

# RapiTrim™ -C-IR

Laser Resistor Trimming System for Thick and Thin Film Resistors



## RapiTrim-C with IR (1064 nm) Laser

Long-life, low maintenance air cooled laser producing short pulses with high peak power for rapid ablation of resistor while minimizing damage to the substrate. Suitable for both thick and thin film materials.

- Unique, proprietary flying probe technology for rapid, accurate trim and test operations
- No restrictions on component size, shape, orientation or density
- Optimized for hybrid, PCB, SMT and embedded circuit trim and test
- Fast job changeover for quick-turn production
- High accuracy throughput with advanced probe and laser spot position control

## Designed for Next-Generation Circuit Trim and Test

Lower cost of operation than fixture-based trimmers with no expensive probe cards to buy. Enhanced layout capability results in no limit on circuit size, orientation or density. Operational flexibility is improved since the system is fully programmable with no waiting days for probe cards. The resulting system is as comfortable in high volume production as in a high-mix quick-turn environment.

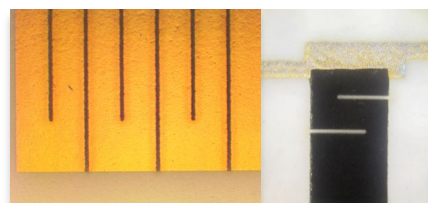
## Advanced ProSys™ Control Software

ProSys software allows for automated file conversion and job generation and provides a vision display of the job features and process status. All machine setup calibration controls, job and process settings, vision and process map, status and diagnostic information are accessible with a single click or tap.

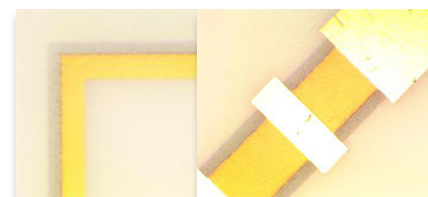
Laser process tools allow precise control over laser energy, bite size, cut direction and trim limits.

## Capabilities

- Thin film and thick film trimming
- Simple two-probe measurement to guard probe to full Kelvin probing
- Optional active circuit trimming with on-board or external instruments
- Optional process sequence customization



Serpentine trims in thin and thick films.



Corner shave trim and symmetrical shave trim.

RapiTrim systems use proprietary fixtureless technology so probe cards and their inherent limitations are eliminated. Restrictions on design layout are lifted, and operational delays waiting for probe cards are removed.

## The RapiTrim™ Fixtureless Advantage

RapiTrim systems enable volume production trim and test using flying probe technology for advanced hybrid circuits and embedded passives.

Using proprietary fixtureless technology, probe cards and their inherent limitations are eliminated. Restrictions on design layout are lifted, and operational delays waiting for probe cards are removed.

Circuit designers are no longer limited by the practical size and density of probe card designs:

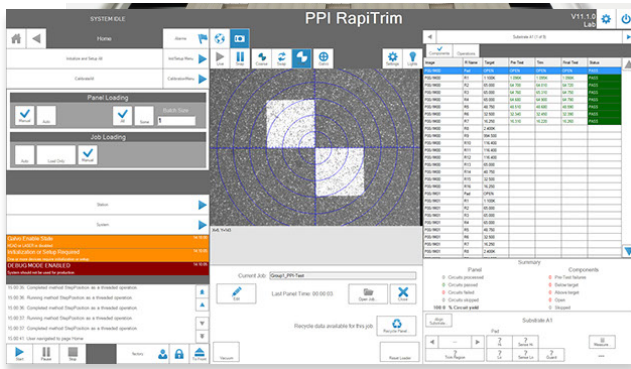
- Circuits can be as large as the substrate itself.

- Probing of dense designs is effortless - this previously required multiple passes with multiple probe cards.

- Four independent flying probes - any component location, size, orientation and layout can be accommodated.

RapiTrim systems function as stand-alone testers, improving ROI.

High reliability fiber laser provides unmatched stability and low cost of ownership.



## RapiTrim Standard Features

Intuitive graphical user interface with ProSys operating software.

Advanced beam positioning and laser pulse control provides high throughput, accuracy, and process stability.

High accuracy measurement system. Auto-calibration functions ensure repeatable quality.

Extensive system diagnostics continuously monitor all critical components and machine performance.

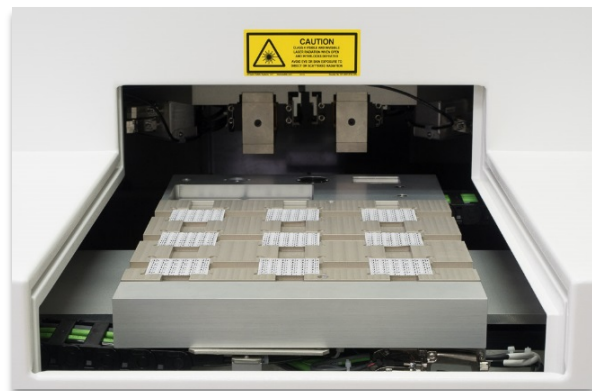
Sealed beam delivery protects optics from process debris, extending component lifetimes.

Touch screen operation (full HD size).



## Custom part fixturing for hybrid circuits or other small substrates

These fixtures are designed in collaboration with the customer and supplied with the system. This is an example of a custom 9-up fixture with locating pockets and vacuum hold-down.



## Software Features

Simple operator interface - load substrates and job, then just press Start.

Process map - visualize all job components in map or camera overlays. Clearly see immediately what and where the process is, in real time, including pass / fail indication.

Visualize trims and markings in the map or camera overlay on actual resistors.

Process multi-up, panelized, or individual fixtured substrates.

Laser scribed marking for serialization and circuit pass / fail status.

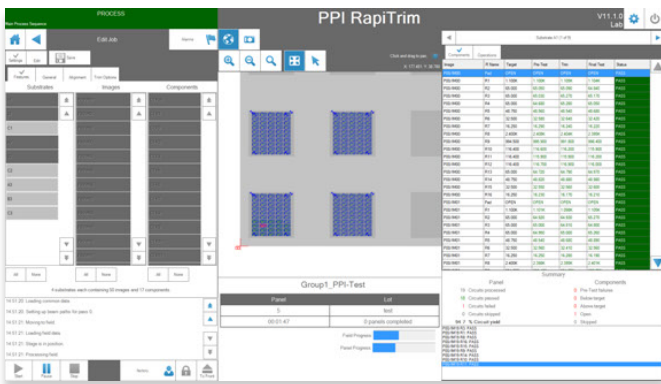
Probe touchdown counter can be used for predictive tip replacement.

Trim profile graphing for detailed process analysis.

Maintenance Tracker keeps log of all system maintenance and history and provides prompts at maintenance intervals.

Full system diagnostics and data logging for enhanced product support and predictive maintenance.

Remote access through the internet allows factory support without the cost of a service visit.



## Trim and Test Results

Easily view detailed results for each component.

Data logged by substrate serial number, providing off-line historical data review and tracking and statistical data report generation.

## Job Creation

Create jobs through an interactive graphical map of components, circuit features, alignment targets, and trims.

Extensive DXF and IPC-D-356 file import support automates and speeds job creation.

Resistor location, orientation, values, and limits are automatically defined.

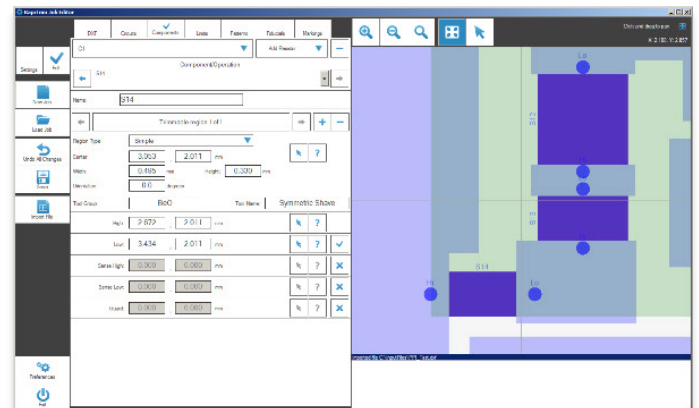
Probe test points can be automatically defined from DXF metallization information.

Interactive graphical process library editor - no programming required.

Trim and measurement tools can be shared by resistors of different sizes and orientations, minimizing setup steps.

Settable min / max cut length limits.

Independent control of laser pulse energy, repetition rate and bite size.



## External Instrument Support

The trim controller can interface to external instrumentation for passive and active trim operations using standard LAN (LXI) interface. Such instrumentation can be digital multimeters, source-measure units, signal generators, power supplies or external loads.

## Switching Matrix

The SM200 base signal routing switch card provides expanded signal routing functionality for active trim and specialized measurement applications.

# RapiTrim Specifications\*

## Trim Types and Accuracy

- Single-plunge, double-plunge, L, L-Vernier, scan, serpentine, and custom multi-leg cut types
- Typical trimmed resistor distribution <1% (3 sigma)
- Advanced laser pulse control optimizes the process and minimizes substrate damage

## Optical System

- High reliability fiber laser or DPSS laser. Air cooled, long lifetime. IR wavelength
- Spot Size: 10 - 50  $\mu\text{m}$ .
- Automated laser power calibration with integrated power meter
- Automated vision system for precision alignment with scaling, offset, trapezoidal and rotation compensation
- Low mag camera field: 20 mm (diag)
- High mag camera field: <3 mm (diag)
- Beam scanning field: 50 x50 mm
- Beam placement accuracy 15  $\mu\text{m}$  (3 sigma) over whole process area
- Beam position resolution <0.5  $\mu\text{m}$
- Telecentric scan optics on precision z-axis focus stage with 0.5 $\mu\text{m}$  resolution

## Mechanical System

- Precision linear motor XY stages with linear optical encoder feedback
- XY travel: 300mm x 450mm
- XY Accuracy: <5  $\mu\text{m}$
- XY resolution: 0.1  $\mu\text{m}$
- XY repeatability: 0.1  $\mu\text{m}$

## Moving Probes

- Number of flying probes: 4
- Range of tip sizes and materials for single or full Kelvin (double tip) probes
- Automated probe tip calibration
- Probe positioning accuracy: <25  $\mu\text{m}$
- Probe XYZ resolution: 0.5  $\mu\text{m}$
- Probe repeatability XYZ: <10  $\mu\text{m}$
- Servo controlled tip contact

## Measurement System

- Fully programmable force voltage or force current
- Resistor range: 0.1 Ohm to 1 GOhm
- Ratio trim and guard functions
- Resistance measurement accuracy:

Low Range (<10  $\Omega$ ):  $\pm 0.05\%$  ( $\pm 0.05\% / R$ )\*

Mid- Range: (10  $\Omega$  to 1 M $\Omega$ )  $\pm 0.05\%$ \*

High Range (>1 M $\Omega$ ):  $\pm 0.05\% \pm 0.02\%$  per M $\Omega$ \*

- Voltage Source Ranges and Measurement Accuracy:

| Range            | Resolution       | Accuracy (% FSR)* |
|------------------|------------------|-------------------|
| $\pm 20\text{V}$ | 80 $\mu\text{V}$ | +/- 0.01%         |
| $\pm 2\text{V}$  | 8 $\mu\text{V}$  | +/- 0.01%         |

- Current Source Ranges and Measurement Accuracy:

| Range             | Resolution      | Accuracy (% FSR)* |
|-------------------|-----------------|-------------------|
| 4 $\mu\text{A}$   | 30 pA           | +/- 0.1%          |
| 40 $\mu\text{A}$  | 300 pA          | +/- 0.05%         |
| 400 $\mu\text{A}$ | 3 nA            | +/- 0.01%         |
| 4mA               | 30 nA           | +/- 0.01%         |
| 25mA              | 200 nA          | +/- 0.01%         |
| 250mA             | 2 $\mu\text{A}$ | +/- 0.05%         |

\* after measurement system calibration, full Kelvin

## Part Handling

- Part handling up to 300x300mm on system vacuum chuck

- Easy access sliding doors with two hand safety operation

## Software

- Auto-import and job creation from DXF
- Automatic substrate vision alignment
- Configurable part marking and serialization
- Automatic system run-time calibration
- Windows® based user interface with multi-level password protection
- All measurement data logged as part of normal operation
- Real-time system diagnostics and health logging
- Internet connection allows factory personnel to provide remote support

## Options

- Automatic part loader / unloader
- Automatic probe tip changer
- Optional network interfaces
- Automated barcode reading functions and job creation / loading
- Custom fixturing
- External instrument support
- Switching matrix

## Facilities Requirements

- Electrical: 200-240VAC, 1ph, 30A, 50/60Hz
- Exhaust: ablation debris removal through 38mm diameter duct.
- Compressed air: 6 bar, 56 l/min, dry and oil-free

\*specifications are subject to revision

