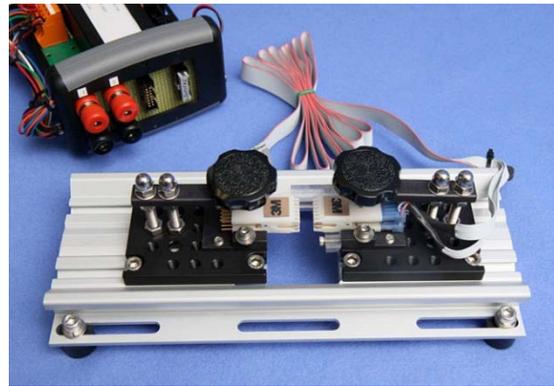


Photovoltaic (PV) IV test Stations



A design for every need

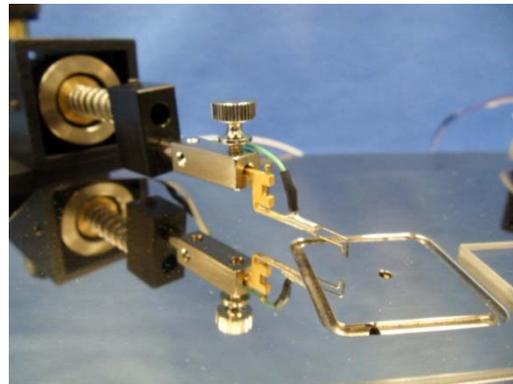
Abet Technologies' Photovoltaic (PV) IV Test Stations come in many flavors: from a simple alligator clip cable set to connect to your electronic load to a complete integrated system with dark curve enclosure, multi-range electronic loads and software controlled relay banks for switching between the various operating modes. A few standard models will be described below.



Test Station Typical Features

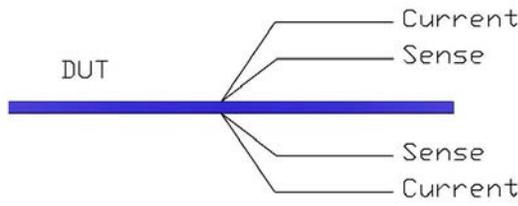
- Vacuum chucks with zones for standard and custom cell sizes, 3 mm to 300 mm
- Four wire test methodology standard
- Top-bottom, top-top, and bottom-bottom contact geometries accommodated
- Electrical contacts using spring loaded bus bars, micromanipulators and custom base pads available
- Bus bar and micromanipulator options easily field switchable
- Glove box compatible models
- Multi-cell devices accommodating models
- Top, side or bottom illuminated models
- Wide temperature range cooled/heated models
- Basic models can be field modified for temperature control
- NIST traceable temperature monitoring
- Attenuator for Bowden method of R_s determination often included
- All tools and components for normal use and maintenance included

However, if your needs are a little different please do ask - a high percentage of our sales addresses special test requirements with custom designs at near off the shelf prices.



Electrical connections

High grade electrical contacts to the solar cell are critical to the quality of data obtained. Most Abet Technologies' stations allow four wire connectivity to minimize the impact of current flow on voltage measurements.



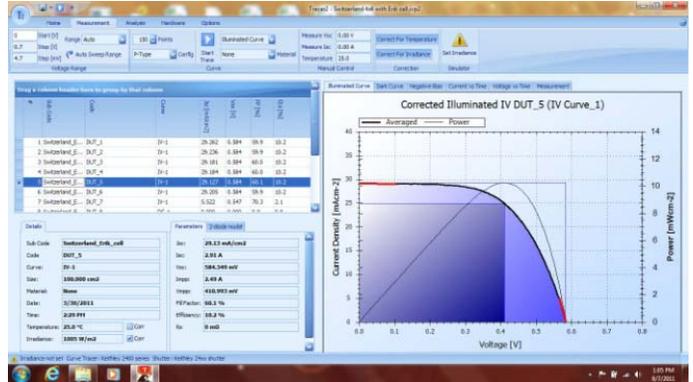
Most of the spring loaded contacts are gold plated for long term stability. Serrated end contacts are most popular as they desensitize the system to flux residues or contacts oxidation on the cells being tested.



Electrical loads

Abet Technologies offers a selection of off the shelf and custom electronic loads from 1 nA to 40 A and above current levels. Order electronic load separately to match you cell's current range. Keithley 24xx series or 2601A SourceMeters™ serve well for smaller current cells and for dark

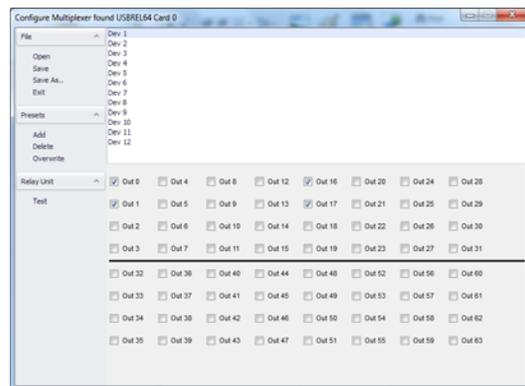
curves. Above 5A combination of DAQ controls and Kepco bi-polar amplifiers are offered. Some of these loads can be sensitive to the high capacitance characteristics of solar cells. Stabilizing solutions are offered to minimize the impact of that sensitivity on test results.



Software

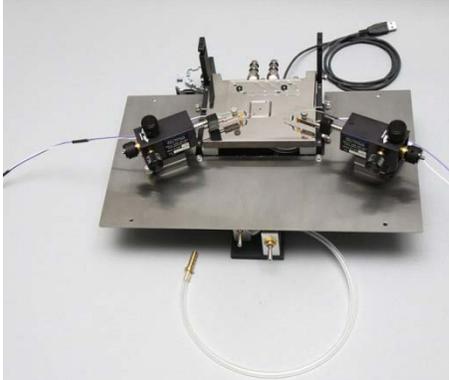
Data acquisition and parameters extraction is accomplished under user friendly and full featured Tracer™ software control.

Multiplexer option speeds up multi-device IV metrology.

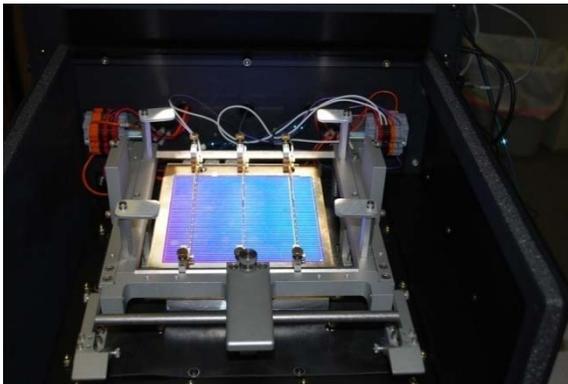


Probes

Micromanipulator probes make multi-device patterns testing an easy task. Each probe can be equipped with a single contact or isolated current and voltage contacts.



Bus bar contacts match standard cell metalization patterns and offer isolated sense metrology as usual.



Field retrofittable dark enclosures are available for dark curve data acquisition.

Numerous options are offered for both top and bottom contact geometries to match the design creativity of solar device researchers and manufacturers.



Reference cells

Absolute metrology requires a reference cell. Calibrated crystalline silicon cells are offered with fused silica or filter windows to minimize the spectral mismatch to user's devices. Relative Spectral Response calibration option available.



Electrical readout options include inexpensive hand held meters as well as interfaces to the electrical loads used for device testing.

Each station is shipped with a number of accessories and options, too numerous to list in this document. Your station quote will include all the items to be included in the shipment.

For most stations vacuum service is required. Small vacuum pumps are available if your lab does not provide it.

Most stations are shipped temperature control ready and with a NIST traceable temperature monitor attached. Ask us about recirculating heated chiller options to make your station temperature controlled.

Order electronic load separately to match your cell's current range. Keithley 24xx series or 2601A SourceMeter™ serve well for smaller current cells and for dark curves. Above 5A combination of DAQ controls and Kepco bipolar amplifiers are offered.

Ordering information

15102 Temperature Control Ready Test Station for up to 50x50 mm cells.

Includes a multi-zone vacuum chuck and one 15135S Probe Bar.

15104 Temperature Control Ready Test Station for up to 50x50 mm cells, micromanipulator probes ready.

Includes a multi-zone vacuum chuck and a stainless steel magnetic platform. Order magnetic base micromanipulators and probes separately.

15110 Station, Multiplexer Enabled, 14 devices

15202 Temperature Control Ready Test Station for up to 156x156 mm cells.

Includes a multi-zone vacuum chuck, two 15236 Probe Bars.

15205 Temperature Control Ready Test Station for up to 156x156 mm cells, micromanipulator probes ready.

Includes a multi-zone vacuum chuck and a stainless steel magnetic platform. Order magnetic base micromanipulators and probes separately.

15210 Temperature Control Ready Test Station for up to 210x210 mm cells.

Includes a multi-zone vacuum chuck and two 15237 Probe bars.

15212 Temperature Control Ready Test Station for up to 300x300 mm cells.

Includes a multi-zone vacuum chuck, two 15238 Probe Bars.

Accessories

10156 Dark Enclosure for 15202 stages

10158 Dark Enclosure for 15210 stages

10160 Dark Enclosure for 15212 stages

15150 Calibrated Reference Cell

15154 Relative Spectral Response Option

15158 Reference Cell Readout, 1 Ohm shunt

15159 Reference Cell Readout, 1 Sun Calibrated

15250-R or -L Micromanipulator right/left hand

Includes magnetic base; right/left hand models to allow close positioning. Includes one IK1B10D1F Kelvin probe with flat tip BeCu .38 mm dia contacts separated by 0.64 mm. Other probe sizes and types available.

15274 Keithley 24xx stabilizing circuit

15275 Vacuum pump, 115 VAC

15276 Vacuum pump, 230 VAC

15277 64 Relay Multiplexer, 1A per channel

778927-01 USB to GPIB adapter

Please contact Abet Technologies for help with ordering other station types, electronic loads matched to test devices, recirculating heated chillers, additional accessories and optional equipment.