

SE 300 Registration Measurements

Registration measurements provide information about how closely the centroids of the solder paste deposits align with the centroids of the features. The values reported by the SE 300 represent the amount of shift between the solder paste and the features, or the amount of *misregistration*. A reported value of zero would indicate that the paste is perfectly aligned on the panel. The SE 300 measures the registration of each feature (or pad) and then calculates registration of the overall component location, image, or panel. Registration results are used to flag failures or to diagnose registration problems.

Failure Detection

The system flags registration failures if the feature-level measurements (offsets) exceed limits specified in Teach, if paste extends beyond the measurement area on two sides of a feature (boundary violation), or if the number of failures exceeds preset limits (failure counts). These failure conditions are described in more detail below.

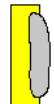
Offset Long/Short

Long and short offset limits are set up at the feature level in the Teach application. Feature-level offsets are the only registration measurements for which tolerances can be set.

- **Offset Long:** Amount of shift in registration measured in the direction of the longest side of the feature. The value is expressed as a percentage of the long side dimension.
- **Offset Short:** Amount of shift in registration measured in the direction of the shortest side of the feature. The value is expressed as a percentage of the short side dimension.



Offset Long



Offset Short

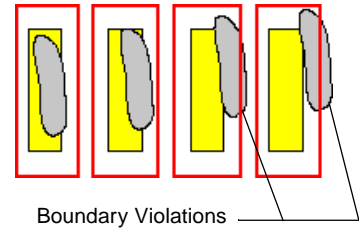
Par ID	Height	Volume	Area	Offset Short	Offset Long	Offset X	Offset Y	Registration Status	Bridge Length	Date/Time
#14	3.176	2862.862438	874.096813	3%	8%	-0.353	-5.793	Bdry. Viol. - Opposing sides	27.660	12-Jun-2003 09:53:42
#13	3.161	2832.433559	872.252620	3%	8%	-0.294	-5.801	Bdry. Viol. - Opposing sides	26.869	12-Jun-2003 09:53:19
#12	3.134	2784.413364	866.582863	3%	8%	-0.305	-5.742	Bdry. Viol. - Opposing sides	27.660	12-Jun-2003 09:52:57
#11	3.166	2823.634545	870.570091	3%	8%	-0.290	-5.711	Bdry. Viol. - Opposing sides	26.869	12-Jun-2003 09:52:34
#10	3.158	2812.850429	865.106020	2%	8%	-0.262	-5.829	Bdry. Viol. - Opposing sides	26.079	12-Jun-2003 09:52:11
#9	3.145	2829.775364	873.104966	3%	8%	-0.305	-5.927	Bdry. Viol. - Opposing sides	29.240	12-Jun-2003 09:48:41
#8	3.166	2841.161785	872.375070	3%	8%	-0.329	-5.813	Bdry. Viol. - Opposing sides	29.240	12-Jun-2003 09:48:18
#7	3.160	2833.448383	870.102300	3%	9%	-0.294	-5.978	Bdry. Viol. - Opposing sides	30.030	12-Jun-2003 09:47:55
#6	3.134	2823.466730	868.912053	3%	8%	-0.302	-5.848	Bdry. Viol. - Opposing sides	28.450	12-Jun-2003 09:47:31
#5	3.186	2848.578611	864.613739	3%	8%	-0.294	-5.876	Bdry. Viol. - Opposing sides	29.240	12-Jun-2003 09:45:48
#4	3.169	2813.906750	857.839451	2%	8%	-0.215	-5.821	Bdry. Viol. - Opposing sides	26.869	12-Jun-2003 09:45:25

Registration measurements Calculated data (see page 3) Boundary violation indication (see next page)

Figure 1. Numeric Report: Feature-Level Data

Boundary Violations

Boundary violations occur when the paste intersects or touches the edge of the measurement area. Because the software cannot determine how much paste extends beyond the measurement area, boundary violations invalidate registration measurements.



The measurement results include a field that indicates whether the feature has a boundary violation and the number of sides affected by the violation (see Figure 1). The field may contain one of these messages:

- **No Bdry. Viol.:** Registration measurement is valid with no boundary violations.
- **Bdry. Viol. - One Side:** A boundary violation occurred on one side of the measurement area. This feature is excluded from the registration failure counts.
- **Bdry. Viol. - Opposing Sides:** A boundary violation occurred on two opposing sides of the measurement area. When a boundary violation occurs on opposing sides of a feature, registration diagnostics data do not include that feature's registration measurements. Opposing Sides boundary violations also cause a measurement failure.

Failure Counts

The system flags a failure when accumulations of registration failures exceed limits set in the Teach application. Failure count limits can be set at the location, image, and panel levels. Registration failures that contribute to the failure count tallies are:

- Offset long
- Offset short
- Boundary violation on opposing sides of the feature

Panel ID	Location Failures H/A/N	Feature Failures H/A/N	Location Failures Reg	Feature Failures Reg	Location Failures Bridging	Feature Failures Bridging	Offset X	Offset Y	Rotation	Scaling (%)	Valid / Possible	Date/Time
#24	11	844	4	66	3	34	-0.790	-1.321	-0.005	0%	194/1058	12-Jun-2003 10:23:58
#23	11	841	4	87	3	35	-0.773	-1.408	-0.004	0%	196/1058	12-Jun-2003 10:23:35
#22	11	844	4	75	3	33	-0.778	-1.352	-0.005	0%	192/1058	12-Jun-2003 10:23:12
#21	11	843	4	79	3	33	-0.777	-1.385	-0.005	0%	197/1058	12-Jun-2003 10:22:49
#20	10	840	4	73	3	33	-0.802	-1.333	-0.005	0%	196/1058	12-Jun-2003 10:22:26
#19	11	840	4	82	3	33	-0.808	-1.399	-0.004	0%	192/1058	12-Jun-2003 10:22:03
#18	11	835	4	77	3	33	-0.811	-1.368	-0.005	0%	201/1058	12-Jun-2003 10:21:39
#17	11	845	4	73	3	34	-0.771	-1.404	-0.005	0%	192/1058	12-Jun-2003 10:21:16
#16	11	835	4	63	3	33	-0.798	-1.361	-0.006	0%	195/1058	12-Jun-2003 10:20:53
#15	11	845	4	65	3	32	-0.745	-1.321	-0.005	0%	193/1058	12-Jun-2003 10:20:29
#14	11	854	4	55	3	32	-0.787	-1.303	-0.005	0%	180/1058	12-Jun-2003 09:53:36

Registration failure counts

Registration data calculated for diagnostics (see next page)

Figure 2. Numeric Report: Image-Level Data

Diagnostics Data

The system uses feature-level measurements to calculate overall registration data for the feature, location, image or panel. The SE 300 uses only data from features with valid measurements for overall registration calculations. Features that fail for paste height, area, or volume and features with boundary violations are considered invalid and are not used in the calculation for overall location, board, or panel registration results. Diagnostic data is displayed in the Numeric report for analysis only; the results do not flag registration failures nor can you set tolerances for these parameters.

- **Offset X:** Amount of shift in registration across the feature, location, image, or panel measured in the X axis.
- **Offset Y:** Amount of shift in registration across the feature location, image, or panel measured in the Y axis.
- **Rotation:** Amount of rotation across the location, image, or panel. Positive values indicate a counter-clockwise rotation, negative values indicate a clockwise rotation.
- **Scaling:** Amount of stretch in registration across the location, image, or panel. This value is expressed as a percentage of the X and Y dimensions. Positive values indicate a stretched pattern, negative values indicate a contracted pattern.
- **Valid/Possible:** The measurement results include a field which indicates the number of feature-level measurements used (Valid) to determine the registration versus the total number of inspectable features in the element (Possible).

Note: See Figure 2 on page 2 for an example of how diagnostic data is reported.

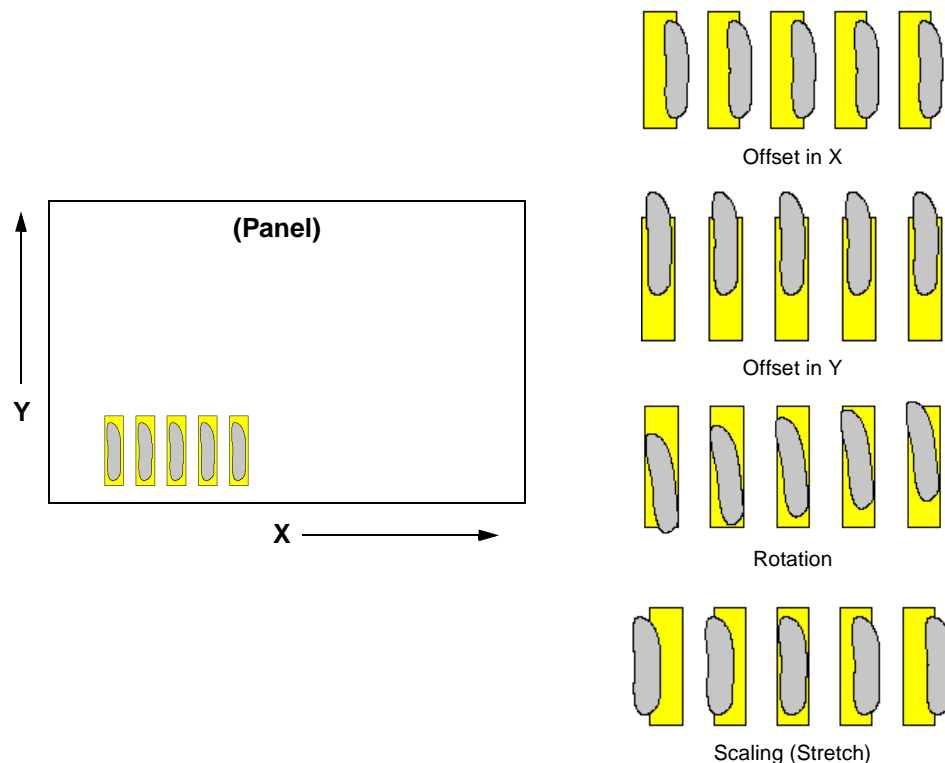


Figure 3. Types of Registration Data

For More Information

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