RapiTrim Solutions

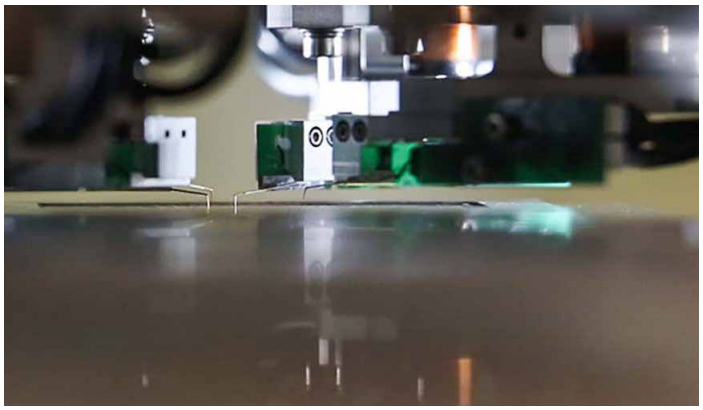
Comparison of Flying Probes Versus Probe Cards

There can be much debate between manufacturers of resistor trimming equipment as to which is better, a flying probe system or a probe card system. Since PPI offers both probing options (among other custom methods) in its RapiTrim series we thought it would be useful to provide a meaningful and unbiased comparison.

The first thing to define in this debate is what is meant by "better", which can only be determined in the context of the customer's requirement. The two extremes of customer situation can be identified: 1) the high mix, quick-turn facilities producing hybrid circuits with a high density of resistors needing to be trimmed, and 2) high volume facilities producing circuits or components that change product infrequently and the product can be trimmed in a single pass. There is a continuum of customers in between these extremes.

High mix, quick-turn.

Due to frequent job changes, the requirements of this customer will be easy job creation and easy job changeover, in addition to the standards of low cost of operation and high throughput. All these are well satisfied by the RapiTrim-C models with flying probes. The DXF auto-import function is a huge benefit to job creation over old-school techniques of programming every step required. Since no probe cards are involved, changing jobs is as simple as closing one job on the computer and opening the next. The low cost of operation and high throughput go together in terms of productivity per dollar of operating cost. With dense circuits that would require two or three passes to fully test and trim with probe cards, the flying probe systems have proven to be much more productive. Only a single processing pass is required, providing a significant advantage in throughput for about the same cost of operation. Customers get the same job done in less time, which either saves money or the available time can be used to trim more product and improve profitability. Real-life examples are provided in our Case Studies.



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High volume of low density components.

Changing and aligning probe cards takes time, and any such overhead time is not available for trimming product. The benefit of probe cards is seen in simple layouts where the probes can access all test points of a circuit or multiple individual components as in an array of small sensors on a substrate. The XY stage movement presents a fresh circuit or set of DUTs to the probe card and laser process field. A simple Z move by the probe card contacts many resistors at the same time. The laser can then quickly trim many resistors with this one move, sharing that overhead time and providing efficiency. The components are easily accessed in turn by the SM200 switch matrix.

Manufacturing sites don't necessarily face one of these extreme situations, of course, but rather somewhere in between. PPI can provide advice on the merits of either probing technique for a customer's intended product mix.

"Better" for some may even mean buying another one of what they have. Even though the hardware is dated, the software primitive requiring custom programming, and the user interface awkward, this is what they know. But even if the choice is for probe cards, customers don't need to continue to suffer with an outdated control system. Consider all the common factors of the RapiTrim design available to the probe card version and the flying probe version as listed below. Customers can have all the benefits they perceive from a probe card system, including continued use of their library of standard probe cards, but with a more modern, easier-to-use system.

Feature or Benefit	Flying Probe	Probe Card
Choice of laser wavelength (1064, 532 or 355nm)	Y	Y
Different spot size options	Y	Y
Choice of probe tip needles	Y	Y
Full Kelvin measurement available	Y	Y
Advanced ProSys user interface	Y	Y
DXF auto-import function	Y	Y
Multi-up configuration of substrates on chuck	Y	Y
On-board self-calibration	Y	Y
Real-time resistance measurement during trim	Y	Y
Full range of trim types available, including custom trims	Y	Y
Z-control of probe touchdown	Y	Y
TeamViewer pre-installed for remote diagnostics	Y	Y
Automation options for load / unload	Y	Y
Compatible with SM200 switch matrix	Y	Y
Active / functional trim capability	Y	Y
Custom sequence programmability	Y	Y
Turn-key systems	Y	Y
No restriction on circuit size	Y	
No restriction on resistor density	Y	
Easier job changeover (no hardware to exchange)	Y	
Optimum for high-mix, quick-turn production	Y	
Optimum for high volume production with infrequent job changes		Y
Compatible with industry standard probe cards	n/a	Y

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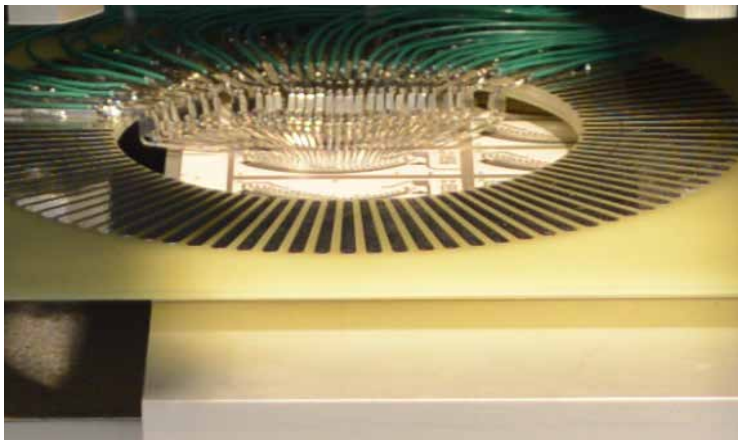

Standard Benefits.

As can be seen by the table, the RapiTrim system has significant user benefits regardless of the probing mechanism employed. Perhaps the most impact is realized within the ProSys software and the modern user interface. The layout is clean and simple, masking the power and versatility beneath. The ability to create jobs directly from DXF import has been a huge help to RapiTrim users, regardless of the probing method. Competitors' systems often require substantial programming to create a job, requiring a high skill / pay level employee.

The software has pre-set trim types (plunge, L-cut and scan cuts) with other more complex cut types (e.g. serpentine, U-cut or other) created through the custom cut function.

The actual probing method almost becomes secondary in the choice of a supplier of resistor trimmers. Given that PPI supplies both main methods you no longer need to compare apples from one supplier with oranges from another. The RapiTrim family of trimmers solves this dilemma.

Yet another alternative.

There are other custom probing methods which PPI has employed for specific customer situations. One particular probing method may be of interest to high volume applications. In one case the customer had a dense array of sensors on a substrate such that neither flying probes nor top-side probe cards were suitable. These semi-finished sensors did have backside contacts however. The solution was to have a fixture with pogo pins (1024 of them) for backside contact and clamp the substrate in place to provide secure electrical contact while the whole array is being trimmed. Each DUT is accessed in turn through the SM200 switch matrix. The unseen but significant benefit of this approach is that all overhead associated with repositioning for probing (flying probe moves or probe card up/down action) is eliminated. The resulting high throughput was quite impressive. And the part-specific fixture can be exchanged in seconds if any of the pogo pins ever become worn or the part design changes and a different fixture layout is required.

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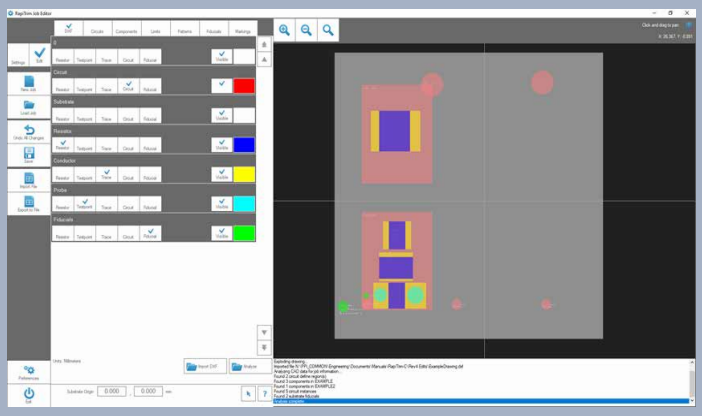
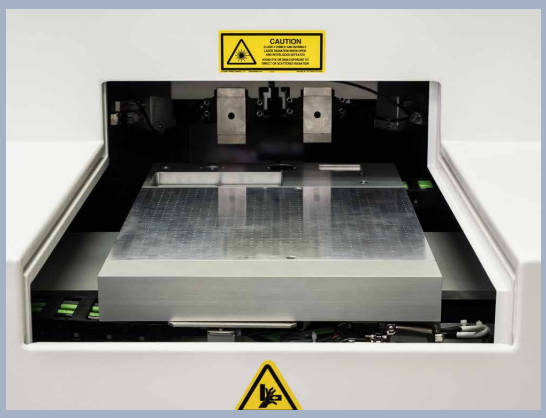
Pickup head for the optional stack loader.



Streamlined job editing with the DXF auto-import function.



Standard flat vacuum chuck on the left and a custom fixture on the right for a 3x3 array of substrates.

Whether you need flying probes or probe cards,
RapiTrim is ***The Future of Resistor Trimming™***.

Summary

As explained above, RapiTrim's fixtureless technology using four independent flying probes is ideal for quick-turn, high-mix production, allowing dense, complex circuit layouts to be trimmed as easily as simple designs. The probe card configuration is appropriate for the highest volume applications with low job changeover. PPI staff are available to help you make the choice.

A complete family of RapiTrim products is available with different wavelengths. Options include stack loaders, custom fixturing, the SM200 switching matrix, external instrument support, bar-code readers and process sequence customization.

PPI can provide turnkey solutions for all trimming needs, from standard component and circuit trim to complex active-trim scenarios with custom fixturing.