

RONCHI RULING FREQUENCY	PERIOD IN MICRONS	LINE OR SPACE WIDTH	ALTA3500 ADDRESS SIZE μ	CUMM ERROR DECISION POINT μ	LINE WIDTH DIVIDED BY ADDRESS SIZE	CL-CL TOTAL WIDTH OF RULING μ	EDGE-EDGE TOTAL WIDTH OF RULING μ	EDGE-EDGE TOTAL WIDTH DIVIDED BY ADDRESS SIZE	TOTAL NUMBER OF EVEN ADDRESS INCREMENTS	CALCULATED ADDRESS SNAP ERROR μ	PERIODIC ADDRESS SNAP ERROR μ	SNAP ERROR OCCURS EVERY NUMBER OF LINE PAIRS	NUMBER OF LINE PAIRS IN RULING	MAXIMUM REPLICATION TOLERANCE μ	OVERALL SNAP PLUS REPLICATION ERROR μ
60LP/mm	16.6667	8.33333	0.08333	0.04167	100.004	4,483.333	4,491.666	53902.152	53902	0.01267	0.08333	62.50	18681	0.06574	0.07841
80LP/mm	12.5000	6.25000	0.08333	0.04167	75.003	4,487.500	4,493.750	53927.157	53927	0.01309	0.08333	83.33	14023	0.06580	0.07889
100LP/mm	10.0000	5.00000	0.08333	0.04167	60.002	4,490.000	4,495.000	53942.158	53942	0.01314	0.08333	125	11225	0.06584	0.07898
120LP/mm	8.3333	4.16667	0.08333	0.04167	50.002	4,491.667	4,495.834	53952.162	53952	0.01351	0.08333	125	9358	0.06586	0.07937
140LP/mm	7.1429	3.57143	0.08333	0.04167	42.859	4,492.857	4,496.428	53959.300	53959	0.02496	0.08333	1.77	8023	0.06588	0.09084
160LP/mm	6.2500	3.12500	0.08333	0.04167	37.502	4,493.750	4,496.875	53964.659	53965	0.02845	0.08333	0.50	7021	0.06589	0.09434
180LP/mm	5.5556	2.77778	0.08333	0.04167	33.335	4,494.444	4,497.222	53968.820	53969	0.01499	0.08333	0.75	6242	0.06590	0.08089
200LP/mm	5.0000	2.50000	0.08333	0.04167	30.001	4,495.000	4,497.500	53972.159	53972	0.01324	0.08333	250	5619	0.06591	0.07915
220LP/mm	4.5455	2.27273	0.08333	0.04167	27.274	1,795.455	1,797.728	21573.596	21574	0.03369	0.08333	0.91	2040	0.02633	0.06002
240LP/mm	4.1667	2.08333	0.08333	0.04167	25.001	1,795.833	1,797.916	21575.859	21576	0.01175	0.08333	250	1871	0.02633	0.03808
260LP/mm	3.8462	1.92308	0.08333	0.04167	23.078	1,796.154	1,798.077	21577.788	21578	0.01766	0.08333	3.21	1727	0.02634	0.04400
280LP/mm	3.5714	1.78571	0.08333	0.04167	21.429	1,796.429	1,798.215	21579.440	21579	0.03664	0.08333	0.58	1604	0.02634	0.06298
300LP/mm	3.3333	1.66667	0.08333	0.04167	20.001	1,796.667	1,798.334	21580.867	21581	0.01106	0.08333	250	1497	0.02634	0.03740
320LP/mm	3.1250	1.56250	0.08333	0.04167	18.751	1,796.875	1,798.438	21582.113	21582	0.00944	0.08333	1.00	1404	0.02635	0.03579
340LP/mm	2.9412	1.47059	0.08333	0.04167	17.648	1,797.059	1,798.530	21583.218	21583	0.0182	0.08333	0.71	1321	0.02635	0.04455
360LP/mm	2.7778	1.38889	0.08333	0.04167	16.667	1,797.222	1,798.611	21584.194	21584	0.01617	0.08333	0.75	1248	0.02635	0.04252
380LP/mm	2.6316	1.31579	0.08333	0.04167	15.790	1,797.368	1,798.684	21585.069	21585	0.00574	0.08333	1.19	1182	0.02635	0.03209

COLUMN A: RONCHI RULING FREQUENCY IN LINE PAIRS PER MM.

COLUMN B: 1000 MICRONS DIVIDED BY THE RONCHI RULING LP/mm. EXAMPLE $1000/240 = 4.1667$ MICRONS.

COLUMN C: LINE OR SPACE WIDTH = 1000 MICRONS DIVIDED BY THE RONCHI RULING (LP/mm X 2). EXAMPLE $1000/(240 \times 2) = 2.0833$ MICRONS.

COLUMN D: ALTA 3500 ADDRESS SIZE: THIS IS THE GRID LAYOUT REPRESENTING THE SMALLEST INCREMENTAL DISTANCE BETWEEN TWO SNAP POINTS FOR GENERATION OF THE PHOTOTOOL. ALL DISTANCES BETWEEN TWO POINTS ARE REPRESENTED BY AN UNIQUE NUMBER OF ADDRESS UNITS. THE WIDTH OF FEATURES THAT CANNOT BE REPRESENTED IN INTEGER ADDRESS UNITS ARE SNAPPED TO THE CLOSEST POINT ON THE ADDRESS GRID.

COLUMN E: CUMULATIVE ERROR DECISION POINT: THIS IS 1/2 THE ADDRESS SIZE. WHEN THE CUMMULATIVE ERROR EXCEEDS THIS NUMBER THE SNAP IS TO THE NEXT ADDRESS POINT ON THE GRID. WHEN THIS SNAP OCCURS THE ERROR BETWEEN THE LAST POINT AND THE NEXT POINT IS ONE ADDRESS UNIT.

COLUMN F: LINE WIDTH DIVIDED BY ADDRESS SIZE: THIS GIVES US THE NUMBER OF THEORETICAL ADDRESS UNITS IN ONE LINE WIDTH OR ONE SPACE WIDTH AT THIS RONCHI RULING FREQUENCY.

COLUMN G: CENTERLINE TO CENTERLINE OF TOTAL WIDTH OF RULING: THIS IS THE DISTANCE BETWEEN THE CENTER OF THE FIRST OPAQUE LINE IN THE RULING AND THE CENTER OF THE LAST OPAQUE LINE IN THE RULING IN MICRONS FOR THE SPECIFIED RONCHI RULING FREQUENCY.

COLUMN H: EDGE-EDGE TOTAL WIDTH OF RULING IN MICRONS: THIS IS THE DISTANCE FROM THE LEFT EDGE OF THE FIRST OPAQUE LINE TO THE RIGHT EDGE OF THE LAST OPAQUE LINE IN MICRONS.

COLUMN I: EDGE-EDGE TOTAL WIDTH DIVIDED BY ADDRESS SIZE: THIS GIVES US THE TOTAL NUMBER OF ADDRESS SNAPS FROM THE START OF THE FIRST OPAQUE RULING LINE TO THE END OF THE LAST OPAQUE RULING LINE.

COLUMN J: TOTAL NUMBER OF EVEN ADDRESS INCREMENTS: SINCE THE SYSTEM WILL SNAP TO A POINT ON THE ADDRESS GRID TO COMPLETE THE LAST LINE THIS IS THE TOTAL NUMBER OF ADDRESS INCREMENTS.

COLUMN K: CALCULATED ADDRESS SNAP ERROR: THIS IS NUMBER OF GRID ADDRESSES (J) TIMES THE ADDRESS INCREMENT (D) MINUS THE THEORETICAL EDGE-EDGE TOTAL WIDTH OF THE RULING (H) NORMALIZED TO A POSITIVE NUMBER.

COLUMN L: PERIODIC ADDRESS SNAP ERROR: THIS IS THE ADDRESS SIZE; HOWEVER, WHEN THE RULING LINE WIDTH IS AN EXACT MULTIPLE OF THE ADDRESS THERE IS NO PERIODIC ADDRESS SNAP ERROR.

COLUMN M: SNAP ERROR OCCURS EVERY NUMBER OF LINE PAIRS: THIS NUMBER IS ONE HALF THE ADDRESS (E), DIVIDED BY THE PRODUCT OF THE PARTIAL NUMBER OF ADDRESS INCREMENTS THAT REPRESENT THE LINE WIDTH (DERIVED FROM J) TIMES THE ADDRESS SIZE (D) X 2. IN THE CASE WHERE THE PARTIAL ADDRESS SIZE BECOMES EQUAL TO OR GREATER THAN .5, THE SNAP WOULD BE TO THE NEXT GRID POSITION; OR, A JUMP OF ONE ADDRESS INCREMENT OF .08333 MICRONS.

COLUMN N: NUMBER OF LINE PAIRS IN RULING: THIS EQUALS THE OVERALL RULING WIDTH (G) DIVIDED BY THE PERIOD OF THE RULING (B)

COLUMN O: MAXIMUM REPLICATION TOLERANCE: THIS IS THE WIDTH OF THE RULING (G) DIVIDED BY THE LENGTH OF THE RULE ON THE SCALE (68,200 MICRONS) X 1. (THE TOLERANCE ON THE LINE RULE LENGTH IS +/-1 MICRON.)

COLUMN P: OVERALL SNAP PLUS REPLICATION ERROR: THIS IS THE SUM OF CALCULATED ADDRESS SNAP ERROR (K) AND THE MAXIMUM REPLICATION TOLERANCE (O). THIS RESULT IS IN MICRONS AND WOULD INDICATE THAT THE OVERALL ERROR OF ANY OF THE RULINGS IS LESS THAN THE ADDRESS ERROR OF .08333 MICRONS.