

Dots

Fingerprint close match experiments for different types of dots were performed to better understand how they occur in fingerprints and to estimate their relative values, e.g., probabilities. Sets of 500 and 1000 flat fingerprint samples, e.g., 50 and 100 ten-print records from different individuals, were used for the experiments.

The different types of dots tested were defined as follows:

Single Dots

The single dot was defined as a single ridge unit *not greater* than .5mm wide and .5mm long *and with no Level II neighbor within 1mm in the same furrow*. No distinction is made between incipient or immature dots and mature dots. For purposes of simplicity, any clear, apparently reliable dot, *regardless of size*, was defined as a “single dot” as long as its nearest Level II neighbor in the same furrow was measured to be more than 1mm distant. *

* Note: The measure “1mm” was initially selected for testing based on the sum of the rough size of the average ridge unit, e.g., 0.5mm, and the rough size of the empty space needed to separate a dot from its nearest neighbor in order to be classified as a dot, e.g., 0.5mm. The idea was that if the distance between a dot and its nearest Level II neighbor in the same furrow, if any, is greater than 1mm, then the dot is not connected to or specifically influenced by that neighbor. As a result, such a dot should be *independent* and therefore bear greater weight and discriminatory power compared to a dot located within 1mm of a Level II neighbor, e.g., a cluster dot.

Cluster Dots

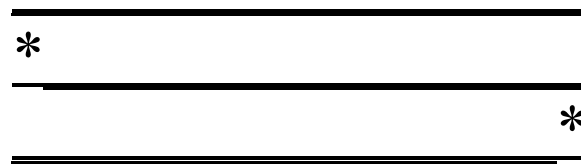
The cluster dot was defined as a single ridge unit, e.g., *not greater* than .5mm width and .5mm long *and with a Level II neighbor less than 1mm distant in the same furrow*. Again, there was no distinction made between incipient or immature dots and mature dots. Any clear, apparently reliable dot, *regardless of size*, was defined as a “cluster dot” as long as its nearest Level II neighbor in the same furrow was measured to be less than 1mm distant.

Eight (8) close match experiments were performed to test the above theories using the below arrangements of dots. Based on T-Model formulae, the weight

The number of “close matches” for each arrangement was counted. The weight for each arrangement was then estimated using lower bound values rounded down to the nearest half. See chart “Value for Dots”.

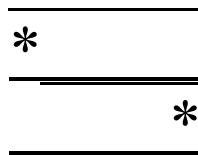
1. **2 single dots:** 2 dots 3mm apart (e.g., with consideration for 20% friction skin elasticity thresholds, i.e. 2.4 - 3.6mm) and separated by 1 intervening ridge with **no** Level II neighbor within *1 mm* of either dot in the same furrow.

Number of close matches observed: **6**



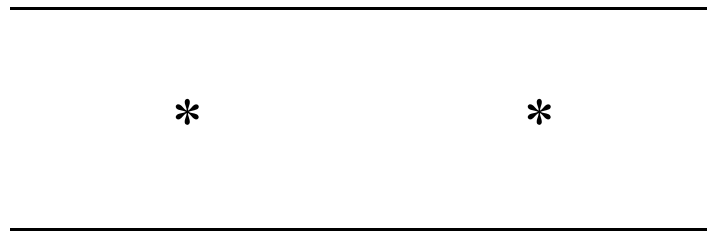
2. **2 single dots:** 2 dots 1mm apart (e.g., with consideration for 20% friction skin elasticity thresholds, i.e. 0.8 – 1.2mm) separated by 1 intervening ridge with **no** Level II neighbor within *1 mm* of either dot in the same furrow.

Number of close matches observed: **16**



3. **2 single dots:** 2 dots 2mm apart (e.g., with consideration for 20% friction skin elasticity thresholds, i.e. 1.6 – 2.4mm) and in the same furrow with no Level II neighbor within *1 mm* of either dot in the same furrow.

Number of close matches observed: **16**



4. **2 clustered dots:** 2 dots 0.5-1mm apart and in the same furrow.

Number of close matches observed in 500 flat fingerprints **250**





5. **3 clustered dots:** 3 dots 0.5-1mm apart in same furrow.

Number of close matches observed in 500 flat fingerprints: **83**



6. **4 clustered dots:** 4 dots 0.5-1mm apart in same furrow.

Number of close matches observed in 500 flat fingerprints: **40**



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7. **5 clustered dots:** 5 dots 0.5-1mm apart in same furrow.

Number of close matches observed in 500 flat fingerprints: **19**

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8. **6 clustered dots:** 6 dots 0.5-1mm apart in same furrow.

Number of close matches observed in 500 flat fingerprints: **6**

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Observations and Conclusions

Numbers of close matches for arrangements of cluster dots were larger than numbers of close matches for arrangements of single dots. As a result, single dots were deemed more rare and bearing more discriminatory power than cluster dots. As a result the T-Model accorded quantitative weights for single dots and cluster dots in line with results from close match experiments.

Weight for a Single Dot

The weight accorded to a **single dot** was simplest to define since results from experiments were fairly consistent. Based on T-Model formulae the weight (probability) accorded to a single dot was as follows:

45 (e.g., a probability of **1/45**)

Weight for a Clustered Dot

Clusters of dots in the same furrow with more dots were found to occur less frequently than clusters of dots with fewer dots. As a result, clusters of dots in the same furrow with more dots were accorded more weight than clustered dots in a furrow with fewer dots.

As a result, best conservative, e.g., lower-bound, estimated standard and aggregate weights (probabilities) for numbers of clustered dots in a furrow separated by less than 1mm were defined as follows:

2 clustered dots = $9^2 = 81$	(1/81)	Value (Probability) per dot = 9 (1/9)
3 clustered dots = $6^3 = 216$	(1/216)	Value (Probability) per dot = 6 (1/6)
4 clustered dots = $4.5^4 = 410$	(1/410)	Value (Probability) per dot = 4.5 (1/4.5)
5 clustered dots = $3.5^5 = 525$	(1/525)	Value (Probability) per dot = 3.5 (1/3.5)
6 clustered dots = $3^6 = 729$	(1/729)	Value (Probability) per dot = 3 (1/3)