Traceability and Verification for the SMT printing Process

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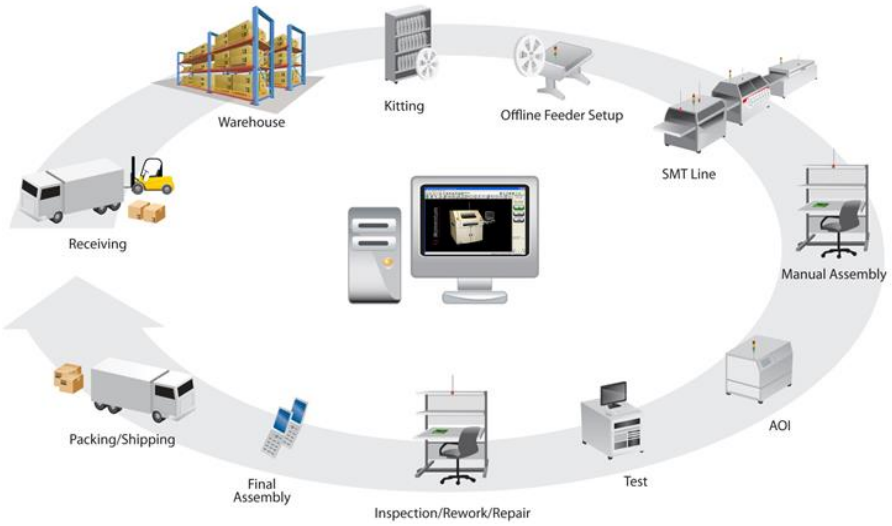
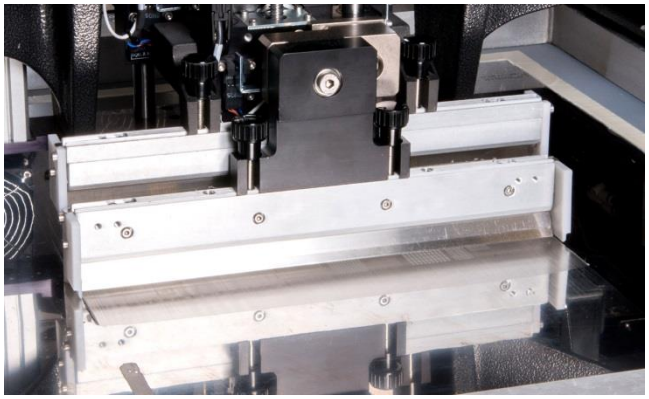
Abstract

Process traceability and verification has become increasingly important as electronics assembly has moved to higher throughputs and volume requirements with tighter process windows. Ensuring repeatable, high yields requires an optimized process that is constantly in control. Knowing and tracking every parameter relative to how a PCB has been assembled is critical to maintaining control and traceability. If and when something goes wrong, it's a lot easier to get to the source of the problem with comprehensive traceability.



The solder paste printing process is critical, since it is estimated that more than 60% of all soldering defects originate with the printing step. Accordingly, a system has been developed to add traceability, data harvesting, and reporting to the printing process. Named PrinTrack, this system creates an easily-accessible comprehensive history detailing how and when a PCB was printed, the process settings, materials, and options used to print it, and all pertinent information that can be used to track PCB assemblies and troubleshoot the process if needed.

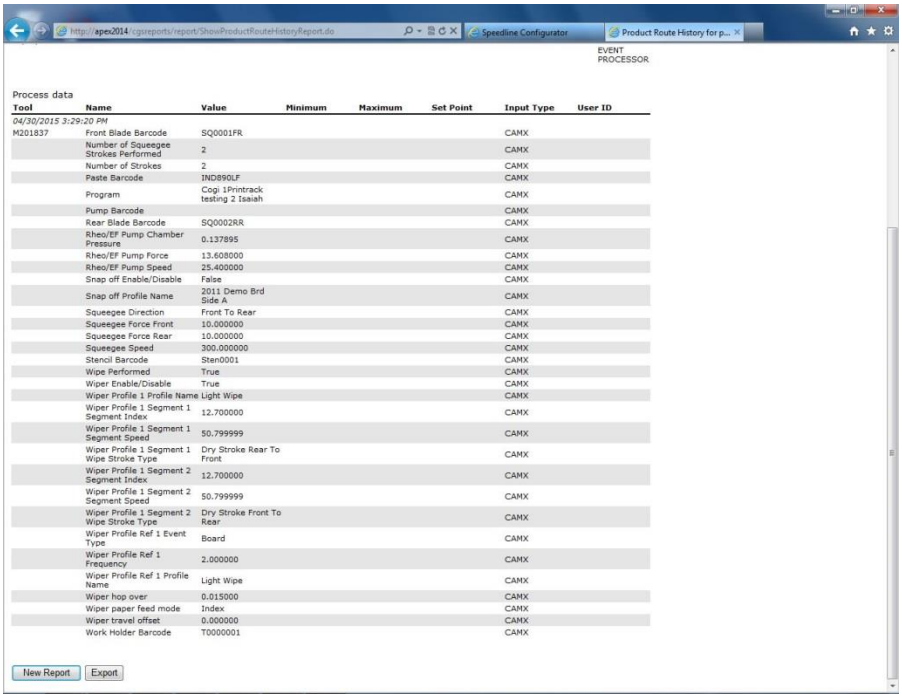


Data Collection

The primary benefit of PrinTrack is to provide real-time data collection during the production process. PrinTrack accurately tracks the printing manufacturing process parameters that allow manufacturers to trace printing-related defects and verify that correct process parameters and materials were used during the manufacturing production process. It accurately tracks manufacturing events by capturing all the printers' traceability/verification barcodes and automatically associates specific process program parameters to each board.

A flexible Web reporting interface can be user-configured to produce traceability reports. PrinTrack is a portal to the Industry 4.0 evolution; it features open architecture for seamless integration, a standard method of connecting to MES and ERP systems, and its open architecture makes it highly compatible and expandable to factory-wide Track, Trace, and Control systems.

PrinTrack collects traceability and verification data along with key process variables, including print speed, print force, squeegee stroke, and wiper profile. Other data collected includes solder paste data (part number, lot number, unique ID, etc.); tooling data for the stencil, squeegees, the program currently running, and more, including assembly part number, work order number, panel ID and other barcode information as scanned by the printer. *Traceability data across several printers is consolidated into one database residing on a server.* Reports that are generated include a product history report, a list of panel IDs, circuit IDs, work order IDs, and etc. produced with a specific solder paste or tooling. PrinTrack collects nearly two dozen different types of data from the print process; following are just a few of the types of data collected:



Tool	Name	Value	Minimum	Maximum	Set Point	Input Type	User ID
04/30/2015 3:29:20 PM							
M201837	Front Blade Barcode	SQ0001FR				CAMX	
	Number of Squeegee Strokes Performed	2				CAMX	
	Number of Strokes	2				CAMX	
	Paste Barcode	IND890LF				CAMX	
	Program	Cogi 1Printrack testing 2 Isaiah				CAMX	
	Pump Barcode					CAMX	
	Rear Blade Barcode	SQ0002RR				CAMX	
	Rheo/EF Pump Chamber Pressure	0.137895				CAMX	
	Rheo/EF Pump Force	13.608000				CAMX	
	Rheo/EF Pump Speed	25.400000				CAMX	
	Snap off Enable/Disable	False				CAMX	
	Snap off Profile Name	2011 Demo Brd Side A				CAMX	
	Squeegee Direction	Front To Rear				CAMX	
	Squeegee Force Front	10.000000				CAMX	
	Squeegee Force Rear	10.000000				CAMX	
	Squeegee Speed	300.000000				CAMX	
	Stencil Barcode	Sten0001				CAMX	
	Wipe Performed	True				CAMX	
	Wiper Enable/Disable	True				CAMX	
	Wiper Profile 1 Profile Name	Light Wipe				CAMX	
	Wiper Profile 1 Segment 1 Segment Index	12.700000				CAMX	
	Wiper Profile 1 Segment 1 Segment Speed	50.799999				CAMX	
	Wiper Profile 1 Segment 1 Wipe Stroke Type	Dry Stroke Rear To Front				CAMX	
	Wiper Profile 1 Segment 2 Segment Index	12.700000				CAMX	
	Wiper Profile 1 Segment 2 Segment Speed	50.799999				CAMX	
	Wiper Profile 1 Segment 2 Wipe Stroke Type	Dry Stroke Front To Rear				CAMX	
	Wiper Profile Ref 1 Event Type	Board				CAMX	
	Wiper Profile Ref 1 Frequency	2.000000				CAMX	
	Wiper Profile Ref 1 Profile Name	Light Wipe				CAMX	
	Wiper hop over	0.015000				CAMX	
	Wiper paper feed mode	Index				CAMX	
	Wiper travel offset	0.000000				CAMX	
	Work Holder Barcode	T0000001				CAMX	

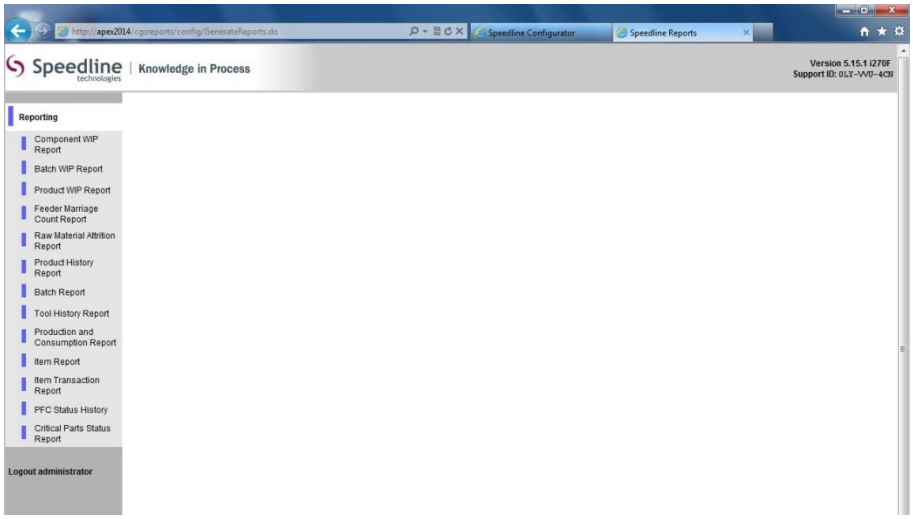
- Assembly Part Number
- Stencil Barcode
- Paste Barcode
- Front Squeegee Blade Barcode
- Rear Squeegee Blade Barcode
- Panel ID Serial Number Barcode
- Board ID Serial Numbers Barcodes
- Number of Squeegee Strokes Performed
- Squeegee Direction, Force, and Speed
- Wiper Profile Frequency
- Snap-off Profile

Three different barcode scanners are used by the system. The Handheld scanner is used for process program verification and for data entry. At certain times, the operator is asked to scan barcodes such as

stencil, solder paste, work-holder, squeegee blades and others. Barcodes are previously ‘taught’ during configuration for production.

An externally-mounted Board Level scanner is used to verify that the correct board is loaded for the process program. It also captures and tracks barcodes on a board-to-board basis. This barcode data is logged to the SPC database and can be used in conjunction with the process program logs to determine the operating parameters at the time the board was printed.

The Internal Camera Scanner is used only for traceability (to track individual panels within a single board). Each panel will have its own barcode; thus, prior to production, panel barcode locations must be identified using a teach routine in conjunction with the camera vision system.



All information is collected and stored for reference and retrieval. Should there be a problem or a question with a PC board or with a batch of boards, an engineer can quickly obtain all the data relevant to how that board or group of boards was printed, the materials used, the machine settings, everything relevant so that forensic analyses, if needed, can be performed.

PrinTrack was developed in partnership with Cogiscan, which provided the enabling technology for the data collected by the printer operating program and barcode readers to be collected, organized, and exported to a server. Without this capability, the collected information would remain in the printer’s operating system, less accessible and usable. With this communication, wider possibilities emerge.

With the PrinTrack system powered by Cogiscan, data can be exported in an MS Excel file. The data can also be accessed remotely through any computer that can connect to the server. The Cogiscan system also has the ability to communicate with other equipment in the line. Open architecture for seamless integration and its standard method of connecting to MES and ERP systems make PrinTrack highly compatible with other systems; in fact it can be expanded to factory-wide Track, Trace, and Control systems.

The need for traceability and verification has become increasingly important in today’s electronics manufacturing environment, especially for aerospace and hi-rel products where quality must be strictly controlled. In contract assembly, the ability to provide the customer with traceability data is often a requirement. Traceability and verification helps the manufacturer achieve long-term goals of process

improvement and optimization. As the industry moves toward distant goals of ‘Industry 4.0’ concepts, tools such as PrinTrack traceability and verification become essential enablers for creating the larger picture.

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