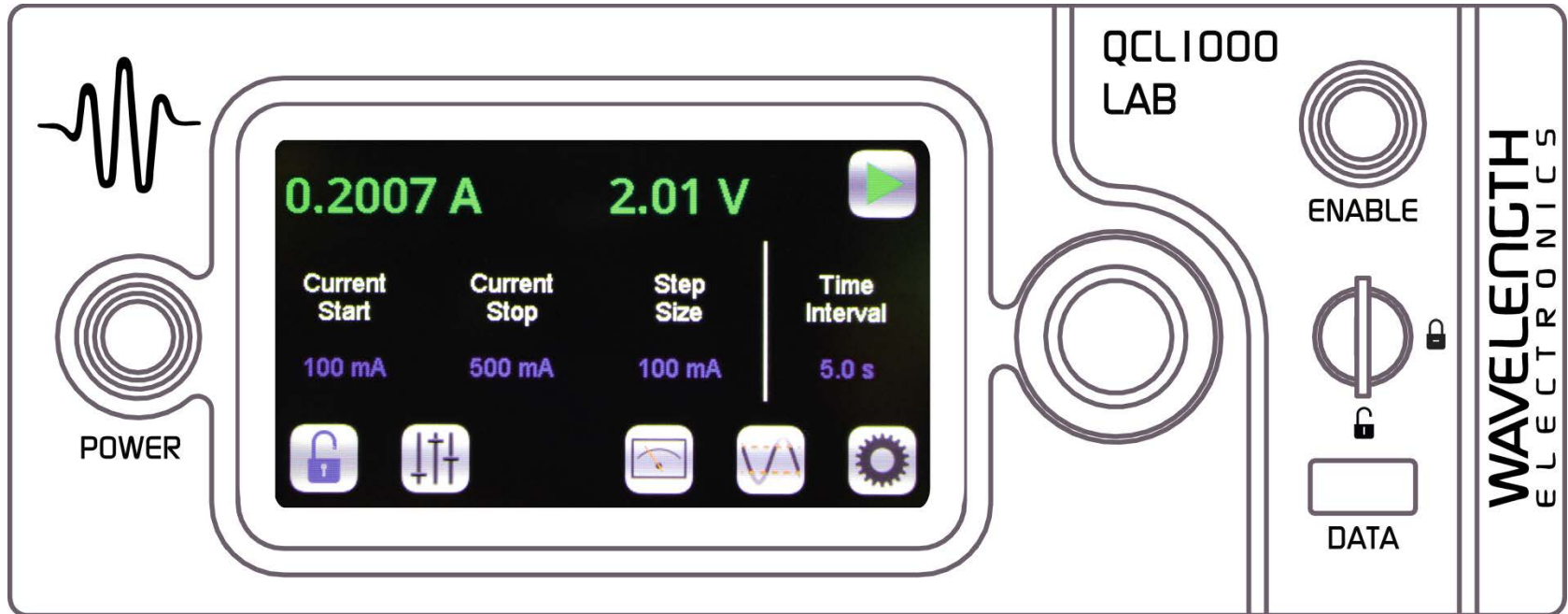
VI
Scan



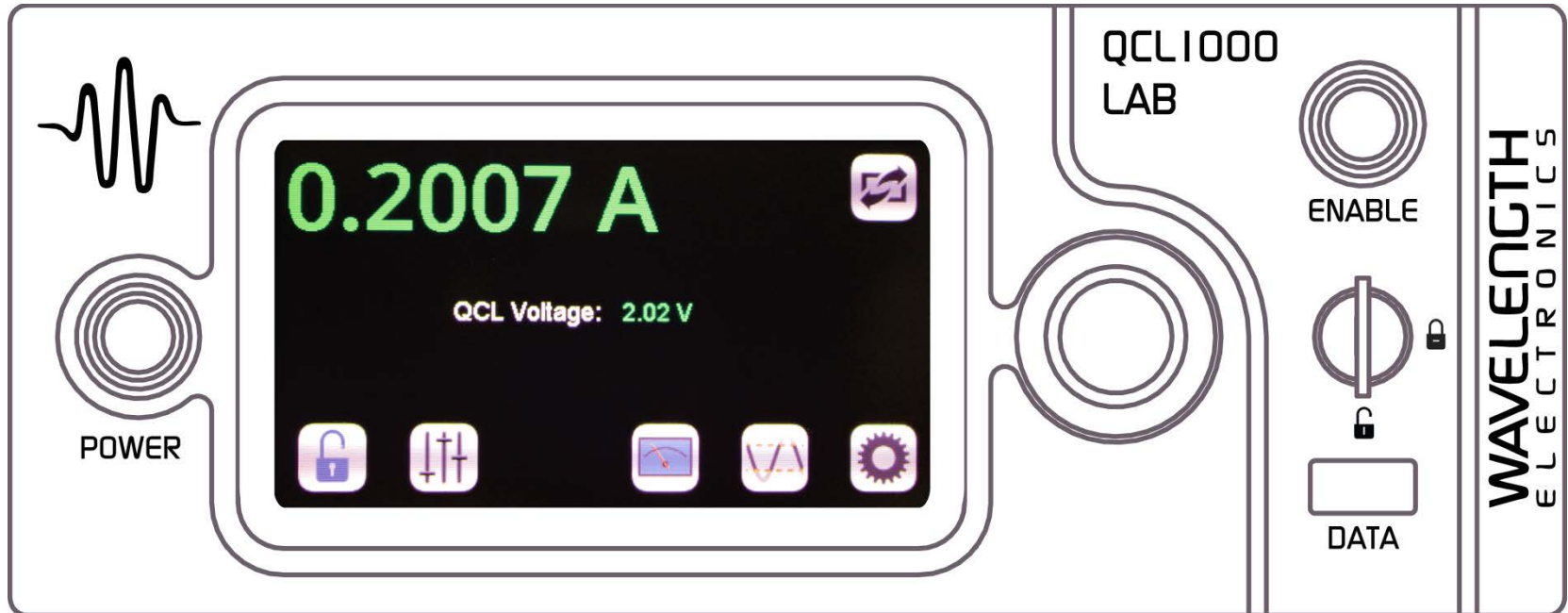
CONTROL SCREEN



VI SCAN



MONITOR SCREEN



LIMIT SCREEN



SAVE/RECALL SCREEN



Applications

Due to their unique construction, QCLs operate with high power in the near-IR through terahertz ranges. These wavelengths are particularly suited to detection of molecules significant to humans. Applications include:

- ▶ trace gas analyzers
- ▶ remote detection of explosive materials
- ▶ medical diagnosis using the breath
- ▶ non-invasive glucose testing
- ▶ emissions monitoring – marine, power generation
- ▶ pharmaceutical process quality control
- ▶ anesthesia and hospital air quality monitoring
- ▶ leak detection in industrial processes



▶ ORDERING INFORMATION

500 mA	QCL500 LAB or OEM
1 A	QCL1000 LAB or OEM
1.5 A	QCL1500 LAB or OEM
2 A	QCL2000 LAB or OEM

▶ ACCESSORIES

- » NOISESCAN
- » QCLTL-LO, QCLTL-1500, QCLTL-2000
Test Loads
- » RCKMT-LABSINGL, RCKMT-LABDUAL
Rack Mount Kits
- » INTLK REPL KIT
Interlock Replacement Kit

▶ PATENTED TECHNOLOGY

(Licensed from Battelle Memorial Institute)

- » 6,696,887
- » 6,867,644
- » 7,176,755



QCL & LASER DIODE DRIVERS TEMPERATURE CONTROLLERS



SOUTH HALL, BOOTH #2406

If you would like

- hands-on experience with the new QCL LAB instrument
- additional information about our QCL drivers
- time to discuss your particular precision control needs

Come visit our booth.